Department of the Army

Installation Management Command

Draft Environmental Assessment for the Construction, Operation and Maintenance of a Dense Urban Terrain Complex

Fort Irwin, California

November 2018

Notice: Reviewers should provide the Department of the Army (DA) with their comments during the review period of the environmental assessment (EA). This will enable the DA to analyze and respond to the comments at one time and to use information acquired in the preparation of the EA, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions (Vermont Yankee Nuclear Power Corp. v. NRDC, 435 United States [U.S.] 519, 553, 1978).

Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the Final Environmental Impact Statement (City of Angoon v. Hodel, 9th Cir, 1986; and Wisconsin Heritages Inc., v. Harris, 490F. Supp. 1334, 1338, E.D. Wis. 1980). Comments on the EA should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 Code of Federal Regulations [CFR] § 1503.3).

Comments received in response to this document, including names and addresses of those who comment, will be considered part of the public record on this proposed action and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who submit anonymous comments will not have standing to appeal the subsequent decision under 36 CFR Parts 215 or 217. Additionally, pursuant to7 CFR § 1.27(d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that, under FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets. The DA will inform the requester of the agency's decision regarding the request for confidentiality, and where the request is denied the agency will return the submission and notify the requester that the comments may be resubmitted, with or without name and address.

Additional documentation, reports, and analysis referenced in this document can be found in the administrative record files. These items have not been included in this document due to the technical nature, excessive length, or are reference materials used to develop the analysis in this document. All supporting documents in the planning record are located at the Environmental Management Division, Directorate of Public Works, Fort Irwin, California.

SIGNATURE PAGE

ENVIRONMENTAL ASSESSMENT

Dense Urban Terrain Complex

Proponent: U.S. Army Garrison, Fort Irwin, California

NEPA Lead agency: U.S. Army Garrison, Fort Irwin, California

APPROVAL

This Environmental Assessment meets the requirements of the National Environmental Protection Agency, 40 CFR 1500-1508, Army Regulation (AR) 200-1, Environmental Protection and Enhancement, dated 13 December 2007 and 32 CFR 651 (AR 200-2) Environmental Analysis of Army Actions, dated 29 March 2002.

Date	Coral A. Eginton Installation Archaeologist
Date	Muhammad A. Bari, P.E. Director, Public Works
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EXECUTIVE SUMMARY

ES.1 Introduction

This Environmental Assessment (EA) evaluates potential environmental effects from the construction, operation, and maintenance of a Dense Urban Terrain (DUT) complex at Fort Irwin. This will allow the Army to provide adequate DUT training on Fort Irwin to allow the Army to conduct Brigade Combat Team (BCT)-level urban terrain training simultaneously with maneuver training or as a standalone training event. A DUT training complex located in an area of Fort Irwin, which minimizes operational constraints and provides flexibility for future expansion, is needed to provide critical training in capture, security, and control of urban terrain to units of all types and sizes.

ES.2 Description of Proposed Action and Alternatives

Proposed Action

The Preferred Action Alternative would construct and operate a DUT complex on approximately 4,000 acres of land in Training Areas (TA) N1, N2, N3, N4, and LF3 near the National Aeronautics and Space Administration (NASA) Goldstone Deep Space Communications Complex (GDSCC) property, approximately 14 miles northwest of Fort Irwin. Infrastructure (i.e. roadway and utility) improvements and extensions under the Preferred Alternative would extend from the western portion of the cantonment area northwest, through the NASA GDSCC property, until intersecting with affected TAs. The road and utility components of the Preferred Alternative would disturb up to approximately 255 acres of land. The location, size, availability, and environmental conditions of TAs N1, N2, N3, N4, and LF3 would support the Proposed Action and, over the long-term, allow for potential future expansion of the DUT complex.

No-Action Alternative

Under the No-Action Alternative, construction and operation of a DUT complex would not occur. The Army would continue to utilize existing Military Operations on Urban Terrain (MOUT) facilities at Fort Irwin. Army Soldiers, as well as other Department of Defense (DoD), Joint, and Allied personnel, would continue to lack a comprehensive training complex able to simulate real-world urban battlefields. The lack of such a complex would preclude BCTs and other units from engaging in urban conflict scenarios that replicate current and future threats. Under the No-Action Alternative, Fort Irwin would not be able to conduct BCT-level DUT training in concert with maneuver training as would be required under a real-world deployment scenario. Overall, the No-Action Alternative fails to address emerging training requirements for BCTs operating in DUT, reducing military readiness.

ES.3 Summary of Environmental Analysis

Table ES-1: Alternatives Comparison Matrix

Technical Resource Area[1]	Proposed Action Alternative	No-Action Alternative
Aesthetics	Less than significant effects to aesthetics would occur.	No change from status quo.
Geology and Soils	Less than significant effects to geology and soils would occur.	No effect to geology and soils and change from status quo.
Biological Resources	Less than significant effects are anticipated to biological resources.	No short-term change from status quo. Long-term effects comparable to Proposed Action Alternative.

Technical Resource Area[1]	Proposed Action Alternative	No-Action Alternative
Water Resources	Less than significant effects to water resources.	No change from the status quo.
Air Quality	The Proposed Action would result in a short-term increase in PM_{10} emissions from construction, but impacts would be below the *de minimus* threshold.	Military training activities would continue to affect local and regional air quality in accordance with the status quo.
Cultural Resources	Less than significant effects to cultural resources.	No change from status quo.
Hazardous and Toxic Materials/Waste	Less than significant effects.	No change from status quo.
Human Health and Safety	Less than significant effects.	Human health and safety risks to military and civilian workers would not change from status quo.
Transportation and Traffic	Less than significant effects.	No short-term change from status quo. No roadway improvements would occur under the No-Action alternative.
Utilities and Infrastructure	Less than significant effects.	No short-term change from status quo.

[1] Land Use, Noise, Mineral Resources, Socioeconomics, and Environmental Justice were not retained for detailed analysis based on a preliminary review of potential effects. See **Section 2.2** for the justification of removing these resources from further consideration.

ES.4 Finding and Conclusions

The Proposed Action would not result in significant impacts to the human or natural environment. Implementation of the Proposed Action would allow the Army to accomplish its mission while minimizing any significant direct, indirect, or cumulative effects. Further, no mitigation measures are necessary to reduce potential adverse environmental impacts to below significance. Therefore, the Army concludes that an Environmental Impact Statement (EIS) is not necessary to implement the Proposed Action.

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Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AAQS	Ambient Air Quality Standards
ACM	asbestos-containing Material
AFCCC	Air Force Combat Climatology Center
afy	acre-feet per year
AR	Army Regulation
ARB	Air Resources Board
APE	area of potential effects
AST	aboveground storage tank
Army	U.S. Army
asl	above sea level
BCT	Brigade Combat Team
BLAAF	Bicycle Lake Army Air Field
BLM	Bureau of Land Management
BMP	best management practice
BO	biological opinion
CAA	Clean Air Act
CAAA	CAA Amendments
CAAQS	California ambient air quality standards
CalEEMod	California Emissions Estimator Model
CalRecycle	California Department of Resources Recycling and Recover
CDCA	California Desert Conservation Area
CDFW	California Department of Fish and Wildlife
CDNPA	California Desert Native Plants Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFCs	chlorofluorocarbons
CFR	Code of Federal Regulations
CGP	Construction General Permit
CH2M	CH2M Hill
CH_4	methane

CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CTC	Combat Training Center
CWA	Clean Water Act
DA	Department of the Army
DA PAM	Department of the Army Pamphlet
DoD	Department of Defense
DPW	Directorate of Public Works (Fort Irwin)
DTSC	[California] Department of Toxic Substances Control
DUT	Dense Urban Terrain
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FICRD	Fort Irwin Cultural Resources Database
FOIA	Freedom of Information Act
GDSCC	Goldstone Deep Space Communications Complex
GHG	greenhouse gas
GIS	Geographic Information System
GWP	global warming potential
HFCs	Hydrofluorocarbons
HWMP	hazardous waste management plan
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management Plan
ITAM	integrated training area management
kV	kilovolt
LOS	level of service
m	meter
MBTA	Migratory Bird Treaty Act

MDAQMD	Mojave Desert Air Quality Management District
MFTL	Mojave fringe-toed lizard
mgd	million gallons per day
MGS	Mohave ground squirrel
MOUT	Military Operations on Urban Terrain
MT	metric tons
NAGPRA	Native American Graves Protection and Repatriation Act
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NAWS	Naval Air Weapons Station
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTC	National Training Center
OB/OD	Open Burning/Open Detonation
OSHA	Occupational Safety and Health Act
O_3	ozone
ODC	ozone depleting chemicals
PFCs	perfluorocarbons
PM_{10}	Particulate Matter (less than 10 microns in diameter)
$PM_{2.5}$	Particulate Matter (less than 2.5 microns in diameter)
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
ROG	reactive organic gases
RONA	record of non-applicability
ROW	right-of-way
RWQCB	Regional Water Quality Control Board
SDWA	Safe Drinking Water Act

SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office(er)
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPCC	Spill Prevention and Countermeasure Control
SWPPP	Storm Water Pollution Prevention Plan
TA	training area
TCP	traditional cultural properties
tpd	tons per day
tpy	tons per year
TSCA	Toxic Substances Control Act
U.S.	United States
U.S.C.	United States Code
US EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UXO	unexploded ordnance
VOC	volatile organic compounds
WEMO	West Mohave Plan
WTP	water treatment plant
WWTP	wastewater treatment plant

1 Purpose and Need

1.1 Introduction

The United States (U.S.) Army (Army) National Training Center (NTC) and Fort Irwin is situated approximately 37 miles northeast of Barstow, California, in the north-central part of the High Mojave Desert, as shown in **Figure 1**. Fort Irwin Road is the only paved road that provides access to the NTC, intersecting with Interstate (I) 15 approximately 37 miles to the south. I-15 provides the major east-west travel route linking Los Angeles and Las Vegas. Fort Irwin encompasses approximately 753,537 acres of desert terrain, most of which (528,573 acres or 83 percent) is used for realistic battlefield training. As shown in **Figure 2**, land use on Fort Irwin also includes the 33,229-acre National Aeronautics and Space Administration (NASA) Goldstone Deep Space Communications Complex (GDSCC) property; and the 91,330-acre Leach Lake Tactical (bombing/artillery) Range. A cantonment area in the southwest portion of Fort Irwin consists of approximately 1,920 acres and provides temporary and permanent living quarters for Soldiers and their families along with support facilities (Army 2017a). Fort Irwin's population includes approximately 4,606 assigned military members; 6,717 rotational training unit Soldiers; 4,155-person civilian workforce; and 6,448 family members (Army 2018).

The NTC is the Army's premier Combat Training Center (CTC). Its primary mission is to design and execute training exercises (rotations) that prepare Brigade Combat Teams (BCTs) and other units for contingency missions. Rotations are realistic training events that incorporate force-on-force scenarios to prepare units for land operations, combined arms maneuver, and security missions. The NTC conducts approximately 10 BCT decisive action rotations per year and supports up to 2 National Guard BCTs annually for training. The NTC also provides interoperability training opportunities for special operations and conventional forces.

The major Training Areas (TAs) on Fort Irwin are divided into three regions, the Northern, Central, and Southern Corridors (**Figure 2)**. The Northern Corridor, north of the Granite Mountains, primarily supports task force live-fire exercises. The Central Corridor is situated north of Tiefort Mountain and is where most force-on-force maneuvers occur. Staging and, to a lesser extent, maneuvers are primary training activities supported by the Southern Corridor (Fort Irwin 2017a). MOUT are a part of Fort Irwin's training mission. Various types and sizes of mock villages, towns, and other built environment features are located throughout the NTC. One such example is Tiefort City, a mock city approximately 10 miles northeast of the cantonment area that simulates potential combat environments, such as urban areas in the Middle East. This 215-acre MOUT training facility consists of numerous buildings and objectives, including a helicopter pad, hospital, palace, prison, and train station (Army 2016b).

Urban areas present a complex environment for military operations. The entirety of an urban area must be addressed simultaneously and systematically, both to disable hostile elements and enable infrastructure elements critical to a city's function. Continual monitoring, assessment, and analysis of information; an understanding of systems infrastructure; and coordinated, integrated maneuvers in horizontal and vertical urban terrain exemplify the many unique challenges of urban conflict or intervention (Department of Defense [DoD] 2013; Army 2017b). The Army lacks the size and density of urban training terrain necessary to conduct military operations and fully engage a BCT in a CTC Dense Urban Terrain (DUT) environment (Fort Irwin 2017b). The Army proposes to ensure the availability of adequate DUT training environments to meet the critical collective unit training need for active, reserve component, and National Guard units that train at Fort Irwin. Hereafter, this action is referred to as the Proposed Action.

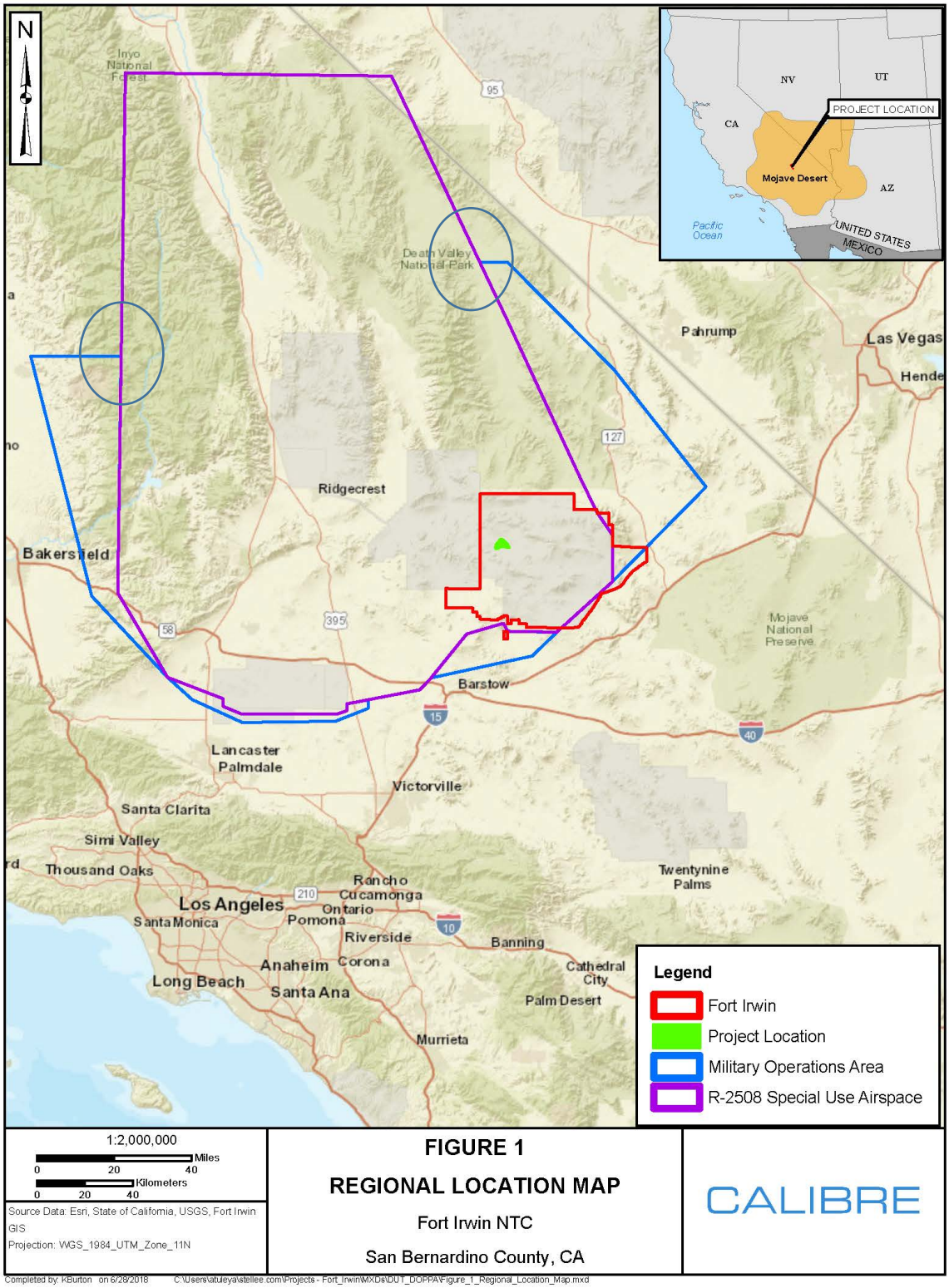

Figure 1: Regional Location Map

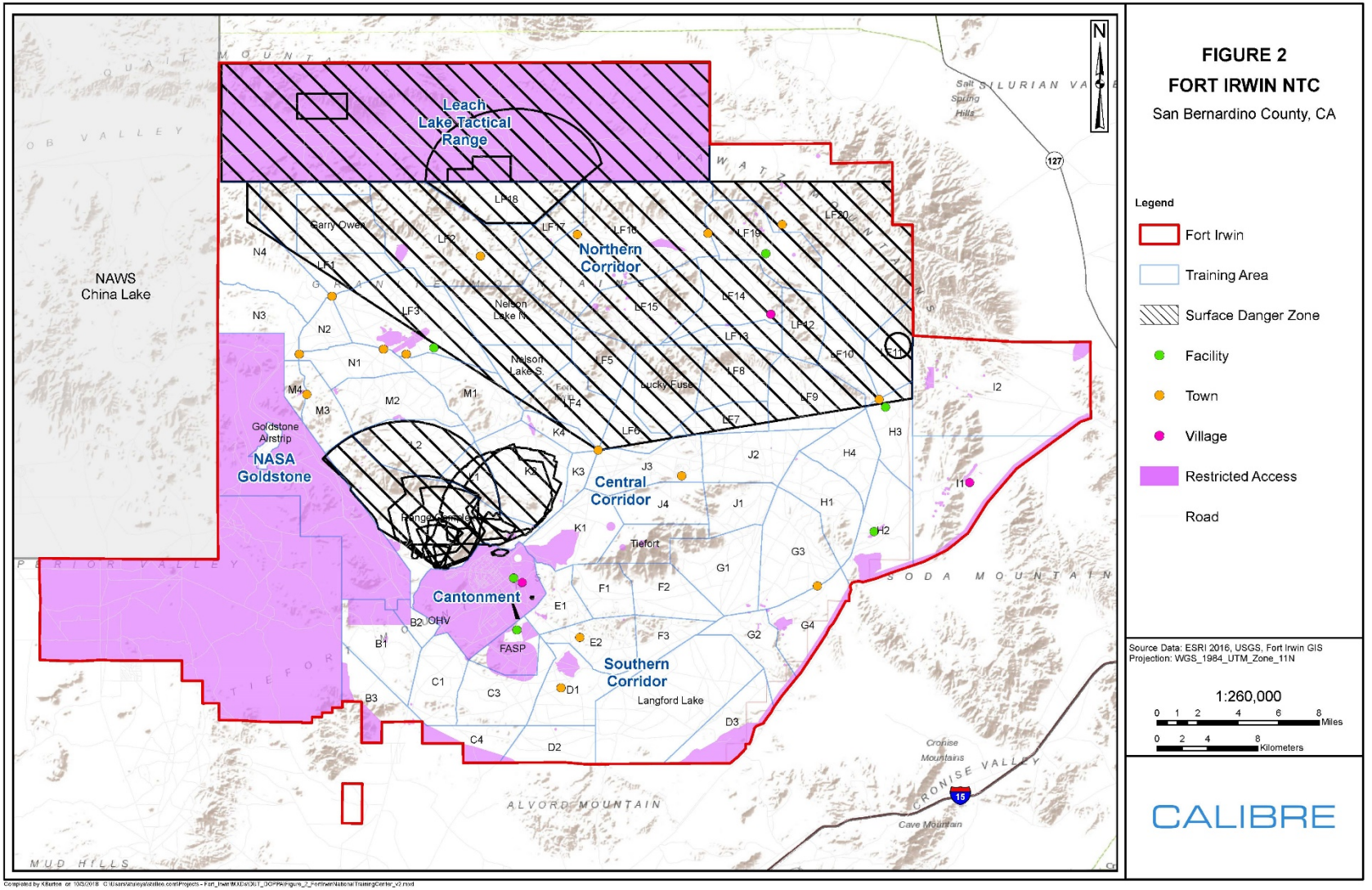

Figure 2: Fort Irwin NTC

This environmental assessment (EA) will analyze and document potential effects on the human and natural environment that may reasonably result from implementation of the Army's Proposed Action or Alternatives.

1.2 Purpose and Need for the Proposed Action

1.2.1 Project Purpose

The purpose of the Proposed Action is to provide adequate DUT training on Fort Irwin that allows the Army to conduct BCT-level urban terrain training simultaneously with maneuver training or as a standalone training event. The DUT complex would replicate current, real-world urban operational environments by establishing multiple, highly dense sub-sections of a mega-city at an Army CTC. This capability would address current home station training shortfalls to meet the full spectrum and complexity of the urban operational environment. A DUT training complex located in an area of Fort Irwin, which minimizes operational constraints and provides flexibility for future expansion, is needed to provide critical training in capture, security, and control of urban terrain to units of all types and sizes.

1.2.2 Project Need

As concluded by an Army Strategic Studies Group report (2014), "the Army stands ill prepared to respond to and operate within complex cities, even as these areas become increasingly strategically significant" (Army 2014b). Whether military action is invoked for humanitarian assistance, direct combat, or any point between, Army forces must prepare and train within the context of the dense urban fight to include subterranean operations. In accordance with Army and Joint Force strategic doctrine, the Proposed Action is needed to meet emerging training requirements for BCTs operating in DUT (Army 2014b and 2017b; DoD 2013).

Fort Irwin provides training support for tenant and non-tenant units, allowing them to meet training requirements and maintain a level of combat readiness not attainable elsewhere. While current NTC training assets can satisfy some of these training requirements, existing facilities and infrastructure lack the size, natural conditions, and realism necessary to support training at the appropriate level. A fully instrumented, cyber-capable DUT complex can consume a BCT and its resources for up to 72 hours. Without establishment of the proposed DUT complex, Soldiers would not be adequately trained and prepared to conduct combat and related activities in the urban domain. Failure to establish a DUT complex at Fort Irwin would continue to result in current and future DUT training deficiencies.

1.3 Scope of Analysis

In accordance with the National Environmental Policy Act of 1969 (NEPA) and implementing regulations specified in 40 *Code of Federal Regulations* (CFR) Parts 1500 through 1508, and 32 CFR Part 651, Fort Irwin will evaluate several locations within the installation boundary to meet this training requirement, as well as the no-action alternative or status quo. The purpose of this evaluation will be to describe current environmental resources on and adjacent to the proposed locations of a DUT training complex and inform decision makers and the public of the potential environmental consequences of implementing the Proposed Alternatives, while presenting the rationale used for evaluating and determining effects and identifying the Preferred Action Alternative. Mitigation measures will be identified and described where warranted.

The EA will identify, document, and evaluate the potential environmental and socioeconomic effects of the Proposed Action alternatives and seek to ensure that appropriate consideration has been given to environmental resources. It will include an evaluation of direct, indirect, and cumulative effects, both

temporary and permanent, that could result from implementing the Proposed Action alternatives, including the No-Action Alternative or current *status quo*. Reasonably foreseeable-future actions that may contribute to cumulative effects will be identified in **Section 4**, *Environmental Consequences*. Any additional requirements stemming from other unrelated military actions would undergo separate NEPA analysis and evaluation.

An interdisciplinary team of environmental scientists, biologists, planners, economists, engineers, archaeologists, historians, and military technicians have analyzed the Proposed Action alternatives based upon existing conditions and identified relevant beneficial and adverse effects associated with each alternative action.

1.3.1 Resource Areas Eliminated from Analysis

The following resource areas or environmental components were eliminated from further analysis because there is no potential for effects or only potential beneficial effects to them from the Proposed Action alternatives. These resources will not be further discussed in the NEPA analysis and documentation.

1.3.1.1 Land Use, Including Recreation

The Proposed Action alternatives would occur on Fort Irwin and would be compatible with the installation's current and future land use designations. No adjacent land use would be affected by the implementation of the Proposed Action alternatives. Therefore, land use is not likely to be impacted and will not be carried forward for detailed analysis.

The Proposed Action alternatives would occur on portions of Fort Irwin already dedicated to the conduct or support of military training and operations. Public access to such areas is strictly prohibited. Therefore, recreation will not be carried forward for detailed analysis.

1.3.1.2 Noise

The Proposed Action alternatives would occur entirely within the boundaries of Fort Irwin. The existing noise environment on the installation is characterized by live-fire and maneuver training activities that occur year-round. In this context, noise associated with the Proposed Action alternatives would be less than or comparable to existing noise levels. Additionally, there are no human receptors beyond the military community itself that live or reside in proximity to the Proposed Action alternatives. Therefore, noise will not be carried forward for detailed analysis.

Section 4.3 addresses potential noise effects on non-human biological resources.

1.3.1.3 Mineral Resources

Mineral resources such as iron and gold are known to occur within the boundaries of Fort Irwin; however, mining or exploration is prohibited by order of an exclusion signed by President Roosevelt in the 1940s. Therefore, mineral resources will not be carried forward for detailed analysis.

1.3.1.4 Socioeconomics

The Proposed Action alternatives are not expected to adversely affect any local or regional socioeconomic conditions. The construction and operation of the Proposed Action alternatives would have a minor, beneficial effect on local economic conditions via the creation of short- and long-term, temporary (i.e., construction) and permanent (e.g., role players to support training) jobs. No other socioeconomic effects are anticipated to result from the Proposed Action alternatives. Therefore, socioeconomics will not be carried forward for detailed analysis.

1.3.1.5 Environmental Justice and Protection of Children

The Proposed Action alternatives would occur entirely within the boundaries of Fort Irwin on land already dedicated to military training and operations. Public access to such areas is strictly prohibited. There are no minority or disadvantaged populations in the vicinity of the Proposed Action alternatives. Children living on the installation are generally restricted to the cantonment and housing areas of Fort Irwin. Therefore, environmental justice and protection of children will not be carried forward for detailed analysis.

1.3.2 Resource Areas to be Analyzed

The EA will include an analysis of all other resource areas that could be affected by the Proposed Action alternatives that are consistent with the Project Purpose and Need. These include the following, which will be discussed in **Section 3**, *Affected Environment*, and **Section 4**, *Environmental Consequences*:

- Aesthetics
- Geology and Soils, including Seismicity
- Biological Resources
- Water Resources
- Air Quality
- Cultural Resources
- Hazardous and Toxic Substances
- Human Health and Safety
- Transportation
- Utilities and Infrastructure

1.4 Framework for Decision Making

The Army is the lead agency for completing a NEPA analysis for the Proposed Action. An EA will be used to identify any potentially significant effects of the Proposed Action alternatives carried forward for analysis. It will identify environmental concerns in advance of project implementation and discuss any appropriate mitigation measures to address those concerns. Agencies, the Army, and Fort Irwin will be able to use this EA to support their decision to issue approvals and/or permits for the Preferred Alternative Action.

1.5 Permits, Approvals, and Agreements Required by Other Agencies

This section provides the reader with a general understanding of the regulatory requirements that may need to be met before the Preferred Action Alternative is implemented. Discussions with those agencies would be required to determine the specific nature of any future permits or approvals that might be required from regulatory agencies. Their inclusion in this document is intended to acknowledge the potential role of these agencies and ensure their notification and subsequent inclusion of any comments from them. This list is not intended to be all-inclusive; for example, a variety of permits and approvals might be needed from local and regional agencies that are not reflected herein. In addition, the permits and approvals required would vary depending on the implementing agency. **Table 1** lists the permits and approvals that may be required to implement the Proposed Action.

The resulting EA could be used to support obtaining permits and approvals from other agencies, such as the Mojave Desert Air Quality Management District (MDAQMD). MDAQMD could require a permit to

construct or operate potential sources associated with the Preferred Action Alternative. Agency discussions and coordination would be needed to determine the specifics of any future permit or approval that may be required. MDAQMD is included in this document to acknowledge the potential role of this agency and to notify MDAQMD of the availability of this document so that their comments and concerns can be included and given consideration.

Table 1: Permits and Approvals
Dense Urban Terrain Complex EA, Fort Irwin, California

Permitting or Approval Agency	Permit or Approval	Requirement	Comments
California Department of Fish and Wildlife	CESA, CDFW Code Section 2081(b) permit, or Natural Community Conservation Plan Section 2835 permit	CESA prohibits the taking of threatened, endangered, or candidate species, except as otherwise provided in that statute. CDFW may permit the taking of those species pursuant to Sections 2081(b) or 2835, if specified conditions are met.	Applies to any implementing agency.
	Lake and Streambed Alteration Agreement	CDFW Code Sections 1600 et seq. require any person, state, or local government agency, or public utility proposing a project that may substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of a river, stream, or lake to notify CDFW before beginning the project. If CDFW determines that the project may substantially adversely affect existing fish and wildlife resources, a Lake or Streambed Alteration Agreement is required.	CDFW Code Sections 1600 et seq. do not apply to activities by the federal government.
California Department of Toxic Substances Control	Various permits and approvals related to hazardous materials	The storage, transport, and disposal of hazardous materials are primarily regulated by DTSC under various federal and state regulations.	Applies to any implementing agency.
California Department of Transportation or Federal Highway Administration	Encroachment and Transportation Permits	Encroachment permits would be needed for any activities in a federal, state, or county road or highway ROW. Transportation permits would be needed for oversized vehicles or extralegal loads.	Applies to any implementing agency.
Lahontan Regional Water Quality Control Board	CWA Section 401 Water Quality Certification	Section 401 of the CWA requires that federally authorized discharges into waters of the United States not violate state water quality standards.	Required if a CWA Section 402 or 404 Permit is required. There are no waters of the United States on Fort Irwin. The requirement is addressed under the project's general construction permit.
	CWA Section 402 NPDES Permit	Section 402 of the CWA authorizes states to issue NPDES permits for discharges to surface water both from point sources and nonpoint sources. Compliance is required for all discharges into waters of the United States, or for construction projects that would disturb one acre or more.	Applies to any implementing agency. There are no waters of the United States on Fort Irwin. The requirement is addressed under the project's general construction permit.

Table 1: Permits and Approvals
Dense Urban Terrain Complex EA, Fort Irwin, California

Permitting or Approval Agency	Permit or Approval	Requirement	Comments
	Waste Discharge Requirements, Porter-Cologne Water Quality Control Act	Waste discharge requirements are required for activities that may discharge waste in a diffuse manner (such as from soil erosion or waste discharges to land), including the discharge of waste from construction operations and dredge and fill activities.	The requirement is addressed under the project's general construction permit.
Project Lead Agency (federal), all Federal Cooperating Agencies, and the Advisory Council on Historic Preservation	Section 106 of the NHPA	Section 106 requires federal agencies to evaluate the effects of federal undertakings on historical, archaeological, and cultural resources. An agency is required to coordinate with the SHPO or Tribal Historic Preservation Officer and other interested parties on effects on historic, cultural, and Tribal resources.	Applies to all actions on federal lands, sponsored or permitted by a federal agency, or funded with federal monies.
Project Lead Agency (implementing agency) and Various Federal, State, and Local Agencies	Land acquisition, land leases, and ROW acquisitions	Depending on the implementing agency, the following land acquisition, land leases, and ROW acquisitions may be needed: • Federal approvals for use of federal lands • Encroachment permits and approvals by public agencies for activities on public lands or public ROWs (approval agencies could include the California State Parks or San Bernardino County) • State Lands Commission Land Use Lease for any activities on state sovereign lands • Land acquisition where appropriate	Extent and requirements for land acquisition, land leases, and ROW acquisitions will vary greatly depending on the final implementing agency.
Mojave Desert Air Quality Management District	CAA General Conformity Determination	CAA Section 176(c) requires federal actions to conform to applicable federal or SIPs to ensure that the actions do not interfere with strategies employed to attain the NAAQS.	Applicable to federal actions. May require modification of the SIP emission budgets for NOx and respirable PM_{10}.
Mojave Desert Air Quality Management District	Permits to Construct and Operate Stationary Sources	Various air quality permits would be needed for construction and operations and maintenance of stationary sources such as generators, pumping plants, and treatment facilities.	Applies to any implementing agency.
Mojave Desert Air Quality Management District	Approval of Large Operation Notification (Dust Control Plan)	The purpose is to reduce the amount of particulate matter entrained in the ambient air as a result of human-made fugitive dust sources by requiring actions to prevent, reduce, or mitigate fugitive dust emissions. Compliance with this regulation would be required for a variety of alternative activities.	Applies to any implementing agency.
U.S. Army Corps of Engineers	CWA Section 404 Permit	Section 404 of the CWA requires that a permit be obtained from the USACE before	There are no waters considered waters of the

Table 1: Permits and Approvals
Dense Urban Terrain Complex EA, Fort Irwin, California

Permitting or Approval Agency	Permit or Approval	Requirement	Comments
		discharging dredge or fill material into waters of the United States, their tributaries, and associated wetlands. Activities regulated by 404 permits include, but are not limited to, dredging, construction activities in waterways, and flood control actions.	U.S. within the boundaries of Fort Irwin.
U.S. Fish and Wildlife Service	ESA Section 7 Incidental Take Statement, or Section 10 Incidental Take Permit	The ESA requires USFWS to maintain lists of threatened and endangered species and protects these listed species (and any designated critical habitat) from unauthorized take. Section 7 of the ESA requires all federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. Section 10 of the ESA describes how USFWS may authorize take of a listed species by nonfederal agencies.	The ESA applies to any action that may result in "may affect" a federally listed species, regardless of the implementing agency.

CAA = Clean Air Act
CDFW = California Department of Fish and Wildlife
CESA = California Endangered Species Act

CWA = Clean Water Act
DTSC = California Department of Toxic Substances Control
ESA = Endangered Species Act (federal)
NAAQS = National Ambient Air Quality Standards
NHPA = National Historic Preservation Act
NOx = nitrogen oxide
NPDES = National Pollutant Discharge Elimination System
PM_{10} = particulate matter less than 10 microns in aerodynamic diameter
ROW = right-of-way
SHPO = State Historic Preservation Office
SIP = state implementation plan
USACE = U.S. Army Corps of Engineers
USFWS = U.S. Fish and Wildlife Service

1.6 Relevant Statutes, Regulations, and Executive Orders

A decision on whether to proceed with the Proposed Action or alternatives depends on numerous factors, including mission requirements, regulatory requirements, and environmental considerations. In addressing environmental considerations, Fort Irwin will be guided by relevant statutes (and their implementing regulations) and Executive Orders (EOs) that establish standards and provide guidance on environmental and natural resources management and planning.

These may include, but are not necessarily limited to, the following:

1.6.1 Federal Statutes

- Archaeological Resources Protection Act of 1979 (16 U.S. Code [U.S.C.] § 470)
- American Indian Religious Freedom Act of 1978 (42 U.S.C. § 1996, as amended)
- Antiquities Act of 1906 (16 U.S.C. § 431 et seq.)
- CAA (42 U.S.C. §§ 7401 et seq., as amended)

- CWA and the Water Quality Act of 1987 (33 U.S.C. §§ 1251 et seq., as amended)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (as amended by the Superfund Amendments and Reauthorization Act of 1986 [42 U.S.C. §§ 9601 et seq.])
- ESA (16 U.S.C. §§ 1531 – 1543)
- Energy Policy Act of 2005 (42 U.S.C. § 15801)
- Farmland Protection Act of 1981 (7 U.S.C. §§ 4201 et seq., as amended)
- Fish and Wildlife Coordination Act (16 U.S.C. §§ 661 et seq.)
- Historic Sites Act of 1935 (16 U.S.C. § 461 et seq.)
- Migratory Bird Treaty Act (16 U.S.C. §§ 701 et seq.)
- National Energy Conservation Policy Act (42 U.S.C. § 8251)
- NEPA (42 U.S.C. §§ 4321 – 4370)
- NHPA (16 U.S.C. §§ 470 et seq., as amended)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. §§ 3001 et seq., as amended)
- Noise Control Act of 1972 (42 U.S.C. §§ 4901 – 4918)
- Resource Conservation and Recovery Act of 1976 (RCRA) (42 U.S.C. § 6901)
- Toxic Substances Control Act (15 U.S.C. §§ 2601 et seq., as amended)

1.6.2 Federal Regulations

- Army Regulation (AR) 190-13, The Army Physical Security Program
- AR 200-1, Environmental Protection and Enhancement
- AR 210-20, Installation Master Planning
- AR 350-19, The Army Sustainable Range Program
- AR 385-10, The Army Safety Program
- AR 385-63, Range Safety
- AR 525-13, Antiterrorism
- Council on Environmental Quality Regulations for Implementing NEPA (40 CFR Parts 1500 – 1508)
- Protection of Historic Properties (36 CFR Part 800)
- Environmental Analysis of Army Actions (32 CFR Part 651)
- Native American Graves Protection and Repatriation Act Implementation (43 CFR 10)
- National Register of Historic Places Implementation (36 CFR 60)
- Preservation of American Antiquities (43 CFR 3)
- Protection of Archaeological Resources (32 CFR 229)

1.6.3 Federal Executive Orders

- EO 11514, Protection and Enhancement of Environmental Quality (amended by EO 11991)
- EO 11593, Protection and Enhancement of the Cultural Environment
- EO 11988, Floodplain Management, as amended
- EO 11990, Protection of Wetlands
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 12372, Intergovernmental Review of Federal Programs
- EO 12580, Superfund Implementation
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- EO 13007, Protection of Indian Sacred Sites
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risk
- EO 13175, Consultation and Coordination with Indian Tribal Governments
- EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds
- EO 13327, Federal Real Property Asset Management
- EO 13287, Preserve America
- EO 13834, Efficient Federal Operations

1.7 Agency and Public Participation

The Army invites public participation in the proposed federal action. Considering the views and information of all interested persons promotes open communication and enables better decision making. All agencies, organizations, and members of the public having a potential interest in the Proposed Action, including minority, low-income, disadvantaged, and Native American groups, are urged to participate in the decision-making process.

Public participation opportunities with respect to this Proposed Action and decision making on the Preferred Alternative are guided by 32 CFR Part 651. Upon completion of the analysis, the resulting NEPA documents, including any decision documents will be made available to the public for comment for a period of 30 days. At the end of the 30-day public review, the Army will consider all comments submitted by individuals, agencies, and organizations. As appropriate, the Army may then execute the decision documents and proceed with implementation of the Proposed Action under the Preferred Action Alternative. If implementing the Proposed Action and Preferred Alternative is determined to result in significant effects, then the Army will publish a Notice of Intent in the *Federal Register* to prepare an Environmental Impact Statement or will not take the action.

Throughout this process, the public may obtain information on the status and progress of the Proposed Action and the analysis of proposed alternatives through Ms. Coral Eginton, Fort Irwin Directorate of Public Works (DPW), Environmental Division, Building 602, P.O. Box 105085, Fort Irwin, California, 92310-5085 or via email at coral.a.eginton.civ@mail.mil.

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2 Description of the Proposed Action and Alternatives

This section describes the Proposed Action alternatives for meeting current and future training needs through the DUT training complex at Fort Irwin that meet the project purpose and need as described in **Section 1.2**, *Purpose and Need for the Proposed Action*. Two alternatives (the Preferred Action Alternative and the No-Action Alternative) will be analyzed in detail. The use of other existing training ranges was considered, but not carried forward due to operational constraints.

2.1 Proposed Action

The Proposed Action would seek to provide adequate DUT training on Fort Irwin that allows the Army to conduct BCT-level urban terrain training simultaneously with maneuver training or as a standalone training event. The DUT complex would replicate current, real-world urban operational environments by establishing multiple, highly dense sub-sections of a mega-city within Fort Irwin's operational boundary. To support the construction and operation of a DUT training complex, the Proposed Action would also include road and utility line extensions and improvements. These components of the Proposed Action would generally start in or near the cantonment area and extend towards the proposed DUT training complex (Fort Irwin 2018).

The proposed DUT complex would be comprised of a city core surrounded by various Dense Urban City Sections designed to represent four different regions of conflict that typify real-world urban operational domains. It would include approximately 1,800 buildings ranging in size from large infrastructure associated with an urban center (e.g., a university or hospital) to outlying residential and commercial districts. A transition zone surrounding the city core would include buildings such as apartments, hotels, and an industrial complex with critical systems infrastructure (e.g., mock water, electrical, and sewer). Approximately half of all the buildings and infrastructure associated with the Proposed Action would be designed to provide subterranean access (e.g., basements and tunnels) to support more complex, realistic urban training scenarios (Fort Irwin 2018). Where possible and applicable, buildings would incorporate sustainable design and energy-saving measures.

Other physical components of the proposed DUT complex would include varied street patterns (i.e., grid, irregular, and linear) and designs; rubble areas; a subway/bus terminal; a real and fictitious power grid; and telecommunications systems that provide working cellular, internet, television, and radio services necessary to support cyber warfare activities and training evaluations. The Proposed Action would provide a realistic digital environment capable of generating situational awareness and relevant common picture data in the battle space. These systems would also be networked to provide a fully instrumented training complex for the scoring of engagement scenarios and to support after-action reviews. Additionally, internal and external video, audio, and even aural urban effects would be employed to simulate real-world urban environments.

The Proposed Action would also put in place the necessary roadway and utility systems infrastructure to support the DUT complex. These various infrastructure components would originate from Fort Irwin's cantonment area, extend through the NASA GDSCC property, and terminate at the site of the proposed DUT complex. The Proposed Action would include both improvements to existing infrastructure and the installation of new infrastructure. Road paving, widening and hardening of existing tank trails, and construction of new tank trails would be required to provide access to the site for construction and military vehicles and equipment. New electrical and water lines would extend from portions of the

installation's existing system. At the site itself, two non-potable water wells would be installed for fire protection and dust suppression; potable water would be brought to the site from existing infrastructure to mimic real-world conditions or to establish an emergency reserve. Additionally, the DUT complex would be equipped with vault latrines as an alternative to extending the sewer system to the site.

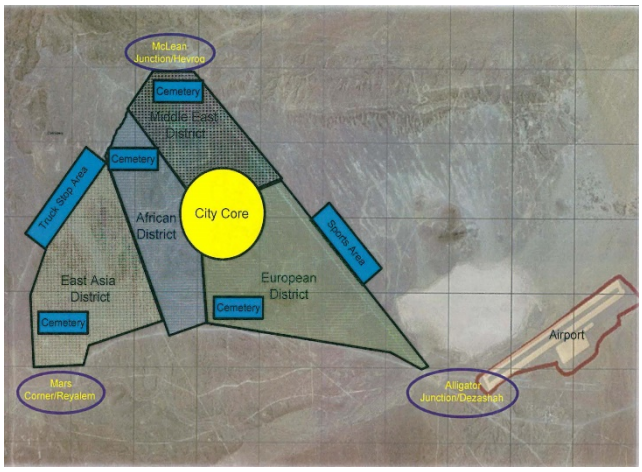
Construction of the Proposed Action would start in approximately February 2019 and be completed in phases. The phasing of construction activities would prioritize development such that key buildings and infrastructure currently not available at home stations are built first (i.e., 5-story or greater structures). Common features of the Proposed Action incorporated into select construction phases would include communications shelters, storage facilities, range operational systems, and after-action review capabilities.

Specific components of the Proposed Action would be phased in or sequenced, as follows:

- **Phase 1.** Power, water, and roadway infrastructure.
- **Phase 2.** Site drainage; mock sewer systems infrastructure; a 500-meter (m) mock subway; and 2 ten-story, 2 five-story, and 1 one-story building(s).
- **Phase 3.** A water tank; highway; sports area; and 2 four-story and 5 six-story buildings.
- **Phase 4.** A mock police station, including a mock prison/jail; mock television/radio station; city hall; mock water treatment facility; mock power station; overpass; and 100 one-story, 75 two-story, and 2 ten-story buildings.
- **Phase 5.** A mock embassy; mock bank; mock gas stations; tunnels/subterranean training features; mock storm and waste water infrastructure; and 150 one-story and 100 two-story buildings.
- **Phase 6.** A mock refinery; mock chemical, biological, radiological, nuclear, and explosive structure; administrative facility; and 2 ten-story buildings (Fort Irwin 2018).

2.1.1 Preferred Action Alternative

The inset figure provides a detailed depiction of the DUT Complex Concept Site Plan. The Preferred Action Alternative (**Figure 3**; hereafter, the Preferred Alternative) would construct and operate a DUT complex on approximately 4,000 acres of land in Training Areas (TA) N1, N2, N3, N4, and LF3 near the NASA GDSCC property, approximately 14 miles northwest of Fort Irwin. Infrastructure (i.e. roadway and utility) improvements and extensions under the Preferred Alternative would extend from the western portion of the cantonment area northwest, through the NASA GDSCC property, until intersecting with affected TAs (**Figures 4** thru **7**, respectively). The road and utility components of the Preferred Alternative would disturb up to approximately 255 acres of land.



DUT Complex Concept Site Plan (Fort Irwin 2018)

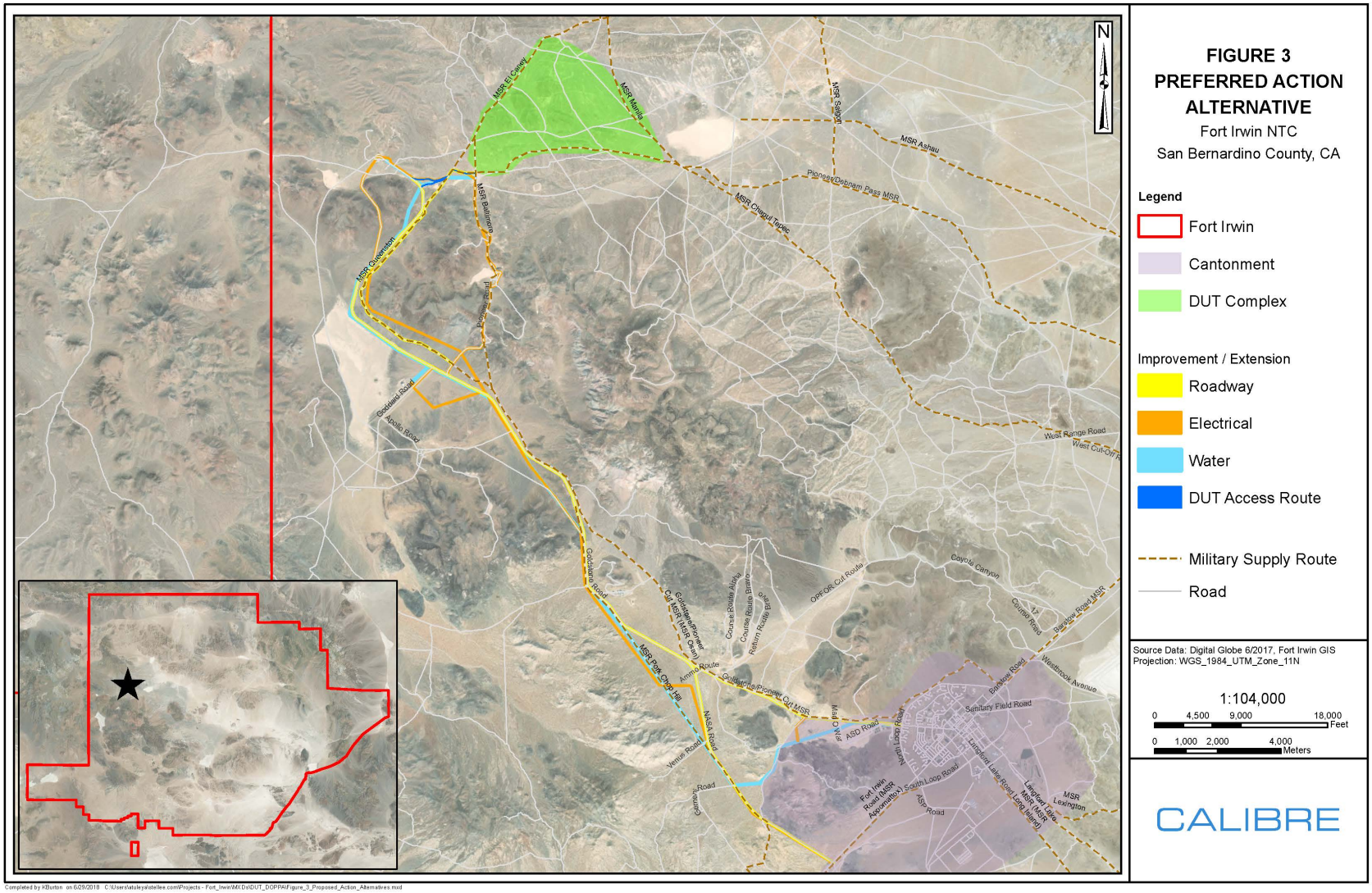


Figure 3: Preferred Action Alternative

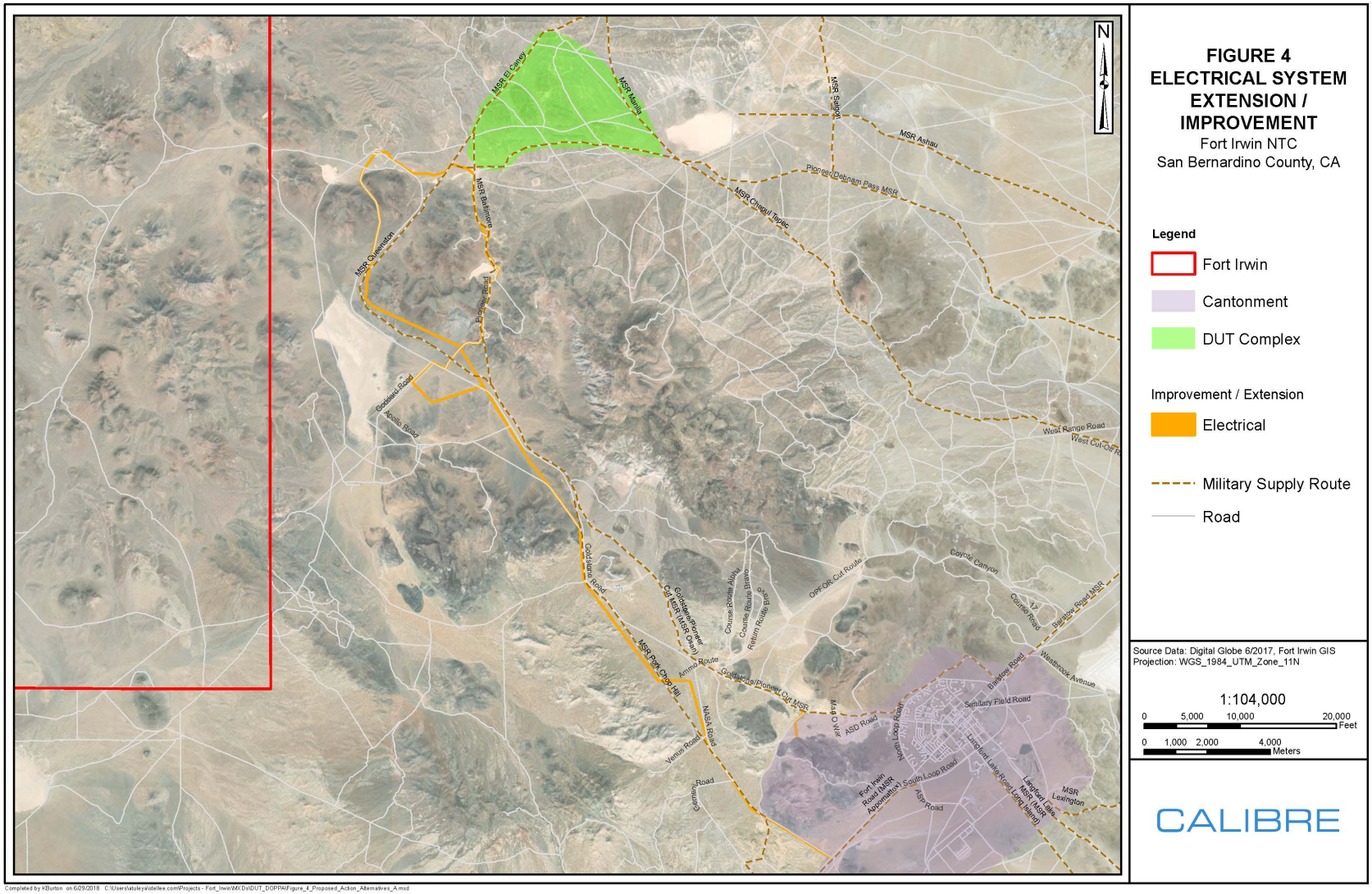


Figure 4: Electrical System Extension/Improvement

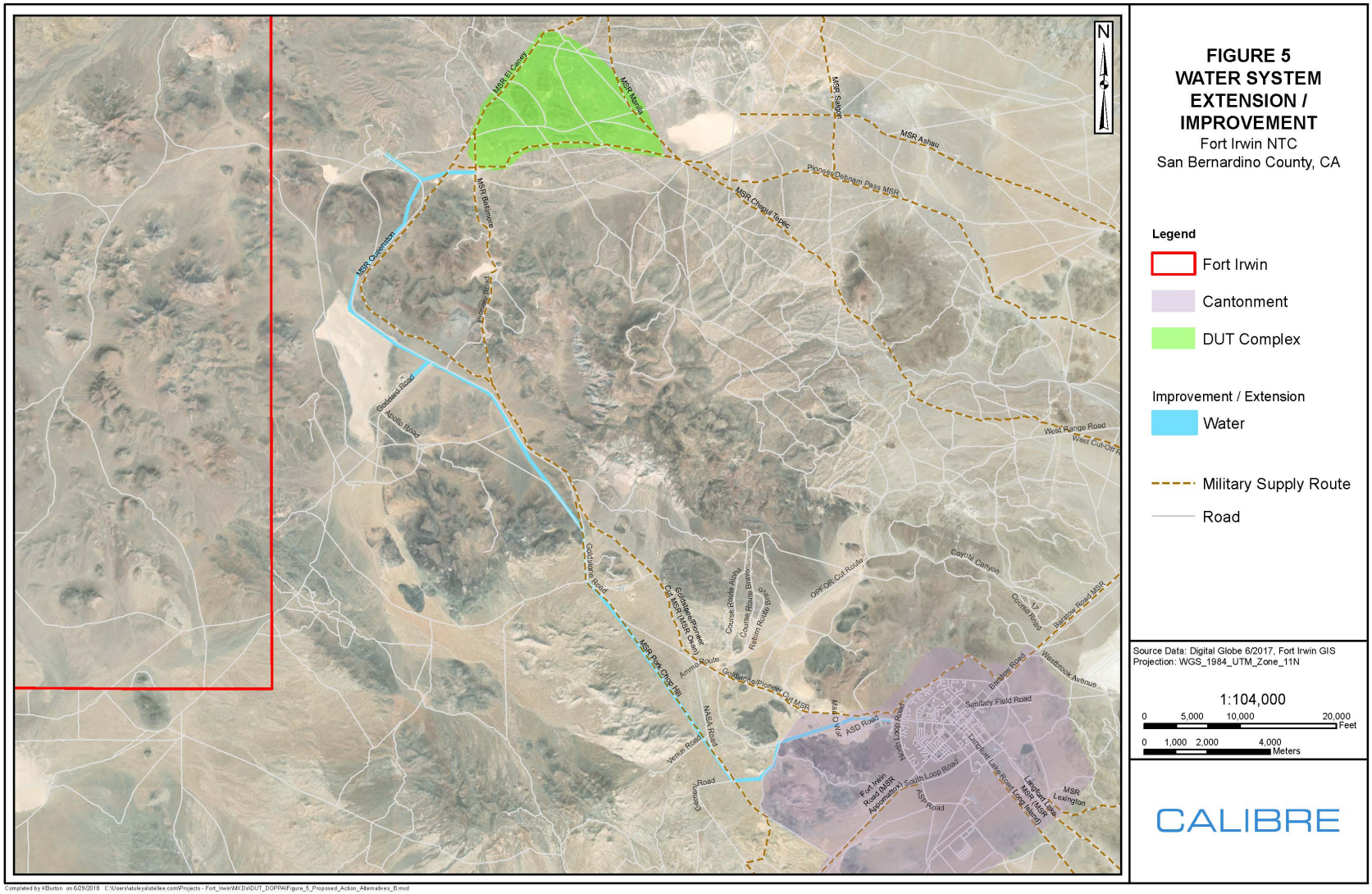


Figure 5: Water System Extension/Improvement

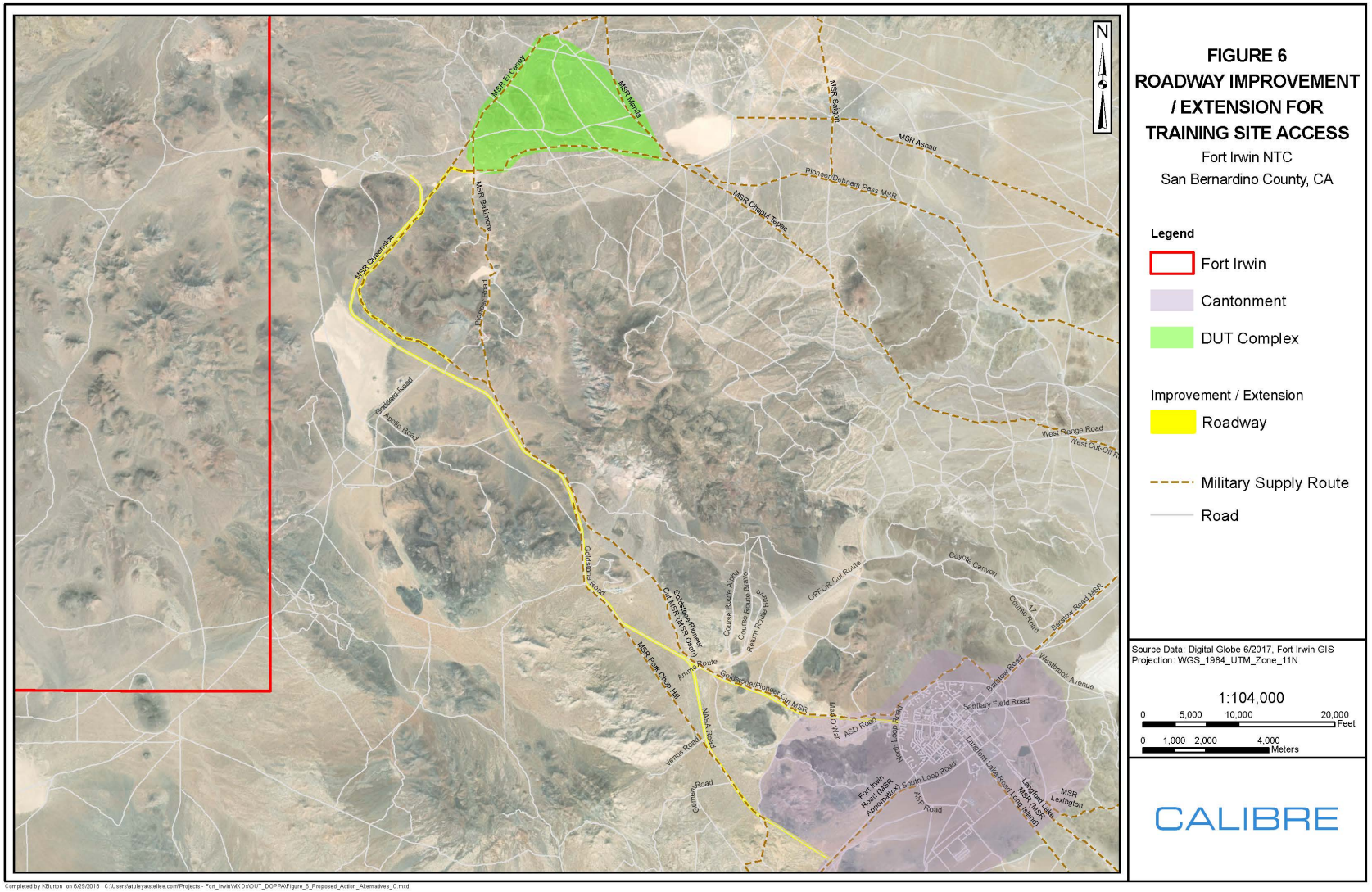


Figure 6: Roadway Improvement/Extension for Training Site Access

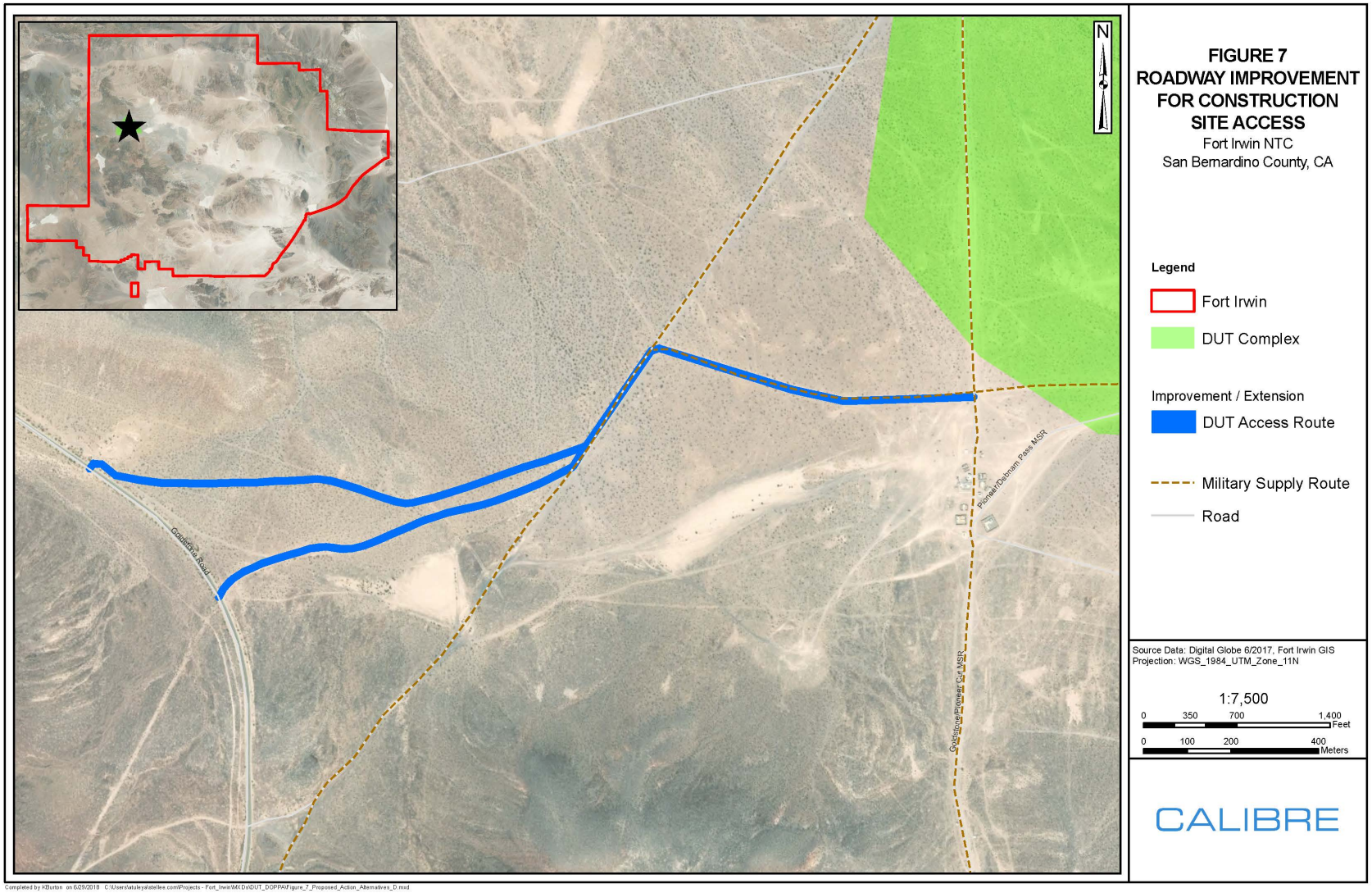


Figure 7: Roadway Improvement for Construction Site Access

The location, size, availability, and environmental conditions of TAs N1, N2, N3, N4, and LF3 would support the Proposed Action and, over the long-term, allow for potential future expansion of the DUT complex. Existing, complimentary training assets located adjacent to or in the vicinity of TAs N1, N2, N3, N4 and LF3 include four mock towns to include Mars Corner (southwest); Alligator Junction (southeast); Lakeside (farther southeast); and McLean Junction (north). Additionally, a remote dirt airfield, Freedom Landing Strip, is located to the east of Alligator Junction. The selection of identified TAs to support the Proposed Action would not affect any other TAs of significance (e.g., maneuver corridors) and would minimize effects on the rotational training schedule. An existing road network leads to the site, which also has infrastructure in place to provide necessary fiber optic redundancy. Additionally, the topography of these TAs is relatively flat, and the site has a low flood potential. Overall, siting a DUT complex in these TAs would provide design flexibility and equip the Army with a comprehensive, one-stop urban training complex able to support training requirements for small to large units up to the BCT-level (Fort Irwin 2017b).

2.1.2 No-Action Alternative

Under the No-Action Alternative, construction and operation of a DUT complex would not occur. The Army would continue to utilize existing MOUT facilities at Fort Irwin. Army Soldiers, as well as other DoD, Joint, and Allied personnel, would continue to lack a comprehensive training complex able to simulate real-world urban battlefields. The lack of such a complex would preclude BCTs and other units from engaging in urban conflict scenarios that replicate current and future threats. Under the No-Action Alternative, Fort Irwin would not be able to conduct BCT-level DUT training in concert with maneuver training as would be required under a real-world deployment scenario. Overall, the No-Action Alternative fails to address emerging training requirements for BCTs operating in DUT, reducing military readiness.

2.2 Alternatives Considered but Not Carried Forward

The use of other training complex locations was considered, but no additional locations were carried forward for detailed analysis. Alternatives considered included Tiefort City, within the boundaries of Fort Irwin, and Detroit, Michigan; however, these sites were eliminated due to factors such as environmental conditions, operational constraints, and logistical costs. Two additional sites at Fort Irwin were also considered but eliminated from detailed analysis. These sites, briefly discussed below, received further consideration as neither would affect the central corridor maneuver area on Fort Irwin, the largest of its kind in the U.S.

2.2.1 Langford Lake Alternative

The Langford Lake Alternative would site a DUT complex east of Langford Lake in the southern maneuver area of Fort Irwin. The remote, relatively flat terrain would provide design flexibility for a DUT complex with limited grading. The site would also have access to a nearby fiber optic network. However, selection of the Langford Lake site would directly affect rotational training scenarios. Due to two major drainage features associated with the site, it has a high potential to flood. Additionally, the site is located near the surface danger zones for the Brigade Support Unit Live-Fire Exercise. For these reasons, the Langford Lake Alternative was eliminated from further consideration.

2.2.2 Training Area A3 Alternative

The TA A3 Alternative would site a DUT complex in the central portion of a property conveyed to Fort Irwin for mission expansion. The site would provide ready access to the western portion of the central corridor maneuver box, through the NASA GDSCC property and the Pioneer Cut military supply route.

The considered location is near the Montana Mine and would offer a variety of subterranean training scenarios. However, this land would not be made available until at least 2025 pending compliance with established administrative and environmental mitigation requirements. The site is also planned as a future maneuver area with sufficient real-estate to support aviation and logistics tactical assembly areas. Additionally, resource limitations such as a lack of existing telecommunications and utility systems infrastructure would substantially increase the cost of development. For these reasons, the TA A3 Alternative was eliminated from further consideration (Fort Irwin 2017b).

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3 Affected Environment

This section describes the existing environmental conditions of the Preferred Alternative area that could be affected by implementing the Proposed Action. These resources include geology and soils; seismicity; biological resources; water resources; air quality; cultural resources; aesthetics or visual resources; hazardous and toxic substances; human health and safety; transportation; and utilities and infrastructure. Resources that would not be affected include land use and recreation; noise; mineral resources; socioeconomics; environmental justice; and protection of children. These resource areas are not discussed in detail because they would not be affected by the Proposed Action.

3.1 Geology and Soils

3.1.1 Geology

Fort Irwin is part of the Mojave Desert Physiographic Province, where isolated mountain ranges are separated by expansive desert plains. The flat, sediment-filled basins are characterized by storm-driven rocks and boulders that spread out to form broad alluvial fans. Where several deposits join, they form bajadas, long, sedimentary slopes composed of gravel and small rocks. These large, expansive bajadas are the dominant geomorphologic feature of the Mojave Desert ecosystem. Other geomorphologic features of the Mohave Desert include playas (dry lakes), arroyos (dry riverbeds), sand dunes, and volcanic remnants.

The geology underlying Fort Irwin has resulted from the Mojave's dynamic depositional and erosional environments. Bedrock distribution and thickness of valley-fill deposits are controlled by modern and past faulting. Igneous, metamorphic, and sedimentary rocks of the Mojave Desert reveal prehistoric landscapes as old as 2.7 billion years. Generally, metamorphic and igneous rocks (1,800 to 1,400 million years old) are overlain by a sequence of sedimentary rocks (1,200 to 200 million years old), including limestone, dolomite, sandstone, and shale. The geology of the Fort Irwin area is complex due to the distribution of wide-ranging types of surficial deposits over long periods of time. As such, the surficial geology of the area provides detail ranging from the regional distribution of mountains, valleys, and faults to the degree of soil development in surface materials (United States Geological Survey [USGS] 2014; Army 2006). **Section 3.2** provides further information with respect to regional fault trends.

3.1.2 Soils

The landscape at Fort Irwin is dominated by alluvial basins between mountain ranges. As mountain tops erode and expose bedrock, the coarse and fine sediments that erode from these outcrops then form the basin's soils. As a result, soils at the base of a mountain range (upper bajada) consist of coarse gravels that transition to loamy gravels towards the toe of alluvial fans. On the lower bajadas, soils consist of sandy loams and finer loamy materials. Playas at the bottom of basins have soils of silts and clays and typically develop salt pans. These playa soils are typically light in color, deficient in phosphorus and nitrogen, and lack organic matter (USACE 2003; Army 2006).

Desert soils develop slowly and are highly susceptible to disturbance and compaction. Cryptogamic crusts (biological soil crusts) and desert pavement are natural phenomena that stabilize surface soils in a desert environment. Hardened soil crusts on clay or silt desert soils are formed by biological activity of resident bacteria, algae, and lichens, making the soil resistant to wind and water erosion. Cryptogamic crusts also fix atmospheric nitrogen in low quantities, making it available to desert flora. By comparison, desert pavement consists of a surface crust of pebbles and rocks coated by manganese oxide due to sun

exposure. Desert pavement has a dark and shiny surface coat that protects fragile soils from erosion; however, once removed or disturbed, re-establishment can take several thousand years (Army 2006).

The proposed DUT Complex is approximately 14 miles north-northwest of the developed cantonment area. This portion of the project area generally occurs on a valley floor between mountains and slopes to the south-southeast. Elevations range from approximately 3,500 feet above sea level (asl) in the north (south of the Granite Mountains) to 3,100 asl near the site's southeastern boundary. Conversely, the terrain encompassing the proposed roadway and utility upgrades is variable in terms of slope and elevation. Overall, the limits of disturbance for the project area includes more than 4,000 acres most of which is associated with the DUT Complex site.

Soils within the proposed project area have experienced varying levels of disturbance from prior and ongoing military vehicle traffic and training activities. Highly disturbed soils are primarily found along existing roadways and utility corridors whereas soils in other portions of the project area are relatively undisturbed. **Figure 8** depicts the soil types associated with the DUT Complex and its associated roadway and utility corridors. **Table 2** characterizes the soil types of the project area.

3.1.2.1 Erosion and Erosion Management

Desert soils are generally poorly developed and held intact primarily by vegetation consisting of sparse desert scrub. As such, these soils are susceptible to disturbance. When disturbed, soil compaction and loss of vegetation increase the potential for wind and water erosion. Blowing sand and dust during windy conditions, as well as fugitive dust caused by land disturbance activities require regular management and maintenance. Although infrequent, rain events often cause washouts where drainages cross roads or trails requiring repeated maintenance and repair. Overall, managing and controlling wind and water erosion of fine-grained desert soils is a continual endeavor on Fort Irwin and a primary consideration when siting new development. For each of the soils in the project area, **Table 2** provides a rating of their susceptibility to wind erosion and water erosion when disturbed.

San Bernardino County has outlined guidelines for erosion and sediment control and the design of plans. These measures are required by Chapter 2, Division 10 of the San Bernardino County Development Code (San Bernardino County 2010a and 2010b).

3.2 Seismicity

The Mojave Desert region, including Fort Irwin, has experienced moderate seismicity in the past. The Mojave Desert Province is wedged in a sharp angle between the Garlock Fault (a strike-slip fault with left-lateral displacement) north of Fort Irwin and the San Andreas Fault (a right-slip fault) located farther south. The San Andreas Fault works in conjunction with the Garlock Fault to push the Mojave block eastward (Army 2008). Death Valley Fault, located northeast of Fort Irwin, is a right-lateral, strike-slip fault that extends along the northeastern Avawatz Mountains and eastern Soda Mountains. Segments of Death Valley Fault have exhibited evidence of movement within the past 10,000 years. Additionally, seismicity has been observed along the eastern portion of Garlock Fault (USACE 2003). Several other faults in the Fort Irwin area show evidence of displacement; however, none have been identified as being active within the past 11,000 years (Army 2006).

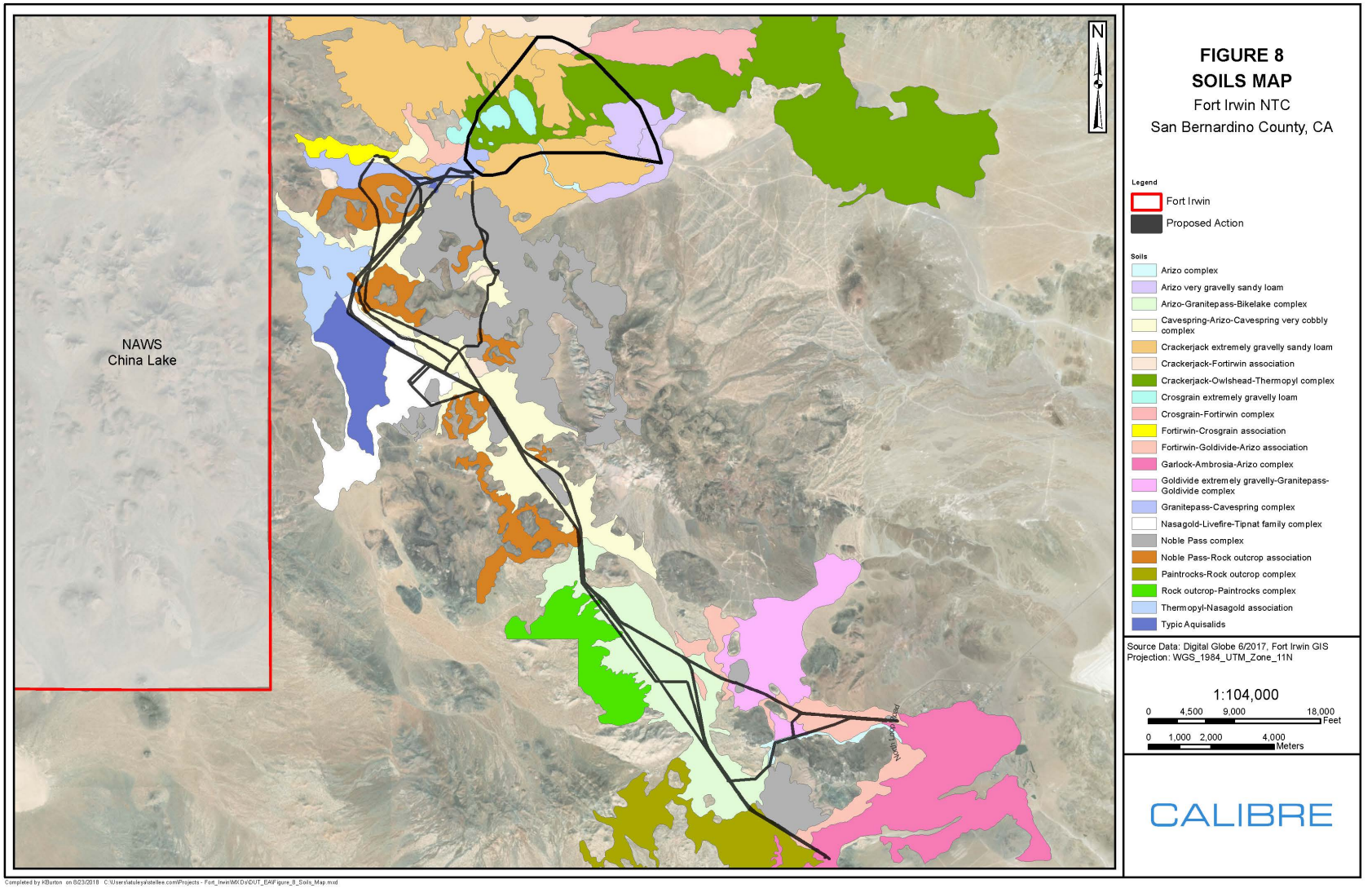

Figure 8: Soils Map

Table 2: Soils of the Project Area
DUT Complex EA, Fort Irwin, California

Soil Map Unit (% Range in Slope)	Area	Description	Wind Erodibility Index (I)	Water Erodibility (K)
Crackerjack-Owlshead-Thermopyl complex (2 to 8 percent)	1384	Shallow, well-drained soils formed in mixed alluvium on fan remnants and ballenas.	Low Susceptibility	Moderate Susceptibility
Cavespring-Arizo-Cavespring very cobbly complex (2 to 15 percent)	775	Deep, well-drained soils formed in mixed alluvium on alluvial fans and fan remnants.	Slight Susceptibility	Moderate Susceptibility
Crackerjack extremely gravelly sandy loam (4 to 15 percent)	773	Well-drained soils formed in mixed alluvium on fan remnants.	Low Susceptibility	Moderate Susceptibility
Crackerjack extremely gravelly sandy loam (2 to 8 percent)	732	Well-drained soils formed in mixed alluvium on fan remnants.	Low Susceptibility	Moderate Susceptibility
Arizo-Granitepass-Bikelake complex (2 to 8 percent)	600	Deep, excessively drained soils formed in mixed alluvium on alluvial fans.	Moderate Susceptibility	Slight Susceptibility
Arizo very gravelly sandy loam (2 to 4 percent)	433	Deep, excessively drained soils formed in mixed alluvium.	Slight Susceptibility	Slight Susceptibility
Crosgrain extremely gravelly loam (8 to 30 percent)	348	Well-drained soils formed in mixed alluvium on ballenas.	Low Susceptibility	High Susceptibility
Granitepass-Cavespring complex (2 to 8 percent)	230	Deep, well-drained soils formed in dominantly granitic alluvium.	Slight Susceptibility	Moderate Susceptibility
Nasagold-Livefire-Tipnat family complex (0 to 2 percent)	199	Deep, well-drained soils formed in mixed alluvium on fan aprons and alluvial flats.	Moderate Susceptibility	Moderate Susceptibility
Noble Pass complex (8 to 30 percent)	197	Well-drained soils formed in colluvium and residuum from volcanic sources on mountains.	Low Susceptibility	High Susceptibility
FortIrwin-Goldivide-Arizo association, 2 to 8 percent slopes	172	Well to excessively drained soils formed in mixed granite and alluvium on alluvial fans and fan remnants.	Moderate Susceptibility	Moderate Susceptibility
Arizo very gravelly sandy loam (0 to 2 percent)	123	Deep, excessively drained soils formed in mixed alluvium on alluvial fans.	Slight Susceptibility	Moderate Susceptibility
Crackerjack-FortIrwin association (2 to 15 percent)	121	Well-drained soils formed in mixed alluvium on fan remnants.	Low Susceptibility	Moderate Susceptibility
Noble Pass-Rock outcrop association, (30 to 75 percent)	113	Well-drained soils formed in residuum and colluvium from volcanic sources on mountains.	Low Susceptibility	High Susceptibility
Goldivide extremely gravelly-Granitepass-Goldivide complex (2 to 8 percent)	38	Well-drained soils formed in mixed granite and alluvium on alluvial fans and fan aprons.	Low Susceptibility	Moderate Susceptibility

Table 2: Soils of the Project Area
DUT Complex EA, Fort Irwin, California

Soil Map Unit (% Range in Slope)	Area	Description	Wind Erodibility Index (I)	Water Erodibility (K)
Arizo complex (2 to 8 percent)	36	Deep, excessively drained soils formed in mixed alluvium on alluvial fans and stream terraces.	Slight Susceptibility	Moderate Susceptibility
Paintrocks-Rock outcrop complex (15 to 50 percent)	32	Shallow, excessively drained soils formed in granite-weathered residuum on mountains, hills, and pediments.	Low Susceptibility	Low Susceptibility
Typic Aquisalids (0 to 2 percent)	31	Deep, excessively drained soils formed in mixed alluvium on fan aprons.	Slight Susceptibility	Moderate Susceptibility
Paintrocks-Rock outcrop complex (4 to 15 percent)	24	Shallow, excessively drained soils formed in granite-weathered residuum on pediments.	Low Susceptibility	Low Susceptibility
Thermopyl-Nasagold association (0 to 4 percent)	16	Well-drained soils formed in mixed alluvium on fan remnants and fan skirts.	Slight Susceptibility	Moderate Susceptibility
Crosgrain-FortIrwin complex (2 to 8 percent)	12	Well-drained soils formed in mixed alluvium on fan remnants.	Low Susceptibility	Moderate Susceptibility
Rock outcrop-Paintrocks complex (15 to 50 percent)	11	Excessively drained soils derived from granite on mountain slopes and pediments.	Low Susceptibility	Low Susceptibility
Garlock-Ambrosia-Arizo complex (2 to 8 percent)	9	Deep, well-drained soils formed in mixed alluvium on old stream terraces and alluvial fans.	Moderate Susceptibility	Slight Susceptibility
Fortirwin-Crosgrain association (2 to 15 percent)	5	Shallow, well-drained soils formed in mixed alluvium on fan remnants.	Low Susceptibility	Moderate Susceptibility

Source: Natural Resources Conservation Service (NRCS) 2018

(K) = numerical value indicating susceptibility of a soil to sheet and rill erosion by water.

(I) = numerical value indicating susceptibility of soil to wind erosion.

Note: Soils acreages denoted in **Table 2** include a buffer of 100 feet each side of the proposed roadway and utility corridors and do not represent the actual limits of disturbance associated with the project.

As shown on **Figure 9**, Quaternary faults are widespread in the Fort Irwin area, including sinistral, east-striking faults and contrasting dextral, northwest-striking. These east-west and northwest-southwest trending faults underlie and intersect one another within the proposed project area. For example, East Goldstone Lake Fault is a northwest-southeast trending fault that underlies portions of the area where the proposed roadway and utility upgrades would occur. The proposed DUT Complex is underlain by numerous, smaller east-west trending faults.

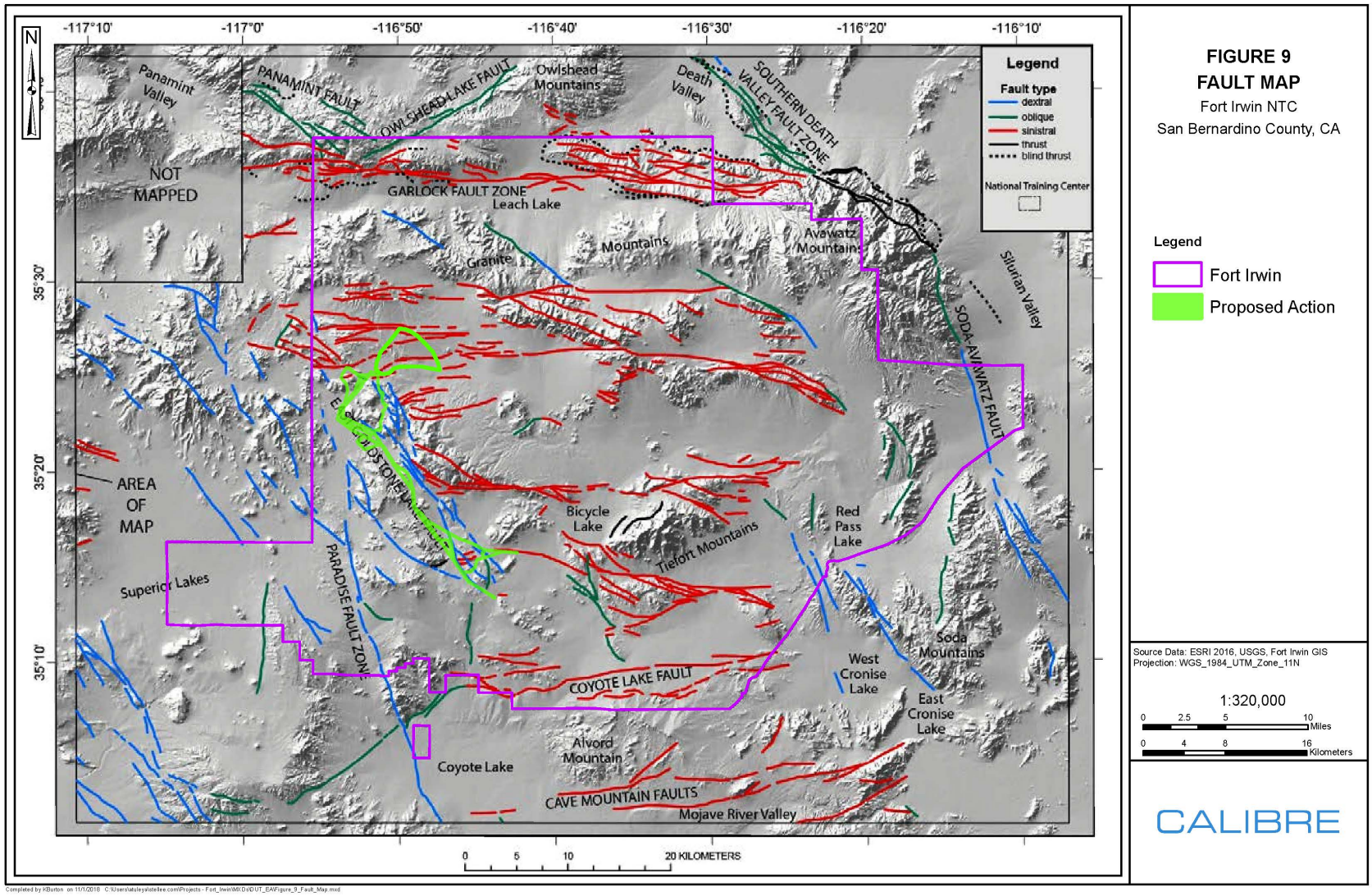

Figure 9: Fault Map

3.3 Biological Resources

Biological resources include plants (flora) and animals (fauna) and the habitats in which they occur. Major vegetation communities are described in terms of the representative species present, with special attention placed on special-status species afforded some level of federal, state, or local protection. General wildlife species expected to occur are described, with emphasis placed on special-status species.

3.3.1 Regulatory Setting

Regulations concerning biological resources include the following:

Endangered Species Act (ESA). The ESA (16 U.S.C. § 1531 et seq.) was established to protect and allow for recovery of species in danger of extinction and their associated habitat. Under the ESA, species may be listed as endangered or threatened. Endangered species includes those in danger of extinction throughout all or a part of its range. Threatened species include those likely to become endangered within the foreseeable future. The ESA also protects habitat considered critical to the existence and recovery of listed species. Section 7 of the ESA specifies that any agency that proposes a federal action that could jeopardize a listed species or result in destruction or adverse modification of its habitat must participate in an interagency cooperation and consultation process with USFWS or the National Oceanic and Atmospheric Administration.

California Endangered Species Act (CESA). The purpose of the CESA is to ensure all native species of flora and fauna, including their associated habitat, threatened by extinction, and/or significantly declining populations that could lead to a threatened or endangered designation, are protected. The CESA delegates the responsibility of maintaining a list of state threatened and endangered species to the CDFW. The CESA encourages consultation with CDFW if a proposed action may affect a state-listed species.

Migratory Bird Treaty Act (MBTA). The purpose of the MBTA (16 U.S.C. § 703 *et seq*.) is to allow for protection of bird species that migrate between the U.S. and other countries. The MBTA states that it is unlawful to pursue, hunt, take, capture, wound, or kill a migratory bird by any means, including any part, egg, or nest unless otherwise authorized, such as within legal hunting seasons. The list of bird species protected by the MBTA is included in 50 CFR § 10.13.

3.3.2 Natural Resources Management

The Fort Irwin Integrated Natural Resources Management Plan (INRMP) addresses and provides a management plan for threatened and endangered species, fish and wildlife, forestry, grazing and cropland, pest management, land, and outdoor recreation. The INRMP prioritizes the management of indigenous, federally-listed species and habitats. Management consideration is also applied to state listed species under the CESA as well as species with federal and state rare and sensitive designations (Army 2006).

Regionally, the California Desert Conservation Area (CDCA) Plan (1980, as amended) guides the management of all Bureau of Land Management (BLM)-administered desert area lands. Implementation of the CDCA Plan has been amended through the development of more detailed Resource Management Plans, including the West Mohave Plan (WEMO) covering 9.3 million acres in the western Mojave Desert area. The WEMO puts forth a comprehensive strategy to conserve and protect more than 100 listed or sensitive wildlife species and their habitats, including the Agassiz's desert tortoise (hereafter, the "desert tortoise;" *Gopherus agassizii*) and Mohave ground squirrel (MGS; *Xerospermophilus mohavensis*) (State of California 2008).

3.3.3 Biological Resources Survey

A natural resources habitat assessment and pedestrian survey was conducted by a team of USFWS-qualified biologists between April and June 2018, on approximately 4,014 acres of land within the DUT Complex project boundary. The purpose of the survey was to determine the presence of 10 species of concern, including Lane Mountain milkvetch (*Astragalus jaegerianus*), desert cymopterus (*Cymopterus deserticola*), desert tortoise, MGS, Western burrowing owl (*Athene cunicularia*), Mojave fringe-toed lizard (MFTL; *Uma scoparia*), American badger (*Taxidea taxus*), desert kit fox (*Vulpes macrotis*), loggerhead shrike (*Lanius ludovicianus*), and LeConte's thrasher (*Toxostoma lecontei*). Additionally, all sensitive plant, cacti, and yucca species were recorded during the survey. The complete survey report is provided in **Appendix B** of this EA.

3.3.4 Flora

The floristic survey identified the following vegetation communities within portions of the DUT Complex project boundary, with some variation in makeup and density:

Bursage-Creosote. Typically found on alluvial fans, bajadas, upland slopes, and minor washes and rills at elevations between -245 and 3,935 feet asl.

Allscale. Typically found on old beaches, lake deposits, dissected alluvial fans, alluvial terraces, and rolling hills at elevations between -245 and 4,920 feet asl.

Creosote Dominant Shrubland. Typically found on alluvial fans, bajadas, upland slopes, and minor intermittent wash channels at elevations between -245 and 3,280 feet asl.

Fourwing or Shadscale Saltbush. Typically found on old beaches, lake deposits, dissected alluvial fans, and rolling hills at elevations between-245 and 4,920 feet asl (Tetra Tech 2016).

As part of the project-specific habitat assessment and pedestrian survey, all plant species were identified to at least genus taxa, the level necessary to determine if a plant or community of plants were a species of concern. Within the sparsely vegetated areas and remnant alluvial fans of the DUT Complex project area, the dominant vegetation community observed was composed of creosote bush (*Larrea tridentate*), white bursage (*Ambrosia dumosa*), and pima rhatany (*Krameria erecta*). Other common shrubs observed as part of this community included turpentine-broom (*Thamnosma montana*), Mojave-aster (*Xylorhiza tortifolia var. tortifolia*), Nevada jointfir (*Ephedra nevadensis*), and Anderson's wolfberry (*Lycium andersonii*). Within the washes and small stream channels of the DUT Complex project area, creosote bush, white bursage, spiny senna (*Senna armata*), and cheesebush (*Ambrosia salsola*) were documented to occur.

The roadway and utility corridors of the project area traversed mountains, alluvial fans, washes, and alkali basins of volcanic origin (northerly sections) and granitic origin (southerly sections). The dominant vegetation communities observed were composed of creosote bush and white bursage, and allscale scrub (*Atriplex polycarpa*). The creosote bush and white bursage community was highly variable along the routes with the most diverse communities found along the volcanic slope east of Goldstone Lake playa, as well as on the granitic alluvial fans found in the southern extent of the survey area. The allscale scrub community occurred along the edges of playas and on dissected alluvial fans (above playas) in pure stands or with shadscale or four-wing saltbush (*Atriplex canescens*). The latter scrub community also occurred in a small area southeast of Goldstone Lake playa.

Appendix B contains additional information on the vegetation communities documented to occur within the proposed project area.

3.3.4.1 Special Status Flora

Special status flora with potential to occur in the project area were identified based upon their range and habitat, as follows:

- ESA-listed threatened and endangered, proposed for listing, or candidate for listing species
- BLM-designated sensitive species subject to special management consideration
- USFWS-designated species of concern or those species formerly designated as candidates for listing as endangered or threatened, but for which information is insufficient to support a determination
- Species listed as threatened or endangered under the CESA by CDFW
- Species designated by the California Native Plant Society (CNPS) as Category 1B (rare, threatened, or endangered in California and elsewhere) or Category 2 (rare, threatened, or endangered in California, but more common elsewhere)
- Species protected under the California Desert Native Plants Act (CDNPA) (Division 23 of the California Food and Agricultural Code, Section 80071-80075)

The following subsections describe special status plant species surveyed for in, or identified during survey of, the project area. Lane Mountain milkvetch is the only federally listed plant species with potential to occur. **Appendix B** provides a full listing of special status plants for the project area, including their conservation status or rank at the federal and state levels.

Lane Mountain Milkvetch

Lane Mountain milkvetch occurs in Joshua tree woodland, mixed Mojave scrub, and creosote bush scrub in poorly developed sandy or granitic gravely soils. Known populations of Lane Mountain milkvetch typically occur at elevations ranging from 3,100 to 4,200 feet asl, and generally occur in areas of small ridges and shallow bedrock. Known populations occur in Mojave creosote bush scrub and Mojave mixed woody scrub communities with diverse shrub assemblages. Lane Mountain milkvetch is a weak climbing plant that typically uses turpentine-broom, annual bursage (*Ambrosia acanthicarpa*), California buckwheat (*Eriogonum fasciculatum*), Cooper's goldenbush (*Ericameria cooperi*), and Nevada jointfir for support. Three major populations of Lane Mountain milkvetch have been mapped on Fort Irwin within a 21,000-acre area, most of which occurs in the western portion of the installation (USFWS 2008; Army 2006).

Within the project area, potential habitat for Lane Mountain milkvetch occurred along the proposed electrical route, where it intersected with granitic boulder outcrops.

Desert Cymopterus

Desert cymopterus (*Cymopterus deserticola*), designated as CNPS CRPR 1B.2, is a herbaceous perennial in the carrot family (*Apiaceae*). It typically occurs on deep, loose, well-drained sandy soil in alluvial fans and basins. This species also occurs on stabilized low sand dune areas and occasionally on sandy slopes. A population of desert cymopterus has been documented in the Superior Valley, just south of the Naval Air Weapons Station (NAWS) China Lake boundary. Several additional populations, estimated to contain several thousand plants, have been observed in the Superior Valley. A 346-acre area within the western portion of Fort Irwin is a designated conservation area for desert cymopterus. This conservation area contains at least 366 individuals of the plant and is west-southwest of the project area (Army 2006). No areas of suitable habitat for desert cymopterus, stabilized dune systems or areas with deep sand, were identified within the project area (**Appendix B**).

Clokey's Cryptantha

Clokey's cryptantha (*Cryptantha muricata var. clokeyi*), designated as CNPS CRPR 1B.2, is an annual herb that is native and endemic to California. It typically occurs in gravelly areas of coarse colluvium substrate, most frequently on upper slopes within creosote bush scrub communities in the Mojave Desert from elevations of 2,919 to 5,118 feet asl (Army 2006). Within the project area, potential habitat for Clokey's cryptantha was identified on portions of the DUT Complex site and over mountain passes along the roadway and utility corridors (**Appendix B**).

Booth's Evening-Primrose

Booth's evening-primrose (*Camissonia boothii*), designated as CNPS CRPR 2B.3, is an annual forb native to the western United States and northwestern Mexico. It has hairy reddish-green stems, produces many small, white to red or yellowish flowers, and typically occurs in dry, well-drained sandy and gravelly soils on desert flats and lower bajadas (CNPS 2018). Throughout the project area, potential habitat for Booth's evening-primrose was identified on sandy flats (**Appendix B**).

Parish's Phacelia

Parish's phacelia (*Phacelia parishii*), designated as CNPS CRPR 1B.1, is a low-growing, annual herb in the borage or waterleaf family (*Boraginaceae*) that is native to California, Nevada, and Arizona. Typical habitat for this species includes clay and alkaline soils, and dry lake margins at elevations ranging from 1,772 to 3,937 feet asl (CNPS 2018). Within the project area, potential habitat for Parish's phacelia was identified along the proposed water route at the edge of Goldstone Lake playa near its intersection with Goldstone Road and along the proposed electrical route at the edge of Pioneer Dry Lake (**Appendix B**).

Jackass-Clover

Jackass-clover (*Wislizenia refracta* ssp. *refracta*), designated as CNPS CRPR 2B.2, is an annual herb with egg-shaped leaflets and yellow flowers. It typically occurs in sandy flats, desert scrub, or along disturbed sites such as roadsides (CNPS 2018). Within the project area, potential habitat for jackass-clover was identified along the proposed water route at the edge of Goldstone Lake playa near its intersection with Goldstone Road and along the proposed electrical route at the edge of Pioneer Lake playa (**Appendix B**).

Mojave Indigo-Bush

Mojave indigo-bush (*Psorothamnus arborescens*) is a short shrub in the legume family that produces many bright purple flowers and is designated as a CNPS CRPR 4.3. It is native to the southwestern United States and typically occurs in desert mountain ecosystems on slopes, canyons, flats, and washes at elevations ranging from 330 to 6,230 feet asl (CNPS 2018). Within the project area, individual and small groups of Mojave indigo-bush occurred on granitic alluvial fans and in washes along the roadway and utility corridors. A total of 975 plants were recorded, including one large population, comprised of approximately 835 individuals between NASA Road and Goldstone Road along the proposed water route (**Appendix B**).

CDNPA-Protected Plants

Several plants protected under the CDNPA were observed throughout the project area, including golden cholla (*Cylindropuntia echinocarpa*), pencil cactus (*Cylindropuntia ramosissima*), cotton-top cactus (*Echinocactus polycephalus* var. *polycephalus*), beavertail (*Opuntia basilaris* var. *basilaris*), Joshua tree (*Yucca brevifolia*), and honey mesquite (*Prosopis glandulosa* var. *torreyana*). Although individual Joshua trees were observed in the project area, no Joshua tree woodland vegetation communities were recorded (**Appendix B**). **Table 3** provides a summary of CDNPA-protected plant species identified during field survey.

Table 3: CDNPA Species Documented to Occur in the Project Area

Dense Urban Terrain Complex EA, Fort Irwin, California

Species	# in DUT	# Along Linear Routes	Total
golden cholla	1092	61	1153
pencil cactus	296	25	321
cotton-top cactus	474	14	588
beavertail	298	24	322
Joshua tree	104	15	119
honey mesquite	0	1	1

3.3.4.2 Field Survey Results

Although the rare plant survey identified potentially suitable habitat for Lane Mountain milkvetch, this species was not documented to occur in the project area. No other federally protected flora are known to occur on Fort Irwin.

Only one CNPS-designated plant species was documented to occur in the project area—the Mojave indigo-bush. Several plant species receiving protection under the CDNPA were identified during field survey, representing 157 taxa in 33 plant families.

Further information on the results of the rare plant survey is provided as **Appendix B**.

3.3.5 Fauna

Wildlife typical of Fort Irwin includes a variety of species adapted to the xeric conditions and sparse cover characteristic of desert scrub habitats. Isolated seeps and springs provide perennial sources of water and support vegetative cover, leading to increased wildlife diversity in these areas. Rocky terrain provides additional cover and habitat for various reptile, rodent, bat, and bird species. Playas may support seasonal wetlands or pools with brine shrimp (*Artemia* sp.), which in turn may support migratory waterbirds. Lack of specialized aquatic habitat contributes to the absence of native amphibian and fish populations on the installation. The wastewater treatment plant (WWTP), east of the developed cantonment, could provide temporary habitat for waterbirds, such as duck and wading bird species, but would not provide suitable habitat for species that require riparian vegetation. The WWTP ponds are regularly drained and maintained and vegetation around the edges of the ponds is regularly removed for maintenance.

Game species found on Fort Irwin include quail (*Callipepla* sp.), dove (*Zenaida macroura*), chukar (*Alectoris chukar*), desert cottontail rabbit (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), and coyote (*Canis latrans*). Larger mammals that may occur in the Fort Irwin area include American badger (*Taxidea taxus*), kit fox (*Vulpes macrotis*), grey fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), Nelson's desert bighorn sheep (*Ovis canadensis nelson*), and mountain lion (*Felis concolor*).

Abandoned mines, natural caves, trees, and built structures throughout the installation provide potential roosting habitat for bats. Bats also use the many cliff faces and rocky ledges of mountain ranges as sites for roosting; bats also could use Joshua trees as night roosts. The western pipistrelle (*Pipistrellus hesperus*) and California myotis (*Myotis californicus*) are the most common bat species (Army 2006).

Sections 3.3.5.1 through **3.3.5.3** identify common wildlife species found on Fort Irwin. The vegetation communities of the project area would provide suitable habitat for many of these species; however, habitat within the project area has been moderately degraded from military training activities. The project area would also provide suitable habitat for some sensitive species, such as the desert tortoise. Special status species are described in **Section 3.3.5.4**.

3.3.5.1 Mammals

Small mammals potentially occurring within the project area would include common species such as black-tailed jackrabbit, desert cottontail, white-tailed antelope ground squirrel (*Ammospermophilus leucurus*), kangaroo rats (*Dipodomys* spp.), pocket mice (*Chaetodipus formosus*, *Chaetodipus penicillatus*, *Perognathus* spp.), and field mice (*Peromyscus* sp.). Desert woodrat (*Neotoma lepida*) and Botta's pocket gopher (*Thomomys bottae*) are also common on Fort Irwin.

Wild burros (*Equus asinus*) were observed within the project area during field activities and occur throughout most of Fort Irwin. Coyotes and kit foxes are known to occur on Fort Irwin, both of which were observed during camera trapping surveys. Nelson's desert bighorn sheep are known to occur in the northeastern portion of Fort Irwin and are not further discussed because there would be no potential to affect this species. Additionally, the western pipistrelle and California myotis have been observed foraging at the WWTP ponds (Army 2006).

3.3.5.2 Birds

Surface water features in the desert attract and support a higher diversity of avian species. For example, the sewage ponds on Fort Irwin are an oasis that attracts and supports large numbers of resident and migratory water dependent birds as well as upland bird species. Due to the lack of water sources in the desert, these human-made water collection areas provide important stopover habitat for migrants and breeding habitat for resident species. In general, areas of higher perennial shrub density and vertical structure, as well as lower levels of disturbance, provide better nesting and foraging habitat for birds than adjacent areas with sparse and/or disturbed vegetation (Army 2006; Cornell 2018).

Over 200 avian species have been documented during previous surveys at Fort Irwin (Moreton and Rathbun 2011). Common bird species potentially occurring in or near the project area include the American robin (*Turdus migratorius*), mourning dove (*Zenaida macroura*), house sparrow (*Passer domesticus*), black-throated sparrow (*Amphispiza bilineata*), rock wren (*Salpinctes obsoletus*), horned lark (*Eremophila alpestris*), common raven (*Corvus corax*), and greater roadrunner (*Geococcyx californianus*).

Additional species could occur as migrants within the project area. Some common species include the yellow-rumped warbler (*Dendroica coronata*), Hutton's vireo (*Vireo huttoni*), cliff swallow (*Hirundo pyrrhonata*), ruby-crowned kinglet (*Regulus calendula*), and white-crowned sparrow (*Zonotrichia leucophrys*). Migrants that may not regularly stopover or occur only for short periods of time include cattle egret (*Bubulcus ibis*), wood duck (*Aix sponsa*), red-breasted merganser (*Mergus serrator*), and osprey (*Pandion haliaetus*). Migrants that are uncommon and/or secretive species or are outside or on the edge of their known geographic range include lesser nighthawk (*Chordeiles acutipennis*), black rail (*Laterallus jamaicensis*), Virginia rail (*Rallus limicola*), white-winged dove (*Zenaida asiatica*), acorn woodpecker (*Melanerpes formicivorus*), vermilion flycatcher (*Pyrocephalus rubinus*), and black and white warbler (*Mniotilta varia*) (Tetra Tech 2016).

Raptors with potential to occur in the project area include red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), golden eagle (*Aguila chrysaetos*), and prairie falcon (*Falco mexicanus*). Due to the lack of suitable habitat and degree of human presence, use of the area within the project area by

raptors would likely be limited to foraging activities. The barn owl (*Tyto alba*) and Western burrowing owl (*Athene cunicularia*) are also known to occur on Fort Irwin (Army 2006).

3.3.5.3 Amphibians and Reptiles

Reptile species on Fort Irwin include common lizards, such as zebra-tailed lizards (*Callisaurus draconoides*), side-blotched lizards (*Uta stansburiana*), desert spiny lizard (*Sceloporus magister*), and Great Basin whiptails (*Aspidoscelis tigris tigris*). Less common species include the desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*), and desert iguana (*Dipsosaurus dorsalis*). Common snake species include the coachwhip (*Masticophis flagellum*), gopher snake (*Pituophis melanoleucus*), western patch-nosed snake (*Salvadora hexalepis*), western shovel-nosed snake (*Chionactis occipitalis*), and Mojave sidewinder (*Crotalus cerastes*). Other species that occur on Fort Irwin include the blind snake (*Leptotyphlops humulis*), ground snake (*Sonora semiannulata*), southwestern speckled rattlesnake (*Crotalus mitchellii pyrrhus*), and the northern Mojave rattlesnake (*Crotalus scutulatus*) (Army 2006).

The desert tortoise occurs in varying densities throughout Fort Irwin. Desert tortoise and signs of individuals of this species were observed within the project area during the field survey. Desert tortoise are further discussed below.

3.3.5.4 Special Status Fauna

Special status fauna with potential to occur in the project area were identified based upon their range and habitat, as follows:

- ESA-listed threatened and endangered, proposed for listing, or candidate for listing species
- BLM-designated sensitive species subject to special management consideration
- USFWS-designated species of concern or those species formerly designated as candidates for listing as endangered or threatened, but for which information is insufficient to support a determination
- Species listed as threatened or endangered under the CESA by CDFW
- Species designated by CDFW as species of special concern

The following subsections describe special status animal species with a known or reasonable likelihood to occur in the project area. Desert tortoise, the only federally listed species, is known to occur. **Appendix B** provides a full listing of special status animals either known or with potential to occur in the project area, including their conservation status or rank at the federal and state levels.

Agassiz's Desert Tortoise

Desert tortoise is a large, herbivorous reptile that occurs in southeastern California, southern Nevada, southwestern Utah, and northwestern Arizona. It most commonly occurs within the desert scrub vegetation type. Optimal habitat for the desert tortoise is characterized as creosote bush scrub where annual precipitation ranges from two to eight inches. These conditions provide a diversity of perennial plants in relatively high abundance and produce ephemerals relied upon by this species. Soils must be friable enough for digging burrows, but firm enough so that burrows do not collapse. Desert tortoises occur from below sea level to an elevation of 7,300 feet asl, but prefer elevations ranging from approximately 1,000 feet to 3,000 feet asl. Within the Mojave region, desert tortoises are most commonly found in areas of gently sloping terrain, sandy-gravel soils, and scattered shrubs, where there is abundant inter-shrub space to support herbaceous plant growth. However, they are also known to inhabit steeper, rockier areas. The desert tortoise is most active in the spring, summer, and autumn when daytime temperatures are below 90 degrees Fahrenheit (Army 2006; USFWS 2014).

Primary threats to the desert tortoise include human-caused habitat destruction (i.e., urbanization), off-road vehicle use, illegal collection for the pet trade, and raven predation on juvenile tortoises. This species occurs throughout Fort Irwin in relatively low numbers (Army 2006). **Appendix B** describes and depicts desert tortoise observations and signs recorded on and near the project area. Additionally, Fort Irwin maintains a database of desert tortoise observations on the installation.

Pursuant to Section 7 of the ESA, Fort Irwin addresses the potential effects of its base-wide operations and activities on the desert tortoise with the USFWS in accordance with a programmatic biological opinion (BO) issued on 8 August 2014. That is, the BO describes criteria by which the Army will determine whether such actions are likely to adversely affect the desert tortoise or its critical habitat. These criteria also provide the framework for ESA Section 7 consultations with the USFWS for categorical actions defined in the BO (USFWS 2014). As desert tortoise is known to occur in the project area, the proposed DUT Complex is subject to the terms of this BO.

Mohave Ground Squirrel

MGS is native to the western Mojave Desert and found only in the counties of San Bernardino, Los Angeles, Kern, and Inyo, California. This species favors open desert scrub, alkali desert scrub, and Joshua tree habitats at elevations ranging from 1,800 feet to 5,000 feet asl. MGS prefer to forage on spiny hopsage (*Grayia spinosa*), white bursage, winterfat (*Krascheninnikovia lanata*), and saltbush (*Atriplex* spp) (Fort Irwin 2016a). MGS has previously been observed in the vicinity of the project area.

Western Burrowing Owl

The burrowing owl is a ground-nesting raptor that occupies burrows in open, dry grasslands, agricultural and range lands, and desert habitats. They have been known to inhabit golf courses, airports, cemeteries, vacant lots, and road embankments, wherever there is sufficient friable soil for a nesting burrow. In addition to burrows, the owls also require perching locations and frequently use fence posts or the top of mounds outside the burrow. Burrowing owls typically use burrows created by other animals (CDFW 2012). This species has previously been observed in the vicinity of the project area (Army 2006).

Mojave Fringe-toed Lizard

The known distribution of the MFTL is restricted to 35 sand dune complexes within the Mojave and Amargosa River drainages in the Mojave Desert and the Colorado River drainage in the Sonoran Desert. MFTLs are omnivorous, primarily feeding on arthropods and, to a lesser extent, on plant matter and hatchling lizards. This species prefers loose sand habitats, which are often scattered across the Mojave Desert resulting in a discontinuous population distribution within its range. On Fort Irwin, MFTL are known to occur in areas of wind dispersed sand along its southeastern boundary (Redhorse 2017). No potential MFTL habitat was identified during field survey of the project area.

American Badger

In California, American badger (*Taxidea taxus*) is most abundant in drier open stages of most shrub, forest, and herbaceous habitats with friable soils. American badgers dig burrows for cover, frequently reusing old burrows. Between March and April, young are typically born in burrows in relatively dry, sandy soils with sparse overstory vegetation (USFWS 2016). This species is known to occur on Fort Irwin but is considered localized and rare.

Desert Kit Fox

Desert kit foxes (*Vulpes macrotis*) generally prefer open desert, shrubby, or shrub-grass habitat. In the Mojave Desert, the species typically occurs in creosote bush vegetation community. The desert kit fox is

a nocturnal species that forages at night and typically resides in a den or burrow during the day (USFWS 2016). This species is known to occur throughout Fort Irwin with potential habitat in the project area.

Loggerhead Shrike

The loggerhead shrike is relatively common in lowland California and prefers open habitat with scattered shrubs and trees for nesting (Cornell 2018). Loggerhead shrike are known to occur throughout Fort Irwin. There is potential nesting and foraging habitat for this species in the project area.

LeConte's Thrasher

LeConte's thrasher (*Toxostoma lecontei*) is native to the southwestern U.S. and northwestern Mexico. It prefers to live in deserts with very little vegetation, where it blends in with the sandy soils. LeConte's thrashers are non-migratory birds that reside in the same territory annually (Cornell 2018). There is potential habitat for this species in the project area.

Golden Eagle

Golden eagle (*Aquila chrysaetos*) is an uncommon permanent resident and migrant throughout California, occurring at elevations that range from sea level to 11,500 feet asl. Preferred habitat for this species includes rolling foothills, mountain areas, sage-juniper flats, and desert. Golden eagles nest on cliffs and steep escarpments in grassland, chaparral, shrubland, forest, and other vegetated areas (Tetra Tech 2016). This species is known to occur on Fort Irwin. Potential habitat in the project area is suitable for foraging but is not likely to support golden eagle nesting or breeding activities.

3.3.5.5 Field Survey Results

The field survey confirmed that the proposed DUT Complex and its associated infrastructure components would not affect ESA-designated critical habitat for the desert tortoise (**Appendix B**). A total of 17 desert tortoises were documented to occur in the project area. Additionally, desert tortoise signs observed during survey included 17 carcasses, 71 burrows, 18 scat events (independent of burrows), and 4 tracks. Thirteen desert tortoises were recorded on the proposed DUT Complex site, most of which were centrally located in undulating terrain.

The MGS camera trapping survey documented a single occurrence of a ground squirrel within the DUT Complex site near Nelson playa with some indication of hybridization of MGS with round-tailed ground squirrel (*Xerospermophilus tereticaudus*).

One burrowing owl was observed in flight during the field survey. Additionally, seven owl burrows were identified, five of which showed signs of occupation (i.e., pellets or whitewash); two burrows were found along the proposed water route and five within the DUT Complex site. All five burrows found with signs of occupation occurred within the DUT Complex site.

Special status species incidentally observed during the MGS camera trapping effort included one golden eagle, seven LeConte's thrasher, one American badger, and three desert kit foxes. Additional live observations of special status species included one LeConte's thrasher, one American badger, and two loggerhead shrikes. Signs of special status species detected during survey included 37 possible desert kit fox burrows, three of which appeared to be active dens and 39 possible American badger burrows, five of which appeared to be active dens.

Further information on the results of the fauna survey is provided as **Appendix B**.

3.3.6 Pest Species

During the field survey, numerous non-native, invasive plant and animal species were documented in the project area. Weedy annual herbs and grasses commonly occurred, including Arabian and Mediterranean grass (*Schismus arabicus* and *S. barbatus*), redstem filaree (*Erodium cicutarium*), and Oriental hedge mustard (*Sysimbrium orientale*).

Although native to the Mojave Desert, common raven (*Corvus corax*) and coyote populations have increased substantially due to human activities in the desert. Because these species are known to prey on juvenile desert tortoises, they are managed as pest species on Fort Irwin (Army 2006). Both species were observed in the project area.

Additionally, evidence (scat) of the wild burro (*Equus asinus*), introduced into the southwest desert in the 1500s by the Spanish, was found throughout the project area.

3.4 Water Resources

Water resources are natural and man-made sources of water that are available for use by, and for the benefit of, humans and the environment. This section describes water resources, both surface and ground, within the project area.

3.4.1 Regulatory Setting

Clean Water Act (CWA). The CWA (33 U.S.C. 1251 *et seq*.) is the primary law regulating water pollution in surface waters. It mandates the NPDES program, which regulates the discharge of point (end of pipe) and non-point (storm water) sources of water pollution and requires a permit for any discharge of pollutants into "waters of the United States." Under the NPDES program, storm water management regulations impose specific best management practices (BMPs) for the design and construction of facilities. Section 401 of the CWA provides a means for states to control the degree of effect of discharges on state waters. The State of California issues NPDES permits and administers Section 401 water quality certifications pursuant to the **Porter-Cologne Water Quality Control Act** (California Water Code, Division 7).

Safe Drinking Water Act (SDWA). The SDWA (40 U.S.C. 100 *et seq*.) directs the United States Environmental Protection Agency (US EPA) to develop national drinking water regulations for public water systems and directs states to establish programs that protect areas around wellheads. The 1996 amendments establish a strong emphasis on source water protection and enhanced water system management.

3.4.2 Surface Water

Surface water resources are scarce on Fort Irwin and in the surrounding region. Washes descending from mountains and other elevated landforms provide ephemeral and intermittent channels that route storm water runoff into basins that store water until percolation or evaporation occurs. All streams are ephemeral or intermittent, and naturally occurring standing water is ephemeral, evident only during and immediately after heavy rains (Army 2006). Surface flows on Fort Irwin generally drain to one of the thirteen playas or dry lakebeds. There are no surface water lakes on Fort Irwin due to the high evaporative potential exceeding surface and groundwater input (Army 2008). Substantial water flow and accumulation occurs during large, high intensity storm events, which typically occur in the summer months in the form of monsoon thunderstorms. Such events can cause three to four inches of rain within 24 hours, and often within six hours (Air Force Combat Climatology Center [AFCCC] 2004).

Alluvial fans are a common landform in and around Fort Irwin. Bedload material composed of sand, gravel, cobbles, and rocks is deposited in alluvial fans during heavy rainfall events. Significant subsurface flows may occur in the unconsolidated sand and gravel channel deposits in washes and alluvial fans, even after surface flows have ceased. Water may pool along washes or in shallow ephemeral lakes, and either percolates to the groundwater or evaporates (Army 2006).

Fort Irwin has six springs that produce small quantities of water and four intermittent springs that produce little to no water during the summer, depending on the seasonal amount of rainfall (Army 2006). No springs are located within or in the immediate vicinity of the project area.

3.4.3 Project Area

There are no water features in the project area that meet the definition of "state waters" pursuant to the California Water Code or "waters of the United States" pursuant to the CWA. Numerous intermittent streams drain the project area and all naturally occurring standing water is ephemeral or present only during and immediately after heavy rain events. During such events, surface water that does not percolate below ground or evaporate generally flows towards the surrounding playas. At the DUT Complex site, surface water is predominately directed towards Nelson playa to the southeast. With respect to the proposed roadway and utility corridors, surface water drainage varies by location but mostly drains west to Goldstone playa or south to the cantonment area.

3.4.4 Groundwater

Several groundwater basins occur in the vicinity of Fort Irwin, including the Bicycle Lake, Capital City, Coyote Lake, Goldstone Valley, Irwin, Langford Lake, and Superior Lake basins. The water supply for Fort Irwin is supplied by groundwater from the Bicycle Lake, Langford Lake, and Irwin groundwater basins. The project area is within the Goldstone Valley groundwater basin, but surface drainages can convey water to the Bicycle Lake groundwater basin through a narrow valley.

Very little natural groundwater recharge occurs in these basins (USGS 1997b). Average annual natural recharge to the Irwin groundwater basin is about 0.04 million gallons per day (mgd) or 50 acre-feet per year (afy) (USGS 1997a). Bicycle Lake and Langford Lake groundwater basins have a recharge rate of 0.03 mgd (30 afy) and 0.07 mgd (75 afy), respectively. Water levels have decreased in the Bicycle Lake and Langford Lake basins, while water levels in the Irwin basin have increased due to infiltration of treated wastewater effluent from the percolation ponds near the Fort Irwin cantonment (CH2M Hill [CH2M] 2007).

3.4.5 Water Quality and Quantity

Fort Irwin monitors the quality of its groundwater, as it is the only source for drinking water. Water from wells in all three basins has high fluoride concentrations, with 90 percent of wells sampled having fluoride above the California maximum contaminant level of 2 milligrams per liter. Arsenic has been detected at concentrations above the state maximum contaminant level of 10 micrograms per liter in 80 percent of the wells sampled. The volcanic rocks common to the area are high in fluoride and arsenic, and the natural weathering of bedrock is a potential source of these elements in groundwater. Water used for drinking is treated to required standards.

The long-term availability of water is a sustainability concern in desert environments. As such, several aquifers within the Fort Irwin training areas (e.g., Leach, Avawatz, and Superior) are being studied for possible development of groundwater wells (Army 2006).

3.5 Air Quality

This section describes air quality conditions and regulatory considerations at Fort Irwin and in the Mojave Desert Region.

3.5.1 Regulatory Setting

3.5.1.1 Federal

Federal air quality is regulated through the Federal Clean Air Act (CAA), as amended. In accordance with the CAA, the US EPA has established National Ambient Air Quality Standards (NAAQS) for the designated criteria pollutants: carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and lead (**Table 4**). The CAA regulatory process requires the US EPA to work with individual states to describe areas (counties or air basins) within a state as attainment or non-attainment of the NAAQS. The CAA was amended in 1977 to require each state to develop, maintain, and periodically review a State Implementation Plan (SIP) for achieving compliance with the NAAQS. An area that is designated as nonattainment is understood to be failing to meet one or more of the criteria pollutant NAAQS and is subject to planning requirements that will enable the area to meet the NAAQS or attain the previously violated standard. In 1990, the CAA Amendments (CAAA) were enacted to address the requirement that all proposed actions in any nonattainment area would conform to the SIP for achieving timely attainment of the NAAQS. In accordance with the CAAA of 1990, US EPA issued SIP conformity guidelines—one set of guidelines for transportation projects and another set of guidelines for federal projects known as General Conformity.

Table 4: Mojave Desert AQMD Attainment Status

Dense Urban Terrain Complex EA, Fort Irwin, California

Pollutant	Averaging Time	California Standards		Federal Standards	
		Concentration	Attainment Status	Concentration	Attainment Status
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Non-attainment	-	Non-attainment*
	8 Hour	0.070 ppm (137 µg/m^3)		0.070 ppm (137 µg/m^3)	
Respirable Particulate Matter (PM_{10})	24 Hour	50 µg/m^3	Non-attainment	150 µg/m^3	Non-attainment***
	Annual Arithmetic Mean	20 µg/m^3		-	
Fine Particulate Matter ($PM_{2.5}$)	24 Hour	No State Standard		35 µg/m^3	Unclassified/ Attainment
	Annual Arithmetic Mean	12 µg/m^3	Non-attainment*	12 µg/m^3	
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10 mg/m^3)	Attainment	9 ppm (10 mg/m^3)	Unclassified/ Attainment
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)	
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppb (57 µg/m^3)	Attainment	0.053 ppm (100 µg/m^3)	Unclassified/ Attainment
	1 Hour	0.18 ppm (330 µg/m^3)		100 ppm (196 µg/m^3)	
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	-	Attainment	0.030 ppm (80 µg/m^3)	Unclassified/ Attainment
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (365 µg/m^3)	

Table 4: Mojave Desert AQMD Attainment Status

Dense Urban Terrain Complex EA, Fort Irwin, California

	3 Hour	-		0.5 ppm (1300 µg/m^3)	
	1 Hour	0.25 ppm (655 µg/m^3)		75 ppb (196 µg/m^3)	
Lead (Pb)	30 Day Average	1.5 µg/m^3	Attainment	-	Unclassified/ Attainment
	Calendar Quarter	-		1.5 µg/m^3	
	Rolling 3-Month Average	-		0.15 µg/m^3	
Visibility Reducing Particles	8 Hour	Extinction Coefficient of 0.24 per kilometer - visibility of ten miles or more due to particles when relative humidity is less than 70 percent	Unclassified	No Federal Standards	
Sulfates	24 Hour	25 µg/m^3	Attainment		
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Non-attainment**		
Vinyl Chloride	24 Hour	0.01 ppm (26 µg/m^3)	Unclassified		

*Southwest corner of desert portion of San Bernardino County only

**Searles Valley (northwest corner of San Bernardino County) only

***San Bernardino County portion only

µg/m^3 = microgram per cubic meter

3.5.1.2 General Conformity

General Conformity ensures that the actions taken by federal agencies do not interfere with a state's plans to attain and maintain national standards for air quality. Established under the CAA (section 176(c)(4)), the General Conformity rule plays an important role in helping states and tribes improve air quality in those areas that do not meet the NAAQS. Under the General Conformity rule, federal agencies must work with state, tribal and local governments in a nonattainment or maintenance area to ensure that federal actions conform to the air quality plans established in the applicable state or tribal implementation plan. US EPA guidance states that a federal project is in conformity with the SIP as long as it does not meet any of the following conditions:

- Cause or contribute to a new violation of the NAAQS
- Cause worsening (contribute to any increase in frequency or severity) of any existing NAAQS violation
- Delay the timely attainment of the NAAQS or any attainment milestones

US EPA first issued the General Conformity Rule in 1993. After suggestions from federal agencies, states and the public on how to improve the rule, US EPA revised the rule on 5 April 2010. Currently, the General Conformity Rule applies to all federal actions that are taken in designated nonattainment or maintenance areas with three exceptions:

- Actions covered by the transportation conformity rule
- Actions with associated emissions below the *de minimis* levels as outlined in 40 CFR 93.153(b)
- Other actions which are either specifically exempted by the rule or are covered by an approved Presumed – to Conform list

In an area with a SIP, conformity can be demonstrated by either showing that the emissions increase caused by the action is included in the SIP, demonstrating that the state agrees to include the emissions increase in the SIP, offsetting the project's emissions, or employing mitigation measures to reduce the emission increase, which in some circumstances is done via an air quality modeling demonstration.

Since the proposed action is being approved by a federal agency and lies within the boundaries of a federal nonattainment area for PM_{10}, General Conformity applies to the proposed action.

3.5.1.3 State

California enacted air pollution control programs prior to the federal requirements, making it one of the earliest and more robust state air quality programs. Responsibility for program management within the state is divided between the California Air Resources Board (ARB), the primary state air quality management agency, and the various air pollution control districts or local air quality management agencies. The ARB oversees air quality policy and regulations in the state and is responsible for preparing and submitting the SIP to US EPA. California has established California ambient air quality standards (CAAQS) which are generally more stringent than the NAAQS and includes additional designated pollutants. (**Table 4**). In 1988, California enacted the California CAA which requires local air districts to develop air plans for the purpose of achieving compliance with the CAAQS. Like US EPA, the California ARB designates counties in California as attainment or nonattainment for the CAAQS. The proposed action is located in California's San Bernardino County, which is designated as nonattainment for the state O_3, $PM_{2.5}$, and PM_{10} ambient air quality standards.

3.5.1.4 Local

Fort Irwin and the proposed action area lie within the jurisdictional boundary of the Mojave Desert Air Quality Management District (MDAQMD). MDAQMD is responsible for regulating stationary source of air pollution and implementing programs required by the state and federal agencies. MDAQMD enforces the regulations and educates source owners and residents concerning their role in protecting air quality. The MDAQMD air quality plan which is applicable to the proposed action is the *Federal Particulate Matter (PM_{10}) Attainment Plan* (MDAQMD 1995). Additionally, the proposed action would be subject to compliance with the MDAQMD Rule 403 and 403.2 with respect to fugitive dust.

3.5.1.5 Existing conditions

San Bernardino County, including Fort Irwin, where the proposed action is located, is in nonattainment of both the CAAQS and NAAQS for PM_{10} (**Figure 10**). Additionally, the south most part of Fort Irwin (below the 90 Universal Transverse Mercator [UTM] grid line) is in nonattainment for both the federal and state standards for O_3 (**Figures 11**). However, the proposed action area is located north of this nonattainment area and lies in an area designated as unclassified/attainment for the federal standard.

The Mojave Desert exhibits high concentrations of particulate matter as a result of wind erosion of exposed or disturbed land areas. Activities at Fort Irwin, such as vehicle traffic on unpaved roads and training maneuvers create respirable particulate emissions (PM_{10}) also known as fugitive dust. Fort Irwin began monitoring these emissions in 1994 and continues to operate eight PM_{10} monitoring sites within its boundaries (**Figure 12**)

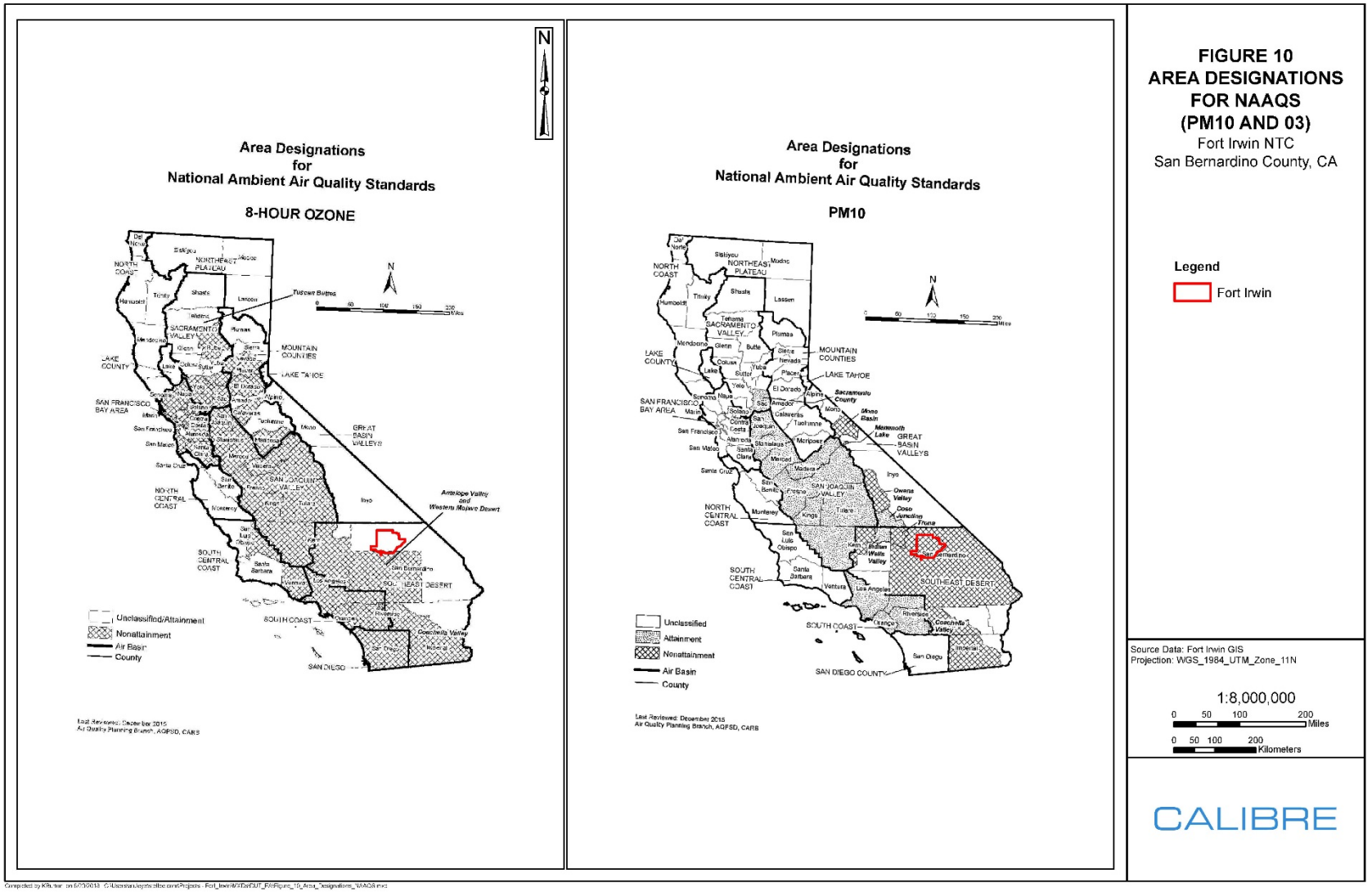

Figure 10: Area Designations for NAAQS PM_{10} and O_3

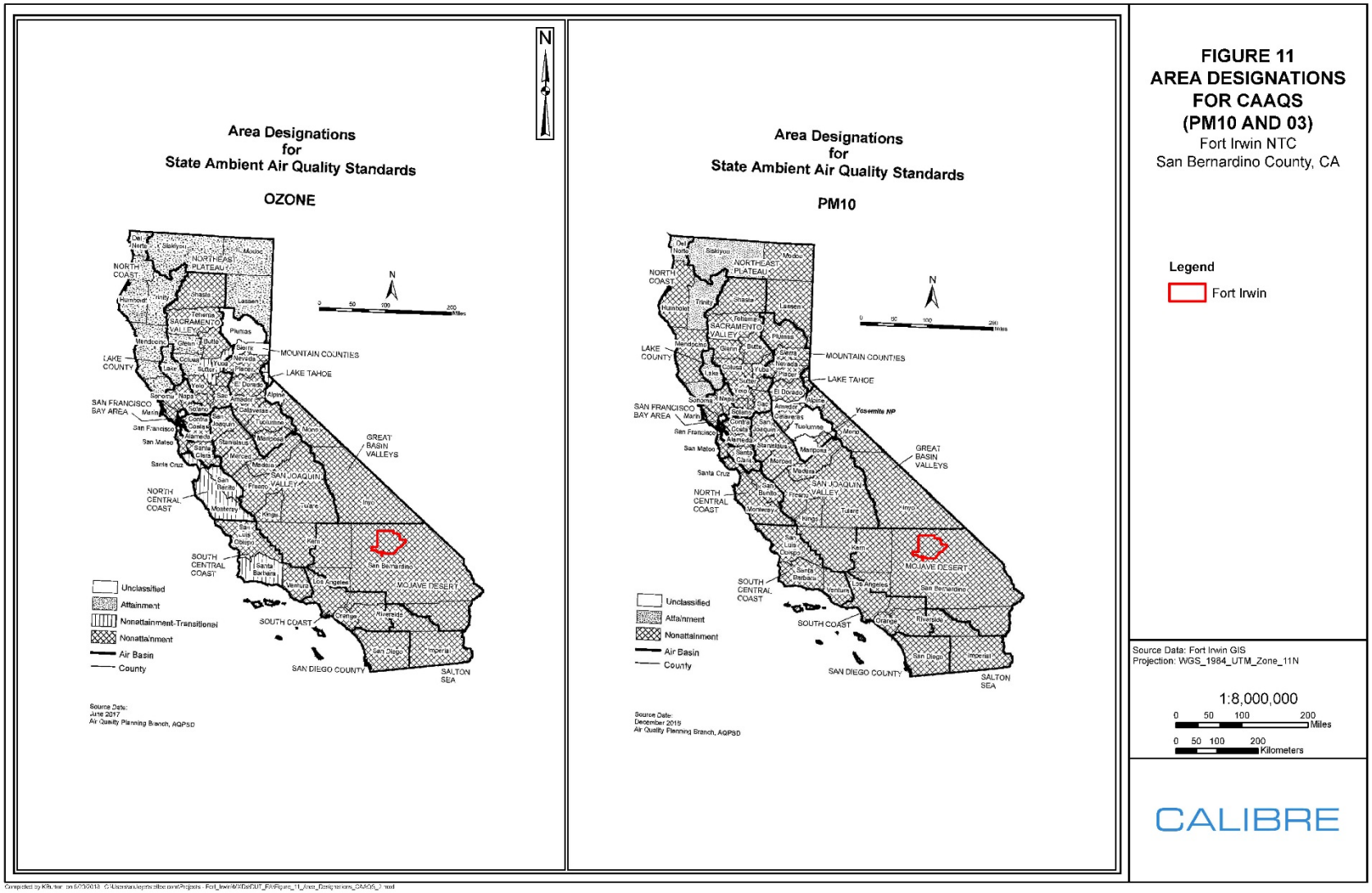

Figure 11: Area Designations for CAAQS PM_{10} and O_3

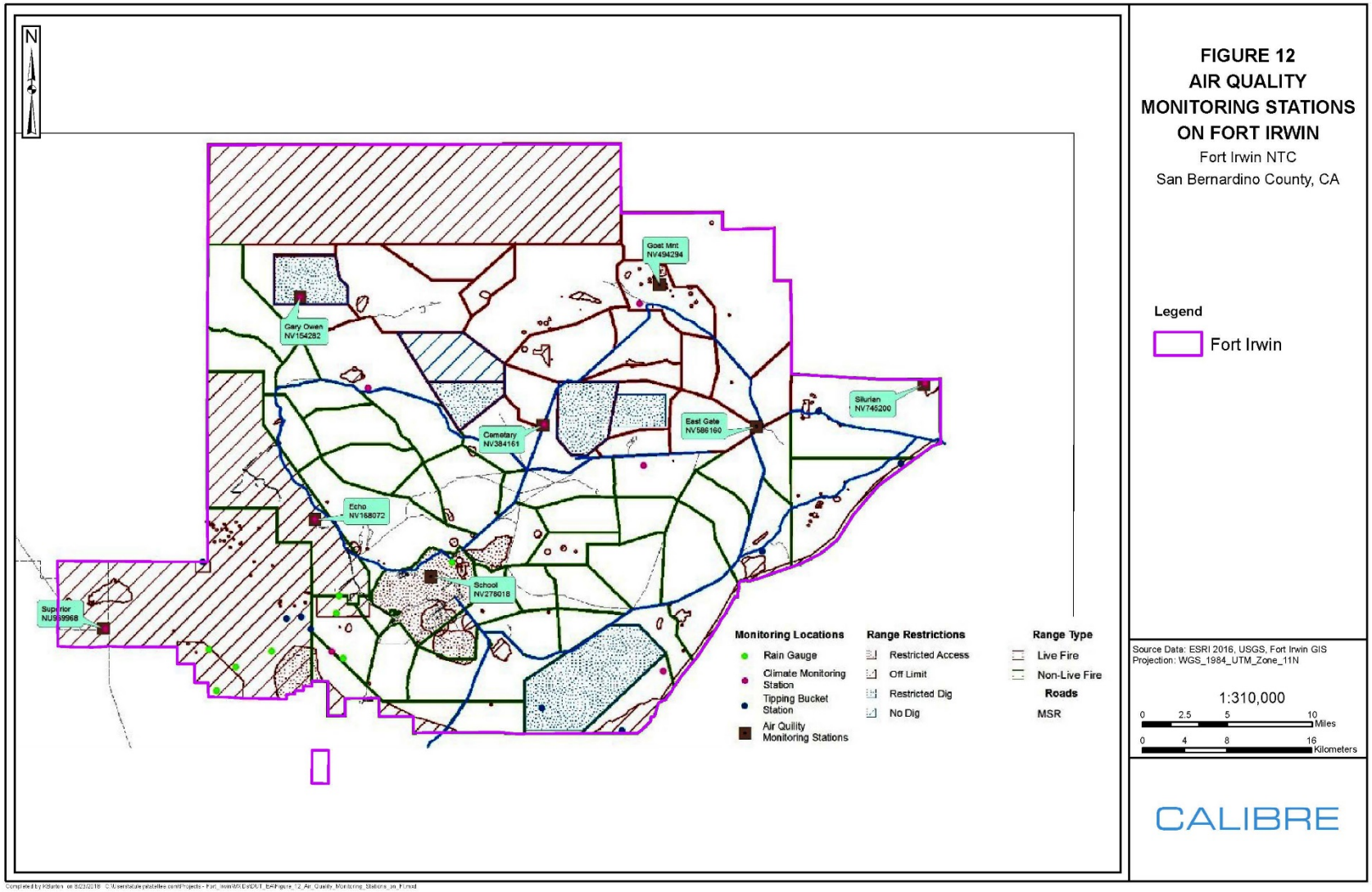

Figure 12: Air Quality Monitoring Stations on Fort Irwin

In addition to monitoring, Fort Irwin employs a variety of activities aimed at managing and reducing PM_{10} emissions. These activities include but are not limited to:

- Placing gravel to control wind erosion
- Paving parking areas
- Stabilizing sites with vegetation or chemical soil stabilizers
- Covering haul trucks
- Utilizing water applications for short term stabilization
- Minimizing tracking of soil onto paved roads

3.5.2 Climate Change and Greenhouse Gases

This section describes the existing conditions, regulatory background and potential greenhouse gas (GHG) emissions from the proposed action.

3.5.2.1 Existing Conditions

Climate change refers to any significant changes in the measurable aspects of the climate, such as temperature or precipitation lasting for an extended period (decades or longer). Climate change may result from any of the following (US EPA 2010):

- Natural factors, such as changes in solar intensity, or changes in the earth's orbit around the sun
- Natural processes within the climate system, such as changes in the ocean circulation
- Human activities that change the composition of the earth's atmosphere, such as burning fossil fuels, or activities that change the surface of the land, such as deforestation, urbanization, and desertification

GHGs include any gas which absorbs infrared radiation in the atmosphere, including the following pollutants (US EPA 2010):

- Carbon Dioxide (CO_2) is a naturally occurring gas and a by-product of burning fossil fuels and biomass (such as wood or other vegetation), land use changes, and other industrial processes. CO_2 is the principal anthropogenic GHG which affects the Earth's atmospheric radiation balance. The global warming potential (GWP) of CO_2 (GWP=1) is the basis of comparison for all other GHGs.
- Hydrofluorocarbons (HFCs) are compounds containing hydrogen, fluorine and carbon which were introduced to replace chlorofluorocarbons (CFCs), identified as ozone depleting chemicals (ODC). While HFCs are a good replacement for ODCs, many have since been determined to have high GWPs ranging from 30 to 18,000 times greater than CO_2.
- Methane (CH_4) has a GWP approximately 20 times greater than that of CO_2. Methane through the anaerobic decomposition associated with municipal solid waste landfills; animal digestion and waste decomposition; the production and distribution of natural gas, coal, and petroleum products; and incomplete fossil fuel combustion.
- Nitrous Oxide (N_2O) has a GWP approximately 300 times that of CO_2. Significant source of N_2O include soil cultivation practices such as the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and burning of biomass.
- Perfluorocarbons (PFCs) are compounds containing only Fluorine and carbon. Similar to HFCs, PFCs have been introduced to replace CFCs. PFCs are used in manufacturing and are emitted as byproducts of industrial processes. Like CFCs and HCFCs, PFCs are significant GHGs whose GWP can range 14 to >10,000 times greater the GWP of CO_2.

- Sulfur hexafluoride (SF_6) is a colorless gas that is soluble in alcohol and ether, and slightly soluble in water. SF_6 is used primarily in electrical transmission and distribution systems, as well as electronics, and is a very powerful GHG whose estimated GWP is between 23,000 and 25,000.

3.5.3 Regulatory Background

3.5.3.1 Federal

On 17 April 2009, following a Supreme Court decision which conferred to the US EPA the authority to list GHGs as pollutants and to regulate their emissions under the CAA, the US EPA found that CO_2, HFC, CH_4, N_2O, PFC, and SF_6 may contribute to air pollution and may endanger public health. The US EPA GHG Mandatory Reporting Rule became effective on 29 December 2009 and applicable sources were required to begin collecting data on GHG emissions on 1 January 2010. Generally, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and combustion engines, and facilities that emit 25,000 metric tons (MT) or more per year of carbon dioxide equivalent (CO_2e) are required to submit annual reports to US EPA. US EPA reporting requirements continue to be updated. On 8 November 2010, reporting requirements for petroleum and natural gas systems were finalized.

3.5.3.2 State and Regional

The Global Warming Solutions Act (AB 32), signed and enacted in 2006, provides the framework for regulating GHG emissions in the state of California. This law requires the California ARB to develop and implement emissions limits, regulations, and other measures that are aimed at reducing GHG emissions to the 1990 levels by year 2020. The law also stipulates that these reduction strategies will consider technical feasibility and cost effectiveness. Ninety percent of the state-wide GHG emissions are attributed to CO_2 emissions, with the remaining 10 percent arising from HFC, CH_4, N_2O, PFC, and SF_6 (California ARB 2007). AB 32 requires large industrial source emitters (25,000 MT or greater) to report and verify their GHG emissions from both fossil fuel combustion and biomass derived fuels (California ARB 2008).

3.6 Cultural Resources

This section discusses cultural resources in relation to the project area, which is defined as the area of potential effects (APE). The APE includes the areas within the DUT Complex boundary and the linear extents of the utility and roadway upgrades necessary for its operation.

Cultural resources include prehistoric and historic archaeological resources, historic-age built environment resources, and Native American traditional cultural properties (TCP) or delineated sacred sites. Prehistoric archaeological resources are physical properties resulting from human activities that predate written records, including village sites, temporary camps, lithic (stone tool) scatters, and burial sites, among others. Historic archaeological resources are generally 100 years old or older and consist of physical properties resulting from human activities that occurred after European settlement and upon which historical written documents can provide contextual information, such as camp sites, mining/farming community remnants, and pioneering trails. Historic built environment resources consist of physical properties such as buildings, structures, or objects that are 50 years old or older, and can include elements related to utilities infrastructure, irrigation, and public works as well. Native American TCP or sacred sites include sites, areas, and materials important to Native Americans for religious, spiritual, or traditional reasons.

3.6.1 Regulatory Setting

National Historic Preservation Act (NHPA). The NHPA (16 U.S.C. §§ 470 et seq.) establishes federal government policy for the preservation of historic properties and administration of federally owned or controlled historic properties. It requires federal agencies to identify and evaluate affects to historic properties that are eligible for listing in the National Register of Historic Places (NRHP) in accordance with the procedures set forth in 36 CFR Part 800 and Section 106 of the Act. If a federal undertaking may affect properties that have religious and cultural significance to a federally recognized Native American tribe, the tribe must be afforded the opportunity to participate as a consulting party during the Section 106 consultation process.

Native American Graves Protection and Repatriation Act (NAGPRA). The NAGPRA (25 U.S.C. §§ 3001 et seq.) protects human remains, funerary objects, sacred objects, and items of cultural patrimony of indigenous peoples on federal lands. It stipulates priorities for assigning ownership or control of such cultural items excavated or discovered on federal or tribal lands, or in the possession and control of an agency that has received federal funding, in accordance with 43 CFR Part 10. The NAGPRA also provides for the repatriation of human remains and associated items previously collected from federal lands and in the possession or control of a federal agency or federally funded repository.

Archaeological Resources Protection Act (ARPA). ARPA (16 U.S.C. 470aa-470mm; Public Law 96-95) is the need to provide more effective law enforcement to protect public archeological sites. Two improvements over the Antiquities Act, which was the statute designed to provide this protection prior to ARPA's enactment, were more detailed descriptions of the prohibited activities and larger financial and incarceration penalties for convicted violators. Section 6 of the statute describes the range of prohibited actions, including damage or defacement in addition to unpermitted excavation or removal. Also prohibited are selling, purchasing, and other trafficking activities whether within the U.S. or internationally. Section 6(c) prohibits interstate or international sale, purchase, or transport of any archeological resource excavated or removed in violation of a State or local law, ordinance, or regulation.

3.6.2 Cultural Resources Management

The Fort Irwin Integrated Cultural Resources Management Plan (ICRMP) 2016 addresses and provides a management plan for cultural resources as defined in Army Regulation (AR) 200-4 using the guidance found in the Department of the Army Pamphlet (DA PAM) 200-4 (Army 2016a).

3.6.3 Cultural Resources Survey

The APE has been previously affected by military training activities. The proposed DUT Complex and its associated infrastructure would occur on approximately 4,000 acres within an APE of 4,660 acres.

An archival review of the APE and an approximately 0.5-mile radius was conducted to identify cultural resources in the vicinity of the project area. Record searches were performed in the Fort Irwin Cultural Resources Database (FICRD), Geographic Information System (GIS) database, and digital and hardcopy files. A second literature search was initiated at the South Central Coastal Information Center, housed at California State University, Fullerton. The resultant data indicated that approximately 4,295 acres (92 percent) of the APE has previously been surveyed for cultural resources. However, due to the age of some of these previous archaeological investigations, approximately 2,532 acres (54 percent) within the APE required either resurvey or initial survey for cultural resources.

The FICRD and South Central Coastal Information Center records indicated a total of 79 cultural resources studies had been previously completed in proximity to the project APE, 41 of which encompassed varying portions of the project APE. Outside the project APE, within a 0.5-mile search radius, a total of 102 cultural resources had been previously recorded. Within the project APE, there were 35 previously recorded sites and isolates. Of the 35 prior records, 12 were sites located within the DUT Complex, 7 were isolates located within the DUT Complex, 9 were sites located along the roadway and utility corridors within the survey area, and the remaining 7 were sites located along the roadway and utility corridors, still within the APE, but outside of the current survey area due to recent investigations and updates. The 12 archaeological sites within the DUT Complex were comprised of small- to medium-sized lithic scatters and quarries that had been previously recommended as "not eligible" for inclusion in the NRHP. However, only one such site had received State Historic Preservation Officer (SHPO) concurrence. A total of 16 of the 35 prior records were situated along the proposed roadway and utility corridors. A cultural resources survey was conducted to re-evaluate the 28 previously recorded sites and evaluate any new unrecorded resources in the APE for NRHP eligibility. The remaining seven sites outside of the current survey area, but within the APE, were not revisited as part of this investigation, as they had been recently recorded or updated.

Eleven of the 12 previously recorded prehistoric archaeological sites within the DUT Complex site were subject to re-evaluation. This effort indicated that these sites were exclusively surficial; not unique to Fort Irwin or specifically associated with any individual known to be important to local history; and did not exhibit distinct characteristics of a type, period, or method of construction or appear to have the potential to provide additional information about the history of the area. As a result, each of the 11 sites are recommended as "not eligible" for listing in the NRHP. Additionally, all seven previously recorded isolates identified on the DUT Complex site are, by definition, "not eligible" for listing in the NRHP. No further work was recommended for the 11 prehistoric archaeological sites.

Nine of the 16 previously recorded resources situated along the proposed roadway and utility corridors were located within the project APE and project survey area. These resources retained their standing NRHP eligibility determinations or recommendations but were revisited during the survey to confirm these findings. Seven of the nine sites were recommended as "not eligible" for listing in the NRHP, findings which were confirmed during field survey. No further work was recommended for these previously recorded sites. Two of nine sites (CA-SBR-2347 and -3314) were recommended as "eligible" for listing in the NRHP and were also revisited during the field survey. Although no cultural manifestations were observed within the APE during survey, to ensure there would be no adverse effects to sites CA-SBR-2347 and -3314 during project construction, archaeological monitoring was recommended.

Conversely, 7 of the 16 previously recorded resources were situated along the proposed roadway and utility corridors within the project APE, but outside of the project survey area. These sites were not subject to re-evaluation as part of the project-specific cultural resources survey. However, all prior NRHP eligibility recommendations remain intact for these sites, including three sites determined "not eligible" for listing in the NRHP and four recommended as "not eligible" for listing in the NRHP. Additionally, no further work was recommended for all seven previously recorded sites.

Pedestrian cultural resources surveys were conducted at Fort Irwin between 21 May and 6 June 2018, covering approximately 2,532 acres of the project APE. Within the DUT Complex site, surveys utilized 15-m transects whereas 10-m transects were utilized on both sides of the proposed roadway and utility corridors. The surveys identified four newly recorded prehistoric sites (CA-SBR-32429, -32426, -32427, and -32428) situated in the project area. These sites were found to be entirely composed of prehistoric

lithic scatters. Due to a lack of temporally diagnostic artifacts; features that lacked integrity due to disturbance from military activities; and a lack of information indicating prehistoric or historic importance, each site is recommended as “not eligible” for listing in the NRHP with no further work required.

As the record searches and field surveys indicate, no properties listed in the NRHP or considered eligible for listing in the NRHP exist within the APE for this proposed undertaking. Therefore, a finding of “No Historic Properties Affected” is recommended in accordance with 36 CFR 800.4(d)(1).

The cultural resources survey of the project area is provided as **Appendix C.**

3.7 Aesthetics / Visual Resources

Aesthetics refers to the beauty in both form and appearance of visual resources, including natural and built components of the environment perceived by humans. Perceptions of what is beautiful or appealing vary between individuals based on personal preferences.

3.7.1 Regulatory Setting

Viewsheds are regulated by federal, state, and local land use and zoning codes. For example, local jurisdictions may independently designate scenic highways that are of local importance. Federal laws governing this resource include the Wild and Scenic Rivers Act (16 U.S.C. § 1271 et seq.); National Trails System Act (16 U.S.C. § 1241 et seq.); Federal Land Policy and Management Act (43 U.S.C. § 35 et seq.); and the NHPA.

3.7.2 Project Area

The proposed project is in a remote area of Fort Irwin. The surrounding mountains are a prominent feature in the landscape. The land on and around the project area is designated and used for military training purposes and is not visible to the public from any public roadway or surrounding vantage point. Much of the habitat in the area has been degraded from training activities. The viewscape consists of mountain ranges, barren desert, degraded desert scrub vegetation, various roads and trails, and structures consisting of small-scale mock villages that support urban warfare training. Noise levels range from those associated with the natural environment to those generated by various military activities such as aircraft operations and real or simulated weaponry.

3.8 Hazardous and Toxic Substances

This section describes hazardous and toxic substances in the region, at Fort Irwin, and within the footprint of the proposed project area.

3.8.1 Regulatory Setting

Numerous statutory and regulatory authorities address hazardous and toxic substances. The three primary federal laws that influence their management include the RCRA (42 U.S.C. 6901 et seq.), pertaining to solid and hazardous waste; CERCLA (42 U.S.C. 9601 et seq.), pertaining to spills and abandoned waste sites; and Toxic Substances Control Act (TSCA) (15 U.S.C. 2601 et seq.), pertaining to the use, storage, and disposal of hazardous chemicals.

Fort Irwin is subject to compliance with AR 200-1, Environmental Protection and Enhancement (2007), which regulates hazardous waste and toxic substances, and AR 385-10, The Army Safety Program (2017) which regulates the safe handling of unexploded ordnance (UXO) containing substances that constitute

a hazardous waste upon being disturbed or handled. These regulations provide protocols and procedures for the installation to comply with numerous federal, state, and local laws and regulations pertaining to hazardous and toxic substances.

3.8.2 Hazardous Waste Management

Pursuant to the RCRA, Fort Irwin is classified as a large-quantity generator of hazardous waste. Although the installation does not operate any storage facilities, it does operate 90-day accumulation points for hazardous waste. Fort Irwin's DPW manages hazardous waste generated on the installation, which is placed in the temporary accumulation points located throughout the cantonment area. These wastes are stored for less than 90 days prior to being transported to a RCRA-approved transfer, storage, and disposal facility (Fort Irwin 2014).

Fort Irwin also maintains a Hazardous Materials and Hazardous Waste Management Plan, which prescribes the responsibilities, policies, and procedures for storing and managing hazardous materials and wastes generated onsite. The plan presents the types of waste that it manages, the locations and status of hazardous waste accumulation points, training requirements, recordkeeping, and spill response procedures (Fort Irwin 2011). All military and civilian personnel on post and all subcontractors working with potentially hazardous materials are required to receive a briefing on the hazardous waste management protocol presented in the management plan (Army 2006).

3.8.3 Special Hazards

Pursuant to the TSCA, Fort Irwin also produces and manages some non-RCRA regulated waste, including items contaminated with lead-based paint, asbestos and polychlorinated-biphenyls. For example, some buildings and utility infrastructure on the installation may contain these special hazards and be subject to regulation, particularly during demolition, removal, or other construction-related activities.

3.8.4 Environmental Restoration Sites

The DoD developed the Environmental Restoration Program (ERP) to facilitate thorough investigation and cleanup of contaminated sites on military installations. The Installation Restoration Program, a component of the ERP, requires each DoD installation to identify, investigate, and clean up hazardous waste disposal or release sites. Army actively investigates and manages known and potentially contaminated sites, including those at Fort Irwin.

There are ERP sites located in the project area that would be intersected by the proposed roadway and utility upgrades. These sites include the GALCIT and ORDCIT projects area, the Close Combat Course, and the Combat Engineer's Range open burning and open detonation (OB/OD) area. **Figure 13** shows the locations of these sites. Materials of concern at all sites include munitions and explosives of concern (MEC) and munitions constituents (MC). An Explosives Site Plan Remedial Investigation was conducted on the sites in 2018 with anticipated remediation planned for March 2019 (AECOM 2018).

3.8.5 Unexploded Ordnance

UXO may contain explosive charges or propellants defined as hazardous by applicable laws and regulations. Although several areas on Fort Irwin are restricted due to the presence of UXO, none are in the project area. However, it is possible that unknown UXO could be encountered during construction activities (Army 2004). To this end, Fort Irwin implements a range safety training program for all those working or training on Fort Irwin, which is required for accessing ranges. The training focuses on increasing awareness of UXO.

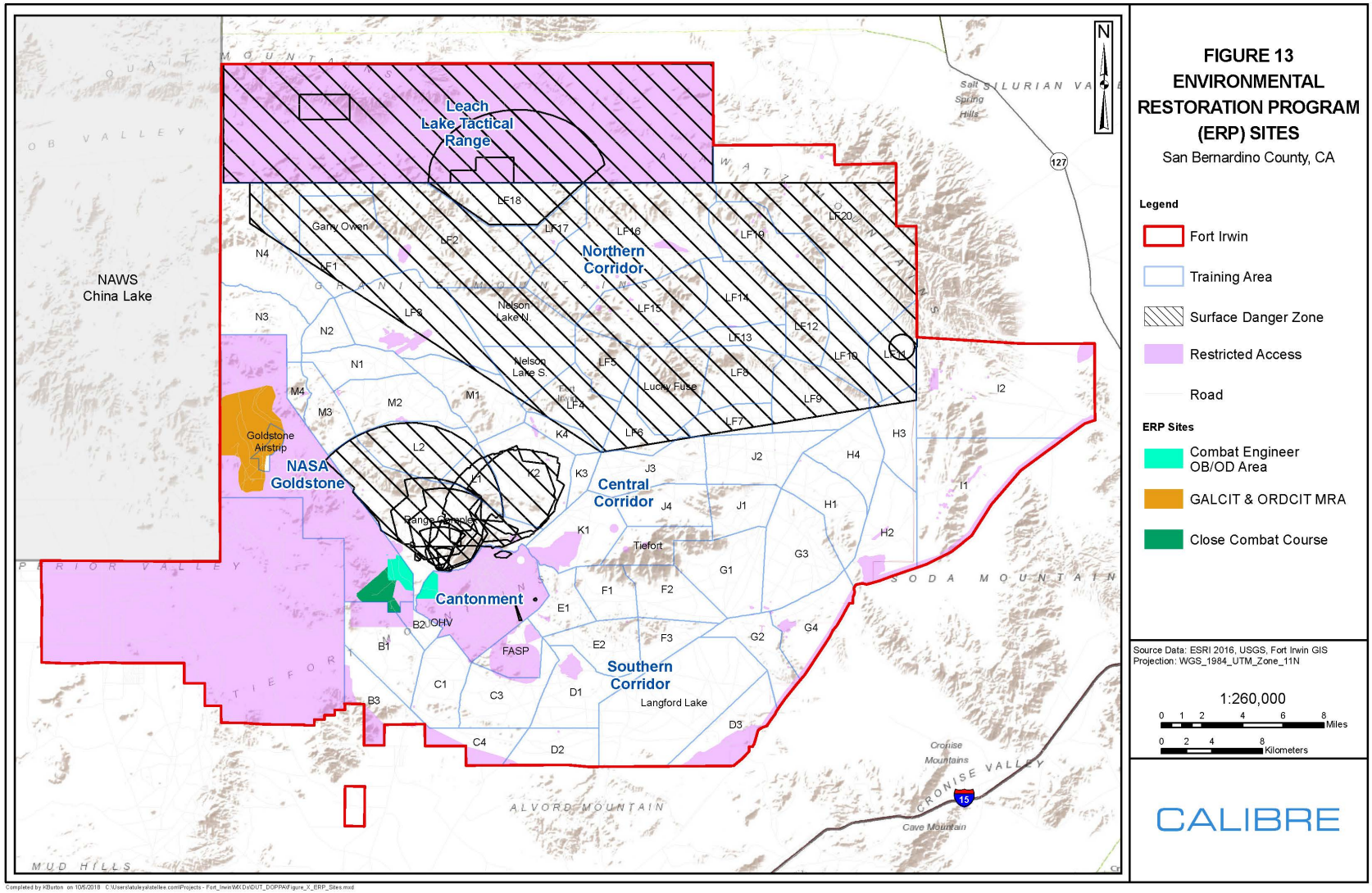

Figure 13: Environmental Restoration Program (ERP) Sites

In the case UXO is encountered while working or training at the installation, the area is immediately flagged and access restricted. The Fort Irwin Explosive Ordnance Disposal Unit is the designated UXO response unit for the installation.

3.9 Human Health and Safety

A safe environment is one in which there is no, or an optimally reduced, potential for death, serious bodily injury or illness, or property damage.

3.9.1 Regulatory Setting

Site safety requires adherence to regulatory requirements imposed for the benefit of employees and the public. The U.S. Occupational Safety and Health Act (OSHA) regulates the safety and health of workers in the U.S. by establishing worker-protection standards that must be followed. OSHA regulations cover potential exposure to a wide range of chemical, physical, and biological hazards and ergonomic stressors. The regulations are designed to control these hazards by eliminating exposure via administrative or engineering controls, substitution, or use of personal protective equipment (PPE).

The health and safety of military and civilian workers are safeguarded by numerous DoD and military branch-specific requirements designed to comply with standards issued by federal and state occupational safety and health agencies. These standards specify health and safety requirements, the amount and type of training required for workers, the use of PPE, administrative controls, engineering controls, and permissible exposure limits for workplace stressors. AR 385-10, The Army Safety Program (2017) implements OSHA and DoD requirements for the health and safety of Army personnel.

3.9.2 Project Area

The proposed DUT Complex and its associated infrastructure is in a remote area of Fort Irwin that is restricted from the public and designated for military training activities. As the installation supports a wide range of live-fire training activities and exercises, there is potential for UXO to be present in the project area. Additionally, valley fever (*Coccidioides immitis*) is known to occur in San Bernardino County, California. Valley fever or coccidioidomycosis is a fungal infection that generally occurs in the southwestern U.S. The fungus occurs in soil and can be acquired by inhaling dust particles that contain the fungus. A study conducted at Fort Irwin found that the risk of a serious infection was low for military personnel training in the desert; however, the incidence of infection may vary depending on activities and geographic factors (Crum et al. 2004). In 2011, there were 75 recorded cases of valley fever in San Bernardino County, an incidence rate of 3.4 cases per 100,000 people (San Bernardino County 2015).

3.10 Transportation

3.10.1 Regional

The major transportation corridors in the vicinity of Fort Irwin include I-15 and US 395. I-15 runs southwest to northeast connecting the City of Barstow (south of the installation) with Las Vegas, Nevada. US 395 runs north to south along the NAWS China Lake boundary, west of Fort Irwin. Fort Irwin Road provides public and military access to Fort Irwin from I-15, northeast of Barstow. Fort Irwin Road is a two-lane defense access road. The U.S. Department of Transportation Federal Highway Administration administers the Federal Lands Highway Program, which surveys, designs, and constructs defense access roads and other roads for federal lands. The Federal Lands Highway Program was established for the military to fund the cost of public highway improvements necessary to mitigate effects of defense

activity. Fort Irwin Road is a paved, San Bernardino County-maintained road that provides one lane in each direction with numerous sections containing passing lanes. Through the Federal Lands Highway Program, San Bernardino County and the Army have funded rehabilitation and other improvements on Fort Irwin Road (Army 2008). In 2014, the average daily traffic on Fort Irwin Road, east of Irwin Road, was 5,827 (San Bernardino County 2014).

3.10.2 Local

The local transportation system at Fort Irwin consists of roadways, pedestrian walkways, and bicycle paths and is used for normal, on-post traffic demands for everyday working, living, or recreational trips. In addition, personnel living off-post commute daily to and from work, and retired military and family members use the service facilities at the installation. The existing roadway network at Fort Irwin consists of an outer loop road, along with a grid of roadways interior to the loop. On the north perimeter is North Loop Road, on the south perimeter is South Loop Road. Barstow Road bisects the base running east-west. Fort Irwin Road connects the west end of the base with the closest neighboring communities and I-15. The intersection of Fort Irwin Road with North/South Loop Road is the primary entry point into Fort Irwin.

Barstow Road is a main thoroughfare through the center of the cantonment that provides access to many of the offices, dormitories, and light industrial areas of Fort Irwin. Goldstone Road, within the outer loop, is another main thoroughfare. Community support facilities and concentrated housing areas located along Goldstone Road contribute to higher amounts of traffic. Its northern extent provides access through the NASA Goldstone property and to the proposed DUT Complex site from the west-southwest. Improvements are proposed for this roadway and the proposed utility corridors would extend from the northwest portion of the cantonment, through the NASA Goldstone property, to provide access, water, and power to the DUT Complex.

The installation has limited public transportation due to its remote location. The Fort Irwin express bus provides service between Barstow and Fort Irwin five times between 4:20 a.m. and 6:35 a.m., with five return routes between 3:45 p.m. and 6:00 p.m. Two additional early-morning routes to Fort Irwin originate in the Victorville area, returning in the afternoon. As such, most people that do not live on Fort Irwin commute to and from the base in personal vehicles (Fort Irwin 2016b).

Overall, the existing cantonment roadway network is generally adequate to meet the transportation needs of the approximately 20,000 people who live and work on Fort Irwin. However, traffic within the cantonment is highly dependent on rotations when units come to Fort Irwin to train. Truck and bus traffic can increase significantly during those rotations.

The Highway Capacity Manual (2010) defines roadway level of service (LOS) as “a quantitative stratification of a performance measure or measures that represent quality of service, measured on an A–F scale, with LOS A representing the best operating conditions from the traveler’s perspective and LOS F the worst.” **Table 5** describes each of the LOS letter grades in accordance with this scale. Currently, the USACE is studying the effect of hauling waste generated at Fort Irwin offsite, while the existing onsite landfill undergoes an expansion project. As part of this study, traffic count data was collected at six intersections on Fort Irwin during the morning and evening peak hours to conduct a LOS analysis.

Table 5: Levels of Service
DUT Complex EA, Fort Irwin, California

Level of Service	Description
A	Free flow with low volumes and high speeds.
B	Reasonably free flow, but speeds beginning to be restricted by traffic conditions.
C	In stable flow zone, but most drivers are restricted in the freedom to select their own speeds.
D	Approaching unstable flow; drivers have little freedom to select their own speeds.
E	Unstable flow; may be short stoppages.
F	Unacceptable congestion; stop-and-go; forced flow.

Source: American Association of State Highway and Transportation Officials (AASHTO) 2011.

The results of this analysis indicate that all signalized and all-way-stop controlled intersections are operating at LOS B or better during the morning peak hour and evening peak hour. One two-way-stop controlled intersection (Fort Irwin Road at North/South Loop Road) was also analyzed. All movements at this intersection were found to be operating at LOS C or better in the morning peak hour and LOS D or better in the evening peak hour. This data indicates that the Fort Irwin roadway network currently operates well.

The USACE study also compared daily traffic volumes with general capacity limits for various roadway types on Fort Irwin. The resultant data indicated that the installation roadway network is adequately sized for traffic demand, even with the additional truck volumes from hauling waste offsite for disposal. Based on a 10-percent-growth scenario, the study concluded that roadways on Fort Irwin would still operate at LOS E or better (Fort Irwin 2016b).

3.10.3 Airfield Facilities

Fort Irwin is served by one on-post airfield—the Bicycle Lake Army Air Field (BLAAF). The main Fort Irwin helipad is located near the Weed Army Community Hospital within the cantonment area. Various other helicopter and airstrip facilities are used in support of training areas. The BLAAF is situated on a dry lakebed to the east of the cantonment area (Fort Irwin 2017a). All airfield facilities are designated for military air traffic only; no public or commercial traffic is permitted.

3.11 Utilities and Infrastructure

This section describes existing utilities at Fort Irwin, including water treatment and distribution, wastewater, energy, communications, storm water, and solid waste management.

3.11.1 Water Treatment and Distribution

On Fort Irwin, untreated water is extracted through two wells in the Bicycle Lake Basin, four wells in the Langford Lake Basin, and two wells in the Irwin Basin (eight wells in total). There are seven aboveground storage tanks (ASTs) in the cantonment area, three store untreated water and four store potable water. Approximately 25 to 40 years of groundwater are available in the aquifer that supplies the post (CH2M 2007).

Water is treated at the new Fort Irwin Water Treatment Plant (WTP; Irwin Water Works) to reduce naturally occurring fluoride and arsenic. The Irwin Water Works treats groundwater for potable use by reducing dissolved inorganic ions and includes an electrodialysis reversal process (California Regional

Water Quality Control Board [RWQCB]/Lahontan Region 2015). The WTP has a maximum daily capacity of 6 mgd and has the capability to expand up to 12 mgd to accommodate future demand increases.

Four large storage tanks serve the potable water system with a capacity of four million gallons. The annual average demand for water typically ranges from two to three mgd; however, during the summer, peak daily water demand periodically can approach four mgd. The water storage capacity of the potable water system is currently adequate for the level of development on the installation. The storage tanks along Goldstone Road provide sufficient water pressure throughout the distribution system. Between 2006 and 2010, the average daily production ranged from 1.4 to 3.8 mgd, with an average daily demand of approximately 2.4 mgd. The plant has a water recovery rate of 99 percent and is expected to extend the lifespan of the Fort Irwin water supply by 60 years (USACE 2016).

3.11.2 Wastewater

The WWTP at Fort Irwin is operated and maintained by a private installation service contractor. The WWTP is permitted to treat two mgd of wastewater. Recent historical flow data at the Fort Irwin WWTP indicate that the average daily flow is 0.98 mgd and the maximum average flow is 1.31 mgd. While the plant is permitted to treat two mgd of wastewater, the permit requires Fort Irwin to plan for a second oxidation ditch if the inflow exceeds 1.5 mgd, which is 75 percent of the permitted capacity, for 30 consecutive days. The sanitary sewer collection system provides adequate service. The outfall line has sufficient capacity to allow for an average flow rate of three mgd, based on a 2.5 peaking factor. Considering the average flow rate of the outfall line, the collection system can support an effective population of almost 43,000.

The project area is not connected to the WWTP distribution system. The proposed DUT Complex will not require a connection to the WWTP as waste streams will be managed onsite and transported offsite to Cantonment for disposal.

Fort Irwin has a tertiary treatment plant that treats wastewater effluent from the Fort Irwin WWTP to required standards to be used as recycled water. Fort Irwin has a separate distribution system for recycled water, which is used for irrigation of green space in the cantonment area, dust suppression, construction purposes, and other non-potable uses. The capacity of the tertiary treatment plant is two mgd; however, Fort Irwin is only permitted to produce and use up to one mgd of recycled water. In 2014, the average use of recycled water at Fort Irwin in 2014 was 0.2 mgd. Fort Irwin is planning to expand the recycled water system in the cantonment so that more recycled water can be produced and used for other non-potable purposes (e.g., cooling towers, reducing the amount of treated groundwater used for irrigation (Army 2017a; 2016b).

3.11.3 Energy

This section discusses energy use at Fort Irwin. Fort Irwin uses liquid petroleum gas as its energy source for space heating and hot water heating. Fuel is transported to the installation by truck and stored in tanks at two locations; however, there are no existing or planned natural gas tanks or connections associated with the proposed DUT Complex.

3.11.4 Electricity

Southern California Edison owns the electrical system at Fort Irwin and is responsible for providing adequate electrical capacity and service to meet the existing and future needs of the installation. The Tiefort Substation serves the cantonment at Fort Irwin, housing two 28-megavolt ampere transformers for a total capacity of 56 megavolt amperes. The substation is a 115-kilovolt (kV) substation that steps

down to 33 kV and feeds two distribution substations in the interior of the base, the Military Substation and Irwin Substation (Army 2017a; 2014a).

Power is not currently provided to the project area. The nearest overhead utility lines are located along Goldstone Road. There are no underground electrical utility lines with proximity to the proposed DUT Complex site.

3.11.5 Communications

Verizon, a public telephone service company, provides facilities and equipment for public and family housing areas of the cantonment area. Approximately 350 miles of cable, consisting of 2,300 paired lines for local and commercial use serve the installation. The cables are expandable to a capacity of 5,000 paired lines. Fort Irwin is linked to Barstow through an underground cable, consisting of 40 lines that can become overloaded due to limitations of the switching equipment (Army 2017a; 2016b).

The proposed DUT Complex is located near existing fiber optic lines that can provide communication and data relay to support its operation. Radio communication can also be used within and around the project area.

3.11.6 Storm Water

Storm water originating from the mountains that surround the proposed DUT Complex site is conveyed by natural contours and generally flows south-southeast. The central portion of the site is devoid of any intermittent streams, where increased percolation into groundwater or evaporation is likely to occur. There is no storm water conveyance infrastructure onsite.

3.11.7 Solid Waste Management

Solid waste is collected and transported to a landfill on Fort Irwin by standard compacting garbage trucks. Solid waste from training activities is collected in the training areas and transported to a central receiving point at the landfill where it is sorted. Located on the eastern edge of the cantonment, Fort Irwin's sanitary landfill encompasses 467 acres of land. It is a Class III permitted facility that only accepts nonhazardous wastes. As the current active portion of the landfill (approximately 25 acres divided into 8-acre cells) is reaching capacity, Fort Irwin is currently constructing a new landfill cell to meet solid waste disposal demands. The landfill has an average waste load of 30 to 35 tons per day (tpd), with a peak waste load of 100 tpd, which typically occurs during rotations (SCS Engineers 2014).

Fort Irwin's solid waste facility permit (SWFP No. 36-AA-0068) is issued by the San Bernardino County Department of Environmental Health Services, the local enforcement agency for the California Department of Resources Recycling and Recover (CalRecycle). The sanitary landfill is permitted to receive nonliquid, nonhazardous waste, but does not accept hazardous materials, hazardous waste, ammunition, oil-contaminated products, petroleum, oil, lubricant-contaminated soil, batteries, friable asbestos, biological waste, polychlorinated biphenyls, toxic chemicals, or lithium/magnesium batteries. Employees at the landfill entrance inspect all deliveries to ensure that only acceptable materials are disposed of at the landfill.

Additionally, Fort Irwin plans to have a waste-to-energy facility operational by 2022. The waste-to-energy facility would be located at the current landfill site and convert up to 34 tons of solid waste per day to 1.6 megawatts of electrical energy, resulting in an 85 percent reduction in landfill waste by volume. The waste would be converted to ash and could be disposed of as nonhazardous waste if not used for some other purpose (ECORP Consulting, Inc. 2014).

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4 Environmental Consequence

This section assesses the environmental consequences associated with the Proposed Action and the No-Action Alternative. Direct, indirect, and cumulative environmental effects are described for each resource. These effects are defined as follows:

- Direct effects are caused by the action and occur at the same time and place (40 CFR § 1508.8).
- Indirect effects are caused by the action and occur later in time or farther removed in distance but are still reasonably foreseeable (40 CFR § 1508.8).
- Cumulative effects are those that result from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR § 1508.7).

Effects were analyzed for each of the resources identified in the previous section as potentially affected by implementation of the Proposed Action.

4.1 Geology and Soils

An effect on geology and soils would be considered significant if an alternative would: (1) result in an increased geologic hazard; (2) result in substantial soil erosion or loss of topsoil; or (3) substantially change the topography of the site.

4.1.1 Proposed Action

During construction, the Proposed Action would disturb surficial geology and soils. The extent and nature of disturbance would vary with each phase of construction and the timing of the specific project components therein. The operation and maintenance of the Proposed Action would disturb soils. Collectively, these effects would be direct and indirect, resulting from activities such as subsurface excavation, earthwork for site preparation (e.g. grading and leveling), and construction and military vehicle operations. Implementation of the Proposed Action would alter surficial geology in some areas and increase susceptibility of soils to wind and water erosion throughout the project area.

The soils of the project area are moderately degraded by historic and current military training and operations. As such, areas containing biological soil crusts and desert pavement are sparse to non-existent. Most soils associated with the project area are already subject to erosion and compaction.

4.1.1.1 Construction

In the short-term, construction of the Proposed Action would disturb up to approximately 4,000 acres of land. Additionally, some of the proposed built environment features would disturb surficial geology when constructing structural foundations or establishing footings for multistory buildings. Subsurface disturbance would primarily be associated with the construction of large multistory facilities or infrastructure, some of which would be designed to accommodate underground access.

The Proposed Action would be implemented in phases. That is, land disturbance would occur piecemeal within portions of the project area over multiple years rather than as a single event. Project phasing under the Proposed Action would limit effects to smaller areas and allow for the implementation of site-specific BMPs to lessen or control potential adverse effects to geology and soils. For example, geotechnical surveys would be prepared for different portions of the project area to inform the siting or placement of buildings and infrastructure. These surveys would include detailed information with respect to local soils and geology to support such decisions.

Under the Proposed Action, Fort Irwin would continue to implement its dust abatement program. This program manages wind erosion and suspension of particles for the installation as a whole, including the project area. Management measures for this purpose include chemical stabilization and revegetation, among others. Additionally, in accordance with the requirements set forth in MDAQMD Rules 403 and 403.2, dust control plans would be developed for projects over 100 acres in area. Upon MDAQMD review and approval, these plans would implement current practices and standard construction site BMPs to reduce erosion and airborne dust resulting from the Proposed Action (MDAQMD 1995).

Fort Irwin would comply with Section 402 of the CWA NPDES permit program under the Proposed Action. Prior to each construction project, a Construction General Permit (CGP) would be obtained for discharges of storm water from construction activities of one acre or more in size. The CGP would require the preparation, approval, and implementation of site-specific storm water pollution prevention plans (SWPPPs) prior to construction, including appropriate structural and non-structural erosion, sediment, and waste control BMPs. Further, the Proposed Action would employ other standard construction site BMPs to minimize soil loss and compaction such as staging equipment and construction materials on existing gravel or paved areas, to the extent practicable.

4.1.1.2 Operation and Maintenance

In the long-term, the operation and maintenance of the Proposed Action would disturb soils in the project area. Vehicles and personnel would travel to and from the DUT Complex to conduct training activities on a routine basis. However, Fort Irwin's dust abatement and integrated training area management (ITAM) programs would continue to be implemented under the Proposed Action. Management of the project area would include regular maintenance activities, including dust and erosion control measures, to ensure the continued operation of the DUT Complex and its supporting infrastructure. Over time, vegetation would re-establish in many areas to further stabilize soils and provide natural dust and erosion control. As necessary, Fort Irwin would employ a rest-rotation strategy to allow for the maintenance, rehabilitation, or recovery of disturbed areas within the DUT Complex.

The topography and soils associated with the site are previously disturbed from historic and recent military training and operational activities. Implementation of the Proposed Action would not substantially alter the condition or function of the underlying geology or the soil strata. Soil erosion under the Proposed Action would be managed by implementing BMPs and complying with applicable laws and regulations. Collectively, these measures would help prevent soil movement or loss and minimize the potential for soils to be transported in surface runoff. Therefore, the Proposed Action would have a less-than-significant effect on geology and soil resources.

4.1.2 No-Action Alternative

Under the No-Action Alternative, construction of the DUT Complex and its associated infrastructure would not occur. Military vehicles and personnel would continue to access the site to conduct training activities at the site. Soil disturbance and topographic change would continue in accordance with the status quo. No effects to geology would occur under the No-Action Alternative.

4.1.3 Cumulative Effects

Cumulative effects to geology and soils could occur if multiple large construction projects occurred simultaneously on or in the vicinity of Fort Irwin. However, this is not likely to occur due to construction phasing under the Proposed Action and, in general, the timing of other known projects near the project area. Any construction projects that overlap with the Proposed Action would also be subject to regulations that require site-specific BMPs to manage or control soil loss or erosion. On Fort Irwin, the ITAM program would continue to manage and monitor the effects of land disturbance activities on the

installation. Therefore, the Proposed Action would not result in any significant cumulative adverse effects on geology and soils.

4.1.4 Project Design Measures

Staked fiber rolls would be placed at all drainage features for the duration of construction and left in place two weeks after completion of construction. Other BMPs incorporated into the Proposed Action for erosion and sediment control may include, but are not limited to, the following:

- Compost blankets; mulching; riprap; geotextiles; slope drains; check dams; slope diversions; and temporary diversion
- Compost filter berms and socks; fiber berms; sediment basins, rock dams, filters, chambers, or traps; silt fences; and weed-free hay bales

Wind erosion control measures would consist of wetting the ground with water, chemical stabilization, and adherence to the measures described in the MDAQMD Rules 403 and 403.2. The requirements of Rule 403.2 for a project over 100 acres are as follows:

- Use periodic watering for short-term stabilization of disturbed surface area to minimize visible fugitive dust emissions. For purposes of this rule, use of a water truck to maintain moist disturbed surfaces and actively spread water during visible dusting episodes shall be considered sufficient to maintain compliance.
- Take actions sufficient to prevent project related track-out onto paved surfaces.
- Cover loaded haul vehicles while operating on publicly maintained paved surfaces.
- Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed more than thirty days, except when such a delay is due to precipitation that dampens the disturbed surface sufficiently to eliminate visible fugitive dust emissions.
- Clean up project-related track-out or spills on publicly maintained paved surfaces within 24 hours.
- Reduce nonessential earthmoving activity under high wind conditions. For purposes of this rule, a reduction in earthmoving activity when visible dusting occurs from moist and dry surfaces due to wind erosion shall be considered sufficient to maintain compliance.
- Prepare and submit to MDAQMD, prior to commencing earth-moving activity, a dust control plan that describes all applicable dust control measures that will be implemented for the Proposed Action.
- Provide stabilized access route(s) to the project area as soon as is feasible. For purposes of this Rule, as soon as is feasible shall mean prior to the completion of construction and demolition activities.
- Maintain natural topography to the extent possible.
- Construct parking lots and paved roads first, where feasible.
- Construct upwind portions of project first, where feasible.

4.2 Seismicity

An effect to seismicity would be considered significant if an alternative would: (1) increase the probability of an earthquake occurrence; or (2) substantially increase risk to people, property, or the built environment in the event of an earthquake.

4.2.1 Proposed Action

The Proposed Action would occur in a seismically active area (**Figure 9**).

4.2.1.1 Construction

The Proposed Action would construct numerous facilities to replicate real-world urban environments, including some buildings and infrastructure with underground components. Prior to development of these facilities, geotechnical surveys would be prepared to provide detailed information with respect to subsurface conditions. These surveys, as well as other available data, would be evaluated to determine any potential concerns with respect to the seismicity of underlying faults in the project area. As necessary, these projects would be designed to address such concerns. For example, siting decisions and building codes and standards. Project phasing under the Proposed Action would allow flexibility in making such decisions during development of the DUT Complex.

4.2.1.2 Operation and Maintenance

The operation and maintenance of the Proposed Action would not affect seismicity.

Overall, implementation of the Proposed Action would not increase susceptibility to or risks associated with an earthquake event. Therefore, the potential effects of seismicity under the Proposed Action would be less-than-significant.

4.2.2 No-Action Alternative

Under the No-Action Alternative, Fort Irwin would continue to be susceptible to a potential seismic event.

4.2.3 Cumulative Effects

No adverse cumulative effects from seismicity are anticipated to occur.

4.2.4 Project Design Measures

No project-specific design measures are identified for seismicity.

4.3 Biological Resources

An effect on biological resources is considered significant if an alternative would: (1) result in a substantial loss of native plants or the spread of invasive plant species; (2) increase habitat fragmentation or disrupt a major wildlife movement corridor; (3) reduce carrying capacity for a designated habitat type; (4) result in a substantial, measurable degradation of habitat quality or disturb the breeding activity of a special status species; or (5) result in incidental “take” of a federally listed species above an agreed upon threshold.

4.3.1 Proposed Action

Plants within the project area would be removed during construction of the Proposed Action. While revegetation would occur in some areas post-construction, in others, permanent vegetation loss would result from development.

With few exceptions, vegetation within the project area is sparse and many plant communities have been previously disturbed by military training activities. There are no known federally protected plant species that occur in the project area. However, field surveys confirmed that various other special status plant species occur in the project area.

Wildlife within the project area would be temporarily or permanently displaced by implementation of the Proposed Action. In some cases, particularly during construction, the Proposed Action could result in wildlife mortality. Wildlife would also be subject to increased noise levels under the Proposed Action.

Numerous wildlife species are known to occur in the project area on a temporary and permanent basis (**Appendix B**). One federally protected species (desert tortoise) is known to occur in the project area. Field surveys confirmed that various other special status species occur on or in the vicinity of the Proposed Action.

4.3.1.1 Construction

The construction of the Proposed Action would directly affect vegetation in the project area during site clearance activities up to approximately 4,000 acres of land. As such, short- and long-term, minor adverse effects to vegetation would result from vegetation removal. However, revegetation, with native species, post-construction would be anticipated to occur in the long-term in areas surrounding the built environment.

The construction of the Proposed Action would result in short- and long-term, direct and indirect, minor adverse effects to wildlife, including some special status species known to occur in the project area. Construction activities under the Proposed Action would generate noise and present a physical risk to local wildlife, particularly to less mobile species. However, noise generated during construction would be intermittent, and many potentially affected species would likely relocate elsewhere on the installation on a temporary or permanent basis. A long-term, indirect adverse effect to wildlife habitat proximate to the Proposed Action would occur if erosion and sedimentation levels increased substantially due to land disturbance activities; however, such effects would be managed to less-than-significant levels given compliance with construction site storm water permit provisions and standard BMPs.

There are no federally protected plant species known to reside in the project area. Several special status wildlife species are known to reside in the project area on a temporary or permanent basis, including one federally protected species, the desert tortoise. Short-term, minor, direct and indirect, adverse effects to special status species and their habitat would occur during construction of the Proposed Action. However, many of these species only use the project area for foraging purposes. Most wildlife species on Fort Irwin are generally adapted to the existing noise environment and would have ample opportunity to relocate elsewhere on the installation or to other nearby public lands. Pursuant to ESA Section 7, Fort Irwin would continue to comply with the agreed upon provisions of the USFWS BO (2014) with respect to potential adverse effects on the desert tortoise. Tortoises found to occur in the project area prior to construction would be relocated in accordance with a project-specific translocation plan. Established or agreed upon protective measures for avoiding or minimizing effects to other special status species during construction of the Proposed Action would also be implemented, to the extent practicable. Project design measures for the desert tortoise, MGS, burrowing owl, American badger, and desert kit fox to be incorporated into the Proposed Action to protect these special status species are summarized in **Section 4.3.4**.

Undeveloped habitat within and near the project area would provide suitable nesting and foraging habitat for common bird species adapted to arid conditions. Some of these species are federally protected by the MBTA or Bald and Golden Eagle Protection Act. The construction phase of the Proposed Action would potentially affect migratory birds that could use the project site for nesting, migration stop-over, or wintering purposes. However, there is a low probability of such an occurrence due to the current use of the site for military training activities and other, more desirable, nesting, stop-over, and foraging opportunities for migratory birds elsewhere in the region. Pre-construction spot

checks and related BMPs for nesting special status birds (**Section 4.3.4.5**) would further minimize the potential for such an occurrence.

4.3.1.2 Operation and Maintenance

The operation and maintenance of the Proposed Action would disturb or remove vegetation in the project area. However, these effects would be comparable to those associated with the current military mission in the project area.

Long-term, negligible, direct and indirect, adverse effects on wildlife would be expected to occur under the Proposed Action from the operation and maintenance of the DUT Complex. However, most wildlife species are adapted to training and operational conditions on Fort Irwin, including the noise they generate. Potential indirect and direct, minor adverse effects to special status species would also be comparable to existing conditions under the Proposed Action. No perceptible effect on the overall noise environment in surrounding areas would be anticipated.

Long-term, minor, direct adverse effects to federally listed and/or migratory bird species on and in the vicinity of the project area would be anticipated. However, Fort Irwin would continue to manage all such species in accordance with its INRMP and in compliance with applicable laws and regulations. This includes the USFWS BO (2014) for the desert tortoise, as well as other established and agreed upon protective measures for other special status species. Additionally, the 2003 National Defense Authorization Act exempts military readiness activities from the incidental take provisions of the MBTA provided that no significant adverse effects accrue to populations of migratory birds. No population level effects to migratory birds would be anticipated to occur during the operation of the Proposed Action.

Overall, continued management of plant and wildlife species in accordance with Fort Irwin's INRMP and compliance with applicable laws and regulations would minimize potential adverse effects on such species. For example, adherence to the USFWS BO (2014) would avoid or minimize potential adverse effects on the desert tortoise. Therefore, the Proposed Action would result in less-than-significant effects on biological resources.

4.3.2 No-Action Alternative

Under the No-Action Alternative, the construction of the DUT Complex and its associated infrastructure would not occur. There would be no change to the nature and frequency of current military mission in the project area. Under the No-Action Alternative, plants and animals that visit or reside on and near the project area would continue to be subject to disturbance or mortality from military training activities. Natural resources management and monitoring efforts would also continue. Over time, the DUT Complex site would likely be developed for another training purpose, resulting in similar effects on plant and animal species.

4.3.3 Cumulative Effects

The Proposed Action would have a minor adverse effect on plant and wildlife habitats, as the project area is moderately to severely degraded from current ongoing military mission training activities. No significant long-term cumulative effect relating to clearing of up to 4,000 acres would be expected, because the project area is within and adjacent to active military training areas and portions of the project area would become naturally vegetated over time. Creosote bush scrub habitat is the most commonly found habitat on Fort Irwin and there would be no substantial reduction in this habitat type on Fort Irwin or within the Mojave Desert. Strict guidelines and management practices for the conservation and recovery of sensitive species and their habitat on Fort Irwin would be implemented

and no significant cumulative effects on special status species would be anticipated. Direct effects on desert tortoise would be unlikely, as mitigation measures in compliance with the 2014 USFWS BO would be implemented to minimize effects. Minor cumulative effects on biological resources would be expected as a result of the Proposed Action.

4.3.4 Project Design Measures

Project design measures for biological resources include, but are not limited to, the following:

4.3.4.1 Desert Tortoise

- Adhere to the USFWS BO (2014), including implementation of agreed upon procedures to minimize effects to desert tortoises during project planning and approval process.
- Desert tortoise awareness training for all construction personnel.
- Develop an onsite communications protocol for desert tortoise sightings and to address wildlife issues during construction.
- Check beneath vehicles for tortoises prior to moving vehicles.
- No parking on road berms in areas not cleared of tortoises.
- All land survey or construction crews to be escorted by a qualified biologist to conduct vehicle path clearance and monitoring.
- Project speed limit not to exceed 15 miles per hour (mph).
- Limit site access to designated roads to avoid “take” on roads where monitoring does not occur.
- Erect and maintain temporary tortoise-proof fencing (one- by two-inch mesh hardware cloth) between the interface of project sites and any remaining desert tortoise habitat prior to construction and onsite clearance surveys. Conduct daily monitoring and inspection of fencing to ensure its integrity is maintained, and to free any trapped or fatally exhausted turtles.
- Desert tortoise exclusion fencing would be placed at staging and parking areas. Desert tortoise guards would be placed at entrances to the staging and parking areas. Fence installation would be overseen by an authorized biologist.
- A preconstruction survey by an authorized biologist would be conducted in areas where desert tortoise exclusion fencing would be placed. The survey would occur prior to fence installation. If an active burrow or desert tortoise are identified during the survey, appropriate measures as identified in the 2014 BO to avoid effects would be implemented.
- During land clearing and construction, an authorized biologist and biological monitors would be onsite to observe construction activities and to verify that no tortoises wander into the construction area. If an active burrow or desert tortoise is identified during the survey, appropriate measures as identified in the 2014 BO to avoid effects would be implemented.
- Desert tortoise burrows located within 100 feet of the limits of construction would be marked and protected by conducting additional briefings on their location to insure avoidance. Desert tortoise burrows that cannot be avoided would be excavated by hand either by or under the direct supervision of an authorized biologist. Burrow excavation and subsequent handling of any desert tortoise would follow the most up-to-date guidelines that are acceptable to USFWS.
- Conduct all tortoise clearance surveys in accordance with USFWS protocol.

- Conduct all pre-construction surveys along the proposed roadway and utility corridors within a 48-hour period for relocation prior to construction.
- Cap all pipes left accessible to wildlife, install escape ramps in all open pits and trenches, and monitor open pits and trenches daily to ensure no animals are trapped.
- Keep garbage, including degradable food scraps, in covered containers inaccessible to coyotes.
- If channels or basins are constructed they would be designed so that desert tortoise can pass through these features unimpeded and so that desert tortoise would not be constrained in these features, and trenches or other excavations would be filled or covered at the end of each work day.

4.3.4.2 Mojave Ground Squirrel

- MGS awareness training for all construction personnel.
- Should an occupied MGS natal burrow be discovered during desert tortoise pre-construction surveys, the squirrels would be relocated by a qualified biologist to an artificial burrow constructed offsite in accordance with CDFW guidelines.
- Should a MGS be observed onsite during monitoring activities that is in imminent danger, cease the work activity and provide opportunity for avoidance.

4.3.4.3 Burrowing Owls

- Conduct initial ground disturbance outside of burrowing owl nesting season from approximately 1 February through 31 August each year; conduct visual surveys no more than 30 days prior to initial ground disturbance.
- If vegetation clearing is required during the breeding and nesting season, preconstruction surveys of breeding birds, including burrowing owl and loggerhead shrike, would be conducted. Identified active nests or burrows would be protected from disturbance by a 500-foot buffer, which would remain in place until the young have fledged from the nest or burrow and no new nests or burrows are initiated for the season.

4.3.4.4 American Badger and Desert Kit Fox

- If construction occurs outside denning season, excavate all burrows concurrent with the desert tortoise clearance survey.
- If construction occurs during denning season, utilize motion sensor cameras on all active burrows/dens to monitor presence of young prior to excavation. If present, establish an exclusion zone until the young disperse. If a burrow or den is determined to be inactive and cannot be excavated immediately, block all entrances until excavation is complete.
- Cap all pipes left accessible to wildlife, install escape ramps in all open pits and trenches, and monitor open pits and trenches daily to ensure no animals are trapped.
- Keep garbage, including degradable food scraps, in covered containers inaccessible to coyotes.
- Do not use rodenticides and pesticides in areas where they pose a risk to desert wildlife.

4.3.4.5 Nesting Birds

- Do not conduct vegetation clearance during the nesting season from approximately 15 February to 31 August each year.

- If vegetation clearance is required during the nesting season, a qualified biologist will conduct a pre-construction nesting bird survey no more than 2 days prior to such activities. Establish a 75-meter protective buffer around each active nest identified by survey where no-disturbance is allowed.
- Place a temporary or permanent cap on all vertical tubes to avoid bird entrapment and death.

4.3.4.6 Pest Species

- Place all trash and debris in covered receptacles for delivery to an approved landfill facility.
- Cleanup of trash and debris daily and empty and dispose of trash in receptacles daily.
- When watering the site for dust control or other purposes, avoid pooling water.

4.4 Water Resources

An effect on water resources is considered significant if an alternative would: (1) exceed an established regulatory threshold or agreed upon standard for water quantity or quality; (2) cause substantial erosion that presents a risk to people or property; (3) groundwater levels are reduced to such an extent that spring flows are diminished or production at existing wells within the basin or adjacent interconnected basins falls below economically feasible or practical engineering limits; or (4) result in a measurable degradation of an important water resource (e.g., ephemeral water resources such as dry lakes or spring flows).

4.4.1 Proposed Action

The Proposed Action would alter topography and drainage in the project area. The construction, operation, and maintenance of the Proposed Action would also increase the susceptibility of soils to wind and water erosion. There is potential for sediment movement and contaminant transport via deposition or surface runoff to occur under the Proposed Action. The Proposed Action could also affect water quantity via extraction of groundwater for non-potable uses (e.g. fire suppression) to support operations.

Surface waters in the project area are limited to various intermittent drainages that transport water offsite only during high-intensity storm events. That is, onsite percolation to groundwater and evaporation are more likely to occur. Groundwater resources underlie the project area and offer potential for extraction and non-potable use within the project area.

4.4.1.1 Construction

In the short-term, construction of the Proposed Action would disturb up to approximately 4,000 acres of land in the project area. Development activities such as excavation, grading, clearing, ditching, boring, and related earthwork would occur prior to and during construction. Any water required for these activities will be transported from offsite. Further, dust abatement and storm water controls would be implemented to manage the potential effects of wind and water erosion within the project area.

Storm water controls under the Proposed Action would be designed to contain runoff onsite during construction activities and to maintain pre-development storm water flow characteristics, to the extent practicable. A CGP would be obtained and a site-specific SWPPP would be prepared and implemented for each of the project components associated with the Proposed Action.

4.4.1.2 Operation and Maintenance

The Proposed Action would primarily use non-potable sources of water to operate facilities, fire suppression, and other training related purposes. Soldiers training at the DUT Complex would be

required to bring potable water to the site as part of training exercises. The Proposed Action would install and operate an unspecified number of groundwater wells to extract water for non-potable purposes. In each case, prospective sites would be evaluated and permitted in compliance with applicable laws and regulations prior to well installation and withdrawal of groundwater. The aquifer supporting these wells is not connected to those used for potable water supply on Fort Irwin. The operation and maintenance of the Proposed Action would not be expected to increase groundwater withdrawals on the installation that are treated for potable use beyond that which already occurs for current training activities in this area. As a result, water usage for operation and maintenance of the Proposed Action is not anticipated to substantially change the projected future water supply for Fort Irwin.

Soil deposition and erosion under the Proposed Action would be managed by implementing BMPs and complying with applicable laws and regulations. Collectively, these measures would help prevent and minimize the potential for soils to be transported offsite. Over the long-term, water use under the Proposed Action would have a minor effect on the quantity of local groundwater resources. Overall, the Proposed Action would have a less-than-significant effect on water resources.

4.4.2 No-Action Alternative

Under the No-Action Alternative, construction of the DUT Complex and its associated infrastructure would not occur. Military training activities would continue to affect surface water drainage features on and down-gradient of the project area in accordance with the status quo. These drainage features would also be subject to continued maintenance under the No-Action Alternative.

4.4.3 Cumulative Effects

Cumulative effects to water resources could occur if multiple large construction projects occurred simultaneously on or in the vicinity of Fort Irwin. However, this is not likely to occur due to construction phasing under the Proposed Action and, in general, the timing of other known projects near the project area. Any construction projects that overlap with the Proposed Action would also be subject to regulations that require site-specific BMPs to manage or control soil loss or erosion. Potential cumulative effects on groundwater would be offset by efficiency gains elsewhere on the installation, including recycling water for non-potable uses and water treatment system improvements. Therefore, the Proposed Action would not result in any significant cumulative adverse effects on water resources.

4.4.4 Project Design Measures

4.4.4.1 Surface Water

Staked fiber rolls would be placed at all drainage features for the duration of construction and left in place two weeks after completion of construction. Other BMPs incorporated into the Proposed Action for erosion and sediment control may include, but are not limited to, the following:

- Compost blankets; mulching; riprap; geotextiles; slope drains; check dams; slope diversions; and temporary diversion
- Compost filter berms and socks; fiber berms; sediment basins, rock dams, filters, chambers, or traps; silt fences; and weed-free hay bales

4.4.4.2 Groundwater

Recycled water would be used for dust suppression and other non-potable uses during construction and maintenance activities.

4.5 Air Quality

This section evaluates the potential effects on air quality and provides design measures in the event adverse air quality effects were identified.

4.5.1 Significant Effects Criteria

The air quality effects of the project construction were evaluated by comparing the projected emissions to the MDAQMD Significance Thresholds Rule 2002 and the General Conformity *de minimus* thresholds. If the emissions are predicted to be less than the thresholds, it can be assumed that the Proposed Action would not violate air quality standards or cause a delay in meeting any of the required milestones to achieving attainment. The Proposed Action would be located in a federal - moderate nonattainment area for PM_{10}, where the General Conformity threshold is established as 15 tpy. This 15 tpy threshold was used for the General Conformity applicability analysis.

4.5.2 Proposed Action

The Proposed Action would include construction of two miles of new road, improvements to twenty-nine miles of existing roads and tank trails, twenty-eight miles of power line, twenty-one miles of water line, and approximately 900,000 square feet of floor surface area, in the form of mock multi and single story structures ranging from single family homes to 10-story commercial buildings and a variety of other mock light industrial facilities associated with an urban environment such as mock power plants, subway stations, and gasoline filling stations. Approximately 75–80 percent of these structures would be unoccupied facades, constructed with minimal internal completion, thereby reducing construction duration, energy usage, and associated construction emissions. These structures would be designed only to simulate the dense urban environment, not to function fully, but to provide a realistic training environment. The remaining structures would be designed to provide a fully functioning training environment, capable of monitoring and scoring of engagement scenarios and after-action reviews. The Proposed action would be constructed over approximately 4,000 acres of land within the N1, N2, N3, N4, and LF3 training areas.

4.5.2.1 Construction

The construction timeline would begin in 2019 and end in 2020, therefore the emissions were estimated over a 2-year period. Project construction would result in short term emissions of reactive organic gases (ROG) also known as volatile organic compounds (VOC), Carbon monoxide, Nitrogen oxides, sulfur oxides, and both respirable and fine particulates. Emissions would result from construction equipment, vehicles, and fugitive dust. Particulate emissions would result from ground disturbing activities, unpaved, and paved roads.

Linear construction emissions associated with the roads and utilities were estimated using the Emissions Factors model (EMFAC) 2014/2017 as utilized by the California Road Construction Emissions Model, Version 9.0.0. All defaults in the model were selected. Vertical building construction emissions were estimated using the California Emissions Estimator Model (CalEEMod version 2016.3.2). Most of the defaults in the estimator were utilized. Building Population was set to zero since most structures would not be occupied. Also, since this would be all new construction, the demolition phase was not considered. Particulate matter emissions were mitigated based on the requirements outlined in the *Federal Particulate Matter (PM_{10}) Attainment Plan* (MDAQMD 1995), and MDAQMD Rules 403 and 403.2. Mobile emissions would include personally owned vehicles used by construction crewmembers for transport to the project site and delivery trucks traveling to the project area. Detailed emissions

calculations are provided in **Appendix D**. **Table 6** provides a summary of emissions as compared to the MDAQMD thresholds. The annual construction emissions would be less than the MDAQMD Thresholds, therefore construction of the project would have minor to moderate adverse effect on air quality.

Table 6: Proposed Action Construction Emissions

Dense Urban Terrain Training Complex EA, Fort Irwin, California

Emissions Source	ROG (VOC)	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
2019 Emissions (tpy)						
New Road Construction	0.05	0.39	0.58	0	0.12	0.04
Existing Road and Utility Improvement	0.46	3.46	4.07	0.01	2.53	0.66
Building Construction	5.425	6.9925	5.3499	0.0131	1.8511	0.8286
Total Emissions	5.935	10.8425	9.9999	0.0231	4.5011	1.5286
MDAQMD Thresholds (tpy)	25	100	25	25	15	15
Threshold Exceedance	No	No	No	No	No	No
2020 Emissions (tpy)						
Building Construction	8.4872	5.3064	5.0156	0.0141	0.7629	0.3343
Total Emissions	8.4872	5.3064	5.0156	0.0141	0.7629	0.3343
MDAQMD Thresholds (tpy)	25	100	25	25	15	15
Threshold Exceedance	No	No	No	No	No	No

4.5.2.2 Operation and Maintenance

The Proposed action is not expected to have any adverse effects on operational air emissions from training at the complex. There would be an increase in energy usage due to the training scenarios and required monitoring, but these would be negligible. Estimated emissions would primarily come from power and water usage in the 20–25 percent completed structures and are summarized in **Table 7**. Any stationary sources installed at the complex would be evaluated for permit applicability and coordinated with the MDAQMD. An estimate of the operational emissions was developed using CalEEMod version 2016.3.2 and are included in **Appendix D**.

Table 7: Proposed Action Operational Emissions

Dense Urban Terrain Training Complex EA, Fort Irwin, California

Emissions Source	ROG (VOC)	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Area	4.8623	2.3134	0.0268	0.00012	0.0127	0.0127
Energy	0.0128	0.0975	0.116	0.0007	0.00882	0.00882
Mobile	3.6692	34.7324	25.8163	0.115	7.6466	2.1186
Stationary	1.0257	2.6152	2.8667	0.00493	0.1509	0.1509
Total Annual Emissions (tpy)	9.5699	39.7585	28.8258	0.12075	7.81902	2.29102

4.5.2.3 General Conformity

General Conformity focuses on a Federal action complying with the plan to maintain the NAAQS or ensuring that a federal action does not cause a new violation, contribute to any increase in frequency or severity of existing NAAQS, or delay the timely attainment of any NAAQS or associated milestones. According to the California Environmental Quality Act and Federal Conformity Guidelines (August 2016), a project conforms if it meets the following conditions:

- Complies with all applicable district rules and regulations
- Complies with all proposed control measures

- Is consistent with the growth forecasts in the applicable plan

The Proposed Action would result in a short-term increase in PM_{10} emissions from construction, with a peak in year 2019 of 4.5 tpy and an estimated 7.8 tpy during operation. Both estimates are below the *de minimus* threshold of 15 tpy and would therefore not require a conformity determination. As required by the Army, a record of non-applicability (RONA) would be used to document that the project is exempt from General Conformity requirements. The RONA and the emissions detail are included as **Appendix D**.

Additionally, the Proposed Action would comply with the applicable MDAQMD rules and regulations and would comply with proposed control measures including development of an approved Dust Control Plan. This analysis indicates that the proposed action conforms to the California Environmental Quality Act and MDAQMD requirements since the emissions of the nonattainment pollutant, PM_{10}, would be less than the general conformity *de minimus* threshold.

4.5.3 No-Action Alternative

Under the No-Action Alternative, construction of the DUT Complex and its associated infrastructure would not occur. Military training activities would continue to affect local and regional air quality in accordance with the status quo.

4.5.4 Cumulative Effects

Multiple construction projects could occur on Fort Irwin simultaneously and could potentially overlap; however, if this should happen, air quality issues related to dust could be problematic but would be controlled using approved dust suppression BMPs making the overall cumulative effect negligible to minor and any additional construction would be spatially disparate from the proposed action and evaluated on their own merits.

4.5.5 Project Design Measures

Project design measures would be used during the construction and operation phases to reduce fugitive dust emissions, the largest source of PM_{10}. BMPs such as spraying the ground with water would be implemented for construction and maintenance activities. Fort Irwin currently implements dust suppression activities to abate problems associated with wind erosion including chemical stabilization and revegetation (Army 2006). In addition, Fort Irwin would adhere to the requirements set forth in MDAQMD Rule 403.2, *Fugitive Dust Control for the MDPA*.

4.6 Climate Change and Greenhouse Gases

4.6.1 Proposed Action

The Proposed Action would generate GHG emissions from construction activities and would result in a short-term, minor increase in GHG emissions. Based on guidance for considering GHG emissions, a value of 25,000 MT of CO_2e would indicate whether additional analysis would be meaningful for NEPA decision makers. Construction emissions from the Proposed Action would be 2153 MT of CO_2e from construction in 2019, well below the 25,000 MT threshold.

4.6.2 No-Action Alternative

Under the No-Action Alternative, construction of the DUT Complex and its associated infrastructure would not occur. Military training activities would continue to generate GHG emissions in accordance with the status quo.

4.7 Cultural Resources

An effect on cultural resources is considered significant if an alternative would: (1) adversely affect a national historic landmark, trail, or property eligible to be formally designated as such; (2) diminish the overall integrity of a historic structure, district, viewshed, or property such that it precludes an eligible resource from listing in the NRHP; or (3) adversely affect an archaeological site or building that is listed in or considered eligible for listing in the NRHP, not able to be resolved by a NHPA Section 106 consultation.

4.7.1 Proposed Action

Based upon a record search and field survey, no properties listed in the NRHP or considered eligible for listing in the NRHP exist within the APE. Only two sites (CA-SBR-2347 and -3314) previously recommended as "eligible" for listing in the NRHP occur within the APE and project area. The Proposed Action would not be likely to affect these sites; however, construction monitoring was recommended to ensure their integrity is maintained. As a finding of "No Historic Properties Affected" is recommended in accordance with 36 CFR 800.4(d)(1) (**Appendix C**), potential adverse effects to cultural resources under the Proposed Action would be less-than-significant.

Under the Proposed Action, consultation with affiliated federally recognized Native American tribes and the California SHPO would occur prior to the start of any project that is considered in this document. Correspondence pertaining to cultural resources is included in **Appendix A**. Should any archaeological resources be discovered or unanticipated effects on historic properties are found after the NHPA Section 106 process has been completed, Fort Irwin would comply with the post-review discovery procedures pursuant to 36 CFR 800.13(b)(1), (2), or (3), as appropriate. All work would be immediately suspended in the area and notification made to Fort Irwin's Cultural Resources Manager to determine an appropriate next step. As necessary, Fort Irwin would conduct further study to support an eligibility determination pursuant to the NHPA.

4.7.2 No-Action Alternative

Under the No-Action Alternative, cultural resources within the APE and project area would continue to be disturbed by military training activities. Cultural resource management on Fort Irwin would continue as guided by the installation's ICRMP.

4.7.3 Cumulative Effects

As no properties within the APE and project area are listed in the NRHP or considered eligible for listing in the NRHP, cumulative effects to cultural resources under the Proposed Action would not be anticipated.

4.7.4 Project Design Measures

Project design measures for cultural resources include, but are not limited to, the following:

- Construction monitoring of sites CA-SBR-2347 and -3314.
- Consistency with the Fort Irwin ICRMP and compliance with policies concerning inadvertent discoveries made during construction or operational activities.

4.8 Aesthetics / Visual Resources

An effect on aesthetics or visual resources is considered significant if an alternative would: (1) adversely affect the viewshed of a national, state, or local historic landmark, trail, or property eligible to be formally designated as such; or (2) adversely affect a natural viewshed or the visual resources therein of Native American cultural significance.

4.8.1 Proposed Action

Construction of the Proposed Action would alter the aesthetics of the project area. The visual character of the site would change incrementally with each phase of construction. The mostly flat, open desert land with mountainous backdrops would be sequentially converted to an urbanized area to support Fort Irwin's mission. Although implementation of the Proposed Action would substantially change the aesthetics of the project area, no formally designated viewsheds exist or would be affected. Additionally, there are no known visual resources associated with the project area of Native American cultural significance. Under the Proposed Action, the natural desert environment, surrounding mountain ranges, and military training activities would continue to define the aesthetic environment. Therefore, the Proposed Action would have a less-than-significant effect on aesthetics or visual resources.

4.8.2 No-Action Alternative

Under the No-Action Alternative, the aesthetics or visual resources in the project area would not change from the current status quo.

4.8.3 Cumulative Effects

The Proposed Action would be consistent with military training environments found elsewhere on the installation. There are no other planned or ongoing construction projects that would be visible from within the project area. In many cases, the mountainous terrain precludes any visual interactions between the various training areas and facilities of Fort Irwin, as well as those that may occur on adjacent public or private lands. No significant cumulative effects on aesthetics or visual resources are anticipated to result from the Proposed Action.

4.8.4 Project Design Measures

No project-specific design measures are identified for aesthetics or visual resources.

4.9 Hazardous and Toxic Substances

A hazardous and toxic substance effect is considered significant if an alternative would: (1) result in a substantial health or safety contamination risk; or (2) result in a spill or release of hazardous or toxic substances into the environment with a measurable degradation of an important natural, cultural, or socioeconomic resource.

4.9.1 Proposed Action

The Proposed Action would use small quantities of hazardous materials and petroleum products such as solvents, hydraulic fluid, oil, and antifreeze. Petroleum, oils, and lubricants, pesticides, and other hazardous materials and substances would be transported to and used at the site where minor equipment service and repair activities may also take place. Construction and operational activities under the Proposed Action could generate these wastes, which could potentially be released into the environment.

Components of the existing water system (e.g. underground pipes) may contain asbestos. The removal of such infrastructure could result in the release of asbestos and adversely affect the human or natural environment.

The Proposed Action could adversely affect the human or natural environment should a project involving excavation intercept an ERP site. In such cases, the Proposed Action could result in contaminant migration via one or more environmental media (i.e., air, water, or soil pathways). Additionally, it is possible that unknown, potentially hazardous materials, substances, or wastes (e.g. UXO) would be discovered or unearthed during implementation of the Proposed Action.

4.9.1.1 Construction

During construction of the Proposed Action, the handling and storage of any hazardous materials and petroleum products would be carried out in compliance with applicable laws and regulations. Implementation of the Proposed Action would adhere to applicable management plans such as the Fort Irwin Integrated Pest Management Plan (IPMP 2017) and Spill Prevention and Countermeasure Control (SPCC) Plan (2014). In accordance with Fort Irwin's SWPPP, each project under the Proposed Action would be reviewed to ensure proper erosion and sediment control measures are considered and incorporated into project designs. Additionally, projects that would individually or cumulatively disturb greater than 1 acre of land would obtain coverage under a NPDES CGP prior to construction. The CGP requires preparation and implementation of site-specific SWPPPs (US EPA 2017). SWPPPs and the NPDES CGP control stormwater that can pick up pollutants such as sediment, debris, and chemicals.

Although construction activities under the Proposed Action may require the temporary use of ASTs onsite for either power generation or equipment fuel, their use and maintenance would comply with applicable laws and regulations.

All projects involving improvement or connection to the existing water line under the Proposed Action would be evaluated for potential to encounter asbestos-containing materials (ACM). As necessary, sampling would be conducted to confirm suspected ACM prior to removal or disturbance activities. Should ACM be present in infrastructure associated with the Proposed Action, a written asbestos notification to certify the finding would be prepared and all ACM would be managed in compliance with applicable laws and regulations.

Construction of the roadway and utility upgrades under the Proposed Action would occur on or pass through actively managed ERP sites. In such cases, projects would be conducted in coordination with appropriate installation personnel prior to the start of construction or maintenance activities. Further, should any unknown, potentially hazardous materials, substances, or wastes be discovered or unearthed during implementation of the Proposed Action, work would immediately cease, and appropriate installation personnel would be contacted. If necessary, sampling would be conducted, and the results analyzed before any further action. Any unknown materials, substances, or wastes determined to be hazardous would then be managed or disposed of in accordance with applicable laws and regulations.

4.9.1.2 Operation and Maintenance

All hazardous and toxic substances used or generated during the operation and maintenance of the Proposed Action would be handled, stored, and disposed of in accordance with Fort Irwin's RCRA permit and applicable management plans such as the IPMP, SPCC Plan, SWPPP, and hazardous waste management plan (HWMP), among others.

Overall, the Proposed Action would implement appropriate, required BMPs to proactively manage and minimize the potential for an accidental release of hazardous substances. Additionally, these measures would limit the extent and severity of potential effects in the event of such an occurrence. As

appropriate, upfront coordination with installation personnel prior to the start of construction would avoid and minimize potential adverse effects under the Proposed Action. Protocols and procedures are also in place to manage risks associated with the unintentional disturbance of hazardous materials, substances, or wastes. Therefore, the Proposed Action would result in less-than-significant adverse effects from hazardous and toxic substances.

4.9.2 No-Action Alternative

Under the No-Action Alternative, construction of the DUT Complex and its associated infrastructure would not occur. Fort Irwin would continue to operate in accordance with its RCRA permit, base-wide SWPPP, and related management plans pertaining to hazardous and toxic substances. The project site would likely be developed for another training purpose in the future.

4.9.3 Cumulative Effects

Given Fort Irwin's military mission, the use and generation of hazardous and toxic substances is a regular and ongoing activity. Accordingly, Fort Irwin implements policies, plans, and programs to specifically address these various types of waste streams (e.g. the HWMP and the ERP). As such, Fort Irwin will continue to be a large-quantity generator of hazardous waste as defined by the RCRA. Hazardous waste management on Fort Irwin will apply to all other ongoing and future projects on the installation. As such, cumulative effects from hazardous and toxic substances are not anticipated to occur.

4.9.4 Project Design Measures

Project design measures for hazardous and toxic substances include, but are not limited to, the following:

- Obtain a NPDES CGP for projects disturbing one acre or more of land and implement project-specific SWPPPs containing BMPs to prevent a release of hazardous materials into the environment during construction.

4.10 Human Health and Safety

An effect on human health and safety is considered significant if an alternative would: (1) result in adverse environmental health or safety risks to military personnel, workers, or other human receptors.

4.10.1 Proposed Action

The construction, operation, and maintenance of the Proposed Action would expose military and civilian workers to health and safety risks. However, all such activities would comply with applicable safety requirements. For example, each construction project under the Proposed Action would require the responsible entity to develop and implement a site-specific health and safety plan, including guidance and direction to prevent or minimize contaminant exposure risks and address other safety concerns. These plans would include, at a minimum, emergency response and evacuation procedures; operational manuals; PPE recommendations (e.g., breathing and hearing protection); protocols and procedures for handling, storing, and disposing of hazardous materials and wastes; information on the effects and symptoms of potential exposures; and guidance with respect to hazard identification. The responsible entity would also be required to submit the health and safety plans to Fort Irwin for review and approval, and for educating workers at each site through daily briefings.

Overall, health and safety risks under the Proposed Action would be controlled and minimized by required and appropriate protection measures and practices. These BMPs would effectively manage the potential adverse effects to human health and safety that could occur under the Proposed Action to

less-than-significant levels. Additionally, because the Proposed Action is located on an active military installation with controlled access, public safety risks would be less-than-significant.

4.10.2 No-Action Alternative

Under the No-Action Alternative, construction of the DUT Complex and its associated infrastructure would not occur. Human health and safety risks to military and civilian workers on Fort Irwin would not change from the status quo. The project site would likely be developed for another training purpose in the future.

4.10.3 Cumulative Effects

The Proposed Action would present human health and safety risks commonly encountered on Fort Irwin. All construction projects and training and operational activities on the installation are subject to varying rules and regulations to manage and minimize such risks. No significant cumulative effects on human health and safety are anticipated to result from the Proposed Action.

4.10.4 Project Design Measures

Project design measures for human health and safety include, but are not limited to, the following:

- During construction, develop and implement site-specific health and safety plans to manage and minimize potential human health hazards and risks.

During construction and maintenance activities, measures to reduce potential exposure to and effects of valley fever include:

- A brochure detailing valley fever, its cause, and symptoms would be made available to those working in the project area. The brochure would include information on how to control the spread of the illness, such as changing clothes daily, using respiratory protection, applying water to the soil, and cleaning equipment and materials.
- Breathing protection equipment would be made available to all workers, at their request and at no cost to the worker.
- Workers would be educated through briefings to recognize the symptoms of valley fever, and to quickly report suspected symptoms of work-related valley fever.
- Signs would be posted at the project site notifying visitors and workers to the threat of valley fever.

4.11 Transportation

An effect on transportation is considered significant if an alternative would: (1) substantially alter or degrade regional traffic volumes or patterns; (2) result in a roadway LOS of E or lower; or (3) exceed the capacity of a roadway in lieu of mitigation to prevent such an occurrence.

4.11.1 Proposed Action

The Proposed Action would not increase the number of military or civilian personnel currently stationed at Fort Irwin, temporarily or permanently. However, construction-related vehicles and equipment under the Proposed Action would require access to and from the project sites. Post-construction, military vehicles would regularly access the project area to conduct operations and maintenance. If not managed properly, the Proposed Action could degrade transportation networks on or in the vicinity of Fort Irwin with respect to volume, flow, or capacity.

The regional and local roadways associated with Fort Irwin currently operate below capacity with minor delays during the morning and evening commute times.

4.11.1.1 Construction

The regional roadway network is sufficient to support the Proposed Action. That is, the roadways that surround and provide connection to Fort Irwin are of an adequate size and capacity. There are no major concerns with respect to traffic volume or flow, particularly outside of normal commuting hours.

Construction-related vehicles and equipment under the Proposed Action would access the project area from Fort Irwin Road through the cantonment area and NASA Goldstone property to the DUT Complex site. Roadway size and weight limits, and the mountainous terrain limit access to portions of the project area. To provide adequate access to the DUT Complex site roadway improvements would be made during the initial phase of construction. As such, large-sized convoys of construction vehicles and equipment would generally not increase or slow traffic in the cantonment area. Further, construction phasing under the Proposed Action would lessen the severity any increases to traffic would have on the cantonment area.

4.11.1.2 Operation and Maintenance

Military vehicles and personnel regularly access the range areas on Fort Irwin to conduct training or maintenance activities. Accordingly, Fort Irwin provides 24-hour range control services to de-conflict such activities and ensure efficient, safe operations. Under the Proposed Action, range control would continue to function in this capacity to support the operation and maintenance of the DUT Complex.

Overall, the Proposed Action would not be anticipated to result in any changes to roadway LOS on or in the vicinity of Fort Irwin. Cantonment area roadways currently operate in accordance with their design capacity and construction phasing would ensure this continues under the Proposed Action. Additionally, military access to the site would be subject to control by Range Operations. Therefore, the Proposed Action would result in less-than-significant effects on transportation.

4.11.2 No-Action Alternative

Under the No-Action Alternative, construction of the DUT Complex and its associated infrastructure would not occur. The roadway networks on and in the vicinity of Fort Irwin would continue to operate in accordance with the status quo. No roadway improvements or extensions would occur in the project area under the No-Action Alternative.

4.11.3 Cumulative Effects

Cumulative effects to transportation would occur if improvements to roadways could not keep pace with anticipated regional or local population growth. As the Proposed Action would not increase the number of military or civilian personnel currently stationed at Fort Irwin on a temporary or permanent basis, it not likely to combine with any plans or projects to degrade the function or capacity of transportation systems on or around Fort Irwin. Additionally, expanded and incentivized alternative transportation options such as rail transit, bicycle and pedestrian paths, high-occupancy vehicle lanes, car-pooling, and bus services, among others, would likely continue with the anticipated growth of the region. These efforts would serve to offset or lessen the potential cumulative adverse effects of the region's growing population. No significant cumulative effects on transportation are anticipated to result from the Proposed Action.

4.11.4 Project Design Measures

There are no additional, project-specific design measures identified for transportation.

4.12 Utilities and Infrastructure

A utility and infrastructure effect is considered significant if an alternative would: (1) increase utility demand over capacity such that expansion or upgrade is required; or (2) substantially deteriorate the physical or functional viability of a utility or infrastructure system or component.

4.12.1 Proposed Action

4.12.1.1 Construction

Water

The phased construction of the Proposed Action would not substantially increase Fort Irwin's average annual water use. It is anticipated that the selected construction firm(s) would supply potable water to project sites during construction. Additionally, recycled water would be used for non-potable uses such as dust suppression during construction, operation, and maintenance of the Proposed Action. No measurable increase in average potable or non-potable water use is anticipated to occur under the Proposed Action.

The extension of the water line under the Proposed Action could result in minor delays and disruptions to Fort Irwin's water delivery system. However, these effects would be managed and minimized with effective scheduling, coordination, and communication.

Wastewater

The construction, operation, and maintenance of the Proposed Action would use portable restroom facilities. Waste from such facilities would be collected and disposed of at the WWTP. No measurable increase in average wastewater generated for disposal is anticipated to occur under the Proposed Action.

Energy

There is no power line utility that connects to the DUT Complex site. Initially, the primary power source for construction of the Proposed Action would be supplied by mobile generators transported onsite for temporary use only. However, the Proposed Action would extend existing overhead electrical lines to the DUT Complex site during the initial phase of construction. Electrical lines extending from existing lines would be buried except where soils/terrain preclude doing so. This power supply would then become available to support subsequent phases of development. No measurable increase in average energy use is anticipated to occur under the Proposed Action.

Communications

An existing fiber optic line is readily available to connect to the DUT Complex site. No effects beyond using this infrastructure and capability to support the construction, operation, and maintenance of the Proposed Action are anticipated.

Storm Water

There is currently limited to no storm water conveyance infrastructure in the project area. Therefore, no effects are anticipated.

Solid Waste Management

In the short term, the construction of the Proposed Action would generate solid waste. Nonhazardous waste associated with the Proposed Action would either be trucked offsite for disposal in an appropriately licensed landfill or disposed of onsite at Fort Irwin's solid waste landfill. Hazardous solid waste would be disposed of by the construction contractor at an appropriately licensed landfill. Solid waste management is sufficient to support the construction, operation, and maintenance of the Proposed Action, and no measurable increase in solid waste generated at Fort Irwin is anticipated over the long-term.

4.12.2 No-Action Alternative

Under the No-Action Alternative, construction of the DUT Complex and its associated infrastructure would not occur. The condition and capacity of utility systems and infrastructure on Fort Irwin would not change.

4.12.3 Cumulative Effects

Cumulative effects on the utility and infrastructure systems of Fort Irwin could occur if population growth and development exceed their operational capacity or cause a substantial decline in their condition. As the Proposed Action would not increase the number of military or civilian personnel currently stationed at Fort Irwin on a temporary or permanent basis, it is not likely to combine with any plans or projects to degrade the function or capacity of utility systems on or around Fort Irwin. Additionally, new developments occurring or planned to occur on the installation are being designed and constructed with increased efficiency. For example, the WTP has a water recovery rate of 99 percent, extending the lifespan of Fort Irwin's water supply. The expansion of the recycled water system and increasing alternative energy use in accordance with net zero energy goals are other examples that contribute to the long-term sustainability of utility and infrastructure systems on the installation. No significant cumulative effects on utilities and infrastructure are anticipated to result from the Proposed Action.

4.12.4 Project Design Measures

No project-specific design measures are identified for utilities and infrastructure.

4.13 Summary of Effects and Project Design Measures

Table 8 summarizes by resource area the project design measures that would be implemented under the Proposed Action to avoid, minimize, or reduce potential adverse environmental effects from the construction, operation, and maintenance of the DUT Complex.

Table 8: Project Design Measures
DUT Complex EA, Fort Irwin, California

Resource	Potential Effect	Design Measure(s)
Geology and Soils	Soil erosion	Place staked fiber rolls at all drainage features for the duration of construction and two weeks post-construction. Other BMPs incorporated into the Proposed Action for erosion and sediment control may include, but are not limited to, the following: → Compost blankets; mulching; riprap; geotextiles; slope drains; check dams; slope diversions; and temporary diversion

Table 8: Project Design Measures
DUT Complex EA, Fort Irwin, California

Resource	Potential Effect	Design Measure(s)
		→ Compost filter berms and socks; fiber berms; sediment basins, rock dams, filters, chambers, or traps; silt fences; and weed-free hay bales Wind erosion control measures would consist of wetting the ground with water, chemical stabilization, and adherence to the measures described in the MDAQMD Rules 403 and 403.2. The requirements of Rule 403.2 for a project over 100 acres are as follows: → Use periodic watering for short-term stabilization of disturbed surface area to minimize visible fugitive dust emissions → Take actions sufficient to prevent project related track-out onto paved surfaces → Cover loaded haul vehicles while operating on publicly maintained paved surfaces → Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed more than thirty days, except when such a delay is due to precipitation → Clean up project-related track-out or spills on publicly maintained paved surfaces within 24 hours → Reduce nonessential earthmoving activity under high wind conditions → Prepare and submit to MDAQMD, prior to commencing earth-moving activity, a dust control plan that describes all applicable dust control measures for implementation during construction → Stabilize access route(s) to the project area as soon as is feasible (i.e., prior to the completion of construction and demolition activities) → Maintain natural topography to the extent possible → Construct parking lots and paved roads first, where feasible → Construct upwind portions of project first, where feasible Obtain a NPDES CGP for projects disturbing one acre or more of land and implement project-specific SWPPPs.
Seismicity		None identified
Biological Resources		
Desert Tortoise	Behavioral change, injury, or morality; habitat loss or degradation	→ Adhere to the USFWS BO (2014), including implementation of agreed upon procedures to minimize effects to desert tortoises during project planning and approval process → Desert tortoise awareness training for all construction personnel. → Develop an onsite communications protocol for desert tortoise sightings and to address wildlife issues during construction → Check beneath vehicles for tortoises prior to moving vehicles. → No parking on road berms in areas not cleared of tortoises. → All land survey or construction crews to be escorted by a qualified biologist to conduct vehicle path clearance and monitoring → Project speed limit not to exceed 15 miles per hour (mph) → Limit site access to designated roads to avoid “take” on roads where monitoring does not occur → Erect and maintain temporary tortoise-proof fencing (one- by two-inch mesh hardware cloth) between the interface of project sites and any remaining desert tortoise habitat prior to construction and onsite clearance surveys. Conduct daily monitoring and inspection of fencing to ensure its integrity is maintained, and to free any trapped or fatally exhausted turtles → Desert tortoise exclusion fencing would be placed at staging and parking areas. Desert tortoise guards would be placed at entrances to the staging and parking areas. Fence installation would be overseen by an authorized biologist.

Table 8: Project Design Measures
DUT Complex EA, Fort Irwin, California

Resource	Potential Effect	Design Measure(s)
		→ A preconstruction survey by an authorized biologist would be conducted in areas where desert tortoise exclusion fencing would be placed. The survey would occur prior to fence installation. If an active burrow or desert tortoise are identified during the survey, appropriate measures as identified in the 2014 BO to avoid effects would be implemented. → During land clearing and construction, an authorized biologist and biological monitors would be onsite to observe construction activities and to verify that no tortoises wander into the construction area. If an active burrow or desert tortoise is identified during the survey, appropriate measures as identified in the 2014 BO to avoid effects would be implemented. → Desert tortoise burrows located within 100 feet of the limits of construction would be marked and protected by conducting additional briefings on their location to insure avoidance. Desert tortoise burrows that cannot be avoided would be excavated by hand either by or under the direct supervision of an authorized biologist. Burrow excavation and subsequent handling of any desert tortoise would follow the most up-to-date guidelines that are acceptable to USFWS. → Conduct all tortoise clearance surveys in accordance with USFWS protocol Conduct all pre-construction surveys along the proposed roadway and utility corridors within a 48-hour period for relocation prior to construction → Cap all pipes left accessible to wildlife, install escape ramps in all open pits and trenches, and monitor open pits and trenches daily to ensure no animals are trapped. → Keep garbage, including degradable food scraps, in covered containers inaccessible to coyotes. → If channels or basins are constructed they would be designed so that desert tortoise can pass through these features unimpeded and so that desert tortoise would not be constrained in these features, and trenches or other excavations would be filled or covered at the end of each work day. →
Mojave Ground Squirrel	Behavioral change, injury, or morality; habitat loss or degradation	→ MGS awareness training for all construction personnel → Should an occupied MGS natal burrow be discovered during desert tortoise pre-construction surveys, the squirrels would be relocated by a qualified biologist to an artificial burrow constructed offsite in accordance with CDFW guidelines → Should a MGS be observed onsite during monitoring activities that is in imminent danger, cease the work activity and provide opportunity for avoidance
Burrowing Owls	Behavioral change, injury, or morality; habitat loss or degradation	→ Conduct initial ground disturbance outside of burrowing owl nesting season from approximately 1 February through 31 August each year; conduct visual surveys no more than 30 days prior to initial ground disturbance → If vegetation clearing is required during the breeding and nesting season, preconstruction surveys of breeding birds, including burrowing owl, would be conducted. → Identified active nests or burrows would be protected from disturbance by a 500-foot nesting buffer, which would remain in place until the young have fledged from the nest or burrow and no new nests or burrows are initiated for the season. →

Table 8: Project Design Measures
DUT Complex EA, Fort Irwin, California

Resource	Potential Effect	Design Measure(s)
American Badger and Desert Kit Fox	Behavioral change, injury, or morality; habitat loss or degradation	→ If construction occurs outside denning season, excavate all burrows concurrent with the desert tortoise clearance survey → If construction occurs during denning season, utilize motion sensor cameras on all active burrows/dens to monitor presence of young prior to excavation. If present, establish an exclusion zone until the young disperse. If a burrow or den is determined to be inactive and cannot be excavated immediately, block all entrances until excavation is complete → Cap all pipes left accessible to wildlife, install escape ramps in all open pits and trenches, and monitor open pits and trenches daily to ensure no animals are trapped → Keep garbage, including degradable food scraps, in covered containers inaccessible to coyotes → Do not use rodenticides and pesticides in areas where they pose a risk to desert wildlife
Nesting Birds	Behavioral change, injury, or morality; habitat loss or degradation	→ Do not conduct vegetation clearance during the nesting season from approximately 15 February to 31 August each year → If vegetation clearance is required during the nesting season, a qualified biologist will conduct a pre-construction nesting bird survey no more than 2 days prior to such activities. Establish a 75-meter protective buffer around each active nest identified by survey where no-disturbance is allowed → Place a temporary or permanent cap on all vertical tubes to avoid bird entrapment and death
Pest Species	Population increase	→ Place all trash and debris in covered receptacles for delivery to an approved landfill facility → Cleanup of trash and debris daily and empty and dispose of trash in receptacles daily → When watering the site for dust control and other purposes, avoid pooling water
Water Resources		
Surface Water	Soil erosion, runoff, and sedimentation	Place staked fiber rolls at all drainage features for the duration of construction and two weeks post-construction. Other BMPs incorporated into the Proposed Action for erosion and sediment control may include, but are not limited to, the following: → Compost blankets; mulching; riprap; geotextiles; slope drains; check dams; slope diversions; and temporary diversion → Compost filter berms and socks; fiber berms; sediment basins, rock dams, filters, chambers, or traps; silt fences; and weed-free hay bales Obtain a NPDES CGP for projects disturbing one acre or more of land and implement project-specific SWPPPs.
Ground Water	Water supply	→ Use recycled water for dust suppression and other non-potable uses during construction and maintenance activities
Air Quality		
	Fugitive dust	→ Spray the ground with water prior to construction and maintenance activities → Chemical stabilization and revegetation for wind erosion control → Adhere to the requirements set forth in MDAQMD Rule 403.2, Fugitive Dust Control for the MDPA
Cultural Recourses		
	Degradation or loss of integrity	→ Construction monitoring of sites CA-SBR-2347 and -3314 → Consistency with the Fort Irwin ICRMP and compliance with policies concerning inadvertent discoveries made during construction or operational activities

Table 8: Project Design Measures

DUT Complex EA, Fort Irwin, California

Resource	Potential Effect	Design Measure(s)
Aesthetics / Visual Resources		
		None identified.
Hazardous and Toxic Substances		
		Obtain a NPDES CGP for projects disturbing one acre or more of land and implement project-specific SWPPPs.
Human Health and Safety		
		During construction, develop and implement site-specific health and safety plans. During construction and maintenance activities, implement measures to reduce potential exposure to and effects of valley fever, including: → Prepare a brochure detailing valley fever, its cause, and symptoms to be made available to those working in the project area → Equip workers with breathing protection equipment, at their request and at no cost → Educate workers through regular briefings to recognize the symptoms of valley fever, and to quickly report suspected symptoms of work-related valley fever → Post signs at the project site notifying visitors and workers to the threat of valley fever
Transportation		
		None identified.
Utilities and Infrastructure		
		None identified.

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5 Distribution List

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P.O. Box 105085
Fort Irwin, CA 92310-5085

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6 List of Preparers

Table 9: List of Preparers
DUT Complex EA, Fort Irwin, California

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Shannon Tannis Danley	B.A., Biology, Natural Resource Management, Columbus State University, 1994	12
Michael G. Robertson	B.S., Crop and Soil Environmental Science, Virginia Tech, 1999	12
Andrew Tuleya	B.A., Geography and Planning, West Chester University of Pennsylvania, 2011	8
Elena Brors	A.S., Civil Engineering, El Paso Community College, 2014	5

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APPENDIX A

Project Correspondence

(Consultation such as tribal consultation is being conducted by Fort Irwin. Pertinent correspondence will be catalogued as part of the public review process and included in the Final EA.)

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APPENDIX B

Natural Resources Survey Report

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Department of the Army

Installation Management Command

Draft Final

Natural Resources Surveys for the Proposed Construction, Operation, and Maintenance of a Dense Urban Terrain Complex

Fort Irwin, California

July 2018

Contents

Appendices

Tables

Figures

Acronyms and Abbreviations

AARs	after action reviews
AMSL	Above Mean Sea Level
Army	U.S. Army
BCC	Birds of Conservation Concern
BCT	Brigade Combat Team
BLM	U.S. Bureau of Land Management
BO	Biological Opinion
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife (Formerly Fish and Game)
CDNPA	California Desert Native Plants Act
CEQA	California Environmental Quality Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
DoD	Department of Defense
DPW	Directorate of Public Works Environmental Division
DUT	Dense Urban Training
EBS	EREMICO Biological Services
GDSCC	Goldstone Deep Space Communications Complex
GPS	Global Positioning System
Km	Kilometer
m	meter
cm	centimeter
mm	millimeter
MBTA	Migratory Bird Treaty Act
MCL	Midline Carapace Length
NASA	National Aeronautics and Space Administration
NRCS	Natural Resources Conservation Service
NTC	National Training Center
SBI	Sundance Biology, Inc.
SSC	Species of Special Concern
TES	Threatened, Endangered, and Sensitive
UFC	Unified Facilities Code
Unk	Unknown
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey

Executive Summary

ES-1 Introduction

The U.S. Army (Army) National Training Center (NTC) and Fort Irwin (Fort Irwin) are situated approximately 37 miles northeast of Barstow, California, in the north-central part of the High Mojave Desert. Fort Irwin encompasses approximately 753,537 acres of desert terrain most of which (528,573 acres or 70 percent) is used for realistic battlefield training. Land use on Fort Irwin also includes the 33,229-acre National Aeronautics and Space Administration (NASA) Goldstone Deep Space Communications Complex (GDSCC) property and the 91,330-acre Leach Lake Tactical (bombing/artillery) Range. A cantonment area in the southwest portion of Fort Irwin consists of approximately 1,920 acres and provides temporary and permanent living quarters for Soldiers and their families along with support facilities (Army 2017).

ES-2 Purpose and Need of the Proposed Action

The purpose of the Proposed Action is to provide adequate dense urban training (DUT) on Fort Irwin that allows the Army to conduct Brigade Combat Team (BCT)-level urban terrain training in concert with maneuver training. The DUT complex would replicate current, real-world urban operational environments by establishing multiple, highly dense sub-sections of a mega-city at an Army CTC. This capability would address current home station training shortfalls to meet the full spectrum and complexity of the urban operational environment. A DUT training complex located in an area of Fort Irwin, which minimizes operational constraints and provides flexibility for future expansion, is needed to provide critical training in capture, security, and control of urban terrain to units of all types and sizes. The proposed DUT site is within the boundaries of Fort Irwin, approximately 14 miles north-northwest of cantonment.

ES-3 Summary of Survey

This Natural Resources Report describes the biological resources associated with the proposed DUT complex and its associated transportation routes and utility corridors (electric and water). Both historical records and results of a 2018 survey are described herein. The natural resources survey focused on ten species of concern: Lane Mountain milkvetch (*Astragalus jaegerianus*), desert cymopterus (*Cymopterus deserticola*), Agassiz's desert tortoise (*Gopherus agassizii*), Mohave ground squirrel (*Xerospermophilus mohavensis*), Western burrowing owl (*Athene cunicularia*), Mojave fringe-toed lizard (*Uma scoparia*), American badger (*Taxidea taxus*), desert kit fox (*Vulpes macrotis*), loggerhead shrike (*Lanius ludovicianus*), and LeConte's thrasher (*Toxostoma lecontei*). Additionally, all sensitive plant, cacti, and yucca species were recorded during the 2018 survey.

Sensitive plant surveys were conducted in areas of suitable habitat. Suitable habitat for the Lane Mountain milkvetch was found on the electric utility corridor, however no plants were observed. No stabilized dune systems or areas with deep sand for desert cymopterus occur on the DUT nor on the transportation and utility corridors. No plants were observed.

Survey methodology for the desert tortoise was consistent with the U.S. Fish and Wildlife Service (USFWS) *2017 Pre-project Field Survey Protocol* for the desert tortoise presence-absence surveys. As defined by the protocol, the action area is 100 percent of the proposed DUT area. Based on GIS data provided by the Army, 4,014 acres were surveyed. Additionally, all tortoise signs observed while

conducting burrowing owl surveys in a 150-meter buffer around the DUT was recorded. Proposed access routes and utility corridors were also surveyed following recommended methodologies.

Desert tortoise and/or tortoise signs were observed throughout the DUT and along transportation routes and utility corridors. During the survey, 17 live desert tortoises were encountered, 13 on the DUT, 1 on the DUT buffer, and 3 on a utility corridor.

Following MGS Survey Guidelines (CDFG 2010), a total of 44 motion-sensor camera trap locations were established for the Mohave ground squirrel survey, totaling 526 camera trap days. Mohave ground squirrels were observed on the DUT during the camera trapping survey. Cameras also recorded the presence of desert kit foxes, an American badger, LeConte's thrashers, and a Golden Eagle. The Golden Eagle (*Aquila chrysaetos*) is fully protected by the U.S. Bald and Golden Eagle Act, 1962 and the Migratory Bird Treaty Act, 1918.

Suitable habitat for the western burrowing owl was present throughout the DUT, transportation routes and utility corridors. One live burrowing owl was observed flying across Goldstone Road. Burrowing owl signs (pellets, white wash, and active burrows) was also encountered on the DUT and along the water utility corridor. A 150-meter buffer around the DUT was surveyed for burrowing owl following methodology stated in the *Staff Report on Burrowing Owl Mitigation* (CDFG 2012).

Two loggerhead shrikes were observed on a utility corridor. An American badger and LeConte's thrasher were observed along a transportation route and LeConte's thrashers were observed on the DUT.

Based on criteria set forth in the USFWS Biological Opinion (FWS-SB-14B0363-14F0495, Biological Opinion for Operations and Activities at Fort Irwin, San Bernardino County, California) construction of the DUT complex and its associated transportation routes, utility corridors, and pumping stations is covered under this Biological Opinion.

1 Introduction

Team CALIBRE biologists conducted a natural resources study of the DUT, transportation routes, and utility corridors (electric and water), as shown in Figure 1-1. The natural resources study included assessing habitat suitability for threatened, endangered, and sensitive (TES) species, describing habitat conditions, and conducting protocol-level surveys to determine the presence or absence of sensitive plant species, desert tortoise, Mohave ground squirrel, and western burrowing owl. The sensitive species of concern included Lane Mountain milkvetch (*Astragalus jaegerianus*), desert cymopterus (*Cymopterus deserticola*), Agassiz's desert tortoise (*Gopherus agassizii*), Mohave ground squirrel (*Xerospermophilus mohavensis*), western burrowing owl (*Athene cunicularia*), Mojave fringe-toed lizard (*Uma scoparia*), American badger (*Taxidea taxus*), desert kit fox (*Vulpes macrotis*), loggerhead shrike (*Lanius ludovicianus*), and LeConte's thrasher (*Toxostoma lecontei*). Complete wildlife and plant lists of all observed species were generated during the surveys.

1.1 Project Description

The Proposed Action would seek to provide adequate DUT training on Fort Irwin that allows the Army to conduct BCT-level urban terrain training in concert with maneuver training. The DUT complex would replicate current, real-world urban operational environments by establishing multiple, highly dense sub-sections of a mega-city within Fort Irwin's operational boundary. To support the construction and operation of a DUT training complex, the Proposed Action would also include road and utility corridor extensions and improvements. These components of the Proposed Action would generally start in or near the cantonment area and extend towards the proposed DUT training complex (Fort Irwin 2018).

Construction of the Proposed Action would start in approximately February 2019 and be completed in phases.

Specific components of the Proposed Action would be phased in or sequenced, as follows:

- Phase I. Power, water, and roadway infrastructure.
- Phase 2. Site drainage; sewer systems infrastructure; a 500-meter mock subway; and 2 ten-story, 2 five-story, and 1 one-story mock building(s).
- Phase 3. A mock water tank; highway; sports area; and 2 four-story and 5 six-story mock buildings.
- Phase 4. A mock police station, including a mock prison/jail; mock television/radio station; mock city hall; mock water treatment facility; mock power station; overpass; and 100 one-story, 75 two-story, and 2 ten-story mock buildings.
- Phase 5. A mock embassy; mock bank; mock gas stations; mock subway; mock storm and waste water infrastructure; and 150 one-story and 100 two-story mock buildings.
- Phase 6. A mock refinery; mock chemical, biological, radiological, nuclear, and explosive (CBRNE) structure; live administrative facility; and 2 ten-story mock buildings (Fort Irwin 2018).

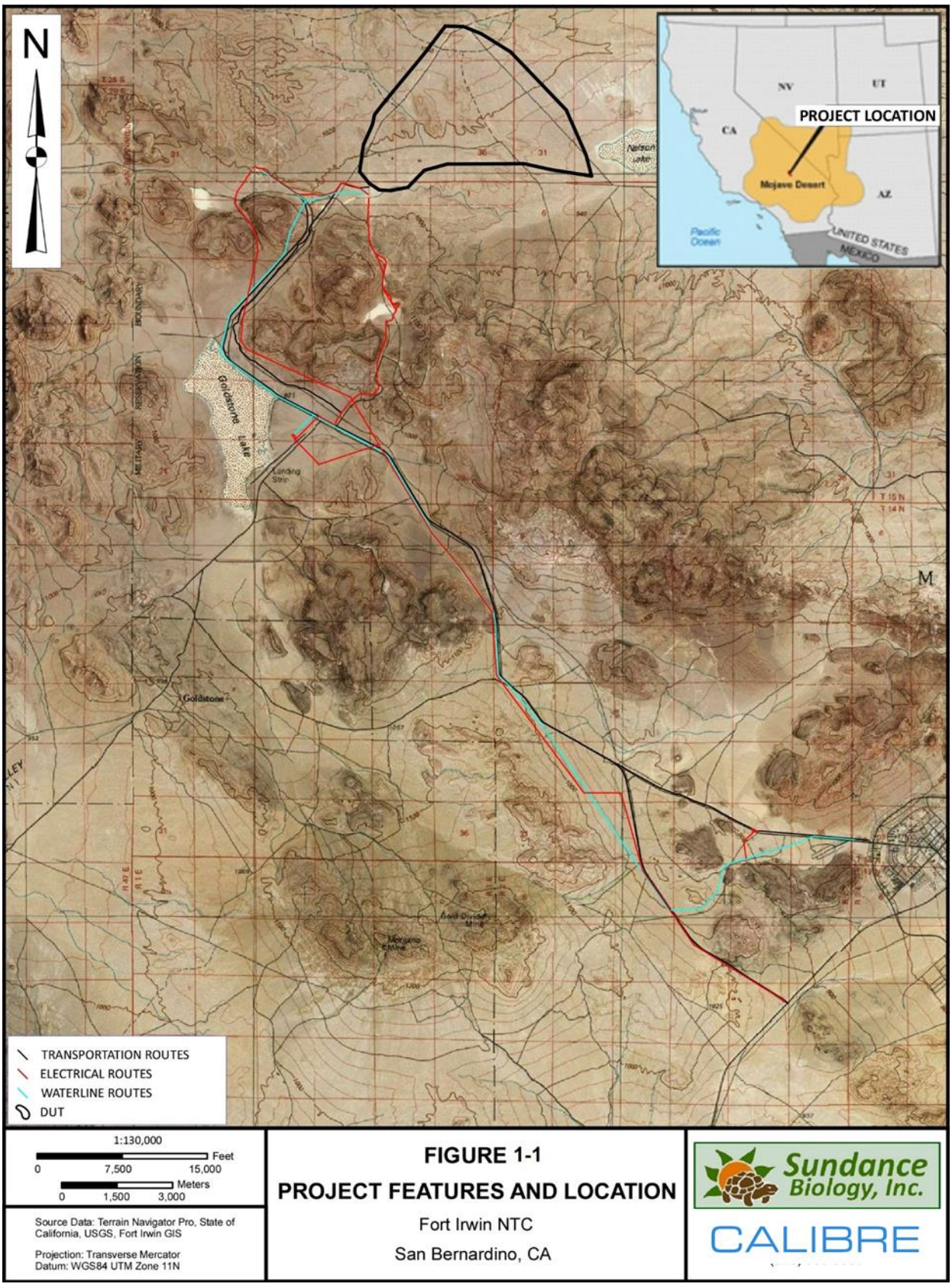

Figure 1-1. Project Features and Location Map

1.2 Site Location

Fort Irwin is in southeast California, 37 miles (59.54 kilometers) northeast of Barstow in the Mojave Desert in northern San Bernardino County. The installation is approximately 25 miles (40 kilometers) from Interstate 15, midway between Las Vegas and Los Angeles. Fort Irwin was designated as a permanent installation in 1961 and today encompasses approximately 753,537 acres (304,946 hectares). Approximately 80 percent of the land area of Fort Irwin is used for military training.

The proposed 4,014-acre (1,624 hectare) DUT site is within the boundaries of Fort Irwin, approximately 14 miles north northwest of cantonment. Transportation routes and utility corridors are located generally in Goldstone Valley between cantonment and the DUT and along Nasa Road (Figure 1-1) and trend north-south. The transportation route is comprised of 29 miles of existing paved and graded dirt roads, 20 meters wide, totaling 230.7 acres (93.3 hectares) and 2 miles of new road, 20 meters wide, totaling 8 acres (3.2 hectares). The electric utility corridor is comprised of 28 miles of existing and new corridor, 10 meters wide, totaling 111.3 acres (45.1 hectares). The water utility corridor is comprised of 21 miles of existing and new corridor, 10 meters wide, totaling 83.5 acres (33.8 hectares).

1.3 Environmental Setting

The project is in the central Mojave Desert physiographic province, an area characterized by alluvial basins between mountain ranges. Mountaintops in the region have been eroded, exposing outcrops of bedrock, while the land in between consists of a variety of coarse and fine sediment materials. The DUT is located northeast of Goldstone Dry Lake and west of Nelson Dry Lake. Landforms on the 4,014-acre site include ballenas with 8-30 percent slope, remnant fans with 2-15 percent slope, alluvial fans with 2-8 percent slope, and alluvial aprons with 0-2 percent slope. Two washes occur in the southwestern portion of the site, and rivulets are common throughout the low-lying areas. The slope aspect of the site is generally south-southeast. Soils in the area are of granitic or volcanic origin. The alluvial fans and aprons are comprised of silty sand, coarse sand, and gravel. The ballenas and remnant fans have cobble and boulders. Soil mapping units occurring on the DUT are listed in Table 1-1 and mapped on Figure 1-2 (Natural Resources Conservation Service [NRCS] 2017).

Table 1-1 Soil Mapping Units Present on the DUT
Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Map Unit Symbol	Soil Mapping Unit	Elevation Where Found (m)	Landforms Associated with Unit
110	Crosgrain extremely gravelly, 8 to 30 percent slope	762 to 1,098	ballenas
221	Arizo complex, 2 to 8 percent slope	488 to 1,280	stream terraces
225	Arizo very gravelly, 2 to 4 percent slope	488 to 945	alluvial fans
261	Crosgrain-Fortirwin complex, 2 to 8 percent slope	610 to 915	fan remnants
280	Crackerjack-Owlshead-Thermopyl complex, 2 to 8 percent slope	732 to 1,067	fan remnants
297	Granitepass-Cavespring complex, 2 to 8 percent slope	640 to 1,006	alluvial fans
320	Fortirwin-Goldivide-Arizo association, 2 to 8 percent slope	488 to 1,280	fan remnants
500	Crackerjack extremely gravelly sandy loam, 4 to 14 percent slope	976 to 1,098	fan remnants

Table 1-1 Soil Mapping Units Present on the DUT
Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Map Unit Symbol	Soil Mapping Unit	Elevation Where Found (m)	Landforms Associated with Unit
501	Crackerjack-Fortirwin association, 2 to 15 percent slope	762 to 1,098	fan remnants
504	Crackerjack extremely gravelly sandy loam, 2 to 8 percent slope	549 to 1,128	fan remnants
580	Arizo very gravelly sandy loam, 0 to 2 percent slope	549 to 976	fan aprons

Source: NRCS 2017

The winter rain period occurs for 3.1 months, from December 11 to March 16, with a sliding 31-day rainfall of at least 0.5 inches. The most rain falls during the 31 days centered around February 20, with an average total accumulation of 0.8 inches. The dry period of the year lasts for 8.9 months, from March 16 to December 11. The least rain falls around June 12, with an average total accumulation of 0.1 inches (Weatherspark, 2018).

The hot season lasts for 3.4 months, from June 6 to September 17, with an average daily high temperature above 84°F (Weatherspark, 2018). The hottest day of the year is July 21, with an average high of 93°F and low of 67°F. The cold season lasts for 3.2 months, from November 21 to February 26, with an average daily high temperature below 58°F. The coldest day of the year is December 24, with an average low of 30°F and high of 49°F (Weatherspark, 2018).

This weather data illustrates the typical weather at Barstow Daggett County Airport, based on a statistical analysis of historical hourly weather reports and model reconstructions from January 1, 1980 to December 31, 2016 (Weatherspark, 2018).

The DUT is within the Nelson Lake drainage basin. Transportation routes and utility corridors occur predominantly within the Goldstone Valley drainage basin, though surface drainages can convey water to the Bicycle Lake and Langford Well Lake drainage basins as well. The DUT portion of the project area generally drains to the east, while the linear portions of the project area generally drain to the south and east.

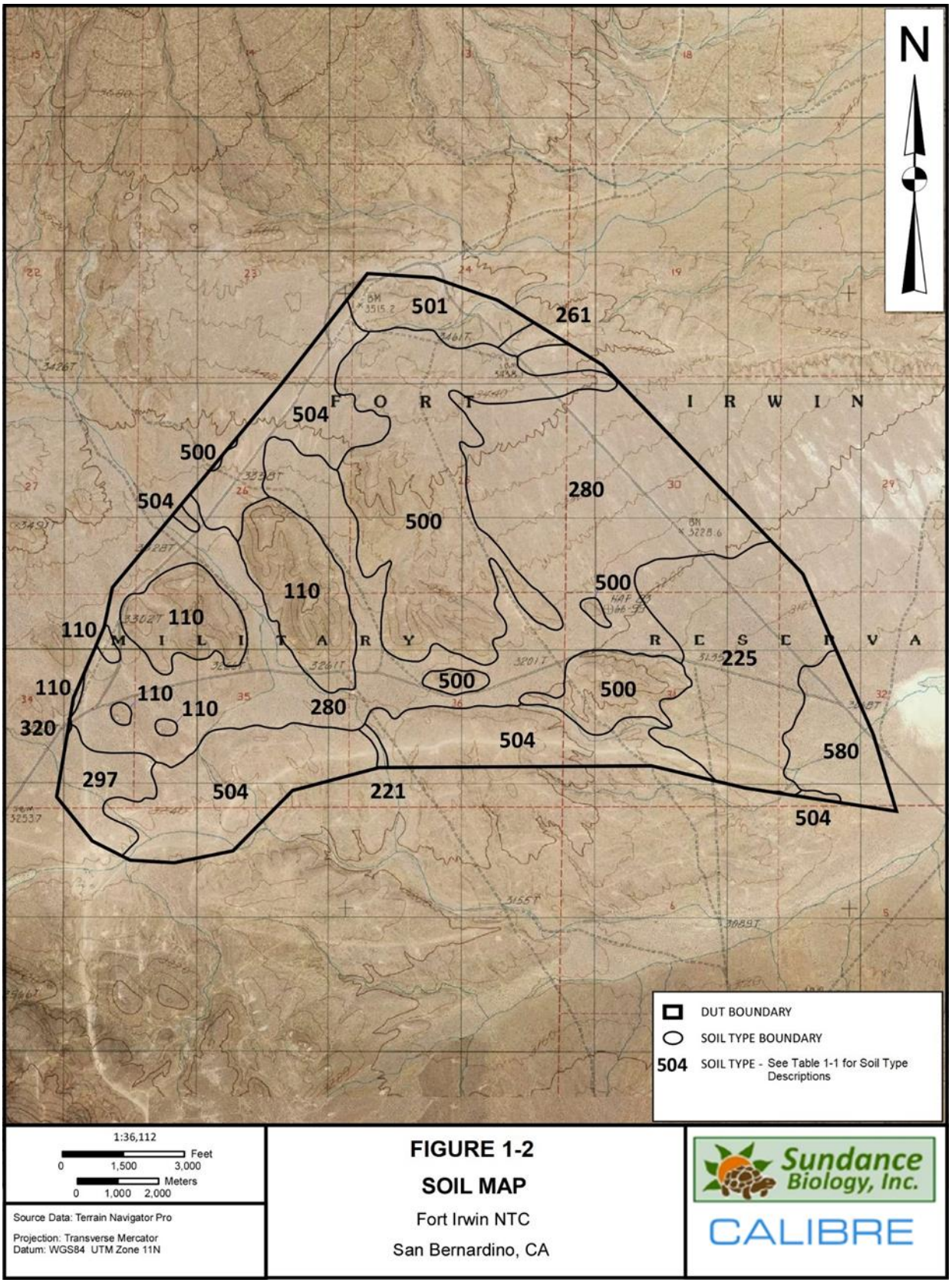

Figure 1-2. Soil Map

2 Methodology

2.1 Literature Search and Pre-survey Investigation

2.1.1 Habitat Assessment

On April 24, 2018 Team CALIBRE lead biologists conducted an initial site visit of the DUT, transportation routes, and utility corridors. Multiple visits were made from April 25-29, 2018 to determine habitat suitability for focused USFWS and California Department of Fish and Wildlife (CDFW) protocol-level surveys for TES species.

The project would impact approximately 4,014 acres (1,624 hectares) for construction of the DUT and 83.5 acres (33.8 hectares) for construction within the water utility corridor for installation of a new waterline and pumping stations. Additional habitat impacts would likely occur due to road widening along the 31-mile transportation route and removal and installation of electric transmission poles along the 28-mile electric utility corridor, although the exact location and acreage of these impacts are currently undetermined.

2.1.2 Rare Plants

The DUT and linear routes occur within the central Mojave Desert region of the desert floristic province. A list of special status plants and sensitive natural communities that occur or have potential to occur in the project area was developed using information from the California Natural Diversity Database (CNDDB 2018), the list of State or Federally endangered, threatened, or rare plants ([CDFW 2017, USFWS 2017), the U.S. Bureau of Land Management (BLM) (BLM 2015), the California Native Plant Society (CNPS 2018), and regional biological resources survey reports. The database query included the 5 U.S. Geological Survey (USGS) 7.5-minute quadrangles where the project site occurs - East of Goldstone, Fort Irwin, Langford Well, Nelson Lake, and West of Nelson Lake - and the 16 surrounding quadrangles-Alvord Mountains East, Alvord Mountains West, Coyote Lake, Drinkwater Lake, Eagle Crags, East of Langford Well, Goldstone, Leach Lake, Leach Spring, Paradise Range, Pilot Knob Valley East, Superior Valley, Tiefort Mountains, West of Drinkwater Lake, West of Leach Spring, and Williams Well.

A special status plant species or sensitive natural community was judged to occur within the project site if there were locality records, either historic or recent, indicating its presence. A species was judged to have potential for inhabiting the project site if it was known to occur in the same general area, in a similar habitat, or at a similar elevation as the project site. A species was included on the special status list if it fell into one or more of the following categories:

- taxa that are officially listed or proposed for listing under the State and/or Federal Endangered Species Acts;
- taxa that are State or Federal candidates for possible listing;
- taxa considered sensitive by the BLM;
- taxa listed in the CNPS *Inventory of Rare and Endangered Plants of California*;
- taxa which meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the California Environmental Quality Act (CEQA) Guidelines, e.g., all CNPS Rank 1 and 2 and some CNPS Rank 3 and 4 plants;

- taxa that are biologically rare, very restricted in distribution, or declining throughout their range but not currently threatened with extirpation;
- populations in California that may be on the periphery of a taxon's range, but are threatened with extirpation in California; and
- taxa closely associated with a habitat that is declining in California at a significant rate, e.g., wetlands, riparian, old growth forests, desert aquatic systems, native grasslands, or vernal pools.

Taxa protected under the California Desert Native Plants Act (CDNPA) (Division 23 of the California Food and Agricultural Code, Section 80071-80075) were also considered. These taxa include

- smoke tree (*Psorothamnus spinosus*);
- all native species in the genus *Prosopis*, i.e., mesquites;
- all native species in the genus *Nolina*, i.e., beargrass;
- all native species in the family Cactaceae, i.e., cacti;
- all native species in the family Agavaceae, i.e., century plants (*Agave* spp.), Joshua trees (*Yucca brevifolia*) and other yucca spp., desert lilies (*Hesperocallis undulata*); and
- creosote bush (*Larrea tridentata*) rings, 3.3 meters in diameter or greater.

In addition, the BLM considers these taxa as unique forms of vegetation that have significant wildlife value. Its policy is to avoid take of individual plants, wherever possible.

Special status species, other than Federally or State threatened or endangered species or proposed threatened or endangered species, receive no legal protection. These species are considered during the planning process because 1) they are declining at a rate that could result in listing or historically occurred in low numbers and 2) known threats to their persistence currently exist. The designations are intended to focus attention on the species to help avert the need for costly listing under Federal and State endangered species laws and cumbersome recovery efforts that might be required.

Prior to conducting field surveys in the project area, the field investigators reviewed the physical description, habitat description, drawings, and photographs of each potentially occurring special status plant species. They also developed a list of known locations for rare plants in the general vicinity of the project site and visited some of these locations immediately prior to the field investigations to become familiar with the plant's appearance and habitat and to determine if it would be identifiable at the time of the survey.

2.1.3 Threatened, Endangered and Sensitive Wildlife

Prior to commencing field surveys, Team CALIBRE conducted background research to determine which TES species from the CDFW Endangered, Threatened and Rare Animal lists and USFWS Threatened and Endangered lists occur or have a likelihood of occurring on Fort Irwin and within the project area boundaries.

A list of special status animals that occur or appear to have some potential to occur in the project area was developed using information from the California Natural Diversity Database (CNDDB 2018), the list of State endangered, threatened, or species of special concern (CDFW 2018a), the list of Federally endangered or threatened (CDFW 2018b), and regional reports provided by the Army. The database query included the 5 USGS 7.5-minute quadrangles where the project site occurs, and the 16 surrounding quadrangles previously mentioned.

2.2 Field Surveys

2.2.1 Human Impacts

"Disturbed areas" as discussed here refer to habitat that has been impacted by human activity. While conducting the desert tortoise survey, disturbed areas were identified, and a measurement was estimated. Vehicle tracks crossed were counted by a single member of each four-five-person survey team. The variable age of the tracks was not recorded. The impacts from dirt roads on the DUT site were assessed by driving the roads on the site and recording the routes on a GPS unit. The average road width was estimated in the field and the resultant acreage was calculated.

2.2.2 Rare Plant Survey

Team CALIBRE conducted the rare plant survey on the DUT and along associated transportation routes and electric and water utility corridors (linear routes) between April 27 - May 28, 2018. The survey consisted of two parts - a reconnaissance-level survey and a full coverage survey. The purpose of the reconnaissance-level survey was to determine if there was habitat for the potentially-occurring special status plants, and if so, determine the optimal time to conduct the full coverage survey. Lead botanists conducted the reconnaissance-level survey by driving to the various habitats throughout the project area and stopping periodically to evaluate them for their rare plant potential.

The full coverage survey was conducted by following protocols recommended by the CDFW (CDFW 2009). Within the DUT, the field crew systematically walked 15-meter-wide parallel line transects over the entire area to achieve full coverage. Within the transportation and utility corridors, the transect width was reduced to ten meters. In areas identified as potential habitat during the reconnaissance-level survey, the transect width was further reduced to three meters. If a crew member encountered any special status plant or CDNPA plant, the location was recorded with a Garmin hand-held GPS unit. California Native Species Field Survey Forms were completed for special status plants, excluding CDNPA plants.

The rare plant survey was floristically based, that is, the field crew identified all plant species, whether fresh or dried, that were encountered in the project area to at least genus and to the level necessary to ensure that they were not plant species of concern. The crew collected and later identified plants that were not readily identifiable in the field. Nomenclature throughout this report follows *The Jepson Manual, 2nd Ed.* (Baldwin et al. 2012).

2.2.3 Agassiz's Desert tortoise

Agassiz's desert tortoise was listed as threatened under the federal Endangered Species Act of 1990 and threatened under the California Endangered Species Act of 1989 (USFWS 1990, CDFW 2018a). The Agassiz's desert tortoise is a large herbivorous reptile associated with the Sonoran (Colorado phase) and Mojave Deserts in the southwestern U.S. Its range extends north and west from the Colorado River. It extends from the desert areas of California south of the San Joaquin Valley, eastward across the Mojave Desert into southern Nevada, the extreme southwestern corner of Utah, extreme northwestern corner of Arizona, as well as southeast across the Colorado desert to the Colorado River. Desert tortoises occur within a variety of desert scrub vegetation communities. Most commonly the desert tortoise occurs below 4,500 feet (1372 meters) elevation in the creosote bush-bursage series of the Mojave Desert scrub biome; dominant plants are creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Desert tortoise habitat may also include various cacti species (*Opuntia* spp.), saltbush (*Atriplex* spp.) scrub, and Joshua tree (*Yucca brevifolia*) woodlands at elevations up to approximately 5,000 feet (1524 meters), (USFWS, 2010). Soils must be firm but not hard for burrow construction; however, they

will utilize rock shelters on slopes if available. Tortoises occur on varied terrain from gently sloping bajadas (preferred terrain) to valley bottoms and steep rocky terrain throughout their geographic range. Reasons for decline and extirpation of local populations include persistent drought, disease, illegal collection, habitat destruction, degradation and fragmentation, and increased depredation from human subsidized predators.

Survey methods for the Agassiz's desert tortoise followed the *Pre-project Survey Protocol 2017 Field Season* for the desert tortoise presence-absence surveys (USFWS, 2017). One hundred-percent-coverage surveys were conducted over the 4,014 acres (1,624 hectares) of the DUT, transportation routes, and utility corridors where habitat was present. The 100-percent-coverage protocol requires biologists walk 33-foot (10 meter)-wide belt transects within the action area to record live desert tortoises and desert tortoise signs. Transects were pre-programmed into handheld GPS units, and surveys were conducted from May 1-June 1, 2018, during the desert tortoise's most active periods (April through May or September through October) (Nussear and Tracy 2007; Inman 2008; USFWS 2009). Temperatures were taken, as noted in the weather section below, to ensure surveys were conducted below the protocol maximum of 104°F (40°C; USFWS, 2017).

Any tortoise or large mammal burrows encountered that could potentially be used by tortoises were visually inspected. Very small burrows that could be potentially utilized by juvenile tortoises but are much more often rodent burrows were also visually checked. Locations of live tortoises and tortoise signs (burrows, carcasses, scat, tracks, mating rings, drinking depressions or eggshell fragments) were recorded. Burrow condition was classified as active (tortoise present), excellent (recent tortoise signs present), good (tortoise but needs maintenance, may have old tortoise signs), poor (possibly tortoise). Time-since-death was estimated for carcasses, < 1 year, 1-2 years, 2-4 years, and > 4 years. Scat was classified as TY (this-year) or NTY (not-this-year).

For live tortoise encounters, activity and location (i.e., under shrub, in open, in burrow, etc.) were recorded. When a tortoise was encountered outside of a burrow, a visual health assessment was completed, and any identifying shell anomalies and/or traumas were drawn. The midline carapace length (MCL) was estimated and the sex was noted. Additionally, photos of the carapace of each tortoise encountered outside of a burrow were taken.

2.2.4 Mohave Ground Squirrel

The Mohave ground squirrel (*Xerospermophilus mohavensis*) is listed as a threatened species under the California Endangered Species Act. Its range is limited to the western Mojave Desert, the eastern portion of which lies on the National Training Center, Fort Irwin. The Mohave ground squirrel has a patchy distribution but occupies a variety of habitats, including desert saltbush (*Atriplex* spp.) scrub, creosote bush scrub, Joshua tree woodland, shadscale (*Atriplex confertifolia*) scrub, blackbrush (*Coleogyne ramosissima*) scrub, and big sagebrush (*Artemisia tridentata*) scrub. It occurs at elevations up to at least 5600 feet (1,707 meters) above mean sea level (AMSL). It eats mainly leaves, fruit, flowers, and seeds of forbs, shrubs, and grasses, Joshua trees, fungi, and arthropods. Reasons for decline and extirpation of local populations include persistent drought, habitat destruction, degradation and fragmentation, use of pesticides for rodent control, domestic cat predation, and, possibly, shooting and vehicle strike (Gustafson 1993).

Recent and historic records of Mohave ground squirrels in the project area were acquired by conducting a query of the CNDDB (2018) and from information provided by the Directorate of Public Works Environmental Division (DPW).

To assess the status of Mohave ground squirrels in the project area, a camera trapping survey was performed in the DUT and along linear routes (Figure 2-1). The DUT area was divided into square units using a 140-acre grid. One camera was placed in each of 30 grid units. An additional 14 cameras were stationed intermittently along linear routes. All cameras were sited in potential habitat for the species.

Stealth Cam® Model STC-G42NG cameras, with 32-gigabyte, secure digital high capacity (SDHC) cards, were deployed for this project. Each camera was set at 8-megapixel, full color resolution, had an infrared flash, and was triggered by motion detection. It was mounted 30-70 centimeters above ground on a T-post positioned about 2.4 meters from the bait. Each camera was aimed towards the north to avoid direct sunlight on the lens (Figure 2-2). The camera was set for six-shot bursts every five seconds when triggered. The bait consisted of one half or one full block of Valley America® Bird Blocks or Arizona's Best® Quail Blocks, topped with 30 milliliters of peanut butter. Cameras were in operation during daylight hours only, from 0600 to 2000 hours. Each camera was deployed for 10 to 14 days over an approximately 9-week period, from April 25 - June 29, 2018.

The following information was noted for each Mohave ground squirrel captured on film: camera number, date or date range, age, and gender. Other vertebrate wildlife species appearing at each camera location were also noted.

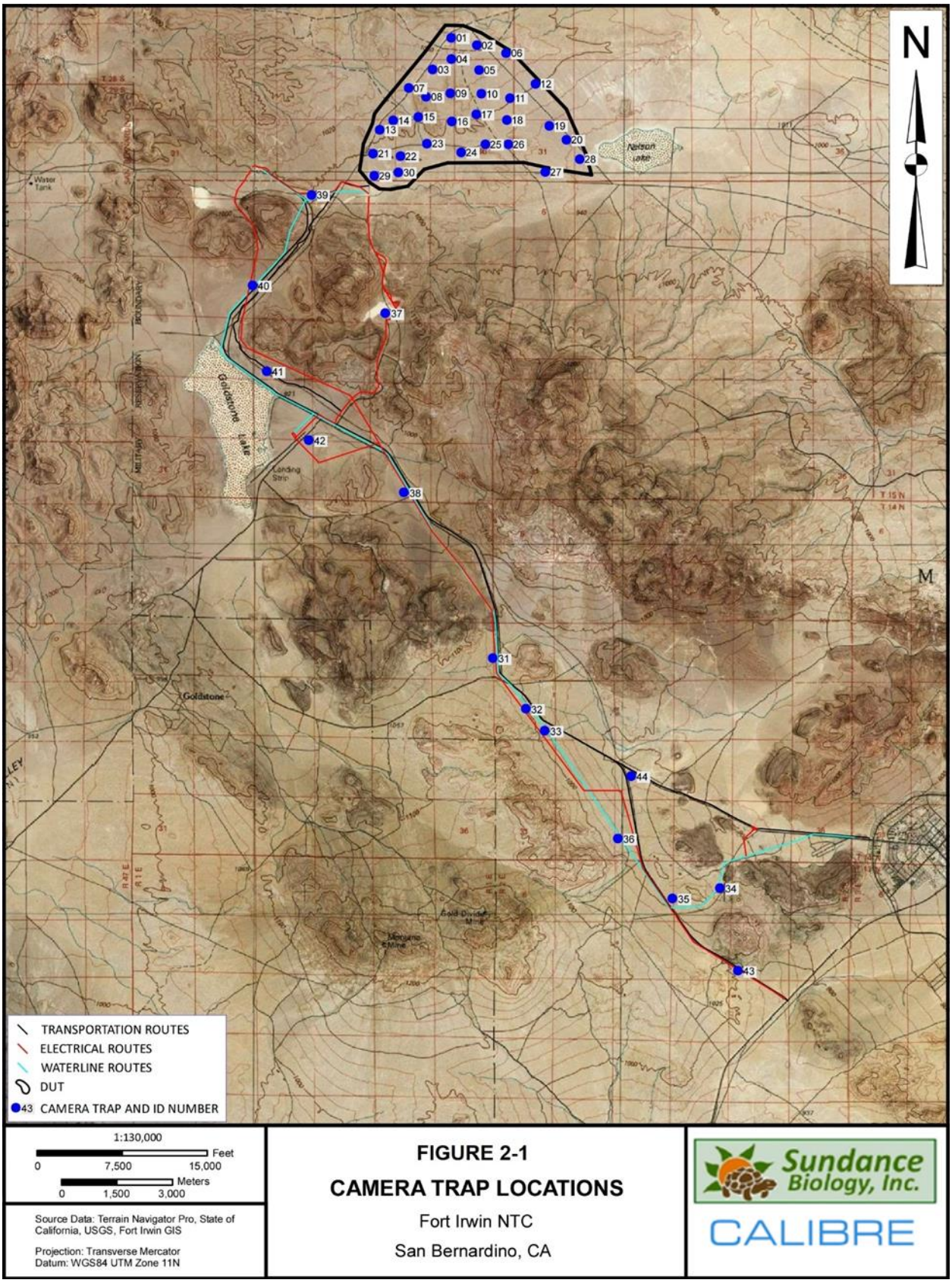

Figure 2-1. Camera Trap Locations

Figure 2-2. Typical Camera Trap Arrangement

2.2.5 Western Burrowing Owl

The burrowing owl is a CDFW Species of Special Concern (SSC), USFWS Bird of Conservation Concern (BCC), and is protected by the Migratory Bird Treaty Act (MBTA; CDFW, 2017a). Burrowing owls are ground-nesting species and live in open, treeless areas with low, sparse vegetation, usually on gently sloping terrain. The owls can be found in grasslands, deserts, and steppe environments, golf courses, pastures, agricultural fields, airport medians, road embankments, cemeteries, and urban vacant lots. They are often associated with high densities of burrowing mammals such as prairie dogs, ground squirrels, and tortoises. Breeding pairs stay near a dedicated nesting burrow, while wintering owls may move around and may roost in tufts of vegetation rather than in burrows (The Cornell Lab of Ornithology). In addition to burrows, the owls also require perching locations and frequently use fence posts or the top of mounds outside the burrow. Burrowing owls typically use burrows created by other animals or artificial structures such as culverts or irrigation pipes for cover.

Recommended CDFW protocol (CDFW 2012) was used to survey for the burrowing owl. Phase 1 of the Protocol, a habitat assessment to determine suitability, was performed between April 25-29, 2018. Phase 2, a project area survey to search for burrowing owl signs, was conducted concurrently with the desert tortoise survey.

In addition, a 150-meter buffer zone was surveyed to account for potential impacts from construction, such as noise and vibration, on adjacent burrows and foraging habitat. The survey of the 150-meter buffer around the DUT was conducted at 20-meter transect intervals. In areas where the transportation

routes and utility corridors deviated more than 150 meters from routinely used paved or dirt roads, the buffer was also surveyed.

All Burrowing owls and signs (i.e. burrows with signs, whitewash, pellets, feathers) were recorded.

2.2.6 Mojave Fringe-toed Lizard

Mojave fringe-toed lizard habitat is restricted to areas of sand dunes, sand sheets, and wind dominated transitional sand-vegetation areas. A search for areas of potential habitat for the Mojave fringe-toed lizard was conducted concurrently with the desert tortoise survey.

2.2.7 Other sensitive animal species

A UTM coordinate and type of sign (i.e. live animal, burrows, carcasses) were recorded for all other sensitive species while conducting desert tortoise, burrowing owl, and plant surveys, and camera trapping. Data were taken for a badger, kit foxes, loggerhead shrikes, and LeConte's thrashers, and incidentally, a golden eagle (*Aquila chrysaetos*).

The American badger is a CDFW Species of Special Concern (SSC). In California, this species is most abundant in drier open stages of most shrub, forest, and herbaceous habitats with friable soils. American badgers dig burrows for cover and frequently reuse old burrows, though some are known to dig a new burrow each night during the summer. This species is known to occur on Fort Irwin and is considered localized and rare, (Army, 2006). The habitat on the DUT, portions of the transportation routes, and utility corridors is suitable for badgers.

The desert kit fox is not listed; however, its status is under review in California. The habitat on the DUT, transportation routes, and utility corridors is suitable for desert kit foxes. Desert kit foxes primarily occur in open desert scrub habitats on gentle slopes. Creosote bush scrub is the most common habitat association for desert kit foxes in California (McGrew 1979). The kit fox is a nocturnal species that hunts at night and primarily remains in burrows and dens throughout the day. Kit foxes are known to occur throughout Fort Irwin, (Army 2006).

The loggerhead shrike is a CDFW SSC and is protected by the MBTA. Loggerhead Shrikes inhabit open country with short vegetation and well-spaced shrubs or low trees, particularly those with spines or thorns. They frequent agricultural fields, pastures, old orchards, riparian areas, desert scrublands, savannas, prairies, golf courses, and cemeteries. Loggerhead Shrikes are often seen along mowed roadsides with access to fence lines and utility poles (The Cornell Lab of Ornithology, 2018). There is suitable nesting and foraging habitat on the DUT, transportation routes, and utility corridors and the species is known to occur throughout Fort Irwin (Army 2006).

The LeConte's Thrasher is a CDFW SSC and is protected by the MBTA. LeConte's thrashers inhabit the deserts of the southwestern U.S. and northwestern Mexico. On Fort Irwin, it inhabits areas of desert scrub and riparian vegetation. This species nests on thorny desert shrubs and cholla cactus and is an insectivore that primarily gets water from its diet (The Cornell Lab of Ornithology, 2018). There is suitable nesting and foraging habitat on the DUT, transportation routes, and utility corridors.

The Golden eagle is a fully protected species in California. This classification represents the State of California's initial effort to identify and provide additional protection to animals that are rare or face possible extinction. This species is also protected by the Bald and Golden Eagle Protection Act and the MBTA and is an FWS Bird of Conservation Concern and a BLM sensitive species (CDFW 2018). The species is an uncommon permanent resident and migrant throughout California and can occur at elevations ranging from sea level up to 11,500 feet (3,500 meters). Suitable habitat includes rolling foothills, mountain areas, sage-juniper flats, and desert. Golden eagles nest on cliffs and steep

escarpments in grassland, chaparral, shrubland, forest, and other vegetated areas (Grinnell and Miller, 1944). This species is known to occur on Fort Irwin. There is suitable nesting and foraging habitat adjacent to the DUT and transportation routes and utility corridors (Army 2016). Major threats to this species include habitat destruction, especially the conversion of grasslands to agriculture; shooting; and human disturbances at nest sites (Zeiner et al. 1990). Surveys for Golden eagle nest locations were beyond the scope of this study and are being conducted under a separate contract.

2.2.8 General Wildlife Species

Incidental sightings of all other animal species were recorded and compiled during the protocol level surveys. Lists of species observed and captured on the Mohave ground squirrel camera traps are provided in Results below.

2.2.9 Weather

In order to follow the temperature limits set forth in the USFWS desert tortoise survey protocol (2017), daily weather data were collected during the desert tortoise survey. Temperature was recorded at 0800, 1200, and 1500 hours at 5 centimeters above the ground surface in a sunny location within the new shade of the observer's body. Wind speed and direction, percent cloud cover, and precipitation were also recorded.

3 Results

3.1 Literature search and Pre-survey Investigation

3.1.1 Rare Plants

The CNDDB search found no records of special status plants or sensitive natural communities in the project area. However, it did identify 16 special status plants that occur in the general area (Table 3-1). One species, Lane Mountain milk-vetch (*Astragalus jaegerianus*), is listed as endangered under the Federal Endangered Species Act (USFWS 2017). This species is a weak-stemmed perennial herb that twines up through a shrub, using that shrub for structural support. In years with sufficient rainfall, this milk-vetch will grow from a taproot and produce pale purple flowers and pendent fruit; otherwise, it will remain dormant underground. Most individuals occur on shallow, well-drained soils derived from granitic outcrops in areas with higher shrub diversity and percent cover than in adjacent unoccupied areas. The Lane Mountain milk-vetch has a limited range and occurs north of the city of Barstow, California, mostly on Federal lands. Three of the four known populations of Lane Mountain milk-vetch are almost entirely on the NTC in the Goldstone Complex, in Paradise Valley, and in Brinkman Wash (USFWS 2008). Occurrences near the project area are shown in Figure 3-1.

Threats to the Lane Mountain milk-vetch include regional changes in rainfall patterns, herbivory and seed predation, off-highway vehicles, and military training activities (USFWS 2008). Because of potential impacts of military activities on this species, the Army established three conservation areas encompassing portions of the three populations on the NTC (Bedford 2017) (Figure 3-1).

Other special status species in the region included eight species that are CNPS Rank 1A, 1B, 2A, or 2B and seven species that are CNPS Rank 3 or 4 (CNPS 2018). The CNPS ranks are defined below:

1A = plants presumed extinct in California;

1B = plants rare and endangered in California and elsewhere;

2A = plants presumed extirpated in California, but common elsewhere;

2B = plants rare, threatened, or endangered in California, but more common elsewhere;

3 = plants about which more information is needed; and

4 = plants of limited distribution, a watch list.

The BLM considers 4 of the 16 species as sensitive (Table 3-1) (BLM 2015).

Most occurrences near the project area of species ranked 2B or higher are shown in Figure 3-1. These species are desert cymopterus (*Cymopterus deserticola*), Clokey's cryptantha (*Cryptantha clokeyi*), and Booth's evening-primrose (*Eremothera boothii* ssp. *boothii*). These three plants, along with Lane Mountain milk-vetch, likely have the best potential of occurring in the project area over other high-ranking species.

The desert cymopterus is a deep-rooted, stemless perennial in the Apiaceae family that usually grows to a height of 15 centimeters. Its leaf blades are 4-8 centimeters long, highly dissected and hairless. The inflorescence is compact and spherical with numerous purple flowers. The fruit is 5-7 millimeters long with narrowly winged ribs. With a flowering season from late March to early May, this rare species occurs at an elevation of 2,300-4,300 feet (700-1,310 meters) AMSL. It grows in fine to coarse, sandy soil of flats in old dune areas that have deep, well-drained sand and typically in creosote bush scrub and

Joshua tree woodland. The nearest known population to the DUT is in Superior Valley, approximately 18 kilometers to the southwest, where the Army established a conservation area for this species (Figure 3-1). Even in areas of preferred habitat and known locations, plants are highly dispersed and rare. Threats to the desert cymopterus include herbivory, off-highway vehicles, military training activities, and development (Baldwin et al. 2012, CNDDB 2018, CNPS 2018).

Clokey's cryptantha is a stout, annual herb, 8-30 centimeters tall, in the Boraginaceae family. Leaves are oblong to linear with bulbous-based hairs. The flowers are similar to other cryptantha species, the distinguishing feature being the fruit. The fruit consists of 3-4 nutlets that are about 3 millimeters long and triangular-ovate in shape. Each nutlet is brown to mottled and shiny with white-translucent tubercles that are somewhat dense and sharp. The nutlet has a wide-truncate base, sharp-angled margins, and acute tip. Clokey's cryptantha grows on rocky to gravelly slopes in the northwestern Mojave Desert (Baldwin et al. 2012, CNDDB 2018). The nearest known population to the DUT is approximately 15 kilometers to the west in the Eagle Crags (CNDDB 2018).

Booth's evening-primrose is an annual herb in the Onagraceae family and is 15-40 centimeters tall with glandular and spreading hairs. Leaf blades are 30-80 millimeters, lanceolate to narrowly ovate with serrate edges. Flowers are white. Fruits measure 1.4-2 millimeters wide and are strongly wavy and twisted. The plant occurs on sandy flats and steep loose slopes in Joshua tree woodland (Baldwin et al. 2012). In 1993, a collection was made along a tank barrier berm in the southeast corner of the Gary Owen Impact Area, approximately 5 kilometers northeast of the DUT (Figure 3-1). The CNDDB (2018) indicates this population needs additional fieldwork.

Prior to the rare plant survey, the field crew visited reference sites for desert cymopterus and Lane Mountain milk-vetch. Two desert cymopterus sites, CNDDB Occurrence Numbers 68 and 69 (CNDDB 2018), were visited by one crew member on April 27, 2018. Both sites were north of Hinkley, California and approximately 60 kilometers southwest of the DUT. Searching each location for 45 minutes, the crew member found no desert cymopterus plants. Habitat in these areas included creosote bush scrub on stabilized dunes. Soils were deep sand. The conditions at the sites, overall, were dry. The only green herbaceous plants observed at the sites were schismus (*Schismus* sp.), one fleshy pincushion (*Chaenactis xantiana*), and some fan-leaved tiquilia (*Tiquilia plicata*).

Information provided by DPW indicated that desert cymopterus resprouted this year at the Superior Valley population, CNDDB Occurrence Number 70 (CNDDB 2018), but barely flowered (Housman 2018a). The field crew did not attempt to visit this population but concluded that desert cymopterus may or may not be visible during the rare plant survey on the project site based on conditions at reference populations.

On April 29, 2018, two field crew members searched for Lane Mountain milk-vetch in the Coolgardie Mesa population, CNDDB Occurrence Number 1 (CNDDB 2018), on BLM lands approximately 42 kilometers south-southwest of the DUT. The crew spent 2.25 hours searching 2 of 36 polygons that define this population and found no plants. The sites were along low ridges and gentle slopes with shallow soils. The plant community was creosote bush scrub with scattered Joshua trees and a high diversity of other shrubs. Soils were decomposed granitic coarse sand and gravel.

With coordinates for two Lane Mountain milk-vetch plants provided by DPW (Housman 2018b), the field crew visited the Goldstone population within the NASA Goldstone Conservation Area (Figure 3-1) on May 15, 2018. The two plants were in leaf, but the fruits had already dehisced. Habitat at this location included creosote bush-white bur-sage scrub with a high shrub diversity. Common associates included spiny hop-sage (*Grayia spinosa*), Cooper goldenbush (*Ericameria cooperi* var. *cooperi*), Mojave Desert California buckwheat (*Eriogonum fasciculatum* var. *polifolium*), Nevada ephedra (*Ephedra*

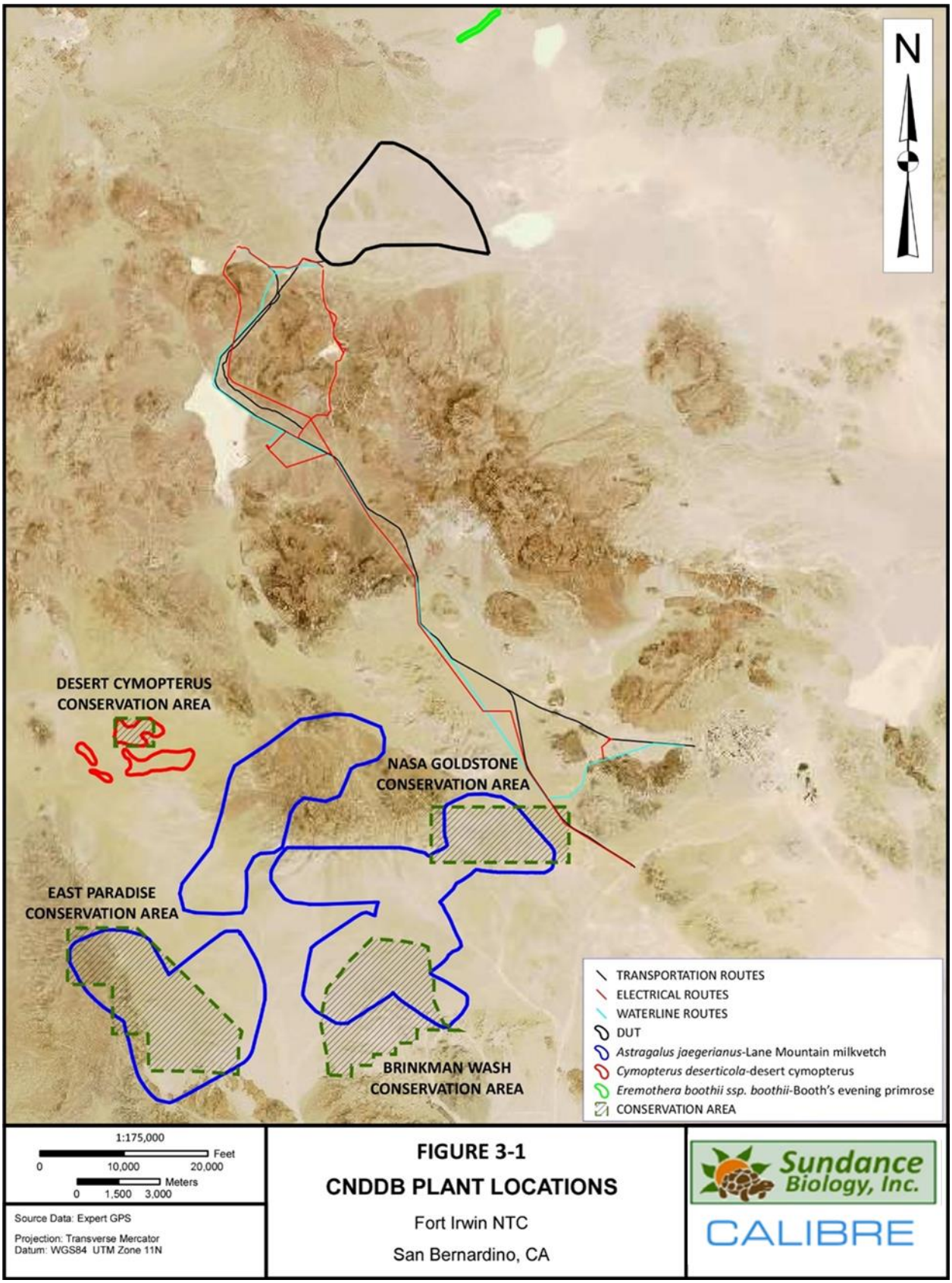

Figure 3-1. CNDDB Plant Locations

nevadensis), and turpentine-broom. The site was in an intermountain basin having shallow, decomposed granitic soils and exposed bedrock. Soil texture was coarse gravel. The site visit confirmed that this species would be visible at the time of the rare plant survey.

Table 3-1. Special Status Plants Known to Occur in the Region and their Occurrence Potential on the Project Site

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Scientific Name Common Name Plant Family, Life Form	Rank or Status[a]					Flowering Period	Habitat and Distribution	Occurrence Potential
	FWS	CDFW	CNDDB	CNPS	BLM			
Federally- or State-listed Rare, Threatened, or Endangered Species								
Astragalus jaegerianus Lane Mountain milk-vetch Fabaceae, perennial herb	E	–	S2	1B.1, E	–	April-June	900-1200 m; granitic, sandy or gravelly; Joshua tree woodland, Mojavean desert scrub; known to occur in granitic areas south of the project area	POSSIBLE-on granitic outcrops along electric corridor
CNPS Rank 1A, 1B, 2A, or 2B								
Allium atrorubens var. *atrorubens* Great Basin onion Alliaceae, perennial bulbiferous herb	–	–	S2	2B.3	–	May-June	1200-2315 m; rocky, sandy; Great Basin scrub, pinyon and juniper woodland; known to occur in the Avawatz Mountains	NONE-project area has no habitat for this species
Calochortus striatus alkali mariposa-lily Liliaceae, perennial bulbiferous herb	–	–	S3	1B.2	Sen.	April-June	70-1595 m; alkaline, mesic; chaparral, chenopod scrub, Mojavean desert scrub, meadows and seeps; known to occur at and near Paradise Spring, south of the Project area	NONE-project area has no habitat for this species

Table 3-1. Special Status Plants Known to Occur in the Region and their Occurrence Potential on the Project Site

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Scientific Name Common Name Plant Family, Life Form	Rank or Status[a]					Flowering Period	Habitat and Distribution	Occurrence Potential
	FWS	CDFW	CNDDB	CNPS	BLM			
Cryptantha clokeyi Clokey's cryptantha Boraginaceae, annual herb	–	–	S3	1B.2, E	Sen.	April	725-1365 m; rocky to gravelly slopes; Mojavean desert scrub; known to occur south and west of the project area in the Paradise Range and the Eagle Crags	POSSIBLE-in rocky or gravelly areas throughout the project area
Cymopterus deserticola desert cymopterus Apiaceae, perennial herb	–	–	S2	1B.2, E	Sen.	March-May	630-1500 m; well-drained sandy soils in old dune areas; Joshua tree woodland, Mojavean desert scrub; known to occur in Superior Valley, southwest of the project area	POSSIBLE-in areas with deep sand or in old dune systems
Eremothera boothii ssp. *boothii* Booth's evening-primrose Onagraceae, annual herb	–	–	S2	2B.3	–	April-September	815-2400 m; sandy flats, steep loose slopes; Joshua tree woodland, pinyon and juniper woodland; known to occur just north of the DUT	POSSIBLE-on sandy flats throughout the project area
Fimbristylis thermalis hot springs fimbristylis Cyperaceae, perennial rhizomatous herb	–	–	S1S2	2B.2	–	July-September	110-1340 m; meadows and seeps (alkaline, near hot springs); known to occur at Jack Spring, south of the project area	NONE-project area has no habitat for this species

Table 3-1. Special Status Plants Known to Occur in the Region and their Occurrence Potential on the Project Site

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Scientific Name Common Name Plant Family, Life Form	Rank or Status[a]					Flowering Period	Habitat and Distribution	Occurrence Potential
	FWS	CDFW	CNDDB	CNPS	BLM			
Phacelia parishii Parish's phacelia Boraginaceae, annual herb	–	–	S1	1B.1	Sen.	April-May	540-1200 m; clay or alkaline; Mojavean desert scrub, playas; known to occur southeast of the Project area	POSSIBLE-along edges of playas in the project area
Wislizenia refracta ssp. *refracta* jackass-clover Cleomaceae, annual herb	–	–	S1	2B.2	–	April-November	600-800 m; desert dunes, Mojavean desert scrub, playas, Sonoran Desert scrub; known to occur southeast of the project area	POSSIBLE-on playas or sandy flats in the project area
								CNPS Rank 3 or 4
Astragalus nutans Providence Mountains milk-vetch Fabaceae, annual herb	–	–	S3	4.3, E	–	March-June	450-1950 m; sandy or gravelly; Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland, Sonoran Desert scrub; known to occur north and west of the DUT	POSSIBLE-in sandy and gravelly soils throughout project area
Euphorbia vallis-mortae Death Valley sandmat Euphorbiaceae, perennial herb	–	–	S3	4.2, E	–	May-October	230-1460 m; sandy, gravelly; Mojavean desert scrub; known to occur in the region	POSSIBLE-in sandy and gravelly soils throughout project area
Johnstonella costata ribbed cryptantha Boraginaceae, annual herb	–	–	S4	4.3	–	February-May	-60-500 m; sandy; desert dunes, Mojavean desert scrub, Sonoran Desert scrub; known to occur near Cantonment	POSSIBLE-sandy soils throughout project area

Table 3-1. Special Status Plants Known to Occur in the Region and their Occurrence Potential on the Project Site

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Scientific Name Common Name Plant Family, Life Form	Rank or Status[a]					Flowering Period	Habitat and Distribution	Occurrence Potential
	FWS	CDFW	CNDDB	CNPS	BLM			
Juncus cooperi Cooper's rush Juncaceae, perennial herb	–	–	S3	4.3	–	April-May	-260-1770 m; meadows and seeps (mesic, alkaline, or saline); known to occur in the Paradise Range	NONE-project area has no habitat for this species
Muilla coronata crowned muilla Themidaceae, perennial bulbiferous herb	–	–	S3	4.2	–	March-April	670-1960 m; chenopod scrub, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland; known to occur southeast of the project area	POSSIBLE-throughout project area
Psorothamnus arborescens var. *arborescens* Mojave indigo-bush Fabaceae, shrub	–	–	S4	4.3	–	April-May	400-1185 m; Mojavean desert scrub, riparian scrub; known to occur in the region	LIKELY-in washes and on alluvial fans throughout the project area
Sclerocactus polyancistrus Mojave fish-hook cactus Cactaceae, perennial stem succulent	–	–	S3	4.2	–	April-July	640-2320 m; usually carbonate; Great Basin scrub, Joshua tree woodland, Mojavean desert scrub; known to occur west of the Project area near the Eagle Crags and Superior Valley	POSSIBLE-on upper alluvial fans and hills throughout the project area

Source: CNNDB 2018

Note:

[a] Rank or status abbreviations:

FWS listings under the Endangered Species: E=Endangered; T=Threatened; – = not listed or proposed for listing (FWS 2017)

CDFW listings under California Endangered Species Act: E=Endangered; T=Threatened; R=Rare; – = not listed or proposed for listing (CDFW 2017)

CNDDB ranks: S1= extremely endangered; S2= endangered; S3= restricted range, rare; S4= apparently secure; S5= demonstrably secure; SH= all California sites are historical. Uncertainty about the rank of an element is expressed in two major ways: 1) by expressing the rank as a range of values: e.g., S2S3 means the rank is somewhere between S2 and S3; and 2) by adding a "?" to the rank: e.g., S2? This represents more certainty than S2S3, but less than S2 (CNDDB 2018, CNPS 2018).

CNPS ranks: 1A=plants presumed extinct in California; 1B=plants rare and endangered in California and elsewhere; 2A=plants presumed extirpated in California but common elsewhere; 2B=plants rare, threatened, or endangered in California but more common elsewhere; 3=plants about which more information is needed; and 4=plants of limited distribution, a watch list; number following Rank is Threat Code: .1=seriously endangered in CA; .2=fairly endangered in CA; .3=not very endangered in CA; E=endemic to CA (CNPS 2018)

BLM (Bureau of Land Management): Sen. = sensitive species on lands administered by the BLM; – = not sensitive (BLM 2015)

3.1.2 Threatened, Endangered, and Sensitive Wildlife

The California Natural Diversity Database (CNDDB) search found records of desert tortoise, Mohave ground squirrel, and western burrowing owl near the project area. Based on habitat, the CNDDB query also documented potential for other target sensitive species to occur on or near the project area. A list of special status animals that occur or appear to have some potential to occur in the project area was developed using information from the CNDDB (Table 3-2).

Table 3-2. Special Status Wildlife Known to Occur in the Region and their Occurrence Potential on the Project Site
Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Scientific Name	Common Name	Federal ESA Listing	California ESA Listing	Other Status	Activity Period	Habitat and Distribution	Occurrence Potential
Gopherus agassizii	Agassiz's desert tortoise	Threatened	Threatened		Spring and Fall	Alluvial fans, washes, and canyons throughout the Mojave Desert	POSSIBLE- throughout the project area
Xerospermophilus mohavensis	Mohave ground squirrel	None	Threatened	BLM_S	Spring and early summer	Joshua tree woodlands, creosote scrub, saltbush scrub and mojave mixed woody scrub in the western Mojave Desert	POSSIBLE- throughout the project area
Athene cunicularia	Western burrowing owl	None	None	BLM_S CDFW_SSC USFWS_BCC	All year	Throughout the Mojave Desert	POSSIBLE- throughout the project area
Uma scoparia	Mojave fringe-toed lizard	None	None	BLM_S CDFW_SSC	Spring through Fall, temperature dependent	Sparsely-vegetated arid areas with fine wind-blown sand, including dunes	POSSIBLE- in sand dune areas
Taxidea taxus	American badger	None	None	CDFW_SSC	All year	Desert scrub throughout the Mojave Desert	POSSIBLE- throughout the project area
Vulpes macrotis	Desert kit fox	None	None	CDFW - Status Under Review	All year	Desert scrub throughout the Mojave Desert	POSSIBLE- throughout the project area
Toxostoma lecontei	LeConte's thrasher	None	None	CDFW_SSC USFWS_BCC	All year	dunes, alluvial fans, and flat to gently rolling hills with shallow washes with sparse vegetation	POSSIBLE- throughout the project area
Lanius ludovicianus	Loggerhead Shrike	None	None	CDFW_SSC	All year	Open country with scattered shrubs and trees	POSSIBLE- throughout the project area

Note:

[a] Rank or status abbreviations:

USFWS listings under the Endangered Species: E=Endangered; T=Threatened

USFWS Birds of Conservation Concern: BCC

CDFW listings under California Endangered Species Act: E=Endangered; T=Threatened; R=Rare

CDFW Species of Special Concern: SSC

BLM (Bureau of Land Management): S = sensitive species on lands administered by the BLM

3.2 **Vegetation Communities**

The plant community throughout the DUT is creosote bush-white bur-sage scrub (*Larrea tridentata - Ambrosia dumosa* Shrubland Alliance), dominated by creosote bush and white bur-sage (Figure 3-2). This vegetation type characteristically occurs between 250 feet and 4,000 feet (75 meters and 1220 meters) AMSL on minor washes, alluvial fans, bajadas, and upland slopes having well-drained, sandy soils. Shrubs are less than 3 meters in height, and the shrub canopy is open to intermittent and may be two-tiered (Sawyer et al. 2009).

Several associations containing 2 to more than 20 shrub species are included in this alliance. Associations vary with elevation, landform, and substrate (Sawyer et al. 2009). On the ballenas and remnant fans in the DUT, the association was creosote bush-white bur-sage-Pima rhatany (*Krameria erecta*). Other common shrubs in these areas included turpentine-broom (*Thamnosma montana*), Mojave-aster (*Xylorhiza tortifolia* var. *tortifolia*), Nevada ephedra (*Ephedra nevadensis*), and Anderson's wolfberry (*Lycium andersonii*) (Photograph 1, Appendix A). The association in washes and rivulets was creosote bush-white bur-sage-spiny senna (*Senna armata*). Cheesebush (*Ambrosia salsola*) was also common (Photograph 2, Appendix A).

The transportation and utility corridors traversed mountains, alluvial fans, washes, and alkali basins of volcanic origin in the northern sections and granitic origin in the southern sections. Two plant communities covered the majority of the area: creosote bush-white bur-sage scrub and allscale scrub (*Atriplex polycarpa* Shrubland Alliance) (Figure 3-2). Associations in the creosote bush and white bur-sage scrub varied greatly along the routes, with the most diverse associations occurring on the volcanic slope east of Goldstone Dry Lake and on the granitic alluvial fans from Echo site south to Fort Irwin Road (Photographs 3-4, Appendix A).

The allscale scrub typically occurs at 250 feet to 4,900 feet (75 meters to 1,500 meters) AMSL in washes and on playa lake beds and shores, dissected alluvial fans, rolling hills, and terraces. Shrubs are less than 3 meters in height and have an open to continuous canopy. Soils can be carbonate-rich, alkaline, sandy, or sandy clay loam (Sawyer et al., 2009). In the project area, this alliance occurred along edges of playas (Photograph 5, Appendix A) and on dissected alluvial fans above the playas in pure stands or with shadscale or four-wing saltbush (*Atriplex canescens*).

Also present along the transportation and utility corridors, but not mapped as separate units, were patches of creosote bush scrub (*Larrea tridentata* Shrubland Alliance). In these areas, creosote bush occurred in pure stands or with very few other shrub species. Another plant community, four-wing saltbush scrub (*Atriplex canescens* Shrubland Alliance), occurred in a small area southeast of Goldstone Dry Lake (Figure 3-2, Photograph 6, Appendix A). This alliance resembles allscale scrub, occurring on similar soils and landforms and at the same elevational range (Sawyer et al., 2009).

Dry conditions prevailed in the project area during the natural resources surveys. Rainfall from October 2017 through March 2018, recorded at Bicycle Lake, 24 km southeast of the DUT, totaled 27 millimeters. Average rainfall for the same period is 73 millimeters (Weather Underground 2018). The rainfall was

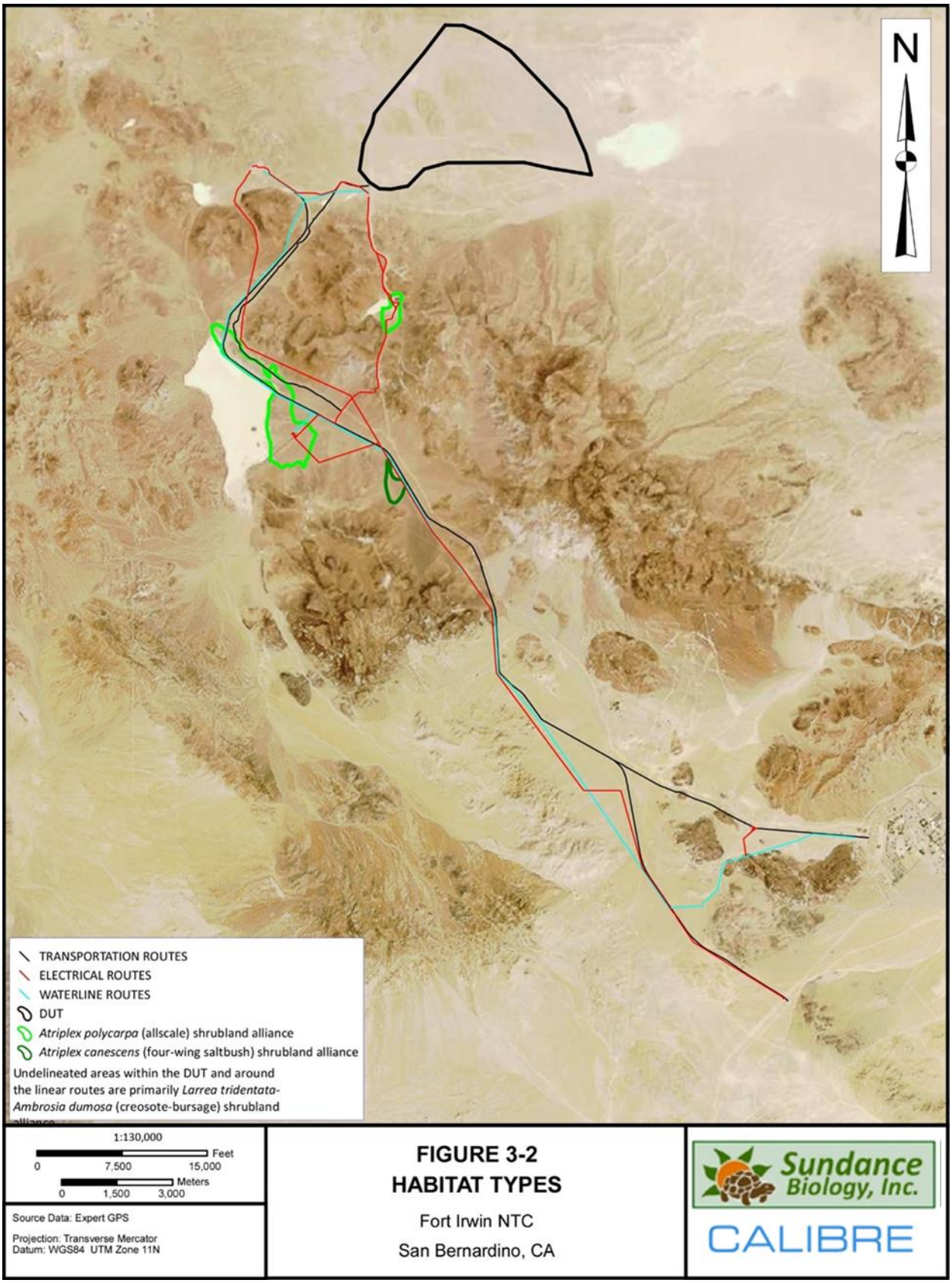

Figure 3-2. Habitat Types

adequate to allow shrubs and perennial herbs to leaf out and bloom but not to germinate most annual herbs.

3.3 Human Impacts

Within the DUT, 90 disturbed areas were identified for a total of 160 acres (64.7 hectares). Out of a total of 1,016 miles of transects walked during this survey, a total of 10,727 vehicle tracks were crossed in a sample of 127 of those miles. Tracks were generally concentrated in the flats. The number of tracks in the hills were less than in the flats. The age of the tracks varied greatly from old to recent, although no differentiation was made regarding age while counting tracks. The impacts from dirt roads within the DUT accounts for approximately 118.9 acres (48.1 hectares) of habitat loss. In general, the habitat on the DUT has been degraded over time, particularly in the flats. In the hills, off road activity is reduced providing a refuge for plants and animals.

Habitat along the transportation and utility corridors is generally in good condition and do not have the impacts of the training activities that generally occur on Fort Irwin.

3.4 Plants

3.4.1 Rare Plant Survey

After evaluating habitats within the project area during the reconnaissance-level survey, the field investigators concluded that potential habitat existed for most species that were identified as having occurrence potential in Table 3-1. The exception was desert cymopterus; the project area had no stabilized dune systems or areas with deep sand for this species. Potential habitat identified for Lane Mountain milk-vetch occurred along the electric utility corridor where it crossed granitic boulder outcrops at two locations (Figure 3-3). In these areas the field crew examined each shrub for Lane Mountain milk-vetch during the full-coverage survey. Potential habitat for Clokey's cryptantha occurred on the ballenas in the DUT and over mountain passes along linear routes. Potential habitat for Booth's evening-primrose occurred on sandy flats throughout the project area. Both Parish's phacelia (*Phacelia parishii*) and jackass-clover (*Wislizenia refracta* ssp. *refracta*) could occur along the water line and Goldstone Road at the edge of Goldstone Dry Lake and along the electric line at the edge of Pioneer Dry Lake.

During the full-coverage survey conducted on May 14-28, 2018, no Lane Mountain milk-vetch and no species ranked CNPS 1A, 1B, 2A, 2B, or 3 were encountered in the DUT or along the linear corridors. Only one CNPS Rank 4 plant, the Mojave indigo-bush (*Psorothamnus arborescens* var. *arborescens*), was found.

Individual and small groups of Mojave indigo-bush occurred on granitic alluvial fans and in washes along linear routes in the south portion of the survey area (Figure 3-4). In total, 975 plants were recorded. One large population, comprised of approximately 835 individuals, occurred in a wash along the water line between NASA Road and Goldstone Road (Figure 3-4). The plant community in these areas was creosote bush-white bur-sage scrub. Other shrubs included cheesebush (*Ambrosia salsola*), California ephedra (*Ephedra californica*), Anderson's wolfberry (*Lycium andersonii*), Acton encelia (*Encelia actoni*), and bladder-sage (*Scutellaria mexicana*). Soils consisted of coarse sand and gravel from decomposed granite. Habitat disturbances included off-highway vehicle tracks, bomb craters, paved and dirt roads, feral ass (*Equus asinus*) scats and tracks, and utility poles. Many individuals occurred on road shoulders and berms, some of which had been crushed by vehicles or were partially buried in sand due to road maintenance activities. Photographs of Mojave indigo-bush and its habitat are provided (Appendix B).

Plants protected by the CDNPA that occurred in the project area were tallied (Table 3-3) and included golden cholla (*Cylindropuntia echinocarpa*), pencil cactus (*Cylindropuntia ramosissima*), cotton-top cactus (*Echinocactus polycephalus* var*. polycephalus*), beavertail (*Opuntia basilaris* var. *basilaris*), Joshua tree, and honey mesquite (*Prosopis glandulosa* var. *torreyana*) (Figures 3-5 and 3-6). In the DUT, most CDNPA plants occurred on ballenas and remnant fans (Figure 3-5). Habitat disturbances in the DUT affecting CDNPA plants included tactical vehicle tracks and trails, bomb craters, fox holes, rock blinds, and encampments. Several individual plants had been crushed or uprooted by military activities, potentially causing death. Prolonged drought from 2012 to 2016 likely killed many individuals, as well.

Even though Joshua trees were present, no Joshua tree woodland, as defined by Sawyer et al. (2009), occurred in the project area. Joshua tree woodland is a sensitive natural community in California (CNDDB 2018). Individual Joshua trees, however, receive special consideration during project planning and implementation on the NTC (U.S. Army [Army] 2006).

Table 3-3. CDNPA Species and Numbers in the Project Area

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Species	# in DUT	# Along Linear Routes	Total
golden cholla	1092	61	1153
pencil cactus	296	25	321
cotton-top cactus	474	14	588
beavertail	298	24	322
Joshua tree	104	15	119
honey mesquite	0	1	1

Plant species identified at the DUT and along linear routes totaled 157 taxa in 33 plant families (Appendix C). Because of below normal precipitation during the previous fall and winter, many annual species did not germinate but are lying dormant as seeds in the soil. Therefore, the plant list does not completely represent the annual flora of the project area.

Non-native, weedy annual herbs and grasses were common in the project area. Arabian and Mediterranean grass (*Schismus arabicus* and *S. barbatus*) and redstem filaree (*Erodium cicutarium*) were ubiquitous. Oriental hedge mustard (*Sysimbrium orientale*) was the most abundant non-native mustard, occurring primarily along shoulders of paved roads, edges of dirt roads, and in highly disturbed sandy areas, but other weedy species were also present (Appendix C).

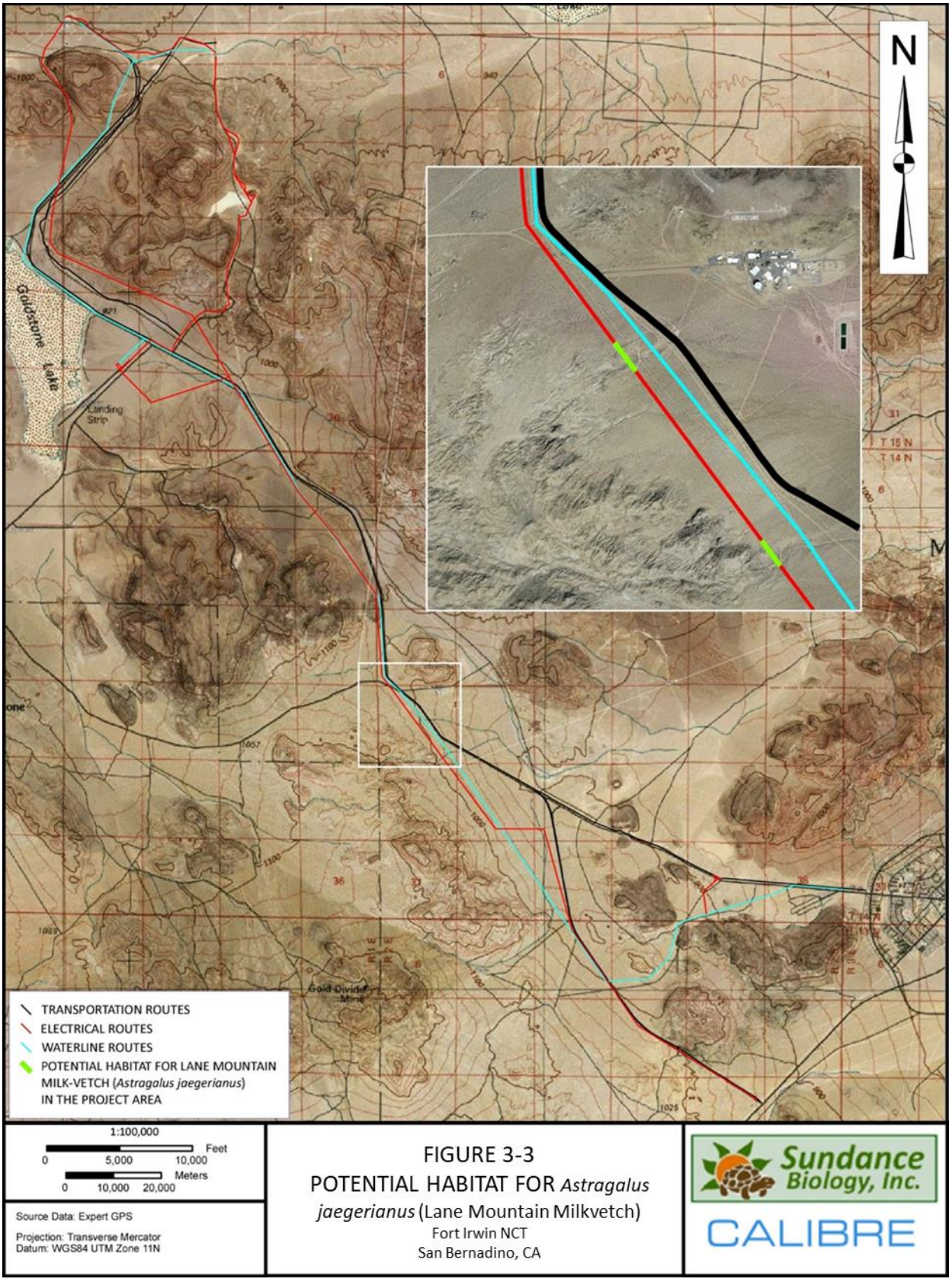

Figure 3-3. Potential Habitat for *Astragalus jaegerianus* (Lane Mountain Milkvetch)

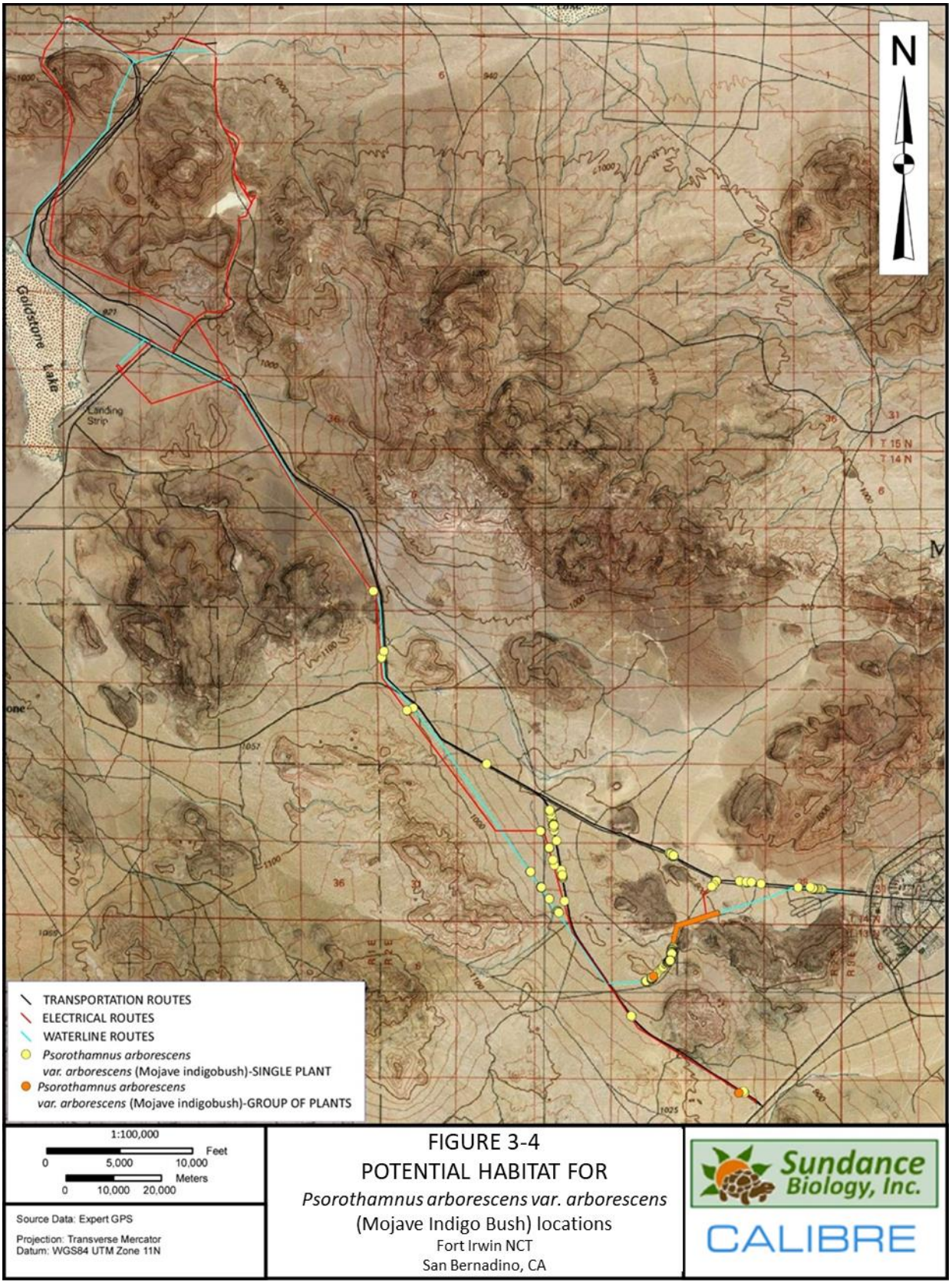

Figure 3-4. *Psorothamnus arborescens var. arborescens* (Mojave Indigo Bush) Locations

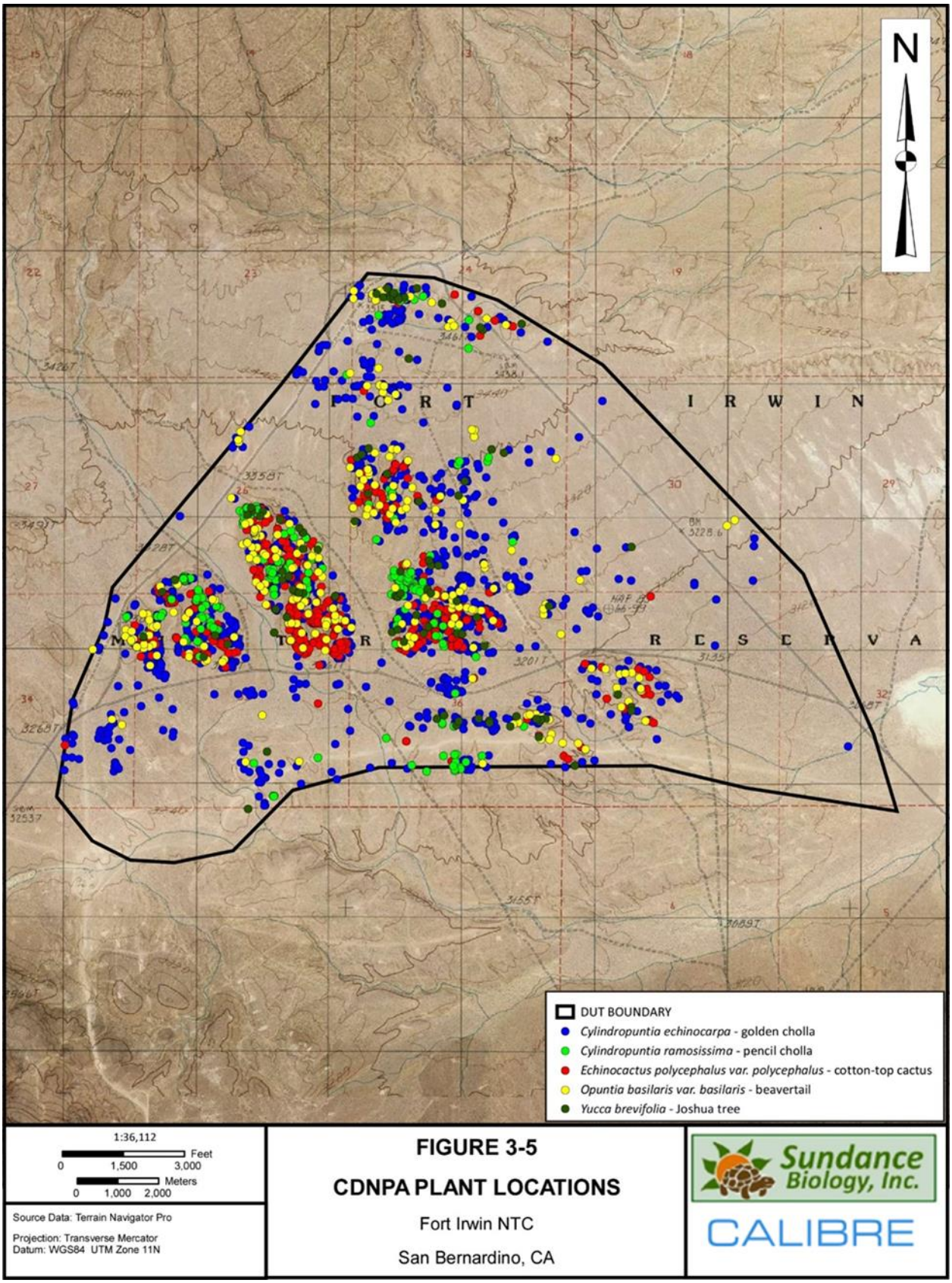

Figure 3-5. CDNPA Plant Locations on the DUT

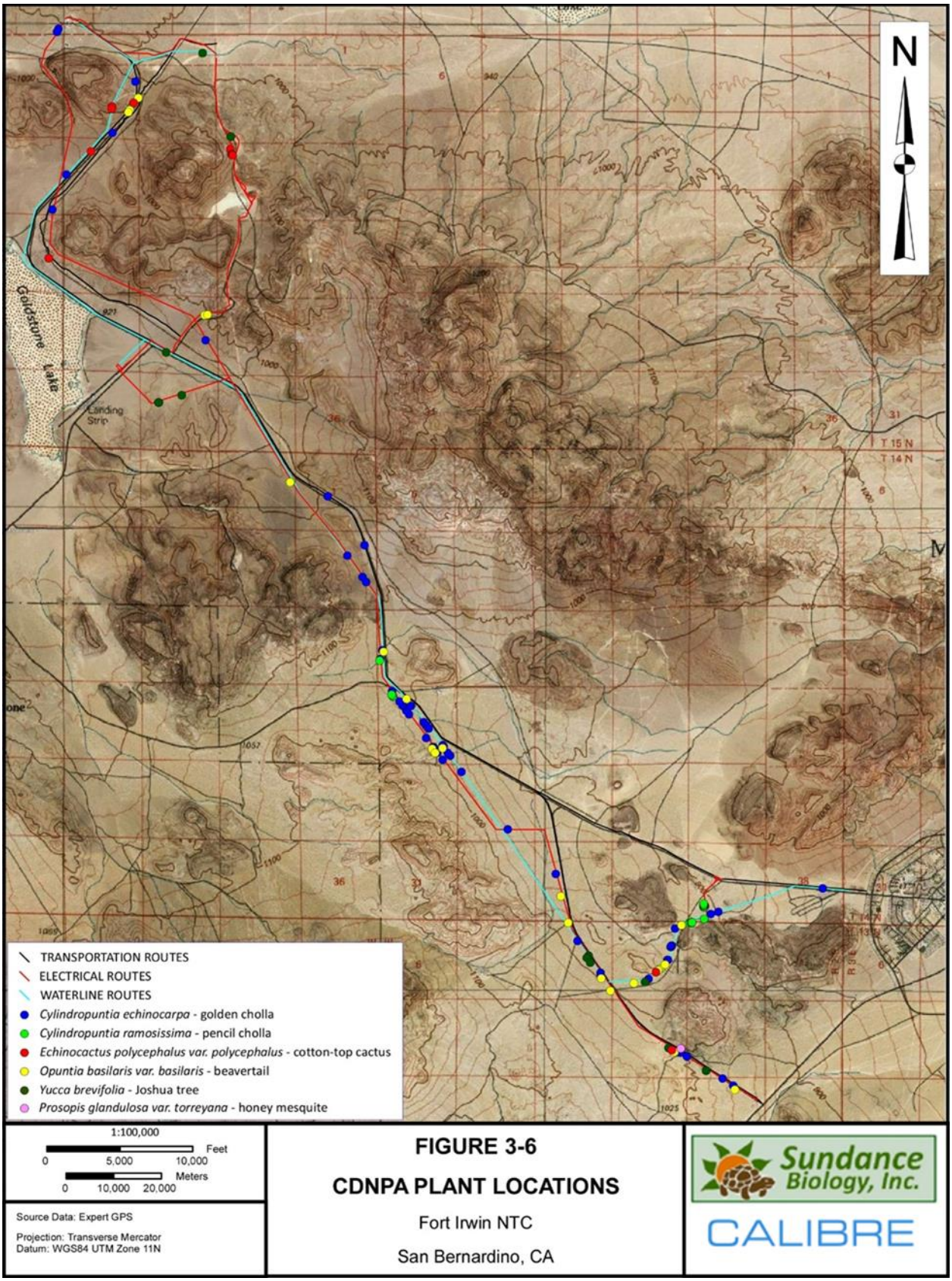

Figure 3-6. CDNPA Plant Locations on the Linear Routes

3.5 Wildlife Species

3.5.1 Desert Tortoise

The proposed project does not occur within critical habitat of the desert tortoise (Figure 3-7). The electric utility corridor comes within 705 feet (215 meters) of the critical habitat boundary approximately 2 miles northwest of the Nasa-Goldstone gate, however, there should be no effect on the critical habitat.

A total of 17 live desert tortoises, 17 desert tortoise carcasses, 71 desert tortoise burrows, 18 desert tortoise scat events independent of burrows, and 4 sets of desert tortoise tracks were found during the survey of the DUT, DUT burrowing owl buffer zone, transportation routes, and utility corridors. Table 3-4 provides a summary of the results of the live desert tortoise and desert tortoise signs observed during the surveys. Figure 3-8 and Figure 3-9 shows the location of where desert tortoise and desert tortoise signs were encountered during the survey.

Survey results for the desert tortoise are provided in Appendix D. Representative photographs of desert tortoise and desert tortoise signs are provided in Appendix E.

Thirteen tortoises were found on the DUT and were concentrated mostly in the hills in the central portion of the site. Seven tortoises were 180 millimeters in carapace length or greater. These were used to calculate the estimated number of tortoises expected to occur on the DUT. Estimations were not made for tortoises found along the linear features of the project.

Calculations were done using the Table 3 DT Pre-project Protocol within the 2017 protocol (USFWS 2017). The full calculation is provided in Appendix K. Based on these calculations the number of adult tortoises estimated to be in the DUT is 13. Table 3-5 shows results of the Table 3 DT Pre-project Protocol calculations.

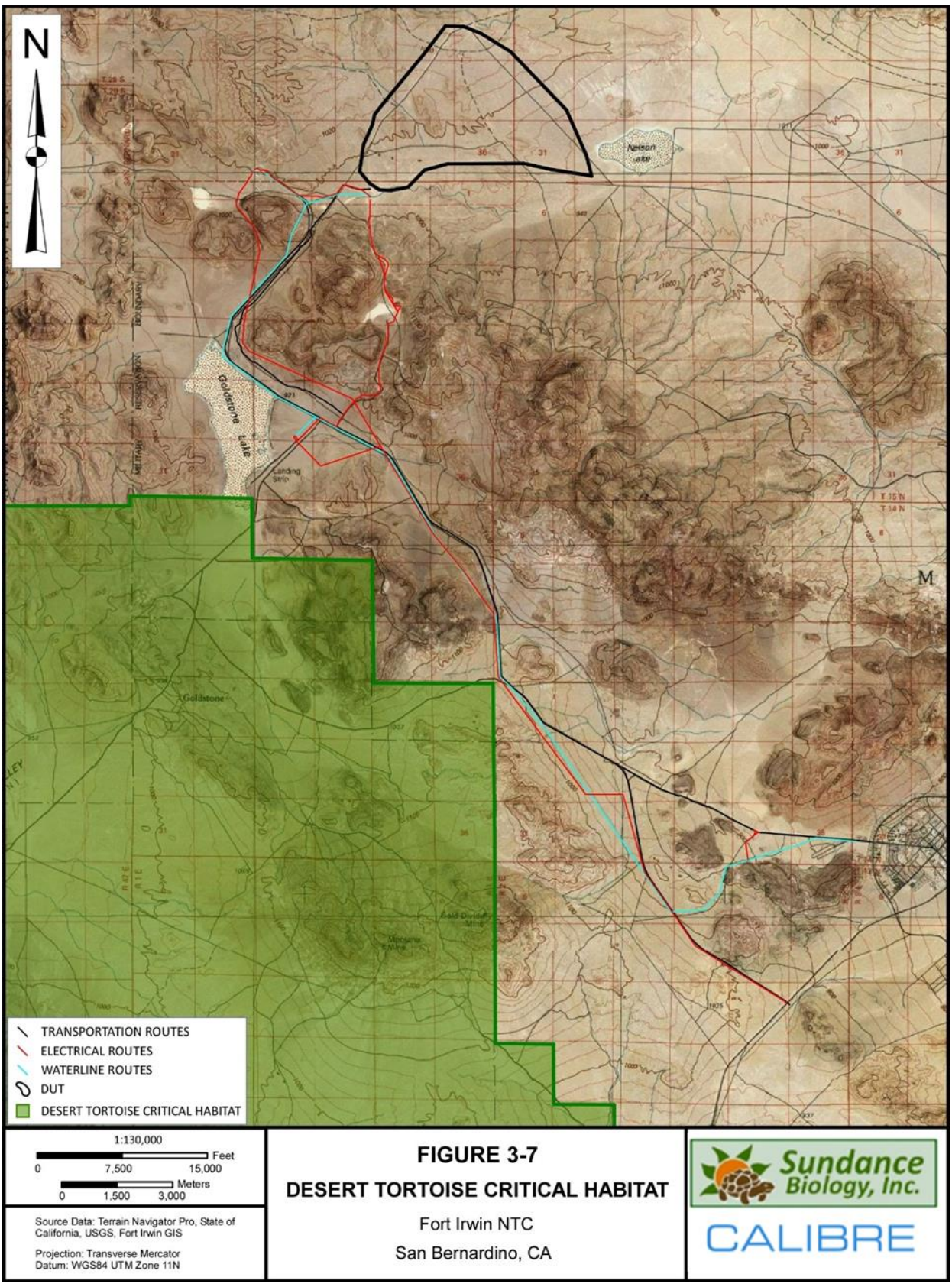

Figure 3-7. Desert Tortoise Critical Habitat

Table 3-4. Desert tortoise and Signs Found on the Project

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Live Desert Tortoises

Location	Size Class			Sex	Subtotal
	Juv	Imm	Ad	M/F	
DUT	1	3	9	6/2	13
BUOW buffer			1	Unk	1
Linear			3	Unk	3
			Total Tortoises		17

Desert Tortoise Carcasses

Location	Size Class				Time Since Death			Subtotal
	Unk	Juv	Imm	Ad	1-2 YRS	2-4 YRS	>4 YRS	
DUT		2	4	6	4	5	3	12
BUOW buffer				1	1			1
Linear	2			2		1	3	4
						Total Carcasses		17

Desert Tortoise Burrows

LOCATION	Burrow Condition				Size Class			Associated Signs at Burrows			Subtotal
	P	G	E	A	Juv	Imm	Ad	Sc	Tr	Es	
DUT	11	22	12	4	0	6	43	2	0	1	49
BUOW Buffer	0	1	2	1	0	0	4	1	1	0	4
LINEAR	1	10	5	2	0	0	18	4	0	0	18
									Total Burrows		71

Desert Tortoise Scat

Location	Scat Age		Subtotal
	Ty	Nty	
DUT	5	7	12
BUOW buffer	1		1
Linear	4	1	5
	Total Scat		18

Abbreviations:
BUOW-Burrowing owl
Size Class: Juv-Juvenile, Imm-Immature, Ad-Adult
Burrow Condition: P-Poor, G-Good, E-Excellent, A-Active
Associated Signs at Burrows: Sc-Scat, Tr-Tracks, Es-Egg Shells
Scat Age: Laid down Ty-This Year, Nty-Not This Year
Sex: M-Male, F-Female

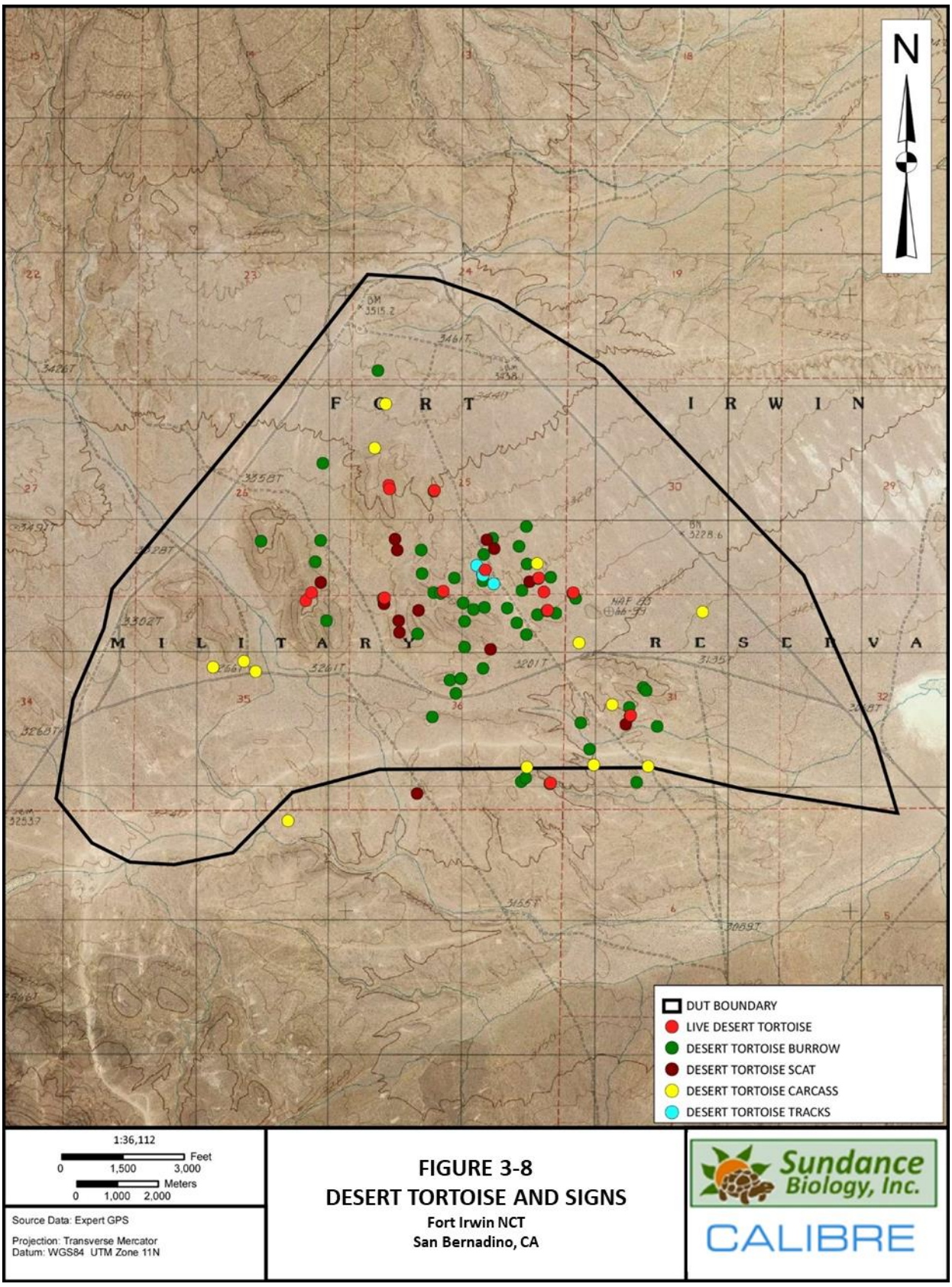

Figure 3-8. Desert Tortoise and Desert Tortoise Signs Found on the DUT

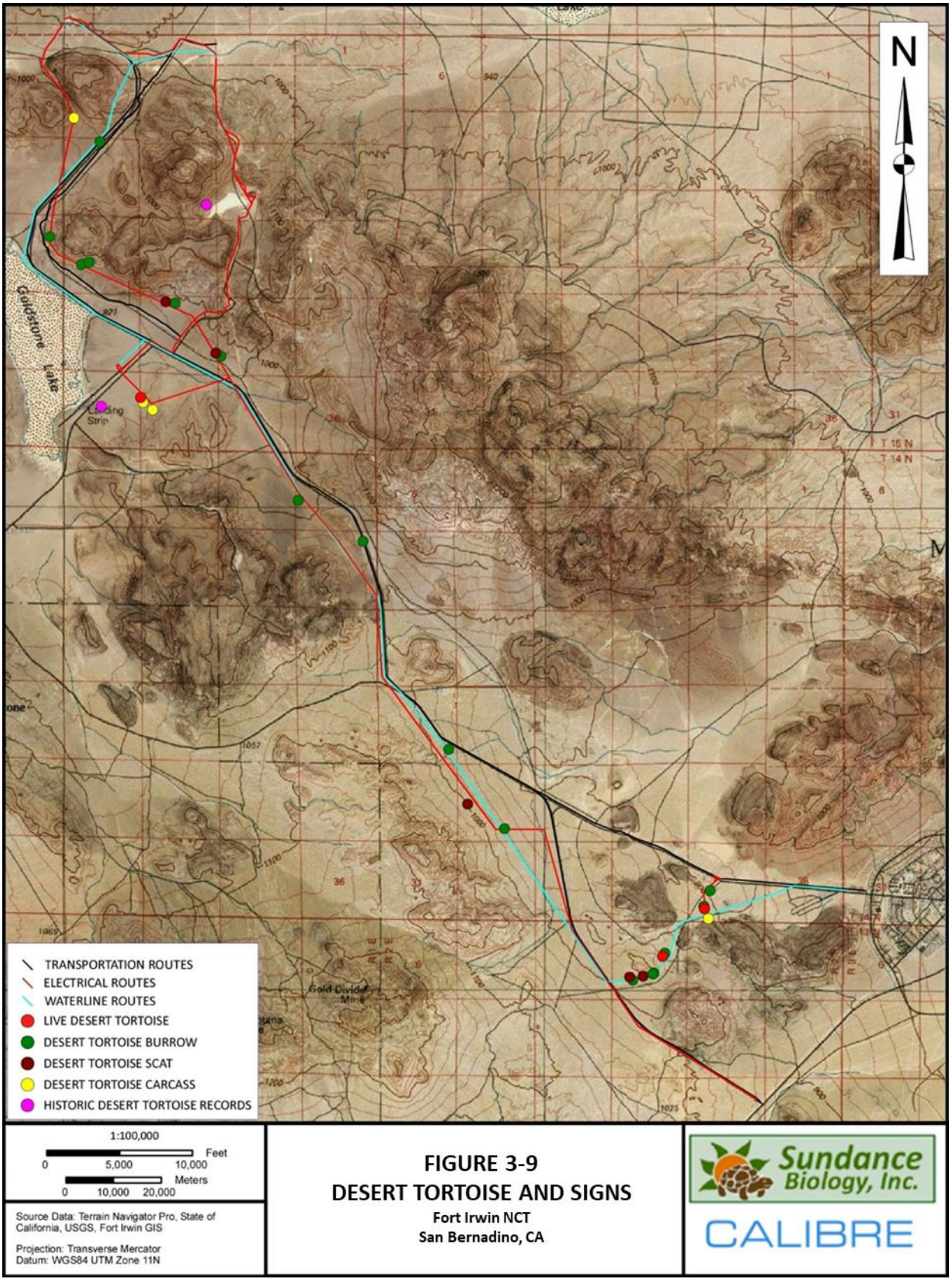

Figure 3-9. Desert Tortoise and Desert Tortoise Signs Found on the Linear Routes

Table 3-5. Table 3 DT Pre-project Protocol Tortoise Density Estimation Calculations

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

N =	13.1
Lower 95%CI =	5.57
Upper 95%CI =	30.72
Total action area (acres)	4014
Prob that a tortoise is above ground given winter rainfall (Pa from Table 2) =	0.850
Total length of transects walked (km) =	1623
Number of transects walked =	626
Number of tortoises found during surveys (n) =	7

3.5.2 Mohave Ground Squirrel

Historic records of Mohave ground squirrels in the project area occur in the southeast corner of the DUT and in the Goldstone Complex, from north of Goldstone Dry Lake to just south of Echo site (Figure 3-10). The DUT records are from 1977 and 1985. The latest records in the Goldstone Complex are from 1994. The population north of Goldstone Dry Lake was estimated at 55 in the mid-1980s. Live-trapping conducted in 2005 at that location yielded no Mohave ground squirrels. The most recent Mohave ground squirrel record nearest the project site, from 2009, occurs in the Western Expansion Area and is 8 kilometers southwest of Echo site and 19 kilometers south of the DUT (CNDDB 2018; Leitner 2009).

The camera trapping effort in the DUT and along linear routes is summarized in Table 3-6. Some cameras operated for only a portion of the 10-14 days of deployment. Potential causes of failure include camera malfunction, battery failure, and excessive movement of vegetation by the wind. The latter may have led to large numbers of unwanted photographs, exhausting batteries or SDHC cards.

Only one Mohave ground squirrel was detected during the camera trapping survey. It was an adult male in non-reproductive condition, appearing on May 8-9, 2018 at Camera #19 in the DUT (Figure 3-11; Photographs 11-12, Appendix F). At this location, a member of the desert tortoise survey crew saw a Mohave ground squirrel on May 8, 2018. This location was approximately one kilometer west-northwest of the 1985 trapping record near Nelson Dry Lake (Figure 3-11). Round-tailed ground squirrels were also detected at Camera #19 (Photograph 12, Appendix F) and at 11 other cameras in the DUT and at 1 camera along linear routes (Figure 3-11, Photographs 13-14). While round-tailed ground squirrels primarily inhabit the eastern Mojave Desert and Sonoran Desert, the NTC is a contact zone with its sister species, the Mohave ground squirrel, and is where limited hybridization occurs (Bell and Matocq 2011, Leitner 2007, Leitner et al. 2017).

Habitat where the Mohave ground squirrel occurred was an alluvial fan with creosote bush-white bur-sage scrub (Photograph 13, Appendix F). An occasional spiny senna was the only other shrub in the area. Soils consisted of silty sand and gravel. Shallow hummocks of blown sand occurred at the bases of creosote bushes. In a 160-acre block centered on Camera #19, there were two maneuver trails and one

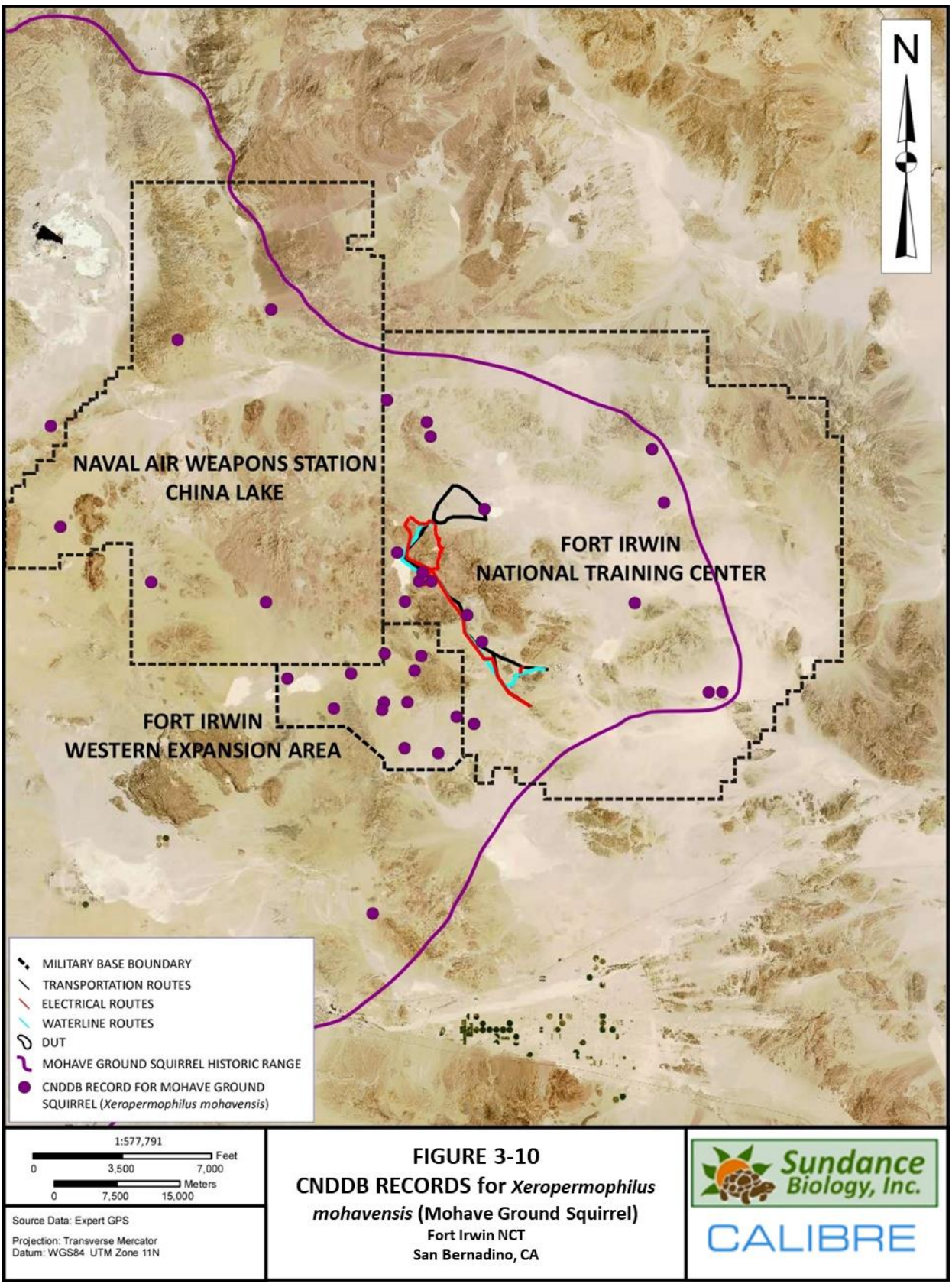

Figure 3-10. CNDDB Records for *Xerospermophilus mohavensis* (Mohave Ground Squirrel)

major dirt road. The site was also crisscrossed with at least four moderately used dirt roads, several minor dirt roads, and multitudes of various aged, single pass, tracks from tactical vehicles (Photograph 15-16, Appendix F).

Appendix G lists wildlife incidentally detected at each camera site, including the following special status species: Golden eagle (*Aquila chrysaetos*), LeConte's thrasher (*Toxostoma lecontei*), and American badger (*Taxidea taxus*). Photographs of these and other species are provided (Appendix H).

Table 3-6. Summary of Camera Trapping Effort

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Camera #	UTM Coordinates		Start Date	End Date[a]	# Survey Days	MGS Detected?
	Easting	Northing				
01	515316	3923682	04/26/2018	05/10/2018	14	no
02	516009	3923482	04/25/2018	05/10/2018	15	no
03	514819	3922830	05/22/2018	06/05/2018	14	no
04	515324	3923110	04/27/2018	05/10/2018	13	no
05	516072	3922814	04/25/2018	05/10/2018	15	no
06	516800	3923270	04/25/2018	05/10/2018	15	no
07	514174	3922330	05/22/2018	06/05/2018	14	no
08	514641	3922099	05/22/2018	06/05/2018	14	no
09	515296	3922192	05/22/2018	06/05/2018	14	no
10	516135	3922179	04/27/2018	05/10/2018	13	no
11	516902	3922059	04/26/2018	05/10/2018	14	no
12	517590	3922444	04/26/2018	05/10/2018	14	no
13	513398	3921205	05/23/2018	06/05/2018	13	no
14	513757	3921457	06/05/2018	06/17/2018	11	no
15	5144434	3921554	05/22/2018	06/05/2018	14	no
16	515336	3921435	05/22/2018	06/05/2018	14	no
17	515999	3921630	04/27/2018	05/10/2018	13	no
18	516825	3921475	04/27/2018	05/10/2018	13	no
19	517965	3921319	04/26/2018	05/10/2018	14	yes
20	518428	3920948	04/26/2018	05/10/2018	14	no
21	513217	3920568	06/05/2018	06/17/2018	11	no
22	513956	3920504	05/23/2018	06/05/2018	13	no
23	514667	3920840	05/24/2018	06/05/2018	12	no
24	515595	3920605	05/24/2018	06/05/2018	12	no
25	516246	3920825	05/24/2018	06/05/2018	12	no
26	516862	3920827	04/27/2018	05/10/2018	13	no
27	517859	3920083	04/27/2018	05/10/2018	13	no
28	518789	3920431	04/27/2018	05/10/2018	13	no
29	513249	3919976	05/24/2018	06/02/2018	9	no
30	513897	3920064	05/24/2018	06/05/2018	12	no

Table 3-6. Summary of Camera Trapping Effort

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Camera #	UTM Coordinates		Start Date	End Date[a]	# Survey Days	MGS Detected?
	Easting	Northing				
31	516470	3907016	05/11/2018	05/23/2018	12	no
32	517366	3905654	05/11/2018	05/18/2018	7	no
33	517872	3905067	05/11/2018	05/20/2018	9	no
34	522614	3900838	05/12/2018	05/24/2018	12	no
35	521331	3900557	05/12/2018	05/17/2018	5	no
36	519860	3902165	05/12/2018	05/24/2018	12	no
37	513554	3916284	05/25/2018	06/05/2018	11	no
38	514059	3911469	05/25/2018	06/05/2018	11	no
39	511561	3919455	06/06/2018	06/17/2018	11	no
40	509973	3917026	06/06/2018 06/18/2018	06/11/2018 06/27/2018	14	no
41	510357	3914718	06/06/2018	06/18/2018	12	no
42	511495	3912867	06/06/2018	06/09/2018	3	no
43	523105	3898617	06/17/2018	06/22/2018	5	no
44	520214	3903849	06/17/2018	06/24/2018	7	no

Note:

UTM=Universal Transverse Mercator, World Geodetic System 1984

MGS=Mohave ground squirrel

[a]Date camera was removed from field or malfunctioned

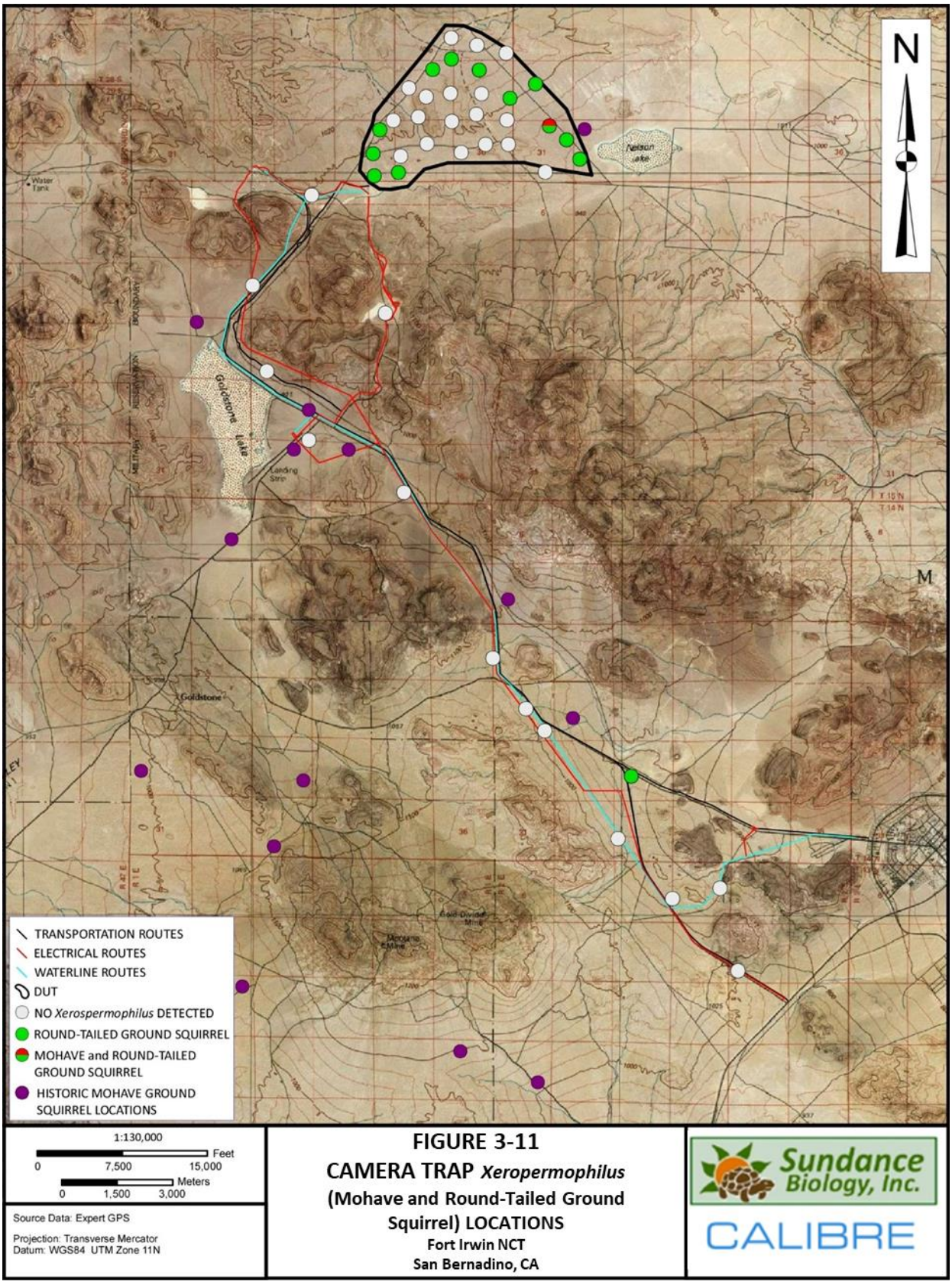

Figure 3-11. Camera Trap *Xerospermophilus* (Mohave and Round-Tailed Ground Squirrel) Locations

3.5.3 Western Burrowing Owl

Surveys for burrowing owls and signs were conducted simultaneously with desert tortoise surveys. Table 3- 7 summarizes the findings. One live burrowing owl and seven burrows, some with burrowing owl pellets or whitewash, were observed (Figure 3-12). The burrowing owl was seen flying across Goldstone road. Two burrows were found along the water utility corridor. Five burrows were found on the DUT, all with whitewash on the mound and two with pellets. No burrowing owls or burrowing owl signs were found on any of the buffer zone surveys. Details of the survey results are provided in Appendix I. Representative photographs of burrowing owl signs are provided in Appendix H. Biologists were not able to take photographs of live burrowing owls.

Table 3-7. Western Burrowing Owl and Signs Found on the Project

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Western Burrowing Owl

Location	Signs Associated with Burrows				Event Subtotal
	Live	Burrow	Pellets	Whitewash	
DUT	0	5	2	5	5
BUOW buffer	0	0	0	0	0
Linear	1	2	0	0	3
				Total Events	8

3.5.4 Mojave Fringe-toed Lizard

The project area does not have potentially suitable habitat for Mojave fringe-toed lizard (*Uma scoparia*). The nearest record from the CNDDB query on Fort Irwin are in the Alvord Mountains 25 miles (40 kilometers) to the south southeast and Red Pass Lake 33 miles (53 kilometers) to the east-southeast. This species is not discussed further in this report.

3.5.5 American Badger

Surveys for American badgers and badger signs were conducted simultaneously with desert tortoise surveys. Table 3-8 summarizes the findings. Two badgers and 39 burrows were detected (Figure 3-13). One badger was observed crossing a transportation route. Another badger was captured on a Mohave ground squirrel camera trap on the DUT. Five burrows were found on the DUT and 34 were found on the linear corridors. Five of the burrows appeared to be active dens. Details of the survey results are provided in Appendix I. Representative photographs of the American badger are provided in Appendix H.

Table 3-8. American Badger and Signs Found on the Project

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

American Badger

Location	Burrow Last Used					Event Subtotal
	Live	Burrow	Ty	Nty	Active Den	
DUT	1	5	5	0	0	6
BUOW buffer	0	0	0	0	0	0
Linear	1	34	3	26	5	35
					Total Events	41

3.5.6 Desert Kit Fox

Surveys for the desert kit fox and kit fox signs were conducted simultaneously with desert tortoise surveys. Table 3-9 summarizes the findings. Three kit foxes were captured on Mohave ground squirrel camera traps on the DUT. Five burrows/burrow complexes were found on the linear corridors and 32 burrows/burrow complexes were found on the DUT (Figure 3-13). Three of the burrows appeared to be

active dens. Details of the survey results are provided in Appendix I. Representative photographs of the desert kit fox are provided in Appendix H.

Table 3-9. Desert Kit Fox and Signs Found on the Project

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Desert Kit Fox								
Location	Burrow Last Used					Signs Associated with Burrows		Event Subtotal
	Live	Burrow	Ty	Nty	Active Den	Scat	Tracks	
DUT	3	32	26	4	2	1	0	35
BUOW buffer	0	0	0	0	0	0	0	0
Linear	0	5	0	4	1	0	1	5
							Total Events	40

3.5.7 Loggerhead Shrike

Loggerhead shrikes were observed twice. Both on the linear corridors. Locations are shown in Figure 3-13. Details of the survey results are provided in Appendix I.

3.5.8 LeConte's Thrasher

A LeConte's thrasher was observed once on a linear corridor. Seven LeConte's thrashers were captured on a Mohave ground squirrel camera trap, six on the DUT and one on a linear corridor. Locations are shown in Figure 3-13. Details of the survey results are provided in Appendix I.

3.5.9 Golden Eagle

A recent golden eagle survey estimated approximately 20 active golden eagle nesting territories on the NTC. While most active nests were clustered in the Tiefort Mountains and the Avawatz Mountains, one was observed in the Goldstone Complex. Many inactive nests were reported in several areas surrounding the project area (Tetra Tech 2016). The project area, with its open habitats, is likely a foraging area for golden eagles.

One golden eagle was captured on a Mohave ground squirrel camera trap on the DUT. Its location is shown on Figure 3-13. The photograph is provided in Appendix H.

3.5.10 General Wildlife Species

Over the course of the survey, 18 avian species, 6 mammal species, and 10 herptile species including TES species were observed. Camera traps set up for Mohave ground squirrels captured an additional three avian species and five mammal species. All of these species could occur on both the DUT and linear corridors. Species observed are listed in Table 3-10.

Table 3-10. Wildlife Species Detected on the DUT and Linear Corridors

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

	Common Name	**Scientific Name**
	Birds	
	Ash-Throated Flycatcher	*Myiarchus cinerascens*
	Black-chinned Hummingbird	*Archilochus alexandri*
	Black-Headed Grosbeak	*Pheucticus melanocephalus*
	Black-throated Sparrow	*Amphispiza bilineata*
	Brown-Headed Cowbird	*Molothrus ater*
	Common Poorwill	*Phalaenoptilus nuttallii*

Table 3-10. Wildlife Species Detected on the DUT and Linear Corridors

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

Common Name	Scientific Name
Common Raven	*Corvus corax*
Golden Eagle	*Aquila chrysaetos*
Great Egret	*Ardea alba*
Greater Roadrunner	*Geococcyx californianus*
Horned Lark	*Eremophila alpestris*
LeConte's thrasher	*Toxostoma lecontei*
Lesser Nightawk	*Chordeiles acutipennis*
Mourning Dove	*Zenaida macroura*
Red-tailed Hawk	*Buteo jamaicensis*
Say's Phoebe	*Sayornis saya*
Townsend's Warbler	*Setophaga townsendi*
Turkey Vulture	*Cathartes aura*
Western Meadowlark	*Sturnella neglecta*
Western Tanager	*Piranga ludoviciana*
White-Throated Swift	*Aeronautes saxatalis*
Wilson's Warbler	*Cardellina pusilla*
Yellow Warbler	*Setophaga petechia*
Mammals	
American badger	*Taxidea taxus*
Black-Tailed Jack Rabbit	*Lepus californicus*
Bobcat	*Lynx rufus*
Coyote	*Canis latrans*
Desert Cottontail	*Sylvilagus audubonii*
Desert Kit Fox	*Vulpes macrotis arsipus.*
Desert Woodrat	*Neotoma lepida*
Feral ass	*Equus africanus asinus*
Kangaroo Rat	*Dipodomys spp.*
Mohave Ground Squirrel	*Xerospermophilus mohavensis*
Round-tailed Ground Squirrel	*Xerospermophilus tereticaudus*
White-tailed Antelope Squirrel	*Ammospermophilus leucurus*
Reptiles	
Coachwhip	*Masticophis flagellum*
Desert Horned lizard	*Phrynosoma platyrhinos*
Desert Tortoise	*Gopherus agassizii*
Gopher Snake	*Pituophis catenifer*
Long-nosed Leopard Lizard	*Gambelia wislizenii*
Side-blotched lizard	*Uta stansburiana*
Sidewinder	*Crotalus cerastes*
Tiger Whiptail	*Aspidoscelis tigris*
Western Patchnose Snake	*Salvadora hexalepis*
Zebra tail lizard	*Callisaurus draconoides*

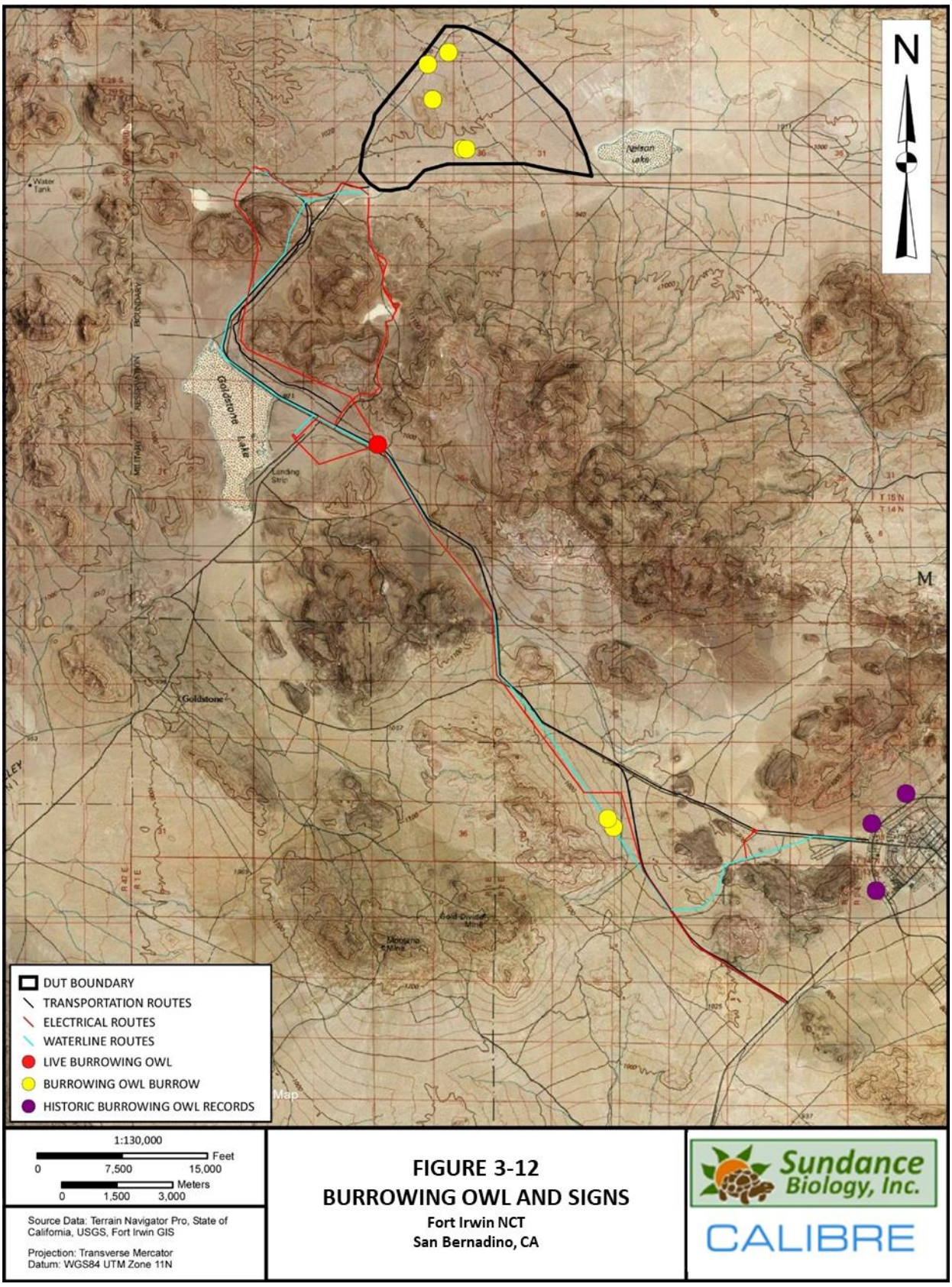

Figure 3-12. Western Burrowing Owl and Burrowing Owl Signs Found on the Project

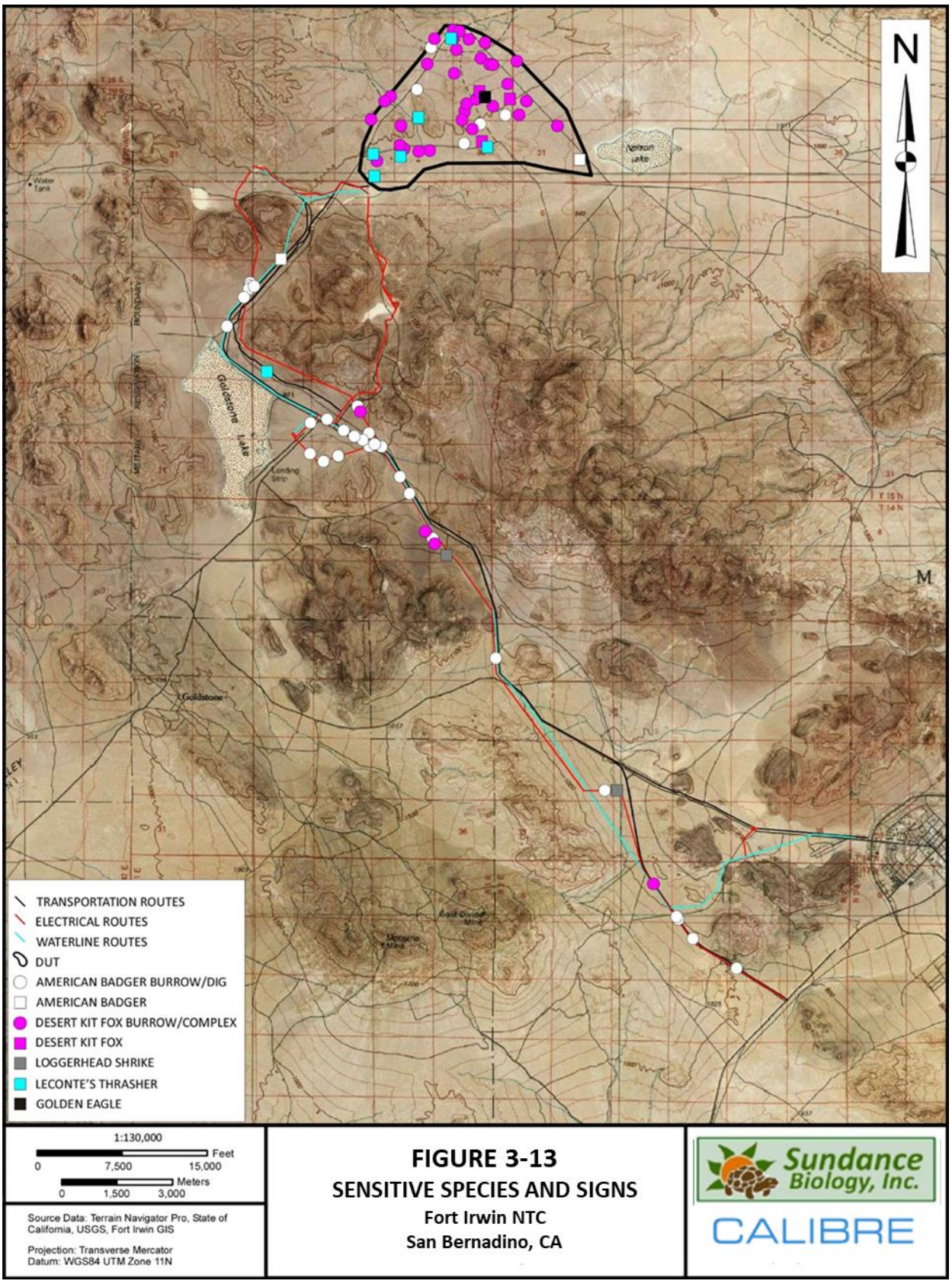

Figure 3-13. Sensitive Species and Their Signs Found on the Project

3.5.11Weather

Following are weather data collected daily at 0800 hours, 1200 hours, and 1500 hours while the desert tortoise survey was being conducted. Temperatures were taken at 5 centimeters above the ground surface in new shade. Wind speed and direction, percent cloud cover, and precipitation were also recorded.

Temperatures generally remained conducive to tortoise activity. On May 1-3, 2018 rain events resulted in an increase in tortoise activity as evidenced by the finding of two juvenile tortoises.

Table 3-11. Weather data on the DUT and Linear Corridors During the Desert Tortoise Survey

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

DATE	WEATHER DETAIL	800 AM	1200 PM	1500 PM
1-May-18	Wind Speed (mph)/Dir.	11/w	6.3/w	17/w
	% Cloud Cover	10	92	80
	Temp Celsius	9.4	14.1	12.2
2-May-18	Wind Speed (mph)/Dir.	4.5/w	3.5/ne	2/nw
	% Cloud Cover	100	60	20
	Temp Celsius	10.1	19.6	18.5
`3-May-18	Wind Speed (mph)/Dir.	4/w	5/e	13/nw
	% Cloud Cover	0	15	10.5
	Temp Celsius	13.3	23.9	15.1
4-May-18	Wind Speed (mph)/Dir.	1/w	3/e	5/e
	% Cloud Cover	2	2	3
	Temp Celsius	20.1	28.7	29.1
5-May-18	Wind Speed (mph)/Dir.	4/w	3/sw	4/w
	% Cloud Cover	9	40	80
	Temp Celsius	23.9	29.9	32.6
7-May-18	Wind Speed (mph)/Dir.	4.5/w	3/sw	2/w
	% Cloud Cover	10	0	0
	Temp Celsius	20.9	31.9	34.7
8-May-18	Wind Speed (mph)/Dir.	6.3/w	10/e	4/e
	% Cloud Cover	2	15	70
	Temp Celsius	22.7	33.6	36.3
9-May-18	Wind Speed (mph)/Dir.	9/w	4/s	10/w
	% Cloud Cover	3	5	5
	Temp Celsius	23.8	34.9	36.6
10-May-18	Wind Speed (mph)/Dir.	15/w	8/sw	4/sw
	% Cloud Cover	1	2	5
	Temp Celsius	19.9	30.2	32.8
11-May-18	Wind Speed (mph)/Dir.	18/sw	23/sw	N/A
	% Cloud Cover	30	40	N/A
	Temp Celsius	19.2	27.8	N/A
12-May-18	Wind Speed (mph)/Dir.	2/w	12/s	10/s
	% Cloud Cover	0	2	2
	Temp Celsius	21.1	24.1	25.2
13-May-18	Wind Speed (mph)/Dir.	3/sw	10/ne	9/ne
	% Cloud Cover	5	10	15
	Temp Celsius	16.8	24.7	23.4
14-May-18	Wind Speed (mph)/Dir.	4/sw	1/s	4/ne
	% Cloud Cover	0	11	10
	Temp Celsius	23.4	26.4	26.3
15-May-18	Wind Speed (mph)/Dir.	2.3/w	N/A	N/A
	% Cloud Cover	0	N/A	N/A
	Temp Celsius	18.5	26.7	27.9

Table 3-11. Weather data on the DUT and Linear Corridors During the Desert Tortoise Survey

Natural Resources Report, Dense Urban Terrain Complex, Fort Irwin, California

DATE	WEATHER DETAIL	800 AM	1200 PM	1500 PM
17-May-18	Wind Speed (mph)/Dir.	5/nw	calm	calm
	% Cloud Cover	0	0	0
	Temp Celsius	16.7	27.1	29
21-May-18	Wind Speed (mph)/Dir.	N/A	0-2 s	0-2 s
	% Cloud Cover	N/A	100	80
	Temp Celsius	N/A	25.4	30.9
22-May-18	Wind Speed (mph)/Dir.	calm	calm	calm
	% Cloud Cover	5%	60%	90%
	Temp Celsius	17.3	29.7	28.8
23-May-18	Wind Speed (mph)/Dir.	2-4 s	calm	1-2 s
	% Cloud Cover	0	1	5
	Temp Celsius	18.1	32	34.9
24-May-18	Wind Speed (mph)/Dir.	calm	2-4 s	1-2 s
	% Cloud Cover	0	0	0
	Temp Celsius	19.6	31	37.1
25-May-18	Wind Speed (mph)/Dir.	2-4 s	0-30 gusts	0-5 s
	% Cloud Cover	0	0	0
	Temp Celsius	16.1	24.1	28.8
26-May-18	Wind Speed (mph)/Dir.	0-5 s	0-2 s	0-5 s
	% Cloud Cover	0	10	5
	Temp Celsius	17	27.4	29.3
27-May-18	Wind Speed (mph)/Dir.	calm	0-5 n	0-2 w
	% Cloud Cover	0	1	5
	Temp Celsius	18.5	29.2	30.8
28-May-18	Wind Speed (mph)/Dir.	0-2 w	calm	calm
	% Cloud Cover	0	0	0
	Temp Celsius	24.7	33.7	33
31-May-18	Wind Speed (mph)/Dir.	0-2 w	calm	calm
	% Cloud Cover	0	0	0
	Temp Celsius	22	33	33.5
1-June-18	Wind Speed (mph)/Dir.	calm	calm	calm
	% Cloud Cover	0	0	0
	Temp Celsius	24	35	34

3.5.12CNDDB California Native Species Field Survey Forms

California Native Species Field Survey Forms were completed for all TES species located during the surveys. Forms are provided in Appendix J.

4 DISCUSSION

Potential impacts to TES species may vary depending on the phases of construction and the Operations and Maintenance phases after construction. Additionally, potential impacts along the utility corridors would differ from those on the transportation routes and DUT complex. Impacts on the utility corridors would result in a temporary loss of habitat. The construction of the DUT Complex would result in permanent loss of habitat and potential for direct take of TES species. As noted in the Project Description, specific components of the Proposed Action would be phased in or sequenced, as follows:

Construction Phases

Phase I. Power, water, and roadway infrastructure.

Phase 2. Site drainage; mock sewer systems infrastructure; a mock 500-meter subway; and 2 ten-story, 2 five-story, and 1 one-story mock building(s).

Phase 3. A mock water tank; mock highway; mock sports area; and 2 four-story and 5 six-story mock buildings.

Phase 4. A mock police station, including a mock prison/jail; mock television/radio station; mock city hall; mock water treatment facility; mock power station; overpass; and 100 one-story, 75 two-story, and 2 ten-story mock buildings.

Phase 5. A mock embassy; mock bank; mock gas stations; mock subway; mock storm and waste water infrastructure; and 150 one-story and 100 two-story mock buildings.

Phase 6. A mock refinery; mock chemical, biological, radiological, nuclear, and explosive (CBRNE) structure; live administrative facility; and 2 ten-story mock buildings (Fort Irwin 2018).

Operations and Maintenance Phases

The Proposed Action would seek to provide adequate DUT training on Fort Irwin that allows the Army to conduct BCT-level urban terrain training in concert with maneuver training. The DUT complex would replicate current, real-world urban operational environments by establishing multiple, highly dense sub-sections of a mega-city within Fort Irwin's operational boundary. The DUT complex and associated infrastructure would require regular maintenance between trainings (i.e. building and roadway maintenance etc.). Both the Operations and Maintenance phases would result in increased traffic to the Project Area, thereby increasing the potential for direct take of TES species.

Project Design Measures

Project design measures should be implemented during the Construction, Operations, and Maintenance phases to reduce risks to sensitive species. There is considerable overlap in measures that benefit the different sensitive species. One of these measures, timing of clearing site vegetation, is an overarching design measure that benefits both the natural resources as well as reducing biological monitoring costs.

This recommendation is based on decades of experience addressing the challenges facing project proponents as well as state and federal agencies on mitigation measures during construction for a varied pallet of projects. The primary activity and breeding windows for many Mojave Desert species is between February-August. Additionally, the desert tortoise is mostly active during spring and fall months. On a large site such as the DUT Complex where vegetation is to be cleared and the potential impacts to a host of species exists it is recommended that clearance surveys (discussed below) for the desert tortoise occur in the fall (September-October). Clearing of vegetation can occur immediately after

the desert tortoise clearance survey and outside the window for breeding birds, including the burrowing owl and outside the period of kit fox and badger denning.

This recommended timing for construction greatly minimizes the potential of direct impacts to TES species and eliminates the need for nesting bird surveys. It also avoids delays related to encountering nesting birds or kit foxes or badgers raising their young and ultimately, is a cost-benefit to the Army.

4.1 Species Specific Impacts

4.1.1 Vegetation

4.1.1.1 Construction Phase Impacts

Construction at the DUT would permanently remove a majority of the vegetation on 4,014 acres of creosote bush-white bur-sage scrub in a remote area of the NTC. Removing vegetation would destabilize soils on the project site. Without short and long-term dust control measures, blowing sand from the DUT would be deposited in adjacent areas, potentially changing the soil dynamics, plant species composition and structure, and faunal diversity on an unknown number of acres.

Both permanent and temporary impacts would be expected during the construction phase along linear routes. The project would permanently remove vegetation on an unknown number of acres 1) at replacement electric pole sites; 2) at two water pumping stations; 3) along sections of new electric corridor; and 4) along transportation route widening or realignments. Water utility corridor construction would be expected to temporarily impact 83.5 acres of relatively undisturbed creosote bush scrub, creosote bush-white bur-sage scrub, allscale scrub, and four-wing saltbush scrub, combined. Post-construction, vegetation would recolonize, beginning with native and non-native weedy species. It might take several decades before recovery of native vegetation would be fully realized. Permanent and temporary loss of habitat and individual plants would be expected to be less than significant as similar habitat is common throughout the area.

4.1.1.1.1 Federally-Listed or State-listed Plants

No plant species listed under the Federal Endangered Species Act or the California Endangered Species Act or ranked rare or endangered in California by CNPS (2018) were found in the project area during the rare plant survey. Even in this dry year, skeletal remains from plants that germinated and reproduced last year, an El Nino year, would have been evident. Therefore, project impacts during construction phase on Federally or State-listed species and on special status plant species with CNPS Rank 2 or higher would not be expected.

4.1.1.1.2 Other Special Status Plants

A total of 975 Mojave indigo-bush individuals, a species on the CNPS watch list, were recorded in nine areas along linear routes. Potential impacts during construction would include permanent loss of habitat and unknown number of individuals 1) at replacement electric pole sites; 2) at three water pumping stations; and 3) along transportation route widening or realignments. Temporary loss of habitat and individuals would be expected along utility corridors and along shoulders and berms of transportation routes. Because Mojave indigo-bush are commonly found in many low-lying areas on the NTC, project impacts during construction would be less than significant.

Biologically significant cacti, Joshua trees, and honey mesquite were found within the project area during the rare plant survey. Expected project impacts for these species during construction phase would include habitat loss on a maximum of 4,014 acres in the DUT, 111.3 acres along electric corridor, 83.5 acres along the water utility corridor, and an unknown number of acres along road berms.

Expected project impacts on individual CDNPA plants during site construction in the DUT could include the loss of at least 1,092 golden chollas, 296 pencil cacti, 474 cotton-top cacti, 298 beavertails, and 104 Joshua trees. Along linear corridors expected impacts to individuals could include the loss of up to 61 golden chollas, 25 pencil cacti, 14 cotton-top cacti, 14 beavertails, 15 Joshua trees, and one honey mesquite. Since these species are common throughout the Mojave Desert, impacts would be less than significant.

4.1.1.2 Operations and Maintenance Phases Impacts

4.1.1.2.1 Federally-Listed or State-listed Plants

Since no Federally-listed or State-listed plant species were found in the DUT or along linear corridors, project impacts during operational and maintenance phases would not be expected.

4.1.1.2.2 Other Special Status Plants

Since no special status plant species with CNPS Rank 2 or higher were found in the DUT or along linear corridors, project impacts during operational and maintenance phases would not be expected. Potential impacts on Mojave indigo-bush, a CNPS Rank 4 plant, would include crushing of individuals that might occur along linear corridors by vehicles traveling outside the project boundaries or by road maintenance equipment. Individuals might also be buried in sand as dirt is pushed onto berms during road grading. Since only a few individuals may be impacted and because Mojave indigo-bush is common in the southern portion of the project area and in other areas on the NTC, potential impacts would be less than significant.

4.1.2 Desert Tortoise

4.1.2.1 Construction Phase Impacts

Desert tortoise occur throughout the Proposed Action area. Impacts to desert tortoise on the DUT Complex site, transportation routes, and utility corridors would occur from the Proposed Action. Permanent loss of habitat for both on-site tortoises and those whose home range includes the Project area would occur. There is potential for vehicle collisions and crushing tortoises in their burrows. Construction of the DUT Complex is covered under the USFWS Biological Opinion, (FWS-SB-14B0363-14F0495) August 8, 2014, Biological Opinion for Operations and Activities at Fort Irwin, San Bernardino County, California. The Biological Opinion states the “Army has proposed to re-initiate formal consultation if five desert tortoises are killed or injured in a calendar year as a result of the actions considered in this biological opinion”. In addition to following measures set forth in the Biological Opinion to minimize the possibility of killing or injuring a desert tortoise during the construction of the DUT Complex and associated linear features, Project Design Measures would be implemented throughout Construction, Operations, and Maintenance that would reduce risks to desert tortoises.

4.1.2.2 Operations and Maintenance Phases Impacts

Desert tortoises occur in the habitat surrounding the DUT complex. An increase in traffic travelling to and from the DUT as well as on the facility may increase the potential for direct take (injuring or killing) of desert tortoise during Operations and Maintenance. Indirect impacts to tortoises in the habitat surrounding the DUT may occur from the potential increases in predators of the tortoise, namely the coyote and Common raven (*Corvus corax*). Since the DUT will not be permanently fenced with tortoise-proof fencing, tortoises from the adjacent habitat may wander into the complex and not find their way back into habitat. If these animals go undetected, potential impacts to these tortoises may result in death from malnutrition due to loss of forage and exposure from loss of thermally buffered shelter.

4.1.3 Mohave Ground Squirrels

4.1.3.1 Construction Phase Impacts

One Mohave ground squirrel was detected in the project area during the camera trapping survey. It was in the eastern portion of the DUT in disturbed creosote bush-white bur-sage scrub. Since there was only one detection, the Mohave ground squirrel population is likely very low in the project area. The cameras also recorded round-tailed ground squirrels in the DUT. Round-tailed ground squirrels are well-adapted to disturbed lands and can tolerate the hotter and drier conditions that are predicted in the Mojave Desert with changing climate (Leitner 2015).

If present during construction, the Mohave ground squirrel could be run over by equipment or vehicles or crushed in their burrows. Therefore, an unknown number of individuals could die. Other impacts would include permanent habitat loss in the DUT and the loss of a portion of the Mohave ground squirrel's range on the NTC. Individual mortalities and loss of habitat may be a significant impact since the amount of remaining Mohave ground squirrel habitat is unknown (Leitner 2015). Since Mohave ground squirrels were not detected along linear corridors, significant project impacts during construction would not be expected.

4.1.3.2 Operations and Maintenance Impacts

Impacts on Mohave ground squirrel during operational and maintenance phases at the DUT would not be expected because habitat would no longer exist. Since Mohave ground squirrels were not detected along linear corridors, project impacts during operational and maintenance phases would be less than significant.

4.1.4 Western Burrowing Owl

4.1.4.1 Construction, Operations, and Maintenance Phases Impacts

Burrowing owl habitat occurs throughout the DUT and along the transportation corridors and utility corridors. During construction, impacts to the burrowing owl would occur through loss of foraging habitat and through destruction of burrows. Noise and ground vibrations during Operation and Maintenance phases may impact owls in adjacent habitat. However, over time, burrowing owls may adapt to such disturbances.

4.1.5 American Badger and Desert Kit Fox

4.1.5.1 Construction, Operations, and Maintenance Phases Impacts

Both the badger and kit fox occur within the project area. The Proposed Action has the potential for both direct and indirect impacts on badgers (CDFW, SSC) and kit foxes through the loss of habitat and the potential for directly killing these species during construction by crushing burrows, vehicle collisions, and inadvertent entrapment in open pipes, pits, and trenches. The desert kit fox currently does not have federal or California special status, although it is protected from hunting as a fur-bearing mammal under Title 14 of the California Code of Regulations, Section 460. In addition, increased human activity may attract a greater number of coyotes to the project area. Coyotes are both predators of kit foxes and direct competitors for food, with substantial spatial, temporal, and dietary overlap (White et al. 1994, 1995; Kozlowski et al. 2008). Habitat and land use changes that attract coyotes therefore would likely have an adverse effect on desert kit foxes.

4.1.6 Nesting Birds

Potential impacts to nesting birds protected under the Migratory Bird Treaty Act (MBTA), including Species of Special Concern loggerhead shrike and LeConte's thrasher are loss of habitat, entrapment in

uncapped pipes, and increased predation pressure from human-subsidized ravens. These impacts are potential threats during construction, operations, and maintenance.

4.2 Project Design Measures

The following project design measures are recommended for minimizing impacts to habitats and protected and sensitive plant and animal species.

4.2.1 Vegetation

4.2.1.1 Construction, Operations and Maintenance

4.2.1.1.1 Lane Mountain Milk-vetch

A pre-construction survey by a botanist familiar with the Lane Mountain milk-vetch would be conducted in potential habitat along the electric corridor in the Goldstone Complex from April 15 to May 15. If milk-vetch plants are found, then individual plants would be flagged for avoidance. A qualified biologist would monitor construction and maintenance activities at the milk-vetch site to ensure avoidance.

Construction and maintenance activities should occur during the dormant period for Lane Mountain milk-vetch, which is late spring through late fall or early winter (Charlton 2007). If construction and maintenance activities occur through the growing season, passive dust monitoring stations could be erected in areas adjacent to Lane Mountain milk-vetch habitat during project construction and maintenance activities to determine if fugitive dust is being deposited in these areas, potentially impacting this species.

Post-construction surveys would be conducted in the project area adjacent to Lane Mountain milk-vetch habitat to monitor the potential spread of invasive, weedy plant species. Invasions would be mapped and then controlled to prevent impacts on Lane Mountain milk-vetch and its habitat.

4.2.1.1.2 Mojave Indigo-bush

The Army, while not legally mandated to do so, would conserve as many Mojave indigo-bush individuals as possible. Conservation measures would include:

- avoidance of individuals, if feasible, during construction and maintenance activities;
- stockpiling top soil and replacing it after construction and maintenance activities;
- collecting seeds and broadcasting them in disturbed areas after construction; and
- propagating plants from seeds and transplanting them into disturbed areas, post-construction.

Restoration of Mojave indigo-bush habitat would facilitate soil stabilization in disturbed areas.

4.2.1.1.3 Joshua Trees

Measures to conserve Joshua trees, a CDNPA plant and a species with special significance on the NTC (Army 2006), would include avoidance of individuals during construction and operational and maintenance activities, where feasible. If avoidance is not possible, the Army would relocate Joshua trees to nearby sites with the same orientation and similar characteristics as their original sites to reduce risk of tree mortality.

4.2.1.1.4 Other CDNPA Plants

The Army, while not legally mandated to do so, would conserve as many individual CDNPA plants as possible. Avoidance would be the preferred conservation measure. Plants remaining in place in the

project area would maintain soil stability. This measure might be feasible along linear corridors but likely not possible in the DUT. Unavoidable plants would be transplanted, to the extent possible, to off-site locations. Off-site locations might include adjacent areas or the cantonment, where salvaged plants could be used in landscaping to help stabilize soils and reduce erosion.

4.2.2 Wildlife

4.2.2.1 Desert Tortoise

4.2.2.1.1 Construction (Measures may differ between the DUT Complex and the transportation route and utility corridors. As such Project Design Measures are listed for each separately).

DUT

- Develop a site-specific translocation plan consistent with 2018 USFWS Translocation Guidelines.
- All construction personnel should undergo desert tortoise awareness training.
- Develop an on-site communications protocol for desert tortoise sightings and to address wildlife issues during construction.
- All construction personnel should check beneath their vehicles for tortoises that may have moved underneath seeking shade prior to moving vehicles. Reminder magnets or placards to adhere to vehicles should be issued to all personnel driving on the site.
- Construction personnel should be instructed not to park on road berms in an area that has not been cleared of tortoises, as tortoises frequently dig burrows in road berms.
- All land survey crews on site prior to construction be escorted by a qualified biologist. Land survey crews frequently travel cross-country in vehicles prior to construction and a qualified tortoise monitor should clear the path immediately in front of the survey crew by walking in front of the surveyor's vehicle.
- Project speed limit not to exceed 15 MPH during construction.
- All vehicular traffic related to the project during construction, be it on existing roads or cross country, be escorted by a qualified biologist unless temporary tortoise proof fencing is erected in these areas and the site has been cleared of tortoises.
- Site access for all construction personnel should be limited to designated access roads to avoid "take" on unmonitored roads.
- Qualified biologist(s) should survey immediately in front of equipment clearing vegetation in case a tortoise was missed during clearance or pre-construction surveys.
- Erect and maintain temporary tortoise-proof fencing (1"x 2" mesh hardware cloth) between the interface of the project construction areas and any remaining desert tortoise habitat prior to initiating construction and clearance surveys for desert tortoises on site. The fence will prevent tortoises from wandering onto the site. Ongoing maintenance of the fencing would be recommended with oversight by an authorized biologist. Fence installation should be monitored by a qualified tortoise biologist.
- Throughout construction, inspection of newly installed fences would be performed, at minimum, once per day since tortoises may pace a new barrier to the point of fatal exhaustion or overheating or become trapped attempting to climb the fence.

- Tortoise clearance surveys as per USFWS clearance survey protocol (USFWS 2009) should be conducted after fencing has been installed. It is recommended that two coverages without finding any tortoises or new tortoise signs be conducted prior to declaring the fenced construction sites free of tortoises. All burrows that could provide shelter for a desert tortoise should be excavated or marked during the first clearance survey. If *in situ* monitoring utilizing radio-telemetry is to occur prior to translocating tortoises, then burrows should be excavated on the final coverage.
- After the tortoise proof-fence is erected and the site is cleared of tortoises a qualified biologist(s) should remain onsite until construction is complete and, at a minimum, conduct site and fence inspections daily throughout construction to maintain compliance with Project Design Measures.
- Qualified biologist(s) should survey immediately in front of equipment clearing vegetation in case a tortoise was missed during clearance or pre-construction surveys.
- Follow protective measures set forth in the Biological Opinion to minimize raven depredation of tortoises: including appropriate garbage storage, water source management and "implementing predator control programs and participating in regional plans sponsored by the Desert Managers Group to control common ravens".
- During construction cap the ends of all pipes left on the ground.
- A qualified biologist(s) should inspect open pits and trenches for trapped wildlife, at minimum daily, more frequently during high temperatures.
- Contractor should install wildlife escape ramps in all open trenches and pits.

Transportation Routes and Utility Corridors

- All construction personnel should undergo desert tortoise awareness training.
- All construction personnel should check beneath their vehicles for tortoises that may have moved underneath seeking shade prior to moving vehicles. Reminder magnets or placards to adhere to vehicles should be issued to all personnel driving on the site.
- Construction personnel should be instructed not to park on road berms in an area that has not been cleared of tortoises, as tortoises frequently dig burrows in road berms.
- Develop an on-site communications protocol for desert tortoise sightings and to address wildlife issues during construction.
- All land survey crews on site prior to construction be escorted by a qualified biologist. Land survey crews frequently travel cross-country in vehicles prior to construction and a qualified tortoise monitor should clear the path immediately in front of the survey crew by walking in front of the surveyor's vehicle.
- Project speed limit not to exceed 15 MPH during construction.
- All vehicular traffic related to the project during construction, be it on existing roads or cross country be escorted by a qualified biologist unless temporary tortoise proof fencing is erected in these areas and the site has been cleared of tortoises.
- Site access for all construction personnel should be limited to designated access roads to avoid "take" on unmonitored roads.
- Pre-construction surveys should be conducted within 48 hours along linear corridors to relocate tortoises out of harm's way.

- Since desert tortoise were seen in the area proposed for construction of water pumping stations, it is recommended that temporary tortoise-proof fencing (1”x 2” mesh hardware cloth) between the interface of the project construction areas and surrounding habitat be installed prior to initiating construction and clearance surveys for desert tortoises on site. The fence will prevent tortoises from wandering onto the site. Ongoing maintenance of the fencing would be recommended with oversight by an authorized biologist. Fence installation should be monitored by a qualified tortoise biologist.
- Throughout construction, inspection of newly installed fences would be performed, at minimum, once per day since tortoises may pace a new barrier to the point of fatal exhaustion or overheating or become trapped attempting to climb the fence.
- Tortoise clearance surveys as per USFWS protocol clearance survey protocol (USFWS 2009) should be conducted after fencing has been installed. It is recommended that two coverages without finding any tortoises or new tortoise signs be conducted prior to declaring the fenced construction sites free of tortoises. All burrows that could provide shelter for a desert tortoise should be excavated or marked during the first clearance survey. If *in situ* monitoring utilizing radio-telemetry is to occur prior to relocating tortoises to adjacent habitat, then burrows should be excavated on the final coverage.
- After the tortoise proof-fence is erected and these sites are cleared of tortoises, a qualified biologist(s) should remain on-call (in case a tortoise is observed outside the fence) until construction is complete and, at a minimum, conduct site and fence inspections daily throughout construction to maintain compliance with Project Design Measures.
- Qualified biologist(s) should survey immediately in front of equipment clearing vegetation in case a tortoise was missed during pre-construction surveys or one has moved onto the right-of-way.
- Follow protective measures set forth in the Biological Opinion to minimize raven depredation of tortoises: including appropriate garbage storage, water source management and “implementing predator control programs and participating in regional plans sponsored by the Desert Managers Group to control common ravens”.
- During construction cap the ends of all pipes left on the ground.
- A qualified biologist(s) should inspect open pits and trenches for trapped wildlife, at minimum daily, more frequently during high temperatures.
- Contractor should install wildlife escape ramps in all open trenches and pits.

4.2.2.1.2 Operations and Maintenance

- Maintain an environmental awareness training program for all maintenance personnel.
- To reduce the potential for impacts to tortoises in the habitat surrounding the DUT, it is recommended that the distance of the diameter of the home range of an adult male tortoise (760 meters), (Harless et al 2009, TRW 1999) surrounding the DUT perimeter be cleared of tortoises and that these tortoises be included in the translocated cohort off the DUT Complex.
- Follow protective measures set forth in the Biological Opinion to minimize raven depredation of tortoises: including appropriate garbage storage, water source management and “implementing predator control programs and participating in regional plans sponsored by the Desert Managers Group to control common ravens”.

- Report any tortoise sightings to Range Control and protect the tortoise until the Base biologist arrives and ensures the animal has been moved out of harm's way.

4.2.2.2 Mohave Ground Squirrel

4.2.2.2.1 Construction, Operation and Maintenance Phases

To avoid potential effects on Mohave ground squirrels, the following measures would be implemented prior to and during construction activities:

- Before construction or maintenance activities begin, personnel working on the project site would receive a briefing, conducted by a qualified biologist, on the Mohave ground squirrel, detailing its life history and the protocol to follow if a Mohave ground squirrel is encountered in the project area.
- If an occupied Mohave ground squirrel natal burrow were to be excavated during pre-construction desert tortoise clearance survey in the DUT, then the Mohave ground squirrels would be relocated by a qualified biologist to an artificial burrow constructed off-site following past CDFW guidelines (CDFG 2004) .
- During construction activities, qualified biologists would be onsite to monitor activities. If a Mohave ground squirrel is observed onsite and is in immediate danger, the project activity threatening the squirrel would stop until the squirrel moves out of harm's way.

To mitigate for the loss of Mohave ground squirrel habitat, the following recommended measure would be implemented:

- Conduct additional surveys for MGS on the Fort Irwin land expansion mitigation lands to determine MGS population levels and evaluate habitat status. Develop prioritized list of these parcels to focus future restoration/habitat enhancement actions.

4.2.2.3 Western Burrowing Owl

4.2.2.3.1 Construction Phase

To minimize potential impacts of burrowing owls and the resources that support viable owl populations on the transportation routes and utility corridors, it is recommended that wherever possible, an emphasis be made on maintaining burrowing owls and their resources in place rather than displacement of owls to an alternate site.

It is recommended that initial ground disturbing activities occur outside of burrowing owl nesting season. Burrowing owls breeding season is generally from February 1 through August 31. Since suitable habitat occurs throughout the project area, surveys should be conducted within 30 days of initial ground disturbing activities.

Where impacts to an occupied burrow are unavoidable:

- Implement passive relocation to a nearby natural or artificial burrow only during the non-breeding season encouraging owls to move a minimum of 50 meters beyond areas of disturbance and to where there is a minimum of 6.5 acres of foraging habitat.
- One-way doors should be left in place 48 hours to ensure owls have left the burrow before excavation. One alternate natural or artificial burrow should be provided for each burrow that will be excavated in the project impact zone. The project area should be monitored daily for one week to confirm owl use of alternate burrows before excavating burrows in the immediate impact zone.

- Whenever possible, burrows should be excavated using hand tools and refilled to prevent reoccupation. Sections of flexible plastic pipe or burlap bags should be inserted into the tunnels during excavation to maintain an escape route for any animals inside the burrow.
- Monitoring by the on-site biologist of the success of mitigation is recommended. A monitoring plan should include mitigation success criteria and an annual report.

4.2.2.3.2 Operations and Maintenance Phases

Vertical tubes used in project construction, operation, or maintenance would be temporarily or permanently capped at the time they are installed to avoid the entrapment and death of burrowing owls.

4.2.2.4 American Badger and Desert Kit Fox

4.2.2.4.1 Construction Phase

If performed in the fall outside denning season for the two species, it is recommended that excavation of all burrows be performed concurrent with the desert tortoise clearance survey. Since desert tortoises often occupy mammal burrows and dens, excavation of these burrows would take place to clear the site of tortoises. If construction is to occur during denning season, utilize motion sensor cameras on all active burrows/dens to monitor presence of young prior to excavation. If badger cubs or kit fox pups are present, establish an exclusion zone until the young disperse. If a burrow or den is determined to be inactive and cannot be excavated immediately, then all entrances should be blocked until excavation can take place.

Additional recommended measures during construction to prevent inadvertent entrapment include: capping all pipes left accessible to wildlife, installing escape ramps in all open pits and trenches, and monitoring open pits and trenches daily to ensure no animals are trapped.

4.2.2.4.2 Operations and Maintenance Phases

During the Operations and Maintenance phases it is recommended that all personnel keep garbage, including degradable food scraps, in covered containers inaccessible to coyotes.

4.2.2.5 Nesting Birds

To mitigate for potential impacts of habitat loss on nesting birds, including birds protected under the MBTA, and including the Species of Special Concern loggerhead shrike and Le Conte's thrasher present on the project area, the following recommended measures would be implemented:

- Vegetation-clearing activities, either during construction or maintenance, would not occur during the nesting season, which is from February 15 to August 31 in the project area.
- If vegetation clearing is required during the nesting season, then a preconstruction nesting bird survey would be conducted by qualified biologists no more than two days prior to vegetation removal activities to identify active nests in the project area. Each active nest would be protected from disturbance by a 75-meter buffer. This no-disturbance buffer would remain in place until a qualified biologist has determined that the young birds have fledged and no new clutch has been initiated.
- Vertical tubes used in project construction, operation, or maintenance would be temporarily or permanently capped at the time they are installed to avoid the entrapment and death of birds protected under the MBTA.
- Because ravens prey on nestlings of other bird species, follow protective measures set forth in the Biological Opinion to minimize raven depredation of tortoises including appropriate garbage

storage, water source management and “implementing predator control programs and participating in regional plans sponsored by the Desert Managers Group to control common ravens”. These measures benefit all desert wildlife that fall prey to the increasing raven numbers.

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Appendix A
Photographs of Habitats in the Project Area

Photograph 1. ***Larrea tridentata-Ambrosia dumosa*** **Shrubland Alliance on ballenas in DUT**

Photograph 2. ***Larrea tridentata-Ambrosia dumosa*** **Shrubland Alliance in washes in DUT**

Photograph 3. Diverse *Larrea tridentata-Ambrosia dumosa* Association East of Goldstone Dry Lake

Photograph 4. Diverse *Larrea tridentata-Ambrosia dumosa* Association South of Echo Site

Photograph 5. *Atriplex polycarpa* Shrubland Alliance near Goldstone Dry Lake

Photograph 6. *Atriplex canescens* Shrubland Alliance Southeast of Goldstone Dry Lake

Appendix B

Photographs of Mojave Indigo-bush and its Habitat

Photograph 7. Mojave Indigo-bush on shoulder of NASA Road

Photograph 8. Mojave Indigo-bush on berm of NASA Road

Photograph 9. Mojave Indigo-bush Detail

Photograph 10. Mojave Indigo-bush Habitat in Wash

Appendix C
Plant List

Family Scientific Name[a]	Common Name	Habit	Plant Location	
			DUT	Linear Routes
GYMNOSPERMS				
Ephedraceae				
Ephedra californica	California ephedra	shrub	X	X
Ephedra nevadensis	Nevada ephedra	shrub	X	X
EUDICOT FLOWERING PLANTS				
Apiaceae				
Lomatium mohavense	desert parsley	perennial herb	X	X
Asteraceae				
Acamptopappus sphaerocephalus var.	rayless goldenhead	shrub	X	X
Adenophyllum cooperi	Cooper's glandweed	perennial herb or	X	X
Ambrosia acanthicarpa	annual bur-sage	annual herb		X
Ambrosia dumosa	white bur-sage	shrub	X	X
Ambrosia salsola	cheesebush	shrub	X	X
Artemisia spinescens	budsage	shrub		X
Bebbia juncea var. *aspera*	sweetbush	shrub	X	
Brickellia incana	woolly brickellia	shrub		X
Chaenactis carphoclinia var.	pebble pincushion	annual herb	X	X
Chaenactis fremontii	Fremont pincushion	annual herb	X	X
Encelia actoni	Acton encelia	shrub	X	X
Encelia farinosa	brittlebush	shrub	X	
Ericameria cooperi var. *cooperi*	Cooper's goldenbush	shrub	X	X
Ericameria cuneata var. *spathulata*	spoonleaf goldenbush	shrub		X
Ericameria paniculata	black-banded rabbitbrush	shrub		X
Ericameria teretifolia	green rabbitbrush	shrub	X	X
Asteraceae				
Eriophyllum ambiguum var. *paleaceum*	annual woolly sunflower	annual herb	X	X
Eriophyllum pringlei	Pringle's woolly sunflower	annual herb		X
Eriophyllum wallacei	Wallace's woolly daisy	annual herb		X
Gutierrezia microcephala	sticky snakeweed	shrub		X
Lasthenia gracilis	common goldfields	annual herb		X
Leptosyne bigelovii	Bigelow tickseed	annual herb		X
Malacothrix coulteri	snake's-head	annual herb	X	X

Family Scientific Name[a]	Common Name	Habit	Plant Location	
			DUT	Linear Routes
Malacothrix glabrata	desert dandelion	annual herb	X	X
Monolopia lanceolata	common hillside daisy	annual herb		X
Monoptilon sp.	desert star	annual herb	X	
Nicolletia occidentalis	hole-in-the-sand plant	perennial herb		X
Prenanthella exigua	brightwhite	annual herb	X	
Rafinesquia neomexicana	desert chicory	annual herb	X	X
Senecio flaccidus var. *monoensis*	smooth threadleaf ragwort	subshrub or shrub		X
Stephanomeria parryi	Parry rock-pink	perennial herb	X	
Stephanomeria pauciflora	wire-lettuce	perennial herb or	X	X
Tetradymia stenolepis	horsebrush	shrub	X	X
Xylorhiza tortifolia var. *tortifolia*	Mojave-aster	perennial herb or	X	X
Bignoniaceae				
Chilopsis linearis ssp. *arcuata*	desert-willow	shrub		X
Boraginaceae				
Amsinckia menziesii	common fiddleneck	annual herb		X
Amsinckia tessellata var. *tessellata*	desert fiddleneck	annual herb	X	X
Cryptantha angustifolia	narrow-leaved cryptantha	annual herb	X	X
Cryptantha circumscissa var.	cushion cryptantha	annual herb	X	X
Cryptantha micrantha var. *micrantha*	red-root cryptantha	annual herb	X	X
Boraginaceae				
Cryptantha nevadensis var. *nevadensis*	Nevada cryptantha	annual herb	X	X
Cryptantha pterocarya var. *pterocarya*	winged-nut cryptantha	annual herb		X
Nama demissum	purple mat	annual herb	X	
Pectocarya linearis ssp. *ferocula*	narrow-toothed pectocarya	annual herb	X	X
Pectocarya platycarpa	wide-toothed pectocarya	annual herb	X	X
Phacelia crenulata	notch-leaved phacelia	annual herb	X	
Phacelia distans	lace-leaf phacelia	annual herb	X	X
Phacelia fremontii	Fremont's phacelia	annual herb		X
Phacelia sp.	phacelia	annual herb	X	X
Phacelia tanacetifolia	tansy-leafed phacelia	annual herb	X	X
Tiquilia plicata	fan-leaved tiquilia	perennial herb		X
Brassicaceae				
*Brassica tournefortii**	Sahara mustard	annual herb	X	X
Caulanthus lasiophyllus	California mustard	annual herb	X	X
Descurainia pinnata	tansy mustard	annual herb	X	X
Lepidium fremontii	desert alyssum	perennial herb or	X	X
Lepidium lasiocarpum ssp. *lasiocarpum*	pepperweed	annual herb	X	X

Family Scientific Name[a]	Common Name	Habit	Plant Location	
			DUT	Linear Routes
*Sisymbrium altissimum**	tumble mustard	annual herb	X	X
*Sisymbrium irio**	London rocket	annual herb	X	X
*Sisymbrium orientale**	oriental hedge mustard	annual herb	X	X
Streptanthella longirostris	long-beaked twistflower	annual herb	X	X
Cactaceae				
Cylindropuntia echinocarpa	silver or golden cholla	perennial stem succulent	X	X
Cylindropuntia ramosissima	pencil cactus	perennial stem succulent	X	X
Echinocactus polycephalus var.	cotton-top cactus	perennial stem succulent	X	X
Opuntia basilaris var. *basilaris*	beavertail	perennial stem succulent	X	X
Campanulaceae				
Nemacladus sp.	threadplant	annual herb	X	X
Chenopodiaceae				
Atriplex canescens	four-wing saltbush	shrub	X	X
Atriplex confertifolia	shadscale	shrub	X	X
Atriplex polycarpa	allscale	shrub	X	X
Atriplex spinifera	spiny saltbush	shrub		X
Grayia spinosa	hop-sage	shrub	X	X
Krascheninnikovia lanata	winter fat	shrub	X	X
*Salsola tragus**	Russian thistle	annual herb	X	X
Cleomaceae				
Peritoma arborea	bladderpod	shrub	X	X
Convolvulaceae				
Cuscuta sp.	dodder	holoparasitic vine	X	
Cucurbitaceae				
Cucurbita palmata	coyote melon	perennial herb	X	X
Euphorbiaceae				
Croton setigerus	turkey-mullein	annual herb		X
Euphorbia albomarginata	rattlesnake weed	perennial herb	X	X
Euphorbia polycarpa	small-seed sandmat	perennial herb		X
Stillingia linearifolia	linear-leaved stillingia	perennial herb	X	X
Fabaceae				
Acmispon wrangelianus	deervetch	annual herb	X	X
Acmispon sp.	deervetch	annual herb	X	
Astragalus layneae	Layne milkvetch	perennial herb		X
Astragalus lentiginosus	freckled milkvetch	perennial herb	X	X
Astragalus lentiginosus var. *fremontii*	Fremont's milkvetch	perennial herb	X	
Fabaceae				

Family Scientific Name[a]	Common Name	Habit	Plant Location	
			DUT	Linear Routes
Dalea mollissima	silk dalea	annual or perennial herb		X
Lupinus concinnus	bajada lupine	annual herb	X	X
Lupinus microcarpus var. *horizontalis*	sunrise lupine	annual herb	X	X
Lupinus sp.	lupine	annual herb	X	X
*Parkinsonia aculeata**	Mexican palo verde	tree		X
Prosopis glandulosa var. *torreyana*	honey mesquite	tree		X
Psorothamnus arborescens var.	little-leaved Mojave indigo-	shrub		X
Psorothamnus arborescens var.	Mojave indigo-bush	shrub		X
Psorothamnus polydenius	Nevada indigo-bush	shrub	X	
Senna armata	spiny senna	shrub	X	X
Geraniaceae				
Erodium cicutarium	redstem filaree	annual herb	X	X
Erodium texanum	Texas filaree	annual herb	X	X
Krameriaceae				
Krameria erecta	Pima rhatany	shrub	X	X
Lamiaceae				
Salvia carduacea	thistle sage	annual herb		X
Salvia columbariae	chia	annual herb	X	X
Scutellaria mexicana	bladder-sage	shrub	X	X
Loasaceae				
Mentzelia albicaulis	white-stem stick-leaf	annual herb		X
Mentzelia sp.	blazing star	annual herb	X	X
Malvaceae				
Eremalche exilis	white mallow	annual herb	X	
Eremalche rotundifolia	desert fivespot	annual herb	X	
Sphaeralcea ambigua	desert mallow	perennial herb	X	X
Nyctaginaceae				
Mirabilis laevis	wishbone bush	perennial herb	X	X
Onagraceae				
Camissonia campestris ssp. *campestris*	Mojave sun cup	annual herb	X	X
Camissonia kernensis ssp. *gilmanii*	Gilman's evening-primrose	annual herb		X
Chylismia brevipes	golden evening-primrose	annual herb	X	
Chylismia brevipes ssp. *brevipes*	golden evening-primrose	annual herb		X
Chylismia claviformis	brown-eyed primrose	annual herb	X	X
Eremothera boothii ssp. *condensata*	dwarf woody bottlewasher	annual herb	X	X
Eremothera boothii ssp. *desertorum*	woody bottlewasher	annual herb	X	X
Papaveraceae				

Family Scientific Name[a]	Common Name	Habit	Plant Location	
			DUT	Linear Routes
Eschscholzia minutiflora	little gold-poppy	annual herb	X	X
Plantaginaceae				
Plantago ovata var. *fastigiata*	desert plantain	annual herb	X	X
Polemoniaceae				
Eriastrum eremicum	desert woollystar	annual herb	X	X
Eriastrum sp.	woollystar	annual herb	X	
Gilia transmontana	transmontane gilia	annual herb		X
Gilia sp.	gilia	annual herb	X	X
Langloisia setosissima	langloisia	annual herb	X	X
Linanthus dichotomus ssp. *dichotomus*	evening snow	annual herb		X
Loeseliastrum sp.	loeseliastrum	annual herb	X	
Polygonaceae				
Chorizanthe brevicornu var. *brevicornu*	brittle spineflower	annual herb	X	X
Chorizanthe rigida	devil's spineflower	annual herb	X	X
Chorizanthe watsonii	Watson's spineflower	annual herb		X
Eriogonum brachypodum	Parry's wild buckwheat	annual herb	X	X
Polygonaceae				
Eriogonum deflexum	skeleton weed	annual herb	X	X
Eriogonum deflexum var. *deflexum*	flat-topped skeleton weed	annual herb	X	X
Eriogonum fasciculatum var. *polifolium*	Mojave Desert California	shrub		X
Eriogonum gracillimum	rose-and-white wild	annual herb	X	X
Eriogonum inflatum	desert trumpet	perennial herb	X	X
Eriogonum maculatum	spotted wild buckwheat	annual herb		X
Eriogonum nidularium	birdnest wild buckwheat	annual herb	X	X
Eriogonum pusillum	yellow turbans	annual herb	X	X
Eriogonum reniforme	kidney-leaf wild buckwheat	annual herb	X	X
Eriogonum trichopes	little desert trumpet	annual herb	X	
Oxytheca perfoliata	round-leaf puncturebract	annual herb	X	X
Rumex hymenosepalus	wild-rhubarb	perennial herb		X
Ranunculaceae				
Delphinium parishii ssp. *parishii*	desert larkspur	perennial herb	X	X
Rutaceae				
Thamnosma montana	turpentine broom	subshrub or shrub	X	X
Solanaceae				
Lycium andersonii	Anderson's wolfberry	shrub	X	X
Lycium cooperi	box-thorn	shrub	X	X

Family Scientific Name[a]	Common Name	Habit	Plant Location	
			DUT	Linear Routes
Lycium pallidum var. *oligospermum*	rabbit-thorn	shrub	X	
Tamaricaeae				
Tamarix ramosissima	saltcedar	shrub or tree		X
Zygophyllaceae				
Larrea tridentata	creosote bush	shrub	X	X
MONOCOT FLOWERING PLANTS				
Agavaceae				
Yucca brevifolia	Joshua tree	perennial leaf succulent,	X	X
Poaceae				
*Arundo donax**	giant reed	perennial grass		X
Bromus madritensis ssp. *rubens**	red brome	annual grass	X	X
Elymus elymoides	squirreltail	perennial grass		X
*Schismus arabicus**	Arabian grass	annual grass	X	X
*Schismus barbatus**	Mediterranean grass	annual grass	X	X
Stipa hymenoides	sand rice grass	perennial grass	X	X
Stipa speciosa	desert needle grass	perennial grass	X	X
Themidaceae				
Dichelostemma capitatum	blue dicks	perennial herb		X

Appendix D
Desert Tortoise Survey Results

Desert Tortoise and Desert tortoise Signs Observed on the Project					
GPS ID	**EASTING**	**NORTHING**	**DATE**	**SIGN TYPE**	**NOTES (scat-ty,nty; burrow-poor, good, excellent, active, juv, imm, adult; carcass- tsd, est. mcl; live tortoise-complete data sheet)**
Burrow01	514773	3921886	5/3/18	Burrow	Adult, good
Burrow02	514810	3922047	5/2/18	Burrow	Adult, poor
Burrow03	514826	3922620	5/2/18	Burrow	Imm, poor
Burrow04	514854	3921445	5/2/18	Burrow	Adult, poor
Burrow05	515234	3923312	5/1/18	Burrow	Adult, poor, BUOW signs
Burrow06	515279	3921612	5/7/18	Burrow	Active 230mm
Burrow07	515538	3921350	5/7/18	Burrow	Adult- Good 340mm
Burrow08	515561	3921972	5/7/18	Burrow	Imm, good
Burrow09	515569	3921797	5/7/18	Burrow	Imm, poor
Burrow10	515649	3920731	5/7/18	Burrow	Adult, good (with kit fox and BUOW signs)
Burrow11	515656	3921659	5/8/18	Burrow	Adult, good
Burrow12	515706	3921653	5/8/18	Burrow	Adult, excellent
Burrow13	515781	3921008	5/7/18	Burrow	Adult, good
Burrow14	515813	3921765	5/8/18	Burrow	Adult, good
Burrow15	515822	3920908	5/7/18	Burrow	Adult, good
Burrow16	515862	3921014	5/8/18	Burrow	Adult, good
Burrow17	515876	3921583	5/8/18	Burrow	Adult, good
Burrow18	515886	3921442	5/8/18	Burrow	Adult, excellent
Burrow19	515891	3921254	5/8/18	Burrow	Adult, good
Burrow20	515952	3921530	5/8/18	Burrow	Adult, excellent w/scat
Burrow21	516023	3921745	5/9/18	Burrow	Adult, good
Burrow22	516025	3921091	5/9/18	Burrow	Adult, good
Burrow23	516031	3921943	5/9/18	Burrow	Adult, excellent 240mm
Burrow24	516038	3921547	5/9/18	Burrow	Adult, good
Burrow25	516208	3921543	5/9/18	Burrow	Adult, good
Burrow26	516278	3921431	5/9/18	Burrow	Adult, good
Burrow27	516316	3920251	5/13/18	Burrow	Excellent, Scat and Tracks approx. 160mm
Burrow28	516318	3921674	5/9/18	Burrow	Imm, good
Burrow29	516347	3920280	5/13/18	Burrow	Adult, Excellent approx. 175mm
Burrow30	516350	3921348	5/9/18	Burrow	Imm, good
Burrow31	516355	3921871	5/9/18	Burrow	Adult, excellent
Burrow32	516430	3921494	5/9/18	Burrow	Imm, excellent

Desert Tortoise and Desert tortoise Signs Observed on the Project					
GPS ID	**EASTING**	**NORTHING**	**DATE**	**SIGN TYPE**	**NOTES (scat-ty,nty; burrow-poor, good, excellent, active, juv, imm, adult; carcass- tsd, est. mcl; live tortoise-complete data sheet)**
Burrow33	516438	3921763	5/9/18	Burrow	Active
Burrow34	516503	3921524	5/9/18	Burrow	Active
Burrow35	516528	3920234	5/13/18	Burrow	Active
Burrow36	516529	3921772	5/9/18	Burrow	Adult, good
Burrow37	516569	3921505	5/10/18	Burrow	Adult, good
Burrow38	516694	3921654	5/8/18	Burrow	Active, approx. 180mm
Burrow39	516721	3921614	5/8/18	Burrow	Adult, good
Burrow40	517178	3920247	5/13/18	Burrow	Adult, good
Burrow41	514362	3922036	5/3/18	Burrow	260mm, good
Burrow42	515654	3922413	5/1/18	Burrow	Excellent, 170mm with TY scat
Burrow43	516094	3922062	5/11/18	Burrow	Adult, excellent, with egg shells
Burrow44	516350	3922150	5/12/18	Burrow	Adult, poor
Burrow45	516760	3920688	5/8/18	Burrow	Adult, 280mm, poor
Burrow46	516825	3920495	5/9/18	Burrow	Adult, 270mm, good
Burrow47	517123	3920806	5/9/18	Burrow	Adult, 200mm, poor
Burrow48	517125	3920740	5/9/18	Burrow	Adult, excellent, approx. 200mm
Burrow49	517228	3920952	5/9/18	Burrow	Adult, 300mm, good
Burrow50	517250	3920933	5/9/18	Burrow	Adult 300mm, poor
Burrow51	517333	3920666	5/9/18	Burrow	Adult, poor
Burrow52	523263	3901866	5/15/18	Burrow	Adult, excellent, w/scat
Burrow53	523276	3901820	5/15/18	Burrow	Adult, active with live tortoise
Burrow54	523394	3902190	5/15/18	Burrow	Adult, excellent, w/scat (possible tortoise inside)
Burrow/pallet55	516293	3922005	5/9/18	Burrow/pallet	Adult, excellent
Burrow/pallet56	515862	3921016	5/7/18	Burrow/pallet	Adult 300mm, poor
Burrow57	517954	3905115	5/15/18	Burrow	fair, 220mm wide, 1m deep
Burrow58	510304	3915141	5/21/18	Burrow	Rock shelter
Burrow59	509646	3915717	5/21/18	Burrow	Caliche, end visible, 220mm wide
Burrow60	513200	3913248	5/22/18	Burrow	Fair, end visible
Burrow61	510465	3915189	5/22/18	Burrow	Caliche, 1 scat TY, 2 scat NTY
Burrow62	512255	3914343	5/22/18	Burrow	Good, Adult
Burrow63	514816	3910268	5/25/18	Burrow	Good, Adult approx. 240mm wide
Burrow64	519111	3903472	5/26/18	Burrow	Good, Adult, approx. 220mm wide, end visible
Burrow65	521787	3900344	5/27/18	Burrow	Good, adult approx. 180mm wide
Burrow66	522230	3900491	5/27/18	Burrow	Good, Adult, 270mm wide
Burrow67	522208	3900467	5/27/18	Burrow	Excellent, Adult, 270mm wide, scat TY
Burrow68	511545	3912391	5/14/18	Burrow	active
Burrow69	522463	3900903	5/15/18	Burrow	Excellent, 310 mm wide, adult
Burrow70	516173	3909418	5/26/18	Burrow	Poor, Adult, 200 mm wide, 300 mm deep

Desert Tortoise and Desert tortoise Signs Observed on the Project					
GPS ID	**EASTING**	**NORTHING**	**DATE**	**SIGN TYPE**	**NOTES (scat-ty,nty; burrow-poor, good, excellent, active, juv, imm, adult; carcass- tsd, est. mcl; live tortoise- complete data sheet)**
Burrow71	510692	3917683	5/27/18	Burrow	Fair, 220mm wide, 200mm deep
Carcass01	514579	3919959	5/13/18	Carcass	165mm 2-4yrs, under J tree (DUT BUOW Buffer)
Carcass02	515222	3922736	5/1/18	Carcass	Juvenile 1-2 yrs, predated, under j tree
Carcass03	515303	3923061	5/1/18	Carcass	1-2 yrs, Male 225mm
Carcass04	516441	3921876	5/9/18	Carcass	Adult D/A Male 260mm 2-4 yrs
Carcass05	516757	3921288	5/8/18	Carcass	D/A Imm 2-4yrs
Carcass06	517681	3921516	5/10/18	Carcass	Juvenile, 2-4 yrs
Carcass07	514013	3921102	5/2/18	Carcass	Imm, D/A approx. 150mm unk. 2-4yrs
Carcass08	514244	3921142	5/3/18	Carcass	Imm, D/A 140mm unk. 2-4yrs
Carcass09	514337	3921070	5/3/18	Carcass	Adult, D/A one piece scute and bone, 1-2yrs
Carcass10	516368	3920361	5/8/18	Carcass	D/A approx. 120mm, 1-2yrs
Carcass11	516867	3920374	5/9/18	Carcass	Adult, D/A, >4yrs, scattered
Carcass12	517003	3920824	5/9/18	Carcass	Adult, D/A, >4yrs, scattered
Carcass13	517272	3920369	5/9/18	Carcass	Adult, D/A, >4yrs, 3 pieces
Carcass14	510156	3918170	5/14/18	Carcass	200 mm MCL, male, >4 years TSD
Carcass15	511798	3912137	5/14/18	Carcass	250 mm MCL, male, >4 years TSD
Carcass16	523364	3901623	5/15/18	Carcass	>4 years TSD
Carcass17	511598	3912288	5/15/18	Carcass	120 mm MCL, 2-4 years TSD
Scat01	514812	3921748	5/2/18	Scat	NTY
Scat02	515282	3921592	5/7/18	Scat	NTY
Scat03	515363	3922073	5/1/18	Scat	TY, 2 pieces
Scat04	515383	3921990	5/1/18	Scat	TY
Scat05	515533	3920180	5/13/18	Scat	TY
Scat06	515540	3921540	5/7/18	Scat	NTY
Scat07	516079	3921252	5/9/18	Scat	TY
Scat08	516109	3922001	5/9/18	Scat	NTY
Scat09	516374	3921759	5/9/18	Scat	NTY
Scat10	515391	3921468	5/13/18	Scat	TY
Scat11	515399	3921379	5/13/18	Scat	NTY
Scat12	516052	3922071	5/11/18	Scat	NTY, Adult
Scat13	517093	3920697	5/9/18	Scat	TY, small adult
Scat14	518343	3903982	5/15/18	Scat	NTY, adult
Scat15	513097	3913312	5/21/18	Scat	TY, Adult
Scat16	512057	3914371	5/22/18	Scat	TY, 2 scat
Scat17	522010	3900423	5/15/18	Scat	TY
Scat18	521732	3900406	5/15/18	Scat	TY
Tortoise01	514694	3921590	5/3/18	Tortoise	Adult 220mm Male
Tortoise02	514734	3921652	5/3/18	Tortoise	Adult 220mm Male- same tortoise as WP049

Desert Tortoise and Desert tortoise Signs Observed on the Project					
GPS ID	**EASTING**	**NORTHING**	**DATE**	**SIGN TYPE**	**NOTES (scat-ty,nty; burrow-poor, good, excellent, active, juv, imm, adult; carcass- tsd, est. mcl; live tortoise-complete data sheet)**
Tortoise03	515279	3921612	5/7/18	Tortoise	Adult 210 Female
Tortoise04	515310	3922451	5/1/18	Tortoise	Juvenile 85mm
Tortoise05	515316	3922424	5/1/18	Tortoise	Imm 125mm
Tortoise06	515723	3921664	5/8/18	Tortoise	Adult 235 Male w/tag NTC1324
Tortoise07	516032	3921823	5/9/18	Tortoise	170mm unk.
Tortoise08	516438	3921763	5/9/18	Tortoise	Approx. 160mm in burrow
Tortoise09	516476	3921658	5/9/18	Tortoise	Approx. 220mm Female in burrow
Tortoise10	516503	3921524	5/9/18	Tortoise	Approx. 130mm in burrow
Tortoise11	516528	3920234	5/13/18	Tortoise	Approx. 160mm in burrow
Tortoise12	516694	3921654	5/8/18	Tortoise	In burrow, 180mm
Tortoise13	515652	3922414	5/1/18	Tortoise	Imm, 120-130mm, deep in burrow
Tortoise14	517126	3920739	5/9/18	Tortoise	Adult, in burrow, unk.
Tortoise15	523276	3901820	5/15/18	Tortoise	Adult Male in burrow, approx. 300mm entrance
Tortoise16	511546	3912391	5/14/18	Tortoise	180 mm in tortoise burrow
Tortoise17	522414	3900836	5/15/18	Tortoise	Tortoise in burrow, 280 mm wide
Tracks01	516003	3922005	5/9/18	Tracks	Adult
Tracks02	516152	3921777	5/9/18	Tracks	Adult
Tracks03	516173	3921743	5/9/18	Tracks	Adult
Tracks04	516456	3921515	5/9/18	Tracks	Small Adult

Appendix E
Photographs of Desert Tortoise

Juvenile Tortoise after the Rain

210 mm Female relocated by Fort Irwin Biologist out of harm's way. It was immediately adjacent to military activities. Recent tracks partially crushed burrow.

Tortoise in Burrow. Approximately 160 mm.

Carcass of Adult Approximately 260mm Male. Time since death 2-4 yrs.

Tortoise scat

Large disturbed area near tortoise activity on the DUT.

Appendix F

Photographs of Mohave Ground Squirrel and its Habitat

Photograph 11. Mohave Ground Squirrel at Camera #19

Photograph 12. Mohave and Round-tailed Ground Squirrels at Camera #19

Photograph 13. Round-tailed Ground Squirrel at Camera #29

Photograph 14. Round-tailed Ground Squirrel at Camera #44

Photograph 15. Mohave Ground Squirrel Occupied Habitat at Camera #19

Photograph 16. Disturbances at Mohave Ground Squirrel Occupied Habitat, Camera #19

Appendix G

Camera Wildlife List

Species	Cameras 01-22																					
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
Tiger Whiptail Aspidoscelis tigris				X	X		X		X			X					X		X	X		X
Zebra-tailed Lizard Callisaurus draconoides		X	X		X	X	X		X	X	X	X			X		X		X			
Long-nosed Leopard Lizard Gambelia wislizenii																						
Desert Horned Lizard Phrynosoma platyrhinos		X				X					X				X							
Turkey Vulture Cathartes aura			X																			
Golden Eagle Aquila chrysaetos										X												
Mourning Dove Zenaida macroura																						
Greater Roadrunner Geococcyx californianus																						
Say's Phoebe Saya sayornis									X													
Common Raven Corvus corax	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Horned Lark Eremophila alpestris							X			X		X		X					X	X		
LeConte's Thrasher Toxostoma lecontei	X														X						X	X

Species	Cameras 01-22																					
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
Black-throated Sparrow Amphispiza bilineata			X	X			X	X	X													
Black-tailed Jackrabbit Lepus californicus		X		X											X	X	X					
Desert Cottontail Sylvilagus audubonii																						
Coyote Canis latrans	X	X				X	X		X			X					X			X		
Desert Kit Fox Vulpes macrotis asipus										X	X											
Bobcat Lynx rufus																						
American Badger Taxidea taxus																						
Feral Ass Equus asinus												X										
Desert Woodrat Neotoma lepida																						
Kangaroo Rat sp. Dipodomys sp.			X	X			X									X	X					
White-tailed Antelope Squirrel *Ammospermophilus leucurus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
Mohave Ground Squirrel Xerospermophilus mohavensis																			X			
Round-tailed Ground Squirrel Xerospermophilus tereticaudus			X	X	X						X	X	X						X	X	X	

Species	Cameras 23-42																					
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Tiger Whiptail Aspidoscelis tigris						X	X	X	X	X	X		X	X	X	X		X		X		
Zebra-tailed Lizard Callisaurus draconoides	X		X	X	X				X			X										
Long-nosed Leopard Lizard Gambelia wislizenii												X						X				
Desert Horned Lizard Phrynosoma platyrhinos																						
Turkey Vulture Cathartes aura					X																	
Golden Eagle Aquila chrysaetos																						
Mourning Dove Zenaida macroura						X																
Greater Roadrunner Geococcyx californianus											X											
Say's Phoebe Saya sayornis																						
Common Raven Corvus corax	X	X	X	X	X	X	X	X		X	X			X			X	X	X	X		
Horned Lark Eremophila alpestris					X												X					
LeConte's Thrasher Toxostoma lecontei			X				X												X			
Black-throated Sparrow Amphispiza bilineata																		X				
Black-tailed Jackrabbit Lepus californicus	X				X	X		X	X		X	X		X	X			X				X

Species	Cameras 23-42																					
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Desert Cottontail Sylvilagus audubonii											X											
Coyote Canis latrans					X	X					X								X			
Desert Kit Fox Vulpes macrotis asipus			X																			
Bobcat Lynx rufus											X											
American Badger Taxidea taxus						X																
Feral Ass Equus asinus					X																	X
Desert Woodrat Neotoma lepida																						
Kangaroo Rat sp. Dipodomys sp.	X				X	X	X				X				X			X	X		X	
White-tailed Antelope Squirrel *Ammospermophilus leucurus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mohave Ground Squirrel Xerospermophilus mohavensis																						
Round-tailed Ground Squirrel Xerospermophilus tereticaudus						X	X	X														X

Appendix H

Photographs of Sensitive and Other Wildlife Species

Photograph 17. Golden Eagle, Camera #10

Photograph 18. LeConte's Thrasher, Camera #25

Photograph 19. Turkey Vulture and Common Raven, Camera #03

Photograph 20. White-tailed Antelope Squirrels, Camera #23

Photograph 21. American Badger, Camera #28

Photograph 22. Desert Kit Fox, Camera #10

Photograph 23. Coyote, Camera #12

Photograph 24. Black-tailed Hare, Camera #15

Photograph 25. Greater Roadrunner, Camera #33

Photograph 26. Feral Ass, Camera #12

Appendix I
Sensitive Wildlife Survey Results

Sensitive Wildlife and Wildlife Signs Observed on the Project

GPS ID	Easting	Northing	DATE	SPECIES	SIGN TYPE	NOTES (sign this year or last year, other observations)
Badger01	514399	3922307	5/3/18	Badger	Dig/Burrow	TY
Badger02	515674	3920860	5/7/18	Badger	Burrow	TY (x2)
Badger03	516781	3921620	5/8/18	Badger	Burrow	TY
Badger04	516104	3921385	5/9/18	Badger	Burrow	TY
Badger05	521497	3900003	5/17/18	Badger	Burrow	NTY
Badger06	513456	3912703	5/21/18	Badger	Burrow	NTY, 200mm wide, 3 holes
Badger07	512803	3913791	5/21/18	Badger	Burrow	NTY, end not visible
Badger08	513113	3913071	5/22/18	Badger	Burrow	NTY, end not visible
Badger09	511986	3913440	5/22/18	Badger	Burrow	NTY, end not visible
Badger10	511536	3913339	5/23/18	Badger	Burrow	NTY, end not visible
Badger11	511916	3912312	5/23/18	Badger	Burrow	NTY, end not visible
Badger12	512303	3912438	5/23/18	Badger	Burrow	NTY, end not visible
Badger13	513123	3912715	5/23/18	Badger	Burrow	Active, end not visible
Badger14	513268	3912773	5/23/18	Badger	Burrow	3 holes, NTY, end not visible
Badger15	512285	3912454	5/23/18	Badger	Burrow	Active, end not visible
Badger16	511885	3912306	5/23/18	Badger	Burrow	NTY, end visible
Badger17	511526	3912515	5/23/18	Badger	Burrow	3 holes, NTY, end not visible
Badger18	509901	3917108	5/24/18	Badger	Burrow	NTY, end not visible
Badger19	509887	3917025	5/24/18	Badger	Burrow	NTY, end visible
Badger20	509869	3916939	5/24/18	Badger	Burrow	NTY, end visible
Badger21	510009	3917010	5/24/18	Badger	Burrow	NTY, end visible
Badger22	514837	3910244	5/25/18	Badger	burrow	NTY, end not visible
Badger23	521446	3900068	5/26/18	Badger	burrow	NTY, end not visible
Badger24	523076	3898682	5/26/18	Badger	burrow	NTY, end visible
Badger25	519502	3903468	5/26/18	Badger	burrow	NTY, end visible
Badger26	512945	3912885	5/27/18	Badger	burrow	NTY, end visible
Badger27	512716	3912981	5/27/18	Badger	burrow	Active, end visible, tracks
Badger28	512434	3913139	5/27/18	Badger	burrow	2 holes, TY, end visible
Badger29	509278	3915937	5/27/18	Badger	burrow	Active, end not visible
Badger30	509738	3916714	5/27/18	Badger	burrow	Active, end not visible
Badger31	514213	3911443	5/27/18	Badger	burrow	NTY, end not visible
Badger32	513953	3911895	5/27/18	Badger	burrow	NTY, end not visible
Badger33	516549	3907016	5/27/18	Badger	burrow	NTY, end visible
Badger34	521890	3899479	5/28/18	Badger	burrow	NTY, end visible
Badger35	514769	3923432	5/2/18	Badger	Dig	TY

Sensitive Wildlife and Wildlife Signs Observed on the Project

GPS ID	Easting	Northing	DATE	SPECIES	SIGN TYPE	NOTES (sign this year or last year, other observations)
Badger36	510734	3917746	5/26/18	Badger	live	running across road
Badger37	518788.7	3920431		Badger	Live Animal	CAMERA
Badger38	510760	3917628	5/21/18	Badger	burrow	Old, 300mm deep
Badger39	510630	3917621	5/27/18	Badger	burrow	Old, 400mm deep
Badger40	511190	3918222	5/27/18	Badger	burrow	Recent, >1 meter deep
Badger41	520106	3903735	5/27/18	Badger	burrow	Two holes, recent, both >1 meter deep
GOEA01	516134.7	3922179		GOEA	Live Animal	CAMERA
Kit Fox01	515398	3922742	5/1/18	Kit Fox	Burrow	NTY
Kit Fox02	515379	3923684	5/1/18	Kit Fox	Burrow	TY
Kit Fox03	514866	3923673	5/2/18	Kit Fox	Burrow	TY
Kit Fox04	513964	3921334	5/4/18	Kit Fox	Burrow	TY
Kit Fox05	513685	3922122	5/5/18	Kit Fox	Burrow	TY
Kit Fox06	515682	3921718	5/7/18	Kit Fox	Burrow	TY
Kit Fox07	515889	3921247	5/8/18	Kit Fox	Burrow	TY
Kit Fox08	520825	3900951	5/26/18	Kit Fox	burrow	NTY, end visible
Kit Fox09	512882	3913646	5/21/18	Kit Fox	burrow	5 holes, NTY
Kit Fox10	516842	3922463	5/12/18	Kit Fox	Burrow	TY
Kit Fox11	516117	3923147	5/13/18	Kit Fox	Burrow	TY
Kit Fox12	516227	3923571	5/13/18	Kit Fox	Burrow	TY
Kit Fox13	517086	3923076	5/14/18	Kit Fox	Burrow	TY
Kit Fox14	515371	3923909	5/1/18	Kit Fox	Burrow/Complex	TY
Kit Fox15	515460	3923376	5/1/18	Kit Fox	Burrow/Scat	TY
Kit Fox16	514675	3922992	5/3/18	Kit Fox	Complex	NTY/ BUOW signs
Kit Fox17	514745	3920665	5/3/18	Kit Fox	Complex	TY
Kit Fox18	514448	3920644	5/4/18	Kit Fox	Complex	NTY
Kit Fox19	513523	3921992	5/5/18	Kit Fox	Complex	NTY
Kit Fox20	513156	3921502	5/5/18	Kit Fox	Complex	TY
Kit Fox21	515612	3921487	5/8/18	Kit Fox	Complex	TY
Kit Fox22	515739	3921929	5/8/18	Kit Fox	Complex	TY
Kit Fox23	516441	3921861	5/9/18	Kit Fox	Complex	TY
Kit Fox24	517150	3921635	5/10/18	Kit Fox	Complex	TY/Active
Kit Fox25	517350	3922000	5/10/18	Kit Fox	Complex	TY
Kit Fox26	518186	3921337	5/11/18	Kit Fox	Complex	TY
Kit Fox27	514640	3910422	5/25/18	Kit Fox	Complex	5 holes, active, tracks
Kit Fox28	514893	3910095	5/25/18	Kit Fox	Complex	NTY, 2 holes
Kit Fox29	515541	3923878	5/1/18	Kit Fox	Complex	TY- Active
Kit Fox30	515987	3922043	5/2/18	Kit Fox	Complex	TY- fresh scat
Kit Fox31	515794	3923656	5/2/18	Kit Fox	Complex	TY
Kit Fox32	514052	3920712	5/3/18	Kit Fox	Complex	TY

Sensitive Wildlife and Wildlife Signs Observed on the Project

GPS ID	Easting	Northing	DATE	SPECIES	SIGN TYPE	NOTES (sign this year or last year, other observations)
Kit Fox33	513937	3920809	5/4/18	Kit Fox	Complex	TY
Kit Fox34	513320	3920388	5/5/18	Kit Fox	Complex	TY- 9 entrances
Kit Fox35	516353	3922992	5/12/18	Kit Fox	Complex	TY- 2 entrances
Kit Fox36	516436	3922974	5/12/18	Kit Fox	Complex	TY- 3 entrances
Kit Fox37	516134.7	3922179		Kit Fox	Live Animal	CAMERA
Kit Fox38	516902.4	3922059		Kit Fox	Live Animal	CAMERA
Kit Fox39	516245.6	3920825		Kit Fox	Live Animal	CAMERA
Kit Fox40	520128	3903627	5/27/18	Kit Fox	burrow	One hole, old, >1 m deep, no scat
LETH01	515316.3	3923682		LETH	Live Animal	CAMERA
LETH02	514433.6	3921554		LETH	Live Animal	CAMERA
LETH03	513217.2	3920568		LETH	Live Animal	CAMERA
LETH04	513956.4	3920504		LETH	Live Animal	CAMERA
LETH05	516245.6	3920825		LETH	Live Animal	CAMERA
LETH06	513249.1	3919976		LETH	Live Animal	CAMERA
LETH07	510357.4	3914718		LETH	Live Animal	CAMERA
LETH08	519374.5	3903233	5/14/18	Leth	live	
LOSH01	515214	3909793	5/25/18	LOSH	live	Calling from Yucca, adult
LOSH02	519831	3903470	5/26/18	LOSH	live	birds interacting in wash
MGS01	516824	3921916	5/8/18	MGS	Live Animal	MGS

Appendix J

California Native Species Field Survey Forms

Mojave Indigo-bush

Site 1

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/15/2018 & 5/16

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Psorothamnus arborescens var. ~~ssp.~~ arborescens

Common Name:

Species Found? (X) Yes ( ) No _____ If not found, why?

Total No. Individuals: ~~3~~ 10 Subsequent Visit? ( ) Yes (X) No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: N/A Number _____ Museum / Herbarium

Reporter: ~~Yousse~~ Youssef Atallah
Address: 154 Paseo Bravo
Palm Desert, CA 92211
E-mail Address: yatallah1@gmail.com
Phone: 909-379-4789

Plant Information
Phenology:
10 % vegetative | 0 % flowering | 0 % fruiting

Animal Information
_____ # adults | _____ # juveniles | _____ # larvae | _____ # egg masses | _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ tek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: Goldstone Deep Space Tracking Center
Quad Name: _____ Elevation: 1006 m
T___ R___ Sec___, ___ 1/4 of ___ 1/4, Meridian: H ( ) M ( ) S ( ) Source of Coordinates (GPS, topo. map & type): GPS
T___ R___ Sec___, ___ 1/4 of ___ 1/4, Meridian: H ( ) M ( ) S ( ) GPS Make & Model: iPhone 8 / Gaia GPS
DATUM: NAD27 ( ) NAD83 ( ) WGS84 (X) Horizontal Accuracy: _____ meters/feet
Coordinate System: UTM Zone 10 ( ) UTM Zone 11 (X) OR Geographic (Latitude & Longitude) ( )
Coordinates: ~~517074E, 3905944N~~ 517080E, 3905936N; 517080E, 3905938N; 517082E, 3905939N; 516539E, 3907022N; 516543E, 3907044N; 516589E, 3907169N; 516690E, 3907168N; 517201E, 3905996N; 517200E, 3905995N; 516366E, 3908408N.

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope:
Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):
Larrea tridentata - Ambrosia dumosa plant community. Associates include Ambrosia salsola, Ephedra nevadensis, Thamnosma montana, Xylorhiza tortifolia. Decomposed granite near wash and granite rock outcrops. Gentle N-facing slope. One plant @ ~~516352E, 3908408N~~ occurred in Larrea-Ambrosia scrub in a mix of basalt rock and decomposed granite. → 516366E, 3908408N

Please fill out separate form for other rare taxa seen at this site. NONE

Site Information Overall site/occurrence quality/viability (site + population): (X) Excellent ( ) Good ( ) Fair ( ) Poor
Immediate AND surrounding land use: Open space and power line corridors (plants under power lines).
Visible disturbances: none
Threats: Potential of upgrade of power line
Comments:
3 Plants close together, within 1-2 m of each other at southernmost site. The 10 plants scattered in a 10m wide survey transect approximately 2 miles long. A few other plants nearby transect were seen but not recorded.

Determination: (check one or more, and fill in blanks)
☒ Keyed (cite reference): Jepson Manual
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☒ By another person (name): Mark Bagley & Youssef Atallah
☐ Other: _____

Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	☐	☐	☒
Habitat	☐	☐	☒
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ( ) yes ( ) no

CDFW/BDB/1747 Rev. 7/15/2015

Site 2

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/16/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Psorothamnus arborescens var. arborescens

Common Name:

Species Found? (X) Yes ( ) No _____ If not found, why?

Total No. Individuals: ~~20~~ 43 Subsequent Visit? ( ) Yes (X) No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: MICHAEL HONER
Address: 7632 ANCHOR DR
GOLETA CA 93117
E-mail Address: mihoner@earthlink.net
Phone: 805 450 7608

Plant Information
Phenology:
99 % vegetative | _____ % flowering | 1 % fruiting

Animal Information
_____ # adults | _____ # juveniles | _____ # larvae | _____ # egg masses | _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: USA : Fort Irwin
Quad Name: _____ Elevation: _____
T___, R___ Sec___, ___¼ of ___¼, Meridian: H ( ) M ( ) S ( ) Source of Coordinates (GPS, topo, map & type): GPS
T___, R___ Sec___, ___¼ of ___¼, Meridian: H ( ) M ( ) S ( ) GPS Make & Model: GARMIN 78SC
DATUM: NAD27 ( ) NAD83 ( ) WGS84 (X) Horizontal Accuracy: 5 m meters/feet
Coordinate System: UTM Zone 10 ( ) UTM Zone 11 ( ) OR Geographic (Latitude & Longitude) ( )
Coordinates: LINEAR POPULATION ALONG ROAD EDGES RUNNING 2KM BETWEEN 11S 525687, 3902278 AND 11S 523996, 3902415 (20 plants)
+23 plants along adjacent water line between 525216E, 3902309N + 525722E, 3902766N

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope:
Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):
On loose D.G. soil pushed up from road margin blading.
Approx 5m from active paved road. Larrea / Ambrosia scrub
with Ambrosia salsola, Ephedra californica, common desert annuals + weeds

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ( ) Excellent ( ) Good ( ) Fair (X) Poor
Immediate AND surrounding land use: military transport + training
Visible disturbances: Road blading, vehicles pulling off pavement, tanks, bombs, etc.
Threats: Base expansion, Utility upgrades, road maintenance, bombs
Comments: well developed healthy plants persisting + fruiting in spite of difficult living situation

Determination: (check one or more, and fill in blanks)
(X) Keyed (cite reference): Desert Jepson
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	☐	☐	☒
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? (•) yes ( ) no

Site 3

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/16/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Boraginaceae arborescens var. arborescens

Common Name:

Species Found? ⊗ Yes ○ No _____ If not found, why?

Total No. Individuals: 9 Subsequent Visit? ○ Yes ⊗ No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Cecile Shohet
Address: 2683 Takelma Way
Ashland, OR 97520
E-mail Address: cshohet@gmail.com
Phone: 510-604-8201

Plant Information
Phenology:
10 % vegetative | 40 % flowering | 50 % fruiting

Animal Information
_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: DoD - Ft Irwin
Quad Name: _____ Elevation: 1000m
T___ R___ Sec___, ___ 1/4 of ___ 1/4, Meridian: H ○ M ○ S ○ Source of Coordinates (GPS, topo. map & type): _____
T___ R___ Sec___, ___ 1/4 of ___ 1/4, Meridian: H ○ M ○ S ○ GPS Make & Model: Garmin GPSmap 60CSX
DATUM: NAD27 ○ NAD83 ○ WGS84 ⊗ Horizontal Accuracy: 1m meters/feet
Coordinate System: UTM Zone 10 ○ UTM Zone 11 ⊗ OR Geographic (Latitude & Longitude) ○
Coordinates: 5240686, 3898073 (polygon 5 plants 36m x 15m); single plants: 521765E, 3899625N; 521750E, 3899683N; 524111E, 3898057N; 524091E, 3898091

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*
Animal Behavior *(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):*
Larrea tridentata - Ambrosia dumosa scrub. Soil: sandy, parent material is decomposed granite.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ○ Good ⊗ Fair ○ Poor
Immediate AND surrounding land use: Paved road and electrical line
Visible disturbances: road shoulder is graded occasionally; one plant has been run over by vehicles
Threats: crushing by vehicles; plants may be disturbed by road and electrical upgrades.
Comments: Surveyed 4km x 30m linear transect. Plants on road shoulder, one berm, and along dirt road under powerline.

Determination: *(check one or more, and fill in blanks)*
☒ Keyed (cite reference): Desert Jepson
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☒
Habitat	☐	☐	☒
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ⊗ yes ○ no

Site 4

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/15/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Pseudognaphalium arborescens var. arborescens

Common Name:

Species Found? ⊗ Yes ○ No _____ If not found, why?

Total No. Individuals: ~~45~~ 23 Subsequent Visit? ○ Yes ⊗ No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Denise LaBerteaux
Address: 211 Snow St.
Weldon, CA 93283
E-mail Address: eremico@aol.com
Phone: 760-617-6306

Plant Information
Phenology:
100 % vegetative _____ % flowering _____ % fruiting

Animal Information
_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: Goldstone Deep Space Tracking Center DOD, Ft. Irwin National Training Center
Quad Name: _____ Elevation: 909-943 m
T___ R___ Sec___, ___ ½ of ___ ¼, Meridian: H ○ M ○ S ○ Source of Coordinates (GPS, topo. map & type): GPS
T___ R___ Sec___, ___ ½ of ___ ¼, Meridian: H ○ M ○ S ○ GPS Make & Model: Garmin etrex 20
DATUM: NAD27 ○ NAD83 ○ WGS84 ⊗ Horizontal Accuracy: 2 meters/feet
Coordinate System: UTM Zone 10 ○ UTM Zone 11 ⊗ *OR* Geographic (Latitude & Longitude) ○
Coordinates: 5202886, 3902648N; 5202888E, 3902649; 5202895E, 3902658N; 5201366, 3903468N; 5201246, 3903539N; 5201206, 3903545N; 5201896, 3903601N; 5201116, 3903604N; 5200956, 3903671N; 5200896, 3903717N; 5200716, 3903790N; 5200556, 3903865N; 5200456, 3903893N; 5201266, 3903605N; 5201276, 3903594N; 5201296, 3903584N; 5201306, 3903581N; 5201886, 3903262N

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*
Animal Behavior *(Describe observed behavior, such as territoriality, foraging, singing, calling, courtship, perching, roosting, etc., especially for avifauna):*
Larrea tridentata - Ambrosia dumosa scrub with Ambrosia salsola and Lycium andersonii. On an alluvial fan, granitic soil, coarse sand. Aspect: N; Slope: 3°

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ○ Good ⊗ Fair ○ Poor
Immediate AND surrounding land use: Plants are immediately adjacent to a paved road. Good habitat away from road.
Visible disturbances: Some plants had been run over. Sand bermed up on other plants
Threats: Road maintenance.
Comments: Walked a linear transect that was 2.7Km long and 20 m wide along Nasa Rd. Only recorded plants within transect. More plants occurred outside transect. Plants either on the road berm or on the road shoulder

Determination: *(check one or more, and fill in blanks)*
☐ Keyed (cite reference): Jepson Manual 2nd Ed.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☒
Habitat	☐	☐	☒
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ⊗ yes ○ no

Site 5

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/15/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Psorothamnus arborescens var. arborescens

Common Name:

Species Found? ☒ Yes ○ No _____ If not found, why?

Total No. Individuals: 13 Subsequent Visit? ○ Yes ☒ No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Denise La Berteaux
Address: 211 Snow St.
Weldon, CA 93283
E-mail Address: eremica@aol.com
Phone: 760-617-6306

Plant Information

Phenology:
100 % vegetative _____ % flowering _____ % fruiting

Animal Information

_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown

☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: Goldstone Deep Space Tracking Center DOD, Ft. Irwin National Training Center

Quad Name: _____ Elevation: 920-972 m

T___ R___ Sec___, ___¼ of ___¼, Meridian: H ○ M ○ S ○ Source of Coordinates (GPS, topo. map & type): GPS

T___ R___ Sec___, ___¼ of ___¼, Meridian: H ○ M ○ S ○ GPS Make & Model: Garmin eTrex 20

DATUM: NAD27 ○ NAD83 ○ WGS84 ☒ Horizontal Accuracy: 2 meters/feet

Coordinate System: UTM Zone 10 ○ UTM Zone 11 ☒ **OR** Geographic (Latitude & Longitude) ○

Coordinates: 520355E, 3902011; 520141E, 3902755N; 520112E, 3902963N; 520035E, 3903107N; 520041E, 3903108N; 520040E, 3903109N; 520036E, 3903114N; 519863E, 3903162N, 519868E, 3903461N; 519864E, 3903458N; 519861E, 3903457N; 519861E, 3903455N; 519854E, 3903458N

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope.
Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):
Larrea tridentata - Ambrosia dumosa scrub with Ambrosia salsola. On an alluvial fan, granitic in origin. Coarse sand, gravel, some cobble. Aspect: N; Slope: 3°.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ○ Good ☒ Fair ○ Poor

Immediate AND surrounding land use: dirt access road adjacent to electric line otherwise undisturbed.

Visible disturbances: some plants had been crushed by vehicles; burro tracks.

Threats: Electrical line maintenance and pole replacement; crushing by vehicles, feral burros

Comments: walked a linear transect that was 3.2 km long and 10 m wide along electrical line. Only recorded plants within the transect; more plant occurred outside transect.

Determination: (check one or more, and fill in blanks)
☒ Keyed (cite reference): Jepson Manual 2nd Ed.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	☐	☐	☐
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ○ yes ○ no

Site 6

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/15/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Pseudathamnus arborescens var. arborescens

Common Name:

Species Found? ⊗ Yes ○ No _____ If not found, why?

Total No. Individuals: 24 Subsequent Visit? ○ Yes ⊗ No

Is this an existing NDDB occurrence? _____ Yes. Occ. # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Denise LaBerteaux
Address: 211 Snow St.
Weldon, CA 93283
E-mail Address: eremico@aol.com
Phone: 760-617-6306

Plant Information
Phenology:
100 % vegetative _____ % flowering _____ % fruiting

Animal Information
_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: Goldstone Deep Space Tracking Center DOD Ft. Irwin National Training Center

Quad Name: _____ Elevation: _____

T___ R___ Sec___, ___¼ of ___ ¼, Meridian: H ○ M ○ S ○ Source of Coordinates (GPS, topo. map & type): GPS

T___ R___ Sec___, ___¼ of ___ ¼, Meridian: H ○ M ○ S ○ GPS Make & Model: Garmin eTrex 20

DATUM: NAD27 ○ NAD83 ○ WGS84 ⊗ Horizontal Accuracy: 2 meters/feet

Coordinate System: UTM Zone 10 ○ UTM Zone 11 ⊗ **OR** Geographic (Latitude & Longitude) ○

Coordinates: 519640E, 3902619N; 519646E, 3902617N; 519863E, 3902307N, 519864E, 3902306N; 519865E, 3902296N; 519866E, 3902293N, 519871E, 3902290N; 519873E, 3902287N; 519872E, 3902296N; 520035E, 3902060N; 520039E; 3902058N; 520215E, 3901808E, 520216E, 3901798N; 5202336, 3901784N; 520238E, 3901775N. Polygon of 9 plants: 520115E, 3901955N.

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*

Animal Behavior *(Describe observed behavior, such as territorially, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):*

Larrea tridentata - Ambrosia dumosa scrub with Ambrosia salsola. Wash and alluvial fan, granitic in origin. Coarse sand and gravel. Aspect: N; Slope: 4°

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ⊗ Good ○ Fair ○ Poor

Immediate AND surrounding land use: adjacent to a water line and dirt road, otherwise open desert.

Visible disturbances: none.

Threats: construction of 2nd water line

Comments: Walked a linear transect measuring 2.7 km long and 10m wide along existing water line. Only recorded plants within the transect, more plant occurred outside transect.

Determination: *(check one or more, and fill in blanks)*
☐ Keyed (cite reference): Jepson Manual 2nd Ed.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☐
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ○ yes ○ no

Site 7

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/16/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Psorothamnus arborescens var. arborescens

Common Name:

Species Found? ☒ Yes ○ No _____ If not found, why?

Total No. Individuals: 17 Subsequent Visit? ○ Yes ☒ No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Denise LaBerteaux
Address: 211 Snow St.
Weldon, CA 93283
E-mail Address: eremico@aol.com
Phone: 760-378-3021

Plant Information
Phenology: 90 % vegetative _____ % flowering 10 % fruiting

Animal Information
_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: DoD Ft. Irwin National Training Center
Quad Name: _____ Elevation: 886m
T___ R___ Sec___, ___¼ of ___ ¼, Meridian: H ○ M ○ S ○ Source of Coordinates (GPS, topo. map & type): GPS
T___ R___ Sec___, ___¼ of ___ ¼, Meridian: H ○ M ○ S ○ GPS Make & Model: Garmin eTrex 20
DATUM: NAD27 ○ NAD83 ○ WGS84 ☒ Horizontal Accuracy: 2 meters/feet
Coordinate System: UTM Zone 10 ○ UTM Zone 11 ☒ *OR* Geographic (Latitude & Longitude) ○
Coordinates: 522631E, 3902935N; 522611E, 3902945N; 522612E, 3902942N; 522610E, 3902945N; 522603E, 3902950N; 522591E, 3902955N; 522589E, 3902958N; 522554E, 3902979N; 522551E, 3902982N; 522546E, 3902986N; 522544E, 3902983N; 522532E, 3903014N; 522554E, 3903003N; 522570E, 3902992N; 522621E, 3902965N; 522622E, 3902963N

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*
Animal Behavior *(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):*
On road ~~shoulder and~~ berm in Larrea tridentata - Ambrosia dumosa scrub, on alluvial fan. Aspect North, 2% slope. Soil: coarse sand and gravel (decomposed granite).

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ☒ Good ○ Fair ○ Poor
Immediate AND surrounding land use: paved road
Visible disturbances: one plant had been run over by a vehicle.
Threats: crushing by vehicles; disturbance to plants by road maintenance and improvements.
Comments: Surveyed both sides of a paved road (shoulder and berm). 4.5 km long transect, 20m wide.

Determination: *(check one or more, and fill in blanks)*
☒ Keyed (cite reference): The Jepson Manual, 2nd Ed.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☐
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ○ yes ○ no

Site 8

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1265
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/16/2018 to 05/17/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Pseudathamnus arboreascens var. arboreascens

Common Name:

Species Found? ⊗ Yes ○ No _____ If not found, why?

Total No. Individuals: 835 Subsequent Visit? ○ Yes ⊗ No

Is this an existing NDDB occurrence? _____ Yes, Occ # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Denise LaBerteaux
Address: 211 Snow St.
Weldon, CA 93283
E-mail Address: eremico@aol.com
Phone: 760-378-3021

Plant Information

Phenology:
98 % vegetative _____ % flowering 2 % fruiting

Animal Information

_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown

☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: DoD - Fort Irwin National Training Center

Quad Name: _____ Elevation: 893 - 975m

T___ R___ Sec___, ___¼ of ___¼, Meridian: H ○ M ○ S ○ Source of Coordinates (GPS, topo. map & type): GPS

T___ R___ Sec___, ___¼ of ___¼, Meridian: H ○ M ○ S ○ GPS Make & Model: Garmin Map 60CSX, 78SC, eTrex 20

DATUM: NAD27 ○ NAD83 ○ WGS84 ⊗ Horizontal Accuracy: 1 meters/feet

Coordinate System: UTM Zone 10 ○ UTM Zone 11 ⊗ OR Geographic (Latitude & Longitude) ○

Coordinates: Plants occurred in 20-m wide belt from 523525E, 3902485N to 523328E, 3901695N to 522713E, 3901515N to 522553E, 3900793N to 522465E, 3900729N to 522116E, 3900359N to 522052E, 3900361N

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope.
Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for evifauna):
Larrea tridentata - Ambrosia dumosa scrub with Ephedra californica, Ambrosia salsola, ~~Scutellaria~~ Scutellaria mexicana, Cylindropuntia spp., and common desert annuals and weeds.
Soils: granitic coarse sand with nearby granitic boulder outcrops. In north and east trending wash. 2% slope.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ○ Good ⊗ Fair ○ Poor

Immediate AND surrounding land use: Military transport and training; water line
Visible disturbances: vehicle tracks, bomb craters, nearby fencing
Threats: construction of new water line; OHV activities
Comments: well-developed native plants from 0.5m to 1m tall, in good condition
Other surveyors: Cecile Shohet, Michael Horer, Youssef Atallah

Determination: (check one or more, and fill in blanks)
☑ Keyed (cite reference): Jepson Manual 2nd Ed.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	☐	☐	☒
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ○ yes ○ no

CDFW/NDDB/1747 Rev. 2/15/2015

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/16/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: PSOROTHAMNUS ARBORESCENS VAR. ARBORESCENS

Common Name:

Species Found? ⊗ Yes ○ No _____ If not found, why?

Total No. Individuals: 1 Subsequent Visit? ○ Yes ⊗ No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: No Number: _____ Museum / Herbarium

Reporter: MARK BAGLEY
Address: PO BOX 1431
BISHOP, CA 93515
E-mail Address: markbagley02@gmail.com
Phone: 760-920-2211

Plant Information
Phenology:
100 % vegetative _____ % flowering _____ % fruiting

Animal Information
_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)
In the shoulder of Goldstone Road, west side of road, on the Goldstone Deep Space Communications Complex – NASA.

County: SAN BERNARDINO Landowner / Mgr: NASA GOLDSTONE
Quad Name: _____ Elevation: 918 m
T___ R___ Sec___, ___¼ of ___¼, Meridian: H ○ M ○ S ○ Source of Coordinates (GPS, topo. map & type): GPS
T___ R___ Sec___, ___¼ of ___¼, Meridian: H ○ M ○ S ○ GPS Make & Model: _____
DATUM: NAD27 ○ NAD83 ○ WGS84 ⊗ Horizontal Accuracy: _____ meters/feet
Coordinate System: UTM Zone 10 ○ UTM Zone 11 ⊗ OR Geographic (Latitude & Longitude) ○
Coordinates: ⊗ 518734, 3904837

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope:
Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):
Plant near edge of pavement (< 1 foot away) in bladed road shoulder with sparse annuals. In decomposed granite. Surrounding vegetation is Mojave Creosote Bush scrub, dominated by Larrea tridentata and Ambrosia dumosa.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ○ Good ○ Fair ⊗ Poor
Immediate AND surrounding land use: Paved road and road shoulder.
Visible disturbances: Roadway and shoulder
Threats: Clearing road shoulder.
Comments: This is an outlier individual.

Determination: (check one or more, and fill in blanks)
☐ Keyed (cite reference): Jepson Manual, 2nd Ed.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): Mark Bagley
☐ Other: _____

Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	☐	☐	☐
Habitat	☐	☐	☒
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ⊗ yes ○ no

Mohave Ground Squirrel

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/08/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Xerospermophilus mohavensis

Common Name: Mohave ground squirrel

Species Found? ⊗ Yes ○ No _____ If not found, why?

Total No. Individuals: 1 Subsequent Visit? ○ Yes ⊗ No

Is this an existing NDDB occurrence? 7 Yes, Occ. # ☐ No ☐ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Denise LaBerteaux
Address: 211 Snow Street
Weldon, CA 93283
E-mail Address: eremico@aol.com
Phone: 760-378-3021

Plant Information
Phenology:
_____ % vegetative _____ % flowering _____ % fruiting

Animal Information
1 # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☒ other

Location Description *(please attach map AND/OR fill out your choice of coordinates, below)*

County: San Bernardino Landowner / Mgr: DoD - Fort Irwin National Training Center
Quad Name: Nelson Lake Elevation: 951m
T___ R___ Sec___, ___¼ of ___¼, Meridian: H ○ M ○ S ○ Source of Coordinates (GPS, topo. map & type): GPS
T___ R___ Sec___, ___¼ of ___¼, Meridian: H ○ M ○ S ○ GPS Make & Model: Garmin eTrex 20x
DATUM: NAD27 ○ NAD83 ○ WGS84 ⊗ Horizontal Accuracy: 1 meters/feet
Coordinate System: UTM Zone 10 ○ UTM Zone 11 ⊗ *OR* Geographic (Latitude & Longitude) ○
Coordinates: 0517965E, 3921319 N

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*
Animal Behavior *(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):*
On an alluvial fan, volcanic and granitic origins. Larrea tridentata - Ambrosia dumosa Shrubland Alliance. An occasional Senna armata present. 1-2 percent slope, SE drainaging. Silty sand and gravel. Shallow hummocks of sand at bases of Larrea bushes.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ○ Good ⊗ Fair ○ Poor
Immediate AND surrounding land use: Active military training site
Visible disturbances: Multiple dirt roads and single pass tracks of tactical vehicles
Threats: Within 4050-ac Dense Urban Terrain Complex (proposed)
Comments: 30 cameras were deployed from Apr 24, 2018 to June 17, 2018 throughout 4050-ac site. Each camera was in operation for 9-15 days. Adult MGS was in non-reproductive condition. Round-tailed ground squirrel also at this location and at 11 other camera locations on project site. This MGS appeared to have a longer tail than normal. May have round-tailed ground squirrel genetic ancestry.

Determination: *(check one or more, and fill in blanks)*
☐ Keyed (cite reference): _____
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☒ By another person (name): Bruce Gackinger, Phil Leitner confirmed ID
☒ Other: personal knowledge

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☒
Habitat	☐	☐	☒
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ⊗ yes ○ no

CDFWBDB/1747 Rev. 7/15/2015

Desert Tortoise

Mail to:
California Natural Diversity Database
Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95811
Fax: (916) 324-0475 email: CNDDB@dfg.ca.gov

Date of Field Work (mm/dd/yyyy): 5/1 THRU 5/31 2018

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Reset

California Native Species Field Survey Form

Send Form

Scientific Name: Gopherus agassizii

Common Name: desert tortoise

Species Found? ☑ Yes ☐ No _____ If not, why?

Total No. Individuals 15 Subsequent Visit? ☐ yes ☑ no

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☑ no ☐ unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Stephen Boland

Address: 478 Lincoln St
San Luis Obispo, CA 93405

E-mail Address: spboland@aol.com

Phone: (928) 380-8850

Plant Information

Phenology: _____% vegetative _____% flowering _____% fruiting

Animal Information

10	7				
# adults	# juveniles	# larvae	# egg masses	# unknown	

☐ wintering ☐ breeding ☐ nesting ☐ rookery ☑ burrow site ☑ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr.: Fort Irwin

Quad Name: Nelson Lake Elevation: 3300

T____ R____ Sec ____, ____ ¼ of _____¼, Meridian: H☐ M☐ S☐

T____ R____ Sec ____, ____ ¼ of _____¼, Meridian: H☐ M☐ S☐

Source of Coordinates (GPS, topo. map & type): GPS

GPS Make & Model Garmin 78

DATUM: NAD27 ☐ NAD83 ☑ WGS84 ☐

Horizontal Accuracy _____ meters/feet

Coordinate System: UTM Zone 10 ☐ UTM Zone 11 ☑ OR Geographic (Latitude & Longitude) ☐

Coordinates: see attached

Habitat Description ***(plants & animals)*** plant communities, dominants, associates, substrates/soils, aspects/slope:

Animal Behavior ***(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):***

Creosote-bursage scrub. Tortoises in burrows and foraging.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ☐ Excellent ☐ Good ☑ Fair ☐ Poor

Immediate AND surrounding land use: Military training activities

Visible disturbances: heavily impacted by off road vehicles (military tacticle vehicles)

Threats: Habitat loss and being crushed. Site will be developed for urban warfare training (building a fake city)

Comments:

Determination: (check one or more, and fill in blanks)

- ☐ Keyed (cite reference): _____
- ☐ Compared with specimen housed at: _____
- ☐ Compared with photo / drawing in: _____
- ☐ By another person (name): _____
- ☐ Other: _____

Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	☐	☐	☐
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? yes ☐ no ☐

DFG/BDB/1747 Rev. 6/16/09

American Badger

Mail to:
California Natural Diversity Database
Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95811
Fax: (916) 324-0475 email: CNDDB@dfg.ca.gov

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work (mm/dd/yyyy): 05/26/2018

Reset

California Native Species Field Survey Form

Send Form

Scientific Name: Taxidea taxus

Common Name: American badger

Species Found? ☑ Yes ☐ No _____ If not, why?

Total No. Individuals 1 Subsequent Visit? ☐ yes ☑ no

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☑ no ☐ unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Stephen Boland
Address: 478 Lincoln St
San Luis Obispo, CA 93405
E-mail Address: spboland@aol.com
Phone: (928) 380-8850

Plant Information

Phenology: _____% vegetative _____% flowering _____% fruiting

Animal Information

# adults	# juveniles	# larvae	# egg masses	# unknown
1				

☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☑ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr.: Fort Irwin
Quad Name: Nelson Lake Elevation: 3300
T____ R____ Sec ____, ____ ¼ of ____ ¼, Meridian: H☐ M☐ S☐ Source of Coordinates (GPS, topo. map & type): GPS
T____ R____ Sec ____, ____ ¼ of ____ ¼, Meridian: H☐ M☐ S☐ GPS Make & Model Garmin 78
DATUM: NAD27 ☐ NAD83 ☑ WGS84 ☐ Horizontal Accuracy _____ meters/feet
Coordinate System: UTM Zone 10 ☐ UTM Zone 11 ☑ OR Geographic (Latitude & Longitude) ☐
Coordinates: 510734 E, 3917746 N

Habitat Description ***(plants & animals)*** plant communities, dominants, associates, substrates/soils, aspects/slope:
Animal Behavior ***(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):***
Creosote-bursage scrub

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ☐ Excellent ☐ Good ☑ Fair ☐ Poor

Immediate AND surrounding land use: Military training activities

Visible disturbances:

Threats:

Comments:

Determination: (check one or more, and fill in blanks)
- ☐ Keyed (cite reference): _____
- ☐ Compared with specimen housed at: _____
- ☐ Compared with photo / drawing in: _____
- ☐ By another person (name): _____
- ☐ Other: _____

Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	☐	☐	☐
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? yes ☐ no ☐

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

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Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 04/29/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Taxidea taxus

Common Name: American Badger

Species Found? (X) Yes ( ) No _____ If not found, why?

Total No. Individuals: 1 Subsequent Visit? ( ) Yes (X) No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Denise LaBerteaux
Address: 211 Snow Street
Weldon, CA 93283
E-mail Address: eremico@aol.com
Phone: 760-378-3021

Plant Information
Phenology:
_____ % vegetative _____ % flowering _____ % fruiting

Animal Information
1 # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☒ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: DoD - Fort Irwin National Training Center
Quad Name: Nelson Lake Elevation: 931m
T___ R___ Sec___, ___¼ of ___ ¼, Meridian: H ( ) M ( ) S ( ) Source of Coordinates (GPS, topo. map & type): GPS
T___ R___ Sec___, ___¼ of ___ ¼, Meridian: H ( ) M ( ) S ( ) GPS Make & Model: Garmin eTrex 20x
DATUM: NAD27 ( ) NAD83 ( ) WGS84 (X) Horizontal Accuracy: _____ meters/feet
Coordinate System: UTM Zone 10 ( ) UTM Zone 11 (X) *OR* Geographic (Latitude & Longitude) ( )
Coordinates: 0518789E, 3920431N

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*
Animal Behavior *(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):*
On alluvial fan apron with multiple rivulets. Larrea tridentata - Ambrosia dumosa shrubland alliance. Gravelly soils, 1 percent slope draining ENE into Nelson Dry Lake.
Badger investigating bait block.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ( ) Excellent ( ) Good (X) Fair ( ) Poor
Immediate AND surrounding land use: Active military training area
Visible disturbances: Multiple dirt roads and single pass tactical vehicle tracks
Threats: Within proposed 4050-ac Dense Urban Terrain Complex
Comments: Badger captured on trail camera investigating bait block. This badger had an unusual colored pelage.

Determination: *(check one or more, and fill in blanks)*
☐ Keyed (cite reference): _____
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☒ Other: Personal Knowledge

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☒
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ( ) yes ( ) no

CDFWBDB/1747 Rev. 7/15/2015

Golden Eagle

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: (916) 324-0475 email: CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): 05/04/2018

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Aquila chrysaetos

Common Name: Golden Eagle

Species Found? (X) Yes ( ) No — If not found, why?

Total No. Individuals: 1 Subsequent Visit? ( ) Yes (X) No

Is this an existing NDDB occurrence? _____ Yes, Occ. # ☐ No ☒ Unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Denise La Berteaux
Address: 711 Snow Street
Weldon, CA 93283
E-mail Address: eremico@aol.com
Phone: 760-378-3021

Plant Information
Phenology:
_____ % vegetative _____ % flowering _____ % fruiting

Animal Information
1 # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown
☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☒ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: San Bernardino Landowner / Mgr: DoD - Ft. Irwin National Training Center
Quad Name: Nelson Lake Elevation: 1013
T___ R___ Sec___, ___¼ of ___ ¼, Meridian: H ( ) M ( ) S ( ) Source of Coordinates (GPS, topo. map & type): GPS
T___ R___ Sec___, ___¼ of ___ ¼, Meridian: H ( ) M ( ) S ( ) GPS Make & Model: Garmin eTrex 20x
DATUM: NAD27 ( ) NAD83 ( ) WGS84 (X) Horizontal Accuracy: 1 meters/feet
Coordinate System: UTM Zone 10 ( ) UTM Zone 11 (X) *OR* Geographic (Latitude & Longitude) ( )
Coordinates: 0516135E, 3922179N

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope.
Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):
On remnant alluvial fan. Larrea tridentata - Ambrosia dumosa Shrubland Alliance.
On a 3-4 percent slope, SE-facing. Soils gravelly and cobbly.
Perching on the ground.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ( ) Excellent ( ) Good (X) Fair ( ) Poor
Immediate AND surrounding land use: Active military training area.
Visible disturbances: Multiple dirt roads and single pass tactical vehicle tracks
Threats: within proposed 4050-ac Dense Urban Terrain Complex
Comments: Immature eagle detected during Mohave ground squirrel ~~trap~~ camera trapping survey. on trail camera

Determination: (check one or more, and fill in blanks)
☐ Keyed (cite reference): _____
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☒ Other: Personal Knowledge

Photographs: (check one or more)

	Slide	Print	Digital
Plant / animal	☐	☐	☒
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? (X) yes ( ) no

CDFW/BDB/747 Rev. 7/16/2016

Appendix K

Table 3 DT Pre-project Protocol Population Estimate Calculations

Table 3. USFWS Desert Tortoise Pre-Project Survey Guidance			
What is the estimated number of tortoises and associated 95% confidence interval for the action area?			
INSTRUCTIONS ***Use this tab when your transects were of unequal length.***			
Enter the appropriate values from the survey into the yellow cells below. The number of tortoises and assocated 95% confidence interval for the action area will be calculated.			
		N =	**13.1**
		Lower 95%CI =	**5.57**
		Upper 95%CI =	**30.72**
Total action area (acres)			**4014**
Prob that a tort is above ground given winter rainfall (Pa from Table 2) =			**0.850**
Total length of transects walked (km) =			**1623**
Number of transects walked =			**626**
Number of tortoises found during surveys (n) =			**7**
Transects of various lengths			
Transect	**Length (km)**	**Tortoises within 5m of centerline**	
1	0.026	0	
2	0.081428645	0	
3	0.16285729	0	
4	0.244285935	0	
5	0.32571458	0	
6	0.407143225	0	
7	0.48857187	0	
8	0.570000516	0	
9	0.651429161	0	
10	0.732857806	0	
11	0.814286451	0	
12	0.849623211	0	
13	0.88495997	0	
14	0.92029673	0	
15	0.95563349	0	
16	0.99097025	0	
17	1.026307009	0	
18	1.061643769	0	
19	1.096980529	0	

20	1.132317289	0	
21	1.167654049	0	
22	1.202990808	0	
23	1.238327568	0	
24	1.273664328	0	
25	1.309001088	0	
26	1.344337847	0	
27	1.379674607	0	
28	1.409753002	0	
29	1.439831397	0	
30	1.469909792	0	
31	1.499988186	0	
32	1.530066581	0	
33	1.560144976	0	
34	1.590223371	0	
35	1.620301765	0	
36	1.65038016	0	
37	1.710985969	0	
38	1.771591778	0	
39	1.832197587	0	
40	1.892803396	0	
41	1.953409204	0	
42	1.972117792	0	
43	1.990826379	0	
44	2.009534967	0	
45	2.028243554	0	
46	2.046952141	0	
47	2.065660729	0	
48	2.084369316	0	
49	2.103077904	0	
50	2.121786491	0	
51	2.140495078	0	
52	2.159203666	0	
53	2.177912253	0	
54	2.196620841	0	
55	2.209010163	0	
56	2.221399485	0	
57	2.233788807	0	
58	2.246178129	0	
59	2.258567451	0	
60	2.270956772	0	
61	2.283346094	0	
62	2.295735416	0	
63	2.308124738	0	
64	2.32051406	0	
65	2.332903382	0	
66	2.345460924	0	

67	2.358018466	0	
68	2.370576008	0	
69	2.38313355	0	
70	2.395691092	0	
71	2.408248634	0	
72	2.420806176	0	
73	2.433363718	0	
74	2.44592126	0	
75	2.458478802	0	
76	2.471036344	0	
77	2.483593886	0	
78	2.496151428	0	
79	2.50870897	0	
80	2.521266512	0	
81	2.533824054	0	
82	2.546381596	0	
83	2.558939138	0	
84	2.57149668	0	
85	2.584054222	0	
86	2.594323163	0	
87	2.604592105	0	
88	2.614861047	0	
89	2.625129988	0	
90	2.63539893	0	
91	2.645667872	0	
92	2.655936813	0	
93	2.666205755	0	
94	2.676474697	0	
95	2.686743638	0	
96	2.69701258	0	
97	2.707281522	0	
98	2.717550464	0	
99	2.727819405	0	
100	2.738088347	0	
101	2.748357289	0	
102	2.75862623	0	
103	2.768895172	0	
104	2.779164114	0	
105	2.789433055	0	
106	2.799701997	0	
107	2.809970939	0	
108	2.82023988	0	
109	2.830508822	0	
110	2.840777764	0	
111	2.851046705	0	
112	2.861315647	0	
113	2.871584589	0	

114	2.881853531	0	
115	2.892122472	0	
116	2.902391414	0	
117	2.912660356	0	
118	2.922929297	0	
119	2.933198239	0	
120	2.943467181	0	
121	2.953736122	0	
122	2.964005064	0	
123	2.974274006	0	
124	2.984542947	0	
125	2.994811889	0	
126	3.005080831	0	
127	3.015349772	0	
128	3.025618714	0	
129	3.035887656	0	
130	3.046156598	0	
131	3.056425539	0	
132	3.058194824	0	
133	3.059964109	0	
134	3.061733394	0	
135	3.063502678	0	
136	3.065271963	0	
137	3.067041248	0	
138	3.068810533	0	
139	3.070579817	0	
140	3.072349102	0	
141	3.074118387	0	
142	3.075887672	0	
143	3.077656956	0	
144	3.079426241	0	
145	3.081195526	0	
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APPENDIX C

Cultural Resources Survey Report

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FINAL
CULTURAL RESOURCES INVENTORY AND NATIONAL REGISTER OF HISTORIC PLACES EVALUATION REPORT FOR THE U.S. ARMY NATIONAL TRAINING CENTER DENSE URBAN TERRAIN COMPLEX AT FORT IRWIN
SAN BERNARDINO COUNTY, CALIFORNIA

July 2018

Prepared for:

Directorate of Public Works, Environmental Division
United States Army National Training Center
Fort Irwin, CA 92310-5097

Contract No.: GSC-QF0B-18-33204
Task Order 47QFCA18F0041/Express Project No. AR00927

Prepared by:

By Matthew Wetherbee, MSc., RPA, Brian Brockman, B.A., and Erica Ward, B.A.
FY18-1001

NADB Keywords: Cultural resources survey; positive results; APE survey acreage 2,532 acres; Fort Irwin Military National Training Center Directorate of Public Works; NRHP assessment of 35 previously recorded prehistoric archaeological sites and isolates and four newly identified archaeological sites; CA-SBR-5029/P-36-005029; CA-SBR-5028/P-36-005028; CA-SBR-13809/P-36-021506; CA-SBR-5026/P-36-005026; CA-SBR-13812/P-36-021509; CA-SBR-13808/P-36-021505; CA-SBR-13810/P-36-021507; CA-SBR-13811/P-36-021508; CA-SBR-6210/P-36-006210; CA-SBR-11716/P-36-011716; CA-SBR-5027/P-36-005027; CA-SBR-28932/P-36-028932; CA-SBR-2353/P-36-002353; CA-SBR-17840/P-36-017840; CA-SBR-10321/P-36-010321; CA-SBR-12039/P-36-012039; CA-SBR-10926H/P-36-010926; CA-SBR-11532/P-36-011532; CA-SBR-11537/P-36011537; CA-SBR-11538/P-36-011538; CA-SBR-11554/P-36-011554; CA-SBR-11555/P-36-011555; CA-SBR-11556/P-36-011556; CA-SBR-10690/P-36-010690; CA-SBR-17842/P-36-017842; CA-SBR-2347/P-36-002347; CA-SBR-3314/P-36-03314; CA-SBR-13735/P-36-021384; Isolates: P-36-028992, P-36-028988, P-36-026429, P-36-026428, P-36-026383, P-36-020208; P-36-020220; CA-SBR-32429/P-36-032429; CA-SBR-32426/P-36-032426; CA-SBR-32427/P-36-032427; CA-SBR-32428/P-36-032428; San Bernardino County; Nelson Lake, East of Goldstone, Fort Irwin, Langford Well, West of Nelson Lake, Goldstone, and Paradise Range, California, 7.5-minute quadrangles; Township 15 North, Range 1 East, Sections 35 and 36; Township 14 North, Range 1 East, Sections 1, 2, and 12; Township 14 North, Range 2 East, Sections 7, 18, 19, 20, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36; Township 14 North, Range 3 East, Section 31; Township 13 North, Range 2 East, Sections 3, 4, 10, 11, and 14; Township 16 North, Range 1 East, Sections 24, 25, 26, 27, 32, 33, 34, 35, and 36; Township 16 North, Range 2 East, Sections 19, 29, 30, 31, and 32; Township 15 North, Range 1 East, Sections 2, 3, 4, 5, 8, 9, 10, 16, 17, 21, 23, 26, 27, 28, 34, and 35.

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
AT&SF	Atchison, Topeka, and Santa Fe
APE	Area of Potential Effects
ARMR	Archaeological Resource Management Reports
BCT	Brigade Combat Team
CCS	Cyrptocrystalline silicate
cm	centimeter
cmbs	centimeters below surface
CFR	Code of Federal Regulations
DPR	Department of Parks and Recreation
DPW	Directorate of Public Works
DoD	Departement of Defense
DUT	Dense Urban Terrain
FGV	Fine-Grained Volcanic
FICRMD	Fort Irwin Cultural Resources Management Database
FMR	Fire Modified Rock
GIS	Geographic Information System
GPS	global positioning system
ICRMP	Integrated Cultural Resources Management Plan
km	kilometer
m	meter
MYBP	million years before present
MSR	Main Supply Routes
NAD	North American Datum
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NTC	National Training Center
RPA	Register of Professional Archaeologists
SCCIC	South Central Coastal Information Center
SHPO	State Historic Preservation Officer
SRL	Segregated Reduction Locales
STP	shovel test probe
T&P	Texas and Pacific
U.S.	United States
USC	United States Code
USGS	Unites States Geological Survey
UTM	Universal Transverse Mercator

EXECUTIVE SUMMARY

Team CALIBRE conducted a cultural resources study on approximately 2,532 acres in support of the Dense Urban Terrain (DUT) Complex, and associated utility corridors and access road improvements performed at Fort Irwin in 2018. Fort Irwin is proposing to construct and maintain a DUT Complex to provide a year-round, comprehensive, and realistic training environment of the size and density of urban terrain in which a Brigade Combat Team may be required to conduct military operations. The study was performed pursuant to Section 106 of the National Historic Preservation Act (NHPA). This cultural resources study is intended to characterize and describe cultural resources identified in the project's Area of Potential Effects (APE) that could be affected by ground-disturbing activities associated with the proposed action. For the purposes of this report the APE is divided into two areas: The DUT Complex footprint; and the linear utility and access road corridors.

Record searches were performed in the Fort Irwin Cultural Resources Database (FICRD), Geographic Information System (GIS) database, and digital and hardcopy files for the entire APE. These GIS data were provided to Team CALIBRE on April 23, 2018, and included the trinomials and locations of recorded sites on Fort Irwin, and the location of cultural resource reports completed for Fort Irwin. A second literature search for the DUT Complex footprint of the APE was initiated at the South Central Coastal Information Center (SCCIC), housed at California State University, Fullerton, on April 16, 2018. The search included a 0.5-mile radius around the DUT Complex, and resources in close proximity to this buffer.

The FICRD and SCCIC records indicate a total of 79 cultural resources studies have been previously completed in proximity to the project APE, with 41 of them encompassing various portions of the project APE. As a result of these studies, a total of 102 cultural resources have been previously recorded within the 0.5-mile search radius, but outside the project APE. The FICRD and SCCIC records indicate a total of 35 previously recorded sites and isolates are within the project APE, including 12 archaeological sites (CA-SBR-6210, -13810, -13808, -13811, -13812, -11716, -2026, -5027, -5028. -5029, -2353, and -13809) and 7 isolates (P-36-028992, P-36-028988, P-36-026429, P-36-026428, P-36-026383, P-36-020208; P-36-020220) within the DUT Complex fooptprint of the APE. All 12 previously recorded resources within the DUT Complex footprint are comprised of small- to medium-sized lithic scatters and quarries that have been previously recommended not eligible for inclusion in the National Register of Historic Places (NRHP). However, only one these (CA-SBR-2353) has received State Historic Preservation Officer (SHPO) concurrence, and therefore will not be re-evaluated during this study. Of the 35 previously recorded resources, 16 resources are located within the utility corridor and access road improvement areas of the project APE. The purpose of this cultural resources study is to evaluate all previously recorded or any newly unrecorded resources in the APE for NRHP eligibility and to re-evaluate and update the 11 previously recorded resources in the DUT Complex footprint without previous SHPO determinations, and to aid the NTC in avoiding effects to these resources during project implementation.

Intensive pedestrian surveys took place between May 21 to June 6, 2018. Surveys were conducted utilizing 15-meter (m) transects within the DUT portion of the APE and 10-m transects on both sides of linear corridor surveys. Crews adjusted transect spacing to a cursory level (15–20 m spacing) in areas where the potential for encountering cultural resources was low or other unforeseen factors precluded the use of 15-m transects, such as slopes, built environment, and heavily disturbed areas. Global positioning system (GPS) data, including all

boundaries and point proveniences, photographs for completion of California Department of Parks and Recreation series 523 forms, and other information, were recorded using iPad units.

The 11 previously recorded prehistoric sites, lacking SHPO determinations, situated within the DUT Complex footprint were re-evaluated and updated for NRHP eligibility. Three of these sites (CA-SBR-6210, -5027, and -5029) were not relocated due to heavy disturbances or destruction as a result of military activity. The other sites had also been impacted by heavy disturbances and were updated accordingly. The results of these re-evaluations indicate that these sites are exclusively surface sites, not unique to Fort Irwin, are not specifically associated with any individual known to be important to local history, do not exhibit distinct characteristics of a type, period, or method of construction and do not appear to have the potential to provide additional information about the history of the area. Thus, they are recommended as not eligible for listing on the NRHP. All seven previously recorded isolates identified in the DUT Complex footprint are, by definition, not eligible for listing on the NRHP. No further work is recommended at these sites.

Of the 16 previously recorded cultural resources situated along the linear utility corridors and access road improvement areas, nine of these resources (CA-SBR-10690, -11537, -11538, 11554, -11555, 11556, -2347, -3314, and 10926H) are located within the project APE, outside of the DUT Complex but within the current survey area. These resources retain their standing NRHP eligibility determinations or recommendations and were not re-evaluated as part of the current undertaking. Site CA-SBR-10926H has been previously determined not eligible for listing on the NRHP and therefore was not revisited during this study. The remaining sites were revisited and inspected to determine if any cultural manifestations exist within the project APE. Only site CA-SBR-11556 had cultural manifestations observed within the project APE. Site CA-SBR-11556 was previously recommended as not eligible for listing on the NRHP and no new components were observed during the current investigation that would change the prior eligibility recommendation. Two prehistoric sites, CA-SBR-2347 and -3314 were previously recommended eligible for listing on the NRHP; however, no cultural manifestations were observed within the current project APE at these two sites. To ensure there are no effects to sites CA-SBR-2347 and -3314 during project construction, archaeological monitoring is recommended. The remaining six sites (CA-SBR-10690, -11535, -11537, 11554, -11555, and -11556) were previously recommended not eligible for listing on the NRHP and no cultural materials were observed within the project APE during the current field survey and it is therefore recommended their prior eligibility recommendations remain unchanged and no further work is recommended at these sites.

Seven of the 16 previously recorded cultural resources (CA-SBR-28932, -17840, -10321, -12039, -17842, 11532, and -13735) are located within the project APE but outside of the survey area for the current undertaking. As such, they were not revisited during the current study but based on their prior recommendations, all previous NRHP eligibility recommendations remain intact for these sites. Sites CA-SBR-17840, -11532, and -13735 have been determined not eligible for listing on the NRHP. Sites CA-SBR-28932, -10321, -12039, and -17842, have been previously recommended not eligible for inclusion in the NRHP. No further work is recommended at these sites.

In addition, Team CALIBRE archaeologists identified four newly recorded prehistoric sites (CA-SBR-32429, -32426, -32427, and -32428) situated within the DUT Complex footprint and along the proposed utility corridors and road improvements areas. These sites are entirely comprised of

prehistoric lithic scatters with the lack of temporally diagnostic artifacts and features and do not retain much of their original integrity due to military activities that have heavily disturbed and compromised the integrity of these sites. All four newly identified sites have been fully recorded and contain no further information important to history or prehistory beyond their recording, and all are recommended not eligible for listing in the NRHP. No further work is recommended at these four sites. Thus, no properties listed in the NRHP or considered eligible for listing in the NRHP exist within the APE for this proposed undertaking. Therefore, a finding of "No Historic Properties Affected" is appropriate for this undertaking, in accordance with 36 Code of Federal Regulations (CFR) 800.4(d)(1).

If archaeological resources are discovered or unanticipated effects on historic properties are found after the 106 process has been completed, the Army will comply with the post-review discovery procedures pursuant to 36 CFR 800.13(b)(1), (2), or (3) as appropriate. The Army will suspend work in the area and notify the cultural resources manager and staff in the DPW, Environmental Division in order to determine the appropriate action, including determine if the finding is eligible for listing on the NRHP.

1 INTRODUCTION

1.1 PROJECT INFORMATION

Team CALIBRE was retained by the Department of Defense (DoD) to conduct a cultural resources study in support of United States (U.S.) Army National Training Center (NTC) located on Fort Irwin in San Bernardino County, California. This cultural resources study is intended to characterize and describe cultural resources identified in the project's Area of Potential Effects (APE) that could be affected by ground-disturbing activities associated with the proposed action. Fort Irwin is proposing to construct, operate, and maintain a Dense Urban Terrain (DUT) Complex to include improvements of roads for access to the DUT, and installation of utilities (fiber, electrical, and water) in designated corridors. This complex is to provide a year-round, comprehensive and realistic training environment of the size and density of urban terrain in which a Brigade Combat Team may be required to conduct military operations. The total APE measures approximately 4,660 acres and is located on Fort Irwin northeast of Barstow, San Bernardino County, California. This contract was awarded to Team CALIBRE Task Order 47QFCA18F0041 under Contract No. GSC-QF0B-18-33204. The investigation was conducted to assist Fort Irwin with Federal laws including Section 106 of the National Historic Preservation Act (NHPA), as amended.

This study includes a cultural context, brief history of the APE, a cultural resources records search of the APE, a 0.5-mile buffer, historic map review, an intensive-level pedestrian survey, National Register of Historic Properties (NRHP) eligibility recommendations of all previously recorded and newly identified cultural resources within the APE, and the preparation of a cultural resources technical report that documents the results of these efforts and provides management recommendations. The twelve previously recorded resources located within the DUT Complex footprint are comprised of small- to medium sized prehistoric lithic scatters and have been previously recommended not eligible for inclusion in the NRHP, but only one (CA-SBR-2353) of which has received State Historic Preservation Officer (SHPO) concurrence, and therefore will not be re-evaluated during this study. The purpose of this cultural resources study is to assess and make recommendations whether all previously recorded and newly unrecorded cultural resources are eligible for inclusion into the NRHP, and to aid the NTC in avoiding effects to these resources during project implementation.

The format used in this report follows Archaeological Resource Management Reports (ARMR): Recommended Contents and Format (California Office of Historic Preservation 1990), and includes five appendices: Confidential Figures (A), Records Search Results from the South Central Coastal Information Center (SCCIC) and Fort Irwin FICRD (B), State of California Department of Parks and Recreation 523 Series Forms (C), Native American Consultation letters (D), and Resumes of Preparers (E).

This report was completed by Cultural Resource Project Manager and Principal Investigator Matthew Wetherbee, MSc., Registered Professional Archaeologist (RPA); with contributions by Brian Brockman, B.A.; Erica Ward, B.A.; and Kacey Burton, B.A, GIS professional, managed and performed quality control of the geographic information systems (GIS data and prepared report figures). All work was performed in accordance with professional standards set forth in the *Secretary of the Interior's Standards and Guidelines of Archaeology and Historic Preservation*.

1.2 PROJECT DESCRIPTION AND LOCATION

The project APE encompasses 4,660 acres of vacant land and is situated within Fort Irwin located 37 miles (59.54 kilometers [km]) northeast of Barstow, California, in the north-central part of the High Mojave Desert midway between Las Vegas, Nevada, and Los Angeles, California (Figure 1). Specifically, the proposed project is in Sections 35 and 36, T15N, R1E; Sections 1, 2, and 12, T14N, R1E; Sections 7, 18, 19, 20, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, T14N, R2E; Section 31, T14N, R3E Sections 3, 4, 10, and 14, T13N, R2E; Sections 24, 25, 26, 27, 32, 33, 34, 35, and 36, T16N, R 1E; Sections 19, 29, 30, 31, and 32, T16N, R2E; Sections 2, 3, 4, 5, 8, 9, 10, 16, 17, 21, 23, 26, 27, 28, 34, and 35, T15N, R1E, San Bernardino Base and Meridian, as shown on the Nelson Lake, East of Goldstone, Fort Irwin, Langford Well, West of Nelson Lake, Goldstone, and Paradise Range, California, 7.5-minute U.S. Geological Survey (USGS) topographic quadrangles (Figures 2 and 3). The APE is at an average elevation of approximately 1,005 m (3,300 feet) and is surrounded by desert hills and mountains. Natural vegetation is sparse and consists of rare mesquite, abundant creosote, rabbit brush, bursage, yucca, and other low growing plants.

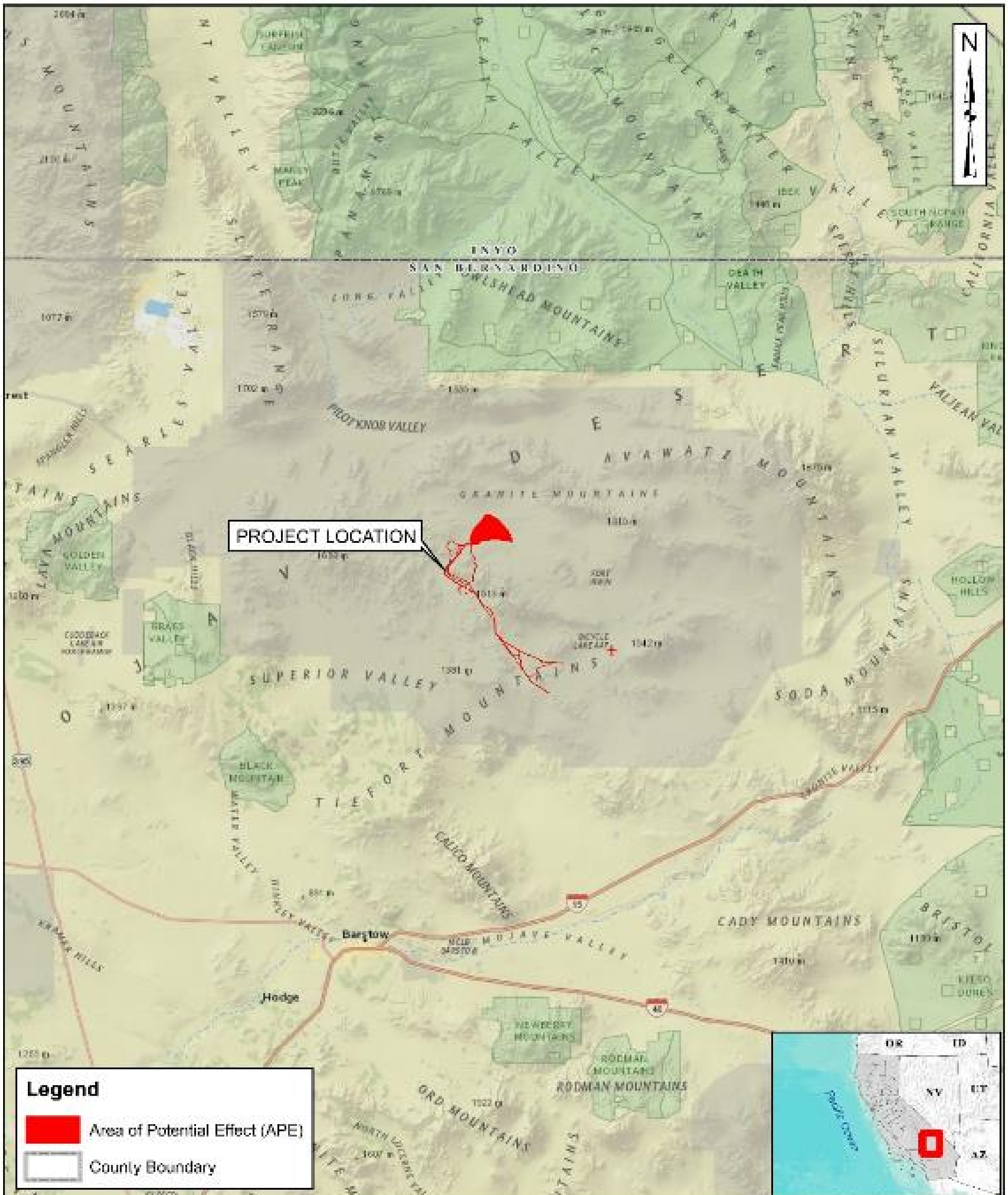
1.3 PROJECT BACKGROUND

In accordance with its mission, Fort Irwin must comply with Federal laws including the National Environmental Policy Act of 1969 (NEPA) and implement regulations specified in 40 CFR Part 1500–Part 1508, and 32 CFR Part 651; and implement all CFR, DoD, and U.S. Army regulations.

Fort Irwin is located 37 miles (59.54 km) northeast of Barstow, California, in the north-central part of the High Mojave Desert midway between Las Vegas, Nevada and Los Angeles, California. Fort Irwin encompasses approximately 753,537 acres (304,946 hectares). Approximately 80 percent of Fort Irwin's land area is used for battlefield training. A cantonment area occupies approximately three-square miles (1,920 acres), and provides temporary and permanent living quarters for soldiers and their families, along with support facilities. Fort Irwin's population includes approximately 4,450 assigned military members; 5,630 rotational soldiers; 7,200-person civilian workforce; and 7,700 family members. Approximately 10, 14-day training rotations occur each year.

1.4 PROPOSED ACTION

The U.S. Army proposes to construct, operate, and maintain a DUT Complex on approximately 4,660 acres of land on Fort Irwin in northern San Bernardino County, California. As part of the Army's NTC, the DUT Complex would provide a year-round, comprehensive training environment of a size and density to support up to a Brigade Combat Team. Realistic, individual, and collective combat training in urban terrain is a mission-critical need in support of current, ongoing U.S. Army operations worldwide. The U.S. Army plans to start construction of the DUT Complex in 2019.



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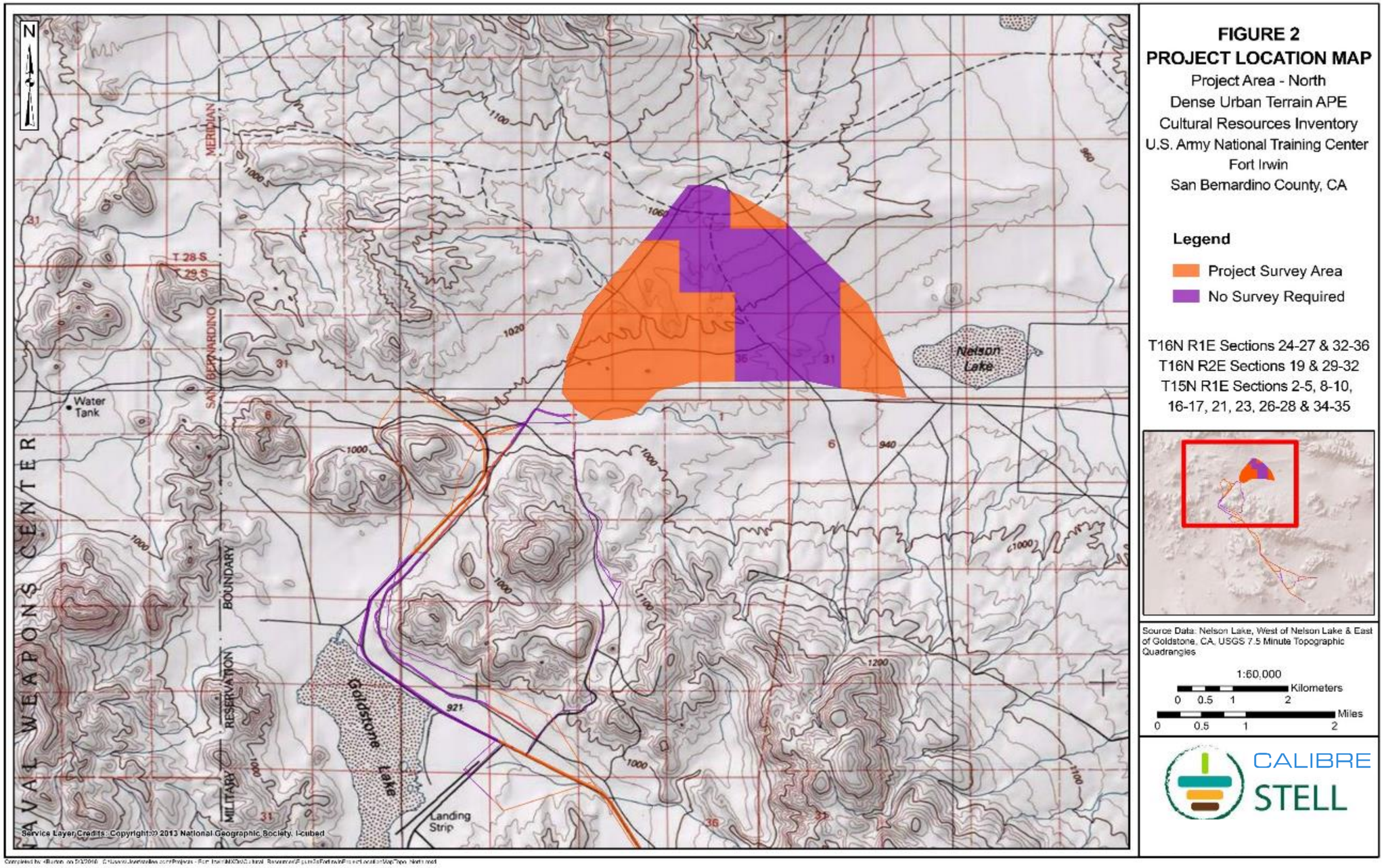
Source Data: Esri, USGS, NOAA, National Geographic, DeLorme, HERE, UNEP-WCMC, NASA, ESA, METI, NRCAN, GEBCO, NOAA, Increment P Corp.

Projection: WGS_1984_UTM_Zone_11N

FIGURE 1
General Vicinity of the APE
Cultural Resources Inventory
U.S. Army National Training Center at Fort Irwin
San Bernardino County, CA

CALIBRE STELL


N
MERIDIAN
SAN BERNARDINO
T 28 S
T 29 S
Water Tank
Nelson Lake
Goldstone Lake
Landing Strip
NAVAL WEAPONS CENTER
MILITARY RESERVATION BOUNDARY
Service Layer Credits: Copyright © 2013 National Geographic Society, i-cubed
FIGURE 2
PROJECT LOCATION MAP
Project Area - North
Dense Urban Terrain APE
Cultural Resources Inventory
U.S. Army National Training Center
Fort Irwin
San Bernardino County, CA
Legend
Project Survey Area
No Survey Required
T16N R1E Sections 24-27 & 32-36
T16N R2E Sections 19 & 29-32
T15N R1E Sections 2-5, 8-10,
16-17, 21, 23, 26-28 & 34-35
Source Data: Nelson Lake, West of Nelson Lake & East of Goldstone, CA, USGS 7.5 Minute Topographic Quadrangles
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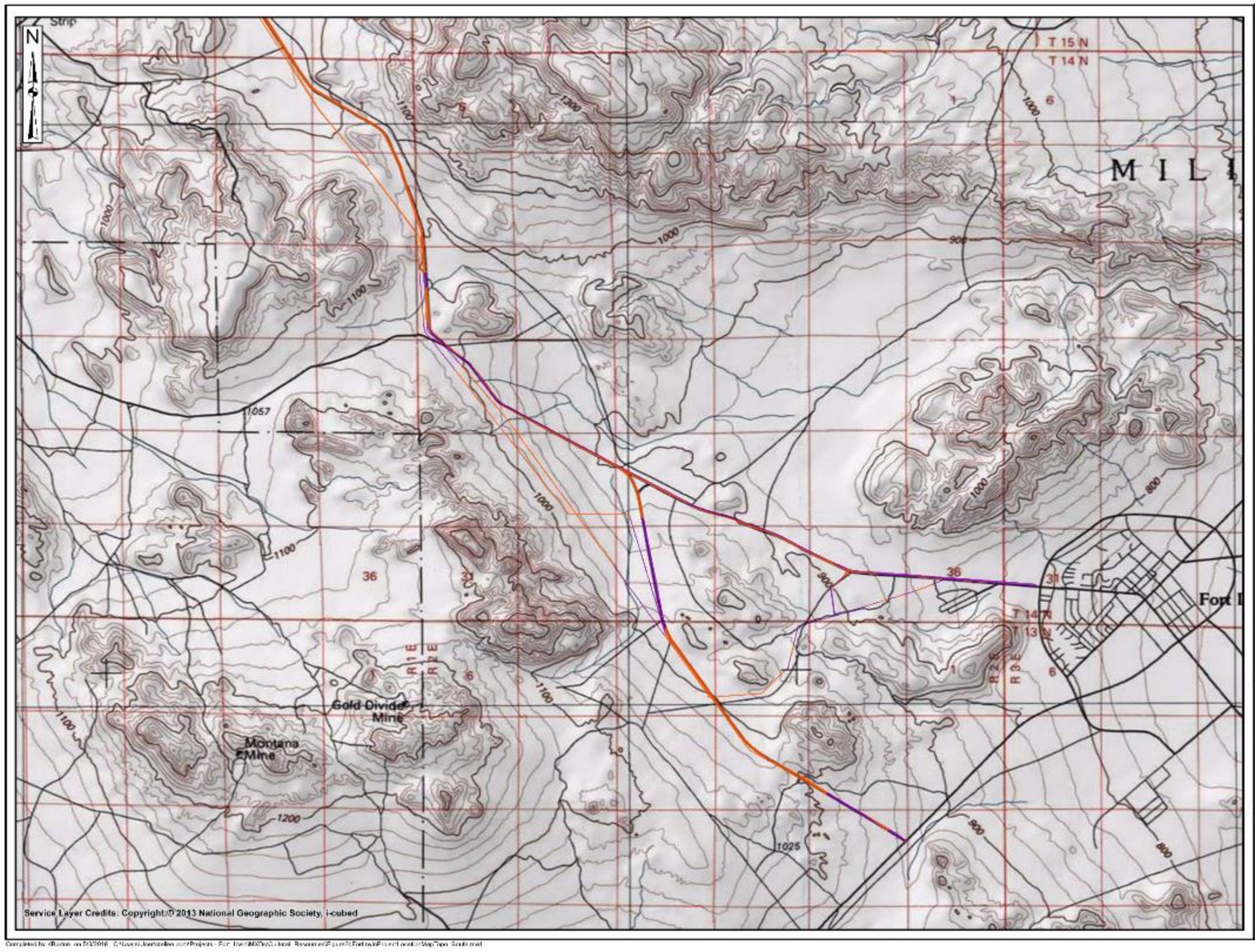


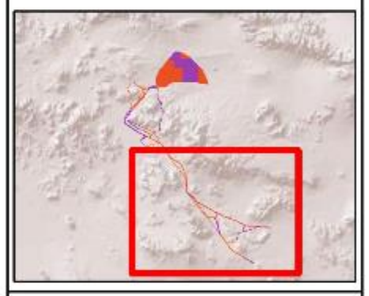
FIGURE 3
PROJECT LOCATION MAP

Project Area - South
Dense Urban Terrain APE
Cultural Resources Inventory
U.S. Army National Training Center
Fort Irwin
San Bernardino County, CA

Legend

- Project Survey Area
- No Survey Required

T15N R1E Sections 35 & 36
T14N R1E Sections 1, 2 & 12
T14N R2E Sections 7, 18, 19, 20 & 27-36
T14N R3E Section 31
T13N R2E Sections 3, 4, 10, 11 & 14



Source Data: Nelson Lake, West of Nelson Lake & East of Goldstone, CA. USGS 7.5 Minute Topographic Quadrangles

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CALIBRE
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1.5 REGULATORY ENVIRONMENT

This section identifies Federal legislation; local statutes, ordinances, and guidelines that govern the identification and treatment of cultural resources; and the analysis of project-related effects to these resources. The lead agency must consider these requirements when making decisions on projects that may affect cultural resources. The current project was undertaken in conformance with these regulations.

1.5.1 FEDERAL REGULATIONS

1.5.1.1 National Historic Preservation Act of 1966

Enacted in 1966 and amended most recently in 2014, the National Historic Preservation Act (NHPA) (54 United States Code [USC] 300101 et seq.) instituted a multifaceted program, administered by the Secretary of the Interior, to encourage sound preservation policies of the nation's cultural resources at the Federal, State, and local levels. The NHPA authorized the expansion and maintenance of the National Register of Historic Places (NRHP), established the position of State Historic Preservation Officer (SHPO), and provided for the designation of State Review Boards. The NHPA also set up a mechanism to certify local governments to carry out the goals of the NHPA, assisted Native American tribes in preserving their cultural heritage, and created the Advisory Council on Historic Preservation (ACHP).

1.5.1.2 Section 106

Section 106 of the NHPA (54 USC 306108) states that Federal agencies with direct or indirect jurisdiction over federally funded, assisted, or licensed undertakings must take into account the effect of the undertaking on any historic property that is included in or eligible for inclusion in the NRHP, and that the ACHP must be afforded an opportunity to comment, through a process outlined in the ACHP regulations in Title 36 of the CFR part 800, on such undertakings. The Section 106 process involves identification of significant historic resources within an "area of potential effect [APE]; determination if the undertaking will cause an adverse effect on historic resources; and resolution of those adverse effects through execution of a Memorandum of Agreement." In addition to the ACHP, interested members of the public, including individuals, organizations, and agencies (such as the California Office of Historic Preservation), are provided with opportunities to participate in the process.

1.5.1.3 National Register of Historic Places

The NRHP was established by the NHPA of 1966 as

> "an authoritative guide to be used by Federal, State, and local governments, private groups and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment" [36 CFR part 60.2].

The NRHP recognizes properties that are significant at the national, State, and local levels. To be eligible for listing in the NRHP, a resource must be **significant** in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess **integrity** of location, design, setting, materials, workmanship, feeling, and association.

1.5.1.3.1 Significance

A property is eligible for the NRHP if it is significant under one or more of the following criteria:

- **Criterion A:** It is associated with events that have made a significant contribution to the broad patterns of our history.
- **Criterion B:** It is associated with the lives of persons who are significant in our past.
- **Criterion C:** It embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction.
- **Criterion D:** It has yielded, or may be likely to yield, information important in prehistory or history. Ordinarily cemeteries, birthplaces, or graves of historic figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; and properties that are primarily commemorative in nature are not considered eligible for the NRHP unless they satisfy certain conditions. In general, a resource must be 50 years of age to be considered for the NRHP unless it satisfies a standard of exceptional importance.

1.5.1.3.2 Integrity

In addition to meeting the significance criteria, a property must retain historic *integrity*, which is defined in National Register Bulletin 15 as the "ability of a property to convey its significance" (National Park Service 1990). In order to assess integrity, the National Park Service recognizes seven aspects or qualities that, considered together, define historic integrity. To retain integrity, a property must possess several, if not all, of these seven qualities, which are defined in the following manner in National Register Bulletin 15:

- **Location:** The place where the historic property was constructed or the place where the historic event occurred;
- **Design:** The combination of elements that create the form, plan, space, structure, and style of a property;
- **Setting:** The physical environment of a historic property;
- **Materials:** The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property;
- **Workmanship:** The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory;
- **Feeling:** A property's expression of the aesthetic or historic sense of a particular period of time; and/or
- **Association:** The direct link between an important historic event or person and a historic property.

1.5.1.4 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC 3001 et seq.) protects human remains, funerary objects, sacred objects, and items of cultural patrimony of indigenous peoples on Federal lands. The NAGPRA stipulates priorities for assigning ownership or control of such cultural items excavated or discovered on Federal or Tribal lands, or in the possession and control of an agency that has received Federal funding.

The NAGPRA also provides for the repatriation of human remains and associated items previously collected from Federal lands and in the possession or control of a Federal agency or Federally-funded repository. Implementing regulations are codified in 43 CFR Part 10. In addition to defining procedures for dealing with previously collected human remains and associated items, these regulations outline procedures for negotiating plans of action or comprehensive agreements for treatment of human remains and associated items encountered in intentional excavations, or inadvertent discoveries on Federal or Tribal lands.

1.5.1.5 Consultation with Native Americans

Section 106 requires the lead agency to initiate consultation with California Native American groups that are traditionally and culturally affiliated with the project, including Tribes that may not be federally recognized. The government will conduct all consultation with the State of California and Federally affiliated Native American tribes.

2 AREA OF POTENTIAL EFFECTS

The APE is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such historic properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

For the current project, the APE that will be directly affected by the construction of the project includes the DUT Complex (2,196 acres), approximately 20.4 miles of existing access road improvements, and approximately 27 miles for the installation of utilities (fiber, electrical, water) in designated corridors. The collective APE measures approximately 4,660 acres located within the boundaries of Fort Irwin. Approximately 2,128 acres (46 percent) of the APE has previously been surveyed for cultural resources in recent years and does not require resurvey as a part of this work. Due to the age of previous archaeological investigations covering the remainder of the APE, some portions of the project area will need to be resurveyed for cultural resources to adhere to currently acceptable data recordation standard. As a result, approximately 54 percent of the APE (approximately 2,532 acres) will require either resurvey or initial survey for cultural resources.

3 ENVIRONMENT AND CULTURAL SETTING

3.1 ENVIRONMENTAL CONTEXT

This section describes the environmental context of the project area. Elements of the environmental context include geology, soils, plants, and animal habitats. Knowledge of the geologic processes associated with landforms in this area can assist in locating archaeological resources. Geographic features, such as shorelines, rivers, lakes, and terraces, are often correlated with the archaeological record. Throughout prehistory, these locations provided an abundance of plant resources and fish, and often attracted terrestrial animals as well. As a result, archaeological sites tend to be found at locations along shorelines, within active floodplains, or along associated terraces. The depth of soils and potential for buried deposits can be derived from soil surveys and geomorphologic descriptions of the landscape. Understanding the extent of native plant and ecological habitats provides a context for interpreting archaeological sites and activity locations.

3.1.1 NATURAL RESOURCES

The Mojave Desert dominates the topography of the region, and much of the APE is characterized by low ridges and terraces dissected by shallow braided washes that slope generally toward the Mojave River, the region's major hydrologic feature. The river's headwaters are to the west in the San Bernardino Mountains. Water rarely flows in the river east of Victorville but travels underground beneath the sand and gravel. The channel is generally dry in this vicinity of the APE, except for brief periods during the rainy season. Nelson Lake is located east of the APE.

The area is extremely arid during the entire year, averaging fewer than 5 inches of rain annually. Although it can happen in any month, most rainfall occurs between December and March. Even then, the average monthly total is less than 1 inch (2.54 centimeters [cm]) of precipitation. During the summer months, widely scattered torrential thunderstorms can occur. The high temperatures range from approximately 60 degrees Fahrenheit (°F) (15.5 degrees Celsius [°C]) in the winter months to approximately 100°F (37.8°C) during the warmest summer months of June through September. However, during the winter nights, temperatures occasionally may drop to below freezing. Snow is rare; however, it has been known to occur, most often in December or January (U.S. Climate Data 2016).

Fauna in the area includes jackrabbit (*Lepus californicus*), coyote (*Canis latrans*), and desert tortoise (*Gopherus agassizii*), along with rodents, snakes and lizards, and birds, such as mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), and nighthawk (*Chordeiles minor*). The vegetation community is creosote bush scrub (Barbour and Major 1988:837). Plants include creosote bush (*Larrea tridentata*), bursage (*Ambrosia dumosa*), Indian or Mormon tea (*Ephedra nevadensis*), yucca (*Yucca schidigera*), and various cactus species (Manley 1996).

3.1.2 GEOLOGIC SETTING AND SOILS

The project is located in the north-central portion of the Mojave Desert in eastern California, a region surrounded by mountains and fault lines, including the San Andreas Fault to the southwest and the Garlock Fault to the north (Schoenherr 1992:13). The geology of the region is complex. The underlying material consists of sandstone, shale, and gravel deposits from the Pliocene (5.3–

1.8 million years before present [MYBP]) and/or Pleistocene (1.64–0.01 MYBP) Epochs. Tertiary (65–1.64 MYBP) volcanic flow rocks, Mesozoic (248–65 MYBP) volcanic and metavolcanic rocks, and granitics are also present in the region (Jennings 1977). The rocky north-south-trending Coast Ranges block the eastward movement of the moisture-laden Pacific air mass. Soils in the APE are well drained, mostly composed of colluvium and alluvium, and consist of various mixtures of sand, loam, and gravel (U.S. Department of Agriculture 2014).

3.2 CULTURAL CONTEXT

This section describes the cultural context of the project APE, which will inform the evaluation of findings from the field investigations performed as part of this assessment. Elements of the cultural context include cultural chronologies developed for the prehistoric occupation through archaeological research, information derived from oral histories and Native American recollections, and historic events and land-use patterns. Reviewing archival archaeological, historical and ethnographic documents provide insight toward developing hypotheses and a research design.

3.2.1 PREHISTORY

The prehistory of southern California is varied and rich, encompassing a period of more than 12,000 years. Numerous chronological sequences have been devised to explicate cultural changes for various areas in southern California over the past 75 years (Moratto 2004). This prehistoric overview is structured using the latest Mojave Desert culture history (Sutton et al. 2007). The framework is therefore divided into four major periods: Pleistocene, early Holocene, middle Holocene, and late Holocene (Table 1).

Table 1. Mojave Desert Chronology

Temporal Period	Cultural Complex or Period	Approximate Dates	Marker Artifact
Pleistocene	Pre-Clovis (hypothetical) Paleoindian	Pre-10,000 cal B.C. 10,000–8000 cal B.C.	Unclear Fluted points (Clovis)
Early Holocene	Lake Mojave	8000–6000 cal B.C.	Stemmed points (Lake Mojave, Silver Lake)
Middle Holocene	Pinto	7000–3000 cal B.C.	Pinto Series points
Late Holocene	Gypsum Rose Spring Late Prehistoric	2000 cal B.C.–cal A.D. 200 cal. A.D. 200–1100 cal. A.D. 1100–Contact	Gypsum and Elko Series points Rose Spring and Eastgate Series points Desert Series points, ceramics

Source: Sutton et al. (2007:236).

3.2.2 PALEOINDIAN PERIOD (CA. 10,000–8000 CAL B.C.)

A firm date for the initial human occupation of the Mojave Desert has not yet been established. Although there have been several controversial claims of Pleistocene-age (pre-Clovis) finds, such as the Early Man Site of Calico Hills (Leakey et al. 1968, 1972), most archaeologists remain unconvinced by available Mojave Desert data. The growing acceptance of evidence for pre-Clovis occupations elsewhere in the Western Hemisphere suggests the possibility that such evidence may yet be found in this region as well.

The earliest broadly accepted cultural complex in the Mojave Desert is the Clovis Complex (Sutton et al. 2007:233). The hallmark artifacts of this complex are large lanceolate-shaped bifaces with distinctive fluting used to thin and flatten the base for hafting (Justice 2002:73). Paleoindian populations associated with fluted point technology consisted of small, mobile groups that hunted and gathered near permanent sources of water, such as pluvial lakes.

There is some doubt as to whether the Clovis Complex had a temporally or geographically extensive presence in the Mojave Desert. Fluted points have traditionally been interpreted as tools used for hunting Pleistocene megafauna due to their clear association with megafaunal remains in the American Southwest; however, most fluted points found in California have been recovered as isolated surface finds without confirmed Pleistocene radiocarbon dates (Arnold et al. 2004).

3.2.3 THE EARLY HOLOCENE (8000–6000 CAL B.C.)

The communities that lived in the Mojave Desert witnessed and were profoundly affected by great environmental changes during the gradual Pleistocene–Holocene transition. Temperatures became warmer, but remained cooler and moister than those of today. The Mojave Desert became marked by shallow lakes and marshes that were biologically very productive. By the early Holocene, warmer temperatures, reduced precipitation, and the eventual dehydration of the pluvial lakes are believed to have led to irregularities in the distribution and abundance of resources (Sutton et al. 2007:237). These climatic changes created the need for a more diversified subsistence strategy; the archaeological pattern associated with this adaptation is known as the Lake Mojave Complex.

Named for a Pleistocene lake in southern California, the Lake Mojave Complex is recognized by the heavy, stemmed projectile points of the Great Basin Stemmed Series, such as Lake Mojave and Silver Lake. Other tools include bifaces, steep-edged unifaces, crescents, the occasional cobble-core tool, and, rarely, ground stone implements (Justice 2002:91). This toolkit represents a generalized adaptation to highly variable terrain (Justice 2002:116).

The changing climate, distribution of occupational sites, and the all-terrain toolkit suggest that the inhabitants of the Mojave Desert during the early Holocene developed a broad-ranging subsistence strategy based on patterns of “intensive environmental monitoring” (Sutton et al. 2007:237). These people monitored the seasons and moved in the direction of known resource patches.

3.2.4 THE MIDDLE HOLOCENE (7000–3000 CAL B.C.)

The middle Holocene climate, although more arid than periods before and after, was still highly variable, with multiple oscillations between wetter and drier conditions occurring throughout. In addition, although the lakes and marshes of the early Holocene dried up, streams and springs in the Mojave Desert may have still maintained water flow from nearby ranges, at various times and places, providing suitable water sources to sustain human activity, albeit at low densities (Aikens 1978; Basgall 2000; Cleland and Spaulding 1992; Sutton 1996; Warren 1984). Between 7000 B.C. and 5000 B.C., temperatures appear to have risen, and aridity appears to have increased, peaking between 6000 B.C. and 5000 B.C. Lowland ephemeral lakes and streams began to dry up, and vegetation communities capable of supporting large game animals became limited to a few isolated contexts. Settlement patterns adapted, shifting to upland settings where sources of water still existed (Sutton 1996). This land-use change also correlated with

adjustments in tool assemblage content and diversity, resulting in the emergence of the Pinto Complex.

Originally defined by Campbell and Campbell (1935), the Pinto Complex appears to represent shifts in subsistence patterns and adaptations, with greater emphasis placed on the exploitation of plants, as well as a continued focus on artiodactyls and smaller animals. It had a wider distribution throughout the Mojave Desert than the previous complexes. The pan-desert nature of the complex suggests that it represents a settlement system with a high degree of residential mobility.

The distinctive characteristics of the Pinto Complex toolkit as defined by Justice (2002:126) and Zyniecki (2003:12) include "indented base and bifurcate base projectile points with robust basal ears and weak shoulders."

Near the end of the middle Holocene, the climate became hotter and drier, marked by a period of "cultural hiatus" between 3000 B.C. and 2000 B.C. During this gap there appears to have been little to no human occupation in much of the Mojave (Sutton et al. 2007:241).

3.2.5 THE LATE HOLOCENE (2000 CAL B.C.–CONTACT)

The climate of the prehistoric late Holocene approximates that of today, with cooler and moister conditions than the middle Holocene, but not as cool and moist as the early Holocene. At least two major droughts are thought to have occurred within the Sierras (Stine 1994), at circa (ca.) A.D. 892–1112, and ca. A.D. 1209–1350. This was followed by a cooler and wetter period between 600 and 150 years ago (Cleland and Spaulding 1992:4). People returned to the region, and human subsistence strategies, compared to previous settlement behavior, changed significantly. This subsistence strategy correlated with adjustments in artifact/tool assemblage content and diversity, resulting in the emergence of the Gypsum Complex.

The Gypsum Complex is characterized by dart-point-size projectile points in notched or eared (Elko), concave-base (Humboldt), and small-stemmed (Gypsum) forms. In addition to diagnostic projectile points, Gypsum Complex sites consist of leaf-shaped points, rectangular-based knives, flake scrapers, T-shaped drills, and, occasionally, large scraper planes, choppers, and hammerstones (Warren 1984:416). Manos and milling stones are common, and the mortar and pestle were also introduced during this period. Other artifacts associated with this complex include split-twig animal figurines, *Olivella* sp. shell beads, and *Haliotis* sp. beads and ornaments.

By A.D. 200, the climate had become slightly cooler. Population size appears to have increased, as evidenced by a higher frequency of archaeological sites. This period in California prehistory is marked by the Rose Spring Complex, an archaeological pattern associated with a timeframe known as the Saratoga Springs, Haiwee, or Amargosa period, depending on the region (Sutton 1996; Sutton et al. 2007:236). By the onset of this period at A.D. 200, dart-point-size projectile points were being replaced with smaller Rose Spring projectile points, signaling the introduction of the bow and arrow (Yohe 1998).

Generally speaking, archaeological evidence left by highly mobile hunter-gatherers in the Mojave Desert most often takes the form of sparse scatters of flaked stone, ground stone, and ceramic artifacts and features, such as hearths, rock rings, and trails. These remains represent resource extraction and processing sites, as well as short-term encampments. Repeated use of specific locations may result in more diverse and substantial archaeological deposits.

3.3 ETHNOGRAPHIC PERIOD

Ethnographic boundaries in the Mojave Desert are loosely defined owing to the highly mobile nature of desert settlement strategies and the variety of alternatives presented by previous researchers. According to available ethnographic maps (Bean and Smith 1978:570; Kroeber 1925; Sutton et al. 2007:232), the project falls within the traditional territory of the Vanyume subgroup of the Serrano people, near the boundary with their northern neighbors, the Kawaiisu, and west of the Chemehuevi or Southern Paiute.

3.3.1 SERRANO/VANYUME

The Serrano language is part of the Serran division of a branch of the Takic family of the Uto-Aztecan linguistic stock (Mithun 2006:539, 543). The two Serran languages, Kitanemuk and Serrano, are closely related. Kitanemuk ethnographic lands were located to the northwest of the Serrano. The Kawaiisu and Chemehuevi, located north and east of the Serrano, respectively, spoke languages that belong to the Numic branch of the Uto-Aztecan family. Serrano was originally spoken by a relatively small group located within the San Bernardino and Sierra Madre Mountains (Kroeber 1925:611). The Vanyume, who lived along the Mojave River and associated Mojave Desert areas and are also referred to as the Desert Serrano, spoke either a dialect of Serrano or a closely related language (Mithun 2006:543).

According to the records by Fr. Francisco Garcés, who was the first European to travel in this region in 1776, the name *Vanyume* is derived from the term for them (Beñeme) used by the Mojave (Coues 1900:Vol. 1:240). Very little is known of the Vanyume-speaking people, because the group was heavily disrupted by the Spanish missionaries between the early 1820s and 1834. By the 1900s, the group was considered extinct (Bean and Smith 1978:570; Kroeber 1925:614). Kroeber (1925:614–615) does make a distinction between the Serrano and Vanyume by reporting that the Vanyume were friendly with the Chemehuevi and Mohave to the east, whereas the Serrano maintained animosity with these groups. The area of combined Serrano/Vanyume occupation—the San Bernardino Mountains, the southwestern portions of the Mojave Desert, and the Mojave River area—has become known as the Serrano area.

Most Serrano lived in small villages located near water sources (Bean and Smith 1978:571). Organization of Serrano lineage sets was considered by Kroeber (1925:617–618) to be similar to political groups. He defined a lineage set as occupying one village, representing at least two moieties, and coordinating its hunting and gathering activities per the religious deliberations and scheduling determined by two leaders (one from each of the moieties), with one leader occupying the ceremonial house and the other possessing the ceremonial bundle. Often, a lineage set had the exclusive power to forge and maintain economic ties to other villages of neighboring Serrano, Cahuilla, Chemehuevi, Gabrielino, and Cupeño. Desert Serrano villages are mentioned in the 1776 account of the Spanish Franciscan missionary Fr. Francisco Garcés and in the records dating to the early 1800s by Fr. Joaquín Nuez. Fr. Garcés mentions villages along the Mojave River near today's Barstow and Daggett (Coues 1900:Vol. 1:241–248). Beattie (1939) suggests the average village population was 70, and that these settlements were generally spaced at 10-mile intervals along the river.

The fundamental economy of the Serrano was one of subsistence hunting and collecting plant goods, with occasional fishing (Bean and Smith 1978:571). Serrano territory was a trade nexus between inland tribes and coastal tribes, and trade and exchange were important aspects of the Serrano economy. Those living in the lower-elevation, desert floor villages traded foodstuffs

with people living in the foothill villages who had access to a different variety of edible resources. In addition to intervillage trade, ritualized communal food procurement events, such as rabbit and deer hunts and piñon, acorn, and mesquite nut-gathering events, integrated the economy and helped distribute resources that were available in different ecozones.

A variety of materials was used for hunting, gathering, and processing food, many of which were also used for shelter, clothing, and ceremonial items. Shell, wood, bone, horn, stone, plant materials, animal skins, and feathers were used for making money, baskets, blankets, mats, nets, and bags. The Serrano made pottery and used it daily to carry and store water or foodstuffs; ceramics were also used as ceremonial objects. They also made awls, sinew-backed bows, arrows, arrow straighteners, throwing sticks (for hunting), traps, fire drills, stone pipes, musical instruments of various types (rattles, rasps, whistles, bull-roarers, and whistles), yucca fiber cordage for snares, nets and carrying bags, and clothing (Bean and Smith 1978:571; Bean and Vane 2002). A strong tradition of basket weaving incorporated the use of *Juncus* sedge, deergrass, and yucca fiber.

Religious doctoring among the Serrano took place within the ceremonial center (Bean and Smith 1978:573). Their doctoring tradition was based on dreaming techniques aided by the hallucinogenic *Datura* plant, by sucking techniques applied by the doctor to the patient's body, and by the administration of pharmacopeia of traditional medicinal plants. Songs and rituals to the creator for the conversion of plants and animals into the foods, medicines, and utensil materials necessary for Serrano sustenance played an important role in any hunting, gathering, or healing endeavor (Bean and Vane 2002). Shamans also had significant roles in typical life rituals, including birth, puberty, marriage, and death. The administration of *Datura* was particularly important in the boys' puberty ceremony because they were expected to have dreams that would determine the future mileposts of their lives.

Prior to Spanish occupation of Serrano lands, cremation of the body and the deceased's possessions was practiced. The completion of the death cycle involved a week-long ceremony that involved ritualized gift giving, feasting, naming, public display of the lineage set ceremonial bundle, an eagle killing and dance ceremony, and a final burning of an effigy depicting the deceased.

Mainly because of the inland territory that Serrano occupied beyond Cajon Pass, contact between Serrano and Europeans was relatively minimal prior to the early 1800s. As early as 1790, however, Serrano began to be drawn into mission life (Bean and Vane 2002). More Serrano were relocated to Mission San Gabriel in 1811 after a failed indigenous attack on that mission. In the 1860s, a smallpox epidemic decimated many indigenous southern Californians, including the Serrano (Bean and Vane 2002). Oral history accounts of a massacre in the 1860s at Twentynine Palms may have been part of a larger American military campaign that lasted 32 days (Bean and Vane 2002:10).

Surviving Serrano sought shelter at Morongo with their Cahuilla neighbors; Morongo later became a reservation (Bean and Vane 2002). Other survivors followed the Serrano leader Santos Manuel down from the mountains and toward the valley floors, and eventually settled what later became the San Manuel Band of Mission Indians Reservation. This reservation was established in 1891 (San Manuel Band of Mission Indians 2008). Although the Vanyume were considered extinct by ethnographers (Bean and Smith 1978:570; Kroeber 1925:614), recent genealogical research combined with mitochondrial DNA (mtDNA) analysis indicate that three lineages from

the Fort Tejon area were originally from the village of *Topipabit* downstream from Victorville (Final Staff Assessment [FSA] 2008:4.3–11). These lineages are currently part of the San Fernando Band of Mission Indians, located in Newhall. This group, which includes Kitanemuk, Inland Chumash, Tataviam, and Vanyume, has applied for federal recognition.

3.3.2 KAWAIISU

The Kawaiisu were mobile hunter-gatherers who primarily resided in a core area in the southern Sierra Nevada and Tehachapi Mountains and made frequent forays into the Mojave Desert to exploit seasonal resources (Zigmond 1986). Linguistically, Kawaiisu has been identified as a part of the Southern Numic branch of the extensive Uto-Aztecan language family, which includes most languages of the Great Basin, extending south from southern Idaho into Mexico and east into Arizona (Mithun 2006:539).

Although there is general agreement about the location of the Kawaiisu core area, the extent of their territory in the Mojave Desert is less clearly understood. Zigmond (1986:399) depicts an area of seasonal use that extends east of the Granite Mountains, in present-day Fort Irwin. Kroeber (1976:602) cites an account of a Kawaiisu group on the upper Mojave River and in the southern Panamint Range. Steward (1938:71, Figure 1) also places the Kawaiisu in the southern Panamint Valley, the Argus Range, Trona, and an undetermined area to the south and west. He notes further that although the northern Panamint Valley was occupied by the Shoshone, the Kawaiisu and Shoshone were mixed in the southern part of the valley and perhaps near Trona.

Dietary staples for the Kawaiisu included piñon, juniper, yucca, chia, wild rice, sunflower, buckwheat, and screwbean. Zigmond (1981) identifies 233 plant species used by the Kawaiisu, of which 112 were used for food and beverages. Deer was a major source of meat when populations were residing in the mountainous core area, and it was supplemented by small game. Antelope and bighorn sheep were exploited by hunters on the desert floor. Salt was also important in their diet and was collected from Koehn Lake, 25 miles northeast of the project, or from Proctor Lake in the Tehachapi Valley when water levels at Koehn Lake were low (Tomo-Kahni State Historic Park 2005).

Pottery is rare in sites attributed to the Kawaiisu and was probably primarily acquired through trading. Basket making was an important tradition among the Kawaiisu, who used numerous types of baskets for food collecting, processing, and storing, such as seedbeaters, burden baskets, containers, winnowers, trays, and hoppers (Zigmond 1986:401). Raw material for tool making, such as chert, was likely obtained from areas near Red Rock Canyon, whereas obsidian was acquired through trade with groups from the Coso Volcanic Field (east of the Sierra Nevada). Long-distance exchange with coastal areas is also evident, with the presence of marine shell artifacts in some sites attributed to the Kawaiisu.

During the winter months, the Kawaiisu lived in tomo-kahni, which are circular, aboveground structures with vertical and transverse poles bound together and covered with brush, bark, and tule mats (Zigmond 1986:401). Other structures included open, flat-roofed shade houses (havakahni) used for summer habitation, sweathouses (tivikahni), circular brush enclosures, and small granaries.

In his review of the ethnographic literature, Earle (2004:82-89) discusses place names and events within or near Fort Irwin that can be used to orient Native American movement and early interactions with Euro- Americans. Mentioned are the Avawatz Mountains, Soda Mountains,

eastern Granite Mountains, and several springs associated with routes near these ranges, including Bitter Spring, Cave Spring, and Drinkwater Spring—all on the eastern side of Fort Irwin and outside the four survey areas. Closer to but still outside the survey areas, Earle (2004:87) discusses the Leach Spring–Leach Lake area in the northwestern portion of Fort Irwin. In 1860, the expedition led by Lieutenant B. F. Davis noted a major trail traversed this region from west to east. The importance of Leach Spring as a Native American camp and the best spring on the trail between Granite Wells and Saratoga Springs is indicated by the abundance of artifacts reported in two water reports dating to the early 1900s (Mendenhall 1909; Thompson 1929).

3.3.3 SOUTHERN PAIUTE

The Southern Paiute belong to the Southern Numic branch of the Uto-Aztekan linguistic family and include 15 subgroups: Antarianunts, Kaiparowits, San Juan, Kaibab, Shivwits, Uinkaret, Saint George, Gunlock, Cedar, Beaver, Panaco, Pahranagat, Moapa, Las Vegas (including Pahrump), and Chemehuevi (Kelly and Fowler 1986). Some ethnographers consider the Chemehuevi as a separate group from the Southern Paiute, though the differences between them and other Sothern Paiute are minimal and are generally attributed to environmental variation (Theodoratus et al. 1998). The traditional territory of the Southern Paiute is vast, and the environmental variation of the lands occupied by the Southern Paiute is pronounced, ranging from the Colorado Plateau to the Mojave Desert, and including the Colorado River basin and numerous small mountain ranges (Kelly and Fowler 1986).

Southern Paiute subsistence was centered on gathering and hunting. The environmental differences of the territories of various Southern Paiute groups were reflected in the resources they exploited for subsistence as well as in the procurement strategies they employed (Theodoratus et al. 1998). Fauna used as a food source included small game such as rabbits and tortoises as well as fish and mountain sheep (Kelly and Fowler 1986). The Southern Paiute exploited a variety of flora, including piñon nuts and agave for food; some groups practiced agriculture, raising maize, squash, and winter wheat among other things (Kelly and Fowler 1986). The basic socioeconomic unit of the Southern Paiute was the family household. No centralized political hierarchy has been recorded, though at times households would corporate during hunting and gathering activities. Immediately after marriage, matrilocal residence was common, though in the longer term most would permanently settle near the husband's relatives (Kelly and Fowler 1986).

3.4 HISTORIC BACKGROUND

Post-contact history for the state of California is generally divided into three periods: the Spanish period (1769–1822), the Mexican period (1822–1848), and the American period (1848–present). Although there were brief visits by Spanish, Russian, and British explorers from 1529 to 1769, the Spanish period in California began with the establishment of Mission San Diego de Alcalá, the first of 21 missions constructed between 1769 and 1823. Independence from Spain marks the beginning of the Mexican period, and the signing of the Treaty of Guadalupe Hidalgo in 1848, ending the Mexican–American War, signals the beginning of the American period, when California became a territory of the United States.

3.4.1 SPANISH PERIOD (1769–1822)

Spanish explorers made sailing expeditions along the coast of Southern California between the mid-1500s and mid-1700s. In search of the legendary Northwest Passage, Juan Rodríguez Cabríllo stopped in 1542 at present-day San Diego Bay. With his crew, Cabríllo explored the shorelines of present-day Catalina Island and San Pedro and Santa Monica Bays. Much of the present California and Oregon coastline was mapped and recorded in the following half-century by Spanish naval officer Sebastián Vizcaíno. Vizcaíno's crew also landed on Santa Catalina Island and at San Pedro and Santa Monica Bays, giving each location its long-standing name. The Spanish crown laid claim to California based on the surveys conducted by Cabríllo and Vizcaíno (Bancroft 1886:96–99; Gumprecht 1999:35).

Inland exploration and colonization of Alta (upper) California by Spain would not be a priority for more than 200 years. The 1769 overland expedition by Captain Gaspar de Portolá marks the beginning of California's Historic period, occurring just after the king of Spain installed the Franciscan Order to direct religious and colonization matters in assigned territories of the Americas. With a band of 64 soldiers, missionaries, Baja (lower) California Native Americans, and Mexican civilians, Portolá established the Presidio of San Diego, a fortified military outpost, as the first Spanish settlement in Alta California. In July 1769, Franciscan Fr. Junípero Serra founded Mission San Diego de Alcalá at Presidio Hill, the first of the 21 missions that would be established in Alta California by the Spanish and the Franciscan Order between 1769 and 1823.

Although Don Pedro Fages traveled near the Cajon Pass as early as 1772, the first known Spanish explorer to enter the area that would become San Bernardino County was Father Francisco Garcés, traveling from the Colorado River in 1776 (Hoover et al. 2002:321). After this time, little documentation exists for European explorations or visits to the Mojave Desert and beyond until the 1800s; however, it is certain that such contacts occurred. Native Americans residing in these areas were likely indirectly affected by disruptions in trade caused by the European occupation in the coastal areas.

The 21 missions paralleled the California coastline between San Diego and Sonoma. Near-coastal locations were preferred by the Spaniards for colonization because they were easier to defend and supply from ships, and were also bordered by populous Native American villages with potential converts. Although present-day San Bernardino County did not formally host Spanish missions, the region remained connected to the California presidio and mission system through the Franciscan rancho and asistencia outposts. The San Bernardino Valley was named in 1810 by the Franciscan missionary Francisco Dumetz, who led a party from the San Gabriel Mission into the valley in observance of the Feast of St. Bernardine of Siena. Near today's city of Redlands in San Bernardino County, the San Bernardino de Sena Estancia (also known as the San Bernardino Rancho) was established in 1819 for grazing cattle owned by the Mission San Gabriel Arcángel.

In the early 1800s, the Spanish increased their efforts to incorporate Native Americans into the mission system. Native Americans from interior tribes were either brought or came to the San Gabriel and San Fernando missions, established in 1771 and 1797, respectively, which may have exerted influence as far as the upper Mojave River. Although the Spanish were determined to gather all natives into the mission system, there are numerous examples of interior Native American villages not represented in the mission registers. As the Spanish presence in Southern California increased, native neophytes attempted to escape missions by running away and

seeking refuge with interior tribes, such as in the Southern San Joaquin Valley or the Mojave Desert and adjacent mountains. This led to forays into these regions by Spanish soldiers who were attempting to recapture runaway neophytes, and the influx of natives from different tribal territories resulted in tribal intermixing and blurred territorial boundaries.

3.4.2 MEXICAN PERIOD (1822–1848)

After more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain in 1821. During this period, trappers and explorers from the eastern United States journeyed westward. Jedediah Strong Smith was among these early American adventurers. He traveled through the project vicinity in 1826 and 1827 and nicknamed the Mojave River the "Inconstant River" because it frequently disappeared beneath the surface.

The influence of the California missions waned in the late 1820s through the early 1830s, and, as one consequence, extensive land grants in the interior were initiated in the Mexican period, in part to increase the population away from the more settled coastal areas where the Spanish had concentrated their colonization efforts. Following adoption of the Secularization Act of 1833, the Mexican government privatized most Franciscan lands, including holdings of their California missions. By 1836, this sweeping process effectively reduced the California missions to parish churches and released their vast landholdings. Although earlier secularization schemes had called for redistribution of lands to Native American neophytes who were responsible for construction of the mission empire, the vast mission lands and livestock holdings were instead redistributed by the Mexican government through several hundred land grants to private, non–Native American ranchers (Langum 1987:15–18).

During the Mexican period, the large ranchos became important economic and social centers. During the supremacy of the ranchos (1834–1848), landowners largely focused on the cattle industry and devoted large tracts to grazing. Cattle hides became a primary Southern California export, providing a commodity to trade for goods from the east and other areas in the United States and Mexico. The non–Native American population of California increased during this period because of the influx of explorers, trappers, and ranchers associated with the land grants. The rising California population unfortunately contributed to the introduction and spread of diseases foreign to the Native American population, who had no associated immunities (Cook 1955).

3.4.3 AMERICAN PERIOD (1848–PRESENT)

The Mexican-American War ended with the Treaty of Guadalupe Hidalgo, signed in 1848, ushering California into its American period. Horticulture and livestock, based primarily on cattle as the currency and staple of the rancho system, continued to dominate the southern California economy through the first decade of the Gold Rush beginning in 1848. California attained statehood with the Compromise of 1850. San Bernardino County was organized from parts of Los Angeles and San Diego Counties in April 1853, and the City of San Bernardino became the county seat in 1854.

During the Gold Rush, thousands of people traveled the Gila Trail or Southern Overland Trail from Texas to Arizona, then crossed the Colorado River at present-day Yuma into California and proceeded across the Colorado Desert to the San José Valley. Thousands traveled the Mojave River Trail, named the Old Spanish Trail by Captain John C. Frémont in 1844. As miners and

settlers began to occupy the Mojave River valley, U.S. Army forts were established to protect them and keep the trail open as the Mohave Indians periodically attacked homesteads and wagon trains.

Following the Civil War, overland stage services to and from Southern California resumed in 1868 with the Holladay and Wells Fargo operations (Nevin 1974; Stein 1994). Railroad surveyors first visited the area in the 1850s, but it was not until 1868, after the Civil War, that congressional approval was given for a railroad charter (McCoy 1994:114–116). The pre–Civil War national initiative for a southern transcontinental railroad route resumed, as the Texas and Pacific (T&P) Railway Company in 1871 conducted transcontinental surveys to pursue the initiative. In 1873, however, the T&P's westerly construction stalled in north-central Texas. The resulting delay was critical, allowing San Francisco investors to extend their own Southern Pacific Railroad through Imperial Valley to the Colorado River in 1877, bridging the river at Yuma into Arizona along the T&P survey in 1878 (Yenne 1985).

The Atlantic and Pacific Railroad (later the Atchison, Topeka, and Santa Fe [AT&SF] and currently the Burlington Northern Santa Fe) soon crossed the central part of the San Bernardino County, linking the area with San Diego and the eastern states by 1887. The railroad activity led to the establishment of Barstow in 1885, and the town continued to grow with additional rail lines and later the establishment of the interstate highway system in the 1920s and 1930s (McCoy 1994:155; Oxsen 1994:111).

The first highways across the Mojave Desert followed the Cajon Pass–Barstow–Needles route established by the Southern California Railway and the AT&SF. Established in 1912, the Ocean-to-Ocean Highway, now known as the National Old Trails Road, stretched from Baltimore, Maryland, to California. The route across the California deserts followed the Mojave River/Old Spanish Trail through Needles and Barstow to San Bernardino. Established in 1926, most of U.S. Route 66 largely followed the Ocean-to-Ocean Highway, passing through the desert region south of Needles on its way across the country to Los Angeles. After U.S. Route 66 was decommissioned in 1985, parts of it became Interstate (I) 40 as well as I-15. Remains of the route in several western states, including California, have been designated a National Trails Highway. Other important highways that crossed the region included the Randsburg/San Bernardino Road, which was added to the state system of secondary highways in 1933 and designated State Route 145. Two years later, the highway was designated U.S. Route 395.

Located approximately 31 miles southwest of Fort Irwin, Barstow became a mining center in the late 1800s, when silver was discovered in the area. The Santa Fe Railroad arrived in 1888, and Barstow was named after the president of the railroad, William Barstow Strong (City of Barstow 2016). Although the silver mines were exhausted and shut down in 1896, borax mining replaced it as the major industry. Barstow became a busy rail center and a stop along the famous U.S. Route 66. Today, Barstow is a major transportation hub of the Mojave Desert. Military bases were established in the desert prior to U.S. entry into World War II. Large tracts of land were set aside for military use near Ridgecrest, Barstow, Lancaster, and Twentynine Palms. From the late 19th century to the early 20th century, the area began to grow tremendously as mining operations of all types flourished.

During World War II**,** the military took control of much of the California desert. While General Patton's Desert Training Program was concentrated in the east (Bischoff 2005; Howard 1985), several military bases were established within the western Mojave. In 1940, a large tract of land

northeast of Barstow was set aside for Fort Irwin. Near Twentynine Palms, a glider training base was set up in 1941. Both of these sites were also used as armored division training areas. Army air bases were created near Daggett and Victorville. Supply depots at Nebo and Yermo were taken over by the Marine Corps after World War II (Norris and Carrico 1978). At the time of the Korean War in the early 1950s, military bases were reactivated. These bases continue to operate (Norris and Carrico 1978).

Since World War II, several areas in the Mojave have experienced a boom in urban growth. Much of this expansion has centered on Barstow, Victorville, Hesperia, and Apple Valley in the west, and near Twentynine Palms and Yucca Valley further to the east. Along with an increased number of year-round occupants and weekend inhabitants, there is an ever-growing number of visitors to natural areas such as Joshua Tree National Park, which was established as a national monument in 1936. Off-road vehicle users, rock hounds, and relic hunters have significantly stepped up their activities in the area. Accessibility to the region was made easier by the establishment of an interstate freeway system.

3.4.4 LOCAL HISTORY

In 1940, President Franklin D. Roosevelt established the Mojave Anti-Aircraft Range, a military reservation of approximately 1,000 square miles in the area of the present Fort Irwin. In 1942, the Mojave Anti-Aircraft Ranges was renamed Camp Irwin, in honor of Major General George LeRoy Irwin, commander of the 57th Field Artillery Brigade during World War I, and it was subsumed into the Desert Training Center as one of its cantonment areas and some of its ranges. Two years later, Camp Irwin was deactivated and placed on surplus status. In 1951, the camp reopened as the Armored Combat Training Areas and served as a training center for combat units during the Korean War. The post was designated a permanent installation of August 1, 1961 and renamed Fort Irwin. In January 1971, the post was deactivated again and placed in maintenance status under the control of Fort MacArthur, California. From 1972 to late 1980, Fort Irwin was used primarily as a training area by the Army National Guard and the U.S. Army Reserve.

In 1981, the Department of the Army announced that Fort Irwin was reactivated as the National Training Center and Fort Irwin was transferred back to the Regular Army from the California Army National Guard. Today, the National Training Center and Fort Irwin continues to serve as the Army's premier training center.

4 RESEARCH DESIGN

The purpose of this research design is to provide a framework to assess whether a known prehistoric, historic-era, or multi-component resource identified during this survey is likely to contain important information and be eligible for the NRHP under Criteria A, B, C, and/or D and exhibits integrity. This research design is divided into prehistoric and historic-era research domains and questions. Three general themes are relevant to assessing the data potential of prehistoric sites in terms of the regional prehistory of the Mojave Desert, and Fort Irwin in particular: chronology, adaptive responses to environmental change, and subsistence and settlement strategies. Archaeological materials from these sites may be considered significant if they occur in sufficient number and diversity in datable contexts to allow meaningful archaeological analysis and interpretation. Artifacts and other archeological materials from the sites may be significant if they can be used to address research domains and topics outlined in the research design below.

PREHISTORIC RESEARCH DOMAINS AND QUESTIONS

4.1 CULTURAL CHRONOLOGY

Cultural chronological information is a fundamental building block of archaeological research. Though there are several chronological frameworks in place for southern California, they tend to focus on either coast or desert regions rather than the inland mountains. They may thus be considered too broad or too specific to be regionally appropriate for the affected sites. Unless there is some way to associate artifacts chronologically, it is not possible to derive meaningful diachronical interpretations of the archaeological data.

4.1.1 RESEARCH QUESTIONS:

- When was each site used/occupied (prehistoric and historic-times)? Was prehistoric/historic use/occupation continuous or discontinuous?
- Are the sites contemporaneous with other sites in the area, or does it represent a different period?
- Were different parts of any site occupied/used at different times?
- How does each site relate to changes through time in the prehistoric occupation, resource procurement, and population patterns of the Mojave Desert?
- How does each site relate to prehistoric cultural chronologies developed by archaeologists for southern California, and how can it contribute to the development of a chronology of the Mojave Desert?
- What methods can be used for dating the sites?

4.1.2 DATA REQUIREMENTS:

Temporally sensitive Native American artifact types such as shell beads and projectile points identifiable to specific time periods can help place the site within the recognized prehistoric cultural horizons developed thus far for southern California. Some archaeological materials can be dated directly using obsidian-hydration analysis, and radiocarbon dating of organic material such as charcoal. Horizontally or vertically stratified cultural deposits are also important for providing relative temporal provenience for artifacts and material.

4.2 SETTLEMENT & SUBSISTENCE

One of the primary goals of archaeological research is to understand the settlement and subsistence practices of native people. Using data from hearths, faunal/floral remains, artifact assemblages (groundstone, flaked stone), and geographic setting, specific settlement and subsistence research goals can be addressed in light of natural and cultural factors influencing selective prehistoric use of specific locales. Spatial distribution of artifacts, features and other cultural materials may reflect the spatial organization of a group of people over time, and may or may not be similar to patterns observed at other sites in the region. Based on temporally and spatially segregated assemblages of artifacts, features, and other cultural remains at the site, identified patterns will be related to the nature of the settlement and subsistence activities at the site over time and may also relate to changing mobility patterns over time. As well, these types of research avenues may relate to how each site fits into an overall developmental model of settlement and subsistence strategies in the region.

On Fort Irwin, the vast majority of cultural resource surveys have been conducted in the lowland areas. Therefore, sites identified during survey of higher elevations may prove critical to a broader understanding of subsistence and settlement strategies. Additionally, since the majority of sites within the desert region are limited to a surficial context, a landscape approach may be feasible, depending on the site types, site distributions, and temporal markers, as well as individual site integrity, identified during the field survey within the four survey areas. A large sample of sites documented across a diverse landscape, including variation within altitudinal ecotones, for example, may make important contributions to this research issue.

4.2.1 RESEARCH QUESTIONS:

- What are the natural and cultural selection factors influencing the Native American decision to use/occupy the site areas and how is the spatial distribution of artifacts, features and other cultural materials reflective of the spatial organization of the occupants and their activities over time?
- What is the nature of raw materials and subsistence items procured at or imported to the sites based on faunal and floral remains, artifact types, etc.? What is the seasonal availability of resources used at the sites?
- How is the evidence for this decision-making similar/dissimilar to that observed at other sites in the region, particularly with regard to changing mobility patterns over time?
- What was the nature of the settlement/subsistence activities at the sites at various points in time as reflected by temporally/spatially segregated assemblages of artifacts, features, and other cultural remains?
- What is the relationship between these sites and other sites in the region?
- How does this site fit into an overall developmental model of settlement/subsistence strategies of prehistoric people in the Mojave Desert?

4.2.2 DATA REQUIREMENTS:

Environmental data regarding the site locations such as natural depositional episodes visible in the site stratigraphy can tell us what environmental processes were active at the site. Faunal and floral remains such as burned and/or butchered animal bone, plant microfossils (e.g., pollen) and macrobotanical remains (e.g., burned seeds) can provide evidence of subsistence strategies. Subsistence strategies may also be inferred through the food procurement and processing

technologies present. The relative type and quantity of millingstones, mortar and pestle, and projectile points in the assemblage may indicate site use, population mobility, technological advancement, and specialized resource exploitation. Residue analysis on these tools may also provide additional data regarding specific subsistence materials. Analysis of the spatial distribution of artifacts and other materials can show how subsistence and settlement patterns changed over time.

Since the majority of sites within the desert region are limited to a surficial context, a landscape approach to this research issue may be feasible, depending on the site types, site distributions, and temporal markers (e.g., projectile points), as well as individual site integrity.

4.3 TRADE & EXCHANGE

Trade and exchange are important methods for acquiring cultural commodities, both as raw material and finished product. The course and extent of trade routes, as well as their implied cultural interfaces and links, provide insights into relationships between neighboring groups, both regionally and locally. An understanding of trade and exchange also includes knowledge of material availability as well as of material preference, cultural mobility patterns, and social/economic interactions with neighboring groups over time. A related concern is whether materials were obtained through direct or indirect means and the implications of trade and exchange on cultural interactions across the scales of time and space.

4.3.1 RESEARCH QUESTIONS:

- What indications are there that the group(s) occupying/using the sites was involved in trade relationships?
- What prehistoric trade routes were associated with the area?
- How does the selection of raw materials for manufacture or the types of lithic materials in finished tools reflect mobility patterns or preferences in social/economic interactions with neighboring groups over time?
- What evidence from research at other sites in the region suggests prehistoric coast/interior interaction and how can this be employed to refine our understanding of human activities of the Mojave Desert sites?
- Are there tool types or styles found at the site that are characteristic of areas other than local assemblages?

4.3.2 DATA REQUIREMENTS:

Evidence of trade and social interaction can be gained through lithic, shell and other materials that derive from identifiable local and distant sources. Geographically and stylistically distinctive tool types are also indicators of the group and temporal period that produced them. Materials must be recovered from intact, datable deposits in order to be related to a particular period.

HISTORIC RESEARCH DOMAINS AND QUESTIONS

4.4 MILITARY PRESENCE

The military has played a vital role in the development of Fort Irwin since the Gold Rush era. Since Fort Irwin and its predecessor, the Mojave Anti-Aircraft Range, were not the first established military presence in the region, there is a possibility that evidence for undocumented 19th century military remains may be present in the APE. The military history of the region prior to World War II is less well documented than the post-World War II history of the installation. It

is possible that unrelated or perhaps associated sites, features, and artifacts dating to the mid-1800s or early 1900s may be present within Fort Irwin. After establishment of the Mojave Anti-Aircraft Range in the 1940s, it is possible that sites may be encountered during the survey that record aspects of the training of World War II military personnel that may not have been previously noted in archival reports and documents. At this time, no known historic-era archaeological sites are noted within the APE.

4.4.1 RESEARCH QUESTIONS

- Do undisturbed historic deposits/features contain evidence of mid-to-late 19th military use (e.g., horse trails, temporary camps, outposts, fortifications, etc.)? If so, what role did they serve?
- Do artifact scatters indicate aspects of military technology and/or the culture of horse soldiers?
- Is there any evidence for unrecorded facilities or features related to installation construction during the World War II-era? If so, is there any evidence in upland settings? If there is evidence for troop training in upland settings, does it differ from accounts of lower altitude training?
- Do personal items or military items demonstrate changes in training practices over time?
- Can personal items be associated with specific units stationed or operating on Fort Irwin prior to World War II? If so, how does the correlation compare with archival records?
- How does analysis contribute to the existing literature concerning military history of this area?

4.4.2 DATA REQUIREMENTS

The data needed to address these questions include physical remains of camps, redoubts, bunkers, outlying trails, and temporary camps, among others, that reveal information about military technology and engineering, as well as the culture of soldiers. Historic debris dumps, discarded items, and soldiers' camps may be identified, for example. The integrity of the military sites or features must be retained along with at least the character and feeling of the original resource.

5 RESOURCE TYPE CLASSIFICATION METHODS

All prehistoric and historic-period sites identified during the current study were classified using six activity sets and in accordance on the Fort Irwin Integrated Cultural Resources Management Plan (ICRMP). The six site types include: (A) Simple Flake Stone Assemblage, (B) Quarry, (C) Simple Milling Equipment/Potter Assemblage, (D) Distinctive Feature/Artifacts, and (E) Complex Feature/Artifact Assemblage.

Sites that consist primarily of simple tools can be classified as Simple Flaked Stone sites or Quarries. These sites are generally small to medium in sized accumulations that are generally comprised of reduction debris and cores (Byrd 1998; Mikkelsen and Hall 1990). Quarries are typically characterized by the occurrence and reduction of locally available tool stone with small assemblages associated with the earliest states of tool manufacture. Segregated Reduction Locales (SRL) are common types of quarries where cobbles occur in significant numbers, or areas where bedrock outcrops have been exploited for tool stone. SRLs typically represent a single flacked stone reduction event where locally available cobbles were briefly assayed and reduced to acquire blanks or cores for subsequent transport and tool manufacture at other sites (Flenniken and Stanfill 1980). SRLs may include a variety of artifacts including flaked stone artifacts, projectile points, bifaces, and flake tools, suggesting a narrow range of procurement activities.

Sites containing one or more pieces of milling equipment and/or pottery are divided into two categories: Simple Milling Equipment/Pottery Assemblage sites and Complex Feature/Artifact Assemblage sites. This division is based on the presence or absence of (1) maintenance and manufacturing implements and (2) domestic facilities and socioeconomic artifacts. Each of these denotes differences in the range of activities performed and the intensity and permanence of occupation. Simple Milling Equipment/Pottery sites are distinguished by the occurrence of milling equipment and/or pottery and, at best, a limited range of flaked stone artifacts corresponding to the general utility implements found at Simple Flaked Stone Assemblage sites. This suggests that a comparatively narrow range of tasks was performed at these small- to medium-sized sites, including some amount of food procurement and processing. Marked different assemblages occur at Complex Feature/Artifact Assemblage sites, with two variants distinguished: those containing a large and wide assortment of both flaked and ground stone artifacts, which reasonably reflect a moderate to high degree of occupational intensity (often referred to as “base camps,” “villages,” and “habitation sites”); and those containing a complement of features suggesting habitation (e.g., rock rings), or the intensive processing/ procuring of a patch resource (e.g., cleared areas on desert pavement). Faunal and/or macrobotanical remains, including charcoal, are further indications of complex sites.

Distinctive Feature/Artifact sites include sites limited primarily to features and artifacts representing ritual or symbolic activities. These locations reflect activities that stand out from subsistence-oriented sites by having trails, rock art, rock alignment features, or out-of-place objects that, according to contemporary Native American perspectives, indicate ceremonial activities. It may not be possible to determine the meanings of such sites, but their unique nature may still be of ethnohistoric significance to Native Americans. Given the vagaries that surround the function of rock art and past Native American behaviors associated with geoglyphs, petroglyphs, and pictographs, it is conceivable that when placed with rock art, seemingly mundane implements and items such as milling gear served a purpose other than that commonly

ascribed to them. Throughout the West, rock art concentrations are commonly found to have milling gear in proximity. This has led to some speculation that in such contexts, the purpose of grinding was special, related to ceremonial feeding, or processing plants with special curative powers.

6 METHODS

Team CALIBRE initiated a cultural resources records search at the at the South Central Coastal Information Center (SCCIC) at California State University, Fullerton. On April 23, 2018, Team CALIBRE conducted a cultural resources records search at Fort Irwin. Team CALIBRE conducted a Class III intensive pedestrian inventory of the previously unsurveyed and/or requiring resurvey portions of the APE. The following section discusses the methods used for both of these efforts. Previously conducted cultural resources investigations and documented archaeological sites are summarized independently.

6.1 RECORDS SEARCHES

6.1.1 CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

Team CALIBRE initiated a California Historical Resources Information System records search at the SCCIC of the DUT Complex of the APE plus an approximate 0.5-mile buffer. The purpose of the records search was to identify previously recorded prehistoric or historic cultural resources, including isolated artifacts, archaeological sites, historical buildings, and structures that are in and within approximately 0.5-mile of this portion of the APE. The records search was intended to give field crews information about specific resources that may be in the APE, as well as to provide a preliminary assessment of the cultural resources sensitivity of the APE. The records search included a review of the appropriate Unites States Geological Survey (USGS) quadrangles on which archaeological sites are plotted, archaeological site records, and data from previous surveys and research reports.

6.1.2 NATIONAL TRAINING CENTER FORT IRWIN

Team CALIBRE conducted an additional search of records at Fort Irwin. Fort Irwin personnel searched the Fort Irwin Cultural Resources Management Database (FICRMD) and provided Team CALIBRE archaeologists with any previously recorded resources or previously conducted studies located within the entire project APE within the Fort Irwin GIS Database.

6.2 FIELD EFFORTS

Archaeological site inventory and evaluations were conducted per Section 800.4 and 800.5 of 36 CFR 800 and based on consultation with the Installation Archaeologist and the Natural and Cultural Resources Program Manager and review of Fort Irwin archaeological site evaluation standards. If a recommendation of eligibility could not be concluded through visual inspection alone, archaeological testing may be conducted to determine the presence or absence of intact subsurface cultural deposits.

6.2.1 FIELD SURVEY

Team CALIBRE archaeologists conducted intensive-level pedestrian surveys of the previously unsurveyed and/or requiring resurvey portions of the APE between May 21 and June 5, 2018. Surveys were conducted by walking parallel transects spaced 15 m (49 feet) apart, depending on terrain. A Trimble GPS receiver and a topographic map were used to locate the project APE and maintain transit accuracy. The ground surface was examined for the presence of prehistoric artifacts (e.g., flaked stone tools, tool-making debris, or stone milling tools), historical artifacts (e.g., metal, glass, or ceramics), sediment discoloration that might indicate the presence of a

cultural midden, depressions, and other features that might indicate the former presence of structures or buildings (e.g., post holes or foundations).

All newly discovered archaeological sites and isolates were recorded on California Department of Parks and Recreation (DPR) series 523 forms. Previously recorded sites in the survey area were field checked and updated, comparing the constituents and condition to that previously recorded. Isolates may be recorded individually or grouped appropriately by survey area. All newly and previously completed DPR 523 Series forms can be found in Appendix C. DPR forms for all newly recorded and updated archaeological resources will be submitted to the SCCIC, which will issue primary numbers for all newly recorded resources and trinomials for all newly recorded archaeological sites.

Recorded isolates will typically consist of one or two artifacts, or less than 20 debitage flakes within a 10 m radius. All isolate records shall include: coordinates of the center point, photograph, material type and colors, counts and characterization.

Recorded sites will consist of bedrock (primary) quarries, pavement (secondary) quarries consisting of accumulations of SRLs, simple milling equipment/pottery/historic equipment locations, distinctive feature/artifact groupings, and complex feature/artifact groupings. More than 30 items within a 20-meter radius but failing to meet site criteria of having at least 20 artifacts within 10-meters, such as several flakes of different toolstone types not representing SRLs, will be designated as an isolate cluster. Field crews will use professional judgment to classify sites or isolate clusters that are within close proximity to one another (less than 30 m apart) as separate clusters or loci of a larger site.

Historic-period site documentation will emphasize data that assist in defining functional use areas and chronological placement. Manufacturing marks, embossing, and technological characteristics of bottles, cans, ceramics, and other materials will be documented and quantified to assist in chronological control.

If identified, all linear site features such as site boundaries, roads, and fence lines, as well as point features such as the site datum, features, and tools, were mapped with these Trimble Insphere TerraFlex mobile data collection application on an Apple iPad 4 device. Spatial data collection forms utilized a feature class schema based on Fort Irwin's CRMP master geodatabase published to the TerraFlex cloud platform and synced to each tablet to collect new features. Field GPS data for sites were post-processed using TerraFlex cloud software and projected into Universal Transverse Mercator (UTM), Zone 11 North, World Geodetic Survey 1984 (WGS 84). All GPS data were exported into a GIS file geodatabase in the DoD Fort Irwin archaeological schema and plotted onto the associated geo-referenced USGS 7.5-minute quadrangle to ensure accuracy and to produce location maps of all resources. In addition to the site mapping, Team CALIBRE documented all sites with overview photographs using an iPad camera, a R1 GPS receiver, and iForms software to manage qualitative information. Associated features and diagnostic artifacts were inventoried, numbered sequentially, measured, recorded using a GPS unit, and photographed and sketched as appropriate. The environmental setting, depositional context, structure, topography, and geographical location were noted for each site.

6.2.2 CURATION

Any artifacts recovered during this investigation will be properly cataloged, analyzed, and prepared for curation prior to deposition at the Fort Irwin Archaeological Curation Facility. Upon

successful completion of the cultural resources field work and final acceptance of the cultural resources report, the report and other associated documents (e.g. reports, original field notes, maps, photographs, inventories, etc) will be prepared for permanent curation in accordance with 36 CFR 79 and standards established by the installation Cultural Resources Management staff and submitted to Fort Irwin.

7 RESULTS

7.1 RECORDS SEARCH

On April 16, 2018, Team CALIBRE initiated the records search at the SCCIC for the DUT Complex of the APE, plus a 0.5-mile buffer. On April 23, 2018, Team CALIBRE conducted an additional records search at Fort Irwin for the entire APE. The results of the records searches, including previous cultural resources studies and previously recorded cultural resources in and within 0.5-mile of the project APE, are described below. The records search results can be found in Appendix B.

7.1.1 PREVIOUS CULTURAL RESOURCES STUDIES

The combined results from the FICRD and SCCIC records searches identified 79 previously conducted cultural resources studies within 0.5-mile of the project APE; 41 of them included portions of the project APE. These studies consist of a variety of professionally conducted surveys, site testing and evaluation, and construction monitoring activities. Reports associated with the previous studies are listed in Table 2.

Table 2. Previously Conducted Cultural Resources Investigations within 0.5 mile of the APE.

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
R-127		*Cultural Resources Inventory and Evaluation, Including Geomorphic and Paleontological Characterization, of the 210-km (130.5-mi) Central Corridor, Fiber Optic Network for Fort Irwin, National Training Center, CA*	2004	Peter, Duane E., Marc W. Hintzman, Marcus Grant, Elizabeth Burson, Robin F. Bowers, Amelia M. Natoli, Heather J. Miljour, Tom Bullard, Christopher Lintz, Manuel Palacios-Fest, and Robert Reynolds	Within APE
	SB-00624/ NADB-R-1060624	*A Preliminary Study of the Archaeology of Fort Irwin*	1978	Alsozatai-Petheo, John, A.,	Within APE
R-007		*Archaeological Field Examination at Fort Irwin in Preparation for the 1980 Gallant Eagle Exercise*. Bureau of Land Management, California. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	1980	Kaldenberg, Russell L.	Within 0.5-mile radius
R-035	SB-01436/ NADB-R-1061436	*An Archaeological Survey of the 1982 Gallant Eagle Exercise Area, Fort Irwin, San Bernardino County, California*	1984	Robarchek, Clay, W. H. Breece, K. A, Bergin, & C. N. Warren	Within APE

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
	SB-01784/ NADB-R-1061784	*Endangered Sites at Nelson Lake, San Bernardino County, California: an Analysis of Museum Collections and Records*	1988	Schneider, Joan, S., and Claude N. Warren	Within APE
DPW-134/ FY09-128		*Research Design for Cultural Resources Inventory and Evaluation, Including Geomorphic Characterization, of the 200 km (124.5 mile) Fiber Optics Network, Phase II, Fort Irwin, National Training Center, California*	2009	Chambers Group, Inc.	Within APE
FY12-1002		*Cultural Resources Inventory and Site Evaluation of 10,000 Acres on Fort Irwin, San Bernardino County, California*	2012	Statistical Research, Inc	Within APE
FY12-258		*Cultural Resources Status Report for the JFE VIP Viewing Area Prep Project National Environmental Policy Act (NEPA) File FY15-258, Fort Irwin, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California	2012	Burnett, K.	Within 0.5-mile radius
R-131		*Archaeological Survey/Monitoring Report; Goldstone Deep Space Communications Complex, Fort Irwin, San Bernardino County, CA*	2005	Southern California Edison	Within APE
R-105		*Environmental Assessment/Initial Study and Finding of No Significant Impact (FONSI) for the National Training Center Range-I Tank Weapons Qualification Project, Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California	1999	U.S. Army Corps of Engineers	Within 0.5-mile radius

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
DPW-062		*Cultural Resource Inventory Report: Launch Approval Planning Group Apollo Antennas Survey, Fort Irwin National Training Center, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2005	Shearer, Jim	Within 0.5-mile radius
DPW-063		*Cultural Resource Inventory Report: Hazmat 3 8 Project Survey, Fort Irwin National Training Center, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2005	Shearer, Jim	Within 0.5-mile radius
DPW-065		*Cultural Resource Inventory Report: Ranges 5 and 7 Project Survey, Fort Irwin National Training Center, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2005	Shearer, Jim	Within 0.5-mile radius
DPW-074		*Cultural Resource Inventory Report: Impound Storage Yard Expansion Survey, Fort Irwin National Training Center, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2006	Brewer, Harold	Within 0.5-mile radius
R-139		*Cultural Resources Inventory and Evaluation of the Proposed Fiber Optic Line (FOL) from Fort Irwin, National Training Center to China Lake, Naval Air Weapons' (NAWS) B Range, San Bernardino County, CA*	2006	DPW	Within APE
DPW-029		*Survey Report: Off-Road Vehicle Area (DPW-029) Fort Irwin, California*	2002	Versar, Inc.	Within APE
DPW-034		*Anti-Terrorist Force Protection Project, Fort Irwin, CA*	2002	Versar, Inc.	Within APE

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
DPW-047		*Cultural Resource Inventory Report: Goldstone Water Treatment Plant Project, Fort Irwin National Training Center, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2006	Simmons, C., and L. Ramirez de Bryson	Within 0.5-mile radius
DPW-109/ FY09-065		*Mountain Top Combat Outposts, Fort Irwin National Training Center, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2009	Ramirez de Bryson, Luz	Within 0.5-mile radius
FY10-082		*Cultural Resources Survey and Evaluation Report: Cobra Border Crossing, Fort Irwin National Training Center, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2010	Chambers Group, Inc.	Within APE
R-164		*Archaeological Survey Report for the Fort Irwin Solar Project Fort Irwin, San Bernardino County, California*	2013	Dudek	Within APE
DPW-024		*Additional Horse Stables Site Survey*	2002	DPW	Within APE
R-134		*Research Design for Cultural Resources Inventory and Evaluation, Including Geomorphic Characterization, of the 200 km (124.5 mile) Fiber Optics Network, Phase II, Fort Irwin, National Training Center, California*	2004	Geo-Marine, Inc	Within APE
R-161	SB-07357	*Cultural Resources Inventory Survey of 58 Square Kilometers and NRHP Evaluation of Archaeology Sites on Fort Irwin , California*	2012	Gust, Sherri, and Nancy Sikes	Within APE
DPW-012		*Stables Arena Expansion Project*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2002	DPW	Within APE

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
DPW-091		*Cultural Resources Inventory and Evaluation: Fort Irwin's Recreational Vehicle Park Expansion*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2007	Yamauchi, Jeff, and Greg Meier	Within 0.5-mile radius
DPW-103		*Preliminary Field Results of Archaeological Investigations: Alternative Access Route B, Fort Irwin, California. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California*.	2009	Ramirez de Bryson, Luz	Within APE
FY11-054		*Urban Assault Course-Hand Grenade Range Cultural Resources Survey and Evaluation Report (FY11-054), Fort Irwin, CA*	2010	Chambers Group, Inc.	Within APE
FY11-274/277		*Cultural Resources Inventory for Well Boring Locations GOLD1 (FY-274), GOLD2 (FY-276), and GOLD3 (FY-277), Fort Irwin, San Bernardino County, California*	2011	Campbell, Mark, and Alec Stevenson	Within APE
R-162		*Archaeological Resources Inventory Report for the Fort Irwin Solar Project, San Bernardino County, CA*	2013	Fergusson, A., N. Lawson, C. Helton	Within APE
R-167		*An Archaeological Inventory of 1,000 Acres at Goldstone Lake, NASA Goldstone Complex, Fort Irwin, San Bernardino County, CA*	2014	ASM Affiliates, Inc.	Within APE
R-073	SB-02798/ NADB-R-1062798	*The Archaeology of Nelson Basin and Adjacent Areas, Fort Irwin, San Bernardino County, CA*	1993	Basgall, Mark E., D. Jones, L. Glover, M.C. Hall, C. Hunter, T. Origer, M. Waters, P. Bouey, B. Wickstrum, and T. Jackson	Within APE
R-155.3		*Cultural Resources Survey and Evaluation Report Annual 10,000 Acre Survey*	2010	Belcourt, Tria Marie, Andrew Belcourt, Paula Sutton, Tiffany Newman, Angela B. McArdle, and Michael D. Giovine	Within APE
R-163/R-154/ R-175	SB-07012	*Fort Irwin Uplands Cultural Resources Survey Project, San Bernardino County, California. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California*.	2012	Coleman, Jason A., and C. Jesse Phillips	Within 0.5-mile radius

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
FY14-1005a		*Cultural Resources Status Report and Survey for the Camp Millennium Project (FY14-1005a) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California	2014	Yacubic, Matthew, and Amber Fankhauser	Within 0.5-mile radius
FY14-1005b		*A Phase I Cultural Resources Inventory: Fort Irwin and the National Training Center: Combat Training Center-Instrumentation System Range Communications Systems (CTC-15 RCS) Project*	2014	Yacubic, Matthew, and Amber Fankhause	Within APE
FY14-1007		*Cultural Resources Inventory and Evaluation for the NASA DSS-26 Chiller Upgrade Project (FY14-1007) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California	2014	Burnett, K., and Matthew Yacubic	Within 0.5-mile radius
FY14-1008		*Archaeological Resources Inventory Report for the Fort Irwin CIP Project W49 – Connect RV Park to Water System, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2014	Fergusson, Aaron	Within 0.5-mile radius
FY14-1023		*Cultural Resources Inventory and Evaluation for the RTU Kitchens Pits Project (FY14-1023) Fort Irwin, San Bernardino County, California*	2014	Burnett, Katherine, and Matthew Yacubic	Within APE
FY12-072		*Cultural Resources NEPA Status Report McLean Kitchen Pads*	2012	Sutton, Mark Q.	Within APE
FY12-081		*Cultural Resources Inventory for the G3 Culverts Installation Project (FY12-081), Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2012	Stanton, Patrick B., and Mark Q. Sutton	Within 0.5-mile radius

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
FY12-299		*Cultural Resources Inventory for the Seattle Hub Hole Project (FY12-299), Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2012	Lev-Tov, Justin E., Steven D. Shelley, and Mark Q. Sutton	Within 0.5-mile radius
FY14-1016		*Cultural Resources Inventory and Evaluation for the NASA Road Repairs Project (FY14-1016) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2014	Burnett, Katherine	Within 0.5-mile radius
FY14-194		*Range 6 Berm Improvement Project (FY14-194) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2014	Yacubic, Matthew	Within 0.5-mile radius
FY15-033		*Cultural Resources Inventory and Evaluation for the Nelson Tactical Unmanned Aircraft Systems (TUAS) Dust Control Project (FY15-033) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2014	Abeyta, Armando, and Matthew Yacubic	Within APE
FY15-058		*Cultural Resources Inventory and Evaluation for the M-N Trail Improvements Project (FY15-058) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2014	Burnett, Katherine	Within APE
FY15-123		*Cultural Resources Inventory and Evaluation for the Sam Bivouac Kitchen Pit Project (FY15-123) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2015	Burnett, Katherine	Within 0.5-mile radius

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
FY13-205		*Cultural Resources Inventory for the Sam Bivouac Shower Pit Project (FY13-205), Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2013	Stanton, Patrick B., Steven D. Shelley, and Mark Q. Sutton	Within 0.5-mile radius
FY15-1006		*Cultural Resources Inventory and Evaluation for the Goldstone G-88 to DSS-14 Trench Project (FY15-1006) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2015	Burnett, Katherine	Within 0.5-mile radius
FY15-230		*Cultural Resources Inventory and Evaluation for the Pioneer Water Tower Trail Improvement Project (FY15-230) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2015	Burnett, Katherine, Armando Abeyta, and Jessica Mauck	Within APE
FY15-239		*Cultural Resources Inventory and Evaluation for the Main Gate Bypass Project (FY15-239) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2015	Burnett, Katherine, Armando Abeyta, and Jessica Mauck	Within 0.5-mile radius
FY16-132		*Pioneer Trail Signs*	2016	Redhorse Corp.	Within 0.5-mile radius
FY16-001		*Cultural Resources Inventory and Evaluation for the Forward Operating Base (FOB) Dallas Seeding Project (FY16-001) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2015	ECORP	Within APE
FY16-167		*Range 5 Reconfiguration*	2016	Redhorse Corp.	Within 0.5-mile radius

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
FY16-023		*Cultural Resources Inventory and Evaluation for the Pioneer Road Repair Project (FY16-023) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2015	Burnett, Katherine, Armando Abeyta, Jessica Mauck, and Amber Fankhauser	Within APE
FY16-1001		*Verizon Fiber Optic Line*	2015	ECORP	Within APE
FY16-1002		*RV Park Expansion Plan*	2016	CH2MHILL	Within 0.5-mile radius
FY16-183		*Cultural Resources Status Report for the DA Connelly Competition National Environmental Policy Act (NEPA) File FY16-183, Fort Irwin, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2016	Brosman, Christopher	Within 0.5-mile radius
FY17-022		*Cultural Resources Inventory and Evaluation for the Maneuver Trails Option Improvement and Repair Project (FY17-022) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2015	Brosman, Christopher and Dean Duryea	Within APE
FY17-086		*GDSCC French Drain Sumps*	2017	Redhorse Corp.	Within 0.5-mile radius
FY17-103		*1916th SB Field Training Exercise*	2017	Redhorse Corp.	Within 0.5-mile radius
DPW-048		*Cultural Resources Survey of Fort Irwin Fiber Optic Network (FON). Phase I Route Changes, DPW-048*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2004	Simmons, C., and L. Ramirez de Bryson	Within APE
DPW-042		*Cultural Resources Inventory and Evaluation for the Fort Irwin and National Training Center (NTC): Proposed Mobile MOUT/Cave Complex Training Facilities*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California	2003	Brewer, H.	Within 0.5-mile radius

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
DPW-046		*DPW-46: Pre-Trenching Survey at NV 150200 – ITAM Revegetation, Fort Irwin National Training Center, San Bernardino County, California. (Cultural Resource Survey)*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2004	Huggan, J., and L. Ramirez de Bryson	Within 0.5-mile radius
DPW-087		*Cultural Resources Survey and Inventory Report: Water Treatment Plant*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2010	Belcourt, Tria Marie, and Tiffany L. Newman	Within APE
R-168		*A Phase I Cultural Resources Inventory: Fort Irwin and the National Training Center: Combat Training Center-Instrumentation System Range Communications System (CTC-IS RCS) Project, San Bernardino County, CA*	2014	Chambers Group, Inc.	Within APE
R-178		*Cultural Resources Inventory Survey of 37.67 Square KM and National Register of Historic Places (NRHP) Evaluation of Archaeological Sites on Fort Irwin, CA*	2016	Gust, Sherris, Ian Scharlotta, Dustin Keeler, Andre Simmons, and Holly Duke	Within APE
R-041	SB-01481/ NADB-R-1061481	*Bits and Pieces of Prehistory at Ft. Irwin: Testing of KD 25, the Knoll Site, the Crossroads Site, Garlic Spring and Bitter Spring; and Survey of Areas 12A and 12H, Fort Irwin, San Bernardino County CA*	1985	Skinner, Elizabeth J.	Within APE
DPW-089		*Marine Mobile MOUT's Survey. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California*.	2007	Ramirez de Bryson, Luz	Within APE
FY15-009		*Cultural Resources Inventory and Evaluation for the Mock Underground Chemical, Biological, Radiological, Nuclear, High Yield Explosive (CBRNE) Training Facility West Project (FY15-009) Fort Irwin, San Bernardino County, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2014	Burnett, Katherine, and Amber Fankhauser	Within 0.5-mile radius

FICRD Library ID	SCCIC Report No.	Report Title	Date	Author(s)	Relationship to APE
FY16-1007		*Cantonment Area Stormwater Management Plan*	2016	CH2MHILL	Within 0.5-mile radius
FY16-1009		*Cultural Resources Inventory Report for the Recycled Water Master Plan, Fort Irwin, California*. On file, Environmental Division, Directorate of Public Works, Fort Irwin, California.	2016	CH2MHILL	Within APE
FY17-178		*GDSCC Mars Site Cable Splicing*	2017	Redhorse Corp.	Within 0.5-mile radius
FY17-215		*GDSCC Echo Site Burro Fence*	2017	Redhorse Corp.	Within 0.5-mile radius
FY17-218		*CH2MHILL W52 Phase III*	2017	Redhorse Corp.	Within 0.5-mile radius
FY17-1001		*Multi-Purpose Range Complex*	2017	CH2MHILL	Within 0.5-mile radius
R-174		*Cultural Resources Inventory Survey of 41.97 Square KM and National Register of Historic Places (NRHP) Evaluation of Archaeological Sites on Fort Irwin, CA*	2015	Cogstone Resource Management, Inc	Within APE
R-179		*Cultural Resources Inventory Survey of 10,000 Acres and National Register of Historic Places Evaluation of Archaeology Sites on Fort Irwin, California*	2017	PaleoWest	Within 0.5-mile radius
FY18-006		CDSCC Switchgear Expansion	2017	Redhorse Corp.	Within 0.5-mile radius

Note:
DPW = Directorate of Public Works
NADB = National Archaeological Database
FY = fiscal year

7.1.2 PREVIOUSLY RECORDED CULTURAL RESOURCES

The combined results from the records searches identified 35 previously recorded cultural resources within the project APE (Table 3). Of these, 19 resources, including seven isolates, are located within the DUT portion of the APE and consist of small- to medium-sized prehistoric lithic scatters and quarries that have been previously recommended not eligible for inclusion in the NRHP, but only one site (CA-SBR-2353) has received SHPO concurrence. The seven previously recorded isolates within the DUT Complex consist of six prehistoric lithic artifacts and one historic-period rock ring with gun shells. The remaining resources within the collective APE consist of 13 prehistoric sites including lithic scatters and quarries, one petroglyph site, one habitation debris site, and two historic-period roads and one munitions storage area. Of the sites situated within the non-DUT portion of the APE, two sites (CA-SBR-2347 and -3314) have been recommended eligible for inclusion in the NRHP; 12 resources have been recommended not eligible for listing on the NRHP and four resources (CA-SBR-17840, -11532, -13735, and-10926) have been determined not eligible for listing in the NRHP by SHPO.

A total of 102 resources were identified within 0.5-mile radius of the APE, but outside of the project APE. These resources comprise 89 prehistoric archaeological sites, one prehistoric isolate, six historic-period sites, four military sites, one historic isolate, and one multi-component site (Table 4). Of these, 68 resources have been recommended not eligible for listing on the NRHP, 31 have been determined not eligible for the NRHP, two have been recommended eligible for the NRHP, and one site has not been evaluated for listing on the NRHP.

Table 3. Previously Recorded Resources within the project APE.

Primary Number	Trinomial CA-SBR-	Resource Type	Recorders and Year	Relationship to APE/DUT	NRHP Status
P-36-028932	CA-SBR-28932	Prehistoric quarry	Cogstone Resource Management, Inc., 2016	Within APE/Not in Survey Area	Recommended Not Eligible
P36-017840	CA-SBR-17840	Historic road	ASM Affiliates, Inc. 2013	Within APE/Not in Survey Area	Determined Not Eligible (USA_2014_0616_001)
P-36-021505	CA-SBR-13808	Prehistoric lithic quarry and reduction area	Chambers Group, Inc., 2010	Within DUT APE	Recommended Not Eligible
P-36-005027	CA-SBR-5027	Prehistoric lithic scatter	Chambers Group, Inc., 2010	Within DUT APE	Recommended Not Eligible
P-36-005028	CA-SBR-5028	Prehistoric lithic scatter	Chambers Group, Inc., 2010	Within DUT APE	Recommended Not Eligible
P-36-010690	CA-SBR-10690	Prehistoric lithic scatter and quarry, rock features	Geo-Marine, Inc., 2003	Within APE/ Access road improvements	Recommended Not Eligible
P-36-010321	CA-SBR-10321	Prehistoric lithic scatter	PaleoWest Archaeology, 2012	Within APE/Not in Survey Area	Recommended Not Eligible
P-36-11556	CA-SBR-11556	Prehistoric lithic scatter and quarry	Brewer, H., N. Reseburg, C. Simmons, B. Flynn, and L. Ramirez de Bryson, 2005	Within APE/ Access road improvements	Recommended Not Eligible
P-36-011555	CA-SBR-11555	Prehistoric lithic scatter	Brewer, H., S. J. Freeman, and J. Huggan, 2003	Within APE/ Access road improvements	Recommended Not Eligible
P-36-011538	CA-SBR-11538	Prehistoric lithic scatter	Brewer, H., S. J. Freeman, and J. Huggan, 2003	Within APE/ utility corridor	Recommended Not Eligible
P-26-011716	CA-SBR-11716	Prehistoric lithic scatter and quarry	Brewer, H., C. Simmons, B. Flynn 2004	Within DUT APE	Recommended Not Eligible
P-36-011537	CA-SBR-11537	Prehistoric lithic scatter	Ft. Irwin DPW staff, 2002	Within APE/ Access road	Recommended Not Eligible
P-36-012039	CA-SBR-12039	Prehistoric lithic quarry	Cogstone Resource Management, Inc., 2013	Within APE/Not in Survey Area	Recommended Not Eligible
P-36-021506	CA-SBR-13809	Prehistoric lithic scatter	Chambers Group, Inc., 2010	Within DUT APE	Recommended Not Eligible
P-36-021509	CA-SBR-13812	Prehistoric lithic scatter	Chambers Group, Inc., 2010	Within DUT APE	Recommended Not Eligible
P-36-021507	CA-SBR-13810	Prehistoric lithic scatter	Chambers Group, Inc. 2010	Within DUT APE	Recommended Not Eligible
P-36-021508	CA-SBR-13811	Prehistoric lithic scatter	Chambers Group, Inc. 2010	Within DUT APE	Recommended Not Eligible
P-36-005029	CA-SBR-5029	Prehistoric lithic scatter	Stockton, R., 1982; Basgall, 1993	Within DUT APE	Recommended Not Eligible

Primary Number	Trinomial CA-SBR-	Resource Type	Recorders and Year	Relationship to APE/DUT	NRHP Status
P-36-017842	CA-SBR-17842	Historic road	ASM Affiliates, Inc., 2014	Within APE/Not in Survey Area	Recommended Not Eligible
P-36-011554	CA-SBR-11554	Prehistoric lithic scatter and bedrock milling feature	Brewer, Harold C. L., Shannon J. Freeman, and Jason J. Huggan, 2003	Within APE/ Access road improvements	Recommended Not Eligible
P-36-005026	CA-SBR-5026	Prehistoric lithic scatter	Breece, W., 1982	Within DUT APE	Recommended Not Eligible
P-36-002347	CA-SBR-2347	Prehistoric rock art/ petroglyphs	Whitley, D., 1998; Abeyta, A., and Fankhauser, 2014	Within APE/ utility corridor	Recommended Eligible
P-36-03314	CA-SBR-3314/ 3306/3307/3309 / 3310/3312/3313	Prehistoric habitation debris/rock shelter/lithic scatter; Subsumes 3306, 3307, 3309, 3310, 3311, 3312, 3313	1978; 2011; Abeyta, A., and Fankhauser, 2015 (update)	Within APE/ utility corridor	Recommended Eligible
P-36-011532	CA-SBR-11532	Prehistoric lithic scatter	Brewer, Harold C. L., and Shannon J. Freeman	Within APE/Not in Survey Area	Determined Not Eligible (USA100405E)
P-36-006210	CA-SBR-6210	Prehistoric lithic scatter	Chambers Group, Inc., 2010	Within DUT APE	Recommended Not Eligible
P-36-010926	CA-SBR-10926H	Historic period munitions storage area	Brewer, Harold C. L., D. Gundrum, S. J. Freeman, and J. Sander	Within APE/ access road improvements	Determined Not Eligible (USA020802A)
P-36-021384	CA-SBR-13735	Prehistoric lithic quarry	Chambers Group, Inc. 2010, Belcourt, 2010	Within APE/Not in Survey Area	Determined Not Eligible (USA_2016_1209_001)
P-36-002353	CA-SBR-2353	Prehistoric bedrock milling feature	Richards, L., and W. Terry 1964	Within DUT APE	Determined Not Eligible (USA_2016_0425_001)
P-36-028992		Isolate – CCS core	Cogstone Resource Management, Inc. 2016	Within DUT APE	Determined Not Eligible
P-36-028988		Isolate – Basalt SRL	Cogstone Resource Management, Inc. 2016	Within DUT APE	Determined Not Eligible
P-36-026429		Isolate – CCS biface and debitage	Cogstone Resource Management, Inc. 2013	Within DUT APE	Determined Not Eligible
P-36-026428		Isolate – CCS biface and debitage	Cogstone Resource Management, Inc. 2013	Within DUT APE	Determined Not Eligible
P-36-026383		Isolate – CCS SRL	Cogstone Resource Management, Inc. 2013	Within DUT APE	Determined Not Eligible

Primary Number	Trinomial CA-SBR-	Resource Type	Recorders and Year	Relationship to APE/DUT	NRHP Status
P-36-020208		Isolate – Historic-period – five rock piles with shells	Geo-Marine, Inc. 2003	Within DUT APE	Determined Not Eligible
P-36-020220		Isolate – Basalt flake	Geo-Marine, Inc. 2003	Within DUT APE	Determined Not Eligible

Table 4. Previously Recorded Cultural Resources within 0.5-Mile Radius of the APE.

Primary Number	Trinomial (CA-SBR-)	Resource Type	Recorders And Year	NRHP Status
	CA-SBR-9	Prehistoric quarry	CH2MHILL, 2016	Determined Not Eligible
	CA-SBR-12	Prehistoric quarry	CH2MHILL, 2016	Determined Not Eligible
	CA-SBR-14	Prehistoric lithic scatter	CH2MHILL, 2016	Determined Not Eligible
P-36-002348	CA-SBR-2348	Prehistoric habitation debris	Basgall, Mark E., and Matthew C. Hall, 1994	Recommended Eligible
P-36-002349	CA-SBR-2349	Downgraded to Historic isolate	Paleowest, 2011	Recommended Not Eligible
P-36-002351	CA-SBR-2351	Prehistoric cairns/rock features	2011	Recommended Not Eligible
P-36-002357	CA-SBR-2357	Prehistoric lithic scatter	2012	Recommended Not Eligible
P-36-003830	CA-SBR-3830	Prehistoric cairns/rock features	2014	Recommended Not Eligible
P-36-004172	CA-SBR-4172	Prehistoric lithic scatter	Kaldenberg, R., 1980, 2010	Recommended Not Eligible
P-36-004173	CA-SBR-4173	Prehistoric lithic scatter	Kaldenberg, R., 1980, 2010	Recommended Not Eligible
P-36-004174	CA-SBR-4174	Prehistoric quarry	Kaldenberg, R., 1980, 2010	Recommended Not Eligible
P-36-004979	CA-SBR-4979	Prehistoric lithic scatter	ERDC, 2004	Determined Not Eligible
P-36-004980	CA-SBR-4980	Prehistoric lithic scatter	Robarchek 1982, 1993	Determined Not Eligible
P-36-004981	CA-SBR-4981	Prehistoric lithic scatter	Robarchek 1982, Far Western 1993	Recommended Not Eligible
P-36-005025	CA-SBR-5025	Prehistoric quarry downgraded to isolate by PaleoWest	Far Western 1993; 2011	Recommended Not Eligible
P-36-005030	CA-SBR-5030	Prehistoric lithic scatter	Far Western 1993	Recommended Not Eligible
P-36-005031	CA-SBR-5031	Prehistoric lithic scatter	Far Western 1993	Recommended Not Eligible
P-36-005032	CA-SBR-5032	Prehistoric lithic scatter	Far Western 1993	Recommended Not Eligible
P-36-005037	CA-SBR-5037	Prehistoric lithic scatter	Basgall and Jang 1988; Far Western 1993	Determined Not Eligible
P-36-005038	CA-SBR-5038	Prehistoric lithic scatter	Far Western 1993	Recommended Not Eligible

Primary Number	Trinomial (CA-SBR-)	Resource Type	Recorders And Year	NRHP Status
P-36-005040	CA-SBR-5040	Prehistoric lithic scatter	Far Western 1993	Recommended Not Eligible
P-36-005041	CA-SBR-5041	Prehistoric lithic scatter	Far Western 1993	Recommended Not Eligible
P-36-005042	CA-SBR-5042	Prehistoric lithic scatter	Far Western 1993	Recommended Not Eligible
P-36-005254	CA-SBR-5254	Prehistoric quarry	Far Western 1993	Recommended Not Eligible
P-36-010320	CA-SBR-10320	Prehistoric quarry	2011	Recommended Not Eligible
P-36-010925	CA-SBR-10925	Historic military property	2002	Determined Not Eligible
P-36-011492	CA-SBR-11492	Prehistoric quarry	Cogstone Resource Management, Inc., 2013	Recommended Not Eligible
P-36-011493	CA-SBR-11493	Prehistoric quarry	Cogstone Resource Management, Inc., 2013	Recommended Not Eligible
P-36-011494	CA-SBR-11494	Prehistoric lithic scatter	Cogstone Resource Management, Inc., 2013	Recommended Not Eligible
P-36-011498	CA-SBR-11498	Prehistoric lithic scatter	Cogstone Resource Management, Inc., 2013	Determined Not Eligible
P-36-011499	CA-SBR-11499	Prehistoric quarry	2011	Determined Not Eligible
P-36-011520	CA-SBR-11520	Prehistoric lithic scatter	Fort Irwin Staff, 2002	Determined Not Eligible
P-36-011521	CA-SBR-11521	Prehistoric lithic scatter	Fort Irwin Staff, 2002	Determined Not Eligible
P-36-011522	CA-SBR-11522	Prehistoric lithic scatter	Fort Irwin Staff, 2002	Determined Not Eligible
P-36-011523	CA-SBR-11523	Prehistoric lithic scatter	Fort Irwin Staff, 2002	Determined Not Eligible
P-36-011524	CA-SBR-11524	Prehistoric lithic scatter	Fort Irwin Staff, 2002	Determined Not Eligible
P-36-011532	CA-SBR-11532	Prehistoric lithic scatter	Fort Irwin Staff, 2006	Determined Not Eligible
P-36-011533	CA-SBR-11533	Prehistoric lithic scatter	Fort Irwin Staff, 2006	Determined Not Eligible
P-36-011534	CA-SBR-11534	Prehistoric lithic scatter	Fort Irwin Staff, 2006	Determined Not Eligible
P-36-011535	CA-SBR-11535H	Historic military property	Fort Irwin Staff, 2006	Determined Not Eligible
P-36-011536	CA-SBR-11536	Prehistoric lithic scatter	Fort Irwin Staff, 2006	Determined Not Eligible
P-36-011546	CA-SBR-11546	Prehistoric lithic scatter	Fort Irwin Staff, 2006	Determined Not Eligible
P-36-011559	CA-SBR-11549	Prehistoric lithic scatter	Fort Irwin Staff, 2006	Determined Not Eligible
P-36-011550	CA-SBR-11550	Prehistoric lithic scatter	Fort Irwin Staff, 2006	Recommended Not Eligible

Primary Number	Trinomial (CA-SBR-)	Resource Type	Recorders And Year	NRHP Status
P-36-011576	CA-SBR-11576	Prehistoric quarry	ERDC, 2004	Recommended Not Eligible
P-36-011577	CA-SBR-11577	Prehistoric quarry	ERDC, 2004	Recommended Not Eligible
P-36-011578	CA-SBR-11578	Prehistoric: quarry	ERDC, 2004	Recommended Not Eligible
P-36-011725	CA-SBR-11725	Prehistoric lithic scatter	FICRP, 2004	Determined Not Eligible
P-36-011726	CA-SBR-11726	Prehistoric lithic scatter	FICRP, 2004	Determined Not Eligible
P-36-012035	CA-SBR-12035	Prehistoric lithic scatter	Grant, 2005	Determined Not Eligible
P-36-012040	CA-SBR-12040	Prehistoric bedrock milling feature	2005	Recommended Eligible
P-36-012041	CA-SBR-12041	Prehistoric lithic scatter	2005	Recommended Not Eligible
P-36-012042	CA-SBR-12042	Prehistoric lithic scatter	2005	Recommended Not Eligible
P-36-012177	CA-SBR-12177	Prehistoric lithic scatter	DPW, 2005	Recommended Not Eligible
P-36-012179	CA-SBR-12179	Prehistoric lithic scatter	DPW 2005, ASM Affiliates, Inc., 2014	Determined Not Eligible
P-36-013736	CA-SBR-13736	Prehistoric quarry	Belcourt, 2010	Recommended Not Eligible
P-36-013737	CA-SBR-13737	Prehistoric quarry	Belcourt, 2010	Recommended Not Eligible
P-36-013738	CA-SBR-13738	Prehistoric lithic scatter	Cogstone Resource Management, Inc., 2013	Recommended Not Eligible
P-36-013804	CA-SBR-13804	Prehistoric lithic scatter	Belcourt, 2010	Recommended Not Eligible
P-36-013805	CA-SBR-13805	Prehistoric lithic scatter	Belcourt, 2010	Recommended Not Eligible
P-36-013806	CA-SBR-13806	Prehistoric lithic scatter	Belcourt, 2010	Recommended Not Eligible
P-36-013807	CA-SBR-13807	Prehistoric hearths/pits	Belcourt, 2010	Recommended Not Eligible
P-36-015015	CA-SBR-15015	Prehistoric lithic scatter	2011	Recommended Not Eligible
P-36-016694	CA-SBR-16694	Prehistoric lithic scatter	2013	Recommended Not Eligible
P-36-26334	CA-SBR-16727	Prehistoric quarry	Cogstone Resource Management, Inc., 2013	Recommended Not Eligible
P-36-26336	CA-SBR-16729	Prehistoric quarry	Cogstone Resource Management, Inc., 2013	Recommended Not Eligible
P-36-26339	CA-SBR-16732	Prehistoric quarry	Cogstone Resource Management, Inc., 2013	Recommended Not Eligible

Primary Number	Trinomial (CA-SBR-)	Resource Type	Recorders And Year	NRHP Status
P-36-26341	CA-SBR-16734	Prehistoric quarry	Cogstone Resource Management, Inc., 2013	Determined Not Eligible
P-36-26342	CA-SBR-16735	Prehistoric quarry	Cogstone Resource Management, Inc., 2013	Determined Not Eligible
P-36-26355	CA-SBR-16748	Prehistoric quarry	Cogstone Resource Management, Inc., 2013	Recommended Not Eligible
P-36-017821	CA-SBR-17821	Prehistoric lithic scatter	ASM Affiliates, Inc., 2014	Recommended Not Eligible
P-36-017822	CA-SBR-17822	Prehistoric lithic scatter	ASM Affiliates, Inc., 2014	Recommended Not Eligible
P-36-017827	CA-SBR-17827	Prehistoric lithic scatter	ASM Affiliates, Inc., 2014	Recommended Not Eligible
P-36-017828	CA-SBR-17828	Prehistoric lithic scatter	ASM Affiliates, Inc., 2014	Recommended Not Eligible
P-36-017829	CA-SBR-17829	Prehistoric quarry	ASM Affiliates, Inc., 2014	Recommended Not Eligible
P-36-017833	CA-SBR-17833	Prehistoric habitation debris	ASM Affiliates, Inc., 2014	Recommended Not Eligible
P-36-017834	CA-SBR-17834	Prehistoric habitation debris	ASM Affiliates, Inc., 2014	Recommended Not Eligible
P-36-017836	CA-SBR-17836	Prehistoric lithic scatter	ASM Affiliates, Inc., 2014	Recommended Not Eligible
P-36-017841	CA-SBR-17841	Historic road	ASM Affiliates, Inc., 2014	Determined Not Eligible
P-36-017897	CA-SBR-17897	Prehistoric lithic scatter	Burnett, Katie, 2014	Recommended Not Eligible
P-36-028933	CA-SBR-28933H	Historic refuse deposit	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028935	CA-SBR-28935	Prehistoric lithic scatter	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028942	CA-SBR-28942	Multi-component	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028943	CA-SBR-28943H	Historic refuse deposit	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028944	CA-SBR-28944H	Historic military installation	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028945	CA-SBR-28945	Prehistoric rock shelter/cave	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028946	CA-SBR-28946H	Historic refuse deposit	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028947	CA-SBR-28947	Prehistoric lithic scatter	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible

Primary Number	Trinomial (CA-SBR-)	Resource Type	Recorders And Year	NRHP Status
P-36-028951	CA-SBR-28951/H	Prehistoric lithic scatter	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028947	CA-SBR-28947	Prehistoric lithic scatter	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028951	CA-SBR-28951	Prehistoric lithic scatter	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028953	CA-SBR-28953	Prehistoric quarry	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028955	CA-SBR-28955	Prehistoric quarry	Cogstone Resource Management, Inc., 2016	Determined Not Eligible
P-36-028956	CA-SBR-28956/H	Historic combat training facility	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028957	CA-SBR-28957H	Historic refuse deposit	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-028959	CA-SBR-28959	Prehistoric rock shelter/cave	Cogstone Resource Management, Inc., 2016	Not evaluated for NRHP eligibility
P-36-031413	CA-SBR-31413	Prehistoric lithic scatter	2016	Recommended Not Eligible
P-36-031634	CA-SBR-31634	Prehistoric quarry	2017	Recommended Not Eligible
P-36-005009	CA-SBR-5009	Prehistoric lithic scatter	1982	Recommended Not Eligible
P-36-028948	CA-SBR-28948H	Historic refuse deposit	Cogstone Resource Management, Inc., 2016	Recommended Not Eligible
P-36-011548	CA-SBR-11548	Prehistoric lithic scatter	DPW, 2006	Determined Not Eligible
P-36-011547	CA-SBR-11547	Prehistoric lithic scatter	DPW, 2006	Determined Not Eligible

7.2 HISTORIC MAP RESEARCH

Additional archival research for the project included review of historic topographic maps including the Avawatz Mountain (USGS 1933) and 15-minute quadrangles: Goldstone Lake (USGS 1948, 1951). Historic topographic quadrangles confirm that the project APE and its immediate surroundings have continuously been void of substantial development since the USGS first began recording the area in the 1930s. A 1933 map of the Avawatz Mountain USGS (1933) 30-minute quadrangle indicates a series of roads that appear to connect to wells, springs, and dry lakes were established in the project vicinity, but nothing within the project APE. Maps from the late 1940s show little change in or near the project APE, except for an unimproved road outlining the APE. Most of the area at this time was still largely undeveloped. Although there are limited topographic quadrangles of the APE and general area from the 1960s and 1970s, those

from the 1980s confirm that little to no substantial development occurred, and the area remained void of any substantial residential or agricultural growth (USGS 1986).

7.3 FIELD SURVEY

This section describes the results of the field investigation, a detailed summary of cultural materials identified, and presents a description of each site including prior investigations and in their current state. Team CALIBRE archaeologists conducted intensive-level pedestrian surveys of the 2,532 acres requiring survey within the project APE. Visibility in the APE was generally good to excellent, averaging approximately 90 percent throughout. Although some vegetation was present, archaeologists generally had very good visual access to the APE. In some cases, artifacts found were partially buried as a result of natural alluvial and aeolian processes. The very dry sediments and frequent high winds indicate that it is possible, though unlikely, that substantial intact, subsurface archaeological resources exist in the APE. Because of the lack of historic-era resources identified in and near the APE, it is unlikely that intentionally buried deposits associated with identified historic archaeological sites are present.

During the field surveys, Team CALIBRE revisited the 11 previously recorded prehistoric archaeological sites to be updated and re-evaluated for inclusion in the NRHP within the DUT Complex footprint of the APE. These resources consist of small- to medium-sized lithic scatters and quarries. One additional site, CA-SBR-2353, had been previously evaluated and determined by SHPO as not eligible for the NRHP and, thus was not re-evaluated in this study. The seven (7) isolates previously recorded within the DUT Complex footprint of the APE generally lack context and data potential, and are by definition not eligible for inclusion in the NRHP. At the time of survey, three of the sites located in the DUT Complex, CA-SBR-5027, -5029, and -6210, were not relocated where mapped nor encountered elsewhere in the survey area.

Nine (9) cultural resources (CA-SBR-10690, -11537, -11538, 11554, -11555, 11556, -2347, -3314, and 10926H) located within the project APE, outside of the DUT Complex, but within the current survey area retain standing NRHP eligibility determinations or recommendations were not re-evaluated as part of the current undertaking. Site CA-SBR-10926H has been previously determined not eligible for listing on the NRHP and therefore was not revisited during this study. The remaining sites were revisited during the current study and will be discussed in the following sections. Sites CA-SBR-3314 and -2347 have been previously recommended eligible for inclusion in the NRHP. The remaining resources (CA-SBR-10690, -11537, -11538, -11554, -11555, and -11556) have been previously recommended not eligible for inclusion in the NRHP. Sites with previous recommendations were inspected to determine if any cultural manifestations are located within the project APE. All prior NRHP eligibility recommendations remain intact for these sites.

A total of seven (7) cultural resources (CA-SBR-28932, -17840, -10321, -12039, -17842, 11532, and -13735) are located within the project APE but outside of the survey area for the current undertaking. As such, they were not revisited during the current study but will be discussed in the following sections. Sites CA-SBR-17840, -11532, and -13735 have been determined not eligible for listing on the NRHP. Sites CA-SBR-28932, -10321, -12039, and -17842, have been previously recommended not eligible for inclusion in the NRHP. All prior NRHP eligibility recommendations remain intact for these sites.

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In addition, Team CALIBRE archaeologists recorded a total of four newly identified sites within the DUT Complex footprint and along the proposed utility corridors and road improvements of the APE. These are comprised entirely of small prehistoric lithic scatters (Appendix A). California DPR 523 Series forms were updated for the 11 previously recorded resources identified and evaluated within the DUT Complex and for the four newly recorded resources. Updates were not prepared for the previously recorded resources along the utility corridors and road improvements components of the APE as they are relatively modern. Past determinations and recommendations for these resources will be used to propose management considerations. No artifacts were collected during the current investigation.

7.4 PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES AND ISOLATES

CA-SBR-6210/P-36-006210

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 120 x 35 m (northwest–southeast x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-6210 is a prehistoric lithic scatter with two rock rings of unknown age located 200 m east of a well-defined and heavily used trail (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). Several seasonal drainages and washes exist within the vicinity of the site, any of which could have served as water sources in the past. Nelson Lake is 5 km to the southeast. Vegetation is sparse creosote scrub; the area is mostly devoid of flora and fauna due to the extent of vehicle impacts to the area. Soils consist of desert pavement surrounded by loose alluvium, derived from granitic sources. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 1988 by Eric Wohlgemuth of Far Western as a lithic scatter measuring 120 x 35 m with two loci and three rock rings. Locus 1 contained a single, well-defined rock ring with a CCS reduction scatter. A 5 x 5 -m surface collection unit was conducted over the reduction scatter and yielded eight large primary flakes. Locus 2 was recorded as containing two rock rings. The site was relocated in 2010 by Chambers Group and was found to be 95 percent impacted by vehicle traffic. The entire surface of the site has been obliterated from countless tracked and wheeled vehicle impacts. No features were identified, and the previously recorded rock rings had been impacted beyond recognition. Three CCS flakes were observed in the vicinity of Locus 1. No diagnostic artifacts were observed during the evaluation. Fort Irwin archaeologists were not able to relocate Locus 2 (Belcourt et al. 2010). The site was recommended as not eligible for listing in the NRHP.

Team CALIBRE revisited the site as part of the current study and observed the entire area to be disturbed by vehicular traffic. An area of shallow, excavated pits was observed in the eastern portion of the reported site boundary and photographed (Figure 4). No artifacts or features were observed at the reported location; therefore, it was determined the site to be not relocated. It is recommended that the site CA-SBR-6210 remains not eligible for listing in the NRHP.

Figure 3. Site CA-SBR-6210; site overview with disturbances to the site; view to the north.

CA-SBR-13810/P-36-021507

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 160 x 45 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-13810 is a prehistoric lithic scatter with three loci on a north/south-trending ridgeline with views to the east and west. Nelson Lake is 6 km to the east and Pioneer Lake is 3 km to the south, along with a playa 2 km to the southwest. The site is bounded by seasonal drainages and washes to the east and west. Vegetation is sparse creosote scrub, grassland with bursage, Beavertail cactus, diamond and pencil cholla, and forms and annuals. Soils consist of desert pavement surrounded by loose alluvium, derived from granitic sources with poorly sorted fine-to-coarse pebble and cobble mixed throughout. Approximately 25 percent of the site has been impacted from past vehicle and military activities. Ground visibility is excellent, ranging from 90 to 95 percent across the site.

The site was originally recorded in 2010 by Chambers Group as a lithic reduction site measuring 166 x 47 m with three loci in relatively good condition and few impacts. Locus 1 measured 5 x 3 m and contained 14 primary decortication flakes, 14 secondary decortication flakes, 18 interior core reduction flakes, 82 interior bifacial thinning flakes, and 35 pieces of shatter. Locus 2 measured approximately 5 x 3 m and contained 17 primary decortication flakes, 4 secondary decortication flakes, and 1 bifacial core. Locus 3 measured approximately 2 x 2 m and contained seven primary decortication flakes, four secondary decortication flakes, and five interior thinning flakes. All artifacts were identified of Fine-Grained Volcanic (FGV) materials. No features or

diagnostic artifacts were observed at the site. The inhabitants of the site utilized local materials and were attempting to garner viable flakes for tool production. These flakes were further reduced to form larger bifaces that were transported from the site (Belcourt et al. 2010). Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study (Figure 5). Site CA-SBR-13810 is located within the DUT portion of the APE (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). All three loci were relocated and mapped with the GPS system. The site largely remains the same as previously recorded and the site boundary was accurate; it measures approximately 160 x 45 m. Few vehicle impacts were observed that have disturbed the site. Other evidence for military use includes shell casings dating to 1989, based on the headstamp "L C 8 9."

Material culture at site CA-SBR-13810 is restricted to 5 unpatterned chipped-stone tools and 125 pieces of lithic core reduction detritus dispersed across 3 loci. Fine-grained volcanic is the only raw material type observed in the artifact assemblage. Specifically, the boundary of Locus 1 measures 10 m in diameter and contains 3 retouched/utilized flakes, 65 tertiary flakes, 20 secondary flakes, 1 primary flake, and 1 decortication flake. As the boundary size of this locus is approximately double the size observed in 2010, and only half of the amount of artifacts were accounted for, it is presumed that erosion has claimed some of the cultural components while spatially dispersing the remaining artifacts.

Measuring at 10 x 6.5 m, Locus 2 contains seven secondary flakes, four tertiary flakes, and two decortication flakes. As with Locus 1, this locus has approximately half the amount of artifacts as were observed during the original recording. This is also likely due to the effects of erosion over time.

Locus 3 measures 6.5 m in diameter and comprises 2 retouched/utilized flakes, 12 secondary flakes, 8 tertiary flakes, 3 decortication flakes, and 2 primary flakes. The increase in artifacts at this locus indicates some degree of artifact regeneration or could be the result of a change in lighting and visibility.

The site is a lithic scatter with numerous lithic reduction flakes, several retouched/utilized flakes, and evidence for later stage chipped-stone tool production, though none of these tools remain on location. The presence of expedient retouched/utilized flakes coupled with a comparative increase in plant species on top of the ridge suggests that some degree of vegetal resource procurement took place. Unfortunately, the lack of diagnostic chipped-stone tools or artifacts precludes the site from meeting the necessary criteria for inclusion on the NRHP. As mentioned above, the site is located on desert pavement, indicating that artifacts are a surficial manifestation with no potential for a buried cultural component. In addition, numerous washes downcut the ridgeline on both sides that may have dispersed some of the artifacts. The site was updated and recorded in its current condition and no new components were observed that would change the prior eligibility recommendations. Site CA-SBR-13810 is recommended not NRHP-eligible.

Figure 4. Site CA-SBR-13810; site overview; view to the south.

CA-SBR-13808/P-36-021505

Resource Type: Prehistoric archaeological site
Site Type: Lithic quarry and reduction
Dimensions: 83 x 9 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-13808 is a prehistoric lithic quarry and reduction site on desert pavement on a southeastern facing slope atop a low hill. Three unnamed playas are located approximately 800 m to the southwest, Goldstone Lake approximately 7 km to the southwest, Mars Lake approximately 5 km to the west, and Nelson Lake approximately 6 km to the east, and all would have provided a reliable source of water in the past. Several seasonal drainages and washes exist within the vicinity of the site. Vegetation is sparse creosote scrub, cheesebush, saltbush, Mojave aster, grassland with bursage, desert trumpet, desert mallow, chia, and annuals. The site is situated on desert pavement with soils deriving from alluvium and colluvium and bearing pebble-to-cobble size inclusions. Approximately 25 percent of the site has been impacted from past vehicle and military activities. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 2010 by Chambers Group as a lithic quarry and reduction site measuring 25 x 25 m consisting of split cobbles, 6 assayed cores and 17 pieces of debitage manufactured from FGV. Most of the artifacts were located within a 13-x-11-m concentration in the center of the site. No features or diagnostic artifacts were observed at the site. The relatively large size (over 10 cm in diameter) of the primary and secondary decortication flakes, and the

presence of multiple cores of varying types indicate that this area was used for lithic procurement (Belcourt et al. 2010). Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study and observed the site boundary circumscribes a smaller artifact concentration with a sparse peppering of artifact outliers between the concentration and greater site boundary (Figure 6). As a result, the site boundary was adjusted from 25 m in diameter to 83 x 9 m (225 m^2), likely due to the effects of natural erosion over time combined with active military use of the area (see Figures B2-aerial/B2-topographic quadrangle, Appendix A).

The lithic assemblage observed was concentrated towards the center of the site and derive primarily from FGV tool-stone and includes 31 tertiary flakes, 13 secondary flakes, and 3 decortication flakes. In addition to the ubiquitous FGV flakes in the artifact concentration are one chalcedony flake each of decortication and tertiary classifications, one burin, and one tested cobble. The burin is a formally patterned tool crafted from locally sourced rhyolite. It measures 6 x 3.3 x 2.2 cm and retains primary geological cortex. The tested cobble is of chalcedony and is the source from which the tertiary and decortication flakes were knocked off. Primary geological cortex is still present, as the artifact was not further reduced. The small scattering of artifacts outside of the concentration are eight tertiary flakes and one secondary flake, each of FGV. No diagnostic or datable materials or features were observed. Vehicle tracks were observed traversing the site; this has compromised the integrity of the site. The site remains approximately 60 percent intact.

Figure 5. Site CA-SBR-13808; site overview; view to the southeast.

The current investigation concurs with the previous site interpretation as a lithic quarry, where stone materials were reduced to a transportable size for further reduction and stone-tool making elsewhere. The lack of diagnostic materials, poor integrity of site constituents, and low potential

for additional data, in addition to no new components, were observed at the site; this renders site CA-SBR-13808 as unable to meet the necessary criteria for inclusion in the NRHP. The site was fully recorded with reduction stages quantified in the field, and no new components were observed that would change the prior eligibility recommendations. Site CA-SBR-13808 is recommended not NRHP-eligible.

CA-SBR-13811/P-36-021508

Resource Type: Prehistoric archaeological site
Site Type: Lithic reduction
Dimensions: 10 x 10 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-13811 is a prehistoric lithic reduction site comprising five large chert cores and numerous lithic reduction flakes located on a side slope within a seasonal drainage that has completely decimated all site integrity. Nelson Lake is approximately 6 km to the east and Pioneer Lake is 3 km to the south, along with a playa 2.5 km to the southwest. The site is bordered by seasonal drainages to the east and south. Vegetation is sparse creosote scrub, grassland with bursage, Beavertail cactus, diamond and pencil cholla, and forbs and annuals. Soils consist of alluvium and colluvium with poorly sorted fine-to-coarse pebble and cobble deriving from past volcanic activity. The site has been 100 percent impacted by water erosion. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 2010 by Chambers Group as a lithic reduction site measuring 10 x 10 m and consisting of chert cobbles eroding out of drainage. Artifacts observed at the site include 24 core reduction flakes, 20 angular block shatter pieces, 1 unidirectional core, 3 multi-directional worked cores, and 2 cobble cores. No features or diagnostic artifacts were observed at the site. It was noted that the integrity of the site had been lost due to water erosion and the site continuing to slowly wash downslope after rain events (Belcourt et al. 2010). Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study and observed the site was mostly unchanged and remained in similar condition as previously recorded (Figure 7; see Figures B2-aerial/B2-topographic quadrangle, Appendix A). The site boundary was accurate, and therefore was not adjusted and currently measures 10 x 10 m in size.

Disturbances from water erosion continues to impact the site and the site appears to be washing downslope. The drainage that traversed the site may have provided an intermittent source of water in the past during times of increased precipitation. The lithic assemblage on site all derive from the same parent material, as the five large chert cores. Each of the cores is multi-directional and has primary geological cortex remaining. In addition to the 5 cores, a total of 52 tertiary flakes, 8 secondary flakes, 6 primary flakes, 2 pieces of shatter, and 1 bifacial thinning flake were observed at the site. The high number of tertiary flakes and the bifacial thinning flake are indicative of late-stage reduction. This is interesting, as the cores are very large and have a viable amount of material left. It may be that the cores were treated with care during the reduction process so as not to waste high-quality material. It is likely that what materials were removed

were reduced elsewhere and crafted into usable chipped-stone tools. No diagnostic or datable materials, or features were observed. The site remains approximately 50 percent intact.

The site represents a prehistoric late-stage lithic reduction area with evidence for material testing and transport off-site. The paucity of information able to be gleaned from what is left of the artifact assemblage, in concert with the intermittent drainage that continually erodes, archaeological integrity renders the site as unable to meet the necessary NRHP criteria. The site was fully recorded with reduction stages quantified in the field and no new components were observed that would change the prior eligibility recommendations. Therefore, it is recommended that site CA-SBR-13811 remains not eligible for listing on the NRHP.

Figure 6. Site CA-SBR-13811; site overview; view to the north.

CA-SBR-13812/P-36-021509

Resource Type: Prehistoric archaeological site
Site Type: Lithic reduction
Dimensions: 58 x 29 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-13812 is a prehistoric lithic reduction site with two loci located on a western aspect slope with a seasonal wash to the west. Nelson Lake is approximately 6 km to the east and Pioneer Lake is 3 km to the south, along with a playa 2.5 km to the southwest. The site is bordered by seasonal drainages to the east and south. Vegetation is sparse creosote scrub, salt bush, cheesebush, Joshua trees, diamond and pencil cholla, and forbs and annuals. Soils consist of alluvial wash derived from various volcanic sources. The site has been impacted by heavy

vehicle activity and water erosion. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 2010 by Chambers Group as a lithic reduction site with two loci measuring 43 x 7 3 m. Locus 1 measured approximately 15 x 20 m and consisted of all FGV lithics with mostly core reduction flakes with some biface-reduction flakes, and two multi-directional cores from split cobbles. The locus was noted about 40 percent intact with some major impacts in one portion causing the artifacts to wash downslope. Locus 2 measured 17 x 42 m and consisted of a lithic scatter composed of jasper material. Twenty-five meters east of this locus, a Stage IV FGV biface (Lake Mojave preform) was documented. Only 20 percent of this locus was noted as intact due to heavy vehicle impacts and artifacts eroding downslope. No features or diagnostic artifacts were observed at the site. It was noted that the site was situated on a west-facing slope and is eroding downslope into drainages below; therefore, the integrity of the site had been lost due to water erosion and vehicle impacts (Belcourt et al. 2010). Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study and observed the site has essentially remained the same, but has sustained heavy disturbances due to vehicular traffic (Figure 8; see Figures B2-aerial/B2-topographic quadrangle, Appendix A). The two loci were identified and mapped; however, both were in poor condition. Loci 1 appeared to be 30 percent intact, and Loci 2 appeared to be 15 percent intact. Due to the disturbances along the eastern boundary and minimal artifacts identified outside of the loci, the site boundary was reduced in size. All stone tools were recorded, mapped, and photographed. The current measurement of the site is approximately 58 x 29 m.

This moderately dense lithic scatter comprises 52 pieces of lithic flaking debris, 7 chipped-stone tools, and 1 core. The artifacts are clustered in two loci within the site boundary; each being made up of either FGV (Locus 1) or jasper tool stone (Locus 2), as previously reported.

Each of the artifacts located within Locus 1 is made from FGV; there are ten tertiary flakes, four secondary flakes, four decortication flakes, and two primary flakes. A single retouched/utilized flake represents the chipped-stone tool class within Locus 1. This utilized flake shows minimal use-wear on the left lateral edge. In addition, a multi-directional core is also present, which exhibits infrequent areas of primary geological cortex.

Artifacts within Locus 2 are greater in both number and variation; all artifacts within this locale are made of jasper. These include 22 tertiary flakes, 6 secondary flakes, and 3 primary flakes. Of the chipped-stone tools, there are six unpatterned retouched/utilized flakes. Three of these show use-wear on both lateral edges and were likely used as expedient tools for opportunistic resource gathering. The remaining two tools are of more interest. The first is a possible spokeshave made from a retouched/utilized flake. The distal end of this artifact shows a concave flake scar with numerous macroscopic flake patterning, reminiscent of prehistoric methodology used to smooth small branches for use in bow-and-arrow technology. The final jasper tool is a possible burin, also crafted from a retouched/utilized flake. The distal end was intentionally shaped into a point, likely used for puncturing thick materials such as animal hides.

The numerous patterned and unpatterned tools suggest that the site was likely used by prehistoric people for lithic procurement and subsequent reduction. The lack of diagnostic artifacts combined with a high degree of man-made disturbance at the site prevents further insights into site interpretation. The site was updated and recorded in its current condition, and no new components were observed that would change the prior eligibility recommendations. Therefore, it is recommended that site CA-SBR-13812 remains not eligible for listing in the NRHP.

Figure 7. Site CA-SBR-13812; site overview with disturbances; view to the east.

CA-SBR-11716/P-36-011716

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter and quarry
Dimensions: 46 x 24 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-11716 is a prehistoric lithic scatter and quarry with two loci located on a small hill within a large valley situated on desert pavement. Nelson Lake is approximately 6 km to the east and Pioneer Lake is 3 km to the south, along with a playa 2.5 km to the southwest. The site is bordered by seasonal drainages to the east and south. Vegetation is sparse creosote scrub and forbs and annuals. Soils consist of desert pavement. The site is adjacent to in unimproved road and has been impacted from tracked and wheeled vehicles. Ground visibility is excellent, ranging from 90 to 100 percent across the site.

The site was originally recorded in 2004 and was comprised of a lithic scatter on desert pavement that measured 47 x 32 m (Brewer et al. 2004). Recorded at this site were two lithic reduction loci and one basalt biface fragment. A total of 153 FGV basalt flakes were recorded. Locus 1 measured 403 m^2 and contained 117 basalt flakes. Locus 2 measured 160 m^2 and contained 36 basalt flakes. One Stage III fine-grained basalt biface fragment was collected from the site and no temporally diagnostic artifacts were observed. In order to determine the data potential of the site, Fort Irwin archaeologists excavated one shovel test pit to a depth of 20 cm (Belcourt et al. 2010). No cultural materials or features were recovered from the shovel test pit. Due to the lack of temporally diagnostic artifacts and the lack of a subsurface component, it was noted that this lithic scatter lacked the potential to provide information on prehistory that can further our understanding of regional knowledge and research questions. Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study and noted that the site had been subjected to heavy disturbance from vehicular traffic (Figure 9). The site boundary was reduced to reflect the site's current condition and lack of artifacts identified on the surface, which is significantly smaller than what was previously reported (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). The current measurement of the site is approximately 46 x 24 m. Both loci were identified and currently measure 10 x 10 m for Locus 1 and 10 x 12 m for Locus 2. Contrary to previous recordings, no chipped-stone tools were observed at site CA-SBR-11716 during the current study. Instead, the lithic assemblage consisted of 40 tertiary flakes, 11 secondary flakes, and 3 primary flakes. Each of the observed lithic reduction flakes are of FGV tool stone. The high proportion of mid-to-late stage lithic reduction flakes is consistent with the previous 2004 site recordation findings; however, the amount of artifacts identified during the current investigation is considerably less. Heavy vehicle tracks abound in the area and are likely the source of artifact obscuration or removal.

Figure 8. Site CA-SBR-11716; site overview with disturbances; view to the northwest.

All artifacts were mapped and recorded, and no additional stone tools were recorded during this study. The site was updated and recorded in its current condition, and due to the large areas of disturbances and that no new components were observed, it is recommended that site CA-SBR-11716 remains not eligible for listing in the NRHP.

CA-SBR-5026/P-36-005026

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 128 x 97 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-5026 is a prehistoric lithic scatter site with two loci situated on an elevated desert pavement section of a knoll. A drainage 6 m west of the site would have provided an intermittent source of water during times of increased precipitation, and Nelson Lake 5 km to the east would have offered more stable provisions. Vegetation is sparse creosote scrub, desert trumpet, and forbs and annuals. Soils are primarily alluvium and colluvium with coarse pebble-to-cobble size inclusions derived from past volcanic activity. Ground visibility is excellent, ranging from 90 to 100 percent across the site. The site has sustained heavy disturbances due to vehicle tracks and military activity. A main access road runs directly through the expanded site boundary, and many rivulets and drainages traverse the site area.

The site was originally recorded in 1982 as a dispersed lithic scatter measuring 26 x 35 m (Breece 1982). Two loci were recorded consisting of chert and chalcedony core reduction flakes with one chert scraper. No artifacts were collected. To determine the data potential of the site, archaeologists excavated one shovel test pit and no cultural materials were recovered. In 1993, the site was re-located by Far Western and combined with CA-SBR-5027 (Basgall 1993). The site contained eight cryptocrystalline and three basalt chipping areas or SRLs ranging from 0.2 to 8.0 m^2 in size, and the site measured 105 x 245 m with materials spanning two washes and spread along three ridges. Eleven loci were identified, and surface artifacts were collected, including 4 bifaces (3 basalt and 1 obsidian), 1 basalt cobble core, 5 cores (1 basalt and 4 CCS, of which one was utilized as a tool), and 241 pieces of debitage (64 basalt and 196 CCS). The study concluded that the site appeared to be generally similar in most respects to others in the greater Nelson Basin area, in that the site was exploited only casually when groups were moving through this part of the basin for alternative purposes (Basgall 1993). Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study and observed heavy disturbances with numerous two-track roads extending through the site boundary (Figure 10) that have exacerbated water erosion, as evidenced by small rivulets downcutting the area. Several vehicle tracks were noted traversing through the center of the site. Additionally, the construction of the access road, Pioneer/Debnam Pass Fort Irwin Main Supply Routes (MSR), and a drainage has completely destroyed the southern portion of the site, including Locus 2. In addition, a concertina fenceline cuts through the southwestern portion of the site that has contributed to the disturbance to CA-SBR-5026.

The site boundary was reduced to reflect the site's current condition and lack of artifacts identified on the surface, which is smaller than what was previously reported (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). The current measurement of the site is approximately 128 x 97 m. All tools were photographed, mapped, and recorded. The lithic assemblage includes ten pieces of lithic flaking debris, two cores, and a scraper. Of the lithic debitage, there are nine pieces of shatter (six are FGV), and three are unsourced brown chert flake, one unsourced brown chert primary flake, and one FGV secondary flake. The cores are each multi-directional and retain primary geological cortex; one core is of jasper, while the other is FGV. The patterned scraper shows 70-degree beveled edges on opposing lateral sides. Each flake scar measures approximately 2 mm. The scraper is of argillite, retains evidence of the original water-worn cortex, and bears heavy desert varnish. The site represents a one-time use area for lithic procurement with limited expedient tool use. The site was updated and recorded in its current condition and no new components were observed that would change the prior eligibility recommendations. In addition, the heavy disturbances to the site has comprised the integrity of the site CA-SBR-5026 in regard to obtaining data potential. Therefore, it is recommended that site CA-SBR-5026 is not eligible for listing on the NRHP.

Figure 9. Site CA-SBR-5026; site overview with disturbances; view to the south.

CA-SBR-5027/P-36-005027

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 18 x 18 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-5027 is a prehistoric lithic scatter site with two loci situated on a small section of alluvial terrace above a north-south trending intermittent drainage (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). A drainage is adjacent to the site and Nelson Lake is approximately 6.3 km to the east. Vegetation is sparse creosote scrub, and forbs and annuals. Soils consist of alluvial deposits derived from various volcanic sources. Ground visibility is excellent, ranging from 90 to 100 percent across the site.

The site was originally recorded in 1982 by Chambers Group as a dispersed lithic scatter measuring 18 x 18 m. Three loci were recorded consisting of 2 chert cores and 83 flakes (49 chert, 14 chalcedony, 12 CCS, and 8 basalt). At this time, in order to determine the data potential of the site, archaeologists excavated one shovel test pit and no cultural materials were recovered. No artifacts were collected. This site was grouped with CA-SBR-5026 by the work conducted by Far Western (Basgall 1993). In 2010, this site was re-located and evaluated. The site was noted to be a low-density lithic scatter, and 76 pieces of basalt debitage and 1 CCS flake were recorded. A hearth feature was also noted and recorded consisting of ten cobbles; it appeared to have been previously impacted. This site has been subjected to 30 years of impacts from wheeled and tracked vehicles, leaving only about 10 percent of the site intact. Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study and observed the entire area to be disturbed by vehicular traffic (Figure 11). No artifacts were observed at the reported location; therefore it was determined the site to be not relocated. It is recommended that site CA-SBR-5027 remains not eligible for listing in the NRHP.

Figure 10. Site CA-SBR-5027; site overview with disturbances; view to the north.

CA-SBR-5028/P-36-005028

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 43 x 36 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-5028 is a prehistoric lithic scatter site situated on an alluvial fan between two seasonal drainages. These drainages, along with Nelson Lake located approximately 6.3 km to the east, are the main sources of water for the site. Vegetation is sparse creosote scrub, bursage, saltbrush, and forbs and annuals. Soils consist of alluvial deposits derived from granite sources. The sparse vegetation allows for excellent ground visibility, ranging from 90 to 100 percent clear across the site.

The site was originally recorded in 1982 by Chambers Group as a dispersed lithic scatter measuring 64 x 24 m. More than 100 basalt flakes, mostly core reduction, were observed along with a retouched basalt flake. One basalt leaf-shape point, one basalt biface fragment, and two metavolcanics millingstone fragments were collected. In order to determine the data potential of the site, archaeologists excavated one shovel test pit and no cultural materials were recovered.

In 1993, Far Western re-located and tested this site (Basgall 1993). Seventy-five 5-x-5-m shovel scrape units and two 1-x-1-m test units were excavated, and no subsurface cultural materials were recovered. The collected artifacts included: 1 Lake Mojave basalt point, 11 basalt bifaces, 2 formed flake tools (1 basalt, 1 rhyolite), 2 casual basalt flake tools, 3 basalt cores, and 325 pieces of debitage (324 basalt, 1 CCS).

In 2010, this site was relocated and evaluated for NRHP eligibility by Chambers Group (Belcourt et al. 2010). Three concentrations were observed at this site which included more than 200 basalt flakes (mostly core reduction flakes), 1 jasper flake, 1 chalcedony flake, 3 basalt cores and 2 retouched basalt flakes. The site was noted in poor condition due to vehicle impacts and sheet-flow erosion. Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study and observed the site was mostly unchanged and remained in similar condition as when previously recorded (Figure 12; Figures B2-aerial/B2-topographic quadrangle, Appendix A). However, additional artifacts were identified to the north and the site boundary was expanded to include these items as part of the update. As a result, the site boundary currently measures 43 x 36 m.

The newly expanded portion of the site contains a light scatter of 13 primary flakes, 7 secondary flakes, 4 pieces of shatter, 1 chalcedony retouched/utilized flake, and 1 multi-directional core with visible areas of remnant primary geological cortex. Except for the single chalcedony specimen, all artifacts are of FGV material. Locus 1 is located along western boundary and measures approximately 4 m in diameter. Within this locus are approximately 150 FGV flakes classified as primary, secondary, and tertiary interior thinning flakes. Measuring 5 x 2 m in size, Locus 2 is located in the northeastern portion of site. Vehicle tracks are noticeably prominent in this area. During the current investigation, there are approximately 60 flakes consisting of

decortication, primary, secondary, and tertiary flakes. Contrary to the previous recording, no cores or retouched/utilized flakes were observed, likely due to the heavy vehicle disturbance. Locus 3 is the least disturbed of the loci, retains the original measurement of 4 x 2 m, and is located in the southern portion of the site. Artifacts include approximately 55 flakes of decortication, primary, secondary, and tertiary typologies.

No diagnostic or datable materials were observed during the current assessment. Archaeological data gleaned from the artifact assemblage suggests that all stages of lithic reduction took place at this locale; however, few chipped-stone tools remain, and the site integrity has been heavily impacted by military training. In addition, the site was extensively subsurface tested during past assessments, and a subsurface component was not identified. The site was fully recorded with reduction stages quantified in the field and no new components were observed that would change the prior eligibility recommendations. The lack of integrity pertaining to association combined with an exhausted data potential makes the site unable to meet the necessary qualification for inclusion on the NRHP. Therefore, it is recommended that site CA-SBR-5028 is not eligible for listing on the NRHP.

Figure 11. Site CA-SBR-5028; site overview; view to the west.

CA-SBR-5029/P-36-005029

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 78 x 42 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-5029 is a prehistoric lithic scatter site within four loci situated on an alluvial fan (see Figures B2-aerial/B2-topographic quadrangle). A drainage is adjacent to the site and Nelson Lake is approximately 6 km to the west. Vegetation is sparse creosote scrub, forbs and annuals. Soils consist of desert pavement derived from granite sources. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 1982 as a low density lithic scatter measuring 78 x 42 m with four loci (Stockton 1982). Locus 1 contained approximately 275 cortical and noncortical flakes of basalt, several basalt cores, a small number of chalcedony flakes, and 1 Gatecliff series projectile point in a 15-x-13-m area. Locus 2 contained approximately 260 noncortical and cortical flakes of basalt, scattered basalt cores, and flakes of chalcedony in a 19-x-7.2-m area. At Locus 3, 1 core and 14 flakes of white chalcedony were observed in a 4-x-3-m area. Locus 4 contained approximately 112 flakes, 1 basalt core, and a few chalcedony flakes in a 13.5-x-7.5-m area. Most of these flakes were secondary percussion flakes, similar to the other loci at this site. The site was noted in good condition; however, the site had received minor impacts due to prior military activities and vehicle tracks that cross the site.

Although the assemblage lacked diagnostic artifacts, the large presence of basalt suggests that the site may be associated to the Lake Mojave and/or Pinto periods. Furthermore, data could be used to reconstruct patterns of lithic technology utilized throughout the prehistory of Fort Irwin. The four loci identified may represent both single and multiple episodes of occupation. At the time, it was suggested that the site has the potential for providing significant data for the study of prehistoric technological change in the Fort Irwin area (Robarcheck et al. 1982).

In 1993, CA-SBR-5029 was subjected to a subsurface testing program (Basgall 1993b) and resulted in the identification of two loci and 14 individual reduction areas, with the emphasis on primary acquisition of local basalt for flaked-stone production. Some activities related to maintenance and processing were indicated by the flake tools, many of which were cryptocrystalline. The temporal data collected from the site indicates that CA-SBR-5029 was occupied during the Lake Mojave interval (Basgall 1993b).

Team CALIBRE revisited the site as part of the current study and observed large areas of vehicular disturbance (Figure 13). No evidence of cultural materials was observed. Given the present condition, it appears that this resource has been lost over time and no longer exists. It is recommended that site CA-SBR-5029 remains not eligible for listing on the NRHP.

Figure 12. Site CA-SBR-5029; site overview with disturbances; view to the northwest.

CA-SBR-13809/P-36-021506

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 29 x 25 m (north–south x east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-13809 is a prehistoric lithic scatter site situated on an elevated terrace along seasonal drainages to the north, east, and south, and is divided into two discrete loci. Nelson Lake is approximately 6.3 km to the east and a major drainage is situated 0.5 km north of the site. Vegetation is sparse creosote scrub, bursage, saltbrush, and forbs and annuals. Soils consist of desert pavement and alluvial deposits derived from granite sources. The site has been impacted by military vehicles. Ground visibility is excellent, ranging from 90 to 100 percent across the site.

The site was originally recorded in 2010 by Chambers Group as a lithic scatter measuring 32 x 53 m. The assemblage was largely comprised of interior flakes and four early-stage bifaces were recorded. Locus 1 measured approximately 10 x 4 m in size and contained five FGV interior flakes and one Stage II FGV biface. Locus 2 measured approximately 30 x 10 m and contained a total of 57 interior flakes, 3 secondary decortication flakes, and 1 primary decortication flake. In addition, three Stage III bifaces were recorded: one complete Stage II, one Stage II medial fragment, and one Stage I distal fragment. The entire artifact assemblage is comprised of FGV. It was noted that the two loci of this site have been impacted by vehicles and are approximately 50 percent intact. No features or diagnostic artifacts were observed at this site. The artifacts indicate

that FGV tool stone was transported to this site and was reduced further. Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, the site was recommended as not eligible for listing in the NRHP (Belcourt et al. 2010).

Team CALIBRE revisited the site as part of the current study and observed the site had been severely impacted by several vehicular tracks traversing the entirety of the site (Figure 14; see Figures B2-aerial/B2-topographic quadrangle, Appendix A). As a result, the site boundary was reduced as only Locus 2 was identified and Locus 1 could not be relocated. The site currently measures 29 x 25 m in size. A total of 30 flakes were observed including 10 primary and 10 secondary, and 10 interior flakes and all of FGV material. Of the four previously recorded bifaces, one nearly complete Stage II FGV biface and one distal fragment Stage II FGV biface were identified. The other two previously recorded bifaces were not relocated. No diagnostic or datable materials were observed. The site was fully recorded in its current condition and reduced in size due to most of the site being destroyed by vehicular activity. No new components were observed that would change the prior eligibility recommendations. Therefore, it is recommended that site CA-SBR-13809 is not eligible for listing on the NRHP.

Figure 13. Site CA-SBR-13809; site overview with disturbances; view to the west.

CA-SBR-2347/P-36-002347

Resource Type: Prehistoric Petroglyphs archaeological site
Site Type: Petroglyphs "Paradise Bird Site"
Dimensions: 175 × 128 m (north–south × east–west)
NRHP Recommendation: Eligible
Proximity to APE: Utility corridor

Site CA-SBR-2347 is a consists of three petroglyphys concentrations, two sleeping circles and a flakes stone scatter with two loci. The site is situated on desert pavement south of the Goldstone Road in a creosote scrub community. Goldstone Lake is located approximately 3.5 km to the east of the site. Ground visibility within the small portion of the APE is good, ranging from 85 to 90 percent.

The site was originally recorded in 1977 and was described as comprising three petroglyphs concentrations, two sleeping circles, and a flaked stone scatter within two loci. The northern locus contains the petroglyphs (12 total) and the southern locus contains the sleeping circles and the lithic assemblage. The site was recorded and evaluated in 1998 by David Whitley at W&S Consultants. The chronometric dating placed the site between 5000 B.P. and 3000 B.P. The site was evaluated as eligible for listing on the NRHP based on various criteria for inclusion (Whitley 1998). The site was revisited in 2000, 2002, and 2005 for condition assessment and mapping purposes. In 2012, PaleoWest relocated the site and confirmed the petroglyphs, the flakes and a sleeping circle. The site was noted in good condition and permanent sign was placed indicating the presence of an archaeological site to warn against disturbance. In 2014, the site was revisited by Fort Irwin staff and updated per its current condition. Continued monitoring of the site was recommended.

A small portion of the northern boundary of Site CA-SBR-2347 lies within a linear utility corridor of the project APE (see Figures C2-aerial/C2-topographic quadrangle, Appendix A). Team CALIBRE revisited the site as part of the current study and did not identify any cultural manifestations of the site within the project APE. The site record was not updated during the current investigation. Based on the prior investigations, it is recommended that site CA-SBR-2347 remain eligible for listing on the NRHP.

CA-SBR-3314/H/P-36-003314

Resource Type: Multi-component archaeological site
Site Type: Multicomponent prehistoric habitation and historic mining site
Dimensions: 235 × 125 m (north–south × east–west)
NRHP Recommendation: Eligible
Proximity to APE: Utility corridor

Site CA-SBR-3314/H is a large multi-component site comprised of prehistoric petroglyphs and rock shelters with lithic scatter and historic-period mining materials located on alluvial fans on the valley floor in a creosote scrub community. The site has been impacted by vehicle traffic and trenching for underground utilities. Goldstone Lake is located approximately 8.5 km to the northwest of the site. Soils consist of alluvial deposits derived from granite sources. Ground visibility of the portion of the site within the APE is excellent, ranging between 85 to 95 percent.

The site was originally recorded in 1978 by Richard McCarty and described as a small lithic scatter with a chopper and bifacially flaked fragments. At that time, it was noted that the area had been heavily disturbed and the site was in poor condition.

The site was then re-surveyed and updated in 2002/2003 by the Fort Irwin DPW Cultural Resources staff (Fort Irwin DPW-Cultural Resources 2003). During this visit, the site was expanded into a large site complex incorporating the smaller neighboring sites CA-SBR-3306, -3307, -3309, -3310, -3311, -3312, and -3313 (Fort Irwin DPW-Cultural Resources 2003). The

site was recorded as a large habitation site consisting of a group of 5 rockshelters, possible pictographs, at least 5 petroglyphs, a watering hole, milling slicks, handstones, pottery, and an opportunistic lithic scatter consisting of 3000+ debitage and artifacts of various materials (Fort Irwin DPW-Cultural Resources 2003). An Eastgate projectile point (500-1000 A.D.) and a Saratoga Springs Triangular projectile point (1000-1870s A.D.) were recorded and collected. A total of 16 lithic concentration loci were recorded during this visit (Fort Irwin DPW-Cultural Resources 2003). Although there is an early-mid 20th century mining activity historical component to the site, CA-SBR-3314/H was designated as a prehistoric habitation site as it was the dominant component (DPW 2003; DPW 2006: 4).

In 2008, Fort Irwin Archaeological staff conducted a reconnaissance survey to ascertain the credibility of the 2002/2003 findings (Fort Irwin Archaeological Staff 2008). The site was subjected to a Phase II site testing during this visit, CA-SBR-3314/H was identified as a separate site from the habitation complex recorded in 2003 and the previously incorporated sites were extracted (Fort Irwin Archaeological Staff 2008). Additionally, a large lithic scatter originally recorded as part of the complex was determined to be rhyolite eroding from a natural geological feature northeast of Goldstone Road (Fort Irwin Archaeological Staff 2008). Therefore, in 2008, the site was recorded as a large lithic scatter containing 300+ flakes, several bifaces, and flake tools centered around a granitic outcrop (Fort Irwin Archaeological Staff 2008). The test units yielded several hundred flakes, a few biface fragments (one complete), a Lake Mojave point preform (7500-3500 B.C.), FAR, and two possible hearth features (Fort Irwin Archaeological Staff 2008). In 2008, CA-SBR-3314/H was recommended eligible for listing on the NRHP under Criterion D for its potential to yield information important to the prehistory of Fort Irwin (Fort Irwin Archaeological Staff 2008).

The site was revisited in 2012 by PaleoWest and noted the petroglyphs, watering hole, the northeastern site loci, and at least ten flaked stone concentrations. The concentrations appeared to be in the original 1978 locations of CA-SBR-3306, -3307, -3309, - 3310, -3311, -3312, and -3313; however, the locations were different than recorded in 2008. As a result, PaleoWest re-combined the previous sites with CA-SBR-3314/H. The site was recommended eligible for inclusion in the NRHP under Criterion D for the potential to yield information important to the prehistory of Fort Irwin (Roberts et al. 2012).

The site has continued to be monitored by Redhorse Corporation through 2015 and additional prehistoric cultural materials and historic-period artifacts have been identified. It was recommended that site CA-SBR-3314/H needs to be re-surveyed, a DPR record needs to be completed, the incorporated sites need to be re-located and re-surveyed, and the map needs to be updated. Due to the presence of diagnostic prehistoric artifacts, features, newly recorded pictographs and the newly recorded incised greenstone pendant fragment, CA-SBR-3314/H site has the potential to yield further information important to the prehistory of Fort Irwin (Fort Irwin Archaeological Staff 2008; Roberts et al. 2012). Therefore, Redhorse concurred with the previous findings that the site is recommended eligible for inclusion in the NRHP under Criterion D (Fort Irwin Archaeological Staff 2008; Roberts et al. 2012).

The northeastern portion of site CA-SBR-3314 lies within the utility corridor and access road improvements of the project APE (see Figures D2-aerial/D2-topographic quadrangle, Appendix A). Team CALIBRE revisited the site as part of the current study and did not identify any cultural manifestations of the site within the project APE. The site record was not updated during

the current investigation. Based on prior investigations, it is recommended that site CA-SBR-3314 remain eligible for listing on the NRHP.

CA-SBR-11538/P-36-011538

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 160 × 286 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Utility corridor

Site CA-SBR-11538 is a large low density prehistoric lithic scatter site located on a moderately steep pediment slope covered in desert creosote scrub south of Goldstone road. A seasonal drainage is located to the south and Nelson Lake is approximately 6.3 km to the east of the site. Soils consist of desert pavement and alluvial deposits derived from granite sources. Site has been impacted by military vehicles. Most of the site lies entirely outside of the project APE. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 2006 as a lithic scatter measuring 160 x 286 m. During that study the eastern half of the site was recorded in detail and evaluated for the NRHP. The eastern portion of the site contained a total of 82 cryptocrystalline and fine-grained basalt artifacts. A less intensive examination of the remainder of the western half of the site was performed. The western extent of the site terminates near a graded dirt road which clips the very edge of the site. This area seemed to contain a small, relatively dense locus of artifacts that included a milling-stone fragment, a biface fragment, a flake tool and a projectile point fragment of unknown typology. The site consists of early and late-stage bifacial reduction of imported cryptocrystalline and basalt materials. At that time, it appeared that much of the original site context has been destroyed through natural processes. The eastern half of the site appears to be comprised of cultural material which has washed down slope from the higher ground to the west (DPW 2006).

A total of seven shovel test probes (STPs) were excavated within the eastern half of the site, yielding no subsurface cultural material. The STPs averaged a depth of 40 cmbs and revealed similar soil profiles. Stratum I consisted of a loosely compact gravelly sand, (10YR *5/3* brown). Stratum n is a lightly compact silty-sand, (10YR *5/3* brown). Stratum III is composed of a moderately compact silty sand with gravels, (10YR *5/4),* yellowish brown. CA-SBR-11538 within the APE lacked any intact subsurface deposits and no further testing was required and was recommended not eligible for the NRHP (DPW 2006).

Small portions of eastern part of site CA-SBR-11538 appear to lay within a linear utility corridor of the project APE (see Figures D2-aerial/D2-topographic quadrangle, Appendix A). Team CALIBRE revisited the site as part of the current study and did not identify any cultural manifestations of the site within the project APE. The site record was not updated during the current investigation. Due to the fact that the eastern portion of the site was previously tested and lacked any subsurface deposits and that no new components were observed during the current investigation; no new data was obtained that would change the prior eligibility

recommendations. Therefore, it is recommended that site CA-SBR-11538 remain not eligible for listing on the NRHP.

CA-SBR-11537/P-36-011537

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 130 × 50 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-11537 is a prehistoric lithic scatter site situated at the terminus of an alluvial fan on a valley floor in a community of desert creosote scrub south of Goldstone road. A seasonal drainage is located to the north and Nelson Lake is approximately 6.3 km to the east of the site. Soils consist of desert pavement and alluvial deposits derived from granite sources. Site has been impacted by military vehicles. Most of the site lies entirely outside of the project APE. Ground visibility within the portion of the APE is good, ranging from 85 to 90 percent across the site.

The site was originally recorded in 2006 as a lithic scatter measuring 130 x 50 m. The assemblage was largely comprised of 88 artifacts including locally available fine-grained basalt, jasper, crytocrystalline, rhyolite, chalcedony, and obsidian materials. A total of 15 STPs were excavated at the site yielding one chalcedony late-stage bifacial thinning flake 20–30 centimeters below surface (cmbs) at STP N20/W20. The remaining 14 STPs were excavated to depths between 40 cmbs and 50 cmbs yielding no cultural material. The strata for these 15 STPs were relatively similar with Stratum I consisting of a loosely compacted silty sand, (IOYR 5/3 brown). Stratum II is composed of a moderately compact gravelly sand, (IOYR 6/3 pale brown). Stratum III is moderately compact gravelly sand, (IOYR 6/4 light yellowish brown). The results of the evaluation indicated that CA-SBR-1l537 lacks temporally diagnostic artifacts and intact subsurface deposits. The site is a relatively small lithic scatter that does not possess the potential to make a significant contribution to regional research questions. The site was recommended not eligible for listing on the NRHP and no further testing was recommended (DPW 2006).

A small portion of the northern boundary of site CA-SBR-11537 appears to lay within the project APE for access road improvements (see Figures D3-aerial/D3-topographic quadrangle, Appendix A). Team CALIBRE revisited the site as part of the current study and did not identify any cultural manifestations of the site within the project APE. The site record was not updated during the current investigation. No new components were observed that would change the prior eligibility recommendations. Therefore, it is recommended that site CA-SBR-11537 remain not eligible for listing on the NRHP.

CA-SBR-11554/P-36-011554

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter

Dimensions: 235 × 125 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-11554 is a large lithic scatter located on a valley floor in a creosote scrub community and bisected by two access roads. The site has been heavily impacted by vehicle traffic trenching for runoff flow and trenching for underground utilities. Garlic Spring is located approximately 16 km to the southeast and Nelson Lake is approximately 6.3 km to the east of the site. Soils consist of alluvial deposits derived from granite sources. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 2003 by employees of Fort Irwin's DPW and contained a total of 760 surface artifacts including flakes of rhyolite, fine-grained basalt and cryptocrystalline, 1 rhyolite millingstone and 1 rhyolite knife. Artifacts are primary decertification flakes, shatter and early and late-stage bifacial reduction flakes. The site was noted in poor condition and measured approximately 235 x 125 m in size (12,773 m²). No temporally datable artifacts were noted. Due to the relatively large size and quantity of surface artifacts, a total of 16 STPs were excavated and yielded only 25 subsurface artifacts. The 16 STPs were excavated to an average depth between 50 cmbs and 60 cmbs and revealed 4 primary strata. The evaluation concluded that site CA-SBR-11554 lacked temporally diagnostic artifacts and does not have a significant amount of intact subsurface deposits. The site is a lithic scatter that lacks the potential to make a significant contribution to regional research questions and was recommended not eligible for listing on the NRHP (DPW 2006). No further testing was recommended.

The bulk of site CA-SBR-11554 lies within the access road improvements of the project APE (see Figures D3-E3-aerial/D3-topographic quadrangle, Appendix A). The construction of the existing roads has destroyed most of the site. Team CALIBRE revisited the site as part of the current study and did not identify any cultural manifestations of the site within the project APE. The site record was not updated during the current investigation. No new components were observed that would change the prior eligibility recommendations. Therefore, it is recommended that site CA-SBR-11554 remain not eligible for listing on the NRHP.

CA-SBR-11555/P-36-011555

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 60 × 95 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-11555 is a small lithic scatter located at the terminus of an alluvial fan on a valley floor in a creosote scrub community and bisected by numerous small season drainages. The site has been heavily impacted by vehicle traffic. Nelson Lake is approximately 6.3 km to the east of the site. Soils consist of desert pavement and alluvial deposits derived from granite sources. The bulk of the site lies outside of the project APE. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 2003 by employees of Fort Irwin's DPW and contained a total of 45 surface artifacts predominately of fine-grained basalt and cryptocrystalline material. The site measured approximately 60 x 95 m in size (4,038 m^2) and artifacts identified included shatter, flake fragments and early and late-stage bifacial reduction flakes. No temporally datable artifacts were noted. Due to the relative small size and paucity of surface artifacts, only four STPs were excavated and no cultural materials were recovered. These 4 STPs reveal 3 strata and was excavated to a depth between 50 cmbs and 60 cmbs. Stratum I was loosely compacted gravelly sand, (10YR 6/3 pale brown). Stratum II consisted of a moderately compacted silty-sand, (10YR 5/4, yellowish brown). Stratum III was composed of a moderately compacted silty-sand with gravels, (10YR 4/4 dark yellowish brown). The evaluation concluded that site CA-SBR-11555 lacked temporally diagnostic artifacts and substantial intact subsurface deposits. The site is a small lithic scatter that lacks the potential to make a significant contribution to regional research questions and was recommended not eligible for the NRHP (DPW 2006). No further testing was recommended.

The northern portion of the site lies within the access road improvements of the project APE (see Figures E3-aerial/E3-topographic quadrangle, Appendix A). Team CALIBRE revisited the site as part of the current study and did not identify any cultural manifestations of the site within the project APE. The site record was not updated during the current investigation. No new components were observed that would change the prior eligibility recommendations. Therefore, it is recommended that site CA-SBR-11555 remain not eligible for listing on the NRHP.

CA-SBR-11556/P-36-011556

Resource Type: Prehistoric archaeological site
Site Type: Lithic quarry
Dimensions: 837 × 483 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-11556 is a large quarry of cryptocrystalline material located along a small ridge and desert pavement covered area and bisected by numerous small season drainages. The site contains several thousand primary and secondary reduction flakes, tested cobbles and expired cores within nine reduction areas. The site has been heavily impacted by vehicle traffic and extensive trenching by modem rock-hounds seeking cryptocrystalline materials and Chapinite, Nelson Lake is approximately 6.3 km to the east of the site. Soils consist of desert pavement and alluvial deposits derived from granite sources. Ground visibility is excellent, ranging from 85 to 95 percent across the site.

The site was originally recorded in 2002 by employees of Fort Irwin's DPW and contained nine reduction loci with several many thousands of primary and secondary cobble reduction flakes, tested cobbles and expired cores. All artifacts were cryptocrystalline silicate. In addition, one rock ring and seven rock cairns of unknown age were identified within the site boundaries. These features were constructed of locally available rocks and ranged in height from 16 to 39 cm. No STPs were excavated across the site and it was noted that the site had been heavily impacted by trenching and military exercises. It was concluded that the site lacked research potential and requires no further testing.

The site was revisited in 2003 and subjected to a test and evaluation program (Peter et al. 2004). Six STPs were randomly places across the site; all but one were negative for cultural materials. Shovel Test 6 produced one CCS flake from within the upper 10 cm, but the shovel test was located in a dirt road and thus the artifact's subsurface provenience may be due to vehicle disturbance of the soils. Despite the large size of the site and artifact density, it yielded no temporally diagnostic artifacts and was recommended not eligible for the NRHP (Peter et al. 2004).

In 2005, site CA-SBR-11556 the site was updated by Fort Irwin staff and described as a cryptocrystalline silicate pavement quarry and contained 60 loci ranging from 10 to over 500 flakes. The site measured approximately 837 x 483 m (244,037 m²) in size and over 500 artifacts were collected during that investigation. In addition, it was noted that the south end of the site was heavily impacted by traffic and rock hounds mining cryptocrystalline silicate. The site was tested and lacked substantial subsurface materials and temporally diagnostic artifacts. The investigation concluded that site CA-SBR-11556 lacked the potential to provide information on prehistory that can further our understanding of regional knowledge and research questions, and therefore was subsequently recommended not eligible for listing on the NRHP.

Site CA-SBR-11556 was revisited in 2015 by Cogstone Resource Management and archaeologists observed that the native rocks and pavement of CCS remain, but very little cultural materials was observed (Gust et al. 2016).

Portions of the site lay within the APE for access road improvements (see Figures E3-aerial/E3-topographic quadrangle, Appendix A). Team CALIBRE revisited the site as part of the current study and identified cultural manifestations of the site within the project APE, but in a disturbed context. The site record was not updated during the current investigation. No new components were observed that would change the prior eligibility recommendations. Therefore, it is recommended that site CA-SBR-11556 remain not eligible for listing on the NRHP.

CA-SBR-10690 (Horse Stables Site)

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter and quarry
Dimensions: 500 × 235 m (north–south × east–west)
NRHP Recommendation: Not eligible
Proximity to APE: Access Road Improvement

CA-SBR-10690 was originally recorded in March 2002 by employees of Fort Irwin's DPW as a large lithic scatter and quarry with 31 loci measuring approximately 500 x 240 m (74,147 m²). The site lies within a dry wash west of the Fort Irwin cantonment along Goldstone Road on the valley floor bisected by basalt bars. The site is situated at the southwest corner of Goldstone Road and Man of War Road. Goldstone Lake is located approximately 3.5 km to the east of the site. The artifact assemblage consisted of thousands of chalcedony flakes, several cores, one possible milling stone and an associated handstone, and two rock rings. No temporally diagnostic artifacts were observed at the site. The site was characterized as an "area of opportunistic quarrying and reduction of locally occurring cryptocrystalline nodules" (DPW-Cultural Resources 2003:48). DPW employees did not conduct shovel testing at CA-SBR-10690 and stated that its National Register eligibility was undetermined.

CA-SBR-10690 was revisited in September 2003 to conduct further testing (Peter et al. 2004). The investigation included a surface collection throughout the 72,578 m² (500 x 235 m) site and the excavation of 14 randomly placed STPs. All shovel tests were negative. A total of 30 artifacts were collected from Loci 3, 11, and 24, and from the general site surface and consisted of debitage including cortical, noncortical, and biface thinning flakes, as well as one chert early-stage percussion biface end fragment. No features were identified during the investigation. It was also noted, that manmade impacts included a cyclone fence along one edge and through one loci and wooden corral along one margin. In addition, Goldstone Road was documented as forming the northern boundary of the site. The results of the testing indicated that flake-core reduction was the dominant strategy at CA-SBR-10690, representing more than 85 percent of the lithic assemblage. Therefore, it was recommended that because the site lacks temporally diagnostic artifacts and subsurface deposits, CA-SBR-10690 was recommended not eligible for inclusion in the NRHP (Peter et. al. 2004).

A small portion of the northern boundary of Site CA-SBR-10690 lies within access road improvements of the project APE (see Figures E3-aerial/E3-topographic quadrangle, Appendix A). Team CALIBRE revisited the site as part of the current study and did not identify any cultural manifestations of the site within the project APE. The portion of the site within the current APE has been heavily impacted by the establishment of Goldstone Road and another existing unpaved access road that runs parallel to Goldstone Road and crosses through the site in an east-west direction. The site record was not updated during the current investigation. No new components were observed that would change the prior eligibility recommendations. Therefore, it is recommended that site CA-SBR-10690 remain not eligible for listing on the NRHP.

CA-SBR-28932/P-36-028932

Resource Type: Prehistoric archaeological site
Site Type: CCS Pavement Quarry
Dimensions: 235 × 150 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Utility Corridor

Site CA-SBR-28932 was originally recorded in 2016 (Gust et al. 2016) as a CCS pavement quarry measuring approximately 21,896m² situated on a slight slope running south to north (see Figures E3-aerial/E3-topographic quadrangle, Appendix A). Sediments consisted of light gray (10YR 7/2) sand within desert pavement, with basalt and quartz pebble and cobble inclusions. Vegetation community was characterized as creosote bush scrub. The slope varied between zero to five degrees and aspect is 45 degrees. Four loci were documented, and artifacts identified include cores, a biface, retouched flakes, and approximately 2,500 pieces of debitage. The loci consisted only of debitage except for a retouched flake in Locus 2. Outside the loci one unidirectional core, three multidirectional cores and a biface were observed. Maximum density within loci was 28 per m² and maximum density outside loci was 5 per m².

Debitage analysis revealed that mostly early to mid-stage reduction of materials were present with 35 percent primary flakes, 34 percent secondary flakes, 25 percent tertiary flakes, and 6 percent shatter. A single surface probe near the datum was negative. The site was fully recorded with reduction stages quantified in the field. No diagnostic artifacts or datable materials were

present. It was recommended that the site had no potential to yield additional information, and was therefore recommended not eligible for listing on the NRHP (Gust et al. 2016). The site was not updated during the current investigation due to the site located outside of the current survey area. Therefore, it is recommended that site CA-SBR-28932 remain not eligible for listing on the NRHP.

CA-SBR-2353/P-36-002353

Resource Type: Prehistoric archaeological site
Site Type: Prehistoric late occupation site
Dimensions: 600 × 100 ft. (northwest–southeast × east–west)
NRHP Recommendation: Determined Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-2353 is a late occupation prehistoric site originally recorded in 1964 near a granitic boulder pile and a dry wash (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). The site measured approximately 600 × 100 ft. and the artifacts identified include pottery brownware, granite metates, a mano, knives, point choppers, and scrappers with all mostly made from basalt. No features were identified during the initial recording and it was noted that there was a possibility of destruction to the site due to military activity. Site CA-SBR-2353 has been determined not eligible for listing on the NRHP ((USA 2016 0425 001; Office of Historic Preservation 2014; Burnett 2015). The site was not updated during the current investigation due its previous determination of not eligible for listing on the NRHP.

CA-SBR-17840/P-36-017840

Resource Type: Historic Two-Track Road
Site Type: Two-Track Road
Dimensions: 4.2 km (92.6 mi)
NRHP Recommendation: Determined Not Eligible
Proximity to APE: Utility Corridor

Site CA-SBR-17840 was originally recorded in 2013 (Giambastiani et al. 2014) as a 4.2 km (2.6 mi) long two-track road that was constructed after 1915 to provide access to the Goldstone town site from the north, and it was then improved and maintained as a military road for Camp Irwin (see Figures C2-aerial/C2-topographic quadrangle, Appendix A). The road does not appear on early maps of the region and is not named on any historic maps, although it remains on its 1948 alignment. No associated features were identified, and the road was noted in fair to poor condition and lacked historical integrity. The southern portion of the road, in particular, has been graded and remains in use today. Site CA-SBR-17840 was recommended not eligible for listing on the NRHP because the site cannot contribute information to any of the historic themes outlined in the Goldstone Mining District theme, and particularly holds little potential to contribute information about significant events or developments in history (Criterion A). This site does not meet the criteria for NRHP eligibility (A through D) because it is not associated

with historically significant persons or events, does not feature exceptional design or construction, and has little potential to yield information important to prehistory or history (Giambastiani et al. 2014). Site CA-SBR-17840 was determined not eligible for listing on the NRHP (USA 2014 0616 001; Office of Historic Preservation 2014).

CA-SBR-10321/P-36-010321

Resource Type: Prehistoric archaeological site
Site Type: Lithic Scatter
Dimensions: 367 × 167 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-10321 was originally recorded in 1998 by the CSU Fullerton Anthropology Department as containing 53 flaked stone artifacts. The site area measured approximately 367m x167m (61,289 m²) but was depicted much larger on the site map (see Figures E4-aerial/E4-topographic quadrangle, Appendix A). It was noted that the site had been disturbed by laid asphalt. Subsurface investigations were not performed at this time and the original recorders recommended the site not eligible for listing on the NRHP (Eisentraut et al. 2003).

Site CA-SBR-10321 was revisited in 2012 by PaleoWest and located approximately 30 flakes in an area much larger than currently appropriate for meeting site criteria. Two shovel tests were excavated to depths of 28 cm and 20 cm, respectively. The first STP did not yield any subsurface cultural materials, while the second STP yielded a single flake beneath the modern disturbance. Both STPs revealed a layer of asphalt and tar beneath the ground surface. It was recommended that site CA-SBR-10321 does not meet current Fort Irwin site criteria as the surface assemblage to too scant and too dispersed (one flake per 1,156 square meters). The site lacks diagnostic tools and features. The site's listed dimensions do not conform to the site boundary as depicted on the original site map and therefore lacks integrity of location. The site has been heavily disturbed due to the proximity of the site to Fort Irwin cantonment (buildings, roads, etc.). The site also demonstrated subsurface disturbance. Because the site is unlikely to yield important information on the prehistory of the area, the site was recommended not eligible for inclusion in the NRHP (Roberts et al. 2012). The site record was not updated during the current investigation due to the site located outside of the current survey area. Therefore, it is recommended that site CA-SBR-10321 remain not eligible for listing on the NRHP.

CA-SBR-12039/P-36-012039

Resource Type: Prehistoric archaeological site
Site Type: Lithic Quarry
Dimensions: 367 × 167 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-12039 was originally recorded in 2005 (Grant et al. 2005) as an extensive prehistoric lithic quarry measuring approximately 175,509 m2 (43.4 acres) with 57 lithic reduction areas (LRAs) ranging from 10-20 flakes per meter to more than 40 flakes per meter (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). The bulk of the cultural material was produced from FGV; however, chert and chalcedony were also utilized. A total of 21 cores, six bifaces, three choppers, 10 edge-modified flakes, and one Lake Mojave projectile point were recorded. Recorded debitage (including within LRAs) include: 397 basalt and 38 chalcedony flakes, and 99 basalt and eight chalcedony pieces of shatter. In order to determine the data potential of the site, Fort Irwin archaeologists excavated three shovel test pits to a depth of 20 cm (Grant et al. 2005). These shovel test pits were devoid of cultural materials. The site was reported to have been disturbed some areas by military activity, but overall to be in fair condition. The investigation concluded that the site occurs only on the surface and is characterized by a limited range of lithic reduction activities without distinct loci representing other resource processing or domestic behaviors. Because of this, it is unlikely that additional work on site would result in information that would be important to the study of prehistory. Site CA-SBR-12039 was recommended not eligible for listing on the NRHP (Grant et al. 2005).

In 2010, site CA-SBR-12039 was resurveyed and the site boundary was extended from the original recording and contained 28 LRAs (Belcourt and Belcourt 2010). Of these, 11 were small artifact scatters encompassing an area 1 x 1 m containing between 5-20 pieces of debitage with no flaked stone tools. The 17 remaining areas contained over 20 pieces of debitage, cores and/or flaked stone tools. In addition, the site had been impacted from four two-track roads. The study concluded that site CA-SBR-12039 lacked a subsurface deposit and contained a limited range of lithic reduction activities coupled without loci distinctly representing other activities (such as non-lithic resource processing and domestic behaviors). Because of these limitations, this site lacked the potential to provide information on prehistory that can further our understanding of regional knowledge and research questions (Belcourt and Belcourt 2010).

The site was relocated in 2013 and the site boundary was reduced based on the maximum extent of surficial lithic debitage (Sikes and Gust 2013). The northern third of the site exhibited poor integrity with severe impacts from vehicular traffic. Although lithic debitage was observed to be very sparse, the majority of chipped stone in this area is ascribed to vehicular traffic and not prehistoric events. Cogstone crews recorded the geospatial data for four two-track roads and three of them were photographed. The site was recommended not eligible for listing on the NRHP (Sikes and Gust 2013). The site was not updated during the current investigation due to the site located outside of the current survey area. Therefore, it is recommended that site CA-SBR-12039 remain not eligible for listing on the NRHP.

CA-SBR-10926H/P36-010926

Resource Type: Military Property
Site Type: Temporary Munitions Storage
Dimensions: 270 x 390 m (east–west x north–south)
NRHP Recommendation: Determined Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-10926H was originally identified in 2002 (DPW 2002) as a military munitions storage site measuring 101,736 m². This site exists along a valley floor that slopes gently to the east and is bisected by ephemeral washes (see Figures E3-aerial/E3-topographic quadrangle, Appendix A). A creosote scrub community exists on the landform the site occupies, with prominent species being creosote bush and bursage. A total of 13 features were recorded, all of which are related to military activities. Of these features, Feature 1 is a single-course rock alignment that is square in shape and likely represents a bivouac area. Features 2 through 10 are trenched areas with associated push piles with fairly uniform sizes. A defilade representing a possible guard position was assigned Feature 11. Another single-course rock alignment that is rectangular in shape was assigned Feature 12 and measures 45 x 50 ft. A pair of parallel single-course rock alignments compose Feature 13 and is 6 ft wide and runs for a distance of 120 ft. Although no mention of munitions and their headstamps are mentioned in the previous recording, it is very possible that the Fort Irwin Range Control Personnel performed a clean sweep of UXO items in the site area after it was no longer in use.

According to a historical archival research, this area appears on a 1941 map that indicates the site as being a munitions storage area. An interview with Fort Irwin Range Control Personnel provided an explanation that the area was probably a temporary munitions storage space while the construction of a new munitions building was constructed in the 1950s or 1960s. Given all the lines of evidence, this site was recommended as not eligible for inclusion to the NRHP. The SHPO concurred (USA020802A) with the recommendation, stating that the structures were temporary, removed, and "The site no longer retains integrity of materials, workmanship, association, feeling or setting" (Carol Roland-Nawi to Muhammad A. Bari, letter, 12 May 2014).

CA-SBR-11532/P-36-011532

Resource Type: Prehistoric archaeological site
Site Type: Lithic Scatter
Dimensions: 32 x 7 m (northeast–southwest x northwest–southeast)
NRHP Recommendation: Determined Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-11532 was originally recorded in 2002 (DPW 2006) as a sparse, prehistoric lithic scatter consisting entirely of chalcedony. The site area occupies an area of 116 m² on a valley floor with open views of the surrounding area (see Figures E3-aerial/E3-topographic quadrangle, Appendix A). A creosote scrub vegetation community is supported by this landform and the nearest permanent water source is located 8 km to the southeast at Garlic Spring. Only 43 pieces of debitage were reported at this location with most of these items being found concentrated in the center of the site. All lithic artifacts were made from chalcedony and were categorized as 39 secondary flakes and 4 primary flakes. Given the limited cultural assemblage, little may be interpreted about activities of prehistoric peoples beyond early-percussion lithic reduction.

Due to the lack of culturally and temporally diagnostic materials, it impossible to place CA-SBR-11532 into a broader prehistoric context for the surrounding area. The limited assemblage provides little data important to the prehistoric record and is not exemplary by any means. Additionally, the site does not exhibit any integrity related to materials, workmanship, association, feeling or setting. Site CA-SBR-11532 was previously determined not eligible for

listing on the NRHP (USA100405E). The site was not updated during the current investigation due to the site located outside of the current survey area. Therefore, it is recommended that site CA-SBR-11532 remain not eligible for listing on the NRHP.

CA-SBR-13735/P-36-021384

Resource Type: Prehistoric archaeological site
Site Type: FGV Quarry / CCS Lithic Scatter
Dimensions: 900 x 644 m (north–south x east–west)
NRHP Recommendation: Determined Not Eligible
Proximity to APE: Access Road Improvement

Site CA-SBR-13735 was originally recorded in 2010 as an extensive FGV quarry with a total of 13 lithic reduction areas, some of which contained CCS (Belcourt et al. 2010). A creosote scrub vegetation community is supported by the slope of a small hill on which the site resides (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). The expansive nature of the site assemblage lends itself to the large site boundary, sprawling across an area measuring approximately 579,600 m². Nearest permanent water was reported to be located approximately 200 m to the east at Russell Playa, while Desert King Spring is located 19 km to the northeast. The cultural material largely consisted of debitage with approximately 500 pieces, as well as 27 cores, 2 biface fragments, and 1 uniface (Belcourt et al. 2010). Of the 13 lithic reduction areas, it appears that five of the larger areas were recorded in further detail. Lithic Reduction Area (LRA) 1 was described as an area measuring 31 x 39 m that contained various FGV cores and related primary and secondary flakes. Other notable items observed in this LRA were two biface fragments and a uniface. Measuring 49 x 44 m, LRA 2 was reported to be similar to LRA 1, in that it was composed primarily of FGV cores and their related debitage. The remaining three LRAs measured 10 x 10 m or smaller. Three FGV cores and approximately 50 pieces of debitage were found within LRA 3. Within the boundaries of LRA 4 a single FGV core and approximately 30 pieces of debitage were observed. Finally, LRA 5 contained a single FGV core an estimated 70 pieces of debitage.

Minimal subsurface testing was performed during the 2010 recording of CA-SBR-13735, but the results provided no evidence of sediment depth. A single shovel test pit was excavated to a depth of 10 cmbs with the only cultural materials recovered being 4 pieces of debitage in the loose surface sediments (Belcourt et al. 2010). After these poor results, the test pit was expanded into a shovel scrape unit measuring 2 x 2 m. This unit was excavated to a depth of 5 cmbs and recovered no additional cultural materials. Given the results of the subsurface testing and overall lack of datable cultural materials, the site was recommended as not eligible for inclusion to the NRHP.

Site CA-SBR-13735 was revisited in 2013 and was found to be in a similar condition as previously reported (Belcourt et al. 2013). The only differences reported during this visit included two push piles or bladed areas along the southeastern site boundary. During this visit, it was reported that the LRAs appeared to be in the same condition as previously reported, though the crew reported areas along the “northeast, east, and south to be very sparse at an average of one flake per four m². No eligibility recommendation was given during the 2013 site update, though it is assumed that the recorders agreed with the previous assessment. Site CA-SBR-13735

was determined not eligible for listing on the NRHP (USA 2016 1209 001). The site was not updated during the current investigation due to the site located outside of the current survey area.

CA-SBR-17842/ASM-GS-22

Resource Type: Historic archaeological site
Site Type: Historic Road
Dimensions: 50 x 8 ft (northeast–southwest x northwest–southeast)
NRHP Recommendation: Not Eligible
Proximity to APE: Utility Corridor

Originally recorded in 2013, site CA-SBR-17842 was identified as a historic military road related to the earliest days of Camp Irwin (Giambastiani et al. 2014). This road segment occupies an area of 400 ft² near Goldstone Lake and exists on mixed alluvium and gravel pavement (see Figures C2-aerial/C2-topographic quadrangle, Appendix A). Vegetation in the area was reported to be virtually absent, though instances of saltbush and other plant species were occasionally encountered. Based upon archival maps from 1948, this section of road appears to follow its original alignment; however, it was apparent to the previous investigators that the site had seen continued use and modification into modern times. Due to the overall disturbances and lack of integrity of this linear resource, the site was recommended as not eligible for inclusion to the NRHP. The site was not updated during the current investigation due to the site located outside of the current survey area. Therefore, it is recommended that site CA-SBR-17842 remain not eligible for listing on the NRHP.

Previously Recorded Isolates

In addition to the archaeological sites identified, the records search also identified seven isolated resources consisting of prehistoric and historic-period artifacts (Figures B2-B3-aerial/B2-B3-topographic quadrangle, Appendix A). Six (P-36-028992, P-36-028988, P-36-026429, P-36-026428, P-36-026383, P-36-020208) of the isolates are comprised of prehistoric flaked stone debitage, one core, basalt SRL and two bifaces, which is consistent with prehistoric sites recorded in the APE, and are likely associated with prehistoric people's use of the area as a quarry to procure lithic materials. The single historic-period isolate (P-36-020220) consists of five rock piles with gun shells. All of the isolates are situated within the DUT Complex footprint of the APE. Isolates generally lack context and data potential, and are by definition not eligible for inclusion in the NRHP.

8 NEWLY RECORDED ARCHAEOLOGICAL SITES AND ISOLATES

A total of four cultural resources were newly identified during the current field survey within the APE and are all comprised of small prehistoric lithic scatters.

CA-SBR-32429/P-36-032429

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 20 × 19 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-32429 is a prehistoric lithic scatter measuring 20 × 19 m on level terrain approximately 15 m west of an existing access road. Nelson Lake is 6.4 km to the east and Pioneer Lake is 3 km to the south along with a playa 2 km to the southwest. Vegetation is sparse creosote scrub, grassland with bursage, and annuals. Soils consist loose alluvium, derived from granitic sources. Approximately 90 percent of the site has been impacted from past vehicle and military activities. Vehicle tracks traverse the entire length of the site in a north-south direction. Ground visibility is excellent, ranging between 90 to 95 percent across the site (Figure 15).

Material culture includes one early-stage biface, four non-bipolar cores, and lithic debitage comprising core reduction flakes and angular shatter. All lithic materials were of the same FGV parent material (Figure 16). The rudimentary nature of the artifact assemblage prevents situation of the site within a specific culture or time period. None of the artifacts exhibit any diagnostic features that can clarify chronology or tool manufacture. No features or diagnostic artifacts were observed at the site. The presence of multiple cores indicates that the site was used as a lithic procurement area, while the limited site dimensions and single material type suggests that the site was a one-time use area. Prehistoric peoples likely used the location opportunistically to utilize the natural resources available. As is characteristic in prehistoric assemblages, the raw tool stone was reduced to a portable size and transported off the site to another location where the material would be further refined into a usable tool.

The site retains its physical integrity and is in poor condition due to the vehicle tracks that traverse the site. Site CA-SBR-32429 is located within the DUT portion of the APE (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, along with the heavy disturbances that have greatly compromised the integrity of the site, site CA-SBR-32429 lacks the potential to provide information on prehistory that can further our understanding of regional knowledge and research questions and is therefore recommended not eligible for listing in the NRHP.

Figure 14. Site CA-SBR-32429; site overview; view to the north.

Figure 15. Artifact concentration; FGV material

CA-SBR-32426/P-36-032426

Resource Type: Prehistoric archaeological site
Site Type: lithic reduction area
Dimensions: 38 × 13 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-32426 is a prehistoric limited early-stage lithic reduction area measuring 38 × 13 m located on a low hill dominated by desert pavement (Figure 17). Nelson Lake is 6.4 km to the east and Pioneer Lake is 3 km to the south along with a playa 2 km to the southwest. The lithic assemblage comprises approximately 50 pieces of debitage and two retouched/utilized flakes. All artifacts are made from the ubiquitous FGV parent material. The site is located among the remains of a military encampment, evidenced by partially buried tent stakes, meal ready-to-eat refuse, and modern military cooking hearths. In addition, numerous vehicle tracks abound in the site area that have further relocated surface artifacts into secondary location. Approximately 90 percent of the site has been impacted from past vehicle and military activities. Vegetation is sparse creosote scrub, grassland with bursage, and annuals. Soils consist loose alluvium, derived from granitic sources. Ground visibility is excellent, ranging between 90 to 95 percent across the site.

Due to this military disturbance, the site is in poor condition with artifacts likely displaced into secondary context. Site CA-SBR-32426 is located within the DUT portion of the APE (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). Due to the absence of temporally diagnostic materials and the lack of subsurface deposits, along with the heavy disturbances that have greatly compromised the integrity of the site from military activity, site CA-SBR-32426 lacks the potential to provide information on prehistory that can further our understanding of regional knowledge and research questions and is therefore recommended not eligible for listing in the NRHP.

Figure 16. Site CA-SBR-32426; site overivew; view to the north.

CA-SBR-32427/P-36-032427

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 23 × 18 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within DUT Complex

Site CA-SBR-32427 is a prehistoric lithic scatter that measures approximately 23 x 18 m (293 m^2). Located in the open flats south of a series of low hills, the site exhibits an open aspect. Native vegetative species are creosote bush, saltbush, and bursage. This sparse vegetation renders ground surface visibility high at 80–95 percent. Distant views are available to the west, south, and east. Soils on site are derived from granitic sources with particle sizes ranging from fine-to-coarse pebble. Nelson Lake, located 5.2 km directly east, would have been a reliable source of water during the prehistoric occupation of the area.

Material culture includes 93 pieces of debitage and no chipped-stone tools or features. All but one of the lithic artifacts are made of high-quality chalcedony tool stone. The artifacts are closely clustered and likely represent a one-time event wherein bifacial manufacture took place. In addition to vehicle tracks extending directly through the boundary, the site's proximity to a main access road further renders it susceptible to ongoing deterioration. The site is considered as being in moderate-to-poor condition with all artifacts being limited to secondary context on the modern ground surface (Figure 18).

Chipped-stone chalcedony flaking debris includes 41 secondary flakes, 41 tertiary flakes, 3 primary flakes, 3 bifacial thinning flakes, and 3 retouch flakes. In addition, one argillite tertiary flake was also observed. The mid-to-late stage nature of these flakes combined with the presence of bifacial thinning and minute retouch flakes indicates that biface technology manufacture took place in this locale. However, no chipped-stone tools or diagnostic artifacts were identified so the

site cannot be reliably placed in time. The final bifacial product was likely transported off-site for later use elsewhere.

Site CA-SBR-32427 is located within the DUT portion of the APE (see Figures B2-aerial/B2-topographic quadrangle, Appendix A). This prehistoric lithic scatter lacks temporally- and culturally-diagnostic attributes, and there is no potential for a subsurface cultural component. Though the artifacts are representative of mid-to-late stage lithic reduction activities with biface manufacture, no actual bifaces were observed, and the site is unable to be situated in time. In addition, vehicle tracks and military activities have disturbed the site and has compromised the integrity of the site. As such, CA-SBR-32427 does not meet eligibility criteria for listing in the NRHP and is therefore subsequently recommended as not NRHP-eligible.

Figure 17. Site CA-SBR-32427; site overview; view to the north.

CA-SBR-32428/P-36-032428

Resource Type: Prehistoric archaeological site
Site Type: Lithic scatter
Dimensions: 123 × 12 m (north–south × east–west)
NRHP Recommendation: Not Eligible
Proximity to APE: Within Utility corridor

Located in the open flats between low hills to the northeast and southwest, the site is a heavily disturbed prehistoric lithic scatter that measures approximately 123 x 12 m (411 m^2) in size. Distant views are available in all directions. Soils on site are derived from granitic sources with particle sizes ranging from fine-to-coarse pebble. Native vegetative species include creosote bush, bursage, and saltbush. Ground visibility is high at 75–90 percent clear across the site.

Within the site boundary are three distinct loci, each containing a single core and numerous lithic reduction flakes. Fine-grained volcanic was the only tool stone observed on-site. No features were observed on the site. A main-access road runs adjacent to the northern site boundary, and a heavily-used two-track road runs directly through the site. The landform upon which the site resides is generally level and exhibits an open aspect. Nelson Lake, located 14.2 km northeast, would have been a reliable source of water during prehistoric times.

Locus 1 appears to be the least disturbed, while Loci 2 and 3 show evidence for further deterioration due to the site's location in an active military training area. Despite the road's intrusion, cores and numerous reduction flakes of FGV material are observable in each of the loci, evidencing prehistoric use of the area for material testing. As no formal chipped-stone tools or late-stage lithic reduction flakes were observed, it is more likely that the parent stones were tested for viability as passers-through navigated the area. No evidence for longer term habitation is present.

Measuring at 6.8 x 5.6 m, Locus 1 contains 22 tertiary flakes, 5 secondary flakes, 4 primary flakes, and a multi-directional core (Artifact 2). The core retains primary geological cortex and measures 6 x 5.9 x 5 cm. Locus 2 measures 7.2 x 6.8 m and comprises 29 tertiary flakes and 23 pieces of shatter with varying degrees of cortex remaining. In addition to the shatter and lithic reduction flakes is a multi-directional core (Artifact 2) that measures 4.5 x 4.1 x 2.5 cm. Primary geological cortex is present on the core. At 7.3 x 4.6 m, Locus 3 has 55 pieces of angular shatter lacking cortex, 2 secondary flakes, and a uni-directional core (Artifact 3). The core measures 7.5 x 5.1 x 2.9 cm. As with the previous two cores, primary geological cortex is present, indicating early-stage material testing.

Site CA-SBR-32428 is located within a linear utility corridor portion of the APE (Figure 19; see Figures C2-aerial/C2-topographic quadrangle, Appendix A). This prehistoric lithic scatter is devoid of temporally- and culturally-diagnostic attributes. All material culture is restricted to the modern ground surface and are representative of early-stage lithic reduction and material testing activities that do not lend themselves to further archaeological interpretation significant to prehistory, and there is no potential for a subsurface cultural component. In addition, vehicle tracks and military activities have disturbed the site and has compromised the integrity of the site. As such, CA-SBR-32428 does not meet the required eligibility criteria for listing in the NRHP and is therefore recommended as not eligible for listing on the NRHP.

Figure 18. Site CA-SBR-32428; site overview; view to the north.

9 SUMMARY AND MANAGEMENT RECOMMENDATIONS

The results of our records search and archaeological survey of the project APE revealed the presence of 39 cultural resources within the entire APE. Of these, 35 previously recorded archaeological sites including seven isolates were identified during the records search within the APE. Twelve of these previously recorded sites (CA-SBR-6210, -13810, -13808, -13811, -13812, -11716, -5026, -5027, -5028, -5029, -13809, and -2353) are located within the DUT Complex footprint of the APE and are comprised of prehistoric lithic scatters and quarries that have been previously evaluated as not eligible for listing on the NRHP. One of the previously recorded prehistoric site (CA-SBR-2353) had previously been determined not eligible for listing in the NRHP and was not revisited during the current investigation. The remaining 11 previously recorded prehistoric sites situated within the DUT Complex footprint were re-evaluated and updated for NRHP eligibility. These sites are not unique to Fort Irwin, are not specifically associated with any individual known to be important to local history, do not exhibit distinct characteristics of a type, period, or method of construction and do not appear to have the potential to provide additional information about the history of the area. Thus, they are recommended as not eligible for listing on the NRHP. All seven isolates identified in the DUT Complex footprint are not eligible for listing on the NRHP. No further work is recommended at these sites. A summary and management recommendations for sites within the APE can be found in Table 5.

Of the 16 previously recorded cultural resources situated along the linear utility corridors and access road improvement areas, nine of these resources (CA-SBR-10690, -11537, -11538, 11554, -11555, 11556, -2347, -3314, and 10926H) are located within the project APE, outside of the DUT Complex but within the current survey area. These resources retain their standing NRHP eligibility determinations or recommendations and were not re-evaluated as part of the current undertaking. Site CA-SBR-10926H has been previously determined not eligible for listing on the NRHP and therefore was not revisited during this study. The remaining sites were revisited and inspected to determine if any cultural manifestations exist within the project APE. Only site CA-SBR-11556 had cultural manifestations observed within the project APE. Site CA-SBR-11556 was previously recommended as not eligible for listing on the NRHP and no new components were observed during the current investigation that would change the prior eligibility recommendation. Two prehistoric sites, CA-SBR-2347 and -3314 were previously recommended eligible for listing on the NRHP; however, no cultural manifestations were observed within the current project APE at these two sites. To ensure there are no effects to sites CA-SBR-2347 and -3314 during project construction, archaeological monitoring is recommended. The remaining six sites (CA-SBR-10690, -11535, -11537, 11554, -11555, and -11556) were previously recommended not eligible for listing on the NRHP and no cultural materials were observed within the project APE during the current field survey and it is therefore recommended their prior eligibility recommendations remain unchanged. No further work is recommended at these sites.

Seven of the 16 previously recorded cultural resources (CA-SBR-28932, -17840, -10321, -12039, -17842, 11532, and -13735) are located within the project APE but outside of the survey area for the current undertaking. As such, they were not revisited during the current study but based on their prior recommendations, all previous NRHP eligibility recommendations remain intact for these sites. Sites CA-SBR-17840, -11532, and -13735 have been determined not

eligible for listing on the NRHP. Sites CA-SBR-28932, -10321, -12039, and -17842, have been previously recommended not eligible for inclusion in the NRHP. No further work is recommended at these sites.

In addition, Team CALIBRE archaeologists identified four newly recorded prehistoric sites (CA-SBR-32429, -32426, -32427, and -32428) situated within the DUT Complex footprint and along the proposed utility corridors and road improvements areas. These sites are entirely comprised of prehistoric lithic scatters with the lack of temporally diagnostic artifacts and features and do not retain much of their original integrity due to military activities that have heavily disturbed and compromised the integrity of these sites. All four newly identified sites have been fully recorded and contain no further information important to history or prehistory beyond their recording, and all are recommended not eligible for listing in the NRHP. No further work is recommended at these four sites. Thus, no properties listed in the NRHP or considered eligible for listing in the NRHP exist within the APE for this proposed undertaking. Therefore, a finding of "No Historic Properties Affected" is appropriate for this undertaking, in accordance with 36 Code of Federal Regulations (CFR) 800.4(d)(1).

If archaeological resources are discovered or unanticipated effects on historic properties are found after the 106 process has been completed, the Army will comply with the post-review discovery procedures pursuant to 36 CFR 800.13(b)(1), (2), or (3) as appropriate. The Army will suspend work in the area and notify the cultural resources manager and staff in the DPW, Environmental Division in order to determine the appropriate action, including determine if the finding is eligible for listing on the NRHP.

Table 5. Summary of Management Recommendations.

Primary/ Temporary Number	Trinomial	Resource Type	Intersecting Project Components	NRHP Status	Management Recommendations
P-36-028932	CA-SBR-28932	Prehistoric quarry	Utility corridor/Not in Survey Area	Recommended Not Eligible	No further work needed
P-36-017840	CA-SBR-17840	Historic road	Access road/Not in Survey Area	Determined Not Eligible (USA 2014 0616 001)	No further work needed
P-36-021505	CA-SBR-13808	Prehistoric lithic quarry and reduction area	Within DUT APE	Recommended Not Eligible	No further work needed
P-36-005027	CA-SBR-5027	Prehistoric lithic scatter	Within DUT APE/ Not relocated	Recommended Not Eligible	No further work needed
P-36-005028	CA-SBR-5028	Prehistoric lithic scatter	Within DUT APE	Recommended Not Eligible	No further work needed
P-36-010690	CA-SBR-10690	Prehistoric lithic scatter and quarry, rock features	Access Road/No cultural material observed in APE.	Recommended Not Eligible	No further work needed
P-36-010321	CA-SBR-10321	Prehistoric lithic scatter	Access Road/Not in Survey Area	Recommended Not Eligible	No further work needed

Primary/ Temporary Number	Trinomial	Resource Type	Intersecting Project Components	NRHP Status	Management Recommendations
P-36-11556	CA-SBR-11556	Prehistoric lithic scatter and quarry	Access Road/ Cultural material identified in APE.	Recommended Not Eligible	No further work needed
P-36-011555	CA-SBR-11555	Prehistoric lithic scatter	Access Road/No cultural material observed in APE.	Recommended Not Eligible	No further work needed
P-36-011538	CA-SBR-11538	Prehistoric lithic scatter	Utility corridor/No cultural material observed in APE.	Recommended Not Eligible	No further work needed
P-26-011716	CA-SBR-11716	Prehistoric lithic scatter and quarry	Within DUT APE	Recommended Not Eligible	No further work needed
P-36-011537	CA-SBR-11537	Prehistoric lithic scatter	Within access road/No cultural material observed in APE.	Recommended Not Eligible	No further work needed
P-36-012039	CA-SBR-12039	Prehistoric lithic quarry	Within access road/Not in Survey Area	Recommended Not Eligible	No further work needed
P-36-021506	CA-SBR-13809	Prehistoric lithic scatter	Within DUT footprint	Recommended Not Eligible	No further work needed
P-36-021509	CA-SBR-13812	Prehistoric lithic scatter	Within DUT footprint	Recommended Not Eligible	No further work needed
P-36-021507	CA-SBR-13810	Prehistoric lithic scatter	Within DUT footprint	Recommended Not Eligible	No further work needed
P-36-021508	CA-SBR-13811	Prehistoric lithic scatter	Within DUT footprint	Recommended Not Eligible	No further work needed
P-36-005029	CA-SBR-5029	Prehistoric lithic scatter	Within DUT footprint/Not relocated	Recommended Not Eligible	No further work needed
P-36-017842	CA-SBR-17842	Historic road	Within access road/Not in survey area	Recommended Not Eligible	No further work needed
P-36-011554	CA-SBR-11554	Prehistoric lithic scatter and bedrock milling feature	Within access road/ No cultural material observed in APE.	Recommended Not Eligible	No further work needed
P-36-005026	CA-SBR-5026	Prehistoric lithic scatter	Within DUT footprint	Recommended Not Eligible	No further work needed
P-36-002347	CA-SBR-2347	Prehistoric rock art/petroglyphs	Within linear utility corridor/No cultural material observed in APE.	Recommended Eligible	Avoid; Restrict ground-disturbing activities to previously disturbed areas; Cultural resources Monitoring

Primary/ Temporary Number	Trinomial	Resource Type	Intersecting Project Components	NRHP Status	Management Recommendations
P-36-03314/H	CA-SBR-3314/ 3306/ 3307/ 3309/3310/ 3312/3313	Prehistoric habitation debris	Within access road and linear utility corridor/No cultural material observed in APE.	Recommended Eligible	Avoid; Restrict ground-disturbing activities to previously disturbed areas; Cultural resources Monitoring
P-36-011532	CA-SBR-11532	Prehistoric lithic scatter	Within access road. Not in survey area	Determined Not Eligible (USA100405E)	No further work needed
P-36-006210	CA-SBR-6210	Prehistoric lithic scatter	Within DUT footprint/ Not relocated.	Recommended Not Eligible	No further work needed
P-36-010926	CA-SBR-10926H	Historic period Munitions Storage Area	Within access road. No cultural material observed in APE.	Determined Not Eligible (USA020802A)	No further work needed
P-36-021384	CA-SBR-13735	Prehistoric lithic quarry	Within access road. Not in survey area	Determined Not Eligible (USA 2016 1209 001)	No further work needed
P-36-002353	CA-SBR-2353	Prehistoric bedrock milling feature	Within DUT footprint	Determined Not Eligible (USA 2016 0425 001)	No further work needed
P-36-028992		Isolate – CCS core	Within DUT footprint	Determined Not Eligible	No further work needed
P-36-028988		Isolate – Basalt SRL	Within DUT footprint	Determined Not Eligible	No further work needed
P-36-026429		Isolate – CCS biface and debitage	Within DUT footprint	Determined Not Eligible	No further work needed
P-36-026428		Isolate – CCS biface and debitage	Within DUT footprint	Determined Not Eligible	No further work needed
P-36-026383		Isolate – CCS SRL	Within DUT footprint	Determined Not Eligible	No further work needed
P-36-020208		Isolate – Historic-period – five rock piles with shells	Within DUT footprint	Determined Not Eligible	No further work needed
P-36-020220		Isolate – Basalt flake	Within DUT footprint	Determined Not Eligible	No further work needed
P-36-032429	CA-SBR-32429	Prehistoric lithic scatter	Within DUT footprint	Recommended Not Eligible	No further work needed
P-36-032426	CA-SBR-32426	Prehistoric lithic scatter	Within DUT footprint	Recommended Not Eligible	No further work needed
P-36-032427	CA-SBR-32427	Prehistoric lithic scatter	Within DUT footprint	Recommended Not Eligible	No further work needed
P-36-032428	CA-SBR-32428	Prehistoric lithic scatter	Within linear utility corridor	Recommended Not Eligible	No further work needed

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APPENDIX A
Confidential Figures

Confidential – Not for Public Distribution

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APPENDIX B
Records Search Results Summary from the South Central Coastal Information Center and Fort Irwin FICRD

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APPENDIX C
State of California Department of Parks and Recreation 523 Series Forms

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APPENDIX D
Native American Consultation
(Native American consultation is ongoing and final results will be included in the Final EA.)

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APPENDIX E
Resumes of
Preparers

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Matthew Wetherbee, MSc., RPA

Principal Investigator / Project Manager

EDUCATION

M.Sc., Environmental Archaeology (Paleoecology of Human Societies), University College London, London, England, 2003

B.A., Anthropology (emphasis in Archaeology and Zooarchaeology), University of California, 2000

Archaeological Field School, North Kharga Oasis Survey, Western Desert of Egypt, Greco Roman Period, Egypt, 2000

Study Abroad at the American University in Cairo, Egypt. 1999-2001

Archaeological Field School, San Juan Bautista Historical Mission, Monterey, California, in conjunction with UCSC, 1999

Archaeological Field School, Saddleback Valley College, San Juan Capistrano, California, 1997

REGISTRATIONS/ CERTIFICATIONS

Register of Professional Archaeologists

Riverside County Certified Archaeologist (No. 156)

AREAS OF EXPERTISE

- Prehistoric archaeology
- Zooarchaeology
- California Environmental Quality Act (CEQA) / National Historic Preservation Act (NHPA) compliance
- California Register of Historic Resources (CRHR) / National Register of Historic Places (NRHP) evaluations
- Cultural resources surveys
- Technical report writing

PROFESSIONAL EXPERIENCE

Mr. Wetherbee is an archaeologist with 15 years of cultural resources management experience focused on prehistory. He has managed multiple small and large-scale residential and commercial projects for environmental firms and high-profile capital projects and operations and maintenance environmental compliance programs for Southern California Edison (SCE). This work includes pre-field research, cultural resources surveys, significant assessments, developing and reviewing mitigation recommendations, preparing technical reports and agreement documents, and reviewing consultants work according to state and federal heritage laws and regulations such as CEQA and Section 106 of the NHPA. Project management duties have included managing financial and technical tasks, including preparing, managing, and reporting on project budgets, providing guidance and leadership to staff and subconsultants, and coordinating with state and federal agencies. By working on large-scale capital projects and operations and maintenance programs, Mr. Wetherbee has provided invaluable in-depth analysis and recommendations for complex resource and regulatory compliance issues regarding the protection of cultural resources and maintaining environmental compliance.

PROJECT EXPERIENCE

SCE Cultural Resources On-Call Contract, CA. Project manager / archaeologist. Managed approximately 150 simultaneous cultural resources projects under this contract valued at $3 million per year. These projects included large, complex, and small projects such as brief desktop reviews, surveys, records searches, resource evaluations, report writing, construction monitoring, and data recovery/mitigation.

PROFESSIONAL AFFILIATIONS

Society of American Archaeology

International Council for Archaeozoology

Society for California Archaeology

Coachella Valley Archaeological Society

Pacific Coast Archaeological Society

TRAINING

CEQA Training

NHPA Training

Riverside County Cultural Resources Training

STELL TENURE

> 1 Year

INDUSTRY TENURE

16 Years

SCE Deteriorated Power Pole Replacement Program, CA. Archaeologist. Mr. Wetherbee managed SCE operations and maintenance deteriorated pole program in coordination with SCE deteriorated pole program team, SCE staff, and other consultants. Over the course of 4 years, Mr. Wetherbee balanced and organized more than 400 regulatory compliance projects; he provided guidance and leadership to the team regarding the protection of cultural resources and contributed in-depth analysis and recommendations to complex resource/regulatory compliance issues. Program duties included coordination with SCE, peer environmentalists, subconsultants, and state and federal agencies; report reviews for regulatory compliance; and identify resource effects to develop appropriate mitigation measures. Other duties included pre-field records searches, field surveys, produce technical reports for CEQA/Section 106 regulatory compliance, distribution of consultant work authorizations to consultants, report out on scope and project performance, and ensuring environmental compliance during emergency facility repair call-outs. In addition, Mr. Wetherbee made decisions based on risk regarding pole replacements and potential impacts/effects to cultural resources and collaborate with project team to reach a solution to avoid impacts/effects to cultural resources and maintain compliance.

Devers-Palo Verde No. 2. Archaeologist. Devers-Palo Verdes No. 2 consisted of approximately 120 miles of the construction of new transmission towers from the Valley substation to new substation in Blythe, CA. The cultural resources portion of this project was $8 million. Mr. Wetherbee reviewed the placement of new alignments with associated access roads and other ancillary projects to determine if they would impact cultural resources. If impacts to significant cultural resources could not be avoided, mitigation such as site significance testing and data recovery was implemented. Mr. Wetherbee provided guidance to the team regarding the protection of cultural resources and contributed in-depth analysis and recommendations to complex resource/regulatory compliance issues. Project duties included coordination with SCE/CES management, peer environmentalists, subconsultants, and state and federal agencies, and also reviewed reports for regulatory compliance and identify resource effects to develop appropriate mitigation measures. When conflicts arose, Mr. Wetherbee identified the issue and collaborated with the project team to reach an agreeable solution to avoid impacts to cultural resources while maintaining the project schedule and compliance. These tasks were conducted in coordination with the California Public Utilities Commission (CPUC), State Historic Preservation Officer (SHPO), and Bureau of Land Management (BLM) along with archaeologists, historians, and Native American tribes. Mr. Wetherbee also oversaw the formal planning, tracking, and reporting of project performance. In addition, Mr. Wetherbee promoted a

safety conscious work environment by following SCE safety protocols and safe work practices and discussed these practices with consultants.

Tehachapi Renewable Transmission Project (TRTP). Archaeologist. The Tehachapi Renewable Transmission Project consisted of the relocation and construction of new transmission towers from Kern County (through the Angeles National Forest) to Ontario, CA. The cultural resources portion of this project was $10 million. Mr. Wetherbee reviewed the placement of new alignments with associated access roads and other ancillary projects to determine if they would impact/effect cultural resources. If impacts/effects to significant cultural resources could not be avoided, mitigation such as site significance assessment testing and data recovery was implemented. These tasks were conducted in coordination with state CPUC and SHPO and federal agencies (Angeles National Forest; U.S. Army Corps of Engineers) along with participating Native American tribes and archaeologist/historians. Mr. Wetherbee provided guidance and leadership to the team regarding the protection of cultural resources and contributed in-depth analysis and recommendations to complex resource/regulatory compliance issues. When conflicts arose, Mr. Wetherbee identified the issue and collaborated with the project team to reach an agreeable solution to avoid impacts to cultural resources while maintaining the project schedule and compliance. Project duties included coordination with SCE/CES management, peer environmentalists, subconsultants, and state and federal agencies, Native American tribes, and also reviewing reports for regulatory compliance and identify resource effects to develop appropriate mitigation measures and reporting out on project performance. In addition, Mr. Wetherbee promoted a safety conscious work environment by following SCE safety protocols and safe work practices and discussed these practices with consultants. This project was executed simultaneously with Devers-Palo Verdes No. 2.

PA6 18, Irvine, CA. Project Archaeologist. Directed an archaeological Phase II test and significance assessment program for regulatory compliance at Site 18 on the PA6 property for the Irvine Community Development Company in Irvine, CA. After completion of the fieldwork, Mr. Wetherbee provided guidance and leadership to staff during the initial stages of the lab work and assisted with the preparation of the final technical for CEQA regulatory compliance. Mr. Wetherbee worked closely with the on-site Native American monitor, project proponent, and lead agency to successfully complete the archaeological fieldwork in accordance with tribal requests regarding the treatment of the resource. Mr. Wetherbee also prepared, tracked, and presented on scope and budget progress and reported on project performance.

Wind Wolves-Vulcan and Wind Wolves East Land Trade, Kern County, CA. Project Archaeologist. Directed an archaeological Phase I Cultural Resources Inventory and a paleontological assessment for the Wind Wolves- Vulcan and Wind Wolves East properties comprising over 3,000 acres in Kern County, CA. Archival and documentary research resulted in the identification of the remains of the historical San Emigdio Pueblo that flourished circa 1860-1890. Both projects were conducted in accordance with CEQA Guidelines and included pre-field records searches, research design, Native American consultation, historic research, and archaeological survey, to identify and evaluate cultural and paleontological resources within the properties. Mr. Wetherbee developed the project budget and delivered the final report to the client in a timely and professional manner. The technical reports analyzed proposed project impacts and developed mitigation measures to ensure regulatory compliance.

España Residential Development, Indio, CA. Project Archaeologist/Faunal Analyst. The España project consisted of three late Patayan II (circa A.D. 1000-1500) sand dune occupation sites in the northern Coachella Valley in the County of Riverside, CA. Mr. Wetherbee directed and conducted the faunal analysis for approximately 10,000 bone specimens for this project. In addition, Mr. Wetherbee prepared the technical report, including research design, historical research, methodology, developed mitigation measures to ensure regulatory compliance, supervised all laboratory analysis for the purpose of evaluating significance and integrity, and California Register of Historical Resources eligibility. Mr. Wetherbee also coordinated with company organizational units, lead agency archaeologists, Native American tribes, and provided guidance and leadership to subconsultants for various analyses for the project. Mr. Wetherbee developed the project budget and delivered the final report to the client in a timely and professional manner.

Talega Development Project, San Clemente, CA. Project Archaeologist/Co-Field Supervisor. Served as co-field supervisor for Phase II significant assessment and Phase III data recovery on the Talega Development property located in San Clemente, Orange County, CA. The Phase II consisted of the excavation of several archaeological test units to sample and evaluate the significance of the area. The Phase III, data recovery, was conducted at a Late Holocene shell midden, CA-ORA-907, a large site with an upper midden and a deeply buried midden beneath sterile channel fill. Mr. Wetherbee assisted with the remote sensing survey of the site prior to the excavations of several archaeological units and subsequent documentation. After completion of the fieldwork, Mr. Wetherbee supervised the initial stages of the lab work including rough sorting of all materials recovered from the excavations. In addition to this fieldwork, Mr. Wetherbee conducted archaeological and paleontological monitoring on the Talega property.

WORK EXPERIENCE

SWCA Environmental Consultants, Pasadena, CA. Senior Archaeologist / Project Manager. Mr. Wetherbee managed high volumes of SCE cultural resources projects, including scope and budgets, and reporting on project performance. Projects involved large capital transmission line projects and operations and maintenance deteriorated pole replacement program located on private and federal lands. Trained, supervised, managed, and mentored six employees. Consulted with federal and state agencies on projects from initiation through project completion. Reviewed technical reports for agency submittal. Supervised and mentored staff for CEQA and Section 106 compliance with technical report writing and fieldwork. Conducted archaeological fieldwork for field survey, site identification and evaluations for CRHR and NRHP, and data recovery programs for projects on lands administered by BLM and USFS. Consults with California Tribes for projects located on Tribal Reservation lands. Prepared scopes of work and cost estimates for cultural resources survey and construction monitoring proposals. Consulted with biologist and paleontologists and other team members on projects to maintain state and federal compliance. Prepared Archaeological Resources Protection Act (ARPA) permits and Fieldwork Authorizations for archaeological surveys on lands administered by federal agencies. Identified problems with potential impacts to cultural resources and project schedules and collaborate with project team to reach an agreeable solution. Prepared cultural sections for environmental

documents. Developed scope of work to distribute to subconsultants for cultural resources studies in support of cultural resources projects.

SCE, Monrovia, CA. Senior Archaeologist. Subject matter expert for two large-scale major capital projects: TRTP and Devers-Palo Verdes No. 2; and the Deteriorated Pole Program. Managed the work of archaeological/historical consulting firms and managed program/project cultural resource area budgets. Conducted fieldwork and prepared technical and agreement documents in coordination with state and federal agencies. Reviewed Environmental Impact Reports and Environmental Impact Statements for state and federal projects and develop mitigation measures for cultural resources. Reviewed, analyzed, and ensured resource data and collection/reporting methodologies meet regulatory requirements. Identified environmental impacts/effects to cultural resources and developed avoidance and mitigation measures with consideration for schedule and cost controls and provide project/program team input. Interfaced and negotiated with other peer environmental specialists, biologists, SCE/CES management, regulatory staff, state, and federal agencies, and subconsultants as a productive and valuable team member. Developed and presented environmental compliance training materials to project team and contractors to inform and guide project activities. Assisted with managing SCE deteriorated pole program in coordination with SCE deteriorated pole team and prepare resource fieldwork permit or authorization applications. Analyzed deteriorated poles located on private lands and make decisions based on risk after considering the costs and benefits of the decision. Provided guidance and leadership to subconsultants and contract archaeologist performing similar tasks. Developed scopes of work (consultant work authorization) to distribute to consultants for cultural resources studies in support of SCE projects/programs. Identified problems with potential impacts to cultural resources and project schedules and collaborated with project team to reach an agreeable solution. Maintained a safety conscious work environment by promoting SCE safety protocols and safe work practices with consultants.

PCR, Services (Now ESA), Los Angeles, CA. Senior Archaeologist. Conduct Phase I Cultural resources surveys for state and federal documents and manage the protection of cultural resources while maintaining environmental compliance. Provide cultural resources sections for environmental documents. Prepared ARPA permits for archaeological surveys on lands administered by federal agencies (Angeles National Forest). Prepared, managed, and reported on scope and budget costs for all projects and on project performance. Prepared scope of work and cost estimates for proposals.

Scientific Resources Surveys, Inc., Orange, CA. Principal Investigator / Faunal Analyst. Conducted Phase I cultural resources surveys and fieldwork for state and federal documents and managed the protection of cultural resources while maintaining environmental compliance. Balanced and organized multiple projects, reviewed, and documented project progress, and reviewed and updated scope and budget progress for several cultural resources compliance projects. Led and provided guidance to staff personnel performing similar tasks. Faunal analyst for Bolsa Chica project.

Stantec Consulting, Inc. Ontario, CA. Project Archaeologist / Faunal Analyst. Balanced several cultural resources regulatory compliance projects including as director for archaeological surveys, Phase II significant assessments, Phase III data recovery, construction monitoring compliance, and laboratory analysis. Prepared all technical reports for cultural resource projects

in coordination with state and federal agencies. Prepared, managed, and reported on scope and budget costs for all projects and on project performance. Coordinated and participated with other organizational units and management on the protection of cultural resources and provided valuable analysis and recommendations for complex resource/ regulatory issues. Managed the protection of cultural resources and developed mitigation measures to ensure regulatory compliance on all projects. Provided guidance and leadership to staff for fieldwork, laboratory analysis, and technical report writing.

CRM TECH, Riverside, CA. Project Archaeologist/Report Writer/Faunal Analyst. Balanced and organized multiple cultural resource projects including Phase I surveys, Phase II significant assessments, and construction monitoring; managed the protection of cultural resources and report on project performance. Provided guidance and leadership in the field, laboratory tasks, and technical report writing for regulatory compliance projects.

Viejo California, Mission Viejo, CA. Archaeologist. Conducted cultural resources surveys, Phase II significance assessments, Phase III data recovery excavations, and construction monitoring.

SWCA, Mission Viejo, CA. Archaeologist. Field crew member for archaeological surveys, Phase III data recovery excavations, and construction monitoring. Report out on project performance.

Theban Mapping Project, the American University in Cairo, Egypt. Research assistant.

American University in Cairo, Egypt, Dr. Salima Ikram. Archaeological assistant. Assisted with the Animal Mummy Project at the Cairo Egyptian Museum and various Egyptology and Zooarchaeological research projects.

PUBLICATIONS

2003 Author of numerous Cultural Resource Management reports for CEQA and Section 106 project compliance reports.
2003 Author of numerous faunal analytical reports for contributions to archaeological studies.
2003 "Making a Duck Mummy and Discovering a Secret of the Ancient Technology," in *KMT: A Modern Journal of Ancient Egypt*, Vol.15(2).

CONFERENCE PAPERS

2012 Bolsa Chica Archaeology Part 6: Foodstuff: A Comprehensive Zooarchaeological Investigation of the Bolsa Chica Mesa.
2008 "Small Game Procurement and Processing at Tomato Springs." Society for California Archaeology (SCA) Symposium, Burbank, CA.
2007 "Zooarchaeological Evidence from Three Late Prehistoric Sites in the Northern Coachella Valley." Coachella Valley Archaeological Society Symposium at College of the Desert, Palm Desert, CA.
2000 "Recipe for the Afterlife," Mummification in Ancient Egypt. American Research Center in Egypt conference at U.C. Berkeley.

EDUCATION

B.A., Anthropology (emphasis in Archaeology), University of Colorado–Colorado Springs (UCCS), 2011

A.S., Computer Science, University of the People, In Progress

Archaeological Field School, Prehistoric Investigations of Stabilized Dune, Paleoindian through Late Prehistoric Stage, Colorado Springs, CO, 2010

Archaeological Field School, Heller House–Historical Archaeology, Colorado Springs, Colorado, in conjunction with UCCS, 2009

REGISTRATIONS/ CERTIFICATIONS

PROFESSIONAL AFFILIATIONS

Colorado Archaeological Society

Society of American Archaeology

TRAINING

NHPA Training

STELL TENURE

5 years / 6 months

AREAS OF EXPERTISE

- Prehistoric archaeology
- National Historic Preservation Act (NHPA) compliance
- National Register of Historic Places (NRHP) evaluations
- Cultural resources survey
- Technical report writing
- Lithic Analysis
- Ceramic Analysis
- Mobile data collection design
- Database design and automation

PROFESSIONAL EXPERIENCE

Mr. Brockman is an archaeologist with over five years of cultural resources management experience focused on prehistoric and historical resources. He has acted as field director and crew chief for three years on a variety of small and large-scale military installation projects for the U.S. Army in Colorado. Tasks required during his tenure included pre-field research, planning and distribution of fieldwork efforts, cultural resources monitoring, cultural resources survey, Phase II and III excavations, significance assessments, installation of site protection measures, finalization of governmental forms, preparation of technical reports, and general routine database upkeep. Most recently, Mr. Brockman was tasked with compiling and reviewing all data collected since 1999 in the Arkansas River Basin of Colorado to synthesize the entirety of the known prehistoric archaeological record in the region. While working on large scale projects on federal lands, he has provided knowledgeable interpretations and recommendations for complex cultural landscapes and resources with regards to compliance and protection from military training.

PROJECT EXPERIENCE

Stell Overview and Synthesis of the Archaeology of the Arkansas River Basin, CO. Researcher / Archaeologist. Performed data mining on over 40,000 prehistoric and historic resources provided in a dataset received from the Colorado SHPO (COSHPO). Reviewed 13,000 prehistoric period records for additional information gained after the publication of the previous synthesis in 1999. Upon completion of the prehistoric synthesis, directions for future research in the region were proposed in order to fill identified data needs in the region. **Stell FY17 Fort Carson Military Reservation (FCMR) Cyclic Monitoring, CO.**

INDUSTRY TENURE

5 years / 7 months

Archaeologist. Performed cyclic monitoring visits in accordance with Stipulation IV of the Programmatic Agreement regarding military training and operational support activities within downrange Fort Carson. Tasks included photographing features and site areas from previously established points. Condition assessments and recommended monitoring frequencies were provided to better inform the Fort Carson CRMP of sites requiring additional action.

Stell FY17 Piñon Canyon Maneuver Site (PCMS) Baseline Monitoring, CO. Archaeologist. Performed baseline monitoring tasks at 251 resources, which included site assessment and impact documentation, site/feature photography, and installation of military approved protection measures for cultural resources. Over the course of the project, the design and implementation of mobile data collection and a corresponding database was developed to increase efficiency of post-processing collected data. Finalized monitoring forms approved by the Fort Carson Cultural Resource Management Program (CRMP) were submitted alongside a technical report.

Stell FY17 PCMS Re-evaluations, CO. Archaeologist. Visited 18 cultural resources to perform re-assessments of NRHP significance through Phase II and III subsurface investigations. Assessments of condition, integrity, and significance were offered, as well as routine monitoring schedules in accordance with the Fort Carson programmatic agreement document.

Stell FY16 FCMR and PCMS Site Testing and Re-evaluations, CO. Archaeologist. A total of 92 sites between the FCMR and PCMS were subjected to Phase II subsurface testing and surface investigations. Complete inventories of surface materials and previous collections were analyzed in order to provide well-informed NRHP significance recommendations. **Stell FY16 FCMR and PCMS Baseline Monitoring, CO.** Archaeologist. Performed baseline monitoring at 150 cultural resources at each military installation, FCMR and PCMS. Tasks included relocating previously documented resources, identifying all associated features, photographing site areas, and providing updated condition assessments for the Fort Carson CRMP to make informed management decisions for future actions.

Stell FY15 Re-assessment of the Fort Carson Turkey Creek Rock Art District (TCRAD), CO. Archaeologist. Assisted Dr. Loendorf and the Sacred Sites organization with access and recordation of contracted rock art resources in the FCMR TCRAD. Responsibilities included providing accurate and safe access to sites, rock art recordation, governmental form completion, and assisting in 3D modelling and photogrammetry efforts. Phase II subsurface testing at sites where it was deemed necessary was also performed in order to provide additional evidence for NRHP significance statements.

Stell FY15 FCMR and PCMS Site Testing and Re-evaluations, CO. Archaeologist. Over the course of the project, 13 sites at FCMR were visited and assessed, as well as 45 sites at the PCMS. All materials from previous collections were inventoried alongside their surface assemblages to provide a full picture of material culture represented at the resource. Phase II subsurface investigations were performed to provide an informed NRHP significance statement. A technical report was delivered alongside governmental forms.

Stell FY15 FCMR and PCMS Baseline Monitoring, CO. Archaeologist. Performed baseline monitoring at 300 sites between the two military bases of FCMR and PCMS. Tasks included relocating resources, photographing features and site areas, providing condition assessments, and recommending monitoring frequencies for subsequent cyclical monitoring efforts. All recommendations and assessments were presented as a technical report, as well as a series of Fort Carson CRMP approved forms.

Stell FY14 PCMS Survey and Inventory, CO. Archaeologist. Tasked with survey and inventory of 4,203 acres at various low and medium probability areas at the PCMS. A total of 213 cultural resources were recorded to the FCMR CRMP standards and subjected to Phase II subsurface testing. Condition assessments and NRHP significance recommendations were provided in governmental forms and a final technical report. **Stell FY14 FCMR and PCMS Site Testing, Re-evaluations, and Architectural Site Assessments.** Archaeologist. Work performed during this contract included 29 site assessments at FCMR, 75 site assessments at PCMS, as well as 22 historical architectural assessments. All sites were subjected to Phase II subsurface investigation, as well as surface inventories and reanalysis of previous collections. Condition assessments were given with NRHP significance statements to the Colorado SHPO.

WORK EXPERIENCE

Stell, Fort Carson, CO. Archaeologist. Over a tenure of 5 years and 6 months, services to the installation included in-depth research of resources in the surrounding region, technical report writing, database development and maintenance, database and for production automation, quality control of field data collected, management of three to 15 crew members in field settings and developing methods for daily field efforts. Research of the region surrounding FCMR and PCMS provided a valuable opportunity to understand and synthesize the level of effort and accomplishments achieved by archaeologists in the region that provide an understanding of the archaeological record in the Arkansas River Basin of Colorado. Contributions to contractually obligated reports have been given to authors every given year in order to complete multiple contracts and deliverables. By acquiring computer science skills, better strategies for development and implementation of databases and technologies allowed for a decrease in post-processing time of field data. Management of multiple field crews allowed for higher ranking archaeologists to provide feedback to previously collected data from afar.

Alpine Archaeological Consultants, Inc., CO. Archaeological Field Technician. Performed intensive pedestrian survey of various federal and state lands under the management of the National Park Service (NPS). Survey consisted of roads and trails in mountainous regions with Phase II subsurface testing being required at locales deemed necessary for additional assessment beyond surface investigations.

PUBLICATIONS

2018 Contributor to *Overview and Synthesis of the Prehistoric and Historical Archaeological Resources in the Arkansas River Basin of Colorado.*

2017 Contributor to *Archaeological Site Assessment and Re-evaluation for 76 Sites at Piñon Canyon Maneuver Site; Archaeological and Architectural Site Assessments for 16 Sites at Fort Carson; Cultural Resources Survey/Inventory of High and Medium Probability Areas at Fort Carson.*

2016 Co-author of *Archaeological Site Assessment and Re-evaluations for 45 Site at Piñon Canyon Maneuver Site.* Contributor to *Archaeological and Architectural Site Assessments for 13 Sites at Fort Carson.*

2015 Contributor to *Archaeological Site Assessment and Evaluation & Historic Resources/Architectural Documentation Piñon Canyon Maneuver Site.*

Erica Ward

Archaeologist / Archaeological Crew Chief/ Cultural Resources Specialist

EDUCATION

M.A., Humanities (emphasis in Cultural Resources Management), Adams State University, Alamosa, *In Progress*

B.A., Anthropology (emphasis in Archaeology), University of Colorado–Colorado Springs (UCCS), 2011

Archaeological Field School, Prehistoric Investigations of Stabilized Dune, Paleoindian through Late Prehistoric Stage, Colorado Springs, CO, 2010

TRAINING

NHPA Training, Tribal Consultation

Stell TENURE

4 years/ 2 months

INDUSTRY TENURE

5 years / 1 month

AREAS OF EXPERTISE

- Prehistoric archaeology
- National Historic Preservation Act (NHPA) compliance
- National Register of Historic Places (NRHP) evaluations
- Cultural resources survey
- Technical report writing
- Lithic analysis
- Tribal consultation
- Cultural resources management
- Collections management

PROFESSIONAL EXPERIENCE

Ms. Ward is an archaeologist with over five years of cultural resources management experience focused on prehistoric and historical resources. She has acted as crew chief for four years on a variety of small and large scale federal land projects for the U.S. Army in Colorado. Required tasks included pre-field research, planning and distribution of fieldwork efforts, cultural resources monitoring, cultural resources survey, Phase II and III excavations, significance assessments, installation of site protection measures, finalization of governmental forms, and preparation of technical reports. Most recently, Ms. Ward has worked as an assistant to facilitate relationship building between the United States Air Force and Native American Tribal governments. This required detailed attention and focused effort on maintaining Tribal contact information and facilitating travel and per diem considerations. While working as a crew chief, she has provided attention to detail, strong writing skills, and knowledgeable archaeological interpretation of relevant field data. As a graduate student, Ms. Ward has completed an internship that provided her experience with Native American Tribal consultation, Sections 106 and 110 reviews, State Historic Preservation Office concurrence, and collections management inventory and assessment at the military installation level.

PROJECT EXPERIENCE

Whitetail Environmental, LLC FY18 Piñon Canyon Maneuver Site (PCMS) Archaeological Survey, CO. Archaeologist/Crew Chief. Led Section 106 survey of 40 acres on the Piñon Canyon Maneuver Site (PCMS) in response to a small wildland fire. Recorded all archaeological sites found within. Supervised and gave direction to a crew of four. Organized hotel rooms and transportation to and from survey area. Performed reconnaissance activities to reach the project area in a deep canyon floodplain with no road access. Completed all site forms and GIS documentation. Made site NRHP-eligibility recommendations. Authored report,

performed all technical editing and addressed client comments in preparation for timely submission of final deliverables.

Whitetail FY18 PCMS and Fort Carson Military Reservation (FCMR) Monitoring Site Data Rectification, CO. Technical Support/Quality Control Lead. Made monitoring and inspection frequency recommendations for 300 previously visited sites at the PCMS and Fort Carson Military Reservation (FCMR) to standardize with guidelines set forth in the 2017 – 2021 Integrated Cultural Resources Management Plan, per Fort Caron Programmatic Agreement standards.

Whitetail/ Stell FY17 PCMS and FCMR Baseline Monitoring, CO. Archaeologist/Crew Chief. Participated in baseline and cyclic monitoring of 300 sites at the PCMS and FCMR. Activities included locating sites, confirmation of site boundary, photography, and assessment of all site attributes, and providing determination of integrity and monitoring schedule frequencies.

Whitetail/ Stell FY17 PCMS Archaeological Site Re-evaluations, CO. Archaeologist/Crew Chief/Report Co-Author. Conducted re-evaluation of 18 need data sites on the PCMS. Fieldwork included navigation to site, survey of extent and contents, subsurface testing, completion of state recording forms, management and NRHP eligibility recommendations, and feature/site overview photography. Post-field laboratory processing consists of quality control of for all paper work, artifact analysis, historic archival research, packaging of collected obsidian and macrobotanical samples for off-site processing, synthesis of results within site narratives, co-authorship and technical editing of report, and finalization of site maps and photographs. (2017-2018)

Stell FY17 FCMR Cyclic Monitoring, CO. Archaeologist/Crew Chief/Report Co-Author. Performed cyclic monitoring at installation-managed archaeological sites in accordance with Stipulation IV of the Programmatic Agreement regarding military training and operational support activities at Fort Carson. Tasks included site- and feature-level photography at previously established locations to facilitate accurate comparison between incremental inspection visits. Provided condition assessments and monitoring frequency recommendations to inform the Fort Carson CRMP of sites requiring additional action. Assisted with authorship of final report. (2017-2018)

Stell FY17 PCMS Baseline Monitoring, CO. Archaeologist/Crew Chief. Performed baseline monitoring tasks at 251 resources, which included site assessment and impact documentation, site/feature photography, and installation of military approved protection measures for cultural resources. Finalized monitoring forms approved by the Fort Carson Cultural Resource Management Program (CRMP) were submitted alongside a technical report. Provided technical support for the final report. (2016-2017)

Stell FY16 FCMR and PCMS Site Testing and Re-evaluations, CO. Archaeologist/Crew Chief. A total of 92 sites between the FCMR and PCMS were subjected to Phase II subsurface testing and surface investigations. Complete inventories of surface materials and previous collections were analyzed in order to provide well-informed NRHP significance recommendations. (2015-2016)

Stell FY16 FCMR and PCMS Baseline Monitoring, CO. Archaeologist/Crew Chief. Performed baseline monitoring at 150 cultural resources at each military installation, FCMR and PCMS. Tasks included relocating previously documented resources, identifying all associated features, photographing site areas, and providing updated condition assessments for the Fort Carson CRMP to make informed management decisions for future actions. (2015-2016)

Stell FY15 Re-assessment of the Fort Carson Turkey Creek Rock Art District (TCRAD), CO. Archaeologist/Crew Chief. Assisted Dr. Lawrence Loendorf and Sacred Sites Research, LLC organization with access and recordation of contracted rock art resources in the FCMR TCRAD. Responsibilities included providing accurate and safe access to sites, rock art recordation, governmental form completion, and assisting in 3D modelling and photogrammetry efforts. Phase II subsurface testing at sites where it was deemed necessary was also performed in order to provide additional evidence for NRHP significance statements. (2015-2016)

Stell FY15 FCMR and PCMS Site Testing and Re-evaluations, CO. Archaeologist/Crew Chief. Over the course of the project, 13 sites at FCMR were visited and assessed, as well as 45 sites at the PCMS. All materials from previous collections were inventoried alongside their surface assemblages to provide a full picture of material culture represented at the resource. Phase II subsurface investigations were performed to provide an informed NRHP significance statement. A technical report was delivered alongside governmental forms. (2014-2015)

Stell FY15 FCMR and PCMS Baseline Monitoring, CO. Junior Archaeologist. Performed baseline monitoring at 300 sites between the two military bases of FCMR and PCMS. Tasks included relocating resources, photographing features and site areas, providing condition assessments, and recommending monitoring frequencies for subsequent cyclical monitoring efforts. All recommendations and assessments were presented as a technical report, as well as a series of Fort Carson CRMP approved forms. (2014-2015)

Stell FY14 PCMS Survey and Inventory, CO. Archaeological Field Technician. Tasked with survey and inventory of 4,203 acres at various low and medium probability areas at the PCMS. A total of 213 cultural resources were recorded to the FCMR CRMP standards and subjected to Phase II subsurface testing. Condition assessments and NRHP significance recommendations were provided in governmental forms and a final technical report. (2013-2014)

Stell FY14 FCMR and PCMS Site Testing, Re-evaluations, and Architectural Site Assessments. Archaeological Field Technician. Work performed during this contract included 29 site assessments at FCMR, 75 site assessments at PCMS, as well as 22 historical architectural assessments. All sites were subjected to Phase II subsurface investigation, as well as surface inventories and reanalysis of previous collections. Condition assessments were given with NRHP significance statements to the Colorado SHPO. (2013-2014)

WORK EXPERIENCE

Stell, Fort Carson, CO. Archaeologist/Crew Chief/Cultural Resources Specialist. Experience includes assisting with facilitation of relationship building between the United States Air Force and Native American Tribal governments; technical report contributions, editing, and authorship; quality control of collected field data; oversight of archaeological field crew members; site

recordation, testing, and providing management and eligibility recommendations; archaeological site monitoring; and supervision of crew members. Tenure with Stell also allowed provided the opportunity to appropriately package and submit macrobotanical and carbon samples for analysis; perform collections management activities; and obtain downrange access at two active military installations.

Whitetail Environmental, LLC, CO. Archaeologist/Crew Chief. Employment with Whitetail Environmental, LLC included taking on a leadership role requiring attention to detail and a dedicated work ethic. Field-level duties involved pedestrian survey; site recordation, testing, management and eligibility recommendations, and site form completion; navigation of remote and difficult terrain by foot and vehicle; and supervision of crew members. Laboratory duties were report authorship, completion of all required state forms, and quality control for contracted task deliverables.

PUBLICATIONS

2018 Co-Author of *Dixie Wildland Fire Survey in Red Rock Canyon of the Piñon Canyon Maneuver Site.*

2017 Author of *2017 PCMS Return Monitoring Report, Piñon Canyon Maneuver Site;*
Co-author of *Archaeological Site Assessment and Re-evaluation for 18 Sites at Piñon Canyon Maneuver Site;*
Contributor to *2017 – 2018 Cyclic Monitoring Report, Fort Carson.*

2016 Contributor to *2016 Archaeological Baseline Site Monitoring Report, Fort Carson;*
Contributor to *Archaeological and Architectural Site Assessments for 16 Sites at Fort Carson;*
Contributor to *Archaeological Baseline Monitoring Report, Piñon Canyon Maneuver Site.*

2015 Contributor to *Archaeological Site Assessment and Re-evaluation for 45 Sites at Piñon Canyon Maneuver Site;*
Contributor to *Research Proposal to Guide the Re-assessment of the Cultural Resources and Boundary of the Fort Carson Turkey Creek Rock Art District;*
Contributor to *Cultural Resources Survey and Inventory of High and Medium Probability Areas at Fort Carson;*
Contributor to *Archaeological and Architectural Site Assessments for 13 Sites at Fort Carson.*

2014 Contributor to *Archaeological Site Assessment and Evaluation & Historic Resources/Architectural Documentation Piñon Canyon Maneuver Site;*
Contributor to *Archaeological Site Assessment and Re-evaluation for 29 Sites on Fort Carson;*
Contributor to *Cultural Resources Survey and Inventory for Fort Carson at Piñon Canyon Maneuver Site in Training Areas 12, 13, and Others.*

Kacey R. Burton
Archaeologist / GIS Analyst

EDUCATION

Graduate Program, Geographic Information Systems, University of Denver, In Progress

B.S., Anthropology,

Illinois State University, 2003

A.A., Secondary Education (Teaching)/History, Springfield College in Illinois, 1999

North Greene High School, White Hall, IL, 1997

TRAINING

Adult First Aid/CPR/AED, American Red Cross Certified, 2013

Native American Communication, Department of Defense, 2010

Section 106 Essentials, Advisory Council on Historic Preservation, 2008

Introduction to ArcGIS I, ESRI, 2008

Range Facility Management Scheduling System (RFMSS) User, USAG – Fort Carson, 2006 to Present

OPSEC/SAEDA Information Assuredness, Annual Training, Department of Defense, 2005 to Present

AREAS OF EXPERTISE

- NEPA/Section 106 Project Analysis
- Geographic Information Systems Analysis
- Lithic Analysis Studies
- Section 110 Compliance

PROFESSIONAL EXPERIENCE

Mr. Burton possesses over 10 years of continuous professional experience in cultural resources management, collections management, tribal consultation, and archaeological research. He also has over 4 years of experience utilizing geographic information systems (GIS) to manage cultural resources assets on military lands. Mr. Burton has worked on several projects throughout the Great Plains and Midwest regions of the United States. These projects have included prehistoric and historic archaeological inventories; National Register of Historic Places evaluations and determinations; authorship of Section 106 consultation documents; Native American government-to-government consultations; Programmatic Agreement (PA) development support; Integrated Cultural Resources Management Plan (ICRMP) development support; development of alternative mitigation strategies; resource protection strategies; formulation of management protocols; viewshed analyses; geodatabase design; cartographic design and production; database administration; and knowledge and appropriate application of federal and state laws and regulations. Mr. Burton has worked for and/or cooperated with the U.S. Army, U.S. Army Corps of Engineers, Army Environmental Command, Illinois Department of Transportation, Illinois Archaeological Survey/Illinois Transportation Archaeological Research Program, State of Colorado, State of Illinois, University of Illinois, New Mexico State University, Colorado State University, U.S. Forest Service, U.S. Fish and Wildlife Service, Native American tribal governments, local governments and municipalities, various DOD contractors, and state and local avocational and professional archaeological organizations.

PROJECT EXPERIENCE

USACE, Kansas City: Cultural Resources Management Services, Fort Carson, CO. As the Stell Environmental

STELL TENURE

2 Years

INDUSTRY TENURE

10 Years

Enterprises (SEE) Archaeologist and GIS Analyst, personally assisted the client in completion of: NEPA/Section 106 undertaking reviews related to large and small-scale construction, land management, and military training events; small-scale intensive cultural resources inventory and evaluation projects and Memorandum for Record/Report production; GIS database maintenance, management, and oversight. Assisted CRMP in Native American government-to-government consultation efforts related to the identification and protection of Properties of Traditional, Religious, and Cultural Importance (PTRCI). Provided technical support regarding the development of Programmatic Agreement documents for the management of both Fort Carson and PCMS downrange cultural resources. Support consisted of subject matter advising; assistance in the development of mitigation strategies and management protocols; GIS data creation, manipulation, and analysis; and cartographic production.

USACE, Kansas City: Professional Archaeological Services, Fort Carson, CO. Served in an Archaeologist and GIS Analyst role for SEE by providing technical support during Native American government-to-government PTRCI identification efforts and reviewed downrange projects submitted through the Fort Carson NEPA process. Performed successful Section 106 compliance actions for a variety of construction, land management, and military training events and built relationships with Fort Carson stakeholders, environmental/cultural leaders, Tribes, local and state officials, and Colorado State Historic Preservation Office (SHPO). Section 110 compliance efforts consisted of final production of site forms; completion of backlog technical reports; final production of small Memoranda for Record (MFR) letter reports; and submission of resource documentation to SHPO for official NRHP determinations. Functioned as primary contact and provided oversight for all USAG – Fort Carson Cultural Resources Management Program (CRMP) GIS data. Performed data maintenance, manipulation, rectification, and geospatial analyses for a variety of projects such as PA development; determinations of effect for Section 106 reviews; survey data rectification; and project scoping and planning. Initiated and coordinated geospatial data sharing with interested stakeholders such as various DOD entities and SHPO personnel.

USACE, Kansas City: Programmatic Agreement Support, Fort Carson, CO. Provided technical support during ongoing development of Fort Carson's Training PA by: participated in Tribal and stakeholder consultation events; assisted in development of GIS data, cartographic products, and soil models; development of agreement documents; creation of datasets related to site protection measures, mitigation measures, and resource significance standards.

USACE, Kansas City: Archaeological Services Support, Fort Carson, CO. Functioned as an Archaeologist/GIS Analyst for SEE and served in a compliance role by completing the following tasks: performed several NEPA/Section 106 undertaking reviews and completed successful 106 consultations; coordinated with training elements to perform site monitoring and installation of physical protection markers (Seibert stakes); produced Memorandum for Record/Report documents; completed GIS database maintenance, management, and oversight; assisted CRMP in Native American government-to-government consultation efforts related to the identification and protection of Properties of Traditional, Religious, and Cultural Importance

(PTRCI). Mr. Burton also provided technical support regarding the development of a Programmatic Agreement primarily for the management of Fort Carson's built environment. Support consisted of subject matter advising; assistance in the development of mitigation strategies and management protocols; GIS data creation, manipulation, and analysis; cartographic production; and interfacing and information sharing with interested stakeholders.

ARCHAEOLOGICAL EXPERIENCE

USACE, Kansas City: Two Years of Archaeological Services Support, Fort Carson, CO. As SEE Archaeologist; directed and performed several small-scale Section 110 compliance-related archaeological inventories; blade and trench monitoring; installation of site protection measures; site protection monitoring; field and project preparation for crews; laboratory analysis of lithic artifacts; site documentation completion and submission to the SHPO; partial production of technical reports and full production of MFR letter reports.

USACE, Kansas City: Five Years of Archaeological Services Support, Fort Carson, CO. Served as a Field Archaeologist for ICI Services by directing and performing the following tasks: completion of Section 110 compliance-related archaeological surveys; site re-evaluations; evaluative test excavations; blade and trench monitoring; site protection monitoring, field and project preparation for crews; laboratory analysis of lithic artifacts; partial production and production of final technical and MFR letter reports; and post-wildfire impact assessments.

USACE, Kansas City: BRAC Pay-Ahead Study, Pinon Canyon Maneuver Site, CO. Mr. Burton began his archaeological experience on the Great Plains in 2005. As an Archaeological Technician for ICI Services he assisted in the archaeological inventory and evaluation of 15,000 acres on the PCMS. Performed resource documentation; cultural material analyses; project technical report contributor.

Western Illinois Survey Division, Illinois Transportation Archaeological Research Program (ITARP): Survey, Evaluative Testing, and Data Recovery/Mitigation for the FAP 315/IL 336, FAP 310/US 67, FAP 318/IL 29 Highway Projects and the Brown County Wetland Mitigation Bank Project; Brown, Hancock, Greene, Morgan, Jersey, Scott, Peoria, Marshall, Putnam, and Bureau Counties. Prior to relocating to Colorado, Mr. Burton served as an Archaeological Field Technician for ITARP for two years (now known as the Illinois State Archaeological Survey (ISAS)). At that time, he gained invaluable experience as a crew member on several Illinois Department of Transportation projects in Western Illinois. His duties included: linear pedestrian survey and shovel testing; evaluative testing; monitoring of mechanical soil stripping; archaeological feature identification and salvage; block excavation; site and feature mapping (hand drawn and electronic survey mapping). Associated laboratory work included lithic, ceramic, and historic artifact processing and analysis; flotation and dry screen sample processing; production of ISAS Archaeological Survey Short Reports (ASSRs).

TECHNICAL REPORTS/PUBLICATIONS/PAPERS

Burton, Kacey R., and Kendra Rodgers

2010 *2008 Fort Carson Military Reservation Training Area 25 Burn Area Emergency Rehabilitation Project.* Submitted to the Fort Carson Cultural Resources Management Program Office, Directorate of Public Works, Environmental Division, Fort Carson. Prepared by ICI Services Corporation. Copies available from the Directorate of Public Works, Cultural Resources Management Program Office, Fort Carson.

APPENDIX D

Record of Non-Applicability

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RECORD OF NON-APPLICABILITY (RONA) FOR GENERAL CONFORMITY

Name of Project: Fort Irwin Dense Urban Terrain Complex

Project ID Number:

Brief Project Description/Scope: The DUT complex would replicate current, real-world urban operational environments by establishing multiple, highly dense sub-sections of a mega-city within Fort Irwin's operational boundary. The majority of simulation structures will be completed to approximately 25% and will not be occupied, ie: residential homes, apartment buildings and office spaces will not be inhabited.

Point of Contact: Mark Burns

Phone/Email: 760.380.3737 / mark.a.burns20.civ@mail.mil

Estimated Start Date: 2019

General Conformity under the Clean Air Act, Section 1.76 has been evaluated for the project described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because:

_____ This Action does NOT require a RONA because the Project Area exists in a region that is in ATTAINMENT for all of the NAAQS of concern.

OR

_____The project/action qualifies as an exempt action under the applicable exemption citation in 40 CFR 93.153: (*citation specific regulation*)

OR

__X___Total direct and indirect emissions from this project/action have been estimated at*:*

5.264 Tons/yr of PM_{10}

These levels are below the conformity threshold values established at 40 CFR 93.153 (b)

Supporting documentation and emission estimates:
_____Attached

___X__Appear in NEPA documentation Environmental Assessment for the Construction, Operation and Maintenance of a Dense Urban Terrain Complex, 2018 *(cite reference)*

Environmental Representative (*title, signature & date*)

RECORD OF NON-APPLICABILITY (RONA) FOR GENERAL CONFORMITY

Proposed Action
Construction Emissions
Dense Urban Terrain
Training Complex EA, Fort Irwin, California

Emissions Source	ROG (VOC)	CO	NOx	SO2	PM10	PM2.5
2019 Emissions (tpy)						
New Road Construction	0.05	0.39	0.58	0	0.12	0.04
Existing Road and Utility Improvement	0.46	3.46	4.07	0.01	2.53	0.66
Building Construction	5.425	6.9925	5.3499	0.0131	1.8511	0.8286
Total Emissions	5.935	10.8425	9.9999	0.0231	4.5011	1.5286
MDAQMD Thresholds (tpy)	25	100	25	25	15	15
Threshold Exceedance	No	No	No	No	No	No
2020 Emissions (tpy)						
Building Construction	8.4872	5.3064	5.0156	0.0141	0.7629	0.3343
Total Emissions	8.4872	5.3064	5.0156	0.0141	0.7629	0.3343
MDAQMD Thresholds (tpy)	25	100	25	25	15	15
Threshold Exceedance	No	No	No	No	No	No

Road Construction Emissions Model, Version 9.0.0

Daily Emission Estimates for -> Ft Irwin DUT New Road Project

Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	1.24	8.82	17.31	10.71	0.71	10.00	2.63	0.55	2.08	0.05	4,752.71	0.44	0.49	4,911.02
Grading/Excavation	5.80	45.02	69.22	13.01	3.01	10.00	4.72	2.64	2.08	0.12	11,572.27	2.49	0.56	11,802.44
Drainage/Utilities/Sub-Grade	4.96	39.08	54.01	12.51	2.51	10.00	4.35	2.27	2.08	0.09	8,867.92	1.62	0.36	9,015.59
Paving	2.07	19.54	23.49	1.32	1.32	0.00	1.10	1.10	0.00	0.06	5,920.65	0.75	0.51	6,091.24
Maximum (pounds/day)	5.80	45.02	69.22	13.01	3.01	10.00	4.72	2.64	2.08	0.12	11,572.27	2.49	0.56	11,802.44
Total (tons/construction project)	0.05	0.39	0.58	0.12	0.03	0.09	0.04	0.02	0.02	0.00	101.54	0.02	0.01	103.63

Notes:

Project Start Year ->	2019
Project Length (months) ->	1
Total Project Area (acres) ->	5
Maximum Area Disturbed/Day (acres) ->	1
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	400	80	600	120	320	40
Grading/Excavation	400	80	600	120	800	40
Drainage/Utilities/Sub-Grade	200	80	300	120	720	40
Paving	80	400	120	600	560	40

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> Ft Irwin DUT New Road Project

Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.00	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	5.23	0.00	0.00	4.90
Grading/Excavation	0.03	0.22	0.34	0.06	0.01	0.05	0.02	0.01	0.01	0.00	57.28	0.01	0.00	53.00
Drainage/Utilities/Sub-Grade	0.02	0.13	0.18	0.04	0.01	0.03	0.01	0.01	0.01	0.00	29.26	0.01	0.00	26.99
Paving	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.77	0.00	0.00	9.12
Maximum (tons/phase)	0.03	0.22	0.34	0.06	0.01	0.05	0.02	0.01	0.01	0.00	57.28	0.01	0.00	53.00
Total (tons/construction project)	0.05	0.39	0.58	0.12	0.03	0.09	0.04	0.02	0.02	0.00	101.54	0.02	0.01	94.01

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Road Construction Emissions Model, Version 9.0.0

Daily Emission Estimates for -> DUT _29mile Improved Road

Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	5.15	37.35	38.32	51.80	1.80	50.00	11.91	1.51	10.40	0.10	8,963.03	0.94	0.41	9,107.74
Grading/Excavation	10.42	77.13	98.84	54.51	4.51	50.00	14.37	3.97	10.40	0.18	16,640.88	3.23	0.49	16,866.46
Drainage/Utilities/Sub-Grade	7.78	58.59	63.73	53.19	3.19	50.00	13.22	2.82	10.40	0.14	12,498.21	1.58	0.44	12,669.30
Paving	5.74	45.33	43.90	2.36	2.36	0.00	1.98	1.98	0.00	0.12	10,823.30	1.11	0.60	11,030.74
Maximum (pounds/day)	10.42	77.13	98.84	54.51	4.51	50.00	14.37	3.97	10.40	0.18	16,640.88	3.23	0.60	16,866.46
Total (tons/construction project)	0.46	3.46	4.07	2.53	0.19	2.34	0.66	0.17	0.49	0.01	756.67	0.12	0.03	767.58

Notes:

Project Start Year ->	2019
Project Length (months) ->	5
Total Project Area (acres) ->	70
Maximum Area Disturbed/Day (acres) ->	5
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	200	80	300	120	3,080	40
Grading/Excavation	200	80	300	120	3,680	40
Drainage/Utilities/Sub-Grade	200	80	300	120	3,400	40
Paving	80	400	120	600	3,280	40

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> DUT _29mile Improved Road

Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.03	0.21	0.21	0.28	0.01	0.28	0.07	0.01	0.06	0.00	49.30	0.01	0.00	45.44
Grading/Excavation	0.26	1.91	2.45	1.35	0.11	1.24	0.36	0.10	0.26	0.00	411.86	0.08	0.01	378.70
Drainage/Utilities/Sub-Grade	0.13	0.97	1.05	0.88	0.05	0.83	0.22	0.05	0.17	0.00	206.22	0.03	0.01	189.64
Paving	0.05	0.37	0.36	0.02	0.02	0.00	0.02	0.02	0.00	0.00	89.29	0.01	0.00	82.56
Maximum (tons/phase)	0.26	1.91	2.45	1.35	0.11	1.24	0.36	0.10	0.26	0.00	411.86	0.08	0.01	378.70
Total (tons/construction project)	0.46	3.46	4.07	2.53	0.19	2.34	0.66	0.17	0.49	0.01	756.67	0.12	0.03	696.35

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Ft Irwin NTC - Dense Urban Terrain Compex - Buildings

San Bernardino-Mojave Desert County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Bank (with Drive-Through)	1.00	1000sqft	0.02	1,000.00	0
General Office Building	339.00	1000sqft	7.78	339,000.00	0
Government Office Building	20.00	1000sqft	0.46	20,000.00	0
General Heavy Industry	30.00	1000sqft	0.69	30,000.00	0
Single Family Housing	250.00	Dwelling Unit	81.17	450,000.00	0
Gasoline/Service Station	32.00	Pump	0.10	4,517.60	0
City Park	10.00	Acre	10.00	435,600.00	0
Apartments Low Rise	60.00	Dwelling Unit	3.75	60,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	32
Climate Zone	10			**Operational Year**	2020
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Ft Irwin NTC - Dense Urban Terrain Compex - Buildings - San Bernardino-Mojave Desert County, Annual

Project Characteristics -

Land Use - Population for all buildings was set to zero. None of the buildings constructed as part of the Mock Urban Terrain Complex will be occupied, with the exception of a few range structures used to monitor training and conduct after action reviews.. Ie. no people will be living in the residential structures, nor working in the commercial structures. These buidlings will be designed to simulate urban terrain only.

Construction Phase - No Demolition will be required. Project is new construction. 75% of structures will be facades or building envelopes with minimal internal completion. Only about 25% of the structures will be 100% complete and functional thereby reducing the associated construction duration, energy usage, and emissions output.

Demolition -

Grading -

Construction Off-road Equipment Mitigation -

Mobile Land Use Mitigation -

Area Mitigation -

Energy Mitigation -

Water Mitigation -

Waste Mitigation - Regulations, Executive Orders and Army Policies set recycling goals. Ft Irwin operates a Qualified Recycling Program which recognizes and supports recycling throughoutthe installation.

Operational Off-Road Equipment -

Stationary Sources - Emergency Generators and Fire Pumps -

Off-road Equipment - No Demolition required/expected in this project.

Off-road Equipment -

Off-road Equipment -

Off-road Equipment -

Off-road Equipment -

Off-road Equipment -

Woodstoves - Since the residential spaces will not be 100% complete nor occupied/lived in, there will be no fire places or woodstoves.

Energy Use - Residential space energy use set to 0. Will only be facades for simulation. Not used as dwellings.

Water And Wastewater - Only a few buildings will be equipped with water, sewer, and waste water treatment. Most buildings will be incomplete structure used tc simulate the urbam environnment and will not include functioning utilities.

Solid Waste - Solid waste footprint will be limited to a few range support building including the Range monitoring and after action review facilities. Solid waste will not be generated for the majority of the buildings since they will not be occupied nor fully functional.

Ft Irwin NTC - Dense Urban Terrain Compex - Buildings - San Bernardino-Mojave Desert County, Annual

Table Name	Column Name	Default Value	New Value
tblAreaMitigation	UseLowVOCPaintParkingCheck	False	True
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	3,100.00	380.00
tblConstructionPhase	NumDays	200.00	0.00
tblConstructionPhase	NumDays	310.00	48.00
tblConstructionPhase	NumDays	120.00	64.00
tblConstructionPhase	PhaseEndDate	1/25/2035	7/10/2020
tblConstructionPhase	PhaseEndDate	5/19/2033	10/30/2020
tblConstructionPhase	PhaseEndDate	11/7/2019	1/31/2019
tblConstructionPhase	PhaseEndDate	7/1/2021	6/28/2019
tblConstructionPhase	PhaseEndDate	3/23/2034	7/2/2020
tblConstructionPhase	PhaseEndDate	4/23/2020	5/1/2019
tblConstructionPhase	PhaseStartDate	3/24/2034	9/8/2019
tblConstructionPhase	PhaseStartDate	7/2/2021	5/19/2019
tblConstructionPhase	PhaseStartDate	4/24/2020	4/24/2019
tblConstructionPhase	PhaseStartDate	5/20/2033	8/30/2019
tblConstructionPhase	PhaseStartDate	11/8/2019	2/1/2019
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	LightingElect	1,608.84	0.00
tblEnergyUse	LightingElect	810.36	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24E	6,155.97	0.00
tblEnergyUse	NT24E	3,172.76	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	NT24NG	6,030.00	0.00
tblEnergyUse	NT24NG	6,030.00	0.00

tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24E	951.67	0.00
tblEnergyUse	T24E	877.14	0.00
tblEnergyUse	T24NG	15.36	0.00
tblEnergyUse	T24NG	24,566.15	0.00
tblEnergyUse	T24NG	9,544.50	0.00
tblFireplaces	FireplaceDayYear	82.00	0.00
tblFireplaces	FireplaceDayYear	82.00	0.00
tblFireplaces	FireplaceHourDay	3.00	0.00
tblFireplaces	FireplaceHourDay	3.00	0.00
tblFireplaces	FireplaceWoodMass	3,078.40	0.00
tblFireplaces	FireplaceWoodMass	3,078.40	0.00
tblFireplaces	NumberGas	137.50	0.00
tblFireplaces	NumberGas	33.00	0.00
tblFireplaces	NumberNoFireplace	25.00	0.00
tblFireplaces	NumberNoFireplace	6.00	0.00
tblFireplaces	NumberWood	87.50	0.00
tblFireplaces	NumberWood	21.00	0.00
tblGrading	AcresOfGrading	120.00	775.00
tblLandUse	Population	715.00	0.00
tblLandUse	Population	172.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00

tblSolidWaste	SolidWasteGenerationRate	0.93	0.00
tblSolidWaste	SolidWasteGenerationRate	17.25	0.00
tblSolidWaste	SolidWasteGenerationRate	37.20	0.00
tblSolidWaste	SolidWasteGenerationRate	315.27	10.00
tblSolidWaste	SolidWasteGenerationRate	18.60	0.00
tblSolidWaste	SolidWasteGenerationRate	27.60	0.00
tblSolidWaste	SolidWasteGenerationRate	0.86	0.00
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	500.00
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	500.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	8.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	8.00
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	500.00
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	500.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	4.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	1.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	ElectricityIntensityFactorToDistribute	1,272.00	0.00
tblWater	ElectricityIntensityFactorToDistribute	1,272.00	0.00
tblWater	ElectricityIntensityFactorToDistribute	1,272.00	0.00

tblWater	ElectricityIntensityFactorToDistribute	1,272.00	0.00
tblWater	ElectricityIntensityFactorToDistribute	1,272.00	0.00
tblWater	ElectricityIntensityFactorToDistribute	1,272.00	0.00
tblWater	ElectricityIntensityFactorToDistribute	1,272.00	0.00
tblWater	ElectricityIntensityFactorToSupply	9,727.00	0.00
tblWater	ElectricityIntensityFactorToSupply	9,727.00	0.00
tblWater	ElectricityIntensityFactorToSupply	9,727.00	0.00
tblWater	ElectricityIntensityFactorToSupply	9,727.00	0.00
tblWater	ElectricityIntensityFactorToSupply	9,727.00	0.00
tblWater	ElectricityIntensityFactorToSupply	9,727.00	0.00
tblWater	ElectricityIntensityFactorToSupply	9,727.00	0.00
tblWater	ElectricityIntensityFactorToTreat	111.00	0.00
tblWater	ElectricityIntensityFactorToTreat	111.00	0.00
tblWater	ElectricityIntensityFactorToTreat	111.00	0.00
tblWater	ElectricityIntensityFactorToTreat	111.00	0.00
tblWater	ElectricityIntensityFactorToTreat	111.00	0.00
tblWater	ElectricityIntensityFactorToTreat	111.00	0.00
tblWater	ElectricityIntensityFactorToTreat	111.00	0.00
tblWater	IndoorWaterUseRate	39,622.92	0.00
tblWater	IndoorWaterUseRate	425,020.45	0.00
tblWater	IndoorWaterUseRate	6,937,500.00	0.00
tblWater	IndoorWaterUseRate	60,251,740.57	700,000.00
tblWater	IndoorWaterUseRate	3,973,193.72	0.00
tblWater	IndoorWaterUseRate	16,288,506.41	0.00
tblWater	IndoorWaterUseRate	3,909,241.54	0.00
tblWater	OutdoorWaterUseRate	24,285.01	0.00
tblWater	OutdoorWaterUseRate	260,496.40	0.00

tblWater	OutdoorWaterUseRate	36,928,486.16	0.00
tblWater	OutdoorWaterUseRate	2,435,183.25	0.00
tblWater	OutdoorWaterUseRate	10,268,840.99	0.00
tblWater	OutdoorWaterUseRate	2,464,521.84	0.00
tblWater	OutdoorWaterUseRate	11,914,813.50	0.00
tblWoodstoves	NumberCatalytic	12.50	0.00
tblWoodstoves	NumberCatalytic	3.00	0.00
tblWoodstoves	NumberNoncatalytic	12.50	0.00
tblWoodstoves	NumberNoncatalytic	3.00	0.00
tblWoodstoves	WoodstoveDayYear	82.00	0.00
tblWoodstoves	WoodstoveDayYear	82.00	0.00
tblWoodstoves	WoodstoveWoodMass	3,019.20	0.00
tblWoodstoves	WoodstoveWoodMass	3,019.20	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	5.4250	6.9925	5.3499	0.0131	1.5586	0.2925	1.8511	0.5566	0.2720	0.8286	0.0000	1,197.7763	1,197.7763	0.1883	0.0000	1,202.4844
2020	8.4872	5.3064	5.0156	0.0141	0.5712	0.1917	0.7629	0.1545	0.1798	0.3343	0.0000	1,278.9663	1,278.9663	0.1505	0.0000	1,282.7286
Maximum	**8.4872**	**6.9925**	**5.3499**	**0.0141**	**1.5586**	**0.2925**	**1.8511**	**0.5566**	**0.2720**	**0.8286**	**0.0000**	**1,278.9663**	**1,278.9663**	**0.1883**	**0.0000**	**1,282.7286**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	5.4250	6.9925	5.3499	0.0131	0.9351	0.2925	1.2276	0.3137	0.2720	0.5858	0.0000	1,197.7757	1,197.7757	0.1883	0.0000	1,202.4838
2020	8.4872	5.3064	5.0156	0.0141	0.5712	0.1917	0.7629	0.1545	0.1798	0.3343	0.0000	1,278.9659	1,278.9659	0.1505	0.0000	1,282.7281
Maximum	**8.4872**	**6.9925**	**5.3499**	**0.0141**	**0.9351**	**0.2925**	**1.2276**	**0.3137**	**0.2720**	**0.5858**	**0.0000**	**1,278.9659**	**1,278.9659**	**0.1883**	**0.0000**	**1,282.7281**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**29.27**	**0.00**	**23.85**	**34.15**	**0.00**	**20.88**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	2-1-2019	4-30-2019	1.7394	1.7394
2	5-1-2019	7-31-2019	2.5232	2.5232
3	8-1-2019	10-31-2019	4.1903	4.1903
4	11-1-2019	1-31-2020	5.8856	5.8856
5	2-1-2020	4-30-2020	5.6345	5.6345
6	5-1-2020	7-31-2020	4.7257	4.7257
7	8-1-2020	9-30-2020	0.9406	0.9406
		Highest	5.8856	5.8856

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.8623	0.0268	2.3134	1.2000e-004		0.0127	0.0127		0.0127	0.0127	0.0000	3.7677	3.7677	3.6900e-003	0.0000	3.8598
Energy	0.0128	0.1160	0.0975	7.0000e-004		8.8200e-003	8.8200e-003		8.8200e-003	8.8200e-003	0.0000	1,326.8994	1,326.8994	0.0520	0.0126	1,331.9452
Mobile	3.6692	25.8163	34.7324	0.1150	7.5440	0.1026	7.6466	2.0221	0.0965	2.1186	0.0000	10,659.9800	10,659.9800	0.7435	0.0000	10,678.5678
Stationary	1.0257	2.8667	2.6152	4.9300e-003		0.1509	0.1509		0.1509	0.1509	0.0000	475.9965	475.9965	0.0667	0.0000	477.6649
Waste						0.0000	0.0000		0.0000	0.0000	2.0299	0.0000	2.0299	0.1200	0.0000	5.0290
Water						0.0000	0.0000		0.0000	0.0000	0.2221	2.9041	3.1262	0.0229	5.6000e-004	3.8673
Total	**9.5699**	**28.8257**	**39.7585**	**0.1207**	**7.5440**	**0.2750**	**7.8190**	**2.0221**	**0.2689**	**2.2910**	**2.2520**	**12,469.5477**	**12,471.7997**	**1.0088**	**0.0131**	**12,500.9340**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.8623	0.0268	2.3134	1.2000e-004		0.0127	0.0127		0.0127	0.0127	0.0000	3.7677	3.7677	3.6900e-003	0.0000	3.8598
Energy	0.0128	0.1160	0.0975	7.0000e-004		8.8200e-003	8.8200e-003		8.8200e-003	8.8200e-003	0.0000	1,318.3124	1,318.3124	0.0516	0.0125	1,323.3275
Mobile	3.6692	25.8163	34.7324	0.1150	7.5440	0.1026	7.6466	2.0221	0.0965	2.1186	0.0000	10,659.9800	10,659.9800	0.7435	0.0000	10,678.5678
Stationary	1.0257	2.8667	2.6152	4.9300e-003		0.1509	0.1509		0.1509	0.1509	0.0000	475.9965	475.9965	0.0667	0.0000	477.6649
Waste						0.0000	0.0000		0.0000	0.0000	1.4209	0.0000	1.4209	0.0840	0.0000	3.5203
Water						0.0000	0.0000		0.0000	0.0000	0.1777	2.3233	2.5010	0.0183	4.5000e-004	3.0939
Total	**9.5699**	**28.8257**	**39.7585**	**0.1207**	**7.5440**	**0.2750**	**7.8190**	**2.0221**	**0.2689**	**2.2910**	**1.5986**	**12,460.3799**	**12,461.9785**	**0.9679**	**0.0130**	**12,490.0341**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**29.01**	**0.07**	**0.08**	**4.06**	**1.37**	**0.09**

3.0 Construction Detail

Construction Phase

Ft Irwin NTC - Dense Urban Terrain Compex - Buildings - San Bernardino-Mojave Desert County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	2/1/2019	1/31/2019	5	0	
2	Site Preparation	Site Preparation	2/1/2019	5/1/2019	5	64	
3	Grading	Grading	4/24/2019	6/28/2019	5	48	
4	Building Construction	Building Construction	5/19/2019	10/30/2020	5	380	
5	Paving	Paving	8/30/2019	7/2/2020	5	220	
6	Architectural Coating	Architectural Coating	9/8/2019	7/10/2020	5	220	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 775

Acres of Paving: 0

Residential Indoor: 1,032,750; Residential Outdoor: 344,250; Non-Residential Indoor: 591,776; Non-Residential Outdoor: 197,259; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Ft Irwin NTC - Dense Urban Terrain Compex - Buildings - San Bernardino-Mojave Desert County, Annual

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	0	0.00	81	0.73
Demolition	Rubber Tired Dozers	0	0.00	247	0.40
Demolition	Excavators	0	0.00	158	0.38
Grading	Excavators	2	8.00	158	0.38
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Building Construction	Generator Sets	1	8.00	84	0.74
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Paving	Paving Equipment	2	8.00	132	0.36
Architectural Coating	Air Compressors	1	6.00	78	0.48
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	0	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	445.00	169.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	89.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Demolition - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Demolition - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Site Preparation - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5781	0.0000	0.5781	0.3178	0.0000	0.3178	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1387	1.4583	0.7060	1.2200e-003		0.0765	0.0765		0.0704	0.0704	0.0000	109.3398	109.3398	0.0346	0.0000	110.2046
Total	**0.1387**	**1.4583**	**0.7060**	**1.2200e-003**	**0.5781**	**0.0765**	**0.6546**	**0.3178**	**0.0704**	**0.3882**	**0.0000**	**109.3398**	**109.3398**	**0.0346**	**0.0000**	**110.2046**

3.3 Site Preparation - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.4700e-003	1.9200e-003	0.0192	5.0000e-005	4.6400e-003	3.0000e-005	4.6700e-003	1.2300e-003	3.0000e-005	1.2600e-003	0.0000	4.1371	4.1371	1.4000e-004	0.0000	4.1406
Total	**2.4700e-003**	**1.9200e-003**	**0.0192**	**5.0000e-005**	**4.6400e-003**	**3.0000e-005**	**4.6700e-003**	**1.2300e-003**	**3.0000e-005**	**1.2600e-003**	**0.0000**	**4.1371**	**4.1371**	**1.4000e-004**	**0.0000**	**4.1406**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2602	0.0000	0.2602	0.1430	0.0000	0.1430	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1387	1.4583	0.7060	1.2200e-003		0.0765	0.0765		0.0704	0.0704	0.0000	109.3397	109.3397	0.0346	0.0000	110.2045
Total	**0.1387**	**1.4583**	**0.7060**	**1.2200e-003**	**0.2602**	**0.0765**	**0.3366**	**0.1430**	**0.0704**	**0.2134**	**0.0000**	**109.3397**	**109.3397**	**0.0346**	**0.0000**	**110.2045**

3.3 Site Preparation - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.4700e-003	1.9200e-003	0.0192	5.0000e-005	4.6400e-003	3.0000e-005	4.6700e-003	1.2300e-003	3.0000e-005	1.2600e-003	0.0000	4.1371	4.1371	1.4000e-004	0.0000	4.1406
Total	**2.4700e-003**	**1.9200e-003**	**0.0192**	**5.0000e-005**	**4.6400e-003**	**3.0000e-005**	**4.6700e-003**	**1.2300e-003**	**3.0000e-005**	**1.2600e-003**	**0.0000**	**4.1371**	**4.1371**	**1.4000e-004**	**0.0000**	**4.1406**

3.4 Grading - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5555	0.0000	0.5555	0.1238	0.0000	0.1238	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1137	1.3085	0.8010	1.4900e-003		0.0572	0.0572		0.0526	0.0526	0.0000	133.6832	133.6832	0.0423	0.0000	134.7406
Total	**0.1137**	**1.3085**	**0.8010**	**1.4900e-003**	**0.5555**	**0.0572**	**0.6127**	**0.1238**	**0.0526**	**0.1764**	**0.0000**	**133.6832**	**133.6832**	**0.0423**	**0.0000**	**134.7406**

3.4 Grading - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0600e-003	1.6000e-003	0.0160	4.0000e-005	3.8700e-003	3.0000e-005	3.9000e-003	1.0300e-003	3.0000e-005	1.0500e-003	0.0000	3.4476	3.4476	1.2000e-004	0.0000	3.4505
Total	**2.0600e-003**	**1.6000e-003**	**0.0160**	**4.0000e-005**	**3.8700e-003**	**3.0000e-005**	**3.9000e-003**	**1.0300e-003**	**3.0000e-005**	**1.0500e-003**	**0.0000**	**3.4476**	**3.4476**	**1.2000e-004**	**0.0000**	**3.4505**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2500	0.0000	0.2500	0.0557	0.0000	0.0557	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1137	1.3085	0.8010	1.4900e-003		0.0572	0.0572		0.0526	0.0526	0.0000	133.6830	133.6830	0.0423	0.0000	134.7404
Total	**0.1137**	**1.3085**	**0.8010**	**1.4900e-003**	**0.2500**	**0.0572**	**0.3071**	**0.0557**	**0.0526**	**0.1083**	**0.0000**	**133.6830**	**133.6830**	**0.0423**	**0.0000**	**134.7404**

3.4 Grading - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0600e-003	1.6000e-003	0.0160	4.0000e-005	3.8700e-003	3.0000e-005	3.9000e-003	1.0300e-003	3.0000e-005	1.0500e-003	0.0000	3.4476	3.4476	1.2000e-004	0.0000	3.4505
Total	**2.0600e-003**	**1.6000e-003**	**0.0160**	**4.0000e-005**	**3.8700e-003**	**3.0000e-005**	**3.9000e-003**	**1.0300e-003**	**3.0000e-005**	**1.0500e-003**	**0.0000**	**3.4476**	**3.4476**	**1.2000e-004**	**0.0000**	**3.4505**

3.5 Building Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1913	1.7074	1.3903	2.1800e-003		0.1045	0.1045		0.0982	0.0982	0.0000	190.4344	190.4344	0.0464	0.0000	191.5942
Total	**0.1913**	**1.7074**	**1.3903**	**2.1800e-003**		**0.1045**	**0.1045**		**0.0982**	**0.0982**	**0.0000**	**190.4344**	**190.4344**	**0.0464**	**0.0000**	**191.5942**

3.5 Building Construction - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0515	1.6344	0.3540	3.8300e-003	0.0913	0.0105	0.1017	0.0264	0.0100	0.0363	0.0000	366.3315	366.3315	0.0256	0.0000	366.9709
Worker	0.1544	0.1200	1.1993	2.8700e-003	0.2905	2.0600e-003	0.2925	0.0772	1.8900e-003	0.0791	0.0000	258.8940	258.8940	8.7700e-003	0.0000	259.1134
Total	**0.2059**	**1.7545**	**1.5533**	**6.7000e-003**	**0.3818**	**0.0125**	**0.3943**	**0.1035**	**0.0119**	**0.1154**	**0.0000**	**625.2256**	**625.2256**	**0.0344**	**0.0000**	**626.0843**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1913	1.7074	1.3903	2.1800e-003		0.1045	0.1045		0.0982	0.0982	0.0000	190.4342	190.4342	0.0464	0.0000	191.5940
Total	**0.1913**	**1.7074**	**1.3903**	**2.1800e-003**		**0.1045**	**0.1045**		**0.0982**	**0.0982**	**0.0000**	**190.4342**	**190.4342**	**0.0464**	**0.0000**	**191.5940**

3.5 Building Construction - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0515	1.6344	0.3540	3.8300e-003	0.0913	0.0105	0.1017	0.0264	0.0100	0.0363	0.0000	366.3315	366.3315	0.0256	0.0000	366.9709
Worker	0.1544	0.1200	1.1993	2.8700e-003	0.2905	2.0600e-003	0.2925	0.0772	1.8900e-003	0.0791	0.0000	258.8940	258.8940	8.7700e-003	0.0000	259.1134
Total	**0.2059**	**1.7545**	**1.5533**	**6.7000e-003**	**0.3818**	**0.0125**	**0.3943**	**0.1035**	**0.0119**	**0.1154**	**0.0000**	**625.2256**	**625.2256**	**0.0344**	**0.0000**	**626.0843**

3.5 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2311	2.0913	1.8365	2.9300e-003		0.1218	0.1218		0.1145	0.1145	0.0000	252.4549	252.4549	0.0616	0.0000	253.9946
Total	**0.2311**	**2.0913**	**1.8365**	**2.9300e-003**		**0.1218**	**0.1218**		**0.1145**	**0.1145**	**0.0000**	**252.4549**	**252.4549**	**0.0616**	**0.0000**	**253.9946**

3.5 Building Construction - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0587	2.0063	0.4199	5.1200e-003	0.1229	9.4800e-003	0.1323	0.0355	9.0700e-003	0.0445	0.0000	489.5505	489.5505	0.0329	0.0000	490.3719
Worker	0.1912	0.1433	1.4523	3.7400e-003	0.3909	2.7000e-003	0.3936	0.1038	2.4800e-003	0.1063	0.0000	337.5344	337.5344	0.0104	0.0000	337.7943
Total	**0.2499**	**2.1496**	**1.8722**	**8.8600e-003**	**0.5137**	**0.0122**	**0.5259**	**0.1393**	**0.0116**	**0.1508**	**0.0000**	**827.0849**	**827.0849**	**0.0433**	**0.0000**	**828.1662**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2311	2.0913	1.8365	2.9300e-003		0.1218	0.1218		0.1145	0.1145	0.0000	252.4546	252.4546	0.0616	0.0000	253.9943
Total	**0.2311**	**2.0913**	**1.8365**	**2.9300e-003**		**0.1218**	**0.1218**		**0.1145**	**0.1145**	**0.0000**	**252.4546**	**252.4546**	**0.0616**	**0.0000**	**253.9943**

3.5 Building Construction - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0587	2.0063	0.4199	5.1200e-003	0.1229	9.4800e-003	0.1323	0.0355	9.0700e-003	0.0445	0.0000	489.5505	489.5505	0.0329	0.0000	490.3719
Worker	0.1912	0.1433	1.4523	3.7400e-003	0.3909	2.7000e-003	0.3936	0.1038	2.4800e-003	0.1063	0.0000	337.5344	337.5344	0.0104	0.0000	337.7943
Total	**0.2499**	**2.1496**	**1.8722**	**8.8600e-003**	**0.5137**	**0.0122**	**0.5259**	**0.1393**	**0.0116**	**0.1508**	**0.0000**	**827.0849**	**827.0849**	**0.0433**	**0.0000**	**828.1662**

3.6 Paving - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0640	0.6707	0.6453	1.0000e-003		0.0363	0.0363		0.0334	0.0334	0.0000	90.0908	90.0908	0.0285	0.0000	90.8034
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0640**	**0.6707**	**0.6453**	**1.0000e-003**		**0.0363**	**0.0363**		**0.0334**	**0.0334**	**0.0000**	**90.0908**	**90.0908**	**0.0285**	**0.0000**	**90.8034**

3.6 Paving - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.8300e-003	2.2000e-003	0.0220	5.0000e-005	5.3200e-003	4.0000e-005	5.3600e-003	1.4100e-003	3.0000e-005	1.4500e-003	0.0000	4.7405	4.7405	1.6000e-004	0.0000	4.7445
Total	**2.8300e-003**	**2.2000e-003**	**0.0220**	**5.0000e-005**	**5.3200e-003**	**4.0000e-005**	**5.3600e-003**	**1.4100e-003**	**3.0000e-005**	**1.4500e-003**	**0.0000**	**4.7405**	**4.7405**	**1.6000e-004**	**0.0000**	**4.7445**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0640	0.6707	0.6453	1.0000e-003		0.0363	0.0363		0.0334	0.0334	0.0000	90.0907	90.0907	0.0285	0.0000	90.8033
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0640**	**0.6707**	**0.6453**	**1.0000e-003**		**0.0363**	**0.0363**		**0.0334**	**0.0334**	**0.0000**	**90.0907**	**90.0907**	**0.0285**	**0.0000**	**90.8033**

3.6 Paving - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.8300e-003	2.2000e-003	0.0220	5.0000e-005	5.3200e-003	4.0000e-005	5.3600e-003	1.4100e-003	3.0000e-005	1.4500e-003	0.0000	4.7405	4.7405	1.6000e-004	0.0000	4.7445
Total	**2.8300e-003**	**2.2000e-003**	**0.0220**	**5.0000e-005**	**5.3200e-003**	**4.0000e-005**	**5.3600e-003**	**1.4100e-003**	**3.0000e-005**	**1.4500e-003**	**0.0000**	**4.7405**	**4.7405**	**1.6000e-004**	**0.0000**	**4.7445**

3.6 Paving - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0895	0.9283	0.9670	1.5000e-003		0.0497	0.0497		0.0457	0.0457	0.0000	132.1863	132.1863	0.0428	0.0000	133.2551
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0895**	**0.9283**	**0.9670**	**1.5000e-003**		**0.0497**	**0.0497**		**0.0457**	**0.0457**	**0.0000**	**132.1863**	**132.1863**	**0.0428**	**0.0000**	**133.2551**

3.6 Paving - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.9000e-003	2.9300e-003	0.0296	8.0000e-005	7.9800e-003	6.0000e-005	8.0300e-003	2.1200e-003	5.0000e-005	2.1700e-003	0.0000	6.8892	6.8892	2.1000e-004	0.0000	6.8945
Total	**3.9000e-003**	**2.9300e-003**	**0.0296**	**8.0000e-005**	**7.9800e-003**	**6.0000e-005**	**8.0300e-003**	**2.1200e-003**	**5.0000e-005**	**2.1700e-003**	**0.0000**	**6.8892**	**6.8892**	**2.1000e-004**	**0.0000**	**6.8945**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0895	0.9283	0.9670	1.5000e-003		0.0497	0.0497		0.0457	0.0457	0.0000	132.1861	132.1861	0.0428	0.0000	133.2549
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0895**	**0.9283**	**0.9670**	**1.5000e-003**		**0.0497**	**0.0497**		**0.0457**	**0.0457**	**0.0000**	**132.1861**	**132.1861**	**0.0428**	**0.0000**	**133.2549**

3.6 Paving - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.9000e-003	2.9300e-003	0.0296	8.0000e-005	7.9800e-003	6.0000e-005	8.0300e-003	2.1200e-003	5.0000e-005	2.1700e-003	0.0000	6.8892	6.8892	2.1000e-004	0.0000	6.8945
Total	**3.9000e-003**	**2.9300e-003**	**0.0296**	**8.0000e-005**	**7.9800e-003**	**6.0000e-005**	**8.0300e-003**	**2.1200e-003**	**5.0000e-005**	**2.1700e-003**	**0.0000**	**6.8892**	**6.8892**	**2.1000e-004**	**0.0000**	**6.8945**

3.7 Architectural Coating - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	4.6775					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0109	0.0753	0.0755	1.2000e-004		5.2800e-003	5.2800e-003		5.2800e-003	5.2800e-003	0.0000	10.4683	10.4683	8.8000e-004	0.0000	10.4904
Total	**4.6885**	**0.0753**	**0.0755**	**1.2000e-004**		**5.2800e-003**	**5.2800e-003**		**5.2800e-003**	**5.2800e-003**	**0.0000**	**10.4683**	**10.4683**	**8.8000e-004**	**0.0000**	**10.4904**

3.7 Architectural Coating - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0156	0.0122	0.1214	2.9000e-004	0.0294	2.1000e-004	0.0296	7.8100e-003	1.9000e-004	8.0000e-003	0.0000	26.2090	26.2090	8.9000e-004	0.0000	26.2312
Total	**0.0156**	**0.0122**	**0.1214**	**2.9000e-004**	**0.0294**	**2.1000e-004**	**0.0296**	**7.8100e-003**	**1.9000e-004**	**8.0000e-003**	**0.0000**	**26.2090**	**26.2090**	**8.9000e-004**	**0.0000**	**26.2312**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	4.6775					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0109	0.0753	0.0755	1.2000e-004		5.2800e-003	5.2800e-003		5.2800e-003	5.2800e-003	0.0000	10.4683	10.4683	8.8000e-004	0.0000	10.4904
Total	**4.6885**	**0.0753**	**0.0755**	**1.2000e-004**		**5.2800e-003**	**5.2800e-003**		**5.2800e-003**	**5.2800e-003**	**0.0000**	**10.4683**	**10.4683**	**8.8000e-004**	**0.0000**	**10.4904**

3.7 Architectural Coating - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0156	0.0122	0.1214	2.9000e-004	0.0294	2.1000e-004	0.0296	7.8100e-003	1.9000e-004	8.0000e-003	0.0000	26.2090	26.2090	8.9000e-004	0.0000	26.2312
Total	**0.0156**	**0.0122**	**0.1214**	**2.9000e-004**	**0.0294**	**2.1000e-004**	**0.0296**	**7.8100e-003**	**1.9000e-004**	**8.0000e-003**	**0.0000**	**26.2090**	**26.2090**	**8.9000e-004**	**0.0000**	**26.2312**

3.7 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	7.8719					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0167	0.1162	0.1264	2.1000e-004		7.6500e-003	7.6500e-003		7.6500e-003	7.6500e-003	0.0000	17.6175	17.6175	1.3600e-003	0.0000	17.6516
Total	**7.8887**	**0.1162**	**0.1264**	**2.1000e-004**		**7.6500e-003**	**7.6500e-003**		**7.6500e-003**	**7.6500e-003**	**0.0000**	**17.6175**	**17.6175**	**1.3600e-003**	**0.0000**	**17.6516**

3.7 Architectural Coating - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0242	0.0182	0.1839	4.7000e-004	0.0495	3.4000e-004	0.0498	0.0131	3.1000e-004	0.0135	0.0000	42.7337	42.7337	1.3200e-003	0.0000	42.7666
Total	**0.0242**	**0.0182**	**0.1839**	**4.7000e-004**	**0.0495**	**3.4000e-004**	**0.0498**	**0.0131**	**3.1000e-004**	**0.0135**	**0.0000**	**42.7337**	**42.7337**	**1.3200e-003**	**0.0000**	**42.7666**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	7.8719					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0167	0.1162	0.1264	2.1000e-004		7.6500e-003	7.6500e-003		7.6500e-003	7.6500e-003	0.0000	17.6174	17.6174	1.3600e-003	0.0000	17.6515
Total	**7.8887**	**0.1162**	**0.1264**	**2.1000e-004**		**7.6500e-003**	**7.6500e-003**		**7.6500e-003**	**7.6500e-003**	**0.0000**	**17.6174**	**17.6174**	**1.3600e-003**	**0.0000**	**17.6515**

3.7 Architectural Coating - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0242	0.0182	0.1839	4.7000e-004	0.0495	3.4000e-004	0.0498	0.0131	3.1000e-004	0.0135	0.0000	42.7337	42.7337	1.3200e-003	0.0000	42.7666
Total	**0.0242**	**0.0182**	**0.1839**	**4.7000e-004**	**0.0495**	**3.4000e-004**	**0.0498**	**0.0131**	**3.1000e-004**	**0.0135**	**0.0000**	**42.7337**	**42.7337**	**1.3200e-003**	**0.0000**	**42.7666**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	3.6692	25.8163	34.7324	0.1150	7.5440	0.1026	7.6466	2.0221	0.0965	2.1186	0.0000	10,659.9800	10,659.9800	0.7435	0.0000	10,678.5678
Unmitigated	3.6692	25.8163	34.7324	0.1150	7.5440	0.1026	7.6466	2.0221	0.0965	2.1186	0.0000	10,659.9800	10,659.9800	0.7435	0.0000	10,678.5678

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Bank (with Drive-Through)	148.15	86.32	31.90	113,504	113,504
Gasoline/Service Station	5,393.92	5,393.92	5393.92	3,107,806	3,107,806
General Heavy Industry	45.00	45.00	45.00	131,378	131,378
General Office Building	3,739.17	833.94	355.95	6,788,858	6,788,858
Government Office Building	1,378.60	0.00	0.00	1,688,667	1,688,667
Single Family Housing	2,380.00	2,477.50	2155.00	6,707,755	6,707,755
Apartments Low Rise	395.40	429.60	364.20	1,124,201	1,124,201
City Park	18.90	227.50	167.40	149,257	149,257
Total	13,499.14	9,493.78	8,513.37	19,811,425	19,811,425

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Bank (with Drive-Through)	9.50	7.30	7.30	6.60	74.40	19.00	27	26	47
Gasoline/Service Station	9.50	7.30	7.30	2.00	79.00	19.00	14	27	59
General Heavy Industry	9.50	7.30	7.30	59.00	28.00	13.00	92	5	3
General Office Building	9.50	7.30	7.30	33.00	48.00	19.00	77	19	4
Government Office Building	9.50	7.30	7.30	33.00	62.00	5.00	50	34	16
Single Family Housing	10.80	7.30	7.50	40.20	19.20	40.60	86	11	3
Apartments Low Rise	10.80	7.30	7.50	40.20	19.20	40.60	86	11	3
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Bank (with Drive-Through)	0.546179	0.037976	0.179086	0.122965	0.018430	0.005460	0.017497	0.061396	0.001337	0.001657	0.006117	0.000817	0.001082
Gasoline/Service Station	0.546179	0.037976	0.179086	0.122965	0.018430	0.005460	0.017497	0.061396	0.001337	0.001657	0.006117	0.000817	0.001082
General Heavy Industry	0.546179	0.037976	0.179086	0.122965	0.018430	0.005460	0.017497	0.061396	0.001337	0.001657	0.006117	0.000817	0.001082
General Office Building	0.546179	0.037976	0.179086	0.122965	0.018430	0.005460	0.017497	0.061396	0.001337	0.001657	0.006117	0.000817	0.001082
Government Office Building	0.546179	0.037976	0.179086	0.122965	0.018430	0.005460	0.017497	0.061396	0.001337	0.001657	0.006117	0.000817	0.001082
Single Family Housing	0.546179	0.037976	0.179086	0.122965	0.018430	0.005460	0.017497	0.061396	0.001337	0.001657	0.006117	0.000817	0.001082
Apartments Low Rise	0.546179	0.037976	0.179086	0.122965	0.018430	0.005460	0.017497	0.061396	0.001337	0.001657	0.006117	0.000817	0.001082
City Park	0.546179	0.037976	0.179086	0.122965	0.018430	0.005460	0.017497	0.061396	0.001337	0.001657	0.006117	0.000817	0.001082

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Exceed Title 24

Install High Efficiency Lighting

Install Energy Efficient Appliances

Ft Irwin NTC - Dense Urban Terrain Compex - Buildings - San Bernardino-Mojave Desert County, Annual

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,191.9892	1,191.9892	0.0492	0.0102	1,196.2536
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,200.5763	1,200.5763	0.0496	0.0103	1,204.8713
NaturalGas Mitigated	0.0128	0.1160	0.0975	7.0000e-004		8.8200e-003	8.8200e-003		8.8200e-003	8.8200e-003	0.0000	126.3232	126.3232	2.4200e-003	2.3200e-003	127.0739
NaturalGas Unmitigated	0.0128	0.1160	0.0975	7.0000e-004		8.8200e-003	8.8200e-003		8.8200e-003	8.8200e-003	0.0000	126.3232	126.3232	2.4200e-003	2.3200e-003	127.0739

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Low Rise	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bank (with Drive-Through)	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Gasoline/Service Station	146777	7.9000e-004	7.1900e-003	6.0400e-003	4.0000e-005		5.5000e-004	5.5000e-004		5.5000e-004	5.5000e-004	0.0000	7.8326	7.8326	1.5000e-004	1.4000e-004	7.8791
General Heavy Industry	974700	5.2600e-003	0.0478	0.0401	2.9000e-004		3.6300e-003	3.6300e-003		3.6300e-003	3.6300e-003	0.0000	52.0137	52.0137	1.0000e-003	9.5000e-004	52.3228
General Office Building	1.17633e+006	6.3400e-003	0.0577	0.0484	3.5000e-004		4.3800e-003	4.3800e-003		4.3800e-003	4.3800e-003	0.0000	62.7735	62.7735	1.2000e-003	1.1500e-003	63.1465
Government Office Building	69400	3.7000e-004	3.4000e-003	2.8600e-003	2.0000e-005		2.6000e-004	2.6000e-004		2.6000e-004	2.6000e-004	0.0000	3.7035	3.7035	7.0000e-005	7.0000e-005	3.7255
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0128**	**0.1160**	**0.0975**	**7.0000e-004**		**8.8200e-003**	**8.8200e-003**		**8.8200e-003**	**8.8200e-003**	**0.0000**	**126.3232**	**126.3232**	**2.4200e-003**	**2.3100e-003**	**127.0739**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Low Rise	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bank (with Drive-Through)	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Gasoline/Service Station	146777	7.9000e-004	7.1900e-003	6.0400e-003	4.0000e-005		5.5000e-004	5.5000e-004		5.5000e-004	5.5000e-004	0.0000	7.8326	7.8326	1.5000e-004	1.4000e-004	7.8791
General Heavy Industry	974700	5.2600e-003	0.0478	0.0401	2.9000e-004		3.6300e-003	3.6300e-003		3.6300e-003	3.6300e-003	0.0000	52.0137	52.0137	1.0000e-003	9.5000e-004	52.3228
General Office Building	1.17633e+006	6.3400e-003	0.0577	0.0484	3.5000e-004		4.3800e-003	4.3800e-003		4.3800e-003	4.3800e-003	0.0000	62.7735	62.7735	1.2000e-003	1.1500e-003	63.1465
Government Office Building	69400	3.7000e-004	3.4000e-003	2.8600e-003	2.0000e-005		2.6000e-004	2.6000e-004		2.6000e-004	2.6000e-004	0.0000	3.7035	3.7035	7.0000e-005	7.0000e-005	3.7255
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0128**	**0.1160**	**0.0975**	**7.0000e-004**		**8.8200e-003**	**8.8200e-003**		**8.8200e-003**	**8.8200e-003**	**0.0000**	**126.3232**	**126.3232**	**2.4200e-003**	**2.3100e-003**	**127.0739**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Low Rise	0	0.0000	0.0000	0.0000	0.0000
Bank (with Drive-Through)	0	0.0000	0.0000	0.0000	0.0000
City Park	0	0.0000	0.0000	0.0000	0.0000
Gasoline/Service Station	45853.6	14.6100	6.0000e-004	1.2000e-004	14.6622
General Heavy Industry	304500	97.0202	4.0100e-003	8.3000e-004	97.3673
General Office Building	3.22728e+006	1,028.2806	0.0425	8.7800e-003	1,031.9593
Government Office Building	190400	60.6655	2.5000e-003	5.2000e-004	60.8826
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Total		**1,200.5762**	**0.0496**	**0.0103**	**1,204.8713**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Low Rise	0	0.0000	0.0000	0.0000	0.0000
Bank (with Drive-Through)	0	0.0000	0.0000	0.0000	0.0000
City Park	0	0.0000	0.0000	0.0000	0.0000
Gasoline/Service Station	45853.6	14.6100	6.0000e-004	1.2000e-004	14.6622
General Heavy Industry	304500	97.0202	4.0100e-003	8.3000e-004	97.3673
General Office Building	3.20033e+006	1,019.6935	0.0421	8.7100e-003	1,023.3415
Government Office Building	190400	60.6655	2.5000e-003	5.2000e-004	60.8826
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Total		**1,191.9892**	**0.0492**	**0.0102**	**1,196.2536**

6.0 Area Detail

6.1 Mitigation Measures Area

Ft Irwin NTC - Dense Urban Terrain Compex - Buildings - San Bernardino-Mojave Desert County, Annual

Use Low VOC Paint - Residential Interior

Use Low VOC Paint - Residential Exterior

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

No Hearths Installed

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.8623	0.0268	2.3134	1.2000e-004		0.0127	0.0127		0.0127	0.0127	0.0000	3.7677	3.7677	3.6900e-003	0.0000	3.8598
Unmitigated	4.8623	0.0268	2.3134	1.2000e-004		0.0127	0.0127		0.0127	0.0127	0.0000	3.7677	3.7677	3.6900e-003	0.0000	3.8598

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.2550					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.5367					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0707	0.0268	2.3134	1.2000e-004		0.0127	0.0127		0.0127	0.0127	0.0000	3.7677	3.7677	3.6900e-003	0.0000	3.8598
Total	**4.8623**	**0.0268**	**2.3134**	**1.2000e-004**		**0.0127**	**0.0127**		**0.0127**	**0.0127**	**0.0000**	**3.7677**	**3.7677**	**3.6900e-003**	**0.0000**	**3.8598**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.2550					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.5367					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0707	0.0268	2.3134	1.2000e-004		0.0127	0.0127		0.0127	0.0127	0.0000	3.7677	3.7677	3.6900e-003	0.0000	3.8598
Total	**4.8623**	**0.0268**	**2.3134**	**1.2000e-004**		**0.0127**	**0.0127**		**0.0127**	**0.0127**	**0.0000**	**3.7677**	**3.7677**	**3.6900e-003**	**0.0000**	**3.8598**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Ft Irwin NTC - Dense Urban Terrain Compex - Buildings - San Bernardino-Mojave Desert County, Annual

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	2.5010	0.0183	4.5000e-004	3.0939
Unmitigated	3.1262	0.0229	5.6000e-004	3.8673

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Low Rise	0 / 0	0.0000	0.0000	0.0000	0.0000
Bank (with Drive-Through)	0 / 0	0.0000	0.0000	0.0000	0.0000
City Park	0 / 0	0.0000	0.0000	0.0000	0.0000
Gasoline/Service Station	0 / 0	0.0000	0.0000	0.0000	0.0000
General Heavy Industry	0 / 0	0.0000	0.0000	0.0000	0.0000
General Office Building	0.7 / 0	3.1262	0.0229	5.6000e-004	3.8673
Government Office Building	0 / 0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**3.1262**	**0.0229**	**5.6000e-004**	**3.8673**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Low Rise	0 / 0	0.0000	0.0000	0.0000	0.0000
Bank (with Drive-Through)	0 / 0	0.0000	0.0000	0.0000	0.0000
City Park	0 / 0	0.0000	0.0000	0.0000	0.0000
Gasoline/Service Station	0 / 0	0.0000	0.0000	0.0000	0.0000
General Heavy Industry	0 / 0	0.0000	0.0000	0.0000	0.0000
General Office Building	0.56 / 0	2.5010	0.0183	4.5000e-004	3.0939
Government Office Building	0 / 0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**2.5010**	**0.0183**	**4.5000e-004**	**3.0939**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	1.4209	0.0840	0.0000	3.5203
Unmitigated	2.0299	0.1200	0.0000	5.0290

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Low Rise	0	0.0000	0.0000	0.0000	0.0000
Bank (with Drive-Through)	0	0.0000	0.0000	0.0000	0.0000
City Park	0	0.0000	0.0000	0.0000	0.0000
Gasoline/Service Station	0	0.0000	0.0000	0.0000	0.0000
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000
General Office Building	10	2.0299	0.1200	0.0000	5.0290
Government Office Building	0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Total		**2.0299**	**0.1200**	**0.0000**	**5.0290**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Low Rise	0	0.0000	0.0000	0.0000	0.0000
Bank (with Drive-Through)	0	0.0000	0.0000	0.0000	0.0000
City Park	0	0.0000	0.0000	0.0000	0.0000
Gasoline/Service Station	0	0.0000	0.0000	0.0000	0.0000
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000
General Office Building	7	1.4209	0.0840	0.0000	3.5203
Government Office Building	0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Total		**1.4209**	**0.0840**	**0.0000**	**3.5203**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	4	8	500	500	0.73	Diesel
Fire Pump	1	8	500	500	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Emergency Generator - Diesel (300 - 600 HP)	0.8205	2.2934	2.0922	3.9400e-003		0.1207	0.1207		0.1207	0.1207	0.0000	380.7972	380.7972	0.0534	0.0000	382.1319
Fire Pump - Diesel (300 - 600 HP)	0.2051	0.5733	0.5231	9.9000e-004		0.0302	0.0302		0.0302	0.0302	0.0000	95.1993	95.1993	0.0134	0.0000	95.5330
Total	**1.0257**	**2.8667**	**2.6152**	**4.9300e-003**		**0.1509**	**0.1509**		**0.1509**	**0.1509**	**0.0000**	**475.9965**	**475.9965**	**0.0667**	**0.0000**	**477.6649**

11.0 Vegetation