NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

March 1, 2013

Thomas Leeman
Chief, San Joaquin Valley Division
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

Dear Mr. Leeman:

The U. S. Department of Energy (DOE) is proposing to provide financial assistance to construct the Hydrogen Energy California (HECA) Integrated Gasification Combined-Cycle Polygeneration Project in western Kern County, California. The enclosed biological assessment (BA) evaluates potential effects to endangered and threatened species and designated critical habitats associated with the construction and operation of the HECA Project and the related Occidental of Elk Hills, Inc. (OEHI) Project (the proposed action). A detailed description of the proposed action and the area that would be affected by the proposed action is provided in the BA.

Formal consultation was originally initiated on February 4, 2010 with the transmittal of the draft BA. The enclosed version of the BA has been revised to address comments provided by the USFWS on August 6, 2010 and subsequent project modifications.

Although the DOE is not providing financial assistance to OEHI in connection with the OEHI Project, this BA evaluates the potential effects associated with the OEHI Project during the demonstration period as reasonably foreseeable indirect effects of the proposed agency action.

As described in the enclosed BA (*2 copies*), the proposed action may affect and is likely to adversely affect, the following species that are listed under the Endangered Species Act (ESA):

- Blunt-nosed leopard lizard;
- Giant kangaroo rat;
- Tipton kangaroo rat; and
- San Joaquin kit fox.

However, the proposed action may affect, but is not likely to adversely affect, the following species that is listed as endangered under the federal ESA:

- Buena Vista Lake shrew.

There is no designated critical habitat in the action area, and the proposed action would not affect the designated critical habitat.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507
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The current condition and locations of the affected species are described in the BA. Potential effects would include temporary and permanent loss of habitats potentially utilized by blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox associated with the proposed action. The construction, operation, and decommissioning of the HECA Project and the OEHI Project will also disturb, and in some limited instances, result in mortality of individuals. Avoidance and minimization measures are proposed or already exist that would reduce potential take of federally listed species and provide long-term beneficial effects. These measures would avoid or minimize the potential for mortality, disturbance, and habitat degradation, as well as, other potential adverse effects on federally listed species. Additional conservation measures would restore and provide permanent protection and enhancement of habitats for federally listed species in the action area. Collectively, when implemented, these measures would avoid jeopardy of the affected species, and improve opportunities for recovery of the species.

DOE requests initiation of formal consultation under Section 7(a)(2) of the ESA. We look forward to working with you towards the successful resolution of this process. Please contact me at (304) 285-5219, or contact HECA's biological consultant, Steve Leach, at (510) 874-3205 regarding this consultation request.

Sincerely,

Fred E. Pozzuto
NEPA Compliance Officer

Enclosure

CEC - Mr. B. Worl

cc w\o enclosure:

URS - Mr. S. Leach
SCS Energy - Ms. M. Mascaro

HYDROGEN ENERGY CALIFORNIA
KERN COUNTY, CALIFORNIA

BIOLOGICAL ASSESSMENT

Prepared for:
U.S. Department of Energy
Environmental Compliance Division
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URS Project Number 28068052

February 2013

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List of Acronyms

AB	Assembly Bill
ADT	average daily traffic
AFC	Application for Certification
APLIC	Avian Power Line Interaction Committee
APN	Assessor's Parcel Number
BA	Biological Assessment
bgs	below ground surface
BRMIMP	Biological Resource Mitigation Implementation and Monitoring Plan
BVWSD	Buena Vista Water Storage District
CCPI	Clean Coal Power Initiative Round 3
CD	compact disc
CDFG	California Department of Fish and Game
CEC	California Energy Commission
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO_2	carbon dioxide
CRP	CO_2 Recovery Plant
CTB	Central Tank Battery
DOE	U.S. Department of Energy
EHOF	Elk Hills Oil Field
EOR	enhanced oil recovery
ESA	Endangered Species Act
GIS	Geographic Information System
HCP	Habitat Conservation Plan
HDD	Horizontal directional drilling
HECA	Hydrogen Energy California
I-5	Interstate 5
KRFCC	Kern River Flood Control Channel
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OEHI	Occidental of Elk Hills, Incorporated
petcoke	petroleum coke
PG&E	Pacific Gas and Electric Company
Project	HECA power generating facility
RCF	Reinjection Compression Facility
ROW	right-of-way
SR	State Route
syngas	synthesis gas
USC	U.S. Code
URS	URS Corporation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WKWD	West Kern Water District

EXECUTIVE SUMMARY

Hydrogen Energy California LLC (HECA LLC) is proposing an Integrated Gasification Combined-Cycle polygeneration project (hereafter referred to as the HECA Project). HECA LLC is owned by SCS Energy California LLC. The HECA Project will gasify a 75 percent coal and 25 percent petroleum coke fuel blend to produce synthesis gas (syngas). Syngas produced via gasification will be purified to hydrogen-rich fuel, which will be used to generate low-carbon baseload electricity in a Combined-Cycle Power Block; low-carbon nitrogen-based fertilizer in an integrated Manufacturing Complex; and carbon dioxide (CO_2) for use in enhanced oil recovery (EOR).

The fertilizer and power produced by the HECA Project have a low-carbon footprint, because more than 90 percent of the CO_2 in the syngas is captured and approximately 3 million tons per year of CO_2 is transported via pipeline for use in EOR, which results in simultaneous sequestration (storage) of the CO_2 in a secure geologic formation (HECA, 2012). CO_2 will be transported for use in EOR in the adjacent Elk Hills Oil Field, which is owned and operated by Occidental of Elk Hills, Inc. (OEHI) (hereafter referred to as the OEHI Project). This Biological Assessment (BA) covers both the HECA Project and the OEHI Project during the period of the U.S. Department of Energy (DOE) Demonstration Period, which is explained below.

The DOE is providing financial assistance to the HECA Project under the Clean Coal Power Initiative Round 3 (CCPI) via a cost-sharing agreement with HECA LLC covering project construction and a "Demonstration Period" for the first 2 years of project operations. The DOE's financial assistance for the construction and operation of the HECA Project during the Demonstration Period is referred to herein as the proposed Agency Action. The DOE will analyze potential environmental impacts associated with the proposed Agency Action by preparing an Environmental Impact Statement pursuant to the National Environmental Policy Act (NEPA). The DOE and the California Energy Commission plan to prepare a joint Environmental Impact Statement/Environmental Impact Report equivalent to satisfy both the requirements of NEPA and the California Environmental Quality Act.

Pursuant to the federal Endangered Species Act (ESA), DOE must ensure that "any action authorized, funded, or carried out...is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat. . ." 16 U.S. Code § 1536[a][2]. Although the DOE would not have any regulatory authority over the HECA Project or the OEHI Project, the funding associated with the proposed Agency Action triggers the need for DOE to consult with the U.S. Fish and Wildlife Service pursuant to Section 7 of the ESA regarding potential effects of the proposed Agency Action on endangered or threatened species.

Accordingly, this BA has been prepared to facilitate the Section 7 consultation process. The scope of this BA covers potential effects to endangered and threatened species associated with the construction and operation of the HECA Project and the OEHI Project. Operational effects are evaluated for the 25-year life of the HECA Project, and during the Demonstration Period for the OEHI Project. Although the DOE is not providing financial assistance to OEHI in

connection with the OEHI Project, this BA evaluates the potential effects associated with the OEHI Project during the Demonstration Period as reasonably foreseeable indirect effects of the proposed Agency Action.

Construction, operation, and decommissioning of the HECA Project and the OEHI Project, including associated linears (pipelines, rail spurs, transmission lines, etc.) are likely to adversely affect the following federally listed species:

- Blunt-nosed leopard lizard;
- Giant kangaroo rat;
- Tipton kangaroo rat; and
- San Joaquin kit fox.

The proposed action may affect but is not likely to adversely affect the following species that is listed as endangered under the federal ESA:

- Buena Vista Lake shrew.

These determinations are based on temporary and permanent loss, associated with the proposed action, of habitats potentially used by blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox. Construction, operation, and decommissioning of the HECA Project and the OEHI Project will also disturb—and in some limited instances, result in—mortality of individuals. Avoidance and minimization measures are proposed, or already exist, that would reduce potential take of federally listed species and provide long-term beneficial effects. These measures include actions that would avoid or minimize the potential for mortality, disturbance, habitat degradation, and other potential adverse effects on federally listed species. Additional conservation measures would restore and provide permanent protection and enhancement of habitats for federally listed species in the Action Area (defined below). Collectively, when implemented, these measures would avoid jeopardy of the affected species, and improve opportunities for recovery of the species.

1.0 INTRODUCTION

Hydrogen Energy California LLC (HECA LLC) is proposing an Integrated Gasification Combined-Cycle polygeneration project (hereafter referred to as the HECA Project). HECA LLC is owned by SCS Energy California LLC. The HECA Project will gasify a 75 percent coal and 25 percent petroleum coke (petcoke) fuel blend to produce synthesis gas (syngas). Syngas produced via gasification will be purified to hydrogen-rich fuel, which will be used to generate low-carbon baseload electricity in a Combined-Cycle Power Block, low-carbon nitrogen-based fertilizers in an integrated Manufacturing Complex, and carbon dioxide (CO_2) for use in enhanced oil recovery (EOR).

The fertilizers and power produced by the HECA Project have a low-carbon footprint because more than 90 percent of the CO_2 in the syngas is captured and approximately 3 million tons per year of CO_2 is transported via pipeline for use in EOR, which results in simultaneous sequestration (storage) of the CO_2 in a secure geologic formation (HECA, 2012). CO_2 will be transported (via a ±3.4-mile pipeline) for use in EOR in the adjacent Elk Hills Oil Field (EHOF), which is owned and operated by Occidental of Elk Hills, Inc. (OEHI) (hereafter referred to as the OEHI Project). This Biological Assessment (BA) covers both the HECA Project and the OEHI Project during the period of the U.S. Department of Energy (DOE) Demonstration Period, as explained below.

The 453-acre HECA Project Site is approximately 7 miles west of the city of Bakersfield, and approximately 2 miles northwest of the unincorporated community of Tupman in western Kern County, California (Figure 1, Project Location). The HECA Project Site is adjacent to the EHOF (Figure 2, Project Vicinity). HECA has an agreement to purchase the HECA Project Site, as well as an additional 653 acres adjacent to the HECA Project Site, herein referred to as the Controlled Area (Figure 3, Project Site Map). The HECA Project Site and Controlled Area are currently used for farming purposes, including the cultivation of cotton, alfalfa, and onions.

OEHI is proposing to extend the life of the EOR operations at its Elk Hills Unit by using CO_2 to facilitate oil production. A pipeline will be constructed to transport CO_2 from the HECA Project Site to the OEHI Project Site; it will temporarily disturb approximately 28.89 acres and permanently impact approximately 0.11 acre. In addition, the OEHI Project will include construction of a 60.61-acre CO_2 EOR processing facility; and three additional 1.06-acre Satellite Gathering Stations for CO_2 EOR and sequestration. The OEHI Project will also use existing producing and injection wells.

The DOE has proposed providing financial assistance to the HECA Project under the Clean Coal Power Initiative Round 3 (CCPI) via a cost-sharing agreement with HECA LLC, covering project

construction and a "Demonstration Period" for the first 2 years of project operations.[1] The DOE's proposed financial assistance for the construction and 25-year operation of the HECA Project, as well as the construction and operation of the OEHI Project during the Demonstration Period, is referred to herein as the proposed Agency Action. The DOE will analyze potential environmental impacts associated with the proposed Agency Action by preparing an Environmental Impact Statement pursuant to the National Environmental Policy Act (NEPA).[2] The DOE and the California Energy Commission (CEC) plan to prepare a joint Environmental Impact Statement/Environmental Impact Report equivalent to satisfy both the requirements of NEPA and the California Environmental Quality Act.[3]

Pursuant to the federal Endangered Species Act (ESA), DOE must ensure that "any action authorized, funded, or carried out...is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat. . ."[4] Although the DOE would not have any regulatory authority over the HECA Project or the OEHI Project, the funding associated with the proposed Agency Action triggers the need for DOE to consult with the U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the ESA, regarding potential effects of the proposed Agency Action on endangered or threatened species.

Accordingly, this BA has been prepared to facilitate the Section 7 consultation process. The scope of this BA covers potential effects to endangered and threatened species associated with the construction and operation of the HECA Project. Operational effects are evaluated for the

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1 *See* DOE website, Clean Coal Power Initiative Round 3 ("On July 1, 2009, U.S. Department of Energy Secretary Steven Chu announced that projects by Basin Electric Power Cooperative and Hydrogen Energy International HECA LLC had been selected for up to $408 million in funding from the American Recovery and Reinvestment Act.") http://www.fossil.energy.gov/recovery/projects/ccpi.html. The DOE and HECA LLC entered into a Cooperative Agreement effective September 30, 2009. Under this agreement, the DOE has awarded up to $408 million in government sharing of the HECA Project costs associated with project construction and the Demonstration Period. Total HECA Project costs are estimated to be $4 billion; however, more detailed estimates are currently being prepared. *See* DOE website, DOE Signs Cooperative Agreement for New Hydrogen Power Plant, November 6, 2009, http://www.fossil.energy.gov/news/techlines/2009/09077-DOE_Signs_Cooperative_Agreement.html. The DOE financial assistance under the CCPI program relates to project construction and the Demonstration Period defined by a Cooperative Agreement between HECA LLC and the DOE.

2 *See* DOE, Amended Notice of Intent Modifying the Scope of the Environmental Impact Statement for the Hydrogen Energy California's Integrated Gasification Combined Cycle Project, Kern County, CA, 77 Fed. Reg. 36519 (June 19, 2012).

3 *See* 77 Fed. Reg. 36519, 36520.

4 16 USC § 1536[a][2]. Under the ESA, "[a]ction" is defined as "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies" (50 Code of Federal Regulations § 402.02). The "effects of the action" are defined as "direct and indirect effects of an action ... together with the effects of other activities that are interrelated or interdependent with that action" (50 CFR § 402.02). "Interrelated actions" are, in turn, defined by the Services' regulations as "those that are part of a larger action and depend on the larger action for their justification." Interdependent action is defined as "those that have no independent utility apart from the action under consideration" (50 CFR § 402.02). Indirect effects as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur" (50 CFR § 402.02).

25-year operation of the HECA Project, and for the OEHI Project during the Demonstration Period. Although DOE is not providing financial assistance to OEHI in connection with the OEHI Project, this BA evaluates the potential effects associated with the OEHI Project during the Demonstration Period as reasonably foreseeable indirect effects of the proposed Agency Action.

The EHOF has already been the subject of Section 7 consultation. The EHOF is currently being operated in compliance with a 1995 Biological Opinion (Appendix A) issued by the USFWS, and a related 1997 Memorandum of Understanding (MOU) between OEHI and the California Department of Fish and Game (CDFG) (Appendix B) that has twice been updated, and remains in effect until 2014 (CDFG, 1997; 1999; 2010). The earlier Section 7 consultation was undertaken in connection with the Supplemental Environmental Impact Statement/Program Environmental Impact Report for the federal government's divestment of the EHOF, and that document contemplated CO_2 EOR and associated impacts. Compliance with the 1995 USFWS Biological Opinion and the 1997 CDFG MOU has been documented in annual and semi-annual monitoring reports submitted to USFWS since 1998.

OEHI reinitiated consultations with USFWS and CDFG in 2002 to support a multi-decade Habitat Conservation Plan (HCP) for the EHOF, and anticipates the new HCP being approved by the end of 2013. The new HCP is being negotiated in contemplation of continued operations consistent with the Supplemental Environmental Impact Statement/Program Environmental Impact Report for the federal government's divestment of the EHOF. OEHI reinitiated consultations with USFWS and CDFG to support a 50-year HCP for all production operations at the field, and anticipates that the Biological Opinion and MOU will be replaced by new Section 10 and Section 2081 permits supported by the HCP at some point in the future. However, until that occurs, the Biological Opinion remains in effect indefinitely, and the MOU remains in effect until December 31, 2014.

1.1 PROJECT PURPOSE AND NEED

The DOE proposed Agency Action is to provide limited financial assistance for the development, construction, and demonstration of the HECA Project. DOE has selected the HECA Project through a competitive process under the CCPI program. The Purpose and Need for DOE's proposed Agency Action are to advance the CCPI program by funding projects that have the best chance of achieving the program's objective as established by Congress—the commercialization of clean coal technologies that advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies that are currently in commercial service. The proposed HECA Project was selected under the CCPI program as one in a portfolio of projects that would represent the most appropriate mix to achieve programmatic objectives and meet legislative requirements.

The HECA Project will be a state-of-the-art facility that will produce electricity and other useful products for California with dramatically lower carbon emissions compared to traditional facilities.

The HECA Project is needed to provide dependable, low-carbon electricity to help meet future power needs, and to help "back up" intermittent renewable power sources, such as wind and solar, to support a reliable power grid. The HECA Project is also needed to provide low-carbon nitrogen-based fertilizers.

According to DOE:

> *The project will be among the cleanest of any commercial solid fuel power plant built or under construction and will significantly exceed the emission reduction targets for 2020 established under the Energy Policy Act of 2005. In addition, emissions from the project plant will be well below the California regulation requiring baseload plants to emit less greenhouse gases than comparably-sized natural gas combined cycle power plants (U.S. Department of Energy, HECA Project Facts, November 2011).*

In addition to DOE's directive to meet emission reduction targets by 2020, California Assembly Bill 32 (AB 32) also has a directive to reduce greenhouse gas emissions to 1990 levels by 2020. AB 32 requires the California Air Resources Board to assign emissions targets to each sector in the California economy, and to develop regulatory and market methods to ensure compliance. These government actions reinforce the timeliness of the HECA Project.

The HECA Project will achieve these important environmental objectives by capturing carbon from its processes and transporting the CO_2 for use in EOR, resulting in permanent sequestration (storage) in secure geologic formations within the earth. A key factor in the siting of the HECA Project is its proximity to EHOF. The EHOF offers an opportunity to beneficially use the CO_2 for EOR. In addition, because of the extensive and long-standing operations at the EHOF, much is known about the subsurface geology, which verifies that it is an ideal location for sequestration. Finally, locating the HECA Project adjacent to the EHOF minimizes the distance the CO_2 must be transported. The proposed Project Site is also close to existing power transmission and natural gas infrastructure, as well as a viable cooling water supply, all of which minimizes the cost and impacts of associated water and natural gas pipelines and electric transmission lines.

DOE recognizes HECA's importance in advancing carbon capture and sequestration:

> *A need exists to further develop carbon management technologies that capture and store or beneficially reuse carbon dioxide (CO_2) that would otherwise be emitted into the atmosphere from coal-based electric power generating facilities. Carbon capture and storage (CCS) technologies offer great potential for reducing CO_2 emissions and mitigating global climate change, while minimizing the economic impacts of the solution. Once demonstrated, the technologies can be readily considered in the commercial market-place by the electric power industry (U.S. Department of Energy, HECA Project Facts, November 2011).*

The HECA Project will provide numerous local, state, regional, national, and global benefits, including the following:

- Promoting energy security by converting abundant and inexpensive solid fuels—petcoke and coal—to clean hydrogen fuel to produce electricity and other useful products.
- Advancing a hydrogen-based transportation system in California by increasing the supply of available hydrogen.
- Improving the reliability of California's electrical grid by generating a nominal 300 megawatts of new, low-carbon baseload electricity—enough electricity to power over 160,000 homes.
- Supporting California's agricultural industries by producing over 1 million tons per year of low-carbon fertilizer.
- Reducing greenhouse gas emissions by capturing approximately 3 million tons of CO_2 per year—equivalent to eliminating 650,000 automobiles from the road—and transporting it for use in EOR, resulting in permanent sequestration.
- Demonstrating the commercial viability of carbon capture and sequestration as a viable method for reducing the carbon footprint of power generation and manufacturing.
- Promoting energy independence by increasing California's production of oil through EOR, extracting an otherwise unrecoverable 5 million barrels of oil each year.
- Improving local groundwater quality and agricultural production by extracting, treating, and using degraded groundwater.
- Providing local jobs to an estimated 2,500 construction workers at peak construction, and to 200 fulltime employees during Project operations.
- Boosting the local and California economy through direct investment and the resulting economic activity and tax revenues in the billions of dollars.

1.2 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This BA documents potential effects of the HECA Project and the OEHI Project on federally listed threatened and endangered species within the Action Area. In addition to construction effects of the proposed facilities, this BA evaluates potential effects during the 25-year operational life of the HECA Project and the 2-year Demonstration Period of the OEHI Project. The Action Area is defined in this BA as the 453-acre HECA Project Site, the 4-acre Pacific Gas and Electric Company (PG&E) switching station, the 1.15–acre water wells, the 93-acre OEHI Project Site, and the construction footprints of the associated linear facilities and adjacent areas that could be directly or indirectly affected by the proposed action (50 Code of Federal Regulations §402.02). Consistent with CEC guidelines and the federal ESA regulations, the Action Area evaluated in this BA is a 1-mile area around the HECA Project Site, a 1,000-foot area adjacent to all associated linear facilities including the CO_2 pipeline, and the OEHI Project

Site. This BA was prepared in accordance with Section 7 of the ESA (16 U.S. Code [USC] 1536 [c]), and follows the standards established in DOE NEPA guidelines.

This BA is organized into eight sections based on the USFWS recommended outline (2008). Section 1 introduces the HECA Project and OEHI Project, HECA Project benefits, as well as the purpose and need for the proposed HECA Project, as detailed above in Section 1.1. Section 2 describes the HECA Project and OEHI Project in more detail. Section 3 describes the environmental setting, including the vegetation communities within the Action Area. Section 4 describes the study methods used to identify the federally listed species that may be affected by the HECA Project and OEHI Project, and describes the life history of these species. Section 5 evaluates the potential adverse effects to these species and associated habitats. Section 6 summarizes the effects to these species and habitat, and includes an effects determination for each species. References are listed in Section 7, and the list of preparers for this BA is provided in Section 8.

The scope of this document is for use by the DOE to support consultation with the USFWS under the ESA. Potential effects on federally listed species are evaluated in accordance with Section 7 of the ESA (16 USC 1536). Criteria used to determine which species were considered for this BA and potential adverse effects to those species from HECA Project and OEHI Project activities are presented in Section 4. In addition, this BA proposes conservation measures to avoid and/or minimize mortality or disturbance to potentially affected species (Section 2).

1.3 SPECIES CONSIDERED IN THIS BIOLOGICAL ASSESSMENT

Federally listed species occurrences and associated habitats in the Action Area are identified based on the results of a literature review, comprehensive background search, and field surveys. A search of four U.S. Geological Survey (USGS) quadrangles in the HECA Project area was conducted (Appendix C); this list was reduced based on habitat and known ranges. The eight species listed as federally endangered or threatened that have the potential to occur within the Action Area are listed in Table 1 (on the following page). These federally listed species are discussed in Sections 4, 5, and 6, and are the subject of this BA. There is no designated Critical Habitat in the Action Area or the vicinity.

1.4 HISTORY OF CONSULTATION

HECA and the DOE have coordinated with the USFWS regarding the HECA Project since 2008. Consultation has included informal discussion, site visits, and formal submittals. A detailed chronology of coordination with the USFWS regarding the HECA Project and the federal Section 7 consultation process is presented below. It should be noted that the original BP/Rio Tinto Project was located in a more sensitive area; any correspondence prior to September 2010 may discuss site conditions and/or impacts that no longer apply, because the project now is being proposed in a different location.

- April 22, 2008, electronic mail from David Kisner (URS Corporation [URS]) to Susan Jones (USFWS) and James Diven (URS) regarding biological aspects in the vicinity of the Project. This discussion related to the former HECA Project Site located in Elk Hills.

Table 1
Federally Listed Species with Potential to Occur within the Action Area

Common Name	Scientific Name	Federal Status
Plants		
California jewel-flower	*Caulanthus californicus*	Endangered
Kern mallow	*Eremalche kernensis*	Endangered
San Joaquin woollythreads	*Monolopia congdonii*	Endangered
Reptiles		
Blunt-nosed leopard lizard	*Gambelia sila*	Endangered
Mammals		
Buena Vista lake shrew	*Sorex ornatus relictus*	Endangered
Giant kangaroo rat	*Dipodomys ingens*	Endangered
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	Endangered
San Joaquin kit fox	*Vulpes macrotis mutica*	Endangered

- July 10, 2008, meeting at California CDFG Office in Fresno, California with Julie Vance (CDFG), Susan Jones (USFWS; by telephone), and Peter Cross (USFWS; by telephone). This discussion again involved the former HECA Project Site located in Elk Hills.

- October 14, 2008, Project meeting at CDFG Office in Fresno, California with Julie Vance (CDFG), Susan Jones (USFWS; by telephone), and Peter Cross (USFWS; by telephone). This discussion again involved the former HECA Project Site located in Elk Hills.

- January 29, 2009, phone conversation between Tim Kuhn (USFWS) and David Kisner (URS) regarding BA/Biological Opinion and conservation measures for the current HECA Project Site.

- June 6, 2009, site visit with Tim Kuhn (USFWS) and Julie Vance (CDFG) to review HECA Project linears and biological constraints.

- February 4, 2010, letter from R. Paul Detwiler (DOE) to Tim Kuhn (USFWS), requesting initiation of formal Section 7 consultation for the *Hydrogen Energy International Integrated Gasification Combined Cycle and Carbon Capture and Sequestration Project.*

- February 5, 2010, electronic mail and attached BA transmitted from Dale Shileikis (URS) to Tim Kuhn and Paul Detwiler on behalf of HECA.

- March 30, 2010, phone conversation between Tim Kuhn (USFWS) and David Kisner (URS) regarding BA/Biological Opinion, rare plants, Migratory Bird Treaty Act, and Coles Levee Ecological Reserve.

- April 12, 2010, CEC Data Response and Issue Resolution Workshop in Tupman, California. Public meeting with CEC (Amy Golden), USFWS (Tim Kuhn), and CDFG (Julie Vance) to discuss biological aspects of the proposed HECA Project.

- June 9, 2010, email correspondence from USFWS biologist Tim Kuhn to CEC and CDFG regarding comments on the February 5, 2010 BA for the HECA Project.

- August 6, 2010, comment letter from USFWS biologist Tim Kuhn regarding the February 8, 2010 BA for the HECA Project.

- September 15, 2010, phone conversation between Tim Kuhn (USFWS) and David Kisner (URS) regarding comments on BA, *California Aqueduct Habitat Conservation Plan*, and San Joaquin Kit Fox Recovery Area Geographic Information System (GIS) data layer.

- September 23, 2010, electronic mail transmittal from Tim Kuhn (USFWS) to David Kisner (URS) of San Joaquin Kit Fox Recovery Area GIS layer and *Draft California Aqueduct San Joaquin Field Division Habitat Conservation Plan.*

- November 2, 2010, meeting with Tim Kuhn (USFWS), U.S. Environmental Protection Agency Region IX, DOE, HECA, and URS regarding ESA consultation for the HECA Project.

- January 18, 2012, meeting with Bill Pelle, Thomas Leeman, and Dan Russell from USFWS to discuss Section 7 consultation for the HECA Project. The meeting was organized by DOE to provide an overview of the new HECA Project components for USFWS and review the potential ESA issues. Other attendees included R. Paul Detwiler (DOE), Marisa Mascaro (HECA), George Landman (HECA) and Steve Leach (URS).

- February 6, 2012, meeting at CDFG office in Fresno, California with Julie Vance (CDFG), and Annee Ferranti (CDFG). This discussion involved introducing the new project team and identifying new project components; the new project elements were discussed with regard to the known and potential biological resources in the area.

- October 17, 2012, field meeting with Thomas Leeman from USFWS to discuss Section 7 consultation for the HECA Project. The meeting included a field review of the HECA Project components for USFWS and CDFG and discussion of the potential ESA issues. Other attendees included Julie Vance (CDFG), Amy Golden (CEC), George Landman (HECA), Ed Western (HECA), Jan Novak (URS), David Kisner (URS), and Steve Leach (URS).

2.0 PROJECT DESCRIPTION

The 453-acre HECA Project Site is currently used for active agricultural purposes, including cultivation of cotton, alfalfa, and onions. HECA also has the option to purchase 653 acres adjacent to the HECA Project Site, over which HECA will control access and future land uses. The HECA Project will generate a nominal 300-megawatt output of low-carbon baseload electrical power. The HECA Project will capture more than 90 percent of the CO_2 in the production of the hydrogen fuel, and transport (via pipeline) approximately 3 million tons per year of CO_2 to the EHOF for EOR and sequestration. In addition, the HECA Project will use the hydrogen produced in the gasifier to produce low-carbon nitrogen-based fertilizer in an integrated Manufacturing Complex.

In addition to the Project Site, the HECA Project includes construction and operation of five linear facilities, which include (1) an approximately 2-mile-long electrical transmission line to a new PG&E switching station; (2) an approximately 13-mile-long natural gas interconnection with an existing PG&E natural gas pipeline; (3) an approximately 15-mile-long process water supply pipeline from the Buena Vista Water Storage District (BVWSD); (4) an approximately 1-mile-long potable water supply pipeline from West Kern Water District; and (5) an approximately 5-mile-long industrial railroad spur that will connect to the San Joaquin Valley Rail Road.

The OEHI Project will include construction and operation of three primary EOR components, including (1) an approximately 3.4-mile-long CO_2 Pipeline from HECA to the Elk Hills Oil Field; (2) a CO_2 EOR Processing Facility at the southern terminus of the CO_2 Pipeline; and (3) three Satellite Gathering Stations.

Construction activities associated with each of the HECA and OEHI project components, including avoidance, minimization, and conservation measures, are described below, followed by descriptions of operation and maintenance of the facilities and the project schedule.

2.1 CONSTRUCTION ACTIVITIES

This section describes the construction activities associated with the proposed action. The activities are organized by location.

2.1.1 Power Generating Facility

The 453-acre HECA Project Site is intensively cultivated for the production of alfalfa, cotton, and onions, and has little habitat value for native flora and fauna. In addition, the closest area with habitat value for native flora and fauna is the Kern River Flood Control Channel (KRFCC), approximately 700 feet south of the HECA Project Site. The majority of the 653-acre Controlled Area may remain in active agriculture and act as a buffer between the Project and the KRFCC. The western border of the Tule Elk State Natural Reserve is approximately 1,700 feet to the east of the HECA Project Site.

Construction activities for the HECA Project will occur throughout the 42-month construction period. All construction laydown and parking areas will be within the HECA Project Site and the Controlled Area. Onsite construction activities include clearing and grubbing, grading, hauling, layout of equipment, delivery and handling of materials and supplies, and HECA Project construction and testing operations. The HECA Project Site occurs in an area of relatively flat topography. Site grading will occur as necessary to form level building pads for major process units.

Construction site access will be via Dairy Road for truck deliveries and Adohr Road for construction craft vehicles arriving and departing the site. Initial site preparation will include construction of temporary access roads, parking, laydown areas, office and warehouse facilities, installation of erosion control measures, and other improvements necessary for construction. Erosion control measures will include construction of stormwater retention basins and related site drainage facilities to control runoff within the HECA Project Site boundary. Existing drainage patterns outside the HECA Project Site boundary will remain unchanged, and no runoff from outside the HECA Project Site boundary will flow onto the HECA Project Site.

2.1.2 Electrical Transmission Line

An electrical transmission line will interconnect the HECA Project to PG&E's future switching station. The transmission line will be constructed and owned by HECA up to the point of interconnection. The power generated by the HECA Project will be connected to the existing PG&E system by a single-tower, 230-kilovolt transmission line that will be constructed as part of the HECA Project. This single-circuit line will be connected to a new switchyard at the HECA Project Site.

The proposed electrical transmission line route is approximately 2 miles long to HECA's property boundary, and passes through previously disturbed areas or active agriculture, predominantly pistachio orchards, alfalfa, and cotton. Construction of the line will require installing approximately 26 (15 offsite and 11 onsite) tubular-steel transmission structures and the supporting foundations.

The electrical transmission line route extends east from the HECA Project Site to a new PG&E switching station (adjacent to the existing Midway-Wheeler Ridge transmission lines) as shown on Figure 4, Project Location Details. The new PG&E switching station will be constructed at the eastern terminus of the electrical transmission line, approximately 2 miles east of the HECA Project Site and next to Elk Valley Road. Access to the switching station site would be along an existing unimproved farm road from Morris Road or Elk Valley Road. The electric transmission switching station will be designed, constructed, owned, and operated by PG&E.

The area occupied by the PG&E switching station will be approximately 417 feet by 417 feet. Portions of the site will be excavated to install a grounding grid, underground control and protection cabling, and foundations. It is anticipated that "dead-end" structures to terminate the transmission line from the HECA site would be approximately 30 feet tall near the western end of the switching station site. A similar set(s) of structures at the eastern end of the station for the

incoming lines from Midway and the outgoing lines to Wheeler Ridge would also be required. The height of a two-level structure would be on the order of 50 to 60 feet. The station would also have structures associated with interconnecting buses and cable "drops" to the circuit breakers. The height of these structures would be on the order of 20 to 30 feet.

Approximately 15 steel poles are expected to be required outside of the HECA Project Site. Construction of the interconnection line will consist of installing footings, poles, insular and hardware, and pulling conductor and shield wires. The new transmission line interconnection will be placed in an approximately 100-foot-wide permanent right-of-way (ROW).

Construction of the new 230-kilovolt transmission line interconnection will require approximately 3 months. It will be scheduled for completion and be operational in time for generation testing of the HECA Project. HECA will provide for the transmission line via a Large Generator Interconnection Agreement up to the point of interconnection at the future PG&E switching station.

Upon completion of the linear installation, agricultural uses may be reestablished along the linear route within the 100-foot-wide permanent ROW. Orchards would be limited to 25 feet in height within the permanent ROW.

2.1.3 Natural Gas Supply

A 13-mile natural gas linear will interconnect with a PG&E natural gas pipeline north of the HECA Project Site. The interconnect will consist of one tap off the existing natural gas line, and one metering station at the beginning of the natural gas linear adjacent to a PG&E Inlet. The metering station will be up to 100 feet by 100 feet, and 8 feet tall, surrounded by a chain-link fence. In addition, there will be a metering station at the end of the natural gas linear, on the western side of the HECA Project Site, and a pressure-limiting station on the HECA Project Site. PG&E will construct and own the natural gas pipeline.

The majority of the natural gas linear extends across areas used for active agriculture and existing roadways. However, the natural gas linear is adjacent to several areas with natural habitat value near Interstate 5 (I-5) and at the northern terminus near Magnolia Avenue.

The natural gas linear would require a 50-foot construction ROW and a 25-foot permanent ROW; however, most of the ROW would be in cultivated fields or other disturbed habitat types adjacent to paved and unpaved roads.

Wetland features adjacent to the proposed natural gas linear ROW will be avoided. Non-wetland potential waters of the U.S. within the natural gas pipeline construction limits are degraded, seasonally ponded claypan depressions. If avoidance of non-wetland waters is not feasible, the feature(s) will be temporarily disturbed by the construction activities during installation of the natural gas pipeline, and the site will be restored to pre-construction condition.

Construction of the natural gas pipeline interconnection will involve a variety of crews performing the following typical pipeline construction activities: hauling and stringing the pipe along the route; welding, radiographic inspection, and coating the pipe welds; trenching; lowering the pipe into the trench; backfilling the trench; hydrostatic testing of the pipeline; tying into the existing pipeline; purging the pipeline; and cleaning up and restoring construction areas. Roads and ROWs will be restored to specifications of the involved agencies. Open trenching will be minimized, and trenches will be covered or ramped when left overnight. In areas with habitat value and in agricultural areas, the topsoil from the trenching will be set aside, preserved, and used to cover the excavation.

Construction of the natural gas pipeline interconnection will take approximately 6 months. It will be scheduled to be finished and operational in time to provide test gas to the HECA Project. Construction will occur in accordance with a traffic management plan to minimize impacts to traffic traveling on the affected roadways. Affected areas will be restored to their original state so as to minimize erosion.

2.1.4 Water Supply Pipelines

For process water, the HECA Project will use brackish groundwater supplied by the Buena Vista Water Storage District (BVWSD) via a new 15-mile pipeline. Potable water for drinking and sanitary use will be supplied by West Kern Water District (WKWD), who will construct a new 1-mile pipeline for that purpose. Installation of the process water and potable water pipelines will involve industry standard construction activities for pipelines, including trenching; hauling and stringing of pipe along the routes; welding; radiographic inspection and coating of pipe welds; lowering welded pipe into the trench; hydrostatic testing; and backfilling and restoring the approximate surface grade. Construction of the water pipelines is expected to take approximately 6 months to complete.

Process Water Supply Pipeline

A new 15-mile, 30-inch-diameter pipeline will convey brackish groundwater supplied from the BVWSD to be used for process water by the HECA project. BVWSD will construct and own the process water supply pipeline, and approximately 14.5 miles of the pipeline will be located in an existing BVWSD ROW. The proposed process water pipeline would be constructed entirely within an existing unpaved road, or within areas that are currently actively farmed; therefore, no direct impacts to natural habitats are anticipated. Once the process water is delivered to the HECA Project Site, the brackish water will be treated on site to meet all process and utility water requirements. The process water supply pipeline will be approximately 15 miles in length and will be constructed by BVWSD.

In addition, BVWSD will own, construct, operate, and maintain the well field that will provide brackish groundwater for the HECA Project's process water supply. This well field will be in the northwestern portion of BVWSD's service area within active agricultural fields near the West Side Canal, in the vicinity of Seventh Standard Road, at the northern end of the 15-mile-long process water line. It is currently anticipated that there will be up to five groundwater

extraction wells. Two of these wells will provide operational redundancy. The maximum depth of the wells will be approximately 300 feet below ground surface. The brackish water will be treated at the Project Site to meet all process and utility water requirements. The process water supply pipeline would require a 50-foot construction ROW and a 25-foot permanent ROW.

BVWSD addressed the groundwater extraction wells and the process water supply pipeline in their Draft and Final Environmental Impact Reports for BVWSD's Groundwater Management Program, issued in October 2009 and December 2009, respectively (BVWSD, 2009a; 2009b). The Final Environmental Impact Report for the Groundwater Management Program (State Clearinghouse No. 2009011008) concludes that the wells and the process water pipeline do not result in significant impacts to any federally listed species.

Potable Water Pipeline

For drinking and sanitary use, the HECA Project will use potable water supplied by WKWD. A new 4-inch-diameter potable water line will be constructed, owned, and maintained by HECA LLC.

The potable water line would be approximately 1 mile in length. This pipeline will require a 10-foot construction and permanent ROW that will be placed within the proposed electrical transmission line ROW. Most of the proposed ROW is within or adjacent to existing dirt access roads, or in cultivated fields.

2.1.5 Industrial Railroad Spur

The industrial railroad spur is approximately 5 miles long and will connect the HECA Project Site to the existing San Joaquin Valley Railroad Buttonwillow Branch (formerly called the SP Buttonwillow Branch). Two public at-grade crossings may be required, and several private crossings will be needed for farmers' access to croplands and the irrigation canal. The industrial railroad spur would require a 75-foot construction ROW, 60-foot permanent ROW, and 3-acre rail laydown area.

2.1.6 OEHI Carbon Dioxide Pipeline

An approximately 3.4-mile-long CO_2 12-inch-diameter pipeline will be constructed to transfer the CO_2 from the HECA Project Site to the OEHI CO_2 Processing Facility used by OEHI for injection into deep underground hydrocarbon reservoirs for CO_2 EOR and sequestration. Additional components of the CO_2 pipeline will include metering facilities at the pipeline origin and terminus, a cathodic protection system, and four emergency block valves. Two of the block valves will be automated and two will be manual block valves.

The CO_2 pipeline route originates at the southern portion of the HECA Project Site and will be constructed using a combination of standard open-trench installation and Horizontal Directional Drilling (HDD). One HDD will be approximately 500 feet in length under the levees associated with the West Side/Outlet Canal crossing. A second HDD will be approximately 2,000 feet long,

and will be used to install the pipeline under the KRFCC and the California Aqueduct. On the southern side of the Aqueduct, the pipeline alignment extends southeast and south to the OEHI CO_2 Processing Facility, and parallels existing private roads. OEHI will construct and own the pipeline.

With the exception of HDD crossings where the depth of the CO_2 pipeline may reach 100 feet below grade, the CO_2 Pipeline will be buried approximately 5 feet below grade. Installation of the CO_2 supply pipeline will involve typical construction activities, including trenching; hauling and stringing pipe along routes; welding; radiographic inspection and coating pipe welds; lowering welded pipe into the trench; backfill of the trench; hydrostatic testing of the pipeline; purging the pipeline; and cleanup and restoration of construction areas. Grade cuts will be restored to their original contours, and affected areas will be restored to their original condition to minimize erosion. The pipeline will be protected by cathodic protection, and monitored by independent leak-detection systems.

Construction of the CO_2 pipeline is expected to take approximately 6 months to complete. The CO_2 pipeline would require a 50- to 80-foot construction ROW and a 25-foot permanent ROW.

HDD involves using a drilling rig that will bore a horizontal hole under water crossings. At each of these crossings, a laydown area (or entry/exit pit) has been identified on either side of the water course to accommodate the HDD installation (see Figure 4, Sheet 4, Project Location Details). The temporary disturbance area would be approximately 120 feet by 100 feet for each HDD entry pit; and approximately 75 feet by 100 feet for each HDD exit pit (Stantec, 2012b).

Best management practices for HDD will include silt fencing around the drill sites, energy dissipation devices for discharging water from hydrostatic testing of the pipeline, selecting drilling fluids for environmental compatibility, and removing spent fluids from the areas immediately adjacent to the water bodies for safe disposal and to prevent contamination. In addition, soil erosion control measures will be implemented to prevent runoff and impacts to water quality.

2.1.7 OEHI Carbon Dioxide EOR Processing Facility

The CO_2 from the HECA plant will be received by the CO_2 EOR Processing Facility, which will be located at the southern terminus of the CO_2 Pipeline in the southeastern quarter of Section 27S. The CO_2 EOR Processing Facility will include the Central Tank Battery (CTB), Reinjection Compression Facility (RCF), CO_2 Recovery Plant (CRP), and a Water Treatment Plant. The CO_2 EOR Processing Facility is expected to occupy and permanently disturb an area of 1,200 feet by 2,200 feet (60.61 acres). These dimensions do not include the area of the CO_2 Pipeline or the Satellite Gathering Stations.

Central Tank Battery

The CTB is the primary oil/water separation system for the CO_2 EOR process. The inlet liquid gathering lines from the Satellite Gathering Stations will be manually directed to one of the three

gas separator tanks. The gas from this process will be combined with the gas from the gas separators. The oil and water will be separated, and the oil will be skimmed off and pumped to Section 18G and metered for sale. The partially treated water will be conveyed via pipeline to the existing water treating facilities.

Water Treatment Plant

The oily water from the inlet section of the CTB will be treated to remove oil, solids, and other contaminants from the produced water. The produced water will be pressurized in the injection pumps and sent to the satellites for injection. Low-pressure gas collected from the CTB will be compressed and then routed to the inlet of the RCF and the CRP for processing.

Reinjection Compression Facility

The RCF will be the first portion of the CO_2 treating/recovery facilities to be installed. Produced gas from the Satellite Gathering Stations (see Section 2.1.8) will initially flow to the RCF. At the RCF, the CO_2 gas will be dehydrated, compressed, blended with CO_2 purchased from the HECA Project, and re-injected into a closed-loop system.

CO_2 Recovery Plant

The CRP is the second part of the gas treating/recovery plant. This facility will separate CO_2 from produced hydrocarbon gas and recycle the separated CO_2. The CRP will consist of several processing units for the separation of the CO_2 from the recovered natural gas. The CRP is not expected to be constructed until 2020, and would not be part of the Demonstration Period defined by DOE.

2.1.8 OEHI Satellite Gathering Stations

The Satellite Gathering Stations (satellites, also known as Production/Well-Testing Satellites) will be a series of facilities that will provide primary separation of the oil/water and gas from the production well stream. Initially, three satellites are scheduled to be installed to handle the expected production for the first several years of the field development during the Demonstration Period. Satellites 1, 2, and 3 are each expected to have a permanent surface footprint of 230 by 200 feet. This footprint is included in the total area of the OEHI Project site evaluated in this Biological Assessment.

Each satellite will be equipped with an inlet manifold in which well flow lines associated with that satellite are connected. Flow from each well flow line will be diverted into either the production separator or the test separator via automated manual valves. The production separator is a two-phase separator to handle primary vapor liquid separation of the fluid recovered from the production wells at each satellite. The gases will be separated and routed to the inlet of the RCF. The entire field production pressure will be controlled at the RCF inlet header, and the individual satellites will "float" on that pressure.

Liquid and gas flow rates will be metered for production trending and monitoring. The test separator will be a three-phase, bucket and weir separator to allow for a 24-hour test cycle of each well serviced by that satellite. The oil and water will be controlled by level control, and the gas will be controlled by a back-pressure controller to hold the test separator pressure slightly above that of the associated production separator. Oil, water, and gas from the test separator will be re-combined and directed to the inlet manifold and then to the production separator.

2.2 OPERATION AND MAINTENANCE

This section describes the operation and maintenance of the HECA and OEHI projects.

2.2.1 HECA Project

HECA Project operation and maintenance will occur within the HECA Project Site. The adjacent Controlled Area will remain in active agriculture similar to the existing condition. Access to linears will be limited in nature, and will be along existing access roads or access roads developed during initial installation activity. HECA LLC will own, operate, and maintain the approximately 2-mile transmission line up to the interconnection with a future PG&E switching station. It is anticipated that annual maintenance of the electrical transmission line will be provided for under an agreement between PG&E and the Project. The electrical transmission line is located entirely within areas that are actively farmed or are developed. Most of the maintenance will be routine and can be scheduled during periods when damage to the crops and land can be minimized. Maintenance activities will be conducted by personnel trained to be aware of the presence of sensitive wildlife.

PG&E will own, operate, and maintain the natural gas pipeline. Maintenance of the natural gas pipeline would follow PG&E corporate policies and protocols. Long-term maintenance needs of the natural gas pipeline would be minimal during the 25-year lifespan of the Project; therefore, they are not quantified in this document.

BVWSD will own, operate, and maintain the approximately 15-mile, 30-inch-diameter process water pipeline and associated wells. Annual maintenance of the process water pipeline and associated groundwater wells would be conducted by BVWSD. Maintenance activities of the wells and the pipeline would follow BVWSD corporate policies and protocols. Long-term maintenance needs of the process water pipeline would be minimal during the 25-year lifespan of the Project, and therefore is not quantified in this document.

HECA LLC will own, operate, and maintain the approximately 1-mile potable water pipeline. Maintenance activities of the pipeline would include:

- Annual reconnaissance of the pipeline ROW;
- Annual inspection and exercising (opening and closing for one cycle) of valves, as necessary;
- Annual vegetation removal, re-grading, and application of dirt for the access road after wet periods and pipe work, as necessary; and

- Replacement of pipeline components (lining and coating, valves, and joints), as determined necessary by routine inspection.

Long-term maintenance needs of the potable water pipeline would be minimal during the 25-year lifespan of the HECA Project; therefore, they are not quantified in this document.

HECA LLC currently anticipates that it will own, operate, and maintain the approximately 5-mile railroad spur. Regardless of final ownership of the spur, maintenance activities will consist of routine annual maintenance activities and programmed maintenance conducted on a periodic basis. Annual maintenance activities consist of visual inspections, vegetation control, spot surfacing and lining of rough spots in the track, and adjusting/lubrication of turnouts. In addition, any warning devices at road crossings will be inspected as frequently as monthly.

Programmed major maintenance consists of surfacing and lining the rail line, typically every 3 to 5 years; replacing the rail, potentially once during the life of the HECA Project; and replacing 15 percent of the timber ties on a 10-year cycle. If concrete ties are used, the ties will not need to be replaced. Major maintenance activities will be conducted using on-track equipment. Replaced materials will be removed from the ROW and recycled. Timber ties will be disposed of by incineration, landfill disposal, or other approved disposal options.

2.2.2 OEHI Project

OEHI will own, operate, and maintain the CO_2 pipeline and the related components of the OEHI Project. Maintenance of the CO_2 pipeline and other EOR facilities will follow existing OEHI operational procedures as required by the existing USFWS Biological Opinion (Appendix A) and the related 1997 MOU between OEHI and the CDFG (Appendix B), which has twice been updated and remains in effect until 2014 (CDFG, 1997; 1999; 2010). The EOR facility operations will be similar to the existing facility operations by OEHI at the EHOF. Operations activities include facility inspection and maintenance. Maintenance needs of the CO_2 pipeline and associated EOR facilities would be minimal during the Demonstration Period of the Project; therefore, they are not quantified in this document.

2.3 PROPOSED CONSERVATION MEASURES

This section describes the conservation measures that are included in the HECA Project and the OEHI Project to avoid, minimize, and/or compensate for impacts on listed species.

2.3.1 HECA Project Design Modifications

The HECA Project design has been refined in coordination with the resource agencies and environmental specialists to avoid and minimize impacts on sensitive biological resources to the extent practicable. These measures include relocating the HECA Project Site from the originally proposed location to its current location across the Aqueduct to reduce impacts to the blunt-nosed leopard lizard; and relocating the natural gas pipeline to avoid portions of the Coles Levee Ecosystem Preserve. In addition, the potable water linear and electrical transmission linear were

shortened and relocated to the east of the HECA Project Site, which avoided impacts to 1.9 acres of Allscale Scrub habitat.

The HECA Project also includes general and species-specific measures to avoid and minimize impacts on listed species and their habitat. For potential impacts on listed species that remain after implementation of feasible avoidance and minimization measures, comprehensive compensatory measures through habitat enhancement, establishment, and preservation are included in the Project to offset potential losses of listed species or their habitat. HECA LLC is committed to implementing these measures as part of the Project. These conservation measures are extracted from the Amended Application for Certification (AFC) submitted to the CEC in May 2012, and the corresponding numbers or mitigation measures from the 2012 Amended AFC (e.g., BIO-1, BIO-2, etc.) are provided where applicable.

2.3.2 OEHI Project Design

The proposed CO_2 pipeline crossings of the West Site Canal/Outlet Canal, the KRFCC, and the California Aqueduct will be constructed using HDD to avoid direct and indirect effects to species movement and dispersal at these locations.

OEHI will minimize impacts associated with the OEHI Project by using existing wells and previously disturbed areas to the maximum extent feasible. Avoidance and minimization will also be achieved by minimizing future land disturbance on those portions of the EHOF considered high value on the HCP multi-species map. The OEHI Project will also be implemented in compliance with the 1995 Biological Opinion issued by the USFWS (Appendix A), and a related 1997 MOU between OEHI and the CDFG, as updated (Appendix B). Finally, the OEHI Project will be implemented in compliance with a 50-year HCP for the EHOF, which is currently under development and anticipated to be approved by the end of 2013.

2.3.3 General Avoidance and Minimization Measures

HECA will implement the following general measures to avoid and minimize potential adverse effects to special-status biological resources. The OEHI Project will implement the avoidance and minimization measures in the 1995 Biological Opinion issued by the USFWS and 1997 MOU between OEHI and the CDFG, as amended in 1999 and 2010; and the HCP for the EHOF, when approved.

Biological Resource Mitigation Implementation and Monitoring Plan (BIO-17)

Prior to ground-disturbing activities, HECA will develop a Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP) in coordination with the CEC, CDFG, and USFWS. The BRMIMP will identify the biological mitigation, monitoring, and compliance measures that will be implemented during construction of the HECA Project. The measures identified in the BRMIMP will address each of the avoidance and minimization measures below, in addition to the terms and conditions of the permits and approvals by the CEC, USFWS, and

CDFG. The BRMIMP will include the qualifications, responsible parties, and schedules for implementing each of the avoidance and minimization measures described below. A draft BRMIMP will be submitted to the CEC, USFWS, and CDFG for review prior to the start of ground-disturbing activities.

Construction Worker Education Program (BIO-7)

A worker education program will be implemented for all HECA Project construction personnel. These personnel will be required to read educational materials and attend an education class given by a qualified biologist. The brochure and class will describe the special-status species that could be encountered, the regulatory protection of the species, and appropriate measures to take upon discovery of a special-status species.

Construction personnel will be instructed to set equipment off the ground when possible to minimize access to small mammals. All work areas will be kept clear of trash and food items to minimize attracting wildlife. Construction techniques to minimize potential adverse impacts will also be presented, such as filling or covering excavations. If excavations are to be left open overnight, ramps will be installed to allow wildlife to escape.

The names and affiliations of all people trained will be documented, and submitted to the CEC, USFWS, and CDFG (see measure BIO-17).

Operations and Maintenance Education Program (BIO-8)

The worker education program will be implemented for HECA Project operations and maintenance personnel. Personnel will be instructed to be alert to and aware of the presence of special-status wildlife. If any special-status wildlife is spotted, activities in the vicinity of the sighting that could impact the species will be halted, and the animal allowed to move away from the activity area.

2.3.4 Special-Status Plant Avoidance, Minimization, and Conservation

The following measures will be implemented to avoid and minimize potential adverse effects to special-status plant species.

Special-Status Plant Pre-Construction Survey (BIO-1)

Qualified biologists will conduct a special-status plant pre-construction survey of the affected areas for the HECA Project and within 200 feet of the affected areas, or to the property boundary if less than 200 feet, and if permission from the adjacent landowner cannot be obtained. Surveys will be conducted according to Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Natural Communities (CDFG, 2009). Special-status plants will be identified, counted, and mapped. Populations of special-status plants will be monitored through the course of the year to determine how many mature and bloom. The results of all pre-

construction surveys will be documented, and submitted to the CEC, USFWS, and the CDFG (see conservation measure BIO-17).

Special-Status Plant Avoidance (BIO-2)

If listed plant species are present that will be affected by construction within the HECA Project area, direct impacts to the plants will be avoided, to the greatest extent feasible.

Special-Status Plant Mitigation (BIO-3)

During construction, construction equipment that travels off the Project Site will be cleaned to remove dirt and seeds of noxious weeds. Native plants will be reestablished in areas where construction activities temporarily disturb natural vegetation. Post-construction monitoring will be conducted, and additional control measures such as hand removal, mowing, or herbicide application will be implemented as needed to minimize the establishment of noxious or invasive species (as defined by the California Agricultural Department and/or the California Invasive Plant Council) in areas where natural vegetation was removed during construction.

For permanent impacts to populations of California Native Plant Society (CNPS)-Ranked plant species that cannot be avoided, disturbance will be timed until after available seeds can be collected. These seeds will be properly stored, and then scattered over a suitable area near the parental site just prior to the first rains of the season.

Prior to temporary disturbance of special-status plant occurrences, seeds will be collected and properly stored for replanting after completion of construction. During construction, the topsoil will be salvaged and replaced on site after construction is completed. After work is completed in that area, the topsoil will be replaced and the seeds will be redistributed prior to the first rains of the season.

Both types of the above-mentioned re-seeded areas will be demarcated in the field, mapped, and monitored post-construction for 3 years. If the re-seeded areas have not met the performance criteria established in the BRMIMP after 3 years, additional monitoring will be conducted based on coordination with the resource agencies. Monitoring will be conducted during the early spring to determine whether the target species are present and whether weed species are common. Weeding will occur if weed species appear abundant or are adversely impacting the target species. Weeding will be done in a fashion that will minimize impacts to special-status plant or animal species and other native species, but may include hand-weeding, weed-whacking, or spraying with an agency-approved herbicide.

As part of the BRMIMP, a monitoring report will be submitted by HECA to the CEC and CDFG each year for 3 years that will document the status of each population, weeding efforts that have been undertaken, and suggested work for the next season (see measure BIO-17); these reports will be available to USFWS, if requested.

It is anticipated that these measures will be sufficient to avoid significant impacts to any special-status plant species that may be present.

2.3.5 Special-Status Wildlife Avoidance and Minimization Measures

The following measures will be implemented to avoid and minimize potential adverse effects to special-status wildlife species.

Terrestrial Wildlife Pre-Construction Survey (BIO-4)

Pre-construction surveys will be conducted in affected areas that have potentially suitable habitat for blunt-nosed leopard lizard, San Joaquin kit fox, giant kangaroo rats, and Tipton's kangaroo rats. Surveys will be conducted less than 2 weeks prior to the start of ground disturbance within the affected areas and adjacent habitats within 200 feet of the affected areas, or to the property boundary if less than 200 feet, and permission from the adjacent landowner cannot be obtained. Efforts will include visual surveys for blunt-nosed leopard lizard, San Joaquin kit fox, giant kangaroo, rats and Tipton's kangaroo rats. Visual surveys will also be conducted for Buena Vista Lake shrew in areas within the process water pipeline construction limits that are adjacent to the West Side Canal and the Kern River Flood Control Channel.

All sightings and/or signs of sensitive wildlife will be mapped using a global positioning system device. The results of all pre-construction surveys will be documented, and submitted to the CEC, USFWS, and CDFG (see measure BIO-17).

Site Clearance Prior to Ground Disturbance (BIO-5)

Prior to ground-disturbing activities in undeveloped and uncultivated lands within the HECA Project area, surveys will be conducted to determine whether San Joaquin kit fox, small mammals, or blunt-nosed leopard lizards are present. To ensure that no blunt-nosed leopard lizards are taken during the initial site preparation, each area with potential habitat will be surveyed by a CEC-approved biologist according to the standard protocols for survey timing and ambient temperature. These surveys will occur prior to any ground disturbance. Exclusion fencing will be installed around the perimeter of the work area to ensure that no wildlife re-enters. Exclusion fencing will consist of tin flashing (or other material approved by CDFG and USFWS) that will be buried at least 9 inches underground, and rise at least 2 feet above the ground.

Once the exclusion fencing has been established, the area will be visually surveyed during the day for wildlife, and small mammals will be trapped and relocated (see conservation measure BIO-15) during the night. All surveying and trapping efforts will be conducted in a manner that minimizes collapsing any small mammal burrows. Tracking stations will be used to determine whether there are additional individuals in the area.

The HECA Project construction areas will be surveyed daily for blunt-nosed leopard lizards when soil and air temperatures are within CDFG survey protocol limits. An area will be deemed

clear of any blunt-nosed leopard lizards after there have been no signs or sightings for 5 survey days. If a blunt-nosed leopard lizard is observed within the construction area, the exclusion fencing will be opened to allow the lizard to leave on its own accord. Once the lizard has left the area, the exclusion fencing will be closed and surveyed until there are no signs or sightings of blunt-nosed leopard lizards for 5 consecutive days.

Exclusion fencing will be left in place only for as long as needed to complete the work. For installation of the Project linears, no one area is likely to be closed for more than 6 months. The fencing will be inspected and maintained daily by the approved biologist. If the exclusion fencing is compromised (by wind or other means) and left open, an approved biologist will repair the fencing and determine if the area will need to be re-surveyed and/or re-trapped for wildlife.

To confirm that BIO-5 is successful, ground disturbance will be monitored (see measure BIO-16).

The results of the blunt-nosed lizard surveys and area clearance will be documented, and submitted to the CEC, USFWS, and CDFG (see measure BIO-17).

Predatory Bird Minimization Measures (BIO-6)

Several species of raptors and corvids (such as common ravens, American crows, and red-tailed hawks) are known to prey on blunt-nosed leopard lizards; common ravens are the most abundant potential avian predator in the Action Area. The HECA Project transmission design has been modified to incorporate elements to discourage raven nesting. For example; instead of lattice-style transmission towers, the HECA Project will use a single-pole transmission line design that minimizes potential perches and nesting sites. The proposed single-pole design is consistent with the Avian Power Line Interaction Committee's suggested practices for avian protection on power lines (APLIC, 2006).

To minimize the number of common ravens in the area, no raven will be allowed to nest in the HECA Project transmission towers within 1 mile of known blunt-nosed leopard lizard habitat. Raven nests will be removed by a CEC-approved biologist prior to egg-laying in early spring. For all bird nests removed, documentation will be prepared by HECA and submitted to the CEC, USFWS, and CDFG (see measure BIO-17).

San Joaquin Kit Fox Mitigation (BIO-14)

Disturbance (including any excavation and/or destruction) to all San Joaquin kit fox dens shall be avoided to the maximum extent possible, and shall only occur in accordance with the protocol described in the Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance (USFWS, 1999b), or as approved by the wildlife agencies. In essence, the following hierarchy shall be adhered to:

1. Pre-construction surveys shall be conducted by the CEC-approved biologist no less than 14 days and no more than 30 days prior to the beginning of ground disturbance and/or

construction activities or any HECA Project activity likely to impact the San Joaquin kit fox. Surveys shall identify kit fox habitat features on the HECA Project Site, and evaluate use by kit fox; and if possible, assess the potential impacts to the kit fox by the proposed activity. The status of all dens will be determined and mapped, and all appropriate equipment exclusion zones (per den type) will be demarcated in a manner that sufficiently alerts equipment operators of the exclusion zone.

2. Regardless of time of year, no natal kit fox dens will be excavated unless authorized by the Wildlife Agencies. Other den types may be excavated only by agency-approved biologists, and only after occupancy status has been determined. Excavation and/or destruction of dens would then be allowed in accordance with the procedures specified in Standardized Recommendations (USFWS, 1999b), or as approved by the wildlife agencies.

3. All known and natal kit fox dens that are slated for destruction will be replaced. Prior to destruction of an active den, artificial replacement dens will be constructed outside the buffer zone. Replaced dens will be constructed according to protocols set forth by the Wildlife Agencies. The replacement ratio will be 1:1 for non-natal dens. If excavation or destruction is approved by the Wildlife Agencies, replacement ratios will be 2:1 for natal dens.

The results of all den assessments, burrow scoping, and excavation activities will be documented, and submitted to the CEC, USFWS, and CDFG (see measure BIO-17).

Small Mammal Mitigation (BIO-15)

Construction work areas will be surveyed and small mammals will be relocated as necessary prior to any ground disturbance to minimize impacts to small mammals during the initial site preparation; work areas will be cleared in accordance with the *Survey Protocol for the Morro Bay Kangaroo Rat* (USFWS and CDFG, 1996), or as determined in consultation with either CDFG or USFWS. Areas will be secured prior to this effort so that wildlife species cannot re-enter the area (in conjunction with conservation measure BIO-5).

Small mammal trapping and relocation will be conducted for 5 consecutive nights, or until no animals are caught on 2 consecutive nights per area. The small mammal trapping surveys would occur within the construction work areas in potentially suitable habitat (alkali desert scrub, pasture, annual grassland, and barren) that contains evidence of small mammals. Traps will be set according to "sign" (burrows, trails, scat, etc.) and/or in areas of high habitat quality. Small mammal trapping and relocation will be performed by a qualified biologist(s) approved by the CEC with the necessary permits. The results of the small mammal trapping and area clearance will be documented, and submitted to the CEC, USFWS, and CDFG (see Mitigation Measure BIO-17).

2.3.6 Monitoring and Mitigation Reporting

Ground-Disturbance Monitoring for Terrestrial Wildlife (BIO-16)

Construction activities in areas with habitat value for listed species will be monitored by a qualified biologist while the top 18 inches of soil are initially disturbed. The biologist(s) will watch for any special-status animals and will have the authority to stop work if a listed wildlife species is encountered in the construction area. If authorized to remove and/or relocate the species, biologists will relocate the animal to the nearest safe location. If the species cannot be legally relocated, work at that location will be shut down and all personnel will be required to leave the area. The approved biologist will watch the wildlife in question from a distance until the individual has left the area. The results of all construction monitoring will be documented, and submitted to the CEC, USFWS, and CDFG (see Mitigation Measure BIO-17).

Reporting to Agencies (BIO-17)

During construction, a quarterly BRMIMP report will be prepared by HECA and submitted to the CEC, CDFG, and USFWS. The report will be submitted by the 20th of the following month (i.e., the report for May will be submitted by June 20). If the 20th falls on a weekend or holiday, the report will be due the first business day following the 20th. To reduce the use of paper, the BRMIMP may be submitted on compact disc (CD) or electronically, as directed by each agency.

During construction at the HECA Project Site, a CEC-approved biologist will examine active work areas every day prior to the onset of activities to ensure that no special-status species are in the area, and that all wildlife barriers are still in place. Biologists will inform the construction crews when areas are clear, and report significant observations of wildlife to the agencies, as required in the BRMIMP.

2.3.7 Habitat Compensation

HECA LLC will implement the following compensation for temporary and permanent losses of habitats used by special-status species due to construction and operation of the HECA Project. Compensation would include offsite acquisition, preservation, and enhancement of land potentially used by one or more of the affected special-status species.

HECA Project Sensitive Habitat Mitigation (BIO-18)

HECA will compensate for the permanent and temporary loss of habitats potentially used by federally and state-listed species by acquiring credits from the USFWS-approved Kern Water Bank Authority mitigation bank.

HECA LLC will acquire USFWS-approved mitigation credits that meet the habitat and/or species requirements of the federally and state-listed species that would be affected by the proposed action. The compensation proposal consists of the following components:

- Compensation for temporary habitat loss associated with construction of the natural gas pipeline: a total of 8.0 acres (credits) would be acquired to compensate for 3.7 acres of natural vegetation that would be temporarily removed during construction.

- Compensation for permanent habitat loss associated with construction of the Project Site, the railroad spur, the natural gas pipeline, and the PG&E switching station: a total of 47 acres (credits) would be acquired to compensate for the permanent loss of 466 acres of cultivated fields that may be used infrequently by San Joaquin kit fox for movement and migration.

OEHI Project Sensitive Habitat Mitigation

OEHI will provide compensation for the OEHI Project, including the CO_2 pipeline, in accordance with the 1995 USFWS Biological Opinion concerning oil production at Maximum Efficient Rate on Elk Hills Naval Petroleum Reserve (USFWS File # 1-1-95-F-102) and the draft HCP currently under review by the USFWS.

2.4 PROJECT SCHEDULE

The anticipated schedule milestones for the Project are as follows:

DOE submits Biological Assessment to USFWS.....March 2013
USFWS finalizes Biological Opinion.....May 2013
Completion of CEC permitting process.....June 2013
Commencement of pre-construction and construction activities.....June 2013
Commencement of truck deliveries and ground disturbance.....August 2013
Completion of construction.....February 2017
Commencement of pre-commissioning and commissioning.....March 2016
Commencement of commercial operation of the Project .....September 2017

3.0 ACTION AREA AND ENVIRONMENTAL SETTING

The following is a discussion of the environmental settings and biological resources currently present in the Action Area, defined in this report as the 453-acre Project Site, the 4-acre PG&E switching station, the OEHI Project Site, and the construction footprints of the associated linear facilities and associated buffers per CEC guidelines (1-mile buffer from the HECA Project Site and 1,000-foot buffer from all associated linear facilities as shown in Figure 5). Information regarding the environmental setting within 35 miles of the HECA Project Site is included when a regional perspective is required.

3.1 PROJECT SETTING

The HECA Project Site is in unincorporated Kern County approximately 2 miles northwest of the unincorporated community of Tupman, and south of Adohr Road. The land use in this portion of Kern County is resource-based oil exploration and production, which provides a large segment of the employment base. Clay mineral extraction also occurs in the area. The 453-acre HECA Project Site is comprised of portions of two agricultural parcels in Section 10 within Township 30 South, Range 24 East.

The HECA Project Site is currently used for farming purposes, including cultivation of cotton, alfalfa, and onions. Land surrounding the HECA Project Site, including the Controlled Area, is also used primarily for farming, particularly the cultivation of alfalfa and cotton. The Outlet Canal, KRFCC, and the California Aqueduct (State Water Project) are 500, 700, and 1,900 feet south of the Project Site, respectively. The western border of the Tule Elk State Natural Reserve is approximately 1,700 feet to the east of the Project Site. The nearest single-family dwellings are approximately 1,400 feet to the east. HECA LLC has an option to purchase the HECA Project Site and Controlled Area.

Land uses in the vicinity of the approximately 13-mile-long natural gas pipeline route are primarily active agricultural land (mainly alfalfa cultivation), disturbed and/or developed areas, and patches of open/undeveloped land (Allscale Scrub).

Land uses in the vicinity of the approximately 15-mile-long process water pipeline are primarily farming (mainly alfalfa, cotton, and wheat cultivation), and orchards (pistachio). Much of the land between the West Side Canal and the KRFCC is Allscale Scrub.

Land uses in the vicinity of the approximately 1-mile-long potable water pipeline consist of previously disturbed habitat and farming (mainly alfalfa, cotton, oat, and wheat cultivation).

Existing land uses in the vicinity of the approximately 2-mile-long electrical transmission line consists of previously disturbed habitat and farming (mainly alfalfa, cotton, oat, and wheat cultivation). The new PG&E switching station at the terminus of the electrical transmission line would occupy approximately 4 acres in a field that is currently cultivated for alfalfa.

The OEHI Project Site consists of approximately 64 acres that will be permanently developed during the Demonstration Period of the project, and approximately 29 acres that will be temporarily disturbed to construct the CO_2 Pipeline. The EHOF is a mix of developed lands used for oil production and undeveloped lands. Land uses in the vicinity of the OEHI Project include farming (mainly alfalfa cultivation), open/undeveloped land (Allscale Scrub; Sawyer, Keeler-Wolf, and Evens, 2009), and resource extraction (oil production). The CO_2 pipeline would cross under the West Side/Outlet Canal, KRFCC, and the California Aqueduct using HDD.

3.1.1 Existing Conservation Lands in the Project Vicinity

Existing conservation lands within 35 miles of the HECA Project Site are listed in Table 2; Figure 5, Existing Natural Resource Conservation Areas, shows those areas within 10 miles, with the exception of the *Elk Hills Unit Draft Habitat Conservation Plan* area, whose boundaries have not yet been published.

Table 2
Existing Natural Resource Conservation Areas near the HECA Project Site

Conservation Area	Approximate Distance (miles)	Direction from HECA Project Site
California Aqueduct San Joaquin Draft Habitat Conservation Plan (developed by Department of Water Resources)	0.3	Southeast
Tule Elk State Reserve	0.3	East
Lokern Ecological Reserve	0.5	South
Occidental of Elk Hills, Inc., Elk Hills Unit Draft Habitat Conservation Plan	1.0	South
Kern Water Bank	1.0	East
Coles Levee Ecosystem Preserve	3.5	Southeast
Buttonwillow Ecological Reserve	6.5	North
Buena Vista Aquatic Recreation Area	7.8	Southeast
Northern Semitropic Ridge Ecological Reserve	22.5	Northwest
Carrizo Plain National Monument	22.7	West
Kern and Pixley National Wildlife Refuges	33.4	Northwest

3.2 CRITICAL HABITAT

Neither the HECA Project nor the OEHI Project would impact any USFWS-designated critical habitat. The nearest critical habitat is for Buena Vista Lake shrew, which is more than 20 miles to the southeast of the HECA Project Site (USFWS 2005).

3.3 ONGOING ACTIVITIES

Numerous ongoing activities in the Action Area may be affecting sensitive habitat, or federally listed plants or wildlife. To the east of the California Aqueduct are areas of active agriculture, active oil and gas extraction, and areas subject to periodic flooding as part of a water-banking system. The EHOF, located south of the California Aqueduct, is one of the most productive oil fields in the western United States, with thousands of existing production wells; it has been in production for decades.

4.0 CONSIDERATION OF FEDERALLY LISTED SPECIES

This section describes the methods used to characterize the HECA Project and OEHI Project's environmental setting and biological resources, and discusses the eight federally listed species with the potential to occur within the Action Area. Giant garter snakes are also included because they historically occupied the Action Area, but are presumed to be extirpated from the area.

4.1 EVALUATION METHODS

The Action Area evaluated for biological resources includes the area within a 1-mile radius of both the 453-acre Project Site and the OEHI Project Site, as well as the area within 1,000 feet of all proposed linear facilities. The proposed linear facilities surveyed by HECA included the process and potable water line corridor, the natural gas pipeline corridor, the railroad spur, the CO_2 pipeline route, and the transmission line route, where access was granted. These surveyed areas are shown on Figure 5, Existing Natural Resource Conservation Areas. In addition to the surveys conducted by HECA, OEHI biologists conducted surveys of the current CO_2 pipeline route and associated facilities in the EHOF.

The impact assessment for biological resources included informal consultation with resource management agencies, literature review, and preliminary field surveys. The literature search included an examination of environmental documents from adjacent and nearby areas, and a review of pertinent maps, scientific literature, and regional biological field guides. Key resources and references include the following:

- Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS, 1998)
- 2001 Special-status plant species survey results at Elk Hills Oil Field, Kern County, California (Quad Knopf, 2001)
- Supplemental Environmental Information, Occidental of Elk Hills, Inc., CO_2 Enhanced Oil Recovery Project (Stantec, 2012a)
- Modified CO_2 Supply Line Alignment Data Gap Analysis (Stantec, 2012b)
- Endangered Species Program 2011 Annual Report (OEHI, 2012)
- Coles Levee Ecosystem Preserve 2007 Annual Report (Live Oak, 2008a)
- Kern Water Bank Authority Habitat Conservation Plan/Natural Community Conservation Plan 2007 Compliance Report and Management Plan (Kern Water Bank Authority, 2008)
- California Natural Diversity Database (CDFG, 2012a)

A summary of the biological resources surveys performed is provided in Table 3. Qualifications of the biologists who contributed to the BA are provided in Appendix D. Plant species observed during these field surveys are listed in Appendix E, and wildlife species observed are provided in Appendix F. Additional wildlife surveys, including protocol surveys for blunt-nosed leopard lizard, were conducted for the OEHI project components in 2012 (Stantec, 2013).

Table 3
Biological Resources Field Surveys

Resource	Field Surveys Completed	Conducted by URS Biologists(s)
General biology	Habitat assessment, small mammal evaluation, general reconnaissance conducted for the process water linear on April 13 and April 24, 2008	Alex Brown and Julian Valenzuela
General biology	Habitat assessment, small mammal evaluation, general reconnaissance conducted for the CO_2 gas linear route on May 20, 2008	David Kisner
Potential jurisdictional wetlands	Habitat assessment in the vicinity of the CO_2 linear route, conducted on March 5, 6, and 20, 2008 and May 28, 2008	David Kisner and Alyssa Berry
General biology	Habitat assessment of the Project Site on December 30, 2008	David Kisner and Cletis England
General biology	Habitat assessment of the Project Site on January 8 and 9, 2009	Cletis England, Alyssa Berry, Robin Murray, Ronald Cummings, David Compton, and Jessica Birnbaum
Special-status wildlife, and potential jurisdictional wetlands	Rare plant, wildlife, and potential jurisdictional wetlands surveys in the vicinity of the CO_2 linear on March 17, 18, and 26, 2009	David Kisner, Wayne Vogler, Alyssa Berry, and Robin Murray
Special-status plant, wildlife, and potential jurisdictional wetlands	Rare plant, wildlife, and potential jurisdictional wetlands surveys of the Project Site on March 23, 2009	David Kisner and Cletis England
Protocol blunt-nosed leopard lizard surveys and special-status plant and wildlife	April through July 2009 protocol surveys were conducted in areas within or south of the Kern River Flood Control Channel	Wayne Vogler, Kate Eldredge, Alyssa Berry, Cletis England, Robin Murray, Ronald Cummings, Jessica Birnbaum, David Kisner, and Andy Evans
Rare plant survey	April 6 through 9, 2010 Surveys were conducted in the vicinity of the CO_2 linear	David Kisner, Kate Eldredge, and Kelly Kephart
General biology survey	April 5 through 9, 19 through 21, and 28, 2010 Surveys were conducted along the electrical transmission linear	David Kisner, Kate Eldredge, Alyssa Berry, and Kelly Kephart
General biology survey	July 27 and 28, 2010 Surveys were conducted along the natural gas linear alignment	David Kisner, Ronald Cummings, Dave Compton, and Kelly Kephart
Blunt-nosed leopard lizard	Protocol adult and juvenile surveys along natural gas linear: 2010 – August 5 through September 15, 2010 2012 – May, June, July, and August, 2012	2010 – David Kisner, Ronald Cummings, Dave Compton, Kate Eldredge, Jolie Henricks, Melissa Newman, Jane Donaldson, Mark Wilson, and Gilda Barboza 2012 – Level two biologists Chris Julian, David Kisner, and Kate Eldridge; and level one biologists Jamie Deutsch, Kelly Kephart, Johanna Kisner, Melissa Newman, Mike Carbiener, Mike Dempsey, and Jane Donaldson

Table 3
Biological Resources Field Surveys (Continued)

Resource	Field Surveys Completed	Conducted by URS Biologists(s)
Field Reconnaissance for Wetlands and Other Waters	December 7, 2010 Field review of the natural gas linear alignment	David Kisner, Jan Novak
Rare plant survey	March 15, 16, and 17, 2011 The survey was conducted along the natural gas linear alignment	David Kisner, Kelly Kephart, Johanna Kisner, Chris Julian, and Jamie Deutsch
Wetland delineation survey	March 15, 16, and 17, 2011 The survey was conducted along the natural gas linear alignment	David Kisner, Kelly Kephart, Johanna Kisner, Chris Julian, and Jamie Deutsch
Habitat Assessment Surveys/Hawk Winter Nest Structure Survey	February 23, 2012 The survey was conducted along the revised natural gas linear alignment, rail spur, and process water linear alignments	David Kisner and Steve Zembsch
Rare Plant Survey, Wetland Delineation and Habitat Assessment	March 27-30, 2012 The surveys evaluated the entire Action Area, including the Project Site and all Project linears, including the industrial rail spur alignment	Kelly Kephart, Jan Novak, and Jane Donaldson

Per CEC guidelines, a record search was performed for a 5-mile radius of the HECA Project Site, and within 1,000 feet of the HECA Project linears. Federally listed species with the potential to occur within 5 miles of the HECA Project Site or within 1,000 feet of the HECA Project linears were identified from the following data sources:

- USFWS species lists provided for each 7.5-minute USGS quadrangle in the biological resources Action Area (called the East Elk Hills and Tupman quadrangles).A search of all species occurrences in the California Natural Diversity Database (CNDDB) within a 5-mile radius of the Project Site and 1,000 feet of linears (CDFG, 2012a).

- The CNPS Inventory of Rare and Endangered Plants for the East Elk Hills and Tupman quadrangles (CNPS, 2009)

- 2001 Special-status plant species survey results at *Elk Hills Oil Field*, Kern County, California (Quad Knopf, 2001)

- Coles Levee Ecosystem Preserve 2007 Annual Report (Live Oak, 2008a)

- Kern Water Bank Authority Habitat Conservation Plan/Community Conservation Plan 2007 Compliance Report and Management Plan (Kern Water Bank Authority, 2008)

- Occidental Elk Hills Oil Field, Kern County, California Biological Database (2008).

Appendix C identifies all federally listed species with potential to occur within 5 miles of the Action Area. Table 4 shows all federally listed plant species with potential to occur within the Action Area. Table 5 is provided in Section 4.3, and identifies all the federally listed and special-status wildlife species with the potential to occur in the vicinity of the Action Area. These tables summarize the preferred habitats for species with potential to occur in the vicinity of the Action Area. Only species identified on Table 4 and Table 5 with a "low" or greater likelihood of occurrence in Action Area are discussed in more detail in the following sections.

4.2 FEDERALLY LISTED PLANT SPECIES

No federally listed plant species were detected during the 2008, 2009, 2010, 2011, or 2012 surveys conducted by HECA northeast of the California Aqueduct. Multi-year vegetation surveys of the Action Area within the EHOF by OEHI have not documented any federally listed plant species within the OEHI Project Site (Quad Knopf, 2001). Surveys conducted northeast of the California Aqueduct used the protocols set forth in the CDFG Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Natural Communities (CDFG, 2009). The surveys were floristic in nature, covered an extensive study area that extended 1,000 feet from the centerline of proposed linears, and reference sites from the Lokern and Lost Hills areas were visited to confirm search images for individual species, and verify that the survey timing coincided with the blooming period for the listed plant species. Figure 6, Federally Listed Plant Species Near the Action Area, shows the species that have been identified near the Action Area; however, no listed plants are within the Action Area.

4.2.1 California Jewel-Flower (*Caulanthus californicus*)

California jewel-flower (listed as federally endangered) is an annual herb that occurs primarily in Fresno, Kern, and Tulare counties. A member of the *Brassicaceae* family, it inhabits chenopod scrub, pinyon and juniper woodlands, and valley and foothill grasslands. Its habitat ranges in elevation from 70 to 1,000 meters. The blooming period is from February to May. The decline of this species is attributable to agriculture, urbanization, energy development, and grazing, and possibly by invasion of non-native plants.

Based on the location of known populations, this species is not expected to be impacted by the HECA Project or the OEHI Project.

4.2.2 Kern Mallow (*Eremalche kernensis*)

Kern mallow (listed as federally endangered) is an annual herb that occurs primarily in Kern and Tulare counties. A member of the *Malvaceae* family, it inhabits chenopod scrub and valley and foothill grasslands. Its habitat ranges in elevation from 70 to 1,000 meters. The blooming period is from March to May. The decline of this species is attributable to conversion of habitat to agricultural use, as well as grazing and oil and gas development.

Table 4
Federally Listed Plant Species with Potential to Occur within 5 Miles of the Action Area

Common Name	Scientific Name	Federal Listing Status[1]	Likelihood of Occurrence in Action Area	Habitat Associations and Flowering/ Greatest Activity Period for Area
California jewel-flower	*Caulanthus californicus*	E	Low Recorded approximately 8 miles south of the Project Site	Chenopod scrub, pinyon and juniper woodlands, valley and foothill grasslands: February-May
Kern mallow	*Eremalche kernensis*	E	Low Recorded near the northern portion of the potable water linear	Chenopod scrub, valley and foothill grasslands: March-May
San Joaquin woollythreads	*Monolopia [Lembertia] congdonii*	E	Moderate Found approximately 2 miles to east of the Project Site	Chenopod scrub, valley and foothill grasslands: February-May
Bakersfield cactus	*Opuntia basilaris* var. *treleasei*	E	Very Low Not recorded in area	Chenopod scrub, cismontane woodland, valley and foothill grassland: April-May

Notes:
[1] E= Endangered

Table 5
Federally Listed or Candidate Wildlife Species with Potential to Occur within 5 Miles of the Action Area

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence in Action Area	Habitat Associations
Reptiles				
Blunt-nosed leopard lizard	*Gambelia sila*	E	Present Observed in 2008 within 1 mile south of the Project Site along the previously proposed CO_2 linear, and in 2010 near the northern terminus of the natural gas linear.	Inhabits sparsely vegetated alkali and desert scrub habitats in areas of low topographic relief. Preferred habitat includes semiarid grasslands, alkali flats, and washes.
Giant garter snake	*Thamnophis gigas*	T	Very Low Last recorded in 1940 within the region. Likely extirpated from Kern County.	Requires adequate water during its active season, herbaceous wetland vegetation as cover, openings in wetland vegetation for basking, and higher elevations for refuge from flood waters during the dormant season. Adapted to irrigation ditches and canals.
Birds				
Western snowy plover	*Charadrius alexandrinus nivosus*	T	Very Low Not found within 5 miles of Project Site.	Breeds above high tide-line on coastal beaches, sand spits, sparsely vegetated dunes, and beaches at creek or river mouths. Western snowy plovers that nest at inland sites are not considered part of the Pacific coast population.
Yellow-billed cuckoo	*Coccyzus americanus*	C	Very Low Poor nesting habitat; migrants may pass through area.	Inhabits open woodlands with clearings and a dense shrub layer. Often frequents woodlands near streams, rivers, or lakes.
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	Very Low Poor nesting habitat; migrants may pass through area.	Breeds in dense riparian habitats along rivers, streams, or other wetlands.
Least Bell's vireo	*Vireo bellii pusillus*	E	Very Low Poor nesting habitat; migrants may pass through area.	Prefers dense, shrubby vegetation, woodlands, scrub oak, coastal chaparral, and mesquite brushlands, often near water in arid regions.

Table 5
Federally Listed or Candidate Wildlife Species with Potential to Occur within 5 Miles of the Action Area
(Continued)

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence in Action Area	Habitat Associations
Mammals				
Buena Vista Lake shrew	*Sorex ornatus relictus*	E	Low Habitats in the Action Area are not suitable for this species; no freshwater marsh wetlands or riparian habitats with dense cover in the Action Area.	Inhabits valley freshwater marsh with well-developed ground layer of dead branches, leaf litter, downed logs, exposed cottonwood and willow roots, and high soil moisture.
Giant kangaroo rat	*Dipodomys ingens*	E	High Observed approximately 1 mile south of the Project Site in 1990. Per February 2012 communication with CDFG, this species is expected on the southern side of California Aqueduct, but not likely to occur east of the Aqueduct.	Saltbush scrub and sink scrub communities in the Tulare Lake Basin of the southern San Joaquin Valley. Requires soft, friable soils, which escape seasonal flooding where it will dig burrows in elevated soil mounds at the base of shrubs.
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	E	High Previously documented within 1 mile of the Project Site and within the Action Area for the linear Project components.	Valley sink scrub and valley saltbush scrub in the Tulare basin. Sparse top moderate shrub cover is associated with high-density populations. Terrain not subject to flooding is an important factor for permanent occupancy.
San Joaquin kit fox	*Vulpes macrotis mutica*	E	Present Active dens observed in vicinity of CO_2 linear in 2008 and potential tracks/sign observed in KRFCC in 2009.	Chenopod scrub, grasslands, and other habitats. Sometimes forages in agricultural areas.

Notes:
E Federal Endangered T Federal Threatened C Federal Candidate

Based on the location of known populations, this species may be found near the process water pipeline. However, the process water pipeline would be installed within an existing dirt road, and therefore the Kern mallow is not expected to be impacted by the HECA Project or the OEHI Project.

4.2.3 San Joaquin Woollythreads (*Monolopia [Lembertia] congdonii*)

San Joaquin woollythreads (listed as federally endangered) is an annual herb that occurs primarily in Fresno, Kern, and Kings Counties. A member of the *Asteraceae* family, it inhabits chenopod scrub as well as valley and foothill grasslands. Its habitat ranges in elevation from 60 to 800 meters. The blooming period is from February to May. The decline of this species is attributable to agriculture, urbanization, oil and gas development, grazing, trampling, and vehicles.

Based on the location of known populations, this species is not expected to be impacted by the HECA Project or the OEHI Project.

4.3 FEDERALLY LISTED REPTILE SPECIES

Federally listed reptile species with the potential to occur within the Action Area are described below and shown in Table 5. Species with no suitable habitat, and those that have been extirpated in the vicinity of the Action Area, are not discussed further in this document.

4.3.1 Blunt-Nosed Leopard Lizard *(Gambelia sila)*

The blunt-nosed leopard lizard is listed as federally endangered. It inhabits sparsely vegetated alkali and desert scrub habitats. Blunt-nosed leopard lizards are carnivorous. They forage opportunistically on the ground, catching grasshoppers, cicadas, and small lizards, including smaller leopard lizards. They commonly hunt by slowly stalking prey, then rapidly dashing in to capture it.

Leopard lizards typically find shelter by using mammal burrows, shrubs, or structures such as fence posts. Females can create nests by altering unused mammal burrows to form a closed chamber below the soil surface (Tollestrup, 1983). Leopard lizard habitat is characterized by sparsely vegetated scrub and grassland habitats in flat areas. Blunt-nosed leopard lizards hibernate during the winter and are active from late March to late June or July. Metabolic rates and activity are regulated by ambient temperatures. They mate from late April through May and the females usually lay eggs between May and June. The usual clutch size is three eggs, but a clutch can range from two to six. Females usually produce one clutch per year, although occasionally a second is produced. The incubation period is approximately 57 days. Females may breed during their first spring, but males may not breed until they are large enough to secure a territory (Tollestrup, 1982; 1983).

Blunt-nosed leopard lizard populations are located in scattered sites in the San Joaquin Valley and adjacent foothills and are found between elevations of 100 to 2,400 feet (Stebbins, 2003) on

alkali flats, large washes, arroyos, canyons, and low foothills. The decline of this species is primarily attributable to conversion of habitat to agricultural land. Other potential factors in the decline of blunt-nosed leopard lizard populations include predation by ravens.

No blunt-nosed leopard lizards have been observed on the Project Site or within the KRFCC area, portions of which were surveyed in 2008. Figure 7, Blunt-Nosed Leopard Lizard Occurrences Near the Action Area, shows known current blunt-nosed leopard lizard observations and the current understanding of occupied habitat within the Action Area; Figure 7 summarizes the information collected on the OEHI portion of the project over the course of 17 years of data collected for annual reporting requirements. In addition to CNDDB records, blunt-nosed leopard lizards have been observed by URS biologists at several other locations in the vicinity of the proposed HECA Project:

- In August 2008, 20 juvenile blunt-nosed leopard lizards were seen in the course of 1 day on the southwest side of the California Aqueduct, west of the proposed CO_2 pipeline.
- In 2009, a male blunt-nosed leopard lizard was seen approximately 0.2 mile west of the town of Tupman north of the east-west access road.
- In late August 2010, one blunt-nosed leopard lizard was observed approximately 0.4 mile east of the Buttonwillow Ecological Reserve.

The CO_2 pipeline south of the California Aqueduct will be constructed within habitats assumed to be used by blunt-nosed leopard lizard based on known occurrences in the vicinity. Annual surveys of the northern flank of Elk Hills for blunt-nosed leopard lizards have detected this species sporadically since 2000 (OEHI, 2012; Figure 7). Most of the recently documented occurrences of blunt-nosed leopard lizard in the Elk Hills have been on the southwestern side of the hills adjacent to the Buena Vista Valley (OEHI, 2012; Stantec, 2013).

The Kern Water Bank properties are potentially suitable for blunt-nosed leopard lizard, but may not be occupied due to the abundance of grass cover and past management activities (i.e., disking or tilling and periodic flooding). The CNDDB shows records for blunt-nosed leopard lizard on the Tule Elk Reserve approximately 0.5 mile to the south of the proposed alignment from 1990.

Protocol surveys for adults and juveniles were conducted by URS in 2012. The 2012 blunt-nosed leopard lizard surveys were conducted according to the protocols described in the California Department of Fish and Game May 2004 Approved Survey Methodology for the adult blunt-nosed leopard lizard (CDFG, 2004). Five sites along the natural gas and/or rail line shown on Figure 7 were determined to have potential habitat for blunt-nosed leopard lizards. No other habitat suitable for this species is present along the linears that will be constructed by HECA. No blunt-nosed leopard lizards were detected in the Action Area during the 2012 adult and juvenile surveys conducted on the five sites shown on Figure 7.

4.3.2 Giant Garter Snake *(Thamnophis gigas)*

The giant garter snake is a federally threatened species and is one of the largest garter snakes, attaining a total length of at least 63 inches. Females tend to be slightly longer and proportionately heavier than males. Its diet consists of small fish, tadpoles, and frogs. Adequate water during the early spring through mid-autumn to provide food and cover is an essential habitat requirement. During its active season, wetland vegetation such as cattails and bulrushes provide essential cover and foraging habitat; openings alongside waterways facilitate basking. During the dormant season of winter, giant garter snakes require higher elevation uplands for cover and safety from flood water. Throughout the dormant season, giant garter snakes inhabit small mammal burrows that lie above flood elevations. Giant garter snakes breed through March and April, and females give birth to live young from late July through early September. Brood size ranges from 10 to 46 young, with an average brood size of 23. Young immediately disperse into dense cover and absorb their yolk sacs, after which they begin foraging independently. Sexual maturity is reached at an average age of 3 years for males and 5 years for females (Stebbins, 2003).

The giant garter snake lives in agricultural wetlands and other waterways such as irrigation and drainage canals, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the Central Valley. Due to the direct loss of natural habitat, the giant garter snake relies heavily on rice fields in the Sacramento Valley, but also uses managed marsh areas in Federal National Wildlife Refuges and State Wildlife Areas. Giant garter snakes are usually absent from larger rivers due to a dearth of suitable habitat and emergent vegetative cover, and from areas with sand, gravel, or rock substrates. Only a few recent sightings of giant garter snakes in the San Joaquin Valley are documented in the CNDDB (CDFG, 2012a).

The species is now apparently extirpated or very rare in most of its former range in the southern San Joaquin Valley. Surveys in the 1970s and 1980s yielded some previously unknown localities and several cases of extirpation or at least severe population declines (USFWS, 1993). The area of occupancy, number of sub-populations, and population size are probably continuing to decline, but the rate of decline is unknown. The decline of this species is primarily attributable to loss and degradation of habitat (USFWS, 1999a). Activities that may degrade habitat include maintenance of flood control and agricultural waterways, weed abatement, rodent control, discharge of contaminants into wetlands and waterways, and overgrazing in wetland or streamside habitats. Factors that may be significant in some areas include predation by and competition with introduced species, parasitism, and road kills (USFWS, 1999a). USFWS (1993) listed threats as habitat loss, flooding (in rice production areas), pollutants, vehicular traffic, livestock grazing, and introduced predators such as house cats and bullfrogs.

No giant garter snakes were observed during the 2008, 2009, 2010, 2011, or 2012 surveys. In addition, based on input from USFWS and CDFG, this species is presumed to be extirpated from the Action Area.

4.4 FEDERALLY LISTED MAMMAL SPECIES

No small mammal trapping was conducted to the northeast of the California Aqueduct during the 2008, 2009, 2010, 2011, or 2012 assessment surveys. Information on the small mammals in the Action Area was gained from other ongoing surveys mentioned above. There is evidence of small mammal activity, including burrows of various sizes, gopher mounds, scat, and tracks within areas of natural vegetation. Potential signs of listed mammals, such as Tipton kangaroo rat (*Dipodomys nitratoides nitratoides)* were seen within the Kern Water Bank properties.

Listed mammal activity on the OEHI property has been monitored over the course of 17 years as part of the ongoing biological monitoring (OEHI, 2012).

4.4.1 Buena Vista Lake Shrew (*Sorex ornatus relictus*)

The Buena Vista Lake shrew is a federally endangered species that inhabits the marshes of the southern San Joaquin Valley. It is a subspecies of the ornate shrew, *S. ornatus ornatus*. Shrews primarily feed on invertebrates, particularly insects. The Buena Vista Lake shrew does not cache food in burrows, and must forage frequently throughout the day and night to maintain its rapid metabolic rate. During the hottest months, activity is mostly confined to cooler periods of the day and night. The reproductive period stretches from late February through September and early October. Females of this species may have from one to eight offspring per litter, though four to six is typical. Nothing is known about the reproductive and mating system of the Buena Vista Lake shrew, but the breeding season may begin in autumn and end with the onset of the dry season in May or June (Williams and Kilburn, 1992).

The Buena Vista Lake shrew formerly occupied the marshlands of the San Joaquin Valley and the Tulare Basin. Its range has diminished due to the loss of lakes and sloughs in the area. It has been recorded from the Kern Lake Preserve area and the Kern National Wildlife Refuge. It occurred in the wetland habitats around the original historic Buena Vista, Tulare, and Kern lakes, and along streams and sloughs throughout the lake basins. Recent captures of shrews at the Kern Lake Preserve were made within a meter of the water line of Gator Pond in the shaded understory of cottonwood-willow riparian habitat, in dense stands of cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.), or occasionally in dense patches of alkali heath (*Frankenia grandifolia*) (Maldonado, 1992; Maldonado et al., 1998). A partial list of plants found at many capture sites is: Fremont cottonwood (*Populus fremontii*), willow (*Salix* spp.), pickleweed (*Salicornia* sp.), alkali heath (*Frankenia grandifolia*), wild-rye (*Elymus* sp.), and Baltic rush (*Juncus balticus*). Many capture sites contain a well-developed ground layer of dead branches, leaf litter, downed logs, exposed cottonwood and willow roots, and high soil moisture. Its current distribution is unknown but is likely to be very restricted due to the loss of habitat. The decline of this species is attributable to loss of habitat due to agricultural conversion (Williams and Kilburn, 1992). Due to lack of study, information about the home range size, breeding territory size, and population densities of the shrew is lacking.

No Buena Vista Lake shrews were seen during the 2008, 2009, 2010, 2011, or 2012 surveys. Established riparian habitat that is potentially suitable for this species is approximately 1 mile

southeast of the HECA Project Site; agricultural waterways which may offer marginal habitat are common within the larger Project Area. There have been observations of this species approximately 3.5 miles southeast of the HECA Project Site in 1999 (CDFG, 2012b). This species is not expected to occur in the HECA Project Site or along any of the linears; however, based on a recent observation of this species in the KRFCC, the USFWS noted during the October 17, 2012, site visit that this species might occur in the vicinity of the process water pipeline, where it is located adjacent to canals or drainage features. These canals or drainage features may offer periodic and temporary dispersal corridors between larger patches of suitable habitat; long-term occupation of the canals and drainage features is not expected due to the lack of sustained habitat, prey, and water levels.

No Buena Vista Lake shrews have been documented in the OEHI Project Site, and no shrews are expected due to the arid habitat and lack of canals, wetlands, or other water features. The proposed CO_2 Pipeline would avoid potential disturbance of the KRFCC by constructing this segment using HDD installation.

4.4.2 Giant Kangaroo Rat *(Dipodomys ingens)*

Giant kangaroo rats are nocturnal rodents that are federally endangered and occur in scattered colonies along the western side of the San Joaquin Valley. They are typically found on fine, sandy loam soils with sparse annual grass and forb vegetation, and marginally found in low-density alkali desert scrub. Their diet primarily consists of seeds, which are cached in burrows (Shaw, 1934) and green vegetation in spring. Level terrain and sandy loam soils are needed for burrowing. Optimal cover consists of areas with almost no shrub overstory, and very few physiographic variations (Grinnell, 1932; Shaw, 1934; Hawbecker, 1951).

Breeding season lasts from January to May, peaking in early spring. Litter size ranges from four to six individuals and young are born and reared in the burrows. Predators include kit foxes, badgers, coyotes, barn owls, rattlesnakes, and gopher snakes. *D. ingens* currently occupies about 2 percent of its former range (CDFG, 1980). The decline of this species is attributable to loss of habitat to cultivation and overgrazing, and the use of rodenticides (CDFG, 1980).

No giant kangaroo rats or precincts were seen during the 2008, 2009, 2010, 2011, or 2012 surveys. Figure 8, Giant Kangaroo Rat Occurrences Near the Action Area, shows all known current giant kangaroo rat observations and the current understanding of occupied habitat within the Action Area. Based on annual monitoring conducted by OEHI, it is assumed that this species may occur within the OEHI Project Site along the CO_2 pipeline, but is not expected to occur farther south within the CO_2 EOR Processing Facility area or satellite development areas.

4.4.3 Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*)

The Tipton kangaroo rat is a federally endangered species typically found in arid-land vegetative communities with flat or gently sloping terrain located within the floor of the Tulare Basin in the southern San Joaquin Valley. Tipton kangaroo rats generally occupy grassland with scattered shrubs and desert-shrub associations on friable soils. Burrows are commonly located in slightly

elevated earth, canal embankments, and bases of shrubs and fences where mobile soils gather above the level of surrounding terrain. Soft soils generally support higher densities of Tipton kangaroo rats than other soil types (Williams and Kilburn, 1992). Tipton kangaroo rats require terrain that is not subject to flooding to support a sustainable population. Reproduction occurs in the winter months, with most females giving birth to only two young.

The historical geographic range of Tipton kangaroo rats encompassed over 1.7 million acres of arid land. Their populations occupied the valley floor of the Tulare Basin throughout level or nearly level terrain. Current occurrences are restricted to scattered, isolated areas. In the southern San Joaquin Valley this includes the Kern National Wildlife Refuge, Delano, and other scattered areas within Kern County. Agricultural and residential development and the widespread use of rodenticides are principally responsible for the decline of the species (Williams and Kilburn, 1992).

No Tipton kangaroo rats were seen during the 2008, 2009, 2010, 2011, or 2012 surveys. However, signs of kangaroo rats (burrows, tail drag, foot prints, and scat) were observed within areas with suitable habitat along portions of the natural gas pipeline alignment. A local small mammal expert noted that 2010 had the highest capture rate for Tipton kangaroo rats ever recorded for the area (Warrick, 2010). Tipton kangaroo rats are assumed to be present throughout the Action Area northeast of the aqueduct in areas where suitable habitat is present. Figure 9, Tipton Kangaroo Rat Occurrences Near the Action Area, shows the locations of known Tipton kangaroo rat. Many of these records are very broad and non-specific and/or older than 20 years, but Tipton kangaroo rats could be present throughout the Action Area in areas with suitable habitat.

4.4.4 San Joaquin Kit Fox (*Vulpes macrotis mutica*)

The San Joaquin kit fox is federally listed as an endangered species (USFWS, 1999b). It historically ranged throughout the San Joaquin Valley from Contra Costa County to northern Santa Barbara County. San Joaquin kit foxes remain widely dispersed but have greatly reduced numbers and isolated populations (Williams and Kilburn, 1992). San Joaquin kit foxes primarily live in grassland and to a lesser extent, shrub and agricultural habitats. They predominantly eat rodents, ground squirrels, rabbits, hares, and ground-nesting birds. The pups are born in late winter and early spring, and the male provides most of the food for the female while she is nursing. Kit foxes change dens frequently, often enlarging existing ground squirrel burrows to create new dens. Predation or competitive exclusion of kit foxes may occur in the presence of coyotes, introduced red foxes, domestic dogs, bobcats, and large raptors. Human threats to the San Joaquin kit fox include destruction of habitat, habitat degradation, predator and pest control programs, and accidents caused by proximity to humans such as electrocution, road-kills, and suffocation from accidental burial in dens (Williams and Kilburn, 1992). Finally, natural factors such as drought, flooding, and rabies cause a significant percent of kit fox deaths.

San Joaquin kit foxes could occur throughout the region of the Project Site and linears; however, based on observations of dens, scat, and burrows during surveys from 2008 through 2010, the Elk Hills area southwest of the Kern River Flood Control Channel is likely to be the most

intensively used area within the Action Area (Figure 10, San Joaquin Kit Fox Occurrences Near the Action Area). Very few kit foxes have been recorded northeast of the Kern River Flood Control Channel near the Project Site and linears in the last 20 years, based on CNDDB records (2012a). No active kit fox dens were seen in 2008, 2009, 2010, 2011, or 2012 in areas northeast of the KRFCC; numerous historic burrows were evident along the proposed natural gas pipeline alignment, but none of the burrows showed sign of recent use.

The Kern Water Bank properties have the potential to contain kit fox habitat, because they are open scrub with friable soils for digging burrows, and support a prey base of rodents. However, no burrows were seen that appeared suitable for kit fox, and coyotes were seen in this area periodically; coyotes tend to exclude kit fox from the immediate vicinity.

San Joaquin kit fox have been regularly documented in the northern portion of the OEHI Project Site along the proposed CO_2 pipeline and the CO_2 EOR Processing Facility during the course of the 17 years of monitoring in this area (OEHI, 2012). There have been no documented kit fox in the area surrounding the three satellites.

5.0 EFFECTS ANALYSIS

This section evaluates the potential effects of the proposed HECA Project and OEHI Project on federally listed species. The effects analysis addresses the federally listed plant and wildlife species described in the previous sections. Potential effects are evaluated based on the area of direct habitat disturbance (direct effect) and additional indirect effects, as defined below. This section also addresses potential cumulative effects.

5.1 DEFINITION OF EFFECTS

Potential effects of the proposed action are characterized in this section using the following terms:

- Direct effects are the immediate effects of a proposed action on a federally listed species or its habitat.
- Indirect effects are defined as "those effects that are caused by or would result from the proposed action and are later in time, but are still reasonably certain to occur" (USFWS/NMFS, 1998).
- Cumulative effects are defined as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (USFWS, 1998).

Potential effects are also characterized as either temporary or permanent in duration. Effects that would be restored to pre-construction elevations within 1 calendar year, and are not subject to active project-related disturbance are identified as temporary effects; effects that cannot be restored to pre-construction conditions within 1 calendar year or are subject to active project-related disturbance are characterized as permanent.

5.2 HABITAT DISTURBANCE

This section summarizes potential habitat disturbance that would be associated with the HECA Project and the OEHI Project. This summary focuses on habitats that are potentially used by federally listed species. Potential habitat disturbance would include permanent conversion to other habitat types (e.g., developed) and temporary removal of habitats during construction.

The HECA Project and OEHI Project would affect habitat that supports or has the potential to support federally listed wildlife species. The estimated direct impacts to habitats potentially used by federally listed species are quantified in Table 6. Construction of the natural gas and CO_2 pipelines would directly impact Natural/Ruderal (Allscale Scrub) habitat that is known to support breeding, foraging, and dispersal of federally listed species listed in the direct effects discussion below. The proposed OEHI CO_2 EOR facilities would affect habitat that has moderate multispecies habitat value in the draft Elk Hills HCP (HCP Section 5, Figure 5.1) (Stantec, 2012a). Therefore, Table 6 includes the OEHI EOR impacts under the Natural/Ruderal habitat category, based on the Demonstration Period project information provided by OEHI (Stantec, 2012c). Habitats within the HECA Project

Table 6
Area of Direct Effects to Habitats and Existing Land Use Types within the Action Area

Habitat/ Land Use Types[1]	Project Site		Construction Staging Area		Railroad Spur		Railroad Spur Laydown Yard		Natural Gas Pipeline		Process Water Supply Pipeline and BVWSD Well Field		Transmission Line/PG&E Switching Station/ Potable Water Pipeline		OEHI CO_2 Pipeline[2]		OEHI EOR Facilities[2]		Total	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Alfalfa	–	118.0	59.8	–	1.7	5.3	2.0	–	3.4	–	5.9	1.15	2.8	3.29	–	–	–	–	75.6	127.74
Other Row Crop	–	317.3	20.0	–	3.5	16.2	–	–	9.4	0.23	1.7	–	–	–	–	–	–	–	34.6	333.73
Orchards	–	–	–	–	1.1	4.5	–	–	0.6	–	2	–	0.7	0.01	–	–	–	–	4.4	4.51
Natural/ Ruderal	–	–	–	–	–	–	–	–	3.7	–	–	–	–	–	28.89	0.11	–	63.79	32.59	63.90
Developed/ Disturbed	–	17.7	11.2	–	3.3	12.4	1.0	–	30.1	–	79.5	–	3.7	0.85	–	–	–	–	128.8	30.95
Total	**–**	**453.0**	**91.0**	**–**	**9.6**	**38.4**	**3.0**	**–**	**47.2[3]**	**0.23**	**89.1**	**1.15[4]**	**7.2**	**4.15**	**28.89**	**0.11**	–	**63.79**	**275.99**	**560.83**

Notes:

[1] Areas not designated as crop land or Natural/Ruderal land have been classified as Developed/Disturbed.

[2] Source: DOE Data Request – Initial Injection Phase Project Description (Stantec, 2012c).

[3] The area of temporary habitat disturbance along the portion of the natural gas linear that follows the railroad spur from the Project Site to the interconnection of the railroad with the existing San Joaquin Valley Railroad line is included in the temporary effects for the railroad spur.

[4] The area that would be permanently affected is based on five wells that would occupy approximately 100 feet by 100 feet each. The exact well locations are not known, but the entire area is assumed to be within alfalfa fields.

CO_2 = carbon dioxide
EOR = enhanced oil recovery
OEHI = Occidental of Elk Hills, Incorporated
PG&E = Pacific Gas and Electric Company

Site, process water pipeline route, and electrical transmission line route are not likely to be used by blunt-nosed leopard lizards or kangaroo rats; however, these areas may offer limited foraging opportunities and dispersal corridors for the San Joaquin kit fox.

One of the constraints associated with the OEHI Project EOR facilities is the presence of existing conservation lands, including the CDFG Lokern Ecological Reserve and other areas. The HECA and OEHI project linears have been aligned to avoid impacts to existing conservation areas and biologically significant areas.

5.2.1 Direct Effects

Direct effects are identified as either permanent or temporary, depending on the duration of disturbance. Permanent disturbance is defined as a disturbance of the substrate that results in paving or development of the surface that will not eventually revert back to natural habitat with value for plants and wildlife. A temporary disturbance implies a physical impact to an area for less than one season, and that the value of the habitat can typically be reestablished within 2 years of disturbance.

Natural habitat types within the Action Area include Allscale Scrub, which includes small patches of Allscale, Riparian Scrub, and open areas dominated by non-native grasses and fiddleneck (*Amsinckia* sp.) (Sawyer, Keeler-Wolf, and Evens, 2009). This document refers to this habitat as Natural/Ruderal habitat. The HECA Project would temporarily and/or permanently remove the following habitats:

- Agricultural lands
- Natural/Ruderal Habitat (Allscale Scrub)

Temporary and permanent direct effects to agricultural lands are not likely to adversely affect blunt-nosed leopard lizards or Tipton or giant kangaroo rats. However, agricultural lands are occasionally used by San Joaquin kit fox for movement and migration. The HECA Project would permanently remove agricultural lands that are cultivated for alfalfa, cotton, and onions. Permanent development of 435 acres of cultivated lands within the HECA Project Site, the 1.15-acre water wells, and the 4-acre PG&E switching station is assumed to have a minimal direct effect on the San Joaquin kit fox population in the region, due to the current land use practices and the distance (approximately 1 mile) from more suitable habitats in the Elk Hills area.

Construction of portions of the CO_2 and natural gas pipelines would affect Allscale Scrub that is potentially used by blunt-nosed leopard lizard, giant kangaroo rat, and San Joaquin kit fox. Approximately 3.7 acres of Natural/Ruderal habitat would be temporarily disturbed during construction of the natural gas pipeline. The OEHI Project would permanently impact 63.79 acres and temporarily impact 28.89 acres within the EHOF (Stantec, 2012a; Stantec, 2012b; and Stantec, 2012c). All of the OEHI temporary effects would be associated with the CO_2 pipeline construction, which would permanently impact approximately 0.11 acre. However, a significant portion of the EOR facilities will be located in areas of the EHOF where disturbance

has already occurred, and OEHI will design project components to use existing disturbed acreage to the maximum extent feasible.

5.2.2 Indirect Effects

The proposed action could indirectly affect adjacent habitats for listed species. Indirect effects could include increased emissions of air pollutants, nitrogen deposition, erosion, dust from construction vehicles, and introduction of invasive or noxious species.

The increased emissions from the construction activities are not expected to significantly affect agricultural or natural habitats. The emissions from the construction vehicles would occur over the course of the 42-month construction schedule and are not anticipated to significantly impact the region's air quality or the vegetation and wildlife in the Action Area. The emissions from the HECA Project include emissions from the plant's heat recovery steam generator stack and cooling tower facilities. The emissions will meet regional air quality standards, and will not result in an impact to the surrounding federally listed plants or wildlife.

Erosion will be controlled by implementing the Storm Water Pollution Prevention Plan and an erosion protection plan.

Dust associated with construction will be controlled by wetting dry, friable soils in the construction area. Periodic wetting of the access routes may also prove necessary depending on the wind and weather patterns.

Ground-disturbing construction activities could potentially introduce or facilitate the establishment of noxious or invasive species. HECA LLC will implement the conservation measures described in Section 2.3 to minimize this impact. OEHI will continue to implement the terms and conditions of the 1995 USFWS Biological Opinion and the 1997 CDFG MOU that are intended to minimize potential effects on listed species.

5.3 FEDERALLY LISTED PLANT SPECIES

No federally listed plant species were detected during the 2008, 2009, 2010, 2011, or 2012 plant surveys, and no federally listed plants are expected to be directly affected by the HECA Project or OEHI Project. The federally listed California jewel-flower, Kern mallow, and San Joaquin woollythreads are known to occur in the region, but are absent from the Action Area. Surveys along the natural gas pipeline are currently being conducted by HECA; however, based on site visits and existing data, no federally listed plants are expected in this area. If any federally listed plant species are found along the natural gas pipeline, the USFWS will be informed immediately and the population will be avoided by rerouting the pipeline, and/or reducing the construction corridor (see conservation measure BIO-3). Additional information will be provided to USFWS following the completion of the surveys.

5.4 FEDERALLY LISTED REPTILE SPECIES

5.4.1 Blunt-Nosed Leopard Lizard

Blunt-nosed leopard lizards were detected within the Elk Hills portion of the Action Area during the 2008 and 2009 surveys. One individual was also detected east of the Buttonwillow Ecological Reserve during the 2010 surveys of the natural gas linear; no blunt-nosed leopard lizards were detected during protocol adult and juvenile surveys completed in 2012 within the five areas of potentially suitable habitat along the natural gas pipeline (Figure 7). Based on these survey results and the distribution of other documented occurrences, blunt-nosed leopard lizards are only expected, if at all, in the flatter portions of the CO_2 pipeline within the Elk Hills area. Potential direct and indirect effects to the blunt-nosed leopard lizard are evaluated below.

Direct Effects

Blunt-nosed leopard lizards have the potential to be directly affected by habitat removal, vehicle strikes, or entrapment in open trenches or within a burrow during the installation and maintenance of the associated pipelines. However, implementation of the proposed conservation measures would substantially minimize potential direct impacts to blunt-nosed leopard lizards during construction, operation, and maintenance. These measures would avoid take of individuals, which is prohibited under the California Fish and Game Code.

Indirect Effects

Indirect effects to blunt-nosed leopard lizards may include:

- Temporary disturbance due to noise from construction and operation activities and human presence.
- A temporary reduction in natural food sources as a result of habitat disturbance.
- Predators attracted to construction-related food or trash in the area may prey on blunt-nosed leopard lizards.
- Construction, maintenance, and operational activities associated with roads and various facilities may result in the disturbance of blunt-nosed leopard lizards.

5.4.2 Giant Garter Snake

No giant garter snakes were observed during the 2008, 2009, 2010, 2011, or 2012 surveys within the Action Area. This species is presumed to be extirpated from the Action Area.

5.5 FEDERALLY LISTED MAMMAL SPECIES

5.5.1 Buena Vista Lake Shrew

No Buena Vista Lake shrews were detected during the 2008, 2009, 2010, 2011, or 2012 surveys. This species is not expected to be present in the Action Area, based on the absence of suitable habitats and the distance from known occurrences; however, due to the unpredictable nature of

this species, and to the length of the process water alignment, the USFWS requested that HECA evaluate potential for take of this species.

Direct Effects

Buena Vista Lake shrews have the potential to be directly affected by habitat removal, vehicle strikes, or entrapment in open trenches or within a burrow during the installation and maintenance of the associated pipelines. However, implementation of the proposed conservation measures would substantially minimize potential direct impacts to Buena Vista Lake shrews during construction, operation, and maintenance. These measures would avoid mortality of individuals.

Indirect Effects

Indirect effects to Buena Vista Lake shrews may include:

- Temporary disturbance due to noise from construction and operation activities and human presence.
- A temporary reduction in natural food sources as a result of habitat disturbance.
- Predators attracted to construction-related food or trash in the area may prey on Buena Vista Lake shrews.
- Construction, maintenance, and operational activities associated with roads and various facilities may result in the disturbance of Buena Vista Lake shrews.

5.5.2 Giant Kangaroo Rat

Based on range generalizations and known occurrences (refer to Figure 8), giant kangaroo rats presumably could be present along the Elk Hills portions of the CO_2 pipeline. Based on habitat preferences, more individuals would be expected within the flatter portions of the alignment, although there are only records for the steeper topographic portions of the Elk Hills area.

Direct Effects

Giant kangaroo rats have the potential to be directly affected by temporary habitat removal, vehicle strikes, or entrapment in open trenches or within a burrow during the installation and maintenance of the CO_2 pipeline. Potential direct effects will be minimized by implementation of the avoidance and minimization measures in the 1995 Biological Opinion issued by the USFWS and 1997 MOU between Oxy and the California CDFG as updated, and the HCP for the EHOF, when approved.

Indirect Effects

Indirect effects to giant kangaroo rats may include the following:

- Temporary disturbance of individual animals caused by noise associated with Project activities and human presence;

- Temporary reduction in natural food sources as a result of habitat disturbance; and

- Increased predation due to night lighting from the HECA Project Site, which would make kangaroo rats more visible to predators, and may interfere with the kangaroo rat's foraging ability.

5.5.3 Tipton Kangaroo Rat

Based on range generalizations and previously documented occurrences, Tipton kangaroo rats are presumed to be present where habitat is potentially suitable for this species, including several segments of the natural gas pipeline (Figure 9). This species is not expected to be present south of the California Aqueduct along the CO_2 pipeline route based on discussions with CDFG (Vance, 2012).

Direct Effects

Tipton kangaroo rats have the potential to be directly affected by temporary habitat removal, vehicle strikes, or entrapment in open trenches or burrows during the installation and maintenance of the natural gas pipeline. Implementation of the trapping, relocation, worker education program, and speed limits would minimize these potential direct effects. Direct impacts to Tipton kangaroo rats are not expected to affect more than 10 individuals over the life of the HECA Project.

Indirect Effects

Indirect effects to Tipton kangaroo rats may include the following:

- Temporary disturbance from noise associated with construction and operation activities and human presence;
- Reduced availability of natural food sources as a result of habitat disturbance; and
- Increased predation because night lighting from the HECA Project may make the Tipton kangaroo rats more visible to predators, and may interfere with the kangaroo rat's foraging ability.

5.5.4 San Joaquin Kit Fox

Potential direct and indirect effects to San Joaquin kit foxes are evaluated in this section. San Joaquin kit fox are known to occur in the Elk Hills area about 1 mile south of the HECA Project Site (Figure 10). This species has also been occasionally observed in agricultural areas in the HECA Project Site and the Controlled Area, as well as the construction areas of the various linear facilities.

Direct Effects

Construction of the HECA Project and OEHI Project could directly affect San Joaquin kit foxes in the region. Direct effects could include temporary and permanent habitat loss, vehicle strikes, and entrapment in open trenches or within burrows during the installation and maintenance of the natural gas, process water, and CO_2 pipelines. In addition, portions of the HECA Project would be within the Western Kern County Core recovery area identified in the Recovery Plan for Upland Species of the San Joaquin Valley (USFWS, 1998).

The USFWS Recovery Plan identifies several kit fox recovery areas in the Action Area, including:

- Western Kern County Core
- Antelope Plain/Semitropic Kern Satellite
- Urban Bakersfield Satellite

The HECA Project Site is adjacent to the northeastern edge of the Western Kern County Core recovery area. In addition, portions of the proposed CO_2 linear, electrical transmission lines, and process water pipeline are within this area (Figure 11 and Table 7). The HECA Project would temporarily disturb or remove habitats in these areas that are already degraded by existing activities (i.e., dirt roads, active agriculture, and canals), and are not likely to provide habitat for breeding or denning kit foxes. These areas are also not high-quality habitat for kangaroo rats, because kit foxes appear to be strongly linked ecologically to kangaroo rats (Cypher, 2006).

Table 7
Overlap of Project Components and the San Joaquin Kit Fox Western Kern County Core Recovery Area

HECA Project Component	Area (Acres) within the Western Kern County Core Recovery Area
HECA Project Site	7.0[1]
Carbon Dioxide Pipeline	28.9
Process Water Pipeline	42.2[2]
Total	**78.2**

Notes:
[1] Acreage is actively farmed and is poor habitat for the San Joaquin kit fox.
[2] Acreage is included in the HECA Project Site area, is actively farmed, and is poor habitat for the San Joaquin kit fox.

The HECA Project Site and other permanent project components are actively farmed and are unlikely to provide foraging or movement habitat for San Joaquin kit fox. Although the HECA Project Site is approximately 1 mile from the margin of the Elk Hills area, the likelihood that kit fox would be present in this area is reduced by the presence of the California Aqueduct, roads, and other existing physical barriers, in addition to human activity associated with cultivated fields. Therefore, permanent loss of 435 acres at the HECA Project Site, 26 acres for the new railroad spur, 0.23 acre for the new natural gas pipeline, 1.15 acre for the BVWSD well field, and 4 acres at the PG&E switching station would have a minimal direct effect on San Joaquin kit fox in the region, because this species is not likely to regularly use the affected fields.

Approximately half of the Western Kern County Core recovery area that would be impacted by the CO_2 pipeline is high-quality habitat potentially used for denning, foraging, and dispersal of San Joaquin kit fox. The other half is less suitable for denning, foraging, and dispersal due to the steep topography of the Elk Hills and the level of existing disturbance to the area. The portion of the Western Kern County Core recovery area impacted by the process water pipeline is generally poor habitat for denning, foraging, and dispersal due to the level of disturbance (i.e., graded dirt roads, agricultural canals, and actively farmed lands) and proximity to other types of human disturbance (i.e., dumping, target shooting, and spraying).

Traffic associated with construction and operations would pass through portions of habitat for the Western Kern County Core recovery area, the Antelope Plain/Semitropic/Kern and Urban Bakersfield Satellite recovery area, and potential habitat linkages along I-5 and State Route 46 (Figure 11). The existing average daily traffic (ADT) and the HECA Project-related increase to the ADT were evaluated for the road segments inside of the San Joaquin kit fox recovery areas (Table 8). Most of the increases in traffic during construction were minimal, with the exception of the increase in traffic on Tupman Road and Stockdale Highway. Operation-related traffic includes the workforce for the HECA Project, the delivery of coal and petcoke, and shipping of some products. Petcoke deliveries are included in the operation-related traffic impacts because the trucks delivering the fuel pass through portions of the Antelope Plain/Semitropic/Kern and Urban Bakersfield Satellite Population. Coal will be delivered by truck or by rail; therefore, the potential increase in truck traffic for coal delivery is addressed in the mortality calculations because it represents the most conservative estimate of potential impacts.

The existing mortality of San Joaquin kit fox in the western Bakersfield area was determined through the 6-year study *Urban Roads and the Endangered San Joaquin Kit Fox* by Bjurlin, Cypher, Wingert, and Van Horn Job (2005). Existing, construction, and operations traffic levels were determined using Section 5.10 of the Amended AFC (Hydrogen Energy California, 2012) and Caltrans traffic estimates. Based on known mortality rates and traffic levels, the HECA Project-related mortality of San Joaquin kit fox is estimated at approximately 39 foxes over the course of 25 years (Table 9). This is a conservatively high estimate because the time of day during which the increased traffic would be on the road was not considered in the estimate; most HECA Project-related traffic would be on the roads during daylight hours when kit fox are less likely to be present. Kit foxes tend to travel during the evenings, at night, or near dawn.

The combination of potential traffic-related impacts summarized above and other potential habitat impacts to San Joaquin kit fox identified in this section is estimated to affect fewer than 39 individuals over the 25-year life of the HECA Project.

Indirect Effects

San Joaquin kit foxes inhabiting the Action Area and surrounding vicinity are likely to be subject to indirect effects, including:

- The temporary and permanent loss of kit fox foraging, pupping, and movement corridor habitat.
- Temporary harassment from noise associated with construction and operation activities and human presence.
- A temporary reduction in natural food sources as a result of habitat disturbance.
- Construction, maintenance, and operational activities associated with roads and various facilities may result in the disturbance of nearby San Joaquin kit foxes.
- Night lighting from the HECA Project Site may make kit foxes more visible to predators, and may interfere with the kit fox's foraging ability.

Table 8
Existing and HECA Project-Related Traffic Estimates within the San Joaquin Kit Fox Recovery Area

Roadway	Current ADT [1]	Construction		Operations[2]		Product Deliveries[3]	
		Current + Project ADT	Project Increase	Current + Project ADT	Project Increase	Current + Project ADT	Project Increase
I-5 (north of SR 46)	30,500	30,759	0.8%	30,876	1.2%	30,702	0.7%
I-5 (south of SR 119)	30,000	30,396	1.3%	30,416	1.4%	30,226	0.8%
Tupman Road (Tupman Town)[4]	490	1,474	200.8%	614	25.3%	490	0.0%
SR 119 (Bakersfield – east of I-5)	6,800	7,554	11.1%	6,918	1.7%	6,822	0.3%
SR 119 (Taft – west of Tupman Road)	11,800	11,924	1.1%	11,816	0.1%	11,800	0.0%
Stockdale Highway (west of I-5)[4]	2,520	3,683	46.2%	3,504	39.0%	4,321	71.5%
SR 46 (west of I-5)	10,000	10,136	1.4%	10,000	0.0%	10,000	0.0%

Notes:
1 Unless otherwise stated, ADT values were obtained from Caltrans 2010 Traffic Data.
2 HECA Project employees or by product trucks only.
3 Petcoke and coal delivery to the HECA Project Site by truck only. (Does not include employees or product trucks.)
4 Calculated from 2012 peak hour counts assuming that PM peak hour equates to 10% of ADT.

ADT = average daily traffic
SR = State Route

Table 9
HECA Project Construction and Operations Traffic Impact to San Joaquin Kit Fox

Roadways	Length (miles)	San Joaquin kit fox Recovery Area	Type	Baseline take (fox/yr/mi)	Baseline annual take (fox/year)	Project vehicles (% increase)	Project Take (fox/yr)	Cumulative Take (fox/yr)
Construction								
I-5 (north of SR 46)	14.00	Antelope Plain/ Semitropic/Kern	Satellite	0.01[1]	0.14	0.8	0.00	0.14
I-5 (south of SR 119)	5.65	Western Kern County	Core	0.03[1]	0.17	1.3	0.00	0.17
Tupman Road (Tupman Town)	5.41	Western Kern County	Core	0.14[2]	0.76	200.8	1.53	2.29
SR 119 (Bakersfield – east of I-5)	4.28	Western Kern County	Core	0.07	0.30	11.1	0.00	0.30
SR 119 (Taft – west of Tupman Road)	13.22	Western Kern County	Core	0.02[1]	0.26	1.1	0.00	0.26
Stockdale Highway (west of I-5)	5.09	Urban Bakersfield	Satellite	0.20[1]	1.02	46.2	0.47	1.49
SR 46 (west of I-5)	10.5	Antelope Plain/ Semitropic/Kern	Satellite	0.06[4]	0.63	1.4	0.01	0.64
SR 46 (west of I-5)	6.75	Link	Link	0.03[4]	0.20	1.4	0.00	0.20
SR 46 (west of I-5)	10.18	Link	Link	0.03[4]	0.30	1.4	0.00	0.30
Subtotal				0.59	3.78		2.01	5.79
Construction-related take over 3 years							**6.03**	

Table 9
HECA Project Construction and Operations Traffic Impact to San Joaquin Kit Fox

Roadways	Length (miles)	San Joaquin kit fox Recovery Area	Type	Baseline take (fox/yr/mi)	Baseline annual take (fox/year)	Project vehicles (% increase)	Project Take (fox/yr)	Cumulative Take (fox/yr)
Operations								
I-5 (north of SR 46)	14.00	Antelope Plain/ Semitropic/Kern	Satellite	0.01[1]	0.14	1.2	0.00	0.14
I-5 (south of SR 119)	5.65	Western Kern County	Core	0.03[1]	0.17	1.4	0.00	0.17
Tupman Road (Tupman Town)	5.41	Western Kern County	Core	0.14[2]	0.76	25.3	0.19	0.95
SR 119 (Bakersfield – east of I-5)	4.28	Western Kern County	Core	0.07	0.30	1.7	0.01	0.31
SR 119 (Taft – west of Tupman Road)	13.22	Western Kern County	Core	0.02[1]	0.26	0.1	0.00	0.26
Stockdale Highway (west of I-5)	5.09	Urban Bakersfield	Satellite	0.20[1]	1.02	39.0	0.40	1.42
Subtotal				0.40	2.65			3.25
Operations-related take over 25 years							**15.00**	

Table 9
HECA Project Construction and Operations Traffic Impact to San Joaquin Kit Fox (Continued)

Roadways	Length (miles)	San Joaquin kit fox Recovery Area	Type	Baseline take (fox/yr/mi)	Baseline annual take (fox/year)	Project vehicles (% increase)	Project Take (fox/yr)	Cumulative Take (fox/yr)
Product Delivery								
I-5 (north of SR 46)	14	Antelope Plain/ Semitropic/Kern	Satellite	0.01[1]	0.14	0.7	0.00	0.14
I-5 (south of SR 119)	5.65	Western Kern County	Core	0.03[1]	0.17	0.8	0.00	0.17
SR 119 (Bakersfield – east of I-5)	4.28	Western Kern County	Core	0.07	0.30	0.3	0.00	0.30
Stockdale Highway (west of I-5)	5.09	Urban Bakersfield	Satellite	0.2	1.02	71.5	0.73	1.75
Subtotal				0.31	1.63		0.73	2.36
Coal/Petcoke-related take over 25 years[4]							**18.25**	
Total Project-related take over 25 years							**39.28**	

Notes:

[1] Mortality calculated from data presented in: esrp.csustan.edu/publications/pdf/esrp_urbanroad_sjkf.pdf.
[2] Mortality estimated based on road type described in: esrp.csustan.edu/publications/pdf/esrp_urbanroad_sjkf.pdf.
[3] Baseline take for SR 46 was estimated based on home range size from http://humboldt-dspace.calstate.edu/xmlui/bitstream/handle/2148/36/Frost.pdf?sequence=1 compared to "urban" kit fox. Link populations were assumed to be half of the satellite population.
[4] Traffic-related impacts associated with operation and product deliveries would be reduced if coal is transported to the project site using the proposed rail spur.

I-5 = Interstate 5
SR = State Route

5.6 CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private projects that are reasonably certain to occur in the Action Area. Future federal projects that are unrelated to the proposed action are not considered in this section because they would require separate consultation pursuant to Section 7 of the ESA (16 USC § 1536).

Only one potential non-federal proposed project occurs within the Action Area (Table 10). This project is an application for a conditional use permit to establish a 1,061-acre dairy complex, consisting of a 121-acre dairy, a 739-acre liquid waste disposal/spreading site, and a 201-acre solid waste disposal/spreading site) at Palm Ranch. Based on aerial topography, this area appears to be an existing agricultural field. Depending on the current agricultural practices at the site, conversion of habitat could potentially contribute to the loss of movement and migration habitat for the San Joaquin kit fox. If patches of alkali and scrub habitats are present within the site, habitat conversion could contribute to the loss of burrowing or denning habitat for the blunt-nosed leopard lizard, Tipton kangaroo rat, and giant kangaroo rat. Agricultural land, which may include small isolated marginal blocks of native vegetation, is marginal habitat for these species. Marginal agricultural habitats are less likely to support these species than higher quality habitats such as the Elk Hills and the Kern River floodplain. However, the loss of 1,061 acres of agricultural habitat in conjunction with the proposed action would result in substantial cumulative effects to federally listed species under USFWS jurisdiction.

Table 10 also presents potential non-federal projects that could occur within the larger vicinity of the proposed action. Most of the projects are at least 5 miles from the Action Area and are clustered around existing highway and road corridors in areas that appear to be used for agricultural, residential, commercial, and industrial purposes. Many of the projects are separated from the Action Area by I-5 and Highway 43, and by large blocks of agricultural land uses. A few of the proposed projects are located south of the Action Area either in the Elk Hills or just east of the Action Area. These projects appear to be located in areas of higher quality habitats (e.g., native vegetation) than the projects in the urban or agricultural areas; they also appear not to have significant dispersal barriers between them and the Action Area, aside from the California Aqueduct, which bisects the Action Area. Therefore, these projects could contribute to the incremental cumulative loss of habitat for the San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, and Giant kangaroo rat.

All of the potential non-federal projects in the vicinity of the Action Area will be required to comply with state and local regulatory requirements that also protect federally listed wildlife and plant species. Effects from these projects are expected to be mitigated through the regulatory pathways that would reduce the cumulative effects on federally listed species; however, the HECA Project and OEHI Project would contribute to a cumulatively adverse effect to the federally listed species, as identified in this biological assessment.

Table 10
Proposed Projects, Which May Lack a Federal-Nexus, Within the Vicinity of the Proposed Action

Case ID	Project Location	APN	Applicant	Case Type	Request	Acres	Use Type
Within Action Area							
10212	Adjacent to the North and West of the Project Site	159-030-06; 159-070-03; 159-130-11; 159-020-16	Dykstra Dairies/ David Albers	CUP	Conditional Use Permit to Establish a 1,061-Acre Dairy (121-Acre Dairy, 739 Acres of Liquid Waste Disposal/Spreading, and 201 Acres for Solid Waste Disposal/Spreading) (Palm Ranch)	1,061	Agriculture
At Least 5 Miles from Action Area and/or separated by major highways or agricultural blocks that reduce the potential for use or movement by federally listed species.							
9952; 9953	7626 Superior Road	104-012-15	Cooper, Michael and Cheryl/D and D	ZCC; EXCLUSION	Zoning Change/Amendment From Exclusive Agriculture (A) to Natural Resource 5 Gross Acre Minimum Lot Size [NR(5)] District; Exclusion From Agricultural Preserve	10	Industrial
10660	Southeast Corner of 7th Standard Road and Brandt Road	463-030-12	Affentranger, Franz (Pine Dairy)	CUP	Conditional Use Permit to Establish a 589.35-Acre Dairy and 1,973.28-Acre Crop Area (Pine Dairy)	2,563.63	Agriculture
12698	Tracy Avenue, Buttonwillow	103-080-44	Rio Bravo Vista/ Mcintosh and Associates	PD	Precise Development for 'La Quinta' Hotel	6.5	Commercial
12766	345 Driver Road	104-291-52	Petro Ready Mix/ Pete Pedroza	PD	Precise Development for Concrete Batch Plant	78.18	Industrial

Notes:

APN	Assessor's Parcel Number
CUP	Conditional Use Permit
Exclusion	Exclusion from Agricultural Preserve
PD	Precise Development
ZCC	Zoning Change/Amendment

6.0 CONCLUSION AND DETERMINATION OF EFFECTS

This section presents determinations of the potential effects of the HECA Project and OEHI Project on federally listed species, based on the effects analysis discussed in Section 5.

6.1 FEDERALLY LISTED PLANT SPECIES

The proposed action would have **no effect** on plant species that are listed or proposed for federal listing. No federally threatened or endangered plant species or plant species proposed for listing were observed in the Action Area during 2008, 2009, 2010, 2011, or 2012 plant surveys. BIO-2 would require avoidance of any listed plant species, to the greatest extent feasible.

6.2 FEDERALLY LISTED REPTILE SPECIES

6.2.1 Blunt-Nosed Leopard Lizard

Implementation of the proposed action **may affect, and is likely to adversely affect** the blunt-nosed leopard lizard. Blunt-nosed leopard lizards have been observed along the CO_2 pipeline alignment, and would be addressed as part of the OEHI Project. Under California law, no mortality is allowed for this fully protected species. For the HECA Project, the avoidance and conservation measures BIO-4, BIO-5, BIO-6, BIO-8, BIO-15, and BIO-17 described in Section 2.3 would avoid mortality and reduce other direct effects on the blunt-nosed leopard lizard, including habitat loss or degradation. For the portions of the project within the EHOF, the avoidance measures in the 1995 Biological Opinion issued by the USFWS and 1997 MOU between Oxy and the California CDFG as updated, and the HCP for the EHOF, when approved, would avoid mortality and reduce other direct effects on the blunt-nosed leopard lizard.

The HECA Project would temporarily remove up to 3.7 acres of natural/ruderal habitat that does not appear to be occupied by the blunt-nosed leopard lizard, based on 2012 protocol surveys. The OEHI Project activities would temporarily remove up to 28.89 acres of habitat and permanently remove up to 63.90 acres of habitat potentially used by the blunt-nosed leopard lizard. Habitat compensation is proposed as described by conservation measure BIO-18 (HECA Project), and in accordance with the 1995 USFWS Biological Opinion (USFWS File # l-1-95-F-102) and draft HCP currently under review by the USFWS (OEHI Project), which will benefit this species to offset the loss of habitat.

6.3 FEDERALLY LISTED MAMMAL SPECIES

6.3.1 Buena Vista Lake Shrew

The proposed action **may affect, but is not likely to adversely affect** the Buena Vista Lake shrew. No Buena Vista Lake shrews were observed in the Action Area during 2008, 2009, 2010, 2011, or 2012 surveys; however, this species is presumed to be present because Buena Vista Lake shrews have been previously documented in the greater biological region. Potential effects could include temporary loss of habitat during construction, and mortality of individuals caused

by construction activities. The avoidance and conservation measures BIO-4, BIO-7, BIO-8, BIO-15, and BIO-16 described in Section 2.3 would substantially reduce the potential for direct effects on the Buena Vista Lake shrews. Also, habitat compensation, as described by conservation measure BIO-18, will provide additional benefits for long-term survival and recovery of the Buena Vista Lake shrew.

6.3.2 Giant Kangaroo Rat

The proposed action **may affect, and is likely to adversely affect** the giant kangaroo rat. No giant kangaroo rats were observed in the Action Area during 2008, 2009, 2010, 2011, or 2012 surveys; however, this species is presumed to be present because giant kangaroo rats have been previously documented in the Elk Hills region that would be crossed by the CO_2 pipeline. Potential effects could include temporary loss of habitat during construction, and mortality of individuals caused by construction activities. The OEHI Project actions would temporarily remove up to 28.89 acres and permanently remove approximately 63.90 acres of habitat potentially occupied by giant kangaroo rat. These 93 acres overlap entirely with the acreage already identified for blunt-nosed leopard lizard above. The avoidance and conservation measures BIO-4, BIO-7, BIO-8, BIO-15, and BIO-16 described in Section 2.3 would substantially reduce the potential for direct effects on the giant kangaroo rats for the portions of the CO_2 pipeline not within the EHOF. For the portions of the pipeline within the EHOF, the avoidance measures in the 1995 Biological Opinion issued by the USFWS and 1997 MOU between Oxy and the California CDFG as updated, and the HCP for the EHOF, when approved, would substantially reduce the potential for direct effects on the giant kangaroo rats. Also, habitat compensation, as described by conservation measure BIO-18 (HECA Project), and the 1995 USFWS Biological Opinion (USFWS File # 1-1-95-F-102) and draft HCP currently under review by the USFWS (OEHI Project), will provide additional benefits for long-term survival and recovery of the giant kangaroo rat.

6.3.3 Tipton Kangaroo Rat

The proposed action **may affect, and is likely to adversely affect** the Tipton kangaroo rat. No Tipton kangaroo rats were observed in the Action Area during 2008, 2009, 2010, 2011, and 2012 surveys; however, based on existing information in the CNDDB and personal communications with local experts, Tipton kangaroo rats are presumed to be present in some areas along the natural gas pipeline. Potential effects could include temporary loss of habitat during construction, and mortality of individuals caused by construction activities. The proposed action would temporarily remove up to 3.7 acres of habitat potentially occupied by Tipton kangaroo rat. In addition, the OEHI Project actions would temporarily remove up to 28.89 acres and permanently remove approximately 63.90 acres of habitat potentially occupied by Tipton kangaroo rat. This is the same area identified for blunt-nosed leopard lizard above. The avoidance and conservation measures BIO-4, BIO-7, BIO-8, BIO-14, BIO-12, and BIO-15 described in Section 2.3 would substantially reduce the potential for direct effects on the Tipton kangaroo rats, which were known to occur in the region, for the HECA Project and the portion of the CO_2 pipeline not within the EHOF. For the portions of the project within the EHOF, the avoidance measures in the 1995 Biological Opinion issued by the USFWS and 1997 MOU

between Oxy and the California CDFG as amended, and the HCP for the EHOF, when approved, would substantially reduce the potential for direct effects on the Tipton kangaroo rats. Also, habitat compensation, as described by conservation measure BIO-18 (HECA Project), and the 1995 USFWS Biological Opinion (USFWS File # 1-1-95-F-102) and draft HCP currently under review by the USFWS (OEHI Project),will provide additional benefits for long-term survival and recovery of the Tipton kangaroo rat.

6.3.4 San Joaquin Kit Fox

The proposed action **may affect, and is likely to adversely affect** the San Joaquin kit fox. San Joaquin kit fox signs were observed during surveys in the Elk Hills area (southwest of the Kern River Flood Control Channel) between 2008 and 2010. Based on these observations and other existing information reviewed for this BA, San Joaquin kit fox are presumed to be present along the CO_2 pipeline (OEHI, 2012). Based on field observations and habitat characteristics, kit fox are substantially less likely to be present along the natural gas pipeline alignment, electrical transmission line, or at the Project Site. Potential effects could include temporary loss of habitat during construction, permanent loss of low-quality migration/movement habitat at the HECA Project Site, and mortality of individuals caused by construction activities and HECA Project operations. The OEHI Project actions would temporarily remove up to 28.89 acres and permanently remove approximately 0.11 acre of habitats that provide all constituent elements (breeding, foraging, and migration) required by San Joaquin kit fox. These 29 acres overlap entirely with the acreage already identified for blunt-nosed leopard lizard above. These impacts would occur only in the CO_2 pipeline construction limits in the Elk Hills area. The Natural/ Ruderal (Allscale Scrub) habitats elsewhere in the HECA Project area are less likely to provide habitat for breeding and foraging kit foxes.

Based on the conservative traffic model described in Section 5.5.4, construction and operation traffic could result in mortality of approximately 39 kit foxes over the course of the 25-year HECA Project lifespan. This mortality would be spread over an area of approximately 3,000 square miles, so the impact to any one population would be minimal on an annual basis. The avoidance and conservation measures BIO-4, BIO-7, and BIO-13 described in Section 2.3 would substantially reduce the potential for direct effects on the San Joaquin kit fox from the HECA Project and portion of the CO_2 pipeline not within the EHOF. For the portions of the pipeline within the EHOF, the avoidance measures in the 1995 Biological Opinion issued by the USFWS and 1997 MOU between Oxy and the California CDFG as updated, would minimize or avoid direct effects on the San Joaquin Kit Fox. Also, habitat compensation, as described by conservation measure BIO-18 (HECA Project), and the 1995 USFWS Biological Opinion (USFWS File # 1-1-95-F-102) and the draft HCP currently under review by the USFWS (OEHI Project), will improve recovery and survival of the kit fox populations in the region by establishing additional permanent conservation areas, and implementing land management activities that will facilitate better regional protection for habitats used by this species. Additional land management activities that may be implemented on existing conservation lands include control of non-native species, limiting off-road vehicle access, and installation of fencing to reduce trespass and trash disposal.

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URS:

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Reviewer:	Steve Leach, Senior Biologist

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PROJECT LOCATION

Biological Assessment
February 2013 — Hydrogen Energy California (HECA)
28068052 — Kern County, California

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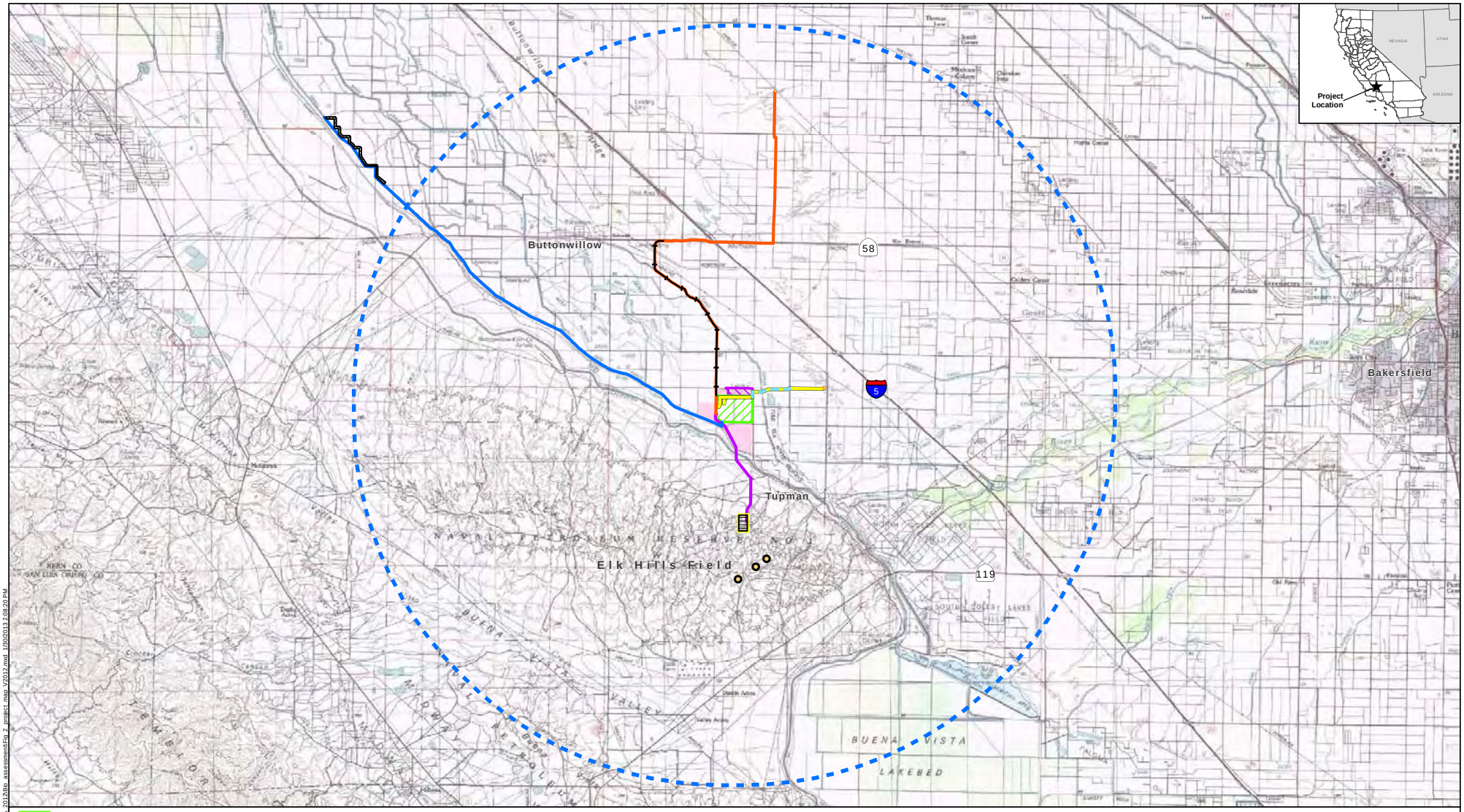
FIGURE 1



PROJECT VICINITY

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
28068052

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FIGURE 2

Sources: USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. HECA Project Team (Biological Data, 2009)

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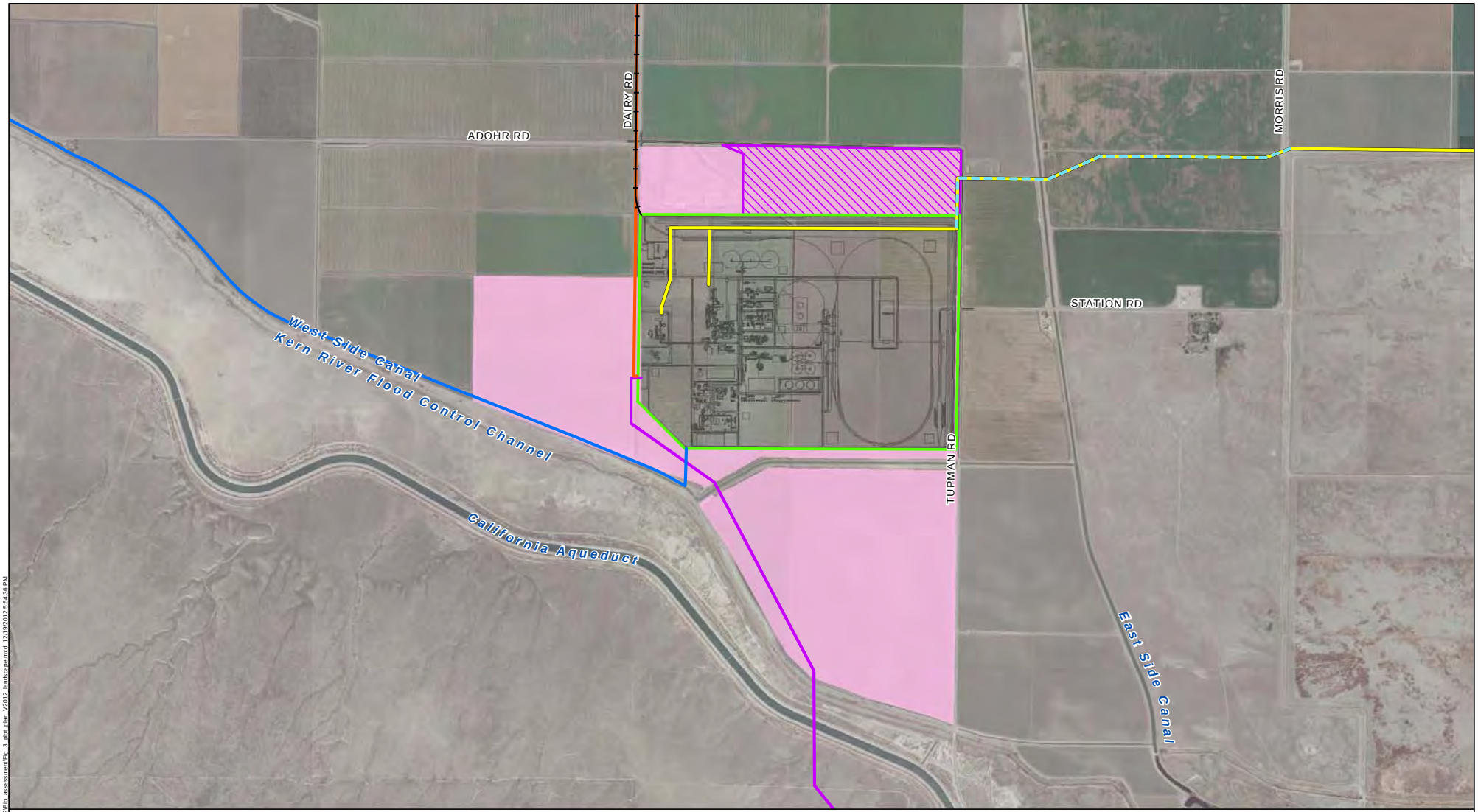

Source: Aerial Photo, Digital Globe, 2008.

PROJECT SITE MAP

Biological Assessment
February 2013 Hydrogen Energy California (HECA)
28068052 Kern County, California

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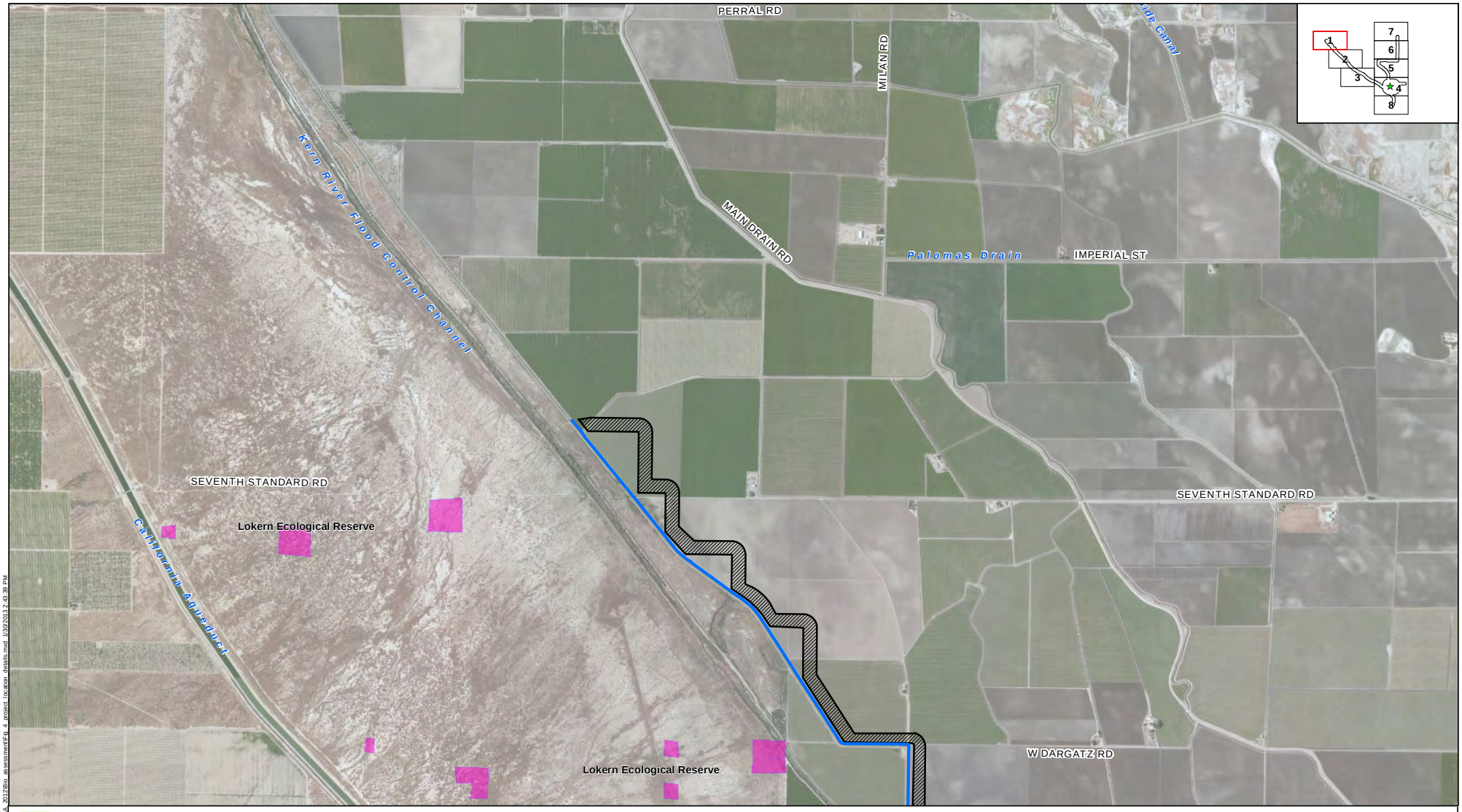
FIGURE 3



PROJECT LOCATION DETAILS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
28068052

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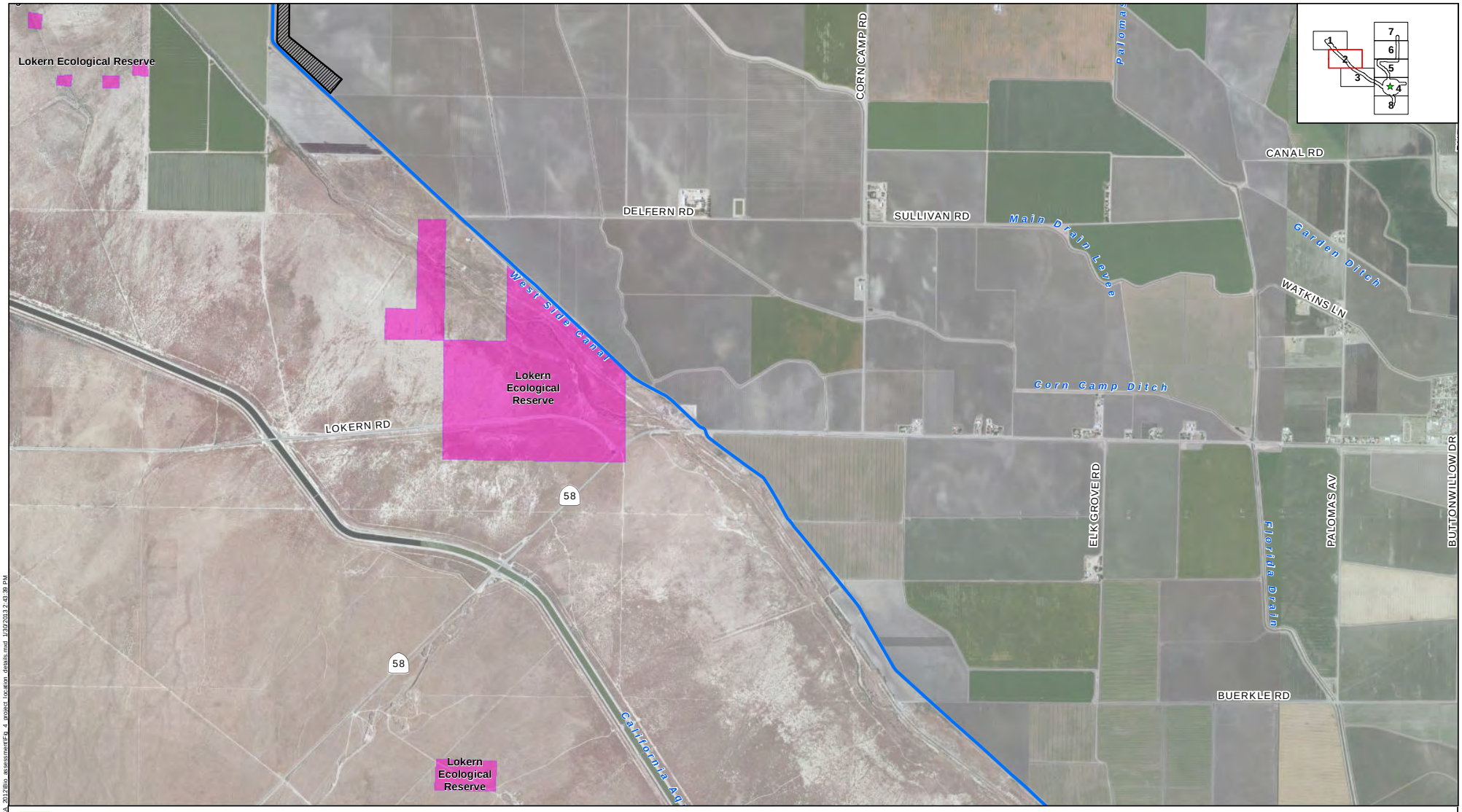
FIGURE 4 (1)



Note:
HDD = Horizontal Directional Drilling

Source: Aerial Imagery, Bing Maps Hybrid, 2010

PROJECT LOCATION DETAILS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
28068052

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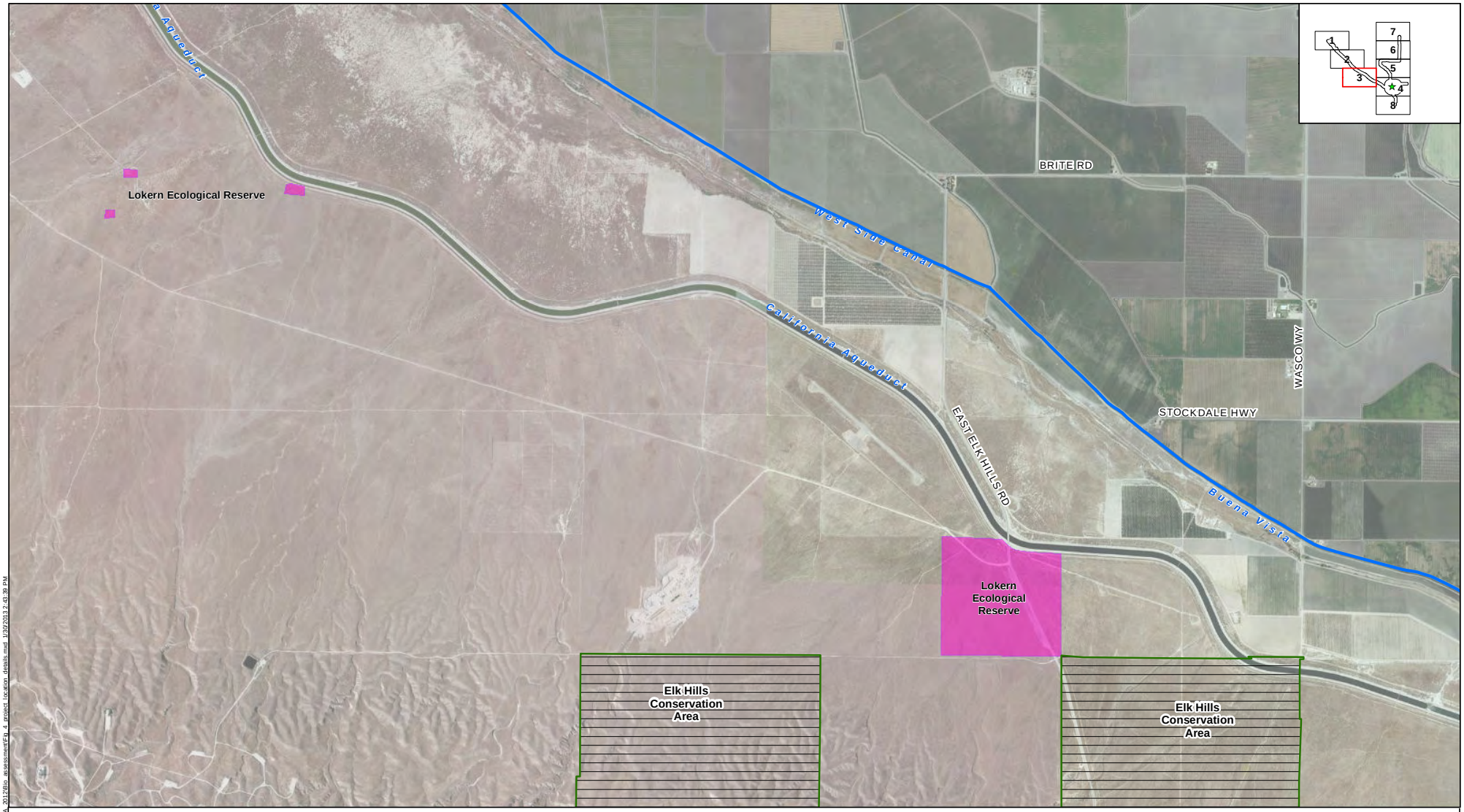
FIGURE 4 (2)



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PROJECT LOCATION DETAILS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
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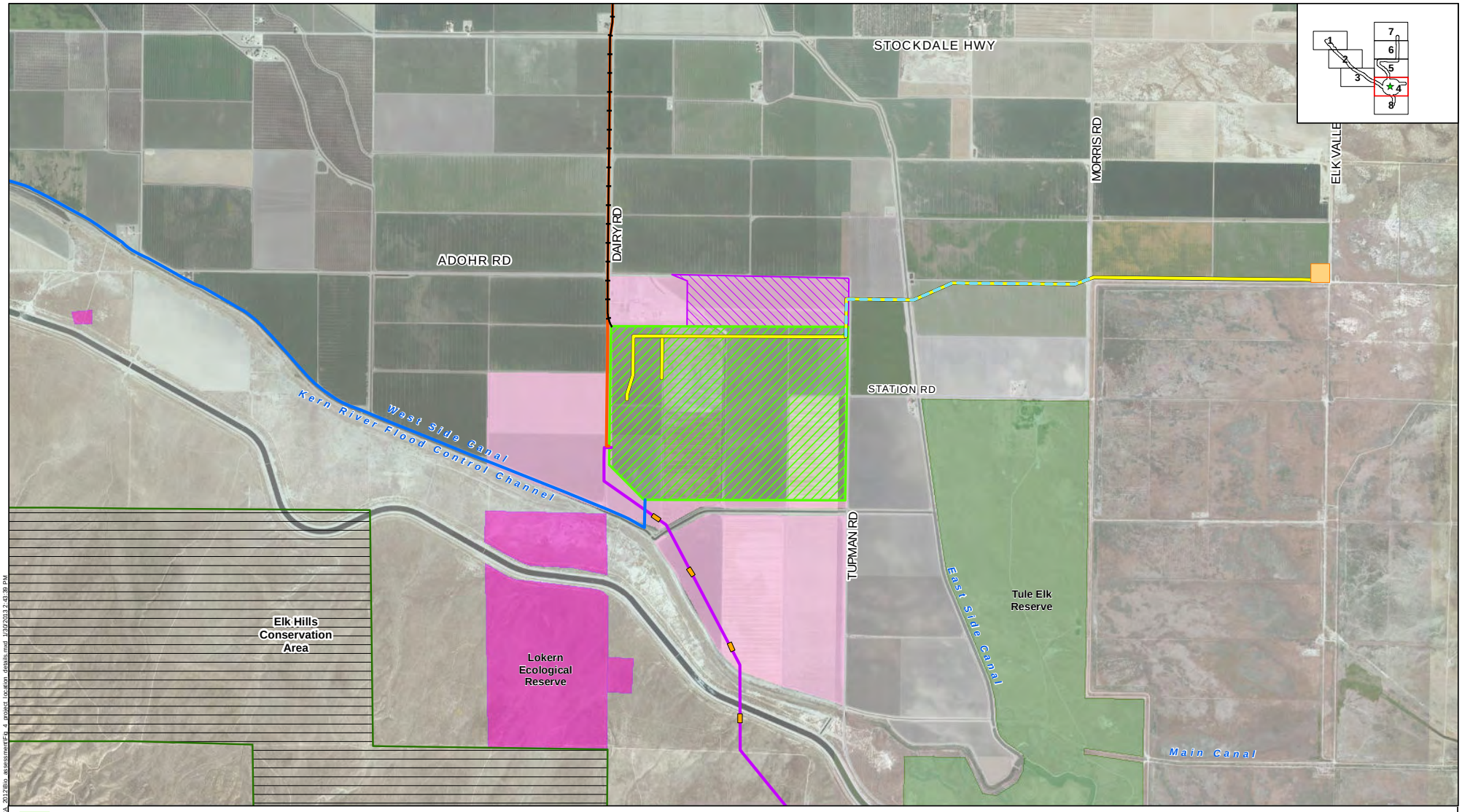
FIGURE 4 (3)



PROJECT LOCATION DETAILS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

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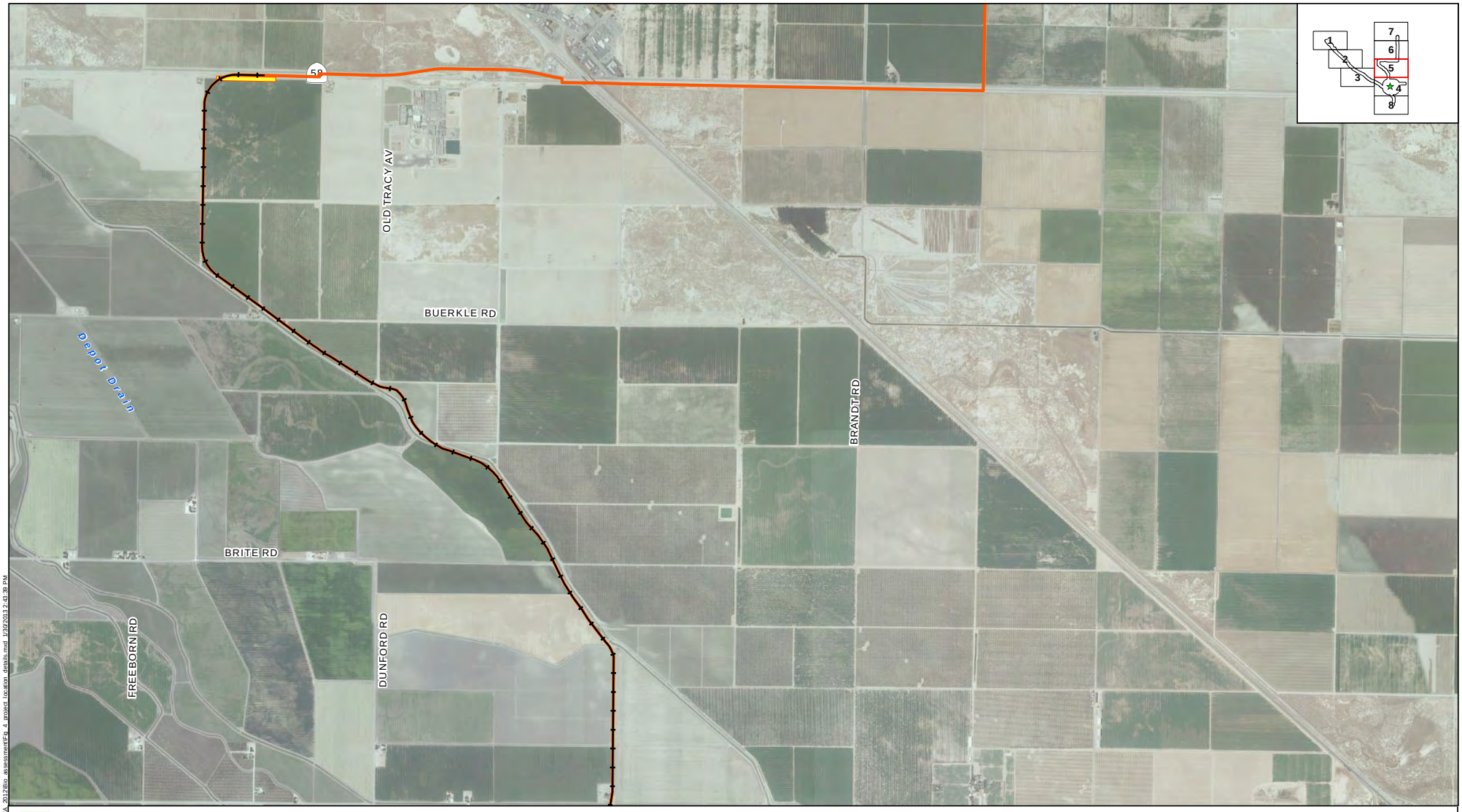

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PROJECT LOCATION DETAILS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
28068052

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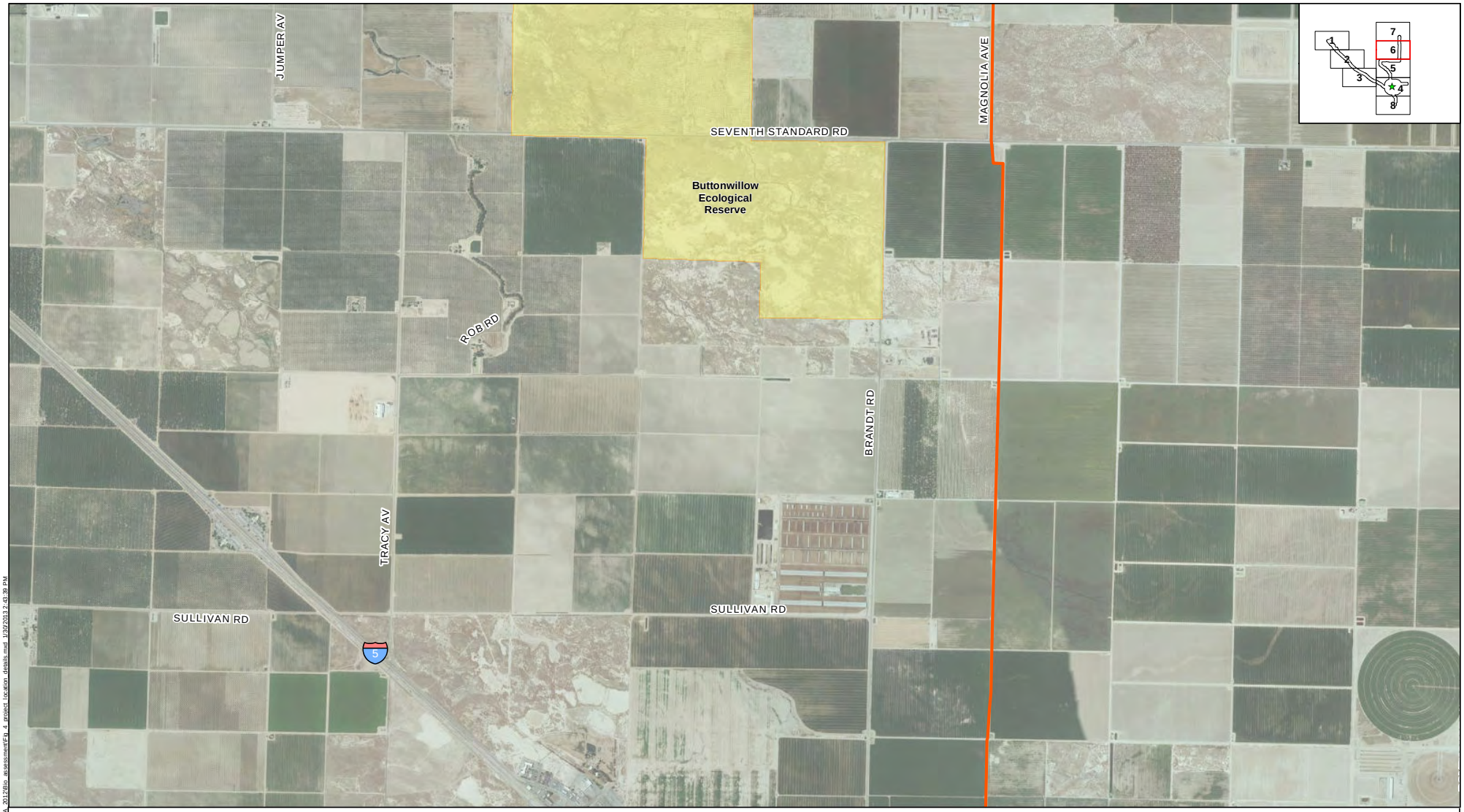
FIGURE 4 (5)



Source: Aerial Imagery, Bing Maps Hybrid, 2010

PROJECT LOCATION DETAILS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
28068052

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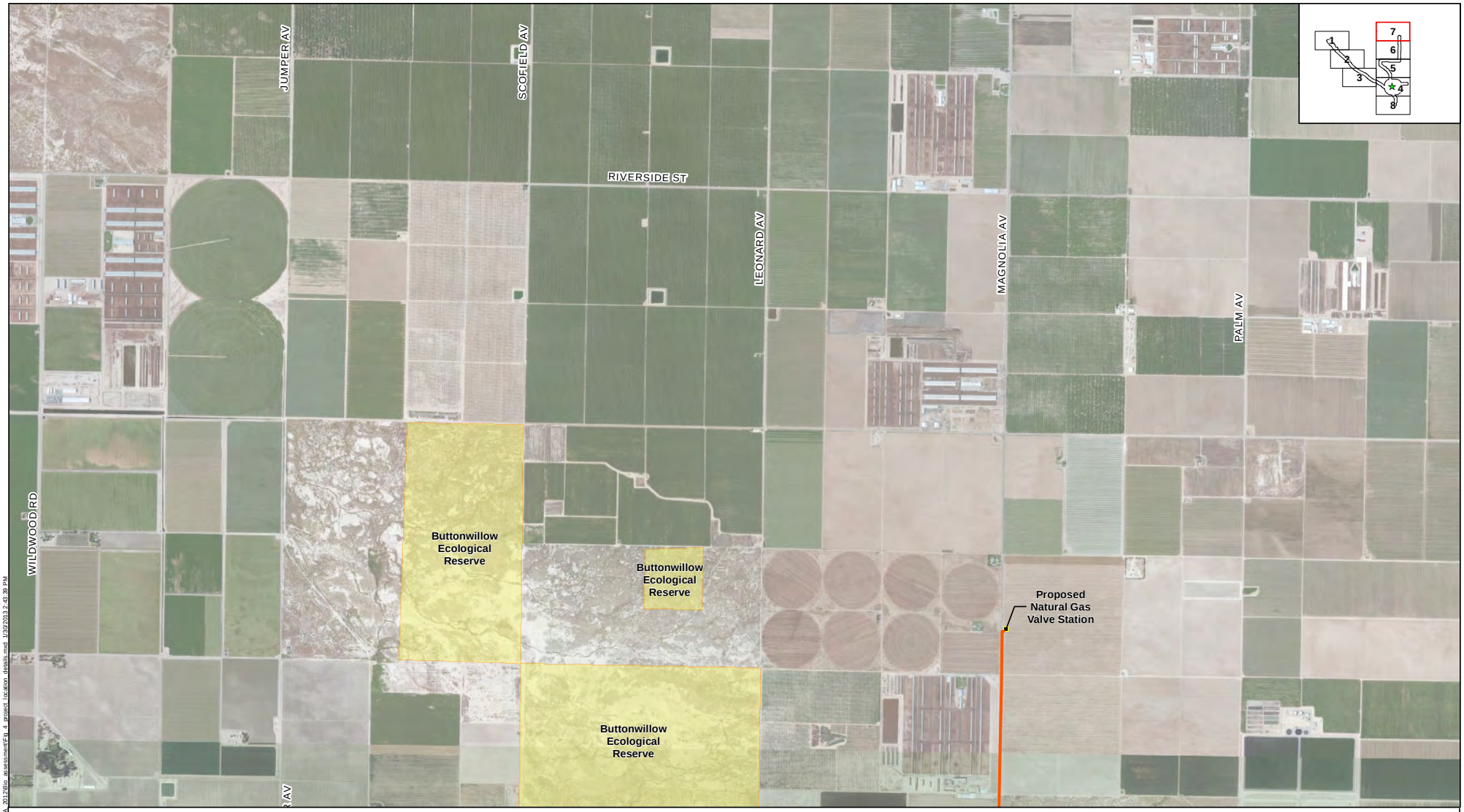
FIGURE 4 (6)



Note:
HDD = Horizontal Directional Drilling

Source: Aerial Imagery, Bing Maps Hybrid, 2010

PROJECT LOCATION DETAILS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
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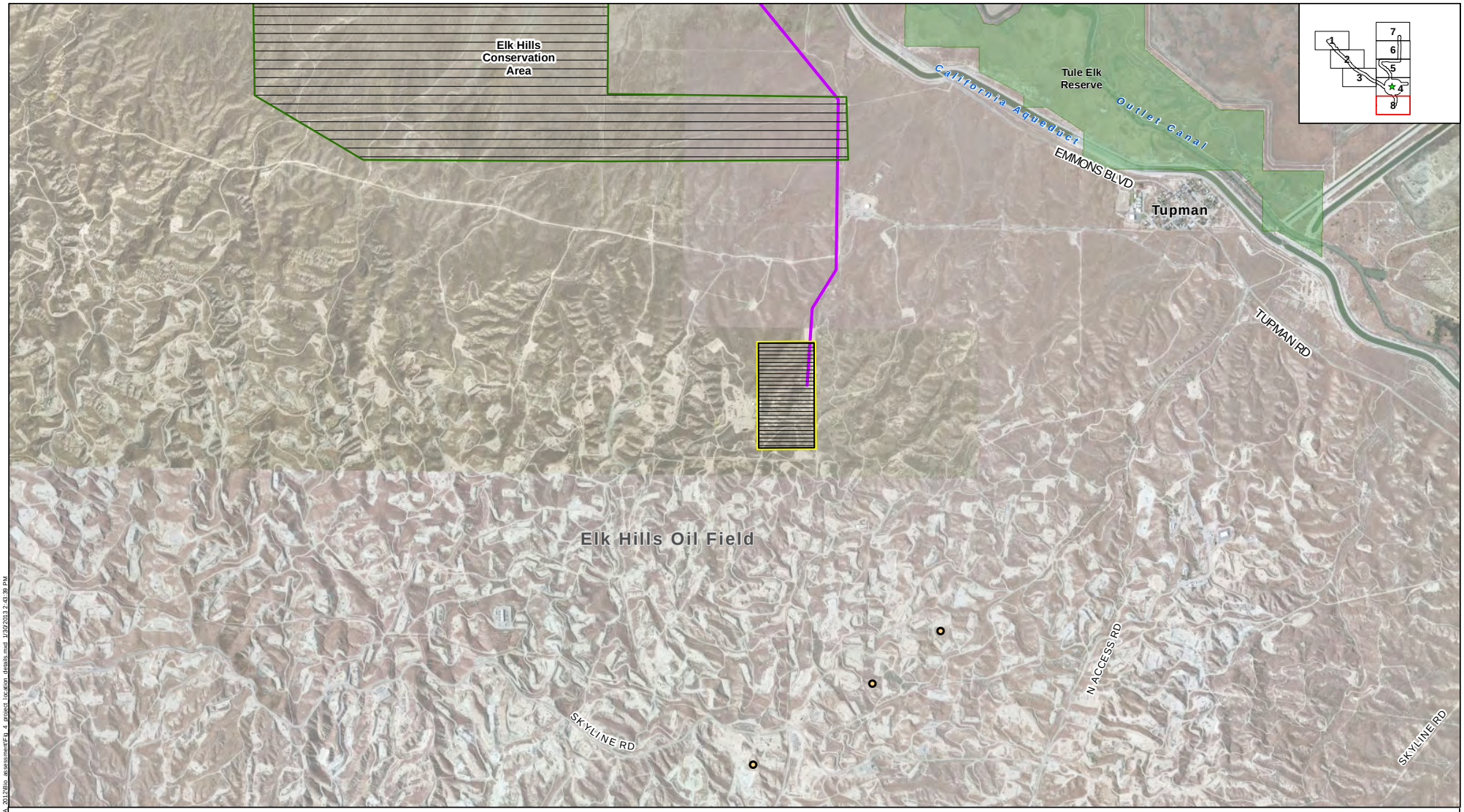
FIGURE 4 (7)



Note:
HDD = Horizontal Directional Drilling

Source: Aerial Imagery, Bing Maps Hybrid, 2010

PROJECT LOCATION DETAILS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
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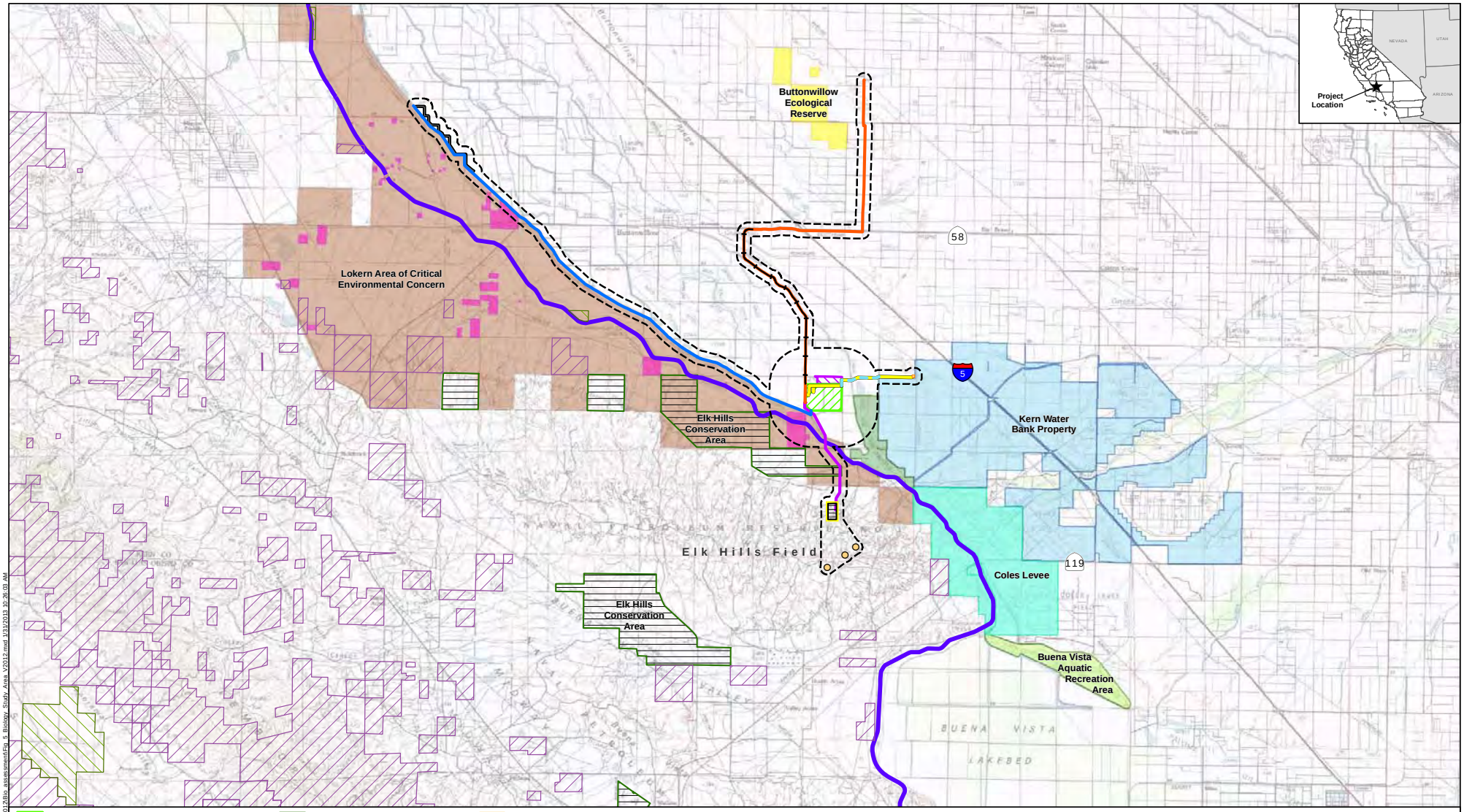
FIGURE 4 (8)



EXISTING NATURAL RESOURCE CONSERVATION AREAS

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
28068052

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FIGURE 5

Sources: USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. HECA Project Team (Biological Data, 2009)

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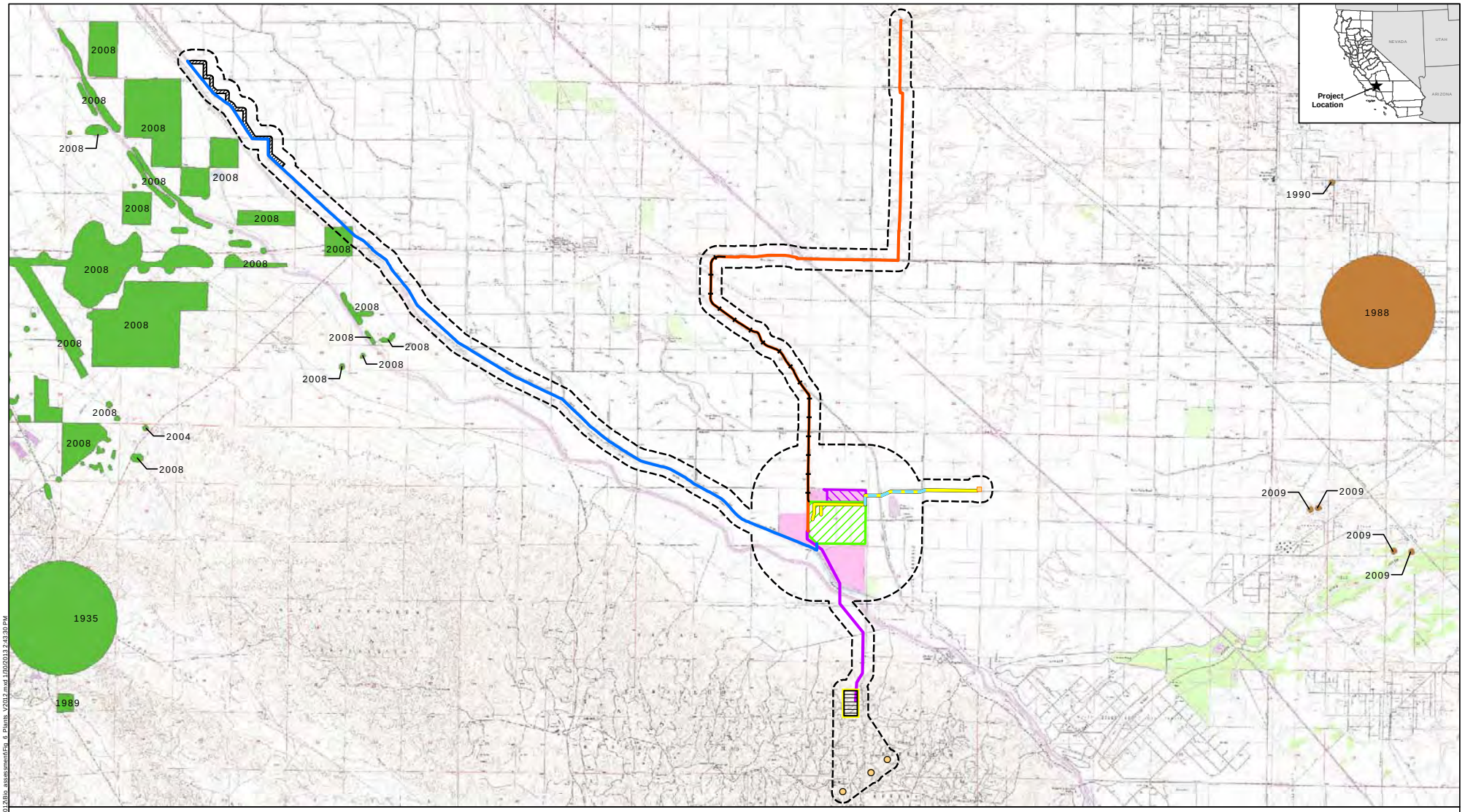

Source: USGS 7.5-minute quadrangles: Buttonwillow, published 1973 (rev 1976), East Elk Hills, published 1973 (rev 1977), Lokern, published 1973 (rev 1976), Tupman, published 1973 (rev 1977), West Elk Hills, published 1973 (rev 1976); Species data, CNDDB, April 2012.

FEDERALLY LISTED PLANT SPECIES NEAR THE ACTION AREA

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
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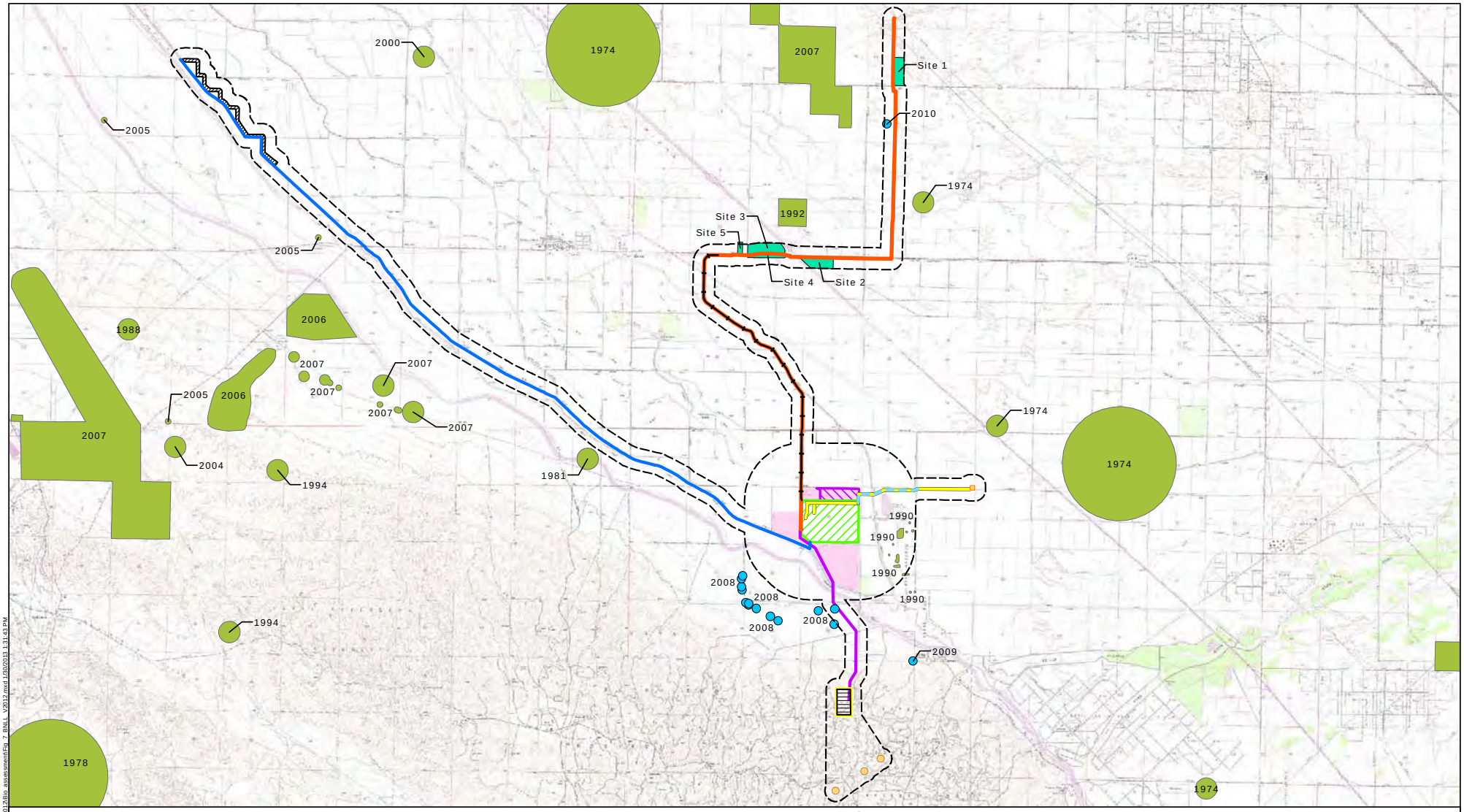
FIGURE 6



Project Site
Construction Staging Area
Controlled Area
Action Area
BVWSD Well Field
Electrical Switching Station

BNLL - CNDDB records
2012 Survey Area
BNLL - URS observation

Carbon Dioxide
Natural Gas
Potable Water
Process Water
Railroad
Transmission

OEHI CO2 EOR Project
EOR Processing Facility
EOR Satellite Gathering Station

N
0 0.75 1.5 MILES

Source: USGS 7.5-minute quadrangles: Buttonwillow, published 1973 (rev 1976), East Elk Hills, published 1973 (rev 1977), Lokern, published 1973 (rev 1976), Tupman, published 1973 (rev 1977), West Elk Hills, published 1973 (rev 1976); Species data, CNDDB, 2012.

BLUNT-NOSED LEOPARD LIZARD OCCURRENCES NEAR THE ACTION AREA

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
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FIGURE 7

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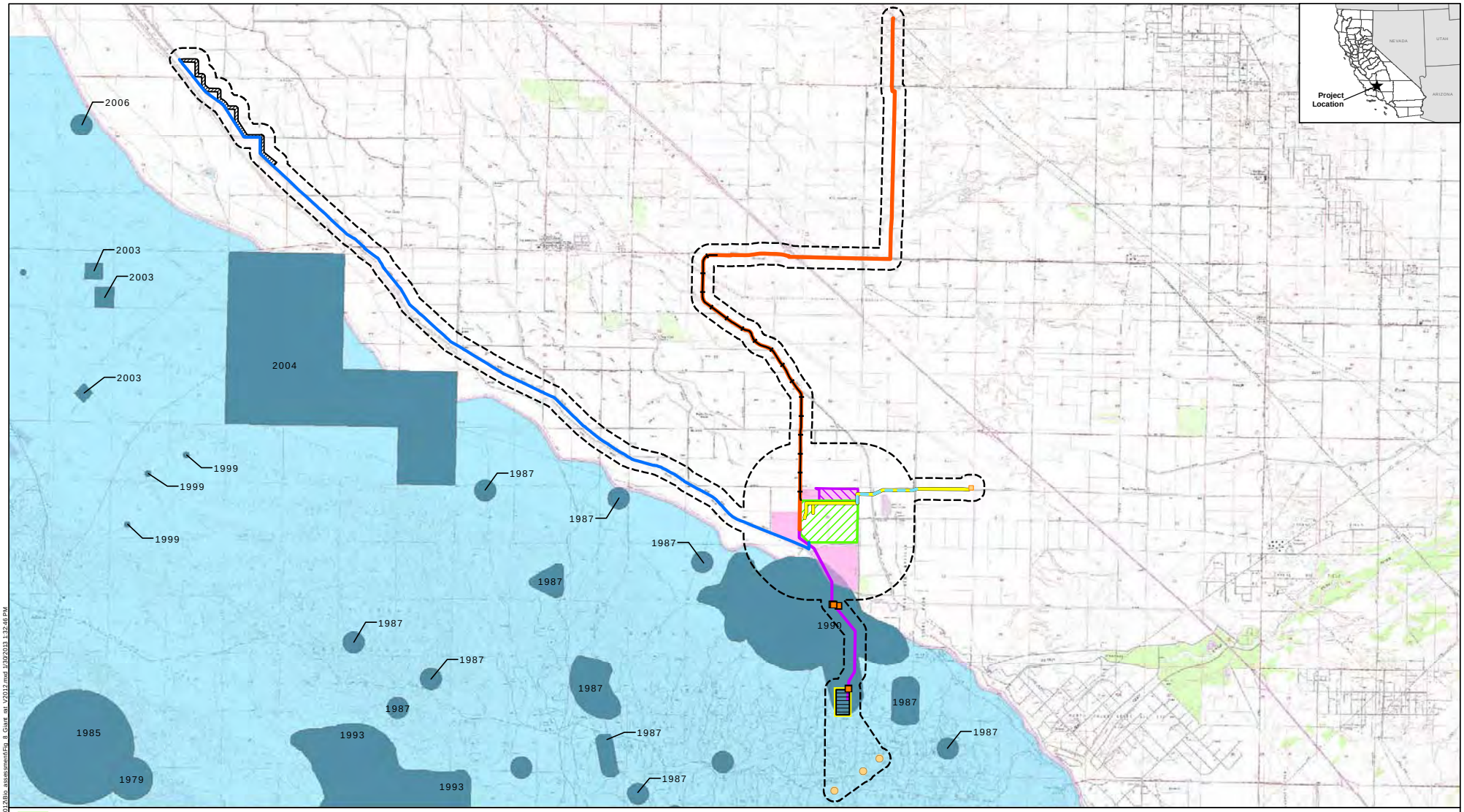

GIANT KANGAROO RAT OCCURRENCES NEAR THE ACTION AREA

Biological Assessment
February 2013
28068052
Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 8

Source: USGS 7.5-minute quadrangles: Buttonwillow, published 1973 (rev 1976), East Elk Hills, published 1973 (rev 1977), Lokern, published 1973 (rev 1976), Tupman, published 1973 (rev 1977), West Elk Hills, published 1973 (rev 1976); Species data, CNDDB, April 2012; Stantec. 2013. 2012 Special-Status Species Surveys for Initial CO2 Injection Phase. OEHI. January 8.

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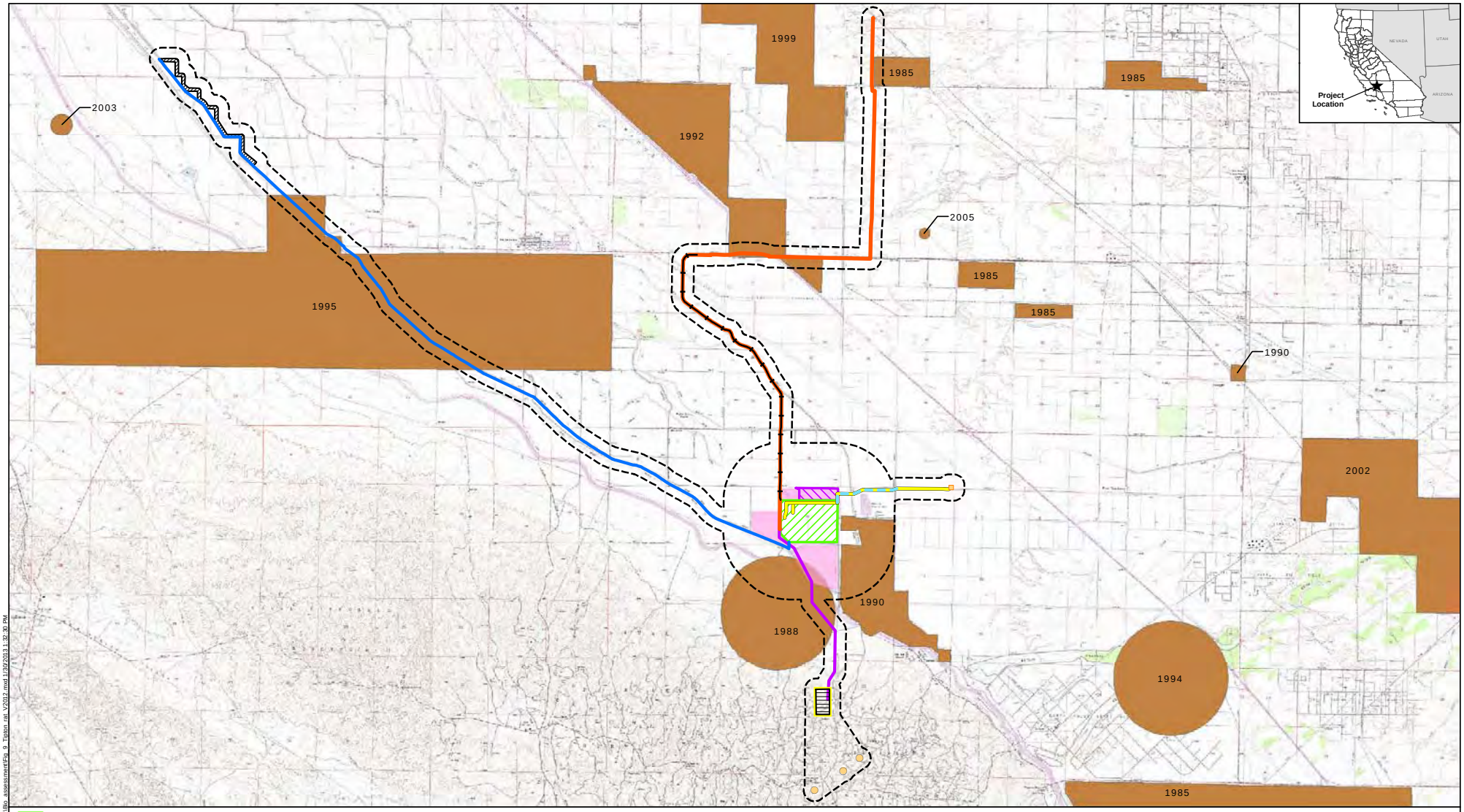

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TIPTON KANGAROO RAT OCCURRENCES NEAR THE ACTION AREA

Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California

February 2013
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FIGURE 9

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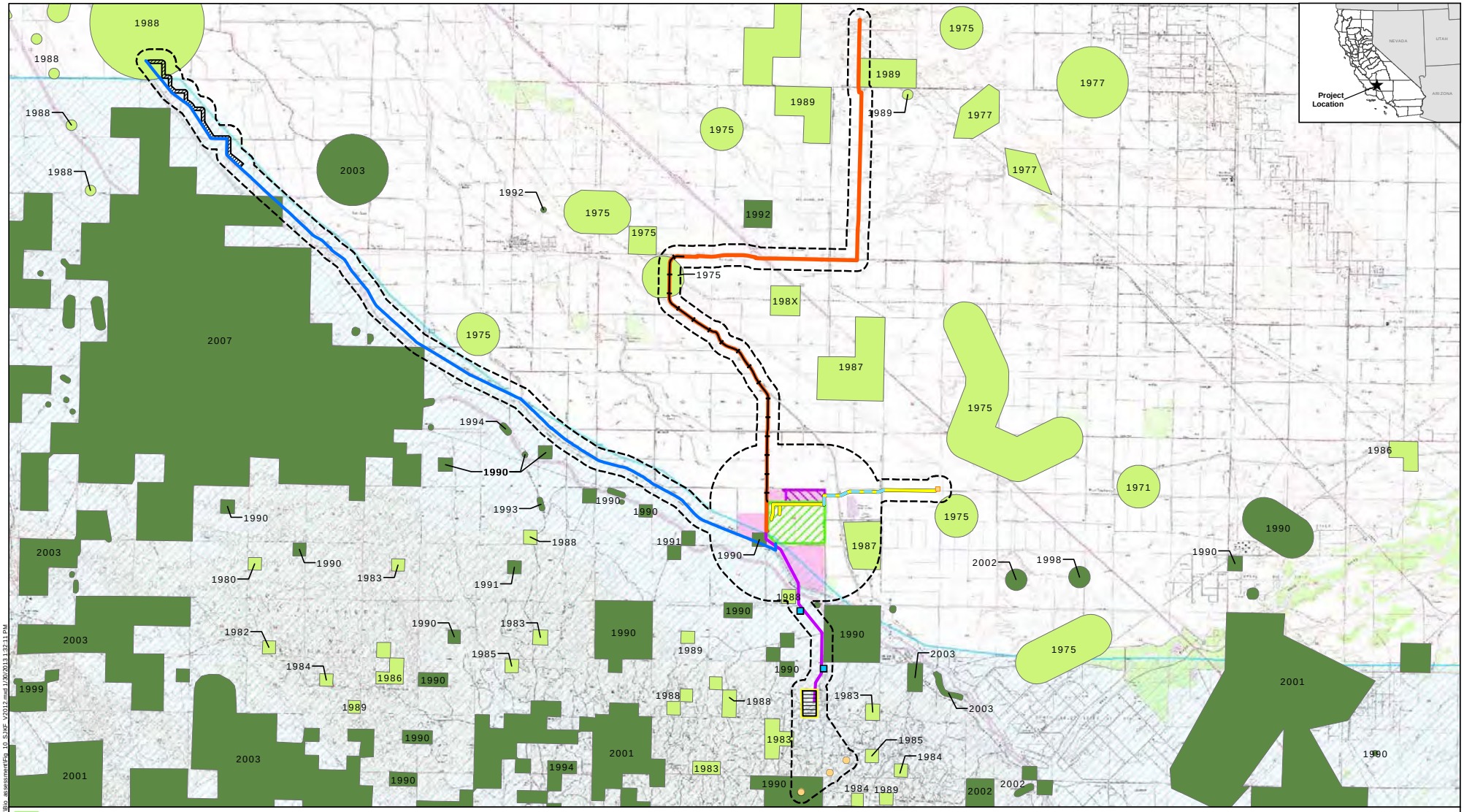

SAN JOAQUIN KIT FOX OCCURRENCES NEAR THE ACTION AREA

Biological Assessment
February 2013
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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 10

Source: USGS 7.5-minute quadrangles: Buttonwillow, published 1973 (rev 1976), East Elk Hills, published 1973 (rev 1977), Lokern, published 1973 (rev 1976), Tupman, published 1973 (rev 1977), West Elk Hills, published 1973 (rev 1976); Species data, CNDDB, 2012; Stantec. 2013. 2012 Special-Status Species Surveys for Initial CO2 Injection Phase. OEHI. January 8.

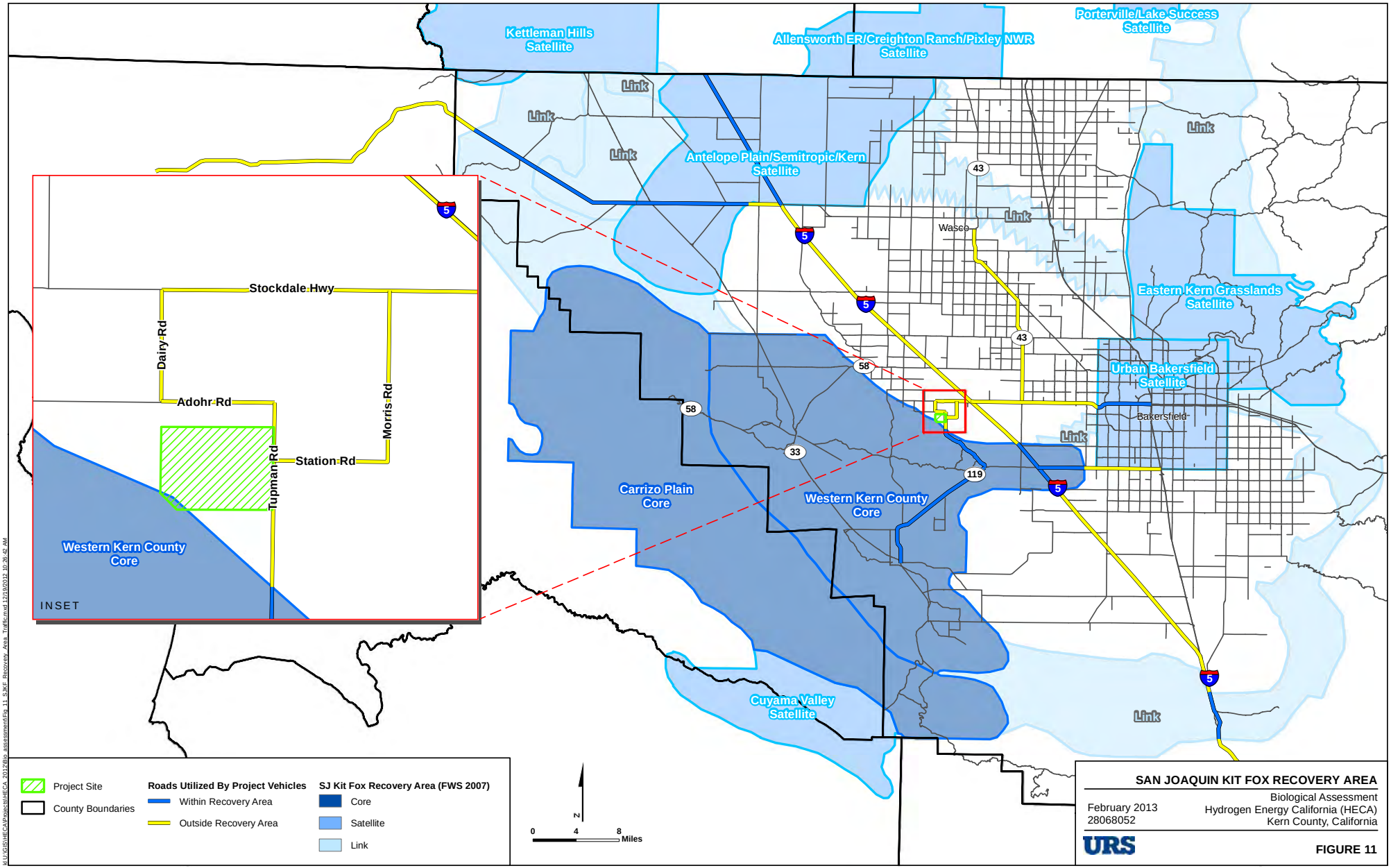
Kettleman Hills Satellite
Allensworth ER/Creighton Ranch/Pixley NWR Satellite
Porterville/Lake Success Satellite
Link
Antelope Plain/Semitropic/Kern Satellite
Eastern Kern Grasslands Satellite
Urban Bakersfield Satellite
Wasco
Bakersfield
Carrizo Plain Core
Western Kern County Core
Cuyama Valley Satellite
Stockdale Hwy
Dairy Rd
Adohr Rd
Morris Rd
Station Rd
Tupman Rd
INSET
Project Site
County Boundaries
Roads Utilized By Project Vehicles
Within Recovery Area
Outside Recovery Area
SJ Kit Fox Recovery Area (FWS 2007)
Core
Satellite
Link
N
0 4 8 Miles
SAN JOAQUIN KIT FOX RECOVERY AREA
Biological Assessment
Hydrogen Energy California (HECA)
Kern County, California
February 2013
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FIGURE 11