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Document Title:	Continuation of Hydrogen Energy AFC Amended Application for Certification 2 - Volume I and II
Description:	*** These documents supersedes TN 65049 which was just the cover letter due to the fact the Amended AFC was too large to docket at the time. *** - Document was on proceeding webpage and is now moved over to the docket log.
Filer:	Raquel Rodriguez
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Table 5.1-27
AERMOD Modeling Results for Project Operations

Pollutant	Averaging Period	Modeled Impact ($\mu g/m^3$)	Background[1] ($\mu g/m^3$)	Monitoring Station Description[1, 2]	Total Predicted Concentration ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Operational Impacts							
CO	1 hour[3]	2,663	4,581	[a]	7,244	23,000	40,000
	8 hour[3]	371	2,485	[a]	2,856	10,000	10,000
NO_2[8]	1 hour CAAQS[3]	185	140	[b]	325	339	--
	1 hour NAAQS[4]	126	[5]	[5]	126	--	188
	Annual CAAQS[6]	1.5	26	[b]	27	57	--
	Annual NAAQS[7]	0.6	26	[b]	27	--	100
PM_{10}	24 hour[3]	4.9	264	[c]	--	50	150
	Annual[6]	0.8	54	[c]	--	20	--
$PM_{2.5}$	24 hour[9]	3.1	196	[c]	--	--	35
	Annual[6]	0.6	22	[c]	--	12	15
SO_2	1 hour[3]	50	42	[d]	92	655	196
	3 hour[3]	29	26	[d]	55	--	1,300
	24 hour[3]	6	13	[d]	19	105	*revoked*
H_2S	1 hour[10]	23	N/A	N/A	23	42	--

Source: HECA, 2012.

Notes:

1 Background concentrations are maximum concentrations from the last 3 years of available EPA AirData and/or CARB data. See note 2.

2 Monitoring station/background concentration as described below:
- [a] Bakersfield—Golden State Highway Monitoring Station, Maximum Concentration, 2007–2009
- [b] Shafter–Walker Street Monitoring Station, Maximum Concentration, 2009–2011
- [c] Bakersfield—California Avenue Monitoring Station, Maximum Concentration, 2008–2010
- [d] Fresno—First Street Monitoring Station, Maximum Concentrations, 2007–2009 for 3-hour SO_2; 2009–2011 for 1-hour and 24-hour SO_2

3 Maximum modeled short term concentration, includes HECA mobile sources associated with Alternative 1 (rail transportation option) and stationary sources

4 Regional NO_2 analysis modeling results. Modeled impact is the maximum 5-year average of 98th percentile of 1-hour daily maximum concentration. Modeled impact includes contributions from HECA, nearby sources and background concentrations. Excludes HECA mobile sources. Includes HECA stationary sources modeled at maximum normal operating emissions or annualized maximum intermittent operating emissions, whichever resulted in higher 1-hour emission rates. See Section 5.1.2.5.9.1 and Appendix E-7, NO_2 1-Hour Regional Analysis, for details and USEPA Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 NAAQS, March 2011.

5 Hourly NO_2 background monitoring concentrations from the Shafter–Walker Street station were included in AERMOD analysis for the same years of meteorological data applied (2006–2010), data provided by SJVAPCD.

6 Maximum annual modeled concentration from any of the 5 years modeled, 2006–2010. Includes HECA mobile sources associated with Alternative 1 (rail transportation option) and stationary sources.

7 Maximum annual modeled concentration from any of the 5 years modeled: 2006–2010. Excludes mobile sources, includes HECA stationary sources

8 NO_2 modeling applied the PVMRM ozone limiting method with hourly ozone data from the Shafter–Walker Street monitoring station.

9 Maximum 5-year average first high daily concentration at any receptor. Excludes HECA mobile sources, includes HECA stationary sources.

10 Maximum modeled 1-hour concentration. Includes all HECA H_2S sources.

CO = carbon monoxide
NO_2 = nitrogen dioxide
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
SO_2 = sulfur dioxide
H_2S = hydrogen sulfide
NAAQS = National Ambient Air Quality Standards
CAAQS = California Ambient Air Quality Standards
$\mu g/m^3$ = micrograms per cubic meter
N/A = not available

Table 5.1-28
SCREEN3 Fumigation Modeling Results for Project Operations

Pollutant	Averaging Period	Maximum Modeled Impact ($\mu g/m^3$)	Background[1] ($\mu g/m^3$)	Monitoring Station Description[1,2]	Total Predicted Concentration ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Fumigation Impacts							
CO	1 hour	282	4,581	[a]	4,863	23,000	40,000
NO_2	1 hour	43	140	[b]	183	339	N/A
SO_2	1 hour	2.7	42	[c]	45	655	N/A

Source: HECA, 2012.

Notes:

[1] Background concentrations are maximum concentrations from the last 3 years of available EPA AirData and/or CARB data

[2] Monitoring station/background concentration as described below:

[a] Bakersfield—Golden State Highway Monitoring Station, Maximum Concentration, 2007–2009

[b] Shafter–Walker Street Monitoring Station, Maximum Concentration 2009–2011

[c] Fresno—First Street Monitoring Station, Maximum Concentration, 2009–2011 for 1 hour SO_2

N/A = not applicable

Table 5.1-29
Commissioning Modeling Results

Modeling Scenario	Pollutant	Averaging Period	Maximum Estimated Impact ($\mu g/m^3$)	Background[1] ($\mu g/m^3$)	Monitoring Station Description[1]	Total Predicted Concentration ($\mu g/m^3$)	Most Stringent Standard ($\mu g/m^3$) [2]
Case A	CO	1-hour	1,975	4,581	[a]	6,556	23,000
		8-hour	801	2,485	[a]	3,286	10,000
Case B	NO_2[3]	1-hour	150	140	[b]	290	339
Case A2	PM_{10}	24-hour	3.4	264	[c]	NA	50
Case B2	SO_2	1-hour	97.4	42	[d]	139	655
		3-hour	37.5	26	[d]	64	1,300
		24-hour	7.5	13	[d]	20	105

Source: HECA 2012.

Notes:

[1] Background Concentrations are maximum concentrations from the last 3 years of available EPA AirData and/or CARB data at the following stations

[a] Bakersfield—Golden State Highway Monitoring Station, Maximum Concentration 2007–2009

[b] Shafter–Walker Street Monitoring Station, Maximum Concentration 2009–2011

[c] Bakersfield—California Avenue Monitoring Station, Maximum Concentration 2008–2010

[d] Fresno—First Street Monitoring Station Maximum Concentrations, 2007–2009 for 3-hour SO_2, 2009–2011 for 1-hour and 24-hour SO_2

[2] Although there are NAAQS for SO_2 1-hour, NO_2 1-hour, and $PM_{2.5}$ 24-hour, these are statistical standards therefore impacts from commissioning activities are only compared to the CAAQS due to the infrequent nature of the commissioning events.

[3] NO_2 modeling for commissioning was conducted with the PVMRM algorithm.

CO = carbon monoxide
NO_2 = nitrogen dioxide
PM_{10} = particulate matter less than 10 microns in diameter
SO_2 = sulfur dioxide
$\mu g/m^3$ = micrograms per cubic meter

Table 5.1-30
Alternative 2 (Truck Transportation) On-Site Maximum Trucks by Period

Period	Feedstock (Petcoke and Coal) Trucks	Product Trucks	Miscellaneous Trucks
1 hour	30	30	5
3 hours	90	89	5
8 hours	239	237	5
24 hours	299	296	5
Annual	76,200	48,960	1,818

Source: HECA, 2012.

Notes:

[1] The facility will also maintain 20 vehicles (10 gasoline and 10 diesel trucks) for onsite operations and maintenance (O&M).

[2] This table presents the delivery trucks associated with Alternative 2 (truck transportation option).

Table 5.1-31
Onsite and Offsite Transportation Emissions from Alternative 2 (Truck Transportation) by Air Basin

Area	Attainment Status	Emission Source	Annual Emission Rates (tons/yr)					
			CO	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
SJVAPCD (San Joaquin Valley)	Ozone Non-attainment – Extreme	Offsite Train	10.91	39.99	0.73	0.71	0.66	2.30
	$PM_{2.5}$ Non-attainment	Offsite Truck	22.37	19.56	5.37	1.62	0.14	1.65
		Offsite Workers Commuting	4.17	0.48	1.05	0.28	0.01	0.13
		Onsite Train	0.00	0.00	0.00	0.00	0.00	0.00
		Onsite Truck	1.42	2.76	0.28	0.09	0.01	0.41
		Total Emission (ton/yr)	**38.86**	**62.79**	**7.43**	**2.70**	**0.82**	**4.50**
		Conformity *De minimis* (ton/yr)	**100**	**10**	**NA**	**100**	**NA**	**10**
		Less than *De minimis*?	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
SCAQMD (South Coast)	Ozone Non-attainment – Extreme	Offsite Train	0.00	0.00	0.00	0.00	0.00	0.00
	PM_{10} Non-attainment – Serious	Offsite Truck	7.96	6.96	1.91	0.58	0.05	0.59
	$PM_{2.5}$ Non-attainment	**Total Emission (ton/yr)**	**7.96**	**6.96**	**1.91**	**0.58**	**0.05**	**0.59**
	CO Non-attainment – Serious	**Conformity *De minimis* (ton/yr)**	**100**	**10**	**70**	**100**	**NA**	**10**
		Less than *De minimis*?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
EKAPCD (East Kern County)	Ozone Non-attainment (Former Subpart 1)	Offsite Train	9.66	35.42	0.64	0.62	0.58	2.03
	PM_{10} Non-attainment – Serious	Offsite Truck	0.00	0.00	0.00	0.00	0.00	0.00
		Total Emission (ton/yr)	**9.66**	**35.42**	**0.64**	**0.62**	**0.58**	**2.03**
		Conformity *De minimis* (ton/yr)	**NA**	**100**	**70**	**NA**	**NA**	**100**
		Less than *De minimis*?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

Table 5.1-31
Onsite and Offsite Transportation Emissions from Alternative 2 (Truck Transportation) by Air Basin

Area	Attainment Status	Emission Source	Annual Emission Rates (tons/yr)					
			CO	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
MDAQMD (Mojave Desert)	Ozone Non-attainment – Moderate (San Bernardino County): approximately 75 percent of the total distance across of MDAQMD	Offsite Train	23.37	64.27	1.56	1.51	1.41	3.69
		Offsite Truck	0.00	0.00	0.00	0.00	0.00	0.00
	PM_{10} Non-attainment – Moderate (San Bernardino County)	**Total Emission (ton/yr)**	**23.37**	**64.27**	**1.56**	**1.51**	**1.41**	**3.69**
		Conformity *De minimis* (ton/yr)	**NA**	**100**	**100**	**NA**	**NA**	**100**
		Less than *De minimis*?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Sacramento Metro	Ozone Non-attainment – Serious	Offsite Train	0.00	0.00	0.00	0.00	0.00	0.00
	PM_{10} Non-attainment – Moderate (Sacramento County)	Offsite Truck	0.00	0.00	0.00	0.00	0.00	0.00
	$PM_{2.5}$ Non-attainment	**Total Emission (ton/yr)**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		Conformity *De minimis* (ton/yr)	**NA**	**50**	**100**	**100**	**NA**	**50**
		Less than *De minimis*?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Yuba City-Marysville	Ozone Non-attainment - Former Subpart 1 (Sutter County)	Offsite Train	0.00	0.00	0.00	0.00	0.00	0.00
	$PM_{2.5}$ Non-attainment	Offsite Truck	0.00	0.00	0.00	0.00	0.00	0.00
		Total Emission (ton/yr)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		Conformity *De minimis* (ton/yr)	**NA**	**100**	**NA**	**100**	**NA**	**100**
		Less than *De minimis*?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

Table 5.1-31
Onsite and Offsite Transportation Emissions from Alternative 2 (Truck Transportation) by Air Basin

Area	Attainment Status	Emission Source	Annual Emission Rates (tons/yr)					
			CO	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Chico	Ozone non-attainment - Former Subpart 1 (Sutter County)	Offsite Train	0.00	0.00	0.00	0.00	0.00	0.00
	$PM_{2.5}$ non-attainment	Offsite Truck	0.00	0.00	0.00	0.00	0.00	0.00
		Total Emission (ton/yr)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		Conformity *De minimis* (ton/yr)	**NA**	**100**	**NA**	**100**	**NA**	**100**
		Less than *De minimis*?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Arizona	Ozone Non-attainment (Former Subpart 1) (Maricopa Co, Pinal Co)	Offsite Train	31.16	57.13	3.78	0.20	1.88	3.28
	PM_{10} Non-attainment (Moderate or Serious) (10 counties)	Offsite Truck	0.00	0.00	0.00	0.00	0.00	0.00
	$PM_{2.5}$ Non-attainment (Santa Cruz and Pinal Counties)	**Total Emission (ton/yr)**	**31.16**	**57.13**	**3.78**	**0.20**	**1.88**	**3.28**
	SO_2 Non-attainment (Pinal county)	**Conformity *De minimis* (ton/yr)**	**100**	**100**	**70**	**100**	**100**	**100**
	CO Non-attainment (Phoenix and Tucson, AZ Maricopa and Pima Counties)	**Less than *De minimis*?**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

Table 5.1-31
Onsite and Offsite Transportation Emissions from Alternative 2 (Truck Transportation) by Air Basin

Area	Attainment Status	Emission Source	Annual Emission Rates (tons/yr)					
			CO	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
New Mexico	PM_{10} Non-attainment – Moderate (Dona Ana County)	Offsite Train	24.15	88.56	1.61	1.56	1.46	5.09
	CO Non-attainment – Moderate (Bernalillo County)	Offsite Truck	0.00	0.00	0.00	0.00	0.00	0.00
		Total Emission (ton/yr)	**24.15**	**88.56**	**1.61**	**1.56**	**1.46**	**5.09**
		Conformity *De minimis* (ton/yr)	**100**	**NA**	**100**	**NA**	**NA**	**NA**
		Less than *De minimis*?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

Source: HECA, 2012.

Notes:

This table presents the transportation emissions associated with Alternative 2 (truck transportation option).
Onsite worker travel and associated emissions are negligible
SJVAPCD – Carbon Monoxide – Not Classified (Bakersfield, CA, Kern County)
MDAQMD – $PM_{2.5}$ Unclassified/Attainment (Federal), $PM_{2.5}$ Non-attainment (State)
MDAQMD – Approximately 75 percent of the train route (distance) within MDAQMD is ozone non-attainment area, while all MDAQMD is PM_{10} non-attainment area. Therefore, for ozone precursor (NO_X and VOC), 75 percent of total travel mileage in MDAQMD was applied to estimate the emission rates of NO_X and VOC.

Table 5.1-32
Difference in Annual Emissions Between
Transportation Alternatives 1 (Rail) and 2 (Truck)
Transportation

Area	Difference in Annual Emissions (tons/yr)[1]					
	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
SJVAPCD (San Joaquin Valley)	-2.37	-43.11	2.10	-0.05	-0.85	-2.15
SCAQMD (South Coast)	0.16	0.14	0.04	0.01	0.00	0.01
EKAPCD (East Kern County)	-2.49	-9.15	-0.17	-0.16	-0.15	-0.53
MDAQMD (Mojave Desert)	-1.56	-5.73	-0.10	-0.10	-0.09	-0.33
Sacramento Metro	-1.72	-6.29	-0.11	-0.11	-0.10	-0.36
Yuba City-Marysville	-1.07	-3.93	-0.07	-0.07	-0.06	-0.23
Chico	-1.07	-3.93	-0.07	-0.07	-0.06	-0.23
Arizona	0.00	0.00	0.00	0.00	0.00	0.00
New Mexico	0.00	0.00	0.00	0.00	0.00	0.00

Source: HECA, 2012.

Notes:
[1] Difference of Alternative 2 (truck transportation) total annual emissions for each Area minus Alternative 1 (rail transportation) total annual emissions.
[2] Annual emissions include both trucks and trains for both alternatives.

Table 5.1-33
Greenhouse Gas Emissions Associated with the Mobile Sources During Project Operations for Alternative 2 (Truck Transportation)

Source	Annual CO_2e Emissions (tonne/yr)
On-site trucks	867
Off-site workers commuting	824
Off-site trucks	18,562
Off-site trains	37,464
Total CO_2e Annual Emissions	**57,717**

Source: HECA, 2012.

Notes:

1 This table presents transportation emissions associated with Alternative 2 (truck transportation option).

2 On-site worker travel and associated emissions are negligible.

Table 5.1-34
Laws, Ordinances, Regulations, and Standards—Air Quality

Laws, Ordinances, Regulations, and Standards	Applicability	Administering Agency
Federal		
Clean Air Act 160-169A and implementing regulations, Title 42 United States Code (USC) 7470-7492 (42 USC 7470-7492; Title 40 Code of Federal Regulations (CFR) Parts 51 and 52 (40 CFR Parts 51 and 52) Prevention of Significant Deterioration Program)	Requires prevention of significant deterioration (PSD) review and facility permitting for construction of new or modified major stationary sources of air pollution. PSD review applies to pollutants for which ambient concentrations are lower than NAAQS.	USEPA Region IX
Title 40 CFR Parts 70 and 71	This rule tailors GHG emissions to PSD and Title V permitting applicability criteria.	USEPA Region IX
CAA 171-193, 42 USC 7501 et seq. (New Source Review)	Requires new source review (NSR) facility permitting for construction or modification of stationary sources. NSR applies to pollutants for which ambient concentrations are higher than NAAQS.	USEPA Region IX
40 CFR Part 98	This rule requires mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of CO_2 equivalent emissions per year.	USEPA Region IX
CAA 401 (Title IV), 42 USC 7651 (Acid Rain Program); SJVAPCD Regulation II, Rule 2540	Requires reductions in NO_X and SO_2 emissions. Applicable to all stationary sources subject to Part 72, Title 40, Code of Federal Regulations (CFR).	SJVAPCD, with USEPA Region IX oversight
CAA 501 (Title V), 42 USC 7661 (Federal Operating Permits Program)	Establishes comprehensive permit program for major stationary sources.	SJVAPCD, with USEPA Region IX oversight
CAA 111, 42 USC 7411, 40 CFR Part 60 (New Source Performance Standards, or NSPS)	Establishes national standards of performance for new stationary sources. This rule incorporates the New Source Performance Standards from Part 60, Chapter 1, Title 40, CFR.	SJVAPCD, with USEPA Region IX oversight

Table 5.1-34
Laws, Ordinances, Regulations, and Standards—Air Quality

Laws, Ordinances, Regulations, and Standards	Applicability	Administering Agency
State		
H&SC 44300-44384; Title 17 of The California Code of Regulations (17 CCR 93300-93300.5) Toxic "Hot Spots" Act	Requires preparation and biennial updating of facility emission inventory of hazardous substances; health risk assessments.	CARB
California Code of Regulations, Title 17, Subchapter 10, Article 2, Sections 95100 et seq.	Requires mandatory GHG emissions reporting as part of the California Global Warming Solutions Act of 2006 (AB 32).	CARB
California Code of Regulations, Title 17, Subchapter 10, Article 5, Sections 95800-96023	Establishes a cap on GHG emissions and provides market-based compliance mechanisms (cap and trade program) for covered entities, including electrical generating units.	CARB
H&SC 41700	Provides that no person shall discharge from any source quantities of air contaminants or material which cause injury, detriment, nuisance, or annoyance to considerable number of persons or to the public which endanger the comfort, repose, health or safety or which can cause injury or damage to business or property.	CARB
California Public Resources Code 25523(a); 20 CCR 1752, 2300 2309 and Div. 2, Chap. 5, Art. 1, Appendix B, Park (k) (CEC and CARB Memorandum of Understanding)	Requires that CEC's decision on the AFC includes requirements to assure protection of environmental quality; AFC is required to address air quality protection.	CEC
The California Global Warming Solutions Act of 2006. AB 32 (Stats. 2006; Chapter 488; H&SC 38500 et seq.)	Requires the ARB to enact standards that will reduce GHG emission to 1990 levels by 2020. Requires new baseload generation power plants to not exceed the rate of GHG emissions from a combined-cycle gas turbine plant.	CARB
California Code of Regulation. Title 20, §2902, Greenhouse Gases Emission Performance Standard.	The GHGs emission performance standard (EPS) applicable to this chapter is 1,100 pounds of CO_2 per megawatt hour of electricity.	CARB
California Code of Regulation. Title 20, §2903, Compliance with the Emission Performance Standard	A power plant's compliance with the EPS shall be determined by dividing the power plant's annual average CO_2 emissions in pounds by the power plant's annual average net electricity production in MWh.	CARB

Table 5.1-34
Laws, Ordinances, Regulations, and Standards—Air Quality

Laws, Ordinances, Regulations, and Standards	Applicability	Administering Agency
California Code of Regulation. Title 20, §2904, Annual Average CO_2 Emissions	(a) Except as provided in Subsections (b) and (c), a power plant's annual average CO_2 emissions are the amount of CO_2 produced on an annual average basis by each fuel used in any component directly involved in electricity production, including, but not limited to, the boiler, combustion turbine, reciprocating or other engine, and fuel cell. The fuels used in this calculation shall include, but are not limited to, primary and secondary fuels, backup fuels, and pilot fuels, and the calculation shall assume that all carbon in the fuels is converted to CO_2. Fuels used in ancillary equipment, including, but not limited to, fire pumps, emergency generators, and vehicles shall not be included. (b) [not presented in this report because it pertains to biomass fuels and does not affect the Project] (c) For covered procurements that employ geological formation injection for CO_2 sequestration, the annual average CO_2 emissions shall not include the CO_2 emissions that are projected to be successfully sequestered. The EPS for such power plants shall be determined based on projections of net emissions over the life of the power plant. CO_2 emissions shall be considered successfully sequestered if the sequestration project meets the following requirements: (1) Includes the capture, transportation, and geologic formation injection of CO_2 emissions; (2) Complies with all applicable laws and regulations; and (3) Has an economically and technically feasible plan that will result in the permanent sequestration of CO_2 once the sequestration project is operational.	CARB
Local		
SJVAPCD Regulation II, Rule 2201 (New and Modified Stationary Source Review Rule)	This rule shall apply to all new stationary sources and all modifications to existing stationary sources which are subject to the District permit requirements and after construction emit or may emit one or more affected pollutant. The requirements of this rule in effect on the date the application is determined to be complete by the Air Pollution Control Officer (APCO) shall apply to such application except as provided in Section 2.1.	SJVAPCD

Table 5.1-34
Laws, Ordinances, Regulations, and Standards—Air Quality

Laws, Ordinances, Regulations, and Standards	Applicability	Administering Agency
SJVAPCD Regulation II, Rule 2520 (Federally Mandated Operating Permits)	2.0 Applicability The provisions of this rule shall apply to the following sources: 2.1 Major air toxics sources, 2.2 Any stationary source that emits or has the potential to emit 100 tons per year of any air contaminant, 2.3 Any major source, 2.4 Any emissions unit, including an area source, subject to a standard or other requirement promulgated pursuant to section 111 (NSPS) or 112 (HAPs) of the CAA published after July 21, 1992 except as provided for in section 4.2 of this rule. 2.4.1 For stationary sources, which are subject to Rule 2520 solely as a result of Section 2.4, only the emissions units within the a stationary source that are subject to the section 111 or 112 standard or requirement shall be subject to the Part 70 permitting requirements; 2.5 A source with an acid rain unit for which application for an acid rain permit is required pursuant to Title IV of the CAA; 2.6 Any source required to have a preconstruction review permit pursuant to the requirements of the prevention of significant deterioration (PSD) program under Title I of the Federal Clean Air Act; 2.7 A solid waste incinerator subject to a performance standard promulgated pursuant to section 111 or 129 of the CAA; and 2.8 Any source in a source category designated, pursuant to 40 CFR Part 70.3, by rule of the EPA. 2.9 When calculating the potential to emit for the purpose of determining if the requirements of this rule are applicable, fugitive emissions must only be included for determining non-hazardous air pollutant emissions if the source is included in the list of source categories identified in the major source definition in 40 CFR part 70.2, or when determining if a stationary source is a major air toxics source.	SJVAPCD
SJVAPCD Regulation II, Rule 2540	All stationary sources subject to Part 72, Title 40, Code of Federal Regulations (CFR)	SJVAPCD

Table 5.1-34
Laws, Ordinances, Regulations, and Standards—Air Quality

Laws, Ordinances, Regulations, and Standards	Applicability	Administering Agency
SJVAPCD Regulation II, Rule 2550 (Federally Mandated Preconstruction Review for Major Sources of Air Toxics)	The provisions of this rule shall only apply to applications to construct or reconstruct a major air toxics source with Authority to Construct issued on or after 28 June 1998. Requirements for other projects that result in increases in emissions of hazardous air pollutants are addressed in the District's Risk Management Policy for Permitting New and Modified Sources.	SJVAPCD
SJVAPCD Regulation III	Identifies fees that are applicable to permit modifications, new facilities, and permitted emissions	SJVAPCD
SJVAPCD Regulation IV, Rule 4001	All new sources of air pollution and modification of existing sources of air pollution shall comply with the standards, criteria, and requirements set forth therein.	SJVAPCD
SJVAPCD Regulation IV, Rule 4002 (National Emission Standards for Hazardous Air Pollutants)	This rule incorporates the National Emission Standards for Hazardous Air Pollutants from Part 61, Chapter I, Subchapter C, Title 40, Code of Federal Regulations (CFR) and the National Emission Standards for Hazardous Air Pollutants for Source Categories from Part 63, Chapter I, Subchapter C, Title 40, Code of Federal Regulations (CFR). All sources of hazardous air pollution shall comply with the standards, criteria, and requirements set forth therein.	SJVAPCD
SJVAPCD Regulation IV, Rule 4101 (Visible Emissions)	The provisions of this rule shall apply to any source operation which emits or may emit air contaminants.	SJVAPCD
SJVAPCD Regulation IV, Rule 4102 (Nuisance)	This rule shall apply to any source operation which emits or may emit air contaminants or other materials.	SJVAPCD
SJVAPCD Regulation IV, Rule 4201 (Particulate Matter Concentration)	This rule shall apply to any source operation which emits or may emit dust, fumes, or total suspended particulate matter.	SJVAPCD
SJVAPCD Regulation IV, Rule 4202 (Particulate Matter—Emission Rate)	This rule shall apply to any source operation which emits or may emit particulate matter emissions.	SJVAPCD
SJVAPCD Regulation IV, Rule 4301 (Fuel Burning Equipment)	The purpose of this rule is to limit the emission of air contaminants from fuel burning equipment. This rule limits the concentration of combustion contaminants and specifies maximum emission rates for sulfur dioxide, nitrogen oxides and combustion contaminant emissions.	SJVAPCD

Table 5.1-34
Laws, Ordinances, Regulations, and Standards—Air Quality

Laws, Ordinances, Regulations, and Standards	Applicability	Administering Agency
SJVAPCD Regulation IV, Rule 4304 (Equipment Tuning Procedure)	The purpose of this rule is to provide an equipment tuning procedure for boilers, steam generators, and process heaters to control visible emissions and emissions of both nitrogen oxides (NO_X) and carbon monoxide (CO).	SJVAPCD
SJVAPCD Regulation IV, Rules 4305-4308 (Boilers, Steam Generators and Process Heaters)	The purpose of this rule is to limit emissions of nitrogen oxides (NO_X) and carbon monoxide (CO) from boilers, steam generators, and process heaters.	SJVAPCD
SJVAPCD Regulation IV, Rule 4311 (Flares)	The purpose of this regulation is to limit the emissions of volatile organic compounds (VOC), oxides of nitrogen (NO_X), and sulfur oxides (SO_X) from the operation of flares. This rule is applicable to operations involving the use of flares.	SJVAPCD
SJVAPCD Regulation IV, Rule 4320 (Boilers, Steam Generators and Process Heaters)	The purpose of this rule is to limit NO_X, CO, SO_2, and PM_{10} from boilers, steam generators, and process heaters.	SJVAPCD
SJVAPCD Regulation IV, Rule 4701 (Internal Combustion Engines)	Except as provided in Section 4.0, the provisions of this rule apply to any internal combustion engine rated greater than 50 brake horsepower (bhp) that requires a Permit to Operate (PTO).	SJVAPCD
SJVAPCD Regulation IV, Rule 4702 (Internal Combustion Engines)	This rule applies to any internal combustion engine with a rated brake horsepower greater than 50 horsepower.	SJVAPCD
SJVAPCD Regulation IV, Rule 4703 (Stationary Gas Turbines)	The provisions of this rule apply to all stationary gas turbine systems, which are subject to District permitting requirements, and with ratings equal to or greater than 0.3 megawatt (MW) or a maximum heat input rating of more than 3,000,000 Btu per hour, except as provided in Section 4.0.	SJVAPCD
SJVAPCD Regulation IV, Rule 4801 (Sulfur Compounds)	The provisions of this rule shall apply to any discharge to the atmosphere of sulfur compounds, which would exist as a liquid or a gas at standard conditions. A person shall not discharge into the atmosphere sulfur compounds, which would exist as a liquid or gas at standard conditions, exceeding in concentration at the point of discharge: two-tenths (0.2) percent by volume calculated as sulfur dioxide (SO_2), on a dry basis averaged over 15 consecutive minutes.	SJVAPCD
SJVAPCD Regulation VII, Rule 7012 (Hexavalent Chromium – Cooling Towers)	The requirements of this rule shall apply to any person who owns or operates or who plans to build, own, or operate a cooling tower in which the circulating water is exposed to the atmosphere.	SJVAPCD

Table 5.1-34
Laws, Ordinances, Regulations, and Standards—Air Quality

Laws, Ordinances, Regulations, and Standards	Applicability	Administering Agency
SJVAPCD Regulation VIII	The purpose of Regulation VIII (Fugitive PM_{10} Prohibitions) is to reduce ambient concentrations of fine particulate matter (PM_{10}) by requiring actions to prevent, reduce or mitigate anthropogenic fugitive dust emissions. The Rules contained in this Regulation have been developed pursuant to U.S. Environmental Protection Agency guidance for Serious PM_{10} Non-attainment Areas. The rules are applicable to specified anthropogenic fugitive dust sources. Fugitive dust contains PM_{10} and particles larger than PM_{10}. Controlling fugitive dust emissions when visible emissions are detected will not prevent all PM_{10} emissions, but will substantially reduce PM_{10} emissions.	SJVAPCD
SJVAPCD Regulation IX	This Rule specifies the criteria and procedures for determining the conformity of federal actions with the San Joaquin Valley Air Pollution Control District's air quality implementation plan.	SJVAPCD
Industry		
None Applicable	None Applicable	

Source: HECA, 2012.

Table 5.1-35
Relevant Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS[1]		CAAQS[2]
		Primary[3,4]	Secondary[3,5]	Concentration[3]
Ozone	1-hour	–	Same as primary standard	0.09 ppm (180 µg/m^3)
	8-hour	0.075 ppm (147 µg/m^3)		0.070 ppm (137 µg/m^3)
Carbon Monoxide	8-hour	9 ppm (10 mg/m^3)	None	9.0 ppm (10 mg/m^3)
	1-hour	35 ppm (40 mg/m^3)		20 ppm (23 mg/m^3)
Nitrogen Dioxide[6]	Annual average	0.053 ppm (100 µg/m^3)	Same as primary standard	0.030 ppm (57 µg/m^3)
	1-hour	0.100 ppm (188 µg/m^3)		0.18 ppm (339 µg/m^3)
Sulfur Dioxide[7]	Annual average	0.030 ppm (for certain areas)[7]	–	–
	24-hour	0.14 ppm (for certain areas)[7]	–	0.04 ppm (105 µg/m^3)
	3-hour	–	0.5 ppm (1,300 µg/m^3)	–
	1-hour	0.075 ppm (196 µg/m^3)	–	0.25 ppm (655 µg/m^3)
Respirable Particulate Matter (PM_{10})	24-hour	150 µg/m^3	Same as primary standard	50 µg/m^3
	Annual arithmetic mean	–		20 µg/m^3
Fine Particulate Matter ($PM_{2.5}$)	24-hour	35 µg/m^3	Same as primary standard	–
	Annual arithmetic mean	15 µg/m^3		12 µg/m^3
Lead[8,9]	30-day average	–	–	1.5 µg/m^3
	Calendar quarter	1.5 µg/m^3 (for certain areas)[9]	Same as primary standard	–
	Rolling 3-month average	0.15 µg/m^3		–

Table 5.1-35
Relevant Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS[1]		CAAQS[2]
		Primary[3,4]	Secondary[3,5]	Concentration[3]
Vinyl Chloride[8]	24-hour	No federal standards		0.01 ppm (26 µg/m^3)
Hydrogen Sulfide	1-hour			0.03 ppm (42 µg/m^3)
Sulfates	24-hour			25 µg/m^3
Visibility Reducing Particles[10]	8-hour (10 am to 6 pm, Pacific Standard Time)			See footnote 10

Source: USEPA-NAAQS, http://www.epa.gov/air/criteria.html; CARB-CAAQS, http://www.arb.ca.gov/aqs/aaqs2.pdf

Notes:

1 National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth-highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

2 California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1- and 24-hour), nitrogen dioxide, and particulate matter (PM_{10}, $PM_{2.5}$, and visibility-reducing particles) are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in § 70200 of Title 17 of the California Code of Regulations.

3 Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4 National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

5 National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

6 To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb.

7 On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated non-attainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

8 The ARB has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

9 The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated non-attainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

10 In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

µg/m^3 = micrograms per cubic meter
CAAQS = California Ambient Air Quality Standards
mg/m^3 = milligram per cubic meter
NAAQS = National Ambient Air Quality Standards
ppm = parts per million [3]

Table 5.1-36
Attainment Status for Kern County with Respect to Federal and California Ambient Air Quality Standards

Pollutant	Federal Attainment Status	State Attainment Status
Ozone	Extreme non-attainment	Non-attainment
CO	Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
PM_{10}	Attainment[1]	Non-attainment
$PM_{2.5}$	Non-attainment	Non-attainment
Lead	Unclassified	Attainment

Source: CARB (http://www.arb.ca.gov/desig/desig.htm); USEPA (http://www.epa.gov/air/oaqps/greenbk/index.html)

Notes:
[1] On 25 September 2008, USEPA redesignated the San Joaquin Valley to attainment for the PM_{10} National Ambient Air Quality Standard (NAAQS) and approved the PM_{10} Maintenance Plan.

CO = carbon monoxide
NO_2 = nitrogen dioxide
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
SO_2 = sulfur dioxide

Table 5.1-37
PSD Emission Threshold Triggers for New Stationary Sources

Pollutant	Applicability Thresholds (tpy)	Significant Emission Rate (tpy)	Project Emissions (tpy)	PSD Triggered by Project?
CO	100	100	275	Yes
SO_2	100	40	29	No
NO_X	100	40	164	Yes
PM_{10}	100	15	90	Yes
$PM_{2.5}$	100	10	80	No[1]
VOCs	100	40	35	No
CO_2	100,000	N/A	535,278	Yes
Lead (Pb)	N/A	0.6	0.007	No
Fluorides	N/A	3	0.001	No
Sulfuric acid mist	N/A	7	1.14	No
Hydrogen sulfide (H_2S)	N/A	10	2.64	No
Total reduced sulfur (TRS)	N/A	10	4.17	No
Reduced sulfur compounds	N/A	10	4.42	No

Source: 40 CFR § 52.21 and HECA 2012.

Notes:

[1] PSD is not triggered as the Project is in a non-attainment area for $PM_{2.5}$.

CO = carbon monoxide
CO_2e = carbon dioxide equivalent
NO_X = nitrogen dioxide
N/A = not applicable
Pb = lead
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
PM_{10} = particulate matter less than 10 microns in diameter
SO_2 = sulfur dioxide
tpy = tons per year
VOCs = volatile organic compounds

Table 5.1-38
Prevention of Significant Deterioration Allowable Increments
(µg/m^3)

Standard	Class I Area	Class II Area	Class III Area
PM_{10} Annual Arithmetic Mean	4	17	34
PM_{10} 24-Hour Maximum	8	30	60
CO 8-Hour Maximum	N/A	N/A	N/A
CO 1-Hour Maximum	N/A	N/A	N/A
NO_2 Annual Arithmetic Mean	2.5	25	50
NO_2 1-Hour Maximum	TBD	TBD	TBD

Source: 40 CFR § 52.21.
Notes:
µg/m^3 = micrograms per cubic meter
NO_2 = nitrogen dioxide
PM_{10} = particulate matter less than 10 microns in diameter
CO = carbon monoxide
N/A = not applicable
TBD = to be determined

Table 5.1-39
Proposed BACT for the Project

Pollutant	Technology	Emission Limit
CTG/HRSG Combustion Turbine (excluding Start-Up/Shut-Down conditions)		
NO_X	Diluent injection, Selective Catalytic Reduction (SCR), Limited operation on natural gas	2.5 ppm NO_X @ 15 percent O_2 on hydrogen-rich fuel, 3-hour average
		4 ppm NO_X @ 15 percent O_2 on natural gas fuel, 3-hour average
CO	GCP, CO catalyst), Limited operation on natural gas	3 ppm CO @ 15 percent O_2 on hydrogen-rich fuel, 3-hour average
		5 ppm CO @ 15 percent O_2 on natural gas fuel, 3-hour average
PM/PM_{10}	GCP, gas cleanup, gaseous fuels, pipeline-quality natural gas	15 lb/hr on hydrogen-rich fuel and natural gas fuel
SO_2	Hydrogen-rich gas cleanup, pipeline-quality natural gas	≤ 2 ppmv total sulfur in hydrogen-rich syngas, ≤ 10 ppmv total sulfur in PSA off-gas
		≤ 0.75 grain/100 SCF (12.65 ppm for natural gas)
VOC	CO catalyst), Limited operation on natural gas	1 ppm VOC @ 15 percent O_2 on hydrogen-rich fuel, 3-hour average
		2 ppm VOC @ 15 percent O_2 on natural gas fuel, 3-hour average
NH_3	SCR	5 ppm NH_3 slip on hydrogen-rich fuel and natural gas fuel
Coal Dryer		
PM/PM_{10}	Baghouse	0.001 grain/scf outlet dust loading
Cooling Towers		
PM/PM_{10}	High-efficiency drift eliminators, Total Dissolved Solids (TDS) limit in circulating water, and good operating practice	0.0005 percent drift as percent of the circulating water
Auxiliary Boiler, Natural Gas 213 MMBTU/hr		
NO_X	Low- NO_X burner and SCR	5 ppm NO_X @ 3 percent O_2
CO	GCP, annual tune-up	50 ppmvd @ 3 percent O_2
PM/PM_{10}	GCP, pipeline-grade natural gas fuel	0.005 lb/MMBtu heat input
SO_2		0.00285 lb/MMBtu (12.65 ppm for natural gas)
VOC		0.004 lb/MMBtu heat input
NH_3	SCR	5 ppm NH_3 slip natural gas fuel
Emergency Diesel Engines (2 Emergency Generators; 2,922 hp each)		
NO_X	Certified EPA Tier 4 diesel engine, combustion controls, restricted operating hours, low-sulfur diesel fuel	0.5 g/bhp/hr
CO		2.6 g/bhp/hr
PM/PM_{10}		0.07 g/bhp/hr
SO_2		Very-low-sulfur diesel fuel (15 ppmw or less)
VOC		0.3 g/bhp/hr

Table 5.1-39
Proposed BACT for the Project

Pollutant	Technology	Emission Limit
Emergency Diesel Engine (Fire Pump; 565 hp)		
NO_X	Certified EPA Tier 4 diesel engine, combustion controls, restricted operating hours, low-sulfur diesel fuel	1.5 g/bhp/hr
CO		2.60 g/bhp/hr
PM/PM_{10}		0.015 g/bhp/hr
SO_2		Very Low Sulfur Diesel fuel (15 ppmw or less)
VOC		0.14 g/bhp/hr
Gasification Flare		
NO_X, CO, PM/PM_{10}, SO_2	GCP, gaseous fuel only, Gas cleanup/limit on reduced sulfur in hydrogen-rich fuel	
VOC	GCP, gaseous fuel only, flare gas recovery system for non-emergency releases, VOC destruction of ≥ 98.5 percent	
Rectisol® Flare		
NO_X, CO, PM/PM_{10}, SO_2	GCP, gaseous fuel only, flare gas recovery system for non-emergency releases, gas cleanup/limit on reduced sulfur in syngas	
VOC	GCP, gaseous fuel only, flare gas recovery system for non-emergency releases, VOC destruction of ≥ 98.5 percent	
SRU Flare (Sulfur Recovery System)		
NO_X, CO, PM/PM_{10}	GCP, gaseous fuel only, flare gas recovery system for non-emergency releases	
SO_2	Caustic Scrubber	
VOC	GCP, gaseous fuel only, flare gas recovery system for non-emergency releases, VOC destruction of ≥ 98.5 percent	
Thermal Oxidizer (Sulfur Recovery System) (excluding Start-Up/Shut-Down conditions)		
NO_X	GCP	0.24 lb/MMBtu
CO		0.20 lb/MMBtu
PM/PM_{10}		0.0076 lb/MMBtu
SO_2	GCP, gas cleanup to ≤ 10 ppmw H_2S	2 lb/hr process vent gas
VOC	GCP	0.0055 lb/MMBtu
CO_2 Vent		
CO	Gas cleanup, restricted operating hours	1,000 ppmv
VOC		40 ppmv
H_2S	Acid gas removal	10 ppmv
Feedstock		
PM/PM_{10}	Dust collector, adequate moisture to prevent visible emissions in excess of 5 percent opacity	0.005 grain/scf outlet dust loading

Table 5.1-39
Proposed BACT for the Project

Pollutant	Technology	Emission Limit
Ammonia Plant Heater, Natural Gas 55 MMBtu/hr		
NO_X	Low- NO_X burner, limited operation	9 ppm NO_X @ 3 percent O_2
CO	GCP, annual tune-up	50 ppmvd @ 3 percent O_2
PM/PM_{10}	GCP, pipeline-grade natural gas fuel	0.005 lb/MMBtu heat input
SO_2		0.00285 lb/MMBtu (12.65 ppm for natural gas)
VOC		0.004 lb/MMBtu heat input
Urea HP Absorber		
NH_3	Wet scrubber	11.1 lb/hr
Urea LP Absorber		
NH_3	Wet scrubber	2.0 lb/hr
Urea Pastillation		
PM/PM_{10}	Baghouse	0.001 grain/dscf
Nitric Acid Plant		
NO_X	SCR	0.2 lb/ton (15 ppmv in vent gas)
NH_3	SCR	5 ppm NH_3 slip
Ammonium Nitrate Plant		
PM/PM_{10}	Wet scrubber	0.2 lb/hr
Fugitives		
VOC	LDAR, leak detection for valves and connectors with VOC > 100 ppmv above background, and for pumps and compressor seals with VOC > 500 ppmv above background	Varies

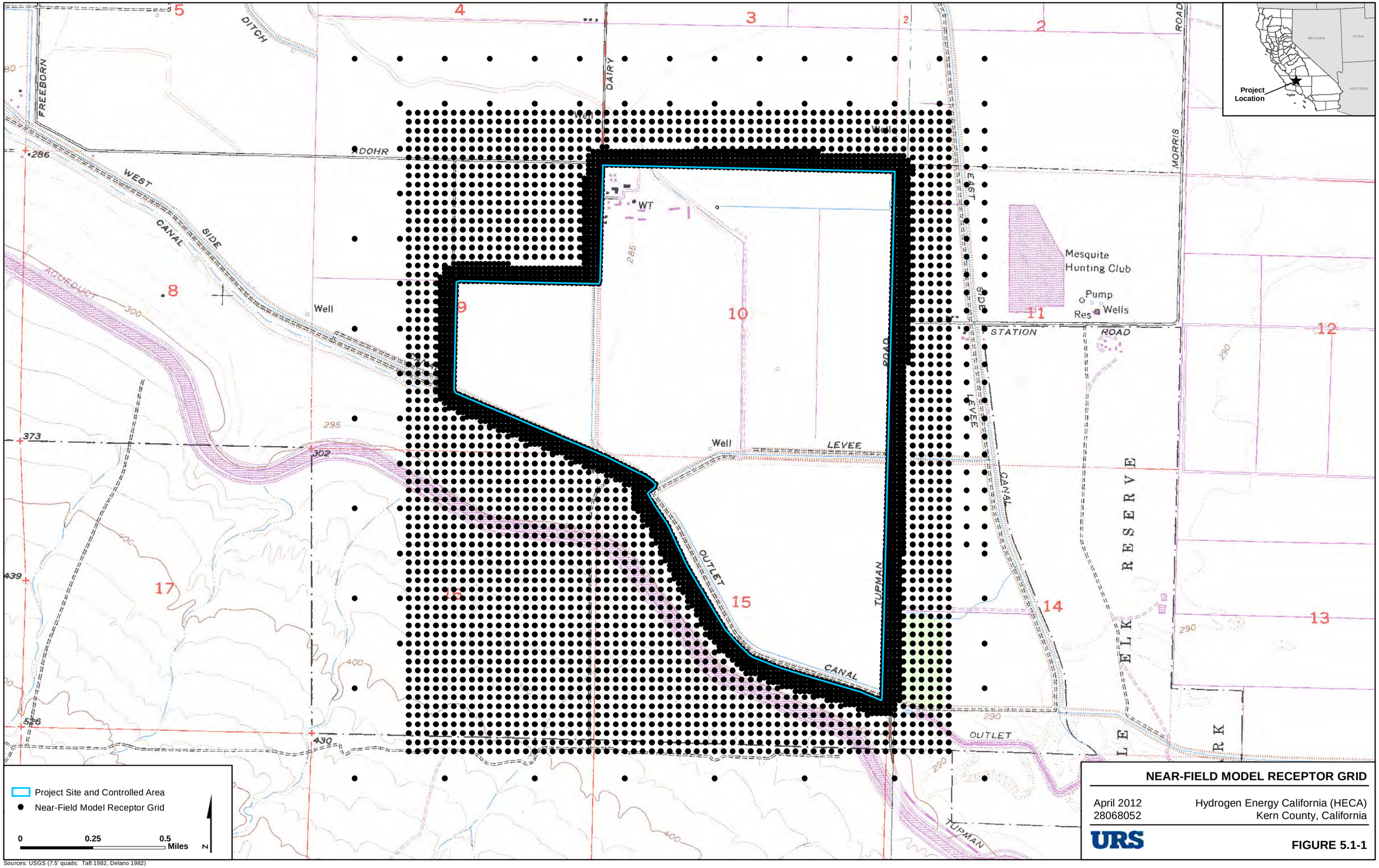
Source: HECA 2012.

Notes:
BACT = best available control technology
CO = carbon monoxide
CPUC = California Public Utility Commission
CTG = combustion turbine generator
FGR = flue gas recirculation
GCP = good combustion practice
LDAR = leak detection and repair
MMBtu = million British thermal units
NH_3 = ammonia
NO_X = nitrogen dioxide
O_2 = oxygen
PM/PM_{10} = particulate matter/particulate matter less than 10 microns
ppm = parts per million
ppmvd = parts per million volumetric dry
SCF = standard cubic feet
SCR = selective catalytic reduction
SO_2 = sulfur dioxide
VOC = volatile organic compound

Table 5.1-40
Involved Agencies and Agency Contacts

Agency	Contact/Title	Telephone
California Energy Commission	Gerry Bemis, Air Quality Specialist 1516 Ninth Street Sacramento, CA 95814	(916) 654-4960
California Air Resources Board	Mike Tollstrup, 1001 I Street Sacramento, CA 95814	(916) 322-6026
San Joaquin Valley Air Pollution Control District	Leonard Scandura, Supervising Air Quality Engineer 34946 Flyover Court Bakersfield, CA 93308	(661) 392-5601
U.S. Environmental Protection Agency	Gerardo Rios, Chief, Permits Office 75 Hawthorne Street San Francisco, CA 94105	(415) 972-3974

Source: HECA, 2012.



NEAR-FIELD MODEL RECEPTOR GRID

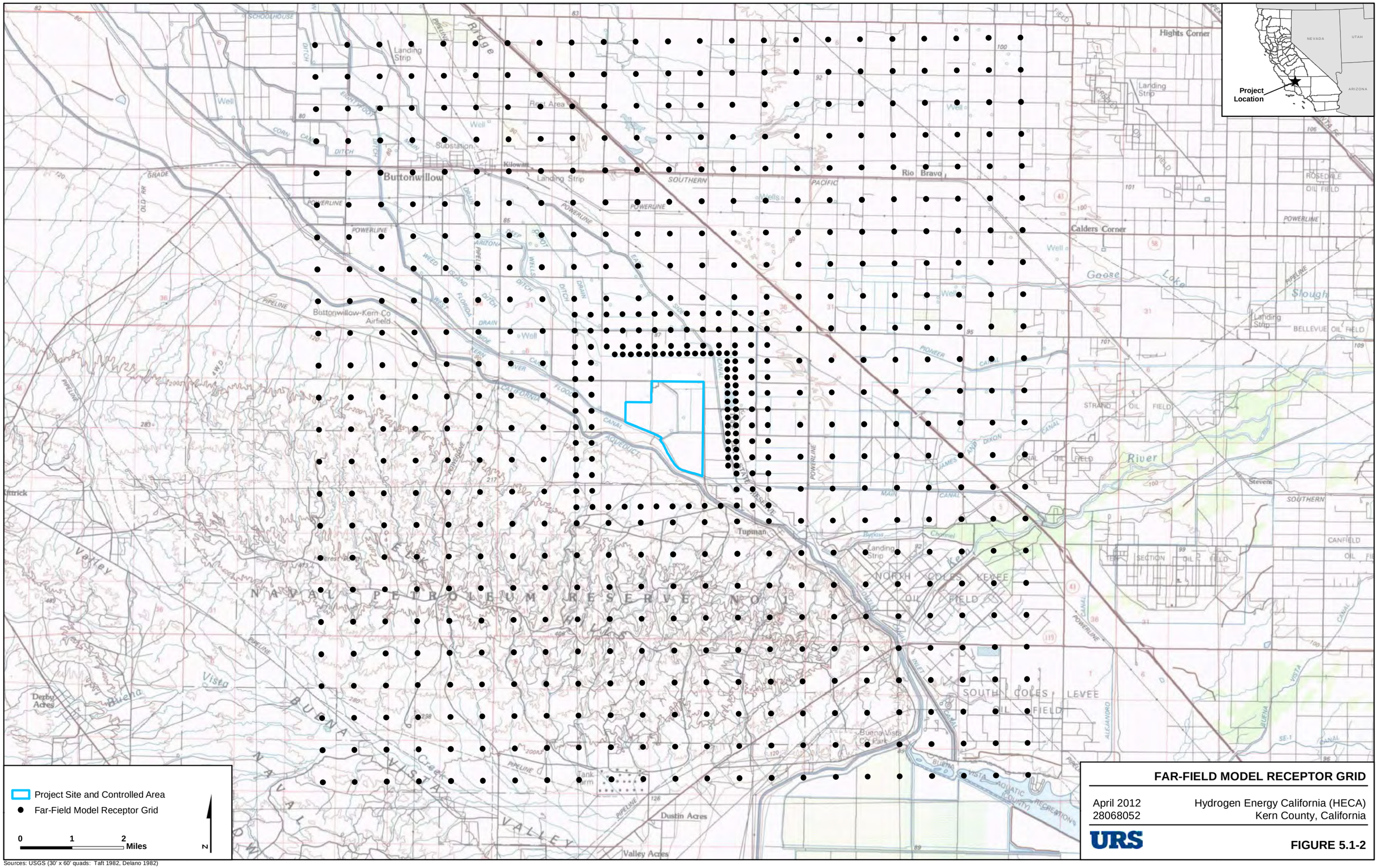
April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.1-1

Sources: USGS (7.5' quads: Taft 1982, Delano 1982)



Sources: USGS (30' x 60' quads: Taft 1982, Delano 1982)

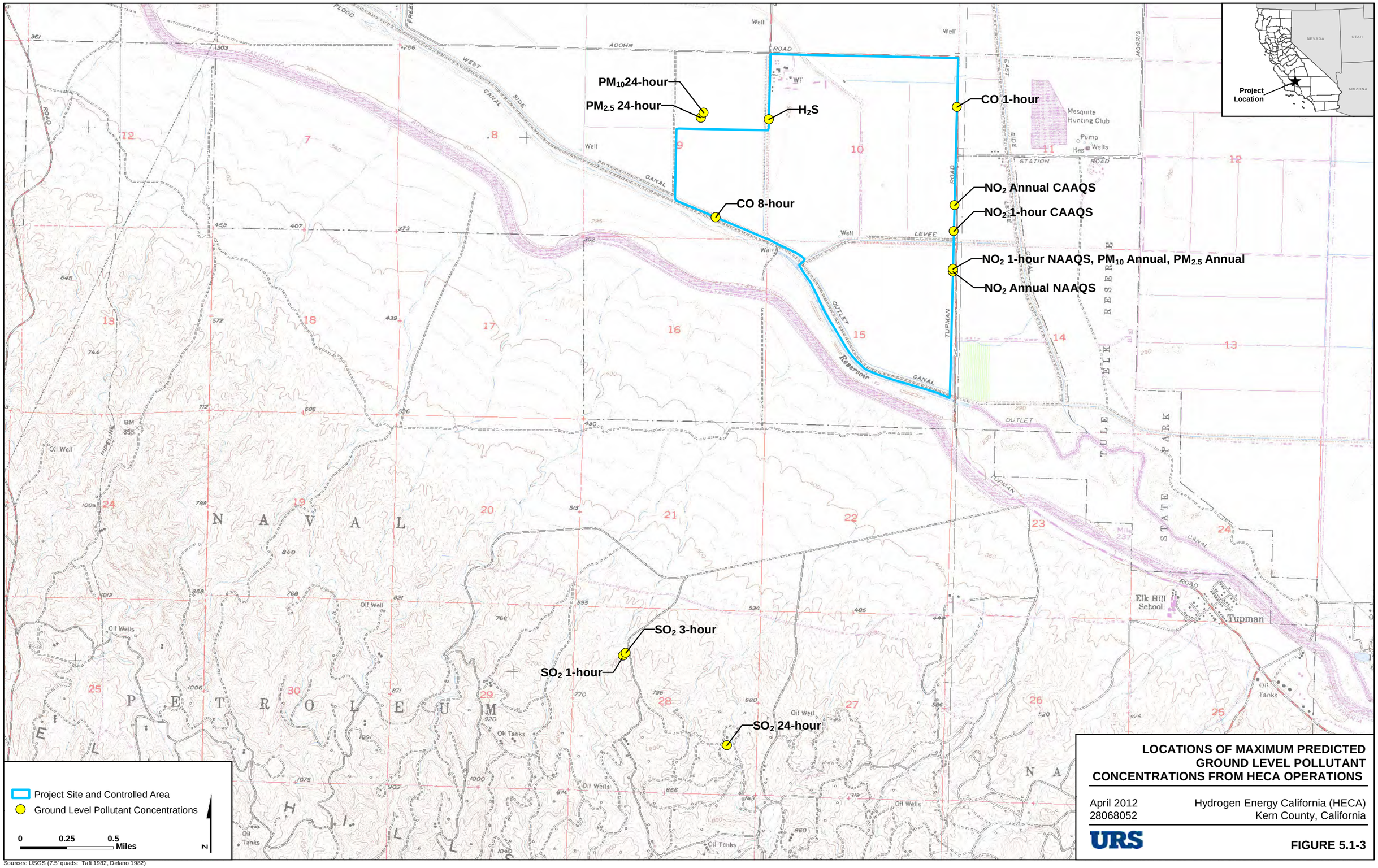
FAR-FIELD MODEL RECEPTOR GRID

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.1-2



LOCATIONS OF MAXIMUM PREDICTED GROUND LEVEL POLLUTANT CONCENTRATIONS FROM HECA OPERATIONS

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.1-3

Sources: USGS (7.5' quads: Taft 1982, Delano 1982)

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5.2 BIOLOGICAL RESOURCES

Hydrogen Energy California LLC (HECA LLC) is proposing an Integrated Gasification Combined Cycle (IGCC) polygeneration project (HECA or Project). The Project will gasify a fuel blend of 75 percent coal and 25 percent petroleum coke (petcoke) to produce synthesis gas (syngas). Syngas produced via gasification will be purified to hydrogen-rich fuel, and used to generate a nominal 300 megawatts (MW) of low-carbon baseload electricity in a Combined Cycle Power Block, low-carbon nitrogen-based products in an integrated Manufacturing Complex, and carbon dioxide (CO_2) for use in enhanced oil recovery (EOR). CO_2 from HECA will be transported by 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). The EOR process results in sequestration (storage) of the CO_2.

Terms used throughout this section are defined as follows:

- **Project or HECA.** The HECA IGCC electrical generation facility, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes, including its linear facilities.

- **Project Site or HECA Project Site.** The 453-acre parcel of land on which the HECA IGCC electrical generation facility, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes (excluding off-site portions of linear facilities), will be located.

- **OEHI Project.** The use of CO_2 for EOR at the EHOF and resulting sequestration, including the CO_2 pipeline, EOR processing facility, and associated equipment.

- **OEHI Project Site.** The portion of land within the EHOF on which the OEHI Project will be located and where the CO_2 produced by HECA will be used for EOR and resulting sequestration**.**

- **Controlled Area.** The 653 acres of land adjacent to the Project Site over which HECA will control access and future land uses.

This introduction provides brief descriptions of both the Project and the OEHI Project. Additional HECA Project description details are provided in Section 2.0. Additional OEHI Project description details are provided in Appendix A of this Application for Certification (AFC) Amendment.

HECA Project Linear Facilities

The HECA Project includes the following linear facilities, which extend off the Project Site (see Figure 2-7, Project Location Map):

- **Electrical transmission line.** An approximately 2-mile-long electrical transmission line will interconnect the Project to a future Pacific Gas and Electric Company (PG&E) switching station east of the Project Site.

- **Natural gas supply pipeline.** An approximately 13-mile-long natural gas interconnection will be made with PG&E natural gas pipelines located north of the Project Site.

- **Water supply pipelines and wells.** An approximately 15-mile-long process water supply line and up to five new groundwater wells will be installed by the Buena Vista Water Storage District (BVWSD) to supply brackish groundwater from northwest of the Project Site. An approximately 1-mile-long water supply line from the West Kern Water District (WKWD) east of the Project Site will provide potable water.

- **Coal transportation.** HECA is considering two alternatives for transporting coal to the Project Site:

  — **Alternative 1, rail transportation.** An approximately 5-mile-long new industrial railroad spur that will connect the Project Site to the existing San Joaquin Valley Railroad (SJVRR) Buttonwillow railroad line, north of the Project Site. This railroad spur will also be used to transport some HECA products to market.

  — **Alternative 2, truck transportation.** An approximately 27-mile-long truck transport route via existing roads from an existing coal transloading facility northeast of the Project Site. This alternative was presented in the 2009 Revised AFC.

OEHI Project

OEHI will be installing the CO_2 pipeline from the Project Site to the EHOF, as well as installing the EOR Processing Facility, including any associated wells and pipelines needed in the EHOF for CO_2 EOR and sequestration. The following is a brief description of the OEHI Project, which is described in more detail in Appendix A of this AFC Amendment:

- **CO_2 EOR Processing Facility.** The CO_2 EOR Processing Facility and 13 satellites are expected to occupy approximately 136 acres within the EHOF. The facility will use 720 producing and injection wells: 570 existing wells and 150 new well installations. Approximately 652 miles of new pipeline will also be installed in the EHOF.

- **CO_2 pipeline.** An approximately 3-mile-long CO_2 pipeline will transfer the CO_2 from the HECA Project Site south to the OEHI CO_2 EOR Processing Facility.

Project Area

The Project Area discussed in this section refers to all areas of temporary and permanent disturbance, including the Project Site (defined above), the construction staging areas, the HECA Project linears, the OEHI CO_2 linear, and the OEHI EOR Processing Facility.

Biological Resources Study Area

The Biological Resources Study Area (BRSA) evaluated in this section consists of the Project Area and the area within a 1-mile radius of the HECA Project Site, and the area within a 1,000-foot radius of the HECA linear facilities and the OEHI CO_2 pipeline. The HECA linear facilities, OEHI CO_2 pipeline, and the associated BRSA are shown on Figure 5.2-1. All of the

proposed HECA linear facilities, as well as the OEHI CO_2 pipeline north of the California Aqueduct, were evaluated by URS for biological resources. Where property access was available, field surveys of the BRSA were conducted to characterize habitat types and evaluate the presence of special-status species or jurisdictional waters. OEHI conducted the surveys for the portion of the CO_2 alignment south of the California Aqueduct, and the results of those surveys are presented in Appendix A-1, Section 4.4, Biological Resources; and Appendix A-2, Section 2.2, Biological Resources. Appendix A also contains the biological resource impact evaluation for the OEHI CO_2 EOR Processing Facility.

The HECA Project and OEHI Project components, the activity duration, the study area limit, and location of the relevant information are shown in Table 5.2-1, Project Components and Biology Resources Study Area.

In accordance with the California Energy Commission (CEC) regulations, Section 5.2, Biological Resources, describes biological resources in the vicinity of the Project Site, including wetlands, vegetation, and wildlife, in Section 5.2.1, Affected Environment. Sections 5.2.2, Environmental Consequences, 5.2.3, Cumulative Impacts Analyses, and 5.2.4, Mitigation Measures, describe the anticipated potential Project-related impacts to biological resources, and measures proposed to mitigate or compensate for those impacts. Laws, ordinances, regulations, and standards (LORS) for protection of biological resources are provided in Section 5.2.5, Laws, Ordinances, Regulations, and Standards. The subsequent sections describe agencies contacted for this evaluation, as well as permits associated with biological resources that will be obtained prior to Project construction. Through agency consultations, Project design modifications, and appropriate mitigation measures, the Project will conform to all applicable LORS for protection of biological resources.

The impact assessment for biological resources included informal consultation with resource management agencies, literature review, and 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)
- Coles Levee Ecosystem Preserve 2007 Annual Report (Live Oak, 2008)
- Kern Water Bank Authority Habitat Conservation Plan/Natural Community Conservation Plan 2007 Compliance Report and Management Plan (Kern Water Bank Authority, 2008)
- California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (CNPS, 2012)
- California Natural Diversity Database (California Department of Fish and Game [CDFG], 2009-2011)

Table 5.2-2, Biological Resources Field Surveys, summarizes the biological resources surveys performed. Resumes for the primary biologists are attached in Appendix F, Biological Resources Information.

Plant and animal species observed during these field surveys are listed in Table 5.2-3, Plant Species Observed in the Biological Resources Study Area, and Table 5.2-4, Wildlife Species Observed in the Biological Resources Study Area.

5.2.1 Affected Environment

5.2.1.1 Regional Setting

The Project is located in Kern County, California at the southern end of the Central Valley. Several biological resources conservation areas are located within 35 miles of the Project Site. These areas include public and private conservation lands and habitat conservation plan areas that are listed in Table 5.2-5, Public and Private Conservation Lands and Habitat Conservation Plan Areas near the Project Site.

5.2.1.2 Local Setting

The Project Site is on the southwestern side of unincorporated Kern County, approximately 1.5 miles northwest of the unincorporated community of Tupman, and immediately south of Adohr Road. The primary land uses in the Project vicinity are agriculture, oil exploration, and oil production. The 453-acre Project Site is currently in agricultural cultivation.

The Project Site is currently used for cultivation of cotton, alfalfa, and onions. Land surrounding the Project Site, including the Controlled Area, is also cultivated for alfalfa and cotton. The West Side Canal, Kern River Flood Control Channel (KRFCC), and the California Aqueduct (State Water Project) are 250, 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.

Land uses in the vicinity of the 13-mile natural gas linear route are primarily active agricultural land with smaller areas of disturbed and developed areas, and isolated areas of undeveloped land with natural vegetation such as Allscale Scrub (Sawyer, Keeler-Wolf, and Evens, 2009). The natural gas linear crosses the East Side Canal.

Existing land uses in the vicinity of the proposed railroad spur are primarily active agricultural land with smaller areas of disturbed and developed areas. Within the same easement as the natural gas linear, the railroad spur also crosses the East Side Canal.

Land uses in the vicinity of the process water linear are primarily farming (typical crops include alfalfa, cotton, and wheat cultivation), and orchards (pistachio). Much of the land between the West Side Canal and the KRFCC is Allscale Scrub, riparian habitat, or unvegetated river cobble.

Existing land uses in the vicinity of the electrical transmission linear and potable water linear consist of water bank basins and disturbed areas, and farming (typical crops include alfalfa, cotton, oat, and wheat cultivation). Both of these linears cross the East Side Canal. Table 5.2-6, Special-Status Plant Species with Potential to Occur within 5 Miles of the Project Area, summarizes the acreage of existing habitats that could be temporarily or permanently disturbed by the proposed Project.

5.2.1.3 Jurisdictional Waters

Several aquatic features are within the BRSA. These features include canals, irrigation ditches, retention/detention basins, as well as two locations with seasonally ponded claypan depressions.

Waters of the United States

Under Section 404 of the federal Clean Water Act (CWA), the United States Army Corps of Engineers (USACE) regulates the discharge of dredged and fill materials into "Waters of the United States." Jurisdictional waters of the U.S. include intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, and wetlands adjacent to any water of the U.S. (33 Code of Federal Regulations [CFR] Section (§) 328). Certain waters of the U.S. are considered "special aquatic sites" because they are generally recognized as having particular ecological value. Such sites include sanctuaries and refuges, mudflats, wetlands, vegetated shallows, coral reefs, and riffle and pool complexes. Special aquatic sites are defined by the U.S. Environmental Protection Agency (USEPA) and may be afforded additional consideration in a project's permit process.

The USACE also regulates navigable waters under Section 10 of the Rivers and Harbors Act as "…those waters of the United States that are subject to the ebb and flow of the tide shoreward to the mean high water mark and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce" (33 CFR §322.2).

In reaction to several court challenges, the USACE and the USEPA issued a joint memorandum on June 5, 2007, with guidelines for establishing whether or not wetlands or other waters of the U.S. fall within USACE jurisdiction (USACE, 2007). As a result, the agencies assert jurisdiction over traditional navigable waters (TNW), wetlands adjacent to traditional navigable waters, non-navigable tributaries to TNWs that are relatively permanent waters (RPW), and wetlands that abut relatively permanent waters. The agencies may take jurisdiction over non-navigable tributaries that are not RPWs, wetlands that are adjacent to non-RPWs, and wetlands that are adjacent to, but not directly abutting, a relatively permanent non-navigable tributary. The agencies will generally not assert jurisdiction over swales, erosional features, or ditches excavated wholly in and draining only uplands, and that do not carry a relatively permanent flow of water.

Waters of the State

The State Water Resources Control Board (SWRCB) and the various Regional Water Quality Control Boards (RWQCB, collectively the "Water Boards") protect the beneficial uses of surface water and groundwater in California under the Porter-Cologne Act, and issue water quality certifications under Section 401 of the federal CWA. California has broader jurisdiction over waters (including wetlands) than the federal government. In other words, some waters that are not jurisdictional under the federal Clean Water Act may be under California's Porter-Cologne Water Quality Control Act. For example, the Water Boards regulate all pollutant or nuisance discharges that may affect either surface water or groundwater. Despite the state's broader regulatory reach, the Water Boards typically have not fully duplicated the federal process for

delineating, and permitting impacts to, jurisdictional waters. There is no approved formal protocol for delineating waters of the State; rather, the Waters Boards historically have tiered off the established federal delineation process.

However, the State Water Resources Control Board released a preliminary draft of the Water Quality Control Policy for Wetland Area Protection and Dredge and Fill Permitting on March 9, 2012 (SWRCB, 2012). If adopted in its current form, this policy would extend the jurisdiction of the Water Boards over unvegetated wetland, as well as wetlands that currently are not regulated by the USACE because they lack a significant nexus to a TNW. However, because the aforementioned policy is still in draft form, the evaluation of potential Project impacts presented in this AFC assumes that the jurisdictions of the Water Boards and USACE are the same.

Delineation Surveys

Consistent with the CEC guidance, the jurisdictional delineation study area includes the Project Area plus a 250-foot buffer from the limits of disturbance for each of the Project components. A preliminary field review of potential jurisdictional waters was conducted along the natural gas linear during a site assessment survey on December 7, 2010, and formal jurisdictional delineations were conducted March 15-17, 2011 and March 27-30, 2012.

During both the March 2011 and March 2012 surveys, potential jurisdictional waters within the BRSA were delineated and mapped following the methods described in the *Corps Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Supplement* (USACE, 2008). The delineation of potential jurisdictional non-wetland waters in the BRSA followed the methods described in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (Lichvar and McColley, 2008).

Potentially Jurisdictional Waters of the U.S.

Potential waters of the U.S. in the delineation study area are shown on Figure 5.2-2 (Sheets 1 through 7 at a scale of 1:24000, and in Appendix F at a scale of 1:24006). These waters include the California Aqueduct, KRFCC, all drainage ditches that connect to these features, and two areas of seasonally ponded claypan depressions. The California Aqueduct conveys water from northern California to southern California for drinking water and irrigation. The California Aqueduct is a significant component of the California Department of Water Resources' State Water Project. The concrete-lined channel has a typical cross section of approximately 40 feet at the base and an average depth of approximately 30 feet. The CO_2 pipeline component of the OEHI Project will be installed beneath the canal using horizontal directional drilling (HDD) so that it will not affect the bed or banks of the canal. The jurisdictional status of the Aqueduct has not been confirmed by the USACE; however, this assessment assumes that the California Aqueduct is a potential jurisdictional water of the U.S., because it conveys water diverted from the San Joaquin and Sacramento rivers to other jurisdictional streams and rivers in southern California.

The KRFCC, an overflow channel of the Kern River, is located approximately 700 feet to the south of the Project Site, and the CO_2 pipeline would be installed beneath the KRFCC using

HDD. A portion of the Kern River was determined to be navigable by the USACE (Case ID: SPK-2008-00968)[1]- (USACE, 2012). The KRFCC would likely fall under the jurisdiction of the USACE because it is hydrologically connected to the Kern River, a TNW, and the bed and bank of the channel is clearly defined by levees within the BRSA.

Shallow topographic depressions, identified as claypan depressions based on the soil characteristics, are present at two locations in the delineation study area. One location was delineated in March 2011 and revisited in March 2012; and the other location was delineated in March 2012.

During the 2011 survey, sediment deposits (a distinguishable layer of sediments peeling away from the topmost soil horizon that potentially indicate ponding) were observed in the shallow, unvegetated claypans near the northern segment of the natural gas linear, but no saturation or ponding was observed. The 2012 surveys, timed approximately 10 days after a significant precipitation event (NOAA, 2012), confirmed that most of the area lacks ponding or saturation of the soil surface for greater than 5 percent of the growing season. A representative soil test pit in one of the depressions consisted of clay and clay loam soils with no visible redoximorphic features. Hydrophytic vegetation was observed along the perimeter of the claypan depressions during the 2011 surveys. Except for small areas of saturation or ponding observed during the March 2012 survey, the majority of the claypan depressions in this area do not meet USACE criteria for wetlands or waters of the U.S., based on the absence of wetland hydrology.

The second area, adjacent to SR 58, has numerous claypan depressions that were ponded or saturated with water during the March 2012 surveys. Mature Lindahl's fairy shrimp (*Branchinecta lindahli*), a common species in seasonally ponded wetlands, was observed in many of these features. This species of fairy shrimp typically requires 10-14 days of ponding to reach maturity, which provides another indicator of the duration of ponding (Eriksen and Belk, 1999). The persistence of ponded water in these features for more than 10 days after the last precipitation event is a positive indicator of wetland hydrology, because it is longer than 5 percent of the growing season in Kern County. Therefore, the extent of ponding of all pools within the BRSA was conservatively delineated as potential waters of the U.S. However, these pools were delineated as non-wetland waters of the U.S., based on the absence of hydrophytic vegetation. The only exception is the vegetated portion of one depression, which was delineated as a wetland.

Non-Jurisdictional Features

Non-jurisdictional waters of the U.S. in the delineation study area include the West Side Canal, East Side Canal, all drainage ditches that connect to these features, and several retention/ detention basins.

The West Side and East Side canals are irrigation canals that were constructed in uplands by Henry Miller and Charles Lux in the 1870s and 1880s. Both canals receive water from TNWs

[1] It is navigable from the headwaters of the North Fork Kern River in Sequoia National Park, and the headwaters of the South Fork Kern River in Inyo National Forest through their convergence at Lake Isabella and down to its historic terminus into Buena Vista Lake.

(the Kern River, as well as two lakes in the Buena Vista Aquatic Recreation Area: Lake Evans and Lake Webb) (GoFISHn.com, 2011). However, the West Side and East Side canals are not jurisdictional waters because they are "closed" conveyance systems that do not discharge water into jurisdictional features (Bartel, 2012). These two canals are non-jurisdictional waters under the CWA because they lack a significant nexus to TNWs. In addition, all tributaries (drainage ditches) that run into the West Side and East Side Canals also lack a significant nexus and are non-jurisdictional.

Several retention/detention basins occur in—or adjacent to—the proposed natural gas linear. These basins store agricultural run-off and exhibit an ordinary high water mark. These features are not jurisdictional waters of the U.S., because artificial lakes or ponds excavated in uplands to collect and retain agricultural runoff for the purpose of irrigation are typically excluded from jurisdiction, as defined by the federal CWA (USACE, 1986).

5.2.1.4 Special-Status Species

The discussion of special-status species includes all federally and state-listed species and species proposed for listing under the Federal and California Endangered Species Acts (FESA and CESA); federal species of concern; state species of special concern; and plant species designated as rare, threatened, or endangered (Rank 1B or Rank 2) by the CNPS. Special-status species with the potential to occur within the BRSA and within 10 miles of the Project Site were identified from the following data sources:

- U.S. Fish and Wildlife Service (USFWS) species lists provided for each 7.5-minute U.S. Geological Survey (USGS) quadrangle in the BRSA (called the East Elk Hills and Tupman quadrangles).
- The California Natural Diversity Database (CNDDB) records (CDFG, 2012; see Figures 5.2-3 and 5.2-4, and Appendix F).
- The CNPS Inventory of Rare and Endangered Plants for the East Elk Hills and Tupman quadrangles (CNPS, 2012).
- 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, 2008).
- Kern Water Bank Authority Habitat Conservation Plan/Natural 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).

Table 5.2-2, Biological Resources Field Survey, summarizes the surveys performed.

Table 5.2-3, Plant Species Observed in the Biological Resources Study Area, identifies all of the listed and sensitive plant species that were observed during surveys of the BRSA. Table 5.2-4, Wildlife Species Observed in the Biological Resources Study Area, identifies all the wildlife

species that were observed during surveys of the BRSA. Table 5.2-7, Special-Status Plant Species with Potential to Occur within 5 Miles of the Project Area, identifies all the listed and sensitive plant species that have potential to occur in the Project Area; and Table 5.2-8, Special-Status Wildlife Species with Potential to Occur within 5 Miles of the Project Area, identifies all the listed and sensitive wildlife species with the potential to occur in the Project Area. These tables summarize the preferred habitats for species with potential to occur in the BRSA. Species with no suitable habitat in the BRSA are not discussed further in this document. Figure 5.2-5 identifies the habitats and existing crop types within the Project Area.

Threatened and Endangered Plant Species [2]

Based on review of the CNDDB (CDFG, 2012) and CNPS (CNPS, 2012) database, as well as the 2007 Annual Monitoring Report for the Kern Water Bank, three listed plant species (Kern mallow, San Joaquin woollythreads, and California jewel-flower) have at least a low chance of being present along portions of the natural gas linear, rail line and/or electrical transmission linear. Species that have a very low chance of occurring within the BRSA are not discussed further. Species accounts are based on information from Calflora (2012) and the CNPS online database (2012).

California Jewel-Flower (*Caulanthus californicus*)

Federal/State/CNPS Status: Endangered/Endangered/Rank 1B.1

California jewel-flower 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, grazing, and possibly to 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 OEHI Project.

Kern Mallow (*Eremalche kernensis [E. parryi* ssp. *kernensis]*)

Federal/State/CNPS Status: Endangered/None/Rank 1B.2

Kern mallow 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 energy development.

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

[2] Note: taxonomic references are consistent with 2012 CNDDB and CNPS Rank status designations.

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

Federal/State/CNPS Status: Endangered/None/Rank 1B.2

San Joaquin woollythreads 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, energy 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 OEHI Project.

Other Sensitive Plant Species

Sensitive plant species were assessed concurrently with the federally and state-listed plant species. Species that have at least a low potential of occurring in the BRSA are discussed below; species with a very low potential of occurring in the BRSA are not discussed further. Species accounts are based on information available through Calflora (2012) and the CNPS website (2009).

Horn's Milk-Vetch (*Astragalus hornii* var. *hornii*)

Federal/State/CNPS Status: None/None/Rank 1B.1

Horn's milk-vetch is an annual herb that occurs primarily in Kern County. A member of the *Fabaceae* family, it inhabits meadows, seeps, and alkaline lake margins. Its habitat ranges in elevation from 60 to 850 meters. The blooming period is from May to October. The decline of this species is attributable to an eradication effort in the early 1900s and habitat alteration.

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

Heartscale (*Atriplex cordulata*)

Federal/State/CNPS Status: None/None/Rank 1B.2

Heartscale has a growth form that ranges from annual herb to shrub, and occurs primarily in Kern, Madera, Merced, Solano, and Tulare counties. A member of the *Chenopodiaceae* family, it inhabits chenopod scrub, meadows and seeps, and valley and foothill grasslands. Its habitat ranges in elevation from 1 to 375 meters. The blooming period is from April to October. The decline of this species is attributable to trampling and competition with non-native plants.

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

Subtle Orache (*Atriplex subtilis*)

Federal/State/CNPS Status: None/None/Rank 1B.2

Subtle orache is an annual herb that occurs primarily in Kern, Madera, Merced, Fresno, and Tulare counties. A member of the *Chenopodiaceae* family, it inhabits valley and foothill grasslands. Its habitat ranges in elevation from 40 to 100 meters. The blooming period is from June to August. It is known from approximately 25 occurrences.

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

Lost Hills Crownscale (*Atriplex vallicola*)

Federal/State/CNPS Status: None/None/Rank 1B.2

Lost Hills crownscale is an annual herb that occurs primarily in Fresno, Kern, and San Luis Obispo counties. A member of the *Chenopodiaceae* family, it inhabits chenopod scrub, valley and foothill grasslands, and vernal pools. Its habitat ranges from 50 to 635 meters, and it blooms from April to August. The decline of this species is attributable to grazing, agricultural conversion, and energy development.

A population of Lost Hills crownscale was observed approximately 1.5 miles south of the Project Site. The Project components will avoid this population of Lost Hills crownscale. Based on the location of known populations, this species is not expected to be impacted by the Project.

Slough Thistle (*Circium crassicaule*)

Federal/State/CNPS Status: None/None/Rank 1B.1

Slough thistle is a perennial herb that occurs primarily in King, Kern, and San Joaquin counties. A member of the *Asteraceae* family, it inhabits chenopod scrub, marshes, swamps, and riparian scrub. Its habitat ranges in elevation from 3 to 100 meters, and the blooming period is from May to August. The decline of this species is attributable to conversion of habitat to agricultural use and the introduction of non-native plants; slough thistle abundance fluctuates widely.

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

Gypsum-loving Larkspur (*Delphinium gypsophilum* ssp. *gypsophilum*)

Federal/State/CNPS Status: None/None/Rank 4.2

Gypsum-loving larkspur is a perennial herb that ranges from Alameda to Ventura County. A member of the *Ranunculaceae* family, it inhabits chenopod scrub, cismontane woodland, and valley and foothill grasslands. Its habitat ranges in elevation from 100 to 825 meters. The blooming period is from February to May. The decline of this species is attributable to road construction and maintenance, as well as energy development and grazing.

URS biologists identified several populations of gypsum-loving larkspur along previously considered linear Project components during botanical surveys in April 2010, approximately 1.5 miles to the south of the Project Site. These sightings were outside of the current BRSA. No populations have been observed in the current BRSA. Based on the location of known populations, this species is not expected to be impacted by the Project.

Recurved Larkspur (*Delphinium recurvatum*)

Federal/State/CNPS Status: None/None/Rank 1B.2

Recurved larkspur is a perennial herb that occurs primarily in Kern, Tulare, and San Luis Obispo counties. A member of the *Ranunculaceae* family, it inhabits chenopod scrub, cismontane woodland, and valley and foothill grasslands. Its habitat ranges in elevation from 3 to 750 meters. The blooming period is from March to June. The decline of this species is attributable to conversion of habitat to agricultural use, as well as grazing and trampling by livestock.

Based on the proximity of known occurrences, this species could potentially occur in natural habitats along the proposed natural gas linear alignment. However, no occurrences of this species have been identified in the BRSA. Based on the location of known populations, this species is not expected to be impacted by the Project.

Hoover's Eriastrum (*Eriastrum hooveri*)

Federal/State/CNPS Status: Delisted/None/Rank 4.2

Hoover's eriastrum is an annual herb that occurs primarily in Fresno, Kern, and Tulare counties. Previously listed as threatened by USFWS, Hoover's eriastrum was delisted October 2003 (CDFG). A member of the *Brassicaceae* family, it inhabits chenopod scrub, pinyon, and juniper woodlands, and valley and foothill grasslands. It ranges in elevation from 50 to 915 meters, and its blooming period is from February to May. The decline of this species is attributable to agriculture, urbanization, energy development, grazing, and possibly competition with non-native plants.

URS biologists identified several populations of Hoover's eriastrum along previously proposed Project linear alignments during botanical surveys in March 2009 and April 2010. The populations, comprised of one to 200 individuals, were located near the town of Tupman approximately 1 mile south of the Project site. Based on the proximity of this occurrence, it is possible that this species could occur in natural habitats along the proposed natural gas linear alignment. However, no occurrences of this species have been identified in the BRSA. Based on the location of known populations, this species is not expected to be impacted by the Project.

Cottony Buckwheat (*Eriogonum gossypinum*)

Federal/State/CNPS Status: None/None/Rank 4.2

The cottony buckwheat is an annual herb that occurs in Fresno, King, Kern, and San Luis Obispo counties. A member of the *Polygonaceae* family, it inhabits chenopod scrub and valley and

foothill grasslands. Its habitat ranges from 100 to 550 meters, and its blooming period is from March to September. The decline of this species is attributable to development.

URS biologists identified several populations of cottony buckwheat during botanical surveys of a previous CO_2 pipeline alignment in 2010. The populations co-occurred with populations of Hoover's eriastrum and oil neststraw. No occurrences of this species have been observed in the current BRSA, including the current CO_2 linear route evaluated by OEHI in Appendix A. Based on the location of known populations, this species is not expected to be impacted by the Project.

Tejon Poppy (*Eschscholzia lemmonii* ssp. *kernensis*)

Federal/State/CNPS Status: None/None/Rank 1B.1

The Tejon poppy is an annual herb that is restricted to Kern County. A member of the *Papaveraceae* family, it inhabits chenopod scrub and valley and foothill grasslands. Its habitat ranges from 160 to 1,000 meters, and its blooming period is from March to May. The decline of this species is attributable to grazing, and invasion by non-native plants.

Based on the proximity of known occurrences south of the Project site, it is possible that this species could occur in natural habitats in the BRSA. However, no occurrences of this species have been identified during previous botanical surveys of the BRSA. Based on the location of known populations, this species is not expected to be impacted by the Project.

Oil Neststraw (*Stylocline citroleum*)

Federal/State/CNPS Status: None/None/Rank 1B.1

Oil neststraw is a perennial herb that occurs primarily in Kern County. A member of the *Asteraceae* family, it inhabits chenopod scrub, as well as valley and foothill grasslands. Its habitat ranges in elevation from 50 to 400 meters. The blooming period is from March to April. The species is "known from fewer than twenty occurrences from the East Elk Hills quadrangle… [and may be]… threatened by energy development and urbanization" (CNPS, 2012).

URS biologists identified several populations of oil neststraw along previously proposed linear Project components during botanical surveys in 2010. The populations were found along with populations of Hoover's eriastrum in the vicinity of the proposed CO_2 linear alignment. Additional occurrences were documented during surveys conducted by OEHI for the current CO_2 linear alignment. The results of these surveys are provided in Appendix A.

Threatened and Endangered Wildlife Species

Habitat in the BRSA was evaluated for its potential to support special-status wildlife species. Threatened and endangered wildlife species with at least a low potential to occur in the BRSA are discussed below and presented in Table 5.2-8, Special-Status Wildlife Species with Potential to Occur within 5 Miles of the Project Area. Species with a very low chance of being in the BRSA are not discussed further.

Reptiles

Blunt-Nosed Leopard Lizard (*Gambelia sila*)

Federally Endangered/State Endangered, Fully Protected

The blunt-nosed leopard lizard 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. *G. sila* do not dig their own burrows. 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. *G. sila* hibernate during the winter and are active from late March to late June or July. Metabolic rates and activity are regulated by ambient temperatures. *G. sila* mate from late April through May, and the females usually lay eggs between May and June. The usual clutch size is three eggs, but 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 attributable to conversion of habitat to agricultural land.

No habitat for blunt-nosed leopard lizards is present in the Project Site. However, this species has been observed in the vicinity of the CO_2 linear and the natural gas linear. Figure 5.2-6 shows the documented blunt-nosed leopard lizard observations and the current understanding of occupied habitat in the BRSA and vicinity. In addition to CNDDB records, blunt-nosed leopard lizards have been observed by URS biologists at several other locations in the vicinity of the Project:

- In August 2008, blunt-nosed leopard lizards were observed on the southwestern side of the California Aqueduct, near the proposed carbon dioxide linear.

- In late August 2010, one blunt-nosed leopard lizard was observed approximately 0.4 mile east of the Buttonwillow Ecological Reserve.

A small segment of the natural gas pipeline would be constructed approximately 0.5 mile from where blunt-nosed leopard lizards were documented in 2007. Another segment of the natural gas pipeline would be constructed adjacent to degraded natural habitat that is approximately 0.75 mile south of a documented occurrence of blunt-nosed leopard lizard from 1992 (Figure 5.2-6).

The Kern Water Bank properties, 1 mile to the east of the Project Site, 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 has records

of blunt-nosed leopard lizard in 1990 on the Tule Elk Reserve, which is approximately 1,700 feet east of the Project Site and 0.5 mile south of the potable water linear and the electric transmission linear alignments.

This species is assumed to be present in areas that have suitable habitat. However, protocol surveys for adult blunt-nosed leopard lizards will be conducted in 2012 in areas with potential habitat, and survey results will be provided to the CEC. The Project would minimize impacts to natural habitats. Direct interactions with this species would not be likely due to the limited amount of suitable habitat in the Project Area.

Giant Garter Snake (*Thamnophis gigas*)

Federal/State Status: Threatened/Threatened

The giant garter snake 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, *T. gigas* require higher-elevation uplands for cover and safety from flood water. Throughout the dormant season, *T. gigas* inhabits 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 averages 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. There have been few recent sightings of giant garter snakes in the San Joaquin Valley.

The species is assumed to be extirpated or very rare in most of the former range in the 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 habitats suitable for giant garter snakes were observed during the 2008, 2009, 2010, or 2011 surveys. Based on input from USFWS and CDFG, this species is presumed to be extirpated from the BRSA due to the absence of suitable habitats. Therefore, no impacts to this species are anticipated.

Birds

Golden Eagle (*Aquila chrysaetos*)

No Federal Status/State Fully Protected

The golden eagle is found throughout Eurasia, Africa, and North America. In North America, they live in the western part of the continent, ranging from Alaska to central Mexico. Small populations exist in the eastern Unites States and Canada. *A. chrysaetos* inhabit open to semi-open areas from sea level to 3,600 meters in elevation. They are found in open and semi-open areas, including tundra, shrublands, woodlands, grasslands, and coniferous forests. Golden eagles primarily inhabit mountainous areas, but can also nest in wetland, riparian, and estuarine habitats. Their diet consists primarily of small mammals, but they also eat birds, reptiles, and fish. *A. chrysaetos* form monogamous pairs, which can persist for several years. Pairs raise one brood annually, and the females lay one to four eggs (Birdweb, 2008).

No golden eagles have been observed during the wildlife or botanical surveys, and there are no documented nest sites within 40 miles of the Project Site.

Swainson's Hawk (*Buteo swainsoni*)

Federal Species of Concern/State Threatened

The Swainson's hawk is found throughout the Western United States from southwestern Canada south to western Texas. *B. swainsoni* breeds in the western United States and Canada, and winters in South America as far south as Argentina (England et al., 1997). Swainson's hawks inhabit open grasslands and desert-like habitats, including agricultural areas. Their diet consists of insects, small birds, mammals, reptiles, and amphibians. *B. swainsoni* form monogamous pairs, which breed and raise a brood once annually. The female lays from two to four eggs. Threats to the Swainson's hawk include loss of foraging and breeding habitat in California; and the use of pesticides by Argentine farmers.

In 2010, URS biologists identified two potential Swainson's hawk nest sites (Tule Elk Reserve and KRFCC) and documented fledged young at the KRFCC nest site (Figure 5.2-7). In 2011, four potential and one confirmed Swainson's hawk nest site were documented. The 2010 KRFCC nest site was occupied again in 2011. A pair of Swainson's hawks was observed near the 2010 Tule Elk Reserve nest site, but the nest structure was occupied by great-horned owls. The other potential Swainson's hawk nest structures were observed near the northern end of the process water linear study area within the KRFCC.

Protocol surveys for nesting Swainson's hawks have been initiated for the 2012 season. The entire BRSA will be surveyed, except for the CO_2 linear segment south of the California Aqueduct, which lacks potential nest trees.

Western Snowy Plover (*Charadrius alexandrinus nivosus*)

Federally Threatened/California Species of Special Concern

The western snowy plover breeds on the Pacific Coast of the United States from southern Baja California, Mexico, to southern Washington. It also breeds in the interior areas of Oregon, California, Nevada, Utah, New Mexico, Colorado, Kansas, Oklahoma, and Texas. *C. alexandrinus nivosus* inhabits sandy or gravelly coastal beaches, estuarine salt ponds, alkali lakes, and the Salton Sea. At the coast, their diet consists of amphipods and insects collected from dry sand; whereas inland, it is primarily comprised of brine flies. Western snowy plovers nest in depressions in the sand. Adults have high breeding-site fidelity. Broods range from two to six offspring, averaging three. Habitat degradation is the primary cause of the decline of this species, as well as nest failure due to predation, nest abandonment, and weather (Page et al., 1995).

This species is not expected to occur in the Project Area due to a lack of suitable habitat.

Yellow-Billed Cuckoo (*Coccyzus americanus*)

Federal Species of Concern and Candidate Species/California Endangered

The yellow-billed cuckoo is somewhat common in the eastern United States, but is rare in California. The bird breeds in North America, migrates through Central America, and winters in South America. *C. americanus* inhabit open woodlands with a dense shrub layer. Their diet consists primarily of large insects, but also includes bird eggs, snails, and small reptiles and amphibians. Yellow-billed cuckoos are likely monogamous, and usually raise one brood per year—occasionally two. Females lay one to five eggs, usually two to three. The decline of this species in California is attributed to development disrupting riparian woodlands where it lives (Birdweb, 2008).

This species is not expected to occur in the Project Area due to a lack of suitable habitat.

White-Tailed Kite (*Elanus leucurus*)

No Federal Status/California Fully Protected

The white-tailed kite inhabits the western United States, including California, Arizona, Oregon, and into Washington. *E. leucurus* frequent open grasslands with scattered trees for nesting and perching. These birds can be easily seen hovering in search of small mammals such as voles, which make up the majority of their diet. White-tailed kites have no known migration pattern, although they do wander widely when prey is scarce. Monogamous pairs are formed in December, and remain together year round. The pair builds a nest in January, and the female incubates four eggs while the male hunts for the pair. After fledging, the pair may raise a second brood. During the 1930s and 1940s, *E. leucurus* were threatened by extinction due to hunting

and egg collecting. Since that time, however, the species has been recovering and expanding its range (Birdweb, 2008).

This species is not expected to occur in the Project Area due to a lack of suitable habitat.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Federally Endangered/California Endangered

The Southwestern willow flycatcher breeds across southern Canada through the southern United States, and winters from Central to South America. It inhabits moist, shrubby areas and its diet consists of insects. *E. trailii extimus* are generally monogamous, with polygyny being occasionally reported. One brood is raised per year, more rarely two broods are reared. Clutch size ranges from two to four eggs, averaging three (Craig and Williams, 1998). The Southwestern willow flycatcher was placed on the Federal Endangered Species List in 1995. The Southwestern willow flycatcher has declined over the last 100 years primarily as a result of the extent of habitat fragmentation and degradation of riparian habitats. The largest remaining population in California is on the South Fork Kern River, Kern County (Unitt, 1987).

This species is not expected to occur in the Project Area due to a lack of suitable habitat.

American Peregrine Falcon (*Falco peregrinus*)

No Federal Status/State Endangered, Fully Protected

Falco peregrinus are found worldwide except for rainforests and arctic regions. They are one of the world's most widespread terrestrial vertebrate species. Peregrine falcons migrate long distances between breeding and winter ranges; typically moving along coastal regions or mountain ranges. They inhabit open habitats, including grasslands, tundra, and meadows. Their diet consists almost entirely of birds. They also prey upon reptiles and small mammals, including bats. Peregrine falcons form monogamous pairs that often persist through several breeding seasons. They have high nest-site fidelity. *F. peregrinus* raise one brood annually, laying from two to six eggs, averaging four. The use of DDT threatened the peregrine falcon with extinction; however, the ban of the chemical in the United States resulted in a remarkable recovery of the species (Birdweb, 2008).

This species is not expected to occur in the Project Area due to a lack of suitable habitat.

Least Bell's Vireo (*Vireo bellii pusillus*)

Federally Endangered/California Endangered

The least Bell's vireo was listed as endangered in 1986. At that time, the species had been extirpated from much of its historic range. In the last 10 years, least Bell's vireos have recovered somewhat, recolonizing the Santa Clara River in Ventura County to the north, and the Mojave River in San Bernardino County to the northeast. A large population of *V. bellii pusillus* inhabit the drainages of Marine Corps Base Camp Pendleton in San Diego County. They inhabit dense, shrubby vegetation, woodlands, scrub oak, coastal chaparral, and mesquite brushlands, often near

water in arid regions. Their diet consists of a wide array of insects, including caterpillars. Least Bell's vireos are monogamous, but they can switch mates between nesting attempts within seasons and between years. Clutch size ranges from two to five eggs, most commonly three to four. The primary reasons for the decline of least Bell's vireos are the loss of riparian habitat and nest parasitism by cowbirds (Brown, 1993).

This species is not expected to occur in the Project Area due to a lack of suitable habitat.

Mammals

Nelson's Antelope Squirrel (*Ammospermophilus nelsoni*)

No Federal Status/California Threatened

Nelson's antelope squirrels are permanent residents of the western San Joaquin Valley. Their habitat is generally composed of sandy loam soils, widely spaced alkali scrub vegetation, and dry washes. Their diet consists of insects, vegetation, small vertebrates, and seeds. They have been known to cache seeds underground (Hawbecker, 1947). Nelson's antelope squirrels dig burrows or use kangaroo rat burrows for shelter, and use rocks and vegetation for cover (Grinnell and Dixon, 1919). Activity is diurnal, yet declines during elevated mid-day temperatures. Breeding occurs from February to May, peaking in April. Nests are constructed within burrows. Nelson's antelope squirrels typically range from elevations of 200 to 1,200 feet from southern Merced County south to Kern, Kings, and Tulare counties, as well as portions of eastern San Luis Obispo and Santa Barbara counties. In 1979, only about 20 percent of the original range was occupied (CDFG, 1980). The decline of this species is attributable to loss of habitat to cultivation and overgrazing, and the use of rodenticides (CDFG, 1980). Badgers, kit foxes, red-tailed hawks, golden eagles, coyotes, and various snakes prey on Nelson's antelope squirrel. California ground squirrels (*Spermophilus beechyi*) have been known to displace *A. nelsoni* from burrows (Harris and Stearns, 1991).

Nelson's antelope squirrels were identified in August 2008 along Tupman Road west of the town of Tupman, and in March 2009 along a previously proposed alignment of the potable water and natural gas linears south of the California Aqueduct. Occurrences of the species have been previously documented in the vicinity of the HECA Project Area near the proposed process water pipeline, the Buttonwillow Ecological Reserve west of the natural gas pipeline, and east of the Project Site on the Tule Elk Reserve. However, there were no sightings of Nelson's antelope squirrel during surveys in 2010 or 2011 in the HECA Project Area. Nelson's antelope squirrels are known from the vicinity of the OEHI Project Area. Based on the absence of observations of this diurnal (daytime active) species during the 2010 and 2011 surveys of the HECA Project Area, this species is not expected to occur in the BRSA north of the California Aqueduct. Nelson's antelope squirrels are assumed to occur in the OEHI Project Area.

Giant Kangaroo Rat (*Dipodomys ingens*)

Federally Endangered/California Endangered

Giant kangaroo rats are nocturnal rodents occurring 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 observed in the BRSA during the 2008, 2009, 2010, or 2011 surveys. Based on discussions with CDFG, giant kangaroo rats are not expected in the valley floor area north of the California Aqueduct. However, this species is assumed to be present in the vicinity of the CO_2 linear route south of the California Aqueduct, as described in Appendix A.

Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*)

Federally Endangered/California Endangered

Tipton kangaroo rats are typically found in arid-land vegetative communities with flat or gently sloping terrain, in 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 observed during the 2008, 2009, 2010, or 2011 surveys. However, signs of kangaroo rats (burrows, tail drag, foot prints, and scat) were observed in areas with suitable habitat along the natural gas linear 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 could be present throughout the BRSA in areas where suitable

habitat is present. Figure 5.2-8, Tipton Kangaroo Rat occurrences near the Biological Resources Study 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 in the Project Area in suitable habitats, north of the California Aqueduct.

Buena Vista Lake Shrew (*Sorex ornatus relictus*)

Federally Endangered/No State Status

The Buena Vista Lake shrew 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, although 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. Its current distribution is unknown, but 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).

No Buena Vista Lake shrews or habitats suitable for this species were observed during the 2008, 2009, 2010, or 2011 surveys of the BRSA. Established riparian habitat that is potentially suitable for this species is approximately 1 mile south of the Project Site. This species was observed approximately 3.5 miles south of the Project Site in 1999 (CDFG, 2012); however, this species is not expected to be impacted because the Project would not impact riparian habitat.

San Joaquin Kit Fox (*Vulpes macrotis mutica*)

Federally Endangered/California Threatened

The San Joaquin kit fox 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. The San Joaquin kit fox is currently listed as a Federally Endangered Species and a State of California Threatened Species (USFWS, 1998).

San Joaquin kit foxes could occur throughout the region of the Project Site and the proposed linear Project components; however, dens, scat, and burrows indicate that the Elk Hills area south of the California Aqueduct is the most intensively used area in the BRSA (Figure 5.2-10, San Joaquin Kit Fox Occurrences Near the Project Area). Very few kit foxes have been recorded north of the California Aqueduct near the Project Site and linears in the last 20 years, based on CNDDB records and site assessments of burrows, sign, and scat. No active kit fox dens were seen in 2008, 2009, 2010, or 2011 in areas northeast of the California Aqueduct; numerous historic burrows were evident along the proposed natural gas linear alignment, but none of the burrows showed signs of recent use.

Other Sensitive Wildlife Species

Other sensitive wildlife species were assessed concurrently when the federally and state-listed wildlife species were assessed. Other sensitive wildlife species with at least a low potential to occur in the study area are discussed below and presented in Table 5.2-8, Special-Status Wildlife Species with Potential to Occur within 5 miles of the Project Area. Species with a very low potential to occur in the Project Area are not discussed further.

Amphibians

Western Spadefoot (*Spea hammondii*)

No Federal Status/California Species of Special Concern

The Western spadefoot is a California Species of Special Concern (CDFG, 2011) found from the Central Valley south to Baja California. It prefers open areas with sandy or gravelly soils. It is found in a variety of habitats, including mixed woodlands, grasslands, chaparral, sandy washes, lowlands, river floodplains, alluvial fans, playas, alkali flats, foothills, and mountains. The Western spadefoot is primarily nocturnal and terrestrial, only entering water bodies to breed. It spends the majority of its time burrowed in the ground. Breeding season depends on weather conditions, but typically occurs between January and May. Eggs laid and attached to submerged vegetation are externally fertilized and mature in up to 6 days. Depending on temperature and food availability, tadpoles morph in 3 to 11 weeks. Adults are stout-bodied, with relatively smooth skin and green or gray dorsum, with skin tubercles tipped with orange. They are white in color below and have a wedge-shaped black spade on each hind foot. Their eyes are pale gold with distinct vertical pupils. Juveniles are similar but have more distinct spotting. The Western spadefoot visually locates its invertebrate prey and captures it with its swift tongue. The decline of this species is attributable to loss of habitat to urbanization and agricultural land (Stebbins, 2003).

Western spadefoot tadpoles were observed along the KRFCC, less than 1 mile south of the Project Site. No direct impacts to this species are expected because the Project will not impact the KRFCC.

Reptiles

Southwestern Pond Turtle (*Actinemys marmorata pallida*)

No Federal Status/California Species of Special Concern

The Southwestern pond turtle is the only native terrestrial turtle found in California and is listed as a California Species of Special Concern. It is an aquatic turtle usually found in and around riparian areas or closely associated with freshwater. Its carapace is brown to olive-colored, without distinct markings. The plastron is light-colored, with light or dark markings. Males have a light, unmottled throat and lower facial area. The females and juveniles have mottled, dark-colored throats with varying degrees of dark and light markings. The southwestern pond turtle is distributed throughout the Pacific slope drainages from Klickitat County, Washington, to Baja California, Mexico. It occupies slow-flowing valley rivers with adjacent upland habitat for breeding. The mating season begins in late April and extends into May. The females migrate to an upland location, at times 400 meters from the aquatic site. The female excavates a shallow nest and deposits 1 to 13 thinly calcified eggs. Southwestern pond turtles become sexually mature in 7 to 11 years, and are generally long-lived. As general opportunists, their diet consists of slow-moving aquatic invertebrates, larvae, carrion, and aquatic vegetation (Stebbins, 2003).

This species is not expected to occur in the Project Area due to a lack of suitable habitat.

Silvery Legless Lizard (*Anniella pulchra pulchra*)

No Federal Status/California Species of Special Concern

The silvery legless lizard is a subspecies of the California legless lizard, appearing gray or beige on top with a dark mid-dorsal line, and yellow below with fine lengthwise lines between scale rows. Legless lizards are most commonly found in coastal ranges, but low-density populations have been found along the San Joaquin Valley floor. They use several habitat types: coastal dune, valley-foothill, chaparral, and coastal scrub—seeking out loose, moist, organic soils. Silvery legless lizards burrow in the soil for shelter and forage for insect larvae, small adult insects, and spiders. It is a Forest Service Sensitive species and a California Species of Special Concern (CDFG, 2011). Agriculture, the introduction of exotic vegetation, housing development, sand-mining, golf courses, and off-road–vehicle use threaten its existence.

This species is not expected to occur in the Project Area due to a lack of suitable habitat.

San Joaquin Whipsnake (*Masticophis flagellum ruddocki*)

No Federal Status/California Species of Special Concern

The San Joaquin whipsnake is slender with smooth scales, large eyes and head, and thin neck. It can range from tan, olive-brown to yellowish brown. The whipsnake is diurnal and can be

observed basking on roadsides. Its habitat is open, dry, treeless grasslands or chenopod scrub. The species is endemic to California and ranges from Sacramento Valley to San Joaquin Valley. It takes refuge in rodent burrows, beneath vegetation, or other objects providing shade. The San Joaquin whipsnake feeds on small mammals, bats, nestlings, adult birds, bird eggs, lizards, snakes, amphibians, and carrion. The San Joaquin whipsnake is threatened by the conversion of its habitat to row crops and urban development within its limited range (Stebbins, 2003).

This species may occur along portions of the natural gas linear or KRFCC, where there is natural habitat.

California Horned Lizard (*Phrynosoma coronatum*)

No Federal Status/California Species of Special Concern

The California horned lizard is a flat-bodied lizard covered with spikes. Its historic range extended from Baja California, along the Pacific Coast to the Bay Area, and inland as far north as the Shasta Reservoir. Its range is currently fragmented due to habitat destruction, development, and agriculture. Populations are also threatened by displacement of native ants, a primary prey item that are threatened by the introduction of non-native ants. Prior to 1981, capture for the pet trade depleted population numbers. California horned lizards may be found in grasslands, woodlands, and chaparral that contain areas of loose, sandy soils from sea level to 8,000 feet (Stebbins, 2003).

The electrical transmission linear route is within the historical range of the California horned lizard; however, the habitat has been substantially modified and is now poorly suited for this species. The natural gas linear route is also within the historical range of the California horned lizard. Scat that is typical for horned lizards (consisting entirely of ant bodies) was found in the BRSA for the natural gas linear in 2011 during blunt-nosed leopard lizard surveys. The allscale scrub habitats along the proposed natural gas linear supports an ant-prey base that is suitable habitat for the California horned lizard.

Birds

Tricolored Blackbird (*Agelaius tricolor*)

Federal Species of Concern/California Species of Special Concern

This species occurs throughout the Central Valley, Inner Coast, and Coast ranges from the Sacramento Valley southward into northwestern Baja California Norte, Mexico. Seasonal breeding aggregations also occur in the Klamath Basin of northern California and southern Oregon, and in northern Oregon (National Geographic, 2001). Although the overall breeding distribution of this species in California has remained relatively constant from historical to present times, the size of most colonies has declined dramatically during the past century. The principal factors for their decline are widespread destruction of wetland habitat and increased use of pesticides, which have negatively affected prey populations. Shuford and Gardali (2008) list tricolored blackbirds as a first priority (high vulnerability) species in California.

Tricolored blackbirds prefer to nest in dense colonies in freshwater marshes with an extensive bed of emergent vegetation, such as tules and cattails. This species is also known to nest in other types of vegetation, including sedges, nettles, willows, thistles, mustard, blackberry, wild rose, and dense grass (Grinnell and Miller, 1944; Kudrak, 1999). Their nests are constructed of mud and plant material and are generally placed on the ground or in emergent aquatic vegetation, either over or within a few feet of fresh water. Nesting occurs from mid-April through late July, during which time they typically raise two broods of young. Clutch size ranges from one to five eggs, averaging three to four. Nesting colonies are typically located adjacent to agricultural fields, pastures, and short grass habitats, in which they feed (Lehman, 1994). Their diet consists of insects, particularly grasshoppers. After the nesting season, they concentrate in mixed flocks with other species of blackbirds to forage on the ground in open, grassy fields, agricultural lands, flooded fields, stock pens, pastures, and along the margins of ponds (Grinnell and Miller, 1944; Lehman, 1994).

This species has not been detected during surveys and is not expected to occur in the Project Area due to a lack of suitable breeding habitat.

Burrowing Owl (*Athene cunicularia*)

No Federal Status/California Species of Special Concern

Burrowing owls were formerly a common, even locally abundant, resident throughout much of California; however, Grinnell and Miller (1944) noted a decline before the early 1940s. Populations have declined significantly throughout California; and now, the highest densities appear to be found in state and federal wildlife refuges (Remsen, 1978). Burrowing owls depend heavily on the presence of burrowing rodents, coyotes, badgers, and other mammals to create the burrows that they use for roosting and nesting. Man-made structures, such as cement culverts and debris piles, may also be used (Kudrak, 1999). Early in this century, efforts to control small mammal populations and predators led to a noticeable decline in this species (Grinnell and Miller, 1944; Garrett and Dunn, 1981). Negative pressures on owl populations have been supplemented by widespread conversion of grassland habitats to agriculture or other development. Shuford and Gardali (2008) list burrowing owls as a first priority (high vulnerability) species in California. Regional declines have been so dramatic that the CDFG has recently been petitioned to list this species as threatened in the state under the CESA.

Burrowing owls prefer dry, open, grassy, usually treeless plains and gently rolling hills. They also inhabit man-made features, such as agricultural fields, airports, roadsides, golf courses, drainage ditches, and vacant lots, if prey and burrow sites are available. Their diet consists of insects, small frogs, lizards, and rodents. Burrowing owls typically nest between early April and late June, with most activity occurring in April in Kern County. Clutch size ranges from seven to nine eggs. Fledging occurs approximately 2 months after the eggs are laid (early June to late August), but family groups stay together at least into fall. Only one brood is raised each year.

In 2011, three different areas south of the proposed electrical transmission/potable water linears had burrowing owl sightings; all three sightings coincide with the potential nesting period for the species. A pair of adults was seen east of Morris Road, south of the proposed alignment, but no young or burrows were detected (Figure 5.2-9). Burrowing owl family groups consisting of

adults and fledged young were observed near the northern end of the natural gas linear, east of the Buttonwillow Ecological Reserve, and along the proposed railroad and natural gas alignments.

Mountain Plover (*Charadrius montanus*)

Federal and California Species of Special Concern

USFWS listed mountain plovers as threatened in 1999. Mountain plovers nest from northern Montana and North Dakota, southward through the Great Plains into southeastern New Mexico and Texas (National Geographic, 2001). This species does not nest in California; however, most of these populations overwinter primarily in California, but with smaller numbers in Texas, Arizona, and Mexico, between mid-September and mid-March. In California they are found in interior valleys and plains at low elevations from the Sacramento Valley southward to San Diego County and eastward to the Mojave and Colorado deserts (Grinnell and Miller, 1944). Both breeding and wintering grounds are characterized as short grass prairie, shrub-steppe landscapes, low, rolling, grassy foothills, and agricultural fields. Mountain plovers are rarely found near water. Mountain plovers begin to arrive on their wintering grounds in California by September, but do not appear in large numbers until November, and leave in late March and early April. The primary wintering sites in California are the Central Valley, Carrizo Plain, and Imperial Valley. The mountain plover is insectivorous. Clutch size ranges from one to six eggs, averaging three. The decline of this species is attributable to loss of nesting habitat, and habitat alteration due to the loss of primary grazers (Knopf, 1996).

This species has not been detected during surveys, and is not expected to occur in the Project Area.

Fulvous Whistling-Duck (*Dendrocygna bicolor*)

No Federal Status/California Species of Special Concern

The fulvous whistling-duck breeds across the world's tropical regions, including the U.S. Gulf Coast. Fulvous whistling-ducks breed once yearly, with clutches ranging in size from eight to sixteen eggs. Nests are built on a stick platform in reeds. *D. bicolor* habitat includes freshwater lakes, rice fields, or reservoirs. Plentiful vegetation is necessary, because the ducks feed primarily on seeds and other plant parts. This species was in decline in the early 1960s due to pesticide application on rice fields. However, since that time, populations of *D. bicolor* have stabilized (Hohman and Lee, 2001).

This species has not been detected during surveys, and is not expected to occur in the Project Area due to a lack of suitable breeding habitat.

California Horned Lark (*Eremophila alpestris actia*)

No Federal or State Status/DFG Watch List

The California horned lark ranges from Humboldt County in the north to northern Baja California in the south. *E. alpestris actia* inhabit open habitat, usually where trees and large

shrubs are absent. They prefer to breed in short grasslands, rangelands, and open fields. Their diet consists of seeds, insects, spiders, and snails, as well as fruit, occasionally. California horned larks form monogamous pairs, but the pairs do not persist for more than one season. They frequently raise two broods per season. Clutches range from two to five eggs. The greatest threat to California horned larks is loss of habitat due to destruction and fragmentation (Beason, 1995).

Horned larks were sighted in and around the Project Site and associated linears. Breeding is likely, yet unconfirmed.

Loggerhead Shrike (*Lanius ludovicianus*)

No Federal Status/California Species of Special Concern

The loggerhead shrike is most common in Central Canada through the Greater Midwest of the United States. During its spring-to-summer migration, it can travel as far southwest as California, although the species is seen in decreasing numbers in that region. The loggerhead Shrike inhabits open spaces bordered by vegetation. It is the only known predatory songbird. Because it does not possess talons, it must impale its prey with its beak against a hard surface, such as a tree trunk. Its diet consists primarily of mice, but it will also eat insects, small amphibians, and small birds. Clutch size ranges from one to nine eggs, most commonly five to six (Birdweb, 2008).

Loggerhead shrikes were observed around the KRFCC, as well as the study areas for previously considered linear Project components. It is likely that loggerhead shrikes breed in the BRSA, but breeding is unconfirmed. Both breeding and foraging are more likely near areas of natural habitat.

Le Conte's Thrasher (*Toxostoma lecontei*)

Federal Species of Special Concern/California Species of Special Concern

Le Conte's thrasher is an uncommon to rare, non-migratory resident of southern California deserts from southern Mono County south to the Mexican border, and in western and southern San Joaquin Valley. This species primarily inhabits open-desert wash, desert scrub, alkali desert scrub, and desert succulent shrub habitats, and also occurs in Joshua-tree habitat with scattered shrubs. In the San Joaquin Valley, they are found primarily in habitats dominated by saltbush (*Atriplex* spp.), and areas of desert washes and flats with scattered bushes. Their diet consists of a variety of insects and other terrestrial arthropods, occasionally seeds, small lizards, and other small vertebrates (Bent, 1948; Sheppard, 1970). Their foraging activity is mostly limited to probing and digging in the soil and litter with their bill.

The Le Conte's thrasher nests in large saltbushes that can support a nest approximately 26 to 38 inches above the ground. Their breeding season begins in late January and lasts through early June, peaking from mid-March to mid-April. Breeding pairs remain together throughout the year. Female thrashers may have up to three broods during a breeding season, each with two to four eggs. The parents share the incubation of the eggs, which lasts 14 to 20 days. The young fledge 14 to 18 days after hatching.

The historic distribution of the San Joaquin Le Conte's thrasher included the western side of the San Joaquin Valley, from the Panoche Mountains, Fresno County, south to Maricopa, Kern County (USFWS, 1998). The current distribution of the San Joaquin Le Conte's thrasher is largely determined by the presence and structure of saltbush, extent of habitat fragmentation, and presence of competitors. The existing populations are within a set of habitat islands with large distances of unsuitable habitat separating them. Degradation, fragmentation, and loss of habitat to agriculture, irrigation, urbanization, oil and gas development, fire, and over-grazing are the primary causes for the decline of the San Joaquin Le Conte's thrasher (Remsen, 1978).

This species has not been detected during surveys, and is not expected to occur in the Project Area.

Mammals

Tule Elk (*Cervus elaphus nannodes*)

No Federal or State Status

Although the tule elk is not identified as a sensitive species, due to its proximity to the Project Site and historical near-extinction, this paragraph is included to further address this species.

The tule elk is a California endemic species. During the 1800s, they were almost extirpated due to hunting and loss of habitat, but populations have recovered, now inhabiting more than 20 different areas in California (McCullough, et al., 1996). These large mammals travel in herds that range from just a few individuals to several hundred. Their diet consists of grasses, herbaceous plants, and conifer leaves. Females generally have one calf per year. The calves are generally nursed for about 5 months, but they begin eating vegetation within the first week of their lives (McCullough, 1969). The primary predators of tule elk were mountain lions and bears, but humans were the only significant predator in the last 200 years.

Tule elk currently inhabit the Tule Elk Reserve approximately 1,700 feet east of the Project Site. Herds average in size about 30 individuals. The Project would not affect the tule elk.

Short-Nosed Kangaroo Rat (*Dipodomys nitratoides brevinasus*)

No Federal Status/California Species of Special Concern

Short-nosed kangaroo rats inhabit flat or gently sloping terrain and on hilltops in desert-shrub associations; primarily, saltbushes and California ephedra. Short-nosed kangaroo rats generally occupy grassland with scattered shrubs and desert-shrub associations on friable soils. *D. nitratoides brevinasus* are nocturnal and active throughout the year. Life history is similar to other species of kangaroo rat (Williams and Kilburn, 1992). Like other subspecies of the San Joaquin kangaroo rat, populations of the short-nosed kangaroo rat undergo dramatic population fluctuations, and sometimes disappear from an area (Williams et al., 1993).

Short-nosed kangaroo rats historically occupied arid lands along the western half of the San Joaquin Valley floor and hills from Merced County south to the foothills of the Tehachapi Range, and east and north inland, north of Bakersfield. Current populations mostly are small and

fragmented. Approximations for the current range of *D. nitratoides brevinasus* estimate the occupied area is only about 3.75 percent of historical habitat. The decline of this species is attributable to loss of habitat to cultivation and overgrazing, and the use of rodenticides (CDFG, 1980).

Signs of common small mammal species (such as gopher and ground squirrel) were observed along the proposed electrical transmission linear route; potential signs of sensitive mammals, such as short-nosed kangaroo rat, were seen in the Kern Water Bank properties adjacent to the proposed electric transmission linear route, and are expected to be present south of the California Aqueduct along the proposed CO_2 linear route.

Tulare Grasshopper Mouse (*Onchomus torridus tularensis*)

No Federal Status/California Species of Concern

The Tulare grasshopper mouse inhabits arid shrublands, particularly alkali sink, saltbush scrub, and upper Sonoran subshrub-scrub. The historic range extended from western Merced and eastern San Benito counties to Madera County and south to the Tehachapi Mountains. Current development and increased agricultural production have caused fragmentation, reduction, and degradation of its habitat (Williams and Kilburn, 1992). Tulare grasshopper mouse has a stout body and short, relatively thick tail. The head, back, and upper sides range in color from pale-brown to grayish or pinkish cinnamon, while the underparts are distinctly white. The grasshopper mouse diet is composed of small animals and seeds, including grasshoppers, scorpions, pocket mice, western harvest mice, spiders, and frogs. The mouse is nocturnal, and active year round. Males have a home range of 3.2 hectares and females range for 2.4 hectares. Both male and female mice care for their young. Up to three litters are produced per year, with two to six young. Most litters are born from May to July (Williams and Kilburn, 1992).

This species has not been detected during surveys; however, this species could potentially be present in natural habitats adjacent to the natural gas linear, electrical transmission linear, and the process water linear.

San Joaquin Pocket Mouse (*Perognathus inornatus*)

No Federal or State Status/BLM Sensitive Species

The San Joaquin pocket mouse inhabits dry, open grasslands or scrub areas on fine-textured soils between elevations of 1,100 and 2,000 feet in the Central and Salinas valleys. Their diet consists primarily of seeds, with green vegetation and insects as a minor component. *P. inornatus* caches gathered seeds in their burrows. San Joaquin pocket mice inhabit shrubby ridge tops and hillsides (Hawbecker, 1951). Burrows are excavated for shelter, with young born and reared within them. Reproduction likely takes place throughout the spring and early summer. The San Joaquin pocket mouse is nocturnal, and may become torpid during extreme heat or cold. Badgers, owls, weasels, skunks, kit foxes, and domestic cats likely prey on San Joaquin pocket mice.

This species has not been detected during surveys of the BRSA; however, this species could potentially be present in natural habitats adjacent to the natural gas linear, electrical transmission linear, and the process water linear.

American Badger (*Taxidea taxus*)

No Federal Status/California Species of Special Concern

Badgers are distributed throughout the western and midwestern U.S., and from Canada southward to Mexico (Hall, 1981). In California, they historically occurred over most of the arid and semi-arid portions of the state (Ingles, 1965). Badger populations have declined drastically in California since the early 1900s, especially in the Central Valley, where they were once considered numerous (Grinnell et al., 1937). They are now restricted to grassland and scrub habitats around the periphery of the valley because of agricultural conversion of grassland habitats (Williams, 1986). Populations have been eliminated from much of the Coast Range and throughout most of the coastal plain of southern California due to poisoning, trapping, and shooting on grazing lands; agricultural development; and urbanization (Williams, 1986).

Badgers inhabit a variety of habitats, including grasslands, savannas, mountain meadows, coastal sage scrub, and riparian scrub. A common feature of these habitats is friable soils and a high density of burrowing rodents such as gophers (*Thomomys*), kangaroo rats (*Dipodomys*), and ground squirrels (*Spermophilus, Ammospermophilus*), and marmots (*Marmota*). They also eat a variety of other wildlife, including mice, reptiles, birds, eggs, bees, and grasshoppers (Williams, 1986). *T. taxus* litters range from one to five offspring, averaging three.

An American badger carcass was observed southwest of the town of Tupman in March 2009. No occurrences of badgers have been documented in the Project Area or the BRSA. However, this species could potentially be present in natural habitats adjacent to the natural gas linear and the process water linear.

Bats

The following special-status bats are known to occur in California in the Project vicinity:

- Pallid bat (*Antrozous pallidus*) – California state species of concern
- Townsend's big-eared bat (*Corynorhinus townsendii townsendii*) – California state species of concern
- Western mastiff bat (*Eumops perotis*) – California state species of concern

These bat species are generally widespread throughout the western United States and Mexico, but are sensitive to human-related impacts. Suitable roosting and nesting areas include caves, mines, tree snags, buildings, bridges, and other human-made structures. In California, these species generally mate during the late fall, and give birth to their young between early May and the end of July (Eder, 2005).

Some of these bat species may forage over the Project Site. The BRSA lacks natural bat roost habitat such as mines, cliffs, or caves. Impacts to breeding and roosting habitat present the biggest threat to declining bat populations in the state.

Pallid Bat (*Antrozous pallidus*)

No Federal Status/California State Species of Concern

The pallid bat inhabits rocky, outcrop areas where they commonly roost in rock crevices, caves, and mine tunnels. They also roost in attics, barns, behind signs, in hollow trees, and in abandoned adobe buildings. *Antrozous pallidus* ranges from Canada to Mexico and east to Utah, Colorado, and Texas (Eder, 2005).

Townsend's Big-eared Bat (*Corynorhinus townsendii townsendii*)

No Federal Status/California State Species of Concern

The Townsend's big-eared bat inhabits desert scrub, mixed-conifer forest, and pinyon-juniper, or pine forest habitat. Within these communities, they are associated with caves, mines, lava tubes, and buildings. *Corynorhinus townsendii townsendii* ranges from British Columbia to central Mexico and east to Texas (Eder, 2005).

Western Mastiff Bat (*Eumops perotis californicus*)

No Federal Status/California State Species of Concern

The Western mastiff bat is the largest bat in North America, found in arid regions from central California to central Mexico. The Western mastiff bat roosts in rock crevices, particularly exfoliating slabs of granite or sandstone, or buildings that provide similar structures. The roosts must be at least 2 to 3 meters above ground to enable sufficient drop time to achieve flight. Bees, wasps, and moths dominate its diet, along with larger insects like cicadas, dragonflies, and grasshoppers. Western mastiff bats commonly forage 100 to 200 feet above ground, but occasionally forage above 2,000 feet (Eder, 2005). It is a California Species of Special Concern, most likely threatened by loss of habitat due to urbanization, marsh drainage, and cultivation of foraging fields (CDFG, 2011). The use of insecticides may also be responsible through the decline of its food source and indirect poisoning.

5.2.2 Environmental Consequences

The Project will have significant impacts on vegetation and wildlife if it will:

- Cause a fish or wildlife population to drop below self-sustaining levels (CEQA Guidelines, §15065 [a])
- Threaten to eliminate a plant or animal community (CEQA Guidelines, §15065 [a])

- Substantially affect, reduce the number, or restrict the range of unique, rare, or endangered species of animal or plant, or the habitat of the species (CEQA Guidelines, §15065 [a], Appendix G [c], Appendix I [II.4.b] and [II.5.b])

- Substantially diminish or reduce habitat for fish, wildlife, or plants (CEQA Guidelines, §15065 [a], Appendix G [t])

- Interfere substantially with the movement of resident or migratory fish or wildlife species (CEQA Guidelines, Appendix G [d])

- Change the diversity of species, or number of any species of plants (including trees, shrubs, grass crops, and aquatic plants) or animals (birds; land animals, including reptiles, fish and shellfish; benthic organisms; or insects) (CEQA Guidelines, Appendix I [II.4.1] and [II.5.a])

- Introduce new species of plants or animals into an area, or act as a barrier to the normal replenishment of existing species (CEQA Guidelines, Appendix I [II.4.c] and [II.5.c])

- Increase the rate of use of any natural resources (CEQA Guidelines, Appendix I [II.9])

- Deteriorate existing fish or wildlife habitat (CEQA Guidelines, Appendix I [II.5.d])

These criteria have been used to evaluate the Project's impact on vegetation and wildlife. Impacts to biological resources are discussed below. Impacts primarily related to construction of the Project, or specific to one plant or animal species, are described first under specific resource headings. Impacts primarily related to Project operation, or that will affect a wider group of resources, are described in Section 5.2.3, Cumulative Impacts Analyses.

5.2.2.1 Waters of the U.S.

The Project construction and operation will avoid nearly all of the potential jurisdictional waters in the Project Area. HDD will be used to avoid non-wetland waters of the U.S. crossed by the CO_2 linear, including the California Aqueduct, KRFCC, and Outlet Canal. The approximately 100-foot by 150-foot entry/exit pits required for HDD would be located to avoid potential waters of the U.S.

Wetland features adjacent to the proposed natural gas linear right-of-way 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. Therefore, the Project would not permanently impact jurisdictional waters of the U.S. or potential waters of the state. Potential temporary impacts to non-wetland waters are summarized in Table 5.2–9.

Potential impacts to non-wetland waters of the U.S. would qualify for authorization under Nationwide Permit (NWP) 12 for Utility Line Activities and NWP 33 for Temporary Construction Access. The Project is expected to affect less than 0.2 acre of permanent impact to

waters of the U.S. Implementation of mitigation measure BIO-20 would reduce potential impacts to a less-than-significant level.

5.2.2.2 Waters of the State

The Central Valley RWQCB may require a CWA Section 401 certification and/or Waste Discharge Requirements for temporary placement of fill in waters of the state. This permit will be transmitted to the CEC once it has been approved by the Central Valley RWQCB.

5.2.2.3 Special-Status Species

The following section evaluates the impacts to special-status species. HECA will seek a 2081 Incidental Take Permit from CDFG if any state-listed species are impacted by the Project. DOE will consult with USFWS on effects to federally-listed species. It is anticipated that a Biological Opinion will be issued by USFWS.

Threatened and Endangered Plant Species

No threatened or endangered plant species were observed during surveys conducted to date, nor are there any historic records of listed plant species in the BRSA northeast of the California Aqueduct[3]; however, three species of listed plant species, Kern mallow (*Eremalche kernensis*), California jewel-flower (*Caulanthus californicus*), and San Joaquin woolythreads (*Monolopia congdonii*), have the potential to occur with the study areas for the linear facilities. No other federally or state-listed threatened or endangered plant species were identified as potentially occurring at the Project Site or linear facilities.

In order to avoid impacts to threatened or endangered plant species, pre-construction surveys will be conducted prior to disturbance (see mitigation measure BIO-1 in Section 5.2.4). If threatened or endangered plant species are detected, the population will be avoided to the extent feasible (see mitigation measure BIO-2). With the implementation of mitigation measures BIO-1 and BIO-2, the impacts to threatened and endangered plant species from the Project will be less than significant.

Other Sensitive Plant Species

Based on the results of plant surveys conducted in the BRSA to date, a literature review of observances of these species, and impact assessment documents for adjacent projects, eight non-listed special-status plant species have the potential to be found in the BRSA for the linear Project components, including Horn's milk-vetch, heartscale, Lost Hills crownscale, slough thistle, recurved larkspur, Hoover's eriastrum, Tejon poppy, and oil neststraw. To avoid significant effects to non-listed special-status plant populations, rare plant surveys will be conducted prior to disturbance (see mitigation measure BIO-1). To the extent feasible, populations of sensitive plant species will be avoided (see mitigation measure BIO-2), but mitigation for impacts to sensitive plants will be required for certain species in specific areas (see

[3] Refer to Appendix A for a summary of special-status plant species observed in the study area of the CO_2 pipeline.

mitigation measure BIO-3). With the implementation of mitigation measures BIO-1, BIO-2, and BIO-3, potential impacts to non-listed special-status plant species would be less than significant.

Threatened, Endangered, and Sensitive Wildlife Species

Three threatened or endangered wildlife species (blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin kit fox) are likely to occur along the off-site linear facilities. In addition, six non-listed special-status wildlife species (burrowing owl, loggerhead shrike, short-nosed kangaroo rat, Tulare grasshopper mouse, San Joaquin pocket mouse, and American badger) are also likely to occur along the natural gas linear and/or electrical transmission/potable water linears.

The following discussion identifies species-specific avoidance and mitigation measures to minimize impacts to sensitive species to less-than-significant levels.

Reptiles

No take of special-status reptiles is anticipated; however, avoidance and minimization measures will be implemented, as appropriate.

Blunt-Nosed Leopard Lizard

Avoidance and mitigation measures will be employed to avoid direct or indirect mortality of blunt-nosed leopard lizards by construction or operation of the Project. During a meeting on June 4, 2008 with CDFG, HECA was provided a draft map that indicates sightings of the lizard. The draft map also identifies a "core population" in the surrounding area, which includes the HECA Project Site originally proposed in the 2008 AFC (south of the California Aqueduct) and the carbon dioxide linear (CDFG, 2008). This information is not available in the CNDDB data URS reviewed for the Project. To assess the population, URS conducted protocol surveys in 2008 to assess hatchling and sub-adult numbers along the previously considered carbon dioxide linear alignments. Biologists conducted additional protocol surveys for adults and juveniles in 2009 between April 15 and July 15 south of Tupman Road, and within the KRFCC drainage. Juvenile blunt-nosed leopard lizard surveys were conducted along the proposed natural gas linear alignment in 2010; if required, adult surveys will be conducted between April 15 and July 15, 2012.

Protocol surveys for blunt-nosed leopard lizard within the Project Site are not necessary because the area is comprised of row crops, and therefore does not include any habitat suitable for blunt-nosed leopard lizard.

To avoid harming, harassing, injuring, or killing any individuals or eggs, a series of silt fence "walls" will be erected prior to construction in habitats that are suitable for the blunt-nosed leopard lizard. Ground disturbance will be allowed only when an area is deemed clear (see mitigation measure BIO-5). The Project will temporarily disturb blunt-nosed leopard lizard habitat during construction of the natural gas pipeline and the CO_2 pipeline south of the California Aqueduct. In addition, efforts will be made to reduce alterations to the Project Area that would benefit avian predators (see mitigation measure BIO-6).

To further protect this species, mitigation measures BIO-7 will be implemented to ensure Project construction and operation personnel are aware of the threats to this species, and how to respond if they encounter any lizards during construction or operations.

With implementation of avoidance and mitigation measures BIO-5, BIO-6, BIO-7, BIO-8, BIO-16, and BIO-18, there will be no Project-related impacts to this species, and impacts to potential habitat will be less than significant.

Birds

No take is anticipated for any bird species described below; however, an incidental take permit will be obtained from federal and/or state agencies, as appropriate.

White-Tailed Kite

This species is not expected to be in the Project Area; CNDDB records indicate this species was observed in 1992, approximately 10 miles east of the Project Site. If this species is found in the Project Area, impacts to this species can be avoided by the implementation of avoidance and mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11.

Swainson's Hawk

Swainson's hawks are known to occur in the area around Tule Elk Preserve and along the KRFCC. There is a potential nest structure in the tall cottonwoods in the Tule Elk Reserve south of the main buildings, and documented fledged young at the KRFCC nest site. The Tule Elk Preserve nest was not confirmed by URS biologists in 2010. In 2011, four potential and one confirmed Swainson's hawk nest sites were documented; follow-up surveys are proposed for 2012. Based on proximity of known individuals and habitat assessment, Swainson's hawks are presumed to occur along the off-site Project linear facilities, and the Project Site. If this species is found within the Project Area, impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, BIO-11, and BIO-13.

Golden Eagle

This species is not expected to be in the Project Area. If this species is found in the Project Area, impacts to this species can be avoided by the implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11.

American Peregrine Falcon

This species is not expected to be in the Project Area because the area has poor foraging and nesting habitat for this species. If this species is found in the Project Area, impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11.

Least Bell's Vireo

This species is not expected to be in the Project Area because the area has poor foraging and nesting habitat for this species; however, impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11.

Mammals

No mortality is anticipated for any mammal species described below; however, an incidental take permit will be obtained from federal and/or state agencies, as required to relocate animals out of work areas.

San Joaquin Kit Fox

Construction of the 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 and process water linears. In addition, portions of the Project would be located in the Western Kern County Core recovery area identified in the Recovery Plan for Upland Species of the San Joaquin Valley (USFWS, 1998).

As shown on Figure 5.2-11, the USFWS Recovery Plan identifies several kit fox recovery areas in the Project vicinity, including:

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

The Project Site is adjacent to the northeastern edge of the Western Kern County Core recovery area. In addition, portions of the carbon dioxide linear and process water linear are located in this area (Figure 5.2-11 and Table 5.2-10). The 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, and kit foxes appear to be strongly linked ecologically to kangaroo rats (Cypher, 2006).

The Project Site is actively farmed and is unlikely to provide foraging or movement habitat for San Joaquin kit fox. Although the 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 barriers, in addition to human activity associated with cultivated fields. Therefore, permanent loss of 453 acres at the Project Site 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.

The portion of the Western Kern County Core recovery area impacted by the process water linear 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; Table 5.2-10).

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 (Figure 5.2-11). The existing average daily traffic (ADT) and the Project-related increase to the ADT were evaluated for the road segments inside of the San Joaquin Kit Fox recovery areas (Table 5.2-11). 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 Project and the delivery of the feedstock. Coal and petcoke deliveries are included in the operation-related traffic impacts because the trucks delivering the feedstock pass through portions of the Antelope Plain/Semitropic/Kern Satellite Population.

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 et al., 2005. Existing, construction, and operations traffic levels were determined using Section 5.10 of this AFC Amendment and Caltrans traffic estimates. Based on known mortality rates and traffic levels, the Project-related impacts to San Joaquin kit fox were estimated between 14.0 and 28.9 foxes over the course of 20 years (Table 5.2-12), based on the method of delivering fuel for the power plant. The model used to estimate fox mortality is conservative and has a high estimate, because the time of day during which the increased traffic would be on the road was not considered in the estimate; most 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 railroad line does not pass through any of the core, satellite, or linkage components of the kit fox recovery area. The design speed of the trains that would access the Project Site is 25 mph, and the average speed will be 18 to 20 mph. Due to the slow speed of the trains and the location of the railroad lines, no kit fox mortality is expected. In addition, use of the rail line would reduce the number of truck trips that would be required, which would reduce the potential for road mortality of kit fox in the region due to the Project.

Impacts to the San Joaquin kit fox will be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, -BIO-7, BIO-8, BIO−13, and BIO-18.

Tipton's Kangaroo Rat

Tipton's kangaroo rats are known to occur to the south of the Project Site and along Project linear facilities. Based on proximity of known individuals, habitat assessment, and sign, Tipton's kangaroo rats are presumed to occur along the off-site Project linear facilities, but are not expected to occur within the Project Site. Pre-construction surveys will be conducted (see mitigation measure BIO-4), and live trapping and relocation of small mammals (see mitigation measure BIO-15) will be conducted to minimize impacts. Other potential impacts will be mitigated by measures BIO-7, and BIO-8.

With implementation of mitigation measures BIO-4, BIO-7, BIO-8, BIO-15, and BIO-18 Project impacts to this species will be less than significant.

Other Special-Status Wildlife Species

Amphibians

Western Spadefoot

This species may be found in the Project Area; however, potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, BIO-16, BIO-18, and BIO-19.

Reptiles

Silvery Legless Lizard

This species is not expected to be in the Project Area; however, potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, and BIO-16.

California Horned Lizard

The current natural gas linear route is within the historical range of the California horned lizard. Salt brush scrub supporting an ant-prey base is suitable habitat for the California horned lizard. Although the species is not expected to be in the Project Area, potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, BIO-16, and BIO-18.

San Joaquin Whipsnake

This species is not expected to be in the Project Area. The closest documented sighting in the CNDDB of this species was approximately 10 miles south of the Project Site in 2006; however, potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, and BIO-16.

Southwestern Pond Turtle

This species is not expected to be in the Project Area, though there is a slight chance that it could be found adjacent to work areas near canals or the California Aqueduct. Potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, BIO-16, and BIO-18.

Birds

Prairie Falcon

This species is not expected to be in the Project Area. If this species is found in the Project Area, impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11.

Mountain Plover

This species is not expected to be in the Project Area because the area has poor foraging and nesting habitat; CNDDB records indicate this species was observed in 1990 approximately 1 mile east of the Project Site. If this species is found in the Project Area, impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11.

Burrowing Owl

Burrowing owls were observed at three different areas south of the proposed electrical transmission linear in 2010; all three sightings coincided with the potential nesting period for this species. A pair of adults was seen east of Morris Road, south of the proposed alignment, but no young or burrows were detected. In addition, burrowing owl family groups consisting of adults and fledged young were observed along the proposed natural gas linear. Additionally, burrowing owls were observed between SR 58 and Stockdale Highway; breeding was not confirmed, but the timing of the observations coincided with the breeding period.

Direct impacts to burrowing owls could occur during preparation of the construction laydown area or linear routes/access road corridor. Destruction or degradation of burrows and destruction or degradation of foraging habitat within approximately 300 feet of occupied nest burrows is considered a potentially significant impact to this species (CDFG, 1995; CDFG, 2012).

Project construction activities during the breeding season (February 1 through August 31) could indirectly affect nesting and foraging burrowing owls if occupied nest burrows are present within 300 feet of the limits of construction. Project construction activities during the non-breeding season (September 1 through January 31) could indirectly affect burrowing owls if occupied burrows are within 150 feet of the limits of construction activities. Noise and visual disturbance from Project construction activities could displace burrowing owls from burrows located within these distances from the construction limits. To reduce potential impacts to a less-than-significant level, mitigation measures BIO-7, BIO-8, BIO-12, and BIO-18 will be implemented.

Loggerhead Shrike

Loggerhead shrikes were seen during the 2008 and 2009 site assessments. The shrikes could have been breeding in the area, although breeding was not confirmed. No significant impacts to this species are anticipated in association with the development of the Project Site; therefore, no species-specific mitigation is recommended. Mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11 will minimize the potential impacts to this species, and all nesting bird species.

Le Conte's Thrasher

This species is not expected to be in the Project Area because the area has poor foraging and nesting habitat; CNDDB records indicate this species was observed in 1989 approximately 1 mile south of the Project Site. If this species is found in the Project Area, potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11.

California Horned Lark

This species was seen at the Project Site and along the process linears during the 2008 and 2009 site assessments. No evidence of breeding was detected at that time, although there is suitable habitat; however, impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-7, BIO-8, BIO-9-, BIO-10, and BIO-11.

Tricolored Blackbird

This species is not expected to be in the Project Area because the area has poor foraging and nesting habitat; CNDDB records indicate this species was observed in 2005 approximately 5 miles south of the Project Site. If this species is found in the Project Area, potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11.

Migratory Bird Species

No direct impacts are anticipated to any species of native birds, their nests, or eggs. No species-specific mitigation is recommended. However, implementation of mitigation measures BIO-7, BIO-8, BIO-9, BIO-10, and BIO-11 will avoid impacts to all nesting migratory bird species.

"Pest" Bird Species

To ensure that the Project does not contribute to the expansion and population growth of "pest" bird species (i.e., European starlings, house sparrows, common ravens, American crows, rock doves, brown-headed cowbirds, etc.), mitigation measures BIO-6 and BIO-10 will be implemented. If pest species become established due to the Project, adaptive management techniques will be implemented to reduce the indirect impacts to listed, sensitive, and/or native species of plants and animals.

Mammals

Short-Nosed Kangaroo Rat

This species is not expected to be found north of the California Aqueduct, based on taxonomic delineations of this species. If individuals of this species are found north of the aqueduct, impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, BIO-15, and BIO-18.

Tulare Grasshopper Mouse

This species is expected to be found along the Project linear facilities and access routes based on habitat requirements and sign. Impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, BIO-15 and BIO-18.

San Joaquin Pocket Mouse

This species is expected to be found along the Project linear facilities and access routes based on habitat requirements and sign. Potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, BIO-15, and BIO-18.

Tule Elk

This species is not expected to be in the Project construction areas, but a herd was found to the east of the Project Site at the Tule Elk State Natural Reserve. Noise and lighting are the only expected potential indirect impacts to the tule elk. Mitigation for these impacts have been incorporated (see Section 5.5, Noise, and Section 5.11, Visual Resources), reducing these potential impacts to a less-than-significant level. Additional mitigation (BIO-4, BIO-7, and BIO-8) is also proposed to ensure the protection of the tule elk and Tule Elk Natural Preserve.

American Badger

This species was not observed at the Project Site. Although it may traverse the area, this species is not expected to be in the Project Area once construction activity levels increase. Potential impacts to this species can be mitigated to a less-than-significant level by the implementation of mitigation measures BIO-4, BIO-7, BIO-8, BIO-16, and BIO-18.

Bats

No impacts to any bat species are anticipated; therefore, no mitigation is recommended.

5.2.2.4 Loss of Sensitive Habitat

To compensate for impacts to threatened and/or endangered plants or wildlife resulting from the temporary loss of habitat during Project construction, and permanent loss along Project linear facilities, HECA LLC is considering a variety of mitigation options for loss of sensitive habitat, as described in mitigation measure BIO-18

5.2.2.5 Noise

The Project will produce noise during both construction and operation, as described in Section 5.5, Noise. During construction, minimal noise will be generated in the evening and nighttime until operations are initiated. Noise may disturb some wildlife using adjacent areas. However, wildlife in the adjacent areas has likely already become accustomed to habitual noise associated with existing development and highway traffic. Noise impacts to biological resources are expected to be less than significant.

5.2.2.6 Electrocution Hazard

The addition of the approximately 2-mile transmission line for the Project will increase collision and electrocution hazard for raptors. Although the potential for electrocution exists if birds collide with transmission lines or if raptors perch on towers in such a manner as to complete an electrical contact (touching two or more live electrical conductors or a live conductor and a grounded surface), electrocution is unlikely to occur on the transmission line associated with the Project because of their design. The distance between conductors or between conductors and the ground wire is such that it is unlikely a bird could complete a circuit and be electrocuted. The transmission line to be constructed for the Project will have a minimum distance greater than the wingspan of any birds in the area. Therefore, impacts with regard to bird electrocutions at the HECA transmission line route are expected to be less than significant.

5.2.2.7 Collision Hazard

The transmission line interconnection (addressed previously with respect to electrocution hazard) could also pose some collision hazard to avian species that may simply fly into the lines. Approximately 2 miles of new transmission line will be installed within an area with numerous existing overhead lines. However, the new transmission line will be in an area that does not bisect avian usage areas (nesting, forage, loafing), and is currently developed with several power transmission line routes. Therefore, this impact will be less than significant.

The height of several Project structures (e.g., heat recovery steam generator stack, carbon dioxide vent, Air Separation Unit, gasification structure, etc.) will also increase collision potential for avian species. Some migrating bird species that fly at night are guided in part by constellations and can become confused by brightly lit tall structures. Fog or low cloud cover can further add to collision potential, although fog does not occur with much frequency in the Project study area. However, the stacks will not be adjacent to aquatic habitat that attracts large numbers of migratory birds. Although the number of potential collisions cannot be quantified, collision will likely occur relatively infrequently. Therefore, this impact will be less than significant.

5.2.2.8 Air Pollutant Emissions

Two primary potential air pollution issues are associated with the Project. The first potential issue involves the use of “raw water” in the cooling towers. This “raw water” contains salts that will be released into the air in the cooling tower vicinity and may be spread downwind. The second potential issue pertains to the release of potentially harmful emissions; namely, carbon monoxide, nitrogen oxides, and particulate matter less than 10 microns in diameter.

As discussed in greater detail in Section 5.1, Air Quality, particulates from the cooling towers, particularly salts, will be dispersed outside of the Project Site. These particulates are likely to accumulate in the soils and on vegetation, causing a slow buildup of salt in the region. However, the majority of plant species in the area are halophytic, and the rate of accumulation is anticipated to be slow. The impact associated with salt accumulation is anticipated to be less than significant.

As discussed in greater detail in Section 5.1, Air Quality, and Section 5.6, Public Health, the emissions associated with this Project will not pose a human health and safety issue. Based on the lack of human health and safety concerns, it is anticipated that there will be no significant impacts to the plants and animals found in the region.

5.2.2.9 Open Water/Wildlife Attractive Nuisances

The near proximity of the California Aqueduct (a permanent source of water), and the various water bank percolation ponds (large, ephemeral sources of water) to the Project Site reduces the likelihood that wildlife will be attracted to open bodies of water associated with the Project. The storm-water retention basins have the potential to attract wildlife if the retention basin holds water for an extended period of time. Retention basins and storm-water collection/conveyance systems will be designed in accordance with the Kern County Development Standards. Storm water from outside the process plant area but within the Project Site should be relatively clean. Storm water from this portion of the Project Site will be collected in unlined retention basins located throughout the Project Site and allowed to percolate or evaporate. Storm water from inside the process plant area will be routed to lined retention basins and retained temporarily in basins before it is reused. Water will be tested to determine an appropriate destination for reuse. Depending on the water quality, it may be used for cooling tower makeup or processed in the zero liquid discharge (ZLD) system at the wastewater treatment plant. Accounting for expected percolation and evaporation rates plus potential re-use, the basins would be expected to be empty within approximately 10 days, if no storm events occur within this time. Because the storm water will be retained only temporarily following a storm event and other water sources beyond the Project Site will be available, wildlife is not likely to be attracted to the storm-water retention basins on site.

5.2.2.10 OEHI Project

The OEHI Project includes the CO_2 pipeline and the CO_2 EOR Processing Facility. The CO_2 EOR Processing Facility and satellites are expected to occupy approximately 136 acres within the EHOF. In addition, the facility will use producing and injection wells. New pipelines will also be installed in the EHOF. The OEHI Project also includes an approximately 3 mile-long CO_2 pipeline that will transfer the CO_2 captured from the HECA Project to the OEHI CO_2 EOR Processing Facility.

The impacts of the OEHI Project on biological resources are analyzed in Appendix A-1, Section 4.4, Biological Resources; and Appendix A-2, Section 2.2, Biological Resources. The analysis in Appendix A concludes that, with implementation of proposed mitigation measures, the OEHI Project will not result in significant adverse impacts to biological resources.

5.2.3 Cumulative Impacts Analyses

Under certain circumstances, CEQA requires consideration of a project's cumulative impacts (CEQA Guidelines Section 15130). A "cumulative impact" consists of an impact which is created as a result of the combination of the project under review together with other projects causing related impacts (CEQA Guidelines Section 15355). CEQA requires a discussion of the cumulative impacts of a project when the project's incremental effect is cumulatively

considerable (CEQA Guidelines Section 15130[a]). "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (CEQA Guidelines Section 15065 [a][3]).

When the combined cumulative impact associated with a project's incremental effect and the effects of other projects is not significant, further discussion of the cumulative impact is not necessary (CEQA Guidelines Section 15130[a]). It is also possible that a project's contribution to a significant cumulative impact is less than cumulatively considerable and thus not significant (CEQA Guidelines Section 15130[a]).

The discussion of cumulative impacts should reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great a level of detail as is provided for the effects attributable to the project under consideration (CEQA Guidelines Section 15130[b]). The discussion should be guided by standards of practicality and reasonableness (CEQA Guidelines Section 15130[b]).

A cumulative impact analysis starts with a list of past, present, and probable future projects within a defined geographical scope with the potential to produce related or cumulative impacts (CEQA Guidelines Section 15130[b]). Factors to consider when determining whether to include a related project include the nature of the environmental resource being examined, the location of the project, and its type (CEQA Guidelines Section 15130[b]). For purposes of this AFC Amendment, Kern County was contacted to obtain a list of related projects, which is contained in Appendix I. Depending on its location and type, not every project on this list is necessarily relevant to the cumulative impact analysis for each environmental topic.

One of the potential future projects identified in Appendix I could contribute to the biological resource impacts identified for the Project: the dairy farm proposed to the north and west of the Project Site.

The proposed dairy farm would occupy approximately 1,057 acres of existing agricultural lands. Of the total project area, approximately 121 acres would be utilized for cattle yards and milking facilities. Development of the dairy facility would have similar effects to Swainson's hawk foraging and San Joaquin kit fox movement as the proposed project. The incremental effects of the proposed dairy farm on San Joaquin kit fox movement, Swainson's hawk foraging, or blunt-nosed leopard lizard are not cumulatively considerable when viewed in connection with the impacts of the Project. Although the affected species are sensitive, the affected habitats and species are widespread in the Project vicinity and are not likely to be significantly affected by the cumulative impacts of the Project and the proposed dairy farm.

The cumulative impacts of the OEHI Project on biological resources are analyzed in Appendix A-1, Section 4.4, Biological Resources; and Appendix A-2, Section 2.2, Biological Resources. The analysis in Appendix A concludes that, with implementation of proposed mitigation measures, the OEHI Project will not result in significant adverse cumulative impacts to biological resources.

5.2.4 Mitigation Measures

This section discusses mitigation measures proposed by HECA that will be implemented to avoid and reduce Project-related impacts to biological resources to less-than-significant levels. The mitigation measures would be implemented within the entire project area, including the portions of the CO_2 pipeline that will be constructed by OEHI. Impacts to biological resources and corresponding mitigation measures are summarized in Table 5.2-13, Project Proposed Avoidance and Mitigation Summary.

5.2.4.1 Special-Status Species

Special-Status Plant Species

Based on information gathered to date, special-status plant species will be temporarily affected by Project construction. The following measures will be implemented to reduce impacts to special-status plants to a less-than-significant level.

BIO-1 Rare Plant Pre-Construction Survey

Approved biologists will conduct a rare plant survey of the Project Area and adjacent areas 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. 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).

BIO-2 Rare Plant Avoidance

If listed plant species are present that will be affected by work within the Project Site, gas pipeline corridor, water pipeline corridor, or transmission line, direct impacts to the plants will be avoided, to the greatest extent feasible. Avoidance measures may include relocating tower footings or realignment of linear facilities.

BIO-3 Rare Plant Mitigation

Vehicles and other equipment 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 CNPS-Ranked plant species that cannot be avoided, disturbance will be timed until after all available seeds can be collected from the parent plant or

plants. 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.

Temporary disturbances that cannot be avoided will be timed for after the blooming period; the seeds from the special-status plants will be collected and properly stored, and the topsoil will be salvaged. After work is completed in that area, the topsoil will be replaced and the seeds will be redistributed just prior to the first rains of the season.

Both types of the abovementioned re-seeded areas will be demarcated in the field, mapped, and monitored for 5 years. 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. A follow-up monitoring effort will be conducted each year to determine how many of the target species set seeds.

As part of the Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP), an annual report will be submitted to the CEC and CDFG documenting the status of each population, weeding efforts that have been undertaken, and suggested work for the next season (see conservation 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.

Threatened and Endangered Wildlife Species

Based on surveys conducted to date, habitat used by listed wildlife species will be affected by the Project. The following measures will be implemented to ensure impacts to sensitive and listed species are less than significant, and mitigated to the greatest extent feasible.

Sensitive Wildlife Species Surveys

BIO-4 Terrestrial Wildlife Pre-Construction Survey

The HECA Project will conduct biological surveys of the affected areas, and adjacent areas 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 surveys for blunt-nosed leopard lizard, San Joaquin kit fox, Tipton kangaroo rat, burrowing owl, loggerhead shrike, LeConte's thrasher, and any other sensitive animals. Qualified biologists will conduct protocol-level presence/absence surveys for the above species as necessary. All sightings and/or sign of listed wildlife will be mapped, and data will be input to a global positioning system. The results of all pre-construction surveys will be documented and submitted to the CEC, USFWS, and CDFG (see conservation measure BIO-17).

The Project will conduct protocol-level presence/absence surveys of the affected areas and adjacent areas 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 looking for blunt-nosed leopard lizard; giant garter snake; San Joaquin kit fox; Giant, Short-nosed, and Tipton's kangaroo rats; Nelson's antelope squirrel; burrowing owl; loggerhead shrike; Le Conte's thrasher; horned lark; and any other sensitive animals. All sightings and/or sign of sensitive wildlife will be mapped and data input to a global positioning system. The results of all pre-construction surveys will be documented and submitted to the CEC, USFWS, and CDFG (see mitigation measure BIO-17).

Blunt-Nosed Leopard Lizard

Blunt-nosed leopard lizards may be present along the proposed natural gas linear. Measures to ensure that there is no mortality of blunt-nosed leopard lizards are described below. Kit fox clearance is the first proposed step, followed by concurrent removal of small mammals and exclusion of blunt-nosed leopard lizards. All reasonable and prudent minimization and avoidance measures have been included as follows:

BIO-5 Site Clearance Prior to Ground Disturbance

To ensure that no blunt-nosed leopard lizards are taken during the initial site preparation, each area with potential habitat will need to be cleared prior to any ground disturbance. Areas will be secured as they are cleared to ensure that no wildlife re-enters. To ensure that wildlife will not enter the work areas, exclusionary fencing consisting of tin flashing (or another material approved by CDFG and USFWS) will be buried at least 9 inches underground and rise at least 2 feet above the ground.

Beginning in mid-April, exclusion fencing will be established to secure the work zone. Once the exclusion fencing has been established, the area will be visually surveyed during the day for wildlife, and "trapped out" small mammals (see conservation measure BIO-9) 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 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.

Exclusionary 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.

If the exclusion fencing is compromised (by wind or other means) and left "open," an approved biologist will confirm with USFWS to determine if the area will need to be re-surveyed and/or re-trapped for wildlife.

To check that BIO-5 is successful, ground disturbance will be monitored (see conservation 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 conservation measure BIO-17).

BIO-6 Predatory Bird Minimization Measures

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 Project Area. Project features would be modified, as needed, to minimize potential perches for common ravens in the Project Site and along the Project transmission linear. Transmission design has been modified to incorporate elements to discourage raven nesting. Instead of lattice-style transmission towers, the 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 Project transmission towers within 1 mile of known blunt-nosed leopard lizard habitat. Raven nests will be removed prior to egg-laying in early spring. For all bird nests removed, documentation will be prepared and submitted to the CEC, USFWS, and CDFG (see conservation measure BIO-17).

BIO-7 Worker Education Program

A worker education program will be implemented for all construction personnel, regular drivers, and operation personnel. All personnel will be required to read an educational brochure and attend an education class given by the approved biologist(s). The brochure and class will describe the special-status species that could be encountered at the Project, the regulatory protection of the species, and appropriate measures to take upon discovery of a special-status species or active bird nest.

Site 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 mitigation measure BIO-17).

BIO-8 Operations and Maintenance Activities

The worker education program will be implemented for operations and maintenance activities along the Project linears (i.e., access road, transmission line). 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 will be halted and the animal will be allowed to move away from the activity area.

Threatened or Endangered Bird Species

The following feasible and prudent minimization and avoidance measures have been included to reduce the potential impacts to most bird species:

BIO-9 Bird Pre-Construction Surveys

Approved biologists will conduct focused avian surveys of the affected areas and adjacent areas 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 focus on rare and/or sensitive species and high-quality habitat, but will identify all bird species present. Surveys will be conducted between 10 minutes before dawn and 10:30 a.m. under favorable weather conditions.

If listed species are detected, additional surveys will be conducted to determine whether the rare or listed species have remained in the area. Surveys will continue twice weekly until the status of the individual(s) has been determined, and surveys will continue as often as necessary to document potential impacts on the species. If there appears to be an adverse impact to the species, additional measures will be put in place to ensure impacts are less than significant. Additional measures may include stopping all work in the vicinity of the listed species, erecting visual barriers, limiting the duration of work in the area, or other measures set forth by the approved biologist or regulatory representative.

The results of all pre-construction surveys will be documented and submitted to the CEC, USFWS, and CDFG (see mitigation measure BIO-17).

BIO-10 Bird Nesting Activity Surveys

Every effort will be made to ensure that birds do not nest in or adjacent to active work zones. Areas that will be attractive nest sites should be made less appealing and be examined regularly by a biologist. During the height of the breeding season, all work areas, laydown sites, and equipment should be checked three times a week.

An approved biologist will also conduct focused searches for nesting birds of the affected areas and adjacent areas 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. All bird species protected under the Migratory Bird Treaty Act (MBTA) will be surveyed for and all nests will be recorded. Particular attention will be paid to habitat that is suitable for nesting by listed birds species.

The results of all nesting surveys will be documented and submitted to the CEC, USFWS, and CDFG (see mitigation measure BIO-17), including nest fate and cause of all nest failures.

BIO-11 Bird Nest Protection

In work areas and laydown sites that will be disturbed during the anticipated breeding season, nests will be removed if they are found prior to egg-laying, in compliance with the MBTA. If eggs or young are in a nest, the nest will be protected. A suitable buffer will be established and demarcated based on the species of bird, nest location, and types of activity with the area as determined by the approved biologist. Once the young have fledged or the nest has failed, as determined by an approved biologist, the nest will be removed and normal actives will resume.

In areas that will not be disturbed during the breeding season, no nest surveys will be required. Any activity that is proposed within these areas will need to be assessed by an approved biologist to ensure that no nests or nestlings protected by the MBTA will be harmed.

The status of all nests being protected and/or monitored will be documented and submitted to the CEC, USFWS, and CDFG (see mitigation measure BIO-17), including nest fate and cause of all nest failures.

BIO-12 Burrowing Owl Pre-Construction Surveys

Prior to ground-disturbing activities, the construction areas and adjacent areas within 500 feet of the work sites, or to the edge of the property if less than 500 feet, will be surveyed by an acceptable biologist for burrows that could be used by burrowing owl. If a burrow is determined to be occupied, the following avoidance/minimization measures will be implemented:

- **During the Non-Breeding Season (August 1 – February 28):** If a burrow can be avoided until the burrowing owl naturally abandons it, a buffer zone of 160 feet from the burrow will be demarcated and work within the buffer zone avoided. If the burrow cannot be avoided, then passive relocation techniques will be employed. Once it is confirmed the burrowing owl has abandoned the burrow, the burrow will be examined with a "burrow scope" and excavated by hand to ensure that no harm or mortality befalls any wildlife possibly remaining in the burrow.

- **During the Breeding Season (March 1 – July 31):** If the burrow can be avoided, a 250-foot buffer will be demarcated around the burrow, and no work activities will be conducted within the buffer until the young are no longer dependent on the burrow, or the burrow has been abandoned. If the burrow is in a critical work area, the nest will be examined with a burrow scope to determine whether eggs and/or young are present; if eggs or young are present, the burrow will be protected until the young are no longer dependent on the burrow. If no young or eggs are present, passive relocation techniques will be employed. Once it is confirmed the burrowing owl has abandoned the burrow, it will be excavated by hand to ensure that no harm or mortality befalls any wildlife possibly remaining in the burrow.

The results of all pre-construction surveys will be documented and submitted to the CEC, USFWS, and CDFG (see mitigation measure BIO-17).

BIO-13 Swainson's Hawk Avoidance and Minimization

The following avoidance and minimization measures have been developed using the information contained in the "Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley" by the Swainson's Hawk Technical Advisory Committee dated May 31, 2000.

Where possible, major ground disturbance would be scheduled to occur between August 1 and December 31 at the Project Site when the hawks are not in the area. The Project Site and a 0.5-mile buffer would be surveyed weekly between late February and April 20 to determine whether any hawks are nesting in the area. If any nests are found, they would be monitored through the breeding season to determine if the ongoing work is affecting the pair. If there appear to be any adverse effects, the CEC and CDFG will be contacted to address the potential impact. No new ground disturbance will occur within 0.5 mile of an active Swainson's hawk nest without concurrence from the CEC and CDFG.

To the greatest extent feasible, work along all linears will occur when Swainson's hawks are absent; in the time period between August 1 and December 31. Work between January 1 and March 1 would continue, with periodic biological monitoring until Swainson's hawks have returned. If work to linears is required during the time period of March 1 to July 30, surveys will be conducted out to 1 mile from the work zone prior to initiation of work. If no sign of Swainson's hawk breeding is observed within 0.5 mile of the work zone (including laydown and staging areas) after four surveys, work would be permitted. Additional surveys would be conducted for as long as the work continues, following the frequencies described in Table 5.2-14, BIO-22 Survey Periods and Frequencies; if nesting is detected, work would be halted while CEC and CDFG are consulted.

The results of all pre-construction surveys will be documented and submitted to the CEC, USFWS, and CDFG (see mitigation measure BIO-17).

Threatened or Endangered Mammal Species

Based on surveys conducted to date, San Joaquin kit fox, and Tipton's kangaroo rat will be affected by the Project. Due to the habitat requirements and their rarity, there should be no impacts to the giant kangaroo rat, Nelson's antelope squirrel, or Buena Vista Lake shrew. The following measures will be implemented to ensure that impacts to sensitive and listed species are less than significant and mitigated to the greatest extent feasible.

BIO-14 San Joaquin Kit Fox Mitigation

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. Preconstruction surveys shall be conducted no less than 14 days and no more than 30 days prior to the beginning of ground disturbance and/or construction activities or any Project activity likely to impact the San Joaquin kit fox. Surveys shall identify kit fox habitat features on the 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 Project 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 project 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 mitigation measure BIO-17).

BIO-15 Small Mammal Mitigation

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 USFWS-approved Field Protocols for Kangaroo Rats. 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 will be conducted for five consecutive nights, or until no animals are caught on two consecutive nights per area. Traps will be set according to "sign" (burrows, trails, scat, etc.) and/or in areas of high habitat quality. Trapping will not be conducted on nights where nighttime temperatures are expected to drop below 50 degrees Fahrenheit. 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).

5.2.4.2 Sensitive Wildlife Species Monitoring

BIO-16 Ground-Disturbance Monitoring for Terrestrial Wildlife

An approved biologist will be present when the top 18 inches of soil are initially disturbed within areas with some habitat value along the linear construction areas. 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).

BIO-17 Reporting to Agencies

A quarterly BRMIMP report will be 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 CD or electronically, as directed by each agency.

Biologists involved with the monitoring and surveying for special-status species will receive written and/or verbal approval from the CEC, CDFG, and USFWS prior to conducting survey work. Biologists will be approved for specific tasks and/or species.

During construction, an 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 within 24 hours.

The BRMIMP will include all relevant information associated with BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, BIO-7, BIO-9, BIO-10, BIO-11, BIO-12, BIO-14, BIO-15, BIO-16, BIO-19, and BIO-13.

5.2.4.3 Sensitive Habitat

BIO-18 Sensitive Habitat Mitigation

A variety of options will be considered to compensate for the permanent and temporary loss of habitats potentially used by federally and state-listed species. HECA is evaluating potential off-site compensation opportunities in western Kern County and Tulare County, based on guidance from the USFWS and the CDFG. To the extent feasible, properties would be acquired and preserved that are occupied by multiple federally or state-listed species affected by the Project.

HECA LLC would provide compensation at the following ratios:

- 2.1:1 for temporary impacts to habitats potentially used by federally or state-listed species; and

- 0.1:1 for permanent impacts to agricultural land potentially used by San Joaquin kit fox for movement and migration habitat.

In addition, cultivated land or other suitable property would be acquired, preserved, and managed to provide foraging and nesting habitat for Swainson's hawks. Future nesting habitat would be established by planting cottonwoods or other suitable trees on the property.

HECA LLC proposes to acquire land that meet the habitat and/or species requirements of the federally and/or 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 would be acquired to compensate for 3.8 acres of Allscale Scrub that would be temporarily removed during construction (2.1:1 ratio).

- Compensation for permanent habitat loss associated with construction of the Project Site: a total of 45 acres would be acquired to compensate for the permanent loss of 453 acres of cultivated fields that may be used by San Joaquin kit fox for movement and migration (0.1:1 ratio).

5.2.4.4 Wetlands and Waters of the U.S.

BIO-19 Protection Measures for Wetlands and Waters Work within 100 feet of waters of the U.S. and/or waters of the State will incorporate Best Management Practices (BMPs) to minimize fill and/or degradation of waters. BMPs might include the following:

- Orange fencing to demarcate the extent of work zones;
- During storm events, use of weed-free erosion control mechanisms;
- Periodic inspection of work zones by qualified biologists to ensure that BMP practices are being adhered to.

Reporting on work adjacent to wetlands will be included in the BRMIMP (BIO-17).

BIO-20 Onsite Restoration of Non-Wetland Waters

Non-wetland waters affected during construction of the natural gas pipeline will be restored following installation of the pipeline. Consistent with standard pipeline construction techniques, the upper 6 inches of soil (topsoil) excavated within non-wetland waters will be segregated and stockpiled separately from the subsoil material. The pipeline trench will be backfilled in the order in which it was removed, and topsoil will be deposited last. Trenches will be slightly overfilled to account for future soil settlement. Backfilled soil will be compacted to a bulk density consistent with the adjacent soil.

5.2.5 Laws, Ordinances, Regulations, and Standards

The Project will be constructed and operated in accordance with all LORS applicable to biological resources. Federal, state, and local LORS applicable to biological resources are discussed below in Table 5.2-15, Summary of LORS – Biological Resources.

5.2.5.1 Federal

Endangered Species Act of 1973 and implementing regulations, Title 16 United States Code (USC) §1531 et seq., Title 50 CFR §17.1 et seq., Title 50 CFR Part 402

The FESA includes provisions for the management and protection of federally listed threatened or endangered plants and animals and their designated critical habitats. Section 10(1)(A) of the FESA requires a permit to take threatened or endangered species during lawful project activities. If there is not a federal nexus for the project, a Habitat Conservation Plan may be necessary. The administering agency of the above authority is the USFWS for terrestrial, avian, and most aquatic species, and the National Marine Fisheries Service (NMFS) for anadromous species.

Fish and Wildlife Coordinating Act, 16 USC 742 et seq., 16 USC 1531 et seq., and 50 CFR 17

The Fish and Wildlife Coordinating Act requires coordination with USFWS for federal actions that would result in the control or modification of a natural stream or body of water.

Section 404 of the Clean Water Act of 1977 (33 USC 1251 et seq., 33 CFR §§320 and 323)

This section of the CWA gives the USACE authority to regulate discharges of dredge or fill material into waters of the U.S., including wetlands.

The administering agency of this authority is the USACE.

Section 401 of the Clean Water Act of 1977

This section of the CWA requires applicants for a federal license or permit to provide a certification that any discharges will comply with applicable provisions of the CWA, including water quality standards for discharges to waterways. A 401 water quality certification is required for Section 404 permits and other federal permits.

The administering agency of this authority is the Central Valley Regional Water Quality Control Board.

Migratory Bird Treaty Act 16 USC §§703-711

The Migratory Bird Treaty Act includes provisions for protection of migratory birds, including the non-permitted take of migratory birds.

The administering agencies for this authority are the USFWS and CDFG.

5.2.5.2 State

California Endangered Species Act of 1984, Fish and Game Code, §§2050 – 2098

The CESA includes provisions for the protection and management of plant and animal species listed as endangered or threatened, or designated as candidates for such listing. The Act includes

a consultation requirement "to ensure that any action authorized by a state lead agency is not likely to jeopardize the continued existence of the species" (§2090). Plants of California declared to be endangered, threatened, or rare are listed at 14 California Code of Regulations [CCR] §670.5. The types and extent of information required to evaluate the effects of a Project on biological resources of a project site are described in 14 CCR §15000 *et seq*.

The administering agency for this authority is CDFG.

Fish and Game Code Fully Protected Species

- §3511: Fully Protected Birds
- §4700: Fully Protected Mammals
- §5050: Fully Protected Reptiles and Amphibians
- §5515: Fully Protected Fishes

The Fish and Game Code prohibits the taking of listed plants and animals that are Fully Protected Species in California.

The administering agency for this authority is CDFG.

Fish and Game Code, §1930 Significant Natural Areas

This section of the code designates certain areas such as refuges, natural sloughs, riparian areas, and vernal pools and significant wildlife habitats. These Significant Natural Areas are listed in the CNDDB.

The administering agency for the above authority is CDFG.

Fish and Game Code, §1580, Designated Ecological Reserves

The CDFG commission designates land and water areas as significant wildlife habitats to be preserved in natural condition for the general public to observe and study.

The administering agency for the above authority is CDFG.

Fish and Game Code, §1600, Streambed Alteration Agreement

This section of the code reviews projects for impacts on waterways, including impacts to vegetation and wildlife from sediment, diversions, and other disturbances.

The administering agency for the above authority is CDFG.

Native Plant Protection Act of 1977, Fish and Game Code, §1900 et seq.

This 1977 Act designates state rare and endangered plants and provides specific protection measures for identified populations.

The administering agency for the above authority is CDFG.

CDFG Policies and Guidelines, Wetlands Resources Policy

This policy provides for the protection, preservation, restoration, enhancement, and expansion of wetland habitats in California, including vernal pools.

The administering agency for the above authority is CDFG, California Environmental Protection Agency (Cal/EPA), and the Colorado River Basin Regional Water Quality Control Board.

Public Resources Code, §§25500 & 25527

According to the Public Resources Code, the siting of facilities in certain areas of critical concern for biological resource, such as ecological preserves, wildlife refuges, estuaries, and unique or irreplaceable wildlife habitats of scientific or ecological value, is prohibited. If there is no alternative, strict criteria are applied.

The administering agencies for the above authority are the USFWS and CDFG.

Title 20 CCR §§1702 (q) and (v)

This title protects "areas of critical concern" and "species of special concern" identified by local, state, or federal resource agencies within the project area.

Title 14 CCR §15000 et seq.

This title describes the types and extent of information required to evaluate the effects of a project on biological resources of a project site.

The administering agencies for the above authority are the USFWS and CDFG.

California Desert Native Plant Act, Food and Agriculture Code §80001 through §80006

The California Desert Native Plant Act protects California desert native plants from unlawful harvesting on both privately and publicly owned lands. The Act protects specific species of native desert plants from being harvested from their natural state for sale, possession, replanting, or other purposes. The removal of plants on one's own property for the purpose of construction or developing the property is allowed.

5.2.5.3 Local

Kern County General Plan

The Kern County General Plan provides guidance on the types of development activity, and allowable uses for those areas within the county limits. In particular Section 1.10.5 pertains to the protection and management of threatened and endangered species and riparian areas within the county (Kern County Planning Department, 2007).

5.2.6 Involved Agencies and Agency Contacts

Table 5.2-16, Agency Contacts, identifies agencies contacted for this evaluation. Due in part to the timing of the Project start and personnel schedules, meetings with USFWS and CDFG did not occur at the beginning of the 2008 field season; however, as detailed below, numerous meetings with CDFG and USFWS have been conducted to ensure information is being shared in a timely fashion.

- April 22, 2008, electronic mail from David Kisner (URS) to Susan Jones (USFWS) and James Diven (URS) regarding biological aspects in the vicinity of the proposed Project. Julie Vance (CDFG), Tim Kuhn (USFWS), and Rick York (CEC) were included in follow-up electronic mails regarding a meeting to discuss the former Project Site when it was located in Elk Hills.
- July 10, 2008, Project meeting in Fresno, California at CDFG office with Julie Vance (CDFG), Susan Jones, and Peter Cross (USFWS; remote). This discussion again involved the former Project Site when it was located in Elk Hills.
- October 14, 2008, Project meeting in Fresno, California at CDFG office with Julie Vance (CDFG), Susan Jones, and Peter Cross (USFWS; remote). This discussion again involved the former Project Site when it was located in Elk Hills.
- June 6, 2009, site visit with Tim Kuhn (USFWS) and Julie Vance (CDFG) to review Project linears and biological constraints.
- 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 Project.
- June 9, 2010, USFWS email correspondence to CEC and CDFG regarding comments on the February 5, 2010 Biological Assessment for the Project.
- August 6, 2010, USFWS comment letter regarding the February 8, 2010 Biological Assessment for the Project. Comment letter was electronically forwarded to Julie Vance (CDFG) and Amy Golden (CEC).
- February 6, 2012 Project meeting in Fresno, California at CDFG office 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 regards to the known and potential biological resources in the area.

5.2.7 Permits Required and Permit Schedule

Additional details on information required for each permit application and where the required information can be found in this document are provided in Table 5.2-17, Biological Permits Required and Scheduled Timing.

5.3 REFERENCES

APLIC, 2006. *Suggested Practices for Avian Protection on Power Lines: State of the Art in 2006.* Avian Power Line Interaction Committee.

Bartel, Dan, 2012. General Manager, Buena Vista Water Storage District, Buttonwillow, California. Telephone conversation with Steve Leach and Dale Shileikis of URS Corporation. April 5.

Beason, Robert C., 1995. Horned Lark (*Eremophila alpestris*) *In* The Birds of North America, No. 195 (A. Poole and F. Gill, eds.) The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.

Bent, A., 1948. Life histories of North American nuthatches, wrens, thrashers, and their allies. U.S. Nat. Mus. Bull. 195. Smithsonian Institution, Washington, D.C.

Birdweb, 2008. Information on the birds of Washington State [web application], Seattle, Washington: Seattle Audubon Society, URL: http://www.birdweb.org/birdweb/browse_birds.aspx.

Bjurlin, C.D., B.L. Cypher, C.M. Wingert, and C.L. Van Horn Job, 2005. *Urban Roads and the Endangered San Joaquin Kit Fox,* California State University, Stanislaus Endangered Species Recovery Program. Prepared for The California Department of Transportation. July 10.

Brown, Bryan T., 1993. Bell's Vireo (*Vireo bellii*). The Birds of North America, No. 35 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Calflora, 2012. Information on California plants for education, research and conservation [web application], Berkeley, California: The Calflora Database [a non-profit organization], URL: at http://www.calflora.org/.

CDFG (California Department of Fish and Game), 1980. At the crossroads, a report on California's endangered and rare fish and wildlife. Sacramento, 147 pp.

CDFG (California Department of Fish and Game), 2012. Staff Report on Burrowing Owl Mitigation. California Department of Fish and Game Memorandum, March 7, 2012.

CDFG (California Department of Fish and Game), 1995. California Department of Fish and Game Staff Report on Burrowing Owl Mitigation Memorandum, October 17.

CDFG (California Department of Fish and Game), 2008. Conversation between David Kisner of URS and Julie Vance of CDFG during the meeting on 4 June 2008.

CDFG (California Department of Fish and Game), 2011. Special Animals, January 2011. State of California Department of Fish and Game. Sacramento, California.

CDFG (California Department of Fish and Game), 2012. California Natural Diversity Database. State of California Department of Fish and Game. Sacramento, California.

CNPS (California Native Plant Society), 2012. Inventory of Rare and Endangered Plants (online edition, v7-08b). California Native Plant Society. Sacramento, California, URL http://www.cnps.org/inventory.

Craig, D. and P.L. Williams, 1998. Willow Flycatcher (*Empidonax traillii*). *In* The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. http://www.prbo.org/calpif/htmldocs/ riparian_v-2.html.

Cypher, B.L., 2006. *Kit Fox Conservation in the San Luis Drainage Study Unit*. Unpublished report to the U.S. Bureau of Reclamation South-Central California Area Office. California State University, Stanislaus, Endangered Species Recovery Program. Fresno, California.

Eder, Tamara, 2005. *Mammals of California*. Lone Pine Publishing. Auburn, Washington.

England, A.S., M.J. Bechard, and C.S. Houston, 1997. Swainson's Hawk (*Buteo swainsoni*). In The Birds of North America, No. 265 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Environmental Laboratory, 1987. Corps *of Engineers Wetlands Delineation Manual* (online edition). Washington, D.C.: U.S. Army Corps of Engineers.

Eriksen, C. and D. Belk, 1999. Fairy Shrimps of California's Puddles, Pools, and Playas. Mad River Press, Inc. Eureka, California.

Garrett, K., and J. Dunn, 1981. Birds of southern California. Los Angeles Audubon Soc. 408 pp.

Grinnell, J., 1932. Habitat relations of the giant kangaroo rat. J. Mammal. 13:305-320.

Grinnell, J. and J. Dixon, 1919. Natural history of the ground squirrels of California. California State Comm. Horticulture Bull. 7:597-708.

Grinnell, J., J.S. Dixon, and J.M. Linsdale, 1937. Fur-bearing mammals of California. 2 Vols. University of California Press, Berkeley. 777 pp.

Grinnell, J., and A.H. Miller, 1944. The distribution of the birds of California. Pacific Coast Avifauna 27:138-139.

GoFISHn, Fishing in Buena Vista Aquatic Recreation Area Kern County, 2011. http://www. gofishn.com/content/buena-vista-aquatic-recreation-area-kern-county-california. Accessed March 6, 2012.

Hall, E., 1981. The mammals of North America. John Wiley & Sons, New York, New York.

Harris, J. and D. Stearns, 1991. Population density, census methods, habitat relationships, and home range of the San Joaquin antelope ground squirrel. 1988-89. Cal. Dept. Fish and Game, Nongame Bird and Mammal Section Rep., 91-02:1-37.

Hawbecker, A., 1947. Food and moisture requirements of the Nelson antelope ground squirrel. J. Mammal. 28:115-125.

Hawbecker, A.C., 1951. Small mammal relationships in an Ephedra community. J. Mammal. 32:50-60.

Hohman, W.L., and S.A. Lee, 2001. Fulvous Whistling-Duck (*Dendrocygna bicolor*). In The Birds of North America, No. 562 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Ingles, L., 1965. Mammals of the Pacific States. Stanford Univ. Press, Stanford, CA. 506 pp.

Kern County Planning Department, 2007. Kern county General Plan. Bakersfield, California.

Kern Water Bank Authority, 2008. Kern Water Bank Authority Habitat Conservation Plan/ Natural Community Conservation Plan 2007 Compliance Report and Management Plan. Bakersfield, California.

Knopf, F.L., 1996. Mountain Plover (*Charadrius montanus*). In A. Poole and F. Gill, editors. The Birds of North America, No. 211. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Kudrak, K., 1999. Burrowing owl, pp. 41-46, In: M. Holmgren and P. Collins (eds.). Distribution and habitat associations of six bird species of special concern at Vandenberg Air Force Base, Santa Barbara County, California. Mus. Systematics and Ecology, Univ. California-Santa Barbara, Environ. Report No. 7.

Lehman, P.E., 1994. The Birds of Santa Barbara County, California. Vertebrate Museum, University of California, Santa Barbara.

Lichvar, R.W. and S.M. McColley, 2008. *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States.* U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory. Hanover, NH. ERDC/CRREL TR-08-12.

Live Oak Associates, Inc., 2008. 2007 Annual Wildlife Monitoring Report for the Kern Water Bank. Bakersfield, California.

McCullough, D.R., J.D. Ballou and J.K. Fischer, 1996. "From bottleneck to metapopulation: recovery of the tule elk in California." pp. 375-410 in D. McCullough, ed. Metapopulations and wildlife conservation. Washington, D.C.: Island Press.

McCullough, D.R., 1969. The tule elk: its history, behavior, and ecology. University of California Publication in Zoology, Vol. 88, University of California Press, Berkeley and Los Angeles. 209 pp.

National Geographic Society, 2001. *Field guide to the birds of North America, third edition*. National Geographic Society. Washington, D.C.

NOAA (National Oceanic and Atmospheric Administration), 2012. National Weather Service Forecast Office – San Joaquin Valley/Hanford, California (accessed April 2012).

Page, G.W., J.S. & J.C. Warriner, and P.W.C. Paton, 1995. Snowy Plover (*Charadrius alexandrinus*). In The Birds of North America, No. 154 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.

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

Reed, P.B., Jr., 1988. National List of Plant Species That Occur in Wetlands: California (Region 0). U.S. Fish and Wildlife Service Biological Report 88(26.10). 135 pp.

Remsen, J., 1978. Bird species of special concern in California. California Department of Fish and Game, Sacramento. Wildl. Manage. Admin. Rep. No. 78-1. 54 pp.

Sawyer, Keeler-Wolf, and Evens, 2009. *A Manual of California Vegetation*, Second Edition. California Native Plant Society. Sacramento.

Shaw, W., 1934. The ability of the giant kangaroo rat as a harvester and storer of seeds. J. Mammal. 15:275-286.

Sheppard, J.M., 1970. A study of the Le Conte's thrasher. California Birds 1:85-94.

Shuford, W.D. and T. Gardali, editors, 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

State Water Resources Control Board, 2012. Preliminary Draft Water Quality Control Policy for Wetland Area Protection and Dredge and Fill Permitting (Version 1). Sacramento, California. March 9.

Stebbins, R., 2003. *Western reptiles and amphibians, third edition*. Houghton Mifflin Company, New York, New York.

Tollestrup, K., 1982. Growth and reproduction in two closely related species of leopard lizards, *Gambelia silus* and G*ambelia wislizenii*. American Midland Naturalist. 108:1-20.

Tollestrup, K., 1983. The social behavior of two species of closely related leopard lizards, *Gambelia silus* and *Gambelia wislizenii*. J. Tierpsychol. 62:307-320.

Unitt, P., 1987. *Empidonax traillii extimus*: An endangered subspecies. Western Birds 18(3):137-162.

USACE (U.S. Army Corps of Engineers), 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region.* Wetlands Regulatory Assistance Program. Washington, D.C.

USACE (U.S. Army Corp of Engineers), 1986. Federal Register 33 CFR Parts 320 through 330, Regulatory Programs of the Corps of Engineers, Final Rule. Rules and Regulations Vol. 51, No. 219, pg. 41216. November 13.

USACE (U.S. Army Corps of Engineers), 2012. Web site. http://www.spk.usace.army.mil/organizations/cespk-co/regulatory/nif_waterways.html Accessed February 29, 2012.

USACE (U.S. Army Corps of Engineers) and U.S. Environmental Protection Agency (USEPA), 2007. *Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States*. June 5. Memorandum.

USFWS (U.S. Fish and Wildlife Service), 1993. Federal Register. Endangered and threatened wildlife and plants; determination of threatened status for the giant garter snake. Rules and Regulations, Fish and Wildlife Service, 58 Final Rule 54053 [Wednesday, October 20, 1993].

USFWS (U.S. Fish and Wildlife Service), 1998. Recovery Plan for Upland Species of the San Joaquin Valley, California. Region 1, Portland, Oregon, 319 pp.

USFWS (U.S. Fish and Wildlife Service), 1999a. Federal Register 49497 Vol. 64.

USFWS, 1999b. U.S. Fish and Wildlife Service Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance. Sacramento, 1999.

Warrick, 2010. Conversation between David Kisner of URS and Greg Warrick of Center for Natural Lands Management.

Williams, D.F., 1986. Mammalian species of special concern in California. California Dept. Fish and Game, Sacramento. Admin. Rep. 86-1. 112 pp.

Williams, D.F. and K.S. Kilburn, 1992. The conservation and status of the endemic mammals of the San Joaquin faunal region, California. pp. 329-345, *in* Endangered and sensitive species of the San Joaquin Valley, California: their biology, management, and conservation. The California Energy Commission, Sacramento, 386 pp.

Williams, D.F., H.H. Genoways and J.K. Braun, 1993. Taxonomy, pp. 38–190 in H.H. Genoways and J.H. Brown (eds.), Biology of the Heteromyidae. Special Publication. No. 10. The American Society of Mammalogists, 719 pp.

Table 5.2-1
Project Components and Biology Resources Study Area

Project Area Components	Activity Duration	Biological Resources Study Area Limits	Location of Biological Resource Information in AFC
Project Site	Permanent	1-mile buffer	Section 5.2
Project Site staging and laydown area	Temporary	1-mile buffer	Section 5.2
Electrical Transmission Linear	Permanent/ Temporary	1,000-foot buffer	Section 5.2
Natural Gas Supply Linear	Temporary (except valve stations)	1,000-foot buffer	Section 5.2
Process Water Linear	Temporary	1,000-foot buffer	Section 5.2
Potable Water Linear	Temporary	1,000-foot buffer	Section 5.2
Railroad Spur	Permanent/ Temporary	1,000-foot buffer	Section 5.2
CO_2 EOR Processing Facility	Permanent/ Temporary	1,000-foot buffer	Appendix A
CO_2 Linear	Temporary	1,000-foot buffer	Appendix A

Table 5.2-2
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 carbon dioxide gas linear route on May 20, 2008[1]	David Kisner
Potential jurisdictional wetlands	Habitat assessment of the carbon dioxide linear route, conducted on March 5, 6, and 20, 2008 and May 28, 2008[1]	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 of the carbon dioxide linear on March 17, 18, and 26, 2009[1]	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 along the carbon dioxide linear[1]	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
Protocol juvenile blunt-nosed leopard lizard	August 5 through September 15, 2010 surveys along natural gas linear alignment	David Kisner, Ronald Cummings, Dave Compton, Kate Eldredge, Jolie Henricks, Melissa Newman, Jane Donaldson, Mark Wilson, and Gilda Barboza,
Field Reconnaissance for Wetlands and Other Waters	December 7, 2010 Field review of the natural gas linear alignment	David Kisner, Jan Novak

Table 5.2-2
Biological Resources Field Surveys

Resource	Field Surveys Completed	Conducted by URS Biologists(s)
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 Survey/Swainson's 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 BRSA, including the Project site and all Project linears, including the industrial rail spur alignment.	Kelly Kephart, Jan Novak, and Jane Donaldson

Notes:

1. These surveys were conducted for the previously proposed CO_2 linear alignment. Although the CO_2 linear alignment has changed, these surveys provide information regarding the general area.

Table 5.2-3
Plant Species Observed in the Biological Resources Study Area

Scientific Name	Common Name	Native/ Exotic	Wetland Indicator Status[1]	CNPS Status[2]
Acroptilon repens	Russian knapweed	E	NI	None
Allenrolfea occidentalis	iodine bush	N	NI	None
Ambrosia dumosa	Burrobush	N	NI	None
Amsinckia menziesii var. *intermedia*	Fiddleneck	N	NI	None
Amsinckia menziesii var. *menziesii*	Fiddleneck	N	NI	None
Anethum graveolens	Dill	E	NI	None
Aster sp.	N/A	N/A	NI	None
Astragalus lentiginosus	freckled milkvetch	N	NI	None
Atriplex lentiformis	Quailbush	N	NI	None
Atriplex phyllostegia	leaf cover saltweed	N	FACW	None
Atriplex polycarpa	desert saltbush	N	FACU	None
Atriplex triangularis	spear leaved saltbrush	N	FACW	None
Atriplex vallicola	Lost Hills saltbush	N	NI	1B.2
Avena fatua	Common wild oats	E	NI	None
Baccharis salicifolia	mule fat	N	NI	None
Bassia hyssopifolia	five hook bassia	E	NI	None
Brassica nigra	black mustard	E	NI	None
Bromus hordeaceus	soft chess	E	NI	None
Bromus madritensis ssp. *Rubens*	red brome	E	NI	None
Calycadenia spicata	spiked western rosinweed	N	NI	None
Camissonia boothii ssp. *Decorticans*	shredding evening primrose	N	NI	None
Camissonia campestris	Mojave suncup	N	NI	None
Capsella bursa-pastoris	shepherd's purse	E	FAC-	None
Castilleja exserta ssp. *exserta*	purple owl's clover	N	NI	None
Centaurea melitensis	Tocalote	E	NI	None
Centaurea solstitialis	yellow star thistle	E	NI	None
Centromadia pungens ssp. *pungens*	common tarweed	N	NI	None
Chaenactis sp.	N/A	N/A	NI	None
Chenopodium berlandieri	Berlandier's goosefoot	N	NI	None
Chenopodium sp.	N/A	N/A	NI	None

Table 5.2-3
Plant Species Observed in the Biological Resources Study Area

Scientific Name	Common Name	Native/ Exotic	Wetland Indicator Status[1]	CNPS Status[2]
Chloracantha sp.	N/A	N/A	NI	None
Convolvulus arvensis	Bindweed	E	NI	None
Crassula connata	sand pygmy weed	N	NI	None
Cuscuta sp.	Dodder	N/A	NI	None
Cynodon dactylon	Bermuda grass	E	NI	None
Datura stramonium	jimson weed	E	NI	None
Deinandra pallida	Kern tarweed	N	NI	None
Deschampsia danthonioides	annual hairgrass	N	FACW	None
Delphinium hesperium ssp. *hesperium*	Western larkspur	N	NI	None
Delphinium gypsophilum	gypsum loving larkspur	N	NI	4.2
Descurainia incisa	mountain tansy mustard	N	NI	None
Dichelostemma capitatum	blue dicks	N	NI	None
Distichlis spicata	salt grass	N	NI	None
Eastwoodia elegans	yellow mock aster	N	NI	None
Encelia actoni	Acton encelia	N	NI	None
Eremalche parryi	Parry's mallow	N	NI	None
*Eriastrum hooveri**	Hoover's eriastrum	N	NI	4.2
Eriastrum pluriflorum	Tehachapi woolystar	N	NI	None
Eriogonum angulosum	anglestem buckwheat	N	NI	None
Eriogonum gossypinum	cottony buckwheat	N	NI	4.2
Eriogonum gracillimum	Slender-stemmed buckwheat	N	NI	None
Erodium botrys	Broad-leaf filaree	E	NI	None
Erodium cicutarium	redstem stork's bill	E	NI	None
Euphorbia chamaesyce	prostrate spurge	E	NI	None
Filago californica	California filago	N	NI	None
Frankenia salina	alkali heath	N	NI	None
Galium sp.	Bedstraw	N	NI	None
Gilia tricolor ssp. *diffusa*	bird's eye Gilia	N	NI	None
Guillenia lasiophylla	California mustard	N	NI	None
Helianthus annuus	common sunflower	N	NI	None

Table 5.2-3
Plant Species Observed in the Biological Resources Study Area

Scientific Name	Common Name	Native/ Exotic	Wetland Indicator Status[1]	CNPS Status[2]
Heliotropium curassavicum	Heliotrope	N	NI	None
Hemizonia sp.	N/A	N/A	NI	None
Hordeum brachyantherum	meadow barley	N	NI	None
Hordeum intercedens	bobtail barley	N	NI	3.2
Hordeum marinum	seaside barley	E	NI	None
Hymenoclea salsola	Cheesebrush	N	NI	None
Isocoma acradenia var. *bracteosa*	alkali goldenbush	N	NI	None
Isomeris arborea	Bladderpod	N	NI	None
Juncus/Carex sp.	N/A	N/A	NI	None
Kochia californica (Bassia californica)	Mojave red sage	N	FACW	None
Lactuca serriola	prickly lettuce	E	NI	None
Lastarriaea coriacea	leather spineflower	N	NI	None
Lasthenia californica	Goldfields	N	NI	None
Lasthenia chrysantha	alkali goldfields	N	NI	None
Layia glandulosa	white tidytips	N	NI	None
Layia pentachaeta ssp. *albida*	Sierra tidytips	N	NI	None
Lepidium dictyotum	alkali pepperweed	N	OBL	None
Lepidium nitidum	Peppergrass	N	NI	None
Lessingia glandulifera	valley lessingia	N	NI	None
Lupinus bicolor	bi-color lupine	N	NI	None
Lycium cooperi	Cooper's box thorn	N	NI	None
Malacothrix californica	desert dandelion	N	NI	None
Malacothrix coulteri	snake's head	N	NI	None
Malva parviflora	Cheeseweed	E	NI	None
Malvella leprosa	alkali mallow	N	NI	None
Marrubium vulgare	Horehound	E	NI	None
Matricaria discoidea	pineapple weed	E	NI	None
Melilotus indicus	annual yellow sweetclover	E	NI	None
Mentzelia affinis	yellow blazing stars	N	NI	None
Mesembryanthemum crystallinum	crystalline ice plant	E	NI	None

Table 5.2-3
Plant Species Observed in the Biological Resources Study Area

Scientific Name	Common Name	Native/ Exotic	Wetland Indicator Status[1]	CNPS Status[2]
Mesembryanthemum nodiflorum	slender-leaf iceplant	E	NI	None
Monolopia stricta	Crum's monolopia	N	NI	None
Mucronea perfoliata	perfoliate spineflower	N	NI	None
Nicotiana glauca	tree tobacco	E	NI	None
Oligomeris linifolia	Oligomeris	N	NI	None
Pectocarya heterocarpa	hairy-leaved comb bur	N	NI	None
Pectocarya linearis ssp. *ferocula*	slender comb seed	N	NI	None
Phacelia distans	common phacelia	N	NI	None
Phacelia tanacetifolia	lacy phacelia	N	NI	None
Phalaris aquatica	Harding grass	E	NI	None
Plagiobothrys canescens	valley popcorn flower	N	NI	None
Plagiobothrys trachycarpus	Rough-fruit popcorn flower	N	NI	None
Plantago elongata	Long-leaf plantain	N	FACW*	None
Plantago ovata	wooly plantain	N	NI	None
Poa annua	annual bluegrass	E	NI	None
Polygonum argyrocoleon	silversheath knotweed	E	NI	None
Portulaca oleracea	Purslane	E	NI	None
Prosopis glandulosa	honey mesquite	N	NI	None
Psilocarphus tenellus	Woolyheads	N	NI	None
Psilocarphus tenellus var. *tenellus*	Woolyheads	N	FAC	None
Psilocarphus oregonus	Oregon woolyheads	N	OBL	None
Rumex crispus	curly dock	E	NI	None
Rumex sp.	N/A	N/A	NI	None
Salicornia virginica	Pickleweed	N	OBL	None
Salix nigra	black willow	N	NI	None
Salsola tragus	Russian thistle	E	NI	None
Salvia carduacea	thistle sage	N	NI	None
Salvia columbariae	Chia	N	NI	None
Schismus barbatus	Mediterranean grass	E	NI	None
Senecio vulgaris	common groundsel	E	NI	None

Table 5.2-3
Plant Species Observed in the Biological Resources Study Area

Scientific Name	Common Name	Native/ Exotic	Wetland Indicator Status[1]	CNPS Status[2]
Sisymbrium altissimum	tumble mustard	E	NI	None
Solanum lanceolatum	lance-leaf nightshade	E	NI	None
Sonchus asper	spiny sow thistle	E	NI	None
Sonchus oleraceus	sow thistle	E	NI	None
Spergularia marina	salt sandspurry	N	NI	None
Spergularia sp.	N/A	N/A	NI	None
Stephanomeria exigua	small wirelettuce	N	NI	None
Stylocline citroleum	oil nest straw	N	NI	1B.1
Stylomecon heterophylla	wind poppy	N	NI	None
Suaeda moquinii	Seablite	N	NI	None
Tamarisk sp.	salt cedar	E	NI	None
Trifolium sp.	Clover	N/A	NI	None
Trichostema ovatum	San Joaquin bluecurls	N	NI	4.2
Typha sp.	Cattail	N	NI	None
Urtica urens	dwarf nettle	E	NI	None
Uropappus lindleyi	silver puffs	N	NI	None
Vulpia myuros	foxtail fescue	E	NI	None
Vulpia microstachys	small fescue	N	NI	None
Vulpia sp.	Fescue	E	NI	None
Xanthium strumarium	Cocklebur	N	NI	None

Notes:

1. Wetland indicator status (Reed 1988) of plant species is defined as follows:
   - UPL (upland) – greater than 99 percent of a species' occurrences are in non-wetlands;
   - FACU (facultative-upland) – 67-99 percent of a species' occurrences are in non-wetlands;
   - FAC (facultative) – 33-67 percent of a species' occurrences are in wetlands;
   - FACW (facultative-wetland) – 67-99 percent of a species' occurrences are in wetlands;
   - OBL (obligate) – greater than 99 percent of a species' occurrences are in wetlands;
   - NL (not listed) – treated as upland because not on wetland plant list.
2. CNPS status "ranks" are defined as follows:
   - 1B (formerly List 1B) are plants that are rare, threatened, or endangered in California and elsewhere
     i. 1B.1 – seriously threatened in California
     ii. 1B.2 fairly threatened in California
   - 3 (formerly List 3) a watch list of plants that require more information
     i. 3.2 fairly threatened in California
   - 4 (formerly List 4) plants that have limited distribution in California
     i. 4.2 fairly threatened in California

Table 5.2-4
Wildlife Species Observed in the Biological Resources Study Area

Scientific Name	Common Name	Observation Type	Federal/State/Other Listing Status[1]
Invertebrates			
Pogonomyrmex californicus	California harvester ant	Visual	NA
Family: Hymenoptera	"furry black" bee	Visual	NA
Apis mellifera	honey bee	Visual	NA
Family: Tenebrionidae	stink beetle	Visual	NA
Family: Coccinellidae	lady beetle	Visual	NA
Family: Sphingidae	sphinx moth	Visual	NA
Order: Scorpionidae	Scorpion	Visual	NA
Amphibians			
Rana catesbiana	bullfrog	Visual	Non-native
Hyla regilla	Pacific treefrog	Visual	NA
Bufo boreas	Western toad	Visual	NA
Spea hammondii	Western spadefoot (tadpoles)	Visual	SSC
Reptiles			
Uta stansburiana	side blotch lizard	Visual	NA
Gambelia sila	blunt-nosed leopard lizard	Visual	CE, Fully Protected/FE
Aspidoscelis tigris tigris	Great Basin whiptail	Visual	NA
Coluber constrictor	Racer	Visual	NA
Pituophis melanoleucus	Gopher snake	Visual	NA
Crotalus viridis	Western rattlesnake	Visual	NA
Birds			
Ardea alba	great egret	Visual	NA
Circus cyaneus	northern harrier	Visual	NA
Accipiter striatus	sharp-shinned hawk	Visual	NA
Accipiter cooperii	Cooper's hawk	Visual	SSC (nesting)
Buteo lineatus	red-shouldered hawk	Visual	WL (nesting)
Falco sparverius	American kestrel	Visual	WL (nesting)
Falco columbarius	merlin	Visual	NA
Callipepla californica	California quail	Visual	NA
Gallinago delicata	Wilson's snipe	Visual	NA

Table 5.2-4
Wildlife Species Observed in the Biological Resources Study Area

Scientific Name	Common Name	Observation Type	Federal/State/Other Listing Status[1]
Numenius americanus	long-billed curlew	Visual	WL (wintering)
Tringa melanoleuca	greater yellowlegs	Visual	NA
Tringa flavipes	lesser yellowlegs	Visual	WL/BCC (nesting)
Charadrius vociferus	killdeer[2]	Visual	NA
Larus argentatus	herring gull	Visual	NA
Columba livia	rock pigeon[2]	Visual	Non-native
Zenaida macroura	mourning dove[2]	Visual	NA
Geococcyx californianus	greater roadrunner[2]	Visual	NA
Bubo virginianus	great-horned owl[2]	Pellets, feathers	NA
Athene cunicularia	burrowing owl	Visual	SSC (nesting)
Lanius ludovicianus	loggerhead shrike[2]	Visual	SSC (nesting)
Corvus corax	common raven	Visual	NA
Toxostoma sp.	thrasher species	Visual	NA
Salpinctes obsoletus	rock wren[2]	Visual	NA
Stelgidopteryx serripennis	northern rough-winged swallow[2]	Visual	NA
Hirundo rustica	barn swallow[2]	Visual	NA
Petrochelidon pyrrhonota	cliff swallow[2]	Visual	NA
Sturnus vulgaris	European starling	Visual	Non-native
Mimus polyglottos	Northern mockingbird[2]	Visual	NA
Eremophila alpestris	horned lark[2]	Visual	SSC
Spizella breweri	Brewer's sparrow	Visual	NA
Sayornis saya	Say's phoebe[2]	Visual	NA
Sayornis nigricans	black phoebe[2]	Visual	NA
Passer domesticus	house sparrow[2]	Visual	Non-native
Anthus rubescens	American pipit	Visual	NA
Carpodacus mexicanus	house finch[2]	Visual	NA
Chondestes grammacus	lark sparrow[2]	Visual, call	NA
Zonotrichia leucophrys	white-crowned sparrow	Visual	NA
Passerculus sandwichensis	savannah sparrow	Visual	NA
Amphispiza belli	sage sparrow[2]	Visual	NA

Table 5.2-4
Wildlife Species Observed in the Biological Resources Study Area

Scientific Name	Common Name	Observation Type	Federal/State/Other Listing Status[1]
Vermivora celata	orange-crowned warbler	Visual	NA
Dendroica coronata	yellow-rumped warbler	Visual	NA
Icterus bullockii	Bullock's oriole	Visual	NA
Sturnella neglecta	Western meadowlark[2]	Visual	NA
Euphagus cyanocephalus	Brewer's blackbird[2]	Visual	NA
Agelaius phoeniceus	red-winged blackbird[2]	Visual	NA
Molothrus ater	brown-headed cowbird[2]	Visual	NA
Mammals			
Canis latrans	coyote	Tracks, Scat	NA
Canis lupus familiaris	domestic dog	Tracks/Visual	NA
Ovis sp.	domestic sheep	Visual/carcass	NA
Vulpes macrotis mutica	San Joaquin kit fox	Tracks, scat, and active dens	FE, CT
Spermophilus beecheyi	California ground squirrel	Visual/burrows	NA
Ammospermophilus nelsonii	Nelson's antelope squirrel	Visual	CT
Thomomys sp.	pocket gopher	Burrows	NA
Dipodomys sp.	short-nosed kangaroo rat	Burrows, tracks, and scat	SSC
Lepus californicus	black-tailed jackrabbit	Visual	NA
Sylvilagus audubonii	Audubon's cottontail	Visual	NA
Taxidea taxa	American badger	Digs, carcass	SSC
Procyon lotor	Raccoon	Visual/tracks	NA

Source: CDFG, 2011

Notes:

NA = Not Applicable.

1. Status designations per CDFG, 2011:
   - BCC = Bird of Conservation Concern (USFWS)
   - CE = California Endang
   - CT = California Threatened
   - FE = Federally Endangered
   - SSC = California Species of Special Concern (CDFG)
   - WL = Watch List (CDFG)
2. Bird species indicting nesting behavior and/or expected to breed in the study area.

Table 5.2-5
Public and Private Conservation Lands and Habitat Conservation Plan Areas near the Project Site

Natural Area	Approximate Distance (miles)	Direction from Project Site
Lokern Ecological Reserve	0.5	South
California Aqueduct San Joaquin Draft Habitat Conservation Plan (developed by Department of Water Resources)	0.3	Southeast
Tule Elk State Reserve	0.3	East
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

Table 5.2-6
Area of Habitats and Existing Land Use Types within the Project Area

	Project Site		Construction Staging Area		Railroad		Rail Laydown Yard		Natural Gas		Process Water		Transmission		OEHI CO_2 Pipeline (Refer to Appendix A)		Total	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Alfalfa		118.2	59.7		7	5.3	1.9		3.4		4.2		9.7	0.07	0		86.7	123.57
Other Row Crop		312.7	19.9		21.4	17.6			12.1	2.2	1.7		0.1		0	0	60.6	332.56
Orchards					1.6	4.5	5.6		0.6		2			0.01			9.8	4.51
Natural/Ruderal Vegetation									3.6							0	3.6	0.06
Developed/ Disturbed		15.6	6.7		15.7	12.4	0.7		30.1		79.5		12.9	0.07	0		159.8	28.07
Total	**0**	**446.5**	**86.3**	**0**	**45.7**	**39.8**	**8.2**	**0**	**49.8**	**2.2**	**87.4**	**0**	**22.7**	**0.15**	**0**	**0**	**320.5**	**488.77**

Note:

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

Table 5.2-7
Special-Status Plant Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations and Flowering/Greatest Activity Period for Area
		Federal	State	Other		
Plants						
Horn's milk-vetch	*Astragalus hornii* var. *hornii*	—	—	CNPS 1B.1	Low Recorded 5 miles south of the Project Site	Meadows, seeps, alkaline lake margins; May-October
Heartscale	*Atriplex cordulata*	—	—	CNPS 1B.2	Low Found approximately 5 miles to south of the Project Site	Chenopod scrub, meadows, seeps, valley and foothill grassland; April-October
Subtle orache	*Atriplex subtilis*	—	—	CNPS 1B.2	Moderate Recorded approximately 5 miles north of the Project Site	Valley and foothill grassland; June-August
Bakersfield smallscale	*Atriplex tularensis*	—	E	CNPS 1B.1	Very Low Not recorded in area	Chenopod scrub; June-October
Lost Hills crownscale	*Atriplex vallicola*	—	—	CNPS 1B.2	Moderate Found in the Project vicinity, approximately 1.5 miles to the south of the Project Site	Chenopod scrub, vernal pools, valley and foothill grassland; April-August
Alkali mariposa lily	*Calochortus striata*	—	—	CNPS 1B.2	Very Low Found approximately 10 miles to the south of the Project Site	Chenopod scrub, Mojavean desert scrub, chaparral, meadows and seeps; April-June
California jewel-flower	*Caulanthus californicus*	E	E	CNPS 1B.1	Low Recorded approximately 8 miles south of the Project Site	Chenopod scrub, pinyon and juniper woodlands, valley and foothill grasslands; February-May
Slough thistle	*Cirsium crassicaule*	—	—	CNPS 1B.1	Moderate Recorded within one-half mile of the Project Site	Chenopod scrub, riparian scrub, marshes and swamps; May-August
Gypsum-loving larkspur	*Delphinium gypsophilum* ssp. *Gypsophilum*	—	—	CNPS 4.2	High Found within a mile southwest of the Project Site	Chenopod scrub, cismontane woodland, valley and foothill grassland; February-May

Table 5.2-7
Special-Status Plant Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations and Flowering/Greatest Activity Period for Area
		Federal	State	Other		
Recurved larkspur	*Delphinium recurvatum*	—	—	CNPS 1B.2	Moderate Recorded near the Project Site and in the vicinity of linear Project components	Chenopod scrub, cismontane woodland, valley and foothill grassland; March-June
Kern mallow	*Eremalche kernensis*	E	—	CNPS 1B.2	Low Recorded near the northern portion of the potable water linear	Chenopod scrub, valley and foothill grassland; March-May
Hoover's eriastrum	*Eriastrum hooveri*	—	—	CNPS 4.2	Moderate Found approximately 1.5 miles to the southwest of the Project Site	Chenopod scrub, pinyon and juniper woodland, valley and foothill grassland; February-May
Cottony buckwheat	*Eriogonum gossypinum*	—	—	CNPS 4.2	Moderate Found approximately 3 miles to the southwest of the Project Site	Chenopod scrub, valley and foothill grassland, March-September
Tejon poppy	*Eschscholzia lemmonii* ssp. *Kernensis*	—	—	CNPS 1B.1	Moderate Numerous populations have been recorded just over 1 mile from the Project Site	Chenopod scrub, valley and foothill grassland; March-May
Showy madia	*Madia glabrata*	—	—	CNPS 1B.1	Very Low Found over 10 miles to the northwest of the Project Site	Cismontane woodland, valley and foothill grassland; March-May
San Joaquin woollythreads	*Monolopia [Lembertia] congdonii*	E	—	CNPS 1B.2	Moderate Found approximately 2 miles to east of the Project Site	Chenopod scrub, valley and foothill grassland; February-May
Bakersfield cactus	*Opuntia basilaris* var. *treleasei*	E	E	CNPS 1B.1	Very Low Not recorded in area	Chenopod scrub, cismontane woodland, valley and foothill grassland; April-May

Table 5.2-7
Special-Status Plant Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations and Flowering/Greatest Activity Period for Area
		Federal	State	Other		
California chalk moss	*Pterygoneurum californicum*	—	—	CNPS 1B.1	Very Low Not recorded in area	Chenopod scrub, valley and foothill grassland
Oil neststraw	*Stylocline citroleum*	—	—	CNPS 1B.1	High Numerous observations within 1 mile of the Project Site	Chenopod scrub, valley and foothill grassland; March-April
Mason's neststraw	*Stylocline masonii*	—	—	CNPS 1B.1	Very Low Not recorded in area	Chenopod scrub, pinyon and juniper woodland; March-May

Notes:

E	Federal/State Endangered	1	Seriously endangered in California
CNPS 1B	Plants that are rare or endangered in California and elsewhere	2	Fairly endangered in California
CNPS 4	Plants that have limited distribution in California	3	Not very endangered in California

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
Invertebrates						
Kern shoulderband	*Helminthoglypta callistoderma*	—	—	IUCN:EN	Very Low No known occurrences within 5 miles of the Project Area	Unknown
Amphibians						
Western spadefoot	*Spea hammondii*	—	SC	—	Present Tadpoles observed in 2009 along KRFCC less than 1 mile south of the Project Site	Inhabits sparsely vegetated alkali and desert scrub habitats in areas of low topographic relief. Preferred habitat includes semiarid grasslands, alkali flats, and washes.
Reptiles						
Blunt-nosed leopard lizard	*Gambelia sila*	E	E and FP	—	Present Observed in 2008 within 1 mile south of the Project Site along 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.
Silvery legless lizard	*Anniella pulchra pulchra*	—	SC	—	Very Low No known occurrences within 5 miles of the Project Area	Inhabits coastal dune, valley foothill, chaparral, and coastal sage scrub habitats. Prefers sandy or loose organic soil suitable for burrowing. Soil moisture is essential to legless lizard success.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
California horned lizard	*Phrynosoma coronatum*	—	SC	—	Low No known occurrences within 5 miles of the Project Area	Inhabits a wide range of habitats including grassland, oak woodland, and riparian habitats. Requirements include an exposed gravelly-sandy substrate.
Giant garter snake	*Thamnophis gigas*	T	T	—	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.
San Joaquin whipsnake	*Masticophis flagellum ruddocki*	—	SC	—	Low No known occurrences within 5 miles of the Project Site	Inhabits valley grassland and saltbush scrub habitats. Uses mammal burrows for refuge.
Southwestern pond turtle	*Actinemys marmorata pallida*	—	SC	—	Moderate One recorded occurrence within 1 mile of Project Site in 1990	Inhabits riparian zone and fresh water bodies; known to use associated upland habitats.
Birds						
Fulvous whistling-duck	*Dendrocygna bicolor*	—	SC	—	Very Low No known occurrences within 5 miles of the Project Area	Inhabits freshwater marshes, lakes, ponds, and rice fields.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
White-tailed kite	*Elanus leucurus*	—	FP	—	Very Low No known occurrences within 5 miles of the Project Area	Inhabits open grasslands with scattered trees for nesting and perching. Often frequent tree-lined river valleys with adjacent open areas.
Swainson's hawk	*Buteo swainsoni*	SC	T	—	Present Individuals observed foraging over the Tule Elk Preserve, with potential nest structures 1 mile east of Project Site. Active nest confirmed in 2011 approximately 500 feet south of process water linear and less than 3 miles west of the Project Site	Inhabits open grasslands and desert-like habitats, as well as agricultural areas.
Golden eagle	*Aquila chrysaetos*	SC	FP	—	Moderate Limited nesting habitat; individuals may pass through Project Area	Found in open and semi-open areas including tundra, shrublands, woodlands, grasslands, and coniferous forests. Primarily inhabits mountainous areas, but can also nest in wetland, riparian and estuarine habitats.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
Prairie falcon	*Falco mexicanus*	SC	—	—	Low Nesting habitat is not present in the Project Area or vicinity; migrants may pass through area	Inhabits arid and semi-arid plains. Nests on rock cliffs in river gorges as well as mountainous regions.
American peregrine falcon	*Falco peregrinus*	—	E	FP	Low Nesting habitat is not present in the Project Area; migrants may pass through area	Prefer open habitats such as grasslands, tundra and meadows. Nests on cliff faces and crevices.
Western snowy plover	*Charadrius alexandrinus nivosus*	T	SC	—	Very Low No known occurrences within 5 miles of Project Area	Breeds above high tide line on coastal beaches, sand spits, sparsely vegetated dunes, and beaches at creek or river mouths.
Mountain plover	*Charadrius montanus*	SC	SC	—	Low Uncommon in Project vicinity during winter; outside of breeding range. One observation within 1 mile of the Project Area in 1990	Inhabits open grasslands, plowed fields and open sagebrush areas. Often roosts in depressions in the ground. Avoids areas with high or dense vegetative cover.
Yellow-billed cuckoo	*Coccyzus americanus*	SC and C	E		Very Low Poor nesting habitat; migrants may pass through area	Inhabits open woodlands with clearings and a dense shrub layer. Often frequent woodlands near streams, rivers or lakes.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
Burrowing owl	*Athene cunicularia*	—	SC	—	Present Individuals detected in the BRSA at several locations during surveys in 2008, 2010 and 2011	Inhabits open, dry grasslands, deserts, and sometimes, ruderal areas along ditch levees. Requires burrows, principally those made by California ground squirrels.
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E	—	Very Low Poor nesting habitat; migrants may pass through area	Breeds in dense riparian habitats along rivers, streams or other wetlands.
Loggerhead shrike	*Lanius ludovicianus*	—	SC	—	Present Individuals observed during survey in 2008 at the Project Site and along linear Project components	Inhabits open spaces bordered by vegetation.
Least Bell's vireo	*Vireo bellii pusillus*	E	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.
LeConte's thrasher	*Toxostoma lecontei*	SC	SC	—	Moderate Potential breeding habitat on edges of Project Site and along previously proposed linear alignments. One record within 1 mile of the Project Area in 1989	Open desert wash, desert scrub, alkali desert scrub, and desert succulent shrub habitats, also occurs in Joshua tree habitat with scattered shrubs.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
California horned lark	*Eremophila alpestris actia*	—	—	DFG:WL	Present Individuals detected during survey in 2008	Inhabits open habitat, usually where trees and large shrubs are absent. Prefers to breed in short grasslands, rangelands and open fields.
Tricolored blackbird	*Agelaius tricolor*	SC	SC	—	Low Typical nesting habitat for this species is not present in the Project Area; foraging possible	Nests in emergent wetland vegetation or near it. Roosts in large flocks in wetland vegetation or in trees.
Mammals						
Buena Vista lake shrew	*Sorex ornatus relictus*	E	SC	—	Low Habitats in the Project Area are not suitable for this species; no freshwater marsh wetlands or riparian habitats with dense cover in the Project Area	Inhabits valley freshwater marsh with dense wetland vegetative cover and detritus.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
Nelson's antelope squirrel	*Ammospermophilus nelsoni*	—	T	—	High Documented occurrences are only known to the west of the California Aqueduct (Elk Hills area). Individuals observed in vicinity of CO_2 linear in 2008 and 2009 approximately 2 miles south of the Project Site. No habitat for this species at Project Site or along other linear components, except CO_2 linear alignment west of California Aqueduct.	Dry, sparsely vegetated loam soils. Need widely scattered shrubs, forbs and grasses in broken terrain with gullies and washes
Giant kangaroo rat	*Dipodomys ingens*	E	E	—	High Observed approximately 1 mile south of the Project Site in 1990. Per February 2012 communication with CDFG, this species is expected on west 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.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
Short-nosed kangaroo rat	*Dipodomys nitratoides brevinasus*	—	SC	—	High Previously documented within 1 mile of the Project Site	Western San Joaquin Valley in grassland and shrub associations, especially *Atriplex*. Favors flat to gently sloping terrain. 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	E	—	High Previously documented within 1 mile of the Project Site and within the BRSA 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.
Tulare grasshopper mouse	*Onychomys torridus tularensis*	—	SC	—	Moderate Previously documented within 5 miles of the Project Site in 2004	Arid shrub-land communities in hot, arid grassland and shrub-land associations
Tule elk	*Cervus elaphus nannodes*	—	—	—	Low Restricted to the Tule Elk Preserve approximately 1 mile east of Project Site	Typically found in grasslands and oak savannas.
San Joaquin kit fox	*Vulpes macrotis mutica*	E	T	—	Present Active dens observed near in vicinity of CO_2 linear in 2008 and potential tracks/sign observed KRFCC in 2009	Chenopod scrub, grasslands, and other habitats. Sometimes forage in agricultural areas.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
American badger	*Taxidea taxus*	—	SC	—	High Carcass and other evidence of this species identified along previously proposed linear alignments in 2008; potential to occur in Project Site and linear components of Project Area	Abundant in drier open stages of most shrub, forest, and herbaceous habitats with friable soils.
San Joaquin pocket mouse	*Perognathus inornatus*	—	—	BLM	High Occurrences documented within 1 mile of the Project Site	Inhabits dry, open grasslands or scrub areas in the Central and Salinas valleys. Inhabits shrubby ridgetops and hillsides.
Pallid bat	*Antrozous pallidus*	—	SC	—	Very Low No occurrences documented within 5 miles of Project Area. However, this species may forage within the Project Area	Inhabits rocky, outcrop areas where they commonly roost in rock crevices, caves, and mine tunnels.
Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	—	SC	—	Very Low No occurrences documented within 5 miles of the Project Area. However, potential for this species to forage and roost within the Project Area	Inhabits desert scrub, mixed conifer forest and pinyon-juniper, or pine forest habitat. Associated with caves, mines, lava tubes, and buildings.

Table 5.2-8
Special-Status Wildlife Species with Potential to Occur within the Project Area

Common Name	Scientific Name	Listing Status			Likelihood of Occurrence in Project Area	Habitat Associations
		Federal	State	Other		
Western mastiff bat	*Eumops perotis californicus*	—	SC	—	Very Low No occurrences documented within 5 miles of the Project Area. However, potential for this species to forage and roost within the Project Area	Inhabits dry washes, flood plains, chaparral, oak woodland, grassland, montane meadows, and agricultural areas. Western mastiff bat primarily roosts on cliffs generally under exfoliating rock slabs (e.g., granite, sandstone or columnar basalt) but also utilizes crevices in large boulders and buildings.

Notes:

E	Federal/State Endangered	FP	State Fully Protected
T	Federal/State Threatened	IUCN:EN	International Union for Conservation of Nature and Natural Resources: Endangered
SC	Federal/California Species of Concern	DFG:WL	Department of Fish and Game Watch List
C	Candidate Species	BLM	Bureau of Land Management Sensitive Species

Table 5.2–9
Temporary Impacts to Non-Wetland Waters of the United States (WUS)[1]

Feature ID	Temporary Impact Area (Square Feet)
WUS 27	373
WUS 28	648
WUS 29	4,203
WUS 33	2,636
WUS 34	8
Total (square feet)	7,868
Total (acres)	0.18

Note:
[1] Impacts are estimated using a 30-foot-wide construction right-of-way.

Table 5.2-10
Overlap of Project Components and the San Joaquin Kit Fox
Western Kern County Core Recovery Area

Project Component	Area (Acres) within the Western Kern County Core Recovery Area
Project Site	7.0[1]
Carbon Dioxide Pipeline	20.0[2]
Process Water Pipeline	42.2[3]
Total	**69.2**

Notes:

[1] Acreage is actively farmed and is poor habitat for the San Joaquin kit fox.

[2] See Appendix A for additional information on CO_2 linear.

[3] Acreage is included in the Project Site area, is actively farmed, and is poor habitat for the San Joaquin kit fox.

Table 5.2-11
Existing and Project-Related Traffic Estimates within the San Joaquin Kit Fox Recovery Area

Roadway	Current ADT [1]	Construction		Operations Alternative 1 (rail transportation)[2]		Operations Alternative 2 (truck transportation)[2]		Product Deliveries During Alternative 1 (rail transportation)[3]		Product Deliveries During Alternative 2 (truck transportation)[3]	
		Current + Project ADT	Project Increase	Current + Project ADT	Project Increase	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%	30,708	0.7%	30,876	1.2%	30,648	0.5%	30,702	0.7%
I-5 (south of SR-119)	30,000	30,396	1.3%	30,230	0.8%	30,416	1.4%	30,166	0.6%	30,226	0.8%
Tupman Road (Tupman Town)[4]	490	1,474	200.8%	614	25.3%	614	25.3%	490	0.0%	490	0.0%
SR 119 (Bakersfield – east of I-5)	6,800	7,554	11.1%	6,900	1.5%	6,918	1.7%	6,816	0.2%	6,822	0.3%
SR 119 (Taft – west of Tupman Rd)	11,800	11,924	1.1%	11,816	0.1%	11,816	0.1%	11,800	0.0%	11,800	0.0%
Stockdale Highway (west of I-5)[4]	2,520	3,683	46.2%	3,132	24.3%	3,504	39.0%	2,851	13.1%	4,321	71.5%
SR 46 (west of I-5)	10,000	10,136	1.4%	10,000	0.0%	10,000	0.0%	10,000	0.0%	10,000	0.0%

Notes:

[1] Unless otherwise stated, ADT values were obtained from Caltrans 2010 Traffic Data.

[2] Project employees or by product trucks only

[3] Petcoke/Coal delivery to the 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 5.2-12
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)	14.00	Antelope Plain/ Semitropic/Kern	Satellite	0.01 [1]	0.14	0.8	0.00	0.14
I-5 (south	5.65	Western Kern County	Core	0.03 [1]	0.17	1.3	0.00	0.17
SR 119 (Taft)	13.22	Western Kern County	Core	0.02 [1]	0.26	200.8	0.52	0.78
Stockdale Highway	5.09	Urban Bakersfield	Satellite	0.20 [1]	1.02	1.1	0.01	1.03
Tupman Road	5.41	Western Kern County	Core	0.14 [2]	0.76	34.2	0.26	1.02
Subtotal				0.40	2.35		**0.80**	3.15
Construction-related take over 3 years							2.39	
Operations Alternate 1								
I-5 (north)	14.00	Antelope Plain/ Semitropic/Kern	Satellite	0.01 [1]	0.14	0.7	0.00	0.14
I-5 (south)	5.65	Western Kern County	Core	0.03 [1]	0.17	0.8	0.00	0.17
SR 119 (Taft)	13.22	Western Kern County	Core	0.02 [1]	0.26	0.1	0.00	0.26
Stockdale Highway	5.09	Urban Bakersfield	Satellite	0.20 [1]	1.02	24.3	0.25	1.27
Tupman Road	5.41	Western Kern County	Core	0.14 [2]	0.76	25.3	0.19	0.95
Subtotal	0.44			0.40	2.35		**0.44**	2.79
Operations-related take over 20 years							8.85	
Operations Alternate 2								
I-5 (north)	14.00	Antelope Plain/ Semitropic/Kern	Satellite	0.01 [1]	0.14	1.2	0.00	0.14

Table 5.2-12
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)
I-5 (south)	5.65	Western Kern County	Core	0.03 [1]	0.17	1.4	0.00	0.17
SR 119 (Taft)	13.22	Western Kern County	Core	0.02 [1]	0.26	0.1	0.00	0.26
Stockdale Highway	5.09	Urban Bakersfield	Satellite	0.20 [1]	1.02	39.0	0.40	1.42
Tupman Road	5.41	Western Kern County	Core	0.14 [2]	0.76	25.3	0.19	0.95
Subtotal				0.40	2.35		**0.59**	2.94
Operations-related take over 20 years							**11.89**	
Product Delivery Alternate 1								
I-5 (north)	14	Antelope Plain/ Semitropic/Kern	Satellite	0.01 [1]	0.14	0.5	0.00	0.14
I-5 (south)	5.65	Western Kern County	Core	0.03 [1]	0.17	0.6	0.00	0.17
SR 119 (Bakersfield)	4.28	Western Kern County	Core	0.07	0.3	0.2	0.00	0.30
Stockdale Highway	5.09	Urban Bakersfield	Satellite	0.2	1.02	13.1	0.13	1.15
Subtotal				0.42	1.63		0.14	1.77
Petcoke-related take over 20 years							**2.72**	
Product Delivery Alternate 2								
I-5 (north)	14	Antelope Plain/ Semitropic/Kern	Satellite	0.01 [1]	0.14	0.7	0.00	0.14
I-5 (south)	5.65	Western Kern County	Core	0.03 [1]	0.17	0.8	0.00	0.17
SR 119 (Bakersfield)	4.28	Western Kern County	Core	0.07	0.3	0.3	0.00	0.30

Table 5.2-12
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)
Stockdale Highway	5.09	Urban Bakersfield	Satellite	0.2	1.02	71.5	0.73	1.75
Subtotal				0.42	1.63		**0.73**	**2.36**
Petcoke-related take over 20 years							**14.65**	
Total Project-related take over 20 years							**between 13.96 and 28.93**	

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.

I-5 = Interstate 5
SR = State Route

Table 5.2-13
Project Proposed Avoidance and Mitigation Summary

Avoidance and Mitigation Measure	Name	Action	Timing	Documentation
BIO-1	Rare Plant Pre-Construction Survey	Rare plant survey(s) will be conducted within the construction limits and adjacent areas within 200 feet of the construction limits.	Early spring and through the course of the year	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-2	Rare Plant Avoidance	Rare plants will be avoided, to the greatest extent feasible.	not applicable	not applicable
BIO-3	Rare Plant Mitigation	For impacts to plant species that cannot be avoided, an appropriate area will be reseeded.	Seeds will be collected according to species; area will be monitored for 5 years	Annually through BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-4	Terrestrial Wildlife Pre-Construction Survey	Wildlife survey(s) will be conducted within the construction limits and adjacent areas within 200 feet of the construction limits.	Prior to ground disturbance	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-5	Site Clearance Prior to Ground Disturbance	Prior to initial site preparation, the entire site will be passively cleared of blunt-nosed leopard lizard.	March through April (dependent on weather), prior to ground disturbance	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-6	Predatory Bird Minimization Measures	Minimize the number and advantages birds will have near the Project Site and along the transmission line	Ongoing from the onset of construction	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-7	Worker Education Program	Worker education program will be implemented for all construction personnel, regular drivers, and operation personnel	Ongoing from the onset of construction	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)

Table 5.2-13
Project Proposed Avoidance and Mitigation Summary

Avoidance and Mitigation Measure	Name	Action	Timing	Documentation
BIO-8	Operations and Maintenance Activities	Training for operation and maintenance personnel	Ongoing from the onset of construction	
BIO-9	Bird Pre-Construction Surveys	Avian survey(s) will be conducted within the construction limits and adjacent areas within 200 feet of the construction limits. If listed species are detected, additional surveys will be conducted	Prior to ground disturbance	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-10	Bird Nesting Activity Surveys	Areas that will be attractive nest sites should be made "less appealing" and be regularly examined by a biologist	During the height of the breeding season, all work areas, laydown sites, and equipment should be checked three times a week	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-11	Bird Nest Protection	If eggs or young are in the nest, the nest will be protected	Once the young have fledged or the nest has failed, as determined by an approved biologist, the nest will be removed and normal actives will resume	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-12	Burrowing Owl Pre-Construction Surveys	The construction areas and adjacent areas within 500 feet of the work sites will be surveyed by an approved biologist for burrows that could be used by burrowing owl.	Prior to ground disturbance	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-13	Swainson's Hawk Avoidance and Minimization	To the greatest extent feasible, major ground disturbance would be scheduled to occur between August 1 and December 31.	Surveys and/or avoidance may be required between January 1 through August 1	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP

Table 5.2-13
Project Proposed Avoidance and Mitigation Summary

Avoidance and Mitigation Measure	Name	Action	Timing	Documentation
BIO-14	San Joaquin Kit Fox Mitigation	Dens will be examined and if vacant, excavated and collapsed.	Prior to ground disturbance	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-15	Small Mammal Mitigation	During the initial site preparation of the Project Site (BIO-6), the entire area will need to be cleared.	March to April, prior to ground disturbance	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-16	Ground Disturbance Monitoring for Terrestrial Wildlife	Approved biologists will be present when the top 18 inches of soil are initially disturbed at the Project Site and along linears.	During ground disturbance of the top 18 inches	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-17	Reporting to Agencies	A monthly BRMIMP report will be submitted to the CEC, CDFG, and USFWS.	Monthly from the onset of construction activities.	BIO-17: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)
BIO-18	Sensitive Habitat Mitigation	Permanent loss of habitat will be replaced at a ratio established with USFWS and CDFG.	Prior to ground disturbance.	Legal agreement in place prior to ground disturbance.
BIO-19	Wetland Protection Measures	Work within 100 feet of waters of the U.S. and/or water of the State will incorporate Best Management Practices for ensuring against fill and/or degradation of waters.	Concurrent with construction adjacent to wetland and/or water features	BIO-20: Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)

Table 5.2-14
BIO-22 Survey Periods and Frequencies

Survey Period	Survey Time	Survey Frequency	Proposed Action
January 1 to March 1	All day	Weekly	Identify old nests and potential competitors.
March 1 to Mar. 20	All day	Twice weekly	Assess hawk activity and territoriality.
March 20 to April 5	Sunrise to 10:00 16:00 to sunset	Twice weekly	Determine potential nesting territories and nest structures.
April 5 to April 20	Sunrise to 12:00 16:30 to sunset	Thrice weekly	Confirm pairs and nest structures.
April 20 to June 10	All day	Weekly	Tracking known nest sites only.
June 10 to July 30	Sunrise to 12:00 16:00 to sunset	Twice weekly	Confirm fledging and nesting success.
July 31 to December 31	n/a	None	Preferred construction window.

Table 5.2-15
Summary of LORS – Biological Resources

LORS	Administering Agency	Applicability	AFC Section
Federal			
Endangered Species Act of 1973 and implementing regulations, Title 16 United States Code (USC) §1531 *et seq*. (16 USC 1531 *et seq*.), Title 50 Code of Federal Regulations (CFR) §17.1 *et seq*. (50 CFR 17.1 *et seq*.)	U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service	Designates and protects federally threatened and endangered plant and animals and their critical habitat.	5.2.1.4, 5.2.2.3, and 5.2.2.4
Fish and Wildlife Coordinating Act, 16 USC 742 *et seq*., 16 USC 1531 *et seq*., and 50 CFR 17.	USFWS	The Fish and Wildlife Coordinating Act requires coordination with USFWS for federal actions that would result in the control or modification of a natural stream or body of water.	5.2.1.4 and 5.2.2.3
Section 10(a)(1)(A) of the FESA	USFWS	Requires a permit to "take" threatened or endangered species during lawful project activities. If there is no federal nexus for the project, a Habitat Conservation Plan (HCP) may be required.	5.2.1.4 and 5.2.2.3
Section 404 of the Clean Water Act of 1977 (33 USC 1251 *et seq*., 33 CFR §§ 320 and 323)	U.S. Army Corps of Engineers (USACE)	Gives USACE authority to regulate discharge of dredge or fill material into Waters of the U.S., including wetlands	5.2.1.3 and 5.2.2.1
Section 401 of the Clean Water Act of 1977	Regional Water Quality Control Board	Requires applicant to conduct water quality impact analysis for the project when using 404 permits and for discharge to waterways.	5.2.1.3, 5.2.2.1, and 5.2.2.2
Migratory Bird Treaty Act 16 USC §§703-711	USFWS	Prohibits the non-permitted "take" of native migratory birds, their nests, or eggs.	5.2.2.3 and 5.2.4
State			
California Endangered Species Act of 1984, Fish and Game Code, §2050 through §2098	California Department of Fish and Game (CDFG)	Protects California's endangered and threatened plant and animal species.	5.2.1.4 and 5.2.2.3
Title 14, California Code of Regulations (CCR) §§670.2 and 670.5	CDFG	Lists plant and animals of California declared to be threatened or endangered.	5.2.1.4 and 5.2.2.3

Table 5.2-15
Summary of LORS – Biological Resources

LORS	Administering Agency	Applicability	AFC Section
Fish and Game Code Fully Protected Species §3511: Fully Protected Birds §4700: Fully Protected Mammals §5050: Fully Protected Reptiles and Amphibians §5515: Fully Protected Fishes	CDFG	Prohibits the taking of listed plants and animals that are Fully Protected in California.	5.2.1.4 and 5.2.2.3
Fish and Game Code, §1930 Significant Natural Areas	CDFG	Identifies and protects Significant Natural Areas of California.	5.2.1
Fish and Game Code, §1580, Designated Ecological Reserves	CDFG	Identifies Designated Ecological Reserves of California.	5.2.1
Fish and Game Code, §1600, Streambed Alteration Agreement	CDFG	Reviews projects for impacts on waterways, including impacts to vegetation and wildlife from sediment, diversions, and other disturbances.	5.2.1.3, 5.2.2.1, and 5.2.2.2
Native Plant Protection Act of 1977, Fish and Game Code, §1900 *et seq.*	CDFG	Designates state rare and endangered plants and provides specific protection measures for identified populations.	5.2.1.4, 5.2.2.3, and 5.2.4
CDFG Policies and Guidelines, Wetlands Resources Policy	CDFG	Provides for the protection, preservation, restoration, enhancement, and expansion of wetland habitats in California, including vernal pools	5.2.1.3, 5.2.2.1, and 5.2.2.2
Public Resources Code, §§25500 & 25527	CDFG, USFWS	Prohibits siting of facilities in certain areas of critical concern for biological resource, such as ecological preserves, refuges, etc.	5.2.1.1, 5.2.1.2, 5.2.1.4, and 5.2.2.3
Title 20 CCR §§1702 (q) and (v)	CDFG, USFWS	Protects “areas of critical concern” and “species of special concern” identified by local, state, or federal resource agencies within the project area, including the California Native Plant Society.	5.2.1.4 and 5.2.2.3
Title 14 CCR Section 15000 *et seq.*	CDFG, USFWS	Describes the types and extent of information required to evaluate the effects of a proposed project on the biological resources of a project site.	5.2

Table 5.2-15
Summary of LORS – Biological Resources

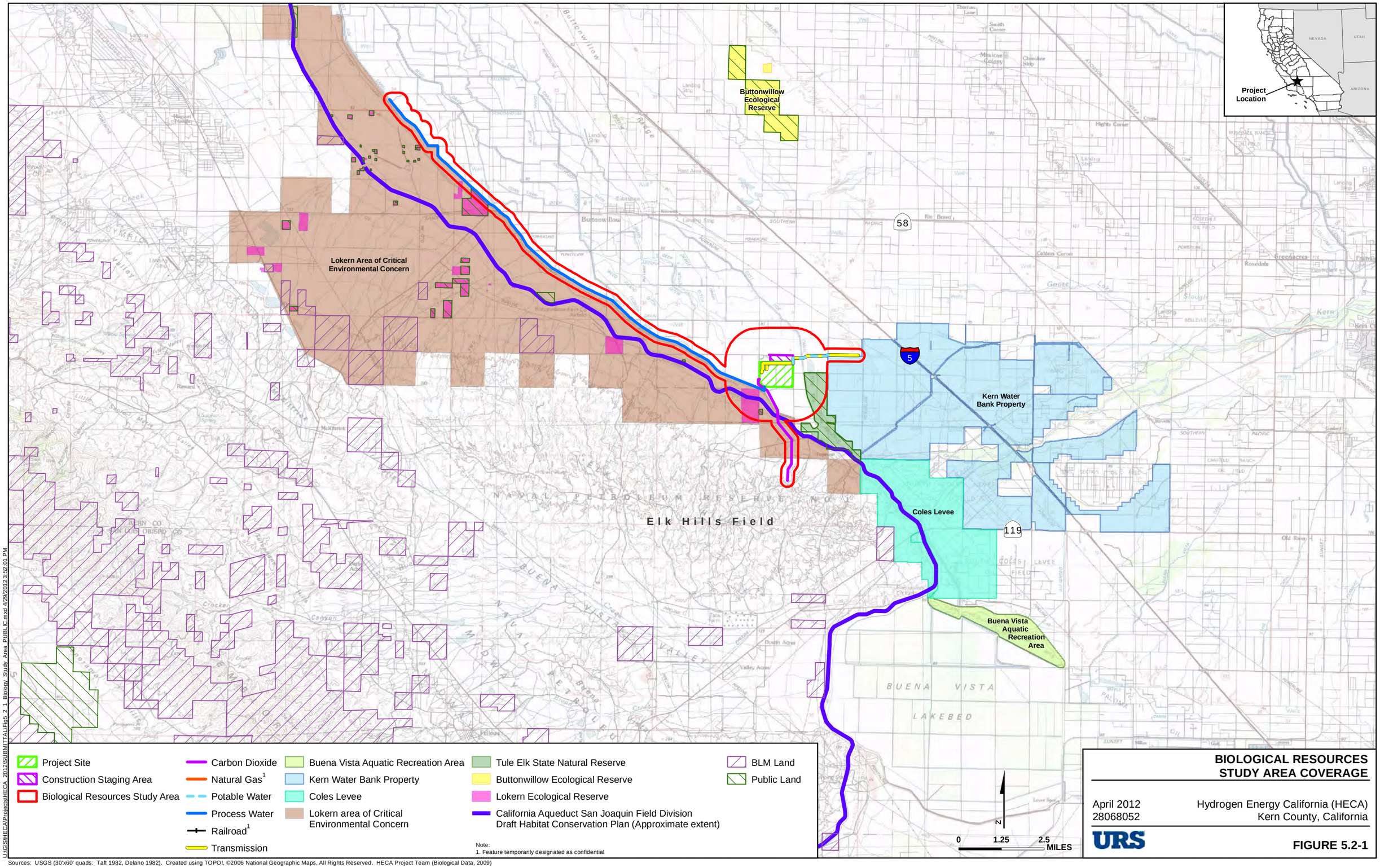
LORS	Administering Agency	Applicability	AFC Section
California Desert Native Plant Act, Food and Agriculture Code §80001 through §80006	California Agricultural Commission	Protects California desert native plants from unlawful harvesting on both privately and public owned lands.	5.2.1.4 and 5.2.2.3
Local			
Kern County General Plan	Kern County	Provides guidance on the types of development activity and allowable uses for those areas within the county limits.	5.2.1 and 5.2.2

Table 5.2-16
Agency Contacts

Issue	Agency	Contact/Title	Telephone	E-mail
Initial Section 7 Consultation/ Survey protocols	U.S. Fish and Wildlife Service	Bill Pelle and Thomas Leeman, San Joaquin Valley Branch	(916) 414-6600	William_Pelle@fws.gov Thomas_Leeman@fws.gov
Occidental of Elk Hills HCP/ Survey protocols	California Department of Fish and Game	Annee Ferranti and Julie Vance, Central Region	(559) 243-4014 x 227 (Ferranti) x 222 (Vance)	AFERRANTI@dfg.ca.gov JVANCE@dfg.ca.gov
Survey protocols	California Energy Commission	Rick York	(916) 654-3945	ryork@energy.state.ca.us

Table 5.2-17
Biological Permits Required and Scheduled Timing

Responsible Agency	Permit/Approval	Schedule
U.S. Fish and Wildlife Service	Section 7 biological opinion for incidental take of federally listed species	Fall 2012
California Department of Fish and Game	2081 Incidental Take Permit	Fall 2012
California Department of Fish and Game	Streambed Alteration Agreement	Fall 2012 (if required)
Regional Water Quality Control Board	Section 401 Water Quality Certification	Fall 2012



BIOLOGICAL RESOURCES STUDY AREA COVERAGE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-1

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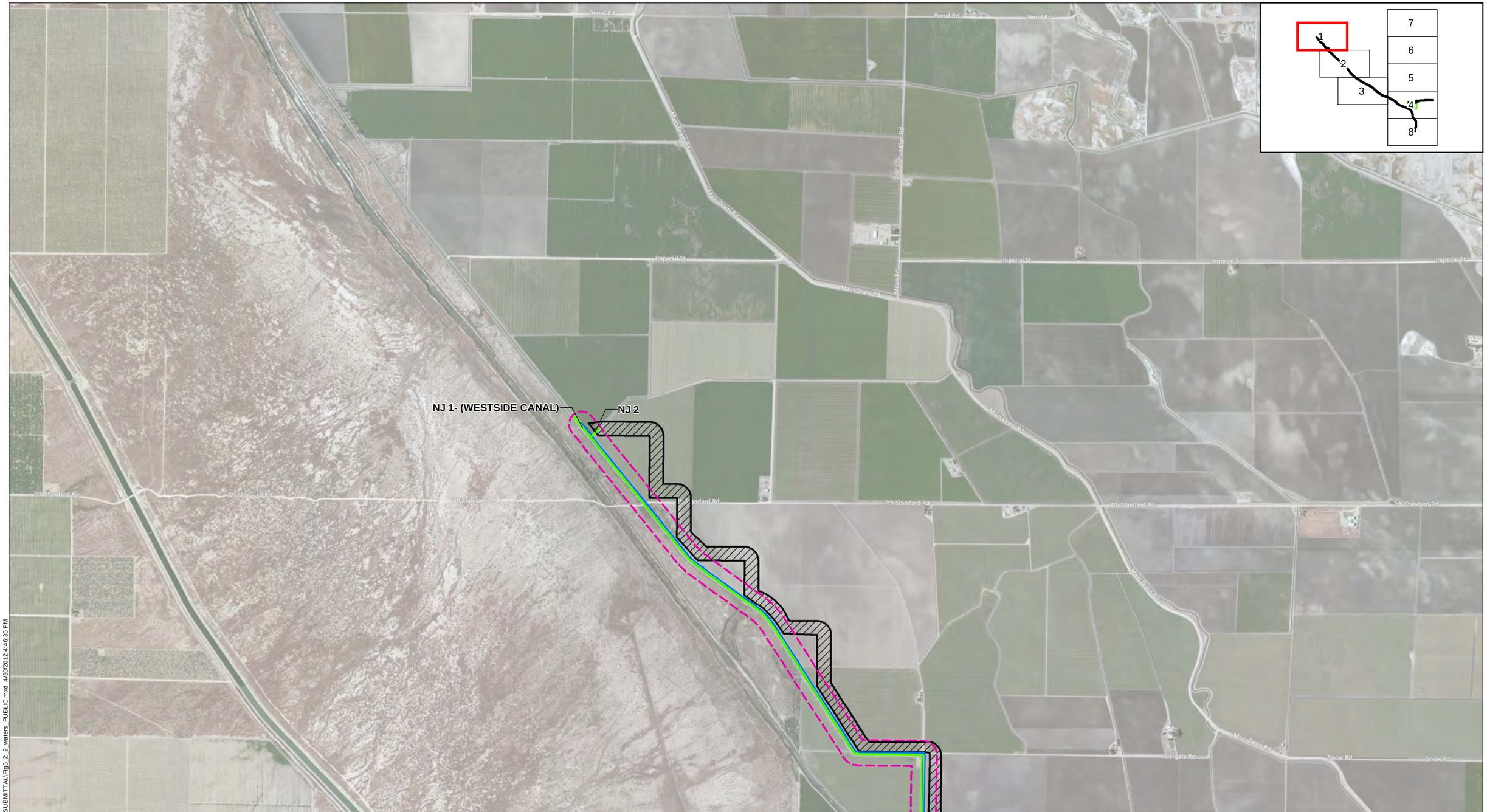
Sources: USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. HECA Project Team (Biological Data, 2009)



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
250-foot Buffer from Disturbance Area
HDD Entry/Exit Pits

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Waters
Non-jurisdictional waters of the U.S. (NJ)
Other waters of the U.S. (WUS)
Wetland (WL)

Note:
1. Feature temporarily designated as confidential

N

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Source: Aerial Imagery, Bing Maps, 2009.

WATERS OF THE U.S.

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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 5.2-2 (1)

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NJ 21
NJ 1- (WESTSIDE CANAL)
NJ 15
NJ 65
NJ 64
NJ 14
Main Drain Rd
Delfern Rd
Gem Camp Rd
Canal Rd
Sullivan Rd
Palomas Ave
Williams Rd
Watkins Rd
Elk Grove Rd
Buerkle Rd
Jeppi Rd
McKittrick Hwy
Lokern Rd
Lokern
58

1 2 3 4 5 6 7 8

Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
250-foot Buffer from Disturbance Area
HDD Entry/Exit Pits

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Waters
Non-jurisdictional waters of the U.S. (NJ)
Other waters of the U.S. (WUS)
Wetland (WL)

Note:
1. Feature temporarily designated as confidential

N
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Source: Aerial Imagery, Bing Maps, 2009.

WATERS OF THE U.S.

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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 5.2-2 (2)

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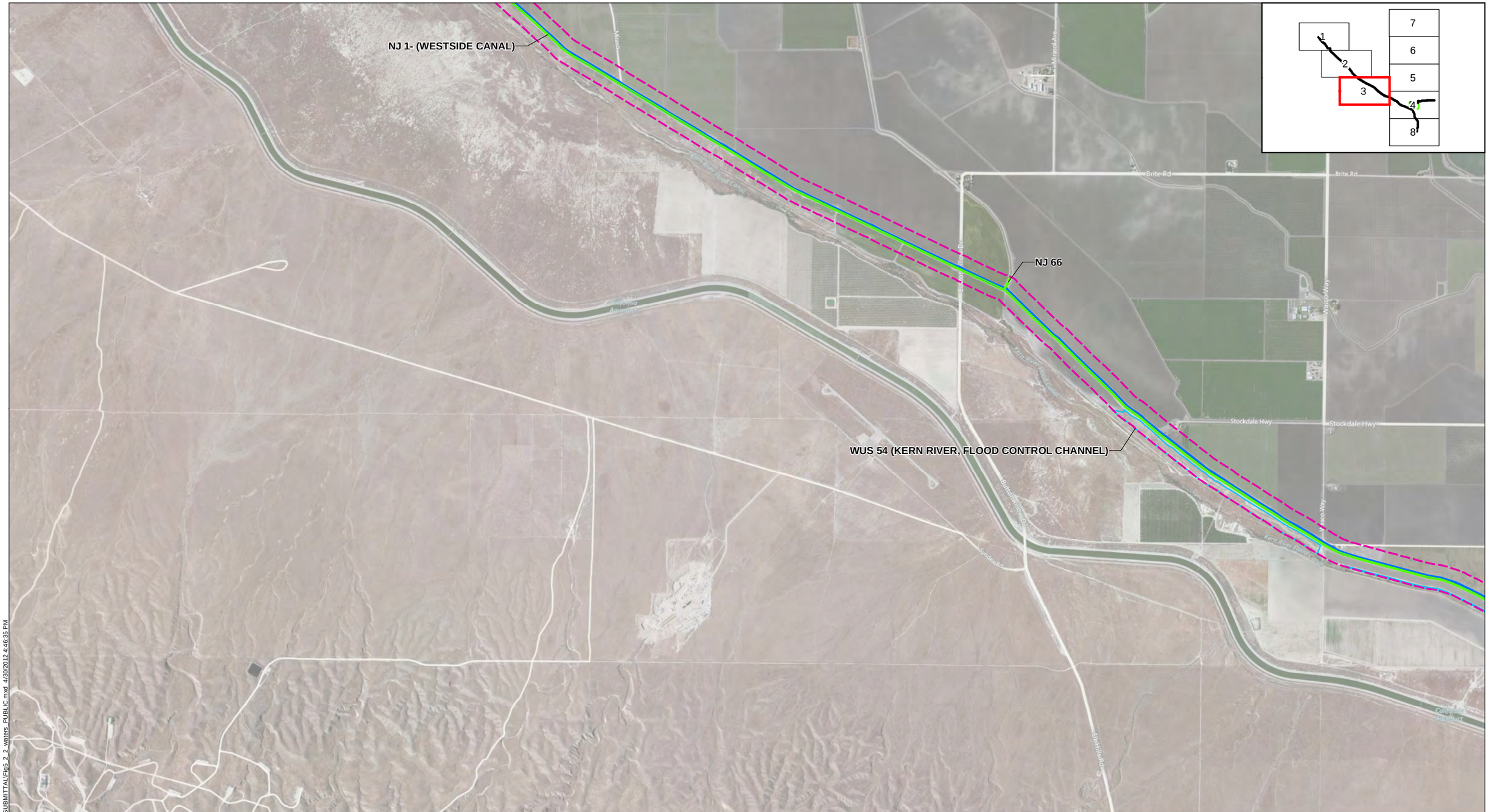

Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
250-foot Buffer from Disturbance Area
HDD Entry/Exit Pits

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Waters
Non-jurisdictional waters of the U.S. (NJ)
Other waters of the U.S. (WUS)
Wetland (WL)

Note:
1. Feature temporarily designated as confidential

N

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Source: Aerial Imagery, Bing Maps, 2009.

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Hydrogen Energy California (HECA)
Kern County, California

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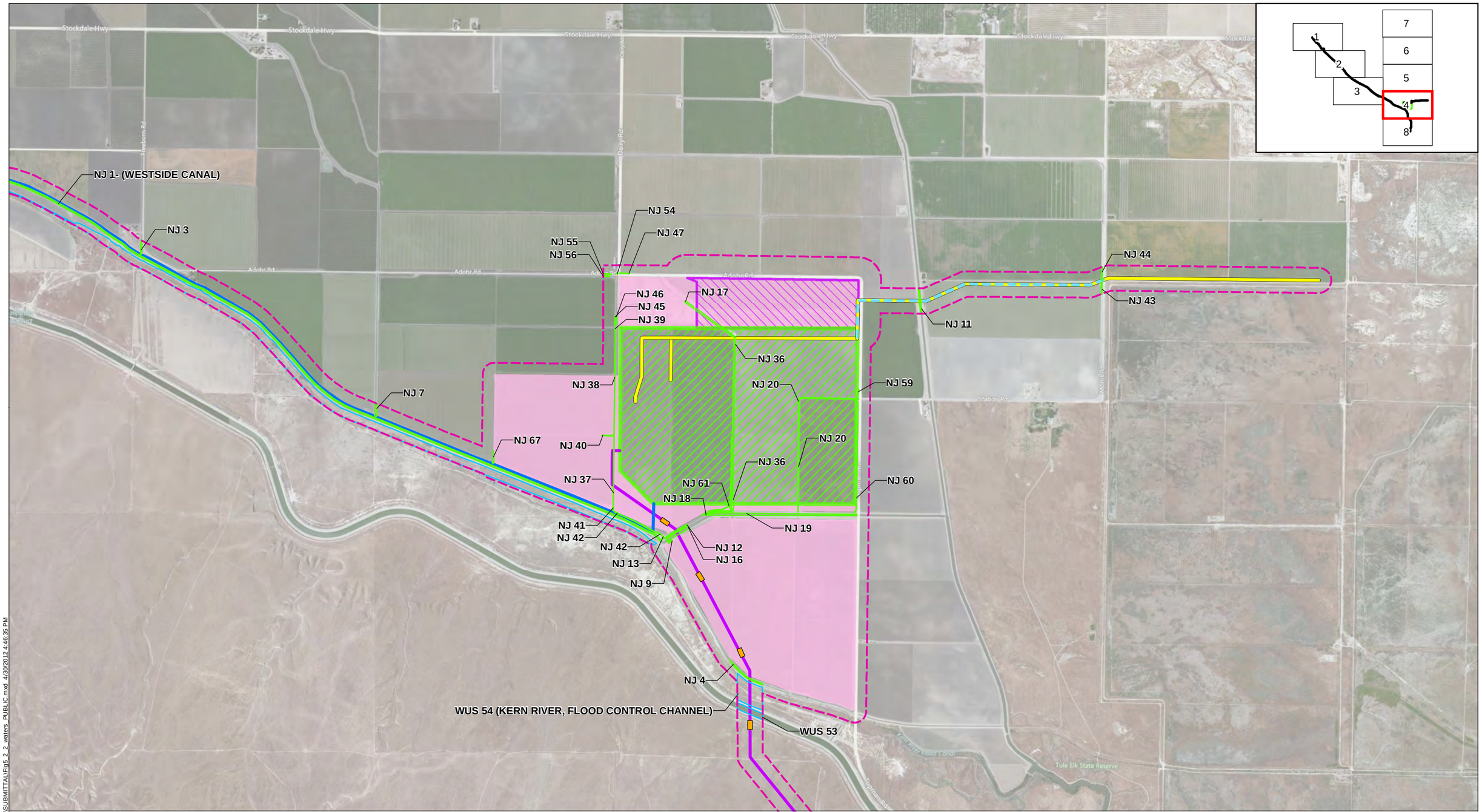
FIGURE 5.2-2 (3)



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
250-foot Buffer from Disturbance Area
HDD Entry/Exit Pits

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Waters
Non-jurisdictional waters of the U.S. (NJ)
Other waters of the U.S. (WUS)
Wetland (WL)

Note:
1. Feature temporarily designated as confidential

N
0 2,000 4,000 FEET

Source: Aerial Imagery, Bing Maps, 2009.

WATERS OF THE U.S.

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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 5.2-2 (4)

Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
250-foot Buffer from Disturbance Area
HDD Entry/Exit Pits

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Waters
Non-jurisdictional waters of the U.S. (NJ)
Other waters of the U.S. (WUS)
Wetland (WL)

Note:
1. Feature temporarily designated as confidential

N

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Source: Aerial Imagery, Bing Maps, 2009.

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WATERS OF THE U.S.

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Hydrogen Energy California (HECA)
Kern County, California

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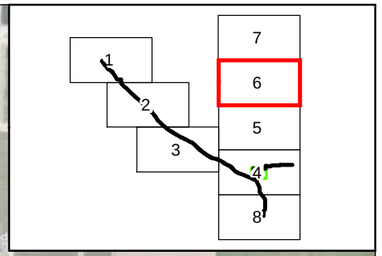
FIGURE 5.2-2 (5)



- Project Site
- Construction Staging Area
- Controlled Area
- BVWSD Well Field
- 250-foot Buffer from Disturbance Area
- HDD Entry/Exit Pits
- Carbon Dioxide
- Natural Gas[1]
- Potable Water
- Process Water
- Railroad[1]
- Transmission

Waters

- Non-jurisdictional waters of the U.S. (NJ)
- Other waters of the U.S. (WUS)
- Wetland (WL)

Note:
1. Feature temporarily designated as confidential

N

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Source: Aerial Imagery, Bing Maps, 2009.

WATERS OF THE U.S.

April 2012
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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 5.2-2 (6)

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Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
250-foot Buffer from Disturbance Area
HDD Entry/Exit Pits

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Waters
Non-jurisdictional waters of the U.S. (NJ)
Other waters of the U.S. (WUS)
Wetland (WL)

Note:
1. Feature temporarily designated as confidential

N

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Source: Aerial Imagery, Bing Maps, 2009.

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WATERS OF THE U.S.

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

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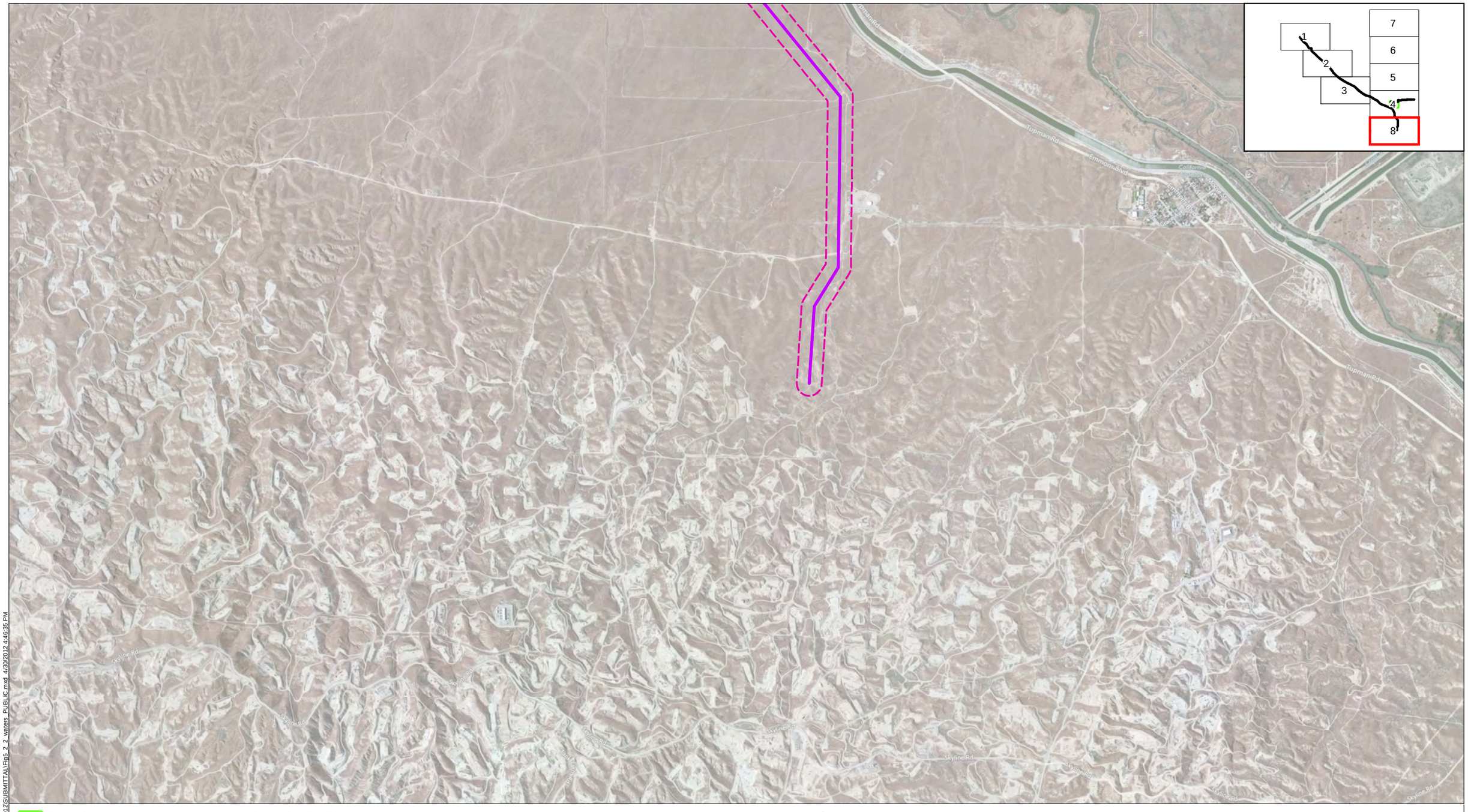
FIGURE 5.2-2 (7)



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field
250-foot Buffer from Disturbance Area
HDD Entry/Exit Pits

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Waters
Non-jurisdictional waters of the U.S. (NJ)
Other waters of the U.S. (WUS)
Wetland (WL)

Note:
1. Feature temporarily designated as confidential

N

0 2,000 4,000 FEET

Source: Aerial Imagery, Bing Maps, 2009.

WATERS OF THE U.S.

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 5.2-2 (8)

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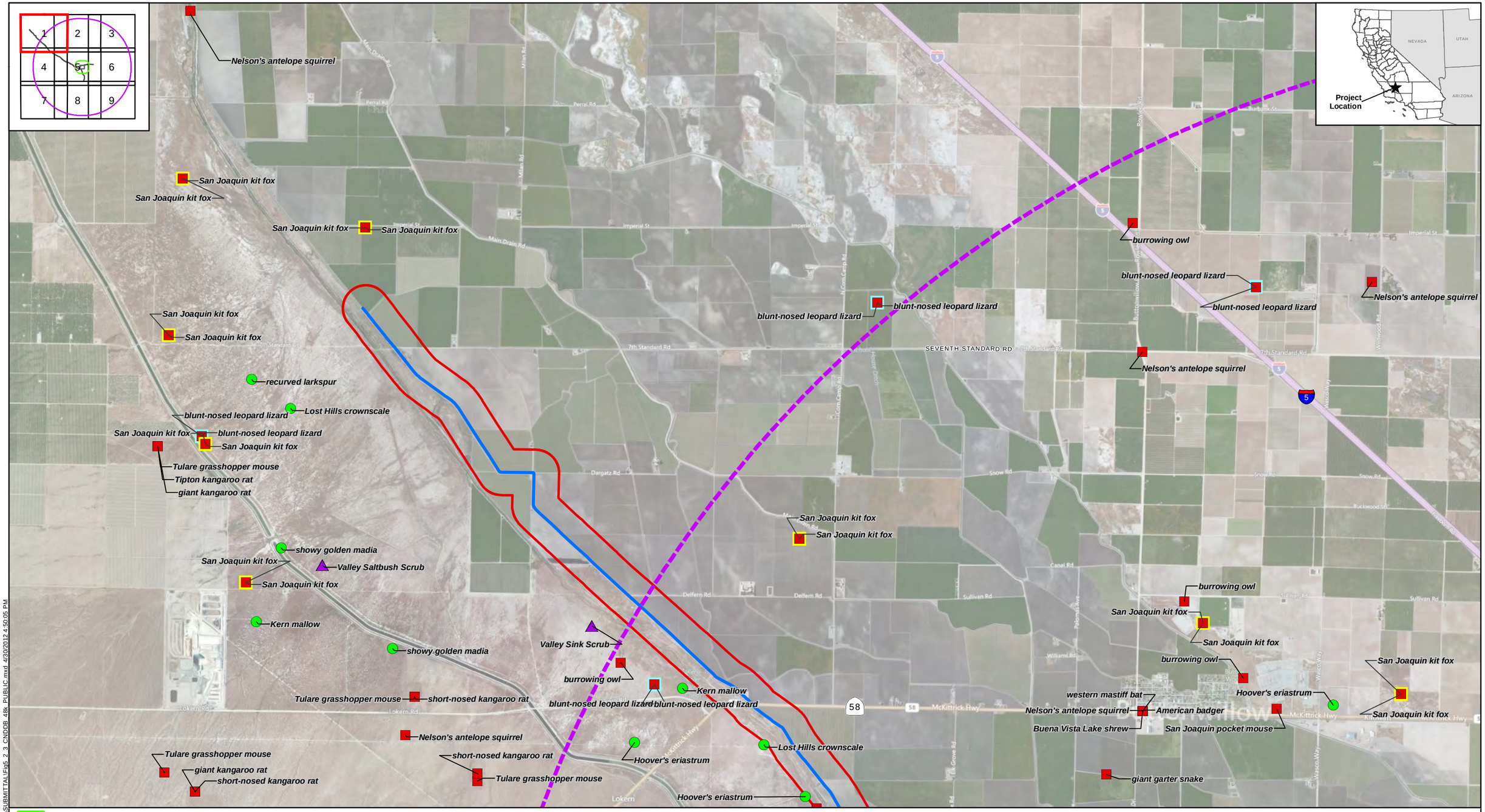

Project Site
Construction Staging Area
1-Mile Radius from Project Site
10-Mile Radius from Project Site
1,000-Foot Radius from Project Site

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Transmission
Railroad[1]

CNDDB Species - March 2012
blunt-nosed leopard lizard
San Joaquin kit fox
oil neststraw

All Other Plants
All Other Animals
Terrestrial Communities

Note: 1. Feature temporarily designated as confidential

N

0 2,000 4,000 FEET

Sources: Aerial imagery, Bing Maps, 2010; California Natural Diversity Database, January 2012.

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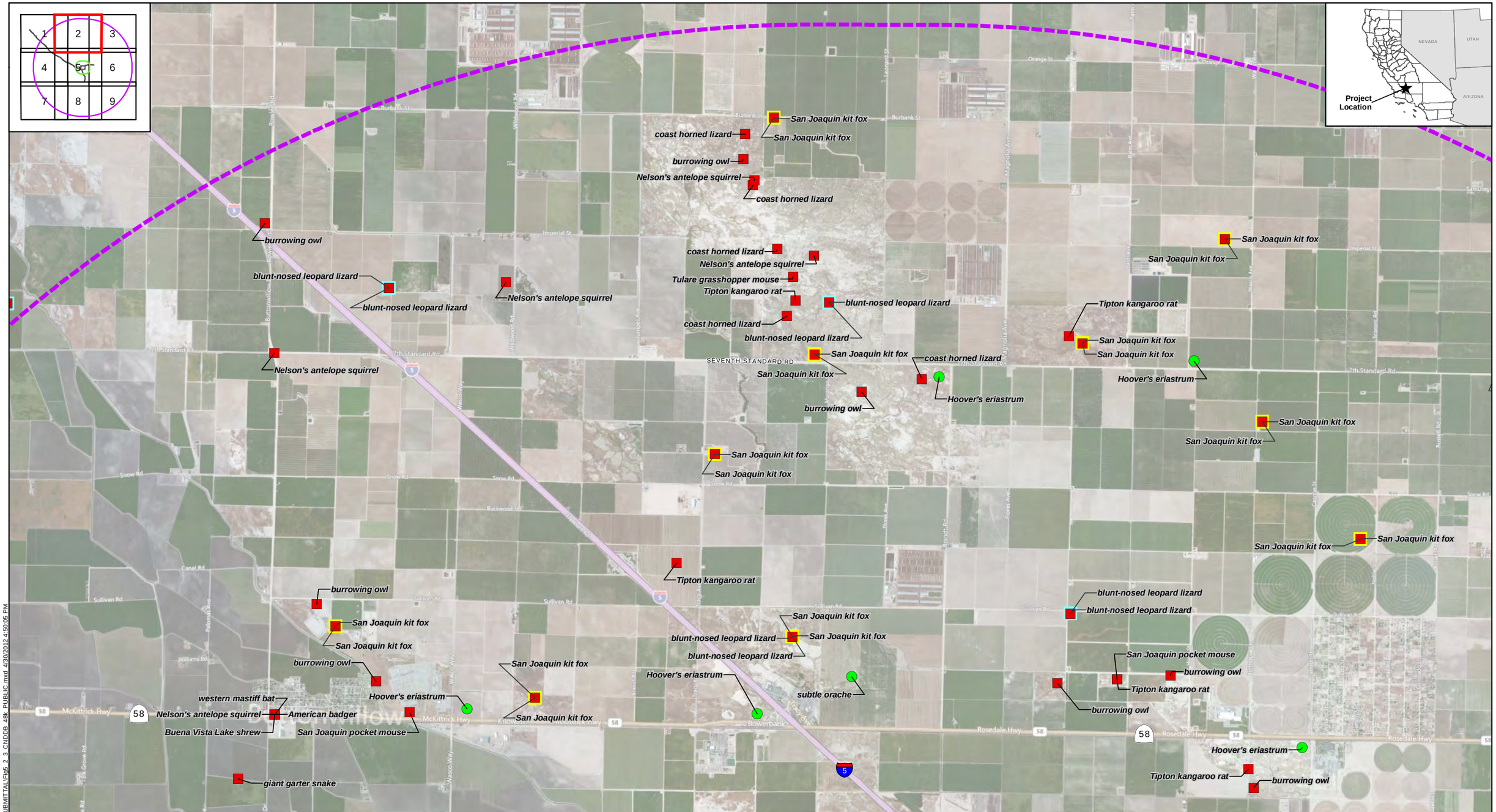
CNDDB SENSITIVE SPECIES 1:48,000-SCALE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-3 - SHEET 1



Project Site
Construction Staging Area
1-Mile Radius from Project Site
10-Mile Radius from Project Site
1,000-Foot Radius from Project Site

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Transmission
Railroad[1]

CNDDB Species - March 2012
blunt-nosed leopard lizard
San Joaquin kit fox
oil neststraw

All Other Plants
All Other Animals
Terrestrial Communities

Note: 1. Feature temporarily designated as confidential

N
0 2,000 4,000 FEET

Sources: Aerial imagery, Bing Maps, 2010; California Natural Diversity Database, January 2012.

CNDDB SENSITIVE SPECIES 1:48,000-SCALE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-3 - SHEET 2

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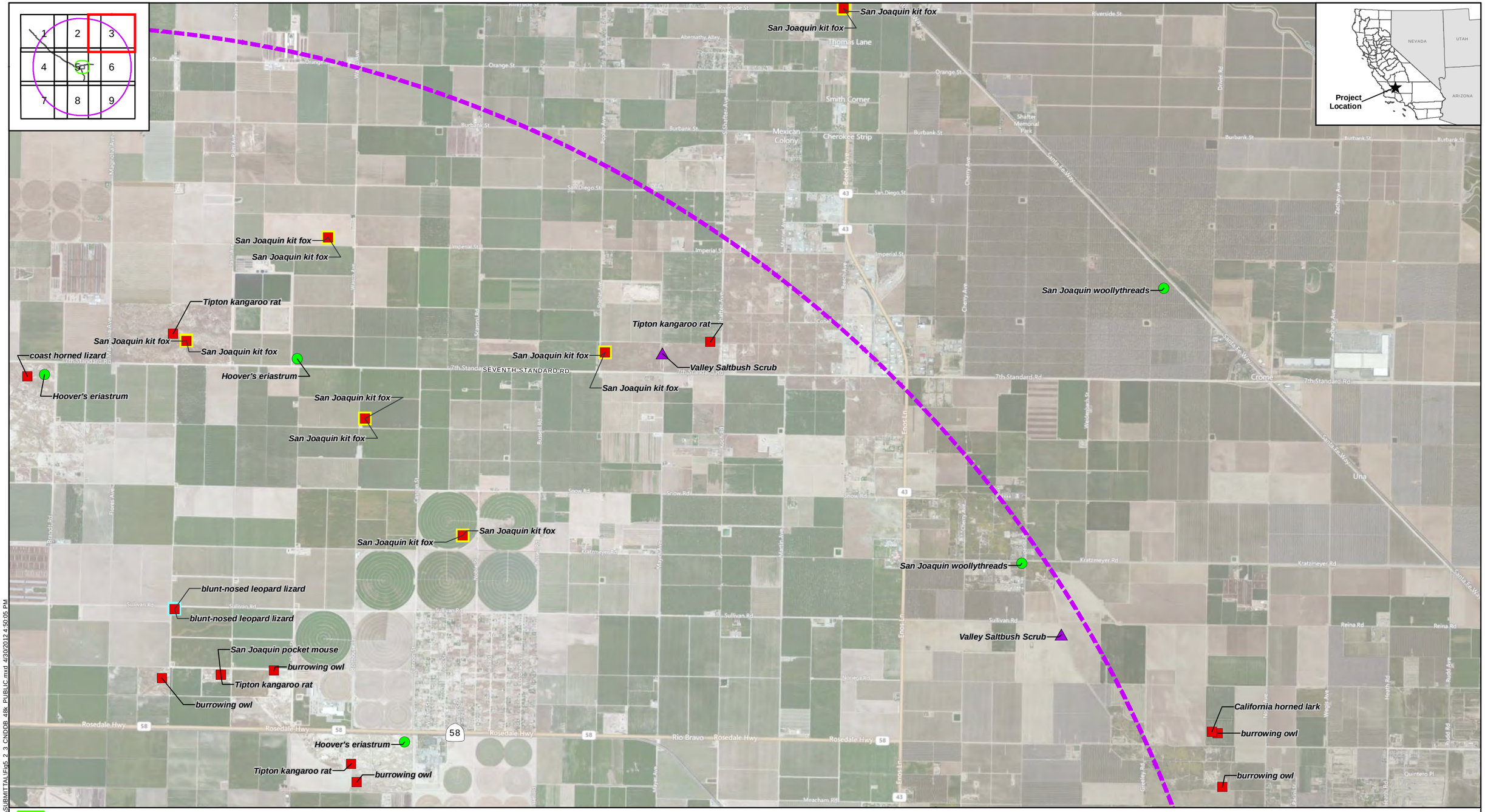


Project Site
Construction Staging Area
1-Mile Radius from Project Site
10-Mile Radius from Project Site
1,000-Foot Radius from Project Site

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Transmission
Railroad[1]

CNDDB Species - March 2012
blunt-nosed leopard lizard
San Joaquin kit fox
oil neststraw

All Other Plants
All Other Animals
Terrestrial Communities

Note: 1. Feature temporarily designated as confidential

N
0 2,000 4,000 FEET

Sources: Aerial imagery, Bing Maps, 2010; California Natural Diversity Database, January 2012.

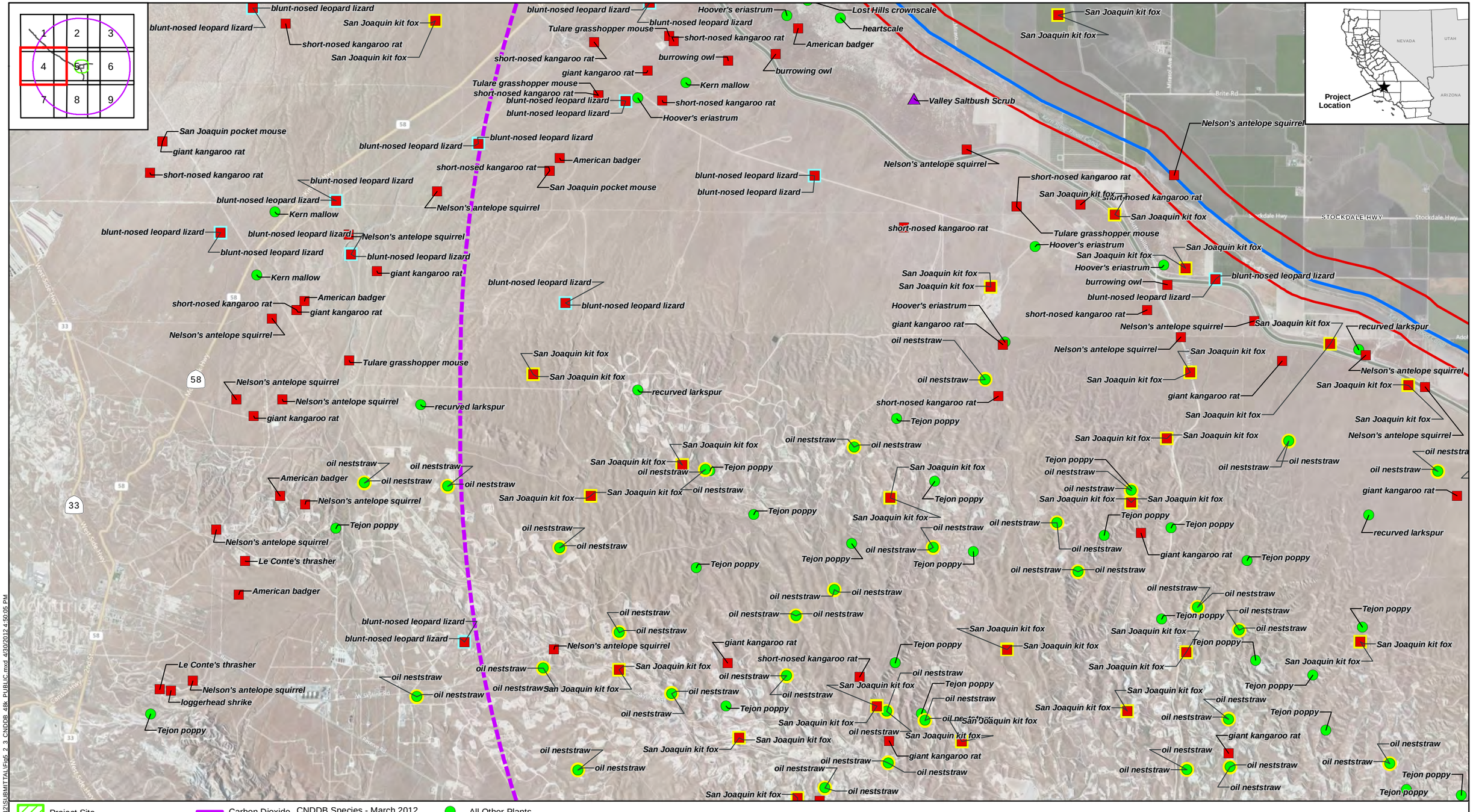
CNDDB SENSITIVE SPECIES 1:48,000-SCALE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-3 - SHEET 3



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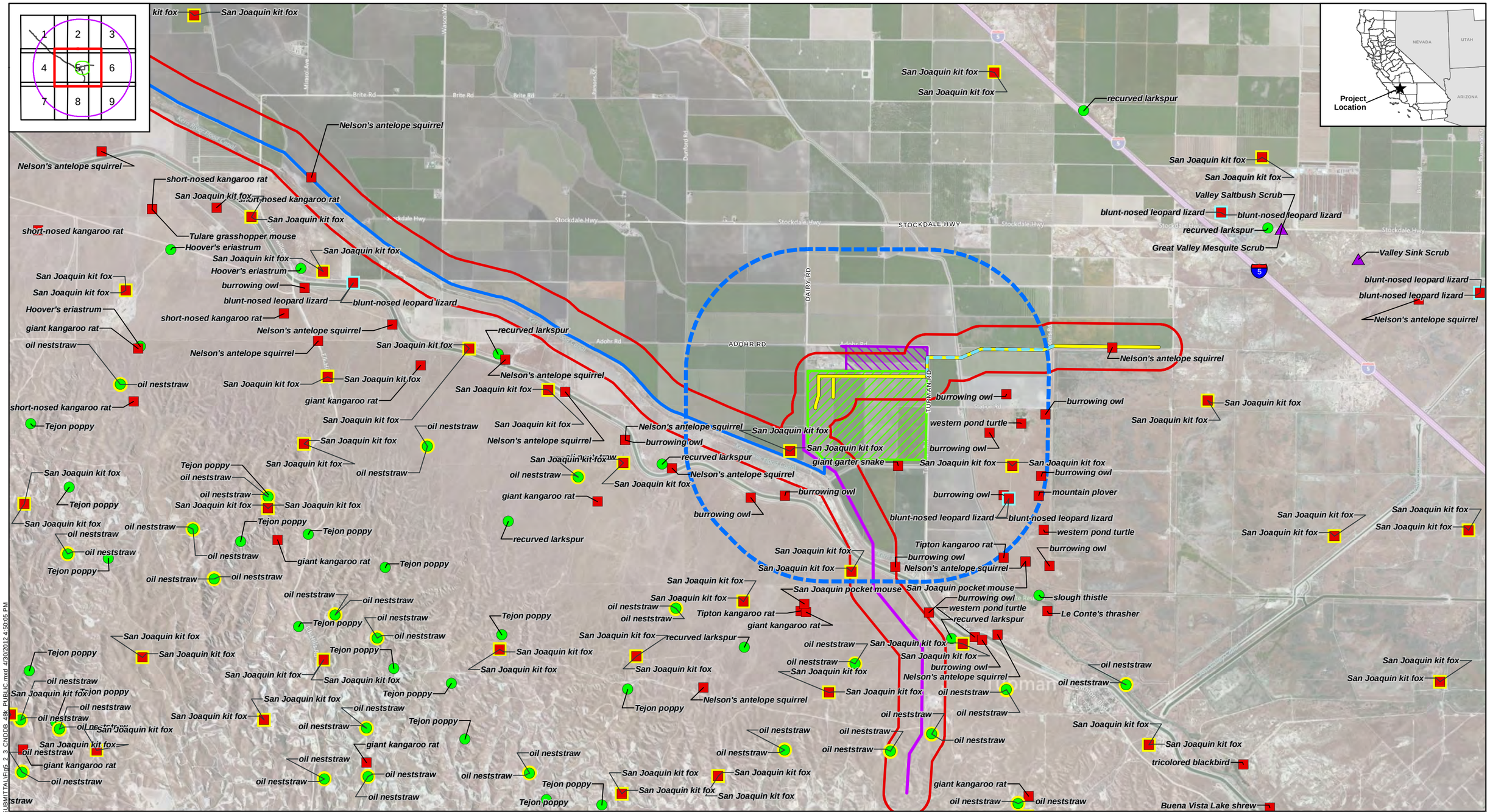

Sources: Aerial imagery, Bing Maps, 2010; California Natural Diversity Database, January 2012.

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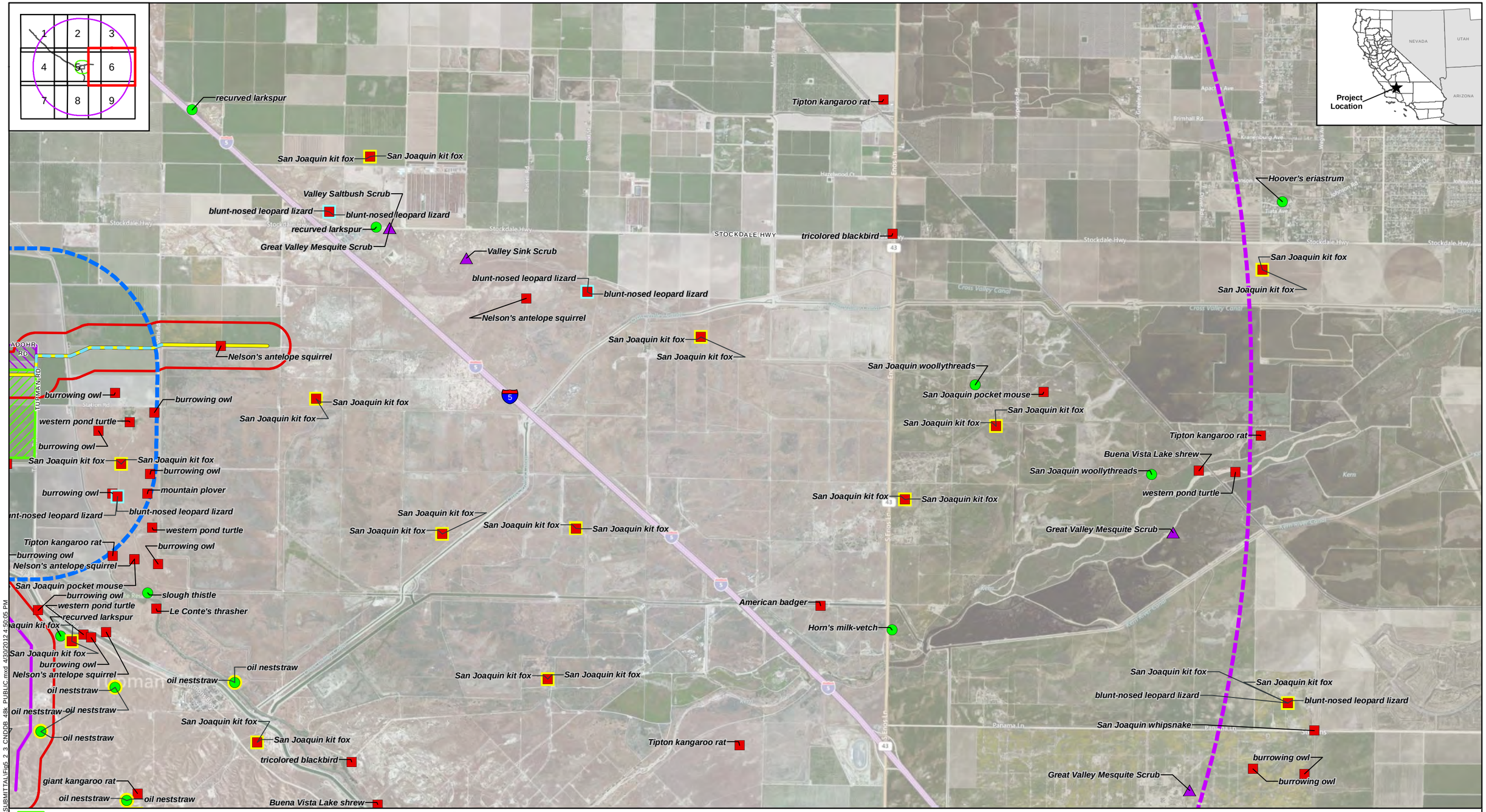
CNDDB SENSITIVE SPECIES 1:48,000-SCALE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-3 - SHEET 5



Project Site
Construction Staging Area
1-Mile Radius from Project Site
10-Mile Radius from Project Site
1,000-Foot Radius from Project Site

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Transmission
Railroad[1]

CNDDB Species - March 2012
blunt-nosed leopard lizard
San Joaquin kit fox
oil neststraw

All Other Plants
All Other Animals
Terrestrial Communities

Note: 1. Feature temporarily designated as confidential

N
0 2,000 4,000 FEET

Sources: Aerial imagery, Bing Maps, 2010; California Natural Diversity Database, January 2012.

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CNDDB SENSITIVE SPECIES 1:48,000-SCALE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

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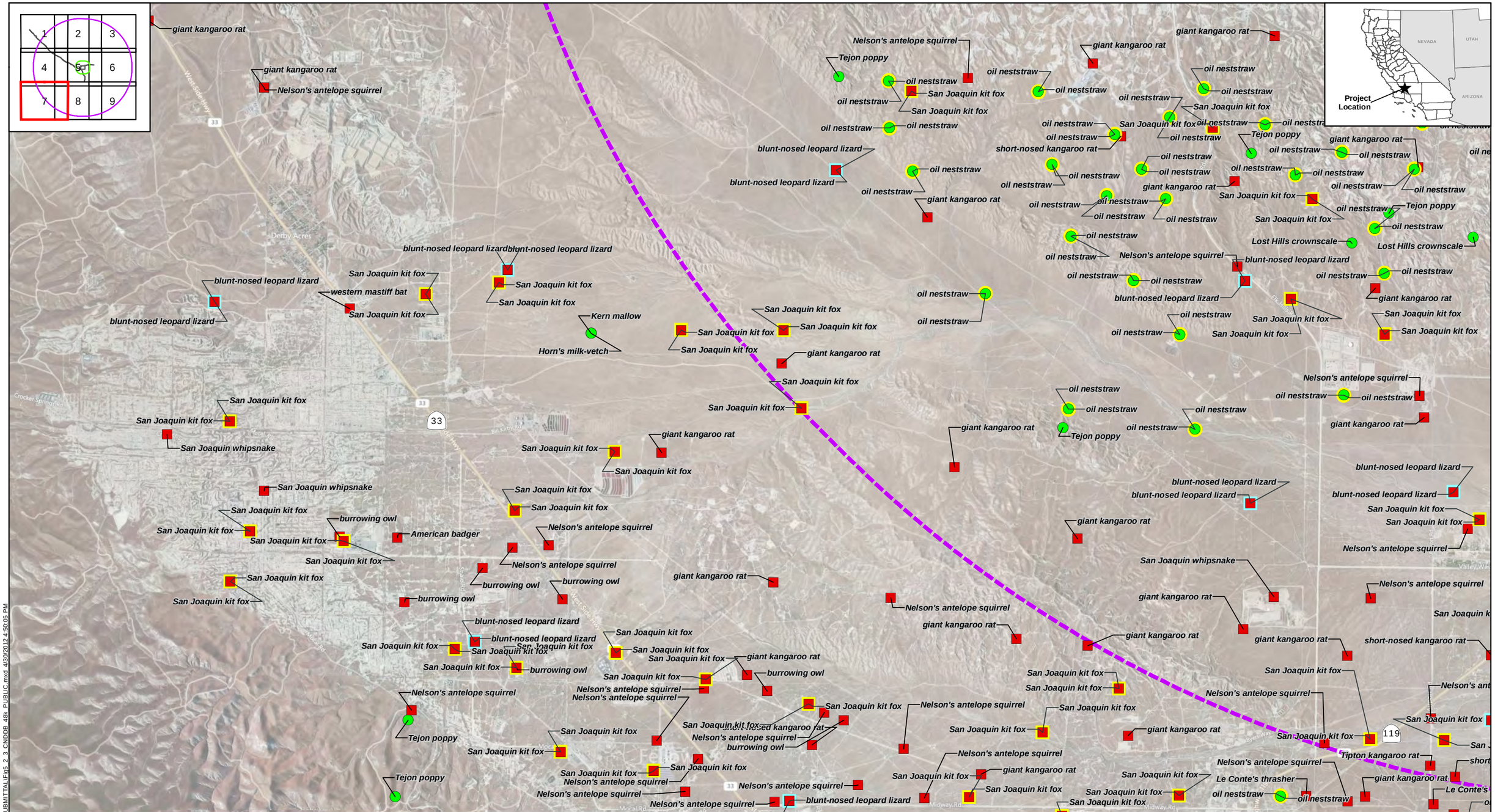
FIGURE 5.2-3 - SHEET 6



Project Site
Construction Staging Area
1-Mile Radius from Project Site
10-Mile Radius from Project Site
1,000-Foot Radius from Project Site

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Transmission
Railroad[1]

CNDDB Species - March 2012
blunt-nosed leopard lizard
San Joaquin kit fox
oil neststraw

All Other Plants
All Other Animals
Terrestrial Communities

Note: 1. Feature temporarily designated as confidential

N
0 2,000 4,000 FEET

Sources: Aerial imagery, Bing Maps, 2010; California Natural Diversity Database, January 2012.

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CNDDB SENSITIVE SPECIES 1:48,000-SCALE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

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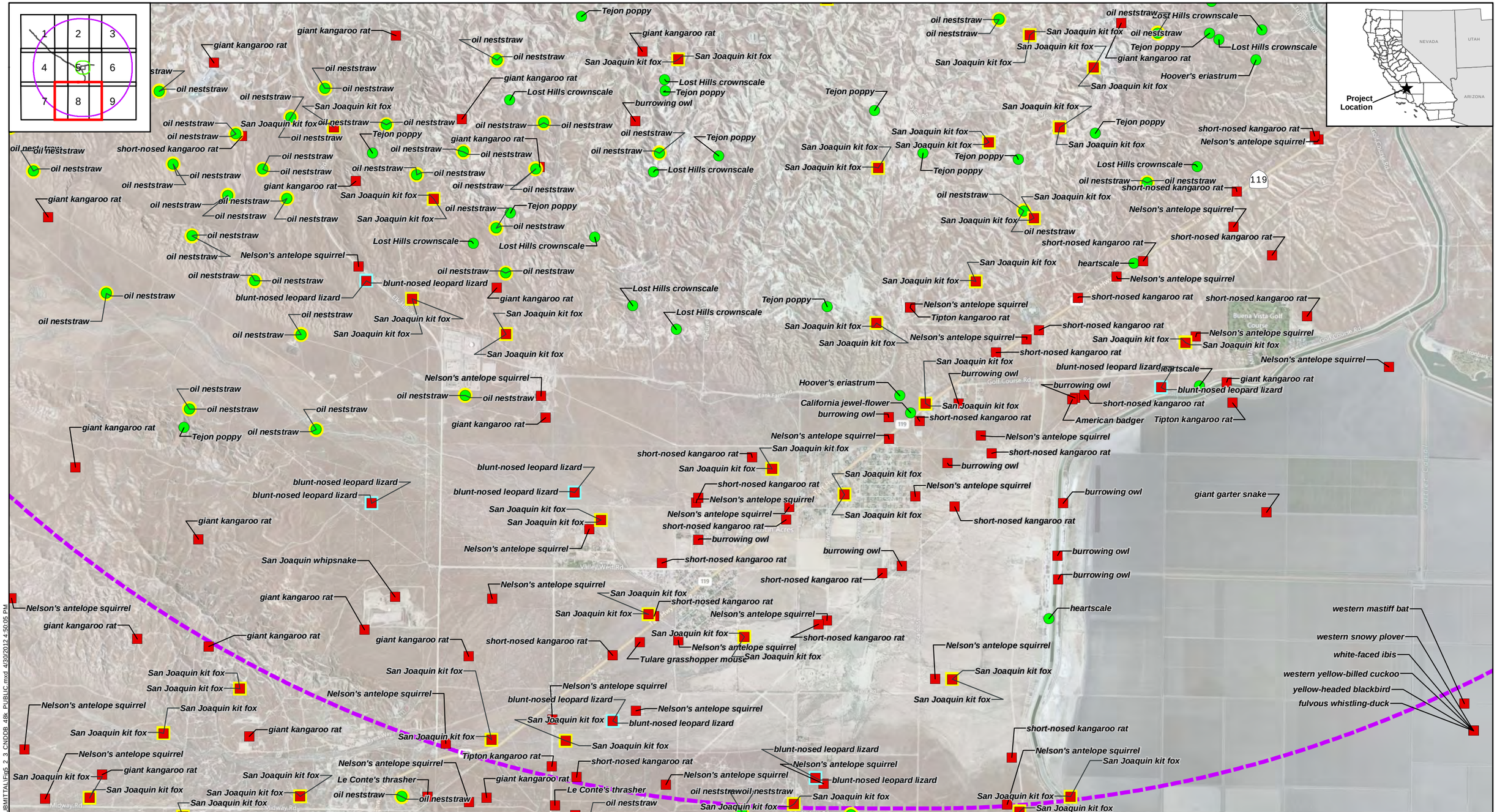
FIGURE 5.2-3 - SHEET 7



Sources: Aerial imagery, Bing Maps, 2010; California Natural Diversity Database, January 2012.

CNDDB SENSITIVE SPECIES 1:48,000-SCALE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 5.2-3 - SHEET 8

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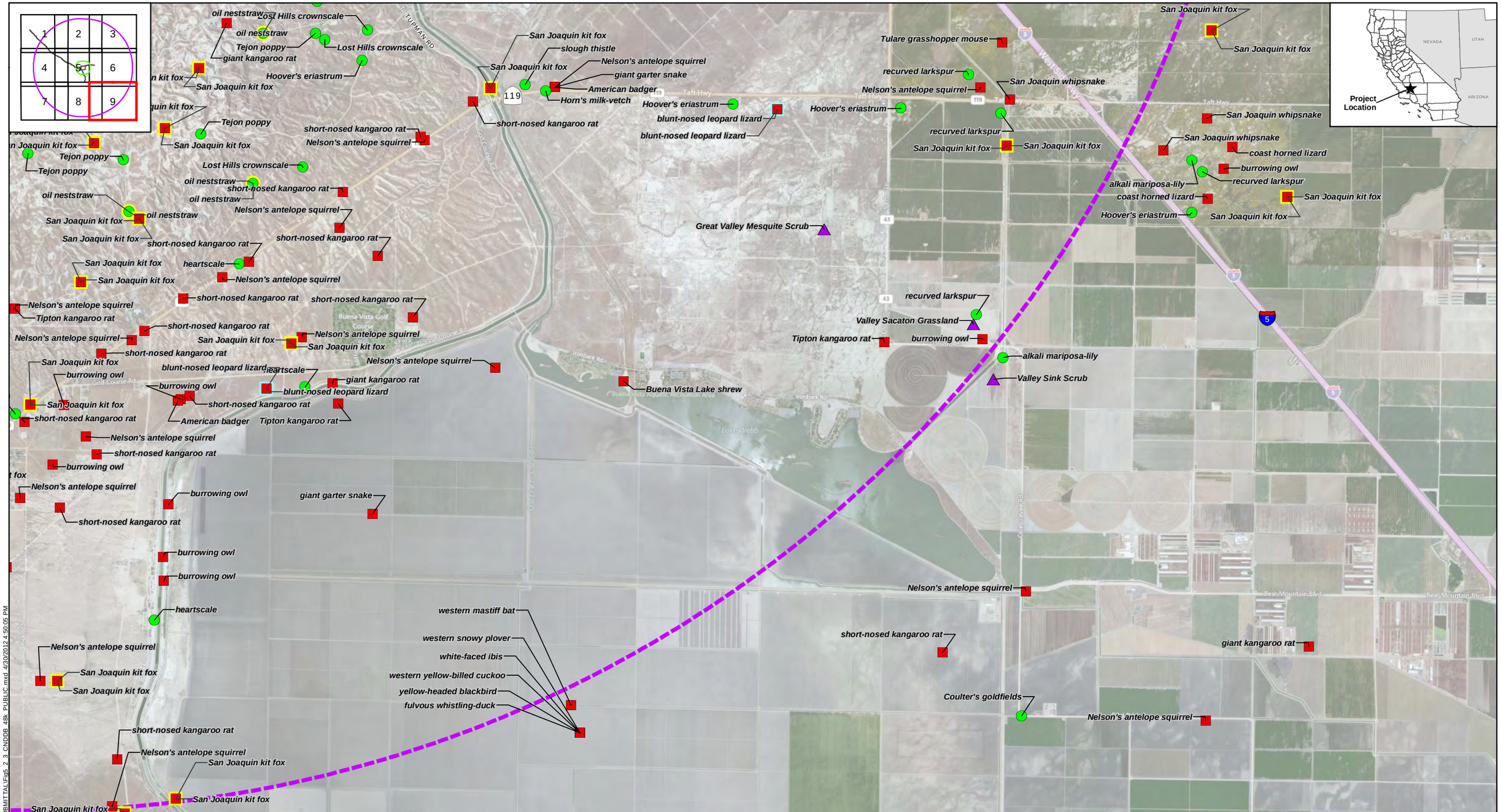

Project Site
Construction Staging Area
1-Mile Radius from Project Site
10-Mile Radius from Project Site
1,000-Foot Radius from Project Site

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Transmission
Railroad[1]

CNDDB Species - March 2012
blunt-nosed leopard lizard
San Joaquin kit fox
oil neststraw

All Other Plants
All Other Animals
Terrestrial Communities

Note: 1. Feature temporarily designated as confidential

N

0 2,000 4,000 FEET

Sources: Aerial imagery, Bing Maps, 2010; California Natural Diversity Database, January 2012.

CNDDB SENSITIVE SPECIES 1:48,000-SCALE

April 2012
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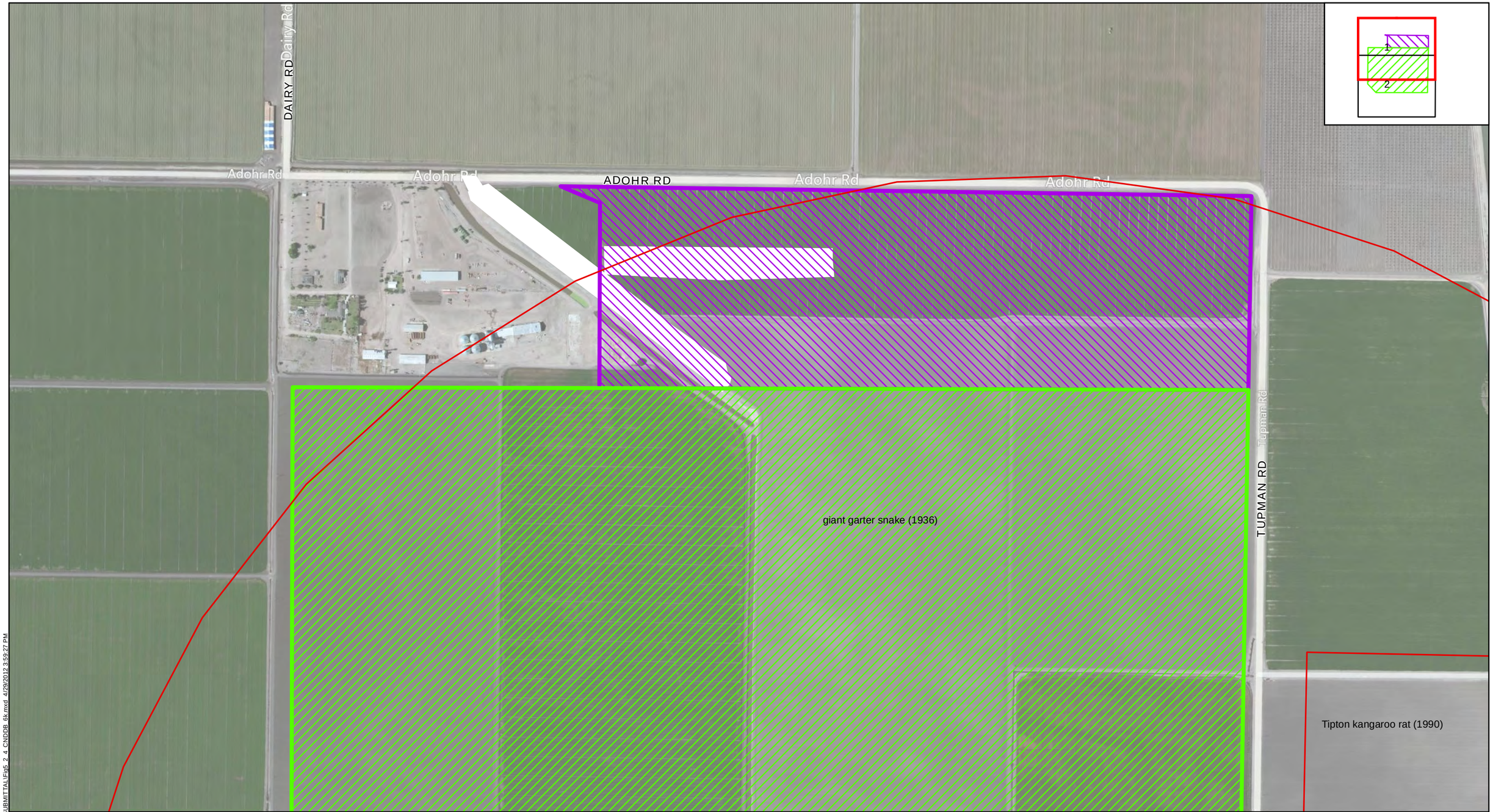
Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-3 - SHEET 9

ed:\UG\S\HECA\Projects\HECA_2012\SUBMITTAL\Fig5_2_3_CNDDB_48k_PUBLIC.mxd 4/30/2012 4:50:05 PM



Project Site

Construction Staging Area

CNDDB Occurrence Records

N

0 250 500 FEET

BIOLOGICAL RESOURCES AT PROJECT SITE
1:6,000-SCALE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-4 - SHEET 1

Sources: USGS (7.5' quads: East Elk Hills 1977, Tupman 1977). The East Elk Hills, CA Quad (Rev. 1973) has been edited to reflect current condition). California Natural Diversity Database, January 2012.

gis\HECA\Projects\HECA_2012\GIS\MXD\TTAL\Fig5_2-4_CNDDB_6k.mxd 4/29/2012 3:59:27 PM

Project Site

Construction Staging Area

CNDDB Occurrence Records

N

0 250 500 FEET

BIOLOGICAL RESOURCES AT PROJECT SITE
1:6,000-SCALE

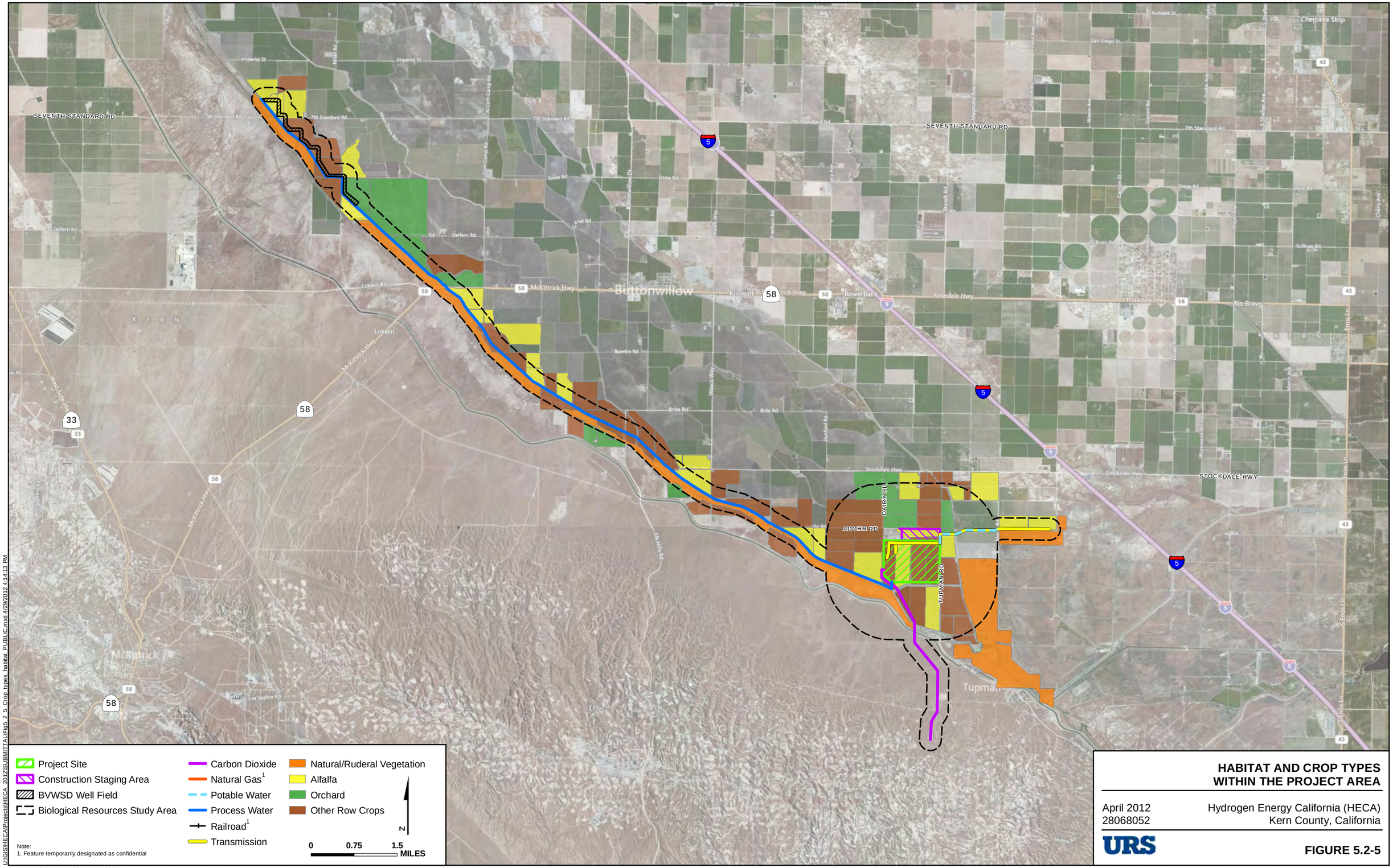
April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-4 - SHEET 2

Sources: USGS (7.5' quads: East Elk Hills 1977, Tupman 1977). The East Elk Hills, CA Quad (Rev. 1973) has been edited to reflect current condition). California Natural Diversity Database, January 2012.



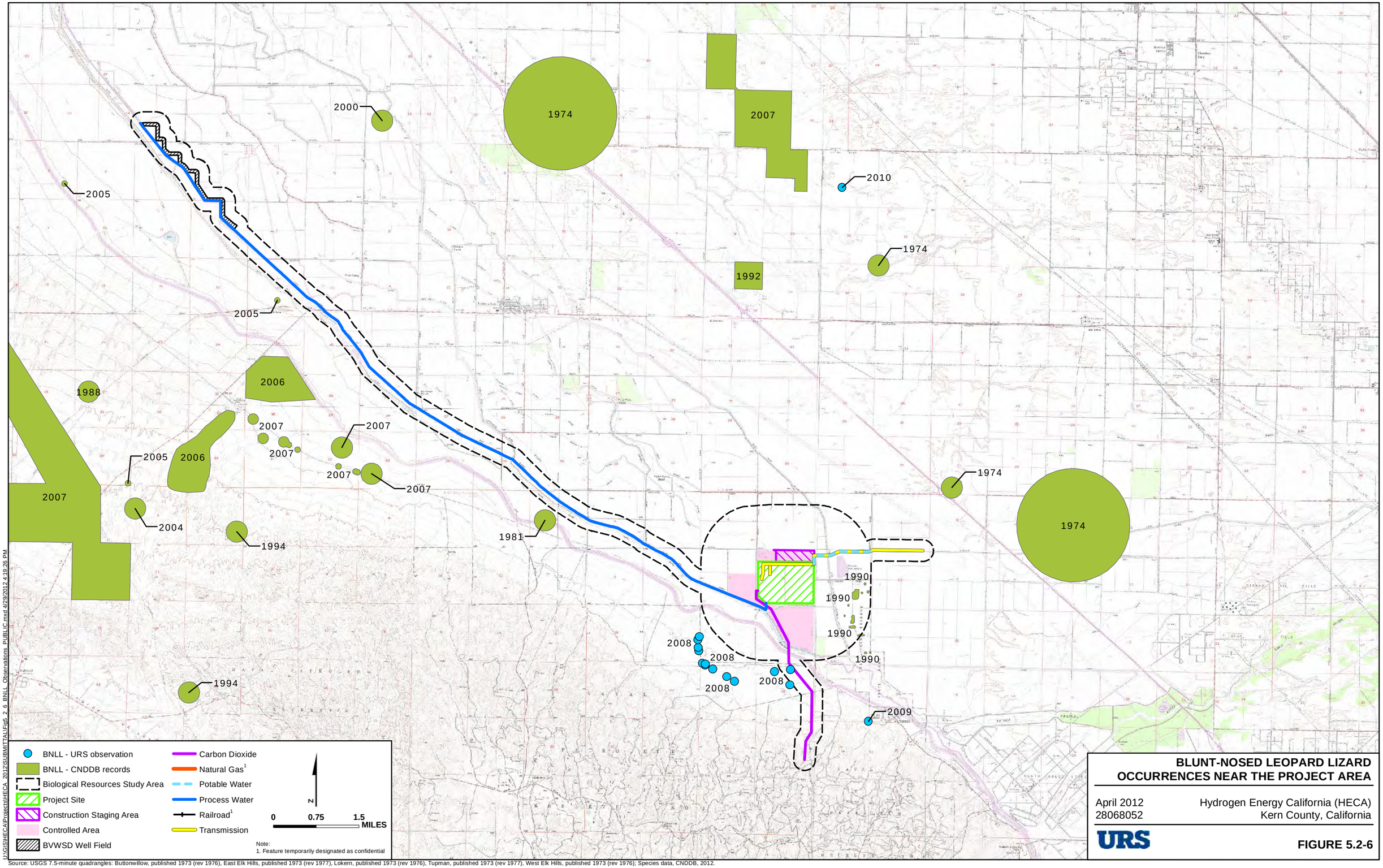
HABITAT AND CROP TYPES WITHIN THE PROJECT AREA

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-5



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.

U:\GIS\HECA\Projects\HECA_2012\SUBMITTAL\Fig5_2_6_BNLL_Observations_PUBLIC.mxd 4/29/2012 4:19:26 PM

BLUNT-NOSED LEOPARD LIZARD OCCURRENCES NEAR THE PROJECT AREA

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-6

2011-21
2011-01
2011-02
2011-20
2011-19
2011-03
2011-18
2011-16
2011-04
2011-17
2011-05
2011-06
2011-07
2011-08
2011-09
2011-10
2011-11
2011-15
2011-14
2011-12
2011-22
2011-23
2011-13

CA Aqueduct

Project Site

Construction Staging Area

Swainsons's Hawk Nest Tree Survey Area

Biological Resources Study Area

Natural Gas[1]

Process Water

Transmission

Potable Water

Railroad[1]

2010 Potential Nest Structures

Swainson's Hawk

2010 Confirmed Nest Structures

Swainson's Hawk

2011 Potential Nest Stuctures

Swainson's Hawk

Red-tailed Hawk

Red-shouldered Hawk

Great-horned Owl

Common Raven

Unoccupied Nest Structure

2011 Confirmed Nest Structures

Swainson's Hawk

Red-tailed Hawk

Red-shouldered Hawk

Great-horned Owl

Common Raven

Note:
1. Feature temporarily designated as confidential

N

0 1 2 MILES

SWAINSON'S HAWK OBSERVATIONS NEAR THE PROJECT AREA

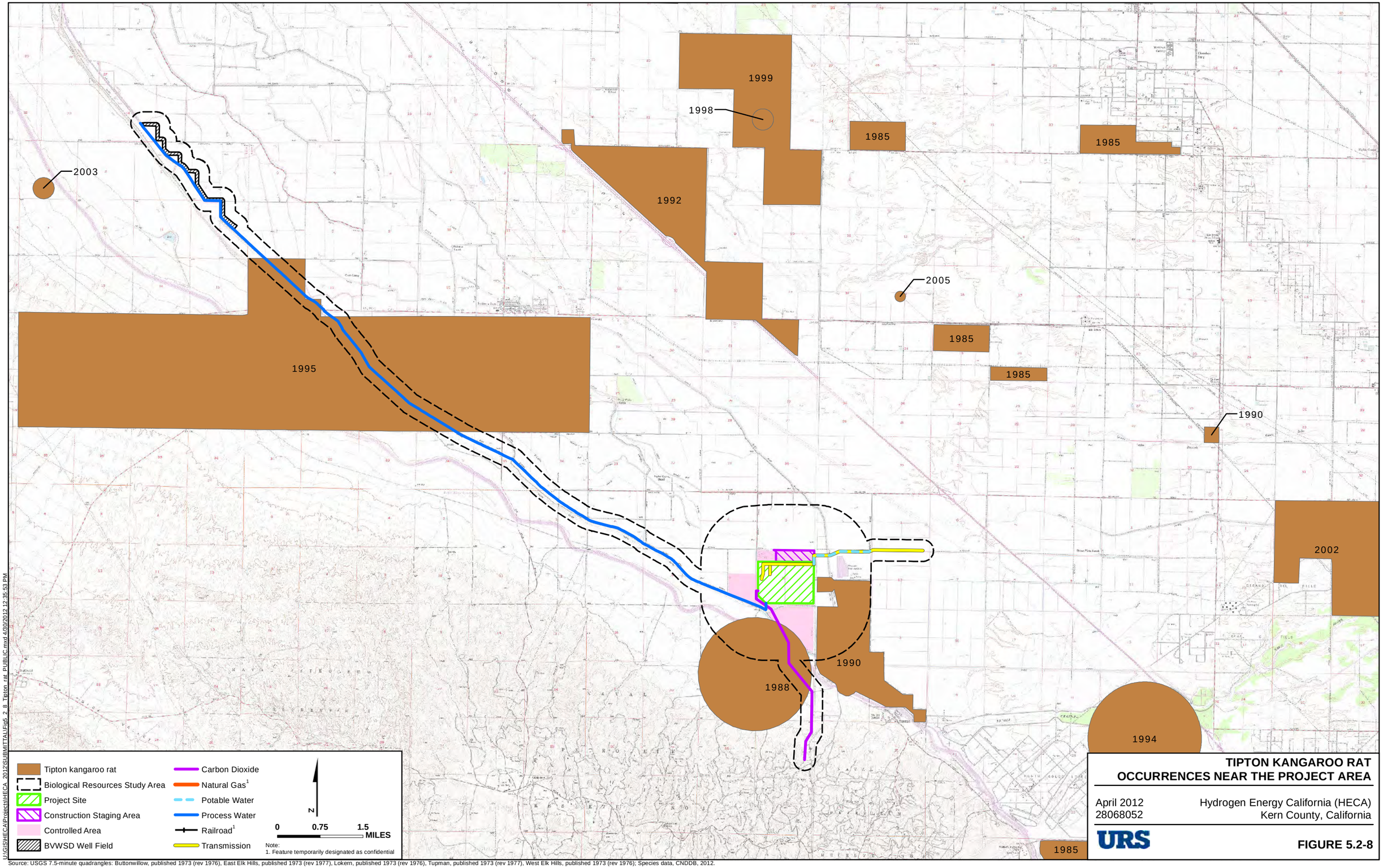
April 2012
2868052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-7

U:\GIS\HECA\Projects\HECA_2012\SUBMITTAL\Fig5_2_7_Swainsons_Hawk_Observations_PUBLIC.mxd 4/30/2012 12:23:37 PM



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.

TIPTON KANGAROO RAT OCCURRENCES NEAR THE PROJECT AREA

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-8

J:\GIS\HECA\Projects\HECA_2012\SUBMITTAL\Fig5_2_8_Tipton_rat_PUBLIC.mxd 4/30/2012 12:35:53 PM

Burrowing Owl Occurrence
Biological Resources Study Area
Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

N

0 0.75 1.5 MILES

Note:
1. Feature temporarily designated as confidential

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).

U:\GIS\HECA\Projects\HECA_2012\SUBMITTAL\Figs 2_9_BurrowOwl_Observations_PUBLIC.mxd 4/30/2012 1:58:02 PM

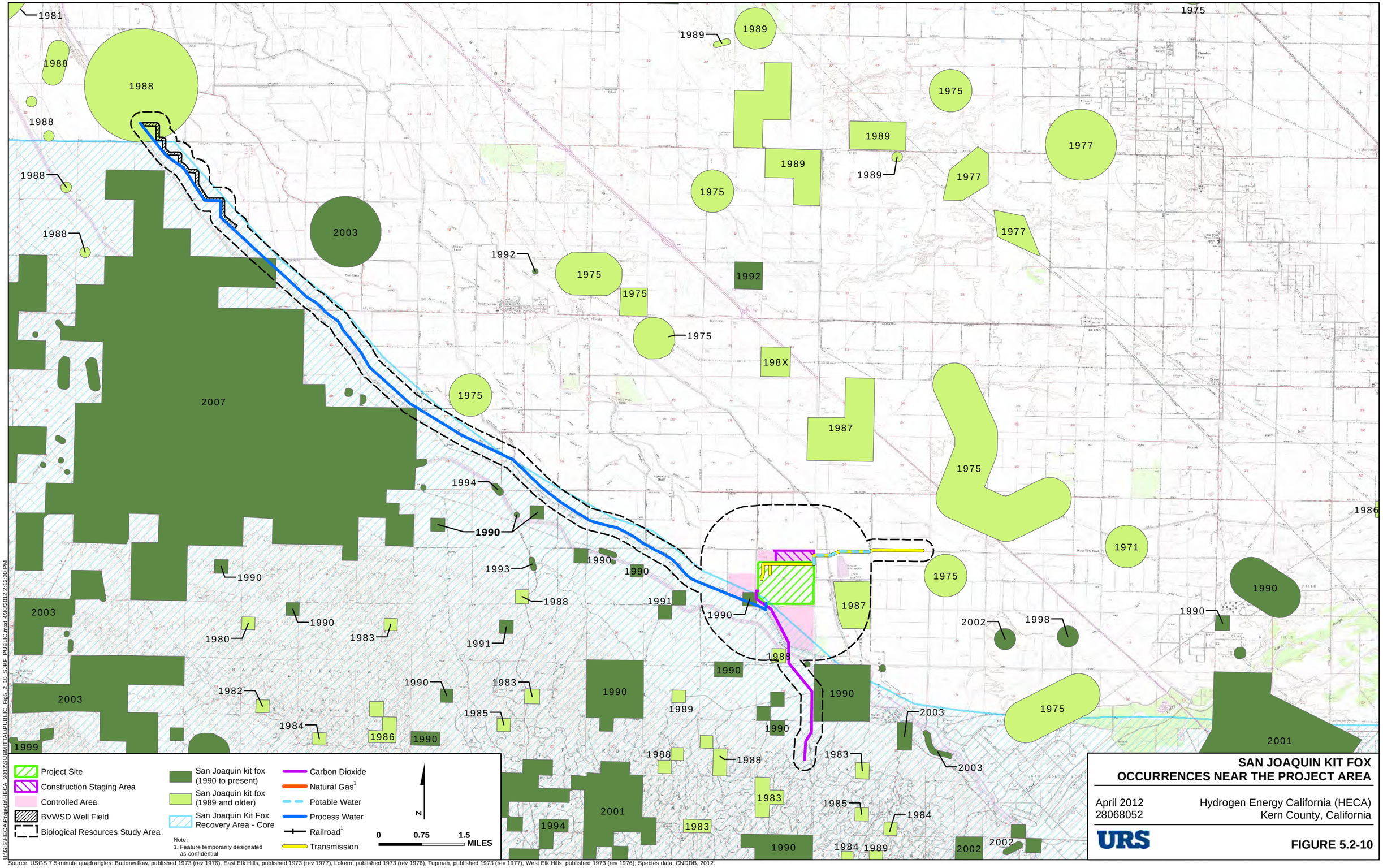
BURROWING OWL OCCURRENCES NEAR THE PROJECT AREA

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-9



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.

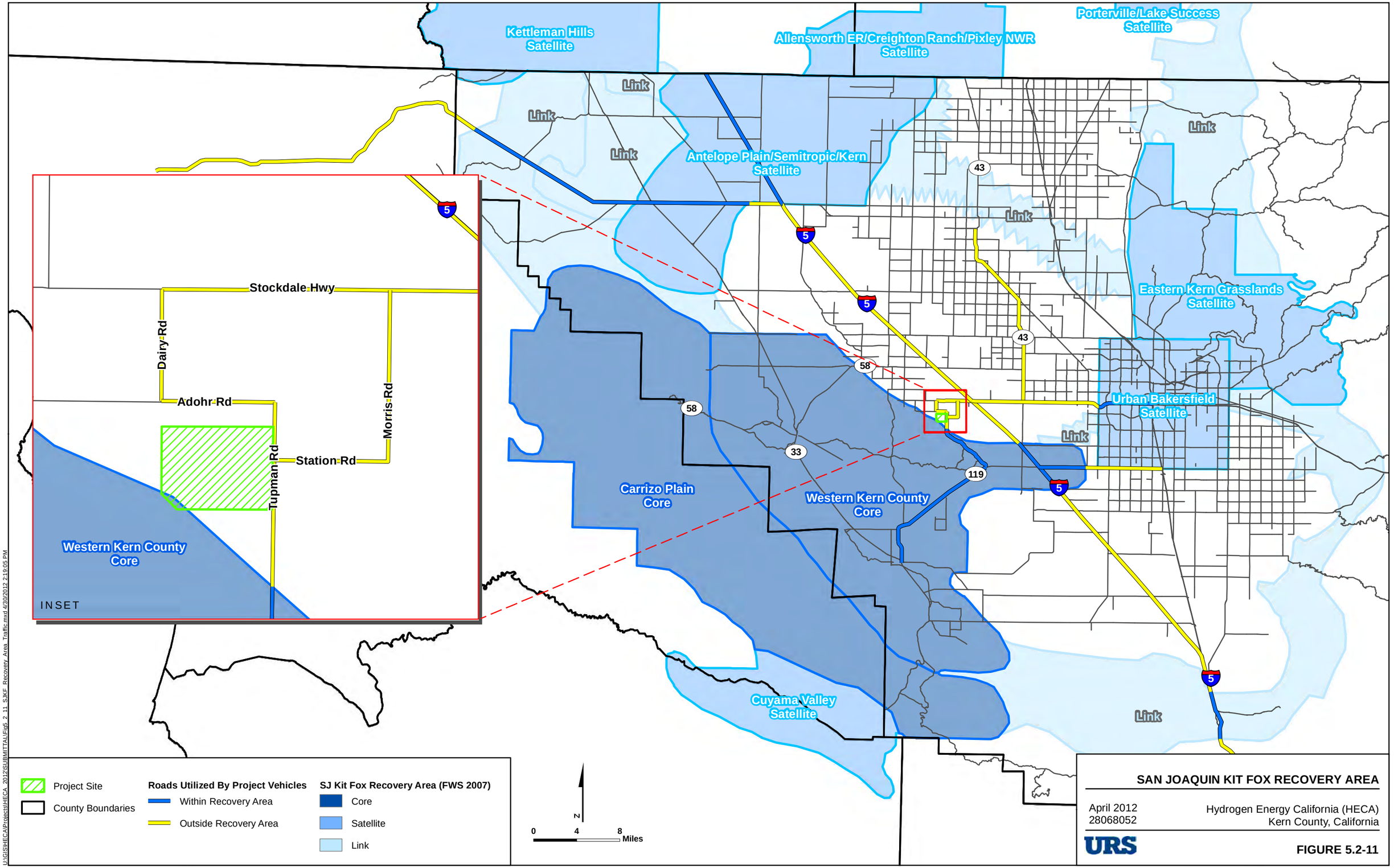
SAN JOAQUIN KIT FOX OCCURRENCES NEAR THE PROJECT AREA

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.2-10


Kettleman Hills Satellite
Allensworth ER/Creighton Ranch/Pixley NWR Satellite
Porterville/Lake Success Satellite
Link
Link
Link
Link
Link
Link
Antelope Plain/Semitropic/Kern Satellite
Eastern Kern Grasslands Satellite
Urban Bakersfield Satellite
Carrizo Plain Core
Western Kern County Core
Cuyama Valley Satellite
Western Kern County Core
INSET
Stockdale Hwy
Dairy Rd
Adohr Rd
Morris Rd
Station Rd
Tupman Rd
5
43
58
33
119
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
April 2012
28068052
Hydrogen Energy California (HECA)
Kern County, California
URS
FIGURE 5.2-11
U:\GIS\HECA\Projects\HECA_2012\SUBMITTAL\Fig5_2_11_SJKF_Recovery_Area_Traffic.mxd 4/30/2012 2:19:05 PM

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Appendices [In Volume II]

5.3 CULTURAL RESOURCES

Hydrogen Energy California LLC (HECA LLC) is proposing an Integrated Gasification Combined Cycle (IGCC) polygeneration project (HECA or Project). The Project will gasify a fuel blend of 75 percent coal and 25 percent petroleum coke (petcoke) to produce synthesis gas (syngas). Syngas produced via gasification will be purified to hydrogen-rich fuel, and used to generate a nominal 300 megawatts (MW) of low-carbon baseload electricity in a Combined Cycle Power Block, low-carbon nitrogen-based products in an integrated Manufacturing Complex, and carbon dioxide (CO_2) for use in enhanced oil recovery (EOR). CO_2 from HECA will be transported by 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). The EOR process results in sequestration (storage) of the CO_2.

Terms used throughout this section are defined as follows:

- **Project or HECA.** The HECA IGCC electrical generation facility, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes, including its linear facilities.

- **Project Site or HECA Project Site.** The 453-acre parcel of land on which the HECA IGCC electrical generation facility, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes (excluding off-site portions of linear facilities), will be located.

- **OEHI Project.** The use of CO_2 for EOR at the EHOF and resulting sequestration, including the CO_2 pipeline, EOR processing facility, and associated equipment.

- **OEHI Project Site.** The portion of land within the EHOF on which the OEHI Project will be located and where the CO_2 produced by HECA will be used for EOR and resulting sequestration**.**

- **Controlled Area.** The 653 acres of land adjacent to the Project Site over which HECA will control access and future land uses.

This introduction provides brief descriptions of both the Project and the OEHI Project. Additional HECA Project description details are provided in Section 2.0. Additional OEHI Project description details are provided in Appendix A of this Application for Certification (AFC) Amendment.

HECA Project Linear Facilities

The HECA Project includes the following linear facilities, which extend off the Project Site (see Figure 2-7, Project Location Map):

- **Electrical transmission line.** An approximately 2-mile-long electrical transmission line will interconnect the Project to a future Pacific Gas and Electric Company (PG&E) switching station east of the Project Site.

- **Natural gas supply pipeline.** An approximately 13-mile-long natural gas interconnection will be made with PG&E natural gas pipelines located north of the Project Site.

- **Water supply pipelines and wells.** An approximately 15-mile-long process water supply line and up to five new groundwater wells will be installed by the Buena Vista Water Storage District (BVWSD) to supply brackish groundwater from northwest of the Project Site. An approximately 1-mile-long water supply line from the West Kern Water District (WKWD) east of the Project Site will provide potable water.

- **Coal transportation.** HECA is considering two alternatives for transporting coal to the Project Site:

  — **Alternative 1, rail transportation.** An approximately 5-mile-long new industrial railroad spur that will connect the Project Site to the existing San Joaquin Valley Railroad (SJVRR) Buttonwillow railroad line, north of the Project Site. This railroad spur will also be used to transport some HECA products to market.

  — **Alternative 2, truck transportation.** An approximately 27-mile-long truck transport route via existing roads from an existing coal transloading facility northeast of the Project Site. This alternative was presented in the 2009 Revised AFC.

OEHI Project

OEHI will be installing the CO_2 pipeline from the Project Site to the EHOF, as well as installing the EOR Processing Facility, including any associated wells and pipelines needed in the EHOF for CO_2 EOR and sequestration. The following is a brief description of the OEHI Project, which is described in more detail in Appendix A of this AFC Amendment:

- **CO_2 EOR Processing Facility.** The CO_2 EOR Processing Facility and 13 satellites are expected to occupy approximately 136 acres within the EHOF. The facility will use 720 producing and injection wells: 570 existing wells and 150 new well installations. Approximately 652 miles of new pipeline will also be installed in the EHOF.

- **CO_2 pipeline.** An approximately 3-mile-long CO_2 pipeline will transfer the CO_2 from the HECA Project Site south to the OEHI CO_2 EOR Processing Facility.

5.3.1 HECA Project Cultural Resources Study Areas

Cultural resources are defined as buildings, sites, structures, objects, or traditional cultural properties, each of which might have historical, architectural, archaeological, cultural, or scientific importance. Because archaeological and historic architectural resources are affected differently (i.e., historic architecture is subject to the potential for indirect effects), two different study areas are defined using CEC criteria to address potential impacts to cultural resources that could occur with implementation of the HECA Project. The study area for each of these cultural resources subdisciplines is described separately below. OEHI conducted the surveys for the portion of the CO_2 alignment south of the California Aqueduct, and the results of those surveys—along with record search data for this area—are presented in Appendix A-1,

Section 4.5, Cultural Resources, and Appendix A-2, Section 2.3, Cultural Resources. Appendix A also contains the cultural resource impact evaluation for the OEHI CO_2 EOR Processing Facility. The HECA Project Site, linear facilities, OEHI CO_2 pipeline, and the associated Cultural Resources Study Areas are shown on Figures 3.8-1 and 3.8-2.

5.3.1.1 Archaeology

The HECA Project Archaeological Resources Study Area (ARSA) analyzed in this section comprises the area where it can be reasonably expected that Project implementation could potentially affect archaeological resources. In accordance with CEC guidelines, this Study Area consists of the proposed facility (the 453-acre Project Site), all the areas within a 200-foot radius of the Project Site; the Project linear rights-of-way (ROW), including areas within a 50-foot radius of the ROWs (except where described otherwise), and the OEHI CO_2 pipeline. The efforts to address archaeological resources as they relate to the Project are discussed in further detail in the archaeological technical report, which is provided in Appendix G–3.

5.3.1.2 Historic Architecture

The HECA Project Historic Architectural Resources Study Area (HARSA) analyzed in this section comprises the area where it can be reasonably expected that Project implementation could potentially affect historic architectural resources. As per CEC guidelines, this study area consists of the proposed facility (the 453-acre HECA Project Site), all areas within a 0.5-mile radius of the HECA Project Site, all above-ground HECA linear ROWS, including areas within a 0.5-mile radius of the ROWs, and the OEHI CO_2 pipeline. The efforts to address historic architectural resources as they relate to the HECA Project are discussed in further detail in the historic architectural technical report by JRP Historical Consulting, LLC (JRP, 2012), which is provided in Appendix G-4.

This section documents the efforts undertaken to determine whether cultural resources could be adversely affected by the implementation of the Project. Section 5.3.1 presents the environment that could be affected; Section 5.3.2 identifies the environmental consequences; and Section 5.3.3 discusses the cumulative effects associated with the Project. Section 5.3.4 identifies the mitigation measures to be implemented to avoid identified impacts. The remaining sections present the regulatory context. Specifically, Section 5.3.5 identifies the cultural resources laws, ordinances, regulations, and standards (LORS) applicable to the Project; Section 5.3.6 lists the involved agencies and agency contacts; and Section 5.3.7 discusses permits and scheduling.

5.3.2 Affected Environment

The analysis of the ARSA and HARSA as defined above included a literature review and record search, archival research, review of collected data, geoarchaeological assessment, pedestrian surveys, archaeological monitoring of the geotechnical investigation, and consultations with the Native American Heritage Commission (NAHC). The literature review and record searches included ethnographic and historic literature and maps; federal, state, and local inventories of historic properties; archaeological base maps and site records; and survey reports on file at the Southern San Joaquin Valley Information Center at California State University, Bakersfield

(SSJVIC). Archival research was conducted at a variety of libraries and repositories, including the California State Library, Sacramento; and Shields Library, University of California, Davis; and data collected from the Water Resources Center Archives and Earth Sciences Map Library at the University of California, Berkeley were reviewed. Pedestrian surveys were performed for both archaeological and historic architectural resources of each cultural resource subdiscipline's Study Area. Consultation has been carried out with the State of California's NAHC, with subsequent contact with Native American groups and individuals identified by the NAHC.

5.3.2.1 Natural Environment

The San Joaquin Valley is bounded by the Sacramento-San Joaquin River Delta to the north, the Sierra Nevada Mountains to the east, the Tehachapi Mountains to the south, and the Coast Range to the west. The western slope of the Sierra Nevada Mountains is the source for rivers and streams that cross the San Joaquin Valley. The San Joaquin Valley is divided into two hydrologic sub-basins: (1) the San Joaquin Sub-Basin to the north; and (2) the Tulare Sub-Basin to the south. Rivers of the San Joaquin Sub-Basin join the San Joaquin River as it drains into the Sacramento River, flowing into San Francisco Bay. The rivers of the Tulare Sub-Basin have no natural perennial surface outlet; and in the past, formed large, shallow, semi-permanent inland lakes. Only in years of exceptional rainfall did water cross the divide and enter the San Joaquin Sub-Basin.

The San Joaquin Valley has a Mediterranean-type climate characterized by hot, dry summers and cool, moist winters. Summer daytime high temperatures frequently exceed 100 degrees Fahrenheit (°F). Mean annual temperature is 65°F. The San Joaquin Valley is separated from the influence of the ocean by the Coast Ranges, and is in a broad rain shadow. Precipitation primarily occurs from September through April, although in normal years, 90 percent of the rain falls between December 1 and April 1. The eastern side of the valley receives about 2 inches more than the western side. Average annual rainfall for the San Joaquin Valley is 4.7 inches, and soil water deficits characterize the grassland and scrub habitats for 4 to 8 months every year. A dense, persistent, ground fog known as "tule fog" can develop in the winter months, resulting in overcast, damp, cool weather.

Historically, the San Joaquin Valley included a variety of ecological communities, with vast areas of woodlands, freshwater marshes, and grasslands prior to the establishment of the present land use patterns. In upland areas, several distinct communities of grasses and shrubs grew along rainfall and edaphic gradients. Today, agricultural development dominates the flat lands in the center of the valley. Undisturbed open space is largely restricted to the sloping margins of the valley.

Section 5.2, Biological Resources, and Section 5.14, Water Resources provide detailed descriptions of the natural environment in the region that includes the Project Site.

5.3.2.2 Prehistoric Background

There is a long history of archaeological research in the southern San Joaquin Valley, with much of the early, purely academic investigations focused on the Buena Vista Lake and adjacent Elk Hills vicinities (portions of both of which fall within 5 miles of the Project). In the last decade of

the nineteenth century, professional and amateur archaeologists began investigating the numerous "Indian mounds" of the region. C.H. Merriam collected a large coiled basket that contained the mummified body of a child, found in a rock shelter near Bakersfield (Merriam, 1905 in Heizer, 1951:30). Other materials collected by Merriam included another basket, a net manufactured from the fibers of the milkweed, hemp cordage, portions of a rush mat, and fragments of a rabbit-skin blanket. In February 1909, N.C. Nelson of the University of California Archaeological Survey recovered a cache of baskets and other artifacts from a dry arroyo in the Elk Hills (Moratto, 1984:174).

In 1926, Gifford and Schenk of the University of California published their volume on the archaeology of the southern San Joaquin Valley. The report included the documentation of approximately 40 sites, the results of their excavation of nine sites, and the examination of private collections. The results of their findings were that the only discernible change in, or in addition to, the culture of the Southern San Joaquin Valley is represented by steatite in the "Slough and Lake regions" (Gifford and Schenk, 1926:118). This apparent lack of change in material culture resulted in their claim that the cultural remains recovered seemed to be as readily assignable to the "last century as to the last millennium" (Gifford and Schenk, 1926:118).

During the Depression years of 1933 and 1934, the Civil Works Administration excavated five sites (two middens, two cemeteries, and a small grave site) adjacent to the southwestern shore of Buena Vista Lake, the northwestern shore of which lies less than 5 miles from the southern reaches of the Project. The midden sites, CA-Ker-39 and CA-Ker-60, exhibited stratified deposits that represented both prehistoric and protohistoric/historic occupations. Materials recovered from the two cemeteries, CA-Ker-40 and CA-Ker-41, appeared contemporaneous with materials from the upper deposits of CA-Ker-39 and -60, suggesting that they may have been the burial grounds for the inhabitants of the midden sites. Reported upon by Wedel (1941), this investigation stands as the "most intensive scientific excavation work so far in the southern San Joaquin Valley" (Moratto, 1984:188).

In 1899, 1909, 1923, 1924, and 1925 test excavations took place at more than 20 different sites around Buena Vista Lake and Slough, and Tulare Lake, all focusing on the recovery of burials and grave goods from large village sites (Gifford and Schenck, 1926; Hartzell, 1992:122). This work was followed in the 1930s through 1960s by limited excavations in the southern San Joaquin Valley, primarily around Buena Vista Lake, by various researchers, including the Smithsonian Institute, Wedel, von Werlhof, Warren, and Fredrickson, also focusing on larger village and burial sites (Schiffman and Garfinkle, 1981:3-4).

CA-Ker-39 and -40 were subsequently found to be components of a much larger site, CA-Ker-116. Excavated in the mid-1960s by Fredrickson and Grossman (1977), CA-Ker-116 was found to contain a deeply buried component that was not identified by Wedel. Situated at depths of greater than 280 centimeters, this component was dated to circa 6250 B.C. (Moratto, 1984:99, 188).

From an archaeological perspective, research conducted in the southern San Joaquin Valley resulted in the identification and definition of a number of temporal components, periods, or phases that reflect prehistoric human lifeways and land use patterns. This research has predominately focused on sites along the ancient shoreline of Buena Vista Lake (Fredrickson and

Grossman, 1977; Gifford and Schenck, 1926; Hartzell, 1992; Riddell, 1951; Walker, 1947; Wedel, 1941) and in the Tulare Basin area (Angel, 1966; Hewes, 1946; Siefkin, 1999).

Wedel's (1941) investigations included excavations at five sites on the southwestern edge of Buena Vista Lake, including two shell middens, two large cemeteries, and an additional small site in the adjacent hills. A general chronological framework was defined based on stratigraphic analyses and comparison of artifact assemblages, resulting in a two-phase sequence of pre-European late occupation and an earlier cultural complex (Wedel, 1941). The early complex was correlated to the Oak Grove Culture of the Santa Barbara Coast, dated at 2,000 – 4,000 years ago (Meighan 1955) and 4000 - 7000 years ago (Heizer, 1964). The late complex was clearly separated from the earlier by both stratigraphy and artifact types. Wedel (1941) subdivided the late complex into two phases: the early late phase, and the later protohistoric period. Wedel suggested that the early late phase began about A.D. 1400, and reflected a simple complex with similarities to the Tulare Basin to the north. The later protohistoric period, after A.D. 1500 or 1600, revealed strong influence from Santa Barbara coastal cultures.

In the mid-1960s, additional investigations were conducted along the southwestern shoreline of Buena Vista Lake at CA-Ker-116 (Fredrickson and Grossman, 1977), a small part of an extensive occupation zone that parallels the shoreline for a distance of about 2 miles (Fredrickson, 1986). Incorporating data from both Wedel's (1941) study and his own 1960s work, Fredrickson (1986) has since proposed a four-phase cultural sequence for the Buena Vista Lake area.

The earliest occupation is represented by a meager inventory of distinctive artifacts, which include a ground-stone atlatl spur, three crescents, and fragments of several crude, leaf-shaped projectile points (Fredrickson, 1986). Radiocarbon age determinations provided three dates of suggested cultural association: two dates were 6250 B.C., and a third 5650 B.C. (Fredrickson, 1986; Fredrickson and Grossman, 1977). Fredrickson (1986) notes that although similar-style artifacts were recovered from Paleo-Indian period contexts at Tulare Lake (Riddell and Olsen, 1969), similar conclusions regarding such antiquity at CA-Ker-116 should not be made in the absence of corroborative stratigraphic data.

The ensuing phase is represented by sparse remains that reflect an early milling stone assemblage with possible cultural relationship to the Oak Grove and other milling stone complexes of southern California (Fredrickson, 1986). Hallmark attributes include handstones, milling stones, flake scrapers, and extended burial posture. This phase remains undated, but inferences may be drawn from the milling stone horizon elsewhere in southern California, which began as early as 5000 BC and persisted for 3,000 years or more (Fredrickson, 1986 citing Wallace, 1971).

The next cultural phase, the late period (ca. A.D. 900 – A.D. 1500), is separated from the milling stone complex by millennia, because no assemblage has been found along the southwestern lakeshore to fill in the presumed occupational gap (Fredrickson, 1986). Based on stylistic and technological differences in artifact forms, Fredrickson (1986) has tentatively divided the late phase into two subphases: the earlier subphase and the later subphase. The earlier subphase is distinguished by split-punched and whole spire-lopped *Olivella* beads and crudely made leaf-shaped points. The later subphase is defined by more finished and rough disk *Olivella* beads and by a local bead-making industry, which may have used rare whole-shell *Olivella* (Fredrickson,

1986). Small quantities of asphaltum are noted, as are hopper mortars, and clay-lined roasting ovens filled with freshwater clamshell; steatite is rare.

The final period at Buena Vista Lake is considered to represent the ancestral Yokuts' continuous use of the lakeshore environment. This protohistoric period, dating perhaps from A.D. 1500 to the ethnographic period, is represented by abundant use of asphaltum and steatite, the presence of baked clay objects, triangular projectile points, an elaborate bone technology, bowl hopper mortar, disk *Olivella* beads, *Haliotis* beads and ornaments, marine clam shell disk beads, and small pendants and carvings of steatite (Fredrickson, 1986).

More recent archaeological research conducted by Hartzell (1992) at sites along the southwestern margin of Buena Vista Lake (Wedel Site #1 and #2; CA-Ker-116) and near Buena Vista Slough (CA-Ker-180 and CA-Ker-1611) has resulted in the refinement of the lakeshore's chronological sequence as it relates to the Holocene epoch. A similar approach was taken by Siefkin and colleagues (1996) for the neighboring Tulare Basin area. Cumulatively, these studies provide definition of three broad temporal periods for the larger southern San Joaquin Valley area: (1) Early Holocene, (2) Middle Holocene, and (3) Late Holocene.

Early Holocene (12,000 to 7000 Years Before Present [B.P.]; 10,000 to 5000 B.C.)

The earliest known period of human use of the southern San Joaquin Valley dates to approximately 12,000 years ago (10,000 B.C.). During this time, native peoples lived in camps around lake margins and relied extensively on lacustrine resources (i.e., fish, turtle, freshwater mollusks, and waterfowls) and terrestrial resources (mainly rabbits and artiodactyls).

Populations are considered to have been small, considering the absence of imported items and the use of local resources from within a relatively small area centered on the lake marshes and the surrounding plains and foothills. Late Pleistocene/Early Holocene cultural deposits found in the Tulare Lake and Buena Vista Lake basins indicate that stemmed and lanceolate points and crescents were used (Hartzell, 1992:317-331; Siefkin, 1999:50). Also noted with these artifacts were species of extinct megafauna, although direct cultural association has not been proven (Siefkin, 1999:49).

Fluted points have yet to be identified at Buena Vista Lake, a factor that Sutton (1996) correlates with the absence of a lacustrine habitat during the early human occupation of the southern San Joaquin Valley. Artifact distribution at Tulare Lake, however, indicates that water levels were lower during the Late Pleistocene, a trend that was likely reflected by Buena Vista Lake (Wallace and Riddell, 1988:89). Siefkin (1999:51) considers the modern archaeological emphasis on the upper shorelines a more reasonable answer to the current lack of fluted points and other Paleo-Indian remains at Buena Vista Lake.

Middle Holocene (7000 to 4000 B.P.; 5000 to 2000 B.C.)

Few well-stratified archaeological deposits from the southern San Joaquin Valley date to this period. The paucity of such sites has been attributed to fluctuating lakeshores and the movement of campsites to locations above or below areas that have been previously studied by archaeologists (Hartzell, 1992:318; Siefkin, 1999:52).

This period is characterized by assemblages that are similar to Windmiller Pattern sites in the northern part of the San Joaquin Valley, although it has been speculated that local deposits more closely resemble the Oak Grove and other millingstone complexes of southern California. Hallmark artifacts include extended burials without funerary objects, Elko and Pinto projectile points, millingstones, handstones, flake scrapers, and charmstones (e.g., Gerow, 1974; Gifford and Schenk, 1926; Hartzell, 1992; Siefkin, 1999; Wallace, 1954:120-121). Mortuary patterns included extended burials without funerary objects. Also found during this period are imported items such as obsidian artifacts, and beads and ornaments made of marine shell. Worked bone and steatite implements occur in the archaeological record in limited amounts (Hartzell, 1992:322).

From archaeological evidence, it appears that year-round acquisition of fauna occurred at lakeshore sites, and many logistical bases were set up along lakeshores. Rises above the lakes were likely occupied by hunting parties when they needed to retool weaponry and process game (Hartzell, 1992:320).

Late Holocene (4000 B.P. to 150 B.P.; 2000 B.C. to A.D. 1850)

In contrast to earlier periods, the archaeological record of the Late Holocene period is significantly more complex. During the Late Holocene period, with the lowering of water levels and greater amounts of alkaline in the area lakes, a residential mobility pattern of land use began. This strategy involved more frequent moves, where an entire population or group traveled to resource areas.

Notable technological changes include the introduction of the hopper mortar, changes in *Olivella* shell bead forms, and the use of asphaltum in small quantities (Fredrickson, 1986; Hartzell, 1992:326). Also introduced into the tool kit were Cottonwood series projectile points, bi-pointed bone objects used as fish hooks, steatite H-shaped "reels," and tule-covered clay ball net weights. Late-Holocene–period sites often contain freshwater mussels, turtle remains, ground stone, and marine shell beads (Peak and Associates, 1991), and are generally found on knolls between ephemeral drainages (Hartzell, 1992:328; Moratto, 1984:189). Mortuary patterns included flexed or semi-flexed burials, somewhat similar to the Late Horizon of the Central Valley sequence.

The protohistoric period of the Late Holocene, dating from roughly 500 years B.P. (A.D. 1500) to the ethnographic period, is represented by a diversified artifact assemblage. Common implements included baked clay objects, triangular projectile points, elaborate bone work, bowl hopper mortars, *Olivella* disk beads, *Haliotis* beads and ornaments, clamshell disk beads, and small steatite pendants and carvings (Fredrickson, 1986).

Elk Hills/Buena Vista Lake

The Project Site is on the northeastern flanks of the Elk Hills, northwest of the ancient shores of Buena Vista Lake. A large number of sites are represented in the archaeological record in the vicinity of the Elk Hills and Buena Vista Lake, dating (very tenuously) to between 5000 and 4000 years B.P. These dates are based on radiocarbon samples associated with deeply stratified freshwater mussel shell in the Elk Hills (Jackson *et al.*, 1999).

As the environment began to normalize and approach near-modern conditions, the lakes, marshes, and sloughs on the valley floor began to revitalize. Oak trees and other temperate plant species began to spread to lower elevations along the river drainages and in the wetter valleys. Plant foods remained an important food supply, but freshwater mollusks, fish, water fowl, and elk returned as staple food sources. As the environment offered more and more stable food sources, the population of California began to steadily increase. By 3000 to 2000 B.P., this increase was leading many groups to the brink of starvation as more and more people competed for a large but limited food supply. It is believed that this stress led the people of California (as a whole) to the development of massive trade networks and their reliance on acorns, which remained relatively unchanged until European contact in the late sixteenth and early seventeenth centuries.

From 3000 B.P. to the near protohistoric contact period, the archaeological record of the Elk Hills area shows an almost continual period of use. The extensive marshlands of Buena Vista Lake, Kern Lake, and their huge interconnected sloughs were fed seasonally by spring and winter flooding of the Kern River. These were the center of the sub-region's human occupation, because much of the immediately surrounding areas were near-desert scrub lands, much as they are today.

The Buena Vista Basin's cultural chronology has been categorized and seriated by Hartzell (1992) based on excavations at several Buena Vista Lake and Slough sites, including the Buena Vista site (KER-116) and the Wedel Sites #1 and #2. Hartzell's first phase for the Late Holocene extends from 4000 B.P to 2000 B.P., and is identified by extended burials, Pinto and Elko projectile points, milling stones and manos, and an increase in the variety of lake fish and land mammals present in associated middens. This phase ends around 2000 B.P. and transitions into a second phase that lasts until approximately 1000 B.P.

This second phase is identified with flexed burials, Cottonwood triangular projectile points, the appearance of the first semi-permanent house structures, clay-lined storage pits, and an explosion in the variety and numbers of lake and land animal remains present in the site middens. This period also shows evidence of the revitalization of long-distance trade and the exploitation of animal and plant resources from well outside the immediate lakeshore area being brought back to the lake villages for processing and consumption.

The final phase begins around 1000 B.P. and continues until the historic period. Hartzell (1992) notes that in this late period, the lakeshore sites are not as continually occupied as in earlier periods. This change coincides with a warm period that would have lowered lakeshore levels and made the water more alkali. It is thought from sites along the eastern fringe of the Elk Hills and along the Buena Vista Slough that much of the area's population moved to where the pluvial environment was more stable, but also incorporated a larger amount of foraging and inter-area and regional trade. In this period, hopper-style mortars and associated groundstone pestles appear, suggesting the use of acorns as a dietary mainstay. An increase in trade material from the Santa Barbara Coast and Trans-Sierra locations gives evidence of this area being a possible focal point for inter-regional trade. The latter half of this phase correlates with a protohistoric period evidenced by the presence of glass trade beads. A primary village in this period is thought to be the historic Tulamni Yokut Village of *Tulamniu*, which was visited and attacked by the Spanish in the late eighteenth and early nineteenth centuries.

5.3.2.3 Ethnographic Background

The Project is within the homeland of the Southern Valley Yokuts (Wallace, 1978:448-449), a geographic division of the much larger Yokuts linguistic group who occupied the entire San Joaquin Valley and adjoining Sierra Nevada foothills (Kroeber, 1907, 1925, 1963; Latta, 1977; Newman, 1944). Yokutsan is one of four Penutian linguistic stocks that included Costanoan (Ohlonean); Miwok (Utian); Wintu, Nomlaki, and Patwin (Wintuan); and the Maidu, Nisenan, and Koncow (Maiduan) (Shipley, 1978). Figure 5.3-3 depicts the ethnographic territories of the Southern Valley Yokuts and their neighbors.

In contrast to the typical California cultural grouping known as the tribelet, the Yokuts were organized into "true tribes," in that each had "a name, a dialect, and a territory." Kroeber (1925:474) estimated that as many as 50 Yokuts tribes may have originally existed, but that only 40 were "sufficiently known to be locatable." Each tribe inhabited an area averaging "perhaps 300 square miles," or about the distance one could walk in any direction in half a day from the center of the territory. Some Yokuts tribes only inhabited a single village, while others occupied several (Kroeber, 1925:474-475).

The Southern Valley Yokuts territory was centered near the basins of Tulare, Buena Vista, and Kern lakes, their connecting sloughs, and the lower portions of Kings, Kaweah, Tule, and Kern rivers (Figure 5.3-3). Sixteen subgroups, each speaking a different dialect of the Yokut language, made up the Southern Valley Yokuts, and included the Apyachi, Choynok, Chuxoxi, Chunut, Hewchi, Hometwoli, Hoyima, Koyeti, Nutunutu, Pitkachi, Tachi, Telamni, Tulamni, Yawelmani, Wowol, and Wechihit. Three of the groups—the Tachi, Chunut, and Wowol—claimed the shores of Tulare Lake, while the Nutunutu inhabited the swampy area north of Tulare Lake, south of Kings River. The Wimilchi, Wechihit, and Apyachi occupied the area to the north of Kings River, with the Apyachi living near the river's outlet on the western side of the valley, and the Wimilichi and Wechithit to the east. The Choynok occupied an area east of Tulare Lake in the Kaweah River Delta, southwest of the Telamni and Choynok groups. The Koyeti's territory was in the swampy sloughs of the Tule River. The Tulamni occupied Buena Vista Lake, with the Chuxoxi living in the channels and sloughs of the Kern River Delta. The Hometwoli occupied the area surrounding Kern Lake, while the Kawelmani lived to the northeast near Kern River and Poso Creek (Wallace, 1978:449).

Subsistence strategies focused on fishing, hunting waterfowl, and collecting shellfish, seeds, and roots. Fish species commonly hunted included lake trout, chubs, perch, steelhead, salmon, and sturgeon. Waterfowl were mainly caught in snares and nets. Plant foods played a key part in the Yokuts diet; the most important resource was tule, whose roots and seeds were eaten. Other plant foods included various species of grasses, clover, fiddleneck, and alfilaria. Acorns were not readily available, and groups often journeyed into foothill zones to trade for the nut (Wallace, 1978:450).

Southern Valley Yokuts generally placed their settlements on top of low mounds near major watercourses, and constructed two types of permanent residences. The first was an oval, single-family dwelling with wooden framing covered by tule mats. The second type was a long, step-roofed communal residence that housed at least 10 families. Other structures included granaries and a communally owned sweathouse (Wallace, 1978:450-451).

Southern Valley Yokuts relied heavily upon tule reeds for making woven baskets and mats. Basketry tools, such as awls, were made from bone (Wallace, 1978:451-452). Flaked-stone implements included projectile points, bifacial and unifacial tools, and edge-modified pieces. Ground stone tools consisted of mortars, pestles, handstones, and millingstones.

5.3.2.4 Historical Background

Hispanic Period

Southern California and the Pacific Coast had been visited by Europeans since the early sixteenth century. With the development of the Spanish mission system and establishment of the first Franciscan mission at San Diego in 1769, California was firmly placed in the historic timeline. European trade goods were likely known to the inhabitants of the southern San Joaquin Valley, but direct contact was rarely made. The Southern Valley Yokuts were no doubt keenly aware of the Franciscan missions, because their southern and western neighbors, the Chumash, were strongly integrated into the mission system. European trade goods were not uncommon, and are often found in historic period burials in the form of trade beads. It is also well documented that many Chumash neophytes fleeing the oppressive mission system went to the *Tulares* area in the southern San Joaquin Valley and hid amongst the Yokuts inhabitants there (Castillo, 1978; Grant, 1978).

The southern San Joaquin Valley was not visited by Europeans until 1772, when Don Pedro Fages entered through the Tejon Pass, south and east of the Elk Hills, in a meandering overland search of southern California for fugitive Indian neophytes between San Diego and San Luis Obispo (Wallace, 1978; Cook, 1960). Fages' party traveled west along the foothills of the Tehachapi Mountain range, arriving at the Tulamni Yokut village of Tulamniu, along the shore of Buena Vista Lake. Fages named the village Buena Vista, making notes on the huge expanse of tule reeds, thus giving the region its historical Spanish name of *Tularenos*. The southern San Joaquin Valley was seen as uninhabitable and not suitable for settlement or a mission due to the marshy landscape and the perception of the interior Native population as dangerous heathens that actively aided in the corruption of the mission neophytes.

The next recorded visit by a European was Padre Francisco Garces in 1776. He entered the Valley through the Tehachapi Mountains and traveled around the Elk Hills and Bakersfield area looking for possible sites for a new mission, although no missions were constructed in the southern San Joaquin Valley. Other Franciscan monks came into the Elk Hills area, mainly traveling east from Santa Barbara and San Luis Obispo towards the Mojave Desert and the Colorado River. The region was only sporadically visited by Europeans over the following 50 years, usually by military or militia forces from the coastal missions and presidios searching for fugitive neophytes or stolen cattle or horses.

The largest incursion came in 1824, in the wake of the Chumash revolt at the Santa Barbara Mission. A vast majority of the Chumash neophytes, fighting against the oppressive mission system and rising death rate, took the Santa Barbara Mission and held it for several days against the Spanish military, trying to remove them. When the rebelling party, numbering over 400, left the mission, they fled north and east towards the southern San Joaquin Valley. This group of Chumash hid amongst the Tulamni villages along Buena Vista Lake and Slough. Several

Spanish-led military forces entered the valley to apprehend the rebels, but were foiled when they were defeated in small skirmishes with the Yokuts. Many of the Chumash rebels later returned to the mission after the Franciscan Padres, escorted by a military force, entered the Buena Vista Lake area and convinced them to return (Castillo, 1978; Grant, 1978).

The decades following this incident saw very few European visitors other than Spanish ranchers or militia attacking groups for punitive raids and to capture slaves. In 1833, a malaria epidemic swept through the tribes of the San Joaquin Valley, decimating the population. Many early American explorers of the mid-1800s commented on the land being essentially depopulated in the aftermath of the epidemic.

Explorers such as the American trapper Jedediah Smith passed through the area, and their routes became important transportation corridors used by later travelers, stage companies, and settlers. The Mexican government granted the first ranchos in the southern part of the valley in the early 1840s, the closest to the study area being the 17,710-acre *Rancho San Emigdio*, which was granted to Jose Antonio Dominguez in 1842 (Beck and Haase, 1974:34; Hoover *et al.*, 1990:123). These ranchos, however, did not result in permanent settlement. Instead, Mexican rancho owners along the California coast allowed their cattle to wander and graze as far afield as the San Joaquin Valley during this period (Robinson, 1961:1-12, 17-20, 28-29).

The American Period

A major factor leading to the disintegration of Mexican control of California was pressure from the United States. Initial contacts were made by private citizens, such as the aforementioned November 1826 visit by Jedediah Smith to the San Gabriel Mission. Settlement by United States citizens greatly increased after discovery of gold in 1848. California became part of the United States as a consequence of the Mexican War of 1846–1847. The territory was formally ceded in the treaty of Guadelupe Hidalgo in 1848, and was admitted as a state in 1850 (Bethel, 1969).

In 1851, the Yokuts, along with several other San Joaquin Valley tribes, agreed to relinquish their land, opening it to settlement under federal land law. These laws fundamentally shaped the early history of Kern County. The study area, which lies along the Buena Vista Slough and the marshy area connecting Buena Vista Lake and Tulare Lake, was sold under the Arkansas Act of September 28, 1850, whereby Congress ceded to certain states the swamp and overflowed lands on the federal public domain within their borders. The state was then to use the proceeds from the sale of such lands to reclaim them, thereby making them useful to the new landowners. The land act was subject to abuse and fraud. The seasonable nature of swamp land in California led to disagreements between state and federal surveyors regarding the boundaries of swamp land. In some instances, parcels sold as “dry” by the federal government were also sold by the state as swamp and allowed to be inundated. In the end, the state made its own surveys, and on December 5, 1871, the Secretary of the Interior accepted the state’s boundaries.

The state also struggled to find a means of reclaiming the swamp lands. The Green Act of 1855 placed settler’s payments into an earmarked fund. When the settler could prove that the land was ‘reclaimed,’ usually by affidavit, they were given a cash credit—about $1 an acre—for the purchase price. The Green Act also removed limits on acreage, allowing the assembly of large tracts. After 1868, the counties’ boards of supervisors served as reclamation commissioners.

The purchase price ($1 per acre) was paid into the county's swampland fund, but the county swampland commissioners could waive payment if independent commissioners attested that the land had been reclaimed and cultivated for 3 years (Thompson, Ph.D. dissertation, 1958, 185-207). Upon the selection of a parcel, a settler received a certificate denoting their claim; a certificate of purchase upon partial payment; and a state patent for the lands followed upon completion of payments and reclamation. It was under these provisions that Henry Miller, Charles Lux, John Redington, Horatio Stebbins, F.A. Tracy, H.L. Bonestell, and Horatio Livermore amassed their acreage on the lower Kern River west of Bakersfield. They acquired swampland certificates of purchase from would-be settlers or from local agents like Julius Chester, Duncan Beaumont, Richard Stretch, and Thomas Baker, whose earliest claims were made in the area dated to January 28, 1870 (Zonlight, 1979). In this manner, Miller and Lux secured their "Southern Division" in Kern and Kings Counties.

The partnership between Henry Miller and Charles Lux, both German immigrants, began in San Francisco where they both worked as butchers in the early 1850s. They cemented their business partnership in 1858 when they joined forces to purchase a herd of Texas cattle. From that point forward, they sought western lands to purchase for the purpose of operating ranches for their increasing herds (Igler, 2001; Introduction). After acquiring their Southern Division, they organized it into ranches, the largest being the Buttonwillow Ranch, which served as the headquarters ranch of that division. Originally, the headquarters complex known as "Old Headquarters" lay in the south at the base of Tupman Road before moving to Buttonwillow in 1885. The Buttonwillow Ranch consisted of 52,440 acres, and the Project study area lies entirely within its former limits. The area operated under this single ownership from the 1870s until 1927, when Miller and Lux Incorporated (Miller & Lux) started selling the land.

The system of drainage, irrigation, and flood control canals built by Miller & Lux has left an enduring legacy in the area. Although some of their southern lands could immediately accommodate their herds of cattle, other areas required an output of time, money, and effort, primarily in the form of water control features. Construction of the drainage and irrigation canals was critical to the reclamation efforts of their newly acquired swampland along the Buena Vista Slough. If the waters of the Kern River could be diverted away from the slough, the swamp could be dried and then irrigated. Under the Arkansas Act, the Buena Vista Slough was to be reclaimed as a part of the purchase agreement.

In accordance with Assembly Bill 54 of 1861, Swampland District 121 was formed in May 1871, including swamplands along Buena Vista Slough. Miller and Lux, along with a few others who had pastured their cattle in the slough, organized the Kern Valley Water Company in 1876. The Kern Valley Water Company acted as agents for the district. The principal works of the company would be canals for irrigation and for reclamation, known as the Kern Valley Water Company Canal (KVWCC). The following year, canal construction began along the western side of the slough. Fifty-horse teams pulling one-ton "Fresno Scrapers" excavated the bed of what would come to be known as the Kern Valley Water Company's Canal. When finished, the canal measured 125 feet wide and 24 miles long. It was a massive project that required a significant labor force. Fortunately for the Kern Valley Water Company, recently laid off Southern Pacific laborers gladly took the jobs.

The system of canals created during the Miller & Lux period consisted of canals dug and maintained by Miller and Lux, and a system of laterals dug and maintained by individual tenant farmers. After constructing the main flood control canal along the western side of the swamp, Miller & Lux also constructed the East Side and West Side canals for distribution, sometime prior to the early 1890s. As their names indicate, these canals bordered the eastern and western sides of the Buttonwillow Ranch, with the West Side canal running closely parallel to the KVWCC. Much smaller in scale than the flood canal, the West Side was only 30 feet wide and 2 feet deep, and the East Side 25 feet wide, and 3 to 5 feet deep. Miller & Lux also constructed a drainage canal, called Main Drain, from the southern end near the old headquarters northerly through the center of the ranch generally along the line of the original Buena Vista Slough (Barnes, 1920:9). Farmers in the north used the water from Main Drain, collected primarily by seepage, for irrigation. The remainder of the canals and laterals in the area were primarily the works of individual farmers who sought to hook in to the main canal system for irrigation of their farms (Miller, n.d.; USGS, 1898: 61-63; Lewis Publishing Company, 1892).

Miller & Lux also had an enduring water control feature built in the study area. Near Old Headquarters, a weir separated the KVWCC from the Outlet Canal that fed water directly from the Kern River. The weir allowed Kern River water to be diverted into the East Side and West Side canals for distribution. Originally, the first in a succession of timber weirs that controlled the flow of water up the canal, after decades of troublesome wash-outs and flood damage, Miller & Lux invested in a more permanent structure at the point where the main canals met, near Old Headquarters. In 1911, they hired John B. Leonard and W. P. Day to engineer a reinforced-concrete structure to serve as both weir and bridge over the massive flood control canal (Leonard and Day, 1913; Lippincott and Means, 1919).

The canal system allowed Miller & Lux to support settlement in the area. By 1919, Miller & Lux farmed the entire area south of Buttonwillow between the East Side and West Side canals south to Old Headquarters. Individual ranches made up of one to four sections and staffed by Miller & Lux employees operated independently of one another. Each had its own set of buildings and a water supply system. Four ranches, in addition to the headquarters, operated in the study area by 1918: Deep Wells, Poplar Grove, Willow Grove, and Morton Place. These ranches grew almost all of the alfalfa farmed by the company at Buttonwillow. North of the railroad that crosses through Buttonwillow, the company rented their land to tenant farmers. Generally, the farmers grew crops Miller and Lux agreed to buy in their entirety, which often translated to corn and grains to serve as hog feed and winter feed storage (Barnes, 1920:17-18). Milo maize and sorghum were also planted and then grazed by herds brought in the fall (Means, 1919:10-11; Stegman, 1918).

The town of Buttonwillow got its start when Miller & Lux established a ranch headquarters near a single landmark buttonwillow tree in the slough in 1885. They tried to name it Buena Vista, but the area had long been described relative to that Buttonwillow tree, and the name stuck (Burmeister, 1977:85). The Old Headquarters was not abandoned entirely; in 1919, an abattoir functioned at the site, supplying the company's ranches, Bakersfield, and the oil regions with a fresh supply of beef, pork, and mutton (Means, 1919).

At the new headquarters in Buttonwillow, a company store provided needed supplies to the ranch hands. In 1893, Miller & Lux sold 71 acres to the Pacific Improvement Company to establish a

station and town at Buttonwillow. In 1895, they advertised in San Francisco to promote the settlement of an Italian colony in the Buttonwillow region to grow wheat. A few families attracted by the offer established farms in the area on land leased from Miller & Lux (*Buttonwillow Times,* 3 March 1960). Angelo Toriginni was one of the Italians attracted from San Francisco to the Buttonwillow area. In 1899, he joined a brother already employed at the Buttonwillow Ranch. In 1950, he reminisced that 23 families lived in the area when he arrived, only 3 of which were not Italian. He also stated that he was the only one of those 23 families remaining in the Buttonwillow area (*Shafter Press* 3 August 1950). A post office established in 1895 indicated a stable population. The majority of the townsite reverted to Miller & Lux, though. In 1927, Miller & Lux Incorporated, under the direction of land agent C. E. Houchin, platted incarnation of the town (Burmeister, 1977:85; Smith Ph.D. Thesis, 1976:328). Eventually, this area became the focus of a large-scale international marketing campaign that brought families from Europe and the eastern U.S. to start farms and vineyards.

Charles Lux died in 1887, and Henry Miller carried on the business until his death in 1916. By this time, the company was in decline, unable or unwilling to meet the changing business environment. As the heirs to the company fought over the estate, the property was sold off following World War I, ushering in a new era for the Buena Vista Slough (Igler, 2001:180).

Miller & Lux entered a period of decline following the death of the two principals. Settlement of the estates and increasing competition resulted in a period of legal reorganization that would have a physical impact on the area south of Buttonwillow. Miller & Lux had both valuable land and valuable water rights. However, the profitability of the two was linked. In order to sell the land, a legal means of matching water to the land was necessary. In 1920, the California State Engineer released a report on the water resources of the Kern River and recommended that a large district, including the Haggin and Miller & Lux water rights, be formed to manage water distribution. Despite the effective implementation of the Miller-Haggin agreement, the two parties chose to protect their interests by forming two districts.

Miller & Lux's holdings became the nucleus for the Buena Vista Water Storage District. The district submitted a petition for formation to the State Engineer in 1922, and received approval in 1924 (Bonte, 1930:243). As a part of the district formation, Miller & Lux allocated water rights to the land in the district, making future sales possible. The district exchanged bonds with Miller & Lux for the existing canals, and additional bonds were sold for the construction of additional canals. The district, however, held off on construction until 1926 to see if it could work with other Kern River users to construct a mountain storage reservoir. Not seeing active progress, the district left the location of water storage flexible and continued operations. The first major construction project was to lessen water loss at the end of the Kern River through the construction of a direct connection to the canal system and a direct canal to Buena Vista Lake. Additional construction would focus on the northern portion of the district, because the southern end around Buttonwillow had been well developed by Miller & Lux (Harding, 1935).

With water rights allocated to the land and an operating water storage district, the area became suitable for sale. Buttonwillow had been first platted by Southern Pacific in 1893 in conjunction with Miller & Lux. Now, with the need for cash, the town was replatted in 1927. Miller & Lux land agent C.E. Houchin organized and promoted the kick-off sale. As discussed above, Miller & Lux had previously leased land north of Buttonwillow and induced Italian immigrants

to come to the Buttonwillow area. The descendants of some of the original immigrants now purchased former Miller & Lux land south of Buttonwillow. Along with the Italians, a few large-scale investors purchased land in the area, including Rhoda Rindge Adamson of Adohr Farms, and the Parsons.

A large oil deposit found in the Kern River Oil field near Bakersfield in 1899 sparked the interest of oil explorers throughout Kern County. By 1910, the entire Elk Hills had been bought. Standard Oil, Southern Pacific, and Associated Oil were the three largest land owners. The government, especially the Navy, became concerned at this rapid industrial growth and stepped in, stopping the sale of all public lands on the Elk Hills. In 1910, only 20 wells were dug, with minimal output. By 1918, only 35 wells had been dug. In the fall of 1918, Standard Oil began the drilling of Hay No. 1, and in January 1919, the well struck oil and produced a modest 200 barrels of oil a day.

By the mid-1920s, several other companies had opened oil camps that were producing up to 4,000 barrels of oil a day. These strikes proved that oil reserves were present on the Elk Hills and another land rush began. The Navy, concerned at the possible depletion of this resource, moved to prevent claim filings. The Navy also began to drill along the edge of federal lease land in an attempt to slow the depletion. Through the 1930s, it was seen as a race against time, and the Navy made several deals with private firms in an attempt to secure as much of the oil as possible.

At the height of World War II, the Navy began to post officers as guards throughout the Elk Hills oil camps. In 1944, an oil shortage compelled Congress to increase oil production from 15,000 barrels to 65,000 barrels per day. In June 1944, the federal government enacted Public Law 343, transferring all public land leases to the Navy's jurisdiction (Baker, 2000). In less than 8 months, 312 new wells had been dug for the Navy, ending in 1945 with the end of the war.

It was during this period that the Navy began to maintain a small force in the Elk Hills. A Construction Battalion (CB) was stationed on the Elk Hills, and their first priority was to build and improve the roads of the area. Well operation was usually undertaken by skilled workmen, leaving the CBs time for other undertakings. The CBs surveyed section lines; installed brass section markers; built barracks; staked over 750 oil wells; graded for over 400 wells; and staked over 100 miles of roads, water lines, and oil and gas mains.

As discussed above, under the control of Miller & Lux, the types of crops were limited, and supported the cattle and ranching operations of the company. In 1920, the area south of Wasco produced alfalfa, grain, and volunteer pasturage (hay). The exact percentages of these crops depended upon the amount of water available from the Kern River runoff. A report from Thomas Means on the Miller & Lux Southern Division in 1919 pointed to the potential for other crops; notably, cotton and fruits (Barnes, 1920:16-17; Raznoff, 1945:26; Means, 1919). The variable volume and seasonability of water, as well as the demands of the Miller & Lux operation, had limited the development of these new crops. However, in 1928, these limits eased enough for the introduction of cotton as a new major crop.

Cotton had been grown in Kern County since 1862. A knowledge base for the cultivation of the plant and its processing slowly developed. Bakersfield became a center for processing and

shipping of the processed fiber and oil. In 1906, the discovery of Acala cotton, a strong, long-fibered variety, at the Shafter Experimental Farm boosted the industry. In 1928, the first cotton crops were planted in the area south of Buttonwillow. No longer restricted to supporting the cattle, the new farmers could exploit this commercial crop. Production was also assisted by the exploitation of groundwater (Burmeister, 1977:81-82; Raznoff, 1945:26).

Groundwater had not been considered as a part of the water supply for the Buena Vista Water Storage District when it was formed. Early attempts to drive wells were thwarted by sandy subsoils, which collapsed into the wells. However, by 1928, new techniques were developed, including a 'gravel envelope' that protected the wells from collapse. A series of dry years had encouraged farmers to develop wells, and between 1928 and 1937, nearly 130 wells were drilled in the area surrounding Buttonwillow (Harding, 1935:24; Raznoff, 1945:45).

One of the largest and most successful enterprises in the study area following Miller & Lux's ranches was the Adohr Stock Farms, which occupied the southern portion of the study area. Adohr Stock Farms was a Southern California dairy company owned by Rhoda Rindge Adamson and her husband Merritt Adamson. Rhoda Rindge was the daughter of Frederick H. Rindge, a very wealthy, influential East-Coast transplant to California (Rindge, 1972; prologue). Rhoda attended one year of college at Wellesley before purportedly missing the West and returning to finish her education in California. After marrying Merritt Adamson, an attorney and sheep rancher's son, she used her family inheritance to start Adohr (her given name spelled backward) Farms with her husband (Los Angeles Times, August 31, 1930; Van Nuys News, January 10, 1949). By the late 1920s, they strove to vertically integrate their business, seeking to not only maintain a herd of productive dairy cows, but to rear "replacement" calves, and grow the alfalfa necessary to keep their herd fed (Ulery, 1930).

In 1929, the Adamsons had an area northwest of Tupman, owned by Miller & Lux, analyzed to determine if the soil and conditions would support an alfalfa farm and a herd of cattle (Los Angeles Times, September 30, 1934). They learned that the land had rich soil, lay on top of an artesian belt, and had already been successfully planted with corn and wheat. After being satisfied that the land met their requirements, they purchased 1,500 acres from Miller & Lux in July 1930 for $250,000. They designated $50,000 for immediate improvements. Their plans to build a ranch headquarters and make irrigation improvements quickly came to fruition. By the fall of the same year, a field had been planted with alfalfa, ten new wells had been sunk, and construction of a headquarters building, dormitory, and dining hall had been completed on the southeastern corner of what became Adohr Road and Dairy Road (*Los Angeles Times*, July 26, 1930; November 9, 1930).

By May 1933, Adohr had expanded its Buttonwillow satellite ranch to 2,600 acres. Although this location was subsidiary to the main San Fernando Valley branch, its significance lay in that it allowed Adohr to hail their "independence." Adohr ran an advertisement in the *Los Angeles Times* in 1933 with the headings, "Adohr grows its own feed; Adohr raises its own dairy cattle; Adohr operates its own stock farms; and Adohr, of course, has its own far-reaching delivery system" (*Los Angeles Times*, June 1, 1933). The rich land in Kern County, already in close proximity to numerous irrigation structures, played a pivotal role in allowing this southern California company to integrate their business model vertically and provide an affordable product to a broader clientele.

Although Adohr Farms reflected the continuing involvement of the stock industry in the study area, most of the area diversified. Between 1920 and 1935, cotton production grew to 3,800 acres, volunteer pasturage ceased, grain production nearly quadrupled, and milo was introduced (Raznoff, 1945:27). By 1945, the three major crops around Buttonwillow were alfalfa, cereal grains, and cotton. These commercial crops supported 187 farms, only 85 of which were tenant-operated. The others were both home and work for 102 families (Raznoff, 1945:26).

In 1954, a new crop—rice—was introduced to the Buttonwillow area. The new reservoir at Lake Isabella had been completed in 1953, promising better regulation of irrigation water. Local farmers Wayne Smith, William Buerkle, Jack Thomson, Nelson Lewis, Charles Parsons, R.L. Adams, and Hall Smalstig harvested their first rice crops in 1954. Two rice dryers were constructed: one at the corner of State Route 58 (SR 58) and Wasco Avenue, and a second on Palm Farms, the former Adohr Farms site. The northern rice dryer was a co-operative investment managed by R.L. Adams, who also managed the Farmer's Cooperative Gin. The first 7,500 acres were planted and treated with weed control via airplane. Combines were used to harvest the crops. Despite the arid conditions in most of Kern County, 3,377 acres of rice remained in production in 1980; however, production has since ceased (Dane, 1954; Day, 1954; Watson et al., 1980).

Despite the changing crops in the study area, the extensive network of canals constructed during the Miller & Lux period remained sufficient. With the advent of groundwater pumping, farmers used the canals to move water from the wells to their fields, a practice that continues today. Several years of groundwater pumping raised the water table in the area to less than 6 feet for almost 95 percent of the Buttonwillow area by 1943. This rapid rise from 1935 levels called for improvements to the drainage system, including Main Drain. At that time, Main Drain was 4 to 10 feet deep, and suggestions were made for deepening it. Between 1943 and 1944, 4.8 miles of new drains were constructed in the water storage district. The drains also needed improvements to remove obstacles to water flow. Culverts and bridges that were added as the road system developed were insufficient to keep the water flowing. Redwood culverts and corrugated metal pipe culverts, some installed by Miller & Lux, began to be replaced. The Buena Vista Water Storage District also instituted a canal maintenance program in 1943 that called for regular hand maintenance, and mechanized maintenance every 4 years. Today, the canals are reshaped twice a year and re-excavated approximately every 5 years (Raznoff, 1945:16, 18-19).

In 1948, the Navy and Standard Oil amended their unit plan, and Standard Oil was named the Elk Hills unit operator. By the 1950s, the Elk Hills produced nearly 20,000 barrels of oil a day. In 1976, the Elk Hills Reserve was opened to maximum production. The Elk Hills are currently privately owned by several oil companies; the Navy sold its reserves in 1998.

5.3.2.5 Resources Inventory

The methods used to inventory cultural resources for the HECA Project consisted of archival research, Native American consultation, and both archaeological and architectural pedestrian surveys of each cultural resource subdiscipline's respective Study Area. Comprehensive technical reports from the cultural resources subdisciplines of archaeology and historic

architecture are included as Appendix G-3 and Appendix G-4, respectively. Specifics of these efforts are presented below.

Archival Research

A records search of files of the California Historical Resources Information System (CHRIS) housed at the SSJVIC was conducted at the request of URS by the staff of the SSJVIC on February 11, 2009 (RS # 09-019). As the design of Project alternative linear alignments was refined, additional records searches of CHRIS were conducted on multiple occasions. The primary records search for the various linear alignments was conducted by the staff of the SSJVIC on February 17, 2009 (RS # 09-056). Supplemental records searches to both RS #09-019 and RS # 09-056 were conducted by URS staff at the SSJVIC to account for refinements in the configuration of the Project. The most recent supplemental search was conducted on February 13, 2012 (Appendix G-1). Record search data for the OEHI CO_2 line south of the California Aqueduct, as well as the OEHI Processing Facility within the EHOF, are discussed in Appendix A.

The purpose of the records searches for this analysis was to identify all previously conducted cultural resource surveys and studies, as well as all previously recorded archaeological (including both prehistoric and historic) sites and historic architectural resources in their respective Study Areas. The results of the records searches are provided in Appendix G-1. In addition to the historical resources files, the following publications, manuscripts, or correspondence were also consulted:

- National Register of Historic Places (NRHP).
- Office of Historic Preservation (OHP) Archaeological Determinations of Eligibility – Records entered into the OHP computer file, received quarterly (2012).
- OHP Directory of Historic Properties – Records entered into the OHP computer file of historic resources, received quarterly (2012).
- Five Views: An Ethnic Sites Survey for California (1988).
- California Historic Landmarks (1988).
- California Points of Historical Interest (1988).

In addition to the aforementioned sources, a review of historic maps (Table 5.3-1, List of Reviewed Historic Maps) and aerial photographs (Table 5.3-2, List of Reviewed Aerial Photographs: Tupman and Buttonwillow, Kern County, California) was also conducted: The records searches revealed that neither the Project Site nor the adjacent Controlled Area had been previously inventoried for cultural resources. Portions of the electric transmission, water (process and potable), natural gas, and rail road alignments had, however, been subjected to cultural resource inventory efforts. The complete results of the records searches are attached as a confidential appendix (Appendix G-1).

The information obtained in these records searches shows that 29 previous cultural resources investigations were conducted within either 1 mile of the Project Site and natural gas tie-in facility, and/or within 0.5 mile of the linear ROWs (see Table 5.3-3).

A review of the studies presented in Table 5.3-3 resulted in the identification of 37 cultural resources (35 archaeological, 2 historic architecture) sites in the records search area (Table 5.3-4, Previously Identified Cultural Resources within Records Search Area). Of the archaeological sites, two are in the ARSA as defined per CEC guidelines for archaeological resources, four others are in close proximity to the ARSA (within 200 feet), and the remainder are only within the records search area and will be given no further consideration. The two historic architectural resources are within the HARSA, as per CEC guidelines for built environment resources.

The records search efforts also revealed that a number of isolated artifacts have been previously identified in the ARSA. Because isolated artifacts do not represent significant cultural resources, they do not receive further consideration in this section.

Maps indicating the location of previous studies and Department of Parks and Recreation (DPR) 523 forms for the identified resources are provided in Appendix G-1.

JRP examined the aforementioned records searches and standard sources of information that list and identify known and potential historical resources, to determine whether any buildings, structures, objects, districts, or sites had been previously recorded or evaluated in or near the cultural resources study area. JRP reviewed the NRHP, California Register of Historical Resources (CRHR), California Historical Landmarks (1996), and California Points of Historical Interest (1992). These lists did not include any historical resources in or near the HARSA. None of the farmsteads or processing facilities in the HARSA has been previously identified as potential historic resources, nor do they appear to have been previously evaluated for listing in the NRHP or CRHR. The California Aqueduct has been previously evaluated and found eligible for the CRHR. None of the other canals in the HARSA have been evaluated.

Native American Consultation

The California NAHC has been contacted on seven occasions during the course of the Project as a result of previous Project modifications, including changes in the Project Site and linear alignments. On each occasion URS requested a records search of the Sacred Lands File (SLF) and a list of local Native American contacts (individuals and/or organizations) that might have knowledge of cultural resources within the defined Project Study Areas. Only one of the seven NAHC SLF searches indicated the presence of cultural resources within the SLF search area. Specifically, the response received from the NAHC on February 13, 2009 concerning all of the linear alignments (as defined at that time), stated that the SLF search "did indicate" the presence of cultural resources in the Project Study Area (as defined at that time). Although the aforementioned response was positive for cultural resources, the California Native American Heritage Commission is exempt from the disclosure of public records of Native American graves, cemeteries, and sacred places [CA GOV § 6254 (r)], and as such denied URS's request for more specific information on this "positive" search result.

The NAHC did, however, provide a list of local Native American representatives that they encouraged be contacted for information regarding issues of concern, including the location of known cultural resources in a given project area. Contact letters describing the HECA Project and a map depicting the HECA Project Site and Project linear alignments were sent to each of the identified parties on multiple occasions. It should be noted herein that the lists provided by

the NAHC were not exact duplicates of each other. Certain individuals only appeared on one list provided by the NAHC, and were thus only contacted once.

The letters inquired whether the individuals/organizations had any concerns regarding the Project or wished to provide input regarding cultural resources in the Project Area. Individuals that were no longer listed on the NAHC's contact list at this time were not contacted via telephone. No responses received to date have revealed specific information regarding the presence of cultural resources in the ARSA.

Copies of the NAHC request letters, NAHC response letters, mailing lists, consultation letters and responses, are appended to the Cultural Resources Technical Report, which is provided in a confidential appendix to this report. Any future responses received after the date of this report will be directly forwarded to the Applicant. A synthesis of the Native American consultation efforts is provided in Table 5.3-5, Native American Consultation Information, and in Appendix G-2.

Archaeological Field Reconnaissance

The pedestrian (field) reconnaissance required the use of both block survey for the Project Site and abutting Controlled Area; and linear survey for the Project linear ROWs [electrical transmission, water (process and potable), natural gas, railroad] where access had been secured; and the portion of OEHI CO_2 pipeline in the Controlled Area to the point that it enters the proposed horizontal directional drilling (HDD) pit north of the California Aqueduct. The block survey was completed by walking an alternating series of parallel transects spaced 15 to 20 meters (50 to 65 feet) apart over the block until the entire land area was covered, while the linear survey involved walking similarly spaced parallel transects in a single direction. In areas where nonagricultural vegetation obscured the ground surface, 20-centimeter by 20-centimeter patches were occasionally cleared using hand tools or footwear to increase ground visibility. It should be noted herein that the Controlled Area was also subject to pedestrian reconnaissance to allow for changes in the configuration of the facility and/or adjustments to the routes of linear alternatives. However, the Controlled Area, although inventoried for archaeological resources, is not part of the Project's ARSA (except for areas within 200 feet of the Project Site).

As sites were located during the survey, they were assigned temporary field designations (e.g., HECA-1, HECA-2, etc.) and their locations were plotted onto U.S. Geological Survey (USGS) topographic maps with the aid of handheld Global Positioning System (GPS) units. Site recordation included site mapping, completion of primary and archaeological site record forms, feature illustrations, and site photographs. All site recordation was completed using State of California DPR Forms.

Site mapping included boundary delineation, location of features, mapping of diagnostic artifacts and artifact concentrations, and location of natural features of assistance in relocating the site. In addition, to assist in the assessment of site integrity and recognition of the extent of previous impacts to sites, observable surface disturbances were also mapped. Distance and bearings to these cultural points and features were recorded from a datum established for the site.

The pedestrian reconnaissance of the ARSA, except the process water line, was conducted by Leroy Laurie (URS Staff Archaeologist), Joe Fayer (URS Staff Archaeologist), Joshua Peabody, M.A. (URS Archaeological Technician), Mark Kile, M.A. (URS Archaeological Technician), and Mark Hale (URS Senior Project Archaeologist). The pedestrian reconnaissance of the process water line was conducted by Joshua McNutt, M.A. (URS Senior Archaeologist), accompanied by Sarah Mattiussi (URS Staff Archaeologist), Kurt McLean (URS Archaeological Technician), and Brian Shaw (URS Architectural Historian).

All archaeological fieldwork for the ARSA, except the ROW for the process water line, was carried out under the supervision of Michael S. Kelly, M.A. (URS Principal Archaeologist), who meets the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (NPS, 1983). Archaeological fieldwork along the process water line was carried out under the supervision of Reid Farmer, M.A., who likewise meets the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (NPS, 1983). All fieldwork is consistent with the procedures for compliance with Section 106 of the NHPA, set forth at 36 Code of Federal Regulations (CFR) 800.

Surface visibility was generally good (greater than 80 percent) throughout the portion of the archaeological resources ARSA where the Project Site is situated. Surface visibility in the adjacent Controlled Area was similar to that experienced within the Project Site. As required by the revised CEC regulations, an examination of a 200-foot-wide buffer radius around the Project Site was also completed. The majority of the buffer falls within the Controlled Area; which, as described above, was completely surveyed for archaeological resources.

Along the course of the linear alignment ROWs [electrical transmission, water (process and potable), natural gas, railroad], surface visibility was variable, but generally was greater than 50 percent. As required by the revised CEC regulations, an examination of a 50-foot-wide buffer either side of the ROW for each of the linear alignments was completed. The exception was along the process water ROW. The process water pipeline is to be placed in the levee adjacent to the north-northeastern side of the West Side Canal, and construction would not occur on the south-southwestern side of the Canal. Because the Canal would act as a physical barrier for construction, impacts to archaeological deposits situated across the canal from the construction area would not occur; therefore, the area south-southwest of the canal was not surveyed.

As a result of the pre-field and field efforts, a total of twelve archaeological resources were identified within or in close proximity (within 200 feet) to the ARSA, as defined for the Project. Of these, six were previously recorded sites (see Table 5.3-4), and the remaining six were composed of newly discovered resources. Descriptions of these resources and their location in relationship to the proposed Project are presented in Section 5.3.3.4. The archaeological survey report documenting these efforts, including the DPR 523 forms, is provided as a confidential appendix (Appendix G-3).

In addition to the pedestrian reconnaissance, Mr. Laurie also conducted archaeological monitoring of the geotechnical investigation conducted within the Project Site (see Appendix P for the geotechnical investigation report). No archaeological materials were observed in any of the five geotechnical borings placed within the Project Site.

Geoarchaeological Study

URS also addressed the geoarchaeological sensitivity of the Project Site and the linear ROWs. The purpose of the geoarchaeological study was to identify specific areas in the ARSA that have sensitivity for buried archaeological sites—based on the existing geological, geomorphological, and archaeological literature and data. For a complete discussion of the methods, sources consulted, and findings of the geoarchaeological study, see Appendix G-3 Archaeological Reconnaissance, Project Study Area.

Several sources were used to assess the geomorphic setting and the potential for buried archaeological sites in the ARSA. The first sources included existing quaternary geological and geomorphological studies, generally produced as "open-file" reports by the USGS. These provide a broad context on the timing and formation of various landforms found throughout the ARSA. The second sources were existing soils data, including a compilation of radiocarbon (14C) dates and their association to specific mapped soil series in the Soil Survey Geographic (SSURGO) database, which provides a more accurate estimate of the age of a given land surface. Finally, reports from archaeological excavations and geomorphological field studies in the Project vicinity provide information on local depositional processes and known buried landforms.

The challenge associated with buried archaeological sites in the San Joaquin Valley, and more generally, the Central Valley as a whole, has been summarized as follows:

> The Central Valley's archaeological record, as we know it today, is biased by natural processes of landscape evolution. Surface sites are embedded in young sediments set within a massive and dynamic alluvial basin, while most older archaeological deposits have been obliterated or buried by ongoing alluvial processes. Consequently archaeologists have had to struggle to identify and explain culture change in portions of the Central Valley where available evidence spans only the past 2,500 years or in rare cases 5,500 years. (Rosenthal, White, and Sutton, 2007:150)

While the assumption that surface archaeological sites exist only in younger sediments is not necessarily accurate, the general problem of site visibility in a region that has been geomorphically dynamic over the past 13,500 years—roughly the period of human occupation in California—is highly relevant to the Project ARSA.

Based on an analysis of existing geological, geomorphological, soils, archaeological, and geoarchaeological studies relevant to the Elk Hills/Buttonwillow region, there is a moderate to high potential for encountering buried archaeological deposits throughout the majority of the Project ARSA. The potential for encountering buried archaeological sites with no surface manifestation is confirmed by the young age of the vast majority of the surface deposits and associated landforms—most of which appear to date to the latest Holocene, or the past ca. 1,000 years. Furthermore, these are predominantly fine-grained alluvial depositional landforms—especially the Buena Vista Slough basin deposits and the Kern River Alluvial Fan deposits—which are likely to contain and preserve formerly stable surfaces (paleosols).

Aside from the northern portion of the railroad and natural gas linears, which are on older Pleistocene alluvium, the Project Site and the remaining linear ROWs appear to be moderately to highly sensitive for buried archaeological deposits. Portions of the linear ROWs that are located on the Buena Vista Slough and Kern River Alluvial Fan landforms include the process water linear, the potable water/electric transmission linears, and southern portions of the railroad and natural gas linears, and have the greatest potential for buried archaeological sites. The process water linear and well field appear to be particularly sensitive. The sensitivity of the process water linear is, however, diminished, because it is to be placed in a levee constructed along the West Side Canal where intact buried archaeological resources are not anticipated to occur.

Built Environment Inventory

JRP conducted fieldwork in the study area and recorded the properties on the DPR 523 forms, included with the built environment technical report in Appendix G-4. Based on the results of the background investigation and the field survey, JRP conducted research at a variety of libraries and repositories, including: California State Library, Sacramento; Shields Library, University of California, Davis; Bancroft Library, University of California, Berkeley; Water Resources Center Archives, University of California, Berkeley; Beale Memorial Library, Bakersfield; and the Kern County Museum, Bakersfield.

JRP then used the research data collected to prepare a historic context to address pertinent themes of Kern County irrigation history and agricultural history, and evaluated properties under CRHR and HRHP criteria on DPR 523 forms. Historic themes are discussed in Section 3 of the appended technical report (Appendix G-4). JRP evaluated the resources in the study area in accordance with Section 15064.5(a)(2)-(3) of the California Environmental Quality Act (CEQA) Guidelines, using the criteria outlined in Section 5024.1 of the California Public Resources Code, and also under NRHP and CRHR criteria listed on the DPR 523 forms included in Appendix G-4.

5.3.3 Environmental Consequences

5.3.3.1 Federal Cultural Resources Evaluation Criteria

Four evaluation criteria to determine a resource's eligibility to the NRHP, in accordance with the regulations outlined in 36 CFR 800, are identified at 36 CFR 60.4. To determine site significance through application of NRHP criteria, several levels of potential significance that reflect different (although not necessarily mutually exclusive) values must be considered. As provided in 36 CFR 60.4:

The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

1. That are associated with events that have made a significant contribution to the broad patterns of our history;

2. That are associated with the lives of persons significant in our past;

3. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

4. That have yielded, or may be likely to yield, information important in prehistory or history.

These evaluation criteria are used to help determine what properties should be taken into account in any assessment or consultation (36 CFR 60.2).

5.3.3.2 State Cultural Resources Evaluation Criteria

In considering impact significance under CEQA, the significance of the resource itself must first be determined. At the state level, consideration of significance as an "important archaeological resource" is measured by cultural resource provisions considered under CEQA Sections 15064.5 and 15126.4, and the criteria regarding resource eligibility to the CRHR.

Generally, under CEQA, a historical resource (these include built-environment historic and prehistoric archaeological resources) is considered significant if it meets the criteria for listing on the CRHR. These criteria are set forth in CEQA Section 15064.5 and defined as any resource that:

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

2. Is associated with lives of persons important in our past;

3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

4. Has yielded, or may be likely to yield, information important in prehistory or history.

Section 15064.5 of CEQA also assigns special importance to human remains, and specifies procedures to be used when Native American remains are discovered. These procedures are detailed under Public Resources Code (PRC) Section 5097.98.

Impacts to "unique archaeological resources" are also considered under CEQA, as described under PRC 21083.2. A unique archaeological resource implies an archaeological artifact, object, or site about which it can be clearly demonstrated that—without merely adding to the current body of knowledge—there is a high probability that it meets one of the following criteria:

1. The archaeological artifact, object, or site contains information needed to answer important scientific questions, and there is a demonstrable public interest in that information;

2. The archaeological artifact, object, or site has a special and particular quality, such as being the oldest of its type or the best available example of its type; or

3. The archaeological artifact, object, or site is directly associated with a scientifically recognized important prehistoric or historic event or person.

A non-unique archaeological resource indicates an archaeological artifact, object, or site that does not meet the above criteria. Impacts to non-unique archaeological resources and resources that do not qualify for listing on the CRHR receive no further consideration under CEQA.

Under CEQA Section 15064.5, a project potentially would have significant impacts if it would cause substantial adverse change in the significance of one of the following:

1. A historical resource (i.e., a cultural resource eligible for the CRHR);

2. An archaeological resource (defined as a unique archaeological resource that does not meet CRHR criteria); or

3. Human remains (i.e., where the project would disturb or destroy burials).

A non-unique archaeological resource is given no further consideration, other than the simple recording of its existence, by the lead agency.

5.3.3.3 Conformity of Federal and State Evaluation Criteria

The criteria for eligibility for the CRHR are very similar to those that qualify a property for the NRHP, which is the significance assessment tool used under the NHPA. The criteria of the NRHP apply when a project has federal involvement.

A property that is eligible for the NRHP is also eligible for the CRHR. All potential impacts of a federal undertaking to an NRHP listed or eligible to be listed resource must be assessed and addressed under the procedures of Section 106 of the NHPA, set forth in 36 CFR 800. Eligibility for listing in either the NRHP or CRHR rests on twin factors of significance and integrity. A property must have both significance and integrity to be considered eligible. Loss of integrity, if sufficiently great, will overwhelm historical significance a property may possess and render it ineligible. Likewise, a property can have complete integrity, but if it lacks significance, it must also be considered ineligible.

5.3.3.4 Archaeological Resources

Twelve archaeological resources have been identified in or within in close proximity of the ARSA as defined for the current Project. Of this total, six were previously identified, while the remaining six sites were discovered as a result of the efforts conducted for this study. Presented below are the archaeological sites situated in the current Project ARSA, defined for the Project using CEC guidelines, as discussed previously in Section 5.3.1.

Although those archaeological sites situated in close proximity to the ARSA (measured as a linear distance of 200 feet from edge of ARSA) may not be in the direct impact area, they are

situated close enough to warrant consideration to ensure their proper management. As such, a discussion of those sites is also presented in a subsequent section.

Archaeological Resources in the ARSA

P-15-171

P-15-171 (CA-KER-171) was originally recorded as an "occupation site" by Latta (1950). Site boundaries were not identified at the time of Latta's recordation, and no site constituent or condition information is provided. A relative site location is plotted in the Lokern 7.5´ USGS quadrangle. The site was not relocated during the current investigation. The purported site vicinity has been highly disturbed by various agricultural activities and the construction of the West Side Canal. The site, as it was plotted, is in the ARSA defined for the Process Water pipeline and well field. The Process Water pipeline is to be constructed in an existing artificial (i.e., constructed) levee that extends several feet above the natural ground surface. The pipeline is to be set into a trench with a maximum depth of 5 feet that is entirely within the soils used to construct the levee. The ARSA for the well field was established to allow for maximum flexibility in the placement of wells and connecting pipelines to allow for the avoidance of identified resources. Given the presence of this design flexibility, the wells and connecting pipelines will be placed in a manner to avoid this archaeological site. As such, no impacts to this site are anticipated from implementation of the Project.

P-15-3108

As originally recorded, P-15-3108 (CA-KER-3108) consisted of a sparse artifact assemblage comprised of lithic debitage and groundstone fragments (Everson, 1991). Everson's site record also describes disturbance to the site from the construction of adjacent railroad tracks and a state highway. Colleagues of Everson, Garcia and Valdez, revisited the site and noted that the area where Everson had plotted the site had been recently disked. During this subsequent visit to the site, no artifacts other than one "possible mano" were observed within the site area as identified by Everson (Garcia and Valdez, 1992:1). Evidently, several of the sites identified during initial field efforts could either not be relocated or had significantly changed when revisited.

According to Parr and Osborne:

> "… a number of sites were revisited to perform some follow up work several months after having been recorded. In a number of instances artifacts that had been visible on the site surface no longer were visible …" (Parr and Osborne, 1992:52).

Similarly to the efforts described above, no evidence of the site was observed during the current pedestrian survey. As plotted, P-15-3108 is within the ARSA as it pertains to the Natural Gas Supply Line. As subsequent efforts to identify the site within the plotted location (including by archaeologists from the same team a year later) have been unsuccessful it is possible that the site was miss-plotted and is in fact within an entire different location. Possibly confirming this premise is the fact that the UTM coordinates noted on Everson's site form place the site

approximately 230 meters to the southeast from where the site is plotted on the accompanying USGS topographic quadrangle (Everson, 1991).

Given that no archaeological materials have been identified within the plotted location, impacts to the site as a result of implementation of the HECA Project are not anticipated.

HECA-2008-1

This particular site consists of a prehistoric lithic scatter that was identified at the bottom of the West Side Canal. The site's artifact assemblage consists of lithic debitage, a projectile point tip fragment, and three pieces of burnt faunal bone. The debitage is composed of Monterey and Franciscan chert, which are both local source materials. This site is a small artifact scatter, but it is believed to represent a much larger site. The site was found at the bottom of a water canal along the eastern edge in a long, thin line. It was originally interpreted to be the re-deposition of artifacts from a site further up the canal. This was rejected because it was unlikely the artifacts would have deposited so regularly along one side of the canal. It is more likely that the canal construction and upkeep has cut horizontally into the edge of a deeply stratified site that is buried 1.8 meters below the modern ground surface; because this site is within the Buena Vista Slough, this is entirely probable. The presence of the artifacts suggests that further intact subsurface cultural context remain intact well below the levels of modern agricultural disturbances. The site is located in the ARSA defined for the Process Water pipeline; however, this is based on CEC guidelines where a 50-foot buffer is placed along either side of linear ROW. The Process Water pipeline is to be constructed within an existing artificial levee that extends several feet above the modern ground surface. The pipeline is to be set into a trench with a maximum depth of 5 feet, which is entirely within the introduced soils used to construct the levee. As such, no impacts to this site are anticipated.

HECA-2009-2

HECA-2009-2 consists of a low-density scatter of lithic artifacts including two chert bifaces, a steatite fragment, and three yellow-brown cryptocrystalline silicate (CCS) reduction flakes. The site appears to have been previously disturbed, because the deposit is situated primarily on the eastern slope of a dirt-road berm that parallels the Outlet Canal. Other modern disturbances in the site vicinity include the grading of two dirt roads, the construction of the Outlet Canal, and the West Side Canal. The location of the site is in close proximity to the CO_2 linear. Because the pipeline will be placed using HDD, and the route of the pipeline will be well below the current ground surface, no impacts to the site are anticipated.

HECA-2009-9

HECA-2009-9 consists of a relatively moderate-sized, low-density scatter of lithic debris, including a CCS core and approximately 25 CCS reduction flakes situated along the northern edge of the West Side Canal. The site is located in the ARSA defined for the proposed Process Water pipeline and well field. The Process Water pipeline is to be constructed within an existing artificial (i.e., constructed) levee that extends several feet above the natural ground surface. The pipeline is to be set into a trench with a maximum depth of 5 feet which is entirely within the introduced soils used to construct the levee. The ARSA for the well field was established to

allow for maximum flexibility in the placement of wells and connecting pipelines to allow for the avoidance of identified resources. Given the presence of this design flexibility, the wells and connecting pipelines will be placed in a manner to avoid this archaeological site. As such, no impacts to this site are anticipated from implementation of the Project.

HECA-2009-10

HECA-2009-10 consists of a relatively large, low-density scatter of CCS debris. The scatter is comprised entirely of debitage including approximately one hundred CCS reduction flakes. The site is located in a plowed agricultural field east, northeast of the West Side Canal. Besides extensive plowing, other modern disturbances in the site vicinity include the construction of the West Side Canal, a graded dirt road, and other associated agricultural activities. The site is located in the ARSA defined for the proposed Process Water pipeline and well field. The Process Water pipeline is to be constructed within an existing artificial (i.e., constructed) levee that extends several feet above the natural ground surface. The pipeline is to be set into a trench with a maximum depth of 5 feet, which is entirely within the introduced soils used to construct the levee. The ARSA for the well field was established to allow for maximum flexibility in the placement of wells and connecting pipelines to allow for the avoidance of identified resources. Given the presence of this design flexibility, the wells and connecting pipelines will be placed in a manner to avoid this archaeological site. As such, no impacts to this site are anticipated from implementation of the Project.

HECA-2010-2

At the time of recordation (2010), HECA-2010-2 consisted primarily of the foundation of a recently demolished farmhouse. The foundation consisted of a concrete footing measuring 7 inches wide, with a cinderblock-based addition at the northern side of the original foundation. These blocks displayed three circular holes in the center of each of the blocks. In the interior of the foundation perimeter, there occurred two rows of concrete pier blocks that would have supported beams running east/west. The building appeared to have undergone a series of changes and alterations, as evidenced by the presence of the cinderblocks, as well as the co-occurrence of original construction clay and cast-iron sewer/water pipes, and the more recent installation of polyvinyl chloride (PVC) plumbing. The contents of the debris observed in the building's footprint indicated that it was likely occupied until demolition. The building itself had been recently razed, and fragments of cinderblock were located in a canal situated approximately 55 meters south of the foundation. A review of archival sources, including aerial photographs and topographic maps, reveal the structure was in place prior to World War II, likely constructed during the 1920s or 1930s. Planted trees surrounding the resource included palm, Monterey pine, black walnut, mulberry, cottonwood, magnolia, and oleander. The site is in the ARSA for the proposed natural gas linear and railroad corridor.

Additional archival research indicates that the property was owned by Leland K. and Ruth B. Olsen from at least the mid-1930s. State voter registrations show the Olsens were ranchers living in the Los Angeles area in 1934; but in 1935, they were residing in Buttonwillow. At that time, Leland, his brother Teddy B. Olsen, and their father George W. Olsen began farming the Elk Hills district. It appears that Leland and Ruth inhabited their Buttonwillow home until Leland's death in 1992. Ruth retained the land, but moved to Bakersfield; she died in 2002.

Since the time of recordation in 2010, the site area has been completely graded by activities unrelated to the Project, removing evidence of the site. Because the structure had internal plumbing, as evidenced by sewer pipes (likely connected to a leach field), it is unlikely that an undiscovered "privy pit" occurs buried in the ARSA. Given its agricultural setting, it is plausible that domestic trash was deposited on site, either being buried or burned. No evidence of such a refuse disposal area was, however, observed at the time of original recordation. Given that all evidence of the site has been eradicated, impacts to HECA-2010-2 are not anticipated.

Archaeological Resources in Close Proximity to the ARSA

P-15-89

P-15-89 (CA-KER-89/H) consists of a prehistoric lithic scatter with human remains, and an associated historic trash scatter recorded by G.W. Laframboise (1990). The site was originally documented by Pilling (1950a) as an "Indian Burial Mound." Laframboise (1990) noted chert debitage, an *Olivella* split-punched shell bead, and purple glass. In addition, he indicates that human remains were present in the site, which suggests Pilling's original classification of the site was accurate.

As recorded by Laframboise (1990), P-15-89 is located on the south-southwestern side of the West Side Canal. The process water linear is to be placed adjacent to the north-northeastern side of the Canal, and no construction or other Project-related ground-disturbing activities would occur on the south-southwestern side of the Canal. Because the Canal would act as a physical barrier for construction, impacts to archaeological deposits situated across the canal from the construction area would not occur. Due to the location of the site and the negative findings of the pedestrian archaeological reconnaissance of the process water linear ROW in the vicinity of P-15-89, there is no indication that the site will be impacted by the Project.

P-15-124

P-15-124 (CA-KER-124) was originally recorded by L.A. Payen in 1963 as a site consisting of a sparse scatter of freshwater mussel shell (Payen, 1963). P-15-124 was not encountered during the any of the archaeological pedestrian reconnaissance surveys conducted for the current ARSA. As portrayed on the SSJVIC, the site is in close proximity to the route of the pipeline that will transmit CO_2 to the Elk Hills for sequestration. Because the pipeline will be placed using HDD, and the route of the pipeline will be well below the current ground surface, no impacts to the site are anticipated.

P-15-179

The site record supplied by the SSJVIC for this site indicates that the site was recorded by Pilling (1950b). Pilling's Archaeological Site Survey Record for P-15-179 (1950b) does not contain a detailed sketch map. According to the site record, the plotting of the site is based on an earlier version of the East Elk Hills 7.5´ USGS quadrangle, which depicted a "Burial Mound" in the location of P-15-179. No description of the site's dimensions, artifacts, or the presence of human remains is provided. Although the site is located within 200 feet of the process water linear

ARSA, the findings were negative during the pedestrian archaeological reconnaissance of the process water linear ROW in the vicinity of P-15-179.

The Process Water pipeline is to be constructed within an existing artificial levee that extends several feet above the modern ground surface. The pipeline is to be set into a trench with a maximum depth of 5 feet, which is entirely within the introduced soils used to construct the levee. As a result, there are no anticipated impacts to the site as a result of the Project.

P-15-2485

P-15-2485 (CA-KER-2485) consists of a lithic scatter recorded by Jackson (1989). He noted an artifact assemblage composed of lithic debitage, projectile points, and groundstone fragments. Jackson also describes extensive disturbance to the site from agricultural activities.

As recorded P-15-2485, is located on the south-southwestern side of the West Side Canal. The process water linear is to be placed adjacent to the north-northeastern side of the Canal, and no construction or other Project-related ground-disturbing activities would occur on the south-southwestern side of the Canal. Because the Canal would act as a physical barrier for construction, impacts to archaeological deposits situated across the canal from the construction area would not occur. Due to the location of the site and the negative findings of the pedestrian archaeological reconnaissance of the process water linear ROW in the vicinity of P-15-2485, there is no indication that the site will be impacted by the Project.

HECA-2012-1

HECA-2012-1 consists of a low-density scatter of CCS debris. The scatter is comprised entirely of debitage including approximately twenty CCS primary reduction flakes, shatter, cores, and core fragments. Modern disturbances within and near the site include a railroad line, agricultural development, two dirt roads which are subject to heavy equipment and vehicular traffic, and extensive evidence that this vehicular traffic is not confined to the existing dirt roads.

The site is situated in close proximity to the ARSA as it is defined for the Natural Gas pipeline, which is the only ground-disturbing Project component within the site vicinity. Although the site is located within 200 feet of the ARSA, impacts to the resource are not anticipated given the distance between the site boundary and the area to be disturbed by the Natural Gas pipeline.

5.3.3.5 Built Environment Resources

Built environmental resources in the HARSA defined for the Project include canals, farmsteads, residential buildings, and industrial sites, as well as utility and railroad corridors. Although some of the canals date from the late-nineteenth century, most of the buildings in the area date from the 1930s and later. This is the result of the dominance of Miller & Lux in the region until 1927.

JRP recorded and evaluated all built-environment resources constructed prior to 1964 in the HARSA. Many properties included buildings from several periods. In these cases, buildings constructed after 1964 may simply be noted in the forms and evaluation. Several mobile homes are installed within the study area; however, because these are movable structures, they were not evaluated. The California Aqueduct, which bisects the southwestern edge of the portion of the

HARSA associated with the plant site, has been previously evaluated and found eligible. This property was not recorded as a part of this Project.

The following subsections describe the buildings and facilities at the existing canals, farmsteads, industrial sites, utility lines, and transportation-related sites in the Project area. For more detailed descriptions of the properties discussed below, see the individual DPR 523 forms provided in Appendix G-4.

Canals

All the canals in the HARSA, except the California Aqueduct, are a part of the Buena Vista Water Storage District and are documented on one DPR 523 form (Appendix G-4). Water flows through the district in a generally southeasterly to northwesterly direction. Canals in the southern portion of the district where the Project Site will be located are all earthen-lined, with either a trapezoidal or U-shaped profile. The smaller canals and ditches, Depot Drain and Deep Wells Ditch, are considered district laterals. These ditches have trapezoidal profiles and are between 15 and 27 feet wide at the top and 6 to 12 feet deep. These canals have few water control features, most of which are modern. Culverts tend to be large pipes without headwalls, and delivery gates are widely spaced. The gates are along the sides of the canals, and have concrete headwalls and flanking walls, with circular metal gates operated with a vertical screw mechanism. The drains are fed through corrugated metal pipes.

The Main Drain is located in the center of the district. The drain constructed between 1916 and 1918 is slightly larger than the lateral canals. The drain follows the general route of the natural Buena Vista Slough, but straightens the route. Approximately 25 to 30 feet wide at the top, the canal is 5 to 9 feet deep. The drain becomes larger as it travels northwest. By the time it crosses under SR 58 in Buttonwillow, it requires a concrete bridge rather than a culvert.

The East Side and West Side canals were constructed in the late 1870s as the main canals for the irrigation system serving the Buena Vista Slough area. The East Side Canal is slightly smaller, at 45 feet across the top, compared to the 50 to 60 feet across for the West Side Canal. Both the East Side and West Side canals are controlled by concrete check gates with metal frames for the gates, and metal mesh walkways across the top. The East Side Canal has more checks along its southern route than the West Side Canal. Pumps divert water from the East Side Canal, along with turn-outs for lateral canals.

The oldest canal is the KVWCC, originally constructed in 1876 as a 125-foot-wide canal. The U-shaped canal was partially dug and leveed. As a result, the western slope of the canal appears as a hump of land in the flat plain. The height of the western side of the canal varies, because the original soil was not suitable for levies or compacted well. The eastern side of the canal is more regular because it also makes up the western side of the West Side Canal. The central channel is uneven, because flood waters have cut a meandering path in the center of the canal. The canal channel is trash- and debris-strewn and highly vegetated. Maintenance has included the removal of vegetation and reshaping by bulldozers. The Old Headquarters Weir is part of this system.

The California Aqueduct brings water from the San Joaquin Delta to Southern California. Over 210 feet across, the concrete-lined canal is a major feature in the Central Valley landscape. The

Aqueduct has been previously evaluated and found eligible for the NRHP/CRHR despite being less than 50 years old. An approximately 0.5-mile-long section of the California Aqueduct occurs in the HARSA defined for the Project. Specifically, an approximately 0.5-mile-long section of the California Aqueduct situated south of the Project Site falls within the portion of the HARSA delineated, as per CEC guidelines, to account for indirect effects (i.e., 0.5 mile from the proposed plant site).

Farmsteads and Residential Buildings

The farmsteads and individual residences in the study area are widely dispersed, and organization of the buildings on the properties depends upon the ownership, crop production, and individual property history. The architectural details and characteristics—combined with mapping and aerial photographs—indicate that many buildings have been moved in this area. Interviews with residents further corroborate this conclusion. Buildings can be divided into three types: early twentieth–century residences, mid– to late–twentieth century ranch houses, and utilitarian out-buildings. Several generations of buildings are usually visible on each property.

Adohr Farms also provided housing for agricultural workers, although the remaining structures are larger than the small buildings provided for single workers or their immediate family. The workers' housing is wood framed with a concrete foundation. The buildings have gable roofs and horizontal wood siding. Often, they are narrow rectangles. The remaining Adohr Farm building was most likely a dining hall for the workers. The building has a monitor roof and porches on either side.

Individual residences in the HARSA include two early twentieth–century-residences, and a house constructed in 1964. All are one-story, wood-frame buildings that have been heavily modified by replacement siding, windows, roofing, and/or porch enclosures. Examples of these buildings include the vernacular craftsman residence located at 6122 Tule Park; the residence at 7345 Adohr Road, which was originally built in 1930 as a headquarters building for Adohr Farms; and the mid-house at 6010 Buerkle Road, which was constructed in 1964.

Industrial

Industrial sites in the HARSA include the ca. 1935 Tupman Water Plant (P-15-15690) and a rice-processing plant, which was constructed in the 1950s at the former location of Adohr Farms. Buildings at these facilities include metal warehouses, sheds, or pump houses, metal tanks, and silos. An airfield is also at the rice processing plant. The airfield is a simple strip of packed earth used for landing small aircraft for either personal transportation or crop management, and includes a single hangar. The hangar uses a standard plan and materials (rectangular corrugated metal building with shed roof) that is common to small airfields across the country.

Miscellaneous

The HARSA included two transportation-related resources. The McKittrick Branch of the Southern Pacific Railroad parallels SR 58 and was constructed in 1893 to connected Bakersfield with Asphalto (now McKittrick). The line has been shortened and now ends in Buttonwillow. The lightweight metal rails are laid on wooden ties on gravel ballast, with trestles and culverts. In the southern portion of the study area, along Dairy Road and Stockdale Highway (near its

intersection with Dairy Road), are four simple board-formed concrete culverts constructed in 1940 by the Works Project Administration (WPA).

A small portion of the Tule Elk State Reserve is also located in the southeastern portion of the study area and contains the reserve's recreational and maintenance facilities, as well as a state park peace officer's residence. Although established in the 1930s, all of the buildings and structures in the study area date to 1956 or after. Buildings at this location are generally constructed of wood frame with wood siding or concrete block

Four PG&E and Southern California Edison transmissions lines pass through the northern and eastern part of the HARSA. These lines, constructed in the mid-twentieth century consist of steel-frame lattice towers carrying either single or double circuits. As with most transmission towers constructed during this period, these were constructed using standard plans, and were built in large quantities throughout the state.

Evaluations

In general, NRHP Criterion D (CRHR Criterion 4) is used to evaluate historic sites (as opposed to buildings, structures, or objects) and archaeological resources. Although buildings and structures can occasionally be recognized for the important information they might yield regarding historic construction or technologies, the properties in the study area for this Project are building types that are well documented. Thus, these properties are not principal sources of important information in this regard.

Certain property types are usually excluded from consideration for listing in the NRHP, but can be considered if they meet special requirements, in addition to meeting the regular criteria. The following are the seven Criteria Considerations that address properties usually excluded from listing in the National Register:

- Consideration A: Religious Properties
- Consideration B: Moved Properties
- Consideration C: Birthplaces and Graves
- Consideration D: Cemeteries
- Consideration E: Reconstructed Properties
- Consideration F: Commemorative Properties
- Consideration G: Properties that have Achieved Significance within the Past Fifty Years

Integrity is determined under NRHP guidelines through applying seven factors to the historic resource. Those factors are location, design, setting, workmanship, materials, feeling, and association. These seven can be roughly grouped into three types of integrity considerations. Location and setting relate to the relationship between the property and its environment. Design, materials, and workmanship, as they apply to historic buildings, relate to construction methods and architectural details. Feeling and association are the least objective of the seven criteria, pertaining to the overall ability of the property to convey a sense of the historical time and place in which it was constructed.

The CRHR definition of integrity and its special considerations for certain properties are slightly different from those for the NRHP. Integrity is defined as "the authenticity of an historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance." The CRHR further states that eligible resources must "retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance," and it lists the same seven aspects of integrity used for evaluating properties under the NRHP criteria. The CRHR's special considerations for certain properties types are limited to: 1) moved buildings, structures, or objects; 2) historical resources achieving significance within the past 50 years; and 3) reconstructed buildings.

Only two of the buildings or structures in the HARSA for the Project—Old Headquarters Weir and the California Aqueduct—appear to meet the criteria for listing in the NRHP. All buildings or structures in the study area around the Project site over 50 years old were evaluated. None of the more recently constructed buildings appear to meet the exacting standards of exceptional significance. Therefore, none of the buildings in the HARSA appear to be significant historic properties subject to Section 106, nor do they appear to be historical resources for the purposes of CEQA.

Old Headquarters Weir

Old Headquarters Weir appears eligible under Criterion 3 (C) at the local level as a significant example of the work of a master designer and as an early example of a significant new construction method applied to water structure/bridge building. The structure is important as a rare surviving example of Leonard & Day's design of a reinforced concrete bridge/water control structure combination. Old Headquarters Weir, built in 1911, represents an early example of the type, and is only one of two known to have been built in this period by Leonard & Day. The structure also stands as an early example of use of reinforced concrete in construction of weirs. Furthermore, the bridge appears to retain a sufficient degree of integrity, and therefore retains the ability to convey its historic significance. Its character-defining features are its reinforced concrete benchwalls and flat slab roadway. For these reasons, Old Headquarters Weir appears to meet the criteria for listing in the California Register and National Register, and would therefore qualify as a significant historic property under Section 106, and a historical resource for the purposes of CEQA.

Old Headquarters Weir does not appear eligible under National Register Criteria A, B, or D (California Register Criteria 1, 2, or 4). Although it is a part of the necessary infrastructure for the development of the area, it does not have significance beyond its normal use. Old Headquarters Weir was built to replace an existing timber weir whose maintenance had become too burdensome. Although Old Headquarters Weir was the first road bridge at this location, it did not fundamentally change transportation in the area. It connected an unimproved dirt road on the southwestern side of the canal to a more established road on the northeastern side of the canal. Its function as a bridge alone does not appear to represent a significant contribution to the transportation history of the area. Although it is the only structure remaining from Miller & Lux Old Headquarters, it alone does not convey the meaning of a ranch headquarters.

Under Criteria B (2), Old Headquarters Weir does not appear to be eligible for association with persons important in our history. It is not eligible for its association with Miller & Lux Inc., who commissioned the bridge.

In rare instances, buildings and structures themselves can serve as sources of important information about historic construction materials or technologies under Criteria D and 4; however, reinforced concrete bridge technology is well documented in published and photographic sources. Therefore, Old Headquarters Weir does not appear to be a source of important information in this regard.

California Aqueduct

The second eligible structure in the study area is the California Aqueduct, which was previously evaluated by other studies at various locations along its 444-mile length. It was found exceptionally significant under Criterion 1 or A for its association with the history of major water systems development in California; and as an exceptionally significant example of hydraulic engineering, under Criterion 3 or C.

Buena Vista Water Storage District Canals

The canals of the Buena Vista Water Storage District in the study area do not appear to meet the criteria for listing in the CRHR or the NRHP. The KVWCC, East Side Canal, and West Side Canal constructed in 1876, along with the Kern Island Canal (ca. 1870), and Calloway Canal (1874-1875), precipitated the seminal *Lux v. Haggin* litigation, which has shaped California water rights. However, on their own, the KVWCC, East Side Canal, and West Side Canal are not significant for their roles in the litigation. The upstream canals diverting water before it reached the Miller & Lux property also had a crucial role in setting the scene of the conflict. One particular canal or water diversion alone could not have been entirely responsible for *Lux v. Haggin*. Numerous conditions converged in Kern County to produce this fierce litigation over water. The shifting course of the Kern River, the construction of numerous canals and ditches diverting water from the river, and the competing interests of two large-scale landholders combined produced lengthy litigation. For this reason, the canals are not eligible under Criterion 1 or Criterion A.

Under Criterion 2 or Criterion B, the canals are not associated with a significant individual. Although the canals were constructed under the auspices of Miller & Lux, it is not directly associated with either of those individuals. Miller & Lux constructed numerous canals throughout their holdings to irrigate feed crops. Although Henry Miller did visit most of his holdings, including Buttonwillow, most of his time was spent in San Francisco or his home ranch, which are more appropriately associated with him and the business.

Under Criterion 3 or C, the canals were designed by S.W. Wible, a civil engineer who designed mines in El Dorado, Amador, and Calaveras counties before coming to Kern County, where he designed the Pioneer and Wible canals before designing the KVWCC. Despite his engineering knowledge, the KVWCC is not an engineering success, and is not significant for its design or construction. The smaller canals are farmer-dug, and were constructed according to the common practice at the time.

In addition, these canals lack integrity to any historical period of significance, owing to their regular realignment, reshaping, and replacement of control structures.

Farmsteads

None of the farmsteads or residences in the HARSA appears to meet the criteria for listing in the CRHR or the NRHP, because they lack significance. The farmsteads were constructed as a part of the general settlement of the area following land sales by Miller & Lux. Farming and irrigation were established by Miller & Lux beginning in the 1870s; the farmsteads represent the ensuing years of crop diversification and family farming as practiced throughout the Central Valley (Criterion 1 or A). None of the farmsteads appear to be associated with significant individuals (Criterion 2 or B). The area has a tradition of multi-generational farms like the Antongiovanni farm and Parsons farm; however, no evidence was found that any of these families or individuals in the families played a significant role in the development of local agriculture.

Charles Parsons is perhaps the best known of the residents of the study area. He was involved in the development of rice culture, banking in Buttonwillow, the Farmer's Cooperative board, and community boosterism. The rice culture, however, was a short-term development that has not resulted in a lasting impact. His involvement with other institutions involved group activity, and the success of any of the ventures cannot be directly attributed to him.

Under Criterion 3 or C, none of the farmsteads possess any distinctive characteristics or high artistic value that would render them eligible under these criteria. The farm residences are common examples of Craftsman and Ranch-style houses found throughout the Central Valley of California. The residence at 5865 Adohr Road is similar to plans and catalog houses available from the end of the nineteenth century through the 1930s. The farm outbuildings are utilitarian and lack distinctive characteristics or artistic value. In rare instances, buildings themselves can serve as sources of important information about historic construction materials or technologies (Criteria D or 4); however, the building does not appear to be a principal source of important information in this regard.

In addition to their lack of significance, the farmsteads in the study area have frequently been altered, thus affecting their integrity. In addition, study of the architectural characteristics, style, and materials of the buildings, along with evidence from maps from various periods, indicates that many of the farm buildings in the study area have been relocated to their current locations. This relocation has by definition degraded their integrity, because moving the buildings and structures has separated them from their original setting, which may have included worker camps, and thereby removed their association with an important aspect of local history.

Industrial and Miscellaneous Properties

None of the industrial properties in the study area appear to meet the criteria for listing in the CRHR or the NRHP. Under CRHR Criterion 1 or NRHP Criterion A, none of the properties is eligible for their association with significant events or trends. The McKittrick branch of the Southern Pacific Railroad, while an important piece of infrastructure for petroleum production southeast of Buttonwillow, is not significant for its association with petroleum production. Production had begun before the construction of the railroad in 1893. The railroad merely

provided additional infrastructure supporting production. The rice elevators and processing plants were associated with the recent and brief period of rice culture in the area between 1954 and the 1980s. Rice culture was practiced as a means of conditioning the soil for other crops, and did not become a significant crop in the area. Numerous airfields exist in the area for crop management and private transportation. The only airfield in the study area is not significant for its roles in transportation or agriculture. The PG&E and SCE transmission lines were constructed to augment the existing electrical grid in the mid-twentieth century, and are not significant in the context of power transmission development in Kern County. The portion of Tule Elk State Reserve in the study area was developed in the mid-twentieth century, and is only associated with the acquisition of the property by California State Parks and their continued management of the remaining elk population. Lastly, while the culverts near the intersection of Dairy Road and Stockdale Highway were constructed by the WPA, they are minor drainage features and do not appear significant in the context of the WPA project in Kern County.

Under CRHR Criterion 2 or NRHP Criterion B, none of the industrial and miscellaneous properties are associated with significant individuals. The industrial properties were developed by groups of individuals. Under CRHR Criterion 3 or NRHP Criterion C, none of the industrial and miscellaneous properties have any distinctive characteristics or high artistic value that would render them eligible under these criteria. The industrial properties are all utilitarian in nature and use standard engineering available at the time of their construction. In rare instances, buildings themselves can serve as sources of important information about historic construction materials or technologies (CRHR Criterion 4 or NRHP Criterion D); however, these resources do not appear to be a principal source of important information in this regard.

In addition to their lack of significance, some properties have lost integrity. The McKittrick branch of the Southern Pacific Railroad has undergone regular maintenance, which has altered with materials and workmanship. The line has also been shortened; tracks between Buttonwillow and McKittrick have been removed, significantly shortening the line and affecting the design, materials, workmanship, and association of the branch line.

These properties have been evaluated in accordance with Section 106 of the National Historic Preservation Act using criteria described in 36 CFR Part 60, and in accordance with Section 15064.5(a) (2)-(3) of the CEQA Guidelines, using the criteria outlines in Section 5024.1 of the California Public Resources Code, and do not appear to be historical resources for the purposes of CEQA.

5.3.3.6 Impacts Analysis

For the Project, potential significant impacts to known cultural resources, as well as inadvertent discoveries, have been evaluated using the criteria listed below. Under criteria based on the state CEQA Guidelines, the Project would be considered to have a significant impact on cultural resources if it would result in any of the following:

- A substantial adverse change in the significance of a historical resource that is either listed or eligible for listing on the NRHP, the CRHR, or a local register of historic resources;
- A substantial adverse change in the significance of a unique archaeological resource; or
- Disturbance of any human remains, including those interred outside of formal cemeteries.

Archaeological Resources

From the list of known archaeological sites presented in Section 5.3.2.4 and summarized in Table 5.3-6, the ARSA contains a wide and varied collection of archaeological resources. As a result of the current effort, it has been determined that twelve archaeological sites are situated either in or within close proximity (within 200 feet) to the archaeological ARSA, as defined for the Project using the CEC-mandated guidelines. Because archaeological sites are generally only physically affected, only impacts resulting from Project-related construction were analyzed. Indirect impacts from Project operation are not expected to occur.

The current analysis finds that none of the identified archaeological sites situated in the ARSA will be impacted with Project implementation. Although the resources identified as a result of this investigation are within the ARSA or in close proximity, all site locations are avoidable, save for P-3108 and HECA 2010-2. Although these latter two sites are within the ARSA—as described in Section 5.3.3.4—impacts are not anticipated, because no evidence of either site was identified during the current inventory effort. There is some question as to whether or not P-3108 was plotted in the correct location, because subsequent surveys—including work by the same team—failed to confirm the presence of the site in its plotted location. In contrast, HECA-2010-2 is no longer present within the ARSA, the result of post-recordation heavy-earth-moving activities not associated with the HECA Project. Below, by Project component, are the resources either in or within close proximity to the ARSA, and their physical relationship to potential direct impacts.

Well Field

Avoidable resources either in or within close proximity to the ARSA for the Well Field include P-15-171, HECA 2009-9, and HECA 2010-10. As discussed previously, the ARSA for the Well Field was established to allow for maximum flexibility in the placement of wells and connecting pipelines to allow for the avoidance of identified resources. Given the presence of this design flexibility, the wells and connecting pipelines will be placed in a manner to avoid the archaeological sites in this portion of the ARSA. These three sites also fall in or within close proximity to the ARSA for the process water pipeline. As with the other sites in the ARSA for the process water pipeline (see discussion below), these sites are situated in the agricultural fields bordering the constructed levee that parallels the West Side Canal. It is within this levee that the process water pipeline is to be constructed. The pipeline is to be placed in a 5-foot-deep trench, where construction is confined to the soils used to construct the levee. Because the construction is confined to the levee, with the implementation of safeguards, including the limiting of all work activities to the crown of the levee, impacts to these archaeological sites would not occur.

CO_2 Pipeline

Avoidable resources in close proximity to the CO_2 pipeline include P-15-124 and HECA 2009-2. Current plans for the CO_2 pipeline in this vicinity call for the use of HDD procedures. The bore to be drilled for the installation of the CO_2 pipe will pass well below these two recorded archaeological sites. Because the resources are thus effectively avoided, no impacts to these resources are anticipated.

Process Water Pipeline

Resources that are located either in or in close proximity to the ARSA for the process water pipeline include P-15-89, P-15-179, P-15-2485, and HECA 2008-1. As discussed previously, P-15-89 and P-15-2485 are both situated on the opposite side of the West Side Canal from where the proposed process water pipeline is to be placed. Although this location falls in close proximity to the ARSA, because the Canal would act as a physical barrier for construction, impacts to these archaeological sites would not occur.

P-15-179 is situated in the agricultural fields bordering the constructed levee that parallels the West Side Canal. HECA 2008-1 is situated entirely in the West Side Canal. The process water pipeline is to be constructed within the levee that parallels this canal. The pipeline is to be placed in a 5-foot-deep trench, where construction is confined to the soils used to construct the levee. Because the construction is confined to the levee, with the implementation of safeguards, including the limiting of all work activities to the crown of the levee, impacts to these archaeological sites would not occur.

Natural Gas Pipeline/Railroad Corridor

Two archaeological sites are situated in the ARSA defined for the natural gas and railroad linears, and a third site has been identified in close proximity (within 200 feet) of the pipeline construction area.

HECA-2010-2 comprises the remnants of a twentieth-century farmhouse. As discussed previously, when recorded in 2010, the site comprised the foundation and other structural remnants of a recently demolished farm house. When recently revisited, the parcel where the foundation and structural remains occurred had been heavily graded. Because there is no longer a site at this location, no impacts to the archaeological resource would occur.

Similarly, it is not anticipated that P-15-3108 will be affected by Project implementation, even though the plotted location of the site places it within the ARSA defined for the natural gas linear. As discussed previously, there are discrepancies in the site record that draw doubt on the exact site location. In addition, archaeologists from the same team that originally recorded the site could not confirm the presence of the site a year later (Parr and Osborne, 1992). The current effort to identify the site in the plotted location was likewise unsuccessful. Lacking evidence of the site in this specific area, impacts to the resource in question are unlikely.

HECA-2012-1 will not be affected by the railroad linear because the new railroad spur would not extend to the site (the spur would have joined with the existing railroad tracks by the point where the site occurs). It is not anticipated that the site will be impacted by installation of the natural gas linear either, because the site is situated on the other side of two existing parallel railroad tracks from where the pipeline will be installed. No evidence of the site was observed in the proposed construction area for the natural gas pipeline. Because a distance of approximately 180 feet separate the site boundary from the limits of the CEC-mandated impact area (i.e., construction ROW plus 50 feet either side), the site will be avoided by construction impacts.

It should be noted herein that it is possible that archaeological deposits could be inadvertently exposed during Project-related construction activities. Previously unidentified archaeological

sites exposed during construction, if any, must be treated as important resources until formally determined otherwise. Measures for the management of inadvertently exposed archaeological resources are thus also provided.

Built Environment Resources

As discussed in Section 5.3.2.5, JRP recorded and evaluated all buildings constructed before 1964 in the HARSA. Table 5.3-7, Historic Architectural Resources in the Project HARSA, below includes all historic-era resources formally evaluated as part of this Project. For more detailed descriptions of these properties, see the individual DPR 523 forms attached to the Historic Architecture Technical Report (JRP, 2012) attached to this document as Appendix G-4.

The following provides reference to the Project description as it relates to the two eligible resources in the HARSA, Old Headquarters Weir and the California Aqueduct, and provides an impact analysis for both historical resources identified in this report. The Project activities will be situated primarily in Township 30 South, Range 24 East, Section 10, Mount Diablo Baseline, and Meridian. The Project excludes parcels in the northwestern and southeastern corners of the Section. The California Aqueduct and Old Headquarters Weir adjoin property controlled by the Project, but are not included in the Project area. None of the Project components or construction activities, therefore, will cause a substantial adverse change to the Aqueduct or weir such that they will be materially impaired and unable to continue to convey their significance. Potential impacts to these resources are to the surrounding setting.

The Project will not directly affect the Aqueduct and weir, but represent a change to the setting from agricultural to industrial use. This change of use does not affect the aspects of the setting that allow the Aqueduct or weir to convey their significance, and therefore does not pose a significant impact.

The weir is significant as an example of early reinforced-concrete construction. Additional significance is a result of the early use of this technique for a structure operating as both a weir and bridge. As a result, the important aspects of the setting for this resource are the KVWCC canal and the gravel access roads. The significant aspects of the weir are not conveyed by the surrounding land use. The Project will not affect the construction of the weir, canal, or roadway, only the surrounding land use. The Aqueduct is a long, linear resource that passes through a variety of settings, many of which have changed over time. Like the weir, this loss of setting does not significantly impact the Aqueduct's ability to convey its significance. Neither the aqueduct nor the weir will be directly affected by the Project in terms of design, materials, workmanship, feeling, location, or association. Therefore, the Project does not pose a significant impact under CEQA, and does not require mitigation.

OEHI Project

The impacts of the OEHI Project on cultural resources are analyzed in Appendix A-1, Section 4.5, Cultural Resources, and Appendix A-2, Section 2.3, Cultural Resources. The analysis in Appendix A concludes that, with implementation of proposed mitigation measures, the OEHI Project will not result in significant adverse impacts to cultural resources.

5.3.4 Cumulative Impacts

Under certain circumstances, CEQA requires consideration of a project's cumulative impacts (CEQA Guidelines § 15130). A "cumulative impact" consists of an impact which is created as a result of the combination of the project under review together with other projects causing related impacts (CEQA Guidelines § 15355). CEQA requires a discussion of the cumulative impacts of a project when the project's incremental effect is cumulatively considerable (CEQA Guidelines § 15130[a]). "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (CEQA Guidelines § 15065 [a][3]).

When the combined cumulative impact associated with a project's incremental effect and the effects of other projects is not significant, further discussion of the cumulative impact is not necessary (CEQA Guidelines § 15130[a]). It is also possible that a project's contribution to a significant cumulative impact is less than cumulatively considerable and thus not significant (CEQA Guidelines § 15130[a]).

The discussion of cumulative impacts should reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great a level of detail as is provided for the effects attributable to the project under consideration (CEQA Guidelines § 15130[b]). The discussion should be guided by standards of practicality and reasonableness (CEQA Guidelines § 15130[b]).

A cumulative impact analysis starts with a list of past, present, and probable future projects within a defined geographical scope with the potential to produce related or cumulative impacts (CEQA Guidelines § 15130[b]). Factors to consider when determining whether to include a related project include the nature of the environmental resource being examined, the location of the project, and its type (CEQA Guidelines § 15130[b]). For purposes of this AFC Amendment, Kern County was contacted to obtain a list of related projects, which is contained in Appendix I. Depending on its location and type, not every project on this list is necessarily relevant to the cumulative impact analysis for each environmental topic.

Each of the projects identified in Appendix I was assessed in conjunction with the Project to ascertain the potential contribution of the Project to cumulative impacts to the cultural resources base. From this analysis, it has been concluded that cumulative impacts from the Project on the regional cultural resources base are limited, because implementation of the mitigation measures proposed below for cultural resources will reduce Project-related impacts to less-than-significant levels. These measures would thus limit the contribution of the Project to cumulative impacts on the regional cultural resources base.

The cumulative impacts of the OEHI Project on cultural resources are analyzed in Appendix A-1, Section 4.5, Cultural Resources, and Appendix A-2, Section 2.3, Cultural Resources. The analysis in Appendix A concludes that, with implementation of proposed mitigation measures, the OEHI Project will not result in significant adverse cumulative impacts to cultural resources.

5.3.5 Mitigation Measures

This section discusses mitigation measures proposed that will be implemented in accordance with applicable laws and regulations; in particular, CEQA Sections 15064.5 and 15126.4, and Section 106 of the NHPA, to reduce Project-related impacts to cultural resources. It should be noted herein that as described in Section 5.3.2.6, impacts to built environment resources (i.e., historic architecture) are not anticipated. As such, mitigation measures specifically targeting the management of built environment resources are not included. In addition, as discussed previously, none of the known archaeological resources situated in the Project ARSA are anticipated to be impacted with Project implementation. Although no impacts to known archaeological resources are anticipated, mitigation measures will be implemented to ensure the proper management of both known and currently unknown archaeological resources that could be inadvertently exposed with Project implementation.

As detailed in Section 5.3.3.4, all identified archaeological resources except two are situated in areas where avoidance is a feasible option. The avoidance of archaeological resources has thus been adopted as a mitigation measure in the current document.

The site areas of P-3108 and HECA-2010-2 will not be avoided by Project construction. These sites, although in the ARSA, will not be impacted as there currently are no identifiable resources within these locations. As described in Section 5.3.3.4, archaeological site P-3108 has not been positively relocated subsequent to original recordation. Also, as detailed in Section 5.3.3.4, archaeological site HECA-2010-2 has been graded away by non-HECA–related construction activities.

It should be mentioned herein that none of the archaeological resources located in the ARSA delineated for the Project, as per CEC guidelines, have been formally evaluated for listing to either the NRHP or CRHR. As such, all archaeological resources in the Project ARSA must be considered NRHP and/or CRHR eligible until formally determined otherwise. In the event that archaeological resources are inadvertently exposed during earth-moving activities implemented as a result of the Project, or at some point avoidance is found to be infeasible, formal evaluation (i.e., testing) will need to be performed.

CUL-1 Retain a Qualified Professional Archaeologist

Prior to the start of Project-related vegetation clearance, earth-disturbing activities, or Project Site preparation, a qualified professional archaeologist will be retained by HECA as the cultural resources specialist (CRS) who will be responsible for implementation of Mitigation Measures CUL-2 through CUL-7.

CUL-2 Avoidance

Because site avoidance is HECA's preferred treatment of archaeological resources, avoidance of archaeological sites, where feasible, will be implemented. Furthermore, if a potentially significant cultural resource is discovered during Project construction, the construction plans will be modified (if possible) to avoid that resource. If there are no feasible means to avoid the resource, then the cultural resource will be tested. If the cultural resource is found to be

significant, the measures for mitigation described below will be implemented in consultation with the CEC.

For any archaeological resource that can be avoided by modification of Project plans, the archaeological resource will be temporarily fenced or otherwise demarcated on the ground, and the area will be designated environmentally sensitive. Construction equipment will be directed away from the cultural resource, and construction personnel will be directed to avoid entering the area. Where cultural resource boundaries are unknown, the protected area will include a buffer zone with a 50-foot radius. In some cases, additional archaeological work could be required to demarcate the boundaries of the cultural resource to ascertain and ensure avoidance.

CUL-3 Testing

In the event avoidance of an archaeological site becomes infeasible; or an archaeological site is inadvertently discovered during construction, HECA and the CRS will prepare and submit to the CEC for review and approval an archaeological testing plan (ATP). The ATP will identify the property types of the expected archaeological resource(s) that potentially could be adversely affected by the proposed Project, the testing method to be used, and locations recommended for testing. The purpose of the archaeological testing program will be to determine—to the extent possible—the presence or absence of archaeological resources, to identify any archaeological resources found, and to evaluate the significance of any archaeological resources found as an historical resource.

At the completion of the archaeological testing program, the CRS will submit a written report of the findings to the CEC. If the CRS finds that significant archaeological resources may be present, based on the archaeological testing program, the CEC, in consultation with HECA and the CRS, shall determine if additional measures are warranted. Additional measures that may be undertaken include additional archaeological testing, archaeological monitoring, and/or an archaeological data recovery program. If the CRS, in consultation with the CEC, determines that a significant archaeological resource is present, and that the resource could be adversely affected by the Project, at the discretion of HECA, in consultation with the CEC, either:

- the Project shall be re-designed to avoid any adverse effect on the important archaeological resource; or
- a data recovery program shall be implemented.

If the archaeological resource being subject to archaeological testing is associated with the Native American inhabitation of the region, it is further recommended that a Native American monitor be present during the implementation of this mitigation measure.

CUL-4 Data Recovery

Data recovery shall be implemented in the event an adverse impact to an important archaeological resource cannot be avoided. The archaeological data recovery program shall be conducted in accord with an archaeological data recovery plan (ADRP). HECA, the CRS, and the CEC shall meet and consult on the scope of the ADRP prior to preparation of a draft ADRP. HECA and the CRS shall submit a draft ADRP to the CEC. The ADRP shall identify how the

proposed data recovery program will preserve the significant information the archaeological resource is expected to contain. That is, the ADRP will identify what scientific/historical research questions are applicable to the expected resource, what data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. Data recovery, in general, should be limited to the portions of the historical property that could be adversely affected by the proposed Project. Destructive data recovery methods shall not be applied to portions of the archaeological resources if nondestructive methods are practical. If the archaeological resource being subject to data recovery is associated with the Native American inhabitation of the region, it is further recommended that a Native American monitor be present during the implementation of this mitigation measure.

CUL-5 Construction Monitoring

Given the archaeological sensitivity of the Project ARSA as determined in the prefield research, including the geotechnical analysis, an archaeological monitoring program shall be implemented. A Cultural Resource Monitor (CRM) will be appointed who will be responsible for keeping a daily monitoring log of construction activities, observations, types of equipment used, problems encountered, and any new archaeological discovery (including the cultural material observed and location). Photographs will be taken as necessary to supplement the documentation. These logs will be signed and dated by the CRM and included in the monitoring report. It may be necessary to appoint multiple CRMs, given the geographical extent of the Project.

The archaeological monitoring program shall minimally include the following provisions:

- The CEC in consultation with HECA and the CRS, shall determine what Project activities shall be archaeologically monitored. In most cases, any soils-disturbing activities, such as demolition, foundation removal, excavation, grading, utilities installation, foundation work, driving of piles (foundation, shoring, etc.), site remediation, etc., shall require archaeological monitoring because of the risk these activities pose to potential archaeological resources and to their depositional context;

- The applicant and the CRS shall advise all Project contractors to be on the alert for evidence of the presence of the expected resource(s), of how to identify the evidence of the expected resource(s), and of the appropriate protocol in the event of apparent discovery of an archaeological resource;

- The CRM(s) shall be present on the Project Site until the CEC has, in consultation with HECA and the CRS, determined that Project construction activities could have no effects on significant archaeological deposits;

- The CRM(s) shall record and be authorized to collect soil samples and artifactual/ecofactual material as warranted for analysis;

- If an intact archaeological deposit is encountered, all soils-disturbing activities in the vicinity of the deposit shall cease. The CRM(s) shall be empowered to temporarily redirect demolition/excavation/pile driving/construction activities, and equipment until the resource is evaluated. In the case of pile-driving activity (foundation, shoring, etc.), if the CRM(s) has

cause to believe that the pile-driving activity may affect an archaeological resource, the pile-driving activity shall be terminated until an appropriate evaluation of the resource has been made, in consultation with the CEC. The CRS shall immediately notify the CEC of the encountered archaeological deposit. The CRS shall make a reasonable effort to assess the identity, integrity, and significance of the encountered archaeological deposit, and present the findings of this assessment to the CEC.

If unanticipated resources are discovered during construction, they will be addressed under the procedures set forth in CEQA Section 15064.5. If possible, the resource will be avoided first through design modification, or second through protective measures as described above. If the resource cannot be avoided, HECA and CRS will consult with the CEC with regard to implementation of testing. If it is determined through testing that that the resource is important, then measures to mitigate impacts will be devised in consultation with the CEC, and will be carried out by HECA.

Whether or not significant archaeological resources were encountered, HECA and the CRS shall submit monthly monitoring progress reports and a written report of the findings of the monitoring program to the CEC.

CUL-6 Crew Education

Prior to the beginning of construction, the construction crew will be informed of the regulatory protections afforded to cultural resources. The crew will also be informed of procedures relating to the inadvertent exposure of archaeological resources. The crew will be cautioned not to collect artifacts, and asked to inform a construction supervisor if cultural remains are uncovered.

CUL-7 Discovery of Human Remains

Some of the sites in the Project ARSA are suspected to contain human remains. Human remains are often fragile, and should be treated with care and respect at all times. The discovery of human remains involves both legal and archaeological issues. Discovery of any human remains in the Project's ARSA is subject to criteria set forth by the Native American Graves Protection and Repatriation Act, 43 CFR Part 10, as amended, 1999. As such, immediately upon the discovery of human remains, the following procedures will be implemented:

- Stop all excavation work, and using appropriate safety precautions, with a minimum of further disturbance to the remains, allow the monitoring archaeologist to verify that the discovery is, in fact, human skeletal material.

- If the remains are determined to be human, the Project Supervisor will call the Public Works Department, who will in turn contact the Kern County Sheriff Department to report the discovery. In addition to the Sheriff, the County Coroner will also be contacted and informed of the discovery.

- In the event of the Coroner's determination that the human remains are Native American, notification of the California State Native American Heritage Commission (NAHC) who shall appoint a Most Likely Descendant (MLD) (Pub. Res. Code Sec. 5097.98). HECA, the

CRS, and the MLD shall make all reasonable efforts to develop an agreement for the treatment of, with appropriate dignity, human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5(d)). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects.

Work in the immediate vicinity of the find shall remain halted until the CEC, after consultation with HECA, CRS, MLD, and relevant agencies, provides written authorization for work to resume in the vicinity of the discovery.

5.3.6 Laws, Ordinances, Regulations, and Standards

The proposed Project will be constructed and operated in accordance with all LORS applicable to cultural resources. Federal, state, and local LORS applicable to cultural resources are discussed below and summarized in Table 5.3-8, Applicable Laws, Ordinances, Regulations, and Standards.

5.3.6.1 Federal

Federal laws, procedures, and policies affecting the treatment of cultural resources include the Antiquities Act of 1906, Public Law 59-209, Executive Order 11593, Section 106 of the NHPA of 1966 (Public Law 89-665), as amended, Public Law 93-291, the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190), the Federal Land Policy Management Act (Public Law 94-94-579), and regulations 36 CFR 60 and 36 CFR 800.

For management purposes, a cultural resource must be recommended as either eligible or not eligible for the NRHP to determine effect, and the need for mitigation of effect. If the property (cultural resource) is determined eligible, then a determination of effect, in accordance with 36 CFR 800, must be provided. If the property is identified as not eligible, then no determination of effect or mitigation measures are necessary. Recommendations are reviewed and approved by the SHPO and the Advisory Council on Historic Preservation (ACHP).

The NHPA requires all federal agencies to assess the effects of any agency-sponsored undertaking on cultural resources. The federal agency is responsible for project compliance with Section 106 of the NHPA and its implementing regulations, set forth by the ACHP at 36 CFR 800. As lead federal agency for the undertaking, in accordance with Section 106 of the NHPA, the DOE will consult with SHPO, federally recognized Indian Tribes, and the ACHP.

Four evaluation criteria to determine a resource's eligibility to the NRHP, in accordance with the regulations outlined in 36 CFR 800, are identified at 36 CFR 60.4. To determine site significance through application of NRHP criteria, several levels of potential significance that reflect different (although not necessarily mutually exclusive) values must be considered. As provided in 36 CFR 60.4:

The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

1. That are associated with events that have made a significant contribution to the broad patterns of our history;

2. That are associated with the lives of persons significant in our past;

3. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

4. That have yielded, or may be likely to yield, information important in prehistory or history.

These evaluation criteria are used to help determine what properties should be taken into account in any assessment or consultation (36 CFR 60.2).

5.3.6.2 State

The basic goal of CEQA is to develop and maintain a high-quality environment now and in the future. The CEQA Guidelines provide a framework for the analysis of impacts to archaeological resources.

In considering impact significance under CEQA, the significance of the resource itself must first be determined. At the state level, consideration of significance as a "historical resource" is measured by cultural resource provisions considered under CEQA Sections 15064.5 and 15126.4, and the criteria regarding resource eligibility to the CRHR.

Generally, under CEQA, a historical resource (these include built-environment historic and archaeological resources) is considered significant if it meets the criteria for listing on the CRHR. These criteria are set forth in CEQA Section 15064.5 and defined as any resource that:

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

2. Is associated with lives of persons important in our past;

3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

4. Has yielded, or may be likely to yield, information important in prehistory or history.

Section 15064.5 of CEQA also assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. These procedures are detailed under Public Resources Code (PRC) Section 5097.98.

Impacts to "unique archaeological resources" are also considered under CEQA, as described under PRC 21083.2. A unique archaeological resource implies an archaeological artifact, object, or site about which it can be clearly demonstrated that — without merely adding to the current body of knowledge — there is a high probability that it meets one of the following criteria:

1. The archaeological artifact, object, or site contains information needed to answer important scientific questions, and there is a demonstrable public interest in that information;

2. The archaeological artifact, object, or site has a special and particular quality, such as being the oldest of its type or the best available example of its type; or

3. The archaeological artifact, object, or site is directly associated with a scientifically recognized important prehistoric or historic event or person.

A non-unique archaeological resource indicates an archaeological artifact, object, or site that does not meet the above criteria. Impacts to non-unique archaeological resources and resources that do not qualify for listing on the CRHR receive no further consideration under CEQA.

Under CEQA Appendix G, a project would potentially have significant impacts if it would cause substantial adverse change in the significance of one of the following:

1. A historical resource (i.e., a cultural resource eligible for the CRHR);

2. An archaeological resource (defined as a unique archaeological resource that does not meet CRHR criteria); or

3. Human remains (i.e., where the project would disturb or destroy burials).

A non-unique archaeological resource is given no further consideration other than the simple recording of its existence by the CEQA lead agency.

Potential impacts to identified cultural resources need only be considered if the resource is an "historical" or "unique archaeological resource" under the provisions of CEQA Sections 15064.5 and 15126.4 and the eligibility criteria. If a resource cannot be avoided, then the resource must be examined vis-à-vis the provisions of CEQA Sections 15064.5 and 15126.4 and of the eligibility criteria as an "historical" or "unique archaeological resource." In many cases, determination of a resource's eligibility can only be made through extensive research and archaeological testing. No mitigation measures are required unless previously undiscovered cultural resources are detected. Mitigation under CEQA must address impacts to the values for which a cultural resource is considered important. To mitigate adequately, it must therefore be determined what elements make a site eligible for the CRHR. The first line of mitigation is complete avoidance, when feasible, of all cultural resources.

5.3.6.3 Local

On the local level, compliance with the Kern County General Plan (Kern County, 2007) is also necessary. According to the General Plan, the County shall address archaeological resources for discretionary projects in accordance with CEQA. As such, compliance with CEQA satisfies the County's concerns for cultural resources.

5.3.7 Involved Agencies and Agency Contacts

Kern County was contacted regarding information about their General Plans. Unless consultation with SHPO becomes necessary, the NAHC is the only agency involved with the management of cultural resources for the Project. Appendix CUL-2 contains the correspondence with the NAHC concerning this Project.

Specific contacts for the NAHC and Kern County are listed in Table 5.3-9, Involved Agencies and Agency Contacts.

5.3.8 Permits Required and Permit Schedule

Other than certification from the CEC, no state, federal, or local permits are required by the Project for the management of cultural resources.

5.3.9 References

Angel, J.L., 1966. Early Skeletons from Tranquility, California. *Smithsonian Contributions to Anthropology* 2(1):1-19. Washington, D.C.

Baker, C.L., 2000. *Elk Hills Oil: The History of Naval Petroleum Reserve No. 1.* Report prepared by PAR Environmental Services Inc. for United States Department of Energy.

Barnes, Harry, 1920. *Data on Irrigation of Buttonwillow Ranch and Adjoining Lands, 1920.* Unpublished manuscript, Water Resources Center Archives, University of California Berkeley, Berkeley.

Beck, W. A. and Y. D. Haase, 1974. *Historical Atlas of California.* University of Oklahoma Press, Norman.

Bethel, John P. (General Editor), 1969. *Webster's Geographical Dictionary*. G. & C. Merriam Co. The Collegiate Press. Menasha, Wisconsin.

Bonte, Harmon S., 1930. *Financial and General Data Pertaining to Irrigation, Reclamation and other Public Districts in California.* Department of Water Resources, Bulletin No. 27., Sacramento, California.

Burmeister, Eugene, 1977. *The Golden Empire Kern County, Califoah marnia.* Autograph Press, Beverly Hills, California.

Buttonwillow Times, 1960. "The Price Tag was 25 Cents an Acre!" March 3.

Castillo, Edward D., 1978. The Impact of Euro-American Exploration and Settlement. In *Handbook of North American Indians, Volume 8, California,* edited by Robert F. Heizer, pp. 99-127. Smithsonian Institution, Washington, D.C.

Cook, Sherburne F., 1960. Colonial Expeditions to the Interior of California: Central Valley, 1800-1820. *University of California Anthropological Records* 16(6):239-292. Berkeley.

Dane, Edith, 1954. "Out of the Past – Kernland Tales." *Daily Midway Driller*. December 27, 1954.

Day, Jim, 1954. "Pipefuls." *Bakersfield Californian.* November 8, 1954.

Fredrickson, David A., 1986. *Buena Vista Lake (CA-KER-116) Revisited*. Coyote Press Archives of California Prehistory 6:75-81.

Fredrickson, David A., and J. Grossman, 1977. A San Dieguito Component at Buena Vista Lake, California. *The Journal of California Anthropology* 4(2):173-190.

Gerow, B.A., 1974. Co-Traditions and Covergent Trends in Prehistoric California. *Occasional Papers of the San Luis Obispo County Archaeological Society* 8.

Gifford, E.W., and W. Egbert Schenck, 1926. Archaeology of the Southern San Joaquin Valley, California. In *University of California Publications in American Archaeology and Ethnology*. A.L. Kroeber and Robert H. Lowie, editors. 13(1): 1-122. Berkeley: University of California Press.

Grant, Campbell, 1978. Chumash: Introduction. In *Handbook of North American Indians, Volume 8, California*, edited by Robert F. Heizer, pp. 505-508. Smithsonian Institution, Washington, D.C.

Harding, S.T., 1935. Report on Bond Issue of the Buena Vista Water Storage District, April 1935. Manuscript, Water Resources Center Archive, University of California Berkeley, Berkeley.

Hartzell, Leslie Louise, 1992. *Hunter-Gatherer Adaptive Strategies and Lacustrine Environments in the Buena Vista Lake Basin, Kern County, California.* Unpublished Dissertation, University of California, Davis.

Heizer, Robert F., 1951. A Cave Burial from Kern County, Ker-185. *University of California Archaeological Survey Reports:* 10:29-37. Berkeley.

Heizer, Robert F., 1964. The Western Coast of North America. In *Prehistoric Man in the New World,* edited by J.D. Jennings and E. Norbeck, pp. 117-148. University of Chicago Press.

Hewes, Gordon W., 1946. Early Man in California and the Tranquility Site. *American Antiquity* 11(4):200-215.

Hoover, Mildred Hero Eugene Rensch, and Ethel Grace Rensch, 1990. *Historic Spots in California*. Stanford, CA: Stanford University Press.

Igler, David, 2001. *Industrial Cowboys: Miller and Lux and the Transformation of the Far West, 1850 – 1920.* University of California Press, Berkeley.

Jackson, Scott, 1989. Archaeological Site Record for CA-KER-2485. On file at the Southern San Joaquin Valley Information Center.

Jackson, T.L., L.A. Shapiro and J.H. King, 1998. *Prehistoric Archaeological Resources Inventory and Evaluation at Naval Petroleum Reserve No. 1 (Elk Hills), Kern County, California.* Report prepared by Pacific Legacy, Inc., for ICF Kaiser Engineers, Inc.

JRP (JRP Historical Consulting, LLC), 2012. Historic Architecture Technical Report: Inventory and evaluation. Hydrogen Energy California Project. Report submitted to URS Corporation, San Francisco.

Kern County, 2007. Kern County General Plan. March 13, 2012.

Kroeber, Alfred L., 1907. *The Yokuts Language of South Central California*. University of California Publications in American Archaeology and Ethnology 2(5):165-377. University of California Press, Berkeley.

Kroeber, Alfred L., 1925. *Handbook of the Indians of California*. Bureau of American Ethnology Bulletin 78, Washington, D.C. [Reprinted, Dover Publications, New York, 1976.]

Kroeber, Alfred L., 1963. *Yokuts Dialect Survey*. University of California Anthropological Records 11(3):177-252, Berkeley.

Laframboise, G.W., 1990. Archaeological Site Record for CA-KER-89/H. On file at the Southern San Joaquin Valley Information Center, California State University Bakersfield.

Latta, Frank F., 1950. Archaeological Site Record for CA-KER-171. On file, Southern San Joaquin Valley Information Center of the California Historical Resources Information System, California State University, Bakersfield.

Latta, Frank F., 1977. *Handbook of Yokuts Indians*. 2nd edition, revised and enlarged, Bear State Books, Santa Cruz, CA.

Leonard, J.B. and W.P. Day, 1913. *The Concrete Bridge: A book on why the Concrete Bridge is replacing other forms of Bridge Construction.* Leonard & Day, San Francisco.

Lewis Publishing Co., 1892. *Memorial and Biographical History of the Counties of Fresno, Tulare and Kern, California* The Lewis Publishing Co., Chicago

Lippincott, J.B. and Thomas H. Means, 1919. Report on the Miller and Lux Ranch Southern Division on Kern River, Calif., Unpublished manuscript, Water Resources Center Archives, University of California Berkeley, Berkeley,

Los Angeles Times, 1930. July 26.

Los Angeles Times, 1930. August 31.

Los Angeles Times, 1930. November 9.

Los Angeles Times, 1933. June 1.

Los Angeles Times, 1934. September 30.

Means, Thomas, 1919. *Report on Farming Lands Miller and Lux, Inc., Southern Division Kern and Kings Counties California.* Unpublished manuscript, Water Resources Center Archives, University of California Berkeley, Berkeley.

Meighan, C., 1955. Archaeology of the North Coast Ranges, California. *University of California Archaeological Survey Reports* 29:1-30. Berkeley.

Merriam, C. Hart, 1905. The Indian Population of California. *American Anthropologist* n.s. 7(4):594-606.

Miller, Mary Catherine, 1982. *Law and Entrepreneurship in California: Miller and Lux and California Water Law, 1879-1928."* Ph.D. Thesis, University of California San Diego.

Moratto, Michael J., 1984. *California Archaeology*. New York: Academic Press.

Newman, Stanley S., 1944. *The Yokuts Language of California*. New York: Viking Fund Publications in Anthropology 2.

NPS (National Park Service), 1983. *Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines [As Amended and Annotated]* http://www.nps.gov/history/local-law/Arch_Standards.htm.

Payen, L.A., 1963a. Archaeological Site Record for CA-KER-125. On file, Southern San Joaquin Valley Information Center of the California Historical Resources Information System, California State University, Bakersfield.

Payen, L.A., 1963b. Archaeological Site Record for CA-KER-126. On file, Southern San Joaquin Valley Information Center of the California Historical Resources Information System, California State University, Bakersfield.

Pilling, Arnold, 1950a. Archaeological Site Survey Record for CA-KER-89. On file at the Southern San Joaquin Valley Information Center, California State University Bakersfield.

Pilling, Arnold, 1950b. Archaeological Site Survey Record for CA-KER-179. On file at the Southern San Joaquin Valley Information Center, California State University Bakersfield.

Raznoff, William A., 1945. *Drainage Investigations Buttonwillow Area of Kern County, California.* Unpublished manuscript, Water Resources Center Archives, University of California Berkeley, Berkeley.

Riddell, Francis, 1951. The Archaeology of Site CA-Ker-74. University of California Archaeological Survey Reports 10:1-28. Berkeley.

Riddell, Francis A., and William H. Olsen, 1969. An Early Man Site in the San Joaquin Valley, California. American Antiquity 34(2):121-130.

Rindge, Frederick H., 1972. *Happy Days in Southern California.* Los Angeles: Rindge Family.

Robinson, William Wilcox, 1961. *The Story of Kern County.* Bakersfield, California: Title Insurance and Trust Company.

Rosenthal, Jeffrey, Gregory White, and Mark Sutton, 2007. The Central Valley: A View From the Catbird's Seat. In *California Prehistory: Colonization, Culture, and Complexity*. Edited by Terry Jones and Kathryn Klar. Alta Mira, New York.

Schiffman, Robert A., and Alan P. Garfinkle, 1981. Prehistory of Kern County: An Overview. Bakersfield College Publications in Archaeology, Bakersfield.

Shafter Press, 1950. August 3.

Shipley, William F., 1978. Native Languages of California. In *California*, edited by Robert F. Heizer, pp. 80-90. *Handbook of North American Indians*, Vol. 8, William G. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Siefkin, Nelson, 1999. Archaeology of the Redtfeldt Mound (CA-KIN-66), Tulare Basin, California. Master's Thesis, Department of Anthropology, University of California, Bakersfield.

Smith, Richard Harold, 1976. *Towns Along the Tracks: Railroad Strategy and Town Promotion in the San Joaquin Valley, California* Ph.D. Thesis, University of California Los Angeles.

Stegman, A.E., 1918. *Map of 1918 Kern County, California*. Bakersfield, CA: County Surveyor.

Sutton, Mark Q., 1996. Charmstone Cache from the Southern San Joaquin Valley. Pacific Coast Archaeological Society Quarterly 32(4):41-54.

Thompson, John, 1958. *The Settlement Geography of the Sacramento-San Joaquin Delta*, California. Ph.D. Thesis, Stanford University.

Ulery, Beatrice, 1930. A Bovine Nursery." *Los Angeles Times*, November 9, 1930.

USGS, 1898. *Water Supply and Irrigation Papers, No. 17, Irrigation near Bakersfield, California* by C.E. Grunsky, WDC:GPO, 1898.

Van Nuys News, 1949. January 10.

Walker, Edwin F., 1947. Excavation of a Yokuts Cemetery. Kern County Historical Society, Bakersfield. Reprinted in 1963.

Wallace, William J., 1954. The Little Sycamore Site and the Early Milling Stone Cultures of Southern California. American Antiquity 20(2):112-123.

Wallace, William J., 1978. Southern Valley Yokuts. In Handbook of North American Indians, Volume 8, California, edited by Robert F. Heizer, pp. 448-461. Smithsonian Institution, Washington, D.C.

Wallace, William J., and Francis Riddell, 1988. Archaeological Background of Tulare Lake, California. In Early Occupations in Far Western North America: The Clovis-Archaic Interface, Judith A. Willig, C. Melvin Aikens, and John L. Fagan, eds., pp. 87-101. Nevada State Museum Anthropological Papers No. 21.

Watson, William D., Carole Frank Nuckton, and Richard E. Howitt, 1980. *Crop Production and Water Supply Characteristics of Kern County*. Davis: University of California, Dept. of Agricultural Economics.

Wedel, W.R., 1941. Archaeological Investigations at Buena Vista Lake, Kern County, California. Bureau of American Ethnology Bulletin 130, Washington, D.C.

Zonlight, Margaret Aseman Cooper, 1979. Land, Water and Settlement in Kern County, California, 1850-1890. Arno Press, New York.

Table 5.3-1
List of Reviewed Historic Maps

Map Name	Type	Date
Buena Vista Lake	USGS 1:25,000	1912
Buttonwillow	USGS 1:24,000	1954
East Elk Hills	USGS 1:24,000	1932
East Elk Hills	USGS 1:24,000	1954
East Elk Hills	USGS 1:24,000	1973
Tupman	USGS 1:31,680	1933
Tupman	USGS 1:24,000	1954
Tupman	USGS 1:24,000	1968
Map of 1918 - Kern County	Ownership Survey; County Map	1918
Township 29 South/Range 22 East	Government Land Office (GLO)	1856
Township 29 South/Range 22 East	Government Land Office (GLO)	1868
Township 29 South/Range 23 East	Government Land Office (GLO)	1856
Township 29 South/Range 23 East	Government Land Office (GLO)	1868
Township 29 South/Range 24 East	Government Land Office (GLO)	1856
Township 29 South/Range 24 East	Government Land Office (GLO)	1868
Township 30 South/Range 24 East	Government Land Office (GLO)	1856
Township 30 South/Range 24 East	Government Land Office (GLO)	1868
Township 30 South/Range 24 East	Government Land Office (GLO)	1894
Township 30 South/Range 25 East	Government Land Office (GLO)	1855
Township 31 South/Range 2 East	Government Land Office (GLO)	1855
Township 31 South/Range 25 East	Government Land Office (GLO)	1868

Notes:
USGS = U.S. Geological Survey

Table 5.3-2
List of Reviewed Aerial Photographs:
Tupman and Buttonwillow,
Kern County, California

Year	Scale	Source
1946	1:1,000	Fairchild
1956	1:1,000	Robinson
1967	1:1,000	Western
1974	1:1,000	NASA
1994	1:1,000	USGS
2002	1:1,000	USGS

Notes:
NASA = National Aeronautics and Space Administration
USGS = U.S. Geological Survey

Table 5.3-3
Previous Cultural Resource Investigations as Identified in Records Search

Report Number	Title	Author	Affiliation	Date
KE-065	Negative Archaeological Survey Report	Osborne, Richard and Dominique Comeyne	Caltrans	1994
KE-142	A Cultural Resources Assessment and Plan for the Kern Water Bank Authority Project Near Bakersfield, Kern County, California Addendum I-Emergency Flood Area	Pruett, Catherine L., Peggy Murphy, and Dorothy Fleagle	Three Girls and a Shovel, LLC.	1997
KE-403	West Coast Cogeneration Project: Belridge	Fredrickson, David A, Ph.D.	Sonoma State University Academic Foundation, Inc.	1985
KE-578	Archaeological Survey Report for the Proposed Buena Vista Slough Bridge Replacement 06-KER-58 P.M. 24.01 Bridge 50-03 06200-225500	Levulett, Valerie	Caltrans	1982
KE-714	Negative Archaeological Survey Report	Noble, Daryly	Caltrans	1987
KE-751	Caltrans Archaeological Survey Report	O'Connor, Dennis	Caltrans	1981
KE-866	Archaeological Survey Report for the Proposed Route Adoption Study Highway 58, Bakersfield, Kern County, California	Parr, Robert E. and Richard Osborne	Cultural Resource Facility California State University Bakersfield	1992
KE-1089	Archaeological Evaluation for the Proposed Belridge Field Cogeneration Plant Kern County, California	Schiffman, Robert A.	Archaeological Research, Bakersfield College	1982
KE-1098	Archaeological Investigation of Proposed Project Site A.P.N 103-080-6 and -07 Kern County, California	Schiffman, Robert A.	Archaeological Research, Bakersfield College	1984
KE-1485	Archaeological Evaluation for the Proposed Belridge Field Cogeneration Plant Kern County, California	Shiffman, Robert A. and Nyle Monday	Dames & Moore	1982
KE-1810	Proposed Capture Pen and Buried Telephone Lines	Woodward, Jim	DPR	1983
KE-1811	Hunter-gatherer Adaptive Strategies and Lacustrine Environments in the Buena Vista Lake Basin, Kern County, California	Hartzell, Leslie Louise	Ph.D. Dissertation University of California, Davis	1992
KE-1813	Supplemental Report Cultural Resources Inventory South Belridge Cogeneration Project Application for Certification	Unknown	Woodward-Clyde	1985

Table 5.3-3
Previous Cultural Resource Investigations as Identified in Records Search

Report Number	Title	Author	Affiliation	Date
KE-2015	Tule Elk State Reserve Cultural Resource Survey	Reinoehl, Gary	California Department of Parks and Recreation	1991
KE-2162	Cultural Resources Technical Report for the La Paloma Generating Project	Hatoff, Brian W.	URS Greiner Woodward-Clyde	1998
KE-2268	Prehistoric Archaeological Resources Inventory and Evaluation at Naval Petroleum Reserve No. 1 (Elk Hills), Kern County, California	Jackson, Thomas L, Ph.D. and Lisa Jackson, M.A.	Pacific Legacy, Inc.	1998
KE-2271	Cultural Resources Technical Report for the La Paloma Generating Project Supplement #2 to Appendix L	Hatoff, Brian W.	URS Greiner Woodward-Clyde	1999
KE-2278	Cultural Resources Inventory Report for Williams Communication, Inc., Fiber Optic Cable System Installation Project San Luis Obispo to Bakersfield	Avina, Mike A.	Jones and Stokes Associates, Inc.	1999
KE-2323	Cultural Resources Inventory Report for the AT&T Corp, Cable Upgrade Project Los Angeles, Kern, and San Luis Obispo Counties, California	Jones and Stokes Associates, Inc.	Jones and Stokes Associates, Inc.	1999
KE-2375	Prehistoric Archaeological Resources Inventory and Evaluation at Naval Petroleum Reserve No. 1 (Elk Hills), Kern County, California	Jackson, Thomas L., Lisa Shapiro, and Jerome King	Pacific Legacy, Inc.	1999
KE-2391	Cultural Resources Inventory for the Proposed Texaco Sunrise Cogeneration and Power Project: Addendum for Route B and Valley Acres Substation Surveys	Jackson, Thomas L. Ph.D. and William A. Shapiro	Pacific Legacy, Inc.	1999
KE-2394	Negative Archaeological Survey Report: Installation of Traffic Surveillance Stations at 21 Locations CALTRANS District 6	Laylander, Don	Caltrans	1999
KE-2452	Western Midway Sunset Cogeneration Company Project	Unknown	WZI Inc.	2000

Table 5.3-3
Previous Cultural Resource Investigations as Identified in Records Search

Report Number	Title	Author	Affiliation	Date
KE-2527	Archaeological Survey for the CALPEAK #3, Midway Kern County, California	Jones, Donna	Latham and Watkins	2001
KE-2885	Archaeological Testing Report for the Restroom Replacement Project at Tule Elk State Reserve	Mealy, Marla M.	California State Parks	2004
KE-3045	Final Cultural Resources Report for the Sunrise Power Project Phase I	Jackson, Thomas L. Ph.D. and Brendan Culleton	Pacific Legacy, Inc.	2003
KE-3054	New Tower Submission Packet: Semi-Tropic CA-3224A	Billat, Scott	Earth Touch, Inc.	2005
KE-3344	Archaeological Monitoring Report Central Valley District	Bissonnette, Linda	California State Parks	2006
KE-3691	Archaeological Reconnaissance Survey of the Perimeter at the Buttonwillow Ecological Reserve	Gorden, Mary A.	State of California Department of Fish and Game	2008

Note:
Caltrans = California Department of Transportation

Table 5.3-4
Previously Identified Cultural Resources within Records Search Area

(P-15) or Temporary Designation	Trinomial (CA-KER-)	Site Type	Prehistoric/ Historic/Historic Architecture	NRHP/CRHR Status*	Within Records Search Area Only	Within ARSA or HARSA as applicable to resource type	Within Close Proximity of the ARSA (200')
34	34	Habitation Site	Prehistoric	Not Evaluated	Yes	No	No
35	35	Habitation Site	Prehistoric	Not Evaluated	Yes	No	No
36	36	Habitation Site	Prehistoric	Not Evaluated	Yes	No	No
86	86	Burial Mound	Prehistoric	Not Evaluated	Yes	No	No
88	88	Burial Mound	Prehistoric	Not Evaluated	Yes	No	No
89	89/H	Lithic and Trash Scatter/Burials	Prehistoric/Historic	Not Evaluated	No	No	Yes
124	124	Lithic and Shell Scatter	Prehistoric	Not Evaluated	No	No	Yes
125	125	Lithic and Shell Scatter	Prehistoric	Not Evaluated	Yes	No	No
171	171	Habitation Site	Prehistoric	Not Evaluated	No	Yes	
179	179	Burial Mound	Prehistoric	Not Evaluated	No	No	Yes
359	359	Lithic and Shell Scatter	Prehistoric	Not Evaluated	Yes	No	No
1493	1493	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
1611	1611	Lithic and Shell Scatter	Prehistoric	Not Evaluated	Yes	No	No
2414	2414	Lithic and Shell Scatter	Prehistoric	Not Evaluated	Yes	No	No
2415	2415	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
2417	2417	Lithic scatter	Prehistoric	Not Evaluated	Yes	No	No
2420	2420	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
2464	2464	Lithic and Shell Scatter	Prehistoric	Not Evaluated	Yes	No	No
2485	2485	Lithic Scatter	Prehistoric	Not Evaluated	No	No	Yes
2718	2718	Lithic and Shell Scatter	Prehistoric	Not Evaluated	Yes	No	No
2719	2719	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
2720	2720	Habitation Site/Burials	Prehistoric	Not Evaluated	Yes	No	No
2721	2721	Lithic and Shell Scatter	Prehistoric	Not Evaluated	Yes	No	No

Table 5.3-4
Previously Identified Cultural Resources within Records Search Area

(P-15) or Temporary Designation	Trinomial (CA-KER-)	Site Type	Prehistoric/ Historic/Historic Architecture	NRHP/CRHR Status*	Within Records Search Area Only	Within ARSA or HARSA as applicable to resource type	Within Close Proximity of the ARSA (200')
3102	3102	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
3103	3103	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
3104	3104	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
3105	3105/H	Lithic and Trash Scatter	Prehistoric/Historic	Not Evaluated	Yes	No	No
3107	3107	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
3108	3108	Lithic Scatter	Prehistoric	Not Evaluated		Yes	No
3355	3355/H	Lithic and Trash Scatter	Prehistoric/Historic	Not Evaluated	Yes	No	No
5984	5018	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
6768	5393	Shell Scatter	Prehistoric/Historic	Recommended Ineligible	Yes	No	No
9734	None	Lithic Scatter	Prehistoric	Not Evaluated	Yes	No	No
11157	6504	Lithic and Shell Scatter	Prehistoric	Not Evaluated	Yes	No	No
15688	8662/H	Lithic, Shell and Trash Scatter	Prehistoric/Historic	Not Evaluated	Yes	No	No
15690	None	Pump House	Historic Architecture	Recommended Ineligible	No	Yes	No
None	None	California Aqueduct	Historic Architecture	Listed	No	Yes	No

Notes:
ARSA = Archeological Resources Study Area
CRHR = California Register of Historical Resources
HARSA = Historic Architectural Resources Study Area
NRHP = National Register of Historic Places

Table 5.3-5
Native American Consultation Information

Contact Name and Title	Address and Native American Groups Represented	Date Contacted By Letter	Date Contacted by Telephone	Comments Received/Notes
Clarence Atwell, Chairperson	Santa Rosa Rancheria P.O. Box 8 Lemoore, CA 93245 Tache, Tachi, Yokuts	March 14, 2008 June 24, 2008 April 1, 2009 December 9, 2009	August 26, 2010	Rancheria Representative Lalo Franco requested that a Cultural Resources Monitoring Plan and a Burial Agreement be considered. Mr. Atwell is no longer Chairperson and was unavailable at this number for a follow up call made on August 26, 2010. A message was left with the Tribal Secretary asking if there was anyone who could comment on the Project. No response has been received to date.
Chairperson	Santa Rosa Rancheria P.O. Box 8 Lemoore, CA 93245	July 28, 2010 August 3, 2010	August 26, 2010	See comment above.
Neil Peyron, Chairperson	Tule River Indian Tribe P.O. Box 589 Porterville, CA 93258 Yokuts	March 14, 2008 June 24, 2008 April 1, 2009 December 9, 2009 July 28, 2010	August 26, 2010	Mr. Peyron is no longer Chairperson and no successor had been named at the time of the follow up call on August 26, 2010
Ron Wermuth	P.O. Box 168 Kernville, CA 93238 Tubatulabal, Kawaiisu, Koso, Yokuts	March 14, 2008 June 24, 2008 April 1, 2009 December 9, 2009 May 18, 2010 July 28, 2010 August 3, 2010	August 26, 2010	Mr. Wermuth stated that there are known internments in the region and suggested that cultural resource monitoring take place during Project activities.
Kathy Morgan, Chairperson	Tejon Indian Tribe 2234 – 4th Street Wasco, CA 93280 Yowlumne, Kitanemuk	March 14, 2008 June 24, 2008 April 1, 2009 December 9, 2009 May 18, 2010 July 28, 2010 August 3, 2010	August 26, 2010	Asked to be kept informed of Project's progress.

Table 5.3-5
Native American Consultation Information

Contact Name and Title	Address and Native American Groups Represented	Date Contacted By Letter	Date Contacted by Telephone	Comments Received/Notes
Kenneth Woodrow Chairperson	1179 Rock Haven Court Salinas, CA 93906 Foothill Yokuts, Mono	March 14, 2008 June 24, 2008 April 1, 2009 December 9, 2009 July 28, 2010 August 3, 2010	August 26, 2010	Mr. Woodrow requested an additional set of Project maps for review, which were emailed to him on August 26, 2010. Mr. Woodrow stated that upon review of the maps, he would provide any comments that he had regarding the Project. No response has been received to date.
Donna Begay, Tribal Chairwoman	Tubatulabals of Kern Valley P.O. Box 226 Lake Isabella, CA 93240 Tubatulabal	March 14, 2008 June 24, 2008 April 1, 2009 December 9, 2009 May 18, 2010 July 28, 2010 August 3, 2010	August 26, 2010	Ms. Begay stated that the Project is outside of her traditional area and that she has no specific comments regarding the Project.
James R. Leon Chairperson	Chumash Council of Bakersfield P.O. Box 902 Bakersfield, CA 93302	March 14, 2008	N/A	No
Arianne Garcia Chairperson	Chumash Council of Bakersfield P.O. Box 902 Bakersfield, CA 93302	April 1, 2009 December 9, 2009 May 18, 2010 July 28, 2010 August 3, 2010	August 26, 2010 August 27, 2010	Ms. Garcia did not answer follow up calls made on August 26 and 27, 2010. A message was left with her voicemail service requesting any information she may have regarding the Project area. No response has been received to date.
Robert L. Gomez, Jr.	2619 Driller Avenue Bakersfield, CA 93306	March 14, 2008	N/A	No
Delia Dominguez Tribal Chairwoman	Kitanemuk & Yowlumne Tejon Indians 981 N. Virginia Covina, CA 91722 Yowlumne, Kitanemuk	April 1, 2009 December 9, 2009 May 18, 2010 July 28, 2010 August 3, 2010	August 26, 2010 August 27, 2010	Ms. Dominguez did not answer follow up calls made on August 26 and 27, 2010. A message was left with her voicemail service requesting any information she may have regarding the Project area. No response has been received to date.

Table 5.3-5
Native American Consultation Information

Contact Name and Title	Address and Native American Groups Represented	Date Contacted By Letter	Date Contacted by Telephone	Comments Received/Notes
David Laughinghorse Robinson	Kawaiisu Tribe of Tejon Reservation P.O. Box 1547 Kernville, CA 93238	January 4, 2010 May 18, 2010 July 28, 2010 August 3, 2010	August 26, 2010	The NAHC provided two telephone numbers for Mr. Robinson. The first was disconnected and the second was not answered and there was no voicemail service.
Ryan Garfield Chairperson	Tule Indian Tribe P.O. Box 589 Porterville, CA 93258	January 4, 2010 May 18, 2010 July 28, 2010 August 3, 2010	N/A	No
Robert Robertson Historic Preservation Officer	Kern Valley Indian Council P.O. Box 401 Weldon, CA 93238	August 4, 2010	N/A	No
Carol A. Pulido	165 Mountainview Street Oak View, CA 93022	January 4, 2010 28 July 2010	August 26, 2010	Ms. Pulido had no comment on the Project.

Note:
NAHC = Native American Heritage Commission

Table 5.3-6
Archaeological Sites in or within Close Proximity (within 200 Feet) to the Project ARSA

Primary # (P-15) or Temporary Designation	Site Type	Prehistoric/ Historic	Associated Project Component	NRHP/ CRHR Status	Trinomial (CA-KER)	Within ARSA	Within Close Proximity to ARSA
89	Lithic and Trash Scatter with Human Remains	Prehistoric/ Historic	PRO H_2O	Not Evaluated	89/H	No	Yes
124	Shell and Lithic Scatter	Prehistoric	CO_2, Controlled Area	Not Evaluated	124	No	Yes
171	Burial Mound	Prehistoric	PRO H_2O	Not Evaluated	171	Yes	No
179	Burial Mound	Prehistoric	PRO H_2O	Not Evaluated	179	No	Yes
2485	Lithic Scatter	Prehistoric	PRO H_2O	Not Evaluated	2485	No	Yes
3108	Lithic Scatter	Prehistoric	NG and Railroad	Not Evaluated	3108	Yes	No
HECA-2008-1	Lithic and Shell Scatter	Prehistoric	PRO H_2O	Not Evaluated	N/A	Yes	No
HECA-2009-2	Lithic Scatter	Prehistoric	CO_2, Controlled Area	Not Evaluated	N/A	Yes	No
HECA-2009-9	Lithic Scatter	Prehistoric	PRO H_2O, Well Field	Not Evaluated	N/A	Yes	No
HECA-2009-10	Lithic Scatter	Prehistoric	PRO H_2O, Well Field	Not Evaluated	N/A	Yes	No
HECA-2010-2	Foundation and Trash Scatter	Historic	NG and Railroad	Not Evaluated	N/A	Yes	No
HECA-2012-1	Lithic Scatter	Prehistoric	NG and Railroad	Not Evaluated	N/A	No	Yes

Notes:
CO_2 = Carbon Dioxide Pipeline
NG = Natural Gas Pipeline
ARSA = Archaeological Resources Study Area
CRHR = California Register of Historical Resources
HECA = Hydrogen Energy California
NG = Natural Gas Pipeline
NRHP = National Register of Historic Places
PRO H_2O = Process Water Pipeline

Table 5.3-7
Historic Architectural Resources in the Project HARSA

Address or Resource Name	Year Built	NRHP/CRHR Status
Relocated Structures North of SR 58	Unknown, moved to site after 1973	Ineligible
Southern Pacific McKittrick (Asphalto) Branch	1893	Ineligible
Pacific Gas & Electric/Southern California Edison Transmission Lines & Towers	ca. 1943-53 ca. 1956-68 ca. 1968-73	Ineligible
6010 Buerkle Road	1964	Ineligible
35034 Stockdale Highway	ca. 1940s	Ineligible
Works Projects Administration Culverts	1940	Ineligible
7307 Adohr Road (Adohr Farms)	1930	Ineligible
7307 Adohr Road (Palm Farms)	1953	Ineligible
7345 Adohr Road	1930	Ineligible
Old Headquarters Weir	1911	Eligible
California Aqueduct	1961-72	Eligible
6122 Tule Park Road	1941	Ineligible
Tupman Water Plant	ca. 1935, 1974-81	Ineligible
Canals	1876-1918	Ineligible

Notes:
CRHR = California Register of Historical Resources
HARSA = Historic Architectural Resources Study Area
NRHP = National Register of Historic Places

Table 5.3-8
Applicable Laws, Ordinances, Regulations, and Standards

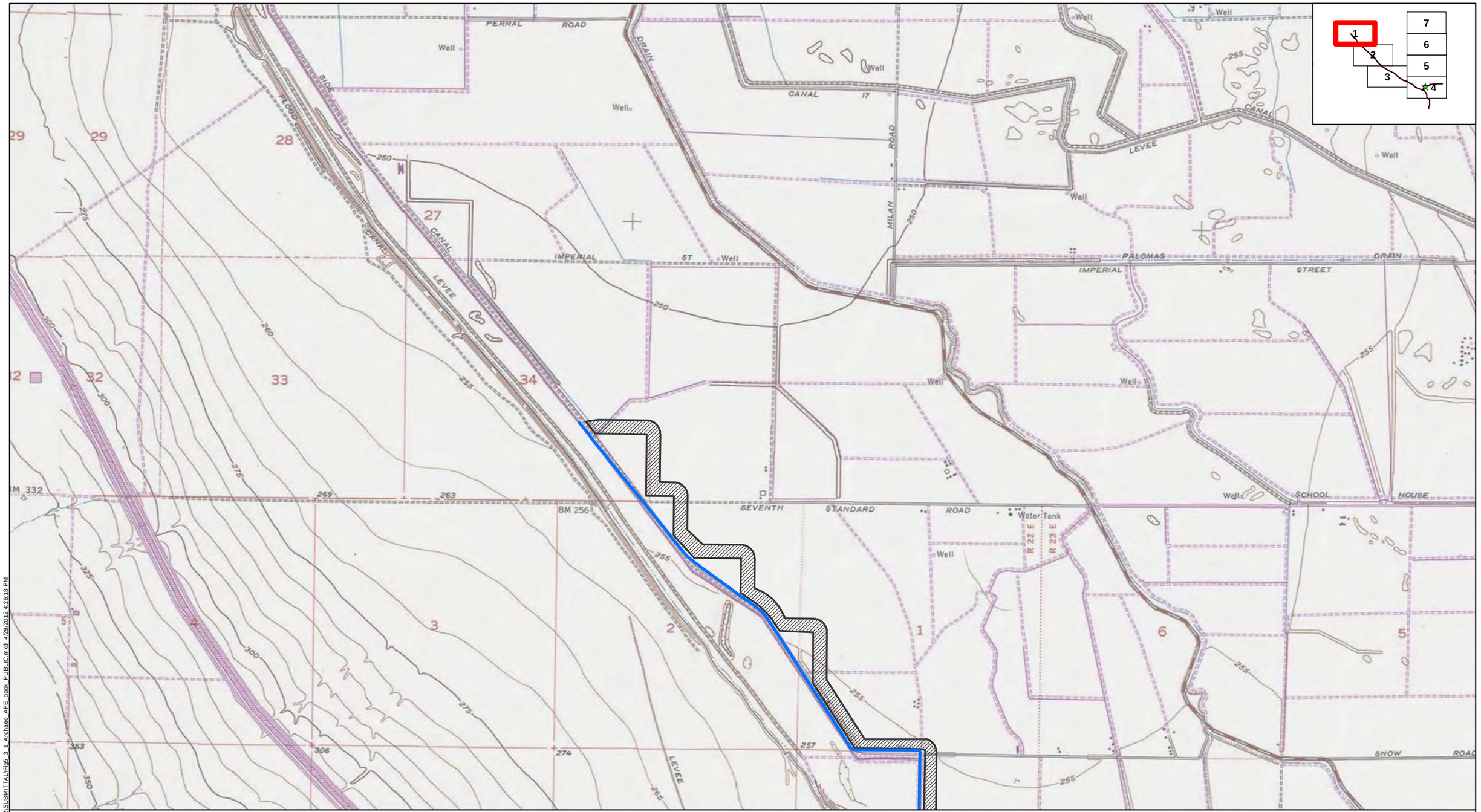
LORS	Applicability	Administering Agency	AFC Section
Federal			
Section 106 of the National Historic Preservation Act	Federal regulation affecting the treatment of cultural resources.	State Historic Preservation Office	5.3.5.1
State			
California Environmental Quality Act	Requires evaluation of impacts of Project on cultural resources.	California Energy Commission	5.3.5.2
Local			
Kern County General Plan	The County shall address archaeological resources for discretionary projects in accordance with CEQA	Kern County Planning Department	5.3.5.3

Notes:
AFC = Application for Certification
CEQA = California Environmental Quality Act of 1970
LORS = laws, ordinances, regulations, and standards

Table 5.3-9
Involved Agencies and Agency Contacts

Issue	Agency/Address	Contact/Title	Telephone
Native American traditional cultural properties	Native American Heritage Commission 915 Capitol Mall, Room 364 Sacramento, CA 95814	Ms. Debbie Pilas-Treadway Associate Government Program Analyst	(916) 653-4038
County compliance with CEQA	Kern County Planning Agency	Lorelei H. Oviatt, AICP Division Chief	(661) 862-8866

Notes:
AICP = American Institute of Certified Planners
CEQA = California Environmental Quality Act of 1970



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Note:
1. Feature temporarily designated as confidential

N

0 1,000 2,000 4,000 FEET

Source: Aerial Imagery, Bing Maps, 2009.

ARCHAEOLOGICAL RESOURCES STUDY AREA

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 5.3-1 - SHEET 1

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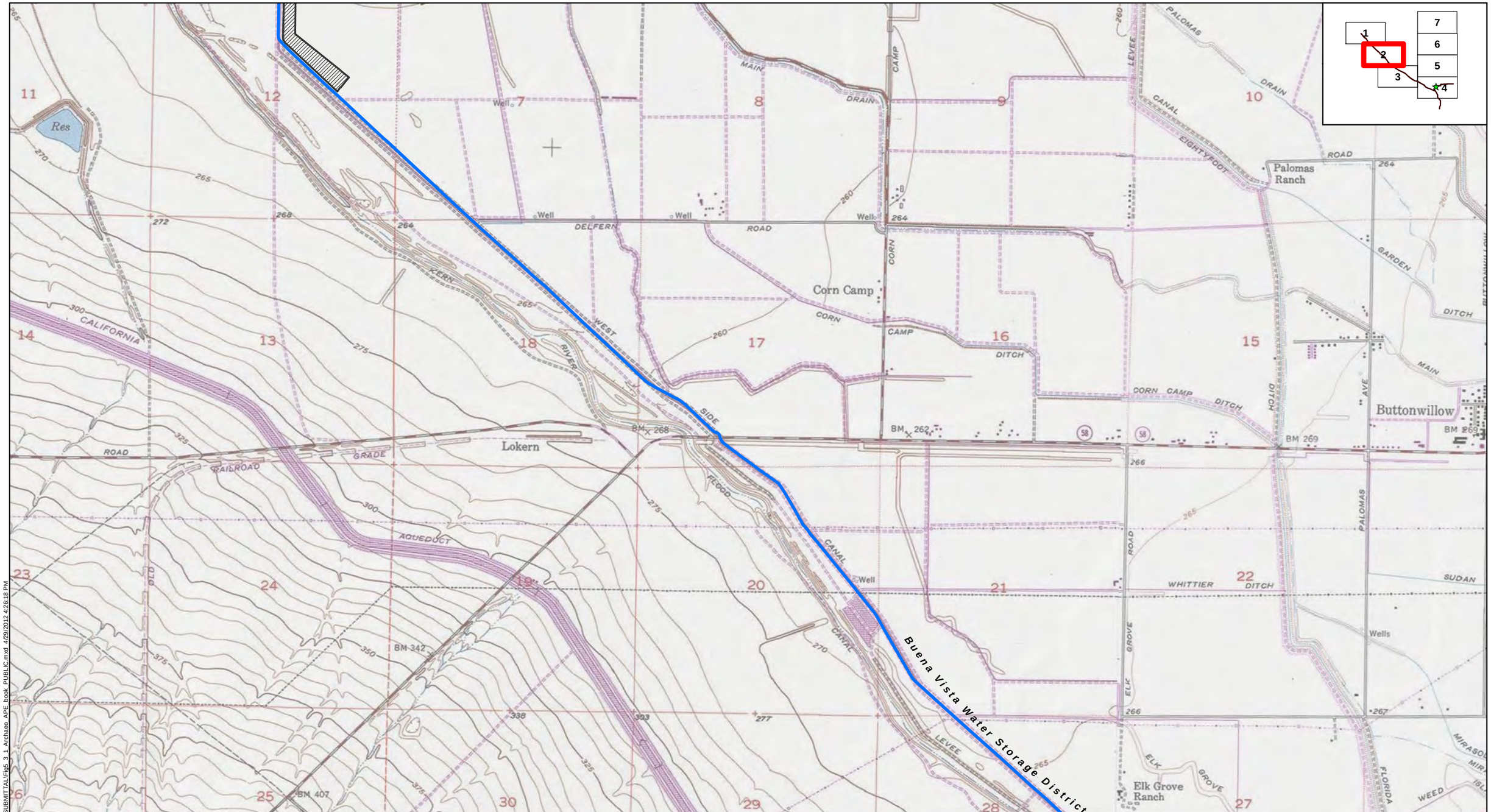

Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Note:
1. Feature temporarily designated as confidential

N

0 1,000 2,000 4,000 FEET

Source: Aerial Imagery, Bing Maps, 2009.

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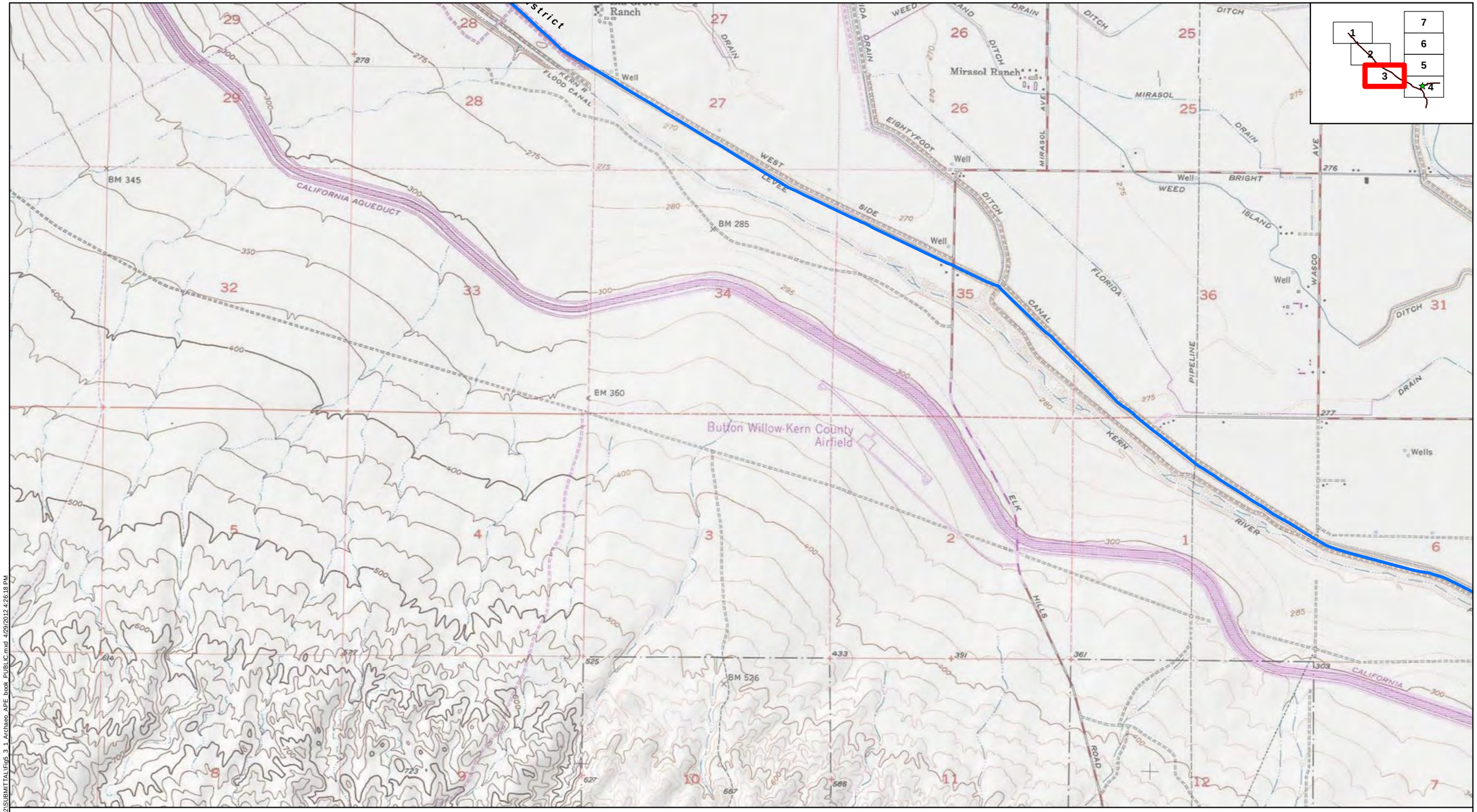
ARCHAEOLOGICAL RESOURCES STUDY AREA

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.3-1 - SHEET 2



Project Site
Construction Staging Area
Controlled Area
BVWSD Well Field

Carbon Dioxide
Natural Gas[1]
Potable Water
Process Water
Railroad[1]
Transmission

Note:
1. Feature temporarily designated as confidential

N

0 1,000 2,000 4,000 FEET

Source: Aerial Imagery, Bing Maps, 2009.

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ARCHAEOLOGICAL RESOURCES STUDY AREA

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.3-1 - SHEET 3