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5.9 SOILS

Hydrogen Energy International LLC (HEI or Applicant) is jointly owned by BP Alternative Energy North America Inc. and Rio Tinto Hydrogen Energy LLC. HEI is proposing to build an Integrated Gasification Combined Cycle (IGCC) power generating facility called Hydrogen Energy California (HECA or Project) in Kern County, California. The Project will produce low-carbon baseload electricity by capturing carbon dioxide (CO_2) and transporting it for CO_2 enhanced oil recovery (EOR) and sequestration (storage)[1].

The 473-acre Project Site is located approximately 7 miles west of the outermost edge of the city of Bakersfield and 1.5 miles northwest of the unincorporated community of Tupman in western Kern County, California, as shown in Figure 2-1, Project Vicinity. The Project Site is near a hydrocarbon-producing area known as the Elk Hills Field. The majority of the Project Site is currently used primarily for agricultural purposes. Existing surface elevations vary from about 282 feet to 291 feet above mean sea level.

The Project will gasify petroleum coke (petcoke) (or blends of petcoke and coal, as needed) to produce hydrogen to fuel a combustion turbine operating in combined cycle mode. The Gasification Block feeds a 390-gross-megawatt (MW) combined cycle plant. The net electrical generation output from the Project will provide California with approximately 250 MW of low-carbon baseload power to the grid. The Gasification Block will also capture approximately 90 percent of the carbon from the raw syngas at steady-state operation, which will be transported to the Elk Hills Field for CO_2 EOR and Sequestration. In addition, approximately 100 MW of natural gas generated peaking power will be available from the Project.

The Project Site and linear facilities comprise the affected study area and are entirely located in Kern County, California. These Project components are described below.

Major on-site Project components will include, as shown on Figure 2-5, Preliminary Plot Plan:

- Solids Handling, Gasification, and Gas Treatment
  - Feedstock delivery, handling and storage
  - Gasification
  - Sour shift/gas cooling
  - Mercury removal
  - Acid gas removal

- Power Generation
  - Combined-cycle power generation
  - Auxiliary combustion turbine generator
  - Electrical switching facilities

[1] This carbon dioxide will be compressed and transported via pipeline to the custody transfer point at the adjacent Elk Hills Field, where it will be injected. The CO_2 EOR process involves the injection and reinjection of carbon dioxide to reduce the viscosity and enhance other properties of the trapped oil, thus allowing it to flow through the reservoir and improve extraction. During the process, the injected carbon dioxide becomes sequestered in a secure geologic formation. This process is referred to herein as CO_2 EOR and Sequestration.

- Supporting Process Systems
  - Natural gas fuel systems
  - Air separation unit (ASU)
  - Sulfur recovery unit/Tail Gas Treating Unit
  - Zero liquid discharge (ZLD) units for process and plant waste water streams
  - Carbon dioxide compression
  - Raw water treatment plant
  - Other plant systems

The Project also includes the following offsite facilities, as shown on Figure 2-7, Project Location Map:

- **Electrical Transmission Line –** An electrical transmission line will interconnect the Project to Pacific Gas & Electric's (PG&E) Midway Substation. Two alternative transmission routes are proposed; alternative is approximately 8 miles in length.

- **Natural Gas Supply –** A natural gas interconnection will be made with PG&E or So Cal Gas natural gas pipelines, each of which are located southeast of the Project Site. The natural gas pipeline will be approximately 8 miles in length.

- **Water Supply Pipelines –** The Project will utilize brackish groundwater supplied from the Buena Vista Water Storage District (BVWSD) located to the northwest. The raw water supply pipeline will be approximately 15 miles in length. Potable water for drinking and sanitary use will be supplied by West Kern Water District to the southeast. The potable water supply pipeline will be approximately 7 miles in length.

- **Carbon Dioxide Pipeline –** The carbon dioxide pipeline will transfer the carbon dioxide captured during gasification from the Project Site southwest to the custody transfer point. Two alternative carbon dioxide pipeline routes are proposed; each alternative will be approximately 4 miles in length.

The Project components described above are shown on Figure 2-8, Project Location Details, which depicts the region, the vicinity, the Project Site and its immediate surroundings.

All temporary construction equipment laydown and parking, including construction parking, offices, and construction laydown areas, will be located within the Project Site.

The disturbed acreage associated with the Project is summarized in Table 5.9-1, Project Disturbed Acreage. See Table 2-1 in Section 2, Project Description of this Revised AFC, for additional details.

This section describes the potential environmental consequences of the Project on soils in accordance with California Energy Commission (CEC) requirements. Impacts to agricultural land uses are evaluated in Section 5.4, Land Use and Agriculture.

5.9.1 Affected Environment

5.9.1.1 Regional Setting

Section 5.15, Geological Hazards and Resources, provides details on the geology of the Project Site and vicinity. The Project Site is on an alluvial fan complex on the southwestern side of the San Joaquin Valley in the southern end of the Great Valley geomorphic province, which

Table 5.9-1
Project Disturbed Acreage

Project Component	Size	Approx. Linear Length (miles)	ROW Construction	ROW Permanent	Temporary Disturbance (acres)	Permanent Disturbance
Project Site	473 acres	NA	NA	NA	473	250
Electrical transmission line	25-foot-diameter structural base (60 structures total)	8	175 feet[1]	150 feet	24	0.67[2]
Natural gas pipeline	16-inch diameter	8	50 feet	25 feet	50[3]	0.33[4]
Process water pipeline	20-inch diameter	15	50 feet	25 feet	93[5]	0.29[6]
Potable water pipeline	6-inch diameter	7	Accounted for in Natural Gas Line ROW	Accounted for in Natural Gas Line ROW	Accounted for in Natural Gas Line ROW	Accounted for in Natural Gas Line ROW
CO_2 pipeline	12-inch diameter	4	50 feet	25 feet	25[3]	0.11[7]
Temporary Construction Areas	Accounted for in Project Site	NA	NA	NA	Accounted for in Project Site	None
Total Project Disturbance					**665**	**251.4**

Source: HECA Project

Notes:
~ = approximately
CO_2 = carbon dioxide
NA = not applicable
ROW = right of way

1. This is a maximum width required in areas where structures will be installed. However, total temporary disturbance along the entire route is calculated based on the following: (1) a 150-foot by 150-foot area is required for each of the 60 structures, equaling 31 acres; and (2) 25-foot temporary roadway is required along the entire 8-mile line, equaling 24 acres.
2. Consists of permanent ground disturbance associated with the base of the 60 new structures.
3. Acreage includes the area required for the entry/exist pits.
4. Acreage includes permanent disturbance occupied by the gas metering station located within the Controlled Area southeast of the Project Site.
5. Acreage includes the 100-foot by 150-foot temporarily disturbed area required for the construction of each of five groundwater wells.
6. Acreage includes the 50-foot by 50-foot permanent disturbed area required for each of five groundwater wells.
7. Acreage includes two 50-foot by 50-foot valve boxes positioned along the pipeline route.

separates the Coast Ranges to the west from the Sierra Nevada Range to the east. The regional geology consists of Quaternary alluvium (approximately 6,000 to 7,000 feet thick) underlain by a sequence of sediments up to 30,000 feet deep (URS 2007).

The Project Site covers the majority of Section 10 in Township 30 South, Range 24 East, on the U.S. Geological Survey (USGS) East Elk Hills, California Quadrangle Map.

The Project Site is predominantly used for agricultural purposes, including cultivation of cotton, alfalfa, and onions.

Adjacent land uses consist of Adohr Road and agricultural uses to the north; Tupman Road and agricultural uses to the east; agricultural uses and an irrigation canal to the south; and a residence, structures (used for grain storage and organic fertilizer production), agricultural uses, and Dairy Road right of way to the west. The land adjacent to the northwestern corner of the Project Site contains the Port Organics Products, LTD natural fertilizer manufacturing plant, farming operations, and a residence. The West Side Canal, Kern River Flood Control Channel, and California Aqueduct are located approximately 500, 700, and 1,900 feet, respectively, to the south of the Project Site. The land southwest of the California Aqueduct is used for mineral and petroleum purposes. The Elk Hills Field is located approximately 1 mile south of the Project Site.

The East Side Canal is 1,300 feet east of the northeastern corner of the Project Site (at the intersection of Adohr and Tupman Roads) and extends generally from the north to the south semi-parallel to the eastern border of the Project Site. The northern boundary of Tule Elk State Reserve is 1,700 feet east of the Project Site on Station Road between the East Side Canal and Morris Road, east of Tupman Road. The reserve extends generally from the north to the south, with the reserve's southern boundary being just east of the unincorporated community of Tupman, California.

5.9.1.2 Soil Resources

The soil resource information presented in this section is based primarily on the Soil Survey of Kern County, California, Northwestern Part prepared and maintained by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) (USDA SCS 1988). Additionally, information for the Soil Survey of Kern County, California, Southwestern Part was obtained through review of the NRCS Web Soil Survey (WSS) – Soil Survey Geographic (SSURGO) database (NRCS 2009). The WSS database contains official USDA soil survey information as viewable maps and tables for more than 2,300 soil surveys in the United States and its territories. The boundaries of the different soil units for the Project Site and associated linears are shown graphically on Figure 5.9-1 (Sheets 1 through 8). Section 5.15, Geological Hazards and Resources, and Appendix P, Geotechnical Investigation, describe the characteristics of the subsurface soil at the Project Site.

The predominant soils at the Project Site and along the associated linears consist of clays, loamy sands, gravely sandy loams, silt loams, fine sandy loams, and sandy loams. The soil mapping units at the Project Site include the Buttonwillow Clay, 0 to 2 percent slopes and the Lokern Clay, 0 to 2 percent slopes.

The soil mapping units along the process water linear includes the Lokern Clay, 0 to 2 percent slopes, Lokern Clay – Saline-Alkali, 0 to 2 percent slopes, and Buttonwillow Clay, 0 to 2 percent slopes.

The soil mapping units along the transmission linears include Lokern Clay – Saline-Alkali, 0 to 2 percent slopes, Milham Sandy Sandy Loam, 0 to 2 percent slopes, Kimberlina Fine Sandy Loam, 0 to 2 percent slopes, Garces Silt Loam, 0 to 2 percent slopes, Buttonwillow Clay, 0 to 2 percent slopes, and Lokern Clay, 0 to 2 percent slopes.

The soil mapping units along the carbon dioxide linears include Torriorthents Stratified, Eroded Elkhills Complex, 9 to 50 percent slopes, Elkhills Sandy Loam, 9 to 50 percent slopes, Cajon Loamy Sand, 2 to 5 percent slopes, Buttonwillow Clay, 0 to 2 percent slopes, Garces Silt Loam, 0 to 2 percent slopes, and Lokern Clay, 0 to 2 percent slopes.

The soil mapping units along the natural gas linear include the Granoso Loamy Sand, 2 to 5 percent slopes, Kimberlina Fine Sandy Loam, Saline-Sodic 0 to 2 percent slopes, and Kimberlina Fine Sandy Loam – Saline-Alkali, 0 to 2 percent slopes.

The soil mapping units along the potable water/natural gas linear include Torriorthents Stratified, Eroded Elkhills Complex, 9 to 50 percent slopes, Lokern Clay, 0 to 2 percent slopes, Cajon Loamy Sand, 0 to 2 percent slopes, Cajon Loamy Sand, 2 to 5 percent slopes, Elkhills Sandy Loam, 9 to 50 percent slopes, and Granoso Loamy Sand, 2 to 5 percent slopes.

Representative soil types and descriptions for the Project Site and associated linears are presented below and soil properties are summarized in Table 5.9-2.

Buttonwillow Clay, Drained (123), 0 to 2 Percent Slopes

This soil type is a deep, somewhat poorly drained soil in basins. It formed in alluvium derived dominantly from granitic rock with slopes of 0 to 2 percent. The representative profile is 0 to 60 inches. The surface layer is typically dark gray clay about 28 inches thick. The upper 27 inches of the underlying material is light gray to gray fine sandy loam, and the lower part to a depth of 60 inches is very dark gray. Permeability of this Buttonwillow soil is moderately rapid between depths of 28 and 55 inches and slow below a depth of 55 inches. Available water capacity is moderate or high, runoff is very slow, and the hazard of water erosion is slight. This unit is suited to irrigated crops and pasture and most areas of this unit are used for irrigated crops, including alfalfa, barley, cotton, and sugar beets. This soil unit is considered Prime Farmland if irrigated (USDA SCS, 1988).

Cajon Loamy Sand (125), 0 to 2 Percent Slopes

This soil type is a deep, somewhat excessively drained soil on alluvial fans. It formed in alluvium derived dominantly from granitic rock. The representative profile is 0 to 60 inches. The surface layer is typically pale brown loamy sand about 9 inches thick. The upper 35 inches of the underlying material is light gray sand, and the lower part to a depth of 60 inches or more is stratified light brownish gray sandy loam. The vegetation in areas that are not cultivated is mainly annual grasses and forbs. Permeability of this Cajon soil is rapid. Available water capacity is low, runoff is very slow, and the hazard of water erosion is slight. This unit is suited

Table 5.9-2
Soil Mapping Units – Descriptions and Properties

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Kern County Northwestern Part											
Buttonwillow clay, drained, 0 to 2% slopes (123)	Clay	No restrictive feature within 200 cm	Somewhat Poorly Drained	High	C	7s	5	0.24	7.9-8.4	High	Prime Farmland if Irrigated
Cajon loamy sand, 0 to 2% slopes (125)	Loamy sand	No restrictive feature within 200 cm	Somewhat Excessively Drained	Negligible	A	7s	5	0.15	7.4-8.4	Moderate	Prime Farmland if Irrigated
Cajon loamy sand, 2 to 5% slopes (126)	Loamy sand	No restrictive feature within 200 cm	Somewhat Excessively Drained	Negligible	A	7e	5	0.15	7.4-8.4	Moderate	Prime Farmland if Irrigated
Elkhills sandy loam, 9 to 50% slopes, eroded (146)	Gravely sandy loam	No restrictive feature within 200 cm	Well Drained	Medium	B	7e	5	0.20	7.4-8.4	High	Not Prime Farmland
Garces silt loam (156)	Silt loam	No restrictive feature within 200 cm	Well Drained	Very High	D	7s	5	0.49	7.9-9.0	High	Farmland of State-Wide Importance
Kimberlina fine sandy loam, 0 to 2% slopes (174)	Fine sandy loam	No restrictive feature within 200 cm	Well Drained	Very Low	B	7c	5	0.24	6.6-8.4	High	Prime Farmland if Irrigated
Kimberlina fine sandy loam, saline-alkali, 0 to 2% slopes (179)	Fine sandy loam	No restrictive feature within 200 cm	Well Drained	Medium	B	7s	5	0.24	7.9-8.4	High	Farmland of State-Wide Importance

Table 5.9-2
Soil Mapping Units – Descriptions and Properties

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Lokern clay, drained, 0 to 2% slopes (187)	Clay	No restrictive feature within 200 cm	Moderately Well Drained	High	C	7s	5	0.28	7.9-8.4	High	Prime Farmland if Irrigated
Lokern clay, saline-alkali, drained, 0 to 2% slopes (188)	Clay	No restrictive feature within 200 cm	Moderately Well Drained	Very High	D	7s	5	0.28	7.9-8.4	High	Not Prime Farmland
Milham sandy loam, 0 to 2% slopes (196)	Sandy loam	No restrictive feature within 200 cm	Well Drained	Medium	B	7c	5	0.32	7.4-8.4	High	Prime Farmland if Irrigated
Panoche clay loam, 0 to 2% slopes (211)	Clay loam	No restrictive feature within 200 cm	Well Drained	Low	B	7c	5	0.43	7.4-8.4	High	Prime Farmland if Irrigated
Panoche clay loam, saline-alkali, 0 to 2% slopes (214)	Clay loam	No restrictive feature within 200 cm	Well Drained	Medium	B	7s	5	0.43	7.4-8.4	High	Farmland of State-Wide Importance
Torriorthents stratified, eroded-Elkhills complex, 9 to 50% slopes (232)	Sandy loam, gravelly sandy loam	No restrictive feature within 200 cm	Well Drained	Medium to High	C	7e	5	0.20	7.4-8.4	High	Not Prime Farmland
Kern County, Southwestern Part											
Granoso loamy sand, 2 to 5% slopes (121)	Loamy Sand	No restrictive feature within 200 cm	Somewhat Excessively Drained	Very Low	A	7e	5	0.17	7.4-8.4	Low	Farmland of State-Wide Importance

Table 5.9-2
Soil Mapping Units – Descriptions and Properties

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Kimberlina fine sandy loam, saline-sodic, 0 to 2% slopes (212)	Fine Sandy Loam	No restrictive feature within 200 cm	Well Drained	Low	B	7s	3	0.24	7.9-8.4	High	Farmland of State-Wide Importance

Source: USDA SCS 1988, NRCS 2009.

Notes:
[1]*Depth to Bedrock or Restrictive Feature:* Represents a restrictive layer that is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.
[2]*Hydrologic Soil Groups:* Are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms. The four hydrologic soil groups are:

Group A - Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B - Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C - Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D - Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

[3]*Land Capability Classes:* ***Class 7*** soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forest land, or wildlife. ***Subclass s*** indicates that the soil is limited mainly because it is shallow, droughty, or stony; ***Subclass c*** indicates that the soil is limited by climates that are very cold or very dry; and ***Subclass e*** indicates susceptibility to erosion is the dominant problem or hazard affecting use with erosion susceptibility and past erosion damage comprising the major soil factors that affect soils in this subclass; Subclass s indicates that the soil is limited mainly because it is shallow, droughty, or stony.
[4]*T Factor:* is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.
[5]*Erosion Factor K:* indicates the susceptibility of a soil to sheet and rill erosion by water. *Factor K* is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of *K* range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.
[6]*Risk of Corrosion:* pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer. For uncoated steel, the risk of corrosion, expressed as “low,” “moderate,” or “high,” is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.
cm = centimeter
% = percent

to irrigated crops but is limited mainly by low available water capacity and the high hazard of soil blowing. Most areas of this unit are used for irrigated crops, mainly alfalfa, cotton, grapes, and small grain. Among the other crops grown are onions and potatoes. Some areas of this unit are used for urban development. This soil unit is designated as Prime Farmland if irrigated (USDA SCS 1988).

Cajon Loamy Sand (126), 2 to 5 Percent Slopes

This soil type is a deep, somewhat excessively drained soil on alluvial fans. It formed in alluvium derived dominantly from granitic rock. The representative profile is 0 to 60 inches.

The surface layer is typically pale brown loamy sand about 9 inches thick. The upper 35 inches of the underlying material is light gray loamy sand, and the lower part to a depth of 60 inches or more is stratified light brownish gray sandy loam. The vegetation in most areas that are not cultivated is mainly annual grasses, forbs, and shrubs. Permeability of this Cajon soil is rapid. Available water capacity is low, runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This unit is suited to livestock grazing irrigated crops but the production of forage is limited by low available water capacity, the high hazard of soil blowing, and low rainfall. This soil unit is designated as Prime Farmland if irrigated (USDA SCS 1988).

Elkhills Sandy Loam (146), 9 to 50 Percent Slopes

This soil type is a deep, well-drained soil found primarily on uplifted, dissected old areas of valley fill. It formed in alluvium derived dominantly from sedimentary and granitic rock. The representative profile is 0 to 65 inches. The surface layer is typically a pale brown sandy loam about 7 inches thick. The subsurface layer is light yellowish brown fine sandy loam about 22 inches thick. The upper 20 inches of the underlying material is very pale brown coarse sandy loam, and the lower part to a depth of 65 inches or more is light gray, stratified gravelly coarse sand, sand, and loamy sand. The vegetation in areas not cultivated is mainly annual grasses, forbs, and scattered shrubs. Permeability of this Elkhills soil is moderately rapid. Available water capacity is moderate or high, runoff is medium, and the hazard of water erosion is moderate. This unit is suited to livestock grazing but the production of forage is limited by low rainfall and steepness of slope. This soil is not considered Prime Farmland (USDA SCS 1988).

Garces Silt Loam (156), 0 to 2 Percent Slopes

This soil type is a deep, well-drained, saline-alkali soil on basin rims. It formed in alluvium derived dominantly from granitic rock. The slope is 0 to 2 percent. The representative profile is 0 to 60 inches. The surface layer is typically pale brown silt loam about 2 inches thick. The subsurface layer is very pale brown silt loam about 3 inches thick. The upper 32 inches of the underlying subsoil material is light yellowish brown clay loam and pale brown loam, and the lower substratum to a depth of 60 inches or more is very pale brown loam and light gray fine sandy loam. The vegetation in areas not cultivated is mainly salt tolerant annual grasses, forbs, and shrubs. Permeability of this Garces soil is very slow. Available water capacity is low to high, runoff is very slow, and the hazard of water erosion is slight. Most areas of this unit are used for irrigated crops, mainly barley, cotton, and sugar beets, as well as almonds, alfalfa, and wheat. Some areas are used for irrigated pasture, livestock grazing, and urban development. This soil unit is designated as farmland of statewide importance (USDA SCS 1988).

Kimberlina Fine Sandy Loam (174), 0 to 2 Percent Slopes

This soil type is a deep, well-drained soil on alluvial fans and plains. It formed in alluvium derived dominantly from granitic and sedimentary rock. The representative profile is 0 to 71 inches. The surface layer is typically a brown fine sandy loam about 9 inches thick. The upper 36 inches of the underlying material is pale brown fine sandy loam, and the lower part to a depth of 71 inches is pale brown silt loam. The vegetation in areas not cultivated is mainly annual grasses, forbs, and a few scattered shrubs. Permeability of this Kimberlina soil is moderate. Available water capacity is high, runoff is slow, and the hazard of water erosion is slight. This unit is suited to irrigated crops and has few limitations. Most areas of this unit are used for irrigated crops, mainly almonds, alfalfa, cotton, and grapes. Other crops grown include potatoes, sugar beets, pistachios, and onions. Some areas are also used for irrigated pasture, limited livestock grazing, and urban development. This soil is considered Prime Farmland if irrigated (USDA SCS 1988).

Kimberlina Fine Sandy Loam (179), Saline-Alkali, 0 to 2 Percent Slopes

This soil type is a deep, well-drained soil on recent alluvial fans and plains. It formed in alluvium derived dominantly from granitic and sedimentary rock. The representative profile is 0 to 71 inches. The surface layer is typically a brown fine sandy loam up to 9 inches thick. The upper 36 inches of the underlying material is brown fine sandy loam, and the lower part to a depth of 71 inches is pale brown silt loam. The native vegetation is mainly salt tolerant annual grasses, forbs, and a few scattered shrubs. The soil is slightly to moderately saline-alkali and permeability of the Kimberlina soil is moderately slow. Available water capacity is very low to moderate, runoff is slow, and the hazard of water erosion is slight. This unit is well suited to irrigated crops that are saline-alkali tolerant and is commonly used for row and field crops such as cotton, alfalfa, and barley. This soil is considered farmland of statewide importance (USDA SCS 1988).

Lokern clay (187), Drained, 0 to 2 Percent Slopes

This soil type is a deep, somewhat poorly drained soil in basins. It formed in alluvium derived from mixed rock sources, dominantly granitic rock with slopes of 0 to 2 percent. The representative profile is 0 to 60 inches. The surface layer is dark gray clay about 21 inches thick. The upper 27 inches of the underlying material is gray and dark gray clay, and the lower part to depths of 60 inches or more is light brownish gray fine sandy loam. The vegetation in areas not cultivated is mainly annual grasses, forbs, and shrubs. Permeability of this Lokern soil is slow. Available water capacity is high, runoff is very slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding, but is protected by dams or levees. This unit is suited to irrigated row and field crops as well as irrigated pasture. Most areas of this unit are used for irrigated crops, including cotton, alfalfa, sugar beets, barley, rice, and wheat. This soil unit is considered Prime Farmland if irrigated (USDA SCS 1988).

Lokern Clay (188), Saline-Alkali, Drained, 0 to 2 Percent Slopes

This soil type is a deep, somewhat poorly drained soil in basins. It formed in alluvium derived dominantly from mixed rock sources, dominantly granitic rock with slopes of 0 to 2 percent. The representative profile is 0 to 60 inches. The surface layer is typically dark gray clay about 21 inches thick. The upper 27 inches of the underlying material is gray and dark gray clay, and the lower part to a depth of 60 inches or more is light brownish gray fine sandy loam. The soil is moderately to strongly saline-alkali. The vegetation in areas not cultivated is mainly annual grasses, forbs, and shrubs. Permeability of this Lokern soil is slow. Available water capacity is moderate or high, runoff is very slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding, but is protected by dams or levees. Toxic levels of boron are present in places. This unit is suited to irrigated row and field crops that are salt tolerant as well as irrigated pasture. Most areas of this unit are used for irrigated crops, mainly cotton and alfalfa. This soil unit is not considered Prime Farmland (USDA SCS 1988).

Milham Sandy Loam (196), 0 to 2 Percent Slopes

This soil type is a deep, well-drained soil on recent alluvial fans, plains, and low terraces. It formed in alluvium derived dominantly from granitic and sedimentary rock. The representative profile is 0 to 60 inches. The surface layer is light brownish gray sandy loam about 4 inches thick. The upper 6 inches of the subsoil is pale brown sandy loam, and the lower 39 inches is yellowish brown loam and clay loam. The substratum to a depth of 60 inches or more is pale olive sandy loam. The vegetation in areas not cultivated is mainly annual grasses and forbs with a few scattered shrubs. Permeability of the Milham soil is moderately slow. Available water capacity is high, runoff is very slow, and the hazard of water erosion is slight. This unit is suited to hay and pasture as well as to irrigated crops with few limitations. Most areas of this unit are used for irrigated crops, mainly cotton, alfalfa, almonds, grapes, pistachios, olives, onions, peppers, and wheat. Some areas are used for irrigated pasture or livestock grazing. This soil is considered Prime Farmland if irrigated (USDA SCS 1988).

Torriorthents, Stratified, Eroded-Elkhills Complex (232), 9 to 50 Percent Slopes

This soil type is a deep, well-drained soil found primarily in areas of uplifted, dissected valley fill and on hills. It formed in alluvium derived dominantly from sedimentary and granitic rock. The surface layer ranges from loamy sand to silt loam. The next layer is stratified silt loam to clay over stratified gravelly sand to silty clay loam. Many areas are saline-alkali. This soil supports little if any vegetation. Permeability of the Torriorthents is moderate to slow. Available water capacity is moderate to high, runoff is rapid, and the hazard of water erosion is high. This unit is poorly suited to livestock grazing as the production of forage is limited by low rainfall, the hazard of erosion, salt content, and steepness of slope. This soil is not considered Prime Farmland (USDA SCS 1988).

Granoso Loamy Sand (121), 2 to 5 Percent Slopes

This soil type is a deep, somewhat excessively drained soil on alluvial fans. It formed in alluvium derived from mixed rock sources with slopes of 2 to 5 percent. The representative profile is 0 to 62 inches. The surface layer consists of loamy sand about 10 inches thick. The upper 26 inches of the underlying material is loamy sand to sandy loam, and the lower part to a depth of 62 inches is typically sand with some fine sand to loamy sand. Permeability of this Granoso soil is moderate. The soil has a slightly sodic horizon within 30 inches of the soil surface. Available water capacity is low, runoff is slow, and the hazard of water erosion is slight. This unit is suited to irrigated crops. This soil is considered farmland of statewide importance (NRCS 2009).

Kimberlina Fine Sandy Loam (212), Saline-Sodic, 0 to 2 Percent Slopes

This soil type is a deep, well drained soil on alluvial fans. It formed in alluvium derived from granitic and sedimentary rock. The representative profile is 0 to 71 inches. The surface layer is typically a fine sandy loam up to 9 inches thick. The upper 36 inches of the underlying material is fine sandy loam to sandy loam, and the lower part to a depth of 71 inches is stratified silt loam to sandy clay loam. The soil has a slightly saline horizon within 30 inches of the soil surface and a moderately sodic horizon within 30 inches of the soil surface. Permeability of the Kimberlina soil is moderate. Available water capacity is moderate, runoff is slow, and the hazard of water erosion is slight. This unit is well suited to irrigated crops that are saline-sodic. This soil is considered farmland of statewide importance (NRCS 2009).

Soil maps and surveys are available from NRCS for the Northwest and Southwest Section of Kern County, which includes the Project Site and associated linears (NRCS Maps Number CA666 and CA691).

5.9.1.3 Agriculture and Important Farmlands

Information regarding Agriculture and Important Farmlands is presented in Section 5.4 (Land Use) of this Revised AFC.

5.9.2 Environmental Consequences

Appendix G of the California Environmental Quality Act (CEQA) identifies the following criteria for determining the significance of impacts to soils resources. The project would result in a significant impact if:

- It would result in substantial soil erosion or loss of topsoil, degradation of soils or farmland, changes in topography, or unstable soil conditions.
- It in an unstable soil or soil that would become unstable because of the project, and potentially result in landslide, lateral spreading, subsidence, liquefaction, or collapse.
- It is located on expansive soil creating substantial risks to life or property.
- It would place septic tanks or alternative wastewater disposal systems on soils incapable of adequately supporting these systems where sewers are unavailable for the disposal of wastewater.

The assessment of Project impacts to the soil resource is based on soils information presented in SSURGO data and the Phase I Environmental Site Assessment report issued by URS in March 2009 (provided in Appendix M, Phase I Environmental Site Assessment), and consideration of mitigation measures. Although no previous geotechnical investigations or related reports are available for the Project Site, HEI conducted a geotechnical investigation. Information related to the geotechnical investigations and associated findings are provided in Section 5.15, Geological Hazards and Resources, and Appendix P, Geotechnical Investigation.

The Universal Soil Loss Equation is typically used to quantify water-induced soil loss in agricultural areas. The Revised Universal Soil Loss Equation (RUSLE1.06c) was used to estimate the potential amount of soil erosion from the Project Site for pre-development conditions. Under the existing conditions, the estimated soil erosion is less than 0.1 ton per acre per year. During construction, the plant site area and the construction laydown area (depicted in Figure 2-5, Preliminary Plot Plan) will be stripped of vegetation. Under these conditions the vegetative cover will be eliminated and the soil erosion is estimated at approximately 0.7 ton per acre per year. However, the use of Best Management Practices (BMPs) will minimize the potential for soil erosion so that the impact will not be significant. Once the Project has been constructed, the Project Site will either be covered with facilities, rock surfacing, or revegetated. Additionally, after construction, storm water will be managed in a fashion such that there will be zero liquid discharge from the site. In summary, during construction, the potential for erosion would be greater than for the period of operations but will be managed through the implementation of BMPs to minimize impacts; and after construction, the potential for erosion will be less than significant.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The two main soil mapping units at the Project Site are the Buttonwillow Clay and the Lokern Clay, which have a wind erodibility group of 8 and 7 respectively. As such the soils have a low potential for wind erosion. The implementation of mitigation measures presented in Section 5.9.4 will reduce the potential for wind erosion from the site during construction and operational activities.

5.9.2.1 Construction-Related Impacts

Minor construction-related impacts to the soil resources are associated with development of the Project, including minor grubbing, grading, and trenching for installation, operation, and maintenance of aboveground electrical power transmission lines and underground pipelines for process water, carbon dioxide, natural gas, and potable water within the Project Site. Approximately 665 acres of land will be disturbed during construction activities (including the linears facilities), 473 acres of which will be on the Project Site.

Based on information generated for the Phase I Environmental Site Assessment (ESA) prepared by URS (URS, 2009), two Recognized Environmental Conditions (RECs) were identified on the Project Site. In addition, a standpipe was observed adjacent to the northwest corner of the Project Site, potentially associated with an underground storage tank (UST), of which the exact location is unknown. Records also indicate that historical USTs may have been present either on or adjacent to the Project Site (URS, 2009). Contaminated soil may be associated with the potential historical or current presence of nearby USTs, unpermitted discharge from the Port Organics Products, LTD (PO) natural fertilizer manufacturing plant, and the open and uncontained tailings pile located at the onsite portion of the PO natural fertilizer manufacturing facility. Based on the results of the Phase I ESA, additional investigation work to address potential issues associated with these identified RECs has been recommended. The Phase I ESA report is included in this Revised AFC as Appendix M.

The existing Project Site topography is generally flat, but some grading will be required to provide a level area for the Project. The surficial soils will likely be excavated and re-compacted or replaced with granular soils within and adjacent to the areas of Project facilities. Preliminary grading plans indicate that approximately 1.1 million cubic yards of soil required for construction will be derived from offsite sources. The potential borrow site for the Project is Syndex Ready Mix located approximately 5 miles west of the Project Site. Additionally, soil removed through grading activities is expected to be reused on site to construct berms at the northwestern and northeastern portions of the Project Site, and therefore, no on- or off-site fill disposal is expected. However, it may be necessary to dispose of vegetative matter and excavated debris. Disposal site options are described in Section 5.13 (Waste Management) of this Revised AFC. Construction will include the installation of several miles of aboveground electrical power transmission lines both on the Project Site and off site (linear facilities). Additional details related to the construction and installation of the electrical transmission lines and other pipelines for water supply, natural gas, and carbon dioxide are provided below under Section 5.9.2.3, Linear Facilities Impacts.

Potential impacts during construction activities on soil resources may include alteration of the existing soil profile, increased soil erosion, and soil compaction. Alteration of the existing soil profiles, including the mixing of soils, will alter the physical, chemical, and biological characteristics of native soils and underlying geology. Soil erosion causes the loss of topsoil and can increase the sediment load in surface-receiving waters downstream of the construction site. Soil action can decrease infiltration rates, resulting in increased runoff and erosion rates. The magnitude, extent, and duration of construction-related impacts depend on the erodibility of the soil; the proximity of the construction activity to a receiving water body; and the construction methodologies, duration, and season. The mitigation measures outlined in Section 5.9.4, Mitigation Measures, will reduce the potential for impacts to soil resources, resulting from construction of the Project, to less-than-significant levels.

5.9.2.2 Project Site Impacts

Project construction activities (including site preparation) at the Project Site are estimated to be conducted during a 44-month period which will be partially overlapped by approximately 12 months of commissioning activities before the Project is operational. Land disturbances related to development activities are expected to be conducted on the 473-acre Project Site, which includes construction laydown areas. Excavation work will consist of the removal, storage, and/or disposal of earth, sand, gravel, vegetation, organic matter, loose rock, boulders, and debris as necessary for construction. Disposal site options are described in Section 5.13 (Waste Management) of this Revised AFC. Materials suitable for backfill will be stockpiled at designated locations using proper erosion protection methods. During the construction phase of the Project, erosion and sediment control measures such as mulching, jute netting, culverts, sediment detention basins, etc., will be temporarily installed as required by local regulations.

Areas to be backfilled will be prepared by removing unsuitable material and rocks. The bottom of an excavation will be examined for loose or soft areas. If observed, these areas will be excavated fully and backfilled with suitable material and compacted. Backfilling will be done in layers of specified thickness (lift). Soil in each lift will be properly moistened to facilitate compaction to achieve the specified density. To verify compaction, representative field density and moisture-content tests will be performed during compaction.

Existing topsoil will be removed as needed. Graded areas will be smooth, compacted, free from irregular surface changes, and sloped to drain. Structures and their foundations and equipment anchors will be designed according to the 2006 International Building Code (IBC), and the Kern County Building Code. Should there be a conflict in code requirements, the more conservative requirements will be implemented. The 2006 IBC was adopted by the state of California in 2008.

Project-related soil erosion will be minimized through implementation of erosion control measures described in Section 5.9.4, Mitigation Measures. Therefore, impacts from soil erosion are expected to be less than significant.

5.9.2.3 Linear Facilities Impacts

The Project will include the construction, installation, operation, and maintenance of new under- and aboveground linear facilities, including electrical power transmission lines, as well as process water, potable water, natural gas, and carbon dioxide pipelines. Each of the individual feedstocks required and products produced from operating the Project are discussed in additional detail below.

Construction, installation, operation, and maintenance of the underground process water and potable water pipelines will result in minor, mostly temporary soils impacts.

Natural gas will be transported to the Project Site through the construction of a new, high strength, carbon-steel underground pipeline that will be interconnected to the existing PG&E or Southern California Gas Company high pressure pipelines. The interconnect will consist of one tap off the existing transmission line, one meter set, one service pipeline connection, and a pressure-limiting station located on the Project Site. Construction, installation, operation, and maintenance of the underground natural gas pipeline will result in minor, mostly temporary soils impacts.

Construction, installation, operation, and maintenance of the aboveground electrical transmission line linear facility will result in minor, mostly temporary soils impacts.

The carbon dioxide pipeline will parallel (but be offset from) existing roads to the extent possible. Construction, installation, operation, and maintenance of this pipeline will result in minor, mostly temporary soils impacts.

The linear routes are shown on Figure 2-7, Project Location Map.

As part of the gasification process, the Project will produce molten sulfur and a solid slag-like by-product (gasification solids). The molten sulfur and gasification solids will be transported off site via truck. No underground or aboveground facilities will be constructed, installed, operated, or maintained to transport these materials off site. Therefore, no resulting linear soil impacts will be created. The disturbed acreage associated with on-site access roads has been accounted for in the disturbed acreage of the Project Site.

Table 5.9-1, Project Disturbed Acreage, indicates the anticipated acreage that will be disturbed through the process of installing the linear facilities required to operate the Project, and is broken down into temporary disturbance area (resulting from construction and installation), and permanent disturbance area (resulting from operation and maintenance).

The general process for constructing and installing the underground linear facilities will involve clearing of brush, grading and trench excavation, installation of the pipelines, connecting linear facilities, lowering facilities into trenches, backfilling, compaction, and revegetation. Once pipelines are covered, hydrostatic testing will commence to ensure structural integrity.

Horizontal Direction Drilling (HDD) will be used to install the natural gas, potable water, and carbon dioxide pipelines under the Westside/Outlet Canal, the Kern River Flood Control Channel, and the California Aqueduct. BMPs for HDD would include silt fencing around the drill sites, energy dissipation devices for discharging water from hydrostatic testing of the pipeline, selecting drilling fluids for environmental compatibility, and removing spent fluids from the areas immediately adjacent to the aqueduct and canal for safe disposal. In addition, soil erosion control measures would be implemented to prevent runoff and impacts to water quality.

Construction and installation of aboveground linear facilities (the 230-kV electrical transmission line) will follow a sequence similar to that of underground facilities, with trench excavation being replaced by augering of holes to facilitate placement of the utility poles, followed by backfilling and compaction. Grade cuts will be restored to their original contours and affected areas will be restored to their original state to minimize the potential for erosion. To the extent possible, the material excavated from trenches and auger holes will be used to backfill around the poles and in the trenches. Additional excess material that cannot be reused along the easement corridor because it will be susceptible to increased erosion, will be transported to another reuse area or disposed of at an off-site landfill facility. During construction and installation, the soil within the alignment for the linear facilities may become more susceptible to erosion. The extent of this construction-related impact on soils and agricultural lands, however, will be temporary and appropriate BMPs will be implemented to minimize potential impacts. With the implementation of mitigation measures described in Section 5.9.4, Mitigation Measures, below, no significant impacts to native soil, receiving water bodies, or area agricultural lands are anticipated at or near linear facilities.

5.9.2.4 Materials and Equipment Staging Area Impacts

Temporary construction areas will be located entirely within the 473-acre Project Site and will be used for equipment staging and storage, construction staff parking, and job trailers. The worker parking and equipment staging will not be paved, but crushed aggregate material will be placed on the laydown to minimize the potential for erosion. Additionally, soil stabilizers will be used in traffic areas to reduce the potential for the generation of fugitive dust from traffic in unpaved areas. Erosion control measures (more fully described in Section 5.9.4, Mitigation Measures) such as track out areas and silt fencing, will be implemented during construction activities to help maintain water quality, protect property from erosion damage, and prevent accelerated soil erosion or dust generation. With the implementation of mitigation measures described in Section 5.9.4, no significant impacts to native soils, receiving water bodies, or area agricultural lands are anticipated at or near the Project Site.

5.9.2.5 Operation-Related Impacts

Routine vehicle traffic during Project operation will be limited to existing paved roads and the Project Site access road, which will be paved. Permanent storm water mitigation measures will be implemented at the Project Site, such as a perimeter drainage berm(s), storm water retention, and other appropriate BMPs. Thus, with the implementation of mitigation measures described in Section 5.9.4, Mitigation Measures, Project operation will not disturb soil or result in increased erosion or compaction.

5.9.2.6 Effects of Emissions on Soil-Vegetation Systems

Emissions from electric generating facilities, especially nitrogen oxides (NO_X) from the combustors or drift from the cooling towers, may have an adverse effect on soil-vegetation systems in the facility vicinity. This is primarily a concern when environments that are highly sensitive to nutrients or salts, such as serpentine layers (soils and bedrock that are acidic, dry, erodible, and nutrient-poor) are downwind from the facilities. State-of-the-art air emissions control and monitoring equipment will be installed to reduce, control, and measure air emissions (e.g., NO_X). The addition of small amounts of nitrogen to the surrounding agricultural use areas created by air emissions from the Project is considered negligible given the likely use of nitrogen-rich fertilizers used by farmers for crop enhancement. A Continuous Emissions Monitoring System (CEMS) will be installed to monitor the emissions as required by LORS. Cooling towers will be equipped with high-efficiency mist eliminators to reduce particulate matter emissions. Given the use of air emission control technology equipment and the likely use of nitrogen rich fertilizers for crop enhancement, the effects of emissions on soil vegetation systems is considered to be less than significant.

The dominant land use within the Project Site consists of agriculture use. No known occurrences of ultramafic (serpentinite) bedrock have been identified in the Project area. As such, there are no concerns related to naturally occurring asbestos (Churchill 2008).

5.9.3 Cumulative Impacts Analyses

The assessment of cumulative impacts for this Project includes a review of other projects where an application has been filed with Kern County. A list of proposed projects within 6 miles of the Project Site is provided in Appendix J. Based on this information, there are currently 20 new developments proposed within a 6-mile area of the proposed Project. Of these 20 projects, two are agriculture, one is oil and gas related, two are commercial, three are residential, two are mixed use, and ten are industrial in nature. Based on review of these projects, soil loss in the area will be reduced due to the change in land use from agricultural uses to developed areas, such as commercial and industrial uses. Therefore, no significant cumulative impacts to soils are expected. Cumulative impacts related to agricultural land conversion are addressed in Section 5.4, Land Use and Agriculture.

5.9.4 Mitigation Measures

This section describes mitigation measures that will be implemented to reduce potential Project-related impacts to soils.

The following mitigation measures will be implemented, thereby mitigating any potential Project impacts to less-than-significant levels. An acceptable level of soil erosion, as used herein, is defined as that amount of soil loss that will not affect (i.e., limit) the potential long-term beneficial uses of the soil as a growth medium, or adversely affect water resources because of accelerated erosion and subsequent sedimentation. Refer to Section 5.14, Water Resources, for mitigation measures related to potential impacts to water quality associated with soil erosion.

- **Soil-1:** Conduct grading operations in compliance with good industry standard practice and Kern County grading permit requirements.

- **Soil-2:** Conduct construction and operational activities in accordance with a construction phase Storm Water Pollution Prevention Plan (SWPPP) and associated monitoring program.

- **Soil-3:** Temporary Erosion Control Measures

  Typically, temporary erosion control measures include revegetation, slope stabilizers, dust suppression, construction of berms and ditches, and sediment barriers. Vegetation is the most desirable form of erosion control because it stabilizes the soil and maintains the landscape, and implementation of vegetation is feasible due to the quality of soil.

  During construction of the Project, employment of control measures will minimize the wind-blown erosion of soil from construction areas, such as dust suppression (spraying water) and timely vegetation of barren construction areas. BMPs identified in the Erosion Control Plan and SWPPP will be in place prior to the commencement of ground-disturbing activities. At this time, these plans do not exist, but they will be developed and implemented prior to initiation of any on- or off-site ground-disturbing activities.

  Sediment barriers such as straw bales or silt fences will slow runoff and trap sediment. Generally, placement of barriers will occur at the base of exposed slopes below disturbed areas. Placing barriers around the Project and the property boundary serves as prevention against sediment leaving the Project Site. Runoff retention basins, drainage diversions, and other large-scale sediment traps are not expected to be needed because of the relatively level topography. Soil stockpiles generated during construction will be covered and protected from precipitation if left on site for extended periods of time.

- **Soil-4: Permanent Erosion Control Measures**

  Following construction of the Project, permanent control measures will be implemented to minimize water and wind-blown erosion of soil from the Project, such as wind barriers, vegetation of barren post-construction areas and earthen berms, and conducting periodic monitoring (inspections) for erosion due to wind or water impacts and initiation of corrective actions to address issues discovered though monitoring. BMPs identified in the Erosion

Control Plan and SWPPP will be in place prior to the initiation of operations. These plans will be developed and implemented prior to commencing operation of the completed Project.

With implementation of the mitigation measures listed above, impacts to the soils resources will be less than significant due to construction and operation of the Project.

5.9.5 Laws, Ordinances, Regulations, and Standards

The following LORS are applicable to protection of soil resources and protection of surface water quality from potential Project-induced erosion impacts. Table 5.9-3 provides a summary of these applicable LORS. As presented in Section 5.9.7, Permits Required and Permit Schedule, the Project will be constructed and operated in accordance with applicable LORS and permit conditions.

5.9.6 Involved Agencies and Agency Contacts

Agencies with jurisdiction to issue applicable permits and/or enforce LORS related to soils resources are shown in Table 5.9-4, Agency Contacts.

5.9.7 Permits Required and Permit Schedule

Table 5.9-5, Applicable Permits, lists all applicable permits for the Project in the area of soils.

5.9.7.1 Federal Authorities and Administering Agencies

The federal LORS applicable to this Project, as detailed in Table 5.9-3, summary of LORS – Soils, were authorized by the U.S. Environmental Protection Agency (USEPA) and USDA. The Clean Water Act empowers the USEPA with regulation of wastewater and storm water discharges into surface waters by using National Pollutant Discharge Elimination System (NPDES) permits and pretreatment standards. The administering agency for LORS authorized by USEPA is the Regional Water Quality Control Board (RWQCB), Central Valley Region (5), under the direction of the State Water Resources Control Board (SWRCB); however, the USEPA may retain jurisdiction at its discretion.

The USDA prescribes standards of technical excellence for the Soil Conservation Service (SCS), now called the NRCS, for the planning, design, and construction of soil conservation practices. The administering agency for LORS authorized by the USDA (Farmland Protection Policy Act) is the NRCS.

5.9.7.2 State Authorities and Administering Agencies

The state LORS applicable to this Project and listed on Table 5.9-3, Summary of LORS – Soils, are administered by the California Environmental Protection Agency (Cal/EPA). With respect to the Project, the California Public Resources Code provides for protection of environmental quality by requiring entities to submit information to the CEC concerning potential environmental impacts. The CEC is the administering agency, and the CEC's decision on the Application for Certification must include consideration of environmental protection.

Table 5.9-3
Summary of LORS – Soils
Permits, Required and Permit Schedule

LORS	Applicability	Conformance
Federal Jurisdiction		
The Federal Water Pollution Control Act of 1972; Clean Water Act of 1977 (including its 1987 amendments)	Establishes requirements for any facility or activity that has or will discharge waste (including sediment due to accelerated erosion) that may interfere with the beneficial uses of receiving waters.	Sections 5.9.2, Environmental Consequences, and 5.9.2.1, Construction-Related Impacts
U.S. Department of Agriculture, SCS. *National Engineering Handbook* (1983), Sections 2 and 3	Planning, design, and construction of soil conservation practices.	Sections 5.9.2, Environmental Consequences, and 5.9.2.1, Construction-Related Impacts
State Jurisdiction		
California Public Resources Code 25523(a): 20 CCR Chapter 6; § 1752, §1752.5, §2300-§2309, and Chapter 2, Subchapter 5, Article 1, Appendix B, Part (i)	Protection of environmental quality.	Sections 5.9.2, Environmental Consequences, and 5.9.2.2, Project Site Impacts
California Environmental Quality Act, California PRC Chapter 21000 et seq.; Guidelines for Implementation of the CEQA, 14 CCR Chapter 3; § 15000-§15387, and Appendix G	Substantial soil erosion or loss of topsoil, degradation or loss of available agricultural land, agricultural activities, or agricultural land productivity in the Project area, alteration of agricultural land characteristics due to plant air emissions, or conversion of prime or unique farmland, or farmland of state-wide importance, to non-agricultural use.	Sections 5.9.2, Environmental Consequences, and 5.9.2.2, Project Site Impacts
The California Porter-Cologne Water Quality Control Act of 1952; California Water Code, §13260 – §13269; and 23 CCR Chapter 9	Requires adequate protection of water quality by appropriate design, sizing, and construction of erosion and sediment controls.	Sections 5.9.2, Environmental Consequences, and 5.9.2.2, Project Site Impacts
Local Jurisdiction		
Kern County Building Inspection Division Building Permit - Kern County Zoning Ordinance, Chapter 17.08	A building permit is required for any construction which physically changes or adds structures to your property or for work regulated by local Codes or Ordinances.	Section 5.9.2, Environmental Consequences
Kern County Building Inspection Division Grading Permit - Kern County Zoning Ordinance, Chapter 17.08 and 17.28.070	No person shall do any grading or cause the same to be done without first having obtained a grading permit from the building official.	Section 5.9.2, Environmental Consequences

Source: HECA Project

Notes:
CCR = California Code of Regulations
CEQA = California Environmental Quality Act of 1970
LORS = laws, ordinances, regulations, and standards
PRC = Public Resources Code
SCS = Soil Conservation Service

Table 5.9-4
Agency Contacts

Agency	Contact	Address	Telephone
Natural Resource Conservation Service (NRCS) Area 3 Office	Edd Russell Soil Scientist	4974 E Clinton Way, Ste. 114 Fresno, CA 93727-1520	(559) 252-2191 x-104
NRCS Richard E. Lyng USDA Service Center	Christopher Paris Soil Scientist	430 G Street Davis, CA 95616-4155	(530) 792-5634
Regional Water Quality Control Board Central Valley Region	Doug Patterson	1685 E Street Fresno, CA 93706	(559) 445-5156
Kern County Planning Department	Lorelei H. Oviatt, AICP Division Chief	Public Services Building 2700 “M” Street, Suite 1000 Bakersfield, CA 93301-2370	(661) 862-8866
Kern County Land Division	Holly Nelson Supervising Planner	Public Services Building 2700 “M” Street, Suite 1000 Bakersfield, CA 93301-2370	(661) 862-8625
Kern County Building Inspection Division	Charles Lackey Director	Public Services Building 2700 “M” Street, Suite 1000 Bakersfield, CA 93301-2370	(661) 862-8650

Source: HECA Project
Note:
NRCS = Natural Resource Conservation Service

Table 5.9-5
Applicable Permits

Responsible Agency	Permit	Schedule
Regional Water Quality Control Board Central Valley Region	NPDES Construction	Notice of Intent filed 30 days prior to construction
Kern County Building Inspection Division	Building Permit	Prior to initiation of construction
Kern County Building Inspection Division	Grading Permit	Prior to initiation of construction

Source: HECA Project

The CEQA guidelines pertaining to potential impacts to soils, as found in the Act, specify that an impact may be considered significant from a soils standpoint if the project results in substantial soil erosion or loss of topsoil. The CEC is the administering agency for potential impacts to soils.

The California Porter-Cologne Water Quality Control Act of 1952 requires adequate protection of water quality by appropriate design, sizing, and construction of erosion and sediment controls. An NPDES California General Activities Construction Permit is necessary if an area greater than one acre will be disturbed. Because the facility will recycle storm water during operation, an operational NPDES permit will not be required.

5.9.7.3 Local Authorities and Administering Agencies

The local LORS applicable to this Project as shown on Table 5.9-3 are administered by Kern County.

5.9.8 References

Casdorph, Cheryl, 2008. Personal telephone conversations and email communication between Jennifer Hillhouse, URS Corporation, and Ms. Cheryl Casdorph, Kern County Planning Department.

Churchill, Ronald, 2008. Personal telephone conversation between Eric Barndt, URS Corporation, and Mr. Ronald Churchill, State of California Department of Conservation Senior Engineer Geologist.

HECA (Hydrogen Energy California) Project, 2008. Field work and observations.

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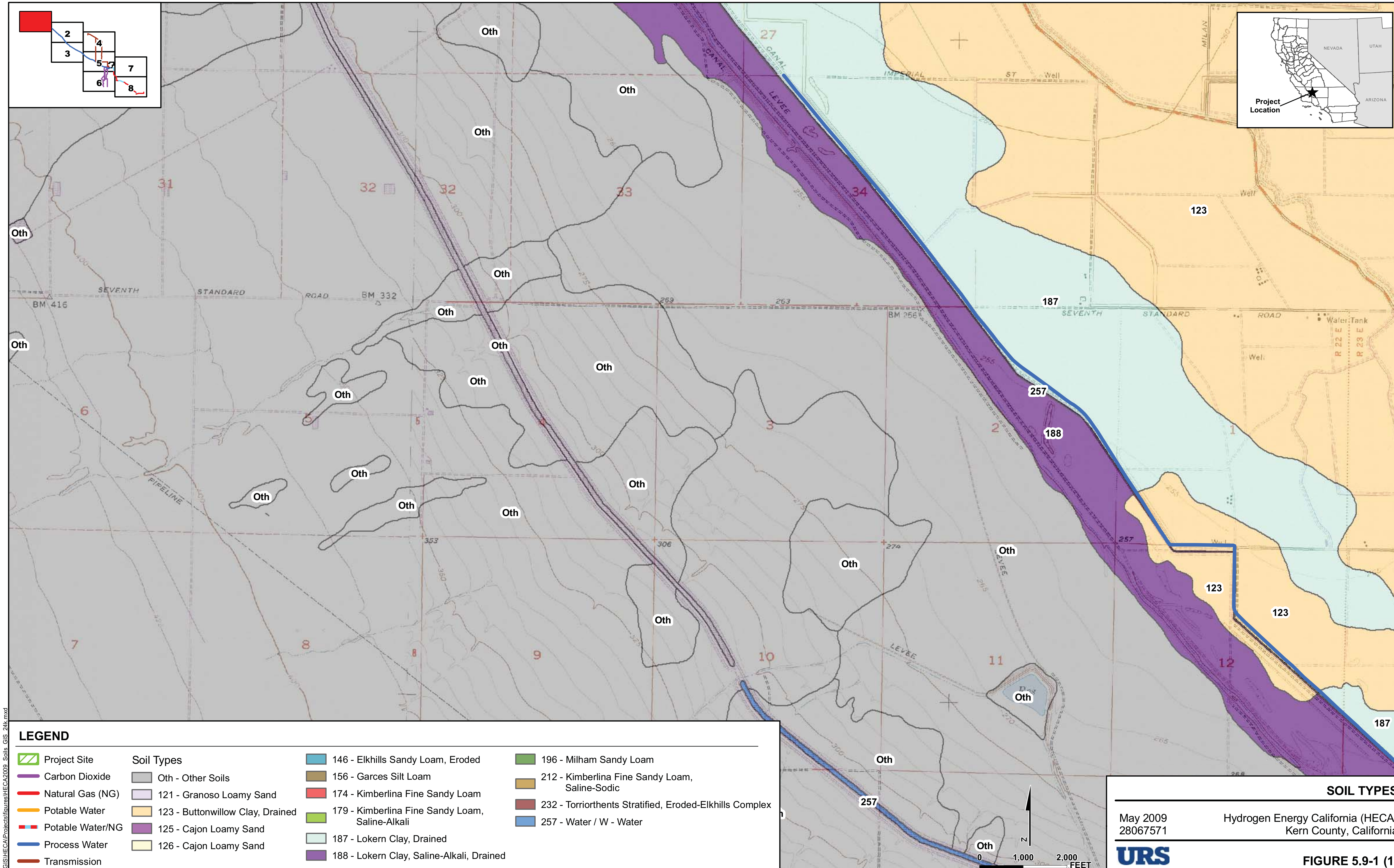
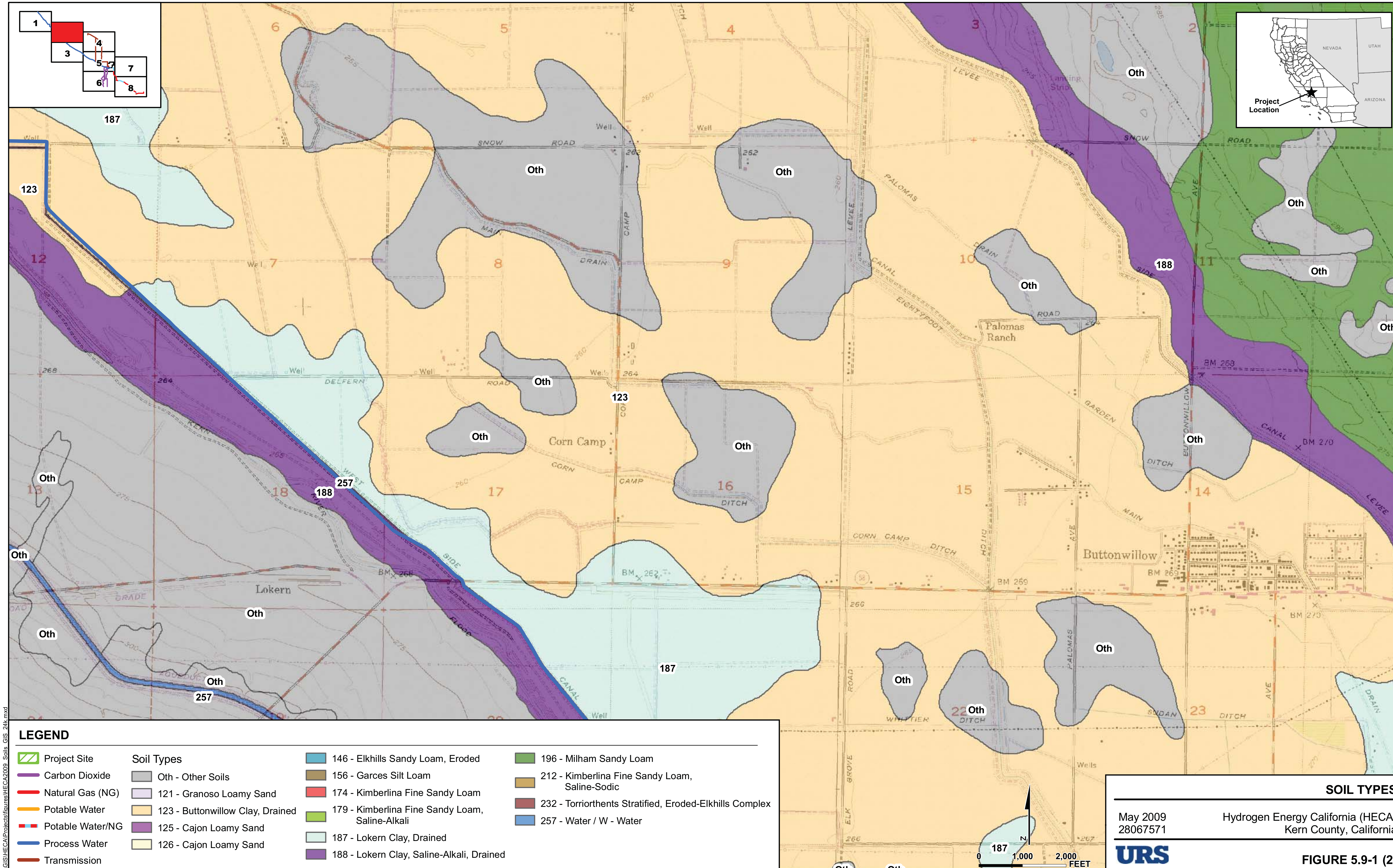


Sources: USGS (7.5' quads: Belridge 1976, Lokern 1976, Buttonwillow 1976, West Elk Hills 1976, East Elk Hills 1977, Tupman 1977, Rio Bravo 1973). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. USDA-NRCS (SSURGO Soils, 2007 and 2008).



SOIL TYPES

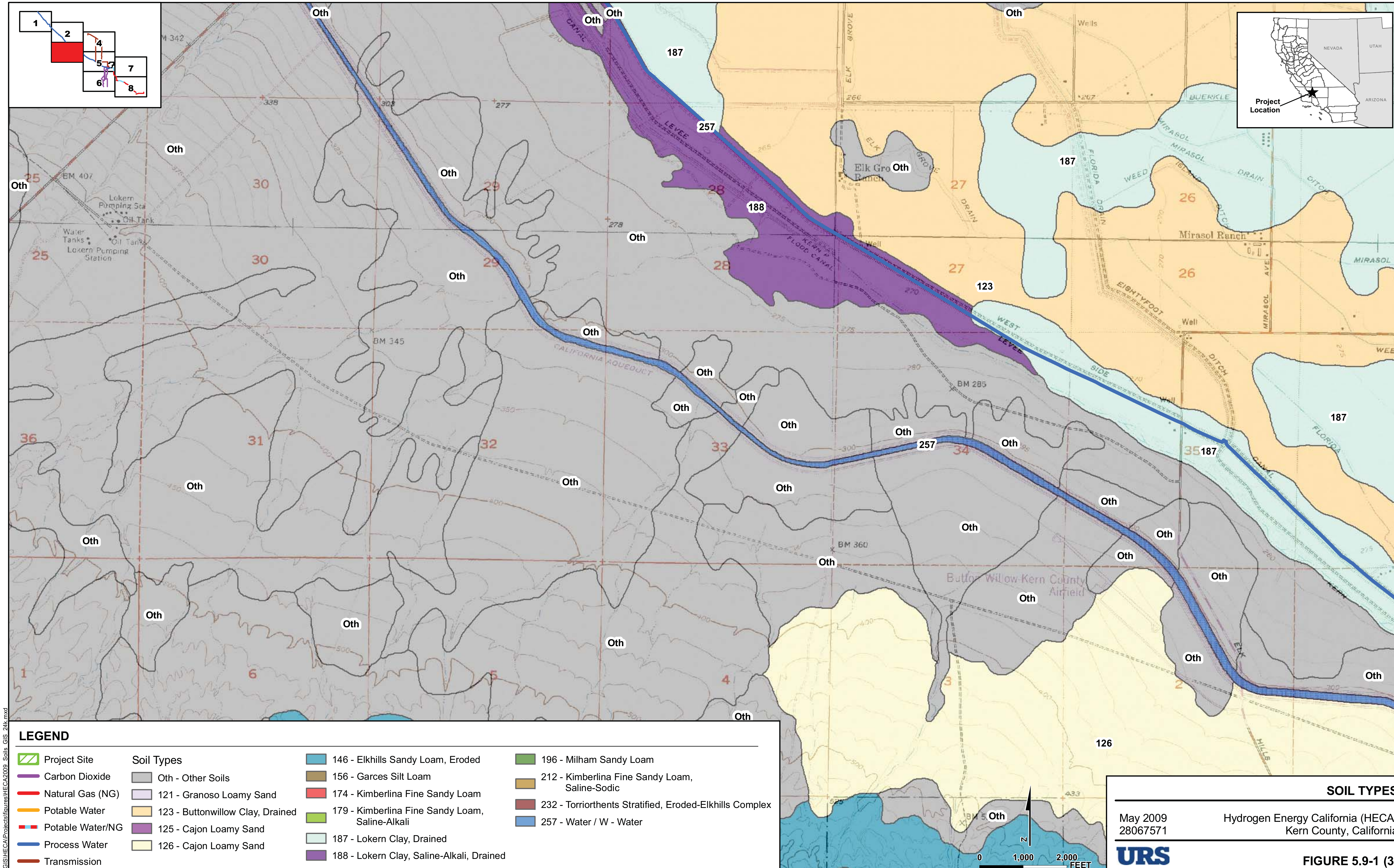
May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.9-1 (2)

Sources: USGS (7.5' quads: Belridge 1976, Lokern 1976, Buttonwillow 1976, West Elk Hills 1976, East Elk Hills 1977, Tupman 1977, Rio Bravo 1973). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. USDA-NRCS (SSURGO Soils, 2007 and 2008).



LEGEND

- Project Site
- Carbon Dioxide
- Natural Gas (NG)
- Potable Water
- Potable Water/NG
- Process Water
- Transmission

Soil Types

- Oth - Other Soils
- 121 - Granoso Loamy Sand
- 123 - Buttonwillow Clay, Drained
- 125 - Cajon Loamy Sand
- 126 - Cajon Loamy Sand
- 146 - Elkhills Sandy Loam, Eroded
- 156 - Garces Silt Loam
- 174 - Kimberlina Fine Sandy Loam
- 179 - Kimberlina Fine Sandy Loam, Saline-Alkali
- 187 - Lokern Clay, Drained
- 188 - Lokern Clay, Saline-Alkali, Drained
- 196 - Milham Sandy Loam
- 212 - Kimberlina Fine Sandy Loam, Saline-Sodic
- 232 - Torriorthents Stratified, Eroded-Elkhills Complex
- 257 - Water / W - Water

SOIL TYPES

May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.9-1 (3)

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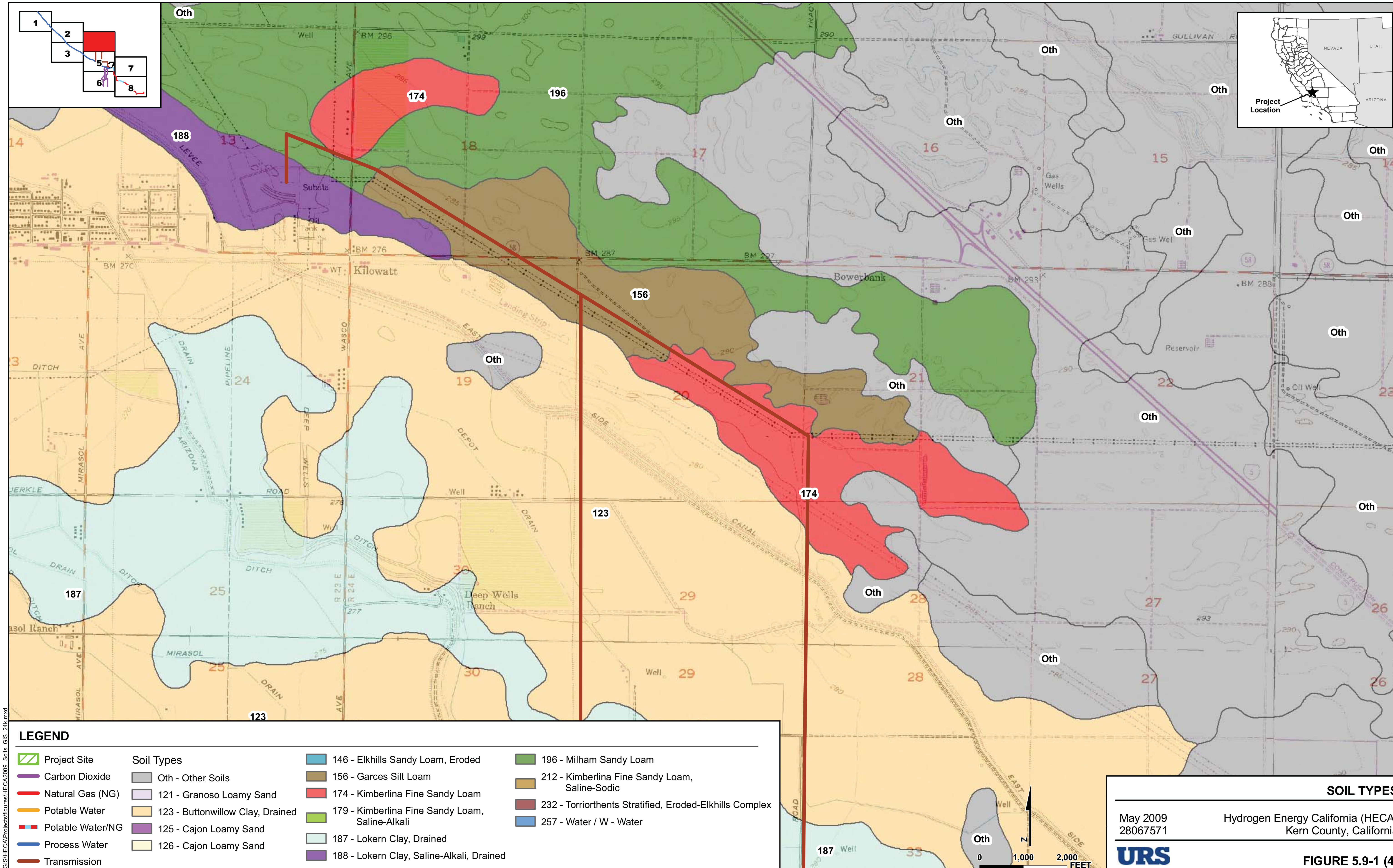
Sources: USGS (7.5' quads: Belridge 1976, Lokern 1976, Buttonwillow 1976, West Elk Hills 1976, East Elk Hills 1977, Tupman 1977, Rio Bravo 1973). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. USDA-NRCS (SSURGO Soils, 2007 and 2008).



SOIL TYPES

May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.9-1 (4)

Sources: USGS (7.5' quads: Belridge 1976, Lokern 1976, Buttonwillow 1976, West Elk Hills 1976, East Elk Hills 1977, Tupman 1977, Rio Bravo 1973). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. USDA-NRCS (SSURGO Soils, 2007 and 2008).

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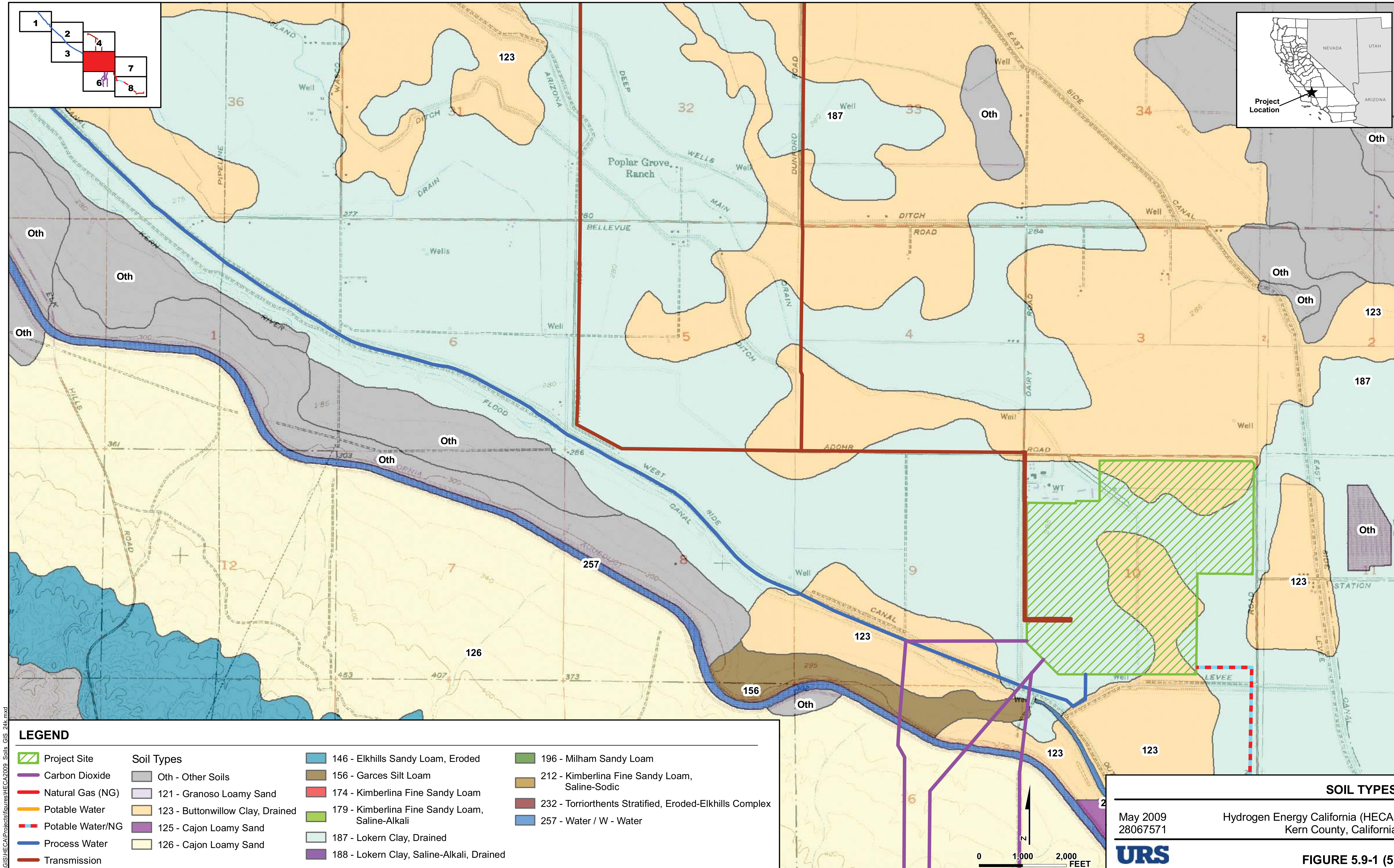
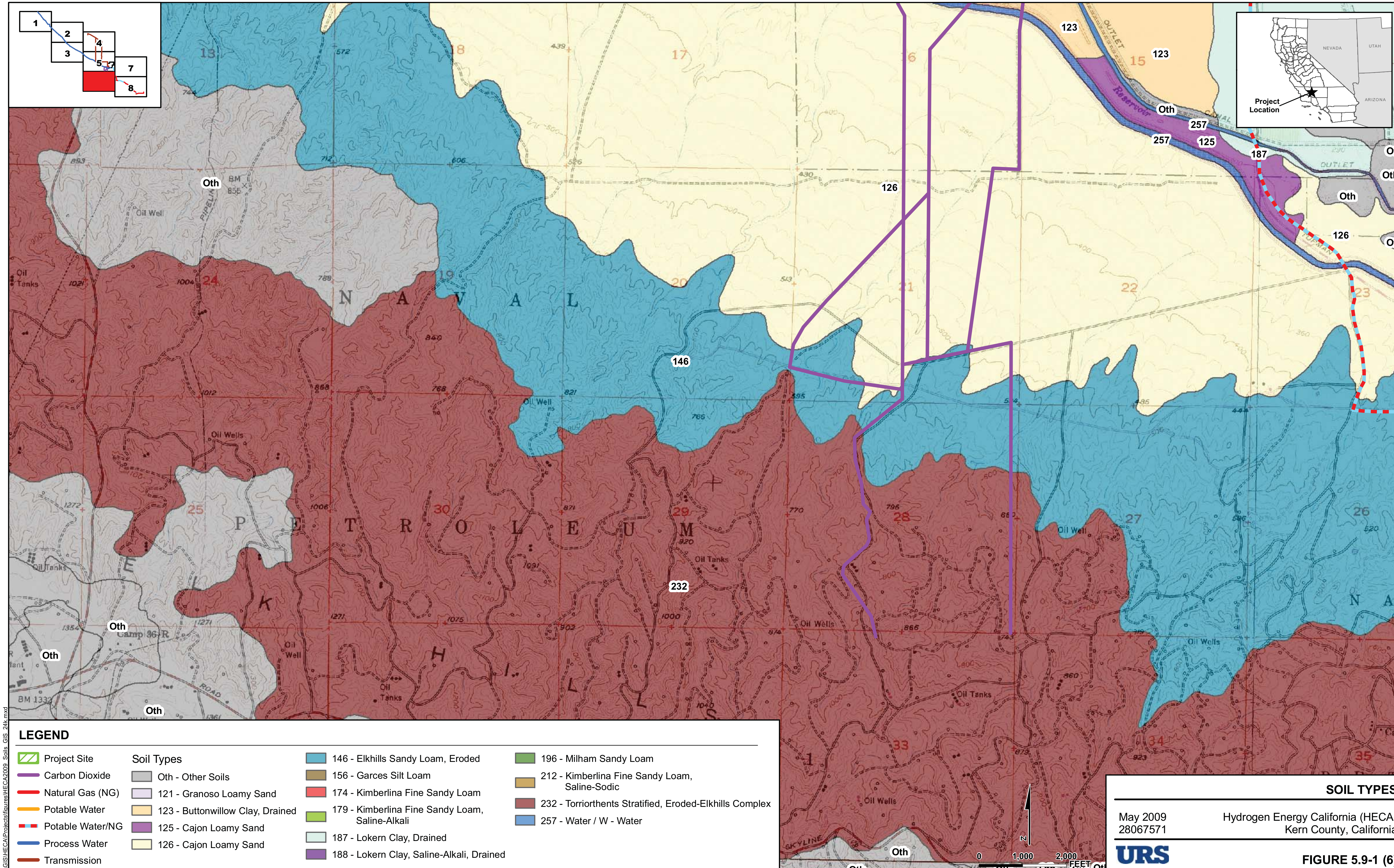
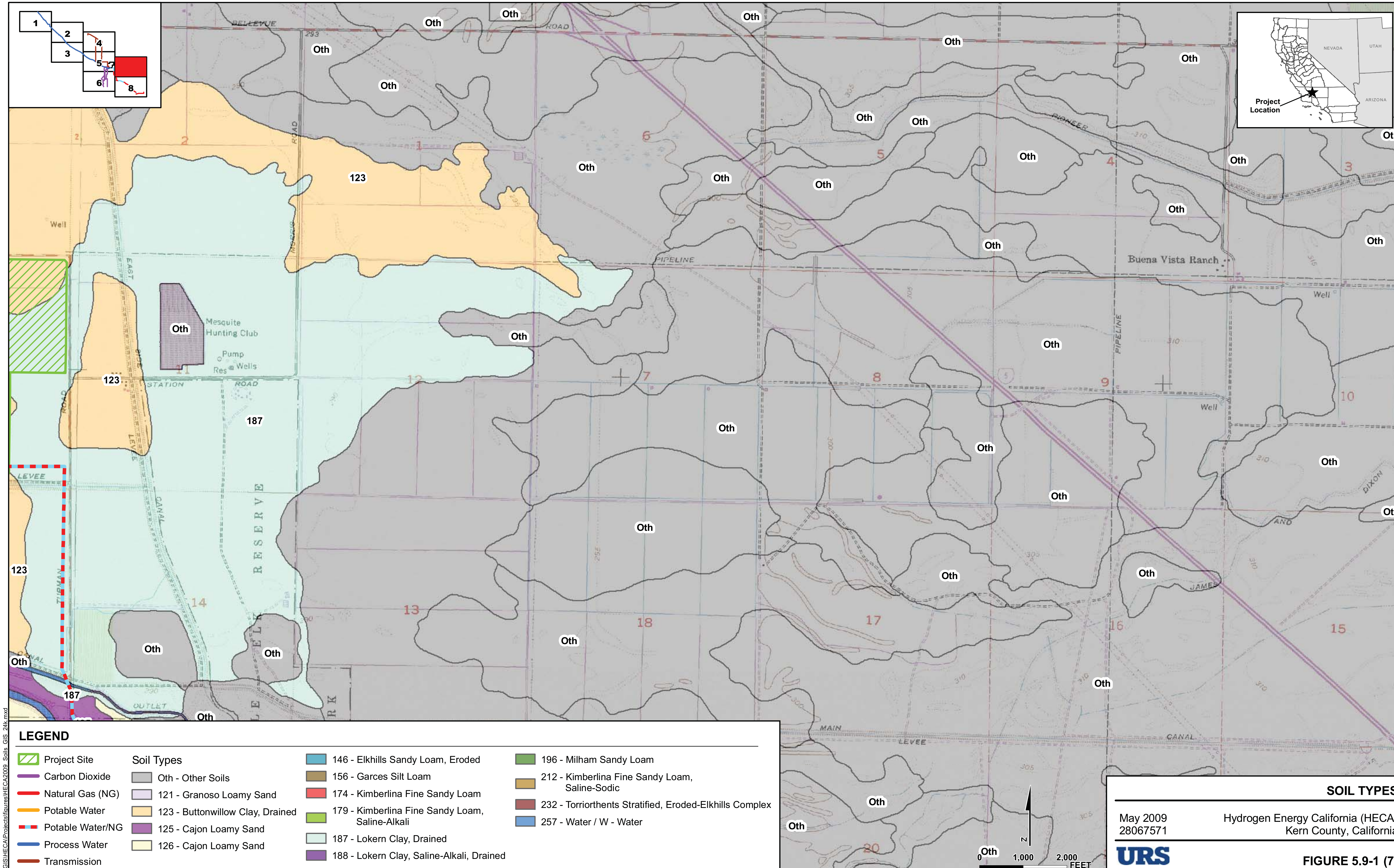


Sources: USGS (7.5' quads: Belridge 1976, Lokern 1976, Buttonwillow 1976, West Elk Hills 1976, East Elk Hills 1977, Tupman 1977, Rio Bravo 1973). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. USDA-NRCS (SSURGO Soils, 2007 and 2008).



Sources: USGS (7.5' quads: Belridge 1976, Lokern 1976, Buttonwillow 1976, West Elk Hills 1976, East Elk Hills 1977, Tupman 1977, Rio Bravo 1973). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. USDA-NRCS (SSURGO Soils, 2007 and 2008).



LEGEND

- Project Site
- Carbon Dioxide
- Natural Gas (NG)
- Potable Water
- Potable Water/NG
- Process Water
- Transmission

Soil Types

- Oth - Other Soils
- 121 - Granoso Loamy Sand
- 123 - Buttonwillow Clay, Drained
- 125 - Cajon Loamy Sand
- 126 - Cajon Loamy Sand
- 146 - Elkhills Sandy Loam, Eroded
- 156 - Garces Silt Loam
- 174 - Kimberlina Fine Sandy Loam
- 179 - Kimberlina Fine Sandy Loam, Saline-Alkali
- 187 - Lokern Clay, Drained
- 188 - Lokern Clay, Saline-Alkali, Drained
- 196 - Milham Sandy Loam
- 212 - Kimberlina Fine Sandy Loam, Saline-Sodic
- 232 - Torriorthents Stratified, Eroded-Elkhills Complex
- 257 - Water / W - Water

SOIL TYPES

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FIGURE 5.9-1 (7)

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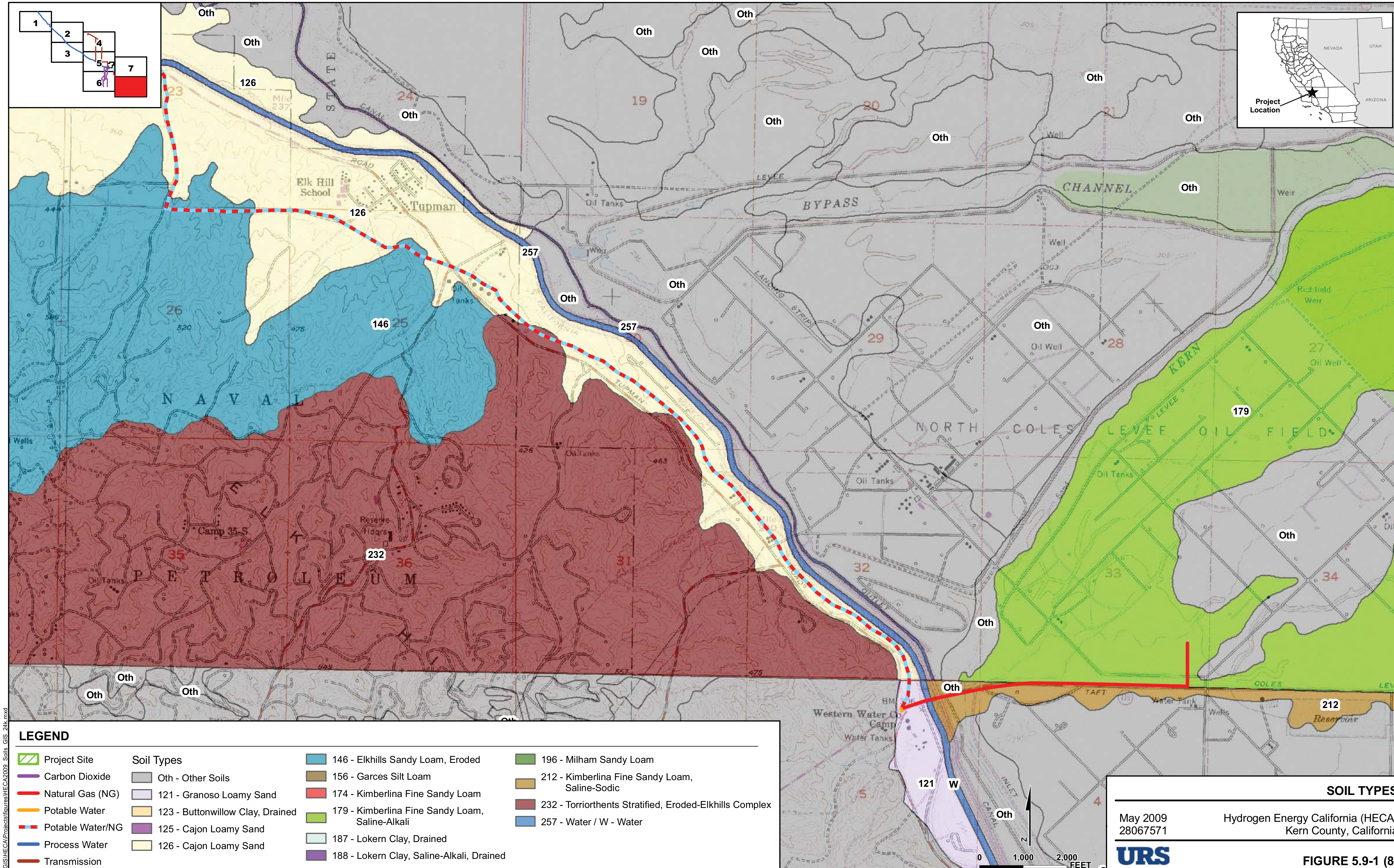
Sources: USGS (7.5' quads: Belridge 1976, Lokern 1976, Buttonwillow 1976, West Elk Hills 1976, East Elk Hills 1977, Tupman 1977, Rio Bravo 1973). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. USDA-NRCS (SSURGO Soils, 2007 and 2008).



SOIL TYPES

FIGURE 5.9-1 (8)

Sources: USGS (7.5' quads: Belridge 1976, Lokern 1976, Buttonwillow 1976, West Elk Hills 1976, East Elk Hills 1977, Tupman 1977, Rio Bravo 1973). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. USDA-NRCS (SSURGO Soils, 2007 and 2008).

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ______

Technical Area: **Soils** Project: ______ Technical Staff: ______

Project Manager: ______ Docket: ______ Technical Senior: ______

Siting Regulations	**Information**	**AFC Page Number And Section Number**	**Adequate Yes Or No**	**Information Required To Make AFC Conform With Regulations**
Appendix B (g) (1)	...provide a discussion of the existing site conditions, the expected direct, indirect and cumulative impacts due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental impacts of the project, the effectiveness of the proposed measures, and any monitoring plans proposed to verify the effectiveness of the mitigation.	Section 5.9.1, p. 5.9-3 Section 5.9.2, p. 5.9-14 Section 5.9.3, p. 5.9-19 Section 5.9.4, p. 5.9-19		
Appendix B (g) (15) (A)	A map at a scale of 1:24,000 and written description of soil types and all agricultural land uses that will be affected by the proposed project. The description shall include:	Figure 5.9-1		
Appendix B (g) (15) (A) (i)	The depth, texture, permeability, drainage, erosion hazard rating, and land capability class of the soil;	Section 5.9.1.2, p. 5.9-4 Table 5.9-2, p. 5.9-7		
Appendix B (g) (15) (A) (ii)	An identification of other physical and chemical characteristics of the soil necessary to allow an evaluation of soil erodibility, permeability, re-vegetation potential, and cycling of pollutants in the soil-vegetation system;	Section 5.9.1.2, p. 5.9-4 Table 5.9-2, p. 5.9-7		
Appendix B (g) (15) (A) (iii)	The location of any proposed fill disposal or fill procurement (borrow) sites; and	Section 5.9.2.1, p. 5.9-15 Section 5.9.2.2, p. 5.9-16		
Appendix B (g) (15) (A) (iv)	The location of any contaminated soils that could be disturbed by project construction.	Section 5.9.2.1, p. 5.9-15		
Appendix B (g) (15) (B)	An assessment of the effects of the proposed project on soil resources and agricultural land uses. This discussion shall include:	Section 5.9.2, p. 5.9-14 Land Use Section 5.4.2, p. 5.4-23		
Appendix B (g) (15) (B) (i)	The quantification of accelerated soil loss due to wind and water erosion; and	Section 5.9.2, p. 5.9-14		
Appendix B (g) (15) (B) (ii)	The effect of power plant emissions on surrounding soil-vegetation systems.	Section 5.9.2.6, p. 5.9-19		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Soils**

Project: ____

Technical Staff: ____

Project Manager: ____

Docket: ____

Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (i) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed; and	Section 5.9.5, p. 5.9-20 Table 5.9-3, p. 5.9-21		
Appendix B (i) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	Section 5.9.6, p. 5.9-22 Table 5.9-3, p. 5.9-21 Table 5.9-5, p. 5.9-22		
Appendix B (i) (2)	The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.	Section 5.9.6, p. 5.9-22 Table 5.9-4, p. 5.9-22		
Appendix B (i) (3)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.	Section 5.9.7, p. 5.9-22 Table 5.9-5, p. 5.9-22		