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2.0 PROJECT DESCRIPTION

2.1 DESIGN BASIS

The East Cat Canyon Oil Field Redevelopment Project (Project) will be designed and operated by Aera Energy LLC (Aera) to comply with all Federal, State, and county laws, regulations and building codes. In addition, the Project will be designed and operated consistently with industry best practices and with Aera's System of Operating Excellence. The Project will also be designed to minimize fresh water use and conserve energy. The Project will not use hydraulic fracturing.

The Project wells, roads, and transportation infrastructure described in this permit application will be built out in two phases. The operational results and monitoring data collected from Phase I will help to confirm the Project's reservoir models and production forecasts, prior to additional investment and construction. The following paragraphs provide a narrative summary of the process design basis for the Project. Additional technical details are included in Appendix B – Supporting Technical Documents. Please note that the Project avoidance and minimization measures discussed in various sections and appendices of this document, and summarized in Section 1.0, are meant to be considered part of the Project Description.

2.1.1 Production, Treatment, and Shipping of Produced Oil and Gas

The proposed enhanced oil recovery Project will recover three primary production fluids (oil, water, and gas) in addition to solids (e.g., sand) that occur naturally in the Brooks reservoir. The produced oil can be characterized as relatively dense and highly viscous at reservoir temperatures, with a field average American Petroleum Institute gravity range forecasted to be between 7.6 degrees and 9.0 degrees. Oil recovery will be enhanced by steam heating the reservoir, which will help the oil to flow. Peak production will be limited by the design capacity of the central processing facility of approximately 10,000 barrels of oil per day.

Produced oil will be piped to the oil cleaning plant portion of the central processing facility, mixed with light crude oil to lower the viscosity and raise the American Petroleum Institute to enhance oil and water separation and to meet shipping requirements, and treated to separate water and solids. It will then be transferred to storage tanks, measured through a dedicated "lease automatic custody transfer" meter, and loaded into trucks for shipment to customers.

The oil reservoir also contains some gas which will be produced along with the oil. This produced gas is expected to be comprised of methane, inert gasses (i.e., carbon dioxide, nitrogen, etc.), hydrogen sulfide, as well as measurable quantities of non-hydrogen sulfide sulfur species (e.g., carbon disulfide, methyl mercaptan, etc.). Average gas production is expected to peak at one million standard cubic feet per day.

Produced gas will be used as fuel in a single dedicated 62.5 million British thermal units/hour once through steam generator. The steam generated will be used for process heat and also for reservoir heating to enhance oil recovery. The produced gas will be treated or "sweetened" to remove hydrogen sulfide gas and water soluble sulfur compounds before the gas enters the steam generator. During Phase I, the sweetening will be performed by two non-regenerative solid bed scavenger units (SulfaTreat® or an equivalent system). In Phase II, a regenerable sweetening solution system (SulFerox® or an equivalent system) may be added to accommodate higher gas volumes or sulfur concentrations.

Any remaining sulfur compounds in the sweetened gas will be combusted in the 62.5 million British thermal units/hour steam generator and exit as sulfur dioxide in the steam generator flue gas. If the flue gas sulfur dioxide concentrations approach Santa Barbara County Air Pollution Control District permit limits, a flue gas scrubber, possibly equipped with a wet electrostatic precipitator, will be added to reduce the sulfur dioxide to levels allowed by the Santa Barbara County Air Pollution Control District.

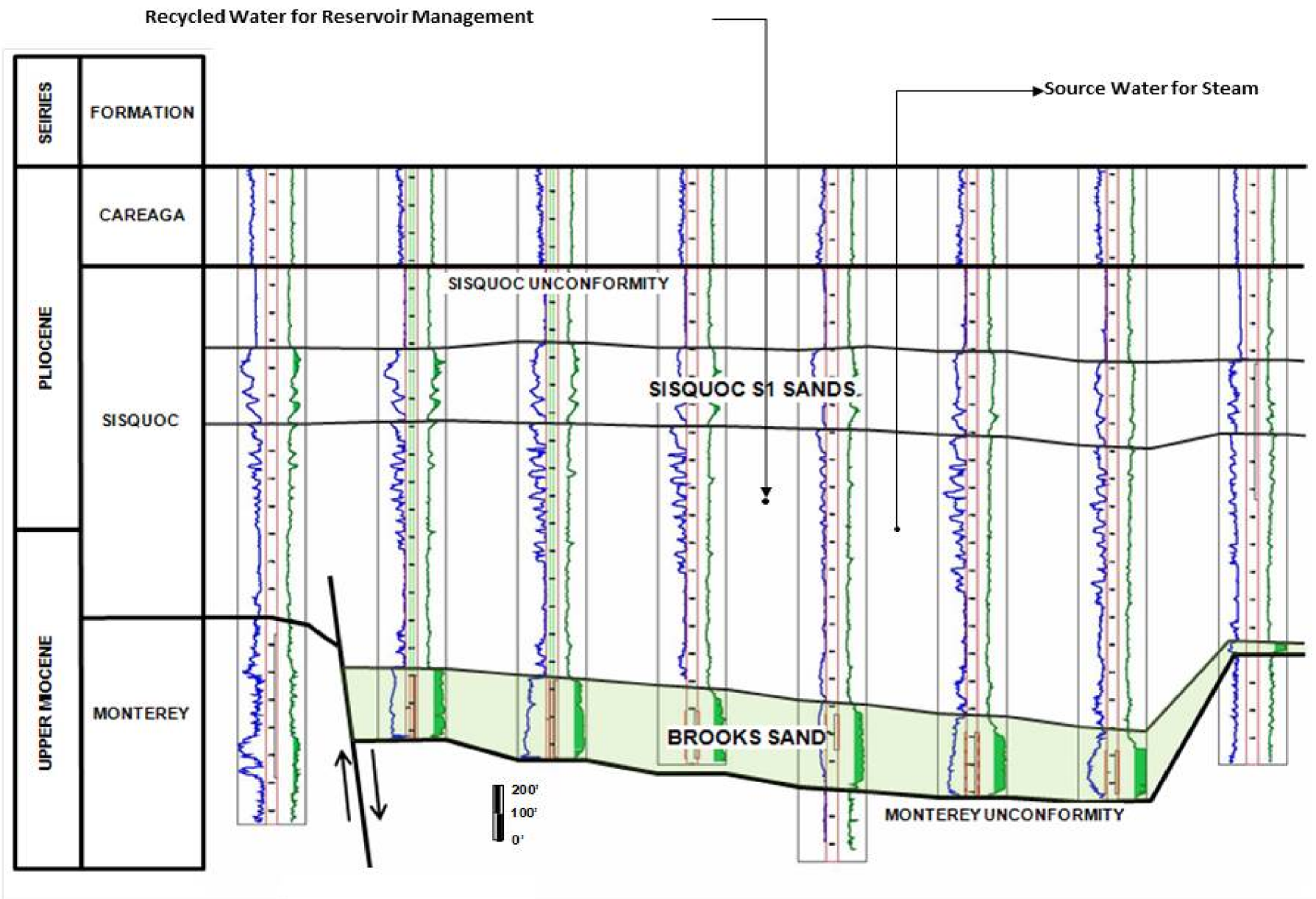
2.1.2 Water Sourcing and Disposition

Water will be used to generate the steam that will be injected into the reservoir to enhance oil recovery. No fresh water will be used to generate steam for the Project. The majority of the steam will be generated using produced water from the Brooks reservoir, which is anticipated to peak at an average rate of 35,000 to 40,000 barrels of water per day. The Brooks reservoir water is not suitable for domestic or agricultural use due to its high salinity content. By using produced water to create steam, fresh water will be conserved for agricultural and other uses.

To supplement the expected produced water volumes reused to generate steam, additional brackish (high salinity content) water will be produced from the upper Sisquoc formation sands, which lies above the Brooks reservoir (Figure 2.1-1 – Generalized Geologic Cross Section). In the vicinity of the Project site, the upper Sisquoc formation sands contain another oil reservoir with similar water composition as the Brooks reservoir, and an ideal non-potable source for supplemental water for steam generation. To offset withdrawal from the upper Sisquoc formation sands, excess water, including brine from softener re-generation, will be re-injected into the upper Sisquoc formation sands. Peak upper Sisquoc formation sands withdrawal and re-injection for Phase I and Phase II is anticipated to be approximately 15,500 barrels of water per day and 5,800 barrels of water per day, respectively.

While the Project will not use fresh water for steam generation, fresh groundwater will be needed for utility purposes including fire protection, lavatories, showers, equipment cleaning, dust control, well drilling, and minor landscape irrigation. Water conservation measures, including drip irrigation, low flow toilets, and alternative dust control measures, will be used where practicable to reduce fresh groundwater use. Fresh groundwater for the Project will be sourced from the water wells that currently exist on the Project site, or due to the age of those existing wells, from two to three new wells that will replace them[1]. These wells are completed in the Careaga sandstone and the Paso Robles formation, which are separated from the oil and gas reservoir below by a thick, pervasive seal. It is estimated that fresh groundwater consumption during project operations would be between 16.32 and 20.92 acre-feet per year, plus an additional 3.58 acre-feet per year for oak tree replacement watering during the first three to five years of the Project.

[1] Due to their inactive status, Aera has elected to remove two of the existing fresh water wells from the Project design. There will be one existing well that provides fresh water needs for the Project.



Source: Aera Energy LLC 1/2014
Notes: This map was created for informational and display purposes only

PROJECT NAME: EAST CAT CANYON OIL FIELD DEDEVELOPMENT PROJECT		GENERALIZED GEOLOGIC CROSS SECTION	FIGURE 2.1-1
PROJECT NUMBER: 1002-0455	DATE: September 2014		

Z:\Kristin\GIS Maps\Map Project\East Cat Canyon\Permit Doc Figures\Section 2\Figure 2.1-1 - Generalized Geologic Cross Section.mxd

2.1.3 Light Crude Oil

Light crude oil will be trucked in for use at the Project site to help separate water from the produced oil, enhance well maintenance, and to meet the oil density and sulfur content specifications for shipping. The light crude oil receiving facilities will consist of truck offloading racks, unloading pumps, meters, and storage tanks. For Phase I, an estimated 1,666 barrels per day of light crude oil will be needed. Phase II will require an estimated 3,320 barrels per day of light crude oil.

2.1.4 Utilities and Communications

The Project will require new natural gas and electrical power utilities as well as new communications media. Natural gas will primarily be consumed to fire steam generation units. Additional uses include tank gas blanketing, vessel purging, emergency flare pilot, emergency generator fuel, and comfort (i.e., building) heating. The Project includes construction of a 14-mile, 8-inch natural gas pipeline and associated facilities to provide 13 million standard cubic feet per day of utility grade natural gas at a delivery pressure of 50 to 300 pounds per square inch gage. This pipeline will be designed and built by the Southern California Gas Company in accordance with California Public Utility Commission regulations. It is expected to be built almost entirely within the public right of way (public roadways) under existing Southern California Gas Company Franchise Agreements.

Electricity will be required to power all facility processing, well lift, operations, maintenance, office equipment, monitoring, control and communication systems, lighting, and building air conditioning. Electrical power will be provided by new overhead transmission lines, which will be constructed, operated, and maintained by Pacific Gas and Electric Company. The lines, which are expected to be approximately 0.3-miles in length, will connect Pacific Gas and Electric Company's Sisquoc-Santa Ynez 115 kilovolt power line on the south side of Cat Canyon Road to the Project site on the north side of Cat Canyon Road. Electrical service provided by the newly installed overhead transmission lines will require step-down transformers to reduce voltage for infield load distribution. An electrical substation rated as 115/12.47 kilovolts will be installed as part of the Project, and will be owned and operated by Aera. Aera will take control of the Pacific Gas and Electric Company-delivered power in front of the proposed 115/12.47 kilovolt substation (point of interconnection). Peak electricity load is anticipated to be 12 megawatts.

The facility will be equipped with a 1,126 brake horsepower natural gas fired emergency electrical generator to support operations and communications during a power outage. Trenching for the new gas line is expected to afford the opportunity to install other underground utilities within the public right of way, such as optical fiber communications lines to serve the Project. No public domestic water service is currently available or planned for the Project. No public sanitary waste service is currently available or planned for the Project.

2.2 SITE PREPARATION

2.2.1 Removal of Existing Facilities

The Project site currently supports office/warehouse buildings, abandoned oil wells, four non-producing test wells, a system of graded access roads and well pads, former facility locations, a permitted beneficial reuse site, fresh groundwater wells, firewater and grazing tanks, and cattle grazing. There is some debris from former operations, such as broken concrete, in scattered locations throughout the Project site. Debris will be reused or recycled to the extent feasible, or disposed of at the Santa Maria Regional Landfill.

2.2.2 Legacy Fill Areas

Various areas throughout the Project site are known to contain pre-existing petroleum hydrocarbon-containing soils. These “legacy fill areas” are remnants from historical oil and gas operations within East Cat Canyon prior to acquisition of the property by Shell and Aera. Project construction activities will encroach upon some legacy fill areas. Aera plans to excavate the petroleum hydrocarbon-containing soils within the Project disturbance areas for beneficial reuse either on-site, at other Aera locations, or at the Santa Maria Regional Landfill, in accordance with the Soil Beneficial Re-Use Plan developed for the Project (Appendix K).

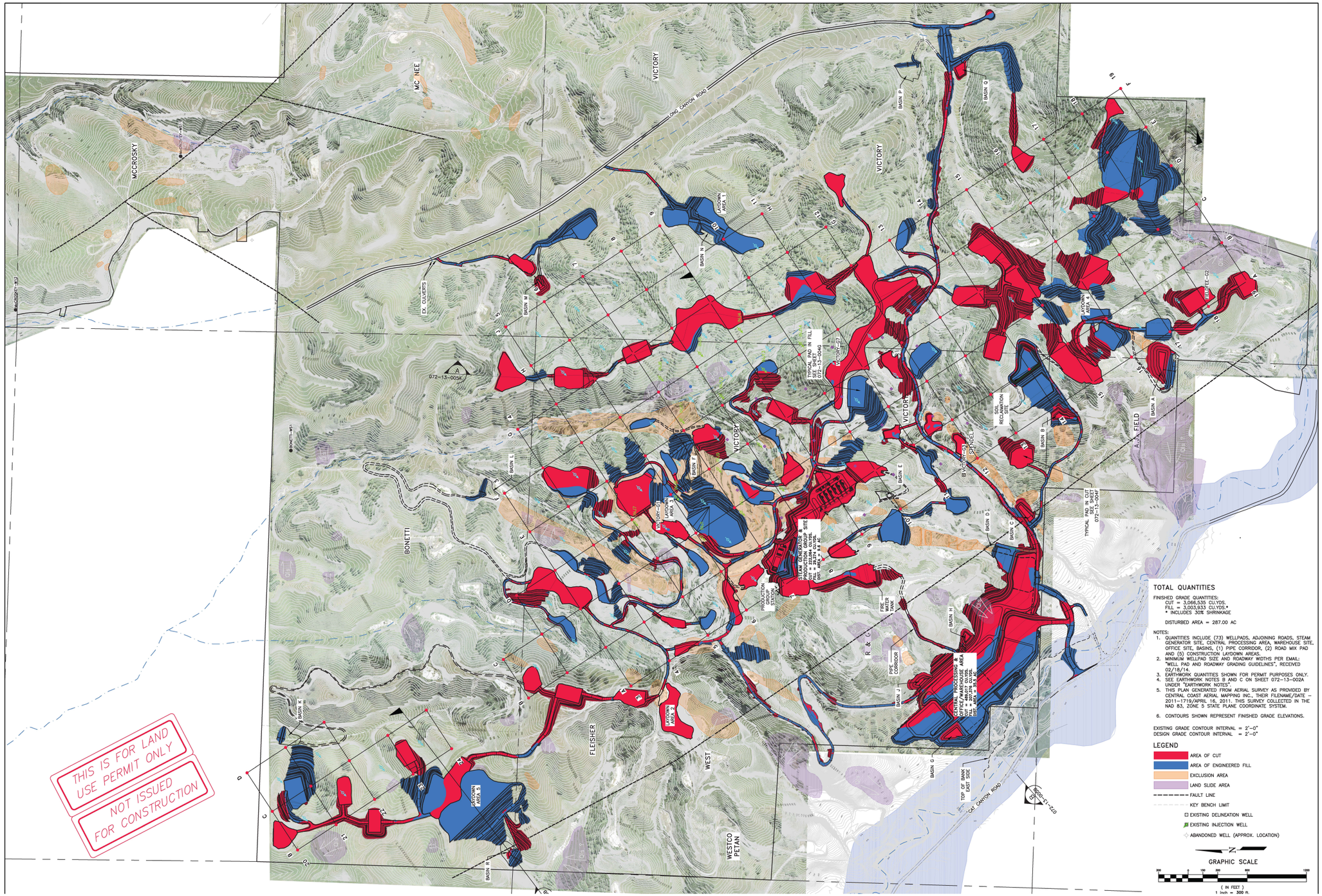
2.2.3 Grading Estimates

The Project is designed to minimize grading and land disturbance by maximizing the use of existing roads, well pads, cleared areas, and contours wherever possible. Care was taken to avoid oak tree removals by minimizing the number and size of new well pads, by routing new roads around canopies, and by designing the new facility campus as a network of smaller parking lot and building spaces that better fit in the existing spaces between oak tree canopies.

Out of the Project site 2,111.7 total acres (2,107.8 acres of Aera-owned parcels and 3.9 acres of Project footprint located on adjacent parcels), 305.1 acres, or 14.4 percent will be graded. Of the 305.1 acres that will be graded, 64.2 acres or 21.0 percent is previously disturbed. The net new disturbance acreage is approximately 240.9 acres or 11.4 percent of the total Project site acreage.

Grading for the Project will consist of the central processing facility, the steam generation site, the production group station, well pads, roads and entrances, pipe corridors, building sites (including parking areas), laydown areas, storm water detention basins, and a new beneficial reuse site. (Figure 2.2-1 - Preliminary Grading Plan). Detailed grading plans for major Project components are included in Appendix C – Civil Grading Plans. As indicated within the grading notes, all grading shall conform to Santa Barbara County Code Chapter 14 and standards and requirements pertaining thereto, the approved Project construction drawings, the recommendations of the soils engineer and the engineering geologist.

Table 2.2-1 - Estimated Project Disturbance Area provides the total estimated areas of disturbance for each major Project component.



Source: TJ Cross Engineers 08-20-2014

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		PRELIMINARY GRADING PLAN	FIGURE 2.2-1
PROJECT NUMBER: 1002-0455	DATE: September 2014		

Table 2.2-1. Estimated Project Disturbance Area[1]

Feature	Total Proposed Grading Limits	Previously Developed/Disturbed Area within Proposed Grading Limits		Net New Disturbed Acreage	
	Acres	Acres	Percentage of Proposed Grading Limits	Acres	Percentage of Total Project Site (2111.7 acres)
Well Pads[5]	88.1	21.8	24.7	66.3	3.1
Roads	47.4	20.7	43.7	26.7	1.3
Beneficial Reuse Site Pad	2.9	0.3	10.3	2.6	0.1
Central Processing Facility Pad	13.3	5.7	42.9	7.6	0.4
Laydown Area Pads[5]	9.6	1.4	14.6	8.2	0.4
Office/Multipurpose Building Site Pad	3.9	0.2	5.1	3.7	0.2
Cut/Fill Slopes (not including benches)	101.7	8.1	8.0	93.6	4.4
Slope Benching	9.9	0.4	4.0	9.5	0.4
Gathering/Distribution Pipeline Corridor[2]	13.9	2.7	19.4	11.2	0.5
Intra-Field Electrical Distribution[3]	0.0 (0.004)	0.0 (0.0004)	10.0	0.0 (0.0036)	0.0
Production Group Station Pad	0.8	0.7	87.5	0.1	0.0
Steam Generation Site Pad	2.6	0.5	19.2	2.1	0.1
Storm Water Basins	9.5	1.5	15.8	8	0.4
Fresh Water Tank Pad	0.9	0.2	22.2	0.7	0.0
Other[4]	0.6	0.02	3.3	0.58	0.0
TOTAL PROJECT	305.1	64.2	21.0	240.9	11.4

1. Calculations based on 8/20/14 field grading plan and field development plan spreadsheets provided by TJ Cross Engineers (Appendix C).
2. Portions of pipeline corridors located outside of other categorized project features (i.e., building pads, etc.).
3. Assumptions based on 12-inch diameter poles for poles located outside of other categorized project features (i.e., building pads, etc.).
4. "Other" features located outside of other categorized project features (i.e., drain culverts, storage area pads, etc.).
5. Well Pad WP6 and Laydown Area 1 are designed to be a single shared pad. For the purposes of categorizing impacts, the WP6 / Laydown Area 1 pad is treated as a Well Pad.

The Project facilities, wells, roads, and other supporting infrastructure described in this permit application will be built out in two phases. The well data, operational results and monitoring data collected from Phase I will help to confirm the Project's reservoir models and production forecasts, prior to additional investment and construction (Refer to Section 1.6 - Project Schedule).

Grading associated with the construction of facilities, building sites, and other miscellaneous site preparation (i.e., selected laydown areas, etc.) will be completed in Phase I. Phase I grading will also include the construction of new and/or the enhancement of existing primary access roads routing through the field to facilitate access and egress, meet Santa Barbara County Fire Department requirements, and support safe operations. Phase I will also include grading for storm water management. Table 2.2-2 – Cut and Fill Estimate (Phases I and II) provides a phased cut and fill estimate for all facility areas (combined), well pads, roads, and other supporting infrastructure. In their Determination of Application Incompleteness letter, dated May 15, 2015, Santa Barbara County requested an additional table including the cut and fill estimates by well pad. This information can be found in Table 2.2-3 – Well Pad Grading Estimates. For additional clarification, Table 2.2-3 also provides the proposed area of disturbance by well pad and the proposed number of wells per pad. The Project design was aimed to balance cut and fill across the Project site in order to minimize the need to import or export significant amounts of soil. Due to limiting parameters, including existing steep terrain and oak tree avoidance, approximately 40,000 cubic yards of excess soil is expected to be generated and balanced on-site. As stated previously, any legacy fill material encountered during Project grading activities will be managed on-site, at another Aera property, or possibly reused at the Santa Maria Regional Landfill in accordance with the Soil Beneficial Re-Use Plan developed for the Project site (Appendix K).

2.2.3.1 Central Processing Facility

The majority of the Project's fluid processing will take place within a single complex called the central processing facility, which is located on the southern portion of the Project site. Grading for the central processing facility will occur in Phase I and will require approximately 13.3 total acres of disturbance; existing disturbance accounts for approximately 42.9 percent of this total area. Estimated earthwork volumes for construction of the pad are 234,610 cubic yards of cut and 118,980 cubic yards of fill. Excess cut will be balanced on the Project site. The finished grade of the central processing facility pad will be sloped uniformly to ensure that ponding does not occur; all cut/fill slopes will have a maximum 2:1 slope (50 percent). The faces of cut and fill slopes will be prepared to control against erosion per the Project erosion control plans. Grading and erosion control plan details are located in Appendix C. The differences in existing ground surface elevation require the pad for the central processing facility to be built on three levels. Processing equipment and other Project infrastructure will be placed on all three levels. The lowest level will also include the Spill Prevention, Control, and Countermeasure Plan and Storm Water Pollution Prevention Plan (Appendix L - SWPPP) containment and/or detention areas.

Table 2.2-2. Cut and Fill Estimate (Phases I and II)

Project Component	PHASE I (cubic yards)			PHASE II (cubic yards)			PROJECT TOTAL (cubic yards)		
	Cut	Fill	Net	Cut	Fill	Net	Total Cut	Total Fill	Total Net
Wellpads	506,676	685,545	-178,869	1,139,727	1,091,091	48,636	1,646,403	1,776,636	-130,233
Roads	119,655	284,569	-164,914	553,794	411,018	142,776	673,449	695,587	-22,138
Central Processing Facility	234,610	118,980	115,629	0	0	0	234,610	118,980	115,629
Fresh Water Tank Pad	47,362	80	47,282	0	0	0	47,362	80	47,282
Group Station	23,804	30,035	-6,231	0	0	0	23,804	30,035	-6,231
Office and Warehouse	187,688	74,363	113,325	0	0	0	187,688	74,363	113,325
Steam Generation Site	162,694	3	162,691	0	0	0	162,694	3	162,691
Secondary Containment	0	14,873	-14,873	0	0	0	0	14,873	-14,873
Detention Basins	72,558	15,071	57,487	50,577	15,070	35,507	123,135	30,141	92,994
Lay Down Areas	0	1,809	-1,809	41,881	208,413	-166,532	41,881	210,222	-168,341
Beneficial Re-use Site	241,858	276,229	-34,371	0	0	0	241,858	276,229	-34,371
Total	1,596,904	1,501,557	95,347	1,785,979	1,725,592	60,387	3,382,883	3,227,149	155,734

Source: TJ Cross Engineers, Field Development Model Spreadsheet (08/26/2014)

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Table 2.2-3. Well Pad Grading Estimates

Well Pad	Total Proposed Grading Limits	Previously Developed/Disturbed Area within Proposed Grading Limits		Net New Disturbed	Cut	Fill	Net	Total Number of Wells Per Pad	Production Wells	Steam Injection Wells	Water Injection Wells	Sisquoc Producer Wells	Observation Wells	Notes
	Acres	Acres	Percentage of Proposed Grading Limits	Acres	Cubic Yards	Cubic Yards	Cubic Yards							
WP10	0.99	0.39	39.09	0.60	12,707	-	12,707	3	2	1	0	0	0	
WP11	0.46	0.41	89.08	0.05	50	1,991	(1,941)	1	1	0	0	0	0	
WP11A	2.17	0.08	3.58	2.09	26,658	20,642	6,016	7	2	4	1	0	0	
WP12	0.47	0.33	70.09	0.14	418	7,508	(7,090)	1	1	0	0	0	0	
WP12A	0.86	0.61	70.47	0.25	1,169	2	1,167	2	1	1	0	0	0	
WP13	2.45	0.50	20.20	1.96	81,866	10,143	71,723	9	5	4	0	0	0	
WP14	0.45	0.36	79.05	0.10	2,060	-	2,060	1	0	1	0	0	0	
WP15	0.43	0.29	66.96	0.14	1,090	1	1,089	1	1	0	0	0	0	
WP16	2.78	2.13	76.58	0.65	42,307	9,867	32,440	12	3	6	2	1	0	
WP17	0.43	0.26	61.69	0.16	186	3,158	(2,972)	1	1	0	0	0	0	
WP18	0.54	0.38	70.58	0.16	269	5,166	(4,897)	2	1	1	0	0	0	
WP19	1.04	0.71	68.65	0.33	3,511	-	3,511	3	2	1	0	0	0	
WP1A	0.81	0.04	4.61	0.77	8,310	-	8,310	1	1	0	0	0	0	
WP20	0.44	0.32	72.92	0.12	295	1,855	(1,560)	1	0	0	1	0	0	
WP20A	0.73	0.69	94.77	0.04	4,091	-	4,091	3	0	1	0	0	2	
WP21	0.70	0.35	49.50	0.35	3,574	959	2,615	3	2	1	0	0	0	
WP22	0.79	0.72	91.22	0.07	7,046	-	7,046	2	1	1	0	0	0	
WP23	3.37	0.83	24.48	2.55	1,819	404,668	(402,849)	9	2	3	3	1	0	includes WP24 & WP25 areas and volumes
WP26	0.85	0.37	44.14	0.47	41,219	686	40,532	5	2	1	1	1	0	
WP27	0.43	0.38	87.69	0.05	321	2,147	(1,825)	1	1	0	0	0	0	
WP28	1.14	0.48	42.09	0.66	5,869	7,891	(2,022)	6	1	1	0	1	3	
WP29	1.17	0.78	66.31	0.40	63,149	80	63,069	3	1	1	0	0	1	
WP30	0.81	0.23	28.71	0.58			-	4	2	1	0	0	1	volumes Included in Steam Generation Site
WP31	0.90	0.75	83.26	0.15	3,744	-	3,744	5	1	2	1	0	1	
WP32	0.56	0.43	77.57	0.13	368	5,437	(5,069)	2	0	0	1	0	1	
WP33	0.88	0.11	12.25	0.77	18,307	-	18,307	5	1	2	0	0	2	
WP34	0.54	0.32	59.47	0.22	12,604	3,202	9,402	2	2	0	0	0	0	
WP35	0.71	0.64	90.98	0.06	3,079	-	3,079	2	2	0	0	0	0	
WP36	1.43	0.36	25.25	1.07	580	54,760	(54,180)	3	1	0	0	0	2	
WP37	1.21	0.44	36.54	0.77	14,571	15	14,556	4	1	2	0	0	1	
WP38	1.26	0.05	3.93	1.21	950	113,862	(112,912)	6	3	1	0	0	2	
WP39	0.37	0.10	25.85	0.28	925	52	873	1	0	1	0	0	0	
WP3A	0.65	0.46	71.03	0.19	2,953	-	2,953	2	1	1	0	0	0	
WP40	0.48	0.33	69.20	0.15	631	7,692	(7,061)	1	1	0	0	0	0	
WP41	0.70	0.36	50.99	0.34	619	8,290	(7,672)	3	1	1	0	0	1	
WP42	0.37	0.36	98.75	0.00	4,004	-	4,004	1	0	1	0	0	0	
WP43	0.54	0.16	29.76	0.38	2,044	144	1,900	2	1	0	0	0	1	
WP45	7.04	1.32	18.73	5.72	140,308	8	140,300	16	5	7	0	0	4	includes WP18A areas and volumes

Table 2.2-3. Well Pad Grading Estimates

Well Pad	Total Proposed Grading Limits	Previously Developed/Disturbed Area within Proposed Grading Limits		Net New Disturbed	Cut	Fill	Net	Total Number of Wells Per Pad	Production Wells	Steam Injection Wells	Water Injection Wells	Sisquoc Producer Wells	Observation Wells	Notes
	Acres	Acres	Percentage of Proposed Grading Limits	Acres	Cubic Yards	Cubic Yards	Cubic Yards							
WP46	0.59	0.36	61.01	0.23	446	8,379	(7,933)	2	2	0	0	0	0	
WP47	1.18	0.05	4.12	1.13	110,322	-	110,322	6	3	3	0	0	0	
WP51	2.54	0.48	18.95	2.06	112,012	-	112,012	8	4	4	0	0	0	
WP53	1.08	0.13	11.96	0.95	8,321	30,806	(22,485)	3	2	1	0	0	0	
WP54	1.13	0.10	8.51	1.03	381	28,389	(28,008)	3	2	1	0	0	0	
WP55	1.18	0.71	60.11	0.47	36,617	-	36,617	5	2	3	0	0	0	
WP56	0.82	0.05	6.02	0.77	23,168	-	23,168	3	2	1	0	0	0	
WP6A	0.40	0.30	76.42	0.09	333	2,120	(1,787)	1	1	0	0	0	0	
WP7	0.86	0.52	61.28	0.33	24,277	-	24,277	3	2	1	0	0	0	
WP8	0.62	0.28	45.57	0.34	240	9,990	(9,751)	3	2	1	0	0	0	
WP8A	4.49	0.61	13.49	3.88	83,174	2,813	80,361	17	5	5	4	3	0	
WP9	2.77	0.57	20.50	2.21	41,085	18	41,067	7	4	3	0	0	0	
WP6	3.40	0.00	0.00	3.40	-	-	-	3	2	1	0	0	0	volumes included in Laydown 1
WP1	1.09	0.00	0.00	1.09	6,157	-	6,157	3	2	1	0	0	0	
WP10A	1.36	0.00	0.00	1.36	-	40,212	(40,212)	5	4	1	0	0	0	
WP13A	0.75	0.00	0.00	0.75	6,726	-	6,726	4	3	1	0	0	0	
WP14 A	1.63	0.00	0.00	1.63	213,097	6,924	206,173	6	3	3	0	0	0	
WP15A	3.98	0.00	0.00	3.98	52,482	418,443	(365,961)	10	6	4	0	0	0	
WP16A	0.53	0.00	0.00	0.53	4,517	354	4,163	3	2	1	0	0	0	wells removed from WP16A on site plans
WP17A	1.02	0.00	0.00	1.02	3,260	175,394	(172,135)	3	2	1	0	0	0	
WP2	1.02	0.00	0.00	1.02	1,151	243,984	(242,833)	5	3	2	0	0	0	
WP2A	1.51	0.00	0.00	1.51	18,490	1	18,489	6	4	2	0	0	0	
WP3	0.87	0.00	0.00	0.87	18,452	-	18,452	4	3	1	0	0	0	
WP4	0.67	0.00	0.00	0.67	32,884	-	32,884	2	1	1	0	0	0	
WP44	1.21	0.00	0.00	1.21	544	35,388	(34,843)	5	2	3	0	0	0	
WP48	1.30	0.00	0.00	1.30	49,727	271	49,455	6	4	2	0	0	0	
WP49	1.00	0.00	0.00	1.00	28,742	-	28,742	5	2	2	0	0	1	
WP4A	1.35	0.00	0.00	1.35	41,511	-	41,511	5	2	3	0	0	0	
WP5	0.79	0.00	0.00	0.79	26,887	-	26,887	2	2	0	0	0	0	
WP50	0.91	0.00	0.00	0.91	31,303	-	31,303	4	2	1	0	0	1	
WP52	1.41	0.00	0.00	1.41	136,237	3	136,234	3	1	2	0	0	0	
WP5A	0.81	0.00	0.00	0.81	474	68,621	(68,147)	3	2	1	0	0	0	
WP7A	1.01	0.00	0.00	1.01	18,619	-	18,619	5	3	2	0	0	0	
WP9A	0.93	0.00	0.00	0.93	-	34,378	(34,378)	4	2	2	0	0	0	
TOTAL	**88.13**	**21.99**	**-**	**66.15**	**1,645,307**	**1,776,716**	**(131,409)**	**293**	**141**	**107**	**14**	**7**	**24**	

NOTE: Totals may not exactly match disturbance area estimates and grading quantity estimates in Tables 2.2-1 and 2.2-2 above due to rounding error and in instances where well pads, laydown areas, and/or facility pads have been combined.

2.2.3.2 Steam Generation Site

Grading for the steam generation site will occur in Phase I and require approximately 2.6 total acres of disturbance; existing disturbance accounts for approximately 19.2 percent of this total area. Estimated earthwork volumes for construction of the steam generation site are 162,694 cubic yards of cut and three cubic yards of fill. Excess cut will be balanced on the Project site. Finished grade of the steam generation site pad will be sloped at uniformly to ensure that ponding does not occur; all cut/fill slopes will have a maximum 2:1 slope (50 percent). A one-foot tall earthen berm will be located at the top of slope and will encompass approximately two-thirds of the final pad area (area of cut). The faces of cut and fill slopes will be prepared to control against erosion per the Project erosion control plans. Grading and erosion control plan details are located in Appendix C.

2.2.3.3 Production Group Station

Grading for the production group station will occur in Phase I and will require approximately 0.8 total acres of disturbance; existing disturbance accounts for approximately 87.5 percent of this total area. Estimated earthwork volumes for construction of the production group station pad are 23,804 cubic yards of cut and 30,035 cubic yards of fill. Finished grade of the production group station pad will be sloped uniformly to ensure that ponding does not occur; all cut/fill slopes will have a maximum 2:1 slope (50 percent). The faces of cut and fill slopes will be prepared to control against erosion per the Project erosion control plans. Grading and erosion control plan details are located in Appendix C.

2.2.3.4 Office and Multipurpose Building

Grading for the office and multipurpose building will occur in Phase I and will require approximately 3.9 total acres of disturbance; existing disturbance accounts for approximately 5.1 percent of this total area. Estimated earthwork volumes for construction of the office and multipurpose building are 187,688 cubic yards of cut and 74,363 cubic yards of fill. Excess cut will be balanced on the Project site. Finished grade of office and multipurpose building pad will be sloped uniformly to ensure that ponding does not occur; all cut/fill slopes will have a maximum 2:1 slope (50 percent). The faces of cut and fill slopes will be prepared to control against erosion per the Project erosion control plans. Grading and erosion control plan details are located in Appendix C.

2.2.3.5 Access Roads

Grading of the access roads will occur throughout Phases I and II, concurrent with the multi-year well development schedule. Fire Department access roads have been designed to maintain a maximum 15 percent grade and withstand a 20 ton vehicle, per Santa Barbara County Fire Department Development Standard #1 (County of Santa Barbara Fire Department, Fire Prevention Division, 2010). Where approved by the Santa Barbara County Fire Department, road grades may exceed 15 percent, and paving will consist of a concrete structural section. Fire Department primary access roads will be graded 28-feet wide to accommodate a 24-foot access road with a two-foot shoulder on the downslope side and a two-foot shoulder on the upslope side of the roadways. Asphalt or concrete paving of Fire Department access roads will occur on road grades exceeding ten percent slope. Additionally, some secondary access roads will be paved.

All other roads will consist of a suitable aggregate material over compacted subgrade soil that can withstand a 20 ton vehicle. Roads servicing well pads will be bladed, compacted, and

covered with beneficial reuse material or equivalent. Grading of access roads will require approximately 47.4 total acres of disturbance; but since the existing roads were incorporated into the Project plan to the extent possible, 43.7 percent of this total area was previously disturbed. Estimated earthwork volume totals for construction of roads throughout the Project site are 28,557 cubic yards of cut and 55,713 cubic yards of fill. Grading plan details are located in Appendix C.

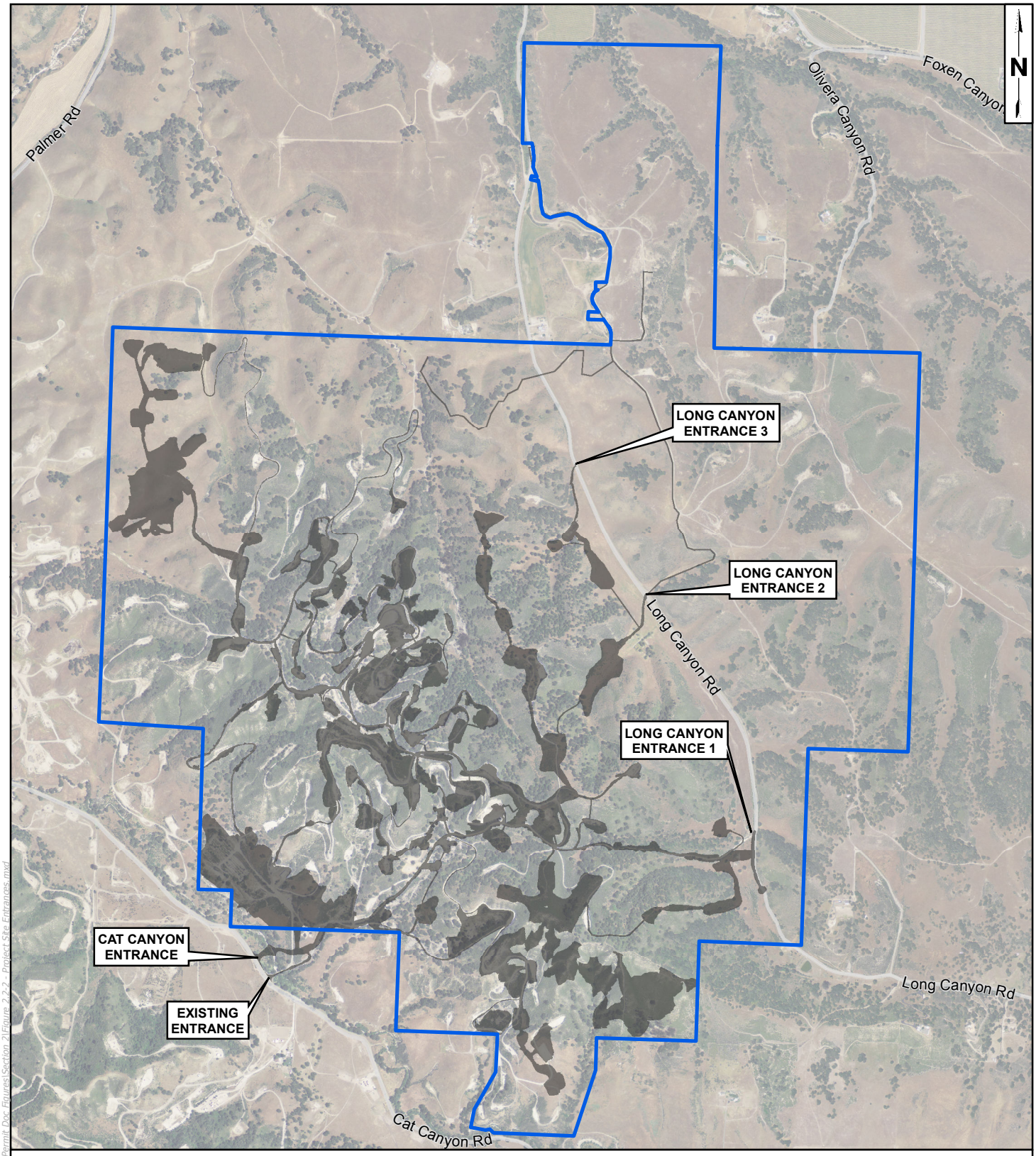
2.2.4 Site Entrances

The primary Project site entrance is currently located at 6516 Cat Canyon Road. Vehicles and equipment entering the Project site travel across Cat Canyon Creek via an existing culvert crossing located just outside of the Aera property boundary. As proposed, the Project will utilize the existing crossing during the initial Project construction (Phase I; Year -3), while concurrently constructing a new Project site entrance located approximately 300 feet north of the existing entrance (Figure 2.2-2 Project Site Entrances). The new Project site entrance is being developed to safely enable two-way traffic into and out of the Project site. Any applicable surface use agreements will be obtained prior to construction on the new Project site entrance. The existing site entrance will remain in place following construction of the new Project site entrance across Cat Canyon Creek.

The Project will also include improvements to a secondary access located along Long Canyon Road, on the eastern boundary of the Project site. The Long Canyon Road entrance will also be constructed during the initial Project construction (Phase I; Year -3). During Phase II, two smaller east side entrances from Long Canyon Road will be constructed to provide adequate access to new well pads nearby. These smaller entrances are expected to utilize “Arizona” swale crossings over a shallow drainage area. Creating three entrances on the east side maximizes the use of the existing roadway (Long Canyon) and minimizes disturbance.

2.2.5 Utilities

To support the major drilling and construction effort, electrical connections are anticipated be in place prior to significant field activities. The natural gas line will be in place prior to the first steam injection. Design and construction will be coordinated with the utility providers. Refer to Sections 2.5 - Pipelines and 2.6 - Electrical Power for additional details on installation of utilities.



Aera Energy LLC Property

Project Footprint

0 900 1,800
FEET

Source: County of Santa Barbara, TJCross 8-20-14, DPSI 2013 Land Survey
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposes only.

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		PROJECT SITE ENTRANCES	FIGURE 2.2-2
PROJECT NUMBER: 1002-0455	DATE: September 2014		

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2.3 SUBSURFACE – WELLS

2.3.1 Well Types

Six different well types will be drilled and maintained for the Project: oil production, steam injection, observation (or monitoring), upper Sisquoc water production (source water), upper Sisquoc water injection, and fresh water wells (Table 2.3-1 – Number of Wells by Phase).

Table 2.3-1. Number of Wells by Phase

Well Type	Phase I Wells	Phase II Wells	Total Number of Wells
Oil Production	35	106	141
Steam Injection	31	76	107
Observation	23	1	24
Upper Sisquoc Water Production	6	1	7
Upper Sisquoc Water Injection	10	4	14
Fresh Water[2]	3	0	3
TOTAL	**108**	**188**	**296**

2.3.1.1 Oil Production Wells

Production wells will be drilled and completed in the Brooks reservoir at a depth of approximately 3,000 feet. Pumps will be required to bring produced oil, water, and gas to the surface. Gas and water vapor will also be produced through the well casing and tied into the flow line. The potential need for a casing vapor recovery system will be assessed in the future on an individual well basis. Although the Project is designed as a continuous steam flood, production wells will be cyclically steamed to initiate production and occasionally thereafter following well maintenance activities. No hydraulic fracturing will be used on this Project.

Although there are 130 abandoned wells that currently exist at the Project site, these wells are not available for Project use. Decommissioning of those wells included, among other things, filling the wellbore with cement so it cannot be used again. However, the well pads surrounding the abandoned wells will be reused to the extent feasible.

2.3.1.2 Steam Injection Wells

Steam injection wells will be drilled and completed in the Brooks reservoir at a depth of approximately 3,000 feet. Steam injection surface equipment will consist of flow lines and measurement and control devices for pressure and flow. High pressure steam will be distributed to well pads from the steam generation site. Steam will be separately measured and controlled

[2] Due to their inactive status, Aera has elected to remove two of the existing fresh water wells from the Project design. There will be one existing well that provides fresh water needs for the Project.

for each steam injection well. After drilling, some injection wells may initially be cyclically steamed and produced, prior to constant steam injection.

2.3.1.3 Observation Wells

Observation wells will be drilled and completed in the Brooks reservoir at a depth of approximately 3,000 feet. Observation wells neither produce nor inject fluids. Temperature sensing devices are inserted into the wellbore to monitor steam movement and distribution in the formation. A total of 24 observation wells are anticipated; the timing of their installation is contingent on assessments of the production data.

2.3.1.4 Upper Sisquoc Water Production and Injection Wells

Upper Sisquoc water production and injection wells will be drilled and completed in the upper Sisquoc formation sands reservoir at a depth of approximately 2,000 feet. Electric submersible pumps will be used in the upper Sisquoc water production wells. The surface equipment will consist of a wellhead, flow measurement device, flow line, and a motor control. Upper Sisquoc water injection wells will be equipped with a wellhead, a flow measurement device, a flow control device, and a flow line.

2.3.1.5 Fresh Groundwater Wells

Fresh groundwater for the Project will come from source wells completed in the Careaga and the Paso Robles formations. These fresh water aquifers are located at approximately 600 feet below the surface, approximately 2,400 feet above the Brooks Formation oil production zone and separated from it by a regionally extensive low permeability zone. It is estimated that fresh groundwater consumption during Project operations will be between 16.32 and 20.92 acre-feet per year, plus an additional 3.58 acre-feet per year for oak tree replacement watering during the first three to five years of the Project.

Several water wells are currently in place at the Project site; however, not all are active. Current plans include the re-drilling or recompletion of up to three existing fresh water wells, or replacements of the same[3]. The freshwater delivery system will likely be three-inch to four-inch high density polyethylene pipe or a spooled fiberglass reinforced polyester pipe and will be buried approximately one to four feet underground. Installation will mostly follow previously disturbed roads and pathways. Other areas of installation might temporarily disturb a 12-foot wide area. The reference name and status of potential fresh groundwater wells is provided in Table 2.3-2 – Fresh Groundwater Well Name and Status.

[3] Due to their inactive status, Aera has decided to remove water wells Bonetti-WS1 and McCroskey-WS11 from the Project design. Water well McCroskey-WS12 is proposed to provide all fresh water needs for the Project. The Well Capacity and Aquifer Test (Appendix G) indicates that the existing McCroskey-WS12 well has a sustainable pumping rate in the range of 125 gallons per minute (180,000 gallons per day), Based on this information, the McCroskey-WS12 well can adequately supply the potable water needs for the Project.

Table 2.3-2. Fresh Groundwater Well Name and Status

Well Name	Status
~~Bonetti-WS1~~	~~Inactive~~
~~McCroskey-WS11~~	~~Inactive~~
McCroskey-WS12	Active

New or re-completed fresh groundwater wells will have a total depth of nearly 600 feet. The wells will likely be completed with six-inch diameter SDR 21 F-480 polyvinyl chloride casing with perforations placed in the lower half of the well (depending on review of the lithological and/or geophysical log data). Wells will be gravel packed, developed by pumping, and pump tests conducted to determine aquifer parameters, sustainable yield, and groundwater quality. Groundwater wells will be constructed in conformance with the California Department of Water Resources Water Well Standards (Bulletin 74-81 [December, 1981] and Bulletin 74-90 [June 1991]), which have been developed for wells for the protection of water quality under California Water Code Section 231.

Although fresh water use will average less than 24.5 acre-feet per year, the Project has designed additional fresh water supply to cover infrequent or contingent demand, for instance, during water well maintenance, water tank filling, or firefighting. Temporary activities such as grading associated with facility construction have been accounted for in water usage estimates and include up to 13.4 acre-feet per year. Accordingly, up to three groundwater wells will be completed to deliver 50 gallons per minute each or 150 gallons per minute total (up to 0.66 acre-feet per day) to supply the extra contingent volume only if and when it is needed[4].

2.4 PROCESSING SYSTEMS

The following sections provide a summarized description of the Project's fluid processing systems. Additional technical details are included in Appendix B (B-1 - Process Design Basis, B-2 - Process Flow Diagrams, and B-3 - Equipment Lists).

The relationship of fluid processing system features is shown in Figure 2.4-1 – Block Flow Diagram. Produced fluids are gathered from production well pads. Gas is separated from produced fluids at the production group station. From the group station, liquids flow to the central processing facility for oil cleaning, water cleaning, water softening, oil storage, and oil sales. Gas from the production group station flows to the steam generator site for treatment and use as fuel for steam generation. From the central processing facility, softened produced water (from oil production wells) and softened brackish water (from upper Sisquoc water production wells) are

[4] Due to their inactive status, Aera has decided to remove water wells Bonetti-WS1 and McCroskey-WS11 from the Project design. Water well McCroskey-WS12 is proposed to provide all fresh water needs for the Project. The Well Capacity and Aquifer Test (Appendix G) indicates that the existing McCroskey-WS12 well has a sustainable pumping rate in the range of 125 gallons per minute (180,000 gallons per day), Based on this information, the McCroskey-WS12 well can adequately supply the potable water needs for the Project.

sent to the steam generation site where steam generators create a wet, saturated steam. The steam is then distributed back to well pads for injection.

2.4.1 Intra-Field Gathering and Distribution System

The Project includes installation of a system of on-site gathering and distribution lines for various services, as described below and depicted in Figure 2.4-3 – Intra-field Pipelines. Table 2.4-1 – Intra-field Pipelines provides additional details regarding the intra-field pipelines.

Table 2.4-1. Intra-field Pipelines

Service	Diameter (inches)	Pipe Material	Approximate Pipeline Length (feet)		
			Phase I	Phase II	TOTAL
Production Gathering	3 to 14	insulated carbon steel	36,868	28,905	65,773
Steam Distribution	3 to 14	insulated carbon steel	32,073	33,922	65,995
Source Water Gathering	3 to 6	carbon steel	9,758	0	9,758
Reservoir Maintenance Distribution	3 to 6	carbon steel	11,791	1,996	13,787
Fuel Gas Distribution	6	steel	4,200	0	4,200
Softened Water Transfer	12	composite	4,200	0	4,200
Separated Produced Gas	10	steel	4,200	0	4,200
Fresh Water Gathering and Distribution	3	composite	15,000	-	15,000

2.4.1.1 Production Gathering System

Reservoir fluids will be pumped to the surface using artificial lift systems (i.e., surface pumping units and/or submersible pumps). Once on the surface, produced fluids (and vapors) from individual wells will be routed through insulated carbon steel flowlines into a piping network connecting the well pads to the production group station and then to the central processing facility. The lines will range in size from three to 14 inches in diameter and will be raised off the ground by pipe supports to minimize external corrosion. Routing will be along access roads to take advantage of ground stability and to support spill prevention and containment.

Provisions for a possible future casing vapor recovery collection system is a part of the overall production gathering system design. Casing vapor recovery collection is a process of

allowing casing gases to be collected and routed to the treatment system at the steam generator site.

The production group station receives produced fluids from the production gathering system, separates liquid and gas, and routes them to the central processing facility and steam generator site, respectively. The production group station will consist of two vessels, one installed in Phase I, and the second installed in Phase II (Figure 2.4-2 – Production Group Station Plot Plan).

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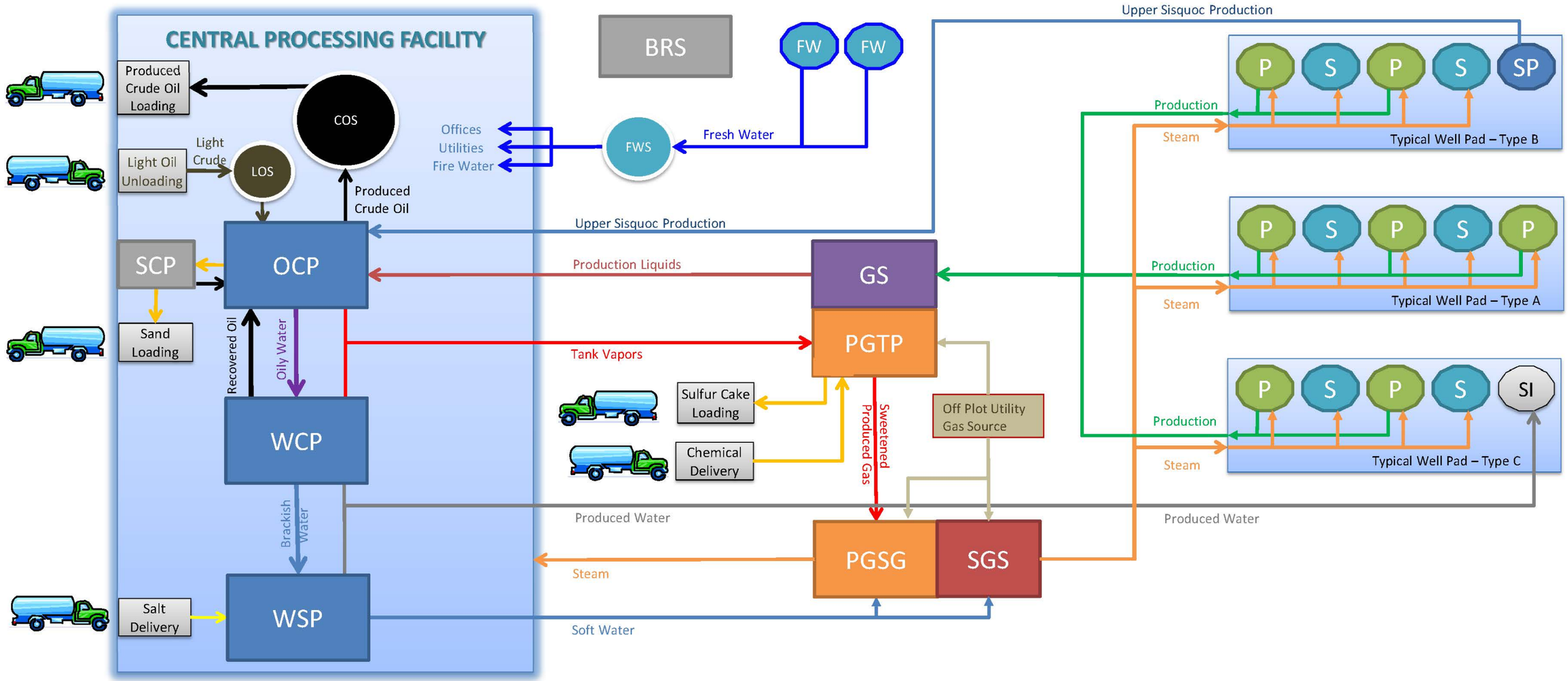
East Cat Canyon Field Redevelopment Project - BFD



Source: TJ Cross Engineers Drawing

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		BLOCK FLOW DIAGRAM	FIGURE
PROJECT NUMBER: 1002-0455	DATE: March 2016		2.4-1

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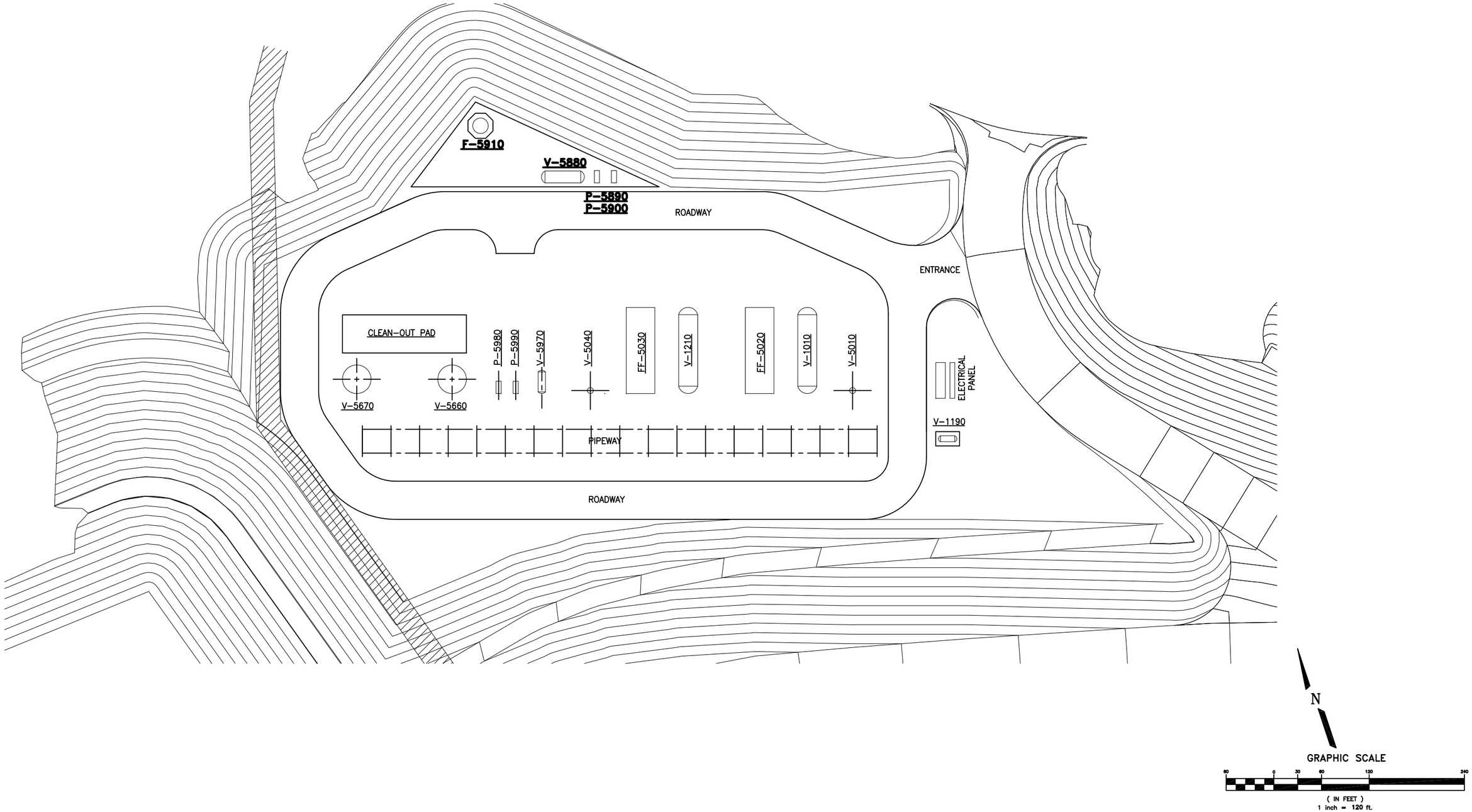

Source: TJ Cross Engineers Drawing 072-13-062Ams_r2_NAD83

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		PRODUCTION GROUP STATION PLOT PLAN	FIGURE 2.4-2
PROJECT NUMBER: 1002-0455	DATE: March 2016		

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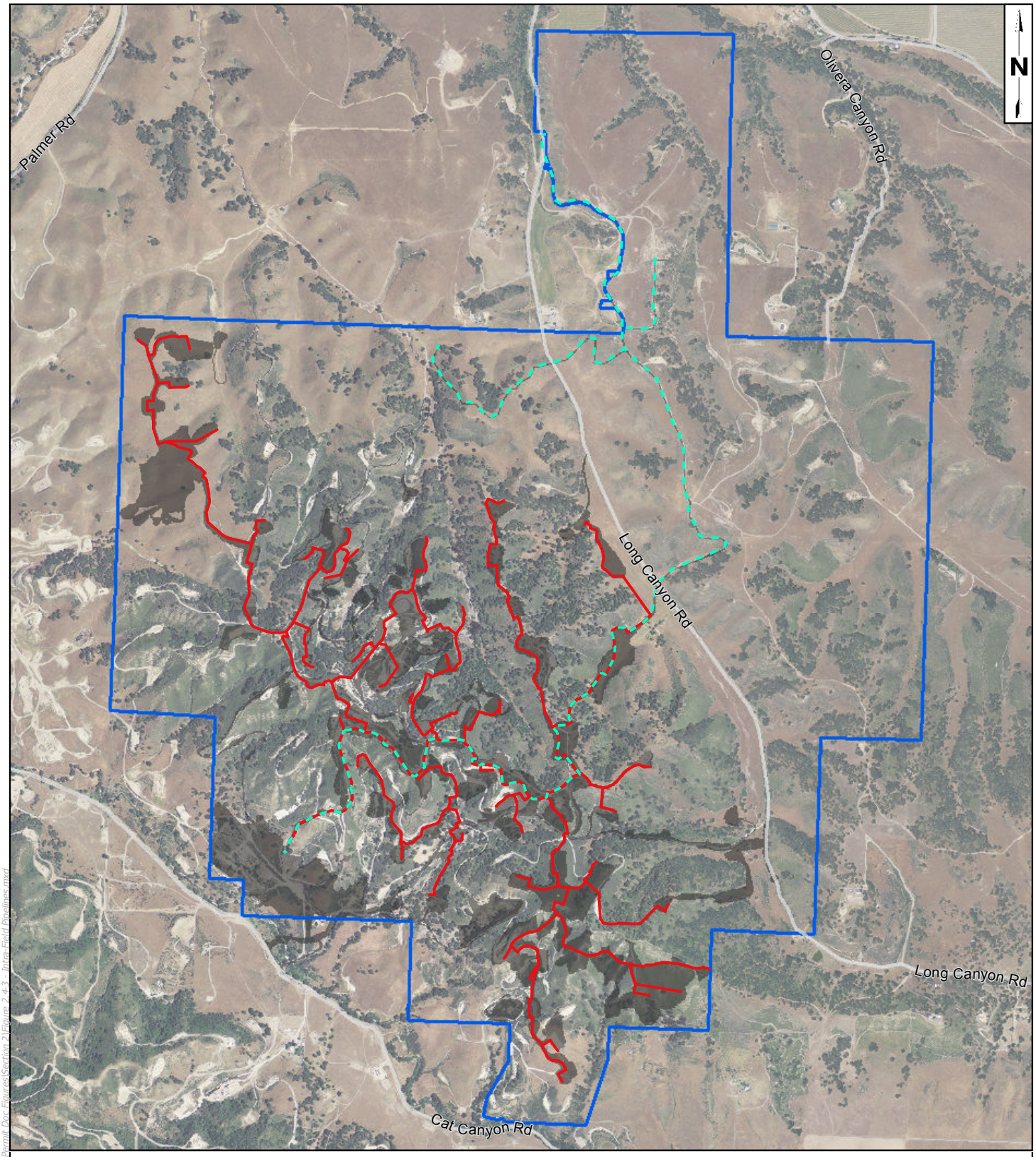

Aera Energy LLC Property
Project Footprint
Fresh Water Piping
Other Piping

0 900 1,800
FEET

Source: County of Santa Barbara, TJCross 8-20-2014, DPSI 2013 Land Survey
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposes only.

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		INTRA-FIELD PIPELINES	FIGURE 2.4-3
PROJECT NUMBER: 1002-0455	DATE: September 2014		

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2.4.1.2 Steam Distribution

The steam distribution system is the conduit for transporting steam produced at the steam generation site to all wells receiving steam for subsurface injection. The steam distribution system starts at the steam generation site exit and terminates at the connection point for each well's flowline (injection line). The steam lines will be constructed of insulated carbon steel in sizes ranging from three to 14 inches in diameter. The lines will be routed along access roads on raised pipe supports to minimize external corrosion.

2.4.1.3 Upper Sisquoc Water Gathering

Production wells completed in the upper Sisquoc reservoir will be used to provide initial (brackish) water for steam generation and to supplement produced water as needed during the life of the Project. These wells will be located on the same pads as the production and steam injection wells. The upper Sisquoc source water gathering system is the conduit for transporting all produced water from the upper Sisquoc water production wells to the central processing facility. The upper Sisquoc source water gathering system starts at the flowline connection at each upper Sisquoc water production well and terminates at the central processing facility. The lines will be constructed of carbon steel in sizes ranging from three to six inches in diameter. The lines will be routed along access roads on raised pipe supports to minimize external corrosion. This water will be combined with the Brooks oil reservoir produced water to make steam for enhanced oil recovery.

2.4.1.4 Reservoir Maintenance Distribution

The reservoir maintenance distribution system is the conduit for transporting recycled produced water from the central processing facility to the upper Sisquoc water injection wells. The distribution system starts at the central processing facility exit and the terminus is at the connection point for each injection well's flowline (injection line). The lines will be constructed of carbon steel in sizes ranging from three to six inches in diameter. The lines will be routed along access roads on raised pipe supports to minimize external corrosion

2.4.1.5 Miscellaneous Field Piping

Miscellaneous field piping includes fresh water gathering pipelines, soft water pipelines connecting the central processing facility to the steam generation site, produced gas pipelines, fuel gas pipelines between the central processing facility and the steam generation site, and fire suppression water pipelines.

2.4.2 Central Processing Facility

With the exception of gas-liquid separation and all of the Project's steam generation, fluid processing will take place within the central processing facility (Figure 2.4-4 – Central Processing Facility Plot Plan). The central processing facility will include the following:

- Oil cleaning plant;
- Light oil storage and unloading;
- Clean oil storage and loading;
- Water cleaning plant;
- Water softening plant; and

- Solids concentrating plant.

2.4.2.1 Oil Cleaning Plant

The oil cleaning plant receives fluids from the production group station. The oil cleaning plant will consist of two equipment "trains"[5]; one train will be constructed during Phase I and the second will be added during Phase II. The primary function of the oil cleaning plant is to remove water and solids from the produced crude. Clean oil leaving the oil cleaning plant will be sent to storage tanks at the crude oil storage plant and separated produced water will be sent to water cleaning plant. Produced gas from the production group station and oil cleaning plant will be cooled and transferred to the produced gas treating plant. Below is a summary of the treating operations in the oil cleaning plant:

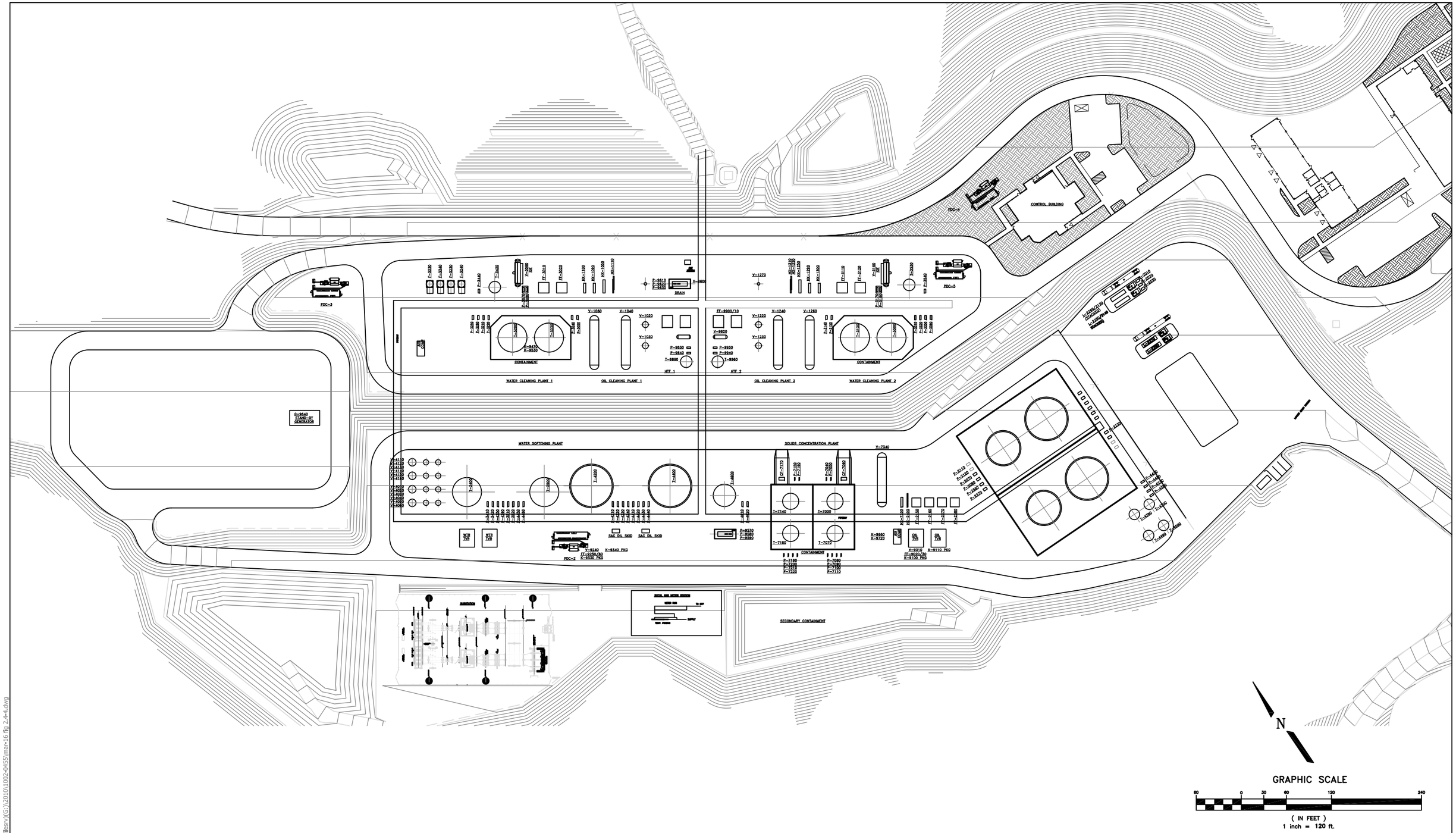
1. Field production will be blended with light crude oil to form a blended, approximately 12 degrees American Petroleum Institute production to allow gravity separation of oil and produced water;
2. De-sanding vessels will settle and remove produced sand and solids from the blended production;
3. Most produced water will be separated from blended production in horizontal, free water knockout vessels;
4. Remaining produced water will be separated from blended production in horizontal coalescer vessels; and
5. Produced gas will be cooled and transferred to the produced gas treating plant for sulfur removal.

2.4.2.2 Crude Oil Storage

The crude oil storage plant receives and stores clean blended crude from the oil cleaning plant. The primary function of the crude oil storage is to store clean blended crude prior to sales. Below is a summary of the operations in the crude oil storage:

1. Clean crude will be inventoried in oil stock tanks;
2. Haulers will remove clean oil at truck loading stations (sales point); and
3. Tank vapors will be collected and transferred to the produced gas treating plant.

[5] Equipment train is defined as a sequence of equipment through which a product is produced or processed.



Source: TJ Cross Engineers Drawing 072-13-063Ams_r2_NAD83

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT	CENTRAL PROCESSING FACILITY PLOT PLAN	FIGURE 2.4-4
PROJECT NUMBER: 1002-0455 / DATE: March 2016		

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2.4.2.3 Light Oil Storage

Lighter, higher American Petroleum Institute crude oil will be handled in the light oil storage plant. The primary functions of the light oil storage are to receive and inventory light crude oil prior to blending with production in the oil cleaning plant. Below is a summary of the operations conducted in the light oil storage:

1. Haulers will deliver light crude oil to truck unloading stations;
2. Light crude oil will be inventoried in light oil stock tanks;
3. Light crude oil will be metered and pumped to the oil cleaning plant for blending with field production; and
4. Tank vapors will be collected and transferred to the produced gas treating plant.

2.4.2.4 Water Cleaning Plant

The water cleaning plant receives produced water from the oil cleaning plant and brackish water from the upper Sisquoc water production gathering system. The plant's purpose is to remove oil and solids from the water stream. After oil and solids removal, a blend of filtered produced and brackish water will be transferred to the water softening plant. Any oil and solids recovered in the water cleaning plant will be reprocessed in the solids concentrating plant. Below is a summary of the treating operations in the water cleaning plant:

1. Oil and solids will first be removed by gravity separation in water clarifier tanks;
2. Additional oil and solids will be removed by induced static floatation units; and
3. Residual oil and solids will be removed by filtration.

2.4.2.5 Water Softening Plant

The water softening plant receives filtered water from the water cleaning plant. The plant's primary purpose is to soften filtered water for use in thermal enhanced oil recovery steam generation. Any excess filtered water will be diverted to upper Sisquoc water injection wells. Below is a summary of the treating operations in the water softening plant:

1. The softening system will remove hardness (naturally occurring scale-forming minerals) from the filtered water;
2. Soft water will be transferred from storage tanks to the steam generation plant; and
3. Water injection pumps will direct excess filtered water into injection wells.

2.4.2.6 Solids Concentrating Plant

The solids concentrating plant serves two purposes: 1) dewater solids collected in the oil cleaning plant, and 2) recover residual oil from various processes in the central processing facility. Residual oil and solids from various plant processes will be directed to dedicated tanks. Wet oil will be cleaned in a "residual oil" treater. Recovered clean oil will be transferred to crude oil storage. Wet solids will be dewatered with a centrifugal process and collected for beneficial re-use. Separated water will be returned to the water cleaning plant. Below is a summary of treating operations in the solids concentrating plant:

1. Wet, separated solids are further concentrated in tanks;

2. Solids are mechanically dewatered and deposited into transport bins;
3. Wet oil streams are collected in “residual oil” tanks; and
4. Water is removed from wet oil with a steam-heated coalescing treater.

2.4.2.7 Produced Gas Treating Plant

The primary role of the produced gas treating plant is to remove sulfur from the produced gas. Treated, or ‘sweetened’, produced gas will be transferred to the produced gas steam generation plant for use to generate steam.

In Phase I, a non-regenerative batch treatment system will be installed at the produced gas treating plant. Batch systems are robust and can accommodate a wide range of gas rates and composition. The batch system will utilize a consumable iron media sold under numerous trade names. The media will require periodic replacement and disposition. Spent media will be directed to a suitably permitted non-hazardous waste management site.

If produced gas volumes or concentration warrant, a continuous treatment system, such as SulfFerox®, may be installed during Phase II of the Project. If used, the continuous treatment system will be designed based on gas production data collected during Phase I operations. This likely system will mix an iron chelant (liquid) with the gas to convert reduced sulfur components (typically hydrogen sulfide) in the gas to elemental sulfur (solid). Elemental sulfur generated in this process may be made available for agricultural use, typically as a fertilizer, or hauled to an appropriate waste disposal site. The existing batch treatment system would be converted to a back-up, or polisher, to the continuous treatment system.

Tank vapor recovery units will be installed within the central processing facility area to collect and compress low pressure tank vapors for treatment in the produced gas treating plant. A Santa Barbara County Air Pollution Control District-permitted emergency flare will be provided to safely incinerate central processing facility vapors when the produced gas steam generator is unavailable. Below is a summary of treating operations in the produced gas treating plant:

1. Tank vapor recovery compressor skids will collect produced gases from various plant processes;
2. Either a batch or continuous treatment system will remove sulfur from the produced gas;
3. Sweetened produced gas will be transferred to the produced gas steam generator for use as fuel;
4. Emergency relief vapors from an unplanned shutdown and from planned maintenance shutdown of the produced gas steam generator will be incinerated in a totally enclosed emergency flare; and
5. Solid sulfur by-products will either be sold for agricultural use or transported to an appropriately permitted disposal facility.

2.4.2.8 Produced Gas Steam Generator

Sweetened produced gas from the produced gas treating plant will be used in a single 62.5 million British thermal units/hour once through steam generator to produced steam for

thermal enhanced oil recovery use. Steam from the produced gas treating plant may also be used for process heating as may be required in the central processing facility during start-up.

The produced gas steam generator will include provisions to add a flue gas sulfur dioxide scrubber with an electrostatic precipitator if needed to achieve Santa Barbara County Air Pollution Control District permit requirements. Gas sweetening will effectively remove hydrogen sulfide but will be less effective in removing other sulfur compounds. Monitoring of produced gas during Phase I operation will indicate if flue gas treatment is required. If necessary to stay below the allowable sulfur dioxide emission limit, produced gas steam generation flue gas will be sent to a one or two stage sulfur dioxide scrubbing system. A caustic solution will strip sulfur components from the flue gas. If necessary, the treated flue stream may also be sent to a wet electrostatic precipitator for particulate removal. Liquid discharge from the sulfur dioxide scrubbing containing the removed sulfur compounds will be blended with other wastewater at the water cleaning plant and injected into California Department of Oil, Gas, and Geothermal Resources-permitted upper Sisquoc water injection wells.

2.4.2.9 Electrical Systems

Sub-Station. New transmission level electrical service is planned for the Project (refer to Section 2.9 below). An electrical substation rated as 115/12.47 kilovolts will be installed as part of the Project, within the central processing plant (Figure 2.4-4 – Central Processing Facility Plot Plan). The proposed 115 kilovolt to 12 kilovolt substation will be the point at which Aera takes control of the electrical power delivered to the Project site from Pacific Gas and Electric Company's transmission system. Aera will engineer, construct, own, operate, and maintain the substation in accordance with Pacific Gas and Electric Company's interconnection requirements.

The substation will consist of incoming metering and switching equipment, transformers, and protective equipment to monitor and provide protection for the various circuits providing power to the central processing facility and field lifting equipment. The incoming 115 kilovolt power from Pacific Gas and Electric Company will come into the substation via overhead aluminum conductors terminating on an A-frame structure that also contains switches and the metering equipment that records the usage from which Pacific Gas and Electric Company bills the end user. Following the A-frame is the high voltage circuit breakers that protect the facility from over and under voltage conditions, as well as fault conditions (abnormal electric current) that may develop on the Pacific Gas and Electric Company side of the service, and faults that could possibly come from the substation side.

The transformers are base rated ten megavolt-ampere units. Secondary (12 kilovolt) circuit breakers will protect the transformers and utility from faults on the secondary bus. The secondary bus will be a combination of aluminum cable and aluminum tubing to allow for the distribution of the secondary 12 kilovolt to field and facility electrical circuits.

Electrical Power Distribution. Electrical power within the central processing facility will be distributed at 12 kilovolt to several power distribution centers. The power distribution centers will include disconnects, breakers, 12 kilovolt to 480 volt transformers and motor control centers. Electrical power from the motor control centers will be run to the motor and lighting loads within the central processing facility.

A natural gas fired emergency electrical generator will be installed at the central processing facility to provide electrical power in the event of an interruption in power service. The

emergency generator will allow vapor control and produced gas process equipment to continue to function to avoid gas release from atmospheric tanks or other vessels.

Electrical power to the field loads will be run on a 12 kilovolt primary/480 volt secondary overhead power distribution system. Pole or pad-mounted mounted transformers will be located throughout the field development. The pole mounted 480 volt secondary electrical power will service each well pad and the steam generation site.

2.4.2.10 Central Processing Facility Control Building

The central processing facility will be supported by a control building. The central processing control building is discussed further in Section 2.5 below.

2.4.2.11 Central Processing Facility Controls

The Project will utilize a distributed control system for normal operation of process equipment. Some individual equipment may also include programmable logic controllers. The distributed control system and programmable logic controllers will control equipment and processes and provide data on process conditions and performance. When applicable, distributed control system and programmable logic controller communication will utilize fiber optic networks.

Process control and monitoring stations will be located in the central processing facility control building. The monitoring and control stations will be configured to provide data and status information to assist Operators to quickly identify and resolve issues. Field measurement and control equipment will be configured to be monitored and operated both locally and from the central processing facility control building. In the event of a serious out-of-normal-range condition, the distributed control system and local equipment programmable logic controllers will be programmed to safely shutdown equipment and processes. Additional information regarding emergency shut-down systems is included in Section 2.7 below.

2.4.2.12 Central Processing Facility Containment and Storm Drain System

Post-construction surface drainage will follow existing on-site drainage patterns and be directed to the north as surface flow through storm water conveyance systems and will discharge at points located at the Project site boundary, as outlined within the Project Storm Water Pollution Prevention Plan (Appendix L).

In addition, any spills on the site will also be contained, both within process system walls/berms around equipment and site walls/berms around the central processing facility. Process walls/berms will be designed to contain at least 110 percent of the largest vessel plus the precipitation generated by a 100-year storm event.

2.4.3 Steam Generation and Distribution

2.4.3.1 Steam Generation Site

The steam generation site consists of six once-through steam generators: three will be installed in Phase I, and three in Phase II. The steam generation site also includes a produced gas steam generator and an emergency flare, both to installed in Phase I, and a produced gas treating plant, portions of which will be installed in both phases. Also included are associated ancillary equipment to support the steam generators, such as high-pressure feedwater pumps

and pre-heaters. Generated steam will be routed to the steam distribution system. Below is a summary of the operations in the steam generation site:

1. Each once through steam generator will have a dedicated feedwater pump and pre-heater;
2. The feedwater pump will boost the pressure sufficiently to allow for steam generation and subsequent injection; and
3. The pre-heater will reclaim waste heat from other facilities to increase overall thermal efficiency and reduce fuel consumption.

2.4.3.2 Steam Distribution and Injection

The steam from the steam generation site is distributed to the injection sites via a carbon steel piping network. Each well requiring steam injection will be connected to the distribution system with a steam injection measurement skid which will monitor, measure, and control steam injection pressure and volume.

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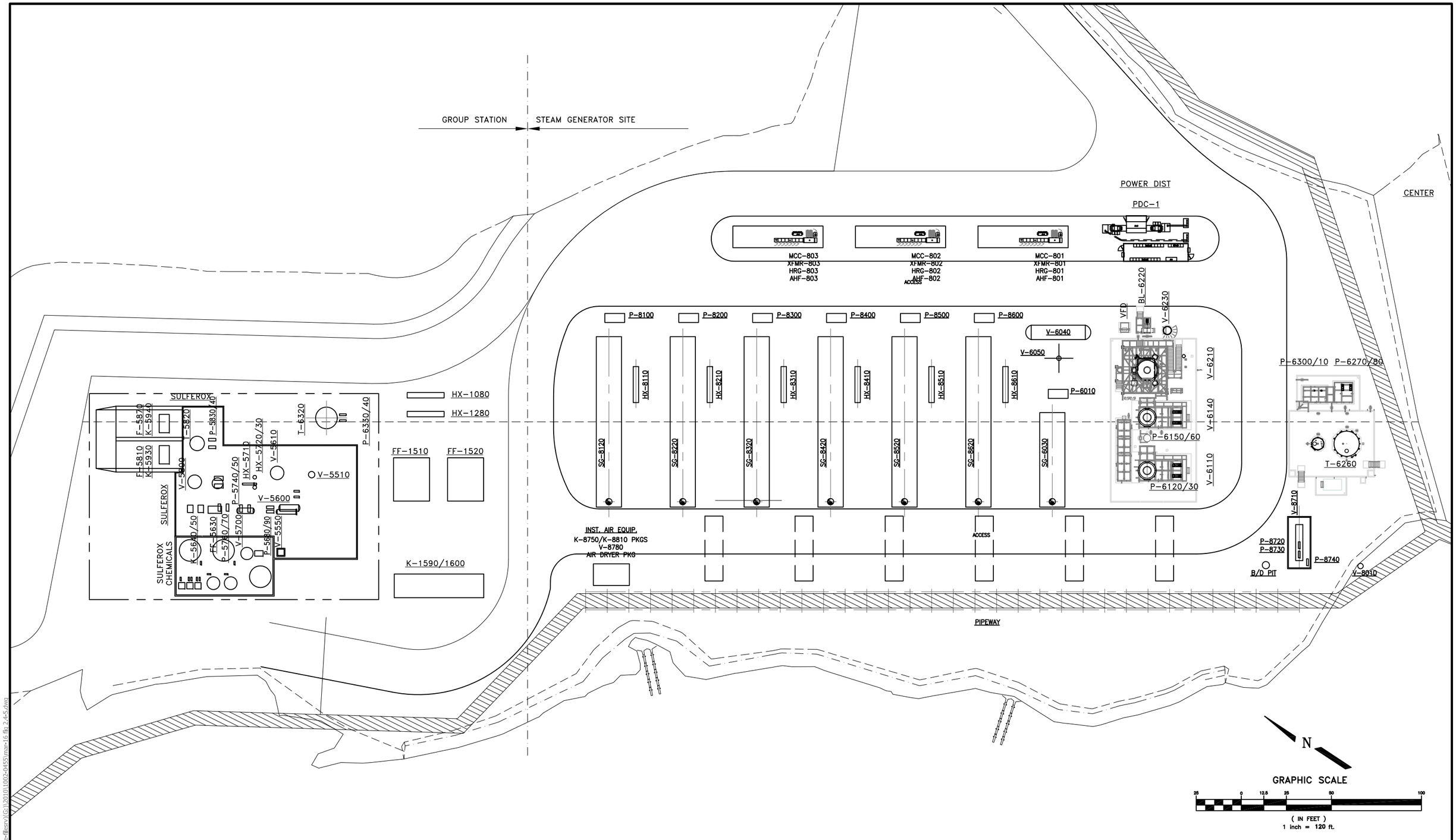


Source: TJ Cross Engineers Drawing 072-13-061Ams_r2_NAD83

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		STEAM GENERATOR SITE AND GROUP STATION PLOT PLAN	FIGURE 2.4-5
PROJECT NUMBER: 1002-0455	DATE: March 2016		

post_ws\graphics\1\pedro-fileserv\(G:)\2010\1002-0455\map-16 (Fig 2.4-5.dwg

2.5 SUPPORT INFRASTRUCTURE

2.5.1 Buildings

The Project will include a production office, warehouse and maintenance shops, and central processing facility control building (Figure 2.5-1 – Building Site Plan). An additional multi-purpose building is also planned. All buildings have been designed to be Leadership in Energy and Environmental Design certifiable. Building footprints and layouts are included in Appendix P – Building Plans, Elevations, and Visual Simulations. In addition, Appendix P includes a schematic landscape plan that identifies areas to be planted and hydro-seeded. The landscape plan includes a drought-tolerant plant palette and general irrigation concept. The following design objectives have been incorporated into all Project building plans:

- Each building will include materials, colors, or building forms that create a cohesive "campus" design theme (Figure 2.5-2 – Example Architectural Rendering);
- Designs will comply with California energy efficiency regulations; additional energy efficient features will be incorporated where possible; and
- Buildings were designed as a campus cluster of smaller buildings in order to better fit into the existing landscape contours and reduce grading, disturbance, and oak tree removals.

The office building "campus" will be sited away from the central processing plant to minimize traffic interference. The office "campus" will provide workspace, meeting rooms, storage, parking, and worker amenities such as changing room, lockers, and showers.

Warehouse and maintenance shop buildings will be located adjacent to the central processing plant. An outdoor equipment and materials storage yard will be adjacent to the warehouse. The warehouse will receive, store, and distribute materials needed to support field operations. The mechanical and electrical shops will also be adjacent to the warehouse and will provide space for repairing and maintaining equipment in a controlled environment.

A control building will be located within the central processing facility. This building will provide operator control stations to monitor and remotely control process equipment. The control building will also house miscellaneous storage, a meeting room, and worker amenities.

During construction and as may be needed during Project operational periods, temporary, modular buildings may be used to provide any required offices space, meeting, space, storage, etc.

2.5.2 Lighting

External pole lighting will be provided as needed by buildings, equipment, entrances, roads, parking lots, drilling sites, and other locations to support operational reliability, safety, and security. Lighting will be directed downward and shielded to avoid obtrusive light beyond the central processing facility boundary, reflective glare, or illumination of the nighttime sky.

2.5.3 Fire Protection

The design and operation of the Project will be required to meet provisions within the California Fire Code and standards of the National Fire Protection Association, including the requirements for the storage of hazardous materials, the installation and use of fire protection

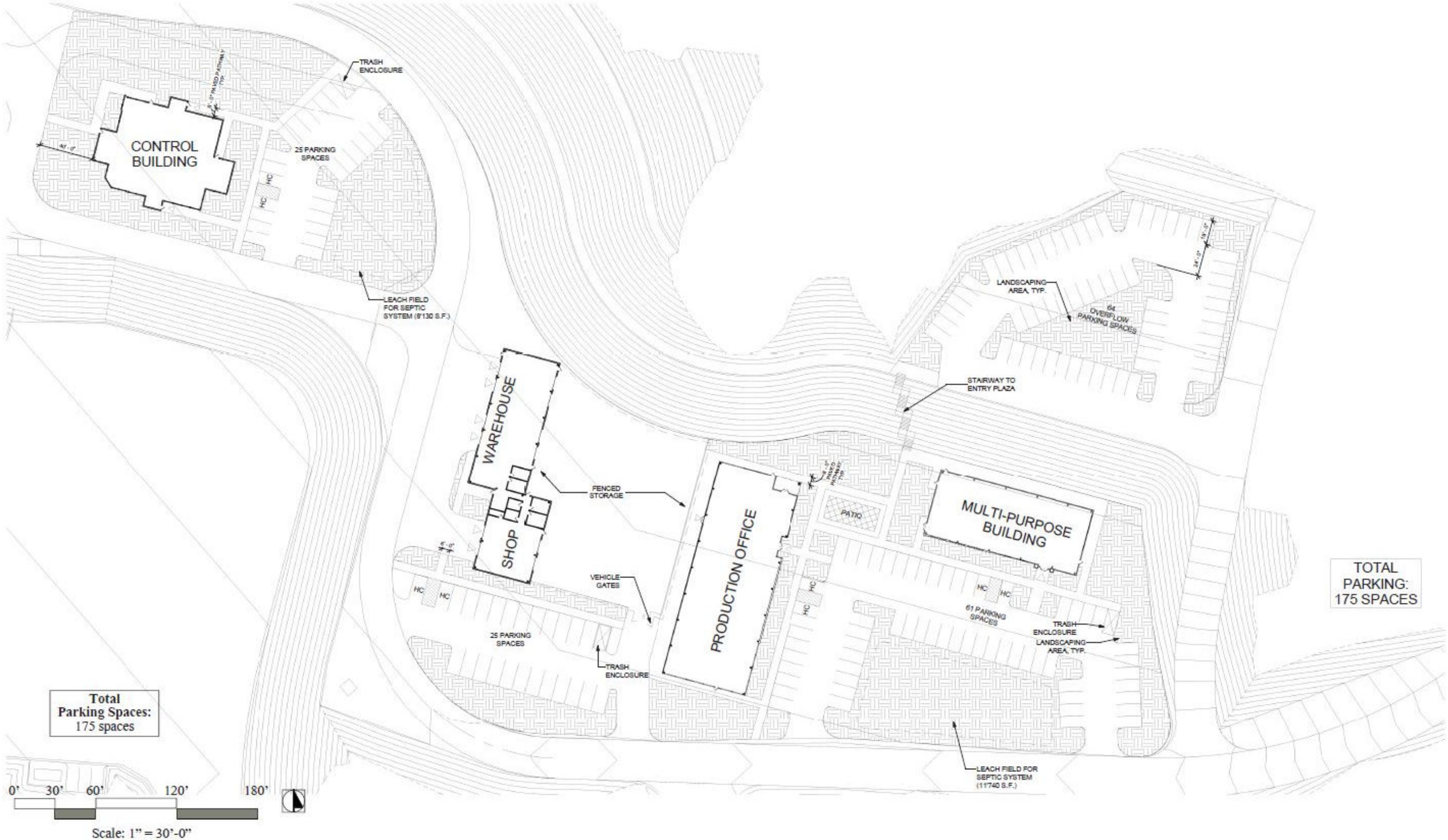
systems and devices, and the implementation of safety measures for employees and emergency responders. The Project has been designed in accordance with all applicable fire codes and standards as outlined within the Master Fire Protection Plan developed by Collings & Associates, LLC on behalf of the Project (August 2014) (Appendix Q).

A fresh water storage tank will be sized and strategically placed within the Project site. A portion of the tank volume will be dedicated to fire water storage. The tank will be placed at an elevation adequate to meet water pressure requirements set forth by the Santa Barbara County Fire Department.

The Master Fire Protection Plan includes distribution of fire water throughout the central processing facility. Hydrants and monitors are positioned at selected locations on the fire water distribution system. Fire monitors may be used to spray a stream of fresh water to cool process equipment adjacent to a fire or monitors may be used with a foaming agent to spray foam for suppression of a pool fire. Buildings will be equipped with applicable overhead fire systems. Project roadways will be designed to support access by fire response vehicles for emergency support or wild fire control. Roadway design is intended to:

- Accommodate Santa Barbara County Fire Department vehicles including unencumbered access by Santa Barbara County Fire Department to the property (refer to Section 2.9.8 - Site Security); and
- Support the Emergency Action Plan/Master Fire Protection Plan (refer to Section 2.9.7 - Personnel and Facility Safety Protocol/Emergency Response).

Fresh water will be provided from wells in the northeast area of the Project site. Refer to Section 2.3 for additional details. Water from the fresh water tank will also be supplied to the central processing facility and to the Project site buildings for utility and landscaping use.



Source: RRM Design Group Drawing

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		BUILDING SITE PLAN	FIGURE 2.5-1
PROJECT NUMBER: 1002-0455	DATE: September 2014		

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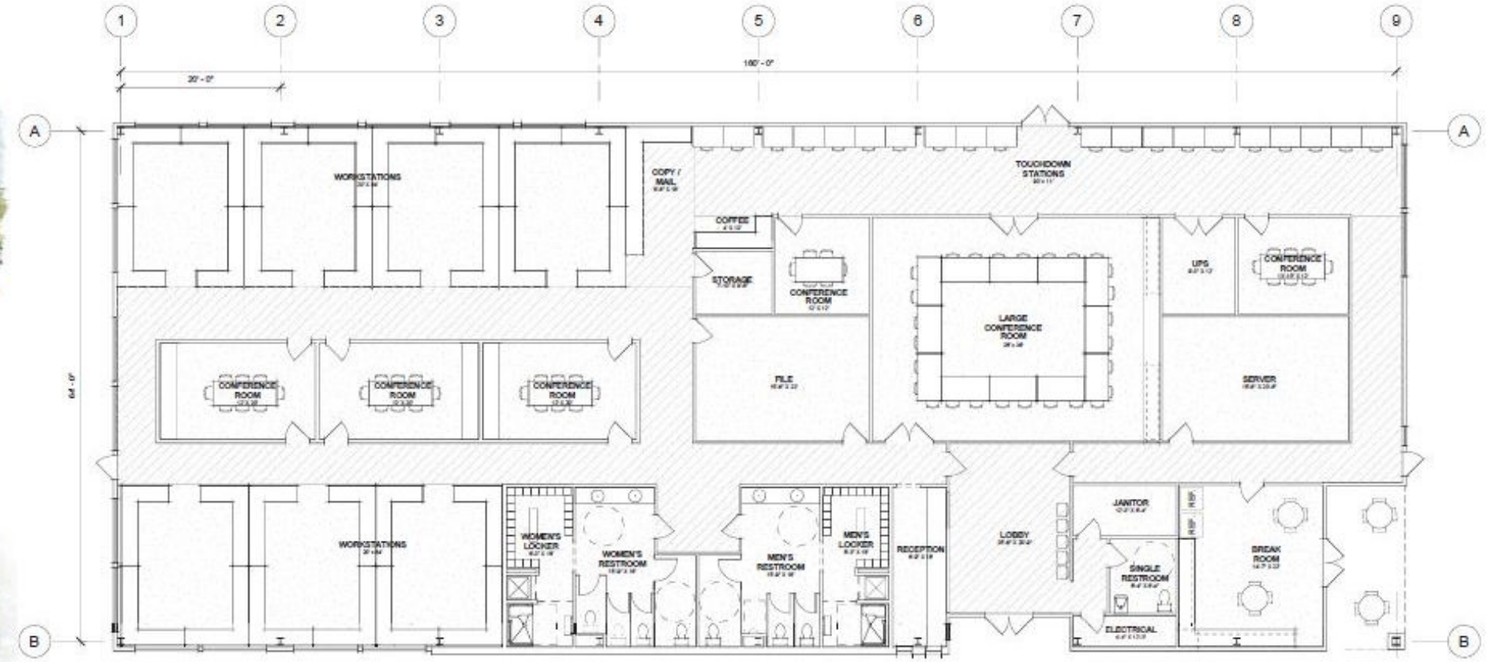
Perspective Rendering
South Facade Corner

Perspective Rendering
East Facade



Office Floor Plan

Scale: 1/8" = 1'-0"

Production Office Front Elevation
Total Building Area: 11'150 s.f.

Scale: 1/8" = 1'-0"

Source: RRM Design Group Drawing

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		EXAMPLE ARCHITECTURAL RENDERING	FIGURE
PROJECT NUMBER: 1002-0455	DATE: September 2014		2.5-2

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2.6 UTILITY CONNECTIONS

2.6.1 Natural Gas Pipeline

A new natural gas pipeline is required in order to deliver natural gas fuel at sufficient rate to meet the needs for thermal enhanced oil recovery steam generation. It is expected that the new fuel gas supply pipeline will be designed and built by Southern California Gas Company.

Additional gas pipeline description details are included in Appendix T – Southern California Gas Pipeline Project Description. Information regarding pipeline construction procedures, including staging area locations and construction methods is included in Section 3.0 – Construction Procedures.

The proposed 14-mile, 8-inch natural gas pipeline and associated facilities will be capable of providing 13 million standard cubic feet per day of natural gas to the Project at a delivery pressure of 50 to 300 pounds per square inch gage. The new pipeline will originate at the existing Southern California Gas Company Line 1010 at Divide Station, located along Graciosa Road, and will terminate at Aera's proposed central processing facility located in the southwest corner of the Project site (Figure 2.6-1 – Proposed Natural Gas Import Pipeline Route).

The natural gas pipeline for the Project will be installed almost exclusively within existing roadway easements. The pipeline will begin at Southern California Gas Company's Divide Station and traverse north along Graciosa Road for approximately 2.65 miles. The pipeline will continue northward along Orcutt Road for approximately 0.57 mile, then turn east on Clark Avenue and will continue under Clark Avenue for approximately 5.02 miles up to Dominion Road. At Dominion Road, the pipeline will head south and east approximately 3.5 miles. The pipeline will then travel east within easements for Palmer Road and Cat Canyon Road for approximately 2.18 miles before leaving the roadway easements and traveling across Cat Canyon Creek for approximately 0.1 mile to the terminus at the Project site.

The proposed natural gas transmission pipeline will be installed using conventional trenching, as well as horizontal directional drilling, slick bore, and jack-and-bore techniques. The natural gas pipeline will be installed within a trench approximately 42-inches below the paved road surface. In addition to the pipeline, Southern California Gas Company will construct two permanent, aboveground isolation valves; four underground isolation valves; and a metering station. The majority of the approximately 14-mile-long underground pipeline will consist of steel pipe designed for a maximum allowable operating pressure of 970 pounds per square inch, with a design level of 975 pounds per square inch. The outside diameter of the pipe will be 8.625 inches with a minimum wall thickness of 0.344 inch. The pipeline will be designed, constructed, operated, and maintained in accordance with all applicable requirements included in the United States Department of Transportation regulations in Title 49 of the Code of Federal Regulations Section 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards. Further, this Project will be subject to California Public Utility Commission standards as embodied under General Order 112-E. The natural gas transmission pipeline excavation may also be used for upgraded communication and other utility installations.

Isolation valves will be provided to shut down the flow of gas during operation and maintenance activities or emergency situations (Figure 2.6-2 – Typical Isolation Valve Station). One of these will be aboveground, located at the delivery point. The remaining two valves will be

underground: one at Divide Station and one at approximate milepost 8.20. Each isolation valve will include automatic shut-off and supervisory control and data acquisition equipment.

The underground valves will be located below the grade, with the exception of an approximately eight-inch access hole with a steel lid and the actuator. The actuator will be protected by a cage, fenced enclosure, and/or bollards measuring approximately ten feet by 20 feet. A small control box will be installed at the fence line of each valve station. At the Divide Station, all of the equipment will be located within the existing fenced limits. Isolation at the Project delivery point will also include require a fenced enclosure measuring approximately 60 feet by 120 feet. The delivery station will include provisions for metering, automated and manual isolation. A typical natural gas metering assembly is shown Figure 2.6-3 – Typical Meter Set Assembly.

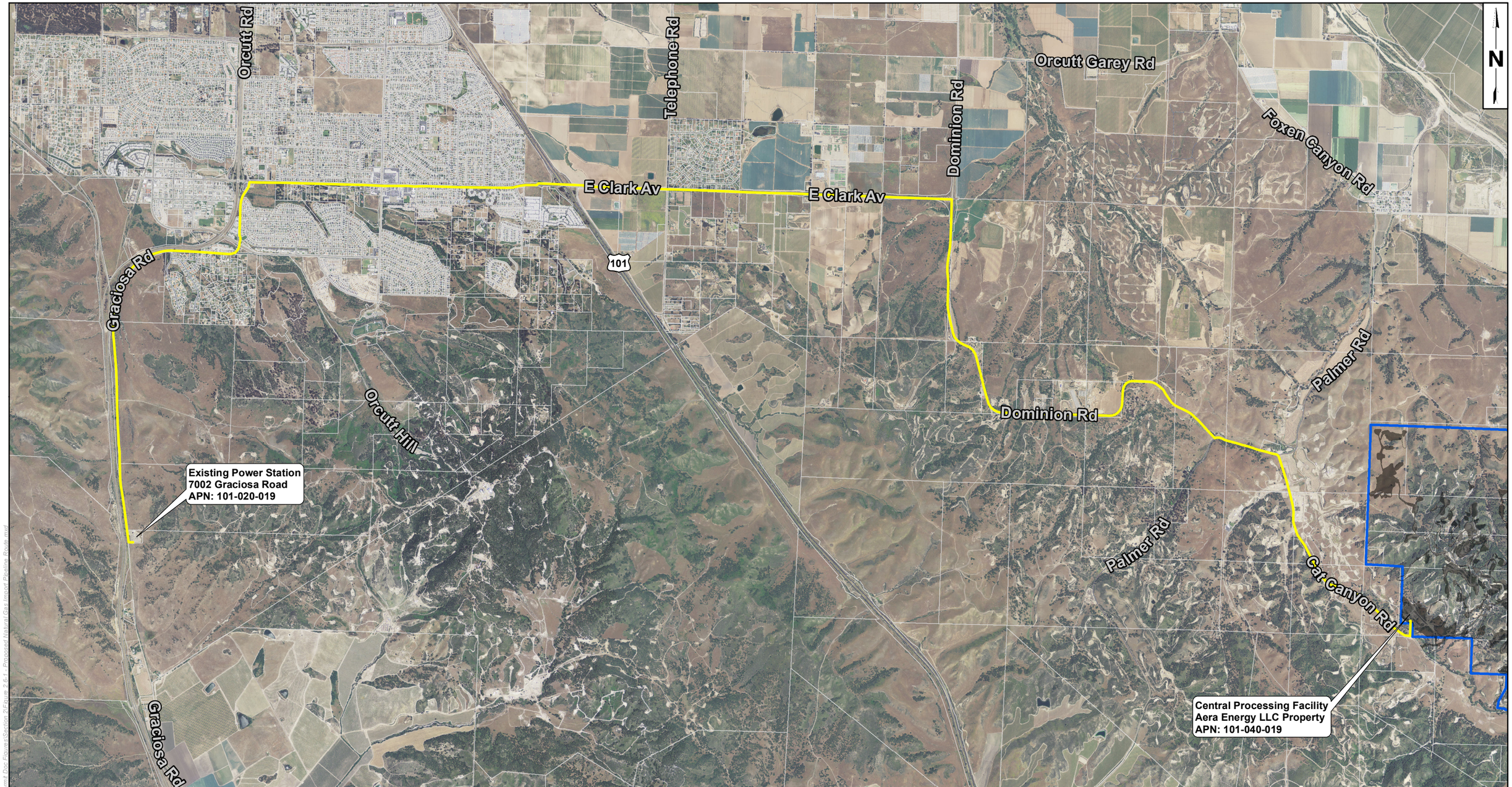
2.6.2 Electrical Power Service

2.6.2.1 Connection to Pacific Gas and Electric Company

The Project will be supported by transmission-level service from Pacific Gas and Electric Company. Expected electric load of the Project is approximately 12 megawatts. Aera has submitted an application to Pacific Gas and Electric Company for transmission interconnect from Pacific Gas and Electric Company to a new Aera-owned substation. The Aera sub-station is described in Section 2.4 above.

Pacific Gas and Electric Company's preferred alternative is to service Aera with transmission voltage power by tapping into Pacific Gas and Electric Company's Santa Ynez – Sisquoc 115 kilovolt Line (Figure 2.6-4 – Proposed Electrical Line Route). The connection will be designed, constructed, and operated by Pacific Gas and Electric Company. Pacific Gas and Electric Company determined that the coordination between relays at Sisquoc substation and the Aera tap can meet Pacific Gas and Electric Company's coordination criteria with some minor work. The relays for Sisquoc circuit breaker 162 need replacement and some relays setting adjustments are required at Santa Maria and Mesa substations.

Pacific Gas and Electric Company is subject to the jurisdiction of the California Public Utilities Commission and must comply with California Public Utilities Commission General Order 131-D on the construction, modification, alteration, or addition of all electric transmission facilities (i.e., lines, substations, switchyards, etc.). This includes facilities to be constructed by others and deeded to Pacific Gas and Electric Company. Because Pacific Gas and Electric Company is subject to the jurisdiction of the California Public Utilities Commission, it must also comply with Public Utilities Code Section 851. Among other things, this code provision requires Pacific Gas and Electric Company to obtain California Public Utilities Commission approval of leases and licenses to use Pacific Gas and Electric Company property, including rights-of-way granted to third parties for interconnection facilities.



LEGEND:

- Proposed Common Carrier Natural Gas Pipeline Route
- Project Footprint
- Aera Energy LLC Property Boundary
- Parcel Boundary

Source: Southern California Gas 8/2013 CAD &1/2014 PDF, Santa Barbara County Assessor, DPSI 2013 Survey, NAIP 2012
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: Discrepancies exist between data sourced from the County of Santa Barbara, such as land parcels and land use, and the Area Energy LLC property boundary. This is due to the Aera Energy LLC property boundary and Aera Energy LLC lease boundaries having been surveyed and field verified by a registered land surveyor (DPSI, 2013) and the County sourced data being created at a desktop level as a cadastral fabric best fitted to cover the entire County area. This map was created for informational and display purposes only.

0 1,750 3,500
FEET

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		PROPOSED NATURAL GAS IMPORT PIPELINE ROUTE	FIGURE 2.6-1
PROJECT NUMBER: 1002-0455	DATE: September 2014		

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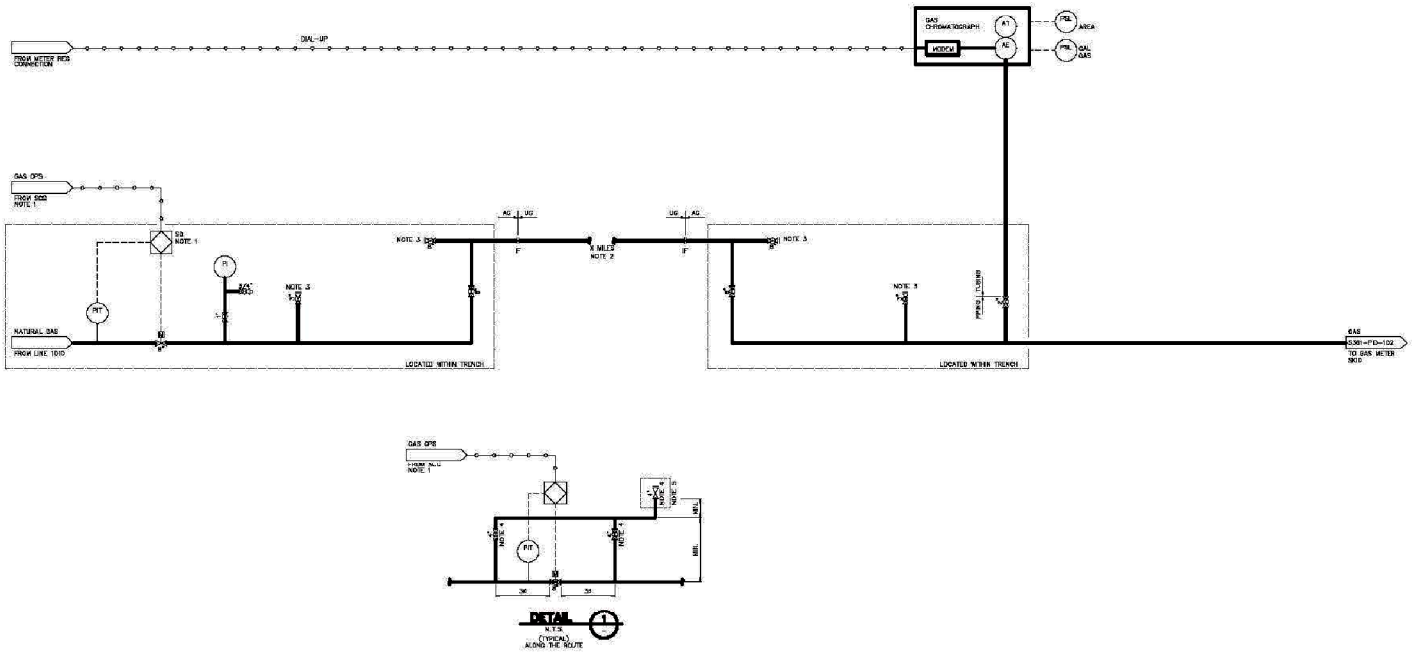

NOTES:

1. SHUT DOWN ON LOW PRESSURE AND/OR SIGNAL FROM SCG.
2. TAKE-OFF LOCATION AND DISTANCE DEPENDENT UPON ROUTE. IN-LINE SHUT-OFF VALVES TO BE LOCATED ALONG ROUTE AS DETERMINED. (SEE DETAIL 1)
3. FOR POTENTIAL PIGGING OPERATIONS (AS NECESSARY).
4. MIN. 4"
5. 12" ALUMINUM VAULT OR 24"x48" BOX FOR UNDERGROUND VALVES. NO VAULT OR BOX FOR ABOVEGROUND VALVES.

Source: SoCal Gas 3/2013
Notes: This map was created for informational and display purposes only.

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT	TYPICAL ISOLATION VALVE STATION	FIGURE 2.6-2
PROJECT NUMBER: 1002-0455 / DATE: September 2014		

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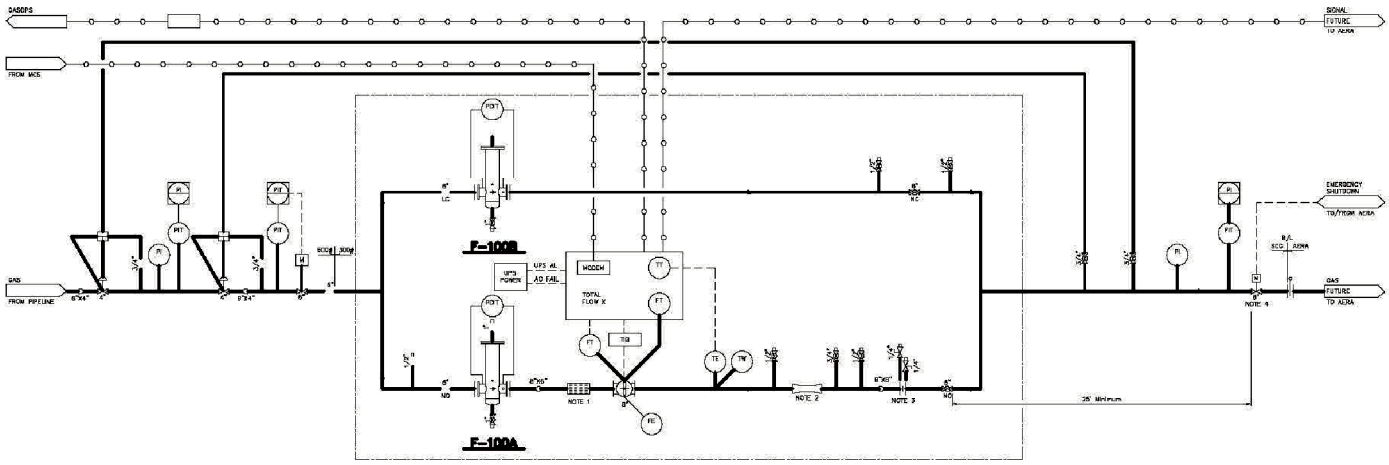
F-100A/B
6" DRY GAS FILTERS



NOTES:

1. FLOW STRAIGHTENING VAIN. NOT REQUIRED FOR QUOTED METER.
2. VENTURI TUBE FOR METER PROVING.
3. FLOW ORIFICE FOR METER PROVING.
4. EMERGENCY SHUTDOWN.
5. OVERPRESSURE PROTECTION.
6. WORKER & SAFETY VALVES TO ENSURE ADEQUATE PRESSURE DROP.

Source:SoCal Gas 2/2013
Notes: This map was created for informational and display purposes only.

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT		TYPICAL METER SET ASSEMBLY	FIGURE 2.6-3
PROJECT NUMBER: 1002-0455	DATE: September 2014		

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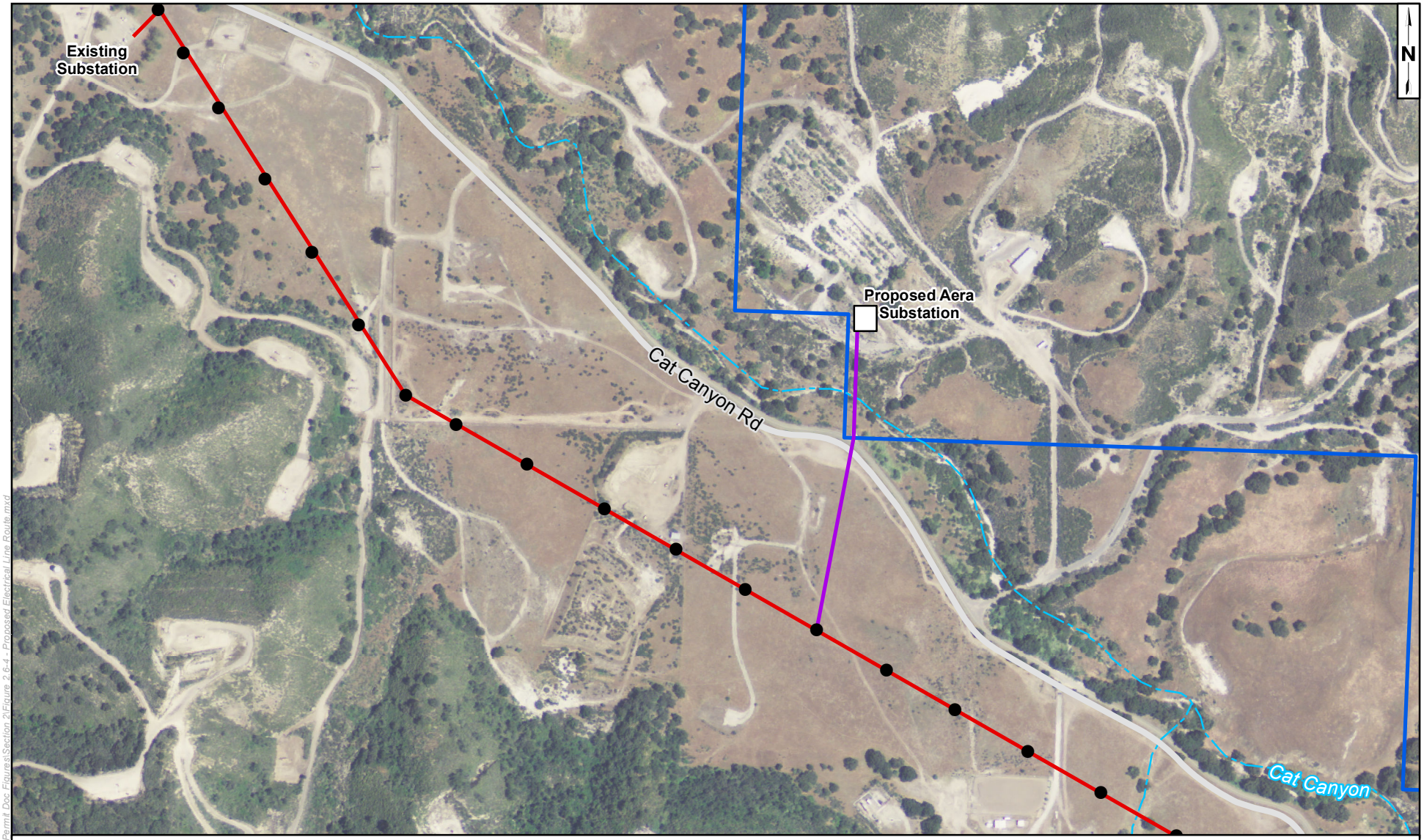

Existing 115kV Line Pole
Existing 115kV Line
Proposed 115kV Service Line
Aera Energy LLC Property
Existing Road
Hydrological Feature

Source: County of Santa Barbara, ESRI Online Basemaps, NAIP 2012, PGE, Aera Energy LLC 11-20-13 drawing, DPSI 2013 Survey
Notes: This map was created for informational and display purposes only

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PROJECT NAME:
EAST CAT CANYON
OIL FIELD REDEVELOPMENT PROJECT

PROJECT NUMBER: 1002-0455

DATE: September 2014

PROPOSED ELECTRICAL LINE ROUTE

FIGURE
2.6-4

Z:\Kristin\GIS Maps\Map Projects\East Cat Canyon\Permit Doc Figures\Section 2\Figure 2.6-4 - Proposed Electrical Line Route.mxd

The Pacific Gas and Electric Company Transmission Interconnection Handbook (Pacific Gas and Electric Company, 2013) explains the technical requirements for interconnection of loads to Pacific Gas and Electric Company's transmission system. The Transmission Interconnection Handbook documents facility connection requirements to the Pacific Gas and Electric Company system as required in North American Electric Reliability Coordination Standard FAC-001-0. They are based on applicable Federal Energy Regulatory Commission and California Public Utilities Commission rules and tariffs (e.g., Electric Rules 2, 21 and 22), as well as accepted industry practices and standards. In addition to providing reliability, these technical requirements are consistent with safety for Pacific Gas and Electric Company workers and the public. Pacific Gas and Electric Company has established standard operating, metering, and equipment protection requirements for load customers. The Transmission Interconnection Handbook covers such requirements for all transmission-level load entities proposing to interconnect with Pacific Gas and Electric Company's electric system. The Project has been designed to satisfy the requirements of the Pacific Gas and Electric Company's Transmission Interconnection Handbook and meet all applicable California Independent System Operator and Western Electricity Coordinating Council standards.

2.6.2.2 Electrical Sub-Station

The Aera-owned sub-station is described in Section 2.4 above.

2.6.3 On-site Septic System

The Santa Barbara County Department of Environmental Health Services requires permits for operation of sewage disposal systems. The Project septic systems will be designed by a qualified environmental professional and all County requirements for soils analysis, percolation testing, groundwater testing, design, and construction/installation will be satisfied.

2.7 EMERGENCY SHUT-DOWN SYSTEMS

Personnel and the environment at Project site will be protected by shutdown systems designed to:

- Shutdown and block-in individual production wells; and
- Interrupt the electric power distribution system to terminate production lift.

Reservoir fluids entering production well bores will be lifted to the surface with positive displacement, rod-pump systems using walking beam pumping units or subsurface pumping equipment. Surface pressure from the lift system will be adequate for produced fluids to continue to flow through the production gathering system and on to the central processing facility. Since reservoir pressure is not adequate to sustain flow without energized and operating artificial lift, an interruption in operation of the lift system will effectively stop flow from the reservoir and hence stop flow to the production gathering system.

Control systems will be installed on individual producing wells to monitor surface temperature, surface pressure, and well lift system performance. Out of range conditions at any individual well will result in a shutdown of the lift system for that well as well as closure of an emergency shutdown valve on the flowline from that well. The emergency shutdown valve protects the gathering system and other downstream pressure piping from overpressure by the production well. Out of range conditions (temperature or pressure) at well pads or at the central

processing facility (multiple types) may also result in a signal to effect shutdown of individual production well lift.

Supplemental to the capability to remotely shutdown individual production wells, the electrical distribution system for production well lift will be designed to allow interruption of all production wells with a single switch. A “re-closer” type electrical switch will be integrated into the 12 kilovolt overhead power distribution system. Manual initiation or significant out of range conditions at the central processing facility will open the switch, cutting power to the lift electrical distribution and stopping flow to the production gathering system. In the event of a shutdown, the process control, fluid inventory, and containment systems will be designed to contain the balance of fluids in the gathering system and in the central processing facility. Liquids will continue to be processed and contained in the piping and equipment of the plant, vapors will continue to collected and combusted.

2.8 OPERATIONS AND MAINTENANCE

All facilities/equipment will be operated, maintained and inspected in accordance with the applicable requirements of Division of Oil, Gas and Geothermal Resources contained in California Code of Regulations Title 14 and Santa Barbara County requirements. The natural gas pipeline will be operated in accordance with the pipeline safety requirements of the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration contained in Title 49 of the Code of Federal Regulations and the requirements of the California Public Utilities Commission. These regulations specify the types and frequencies of safety inspections and maintenance to be performed. Records documenting compliance with these requirements will be maintained on site and will be periodically reviewed by Aera personnel to ensure compliance. In addition, safety and compliance inspections/audits of the facilities are performed on a regular basis by Division of Oil, Gas and Geothermal Resources personnel.

2.8.1 Operations Processes, Systems, and Controls

2.8.1.1 System of Operating Excellence

The Project will implement Aera’s over-arching management system known as the System of Operating Excellence. The System of Operating Excellence provides a framework to achieve reliable and safe operations while minimizing impacts to the environment. The System of Operating Excellence continuously yields improvements to safety and the protection of human health and the environment. The System of Operating Excellence framework consists of Elements and Expectations. There are nine elements that define the strategic areas addressed by the framework:

1. Leadership, commitment and involvement;
2. Risk management;
3. People;
4. Process design and equipment operation and maintenance;
5. Contractor stewardship;
6. Environmental key processes and programs;
7. Health and safety key processes and programs;

8. Incident preparedness, response and follow-up; and
9. Auditing.

Each Element is further defined by Expectations that must be met to fulfill that element. Expectations will require that a process is in place to support the overall system and have the following five characteristics:

1. Scope and objectives;
2. Procedures;
3. Responsible and accountable resources;
4. Verification and measurement; and
5. Feedback protocol to improve the process.

2.8.1.2 Maintenance Philosophy

Total productive maintenance is fundamental to Aera's overall equipment reliability strategy. Total productive maintenance is productive maintenance carried out by all employees on a company-wide basis. A basic principle of total productive maintenance is a "total maintenance system" that includes a plan for the life cycle of the equipment:

- Maximize overall equipment effectiveness;
- Maintenance prevention (maintenance free design);
- Preventive and predictive maintenance;
- Equipment improvement (repairing or modifying equipment to prevent breakdowns and facilitate ease of maintenance); and
- Autonomous maintenance by operators.

All surface equipment, including but not limited to, production safety systems, wellheads, separators, valves, and pipelines, used for handling oil, gas, and produced water will be maintained in good operating condition and inspected and tested at regular intervals. Records showing the present status and history of each well safety device installed will be maintained, including dates, details and the results of inspections, tests and repairs.

2.8.1.3 Controls Philosophy

The Project will employ appropriately applied automation to improve safety, meet operations expectations and deliver planned performance. The main design objectives include:

- Equipment and facilities fail safe with all process fluids contained;
- Equipment and facilities sufficiently instrumented and controlled to run unattended;
- Adequate response time is included to implement corrective action or shutdown the process;
- Process data capture to facilitate continuous improvement efforts; and
- Design incorporates maintainability aspects.

2.8.1.4 Attendance Philosophy

During initial operation, the central processing facility will be provided with 24-hour surveillance. After the systems are mature, surveillance may be reduced to daylight hours only. Night surveillance of the wells will be a standing expectation throughout the life of the Project. Night surveillance duty will consist of driving through the field, including the central processing facility and other plant areas and responding to down equipment, pipeline leaks, storm water management issues, or property security issues.

2.8.2 Well Maintenance and Workover Operations

The profitability of a well depends on how long it is on-stream and on how much it produces. Its lifetime and output are dependent on keeping the well maintained in good working order and adjusting its operation to the constantly varying conditions prevailing in the reservoir and around the wellbore. After a well is completed and produced for some time, it may require a workover. A workover is any operation performed on a well to restore or increase its production. In general, workovers are done to:

- Control water or gas production in an oil well;
- Prevent water inflow from the reservoir;
- Repair mechanical problems;
- Remove scaling mineral deposits that clog flow; and
- Improve production.

Another workover operation is plugging and abandonment; however, it is a special case because plugging and abandonment occurs only after a well is no longer capable of economically producing oil and gas. Plugging and abandonment is included in workover operations because the same type of equipment and techniques are employed in it as are employed in other workover jobs.

The phases and sequencing of a well workover operation vary from one job to another; however, the general procedures are listed below:

1. Prepare the well before the servicing or workover unit arrives (i.e., checking the status of the well, pressure testing, opening a downhole circulating device, etc.);
2. Prepare the wellsite before the servicing or workover unit arrives (i.e., check accessibility for workover rig);
3. Put the well under safe conditions before rigging up the servicing or workover unit;
4. Install the servicing or workover unit. Once the well has been placed under safety conditions, the rig and all its equipment can be set up in accordance with safety distances, rules and regulations;
5. “Kill” the well (i.e. place a control fluid in the well whose hydrostatic pressure is equal to or greater than the reservoir pressure);
6. Conduct downhole operations;
7. Move out the servicing or workover unit; and

8. Start-up the well.

Well-servicing operations will be conducted primarily by contract services and will include one well servicing rig with a crew of four personnel for well workover and maintenance activities through “Year 4”. A second well servicing rig and crew of four personnel will be added in “Year 5” as the Project well drilling program progresses.

2.8.2.1 Well Abandonment

Aera will comply with California Senate Bill 1763 that requires the operators of oil, gas, injector, disposal and observation wells in the State of California to develop a process to abandon the idle wells under their control.

Within Aera, an Investment Recovery Team is tasked with coordinating all well abandonment activities which is based on the following process:

- Identify/approve well candidates.
- Obtain required permits.
- Safety review/pre-abandonment well walk.
- Well plan/cost estimate.
- Accounting procedures (pre abandonment).
- Well abandonment execution:
  - Preparation of the well location;
  - Salvage of reusable sub-surface equipment and preparation of the well bore;
  - Abandoning of the well bore;
  - Surface abandonment/recovery of surface equipment;
  - Transporting recovered material to appropriate destination; and
  - Documentation of well abandonment and recovered material.
- Post inspection of abandoned location.
- Accounting procedures (post abandonment).
- Post project review and reporting.

Per Santa Barbara County Petroleum Code (Chapter 25) requirements, Aera will implement the following procedures when abandoning wells:

- Prior to starting the plugging and abandonment of any well, Aera will furnish the petroleum administrator with copies of the Division of Oil, Gas, and Geothermal Resources notices required, a copy of the Division of Oil, Gas, and Geothermal Resources permit to conduct abandonment operations, and the anticipated date the plugging and abandonment operations are to commence.
- The subsurface plugging and abandonment of all oil and gas-related wells will be done in accordance with current Division of Oil, Gas, and Geothermal Resources regulations. Aera

will furnish the petroleum administrator with the required Division of Oil, Gas, and Geothermal Resources notice to verify compliance with all Division of Oil, Gas, and Geothermal Resources requirements.

- When conducting well abandonment activities, all drilling, production and appurtenant equipment, including pipelines, designated for the exclusive use of the subject well will be removed. Existing pipelines and equipment designated for current operations may be left in place. Aera may petition the petroleum administrator to leave equipment and pipelines, designated for future use, in place.
- The well casing will be cut off at least five feet below the ground level. Nothing will be placed in the excavation above the point of cutoff until the cutoff has been inspected by the petroleum administrator.
- The surface cement plug depth will conform to the requirements of Division of Oil, Gas, and Geothermal Resources.
- A steel cap of not less than the same thickness as the well casing will be welded to the casing. The steel cap will be located via Global Positional System and the well number and American Petroleum Institute number will be welded on the top of the casing.
- An investigation will be conducted to determine if a sump or pit is present. If a sump or pit is found to be present it will be remediated per an approved plan.
- All cellars and surface concrete structures will be removed. Tie downs will be removed to a minimum of six feet below ground surface. Soil below the cellars will be tested for hydrocarbon contamination. If contamination is found to be present, the area will be remediated. All excavations and depressions will be filled with clean soil. All oil, waste oil, refuse, and waste material will be removed from the drill site pursuant to all applicable laws and regulations.

In addition, per the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources lease restoration regulations (California Code of Regulations, Chapter 4, Subchapter 2, Article 3, section 1776), Aera will implement the following wellsite and lease restoration requirements at the end of the Project life:

- In conjunction with well plugging and abandonment operations, any auxiliary holes, such as rat holes, shall be filled with earth and compacted properly; all construction materials, cellars, production pads, and piers shall be removed and the resulting excavations filled with earth and compacted properly to prevent settling; well locations shall be graded and cleared of equipment, trash, or other waste materials, and returned to as near a natural state as practicable. Well site restoration must be completed within 60 days following plugging and abandonment of the well.
- Sumps shall be closed in accordance with Regional Water Quality Control Board and Department of Toxic Substances Control requirements.
- Unstable slope conditions created during site preparation shall be mitigated in such a manner as to prevent slope collapse.

- Access roads to well locations generally will not be covered by these regulations; however, any condition that creates a hazard to public safety or property or causes interference with natural drainage will not be acceptable.
- Prior to the plugging and abandonment of the last well or group of wells on a lease, the operator shall submit a plan and schedule for completing lease restoration. The lease-restoration plan shall also include the locations of any existing or previously removed, where known, sumps, tanks, pipelines, and facility settings. Lease restoration must begin within three months and be completed within one year after the plugging and abandonment of the last well(s) on the lease. However, the Supervisor may require or approve a different deadline for lease restoration.
- Lease restoration shall include the removal of all tanks, above-ground pipelines, debris, and other facilities and equipment. Remaining buried pipelines shall be purged of oil and filled with an inert fluid. Toxic or hazardous materials shall be removed and disposed of in accordance with Department of Toxic Substances Control requirements.
- Upon written request of the operator or property owner, exceptions to this section may be made provided the condition does not create a public nuisance or a hazard to public safety. Exceptions may also be granted by the Supervisor when these requirements conflict with local or federal regulations. If a written request for an exception is received from the operator, consent to the exception from the property owner may be required before it is approved by the Supervisor.

2.8.3 Permanent Personnel Requirements

At full build-out (Phase II), the Project will require an estimated 40 operating personnel comprised of staff and hourly worker positions. Company workforce will be supplemented with approximately 75 additional contractor personnel for well and equipment maintenance, on-going new construction activities, infrastructure and operations support, and materials delivery. The following Table 2.8-1 – Personnel Requirements and Shift Schedules provides a listing of the permanent personnel requirements and contract services for surface, subsurface, and drilling support for the operational phase of the Project.

Table 2.8-1. Personnel Requirements and Shift Schedules

Job Category	Personnel Count (per shift)	Shift Type[1]
FIELD OPERATIONS		
Operations Manager	1	9/80
Process Supervisor	3	9/80
Process Specialist	3	9/80
Logistics Specialist	1	9/80

Table 2.8-1. Personnel Requirements and Shift Schedules

Job Category	Personnel Count (per shift)	Shift Type[1]
Field Administrator	2	9/80
Senior Reliability Specialist (SRS)	3	9/80
Reliability Specialist- Plants (daylights)	2	12H
Reliability Specialist- Plants (evenings)	2	12H
Reliability Specialist- Night Rider	1	12H
Reliability Specialist- Steam	2	9/80
Reliability Specialist- Production	3	9/80
Reliability Specialist- Measurement	2	9/80
SRS- Mechanic	2	9/80
SRS- Electrician	1	9/80
SRS -Instrument Tech	2	9/80
Production Engineer	2	9/80
Facilities Engineer	2	9/80
Engineering Tech	1	9/80
Field Automation Specialist	1	9/80
Health and Safety Professional	1	9/80
Environmental Professional	1	9/80
Purchasing Professional	1	9/80
Warehouse Staff	2	9/80
CONTRACT SERVICES- SURFACE SUPPORT		
Pumping Unit Crew- crane operator	1	9/80
Pumping Unit Crew- support	2	9/80
Maintenance Contractor Supervisor	1	9/80
General Maintenance- crew	2	9/80
General Maintenance- welder	1	9/80

Table 2.8-1. Personnel Requirements and Shift Schedules

Job Category	Personnel Count (per shift)	Shift Type[1]
Plant Maintenance- crew	2	9/80
Plant Maintenance- welder	1	9/80
Vacuum Truck	1	9/80
Tank cleaning crew	3	12H
Tank cleaning- vacuum truck	1	12H
Electrical Maintenance- crew	2	9/80
Chemical Delivery	1	9/80
Chemical support- technician	1	9/80
Capital Project- supervisor	1	9/80
Capital Project- crew	2	9/80
Capital Project- crew	2	9/80
Capital Project- welders	2	9/80
Capital Project- electrical crew	2	9/80
CONTRACT SERVICES- SUBSURFACE SUPPORT		
Well servicing- rig	1	12H
Well servicing- gang truck	2	12H
Well servicing- tool pusher	1	12H
OTHER		
Vacuum Truck	1	12H
R&R- rig	1	12H
R&R- gang truck	2	12H
R&R- supervisor	1	12H
R&R Vacuum Truck	1	12H
Chemical- shot truck	1	9/80
DRILLING		

Table 2.8-1. Personnel Requirements and Shift Schedules

Job Category	Personnel Count (per shift)	Shift Type[1]
Drilling Support - Crew	2	On-Call
Drilling Support - Backhoe	1	On-Call
Tubular transportation	2	On-Call
Gravel sand delivery	1	On-Call
Float Equipment Delivery	1	On-Call
Drilling Rig - Rig	1	24H
Drilling Rig - Rig Crew	5	12H
Drilling Rig - Safety Captain	1	12H
Drilling Rig - Tool Pusher	1	24H
Drilling Fluids - Mud Engineer	1	24H
Cementing Services - Pump truck	1	On-Call
Cementing Services - Bulk truck	1	On-Call
Cementing Services - Supervisor	1	On-Call
Logging Services - Wireline truck	1	On-Call
Logging Services - Supervisor	1	On-Call
Mud Logging	1	12H
Vacuum Services	1	On-Call
Vacuum Services - Supervisor	1	On-Call
Gravel Pack Unit	1	On-Call
Solids control support	1	On-Call
Directional drilling services - Dir. Driller	1	24H
Directional drilling services - EM Technician	1	24H
Gas Detection Services	1	On-Call
Bit Support (Delivery)	1	On-Call
Under-reamer/Stabilizer Support (Delivery)	1	On-Call

Table 2.8-1. Personnel Requirements and Shift Schedules

Job Category	Personnel Count (per shift)	Shift Type[1]
Under-Reamer Supervision	1	On-call
Rig Supervision	1	24H

Notes:

1. 9/80 shift is 9 hour workdays on 9 of 10 weekdays over a two week period. Normal 9/80 workday hours are 630 am to 415 pm; 9/80 staff is not present on weekends or holidays. 12 hour shift change is 6:00 am and 6:00 pm, seven days a week; 12-hours shifts are fully staffed 365 days/year.

2.8.4 Tanker Truck Transportation Program

Light crude will be imported and produced oil will be exported by truck during Phase I. Light crude oil facilitates oil dehydration and also facilitates produced oil transportation by lowering the viscosity and raising the American Petroleum Institute of the produced oil.

Light crude sources are currently targeted to come from Aera's Belridge Producing Complex (South Belridge Oil Field) located approximately 45 miles west/northwest of Bakersfield in Kern County, California (Figure 2.8-1 – Regional Roadway Map). The approximate travel distance (one-way) from the Project site to the South Belridge Oil Field is approximately 133.8 miles. Produced oil, which will be a mixture of light crude and produced oil, will be trucked to Aera's Belridge Producing Complex by utilizing a portion of the returning trucks bringing light crude oil. Approximately 75 percent of the truck trips will be roundtrip (produced oil delivered to Belridge and light crude backhauled to the Project site) and 25 percent will be one-way (produced oil delivered to Belridge with no backhaul).

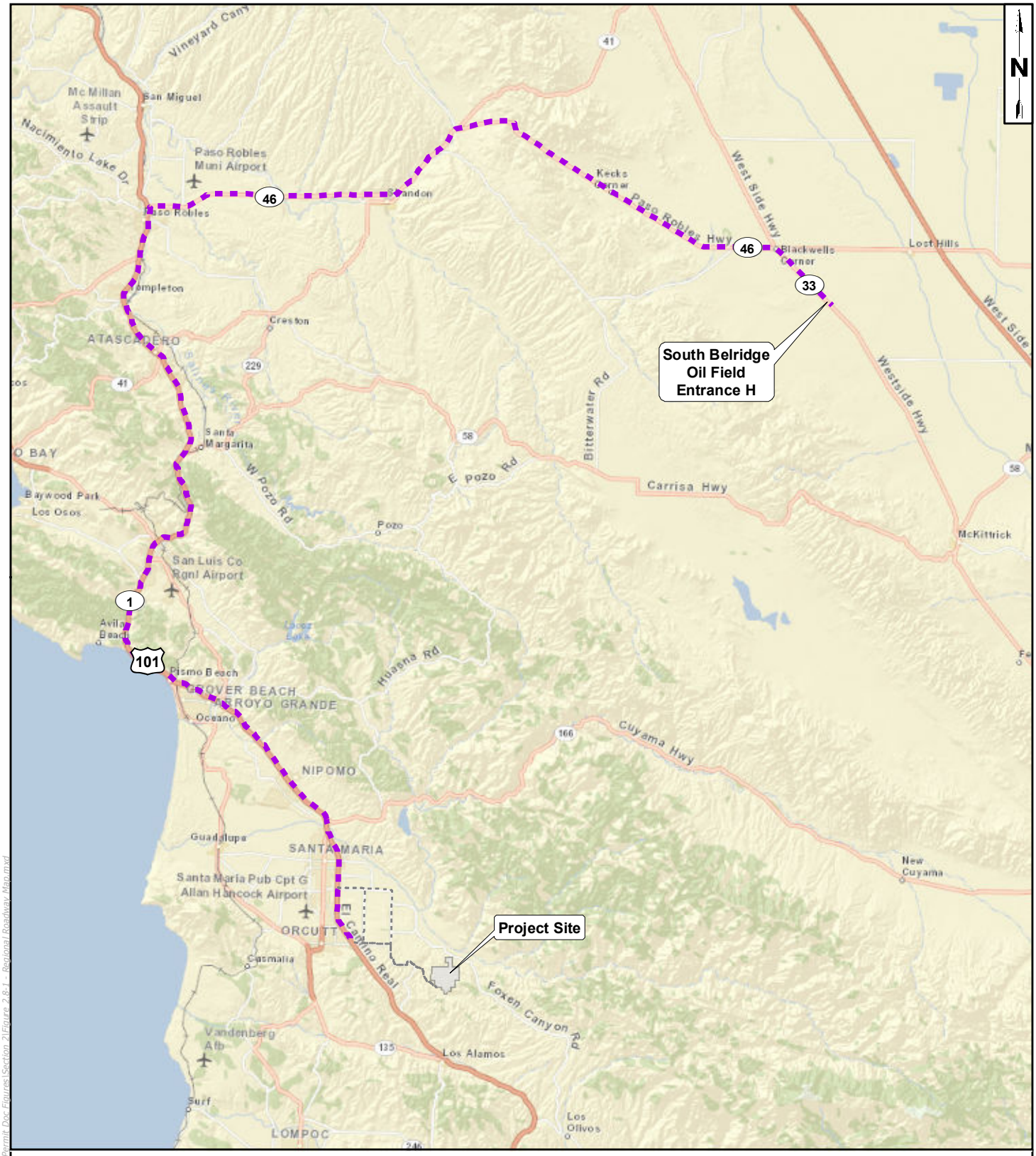
Figure 2.8-2 - Proposed Trucking Routes to Highway 101 Detail depicts the local road network that will be utilized between the Project Site and U.S. Highway 101. The Project will utilize a combination of one (or more) of three local roadway route alternatives. The Project traffic study (Appendix M) concluded that none of the route options will have a significant impact on traffic level of service on the roads and interchanges being travelled. The largest anticipated traffic delay at any intersection is measured in tenths of a second. The three route alternatives are as follows:

- Route Option 1 - Cat Canyon Road to Dominion Road to Clark Avenue to U.S. Highway 101;
- Route Option 2 - Cat Canyon Road to Dominion Road to Clark Avenue to Telephone Road to Betteravia Road to U.S. Highway 101; and
- Route Option 3 - Cat Canyon Road to Dominion Road to Foxen Canyon Road to Betteravia Road to U.S. Highway 101.

One of the Project goals is to safely and securely import light crude oil and export produced oil to and from the Project site. Aera has among the industry's most stringent safety expectations for its employees and contractors. Aera has designed the Project tanker truck transportation

program to meet and exceed its health, safety, security, and environmental compliance standards through implementation of the following policies, programs, and features:

- Fleet trucks will meet or exceed the *future* (2019) California Air Resources Board low emissions standards;
- Fleet trucks will be replaced with new trucks or new truck engines *every three years* to achieve continuously lower emissions as engine efficiency and technology improves. This will reduce air emissions *significantly* from a standard aggregate fleet mix;
- The feasibility of alternative fuel trucks, such as liquefied natural gas, which could potentially reduce emissions further, will be evaluated as an alternative for Phase II;
- Fleet drivers will have a minimum of two years of commercial driver experience, plus extensive training in defensive driving, emergency response, and other driving skills;
- Drivers will be trained on Project-specific requirements, including loading and transportation procedures, local traffic concerns and hazards, driver safety, and driver courtesy;
- All trucks will be linked to an integrated fleet geographical information management system that provides real-time satellite tracking and mapping of locations, speeds, and other parameters;
- A “geographical information system fence” feature can be used to set and measure compliance to limits, such as speed, acceleration, and de-acceleration, for trucks in a specific area and/ or at a specific time of day;
- All tanker trucks will be equipped with dual-sided dashboard video cameras;
- A fleet maintenance program including California’s Biennial Inspection of Terminals inspection program;
- The fleet operates an Electronic Driver Vehicle Inspection Report system, integrated with its maintenance system; and
- The fleet will operate under an effective health, safety, security, and the environment management system and emergency response system.



Aera Energy LLC Property

Proposed Route Option to U.S. Highway 101

Proposed Route to Belridge

0 5 10
MILES

Source: TJ Cross, ATE, ESRI Online Basemap
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposes only

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT	REGIONAL ROADWAY MAP	FIGURE 2.8-1
PROJECT NUMBER: 1002-0455 / DATE: March 2015		

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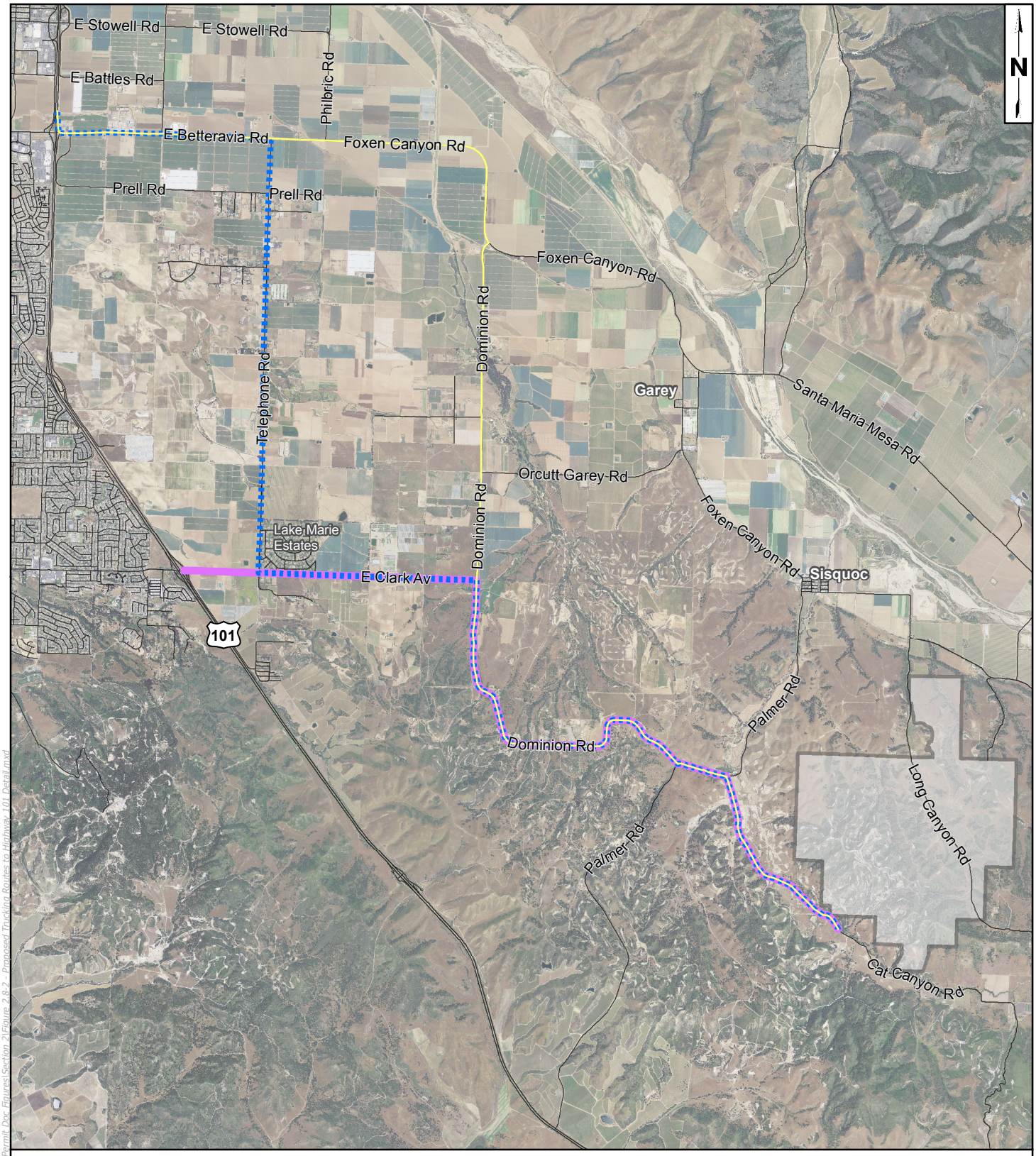

Aera Energy LLC Property
Project Option 1
Project Option 2
Project Option 3
Existing County Road

0 0.75 1.5
MILES

Source: ATE, NAIP 2012, County of Santa Barbara
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposes only

PROJECT NAME: EAST CAT CANYON OIL FIELD REDEVELOPMENT PROJECT	PROPOSED TRUCKING ROUTES TO HIGHWAY 101 DETAIL	FIGURE 2.8-2
PROJECT NUMBER: 1002-0455 / DATE: September 2014		

Z:\Kristin\GIS Maps\Map Project\East Cat Canyon\Permit Doc Figures\Section 2\Figure 2.8-2 - Proposed Trucking Routes to Highway 101 Detail.mxd

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2.8.5 Waste Handling and Storage

2.8.5.1 Anticipated Waste Streams

Ongoing field operations will generate the following waste streams and each of them will be managed in accordance with applicable Federal, State and local laws, regulations and ordinances:

- Spent non-regenerative sulfur treatment media: The spent media results from a batch process (marketed under numerous trade names) that will use iron oxides to remove hydrogen sulfide from the produced gas stream so that the gas can be used as supplemental fuel source. Spent media will be removed from the treatment vessel and then manifested and transported offsite and disposed or recycled appropriately at a licensed facility;
- Solid sulfur: In Phase II, a SulFerox® (or equivalent) gas treatment process will be added to the batch treatment process. SulFerox® is an iron-chelating based process that converts the sulfur species in the gas phase to elemental sulfur. This produces a sulfur slurry or cake that will be trucked offsite for agriculture (fertilizer) reuse, or to a licensed, offsite treatment, recycling, or disposal facility;
- Produced solids: Solids, (i.e., sand and fine grained sediments produced from the oil reservoir) are separated from the produced oil and sent to the solids concentrating plant. The solids will then be beneficially reused on site according to the Soil Beneficial Re-Use Plan developed for the Project site (Appendix K), or loaded into trucks to be beneficially reused at another Aera property offsite, or at the Santa Maria Landfill;
- Spent caustic solution (sulfur dioxide scrubber): The Project plan includes a contingent flue gas scrubber for Phase II if it is needed to remove residual sulfur components that would otherwise exceed Santa Barbara County Air Pollution Control Board permit limits. These flue gas scrubbers use consumable caustic solution to strip the sulfur components in the gas phase. The spent caustic solution will be neutralized and collected on site and sent to California Division of Oil, Gas, and Geothermal Resources permitted Class II upper Sisquoc water injection wells for reservoir maintenance or disposal; and
- Spent brine and neutralized acid and caustic from water softening: Spent brine from the produced water softening system will be collected and sent to California Division of Oil, Gas, and Geothermal Resources permitted Class II upper Sisquoc injection water wells for reservoir maintenance or disposal. The upper Sisquoc formation sands is an oil reservoir.

Table 2.8-2 – Process Waste Streams provides the listed average quantities for Phases 1 and II, temporary handling (staging), and final disposition of anticipated waste.

Table 2.8-2. Process Waste Streams

Type	Quantity (Average Rate)		Staging	Final Disposition
	Phase I	Phase II		
Spent non-regenerative sulfur treatment media	120.3 tons/month	35.4 tons/month	bins	Truck offsite to an appropriate recycling, treatment or disposal facility
Solid sulfur (from produced gas treating plant)	n/a	1.8 tons/day	bins	Truck offsite to an appropriate recycling, treatment or disposal facility
Produced solids	1.3 tons/day	3.5 tons/day	tank	Onsite beneficial reuse or truck offsite to an appropriate recycling, treatment or disposal facility
Spent caustic (sulfur dioxide scrubbers)	n/a	431.8 barrels/day	tank	Permitted well injection
Spent brine from water softening plant	4,404.5 barrels/day	13,136.8 barrels/day	tank	Permitted well injection

2.8.5.2 Waste Transport

A Hazardous and Non-hazardous Waste Materials Management/Transportation Plan will be developed by Aera to comply with state and federal regulations. Any waste scheduled to be transported offsite will be placed in U.S. Department of Transportation-approved containers, loaded into the appropriate vehicle (i.e., tanker truck, dry bulk carrier, bin carrier, etc.), manifested, and shipped to an appropriate waste facility.

2.8.6 Personnel and Facility Safety Protocol/Emergency Response

Injury and Illness Prevention Program. Consistent with California Code of Regulations Title 8, Section 3203, Aera has an established injury and illness prevention program that focuses on seven basic elements. These elements are intended to outline the following:

- Who is responsible for implementation of the injury and illness prevention program;
- How to promote compliance with safe and healthy work practices;
- Communication with employees in a readily understandable form;
- Identification and evaluation of workplace hazards:
- Investigation of occupational injuries or illnesses;

- Correction of unsafe or unhealthy conditions; and
- Training on the program.

Emergency Action Plan and Fire Protection Plan. Aera is currently working with a certified fire protection engineer to develop an Emergency Action Plan and Fire Protection Plan for the Project site. The plan will be written in accordance with Occupational Safety and Health Administration and Code of Federal Regulations under Title 8 and Title 29 for Emergency Action and Fire Prevention Plans as well as Santa Barbara County Fire Protection Development Standards. The primary goal of the Emergency Action Plan and Fire Protection Plan is the safety of workers during a workplace emergency. The Emergency Action Plan and Fire Protection Plan will describe the roles and responsibilities of the facility's responsible official, supervisors, employees, and emergency response teams to respond to various emergency scenarios. It will outline fire prevention/suppression equipment, as well as evacuation procedures to be followed to ensure safety of employees and the surrounding community.

Emergency Response Plan. Aera will develop an Emergency Response Plan specifically tailored to both the construction and operational portions of the proposed Project. The Project emergency response plan will include crisis management and business resumption planning in order to provide for the safety of workers and the general public, as well as the protection of the environment and property in the event of a major event. The intention of the plan is to initiate measures in advance to reduce potential dangers, impacts, and losses related to potential events associated with oil and gas operations. The plan will define what would constitute an event, the appropriate organizational response team, and the location of the company emergency operations center from which management will make response decisions.

The on-site manager, or supervisor, or his/her designated representative or "person in charge" will be responsible for notifications to 911, the Santa Barbara County Hazardous Materials Unit, State Office of Emergency Services, all personnel working at the facility at the time and the nearby community in the event of a hazardous materials release/emergency shut-down. A minor event may be dealt with by the on-site cleanup crew; on-site personnel who have been trained in spill cleanup. A major event may require the assistance of offsite personnel or a cleanup contractor. In order to prevent potential incidents, all responsible measures will be taken to stop or limit the release of hazardous materials or waste, including measures such as stopping operations, collecting or containing released materials, and removing or isolating containers. Emergency response equipment will be inspected regularly to ensure that equipment is available and in good working order if required. The facility will be equipped with a combustion-fired backup generator in order to operate critical equipment in the event of a major power failure.

2.8.7 Site Security

Public access to the Project site is restricted due to the presence of a locked, electronic gate located off of Cat Canyon Road and a locked, manual gate off of Long Canyon Road. The electronic gate is equipped with a "Knox Box" key for emergency response personnel and both gates are also equipped with combination padlocks that have been provided to Santa Barbara County Fire Department personnel for access to the property from either entrance. The remote nature of the Project location and presence of a maintained locked access gates will restrict public access to the Project site.

Additionally, the Project will conform to Aera's Information and Physical Security Programs. The elements of the Physical Security Program include three Process Standards which are Aera companywide basic requirements as well as 12 Project-specific Process Standards which are required for all Aera operations.

Aera Process Standards

1. Signage – trespass/ contraband & search authorization;
2. Buildings or grounds search procedure; and
3. Roadway control.

East Cat Canyon Process Standards

1. Check in/check out;
2. Physical security systems and communications systems tested;
3. Emergency communications systems;
4. Security awareness training;
5. Suspicious activity, trespasser and parked vehicle procedure;
6. Vehicle/personnel access points minimized;
7. Ensure remote buildings/facilities and equipment are secure;
8. Check designated unmanned or remote locations at frequent intervals;
9. Mail inspection procedure;
10. Evacuation shut down procedures;
11. Incident response plan; and
12. Security plan review.

2.9 END OF LIFE AND DECOMMISSIONING

2.9.1 General Decommissioning Procedures

Based on current projections, Aera estimates that the Project will span approximately 30 years. At such a time that Aera determines that its use of the East Cat Canyon properties as an oil producing facility has come to an end, Aera will make a determination as to divesture or decommissioning of the Project site facilities and wells. Surface and subsurface abandonment activities will begin after all applicable permits and notifications are completed.

Typically, decommissioning of an oil field property includes the following:

- Shut-down and bleed down of facilities and pipelines;
- Removal of residual oil, gas, and water from tanks, pipelines, and vessels;
- Plugging and abandonment of oil wells;
- Removal of surface equipment at well sites;
- Isolation and removal of utility systems (water, electrical service, and natural gas);

- Demolition and removal of intra-facility pipelines, tanks, vessels, and other equipment;
- Demolition of on-site buildings and structures;
- Demolition and removal of concrete foundations and slabs;
- Assessment and remediation of contaminated soils; and
- Re-grading and re-seeding of facility and infrastructure areas.

Permits will be required for decommissioning activities from the County of Santa Barbara and other regulatory agencies as needed, including but not limited to the U.S. Army Corps of Engineers, Central Coast Regional Water Quality Control Board, California Department of Fish and Wildlife, California Division of Oil, Gas, and Geothermal Resources, and the Santa Barbara County Air Pollution Control District.

2.9.2 Santa Barbara County Petroleum Code

The County of Santa Barbara has enacted regulations under the County Petroleum Code [Chapter 25 (Ordinance #4794)] that regulate the abandonment and removal of oil and gas facilities. The Petroleum Code addresses well abandonment and lease restoration requirements and requires submittal of a lease restoration plan to the Petroleum Office prior to the abandonment of the last well on a lease.

At the completion of the Project site's oil producing activities, Aera is committed to restoring the Project site per Santa Barbara County "lease restoration procedures", as outlined in Chapter 25 – Petroleum Code (Sec. 25-31). Prior to the abandonment of the last well on the Project site, Aera will file with the petroleum administrator a plan, for approval, to restore the Project site to a condition in conformance with state, county, and local ordinances. Aera will coordinate with the County petroleum unit along with County grading, planning and development, the fire department and other agencies, as required, to ensure all lease restoration requirements have been addressed.

The lease restoration plan may include the following measures/procedures, or equivalent:

- Equipment removal. Tank batteries, production islands, gas treating/compression areas, all appurtenant equipment areas, pipelines and foundations will be removed, unless otherwise noted in the approved lease restoration plan. An investigation will be conducted to determine if soil contamination is present. If soil contamination is found, the area will be remediated if necessary, per an approved plan.
- Removal of flow lines and utilities. All flow lines, gathering lines and other lease pipelines will be flushed with water and removed, unless due to location the removal will cause more environmental damage than the potential benefit by its removal or unless otherwise noted in the approved lease restoration plan. The soil will be sampled along the lines at a rate specified in the approved lease restoration plan. Electrical transmission and communication lines will be removed, unless otherwise noted in the approved lease restoration plan.
- Building removal. All buildings will be removed from the Project site, unless otherwise noted in the approved lease restoration plan. Buildings and areas used for storage and/or testing will have an investigation to determine if soil contamination exists. If soil

contamination is found, the impacted area will be remediated if necessary, per an approved plan.

- Remediation of sumps, pits and areas of soil contamination. An investigation will be conducted in locations of historic sumps, pits and known soil contamination. If soil impacts are identified, the areas will be remediated if necessary per an approved plan.
- Removal of roads and well sites: Roads and well sites will be removed and the areas re-contoured to as close to natural slope as reasonable, unless otherwise noted in the approved lease restoration plan.
- Facilities to be left in place. Aera will coordinate with the petroleum administrator to determine which facilities, if any, may be appropriate to leave in place, including but not limited to: roads and well pads, electrical power lines, communication lines, pipelines, concrete pads, and buildings.
- Completion. Upon completion of full site restoration Aera will obtain a closure letter from the petroleum administrator.