CE Obsidian Energy LLC
A Limited Liability Company

DOCKET	
02-AFC-2C	
DATE	Jul 30 2009
RECD.	Aug 10 2009

July 30, 2009

State Water Resources Control Board
Colorado River Basin Region
73-720 Fred Waring Drive
Suite 100
Palm Desert, CA 92260
Attn.: Herb Jackson, P.G., REA II
Engineering Geologist

Subject: Application/Report of Waste Discharge
Black Rock 1, 2, and 3 Geothermal Power Project

Dear Herb:

This transmittal letter is to submit the enclosed Application/Report of Waste Discharge (ROWD) associated with construction of the "Black Rock 1, 2, and 3 Geothermal Power Project", which was formerly listed as the "Salton Sea Geothermal Unit 6 Power Project" (SSU6). The new project referred to as the Black Rock 1, 2, and 3 project was fully described within the SSU6 Amendment Petition submitted to the California Energy Commission (CEC) in March 2009. The CEC should have furnished you a copy of the SSU6 Amendment Petition and CEC stated they have been in discussions with you regarding the specific issues of this project as part of their staff analysis.

The subject project will involve construction of three (3) brine ponds on the main plant site. Also, three (3) mud sumps will be constructed on the plant site to facilitate drilling of the project's brine production wells. Additionally, there will be three (3) mud sumps constructed at off site locations from the main site for the purpose to handle the drilling of the project's brine injection wells. These off site mud sumps will be constructed adjacent to pad for the three brine injection well located generally to the south, southeast, and east of the main plant site. All of the mud sumps will be decommissioned at the conclusion of the drilling program per regulations.

7030 GENTRY ROAD • CALIPATRIA, CALIFORNIA 92233 • 760-348-4000 • Fax: 760-347-2714

If you have any questions regarding this application, then please contact Doug Hackley at 760.604.2792, or Michael P. Fawdry, P.E. at 518.810.1395. We look forward to working with you on this project.

Best regards,

D Hackley

Doug Hackley
Project Manager

Attachment

CC: S. Larsen, President, CalEnergy
C. Parker, CalEnergy
D. Rundquist, CEC
M. Trask, CEC
J. Salamy, CH2M Hill
M. Fawdry, P.E., ICSUS

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

I. FACILITY INFORMATION

A. Facility:

Name: Black Rock Units 1-3			
Address: McKendry Road to the north, Severe Road to the west, Peterson Road to the south, and Boyle Road to the east			
City: Unincorporated County	County: Imperial	State: CA	Zip Code: 92233
Contact Person: Doug Hackley		Telephone Number: 760-348-4025	

B. Facility Owner:

Name: CE Obsidian Energy LLC			Owner Type (Check One) 1. ☐ Individual 2. ☑ Corporation 3. ☐ Governmental Agency 4. ☐ Partnership 5. ☐ Other:
Address: 1111 South 103rd Street			
City: Omaha	State: NE	Zip Code: 68124	
Contact Person: Steve Larsen		Telephone Number: 760-348-4221	Federal Tax ID:

C. Facility Operator (The agency or business, not the person):

Name: CalEnergy Operating Corporation			Operator Type (Check One) 1. ☐ Individual 2. ☑ Corporation 3. ☐ Governmental Agency 4. ☐ Partnership 5. ☐ Other:
Address: 7030 Gentry Road			
City: Calipatria	State: CA	Zip Code: 92233	
Contact Person: Doug Hackley		Telephone Number: 760-348-4025	

D. Owner of the Land:

Name: Imperial Magma, LLC			Owner Type (Check One) 1. ☐ Individual 2. ☑ Corporation 3. ☐ Governmental Agency 4. ☐ Partnership 5. ☐ Other:
Address: 1111 South 103rd Street			
City: Omaha	State: NE	Zip Code: 68124	
Contact Person: Steve Larsen		Telephone Number: 760-348-4221	

E. Address Where Legal Notice May Be Served:

Address: 1111 South 103rd Street		
City: Omaha	State: NE	Zip Code: 68124
Contact Person: Steve Larsen		Telephone Number: 760-348-4221

F. Billing Address:

Address: 7030 Gentry Road		
City: Calipatria	State: CA	Zip Code: 92233
Contact Person: Doug Hackley		Telephone Number: 760-348-4025

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

**APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT**

II. TYPE OF DISCHARGE

Check Type of Discharge(s) Described in this Application (A or B):

☑ **A. WASTE DISCHARGE TO LAND** ☐ **B. WASTE DISCHARGE TO SURFACE WATER**

Check all that apply:

☐ Domestic/Municipal Wastewater Treatment and Disposal
☐ Cooling Water
☐ Mining
☐ Waste Pile
☐ Wastewater Reclamation
☐ Other, please describe: ______
☐ Animal Waste Solids
☐ Land Treatment Unit
☐ Dredge Material Disposal
☑ Surface Impoundment
☑ Industrial Process Wastewater
☐ Animal or Aquacultural Wastewater
☐ Biosolids/Residual
☐ Hazardous Waste (see instructions)
☐ Landfill (see instructions)
☐ Storm Water

III. LOCATION OF THE FACILITY

Describe the physical location of the facility.

1. Assessor's Parcel Number(s)	2. Latitude	3. Longitude
Facility: 020-110-08	Facility: 33 10' 50"	Facility: 115 37' 28"
Discharge Point: 020-110-08	Discharge Point: 33 10' 50"	Discharge Point: 115 37' 28"

IV. REASON FOR FILING

☑ New Discharge or Facility
☐ Change in Design or Operation
☐ Change in Quantity/Type of Discharge
☐ Changes in Ownership/Operator (see instructions)
☐ Waste Discharge Requirements Update or NPDES Permit Reissuance
☐ Other: ______

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency: California Energy Commission

Has a public agency determined that the proposed project is exempt from CEQA? ☐ Yes ☑ No

If Yes, state the basis for the exemption and the name of the agency supplying the exemption on the line below.

Basis for Exemption/Agency: ______

Has a "Notice of Determination" been filed under CEQA? ☐ Yes ☑ No

If Yes, enclose a copy of the CEQA document, Environmental Impact Report, or Negative Declaration. If no, identify the expected type of CEQA document and expected date of completion.

Expected CEQA Documents:

☐ **EIR** ☐ **Negative Declaration**

Expected CEQA Completion Date: Unknown

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

Application/Report of Waste Discharge General Information Form for Waste Discharge Requirements or NPDES Permit Section VI - Other Required Information and Section VII - Other; July 2009

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name: Stephen Larsen Title: President

Signature: Stephen Larsen Date: 7/30/09

FOR OFFICE USE ONLY

Date Form 200 Received:	Letter to Discharger:	Fee Amount Received:	Check #:

Application/Report of Waste Discharge General Information Form for Waste Discharge Requirements or NPDES Permit

Section VI – Other Required Information and Section VII – Other

1.1 Introduction

CE Obsidian Energy, LLC (CE Obsidian) is proposing an amendment to the currently effective license for the Salton Sea Unit 6 (SSU6) project to allow for the construction of three smaller geothermal plants that will produce a combined total of 159-megawatt (MW) net (nominal) of clean, renewable energy (referred to herein as the "Amended Project"). A copy of this amendment should have been transmitted to the Regional Water Quality Control Board by the California Energy Commission (CEC). The following information includes excised portions of material contained in the Amendment Petition for the Amended Salton Sea Unit 6 Project, submitted to the CEC in February 2009, which are relevant to the Application/Report of Waste Discharge.

CE Obsidian specifically submits this application for the following components of the Amended Project:

- Mud Sumps
- Brine Ponds (surface impoundments)

1.1.1 Affected Environment

1.1.1.1 Project Location and Description

The Amended Project is located southeast of the Salton Sea in an unincorporated area of Imperial County, approximately 6 miles northwest of the community of Calipatria and approximately 7.5 miles southwest of the community of Niland (Figure 1). The project site is bounded by McKendry Road to the north, Severe Road to the west, Peterson Road to the south, and Boyle Road to the east. The approximately 160-acre project site (APN 020-110-08) is at an average elevation of 225 feet below mean sea level (msl). The property is owned by Imperial Magma, LLC, which is an affiliate of CE Obsidian. The project site is located in the southwest quarter of Section 33 Southwest, Township 11 South, Range 13 East, San Bernardino Meridian. Primary land uses in this region of the Imperial Valley include agriculture and geothermal power production. The project site is located within the Salton Sea Known Geothermal Resource Area and is covered by the County of Imperial's Geothermal Overlay Zone, which allows for development of geothermal resources and geothermal power plants.

The Amended Project consists of three 53-MW net geothermal electric power plants (Black Rock Units 1, 2, and 3), which will produce a combined 159-MW net of clean, renewable geothermal power. These plants will be operated as base load plants that will be in continuous operation excepting planned maintenance outages and so forth. The three units will be co-located on a common site. This site incorporates 80 acres of the original SSU6 project site as well as an additional contiguous 80-acre site located to the south. The Amended Project will be owned by CE Obsidian and operated by CalEnergy Operating Corporation, an affiliate of CE Obsidian.

The Amended Project includes 22 wells:

- Nine production wells on three pads (average pad size 6.6 acres, three wells each) onsite
- Nine injection wells on three pads (average size 4.7 acres, three wells each) offsite (approximately 8,000 to 10,000 feet south, southeast, and east of the plant site)
- Two plant wells
- Two aerated brine wells

The three geothermal power plants will be situated near the center of the site. A site map is included as Figure 2. Each of the three proposed geothermal power plants consists of two major components, a Resource Production Facility (RPF) and a Power Generating Facility (PGF). The three plants also will share various support facilities and equipment. The RPF includes all the brine and steam handling facilities from the production wellheads to the injection wellheads. RPF equipment includes a brine injection system, a brine pond, steam-polishing equipment designed to provide turbine-quality steam to the PGFs, and appropriate steam-venting vessels to support operations during startup/shutdown and emergency conditions. Each PGF includes a condensing turbine/generator set, a noncondensable gas (NCG) removal and abatement system, and a cooling tower. Shared support facilities include a 230-kilovolt (kV) switchyard, a control building, service water pond, plant injection wells, and a condensate storage/stormwater sedimentation basin.

1.1.1.2 Site Characteristics

The climate is characterized by extreme aridity and high summer temperatures. Precipitation in the area averages approximately 2.64 inches per year. Table 1 summarizes monthly precipitation in the vicinity of the Amended Project.

TABLE 1
Average Monthly Precipitation near the Project Site (Niland, California) (1914-2008)

Precipitation	Annual	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Average (inches)	2.64	0.22	0.20	0.36	0.40	0.37	0.29	0.09	0.01	0.02	0.18	0.28	0.22

Source: AECOM, 2009

Current land uses around the plant site include agriculture, geothermal production, and wildlife conservation habitat. The injection well pads and pipeline routes occur on and are surrounded by agricultural lands, roadways, ditches, and developed industrial area. Most of the agricultural areas on and adjacent to the project site are currently active with agricultural fields, or have been recently used for alfalfa, wheat, or onion production. Alluvial and non-marine deposits underlie the project area. Potential for water and wind erosion ranges from high to moderate for soil types in the project area. Soil types found at the project site are as follows:

- Glenbar Clay Loam, wet – Nearly level, very deep soils formed in alluvial sediment on floodplains and in alluvial basins within irrigated areas. Irrigation has caused a perched water table at a depth of 36 to 60 inches, and the water can rise to a depth of 18 inches during periods of heavy irrigation.
- Holtville Silty Clay, wet – Nearly level, very deep stratified soil formed in alluvial sediment on floodplains and alluvial basin floors. Irrigation has caused a perched water table at a depth of 36 to 60 inches, and the water table can rise to within 18 inches of the surface during periods of heavy irrigation.
- Imperial-Glenbar Silty Clay Loams, wet, 0 to 2 percent slopes – Nearly level, very deep calcareous soils formed in alluvial deposits on floodplains and lakebeds within the irrigated areas of Imperial Valley. Irrigation has caused a perched water table commonly at a depth of 36 to 60 inches, but which can rise to a depth of 18 inches during periods of heavy irrigation.
- Indio Loam wet – Nearly level, very deep soils formed in alluvium and eolian sediments on floodplains and basin floors. Irrigation has caused a perched water table commonly at a depth of 36 to 60 inches, but which can rise to a depth of 18 inches during periods of heavy irrigation.

1.1.1.3 Surface Water

Surface water features in the vicinity of the Amended Project include the Salton Sea (0.3 mile to the west and north), New River (2.7 miles to the southwest), Alamo River (4.8 miles to the northeast), and two irrigation drains, Vail Drain 4a and Vail Lateral Drain 5 (on the east and west sides of the project site, respectively). All drainage from the project area drains toward the Salton Sea, which is a closed basin with no outlet for surface water discharge. Inflows to the Salton Sea are limited primarily to surface and groundwater return flows from agricultural irrigation and stormwater runoff during the rainy season. The New and Alamo Rivers are both perennial streams with headwaters starting in Mexico that convey primarily agricultural irrigation drainage and some treated wastewaters. The Sonny Bono Salton Sea Wildlife Refuge Headquarters is approximately 1 mile northeast of the project site. The beneficial use designations for surface water bodies in the area of the Amended Project are listed as follows.

- <u>Salton Sea</u>: Aquaculture; Industrial Service Supply (potential); Water-contact Recreation; Non-contact Water Recreation; Warm Freshwater Habitat; Wildlife Habitat; and Preservation of Rare, Threatened, or Endangered Species.
- <u>Alamo River, New River, and Imperial Valley Drains including the Vail Drains</u>: Freshwater Replenishment; Industrial Service Supply (New River only); Water-contact Recreation (Alamo River only); Non-contact Water Recreation (Alamo River only); Warm Freshwater Habitat; Wildlife Habitat; Hydropower Generation (potential – Alamo River only); and Preservation of Rare, Threatened, or Endangered Species.

Water contact is unauthorized in the Vail Drains. The New River is unfit for any recreational use because of existing contamination. The Salton Sea has a history of water quality issues associated with increasing salinity and nutrient concentrations. The Clean Water Act Section 303(d) requires states to list water bodies not meeting water quality standards (or impaired). The Salton Sea is listed for nutrients, salinity, and selenium with sources designated as agricultural return flows. The New River is listed for bacteria, nutrients, pesticides, and sedimentation/siltation and the Alamo River is listed for pesticides, sedimentation/siltation, and selenium. The sources of pollutants are all designated as agricultural runoff.

1.1.1.4 Groundwater

The Amended Project site is located within the Imperial Hydrologic Unit of the Imperial Valley Planning Area. The Imperial Valley Planning Area encompasses approximately 2,500 square miles. The main source of groundwater recharge to the shallow aquifer system is imported Colorado River water that seeps from canals and is applied as irrigation. Shallow groundwater, ranging in depths from approximately 5 to 20 feet below the ground surface (bgs), is drained by an extensive network of ditches and drains in agricultural areas as well as into the Alamo and New Rivers that then drain to the Salton Sea. The deep aquifer has been estimated to contain anywhere from 1.1 billion to 3 billion acre-feet of water, and the total recoverable water has been estimated to be approximately 20 percent of the total. Water in the upper portion of the deep aquifer, known as the KGRA, is high temperature and high in total dissolved solids (TDS). The Amended Project uses this aquifer for the brine from which geothermal steam is extracted. Groundwater in the Imperial Hydrologic Unit has a designated beneficial use for industrial supply purposes.

Previous geotechnical investigations performed at the Amended Project site found that the depth to groundwater is shallow, ranging from approximately 3 to 6 feet bgs. Naturally occurring groundwater in the area is hydraulically connected to the Salton Sea and is very saline. The fine-grained deposits that are characteristic of the area have transmissivities of 1,000 to 10,000 gallons per day per foot to depths of approximately 500 feet. The low transmissivity of these deposits limits the ability of water to percolate downward into deeper aquifers (greater than 500 feet bgs). As a result, depleted groundwater levels will recharge slowly, which limits the potential for development of groundwater in the area. The deep aquifer is too saline for irrigation and most other beneficial uses. The geothermal reservoir is not in hydraulic connection with surficial groundwater.

1.2 Project Characteristics

1.2.1 Process Description

The Amended Project includes three RPFs, three PGFs, and ancillary facilities. The project includes three high-efficiency condensing steam turbines with a net unit output of 53 MW each (159 MW total). The design of the RPF utilizes a single-stage flash to produce the required steam supply to the turbine. The single-stage flash starts at the production well pad that supports its associated PGF. Hot, high-pressure (HP) geothermal fluid (brine) is extracted from the geothermal reservoir through three production wells located on the aforementioned well pad. As the brine travels up the production well casing, it “flashes” producing two-phase steam and brine flow, which is conveyed to a steam handling system. The flash point is set to avoid solids precipitation in the depleted brine and the depleted brine can be further chemically conditioned if necessary with hydrochloric acid to prevent scale formation in the process piping or injection wells, and injected back into the formation through the offsite injection wells. The facilities and equipment that handle the brine constitute the RPF. The steam handling system consists of a scrubber, HP separator, and demister.

Steam from the RPF is conditioned through scrubber and demister stages and sent to the steam turbine, which drives a generator for power production. The depleted steam leaves the turbine and enters a shell-and-tube heat exchanger that condenses the steam to water. Cooling water for the heat exchanger is provided by a piping loop from the cooling towers. Water condensed in the heat exchanger is used for cooling tower make-up water, among other (much smaller quantity) uses. NCGs released from the condensed steam are evacuated from the heat exchanger using a vacuum pump and sent to a regenerative thermal oxidizer (RTO) for control of hydrogen sulfide (H_2S), methane, benzene, and other trace gases. Exhaust from the RTO is routed to a wet scrubber before being released to the atmosphere. Wastewater from the wet scrubber flows to the cooling tower basin and then to the plant injection well for reinjection into the formation. Figure 3 shows the Process Flow Diagram for the Amended Project.

1.2.1.1 Resource Production Facility

The fundamental purpose of the RPF is to extract geothermal brine, to produce steam for power generation, and re-inject the spent geothermal brine. Three different types of wells associated with the RPF include: (1) production wells that are used to extract geothermal fluids; (2) injection wells that are used to inject geothermal brine after energy has been extracted; and (3) plant wells that are used as injection wells dedicated to excess condensate generated, cooling tower blowdown, and aerated brine from the brine ponds. In addition to the production and injection wells, numerous processing components are associated with the RPF. The following list of major subsystems of the RPF are described in the following sections.

- Production wells, well pads, and associated pipelines
- Steam handling system
- Brine injection wells, well pads, and associated piping
- Brine ponds
- Production Test Units (PTU) and rock muffler

1.2.1.1.1 Production Wells

As part of the Amended Project, there are nine production wells (three for each 53-MW unit on three separate well pads). Each production well will be drilled to a depth of approximately 7,400 feet, with casing set at a depth of approximately 2,500 feet bgs. However, the actual depths will vary based on the geology and reservoir characteristics encountered during the drilling of the production wells. The proposed production wells are spatially separated from injection wells to optimize field development and reservoir management. The well pads will be equipped with production line warm-up headers used to start up the production wells after they are drilled and for facility startups. During initial startup, the warm-up headers will feed into a warm-up line that discharges into a PTU located near the brine pond. For each of the three power plants, there will be one PTU and one brine pond. Liquid from each PTU will discharge into the brine pond. Each production well will have an average flow rate of approximately 2.1 million pounds of brine per hour at wellhead pressures of 375 to 425 pounds per square inch (psi) and at temperatures of 450 degrees Fahrenheit (°F) to 480°F.

Reservoir properties of the hyper-saline brine in the Amended Project area are expected to have downhole temperatures of 500 to 600°F and a TDS content of approximately of 23.5 percent by weight, with NCGs of 0.212 percent by weight. Dissolved solids consist primarily of sodium chloride, calcium chloride, and potassium chloride salts. Zinc, manganese, iron, and silica are also dissolved in the brine. The major component of the NCG is carbon dioxide (CO_2). While the brine includes a broad range of other components, the other components each represent less than 0.3 percent by weight. Each well will produce an average of 2.1 million pounds per hour of a mixture of steam vapor, NCG, and brine in a two-phase flow.

The anticipated chemical composition of the produced fluids based on the applicant's operating experience is shown in Table 2.

TABLE 2
Anticipated Chemical Composition of Produced Fluids

Constituent	Concentration (ppm)
Beryllium	ND[1]
Ammonium	369
Sodium	50,169
Magnesium	39
Aluminum	ND[1,2]
Potassium	12,784
Calcium	24,584
Chromium	ND[1]
Manganese	983
Iron	1,180
Nickel	ND[1]
Copper	4
Zinc	320
Rubidium	69
Strontium	443
Silver	ND[1]
Cadmium	1
Antimony	1
Cesium	12
Barium	177
Mercury	ND[1]

TABLE 2
Anticipated Chemical Composition of Produced Fluids

Constituent	Concentration (ppm)
Lead	79
Bicarbonate	69
Nitrate	ND[1]
Fluorine	20
Sulfur Monoxide	98
Chlorine	137,670
Arsenate	20
Selenate	ND[1]
Bromine	89
Iodine	10
Silicon Dioxide	433
Carbon Dioxide	3,309
Boric Acid	1,800
Hydrogen Sulfide	15
Ammonia	59
Methane	10
Total Dissolved Solids	235,000

ND = Not Detected

[1] Several of the constituents listed as ND have been detected in brine from this resource, although the quantities may be present at trace levels.

[2] Aluminum is known to be present in measureable quantities in brine from this resource.

Source: AECOM, 2009

1.2.1.1.2 Steam Handling System

The common production header discharges the two-phase brine flow into one HP steam/liquid separator for each of the three RPFs. There will be three HP steam liquid separators (one per power plant). Production brine is discharged to the HP separator to separate the process steam from the brine and reduce its temperature and pressure prior to discharging the spent brine to the injection wells. HP steam is directed from the separator to a chloride scrubber and demister in series, then into the HP inlets of the steam turbine. The scrubber accomplishes chloride removal from the steam to prevent damage to the steam turbine using an injected water stream and chemical conditioning. The discharge stream from the scrubber is routed to the RPF brine injection system for re-injection into the geothermal reservoir. The demister is a device that removes liquid droplets entrained in the steam phase flow to the turbine. The demister aggregates water droplets entrained in the steam phase flow that will otherwise damage the steam turbine. This is accomplished with an injected water stream to the demister. The discharge stream from the demister is routed to the RPF brine injection system for re-injection into the geothermal reservoir. The steam handling system also has a rock muffler, which is an emergency bypass vessel. In the event of a plant trip or mechanical malfunction necessitating the shutdown of the PGF, HP steam can be released to the atmosphere through the rock muffler; its design is such that it muffles the noise levels associated with the event. This rock muffler is used for short periods of time until the plant can either be completely shutdown or returned to service.

1.2.1.1.3 Hot Brine Injection System

For each power plant, three hot brine injection wells will be situated on three new brine injection well pads. Injection well pads will be located to the south, southeast, and east approximately 8,000 to 10,000 feet from the plant site. Injection wells will be drilled to an average depth of 8,725 feet. The brine injection wells will each have an average injection rate of approximately 1.9 million pounds per hour of brine at a temperature of approximately 400°F to 420°F. Use of the single-stage flash technology for the Amended Project allows for maintaining this elevated injection temperature which, in turn, mitigates solids precipitation and allows the three power plants to be operated without producing large amounts of brine filter cake solids. The brine injection system operates as follows: brine from the HP separator is pumped from the RPF to the remote injection well pads via an aboveground pipeline. Each injection well is remotely metered for pressure, temperature, and flow rate. Brine injection will take place in accordance with California Division of Oil, Gas, and Geothermal Resources (CDOGGR) regulations.

1.2.1.1.4 Plant Injection Wells

In addition to the hot brine injection wells, four additional injection wells will be dedicated to managing excess condensate and cooling tower blowdown and aerated brine. Two injection wells for aerated brine (brine that has been exposed to the atmosphere) will be constructed for the management of brine pond liquids. Two separate injection wells, known as “plant” injection wells, will be dedicated to the management of excess condensate and cooling tower blowdown. The two plant condensate injection wells and two aerated brine injection wells will be located within the plant site. Generally, fluid from these two sources is not co-mingled in a single injection well, due to chemical incompatibility. Constituents of the cooling tower blowdown and injected brine are provided in Table 3.

TABLE 3
Cooling Tower Blowdown and Injected Process Brine Fluid Characterization

Constituent	Cooling Tower Blowdown mg/L	Aerated Brine mg/L
Lithium	ND	253.3
Beryllium	ND	0.01
Ammonia	900	500.0
Sodium	197	68,024
Magnesium	46	53.3
Aluminum	0.42	0.3
Potassium	7.3	17,333
Calcium	121	33,333
Chromium	ND	0.004
Manganese	0.13	1,333
Iron	0.21	1,600

TABLE 3
Cooling Tower Blowdown and Injected Process Brine Fluid Characterization

Constituent	Cooling Tower Blowdown mg/L	Aerated Brine mg/L
Nickel	ND	0.03
Copper	0.06	5.3
Zinc	0.05	433.3
Rubidium	NA	93.3
Strontium	2.3	600.0
Silver	ND	0.3
Cadmium	ND	1.7
Antimony	ND	1.1
Cesium	NA	16.7
Barium	0.21	240.0
Mercury	ND	0.004
Lead	ND	106.7
Bicarbonate	NA	93.3
Nitrate	1.26	0.0
Fluoride	0.88	26.7
Sulfate	3,132	133.3
Chloride	210	186,667
Arsenic	0.53	14.7
Selenium	ND	0.007
Bromide	ND	120
Iodine	NA	13.3
Silica	13	586.7
CO2	NA	2,007
Boron	399	426.6
Sulfide	11.76	20.1
Benzene	0.01	0.003
TDS	7,952	316,063
pH	6.60	4 to 7

mg/L = milligrams per liter
ND = Not detected
NA = Not analyzed
Source: AECOM, 2009

1.2.1.1.5 Mud Sumps

Six mud sumps will be constructed; one dedicated for each production and hot brine injection well pad location. Spent drilling fluids and cuttings will be managed in the mud sumps. Other materials managed in these mud sumps will consist of soils, brine effluent, and other materials removed from the ground during the construction of production and injection wells. The six mud sumps are temporary containment ponds that will be decommissioned and removed subsequent to completion of the well construction activities. The mud sumps will be lined impoundments employing polyester fabric/fluoropolymer-coated geosynthetic liner rated for a minimum temperature of 200°F. The liner will be covered with approximately 12 inches of compacted clay to hydraulically isolate the mud sump from the underlying groundwater table. Nominal sump dimensions will be 726 feet long by 11 feet wide by 5 feet deep, with 2 feet of freeboard. Figures 4a and 4b show the design of the mud sumps.

Prior to construction of the mud sumps, a site assessment incorporating baseline groundwater monitoring may be performed if required by the waste discharge requirement (WDR) issued by the RWQCB. During operation of the mud sumps, groundwater monitoring will be conducted under the WDR to ensure protection of subsurface water quality.

1.2.1.1.6 Brine Ponds

Three brine ponds (636 feet by 58 feet by 7.5 feet each) will be constructed; one for each of the three power plants. In addition to the six mud sumps, the three brine ponds initially will be used to manage material from well construction. The brine ponds will be designed in accordance with Title 27 Division 2 of the California Code of Regulations (CCR) – Special Requirements for Surface Impoundments. Figures 4a and 4b depict the design of the three brine ponds within the plant site. Each brine pond will contain a surrounding 20-foot area for cleanout vehicle access with an entry ramp. The brine ponds are of earthen construction, lined with the following layered liner materials, and include a built-in leak detection system:

- Geosynthetic clay liner (GCL) – Bent fix Thermal Lock GCL
- GSE HD – high-density polyethylene (HDPE) Remembrance 80 mil
- GSE Hyper Net – HDPE Genet 200 mil
- GSE HD White Texture single side – HDPE Remembrance 80 mil
- 6-inch Compacted Soil
- 6-inch Fiber-Reinforced Concrete

During plant-upset conditions, well flow testing, or startup, produced brines will be discharged to the brine ponds. The brine ponds will collect brine from production wells and steam will be vented to the PTU during startup. Aerated brine will be pumped into one of two aerated brine injection wells. Brine produced in startup will be infrequent because the project will be operated as a base load facility. During operational upset conditions, HP separator brine and condensate from the steam vented to the rock muffler will be directed to the brine ponds for temporary containment. Most of the material collected in the brine ponds will be managed by dilution as necessary and subsequently pumped to one of two aerated brine injection wells.

The brine ponds will be used for the collection of permitted wastewater streams prior to injection into the formation. The Amended Project is expected to generate a small amount of solids that are expected to precipitate out of the brine in the brine pond due to the low temperature (relative to reservoir temperatures). The rate of accumulation is not known, but is expected to be only a few tons per year. The brine pond solids will be removed annually, then dewatered in a filter press and transported by a licensed transporter to an appropriately permitted offsite facility. Liquids from the dewatering will be directed to the plant injection wells.

1.2.1.1.7 Production Test Unit

Each RPF will have a PTU, which is used for well startup. The PTU is an atmospheric flash tank into which brine flows during production well testing and startups until a sufficiently high temperature is reached. The brine flow is then directed to the HP separator for steam production to feed the PGF. Brine passing through the PTU is then discharged to the brine pond. The PTU will be designed for 1 million pounds per hour (lbs/hr) of brine flow with a 20 percent flash rate (200,000 lbs/hr of steam flow).

1.2.1.2 Power Generation Facility

This section describes the major energy conversion components of the Amended Project that are included in each of the three identical PGFs. Each PGF includes the following components:

- STG – single-casing, single-pressure, down-exhaust condensing turbine
- Condenser – shell-and-tube type heat exchanger (part of the power cycle heat rejection system)
- One five-cell cooling tower (part of the power cycle heat rejection system)
- One RTO and scrubber system – air emission control system
- Chemical oxidization
- One rock muffler/pressure-relief vent system
- One 1.5-MW emergency generator, diesel fueled, 4,160 volts (V)
- One 1.0-MW emergency generator, diesel-fueled, 480 V

1.2.1.2.1 Steam Turbine Generator

The PGF includes a single-cased, single-pressure, down-exhaust condensing turbine. Geothermal steam from the RPF will be the only steam source used by the STG. Each turbine generator set will consist of a condensing turbine generator with HP steam entry pressure. The STG is nominally rated at 53 MW (net). Heat rejection for the steam turbines will be accomplished with a condenser and counter flow cooling tower.

1.2.1.2.2 Condenser

The condenser is a stainless steel shell-and-tube type heat exchanger designed to operate under vacuum. It receives steam from the turbine exhaust of the STG and condenses it to liquid for return to the cooling tower. During base load operation at design ambient conditions (83.7°F wet bulb temp, 105°F dry bulb temp), the condenser is expected to operate at a vacuum pressure of 2.34 inches mercury (atmospheric) and produce condensate flow of 804,935 lbs/hr. The warmed circulating water exits the condenser and returns to the cooling tower.

1.2.1.2.3 Counter Flow Cooling Tower

Each PGF will have a dedicated five-cell, induced-draft cooling tower. Each cooling tower will have three 50-percent capacity, vertical, wet-pit circulating water pumps to circulate water between the cooling tower and condenser and two 100 percent capacity, vertical, wet-pit auxiliary water pumps that will circulate water between the cooling tower and the plant auxiliary cooling loads. Each cooling tower has an inlet circulating water flow rate of 89,112 gpm and will be equipped with a high-efficiency mist eliminator to minimize drift losses to no more than 0.0005 percent of design flow rate to reduce particulate matter (PM10) emissions. The circulating water is distributed among multiple cells of the cooling tower, where it cascades downward through each cell and collects in the cooling tower basin. The circulating water is cooled through evaporation. The cooled circulating water is pumped from the cooling tower basin back to the condenser.

1.2.1.2.4 Closed-loop Auxiliary Equipment Cooling Water System

The closed-loop auxiliary cooling water system will be filled with a coolant such as a mixture of glycol and water. The coolant is circulated through a closed-loop system to cool auxiliary equipment including the STG lubrication oil coolers, air compressor aftercoolers, and steam cycle sample coolers. The coolant absorbs heat from the various equipment items being cooled and is, in turn, cooled by non-contact heat exchange with a branch of the circulating water system.

1.2.1.2.5 Air Emission Control System (Recuperative Thermal Oxidizer)

Air emissions control for each PGF will be accomplished using an RTO and scrubber primarily for control of sulfur dioxide (SO_2). NCGs are evacuated from the condenser heat exchanger using a vacuum pump and routed to the RTO for control of H_2S, methane, benzene, and other trace gas emissions. The RTO is a direct oxidizing process that allows for simultaneous destruction of benzene and H_2S and other combustible constituents present in the NCG in a compact unit that is easy to operate and maintain. Following the RTO, the exhaust gas enters a quench tower in which the temperatures of the gases are lowered using water injection. The quench water is discharged to the cooling tower basin.

The applicant has developed a chemical oxidation (Chem Ox) process that will be used for treatment of condensate prior to the use in the cooling tower. The Chem Ox system will oxidize H_2S found in the hot-well condensate into sulfates by the addition of air and an oxidant (hydrogen peroxide, bleach, or similar compound). The oxidant will be direct injected into the condensate line using metering pumps to facilitate the oxidization process. The oxidant will be stored in a 1,000-gallon storage tank. The byproduct of the oxidation process is a soluble sulfate salt that will remain dissolved in the condensate. The Chem Ox system is expected to have an overall H_2S control efficiency of 90 percent or more.

Following the RTO and quench tower, the gas stream enters a packed-bed SO_2 scrubber where a sodium hydroxide (NaOH) solution is introduced. The scrubbing solution is discharged to prevent sulfate and sulfite buildup in the scrubber tower. The sodium sulfite/sulfate solution created by operation of the SO_2 scrubber is of a sufficiently small volume that it can be safely introduced into the cooling tower basin where it ultimately is re-injected into the underlying geothermal formation. The treated exhaust then vents to the atmosphere through a stack. Excess condensate (that is, not used in the cooling tower) will be sent to the plant injection well for reinjection into the formation.

1.2.1.2.6 Steam Relief System (Rock Muffler)

The rock muffler is a system used during upset conditions when it is necessary to vent steam to the atmosphere. The proposed rock muffler vent system is a reinforced-concrete rectangular structure with dual chambers, to be designed to allow internal inspection of the diffuser at the bottom chamber through a manway into the vent chamber. The rock muffler’s dimensions are 16 feet wide by 20 feet long by 24 feet high, and the wall thickness is approximately 1 foot. During these upset events, steam bypasses the turbine and is rerouted to the rock muffler for venting to the atmosphere. The rock muffler can receive the flow of steam generated from 6.3 million pounds per hour of geothermal brine. Condensate from the rock muffler will be routed to the brine pond rather than the cooling tower due to the potentially high concentration of chlorides in the condensate.

1.2.1.2.7 Diesel-Fueled Emergency Generators and Fire Water Pumps

There are two diesel-fueled emergency generators (one 1.5-MW, 4,160V emergency generator and one 1.0-MW, 480V emergency generator); one 200-horsepower, diesel-fueled, 2,400 gallons per minute emergency fire water pump; and one 25-horsepower diesel “jockey” pump.

1.2.1.2.8 PGF Shared Components

The three PGFs will share the following common process equipment and components, as listed in Table 4.

TABLE 4
Shared Components

Component	Description
Electrical control building	Control functions for all functions of the project
Stormwater runoff detention basin	Designed for retention of stormwater expected from a 100-year storm event, plus freeboard
Plant injection wells	Injection wells will be dedicated to managing excess condensate and cooling tower blowdown, and aerated brine
Fire water pump and associated protection system	Diesel-fueled pump
Fire water pond	Approximately 646,000-gallon capacity
Condensate storage pond	Stores excess condensate from the PGF for use in other plant water demands such as the steam scrubbing water, quench water for exhaust from the RTO, and pump seal flush water (approximately 862,000-gallon capacity)
Raw water pond	The approximately 1,100,000-gallon service water pond is a lined earthen structure that will hold Imperial Irrigation District (IID) canal water to supply facility service water needs
Paved parking area	Employee and contractor parking
Reverse osmosis (RO) system	Used for purifying service water from the IID canal for use as service water and for wash rooms, toilets, etc.

Source: AECOM, 2009

1.2.2 Water Supply

The primary water demand for the Amended Project is for cooling tower makeup. This water demand will be satisfied largely (about 95 percent on an annual average basis) by condensate from steam extracted from the geothermal brine. After powering the turbines, the steam will be sent to condensers and the resulting condensate will then be routed to the cooling towers. Condensed steam will also be the source of scrubber makeup water and will be the source of seal water for the mechanical pump seals.

Additional water from condensate will be required for the dilution of acid to be added to the injected brine, potable water treatment, and quench water for the RTO air emissions control equipment. Any "deficit" water will be supplied from an Imperial Irrigation District (IID) canal adjacent to the plant site via a new water supply pipeline. The water delivery will occur under a new water supply agreement currently being negotiated. The connection point to the IID canal will be the Vail 4A Lateral, Gate 459 and/or 460 at the southeast corner of the power plant site, along Boyle Road. The supply pipeline will be a 500-foot-long, buried, 10-inch pipeline. Water quality data for IID water are shown in Table 5.

TABLE 5
Expected Water Quality – IID Canal

Constituent	IID Canal Water (ppm)
Calcium	88
Magnesium	34
Sodium	140
Potassium	5.5
Total alkalinity	150
Hydroxide	ND
Carbonate	ND
Bicarbonate	180
Chloride	120
Sulfate	320
Fluoride	0.6
Nitrate	1.0
pH	8.1
TDS	750
Bromide	0.12
CO_2	2.9
Sulfide	ND
Benzene	ND
Ethyl benzene	ND
Toluene	ND
Xylenes	ND

TABLE 5
Expected Water Quality – IID Canal

Constituent	IID Canal Water (ppm)
Ammonia-Nitrogen	ND
Aluminum	290
Antimony	ND
Arsenic	ND
Barium	130
Beryllium	ND
Boron	190
Cadmium	ND
Total Chromium	ND
Copper	39
Iron	230
Lead	ND
Lithium	ND
Manganese	80
Mercury	ND
Nickel	ND
Selenium	ND
Total Silica	10
Silver	ND
Strontium	1,400
Zinc	30

ND = Not Detected

Source: AECOM, 2009

1.2.3 Site Drainage

The project site is fairly level and proposed site drainage generally will flow from the southeast corner to the northwest corner toward the stormwater detention pond located in the northwestern area of the plant site (Figure 5). The stormwater detention pond will be an earthen structure. All buildings and equipment are constructed on foundations with the overall site grading scheme designed to route surface water around and away from equipment and buildings. Stormwater flows will be directed to the stormwater detention pond via ditches, swales, and culverts. Chemical spills will not flow into the stormwater collection system. Spill containment areas and sumps (subject to chemical spills) will be designed to route liquids to a diked area where they will be pumped out, characterized, and properly disposed.

The proposed stormwater detention pond for the Amended Project is designed for 3 inches of precipitation in a 24-hour period (100-year storm conditions) and will be approximately

500 feet long by 225 feet wide by 3.5 feet deep and the sides will have a 2:1 (horizontal: vertical) side slope. Stormwater accumulated in the pond will evaporate and infiltrate.

Furthermore, Imperial County's Land Use Ordinance Section 90106.00, et seq., and Section 91604.00, et seq., require a Development Permit for construction below -220 feet msl along any portion of the Salton Sea. For the Amended Project, this will require the 160-acre project site to be enclosed by a perimeter berm designed with 2:1 (horizontal to vertical) sloping sides with a top elevation of -220 feet msl. This berm will meet the County's encroachment permit requirements because it will be of adequate height to provide flood protection to an elevation of at least -220 feet msl in accordance with the County's Land Use Ordinances and will reduce the potential for offsite drainage.

1.2.4 Waste Generation During Construction

1.2.4.1 Material from Well Construction

The construction of the production, injection, and plant wells associated with the Amended Project will result in the following.

- Spent drilling fluids and drilling cuttings
- Material from well construction (solids)
- Fluids from performing "flowbacks" on the completed wells

Spent drilling fluids and cuttings will be managed in mud sumps or the brine ponds. Material from well construction will be pumped to the mud sumps and brine ponds where the liquid constituents will be allowed to separate by gravity and/or evaporate. Gravity-separated fluids may be pumped or conveyed by truck between sumps/ponds as management demands dictate. Decanted fluids will be injected into the geothermal formation to help preserve the geothermal resource. Materials from geothermal drilling are exempt from regulation as hazardous waste under California Health and Safety Code Section 25143.1. Material from well construction generated from the project will be disposed in the Applicant's affiliate-operated local monofill.

After a well is completed, it must be "flowed back," which flushes the well to remove drilling mud remnants, cuttings, and other materials that ultimately might inhibit well performance. Depending on the well, a certain amount of geothermal brine may also be entrained in the flowback stream. The amount of material generated from this activity varies; however, in practice the well is flowed until such time as the fluids are clear. These materials will be managed in the same manner as the materials from well construction discussed previously. Solid waste from well construction will be managed in roll-off containers. These containers will be removed from the job site by a permitted hauler and conveyed to a permitted facility for ultimate disposal.

1.2.4.2 Hazardous Waste

Hazardous waste generated by the Amended Project during construction will be accumulated onsite for less than 90 days at specified accumulation points. Hazardous and universal wastes will be transported by a licensed transporter using a Uniform Hazardous Waste Manifest and disposed or recycled at an appropriate Treatment, Storage, or Disposal Facility (TSDF). Copies of manifests, reports, waste analysis, exception reports, land disposal restrictions, and other related documents will be maintained onsite as required.

1.2.4.3 Miscellaneous Construction Wastes

During construction of the Amended Project, the primary type of waste generated will be solid non-hazardous wastes. Small quantities of non-hazardous liquid wastes, hazardous solid and liquid wastes, and universal wastes also may be generated during construction. Non-hazardous wastes generated during construction is expected to include scrap wood, concrete, empty containers (plastic, metal, glass, cardboard, and Styrofoam), packaging materials, scrap metals, insulation (silicate and mineral wool), and materials from well construction. Approximately 20 to 40 cubic yards per week of construction wastes are expected to be generated during construction of the Amended Project. Management of these wastes will be the responsibility of the construction contractor(s). Where practical, such as in the case of scrap steel, the wastes will be recycled. Non-hazardous wastes will be properly stored to prevent wind dispersion, and will be transported by a licensed transporter and disposed or recycled at an appropriately permitted facility.

1.2.4.4 Mud Sumps

The mud sumps will be decommissioned following completion of the wells they serve. Because the clay liner of the mud sump is in direct contact with both drilling fluids and brine, the clay (and the geomembrane liner materials) may become contaminated and therefore will be treated as waste. The clay will be tested to determine the appropriate disposal requirements. If determined to be non-hazardous, the clay will be disposed at the Desert Valley Company’s Monofill Facility, a Class II landfill. If hazardous, the clay will be disposed at an appropriate Class I TSDF.

1.2.4.5 Sanitary Waste

During construction, sanitary waste will be collected in portable, self-contained toilets. The sanitary wastes from the portable chemical toilets will be pumped out regularly by a licensed contractor and transported to a sanitary wastewater treatment plant.

1.2.5 Byproduct Generation During Operation

1.2.5.1 Spent Brine

The primary discharge from the Amended Project consists of spent brine that is injected directly into the brine injection wells. Spent brine is exempt from regulation as hazardous waste according California Health and Safety Code Section 25143.1 so long as the spent brine is contained in a piping system or lined pond. During normal operations, brine will be injected in the injection wells immediately following the HP separator. During startup and shutdown, some brine may be directed to the brine ponds and subsequently injected into the aerated brine injection wells on the plant site, discussed as follows.

1.2.5.2 Brine Solids

During plant-upset conditions, during well flow testing, or during startup, production brines will be discharged to the brine ponds. The brine ponds will be used for the collection of miscellaneous byproduct streams prior to their injection into the formation. The brine is then pumped into one of two aerated brine injection wells located on the plant site. As needed, brine pond liquids will be pumped out and injected, and the solids will be removed, and dewatered with a portable pressure filter press. Solids will be transported by a licensed transporter to an appropriately permitted offsite facility.

1.2.5.3 Wastewater

The base load and peak load water balance diagrams (Figures 6a and 6b) show the power plant's wastewater streams and the disposition of wastewater. Sources of wastewater and their dispositions include the following.

- Blowdown from the cooling towers will be injected into one of the two dedicated plant injection wells.
- Blowdown from the quench and scrubber stages of the air emissions control system will be bled into the cooling tower basin, and will be injected into one of the two dedicated plant injection wells along with the cooling tower blowdown.
- HP steam is directed from the separator to a chloride scrubber and demister in series, then into the HP inlets of the steam turbine. The scrubber accomplishes chloride removal from the steam to prevent damage to the steam turbine using an injected water stream and chemical conditioning. The discharge stream from the scrubber is routed to the RPF brine injection system for re-injection into the geothermal reservoir.
- Reject water from the RO water purification system will be pumped to the cooling tower basin.
- Uncontaminated stormwater collected in the chemical storage and feed containment areas that contain fixed or portable tanks and other containers will be directed to the brine ponds and discharged together with other plant wastewater to a dedicated plant site injection well.

1.2.5.4 Sanitary Waste

Sanitary waste for the Amended Project will be directed to a septic tank, which will be constructed according to the Imperial County building code. This tank will be pumped out as necessary; there will be a leach field. There are no drinking water wells in the area near the Amended Project.

1.2.5.5 Well Rehabilitation

Periodically (once every 5 to 10 years), production or injection wells have to be re-drilled to maintain their productive capacity. Wet materials from well construction consist of soils, brine effluent, and other materials removed from the ground during the re-drilling of production and injection wells. This waste will be allowed to dry out in the clay-lined mud sumps. By regulation, materials from geothermal drilling are non-hazardous; therefore, after evaporation, the remaining solid waste in the mud sumps will be disposed at the Desert Valley Company's Monofill Facility, a Class II landfill.

1.2.5.6 Facility Operation and Maintenance Wastes

Office waste and general refuse will be recycled to the extent practicable and the remainder will be disposed by the local sanitation service to a Class III landfill. Pipe maintenance and de-scaling activities that include hydroblasting or sandblasting will be performed in a designated containment area to prevent wastes generated from these activities from impacting the environment. Water from the hydroblasting process will be conveyed to the brine ponds for injection into the geothermal resource.

1.2.5.7 Hazardous Wastes

Hazardous and universal waste expected to be generated by the Amended Project during normal operations include the limited amounts of brine pond solids (if testing reveals them to be hazardous), scale from the walls of piping and brine handling equipment (if testing reveals them to be hazardous), used oil, oil adsorbents, cleaning solutions and solvents, empty containers, fluorescent lamps, used batteries, and electronic equipment. If determined to be non-hazardous, these wastes will be removed regularly by a certified waste handling contractor to the Applicant’s affiliate operated Class II monofill. Hazardous wastes will be disposed at an appropriate Class I hazardous waste management facility. Universal wastes will be recycled or disposed properly.

1.2.6 Project Features to Avoid or Reduce Environmental Impacts

The Amended Project has been designed and engineered with numerous features to avoid or reduce potential environmental impacts. A summary of these features is provided in Table 6.

TABLE 6
Summary of Project Features

Project Feature	Description
Water Conservation	Extensive use of steam condensate to minimize water demand from outside sources.
Mud Sumps	Material from well construction will be discharged to mud sumps, which will be decommissioned and removed subsequent to completion of the well construction activities. The mud sumps will be lined impoundments employing a polyester fabric/fluoropolymer-coated geosynthetic liner rated for a minimum temperature of 200°F. The liner will be covered with approximately 12 inches of compacted clay to hydraulically isolate the mud sump from the underlying groundwater table. Prior to construction of the mud sumps, a site assessment incorporating baseline groundwater monitoring may be performed if required by the Waste Discharge Requirements (WDR) issued by the RWQCB. During operation of the mud sumps, groundwater monitoring will be conducted under the WDR to ensure protection of subsurface water quality.
Brine Ponds	The brine ponds will be designed in accordance with Title 27 Division 2 of the CCR – Special Requirements for Surface Impoundments. Each brine pond will contain a surrounding 20-foot area for cleanout vehicle access with an entry ramp. The brine ponds are of earthen construction, lined with an HDPE liner and concrete such that the contents will not leach into the soil. Each brine pond includes a built-in leak detection system. Monitoring wells will be provided adjacent to the brine ponds. Several groundwater monitoring wells and one background well will be drilled and constructed around each brine pond. Prior to Amended Project operation, a site assessment work plan will be completed and groundwater compliance wells identified.
Perimeter Berm	The project site is located approximately 225 feet below msl and will be entirely enclosed by perimeter berms with a top elevation of 220 feet below msl consistent with Imperial County requirements to prevent water run-on in the 100-year

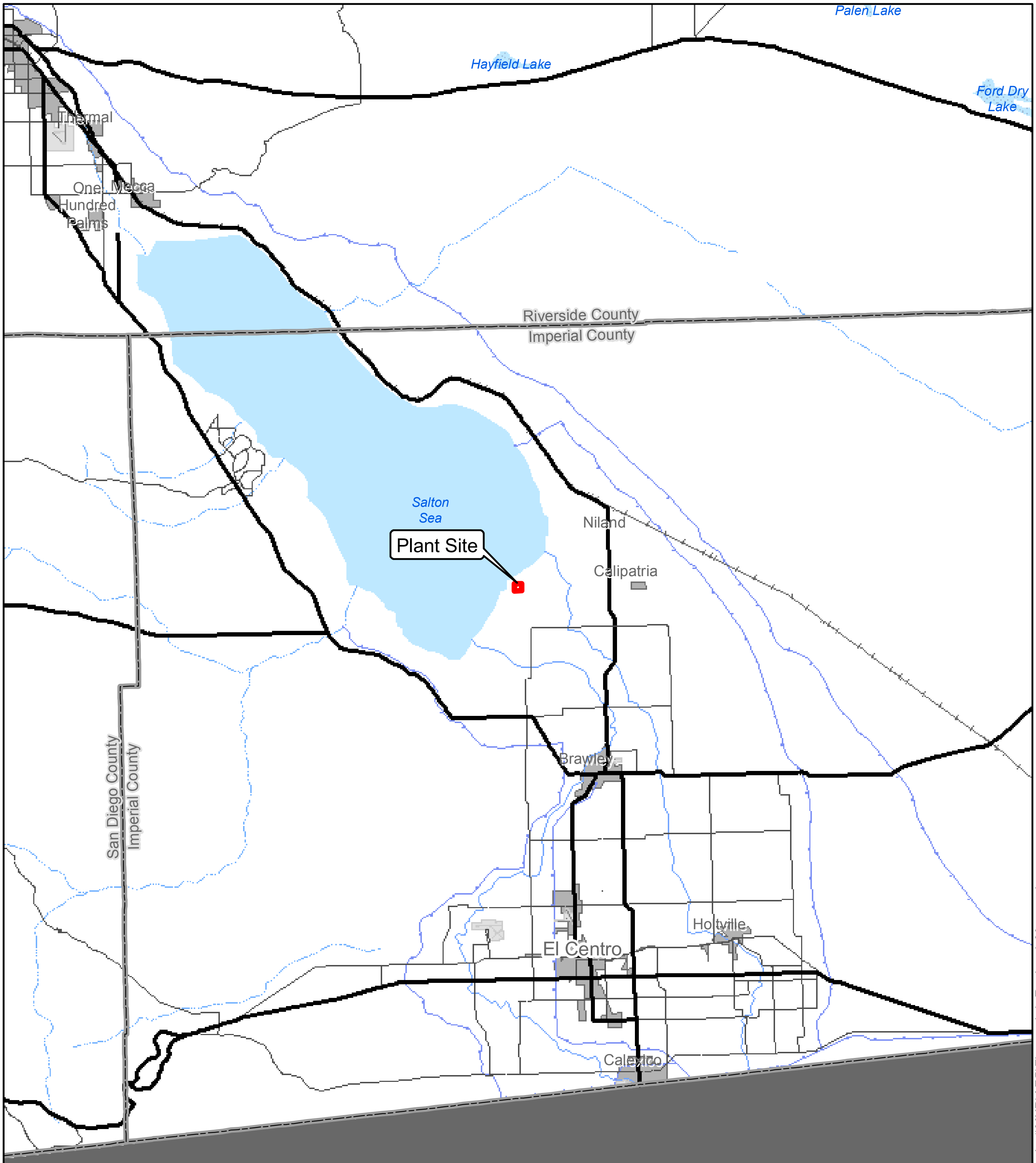
TABLE 6
Summary of Project Features

Project Feature	Description
	storm event.
Compliance with General Construction Permit	A Construction Storm Water Pollution Prevention Plan (SWPPP) will be prepared for the site and will be implemented during the construction phase of the project. The SWPPP includes Best Management Practices (BMPs) to control sediment-laden runoff and ensure the integrity of the stormwater collection system.
Stormwater Runoff Retention Pond	The site shall be graded such that onsite runoff flows toward the retention basin. The retention basin is designed to accommodate the 100-year storm event.
Production and Injection Best Management Practices	BMPs will be developed and implemented for construction, post-construction, and operational phases to maintain the integrity of the drilling fluid handling systems and runoff.
Casing Shallow Portions of Production and Injection Wells	Casing the shallow portions of the production and injection wells will minimize potential release of both construction-related drilling fluids and production-related geothermal brines to the shallow groundwater aquifer.
Protective Pipeline Design and Detailed Inspection Routine	Production pipelines will be constructed of highly corrosion-resistant alloy. The injection pipelines will be fabricated from either 25Cr duplex alloy or 2205 duplex mechanical-clad carbon steel to resist the slightly acidified, corrosive injection brine. Both pipelines will be routinely inspected to prevent potential releases. Soil berms are graded to minimize the risk of spills or releases entering surface waters.
Pipeline Isolation Valves	Pipelines at each wellhead will be equipped with remotely operated electrical emergency shutoff valves, as well as manual alloy isolation valves to prevent potential releases.

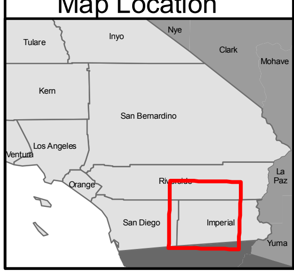
1.3 References

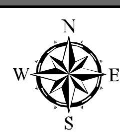
AECOM. 2009. Amendment Petition for the Amended Salton Sea Unit 6 Project; Appendix J, Construction Drainage, Erosion, and Sediment Control Plan (DESCP)/SWPPP. Prepared for CE Obsidian Energy LLC. Submitted to the CEC February 2009.

Figures



Map Location





Black Rock Units 1–3

Figure 1
Location Map

1:600,000

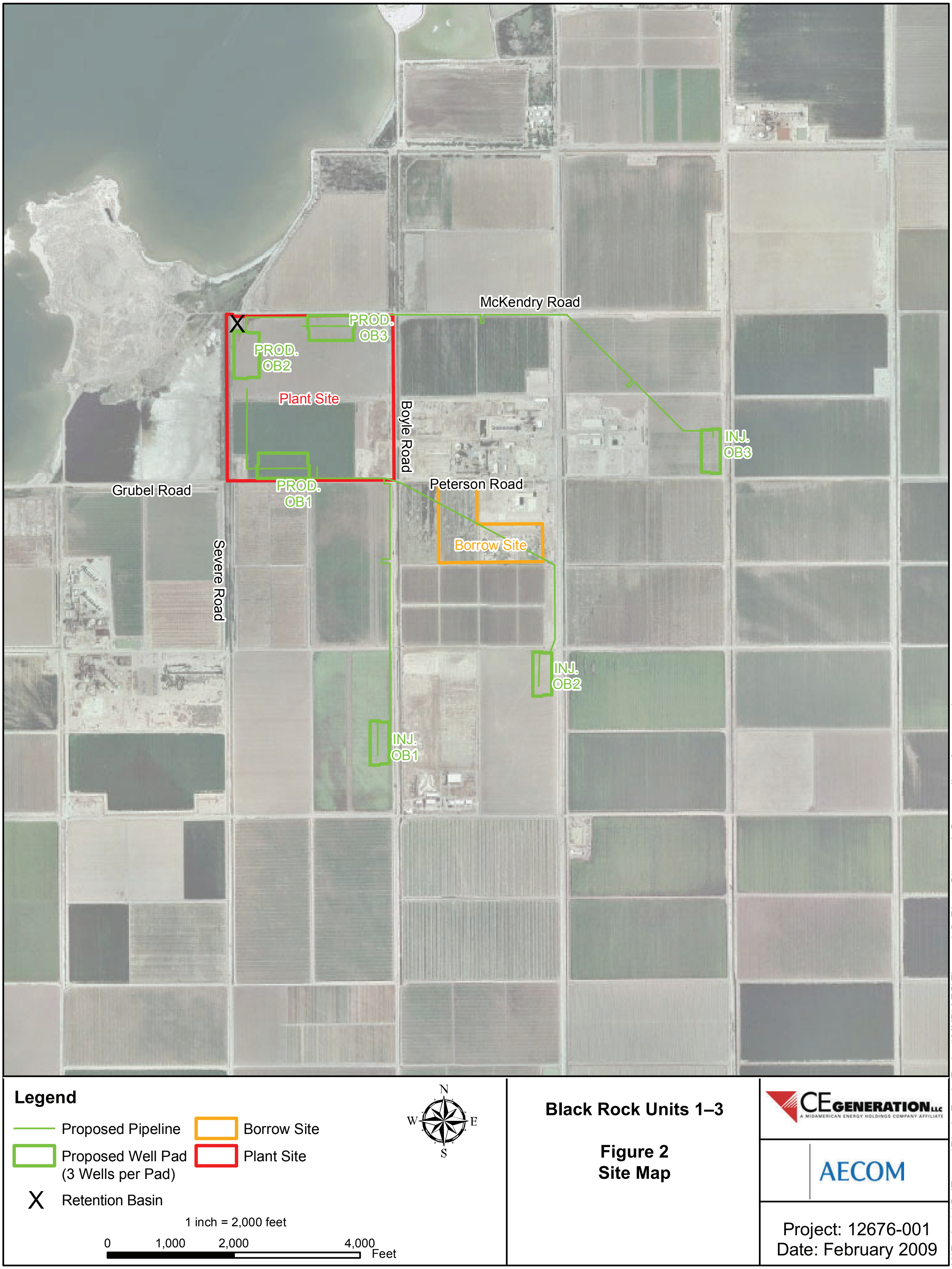
0 5 10 15 Miles

CE GENERATION LLC
A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE

AECOM

Project: 12676-001
Date: February 2009

Y:\Projects\CalEnergy\Black_Rock_Project\MXD\AFC\Figure_1-1_Regional_Map.mxd



Black Rock Units 1–3

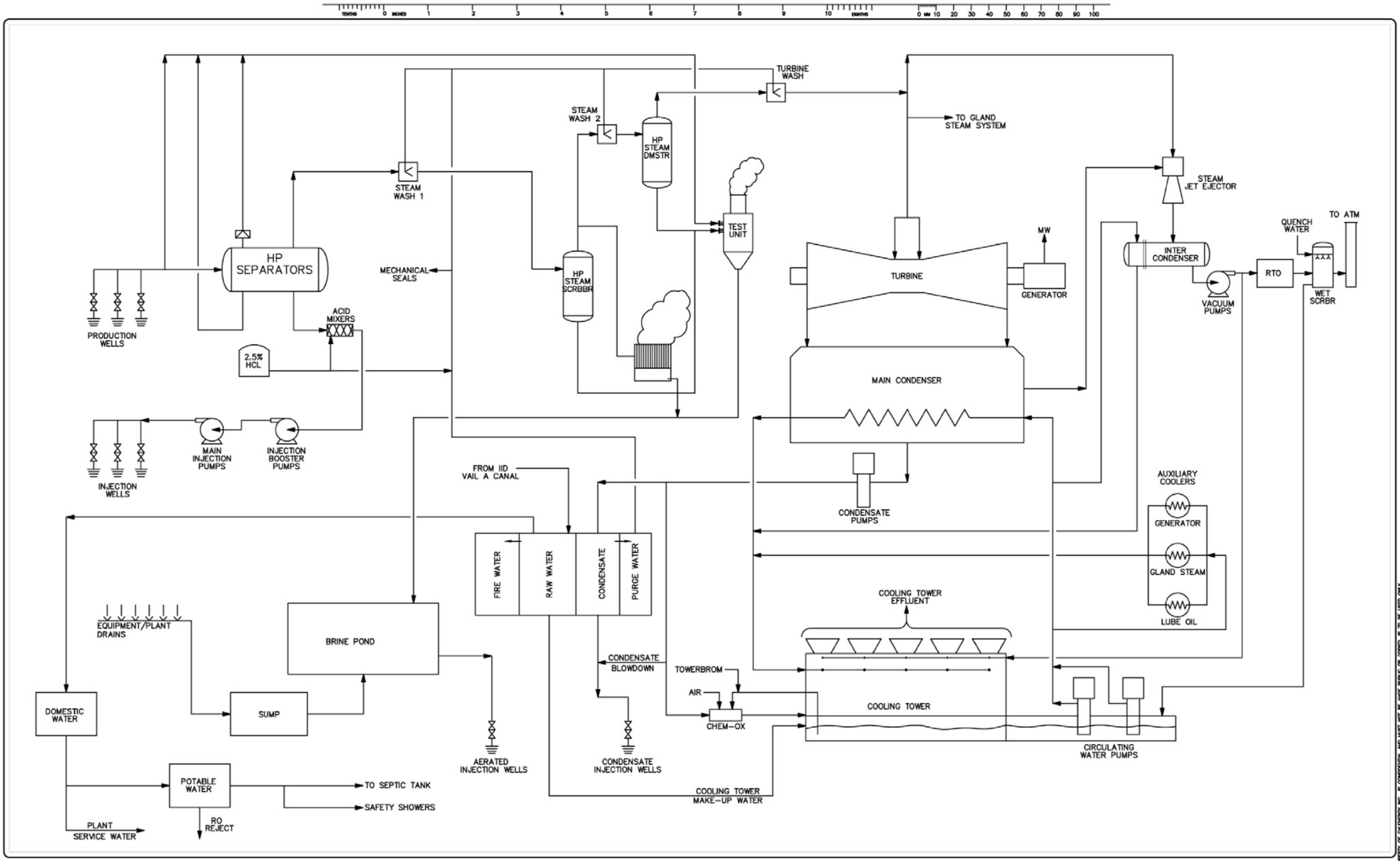
Figure 2
Site Map

CE GENERATION LLC
A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE

AECOM

Project: 12676-001
Date: February 2009

Y:\Projects\CalEnergy\Black_Rock_Project\MXD\AFC\Figure_1-2_Plant_Site_and_Surrounding_Areas.mxd



CAL ENERGY
OPERATING CORPORATION
A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE
7030 GENTRY ROAD
CALIPATRIA, CALIFORNIA 92233

Amended SSU6 Project

Figure 3
Process Diagram

REV	DATE	DESCRIPTION	BY	APRV

REVISION RECORD

ISSUE	DATE	REV	DESCRIPTION
4			
2			
1	9/26/08	A	ISSUED FOR REVIEW

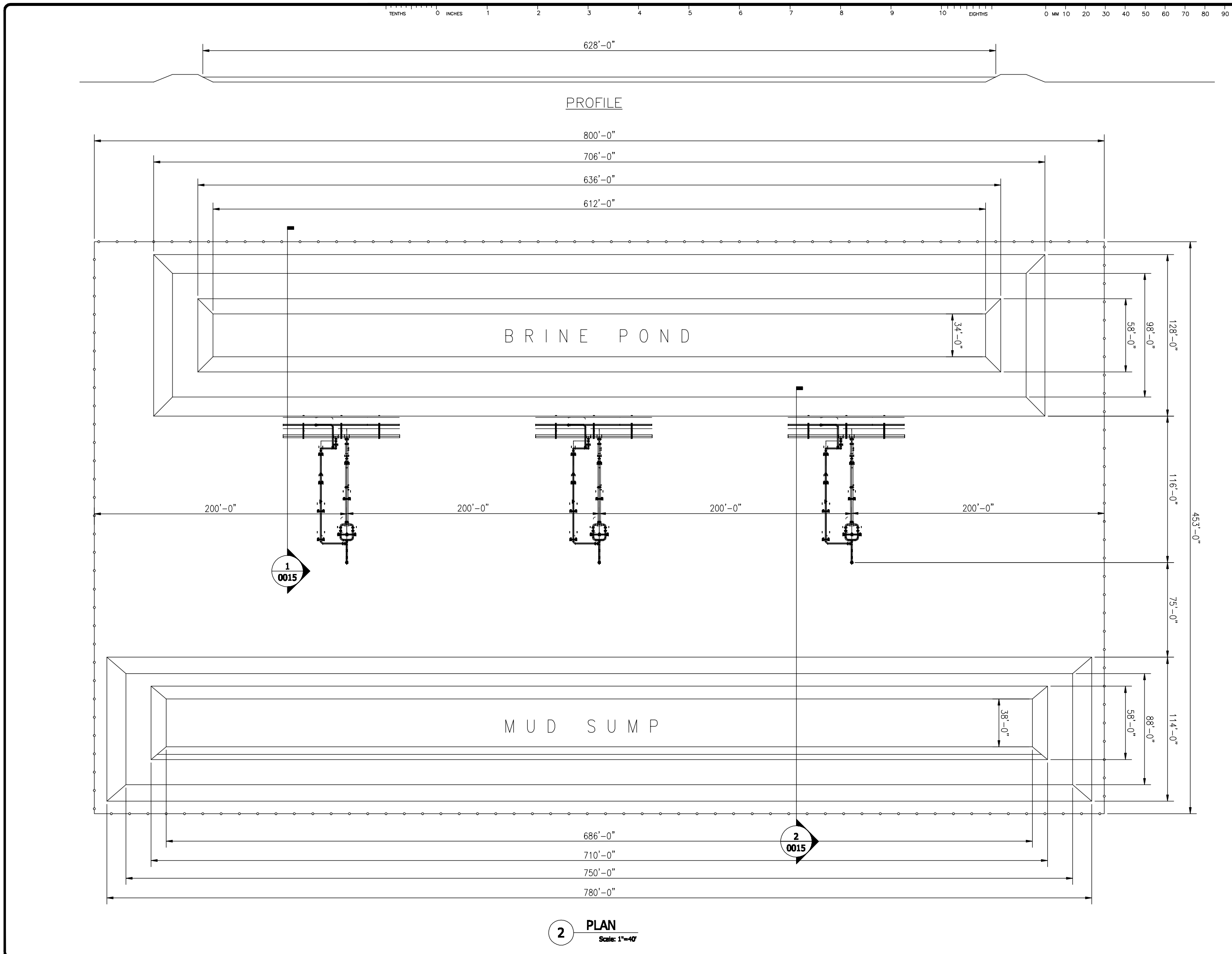
ISSUE RECORD

ENGINEERING MGR:
PROJECT MGR:
PROJECT ENG: J. P. REVERENTE
DRAWN BY: R. CALLES
DRAWN DATE: 9/29/09

CE OBSIDIAN ENERGY, LLC
BLACK ROCK UNITS 1, 2 AND 3
PRELIMINARY WATER BALANCE
FLOW DIAGRAM

PROJECT NUMBER -
DRAWING NUMBER 52-DJ0-1-BR-1
SHEET NUMBER 1 OF 1

plot scale: 6 35/256" = 1'-0"
last printed: Tuesday, September 30, 2008 4:42:30 PM
V:\Drafting-iv\2 P&ID's\Black Rock 1 P&ID's\WATER BALANCE FLOW D\52-DJ0-1-BR-1



BRINE POND CAPACITY:
42'x620'x4'
=104,160 CF
=779,117 GALLONS

MUD SUMP CAPACITY:
44'x700'x3'
=92,400 CF
=691,152 GALLONS

CAL ENERGY
OPERATING CORPORATION
A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE
7030 GENTRY ROAD
CALIPATRIA, CALIFORNIA 92233

Figure 4a
Mud Sump/Brine Pond Design

REV	DATE	DESCRIPTION	BY	APRV
2	12/19/08	INCREASED LENGTH OF PAD	JH	JR
1	12/16/08	ADDED MUD SUMP	JH	JR

REVISION RECORD

ISSUE	DATE	REV	DESCRIPTION
3	12/19/08	2	ISSUED FOR INFORMATION
2	12/16/08	1	ISSUED FOR INFORMATION
1	12/9/08		ISSUED FOR INFORMATION

ISSUE RECORD

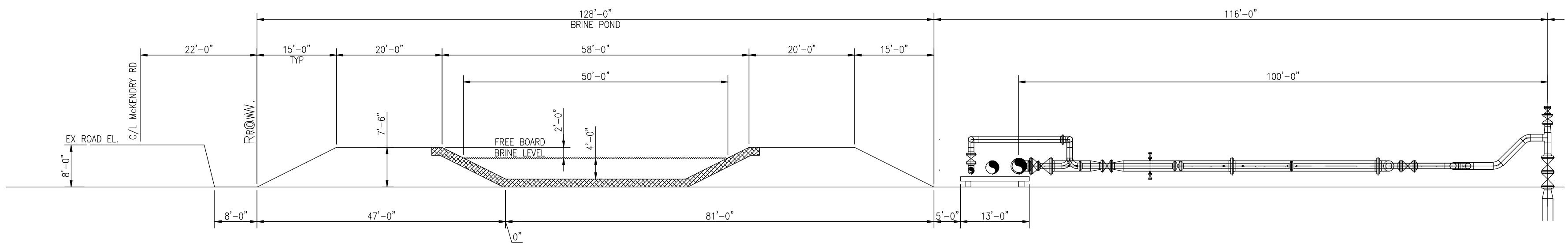
last printed: Friday, December 19, 2008 9:09:25 AM

ENGINEERING MGR: ----
PROJECT MGR: D HACKLEY
PROJECT ENG: G FURMANSKI
DRAWN BY: J HULA
DRAWN DATE: 11/6/2008

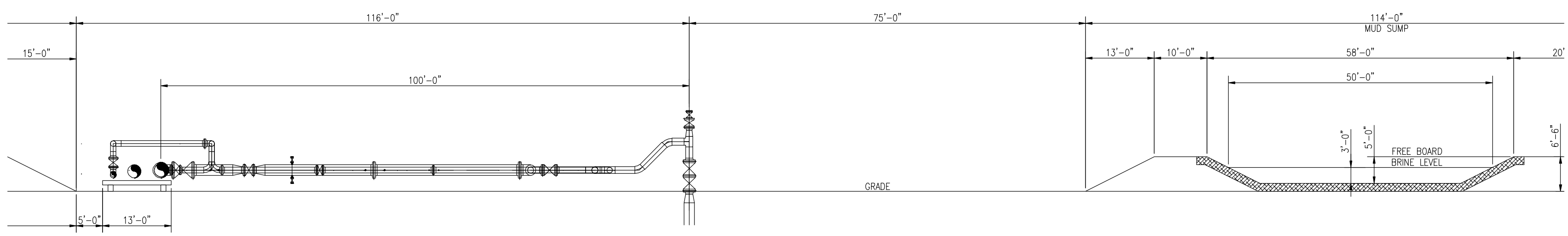
BLACK ROCK PROJECT
McKENDRY ROAD PROFILE
PROD. WELL PAD
ELEVATION STUDY

PROJECT NUMBER
EP-08-014
DRAWING NUMBER
180804-DY-0003
SHEET NUMBER
0014

W:\Drafting-iv\2008 Folder\18-0804 EP-08-014 BLACK ROCK PHASE 1\9 Drawings\180804-DY-0003



1 PROFILE
Scale: 1"=10'



2 PROFILE
Scale: 1"=10'

BRINE POND CAPACITY:
42'x620'x4'
=104,160 CF
=779,117 GALLONS

MUD SUMP CAPACITY:
44'x700'x3'
=92,400 CF
=691,152 GALLONS

CAL ENERGY
OPERATING CORPORATION
A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE
7030 GENTRY ROAD
CALIPATRIA, CALIFORNIA 92233

Figure 4b
Mud Sump/Brine Pond Design

REV	DATE	DESCRIPTION	BY	APRV
2	12/19/08	INCREASED LENGTH OF PAD	JH	JR
1	12/16/08	ADDED MUD SUMP	JH	JR

REVISION RECORD

ISSUE	DATE	REV	DESCRIPTION
3	12/19/08	2	ISSUED FOR INFORMATION
2	12/16/08	1	ISSUED FOR INFORMATION
1	12/9/08		ISSUED FOR INFORMATION

ISSUE RECORD

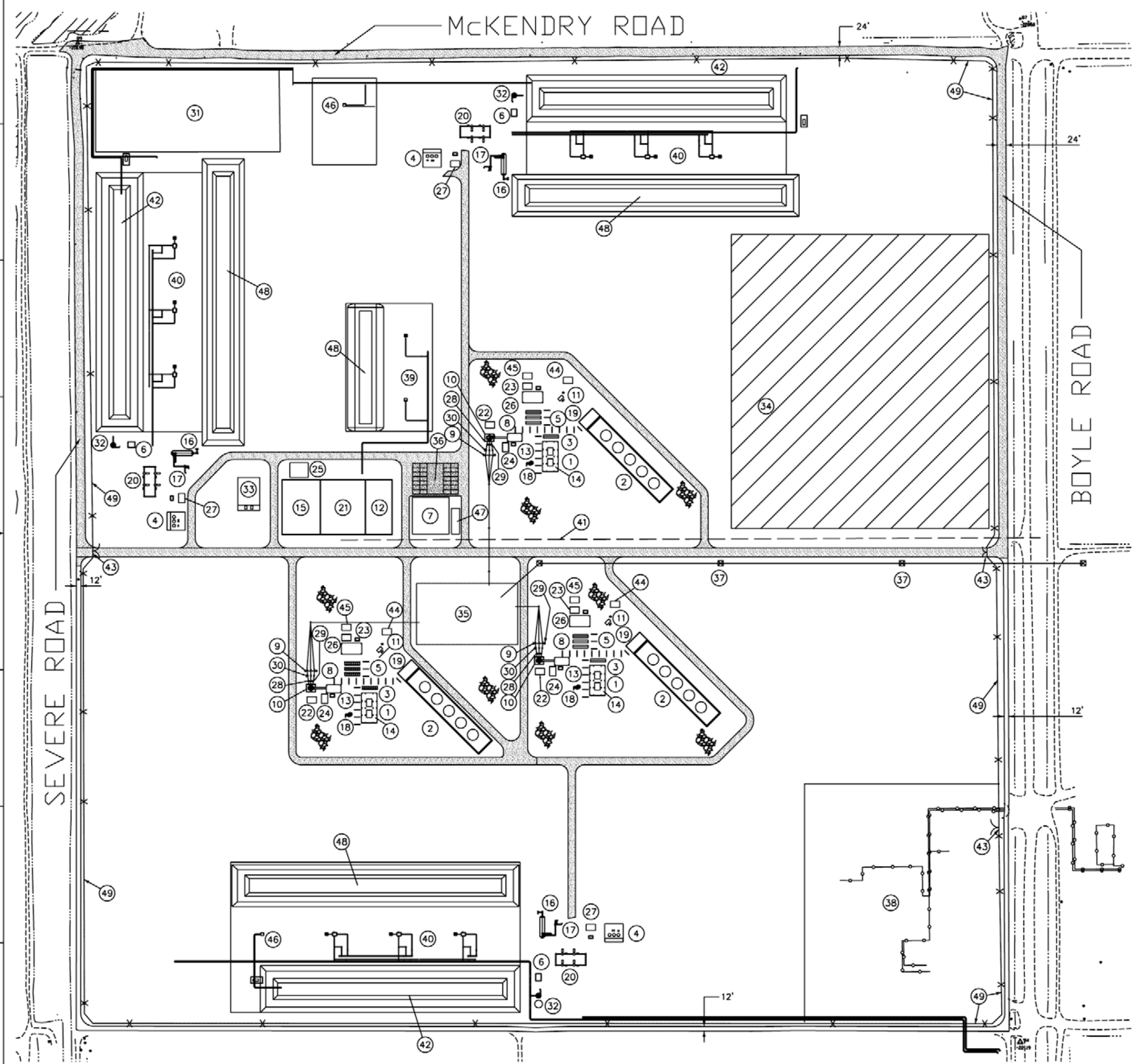
last printed: Friday, December 19, 2008 9:09:26 AM

ENGINEERING MGR: ----
PROJECT MGR: D HACKLEY
PROJECT ENG: G FURMANSKI
DRAWN BY: J HULA
DRAWN DATE: 11/6/2008

BLACK ROCK PROJECT
McKENDRY ROAD PROFILE
PROD. WELL PAD
ELEVATION STUDY

PROJECT NUMBER
EP-08-014
DRAWING NUMBER
180804-DY-0003
SHEET NUMBER
0015

W:\Drafting-iv\2008 Folder\18-0804 EP-08-014 BLACK ROCK PHASE 1\9 Drawings\180804-DY-0003



1. STEAM TURBINE/GENERATOR
2. COOLING TOWER
3. SURFACE CONDENSER
4. ACID SYSTEM
5. NCG REMOVAL SYSTEM
6. ROCK MUFFLER
7. CONTROL BUILDING
8. PDC 101 (4160V)
9. 230 KV IID TAKE OFF STRUCTURE
10. TRANSFORMER 230 KV–13.2 KV
11. H2S ABATEMENT
12. CONDENSATE STORAGE
13. LUBE OIL SKID
14. PURGE WATER STORAGE TANK (UNDER TURBINE)
15. FIRE WATER TANK
16. HIGH PRESSURE SEPARATOR
17. HIGH PRESSURE SCRUBBER
18. HIGH PRESSURE DEMISTER
19. CIRC. WATER PUMPS
20. BRINE BOOSTER, INTERMEDIATE & MAIN BRINE INJECTION PUMPS
21. WATER POND
22. 4160V TRANSFORMER
23. 480V DIESEL GEN., BLACK START
24. 4160V DIESEL GENERATOR
25. FIRE WATER PUMP HOUSE
26. PDC 102 (480V)
27. PDC 103 (4160V)
28. CIRCUIT BREAKER
29. 480 V. TRANSFORMER
30. PT/CT
31. STORM WATER DETENSION BASIN
32. PRODUCTION TEST UNIT
33. HYDRO TEST PAD
34. LAYDOWN AREA
35. SWITCHYARD
36. COVERED PARKING
37. IID 230 KV TRANSMITTION TOWERS
38. EXISTING PIPING
39. CONDENSATE INJECTION WELL
40. BRINE PRODUCTION WELLS
41. RAW WATER PIPELINE (U/G)
42. BRINE POND
43. ENTRANCE GATE
44. PROPANE TANK
45. UREA TANK
46. AERATED BRINE INJECTION WELL
47. SEPTIC TANK
48. MUD SUMP
49. FENCE

PLANT NORTH

ASPHALT

GRAVEL

130 0 130 260 390

SCALE: 1" = 130'

REV	DATE	DESCRIPTION	DRAWN	CHECKED	LEAD DESIGNER	ENGINEER/TECH SPEC	LEAD DISC ENGINEER	PROJ ENGR MANAGER	PROJECT MANAGER
C	12/10/08	ISSUED FOR INFORMATION ONLY	RVG	MP	RVG	MP	MP	MP	KS

PRELIMINARY STATUS DATE — REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
LOE

APPROVED STATUS DATE — REPRESENTS REVIEWED AND APPROVED DESIGN, ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.
LOE

ORIGINATING PERSONNEL

DRAWN BY: R. GRANT
CHECKED BY: M. PELLETIER
LEAD DESIGNER: P. LOUEN
ENGINEER/TECH SPECIALIST: M. PELLETIER
PROJECT ENGINEERING MANAGER: M. PELLETIER
PROJECT MANAGER: K. STUCKI

PROFESSIONAL ENGINEER'S SEAL

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF
PE: ______ STATE: ______
LIC. NO.: ______ DATE: ______

Zero Harm — Leadership, No Incidents, Safe Behavior

WorleyParsons resources & energy

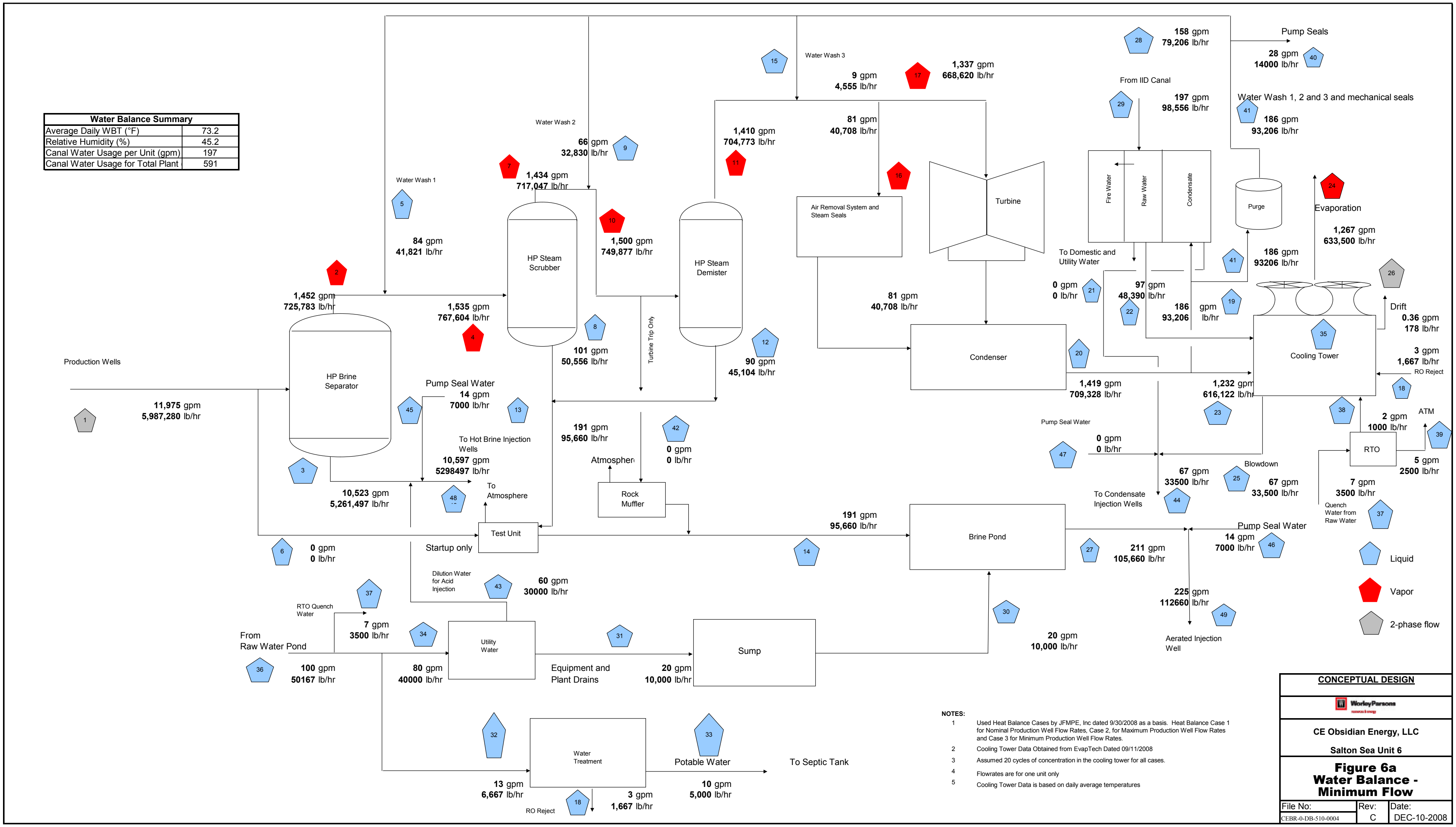
CAL ENERGY OPERATING CORPORATION
A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE
7030 GENTRY ROAD
CALIPATRIA, CALIFORNIA 92233

CLIENT/PROJECT TITLE
CAL ENERGY - SALTON SEA 6
UNITS 1, 2, & 3
AMMENDED

Figure 5
Overall Site Plan

SCALE: 1" = 130'
DRAWING SIZE: ARCH D (36" x 24")
WORLEYPARSONS DWG. NO.: CEBR-0-SK-111-007-001
REV: C

$$DESIGN-FILE-NAME$$ $$DATE$$ $$TIME$$



Water Balance Summary	
Average Daily WBT (°F)	73.2
Relative Humidity (%)	45.2
Canal Water Usage per Unit (gpm)	197
Canal Water Usage for Total Plant	591

NOTES:

1. Used Heat Balance Cases by JFMPE, Inc dated 9/30/2008 as a basis. Heat Balance Case 1 for Nominal Production Well Flow Rates, Case 2, for Maximum Production Well Flow Rates and Case 3 for Minimum Production Well Flow Rates.
2. Cooling Tower Data Obtained from EvapTech Dated 09/11/2008
3. Assumed 20 cycles of concentration in the cooling tower for all cases.
4. Flowrates are for one unit only
5. Cooling Tower Data is based on daily average temperatures

CONCEPTUAL DESIGN

WorleyParsons

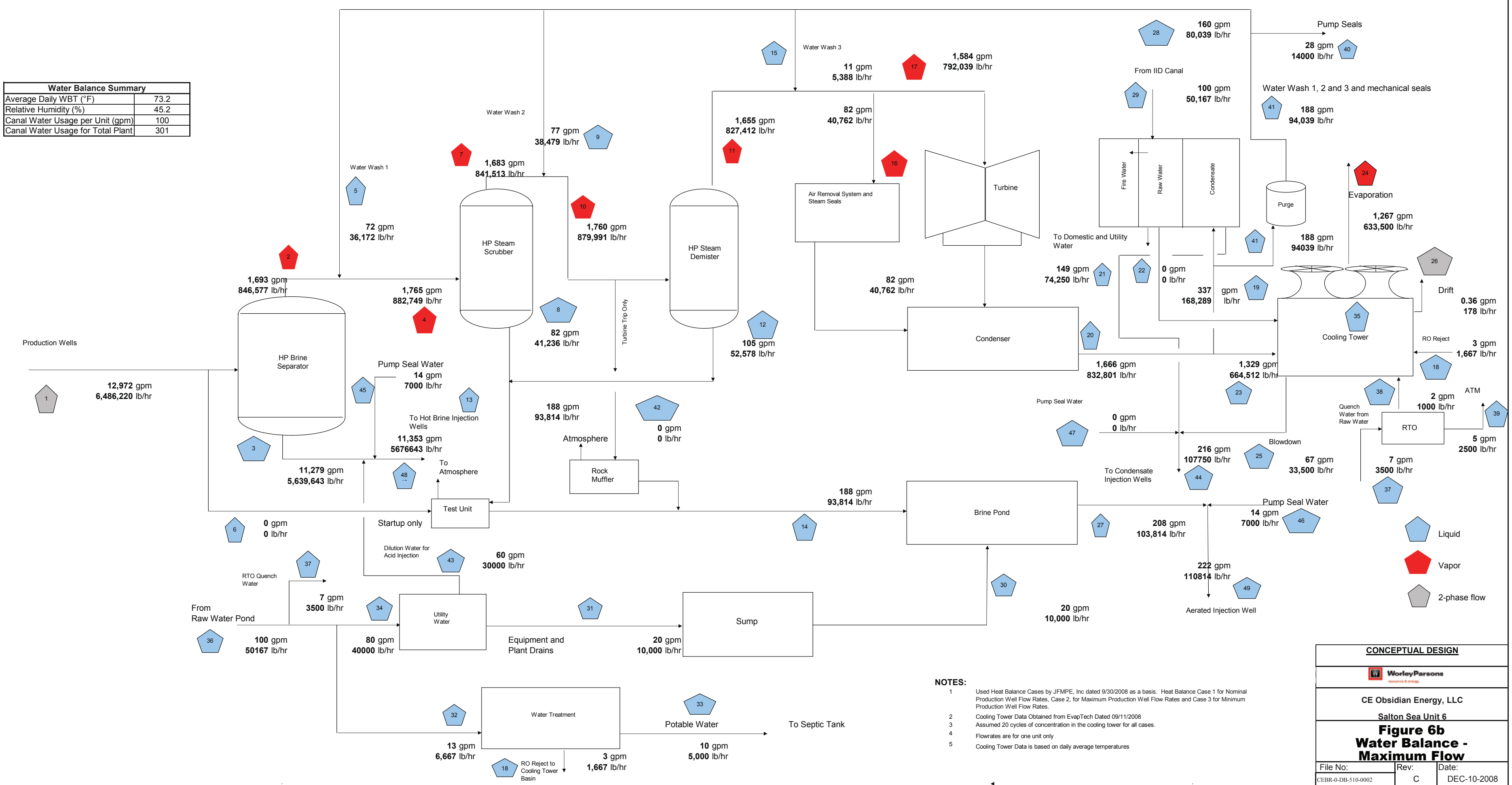
CE Obsidian Energy, LLC

Salton Sea Unit 6

Figure 6a
Water Balance - Minimum Flow

File No:	Rev:	Date:
CEBR-0-DB-510-0004	C	DEC-10-2008

Water Balance Summary	
Average Daily WBT (°F)	73.2
Relative Humidity (%)	45.2
Canal Water Usage per Unit (gpm)	100
Canal Water Usage for Total Plant	301



NOTES:

1. Used Heat Balance Cases by JFMPE, Inc dated 9/30/2008 as a basis. Heat Balance Case 1 for Nominal Production Well Flow Rates, Case 2, for Maximum Production Well Flow Rates and Case 3 for Minimum Production Well Flow Rates.
2. Cooling Tower Data Obtained from EvapTech Dated 09/11/2008
3. Assumed 20 cycles of concentration in the cooling tower for all cases.
4. Flowrates are for one unit only
5. Cooling Tower Data is based on daily average temperatures

CONCEPTUAL DESIGN

WorleyParsons

CE Obsidian Energy, LLC

Salton Sea Unit 6

Figure 6b Water Balance - Maximum Flow

File No:	Rev:	Date:
CEBR-0-DB-510-0002	C	DEC-10-2008