PALEN SOLAR ELECTRIC GENERATING SYSTEM

California Energy Commission
DOCKETED
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PETITION TO AMEND

DECEMBER 2012

09-AFC-7C

SUBMITTED BY:

PALEN SOLAR HOLDINGS, LLC

PREPARED BY:

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December 17, 2012

Christine Stora
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Subject: **PALEN SOLAR HOLDINGS, LLC'S PETITION FOR AMENDMENT**
PALEN SOLAR ELECTRIC GENERATING SYSTEM
DOCKET NO. (09-AFC-7C)

Dear Ms. Stora,

On behalf of Palen Solar Holdings, LLC (PSH), GalatiBlek LLP hereby submits ten (10) hard copies and ten (10) CDs of PSH's Petition for Amendment (Petition) for the Palen Solar Electric Generating System (PSEGS) (09-AFC-7C) to eliminate the use of solar parabolic trough technology and replace it with BrightSource's LPT solar power tower technology.

I certify under penalty of perjury that the foregoing is true, correct, and complete to the best of my knowledge. I also certify that I am authorized to submit PSH's Petition for the PSEGS on behalf of PSH.

Sincerely,

Scott A. Galati
Counsel to Palen Solar Holdings, LLC

PALEN SOLAR ELECTRIC GENERATING SYSTEM

Petition to Amend

(09-AFC-7C)

Submitted By:

PALEN SOLAR HOLDINGS, LLC

Submitted to:

California Energy Commission

Prepared by:

centerline

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Section 1 INTRODUCTION

1.1 INTRODUCTION TO PETITION

Palen Solar Holdings, LLC (PSH), a joint venture between BrightSource Energy, Inc. (BrightSource) and Caithness Energy, LLC (Caithness), files this Petition For Amendment (Petition) with the California Energy Commission (Commission) to eliminate the use of solar parabolic trough technology and replace it with BrightSource's LPT solar power tower technology for the previously approved Palen Solar Power Project (PSPP). This section describes the procedural background of the PSPP and the authority for the Commission to process this Petition. The purpose and need for the Petition and the benefits from the project after modification are also described in this section.

Section 2 of the Petition describes the modifications proposed to convert the Project to solar tower technology as well as the modifications to the project footprint to reduce environmental impacts.

Sections 3, 4, 5 and 6 contain analysis of the proposed modifications comparing the potential environmental impacts from the modified solar tower configuration to the potential environmental impacts of the original project as approved in the Commission Final Decision. These sections also include an update of laws, ordinances, regulations or standards applicable to the solar tower configuration. Where appropriate each technical section proposes modifications to the Conditions of Certification contained in the Final Decision.

Section 7 contains an analysis demonstrating that the modifications do not increase any potential effects on nearby property owners.

1.2 FINAL DECISION BACKGROUND

Palen Solar I, LLC (PSI) filed an Application For Certification (AFC) with the Commission on August 24, 2009 to construct and operate a nominal 500 megawatt (MW) concentrating solar thermal electric power generating facility using solar parabolic trough technology. The Commission issued a Final Decision approving two alternative configurations for the PSPP on December 15, 2010 (Order No. 10-1215-19, the "Final Decision", 09-AFC-7). Approved Reconfigured Alternative 3 concentrated development of project facilities on federal land managed by the United States Bureau of Land Management (BLM), while Approved Reconfigured Alternative 2 allowed development of project facilities on federal land and on adjacent private parcels should PSI acquire the private parcels in the future.

1.2.1 Change in Ownership and Project Name

On April 2, 2012 PSI, along with other Solar Millennium US-based companies, petitioned for relief in federal bankruptcy court. On June 21, 2012, the bankruptcy court approved the transfer of the project to BrightSource. The Commission subsequently approved a petition to amend the Final Decision to transfer ownership of the Project to Palen SEGS I, LLC, a wholly owned, indirect subsidiary of BrightSource (Order No. 12-0711-3). After approval of the ownership transfer of the Final Decision to Palen SEGS I, LLC, BrightSource and Caithness formed a joint venture to develop the site using BrightSource's solar power tower technology. The joint venture company is PSH.

This Petition requests that the Final Decision be amended to describe the ultimate ownership as follows: PSH is the parent company of Palen SEGS I, LLC and Palen SEGS II, LLC. Palen SEGS I, LLC will own and operate Unit 1, Palen SEGS II, LLC will own and operate Unit 2, and both entities will share ownership of common facilities and the generation tie-line. Since both entities are wholly owned by PSH, this Petition will refer to the Applicant as PSH. PSH requests an order in the form approved for the Ivanpah Project where ownership of the units, as described above, is specifically authorized to avoid further Petitions For Ownership Change.

PSH also requests that the PSPP name be changed to Palen Solar Electric Generating System (PSEGS).

For convenience, the term "Approved Project" refers to the PSPP as described in the Final Decision. The term "Modified Project" refers to the PSEGS as proposed in this Petition.

1.3 PURPOSE AND NEED FOR AMENDMENT

PSH acquired the PSEGS site in order to develop BrightSource's proprietary solar thermal tower technology on the site. This change in technology could not have been anticipated during the original permitting process because at the time of the original licensing PSI was wholly-owned by Solar Millennium whose plans involved developing its own proprietary parabolic trough technology sometimes referred in the Final Decision as "helitrough". PSH did not acquire the project site until after the Commission's Final Decision.

1.4 PROJECT AMENDMENT BENEFITS

The PSEGS site has received a Commission Final Decision in 2010 and was very near receiving its BLM Right of Way Grant (ROW). The modifications proposed in this Petition provide an opportunity to deliver clean renewable power to California without the need to permit a new site. The PSEGS site is also designated "Developable" in BLM's Eastern Riverside County Solar Energy Zone. In addition, as described in this

Petition, PSH's proposed technology eliminates the use of millions of gallons of Therminol, the Heat Transfer Fluid (HTF) utilized by the parabolic technology. The Modified Project will also reduce the original PSPP footprint to further avoid environmental impacts. Each Unit has an approved Power Purchase Agreement (PPA) and PSH has a Large Generator Interconnect Agreement (LGIA) for 500 MW of interconnection rights which allow it to safely deliver the electrical output of the PSEGS to the Southern California Edison (SCE) Red Bluff Substation. The use of a fully permitted site (as reconfigured), with an approved LGIA, on BLM land designated for solar development is a responsible approach to helping California achieve its Renewable Portfolio Standards and beyond.

In order to further reduce environmental impacts, PSH has reconfigured the site and further reduced the ground disturbance footprint. Specifically, the Modified Project reduces the project footprint from up to 4,366 acres to approximately 3,794 acres and provides the following environmental benefits:

- Reduces 572 acres of impacts to Desert Tortoise Habitat
- Reduces impacts to Mojave Fringe Toed Lizard Habitat
- Reduces water use from 300 acre feet per year (AFY) to 201 AFY
- Reduces water use during construction from 5,750 acre feet to 1,130 acre feet
- Reduces grading from a total of 4.5 million cubic yards of cut and fill to 0.2 million cubic yards of cut and fill
- Reduces grading across the solar field thereby reducing direct and indirect impacts to washes
- Reduces impacts by eliminating the relocation of existing SCE 161 kV transmission line

1.5 SCOPE OF ANALYSIS

PSH requests the Commission to process this Petition in accordance with Section 1769 of its regulations and the well-established principles of practice the Commission has followed when processing other petitions for amendment. This Petition has been prepared in accordance with those principles, focusing on comparing the modifications proposed herein to the original project as described in the Final Decision. Additionally, to comply with financing obligations to meet the Investment Tax Credit deadline, PSH is aiming to obtain a final decision on this Petition by October, 2013.

Section 2 DESCRIPTION OF PROJECT AMENDMENT

This section provides a description of the modifications to the approved project that are proposed by PSH. The Final Decision describes the PSPP as a solar thermal project using parabolic trough technology. Under the Modified Project, the troughs and associated HTF will be eliminated and the PSEGS will be reconfigured to utilize BrightSource's solar tower technology consisting of two solar towers and associated power blocks and heliostat fields. This section contains a complete description of the Modified Project proposed in this Petition and compares the modifications to the Approved Project described in the Final Decision.

2.1 GENERAL PROJECT DESCRIPTION

2.1.1 Site Overview

The site is located in the Southern California inland desert, approximately 10 miles east of Desert Center, eastern Riverside County, California. See Site Vicinity Map Figure 2.1-1. The Project facilities will be located entirely on Federal land, BLM ROW # CACA 48810, in Townships 5 and 6 South, Range 17 East. The BLM is conducting a concurrent process to issue a Record of Decision as required for PSH to utilize approximately 5,200 acres of public lands owned by the federal government for the Modified Project.

2.1.2 Description of Approved Project

The Commission Final Decision for the PSPP approved the PSPP as a solar thermal generating facility that would consist of two adjacent but independent units of 250 megawatt MW nominal capacity each for a total nominal capacity of 500 MW. The Approved Project would have utilized solar parabolic trough technology to generate electricity. With this technology, arrays of parabolic mirrors refocus the sunlight on a receiver tube to create and collect heat energy. The receiver tube is located at the focal point of the trough's parabola shape. A heat transfer fluid (HTF) is brought to high temperature (750°F) as it circulates through the receiver tubes. The HTF is then piped through a series of heat exchangers where it releases its stored heat to generate high pressure steam. The steam is then fed to a traditional steam turbine generator where electricity is produced. Individual components of the Approved Project included:

- Graded Solar Field & Power Block #1 (east)
- Graded Solar Field & Power Block #2 (west)
- Access road from Corn Springs Road
- Warehouse/maintenance building, assembly hall and laydown area
- Telecommunications lines
- Liquified Petroleum Gas (LPG) tank
- Concrete batch plant
- Fuel depot
- Onsite transmission facilities, including central internal switchyard
- 230 kV single circuit transmission line interconnecting to SCE's Red Bluff Substation
- Groundwater wells used for water supply
- Four evaporation ponds for wastewater
- Septic systems for sanitary wastewater

- Land treatment units for handling of spills of Therminol HTF.

During the Commission's licensing process, Commission Staff concluded that the PSPP as originally proposed by PSI would result in unmitigable significant adverse impacts to biological resources associated with sand transport interference. While PSI disagreed with these findings, PSI developed and submitted two other site configuration alternatives in an effort to accommodate Staff's and other biological agencies' concerns. The alternative configurations moved the project facilities westerly in order to prevent the project footprint from interfering with the area with the greatest sand transport potential. These alternatives were designated Reconfigured Alternative 2 and Reconfigured Alternative 3. A key difference between Reconfigured Alternative 2 and Reconfigured Alternative 3 is that Reconfigured Alternative 2 incorporated into the project boundary 240 acres of private land near the southeast corner of the site. As PSI did not have ownership or control of this private land, PSI requested the ability to construct Reconfigured Alternative 2 or Reconfigured Alternative 3 until the land acquisition efforts could be concluded. The Commission approved use of either Reconfigured Alternative 2 or Reconfigured Alternative 3 by PSI. Figures 2.1-2A and 2.1-2B show the two alternatives that were approved in the Final Decision.

2.1.3 Overview of Modified Project (PSEGS)

The Modified Project includes replacing the parabolic trough solar collection system and associated HTF with the BrightSource technology. The BrightSource technology uses heliostats—elevated mirrors guided by a tracking system mounted on a pylon—to focus the sun's rays on a solar receiver steam generator (SRSG) located atop a solar tower near the center of each solar field to create steam. Access to the site will be the same as the Approved Project and the PSEGS will continue to interconnect to the regional transmission grid at SCE's Red Bluff Substation which is currently under construction.

PSEGS will be comprised of two adjacent solar fields and associated facilities with a total combined nominal output of approximately 500 MW. PSH proposes to develop PSEGS in two operational phases: each phase will consist of one solar field and power block with approximately 250 MW of electricity. Each phase will also share common facilities, including a common area containing an administration building, warehouse, evaporation ponds, maintenance complex and a meter/valve station for incoming natural gas service to the site; an onsite switchyard; and a single-circuit 230 kV generation tie-line to deliver power to the electricity grid. Other onsite facilities will include access and maintenance roads (either dirt, gravel or paved), perimeter fencing, tortoise fencing and other ancillary security facilities.

The Modified Project will be located on approximately 3,794 acres of public land entirely within BLM right-of-way (ROW) # CACA – 048810. While the Approved Project also included the use of a private parcel (approximately 40 acres) located in the northeast portion of the site, the Modified Project will not include any development within this private parcel. The Approved Project also included the ability to develop the private parcels (approximately 240 acres) located in the southeastern portion of the site if the parcels were acquired. The Modified Project will not develop these private parcels.

Assuming that required permits are in place and construction progresses as planned, PSH would begin construction on the PSEGS immediately after the Fall 2013 Desert Tortoise Survey Window. The first phase of construction would include the generation tie-line and the first solar field/power block. The second phase of construction would begin shortly after start of construction of the first phase and would continue to support the commercial operation dates of both units by the end of June 2016.

For ease of review, the following identifies the primary modifications to the Approved Project:

- The proposed technology to be utilized for the Modified Project would be two units each with a net generating capacity of up to 250 MW and each consisting of a 750 foot tall solar power tower and receiver, a power block and a dedicated field of approximately 85,000 heliostats.
- The Modified Project would include an approximately 15 acre common facilities area located in the southwestern corner of the site with an administrative/warehouse building and two 2-acre evaporation ponds.
- An approximately 203 acre temporary construction laydown area located in the southwestern portion of the site immediately north of the common facilities area. This area will be used for laydown of materials, staging of traffic to avoid congestion on the I-10/Corn Springs interchange, and may be the temporary location of the concrete batch plant.
- The Modified Project includes a slight re-routing of the generation tie-line near the western end of the route and around the newly constructed Red Bluff Substation. The purpose of this re-routing is to align the PSEGS generation tie-line route immediately adjacent to the NextEra Desert Sunlight generation tie-line to minimize crossings over Interstate-10 and to ensure easy entry into the Red Bluff Substation nearest the PSEGS breaker position.
- Elimination of the secondary access road.

- Re-routing of the redundant telecommunication line along the generation tie-line route.
- Natural gas delivery from a new extension of the existing Southern California Gas (SoCal Gas) distribution system to the project boundary.

In addition to changing the technology, PSH has reconfigured the project layout to further reduce environmental impacts. Specifically, the Modified Project reduces the project footprint from 4,366 acres to 3,794 acres and provides the following environmental benefits:

- Reduces 572 acres of impacts to Desert Tortoise Habitat
- Reduces impacts to Mojave Fringe Toed Lizard habitat
- Reduces water use from 300 acre feet per year (AFY) to 201 AFY.
- Reduces water use during construction from 5,750 acre feet to 1,130 acre feet
- Reduces grading from a total of 4.5 million cubic yards of cut and fill to 0.2 million cubic yards of cut and fill.
- Reduces grading across the solar field thereby reducing direct and indirect impacts to washes.
- Reduces impacts by eliminating the relocation of the existing SCE 161 kV transmission line.

Figure 2.1-3 shows the overall facility boundaries of the Modified Project including linear features. Figure 2.1-4 shows the acreage estimates of the various project features. Figure 2.1-5 shows the Overall Site Plan.

2.2 GENERATING FACILITY DESCRIPTION

This section describes PSEGS's conceptual design and proposed operation.

2.2.1 Process Description

The Project will have a nominal output of 500 megawatts (MW), and consist of two adjacent and independent solar plants of approximately 250 MW Solar Plant 1 (located on the western portion of the site) and Solar Plant 2 (located on the eastern portion of the site). Both Plants will share common facilities. Each of the 250 MW units will have a dedicated SRSG/tower, solar field/heliostat array, and a dedicated non-reheat Rankine-cycle steam turbine generator/ power block. Figures 2.2-1A and B show the Equipment Arrangement Plans for each power block. Figures 2.2-2A and B show the Equipment Arrangement Elevations for each power block. Equipment dimensions are shown in Appendix 2-A.

Each solar plant will use heliostats—elevated mirrors guided by a tracking system mounted on a pylon—to focus the sun's rays on a SRSG atop a tower near the center of each solar field. In each plant, one Rankine-cycle steam turbine will receive steam from the SRSG to generate electricity. The solar field and power generation equipment will start each morning after sunrise and will shut down (unless augmented by the auxiliary boiler) when insolation drops below the level required to keep the turbine online. To conserve water in the site's desert environment, each plant will use an air-cooled condenser for the main steam cycle. A wet surface air cooler (WSAC) will be used for auxiliary equipment cooling. Raw water will be drawn daily from onsite wells located in each power block and in the common area adjacent to the administration building. Groundwater will be treated in onsite treatment systems and will be used for mirror washing, WSAC makeup and process makeup.

Each of the power blocks will be connected via underground electrical cables to the onsite switchyard in the northern area of the site. Each power block will also have a gas metering set. Permanent parking areas will be provided at each power block for operations and maintenance personnel.

During normal operation, the steam turbine in each Plant receives steam from the SRSG located in the power block at the top of the solar power tower. The solar field and power generation equipment are started each morning after sunrise and insolation build-up, and shut down when insolation drops below the level required to keep the turbine online. Natural-gas-fired boilers may also be used to extend daily power generation. However, on an annual basis, the natural gas used as a supplement to power generation is limited to below 2% of the annual energy output of the Modified Project.

Each solar plant includes two auxiliary boilers. A startup boiler will be used during the morning start-up cycle to assist the plant in coming up to operating temperature more quickly and for augmenting the solar operation when solar energy diminishes or during transient cloudy conditions. Each solar plant also includes a night preservation boiler that will be used to provide steam to the gland systems of the steam turbine and boiler feedwater pump turbine to prevent air ingress overnight and during other shutdown periods when steam is not available from the SRSG. This boiler will also provide pegging steam to the deaerator during these shutdowns.

The annual average electricity production expected for PSEGS is presented in Table 2.2-1.

Table 2.2-1
Annual Average Electricity Production

Plant	Capacity (Nominal, MW)	No. of Heliostats	Annual Electricity Production (MWh, Net)		
			From Solar Energy	From Natural Gas	Total
Solar Plant 1 (West)	250 MW	85,000	700,100	5,100	705,200
Solar Plant 2 (East)	250 MW	85,000	701,800	5,300	707,100
Total	500 MW		1,401,900	10,400	1,412,300

MW = megawatt
MWh = megawatt hour

2.2.1.1 Power Cycle

Solar energy is reflected by the heliostats onto the SRSG where the energy heats water into superheated steam. The steam is then routed to the steam turbine generator (STG) where the energy in the steam is converted to electrical energy. Heat balance diagrams for the NCR (Normal Continuous Rating) and MCR (Maximum Continuous Rating) of the steam turbine are shown in Figures 2.2-3A and B.

Following expansion through the steam turbine, exhaust steam is directed to the air cooled condenser. The air-cooled condenser blows ambient air across a heat transfer surface area to cool and condense the steam. The condensed steam is collected in a condensate tank and returned to the SRSG via a series of feedwater heaters and pumps.

2.2.1.2 Solar Field

Each of the heliostat assemblies is composed of two mirrors, each approximately 12 feet high by 8.5 feet wide, with a total reflecting surface of 204.7 square feet. Each heliostat assembly is mounted on a single pylon, along with a computer-programmed aiming control system that directs the motion of the heliostat to track the movement of the sun. Figure 2.2-4 shows a typical heliostat assembly.

Communication between the heliostats and the operations center will be done via surface-mounted anchored cable or wireless remote system. The final layout will be completed during detailed design but is expected to consist of approximately 85,000 heliostats in each solar field.

2.2.1.3 Solar Plants

The following provides further details regarding the two 250 MW solar plants.

- The solar power tower structure height is approximately 620 feet tall.
- The SRSG located at the top of the solar power tower is approximately 130 feet tall, resulting in an overall tower height of approximately 750 feet (not including regulation lighting appurtenance).
- No heliostat will be built closer than 260 feet from the solar power tower location.
- The arrangement of the heliostats within the solar field is designed for maximum efficiency. The area immediately adjacent to the tower contains the power block and is designated as a 'heliostat' free zone. Heliostats located closest to the tower and just outside the heliostat free zone are more densely-packed than mirrors located farther from the tower to maximize collection of solar energy. In this zone, there will be no concentric roads separating the heliostats for vehicular access; mirror washing in this zone will be performed by a small mirror washing machine. The heliostats in the larger solar field arrays will be separated by 10 feet dirt roads arranged concentrically around the tower and will be spaced approximately 153 feet apart.
- For Solar Plant 1, the distance between the solar power tower and the farthest heliostat in the solar field is approximately 8,456 feet to the northeast section of the heliostat array. For Solar Plant 2, the longest distance between the solar power tower and the farthest heliostat in the solar field is approximately 8,966 feet to the east section of the heliostat array. Generally, this is due to the higher efficiency of heliostats in the northern section in the northern hemisphere. With the sun predominantly in the southern sky, the cosine effect of incidence and reflection angles is less in the northern heliostats than in the southern ones. The converse (lower collection efficiency in the southern section) is also true and, therefore, the maximum southern arc radius is the shortest.

- The eastern sector heliostat energy collection is more valuable than the western sector collection because afternoon energy collection, during on-peak utility hours, is more valuable than morning energy collection, during part-peak or off-peak hours.

2.2.1.4 Steam Turbine Generator and Air-Cooled Condenser

Each solar plant will contain a nonreheat, Rankine-cycle, condensing STG with gland steam system, lubricating oil system, hydraulic control system, and steam admission/induction valving. High pressure (HP) steam from the SRSG superheater enters the HP steam turbine section and expands through multiple stages of the turbine, driving a generator to produce electricity. On exiting the Low Pressure (LP) turbine, the steam is directed into the air-cooled condenser.

The turbine will consist of high/intermediate pressure and low pressure sections. Superheated steam enters the HP turbine casing at 2,466 pounds per square inch absolute (psia) and 1,085 degrees Fahrenheit (°F) at the Normal Continuous Rating.

Following expansion through the HP turbine, the steam is conveyed to the inlet of the intermediate pressure (IP) turbine. Exhaust steam from the turbine is directed to the air cooled condenser. The air-cooled condenser blows ambient air across a heat transfer surface area to cool and condense the steam. The condensed steam is gathered in a condensate tank and provided to the feedwater circuit through a condensate pump. The air-cooled condenser normally operates at a pressure of 3.25 inches of mercury absolute (approximately 1.6 psia).

2.2.1.5 Natural Gas Boilers

Each solar plant will include two natural gas-fired boilers to assist with daily start-up of the power generation equipment and to preserve energy in the steam cycle overnight. The design of the auxiliary boiler system has been optimized to reduce natural gas consumption and emissions and to support the operation of the SRSG in an efficient and effective manner.

Each solar plant will contain the following boiler equipment:

- One 249 MMBtu/hr packaged natural-gas-fired auxiliary boiler for startup and cycle augmentation,
- One 10 MMBtu/hr natural gas-fired “night preservation” boiler to maintain system temperatures overnight.
- The start-up auxiliary boiler will be used to pre-warm the SRSG to expedite the process of bringing the plants online each morning, and to assist during

shutdown cooling operation. The boiler may also be used to augment the solar operation during the evening shoulder period as solar energy diminishes. It is assumed that power augmentation would be needed primarily in the later afternoon/early evening. The start-up auxiliary boiler will have a capacity of 185,000 pounds per hour (lb/hr) at 770°F and 650 psia.

- The night preservation boiler will provide superheated steam to the STG and boiler feedwater pump gland systems overnight and during other shutdown periods when steam is not available from the SRSG. The night preservation boiler will produce 10,000 lb/hr at 500°F and 175 psia.

Table 2.2-2 provides the maximum anticipated maximum natural gas fuel use for the Project.

TABLE 2.2-2
Facility Natural Gas Fuel Use (Total, All Units)

Period	Anticipated Maximum Fuel Use (MMBtu/year)		
	Solar Plant 1 (West)	Solar Plant 2 (East)	Total
Per Hour	249	249	498
Per Day	1,450	1,450	2,900
Per Year	371,000	371,000	742,000

2.2.2 Major Electrical Equipment and Systems

The bulk of the electric power produced by the facility will be transmitted to the grid. Approximately 22 MW of electric power will be used onsite to power auxiliaries such as the air-cooled condenser, pumps and fans, control systems, and general facility loads including lighting, heating, and air conditioning. Some power will also be converted from alternating current (AC) to direct current (DC) and stored in batteries, which will be used as backup power for the plant control systems and essential uses. Emergency power will be provided by two diesel generator sets (one in each power block), each with 2,500 kW output capacity and one diesel generator set in the common area (with a 250 kW output capacity). Transmission and auxiliary uses are discussed in the following subsections.

2.2.2.1 AC Power—Transmission

Each solar plant will include a STG to convert thermal energy into electrical power. Power will be generated by the air-cooled generator and connected through a generator circuit breaker to the generator step-up (GSU) transformer where the voltage will be stepped up and transmitted to the onsite switchyard. Surge arresters will be provided at the high voltage bushings to protect the transformers from surges on the system caused

by lightning strikes or other system disturbances. The transformers will be set on concrete pads within containments designed to contain the transformer oil in the event of a leak or spill. Fire protection systems will be provided for the transformers. The high-voltage side of the GSU transformers will be connected to the common switchyard located in the northern area of the site by underground cables. From the switchyard, power will be transmitted via an overhead transmission line to the electrical grid.

A description of the switchyard and generation tie-line is contained in Section 3.2 of this Petition.

2.2.2.2 AC Power—Distribution to Auxiliaries

Auxiliary power to each solar plant will be supplied at 4,160 volts AC by a 4,160 volt switchgear lineup. The oil-filled, 21- to 4.16-kV unit auxiliary transformer will supply primary power to the switchgear. The high voltage side (21 kV) of the unit auxiliary transformers will be connected to the outputs of each of the STGs. The generator circuit breaker is used to isolate and synchronize the generators, and will be located between the generators and both connections to the transformers. The 4,160 volt switchgear lineup supplies power to the various 4,160 volt motors, and to the load center transformers, rated 4,160 to 480 volts, for 480 volt power distribution. The switchgear will have vacuum interrupter circuit breakers for the main incoming feeds and for power distribution. The load center transformers will be oil-filled, each supplying 480 volt, three-phase power to the load centers.

The load center transformers will provide power through feeder breakers to the various 480 volt loads and the 480-volt motor control centers (MCCs). The MCCs will distribute power to 480 volt motors, to 480 volt power distribution panels, and lower voltage lighting and distribution panel transformers. Power for the AC power supply (120 volt/208 volt) system will be provided by the 480 volt MCCs and 480 volt power panels. 480-120/208 volt dry-type transformers will provide transformation of 480 volt power to 120/208 volt power.

2.2.2.3 125-Volt DC Power Supply System

A 125-volt DC power supply system consisting of two 100-percent-capacity battery banks, two 100 percent static battery chargers, a switchboard, and distribution panels will be supplied for essential balance-of-plant and STG equipment.

Under normal operating conditions, the battery chargers supply DC power to the DC loads. The battery chargers receive 480 volt, three-phase AC power from the AC power supply (480 volt) system and continuously charge the battery banks while supplying power to the DC loads.

Under abnormal or emergency conditions, when power from the AC power supply (480 volt) system is interrupted, the batteries supply DC power to the DC system loads. Recharging of a discharged battery occurs whenever 480 volt power becomes available from the AC power supply (480 volt) system. The rate of charge depends on the characteristics of the battery, battery charger, and the connected DC load during charging. The anticipated maximum recharge time will be 12 hours.

The 125 volt DC system will also be used to provide control power to the 230-kV generator breakers, 4,160 volt switchgear, to the 480 volt load center transformers, to critical control circuits, and to the emergency DC motors.

2.2.2.4 Uninterruptible Power Supply System

Each solar plant will also have an essential service 120 volt AC, single-phase, 60 hertz (Hz) uninterruptible power supply (UPS) to supply AC power to essential instrumentation, critical equipment loads, and unit protection and safety systems that require uninterruptible AC power.

Redundant UPS inverters will supply 120-volt AC single-phase power to the UPS panel boards that supply critical AC loads. The UPS inverters will be fed from the station 125 volt DC power supply system. Each UPS system will consist of one full-capacity inverter, a static transfer switch, a manual bypass switch, an alternate source transformer, and panel boards.

The normal source of power to the system will be from the 125-volt DC power supply system through the inverter to the panel board. A solid-state static transfer switch will continuously monitor both the inverter output and the alternate AC source. The transfer switch will automatically transfer essential AC loads without interruption from the inverter output to the alternate source upon loss of the inverter output.

A manual bypass switch will also be included to enable isolation of the inverter for testing and maintenance without interruption to the essential service AC loads.

The distributed control system (DCS) operator stations will be supplied from the UPS. The parametric emissions monitoring equipment, DCS controllers, and input/output (I/O) modules will be fed using either UPS or 125-volt DC power directly.

2.3 NATURAL GAS SUPPLY

The Approved Project did not include a natural gas supply pipeline but rather was approved to use LPG for its auxiliary fuel. The Modified Project will use natural gas to fire its auxiliary and nighttime preservation boilers. The natural gas supply for PSEGS will be provided by SoCal Gas, which will upgrade and extend an existing distribution line from its main transmission gas pipeline located approximately 1.8 miles west and

south of the site. The existing distribution facilities will be upgraded from a 4 inch pipeline to an 8 inch pipeline. Additionally, SoCal Gas will permit and construct a new 8 inch gas pipeline extension from the current retail meter point to the new PSEGS meter to be located within the common area. (See Figure 2.1-3). SoCal Gas will construct, own and operate the new distribution line as part of its extensive gas supply system. A tap station on the main transmission gas pipeline will be installed at this point with a new gas metering station to measure and record gas volumes from the metering station. The PSEGS will install a gas metering station at the common area.

From the onsite metering station in the common area, an underground pipe approximately 8" in diameter and buried to a depth of approximately 5 feet, will be installed along the southern border of the Solar Plant 1 solar field. At the road that divides the two solar fields, the pipeline will turn northeasterly and continue to the point where it intersects the road between the two solar plants. At this point, the pipeline will divide—with one branch proceeding northwest to Solar Plant 1 and the other southeast to Solar Plant 2. Individual metering sets (including electrical preheaters for the natural gas, pressure-reduction equipment, and filter-separator skids) will be installed at each power block to monitor gas usage.

Construction activities related to the onsite metering station and metering sets will include grading a pad and installing above- and belowground gas piping, metering equipment, gas conditioning and pressure regulation equipment, and possibly pigging facilities. A distribution power line for metering station operation lighting, communication equipment, and perimeter chain link fencing for security will also be installed.

2.4 WATER SUPPLY AND USE

The Final Decision allowed the Approved Project to use up to 1,917 acre feet per year (AFY) during construction (for a total of 5,750 acre feet during the 39 months) and 300 AFY during operation from up to 10 groundwater wells. The Modified Project will utilize the same number of groundwater wells but will only use up to 400AFY during construction (for a total of 1,130 acre feet during the construction period) and up to 201 AFY during operation. Water balance diagrams for the PSEGS are shown on Figures 2.4-1A through D. The wells will be used for process make-up water, mirror wash water, and domestic uses.

Each solar plant will have a raw water tank with a capacity of 800,000 gallons. A portion of the raw water (200,000 gallons) is for plant use while the majority will be reserved for fire water. The common area will also contain a combined service water/firewater tank with a capacity of 480,000 gallons..

PSEGS will generate electricity up to 16 hours a day, with the exception of a scheduled shutdown in winter for maintenance. However, the water treatment plant will operate continuously in order to minimize water treatment system size and capital cost, and to use off-peak energy at night.

2.4.1 Water Requirements

A breakdown of the estimated average daily quantity of water required for PSEGS operation is presented in Table 2.4-1. The daily water requirements shown are estimated quantities based on PSEGS operating at full load.

TABLE 2.4-1
Average Daily Water Requirements (Both Solar Plants)

	Average Daily Use		Annual Average Use
Use	gpd	Gpm	AFY
Process Uses	63	90,873	102
Mirror Washing	44	63,408	71
Potable Water	2.1	2,995	3.4
Dust Suppression	15	21,802	24.4
Total	124	179,078	201

gpd = gallons per da
gpm = gallons per minute
AFY = acre-feet per year
Average Daily Use is based on annual operating hours of 3,500 hours/year

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Because usage rates will vary during the year and will be higher in the summer months, the system will be designed to ensure higher pumping rates can be met for operational and emergency needs.

Because the facility will use air-cooled condensers, water needs will be minimal. Primary water uses consist of replacing boiler blowdown providing supplemental cooling for plant auxiliary systems and water for washing the heliostats to ensure they function at full performance. Because the site is in a valley with the potential for high winds and near the location of a sand transport corridor, the frequency of mirror washing activities is anticipated to be greater than at other BrightSource facilities currently undergoing permitting. Regular mirror washing is anticipated to be needed once a week. Additional

mirror washing may occur on an as-needed basis as determined by a reflectivity monitoring program. Mirror washing will occur primarily at night and involves a water truck spraying treated water on the mirrors in a drive-by fashion. Wash water falls from the mirrors to the ground and, due to the small volume, soaks in with no appreciable runoff. Remaining rinse water from the mirror washing operation is expected to evaporate on the mirror surface.

Water for domestic uses by project employees will also be provided by onsite groundwater treated to potable water standards. The estimated annual water use for this purpose is 4 AFY.

2.4.2 Water Supply and Treatment

The onsite groundwater production wells will supply both solar plants and the common area with make-up water, mirror-wash water, and domestic water. Each solar plant will include a water treatment and deionizing facility in the power block area.

The water treatment systems will be supplied by a water treatment specialty company and will include the following components:

- Manganese dioxide iron removal filter (MDIRF). The MDIRF will remove soluble iron prior to the reverse osmosis membranes that are affected negatively by iron scaling. Sodium hypochlorite is injected upstream of the MDIRF to oxidize iron to iron +3. Iron +3 reacts in water to form an insoluble iron hydroxide that is retained by the filter media and allows the iron free water to pass through. During the treatment phase iron particulate is collected and the delta pressure across the filter builds up to the point that the filter requires back washing. The iron particulate is removed with the backwash and then the filter can be placed back on-line. Back wash is transferred to the evaporator for treatment.
- Cartridge Filters (CF). CF are used to remove small particulate (1 to 5 microns) missed the MDIRF. These are simple fiber filters physically capture particulate in the filter. As the filters fill with particulate the pressure across the filter become too high and the filter cartridges are replaced with new filters. Used filter cartridges are disposed of as a solid waste off site.
- Reverse Osmosis (RO). The RO system treats the cartridge filter effluent through a membrane to produce very high quality water. The RO membrane will allow water to pass through (permeate) but will retain atomic sized molecules. The molecules retained are removed via RO reject. The RO will be a two stage system. The first stage permeate is an intermediate quality water and will be used for mirror wash. The second stage permeate will be of higher quality and

will be used as feed water for the final polishing step. RO reject will be reused as a blended makeup to the WSAC cooling tower along with untreated well water.

- Electrodeionization (EDI). EDI is a polishing step that will treat second stage RO permeate to produce the highest quality water used for turbine and aux boiler steam cycle makeup and closed cooling water system make. The EDI system uses a combination of resin and membranes where the resin is regenerated electronically and does not require storage and handling of hazardous chemicals for regeneration. EDI reject is reused and recycled just upstream of the RO second stage.

2.4.3 Plant Cooling Systems

The cycle heat rejection system for the main steam cycle will consist of an air-cooled condenser system. The heat rejection system will receive exhaust steam from the low-pressure section of the steam turbine and feedwater heaters and condense it back to water for reuse. The condenser will be designed to normally operate at a pressure of about 3.25 inches of mercury absolute (0.11 millibar absolute). The condenser will remove heat from the condensing steam up to a maximum of 1,140 million British thermal units per hour (MMBtu/hr), depending on ambient temperature and plant load.

A WSAC will cool the generator, steam turbine generator lubrication oil, boiler feed pump lubricating oil, SRSG circulating water pumps, and other equipment requiring cooling. The WSAC will use RO brine mixed with filtered well water for cooling. A 40% propylene glycol/60% demineralized water mixture shall be used in the CCW loop to provide freeze protection.

2.5 COMMON FACILITIES AREA

A 15 acre common facilities area will be established on the southwestern corner of the site to accommodate an administration, warehouse, and maintenance complex; and an asphalt-paved visitor and employee parking area. The administration complex will be served by power from the local 12.47 kV distribution system and water from water supply wells located in the common facilities area.

The common facilities area will also be used for a temporary construction laydown area, as described below. The layout and elevations of the equipment within the common facilities area is shown on Figure 2.5-1.

2.6 TEMPORARY CONSTRUCTION LAYDOWN AREA

The 203-acre temporary construction laydown area on the west side of the site will be used for equipment laydown, construction parking, construction trailers, a tire cleaning station, heliostat assembly, a temporary concrete batch plant and other construction support facilities. The surface areas within the temporary construction area that are

used frequently will be stabilized and dust suppression maximized with a layer of crushed stone in areas subject to heavy daily traffic. The temporary construction laydown area has been sized large enough to allow the staging of deliveries and truck and worker ingress and egress to the site to avoid stacking on the I-10/Corn Springs interchange.

2.7 ACCESS ROADS AND DRIVE ZONES

Primary access to the site during both construction and operation will be by a new 1,350-foot, 24-foot wide paved road from Corn Springs Road. The access road will be constructed from a point just north of the I-10 Corn Springs Road entrance/exit ramps east to the Project site entrance, as described in the Final Decision. This road will include a 12-foot wide shoulder with gravel surface for truck staging to preclude traffic interferences.

The Project will contain internal roadway and utility corridors for each heliostat field and power block. Each solar plant site will be accessible from a 20-foot-wide paved or hardscape access road from the entrance of the Project site to the power block, and then around the power block.

In addition to the paved or hardscaped access road to the power block of each unit, 12-foot wide unpaved roads will radiate from the power block to provide access through the solar field to the internal perimeter access road. Within the heliostat fields, 10-foot wide "drive zones" will be located concentrically in the field to provide access to the heliostat mirrors for maintenance and cleaning (Figure 2.1-5). The drive zones will be located approximately 152 feet apart and will be grubbed to remove vegetation and smoothed. A 12-foot-wide unpaved path offset from the site fence by 5 feet will be constructed on the inside perimeter of the project boundary fence for use by PSEGS personnel to monitor and maintain perimeter security and tortoise exclusion fencing. These paths will be grubbed, bladed, and smoothed to facilitate safe use with minimal grading where necessary to cross washes.

2.8 WASTE MANAGEMENT

Waste management is the process whereby all wastes produced at the project site are properly collected, treated (if necessary), and disposed of. Project wastes would be comprised of non-hazardous wastes including solids and liquids and lesser amounts of hazardous wastes and universal wastes. The non-hazardous solid waste primarily would consist of construction and office wastes, as well as liquid and solid wastes from the water treatment system. The non-hazardous solid wastes would be trucked to a nearby Class II or III landfill. Non-hazardous liquid wastes would consist primarily of domestic sewage and wastewater streams such as RO system reject water, boiler blowdown, and auxiliary cooling tower blowdown. A septic tank and leach field system

would be installed to manage domestic sewage. All other waste streams will be either recycled or sent to the evaporation ponds.

2.8.1 Wastewater Collection, Treatment, and Disposal

The primary wastewater collection system will collect process wastewater from all of the solar plant equipment, including the boilers and water treatment equipment. To the extent practical, process wastewater will be recycled and reused.

Each solar plant and the administration complex will include a septic tank and leach field system for sanitary water streams, including showers and toilet. When needed, septic tank contents will be removed from site by a sanitary service. Based on the current estimate of approximately 3,010 gallons of sanitary wastewater production per day, a total leach field area of approximately 6,000 square feet would be required, spread out among three or more locations.

Plant waste water streams, as further described below, will be recycled as much as possible before being sent directly to a thermal evaporation system (vapor recompression evaporation system). The thermal evaporator will be powered by electricity. The waste brine from the thermal evaporator will be collected in a storage tank before being transferred to the evaporation ponds by tank truck. Thermal evaporator distillate will be transferred to the well water tank for reuse.

The PSEGS will include two 2-acre evaporation ponds located in the common facilities area. Each pond will be divided into two cells and will be capable of evaporating the total wastestream from the entire facility for the life of the project. Two ponds were selected for reliability. If one pond requires maintenance or solids removal, the plant can still operate with the other pond. The waste brine from the each power block will be transported to the evaporation ponds by tank truck. One truck trip a day from each power block is anticipated to be sufficient for this purpose. The design basis for the evaporation ponds is contained in Appendix 2-B.

The evaporation ponds will be double-lined with high-density polyethylene (HPDE) liners to prevent infiltration of process water into the soil below and covered with narrow-mesh netting to prevent access by ravens and migratory birds in accordance with the Final Decision.

2.8.1.1 Plant Drains and Oil/Water Separator

General plant drains will collect wash down. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping and routed to an oil/water

separator. Water passing through the oil/water separator will be collected in a tank and then treated in the thermal evaporator system (described in Section 2.8.1.4 below).

2.8.1.2 Power Cycle Makeup Water Treatment Wastes

High quality deionized water from the demineralized water tank will be used for steam-cycle makeup.

2.8.1.3 SRSG, WSAC and Boiler Blowdown

SRSG and natural-gas-fired boiler blowdown is the removal of water from the boiler system to control boiler water parameters within prescribed limits to minimize scale, corrosion, carryover and other problems. The blowdown will be discharged to flash tanks. A portion of the steam from the flash tanks will be recovered back into the steam cycle via the deaerator. Condensate from the flash tanks will be further flashed to atmosphere then cooled and a collection tank where this water is blended with other high quality wasterwaters (i.e., sample panel water and condensate polishing slurry water). Water is transferred from the collection tank to the well water storage tank for reuse.

2.8.1.4 Evaporation Treatment System

Each plant will have an onsite Waste Water Treatment (WWT) system consisting of thermal evaporation with mechanical vapor compression to concentrate the wastes prior to final disposal to evaporation ponds. The wastewater streams from WSAC and oil/water separator will be collected in a storage tank from which it will be pumped at a constant flow rate to a thermal evaporation unit. The thermal evaporator treats the collected wastewater by concentrating the soluble materials through evaporation. Distillate collected from the WWT System will be recycled and routed to the well water storage tank for reuse. Concentrated waste brine from the evaporator will be transported to the evaporation ponds by tank truck.

2.8.2 Solid Wastes

PSEGS will produce maintenance and plant wastes typical of power generation operations and similar to the types and amounts of waste generated for the Approved Project. Generation plant wastes may include oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other solid wastes, including the typical refuse generated by workers. Solid wastes will be trucked offsite for recycling or disposal in the same manner as described in the Final Decision for the Approved Project.

2.8.3 Liquid Waste

Waste lubricating oil will be recovered and recycled by a waste oil recycling contractor. Spent lubrication oil filters will be disposed of at an appropriate disposal facility. Workers will be trained to handle hazardous wastes generated at the site.

2.8.4 Hazardous Wastes

The hazardous wastes anticipated to be generated by the Modified Project are the same types and quantities of wastes as the Approved Project. The hazardous wastes anticipated to be generated by the Modified Project are significantly lower due to the elimination of the HTF requirement on site. Aside from this improvement, the types and quantities of wastes for the Approved Project are similar. Several methods will be used to properly manage and dispose of hazardous wastes generated by the project. Chemical cleaning wastes will consist of alkaline and acid cleaning solutions used during pre-operational chemical cleaning of the boilers, and acid cleaning solutions used for chemical cleaning of the boilers after the units are put into service. These wastes, which are subject to high metal concentrations, will be temporarily stored onsite in portable tanks or sumps, and disposed of offsite by the chemical cleaning contractor in accordance with applicable regulatory requirements.

2.8.4.1 Management of Hazardous Materials

A variety of chemicals will be stored and used onsite during PSEGS construction and operation. The storage, handling, and use of all chemicals will be conducted in accordance with applicable laws, ordinances, regulations, and standards (LORS). Section 4.5, Hazardous Materials Management, provides a description of the types, locations and quantities of hazardous material storage onsite. Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and most other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks, spills, and stormwater. Concrete containment pits and drain piping design will allow a full tank capacity spill without overflowing the containment area. For multiple tanks located within the same containment area, the capacity of the largest single tank will determine the volume of the containment area and drain piping. Drain piping for reactive chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors.

Safety showers and eyewashes will be provided adjacent to, or in the vicinity of, chemical storage and use areas. Plant personnel will use approved personal protective equipment during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and instructed in the procedures to

follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material will be stored onsite for spill cleanup.

2.8.5 Emission Control and Monitoring

Air emissions from the combustion of natural gas in the auxiliary and nighttime preservation boilers will be controlled using state-of-the-art systems. To ensure that the systems perform correctly, parametric (predictive) emissions monitoring systems (PEMS) for nitrogen oxides (NOx) and carbon monoxide (CO) will be employed as required by the South Coast Air Quality Management District (SCAQMD). When submitted, Section 4.2, Air Quality, will include additional information on emission control and monitoring.

2.8.5.1 NOx Emission Control

The boilers will be provided with ultra-low-NOx burners and flue gas recirculation to minimize NOx emissions.

2.8.5.2 Particulate Emission Control

Particulate emissions will be controlled by the use of best combustion practices, the use of natural gas (which is low in sulfur) as the sole fuel for the boilers, and high-efficiency air inlet filtration.

2.8.5.3 Emissions Monitoring

For each of the start-up boilers and night preservation boilers, PEMS will be used. PEMS are permitted on boilers that are rated at less than 250 MMBTU/hr. PEMS can be classified as a software-based CEMS in which key operating parameters are correlated to pollutant emission rates. A mathematical model is developed which then "predicts" emission levels based on the operating parameters.

2.9 FIRE PROTECTION

The fire protection system will be designed in accordance with applicable regulations, standards and codes to protect personnel and limit property loss and plant downtime in the event of a fire. The primary source of fire protection water will be the service/firewater storage tank located at each power block and the firewater storage tank in the common area. An electric jockey pump and electric-motor-driven main fire pump will be provided for each power block and the common area to maintain the water pressure in the fire main at the level required to serve all fire fighting systems. In addition, a back-up 204hp diesel-engine-driven fire pump will be provided for each power block and the common area to pressurize the fire loop if the power supply to the

electric-motor-driven main fire pump fails. A fire pump controller will be provided for each fire pump.

The fire pumps will discharge to a dedicated underground firewater loop piping system. Normally, the jockey pumps will maintain pressure in the firewater loop. Both the fire hydrants and the fixed-suppression systems will be supplied from the firewater loop. Fixed fire suppression systems will be installed at determined fire risk areas, such as the transformers and turbine lube oil equipment. Sprinkler systems will also be installed in the administration complex buildings and fire pump enclosure as required by National Fire Protection Association (NFPA) and local code requirements. Handheld fire extinguishers of the appropriate size and rating will be located in accordance with NFPA 850 throughout the power block and common area. Generator step-up transformers and other oil-filled transformers will be contained and provided with a deluge system. Onsite personnel will be trained in the use of fire protection equipment and will be the first responders to an incident.

The Project is located such that it will fall under the jurisdiction of the Indio Office of the Riverside County Fire Department. Based on the requirements of Riverside County Ordinance No. 787.1, the piping system supplying the fire hydrants must be sized to convey a potential firewater flowrate of 5,000 gpm. Minimum firewater storage volume in each power block will be 600,000 gallons. Firewater will be supplied from the combined storage tank located at each power block . One electric primary and one diesel-fueled backup firewater pump, each with a capacity of 5,000 gpm, will deliver water to the fire protection piping network. Fire protection for the solar field is not required since no combustible materials will be present in the solar field area.

The common area fire protection system will be sized to comply with LORS, and will consist of one electric primary and one diesel-fueled backup firewater pump. Firewater will be supplied from the combined service water/firewater storage tank with a storage volume of 480,000 gallons.

The Hazardous Materials Risk Management Plan as required by the Conditions of Certification will include all information necessary to allow firefighting and other emergency response agencies to plan and implement safe responses to fires, spills, and other emergencies.

2.10 PLANT AUXILIARIES

The following systems will support, protect, and control the generating facility.

2.10.1 Lighting

The lighting system will provide personnel with illumination for operation under normal conditions and for egress under emergency conditions, and will include emergency lighting to perform manual operations during an outage of the normal power source. The system also will provide 120-volt AC convenience outlets for portable lamps and tools. Exterior light fixtures will utilize technologies to reduce light pollution.

As consistent with the Final Decision:

- Lighting design shall consider setbacks of project features from the site boundary to aid in satisfying the lighting mitigation requirements;
- Lighting shall incorporate fixture hoods/shielding, with light directed downward or toward the area to be illuminated;
- Light fixtures that are visible from beyond the project boundary shall have cutoff angles that are sufficient to prevent lamps and reflectors from being visible beyond the project boundary, except where necessary for security;
- All lighting shall be of minimum necessary brightness consistent with operational safety and security; and
- Lights in high illumination areas not occupied on a continuous basis (such as maintenance platforms) shall have (in addition to hoods) switches, timer switches, or motion detectors so that the lights operate only when the area is occupied.

2.10.2 Grounding

The electrical system is susceptible to ground faults, lightning, and switching surges that result in high voltage that constitute a hazard to site personnel and electrical equipment. The station grounding system will provide an adequate path to permit the dissipation of current created by these events.

The station grounding grid will be designed for adequate capacity to dissipate the ground fault current from the ground grid under the most severe conditions in areas of high ground fault current concentration. The grid spacing will maintain safe voltage gradients.

Bare conductors and ground rods will be installed below-grade in a grid pattern. Each junction of the grid will be bonded together by an exothermic weld.

Ground resistivity readings will be used to determine the necessary numbers of ground rods and grid spacing to ensure safe step and touch potentials under severe fault conditions.

Grounding conductors will be brought from the ground grid to connect to building steel and non-energized metallic parts of electrical equipment.

2.10.3 Distributed Control System

The DCS provides modulating control, digital control, monitoring, and indicating functions for the plant power block systems. The DCS will provide the following functions:

- Controlling the STG, SRSG, heliostat mirrors, and other systems in a coordinated manner;
- Controlling the balance-of-plant systems in response to plant demands and operator;
- Monitoring controlled plant equipment and process parameters and delivery of this information to plant operators;
- Providing control displays (printed logs, video monitors) for signals generated within the system or received from I/O;
- Providing consolidated plant process status information through displays presented in a timely and meaningful manner;
- Providing alarms for out-of-limit parameters or parameter trends, displaying on alarm video monitors(s), and recording on an alarm log printer; and
- Providing storage and retrieval of historical data.

- The DCS will be a redundant microprocessor-based system and will consist of the following major components:

- Personal computer-based operator consoles with liquid-crystal diode video monitors;
- Engineer workstation;
- Distributed processing units;
- I/O cabinets and cards;
- Historical data unit or historian;
- Printers; and
- Data links to the steam turbine control systems.

The DCS will have a functionally distributed architecture comprising a group of similar redundant processing units linked to a group of operator consoles and the engineer

workstation by redundant data highways. Each processor will be programmed to perform specific dedicated tasks for control information, data acquisition, annunciation, and historical purposes. By being redundant, no single processor failure can cause or prevent a unit trip.

The DCS will interface with the control systems furnished by heliostat mirror and STG suppliers to provide remote control capabilities, as well as data acquisition, annunciation, and historical storage of turbine and generator operating information.

The system will be designed with sufficient redundancy to preclude a single device failure from significantly affecting overall plant control and operation. This also will allow critical control and safety systems to have redundancy of controls, as well as an uninterruptible power source.

As part of the quality control program, daily operator logs will be available for review to determine the status of the operating equipment.

2.10.4 Cathodic Protection

The cathodic protection system will be designed to control the electrochemical corrosion of designated metal piping buried in the soil. Depending on the corrosion potential and the site soils, either passive or impressed current cathodic protection will be provided.

2.10.5 Service Air

The service air system will supply compressed air to hose connections for general plant use. Service air headers will be routed to hose connections located at various points throughout the facility.

2.10.6 Instrument Air

The instrument air system will provide dry air to pneumatic operators and devices. An instrument air header will be routed to locations within the facility equipment areas and within the water treatment facility where pneumatic operators and devices will be located.

2.11 PROJECT SCHEDULE

Construction of PSEGS, from perimeter fencing installation to site preparation and grading to commercial operation, is expected to take place from the fourth quarter of 2013 to commercial operation in June 2016. Major milestones anticipated are listed in Table 2.11-1. Construction of the common area facilities would occur concurrently with the construction of the first plant.

Table 2.11-1
Project Schedule Major Milestones

Activity	Date
Solar Plant 1	
Fencing and tortoise clearance	Fourth Quarter 2013
Begin construction	Immediately after Fall 2013 DT clearance activities and fencing
Startup and commissioning	First and Second Quarter 2016
Commercial operation	June 2016
Solar Plant 2	
Fencing and tortoise clearance	Fourth Quarter 2013
Begin construction	First Quarter 2014
Startup and commissioning	Second Quarter 2016
Commercial operation	June 2016

There will be an average and peak workforce of approximately 998 and 2,311 respectively, of construction craft people, supervisory, support, and construction management personnel onsite during construction. The peak construction site workforce level is expected to occur in month 22. Construction personnel by month is included in Appendix 2-C.

Generally, construction activities will occur from 5:00 a.m. to 3:30 p.m. with a swing shift during heliostat assembly (from 6:00 p.m. to 4:00 a.m) and during tower construction (which may occur in three shifts around the clock until these tasks are completed). Additional hours may be necessary to make up schedule deficiencies, or to complete critical construction activities (e.g., tower construction, foundation pouring, or working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities will continue 24 hours per day, 7 days per week.

2.12 GENERATING FACILITY OPERATION

Management, engineering, administrative staff, skilled workers, and operators will serve both plants. PSEGS is expected to employ up to 100 full-time employees: 30 at Solar Plant 1 (including mirror washing machine operators), 30 at Solar Plant 2 (including mirror washing machine operators), and 40 at the administration complex. The facility will operate 7 days a week. To maintain heliostat performance, heliostat washing is projected to occur up to 24 hours per day (including nighttime mirror washing), covering the entire solar field weekly.

A plant operation and maintenance program, typical of a project this size, will be implemented by PSEGS to control the quality of operations and maintenance. Operations and maintenance procedures will be consistent with industry standards practices to maintain useful life of plant components. A specific program for this project will be defined and implemented during initial plant startup.

Detailed long-term maintenance schedules are currently unavailable, but will include periodic maintenance and overhauls in accordance with manufacturer recommendations.

PSEGS is expected to have an annual equivalent plant availability of 92 to 98 percent. It will be possible for plant availability to exceed 98 percent for a given 12-month period.

The facility will be operated in one of the following modes:

- The facility will be operated at its maximum continuous output for as many hours per year as solar input allows or as limited by contractual terms and conditions.
- A full shutdown will occur if forced by equipment malfunction, transmission or gas line disconnect, or scheduled maintenance.

2.13 PROJECT CONSTRUCTION

2.13.1 General Design Considerations and Construction

The technology proposed for this project allows for several strategies to reduce environmental impacts and take advantage of the site's natural attributes. These include the following.

- Avoid grading entire solar field
- Restricting grading activities to areas where foundations, drainage facilities, and all-weather roads must be placed
- Taking advantage of the natural permeability of the alluvium at the site by minimizing compaction and decompacting soils where necessary
- Implementing a stormwater control design that promotes sheet flow and greater infiltration

2.13.1.1 General Grading and Leveling

The Approved Project required extensive grading to maintain a consistent grade for interconnecting piping and resulted in three major drainage channels to route the water through and around the entire solar field. The Modified Project will require much less grading because the heliostat technology does not require an entirely flat surface.

The Modified Project general grading plan for the proposed tower technology will be as follows. The surface soil grade of each area will be designed to provide the minimum requirements for access of installation equipment and materials during site construction and operations. Most of the natural drainage features will be maintained and any grading required will be designed to promote sheet flow where possible. Areas disturbed by grading and other ground disturbance will be protected from erosion by implementation of appropriate best management practices (BMPs) that will be identified in the project's Construction Stormwater Pollution Prevention Plan (SWPPP), a draft of which will be provided under separate cover.

Heavy to medium grading will be performed within each plant's solar power tower and power block areas, for the switchyard, within the administration complex area, and for the heliostat assembly area. The deepest excavations will be restricted to foundations and sumps. Within each of these individual areas, earthwork cuts and fills will be balanced to the greatest degree possible. The earthwork within the power blocks and common area will be excavated and compacted to the recommendations of the associated geotechnical report.

At some washes, limited grading may be required. Surface rocks and boulders will need to be relocated to allow proper installation of heliostats and facilities when they cannot be avoided. A preliminary grading plan is included in Appendix 2-D.

2.13.1.2 Storm Drainage System

The majority of the project site will maintain the original grades and natural drainage features and, therefore, will require no added storm drainage control. In limited areas, such as the power blocks, switchyard, heliostat assembly area and administrative areas, the stormwater management system will include diversion channels, bypass channels, or swales to direct run-on flow from up-slope areas and run-off flow through and around each facility. Diversion channels will be designed so that a minimum ground surface slope of 0.5 percent will be provided to allow positive, puddle-free drainage. To reduce erosion, storm drainage channels may be lined with a nonerodible material such as compacted rip-rap, geo-synthetic matting, or engineered vegetation. The design will be developed for sheet flow for all storm events less than or equal to a 100-year, 24-hour storm event.

The project site is in close proximity to the I-10 Freeway. The stormwater management design for the freeway includes three drainage culverts to allow rain to flow from south to north underneath the freeway. The design of the site encompasses a worst-case conservative approach with respect to stormwater runoff and reflects a situation where some of the runoff south of the freeway will overtop the freeway and run on the site. All

surface runoff during and after construction will be controlled in accordance with the requirements of the Drainage, Erosion, and Sedimentation Control Plan, and all other applicable LORS.

2.13.1.3 Erosion and Sediment Control Measures

Protection of soil resources will be an important factor in the design of the erosion and sedimentation controls. To minimize wind and water erosion, open spaces will be preserved and left undisturbed maintaining existing vegetation to the extent possible with respect to site topography and access requirements. Areas compacted during construction activities will be restored, as appropriate, to approximate preconstruction compaction levels to minimize the opportunity for any increase in surface runoff.

If needed, stone filters and check dams will be strategically placed throughout the project site to provide areas for sediment deposition and to promote the sheet flow of stormwater prior to leaving the project site boundary. Where available, native materials (rock and gravel) will be used for the construction of the stone filter and check dams. Diversion berms will be used to redirect stormwater around critical facilities, as required.

Periodic maintenance will be conducted as required after major storm events and when the volume of material behind the check dams exceeds 50 percent of the original volume. Stone filters and check dams are not intended to alter drainage patterns but to minimize soil erosion and promote sheet flow.

2.13.1.4 Trenching/Excavation

During construction, trenches will be excavated for the installation of underground systems, equipment and materials including the following:

- On-site electrical transmission system conductors; and
- On-site natural gas system.

While the typical trench will be 2-3 feet wide at the base and 3-6 feet deep, a few trenches may have widths and/or depths up to 12 feet. Areas in which two electrical conductors (one from each solar plant) are routed in parallel to the switchyard may require trenches that are slightly wider and/or of greater depth. In addition, buried conductors will also require manholes located at intervals of approximately 1,000 to 2,000 feet for cable pulling during construction. The manholes will be approximately 8-10 feet in depth. Trench sides will be sloped or shored in accordance with applicable safety requirements to prevent trench walls from collapsing.

2.13.2 Heliostat Field Preparation

Vegetation clearing, grubbing, and contour smoothing in the heliostat fields will occur where necessary to allow for equipment access and stormwater management. In areas where these activities are not required for access or construction, the vegetation will not be removed but will be mowed (if needed) to a height of approximately 12 to 18 inches.

A linear swath of vegetation along the outer edge of each heliostat field will be cleared, grubbed and smoothed to create a 12-foot wide external perimeter path for installation and maintenance of the tortoise and security fence and associated external perimeter inspection roads. Grading of the roads will be performed in limited areas to afford safe passage of vehicles. The setback area from the property line will be a minimum of 5 feet between the edge of the roadway and the property line. Additional setbacks may be required due to installation of gas and electric utilities. Elsewhere, vegetation will remain but will be cut (when necessary) to a height that will allow clearance for heliostat function while leaving the root structures intact. Occasional cutting of the vegetation will be performed as needed to permit unobstructed heliostat mirror movement.

2.13.2.1 Installation of Heliostats

The heliostats will be installed in two steps. Initially, the support pylons will be installed using vibratory technology to insert the pylons into the ground (pre-augering prior to the installation of the pylon may be required). Depths are not expected to be greater than 12 feet. The heliostat assembly (mirrors, support structure and aiming system) will be mounted on the pylon. The majority of the project site will maintain the original grades and natural drainage features and, therefore, construction will require machines that are maneuverable and can negotiate the terrain. The siting of pylons will be guided by global positioning system (GPS) technology. Pylons will be delivered to their locations by an all-terrain vehicle. Installation of the heliostat assemblies will be accomplished with a rough terrain crane. The crane will be able to mount heliostat assemblies on several pylons before moving to the next location.

The heliostats located in closest proximity to the tower will be densely packed to maximize collection of solar energy. A smaller mirror wash machine will be used to wash mirrors in this area. In the larger heliostat array outside of this zone, the solar field will include drive zones. The drive zones will be used for installation of the heliostats and then subsequent washing of the mirrors. The drive zones will be located approximately every 152 feet in a circumferential fashion surrounding the power blocks. The drive zones will be approximately 10 feet wide and will be cleared, grubbed, smoothed, and rolled to permit safe and efficient installation of the heliostats and washing of the mirrors. The shoulders of washes crossed by the drive zones will be

graded as necessary to permit safe passage of vehicles for installation and maintenance activities.

2.13.3 Construction of Power Blocks

Project construction will commence with the building of site roads and the installation of temporary construction facilities including office trailers, parking areas, material laydown areas, a concrete batch plant, and a heliostat assembly facility. The construction of each plant will begin with grading and construction of earthen berms around the power block areas to divert storm water followed by the excavation and placement of foundations and other underground facilities. Superstructures and equipment will then be placed on the foundations. Major items include the 750-foot-tall solar power tower and SRSG construction, the STG pedestal and STG, and construction of the air-cooled condenser. Once the mechanical equipment is in place, construction will continue with the installation of the piping, electrical equipment, and cables necessary to connect and power the equipment. Upon completion of construction, the checkout, testing, startup and commissioning of the various plant systems will begin resulting in a fully operational solar plant.

The following preliminary estimates of the disturbed soil depths at the major structural foundations is based on the current general equipment arrangement plan and the Kleinfelder Preliminary Geotechnical Investigation Report Solar Millennium Concentrating Solar Power Project, Palen, Riverside County, California dated September 16, 2009 for the project site.

2.13.3.1 Spread Footings

For most of the PSEGS project power island and common areas, shallow footings would be on the order of 1'-6" to 4'-0" thick with approximate top of footing set 2 ft +/- below grade requiring between 3'-6" to 6'-0" of excavation.

2.13.3.2 Slabs and Mat Foundations – Buildings and small equipment

Slabs and mat foundations placed near grade elevation can range from 0'-6" TO 4'-0" thick and may be placed at grade level. Over-excavation of poor surface soils to 2'-0" depth that extends up to 5'-0" beyond the slab or mat may be required per the geotechnical report.

2.13.3.3 Large Foundations

Deeper mat foundations for the solar tower and STG are sized based on the Preliminary Geotechnical report that was prepared and submitted as part of the Approved Project. Foundation design site parameters need to be verified with a specific soils investigation

that addresses the power island foundation requirements. Note that an increase in the depth of these foundations requires an increase in the footing width to maintain the same contact pressure. The suggested foundation sizes can also be used as a pile supported mat, should further geotechnical investigation indicate the soil supported settlements are greater than currently anticipated.

2.13.3.3.1 Solar Tower

At the Solar Tower, the footing size would be 195 ft octagonal diameter (across flats) with a depth of 6'-0" below finish grade and soil disturbance to 8'-6" below grade.

2.13.3.3.2 Steam Turbine Generator (STG)

At the STG foundation, the mat will range from 3'-0" thick at the Lube Oil and Excitation Container area to between 6'-6" to 8'-0" thick under the STG and may extend beyond the edges of the STG unit to pick up the adjacent equipment skids.

2.14 FACILITY CLOSURE

Facility closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance, including closure for overhaul or replacement of the steam turbine. Causes for temporary closure include a disruption in the supply of natural gas or damage to the plant from earthquake, fire, storm, or other natural acts. Permanent closure is defined as a cessation in operations with no intent to restart operations owing to plant age, damage to the plant beyond repair, economic conditions, or other reasons.

2.14.1 Temporary Closure

For a temporary facility closure, where there is no release of hazardous materials, security of the facilities will be maintained on a 24-hour basis. The Commission would be notified. Other responsible agencies would also be notified as necessary and appropriate. Depending on the length of shutdown necessary, a contingency plan for the temporary cessation of operations will be implemented. The contingency plan will be conducted to ensure conformance with all applicable LORS and the protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, may include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes will be disposed of according to applicable LORS.

Where the temporary closure includes damage to the facility, and there is a release or threatened release of regulated substances or other hazardous materials into the environment, procedures will be followed as set forth in a Risk Management Plan and a Hazardous Materials Business Plan to be developed as described in the Final Decision Conditions of Certification. Procedures will include methods to control releases,

notification of applicable authorities and the public, emergency response, and training for plant personnel in responding to and controlling releases of hazardous materials. Once the immediate problem is solved, and the regulated substance/hazardous material release is contained and cleaned up, temporary closure will proceed as described above for a closure where there is no release of hazardous materials.

2.14.2 Permanent Closure

When the facility is permanently closed, the closure procedure will follow a plan that will be developed. The removal of the facility from service, or decommissioning, may range from mothballing to the removal of all equipment and appurtenant facilities, depending on conditions at the time. Because the conditions that would affect the decommissioning decision are largely unknown at this time, these conditions would be presented to the Commission when more information is available and the timing for decommissioning is more imminent.

To ensure that public health and safety and the environment are protected during decommissioning, a decommissioning plan will be submitted to the Commission for approval prior to decommissioning. The plan will address the following:

- Proposed decommissioning activities for the facility and all appurtenant facilities constructed as part of the facility;
- Conformance of the proposed decommissioning activities to all applicable LORS and local/regional plans;
- Activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities;
- Decommissioning alternatives other than complete restoration; and
- Associated costs of the proposed decommissioning and the source of funds to pay for the decommissioning.

In general, the decommissioning plan for the facility will attempt to maximize the recycling of all facility components. PSH will attempt to sell unused chemicals back to the suppliers or other purchasers or users. All equipment containing chemicals will be drained and shut down to ensure public health and safety and to protect the environment. All nonhazardous wastes will be collected and disposed of in appropriate landfills or waste collection facilities. All hazardous wastes will be disposed of according to all applicable LORS. The site will be secured 24 hours per day during the decommissioning activities.

2.15 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

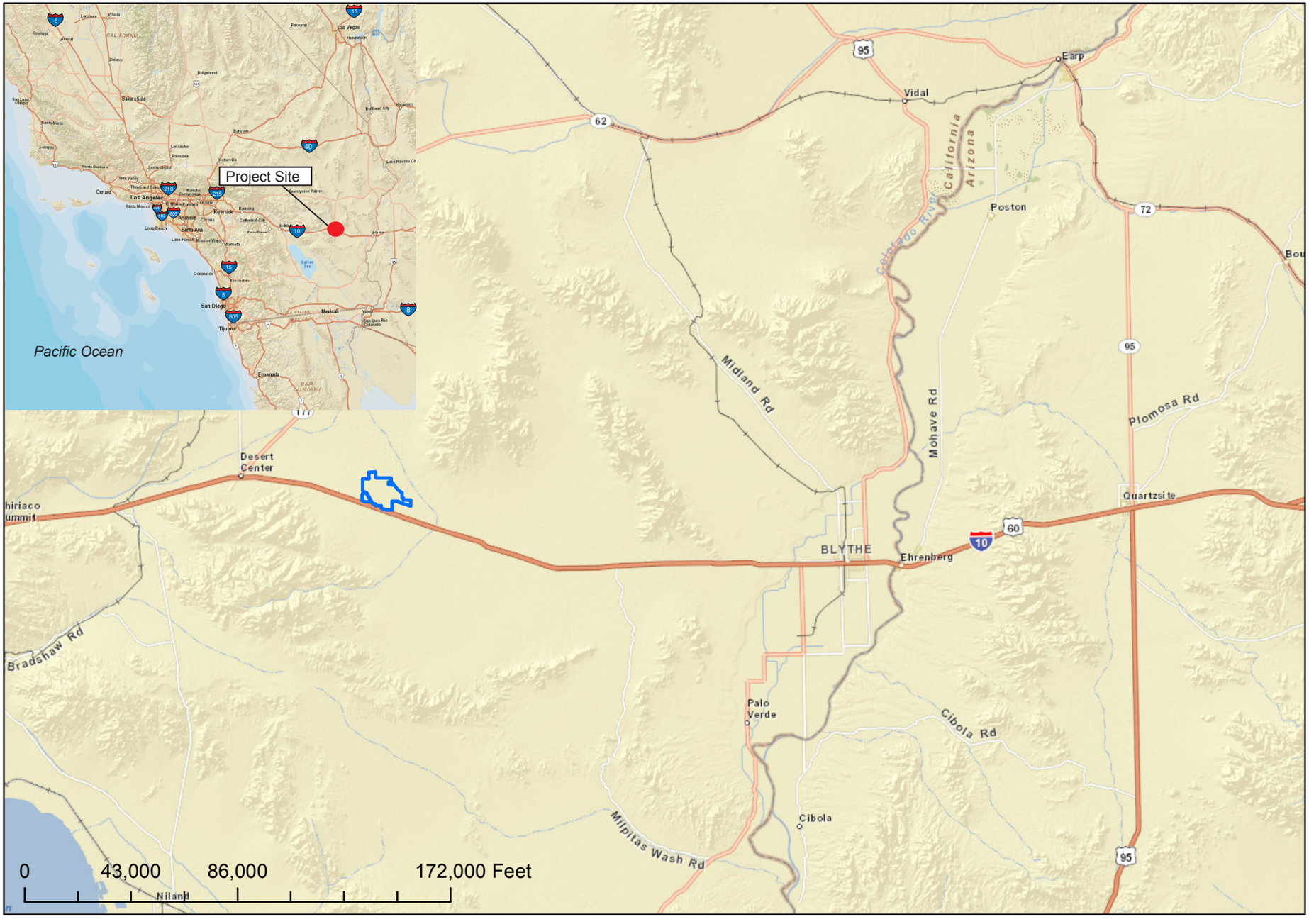
The LORS have been updated relevant to the Modified Project. The LORS listed in Section 2.15.1 are generally applicable to the engineering aspects of the project.

2.15.1 General Laws, Ordinances, Regulations, and Standards

California Building Standards Code—2010

- Uniform Fire Code, Article 80
- Occupational Safety and Health Act—29 Code of Federal Regulations (CFR) §1910 and 29 CFR §1926
- Environmental Protection Agency—40 CFR §60, 40 CFR §75, 40 CFR §112, 40 CFR §302, 40 CFR §423, 40 CFR §50, 40 CFR §100, 40 CFR §260, 40 CFR §300, and 40 CFR §400
- California Code of Regulations—Title 8, Sections 450 and 750 and Title 24, 2001, Titles 14, 17, 19, 20, 22, 23, 26, and 27
- California Department of Transportation—Standard Specifications
- California Occupational Safety and Health Administration—Regulations and Standards
- California Business and Professions Code—Sections 6704, 6730, and 6736
- California Vehicle Code—Section 35780
- California Labor Code—Section 6500
- Federal Aviation Agency—Obstruction Marking and Lighting AC No. 70/7460-1H

Codes and standards pertinent to the generating facility are presented in Engineering Appendixes 2-E through 2-J.



Legend

Palen Solar Electric Generating System

N

FIGURE NO. 2.1-1

SITE VICINITY MAP

FIGURE NO. 2.1-2A - APPROVED PROJECT RECONFIGURED ALTERNATIVE 2

FROM: CALIFORNIA ENERGY COMMISSION 09-AFC-07 FOR THE PALEN SOLAR POWER PROJECT REVISED STAFF ASSESSMENT PART I, ALTERNATIVES - FIGURE 1B

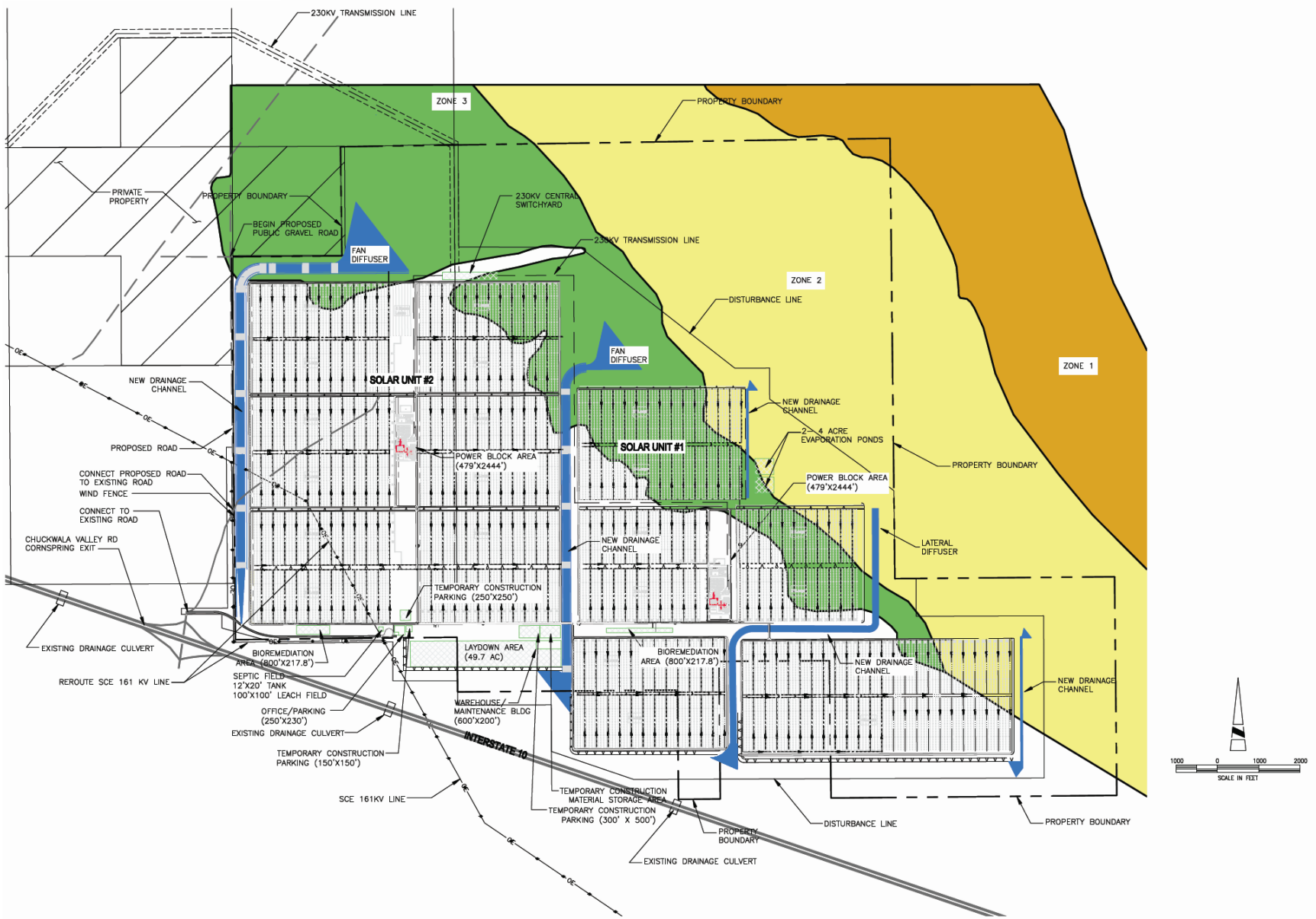
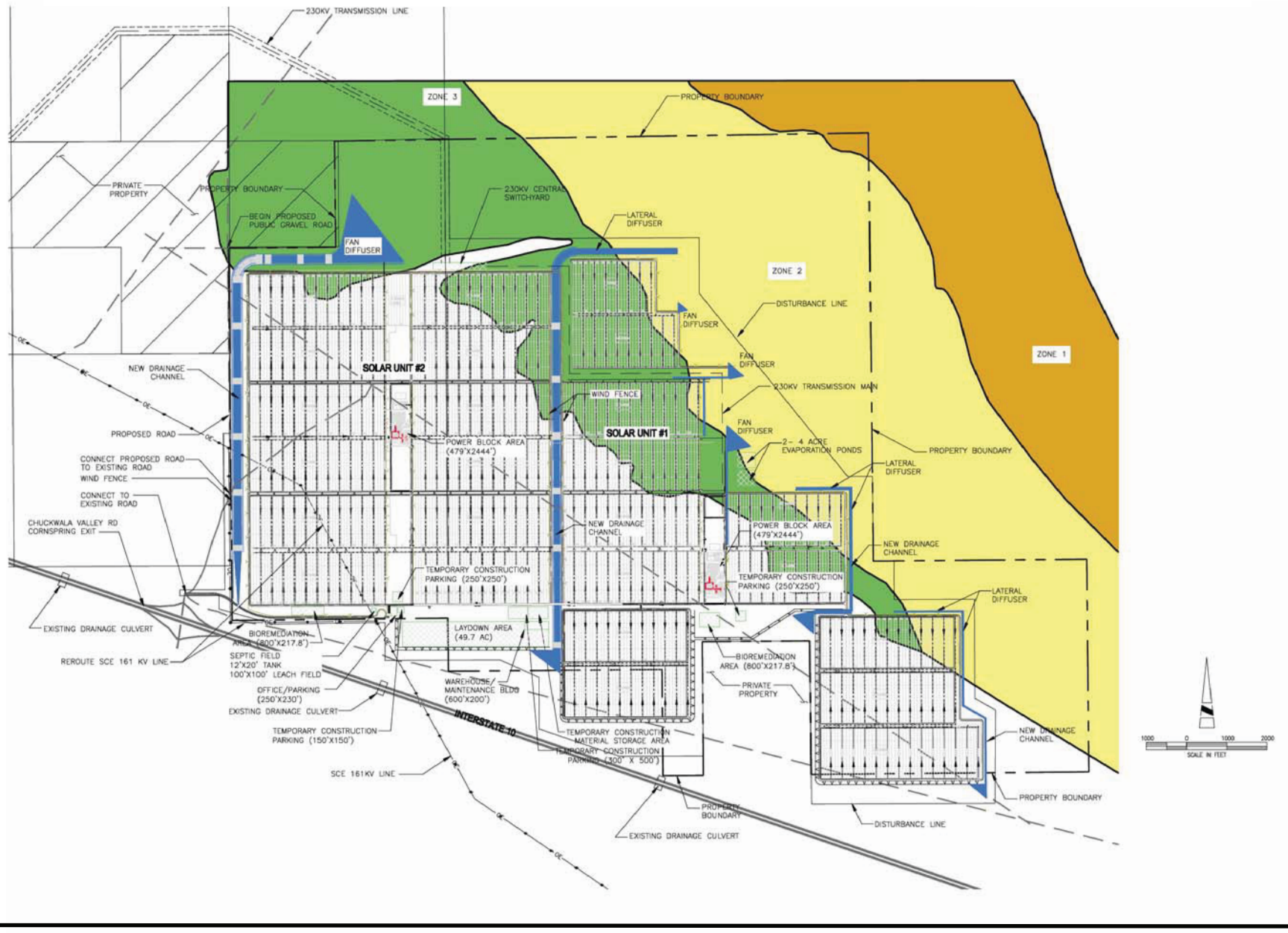
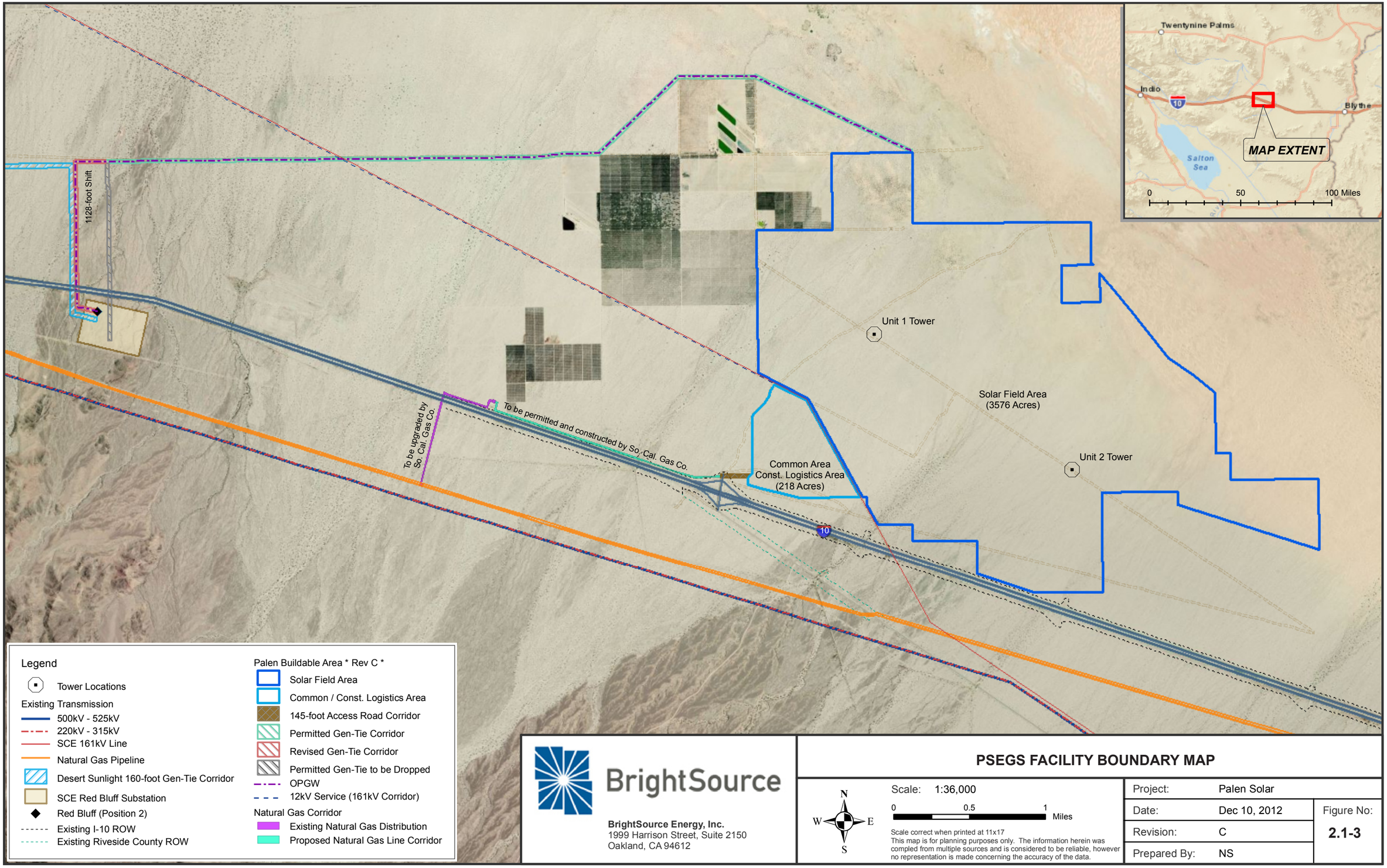


FIGURE NO. 2.1-2B - APPROVED PROJECT RECONFIGURED ALTERNATIVE 3

FROM: CALIFORNIA ENERGY COMMISSION 09-AFC-07 FOR THE PALEN SOLAR POWER PROJECT REVISED STAFF ASSESSMENT PART I, ALTERNATIVES - FIGURE 1C





Legend

- Tower Locations

Existing Transmission

- 500kV - 525kV
- 220kV - 315kV
- SCE 161kV Line
- Natural Gas Pipeline
- Desert Sunlight 160-foot Gen-Tie Corridor
- SCE Red Bluff Substation
- Red Bluff (Position 2)
- Existing I-10 ROW
- Existing Riverside County ROW

Palen Buildable Area * Rev C *

- Solar Field Area
- Common / Const. Logistics Area
- 145-foot Access Road Corridor
- Permitted Gen-Tie Corridor
- Revised Gen-Tie Corridor
- Permitted Gen-Tie to be Dropped
- OPGW
- 12kV Service (161kV Corridor)

Natural Gas Corridor

- Existing Natural Gas Distribution
- Proposed Natural Gas Line Corridor

BrightSource

BrightSource Energy, Inc.
1999 Harrison Street, Suite 2150
Oakland, CA 94612

PSEGS FACILITY BOUNDARY MAP

N W E S

Scale: 1:36,000

0 0.5 1 Miles

Scale correct when printed at 11x17

This map is for planning purposes only. The information herein was compiled from multiple sources and is considered to be reliable, however no representation is made concerning the accuracy of the data.

Project:	Palen Solar
Date:	Dec 10, 2012
Revision:	C
Prepared By:	NS

Figure No: **2.1-3**

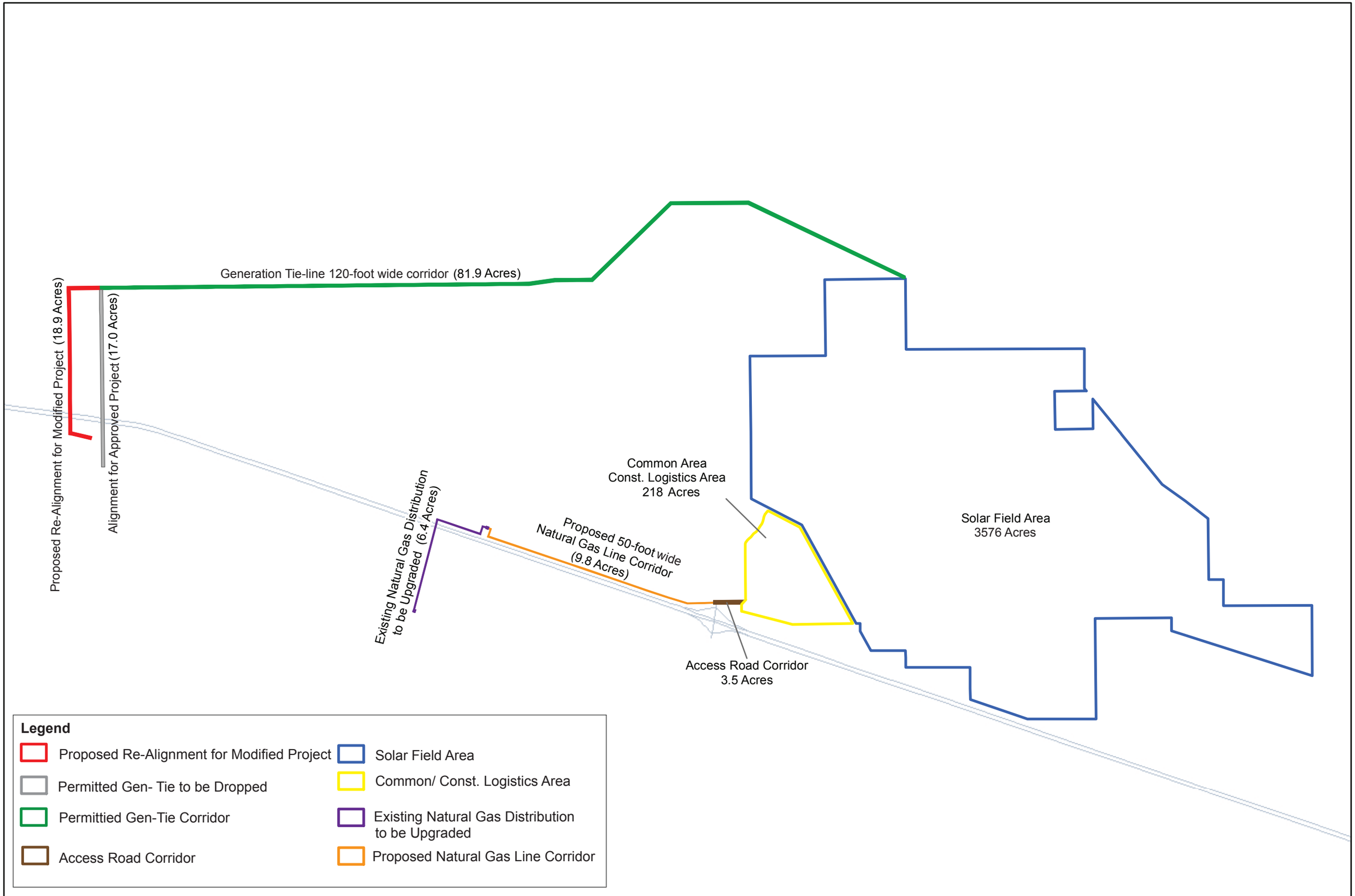
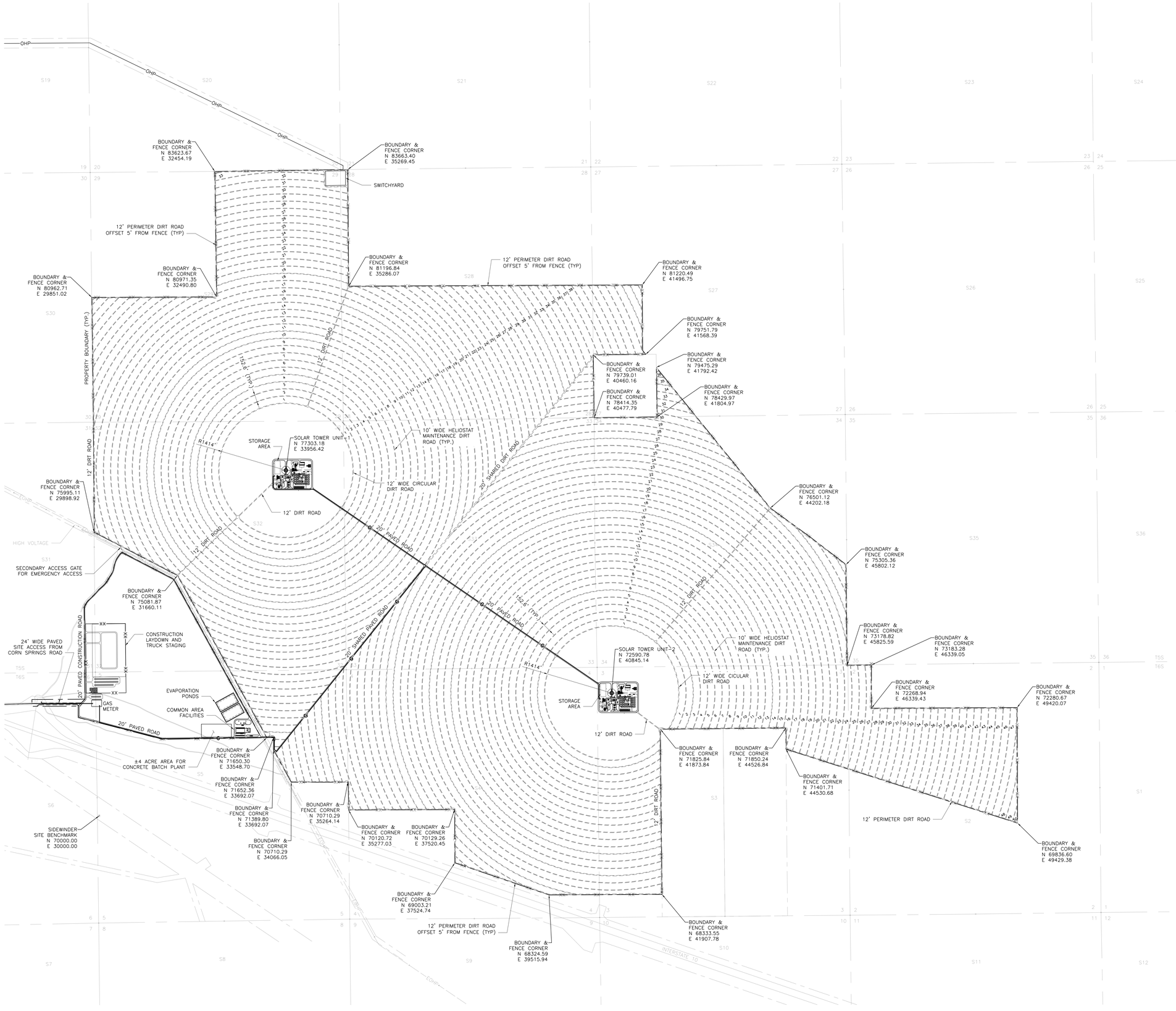


FIGURE NO. 2.1-4
FACILITY ACREAGE ESTIMATES



GENERAL NOTES:

1. FOR CIVIL PROJECT INFORMATION, ABBREVIATIONS AND LEGEND SEE SHEET C-0001.
2. ALL EXISTING SITE INFORMATION: TOPOGRAPHY, BUILDING LOCATIONS, ROADS & PAVEMENT LOCATIONS, SITE UTILITIES, AND PROPERTY LINE INFORMATION WERE OBTAINED FROM OWNER PROVIDED DOCUMENTS/DRAWINGS.
3. FOR CIVIL OVERALL GRADING AND DRAINAGE PLAN SEE SHEET C-2000.
4. ALL NECESSARY LICENSES SHALL BE OBTAINED PRIOR TO COMMENCEMENT OF WORK.
5. VERIFY ALL MEASUREMENTS AND DIMENSIONS PRIOR TO ORDERING ANY MATERIALS OR CONDUCTING ANY WORK.
6. ALL WORK SHALL BE PERFORMED IN A FINISHED AND WORKMAN LIKE MANNER AND CONSISTENT WITH THE BEST RECOGNIZED TRADE PRACTICES.
7. COORDINATES SHOWN ARE IN PALEN / PROJECT LOCAL GRID SYSTEM.
8. NO BOUNDARY SURVEY INFORMATION IS SHOWN OR IMPLIED ON THESE DRAWINGS.

*NOTE:

QUANTITIES SHOWN ARE FOR PRELIMINARY INTERNAL ESTIMATING AND NOT TO BE USED FOR BIDING PURPOSES. IT IS THE CONTRACTORS RESPONSIBILITY TO ESTABLISH THERE OWN QUANTITY TAKE-OFF'S FROM APPROVED PLANS.

*HARDSCAPE AREA DATA:

1. TOWER UNIT #1
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±10,100 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±900 S.Y.
   CONCRETE PAVEMENT AREA: ±2,850 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±47,000 S.Y.
2. TOWER UNIT #2
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±10,100 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±900 S.Y.
   CONCRETE PAVEMENT AREA: ±2,850 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±47,000 S.Y.
3. PAVED ROADS
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±45,000 S.Y.
4. COMMON AREA
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±8,900 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±1,450 S.Y.
   CONCRETE PAVEMENT AREA: ±100 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±5,300 S.Y.

*EARTHWORK QUANITITIES:

1. TOWER UNIT #1
   CUT: 9,260 CUBIC YARDS
   FILL: 45,589 CUBIC YARDS
   NET (FILL) 36,329 CUBIC YARDS
2. TOWER UNIT #2
   CUT: 3,169 CUBIC YARDS
   FILL: 95,925 CUBIC YARDS
   NET (FILL) 92,756 CUBIC YARDS
3. COMMON AREA-ADMIN/MAINTENANCE WAREHOUSE BLDG.
   CUT: 35,665 CUBIC YARDS
   FILL: 23,459 CUBIC YARDS
   NET (CUT) 12,206 CUBIC YARDS

DIGALERT 800-227-2600 Call 2 Full Working Days In Advance

PRELIMINARY NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
D	13-DEC-2012	ISSUE FOR PERMIT	T.O.C.	D.E.M.	C.S.H.
C	04-DEC-2012	ADDED EARTHWORK QUANTITIES	T.O.C.	D.E.M.	C.S.H.
B	27-NOV-2012	REVISED PER MEETING ON 19-NOV-2012	T.O.C.	D.E.M.	C.S.H.
A	19-NOV-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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DESIGNED BY T.O.C
CHECKED BY D.E.M
APPR. BY C.S.H.
CLIENT APPR.

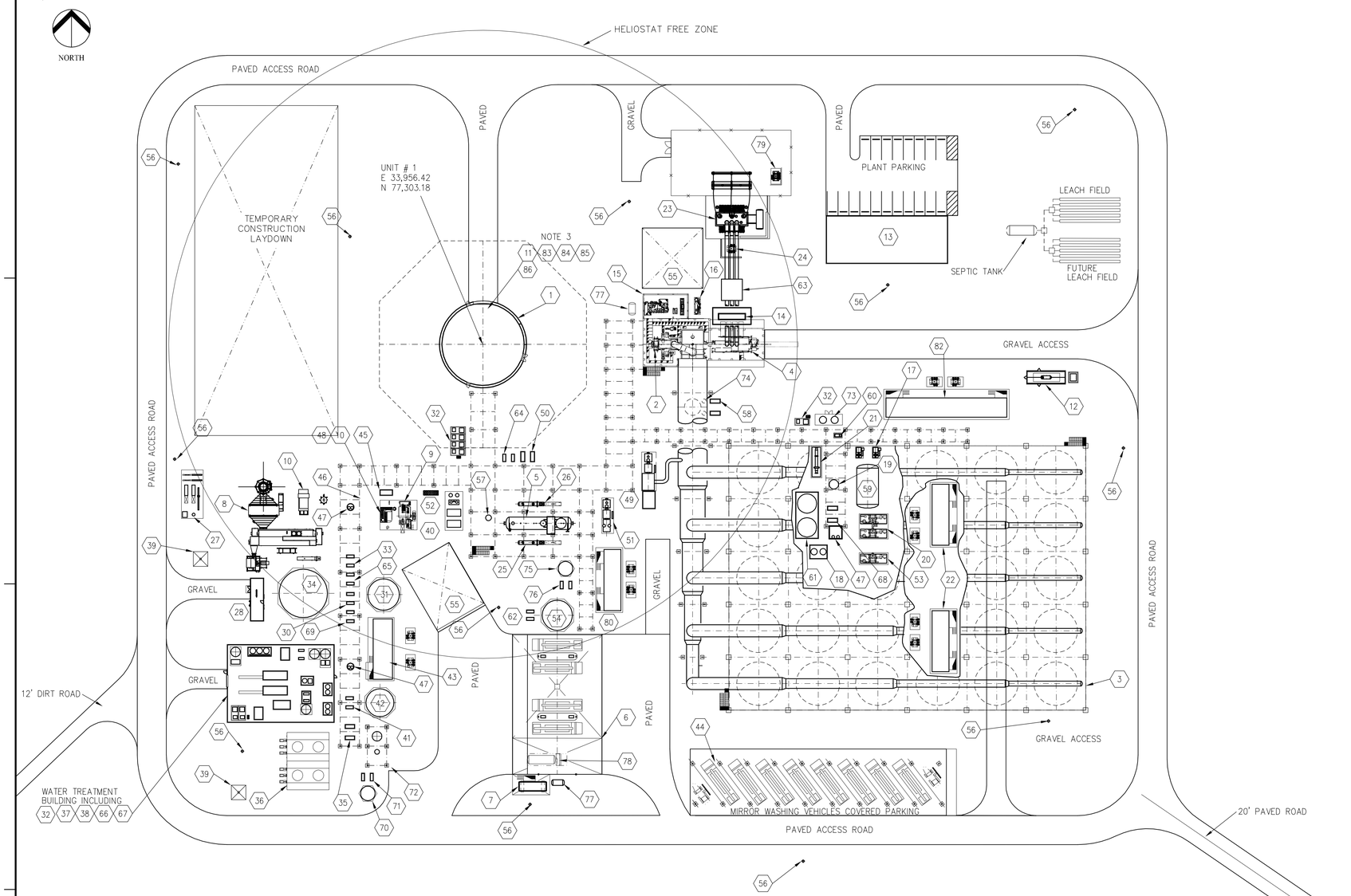
CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
OVERALL SITE PLAN
FIGURE NO. 2.1-5

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-1000.dwg
SCALE 1" = 750'
REV. NO. D
DWG. NO. C-1000

LGAE_3, ANSI E, 34 x 44 in.



NOTES:

1. SOLAR POWER TOWER WILL INCLUDE STAIRS, ELEVATOR WITH THE SRSG ON THE TOP.
2. FEED WATER DEAERATOR WILL BE INSTALLED ON THE TOP PLATFORM OF 5 TOTAL. EACH PLATFORM WILL BE AT ± 20 FEET BETWEEN LEVELS.
3. ITEMS 11, & 83–86 TO BE PLACED ON ELEVATED PLATFORMS IN THE (SRSG) TOWER.

EQUIPMENT LEGEND

1	SOLAR POWER TOWER	50	START–UP AUXILARY BOILER FEED PUMPS (2 REQ'D)
2	STEAM TURBINE	51	ELECTRIC BOILER FEED WATER PUMP
3	AIR COOLED CONDENSER (ACC)	52	BULK STORAGE NITROGEN BOTTLES
4	STEAM TURBINE GENERATOR	53	ACC VACUUM SKID (NIGHT OPERATION)
5	FEED WATER DEAERATOR	54	WASH WATER STORAGE TANK
6	WASH VEHICLE FILLING / FUELING STATION & PARKING	55	CONSTRUCTION AND MAINTENANCE CRANE PAD
7	8000 GAL. DIESEL FUEL STORAGE TANK	56	FIRE HYDRANT W/HOSE (10)
8	START–UP AUXILARY BOILER	57	CCW EXPANSION TANK
9	NIGHT PRESERVATION AUXILARY BOILER (NPAB)	58	ACC DRAIN PUMPS (2 REQ'D)
10	START–UP BOILER & PUMP SKID	59	CONDENSATE TANK
11	SOLAR RECEIVER STEAM GENERATOR (SRSG)	60	ACC WASHING SKID
12	EMERGENCY DIESEL GENERATOR	61	POLISHING SKID
13	PLANT SERVICES BUILDING	62	WASH WATER PUMPS (2 REQ'D)
14	STEAM TURBINE EXCITATION CONTAINER	63	GENERATOR CIRCUIT BREAKER
15	STEAM TURBINE OIL SYSTEMS	64	CLOSED COOLING WATER BOOSTER PUMPS (2 REQ'D)
16	STEAM TURBINE GLAND STEAM CONDENSER	65	RAW WATER FORWARDING PUMPS (2 REQ'D)
17	CONDENSATE PUMPS (2 REQ'D)	66	SERVICE WATER BAG FILTERS
18	CONDENSATE POLISHER PREFILTER SKID	67	DEMINERALIZED WATER CARTRIDGE FILTERS
19	CONDENSATE FILTER AIR RECEIVER	68	POLISHER SLUICE PUMPS (2 REQ'D)
20	ACC VACUUM SKID (NORMAL OPERATION)	69	WSAC MAKE–UP WATER PUMPS (2 REQ'D)
21	ACC AIR EJECTOR SKID	70	RESIDUE TANK
22	ACC POWER DISTRIBUTION CENTER TRANSFORMERS	71	RESIDUE TANK PUMPS (2 REQ'D)
23	GSU STEP–UP TRANSFORMER	72	THERMAL EVAPORATION UNIT
24	UNIT AUXILRY TRANSFORMER	73	SPENT AND CLEAN RESIN STORAGE TANKS
25	LP FEED WATER HEATERS (4 REQ'D)	74	CONDENSATE FILTERS (2 REQ'D)
26	HP FEED WATER HEATERS (3 REQ'D)	75	DRAINS TANK
27	FUEL GAS FILTER/METERING STATION	76	DRAINS TANK PUMPS (2 REQ'D)
28	FIRE WATER PUMP HOUSE W/1 DIESEL, 1 ELEC. & 1 JOCKEY PUMP	77	OIL WATER SEPARATOR
29	NOT USED	78	DIESEL FUEL TRUCK REFUELING
30	DEMIN. WATER TRANSFER PUMPS (2 REQ'D)	79	STATION SERVICE TRANSFORMER
31	DEMIN. WATER STORAGE TANK	80	BOILER PUMP POWER DISTRIBUTION CENTER AND TRANSFORMER
32	CHEMICAL FEED STATION	81	FIN FAN COOLER
33	SERVICE WATER DISTRIBUTION PUMPS (2 REQ'D)	82	MAIN PLANT POWER DISTRIBUTION CENTER
34	SERVICE / FIRE WATER STORAGE TANK	83	SRSG CIRCULATING PUMPS (4 REQ'D)
35	CLOSED COOLING WATER (CCW) PUMPS (2 REQ'D)	84	SRSG CIRCULATING PUMPS COOLING EXPANSION TANK
36	CCW WET SURFACE AIR COOLER (WSAC)	85	SRSG FLASH TANK
37	POTABLE WATER PUMPS (2 REQ'D)	86	SRSG BLOWDOWN TANK
38	POTABLE WATER GENERATION SKID		
39	GROUND WATER WELLS W/PUMPS (2 REQ'D)		
40	DUEL AIR COMPRESSOR SKID		
41	WASTE WATER PUMPS (2 REQ'D)		
42	WASTE WATER STORAGE TANK		
43	WATER SYSTEMS POWER DISTRIBUTION CENTER AND TRANSFORMERS		
44	MIRROR WASH TRUCKS		
45	SAMPLE PANEL		
46	NOT USED		
47	WASTE WATER SUMP W/ 2 PUMPS (3 REQ'D)		
48	NP AUXILARY BOILER DEAERATOR / PUMP SKID		
49	TURBINE DRIVE BOILER FEED WATER PUMP		

50 0 50 100
Scale: 1 INCH = 50 FEET

NO.	DATE	REVISION	BY	CHK
0		ISSUED FOR REVIEW	WAN	
1	11/13/12	INCORPORATED CLIENT COMMENTS	WAN	
2	11/20/12	INCORPORATE 11/19/12 MEETING COMMENTS	JBA	
3	12/5/2012	ISSUED FOR PERMITTING	MTC	

REVISION APPROVAL		REV DATE	
DISCIPLINE	REVIEWED	DISCIPLINE	REVIEWED
CIVIL		ELECTRICAL	
STRUCTURAL		INST & CNTRL	
MECHANICAL		ARCHITECTURAL	
PROCESS		PLANT LAYOUTS	
PIPING			

STATUS	REV	DATE	DM	SDE	PEM
ISSUED					
PRELIMINARY					
FOR REVIEW AND APPROVAL					
APPROVED FOR CONSTRUCTION					
REVISED & APPROVED FOR CONSTRUCTION					

RESPONSIBLE ENGINEER PE #

BrightSource
BRIGHTSOURCE INDUSTRIES ISRAEL
PALEN SOLAR
ELECTRIC GENERATING SYSTEM

PROJECT NO. 459892

SCALE 1"=50'-0"

CH2MHILL

DWG. NO. P-1000B

REV. 3

EQUIPMENT ARRANGEMENT PLAN POWER BLOCK #1
FIGURE NO. 2.2-1A

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

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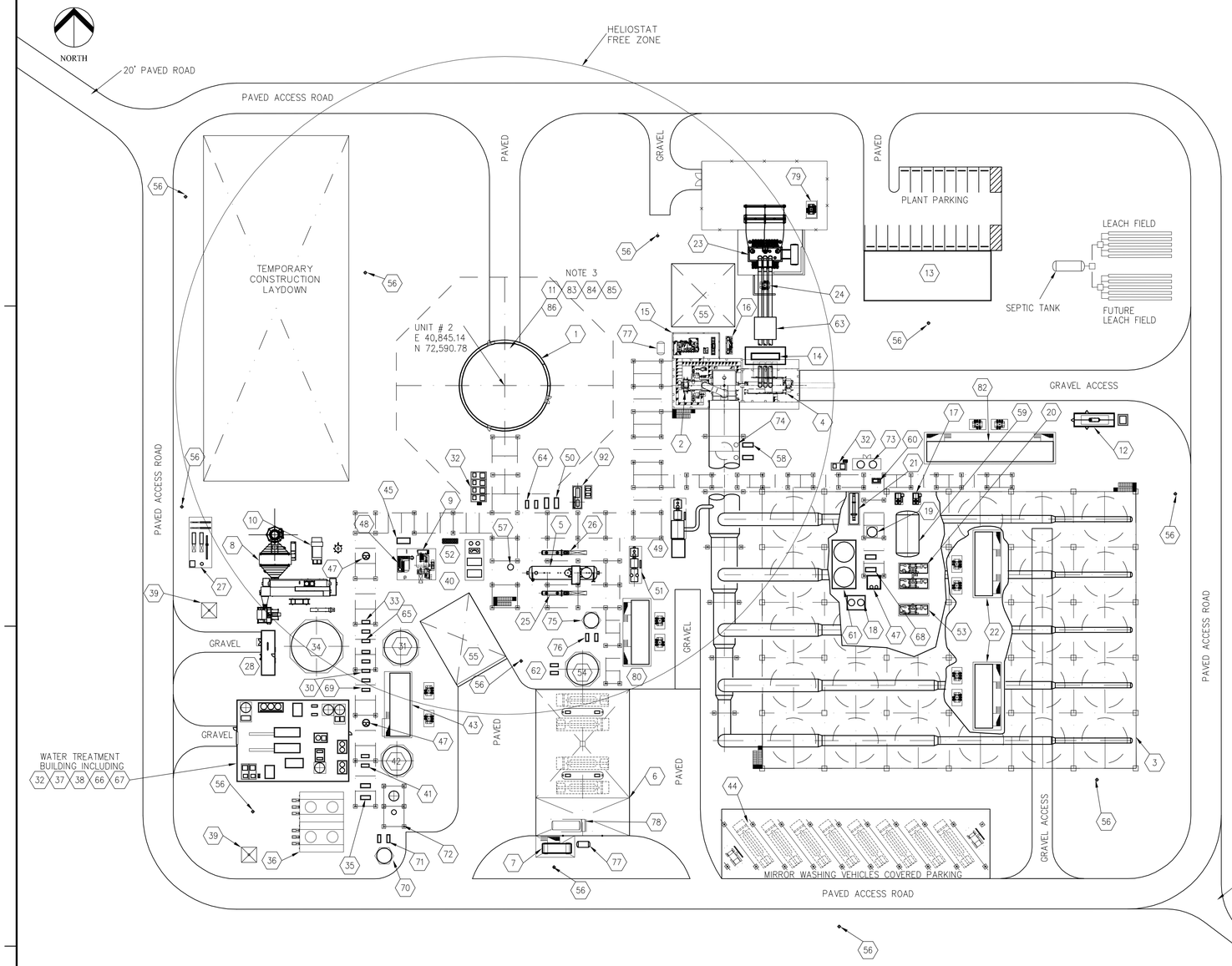

SOLAR TOWER #2 GRADE ELEV. 538'-0"

NOTES:

1. SOLAR POWER TOWER WILL INCLUDE STAIRS, ELEVATOR WITH THE SRSG ON THE TOP.
2. FEED WATER DEAERATOR WILL BE INSTALLED ON THE TOP PLATFORM OF 5 TOTAL. EACH PLATFORM WILL BE AT ± 20 FEET BETWEEN LEVELS.
3. ITEMS 11, & 83-86 TO BE PLACED ON ELEVATED PLATFORMS IN THE (SRSG) TOWER.

EQUIPMENT LEGEND

1	SOLAR POWER TOWER	46	NOT USED
2	STEAM TURBINE	47	WASTE WATER SUMP W/ 2 PUMPS (3 REQ'D)
3	AIR COOLED CONDENSER (ACC)	48	NP AUXILARY BOILER DEAERATOR / PUMP SKID
4	STEAM TURBINE GENERATOR	49	TURBINE DRIVE BOILER FEED WATER PUMP
5	FEED WATER DEAERATOR	50	START-UP AUXILARY BOILER FEED PUMPS (2 REQ'D)
6	WASH VEHICLE FILLING / FUELING STATION & PARKING	51	ELECTRIC BOILER FEED WATER PUMP
7	8000 GAL. DIESEL FUEL STORAGE TANK	52	BULK STORAGE NITROGEN BOTTLES
8	START-UP AUXILARY BOILER	53	ACC VACUUM SKID (NIGHT OPERATION)
9	NIGHT PRESERVATION AUXILARY BOILER (NPAB)	54	WASH WATER STORAGE TANK
10	START-UP DEAERATOR & PUMP SKID	55	CONSTRUCTION AND MAINTENANCE CRANE PAD
11	SOLAR RECEIVER STEAM GENERATOR (SRSG)	56	FIRE HYDRANT W/HOSE (10)
12	EMERGENCY DIESEL GENERATOR	57	CCW EXPANSION TANK
13	PLANT SERVICES BUILDING	58	ACC DRAIN PUMPS (2 REQ'D)
14	STEAM TURBINE EXCITATION CONTAINER	59	CONDENSATE TANK
15	STEAM TURBINE OIL SYSTEMS	60	ACC WASHING SKID
16	STEAM TURBINE GLAND STEAM CONDENSER	61	POLISHING SKID
17	CONDENSATE PUMPS (2 REQ'D)	62	WASH WATER PUMPS (2 REQ'D)
18	CONDENSATE POLISHER PREFILTER SKID	63	GENERATOR CIRCUIT BREAKER
19	CONDENSATE FILTER AIR RECEIVER	64	CLOSED COOLING WATER BOOSTER PUMPS (2 REQ'D)
20	ACC VACUUM SKID (NORMAL OPERATION)	65	RAW WATER FORWARDING PUMPS (2 REQ'D)
21	ACC AIR EJECTOR SKID	66	SERVICE WATER BAG FILTERS
22	ACC POWER DISTRIBUTION CENTER TRANSFORMERS	67	DEMINERALIZED WATER CARTRIDGE FILTERS
23	GSU STEP-UP TRANSFORMER	68	POLISHER SLUICE PUMPS (2 REQ'D)
24	UNIT AUXILRY TRANSFORMER	69	WSAC MAKE-UP WATER PUMPS (2 REQ'D)
25	LP FEED WATER HEATERS (4 REQ'D)	70	RESIDUE TANK
26	HP FEED WATER HEATERS (3 REQ'D)	71	RESIDUE TANK PUMPS (2 REQ'D)
27	FUEL GAS FILTER/METERING STATION	72	THERMAL EVAPORATION UNIT
28	FIRE WATER PUMP HOUSE W/1 DIESEL, 1 ELEC. & 1 JOCKEY PUMP	73	SPENT AND CLEAN RESIN STORAGE TANKS
29	NOT USED	74	CONDENSATE FILTERS (2 REQ'D)
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34	SERVICE / FIRE WATER STORAGE TANK	79	STATION SERVICE TRANSFORMER
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36	CCW WET SURFACE AIR COOLER (WSAC)	81	FIN FAN COOLER
37	POTABLE WATER PUMPS (2 REQ'D)	82	MAIN PLANT POWER DISTRIBUTION CENTER
38	POTABLE WATER GENERATION SKID	83	SRSG CIRCULATING PUMPS (4 REQ'D)
39	GROUND WATER WELLS W/PUMPS (2 REQ'D)	84	SRSG CIRCULATING PUMPS COOLING EXPANSION TANK
40	DUEL AIR COMPRESSOR SKID	85	SRSG FLASH TANK
41	WASTE WATER PUMPS (2 REQ'D)	86	SRSG BLOWDOWN TANK
42	WASTE WATER STORAGE TANK		
43	WATER SYSTEMS POWER DISTRIBUTION CENTER AND TRANSFORMERS		
44	MIRROR WASH TRUCKS		
45	SAMPLE PANEL		

50 0 50 100
Scale: 1 INCH = 50 FEET

NO.	DATE	REVISION	BY	CHK
0		ISSUED FOR REVIEW	WAN	
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2	11/20/12	INCORPORATE 11/19/12 MEETING COMMENTS	JBA	
3	12/5/2012	ISSUED FOR PERMITTING	MTC	

REVISION APPROVAL		REV DATE	
DISCIPLINE	REVIEWED	DISCIPLINE	REVIEWED
CIVIL		ELECTRICAL	
STRUCTURAL		INST & CNTRL	
MECHANICAL		ARCHITECTURAL	
PROCESS		PLANT LAYOUTS	
PIPING			

STATUS					
ISSUED	REV	DATE	DM	SDE	PEM
PRELIMINARY	2/5/2012				
FOR REVIEW AND APPROVAL					
APPROVED FOR CONSTRUCTION					
REVISED & APPROVED FOR CONSTRUCTION					

RESPONSIBLE ENGINEER
PE #

SCALE 1"=50'-0"

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

BrightSource
BRIGHTSOURCE INDUSTRIES ISRAEL
PALEN SOLAR
ELECTRIC GENERATING SYSTEM

PROJECT NO. 459892

CH2MHILL

EQUIPMENT ARRANGEMENT PLAN POWER BLOCK #2
FIGURE NO. 2.2-1B

DWG. NO. P-1000A

REV. 3

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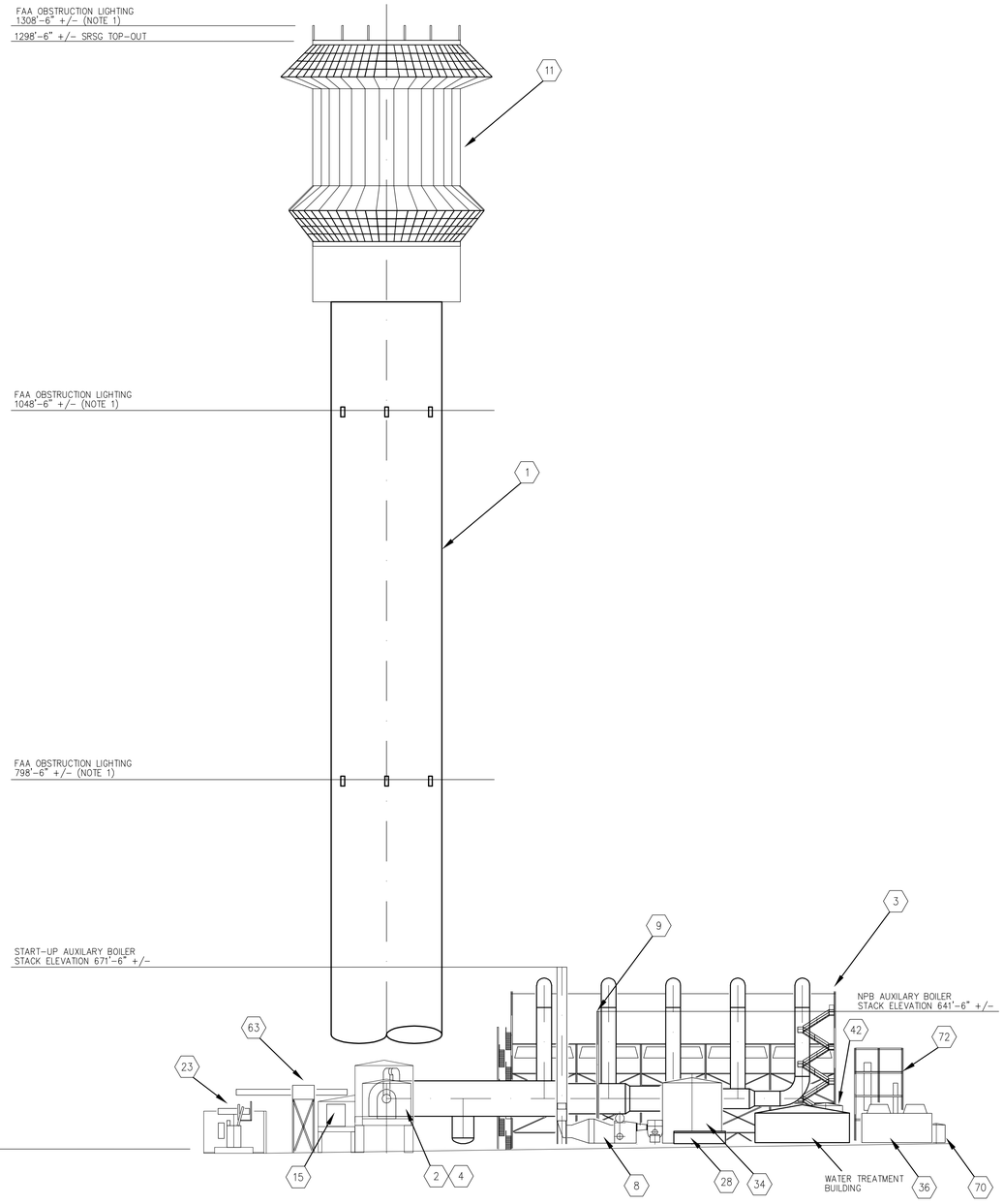

VIEW LOOKING EAST

EQUIPMENT LEGEND

1	SOLAR POWER TOWER
2	STEAM TURBINE
3	AIR COOLED CONDENSER (ACC)
4	STEAM TURBINE GENERATOR
8	START-UP AUXILARY BOILER
9	NIGHT PRESERVATION AUXILARY BOILER (NPAB)
11	SOLAR RECEIVER STEAM GENERATOR (SRSG)
15	STEAM TURBINE OIL SYSTEMS
23	GSU STEP-UP TRANSFORMERS
28	FIRE WATER PUMP HOUSE W/1 DIESEL, 1 ELEC. & 1 JOCKEY PUMP
34	SERVICE / FIRE WATER STORAGE TANK
36	CCW WET SURFACE AIR COOLER (WSAC)
42	WASTE WATER TANK
70	RESIDUE TANK
72	THERMAL EVAPORATION UNIT

NOTES:

1. FAA OBSTRUCTION LIGHTING:
MEDIUM INTENSITY FLASHING WHITE OBSTRUCTION LIGHT SYSTEM (MIWOL). SIX LIGHT UNITS PER LEVEL (0° NORTH 60°, 120°, 180° SOUTH, 240°, 300°).

50 0 50 100
Scale: 1 INCH = 50 FEET

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REVISION APPROVAL		REV	DATE
DISCIPLINE	REVIEWED	DISCIPLINE	REVIEWED
CIVIL		ELECTRICAL	
STRUCTURAL		INST & CNTRL	
MECHANICAL		ARCHITECTURAL	
PROCESS		PLANT LAYOUTS	
PIPING			

STATUS	REV	DATE	DM	SDE	PEM
ISSUED					
PRELIMINARY					
FOR REVIEW AND APPROVAL					
APPROVED FOR CONSTRUCTION					
REVISED & APPROVED FOR CONSTRUCTION					

SCALE 1" = 50'-0"

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ELECTRIC GENERATING SYSTEM

PROJECT NO. 459892

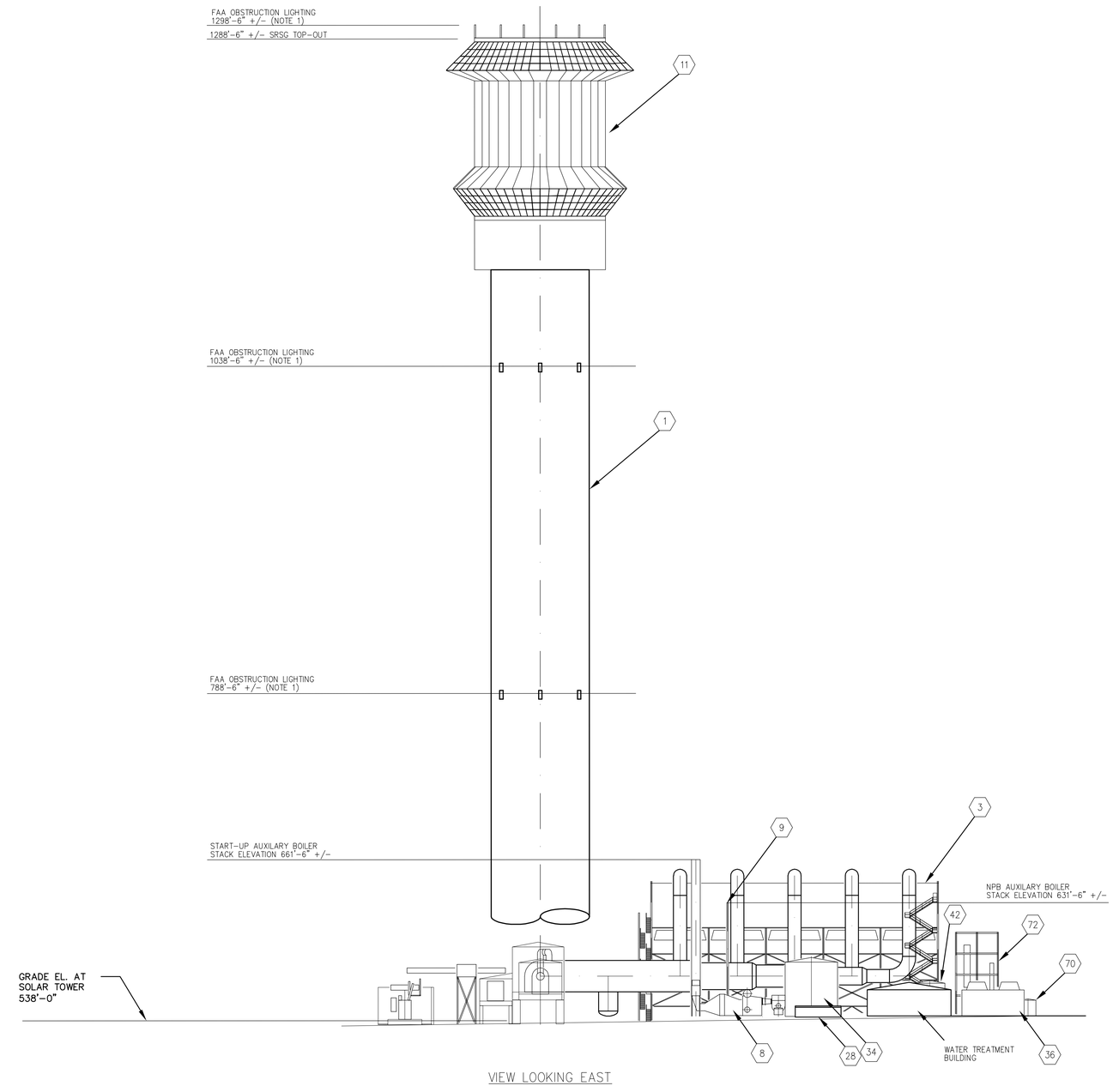
CH2MHILL

EQUIPMENT ARRANGEMENT ELEVATION POWER BLOCK #1

FIGURE NO. 2.2-2A

DWG. NO. P-1002B REV. 1

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"



VIEW LOOKING EAST

EQUIPMENT LEGEND

1	SOLAR POWER TOWER
3	AIR COOLED CONDENSER (ACC)
8	START-UP AUXILARY BOILER
9	NIGHT PRESERVATION AUXILARY BOILER (NPAB)
11	SOLAR RECEIVER STEAM GENERATOR (SRSG)
28	FIRE WATER PUMP HOUSE W/1 DIESEL, 1 ELEC. & 1 JOCKEY PUMP
34	SERVICE / FIRE WATER STORAGE TANK
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NOTES:

1. FAA OBSTRUCTION LIGHTING:
MEDIUM INTENSITY FLASHING WHITE OBSTRUCTION LIGHT SYSTEM (MIWOL). SIX LIGHT UNITS PER LEVEL (0° NORTH 60°, 120°, 180° SOUTH, 240°, 300°).

50 0 50 100
Scale: 1 INCH = 50 FEET

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REVISION APPROVAL		REV DATE	
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PROCESS		PLANT LAYOUTS	
PIPING			

STATUS	REV	DATE	DM	SDE	PEM
ISSUED					
PRELIMINARY					
FOR REVIEW AND APPROVAL					
APPROVED FOR CONSTRUCTION					
REVISED & APPROVED FOR CONSTRUCTION					

SCALE 1" = 50'-0"

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ELECTRIC GENERATING SYSTEM

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EQUIPMENT ARRANGEMENT ELEVATION POWER BLOCK #2

FIGURE NO. 2.2-2B

DWG. NO. P-1002A

REV. 1

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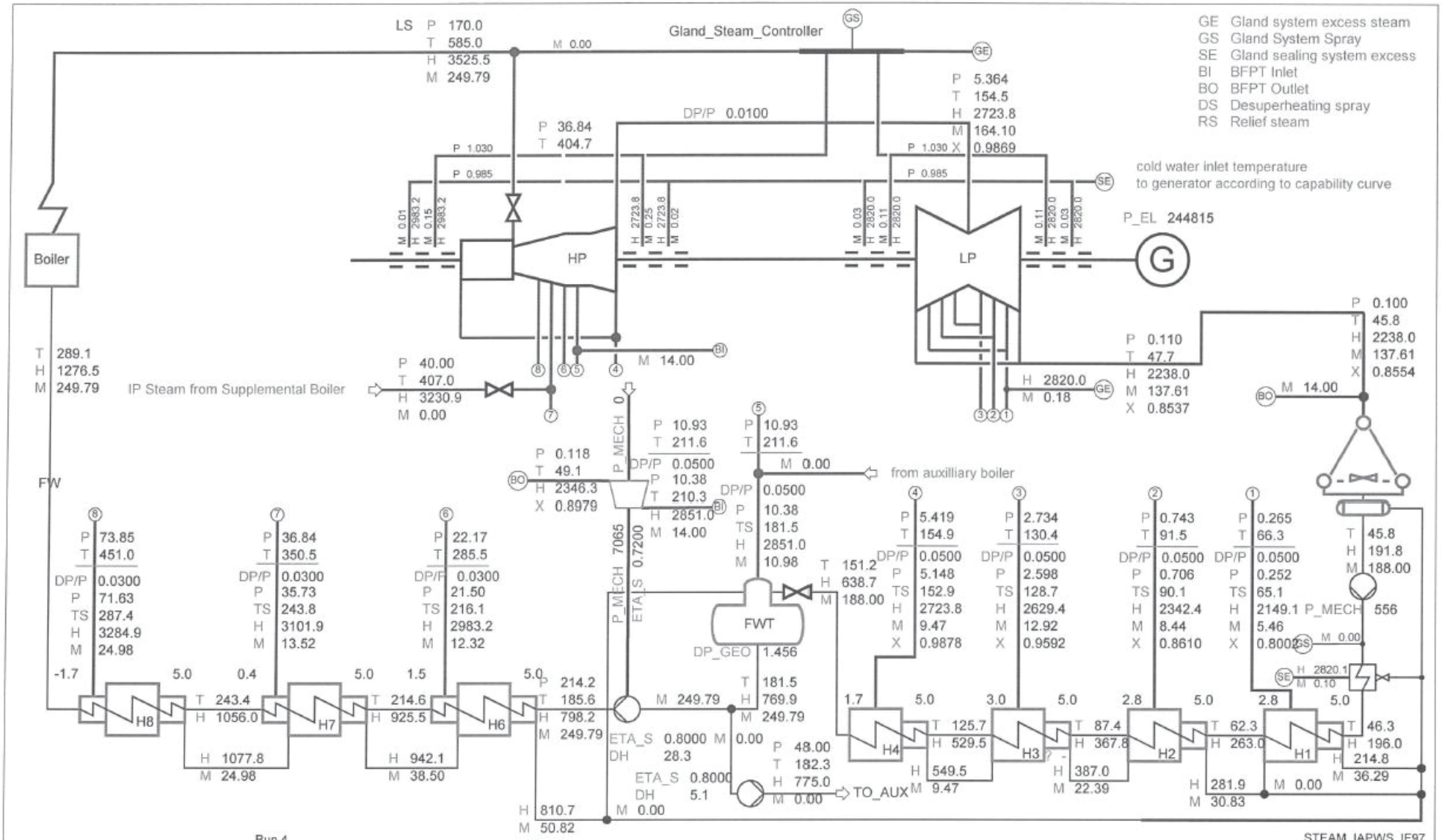
0 1"



Run 4
R:\PROJEKTE\Rio Mesa - 2012\2012-05-12-br-GMD6021995\HBD_STPPS_GMD6021995.algx

STEAM_IAPWS_IF97
ALPRO 4.4.2: (WinAlpro 2011-12-06)

P	Pressure	bar
T	Temperature	°C
H	Enthalpy	kJ/kg
M	Mass flow	kg/s
TS	Saturation temperature	°C
X	Mass fraction of vapor	-
P_MECH	Mechanical power	kW
P_EL	Electrical power	kW

HR = (LS_B."Q"-FW."Q"+ IP_AUX_STEAM."Q" + AUX_BOILER."Q" - TO_AUX."Q")/(GEN."P_EL") = 8261 [kJ/(kW*h)]
Q_Solar = 561.8 [MW]
Q_IP_Admission = 0.0 [MW]

Drawn: 2012-05-14
Revision:
Checked:
Approved:
Doc: | Format: | Lang: E | Sheet: 1 | No of Sh: 26

For information only!

ALSTOM

HEAT BALANCE DIAGRAM

STPPS
NCR 28°C

FIGURE NO. 2.2-3A

60Hz

Brandt
STSNE
2012-05-11/19:21
GMD6 021 995

p.f. = 0.9; Tcg = 40°C; TcCW = 35°C with 40% glycol content

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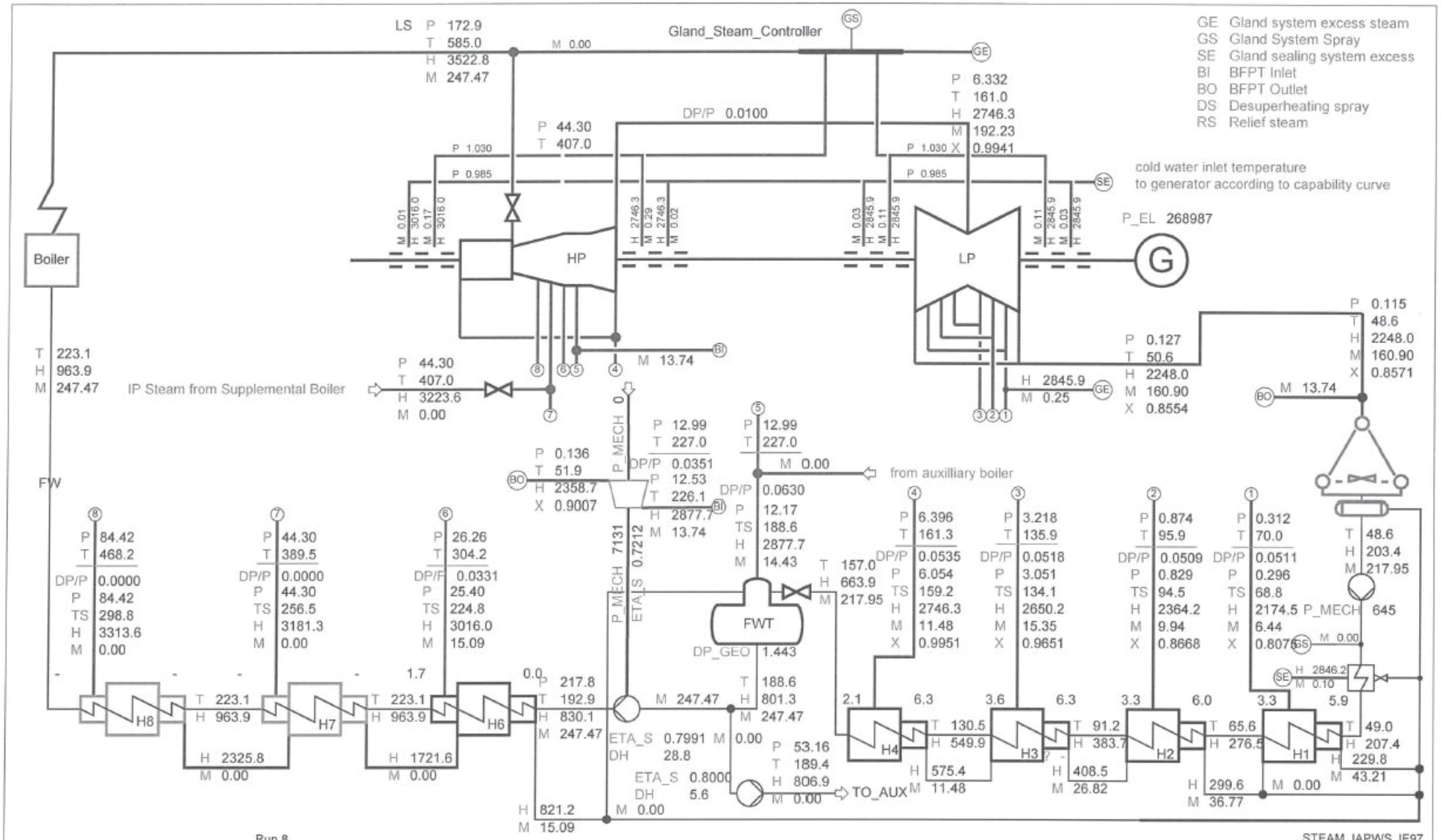

Run 8
R:\PROJEKTE\Rio Mesa - 2012\2012-05-12-br-GMD6021995\HBD_STPPS_GMD6021995.algx

STEAM_IAPWS_IF97
ALPRO 4.4.2: (WinAlpro 2011-12-06)

P	Pressure	bar
T	Temperature	°C
H	Enthalpy	kJ/kg
M	Mass flow	kg/s
TS	Saturation temperature	°C
X	Mass fraction of vapor	-
P_MECH	Mechanical power	kW
P_EL	Electrical power	kW

HR = (LS_B."Q"-FW."Q"+ IP_AUX_STEAM."Q" + AUX_BOILER."Q" - TO_AUX."Q")/(GEN."P_EL") = 8475 [kJ/(kW*h)]
Q_Solar = 633.2 [MW]
Q_IP_Admission = 0.0 [MW]

Drawn: 2012-05-14
Revision:
Checked:
Approved:
For information only!
ALSTOM

HEAT BALANCE DIAGRAM

STPPS
MCR 28°C
FIGURE NO. 2.2-3B

60Hz

Brandt
STSNE
2012-05-11/19:30
GMD6 021 995

Doc:	Format:	Lang:	Sheet:	No of Sh:
		E	2	26

p.f. = 0.9; Tcg = 40°C; TcCW = 35°C with 40% glycol content

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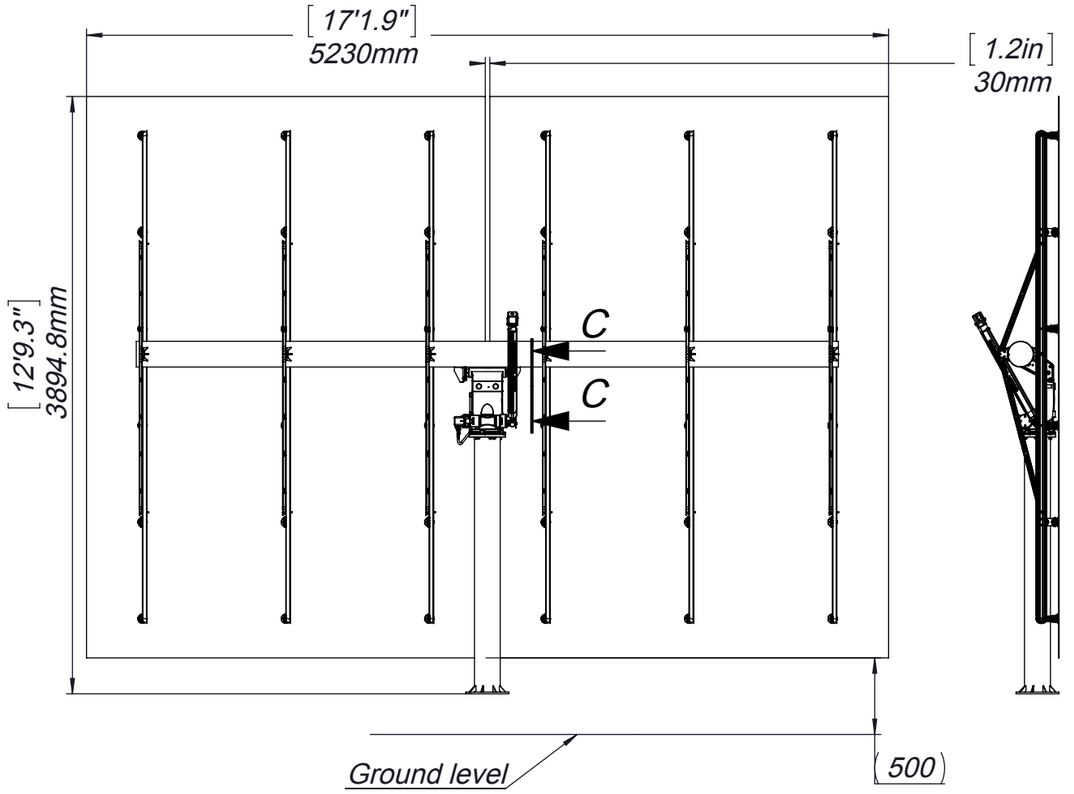
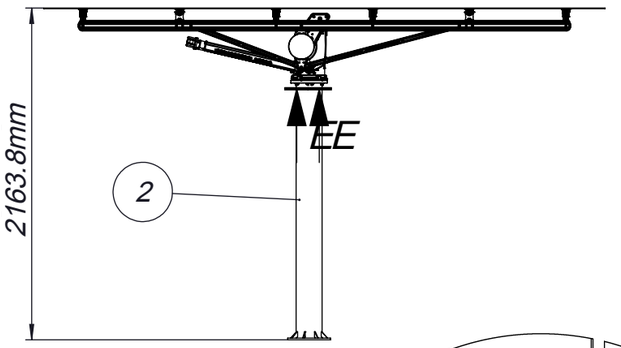
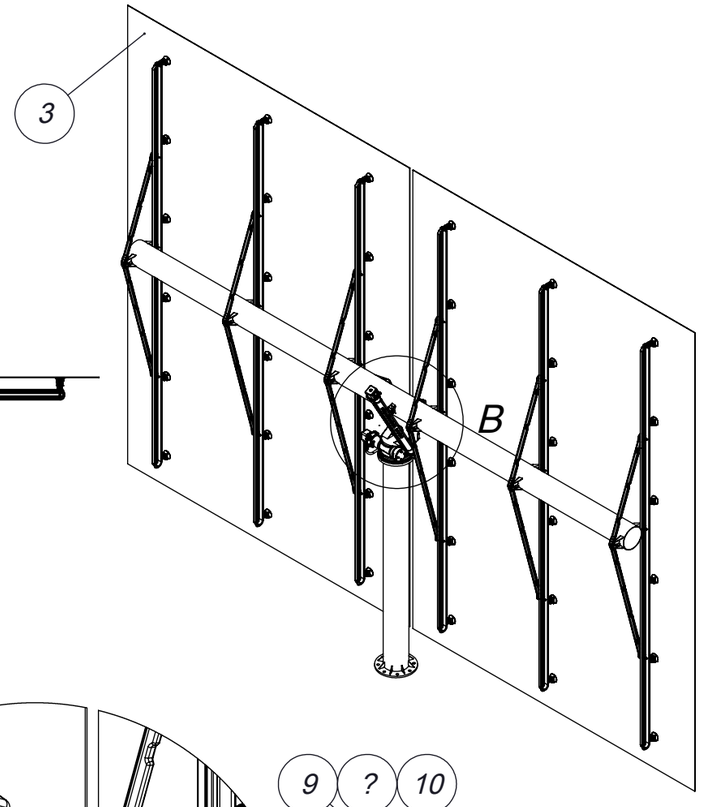
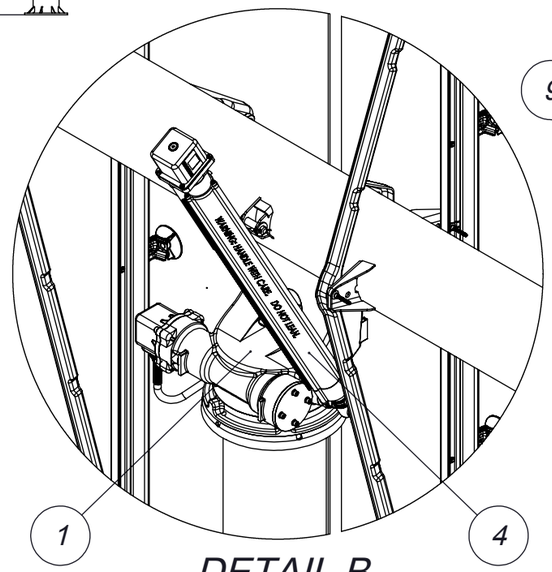




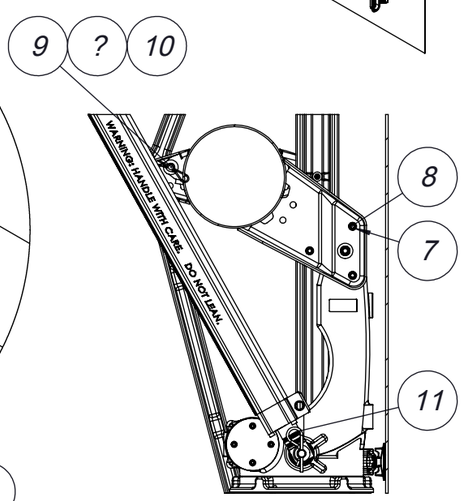
SECTION E-E
SCALE 1 : 15







DETAIL B



SECTION C-C

NO.	Part Number	Description	Vertical Heliostat/QTY.	Notes
12	09-00070S09	FLAT WASHER M12; DIN 125A; BN 715	1	
11	09-02560S02	R-Pin - Spring Cotter 4mm wire diameter DIN 11024; FABORY No. 030.001	1	
10	09-02560S01	R-Pin - Spring Cotter 2mm wire diameter DIN 11024; FABORY No. 030.001	1	
9	08-23587A01	Clevis-pin-M12x45 - F9	1	
8	09-02230S02	1/4" [6.4mm] AVDELOK FASTENER - Pin	6	
7	09-02240S02	1/4" [6.4mm] AVDELOK FASTENER - Collar	6	
6	09-00310S02	Hex cap bolt M8x25 ISO4017/DIN933/BN56	5	
5	09-00900S02	NORD LOCK washer metric NL8	5	
4	01-23101A01	ELEVATION DRIVE	1	
3	01-23129A01	Heliostat Reflector Assy	1	
2	05-23417A01	Test site Pylon	1	
1	01-23260A01	AD Main assembly	1	

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TOLERANCES

0..120 = ±0.1

Angles = ±0.5°

Between Holes = ±0.1

Holes <ϕ 8 = +0.2 -0.05

Drawing REV 00C

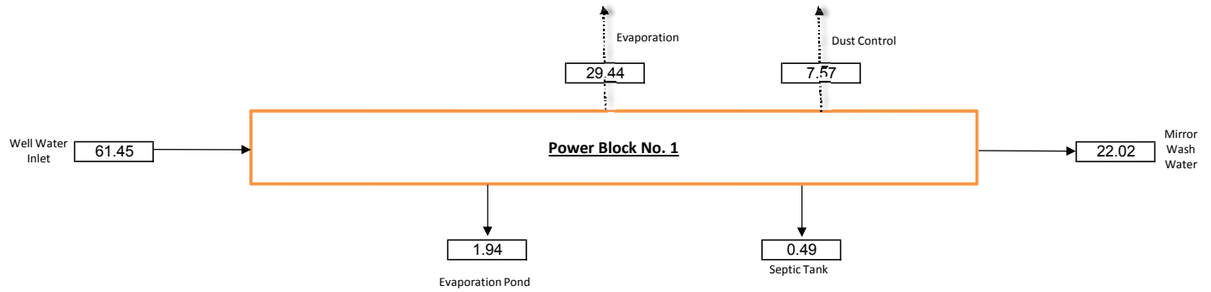
	NAME	DESIGN STATUS
CHECK-IN:	SElany	In Design
CHECK-IN Date:	8/21/2011	MATERIAL: See BOM
DESIGN:	SElany	TREATMENT
APPROVED:	S.Huss	FINISH
QA:	A.Keiser	WEIGHT: 339.48
Reviewer:		DIMENSIONS ARE INmm

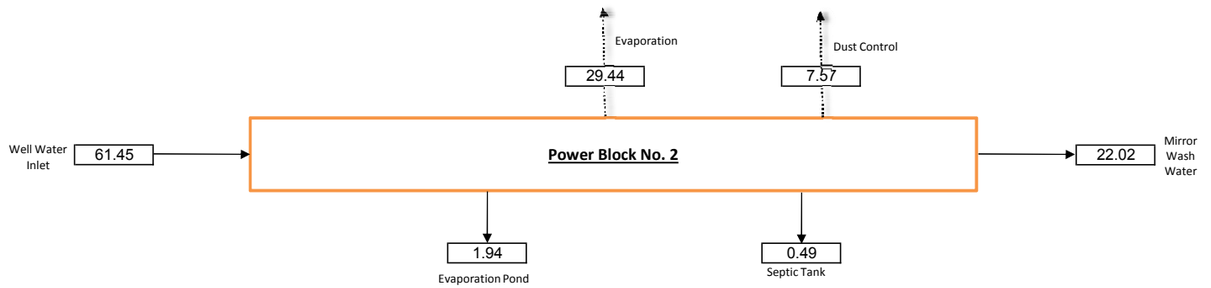
BrightSource
Har Hotzvim, Kiryat Mada # 11
Amot Bldg # 6
Jerusalem 91450, ISRAEL
Tel: 972-(0)77-202-5000
Fax: 972-(0) 2-571-1059

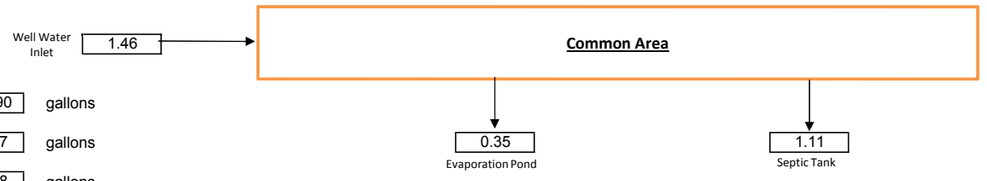
TITLE: FIGURE NO. 2.2-4

LH2.3 Mock-up Top Assy

SIZE: A3 | SCALE: 1:10 | DOCUMENT NO. 01-22951A01 | SHEET: 1 of 1 | REV 00Q



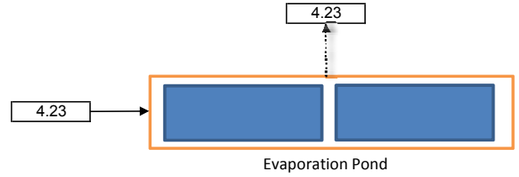




Ave Annual Well Water Usage per day =	179,090	gallons
Ave Annual Evaporation per day =	84,797	gallons
Total Mirror Wash per day =	63,408	gallons
Total Septic per day =	2,998	gallons
Total Wastewater to Evaporation Ponds per day =	6,086	gallons
Total Raw Water for Dust Control per day =	21,802	gallons
Total Well Water Usage per year =	65,367,768	gallons
Duration per year	3,500	Hours (Block 1)
Total Well Water Usage per year =	201	Acre-Feet

Water Balance per day = 0 gallons

3500 Hours (Block 2)



Acres Required/Pond = 1.50 Permit will request 2 ponds 2 acres each for a total of 4 acres

CH2MHILL

Client:	BrightSource
Project Title:	Palen Solar Project
Project Number:	
Prepared By:	John Oster

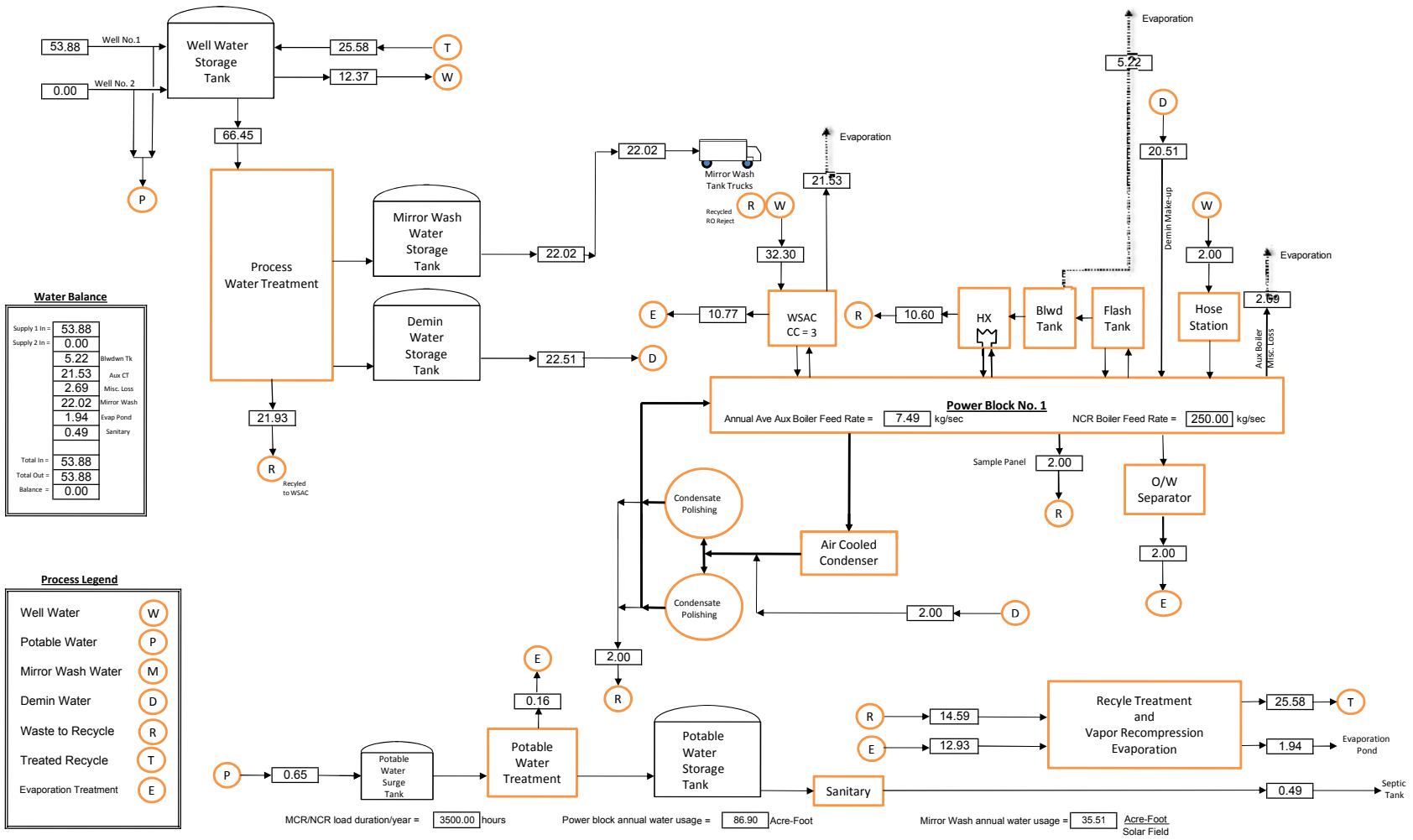
Cycle Type:	Steam Turbine	Fuel Type	Solar
Configuration:	One per Project	Duct Firing:	NA
Dry Bulb Temp:	NA	Amb. Pressure	NA
Power Aug:	NA	Wet Bulb Temp:	NA
Power Aug Type:	NA	# of CT Operating:	Aux Cooling

Title: Water Balance Summary

Figure Number:	2.4-1A	Sheet Number:	1 of 4
Flow Rate Units:	GPM	Volume Units:	Gal
Revision Number:	0	Issue Date:	12/10/2012

250 Mega Watt Power Block No. 1 West

Normal Continuous Rating (NCR)



Water Balance

Supply 1 In =	53.88	
Supply 2 In =	0.00	
	5.22	Blwdwn Tk
	21.53	Aux CT
	2.69	Misc. Loss
	22.02	Mirror Wash
	1.94	Evap Pond
	0.49	Sanitary
Total In =	53.88	
Total Out =	53.88	
Balance =	0.00	

Process Legend

Well Water	W
Potable Water	P
Mirror Wash Water	M
Demin Water	D
Waste to Recycle	R
Treated Recycle	T
Evaporation Treatment	E

CH2MHILL

Client: BrightSource
Project Title: Palen Solar Project
Project Number:
Prepared By: John Oster

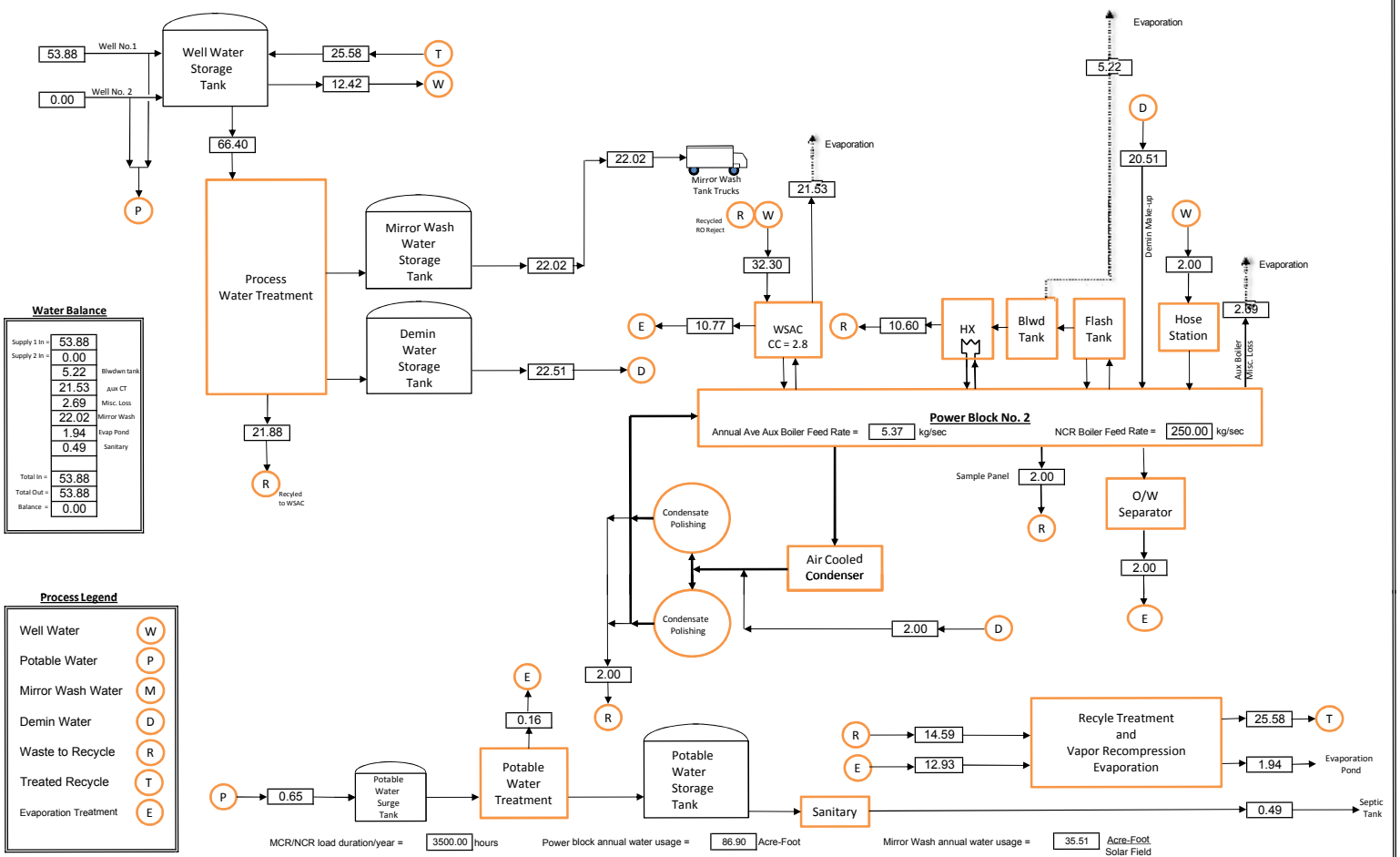
Cycle Type:	Steam Turbine	Fuel Type	Solar
Configuration:	One Per Plant	Duct Firing:	NA
Dry Bulb Temp:	NA	Amb. Pressure	NA
Power Aug:	NA	Wet Bulb Temp:	NA
Power Aug Type:	NA	# of CT Operating:	Aux Cooling

Title: Water Balance Power Block 1 NCR Operating Conditions

Figure Number: 2.4-1B
Flow Rate Units: GPM
Revision Number: 0
Sheet Number: 2 of 4
Volume Units: Gal
Issue Date: 12/10/2012

250 Mega Watt Power Block No. 2 East

Normal Continuous Rating (NCR)



Water Balance

Supply 1 In =	53.88	
Supply 2 In =	0.00	
	5.22	Blwdwn tank
	21.53	Aux CT
	2.69	Misc. Loss
	22.02	Mirror Wash
	1.94	Evap Pond
	0.49	Sanitary
Total In =	53.88	
Total Out =	53.88	
Balance =	0.00	

Process Legend

Well Water	W
Potable Water	P
Mirror Wash Water	M
Demin Water	D
Waste to Recycle	R
Treated Recycle	T
Evaporation Treatment	E

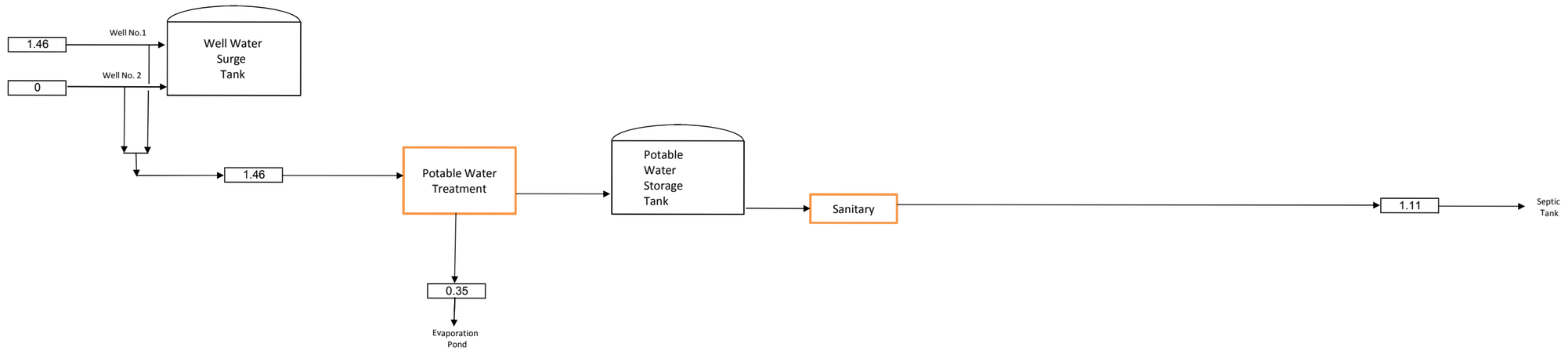
CH2MHILL

Client: BrightSource
Project Title: Palen Solar Project
Project Number:
Prepared By: John Oster

Cycle Type:	Steam Turbine	Fuel Type	Solar
Configuration:	One Per Plant	Duct Firing:	NA
Dry Bulb Temp:	NA	Amb. Pressure	NA
Power Aug:	NA	Wet Bulb Temp:	NA
Power Aug Type:	NA	# of CT Operating:	Aux Cooling

Title: Water Balance Power Block 2 NCR Operating Conditions

Figure Number: 2.4-1C
Sheet Number: 3 of 4
Flow Rate Units: GPM
Volume Units: Gal
Revision Number: 0
Issue Date: 12/10/2012



Gallons per year = 766324.8

Acre-Feet per year = 2.35

CH2MHILL

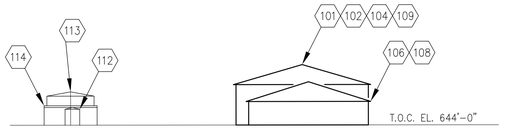
Client:	Bright Source
Project Title:	Palen Solar Project
Project Number:	
Prepared By:	John Oster

Cycle Type:	Steam Turbine	Fuel Type	Solar
Configuration:	N/A	Duct Firing:	NA
Dry Bulb Temp:	NA	Amb. Pressure	NA
Power Aug:	NA	Wet Bulb Temp:	NA
Power Aug Type:	NA	# of CT Operating:	Aux Cooling

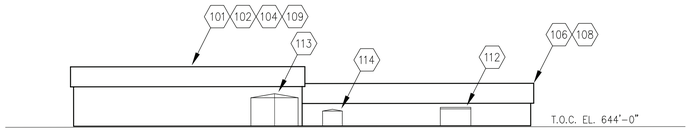
Title: Water Balance Common Area

Figure Number:	2.4-1D	Sheet Number:	4 of 4
Flow Rate Units:	GPM	Volume Units:	Gal
Revision Number:	0	Issue Date:	12/10/2012

NORTH



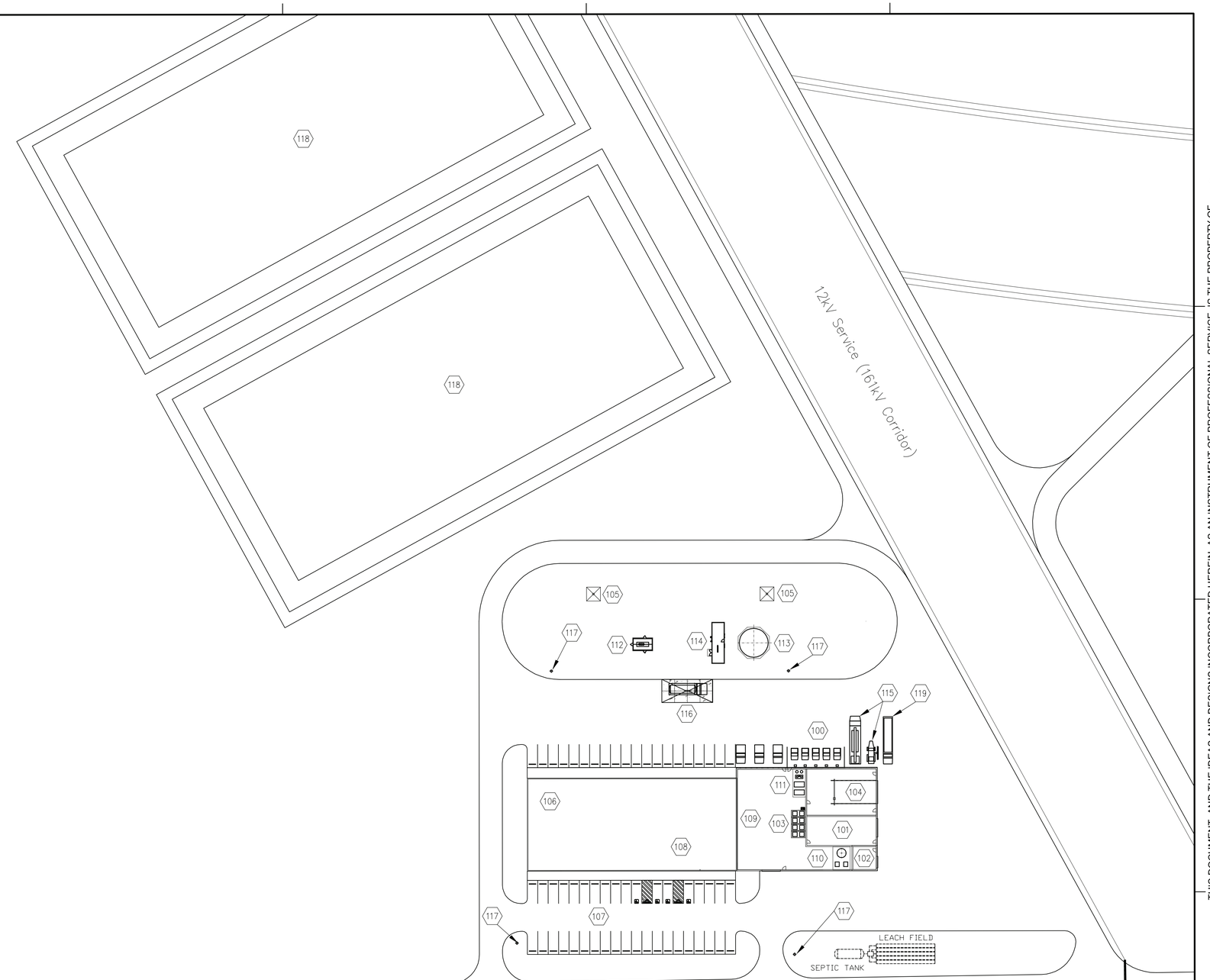
COMMONS AREA LOOKING EAST



COMMONS AREA LOOKING SOUTH

EQUIPMENT LEGEND CONTINUED FROM DWG. P-1000

100 BATTERY CHARGING STATION
101 MECHANICAL MAINTENANCE SHOP
102 ELECTRICAL / INSTRUMENT MAINTENANCE SHOP
103 BULK CHEMICAL STORAGE
104 VEHICLE MAINTENANCE SHOP
105 GROUND WATER WELLS
106 CONTROL ROOM
107 PARKING
108 ADMINISTRATION
109 WAREHOUSE
110 POTABLE WATER GENERATION
111 AIR COMPRESSOR SKID
112 EMERGENCY DIESEL GENERATOR
113 FIRE / SERVICE WATER STORAGE TANK
114 FIRE WATER PUMP HOUSE
115 SPARE WASH TRUCKS
116 DIESEL FUEL TRUCK PARKING
117 FIRE HYDRANT WITH HOSE (4)
118 EVAPORATION POND (2)
119 WASTE WATER TRUCK



NO.	DATE	REVISION	BY	CHK
0		ISSUED FOR REVIEW	WAN	
1	11/20/12	INCORPORATE 11/19/12 MEETING COMMENTS	JBA	
2	12/5/2012	ISSUED FOR PERMITTING	MTC	

REVISION APPROVAL		REV DATE	
DISCIPLINE	REVIEWED	DISCIPLINE	REVIEWED
CIVIL		ELECTRICAL	
STRUCTURAL		INST & CNTRL	
MECHANICAL		ARCHITECTURAL	
PROCESS		PLANT LAYOUTS	
PIPING			

STATUS					
ISSUED	REV	DATE	DM	SDE	PEM
PRELIMINARY					
FOR REVIEW AND APPROVAL					
APPROVED FOR CONSTRUCTION					
REVISED & APPROVED FOR CONSTRUCTION					

RESPONSIBLE ENGINEER
PE #

SCALE 1"=50'-0"

BrightSource
BRIGHTSOURCE INDUSTRIES ISRAEL
PALEN SOLAR
ELECTRIC GENERATING SYSTEM

PROJECT NO. 459892

CH2MHILL

EQUIPMENT ARRANGEMENT PLAN
COMMON AREA
FIGURE NO. 2.5-1

DWG. NO. P-1001

REV. 2

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

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REUSE OF DOCUMENTS:

Section 3 ENGINEERING ANALYSIS

The following sections provide a description of the modifications proposed to the PSEGS as they may affect the assumptions, rationale, and Conditions of Certification in the Final Decision for the areas of 3.1 Facility Design, Efficiency and Reliability, 3.2 Transmission System Engineering, and 3.3 Transmission Line Safety and Nuisance.

3.1 FACILITY DESIGN, RELIABILITY AND EFFICIENCY

This section outlines the portions of the Modified Project that may affect the analysis, rationale, conclusions, and Conditions of Certification contained in the Final Decision for the Approved Project.

3.1.1 Overview of Approved Project

The Approved Project was originally licensed as a nominally rated 500 MW solar thermal facility to be developed in two independent units, each with a capability of generating up to 250 MW with conventional steam turbine technology. The Approved Project would interconnect with a single circuit 230 kV transmission generation tie-line to the Red Bluff Substation. The Red Bluff Substation is under construction and scheduled to be operational in 2013.

The Approved Project would have utilized solar heliotrough technology to generate electricity. With this technology, arrays of parabolic mirrors refocus the sunlight on a receiver tube to create and collect heat energy. The receiver tube is located at the focal point of the trough's parabola shape. A heat transfer fluid (HTF) is brought to high temperature (750°F) as it circulates through the receiver tubes. The HTF is then piped through a series of heat exchangers where it releases its stored heat to generate high pressure steam. The steam is then fed to a conventional steam turbine generator where electricity is produced. Individual components of the Approved Project included:

- Graded Solar Field & Power Block #1 (east)
- Graded Solar Field & Power Block #2 (west)
- Access road from Corn Springs Road
- Warehouse/maintenance building, assembly hall and laydown area
- Telecommunications Lines
- Liquid Propane Gas storage tank
- Concrete batch plant
- Fuel depot
- Onsite transmission facilities, including central internal switchyard
- 230 kV single circuit transmission line interconnecting to Southern California

Edison's Red Bluff Substation

- Groundwater wells used for water supply
- Four evaporation ponds for wastewater
- Septic systems for sanitary wastewater
- Land Treatment Units for handling of spills of therminol HTF

3.1.2 Relevant Modifications to Project Description

The primary modifications relevant to Facility Design, Efficiency and Reliability are the following:

- The parabolic trough solar collection system and associated therminol as the HTF will be replaced with heliostats and BrightSource solar technology which utilizes water as the HTF.
- The Land Treatment Units for HTF have been eliminated.
- The large assembly hall will be eliminated.
- The evaporation ponds have been reduced from four 4-acre ponds to two 2-acre ponds.
- The large drainage structures surrounding the site will be eliminated. (The prior parabolic trough technology required substantial grading to achieve a level site which is no longer necessary for the tower technology.)
- The Modified Project includes a minor re-routing of the generation tie-line near the western end of the route and at the tie-in location to the Red Bluff Substation. The purpose of this re-routing is to align the PSEGS generation tie-line route immediately adjacent to the NextEra Desert Sunlight generation tie-line to minimize crossings over Interstate-10 and to ensure entry into the western side of Red Bluff Substation nearest the PSEGS breaker position avoids interference with other transmission lines.
- The secondary access road has been eliminated and replaced with a secondary access gate as shown in Figure 2.1-5.
- The redundant telecommunication line has been rerouted to be buried along the generation tie-line route.
- The use of LPG has been replaced with natural gas which will be delivered via a new extension of the existing SoCal Gas distribution system to the project boundary.

In accordance with Commission regulations, this section together with the engineering appendices listed below present information concerning the design and engineering of PSEGS. The LORS applicable to the engineering of the project have been updated.

3.1.3 Facility Design

A description of the project is provided in Section 2.0 of this Petition.

Descriptions of the design criteria are included in the following appendices:

- Appendix 2E, Civil Engineering Design Criteria
- Appendix 2F, Structural Engineering Design Criteria
- Appendix 2G, Mechanical Engineering Design Criteria
- Appendix 2H, Electrical Engineering Design Criteria
- Appendix 2I, Control Engineering Design Criteria
- Appendix 2J, Geologic and Foundation Design Criteria

The PSEGS will be designed to maximize safe construction and operation. Potential hazards that could affect the facility include earthquake, flood, and fire. The project will be designed in accordance with all applicable codes regarding these hazards. Facility operators will be trained in safe operation, maintenance, and emergency response procedures to minimize the risk of personal injury and damage to the facility.

3.1.3.1 Natural Hazards

The principal natural hazard associated with the project site is earthquakes. As required by the Decision for the Approved Project, the Modified Project structures will be designed to meet the seismic requirements of California Code of Regulations Title 24 and the 2010 California Building Standards Code (CBC). Potential seismic hazards will be mitigated by implementing the 2010 CBC construction guidelines. Appendix 2F, Structural Engineering, includes the structural seismic design criteria for the buildings and equipment.

3.1.3.2 Emergency Systems and Safety Precautions

This subsection discusses the fire protection systems, emergency medical services, and safety precautions to be used by project personnel.

3.1.3.2.1 Fire Protection Systems

The project will rely on both onsite fire protection systems and local fire protection services.

3.1.3.2.1.1 Onsite Fire Protection Systems

The fire protection systems are designed to protect personnel as well as to limit property loss and plant downtime from fire. The project will have the following fire protection systems:

- **Steam Turbine Lube Oil Areas Water Spray System.** This system provides fire suppression for the steam turbine lube oil piping and lube oil storage area.

- **Fire Hydrants/Hose Stations.** This system will supplement the facility's fixed fire suppression systems. Water will be supplied from the fire water system loop.

- **Fire Extinguisher.** The administrative complex buildings, and power block areas will be equipped with fixed fire suppression systems and portable fire extinguishers as required by the local fire department.

3.1.3.2.1.2 Local Fire Protection Services

As the Commission found in the Final Decision, the Riverside County Fire Department (RCFD) has jurisdiction to enforce fire safety at the site and is therefore required to provide initial fire protection support and respond to major hazardous materials incidents at the site. The closest RCFD fire station to the project site is the Lake Tamarisk Station #49 located at 43880 Lake Tamarisk in Desert Center, about 13 miles from the project. The estimated response time is 14 minutes once dispatched. The next nearest station is the Blythe Air Base Station #45 located about 40 miles east, with a response time of about 30 minutes once dispatched. The fire station in Indio (Terra Lago Station #87 located at 42900 Golf Center Parkway, about 59 miles west of the site) could also respond if necessary, with a response time of 45 minutes once dispatched. All RCFD fire stations are staffed full-time with a minimum of three personnel per shift which include paramedics.

Appropriate plant personnel will be trained as a hazardous materials response team and one or more spill response kits will be available on-site. In the event of a large incident involving hazardous materials, backup support will be provided by the RCFD, which has a hazmat response unit located in Palm Desert (about 70 miles away) and could respond within 1.5 to 2 hours.

3.1.3.2.2 Personnel Safety Program

PSEGS will operate in compliance with federal and state occupational safety and health program requirements. Compliance with these programs will minimize project effects on employee safety.

3.1.4 Facility Reliability

This subsection discusses the expected facility availability, equipment redundancy, fuel availability, water availability, and project quality control measures.

3.1.4.1 Facility Availability

It is anticipated that the facility will normally operate at high average annual capacity factors during periods of sunlight. PSEGS will be designed for an operating life of 25 to 30 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

The percent of time that the solar plants are projected to be operated is defined as the service factor. The service factor considers the amount of time that a unit is operating and generating power, whether at full or partial load. The projected service factor for the power block, which considers projected percent of time of operation, differs from the equivalent availability factor (EAF), which considers the projected percent of energy production capacity achievable.

The EAF, which is a weighted average of the percent of energy production capacity achievable, differs from the availability of a unit, which is the percent of time that a unit is available for operation, whether at full load, partial load, or standby. The projected equivalent availability factor for the project is estimated to be approximately 92 to 98 percent.

3.1.4.2 Redundancy of Critical Components

The following subsection identifies equipment redundancy as it applies to project availability. A summary of equipment redundancy is shown in Table 3.1-1.

Table 3.1-1
Major Equipment Redundancy

Description	Number	Note
Solar Receiver Steam Generators	One per plant	
SRSG Circulating Pumps	Four – 25 percent capacity per plant	Two spares per plant in warehouse
STG	One per plant	
Main Boiler feedwater pump (Turbine Driven)	One – 100 percent capacity per plant	One spare per plant in warehouse (consisting of a spare pump cartridge and key spare parts for turbine drive)
Back-up Boiler feedwater pump (Motor Driven)	One – 50 percent capacity per plant	One spare in warehouse
Start-up boiler feedwater pump	One – 15-25 percent capacity per plant	One spare in warehouse
Condensate pumps	Two – 50 percent capacity per plant	One spare in warehouse
Air-Cooled Condenser	One per plant	
Demineralization unit	Two – 100 percent capacity per plant	

3.1.4.2.1 Power Block

The major components of each solar plant's power block are identified in Table 3.1-2 and described below.

TABLE 3.1-2
Power Block Major Equipment and Facility List

Steam Turbine Generator	SRSG Solar Power Tower
Auxiliary Boilers	Switchyard
Air-cooled Condenser	Generator Step-up Transformer
Feed Water Heaters	Unit Auxiliary Transformer
Boiler Feed Pumps	Station Services Transformer
Plant Services Building	Raw Water/Fire Water Tank
Water Treatment Equipment Area	Demineralized Water Tanks
Underground Gas Pipeline	Raw Water Forwarding Pumps

Condensate Tank/Pump	Demineralized Water Forwarding Pumps
Emergency Generator	Access Roadway
Local Control Building	230-kV Generation Tie Line
Wastewater Storage Tanks	

3.1.4.2.2 Steam Generation Subsystems

Each solar plant will have one SRSG. Thermal energy from the steam generation system will be converted to mechanical energy, and then electrical energy in the STG. The expanded steam from the STG will be condensed and recycled to the feedwater system.

The steam generation subsystems consist of the SRSG including superheater, circulation pumps and blowdown systems. The SRSG collects solar energy from the heliostat mirrors and transfers it to feedwater flowing through the SRSG. The solar energy produces steam at the pressures and temperatures required by the steam turbine. Feedwater quality is maintained by the blowdown system. The system includes safety and auto relief valves and processing of continuous and intermittent blowdown streams.

3.1.4.2.3 Steam Turbine Generator Subsystems

The steam turbine converts the thermal energy in the steam to mechanical energy to drive the generator. The basic subsystems include the steam turbine non-reheat type with eight stages of steam extraction. The turbine will consist of a high/intermediate pressure and low pressure sections, auxiliary systems, turbine lube oil system, and generator/exciter system.

3.1.4.2.4 Distributed Control System

The DCS will be a redundant microprocessor-based system that will provide the following functions:

- Control the heliostat mirrors, STG, and other systems in response to unit load demands (coordinated control);
- Provide control room operator interface;
- Monitor plant equipment and process parameters and provide this information to the plant operators in a meaningful format; and

- Provide visual and audible alarms for abnormal events based on field signals or software-generated signals from plant systems, processes, or equipment.

The DCS will have functionally distributed architecture comprising a group of similar redundant processing units linked to a group of operator consoles and an engineer workstation by redundant data highways. Each redundant processor pair will be programmed to perform specific dedicated tasks for control information, data acquisition, annunciation, and historical purposes.

Plant operation will be controlled from the operator panel located in the control room. The operator panel will consist of two individual video/keyboard consoles and one engineering workstation. Each video/keyboard console will be an independent electronic package so that failure of a single package does not disable more than one video/keyboard. The engineering workstation will allow the control system operator interface to be revised by authorized personnel.

3.1.4.2.5 Boiler Feedwater System

The boiler feedwater system transfers feedwater from the deaerator to the SRSG. The system will consist of:

- Main boiler feedwater pump set - one 100%-capacity (100% turbine load) steam turbine-driven;
- Back-up boiler feedwater pump - one 50%-capacity (50% turbine load) motor-driven with variable frequency dring (VFD); and
- Start-up boiler feedwater pump - one 15 to 25% capacity (15 to 25% turbine load) motor-driven with VFD.

The pumps will be multistage, and will include regulating control valves, minimum flow recirculation control, and other associated piping and valves. One spare turbine-driven pump (spare pump cartridge and key spare parts for turbine drive) and one spare motor-driven pump will be available in the warehouse for the project.

3.1.4.2.6 Condensate System

The condensate system will provide a flow path from the air-cooled condenser condensate storage tank to the deaerator. The condensate system will include two 50-percent-capacity multistage, vertical, motor-driven condensate pumps and four feedwater heaters. One spare condensate pump will be available for the project.

3.1.4.2.7 Demineralized Water System

For each plant, the demineralized water will be produced by mixed bed (cation /anion) ion exchangers. The regeneration of the mixed bed resin will be performed on-site. Two 100%-capacity demineralized water transfer pumps will distribute water from the

demineralized water storage tank for steam cycle makeup, auxiliary boiler makeup, ACC condensate storage tank fill, ACC vacuum pump makeup, CCW system fill and makeup, and condensate polisher sluice water.

The demineralized water system is fed from the treated water storage tank and consists of the treated water (RO permeate) and the following recycled process streams returned to the treated water storage tank: steam cycle blowdown, condensate polisher sluice water.

The demineralized water system shall be designed to operate using any of the above sources of water. The demineralized water system will be designed to refill the demineralized water reserve volume in 24 hours.

3.1.4.2.8 Power Cycle Makeup and Storage

The power cycle makeup and storage subsystem provides high quality demineralized water storage and pumping capabilities to supply high-purity water for system cycle makeup and chemical cleaning operations. Major components of the system are the demineralized water trailers; high quality demineralized water storage tank; and two 100-percent-capacity, horizontal, centrifugal, cycle makeup water pumps.

3.1.4.2.9 Compressed Air

The compressed air system provides instrument air and service air to points of use throughout the facility. The compressed air system will include two 100-percent-capacity motor-driven air compressors, two air dryers with pre-filters and after-filters, an air receiver, instrument air header, and service air header. All instrument air will be dried. A control valve will be provided in the service air header to prevent high consumption of service air from reducing the instrument air header pressure below critical levels.

3.1.4.3 Fuel Availability

Natural gas will be delivered via pipeline as described previously in Section 2.3 of this Petition.

3.1.4.4 Water Availability

The project will use approximately up to 201 AFY of well water. The boiler blowdown will be flashed into steam and condensate and the remaining water will treated and reused in the PB cycle.

Potable water for drinking, safety showers, fire protection water, service water, and sanitary uses will be served from the onsite wells and treated appropriately. The Commission previously found that the Approved Project had sufficient water availability

to supply up to 300 AFY and therefore the Modified Project's proposed use of 201 AFY is consistent with that finding.

3.1.4.5 Project Quality Control

The objective of the PSEGS quality control program is to ensure that all systems and components have the appropriate quality measures applied; whether it is during design, procurement, fabrication, construction, or operation. The goal of the quality control program is to achieve the desired levels of safety, reliability, availability, operability, constructability, and maintainability for the generation of electricity.

The required quality assurance for a system is obtained by applying controls to various activities, according to the activity being performed. For example, the appropriate controls for design work are checking and review, and the appropriate controls for manufacturing and construction are inspection and testing. Appropriate controls will be applied to each of the various activities for the project.

3.1.4.5.1 Project Stages

For quality assurance planning purposes, the project activities have been divided into the following nine stages that apply to specific periods of time during the project:

1. **Conceptual Design Criteria.** Activities such as definition of requirements and engineering analyses.
2. **Detail Design.** Activities such as the preparation of calculations, drawings, and lists needed to describe, illustrate, or define systems, structures, or components.
3. **Procurement Specification Preparation.** Activities necessary to compile and document the contractual, technical, and quality provisions for procurement specifications for plant systems, components, or services.
4. **Manufacturer's Control and Surveillance.** Activities necessary to ensure that the manufacturers conform to the provisions of the procurement specifications.
5. **Manufacturer Data Review.** Activities required to review manufacturers' drawings, data, instructions, procedures, plans, and other documents to ensure coordination of plant systems and components, and conformance to procurement specifications.
6. **Receipt Inspection.** Inspection and review of product at the time of delivery to the construction site.
7. **Construction/Installation.** Inspection and review of storage, installation, cleaning, and initial testing of systems or components at the facility.

8. **System/Component Testing.** Actual operation of generating facility components in a system in a controlled manner to ensure that the performance of systems and components conform to specified requirements.
9. **Plant Operation.** Operation of the facility's systems and equipment by operations personnel according to manufacturer's recommendations and instructions.

As the project progresses, the design, procurement, fabrication, erection, and checkout of the facility system will progress through the nine stages defined above.

3.1.4.5.2 Quality Control Records

The following quality control records will be maintained for review and reference:

- Project instructions manuals
- Design calculations
- Project design manual
- Quality assurance audit reports
- Conformance to construction records drawings
- Procurement specifications (contract issues, change orders, etc.)
- Purchase orders and change orders
- Project correspondence

For procured component purchase orders, a list of qualified suppliers and subcontractors will be developed. Before contracts are awarded, the subcontractors' capabilities will be evaluated. The evaluation will consider suppliers and subcontractors' personnel, production capability, past performance, and quality assurance program.

During construction, field activities are accomplished during the last four stages of the project: receipt inspection, construction/installation, system/component testing, and plant operations. The construction contractor will be contractually responsible for performing the work in accordance with the quality requirements specified by contract.

The subcontractors' quality compliance will be surveyed through inspections, audits, and administration of independent testing contracts.

A plant operation and maintenance program, typical of a project this size, will be implemented by the applicant to control operation and maintenance quality. A specific program for this project will be defined and implemented during initial plant startup.

3.1.5 Power Plant Efficiency

An analysis of the Modified Project's efficient use of land to generate electricity will be submitted under separate cover.

3.1.6 Compliance with LORS

The Commission Decision concluded that, with implementation of the Conditions, the Approved Project would comply with all applicable LORS. No LORS have been identified that are uniquely applicable to the PSEGS. In fact, some of the LORS that would have been applicable to the Approved Project, such as those associated with the design of the facility components using HTF, would no longer be applicable to the Modified Project. As with the Approved Project, the Modified Project would comply with all applicable LORS.

3.1.7 Conditions of Certification

The Conditions of Certification consistently refer to the 2007 CBC. A global replacement is required to reflect that the 2010 CBC will be applicable to the PSEGS.

Condition of Certification **GEN-2** contains a table of major structures associated with the Approved Project. The table should be modified as follows:

Breakers
Step-up transformer
Switchyard
Busses
Surge arrestors
Disconnects
Take-off facilities
Switchyard control building
Transmission pole/tower
Grounding system

No other modifications to the Conditions of Certification contained in the Final Decision sections addressing Facility Design, Efficiency or Reliability are required for the PSEGS.

3.2 TRANSMISSION SYSTEM ENGINEERING

This section outlines the portions of the Modified Project that may affect the analysis, rationale, conclusions, and Conditions of Certification contained in the Final Decision for the Approved Project.

3.2.1 Overview of Approved Project

The Approved Project was originally licensed as a nominally rated 500 MW solar thermal facility to be developed in two independent units, each with a capability of generating up to 250 MW using a heliotrough solar collection system to heat HTF to generate steam and then generate electricity using conventional steam turbine technology. The Approved Project would interconnect to the electricity grid with a single circuit 230 kV transmission generation tie-line to SCE's Red Bluff Substation which is under construction. CAISO, SCE and the previous owner executed a LGIA in November 2010, which was approved by the Federal Energy Regulatory Commission (FERC) in March 2011.

3.2.2 Relevant Modifications to Project Description

The Modified Project will replace the solar collection technology with BrightSource's solar tower technology. The switchyard has been slightly modified as part of BrightSource's design. Figure 3.2-1 shows the Switchyard Layout. Figure 3.2-2 shows a preliminary one-line diagram.

The Modified Project includes a slight re-routing of the generation tie-line near the western end of the route and at the point of interconnection with the newly constructed Red Bluff Substation. The Modified Project will realign a portion of the PSEGS generation tie-line route to (1) minimize crossings over Interstate-10 (by aligning the PSEGS right-of-way to be adjacent to the NextEra Desert Sunlight generation tie-line right-of-way) and (2) interconnect the generation tie-line to a breaker position located on the west side of Red Bluff Substation (which has been assigned to PSEGS by SCE) to reduce interference with other incoming or outgoing transmission lines. The modified route is shown on Figure 2.1-3. No other modifications to the Approved Project generation tie-line are proposed.

PSH has conducted an internal review and determined that the proposed technology change will not constitute a "material modification" to the LGIA (as that term is defined by the interconnection policies and procedures of the California Independent System Operator (CAISO)). PSH submitted the results of its analysis to CAISO for concurrence on December 7, 2012. PSH expects CAISO to concur with the conclusion that the

technology change does not constitute a “material modification” by the end of first quarter of 2013. While the LGIA will require a minor amendment, it is anticipated that because the new technology will not exceed the requested interconnection capacity, there will be no change to the downstream transmission system upgrades identified in the previous CAISO studies, upon which the LGIA was based.

3.2.3 Compliance with LORS

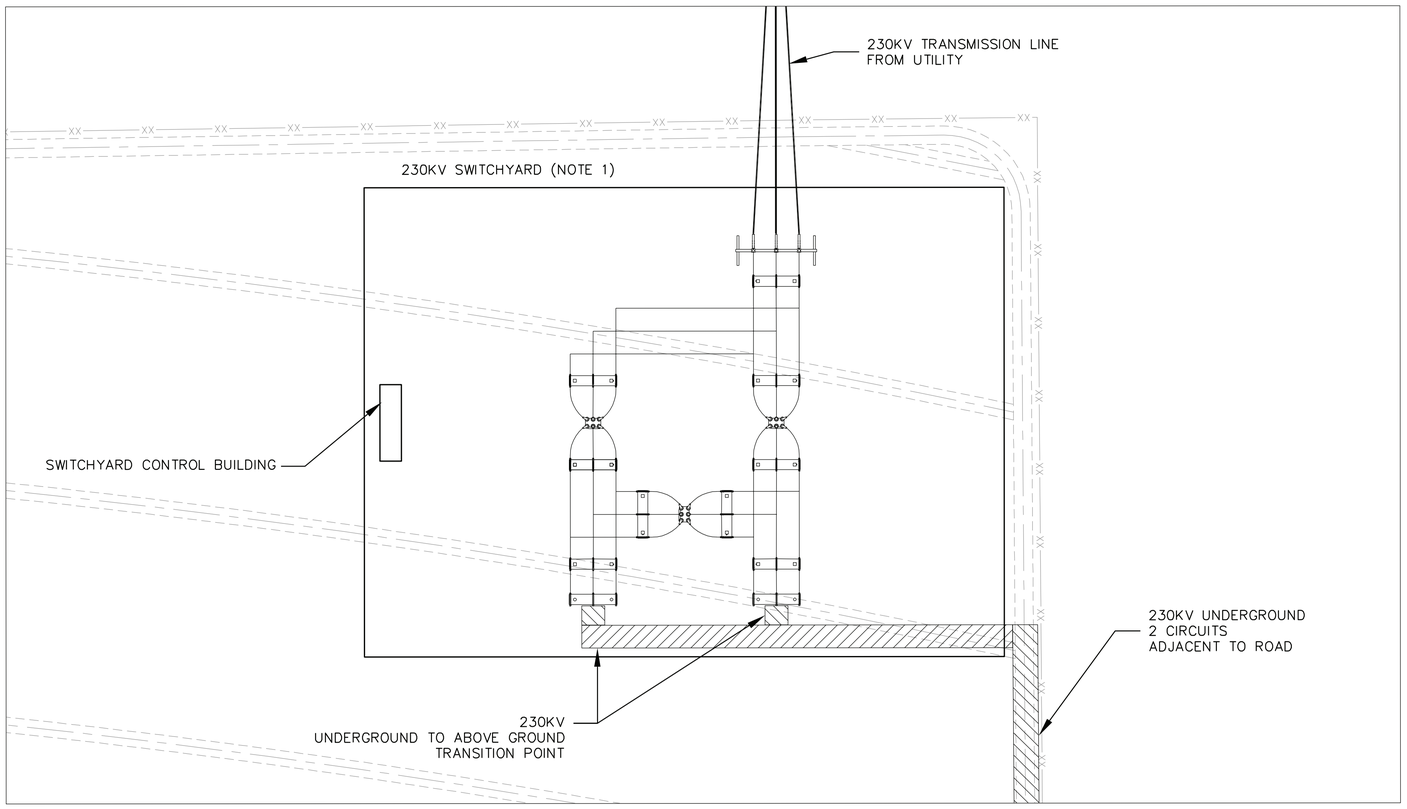
The Modified Project will comply with all transmission system engineering related laws, ordinances, regulations and standards. This will be ensured by enforcement of the existing Conditions of Certification which do not require modification.

3.2.4 Proposed Modifications to Conditions of Certification

No modifications of Conditions of Certification are proposed to the Final Decision to accommodate the Modified Project.

3.3 TRANSMISSION LINE SAFETY AND NUISANCE

There will be no changes to the Commission's assumptions, analysis, rationale or Conditions of Certification as a result of the Modified Project to the technical area of Transmission Line Safety and Nuisance because the characteristics of the Approved Transmission Line are not changing, except for a minor shift westerly to consolidate transmission corridors with another project as described in Section 3.2. The re-routing will not include any new potential sensitive receptors for the project.



NORTH

NOTES:

1. SWITCHYARD SHALL HAVE A MINIMUM 30' DRIVE ISLE BETWEEN EQUIPMENT AND THE FENCE.

50 0 50 100
Scale: 1 INCH = 50 FEET

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DISCIPLINE	REVIEWED	DISCIPLINE	REVIEWED
CIVIL		ELECTRICAL	
STRUCTURAL		INST & CNTRL	
MECHANICAL		ARCHITECTURAL	
PROCESS		PLANT LAYOUTS	
PIPING			

RESPONSIBLE ENGINEER
PE #

STATUS	REV	DATE	DM	SDE	PEM
PRELIMINARY					
FOR REVIEW AND APPROVAL					
APPROVED FOR CONSTRUCTION					
REVISED & APPROVED FOR CONSTRUCTION					

SCALE 1" = 50'-0"

BrightSource
BRIGHTSOURCE INDUSTRIES ISRAEL
PALEN SOLAR
ELECTRIC GENERATING SYSTEM

PROJECT NO. 459892

CH2MHILL

ELECTRICAL
ON-SITE 230KV SWITCHYARD
FIGURE NO. 3.2-1

DWG. NO. E-SKE-102 REV. A

FILENAME: PLOT DATE: PLOT TIME:

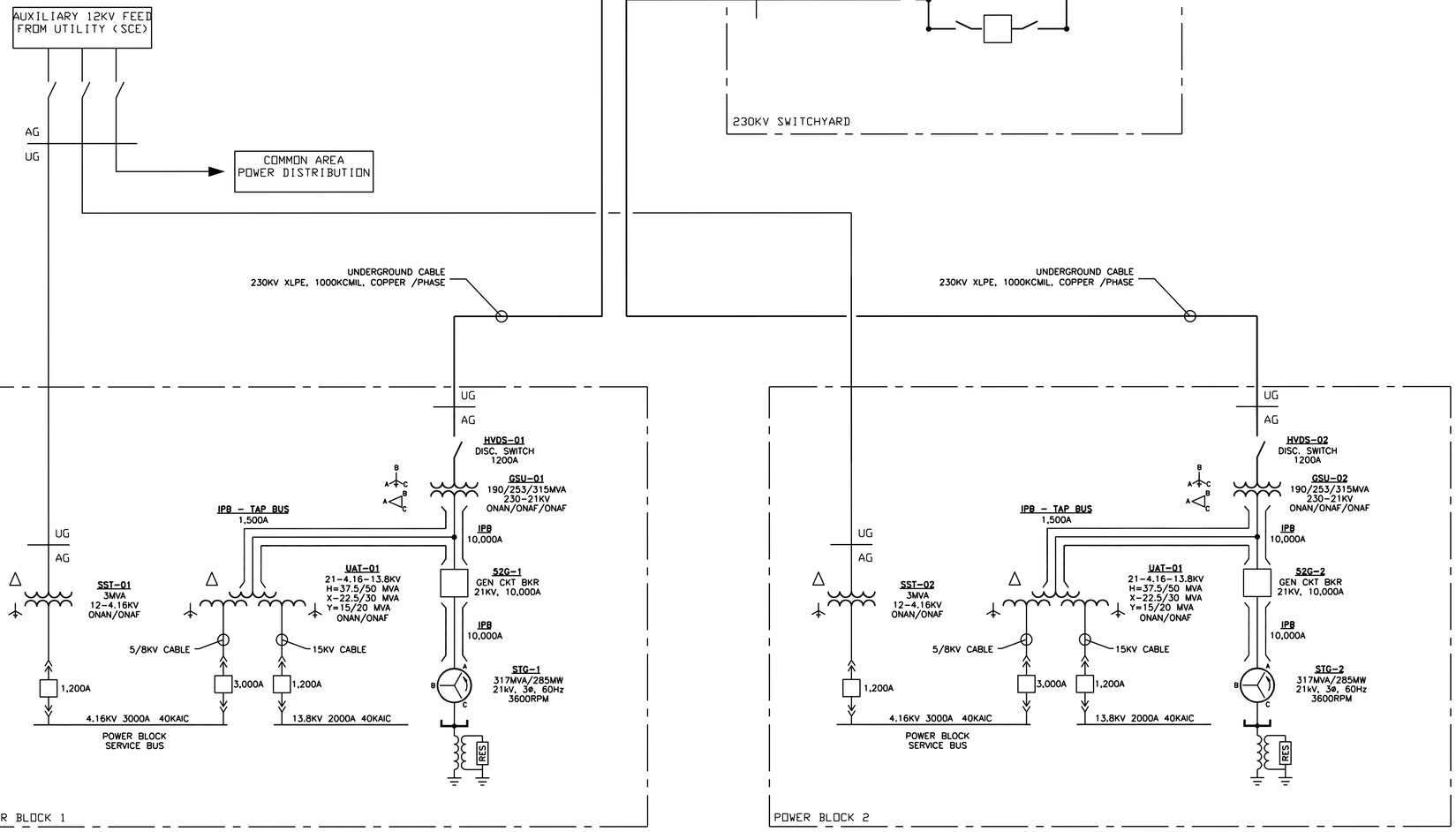
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

NOTES:
1. ALL EQUIPMENT SIZES AND RATINGS ARE APPROXIMATE AND SHALL BE FINALIZED DURING DETAILED DESIGN

LEGEND:

AG = ABOVE GROUND

UG = UNDER GROUND



NO.	DATE	REVISION	BY	CHK
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MECHANICAL		ARCHITECTURAL	
PROCESS		PLANT LAYOUTS	
PIPING			

STATUS	REV	DATE	DM	SDE	PEM
PRELIMINARY					
FOR REVIEW AND APPROVAL					
APPROVED FOR CONSTRUCTION					
REVISED & APPROVED FOR CONSTRUCTION					

RESPONSIBLE ENGINEER

PE #

SCALE N.T.S.

BrightSource
BRIGHTSOURCE INDUSTRIES ISRAEL
PALEN SOLAR ELECTRIC GENERATING SYSTEM

PROJECT NO. 459892

CH2MHILL

ELECTRICAL

OVERALL SINGLE LINE DIAGRAM

FIGURE NO. 3.2-2

DWG. NO. E-SKE-101

REV. A

FILENAME: PLOT DATE: PLOT TIME:

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

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Section 4 PUBLIC HEALTH AND SAFETY

The following sections provide a description of the modifications proposed to the PSEGS as they may affect the assumptions, rationale, and Conditions of Certification in the Final Decision for the following technical areas: 4.1 Air Quality, Greenhouse Gas Emissions, and Public Health; 4.2 Worker Health and Safety/Fire Protection; 4.3 Hazardous Materials Management; and 4.4 Waste Management.

4.1 AIR QUALITY, GREENHOUSE GASES AND PUBLIC HEALTH

This section presents the methodology and results of an analysis performed to assess potential impacts of airborne emissions from the construction and routine operation of the Modified Project.

4.1.1 Project Changes Related to Air Quality

The Approved Project's auxiliary boilers and HTF ullage system would be eliminated. The Modified Project will consist of two 250 MW (gross) solar units. The Modified Project would use heliostats—elevated mirrors guided by a tracking system mounted on a pylon—to focus the sun's rays on a solar receiver steam generator (SRSG) located atop a solar tower near the center of each solar field to create steam. Each of the 250 MW units will have a dedicated SRSG/tower, solar field/heliostat array, and a dedicated non-reheat Rankine-cycle steam turbine generator/ power block.

PSH is proposing to install two (2) emergency fire pump engines rated at approximately 204 hp, two (2) emergency generator sets rated at 3633 hp (2500 kW), two (2) auxiliary natural gas fired boilers each rated at ~249.0 MMbtu/hr, two (2) natural gas fired night preservation boilers rated at ~10 mmbtu/hr each, and two (2) wet-surface air condensers. In addition, the facility common area will have a separate emergency electrical generator and fire pump system. The engines will meet all applicable U.S. Environmental Protection Agency (EPA) Tier emissions standards depending upon engine size, year of manufacture, and service category.

Proposed equipment specifications, for emissions sources for both power blocks, are summarized as follows:

Auxiliary Boilers (2)

- Manufacturer: Rentech (or equivalent)
- Model: D-Type Watertube
- Fuel: Natural Gas
- Rated Heat Input: 249.0 MMbtu/hr
- Fuel consumption: ~244,118 scf/hr (Gas HHV 1020 btu/scf)
- Exhaust flow: ~74,100 acfm, at 100% load
- Exhaust temperature: ~300 degrees Fahrenheit (°F)

Night Preservation Boilers (2)

- Manufacturer: Rentech (or equivalent)

- Model: Watertube Type
- Fuel: Natural Gas
- Rated Heat Input: 10 mmbtu/hr
- Fuel Consumption: ~9,800 scf/hr
- Exhaust Flow: ~5000 acfm, at 100% load
- Exhaust temperature: ~300 degrees Fahrenheit (°F)

Fire Pump Engines (2)

- Manufacturer: Cummins (or equivalent)
- Model: CFP7E-F30 (or equivalent)
- Fuel: Diesel or distillate oil (15 ppmw S), 550 gal AGT
- Rated horsepower: ~204 hp
- Fuel consumption: ~12 gallons per hour (gph)
- Exhaust flow: ~1615 actual cubic feet per minute (acfm)
- Exhaust temperature: ~959 degrees Fahrenheit (°F)

Emergency Electrical Generators (2)

- Manufacturer: Caterpillar (or equivalent)
- Model: 3516C (or equivalent)
- Fuel: Diesel or distillate oil (15 ppmw S), 1500 gal AGT
- Rated horsepower: ~3633 (2500 kW)
- Fuel consumption: ~175 gph
- Exhaust flow: 19,600 acfm
- Exhaust temperature: 925 °F

Wet SAC (2)

- Manufacturer: SPX Cooling Technologies, Inc. (or equivalent)
- Number of Cells: 4
- Number of Fans: 4 (147,500 acfm each)
- Water circulation rate: 4,000 gallons per minute (gpm)
- Drift rate: <0.0005%
- Expected TDS: ~1500 ppm

Additional equipment common to both power blocks is as follows:

Fire Pump Engines (1)

- Manufacturer: Cummins (or equivalent)

- Model: CFP5E-F30 (or equivalent)
- Fuel: Diesel or distillate oil (15 ppmw S), 550 gal AGT
- Rated horsepower: ~129 hp
- Fuel consumption: ~8 gallons per hour (gph)
- Exhaust flow: ~973 actual cubic feet per minute (acfm)
- Exhaust temperature: ~927 degrees Fahrenheit (°F)

Emergency Electrical Generators (1)

- Manufacturer: Caterpillar (or equivalent)
- Model: 250 kWe (or equivalent)
- Fuel: Diesel or distillate oil (15 ppmw S), 500 gal AGT
- Rated horsepower: ~398 (250 kW)
- Fuel consumption: ~20 gph
- Exhaust flow: 2,250 acfm
- Exhaust temperature: 855 °F

Mirror Washing Equipment

Tractor-pulled crane-arm systems (diesel fuel)

Small vehicle systems (diesel fuel)

Three (3) – 8,000 gal AGT

The only fuels to be combusted by stationary sources on-site will be California-certified low-sulfur, low-aromatic diesel fuel used by the emergency fire pumps, the emergency generator engines, and the mirror washing equipment, and natural gas for the various boilers. Table 4.1-1 presents a fuel use summary for the PSEGS. Fuel use values are based on the maximum heat rating of each system, fuel specifications, and maximum operational scenarios. Typical fuel analysis data is presented in Appendix 4, Table-1 for all proposed fuels.

Table 4.1-1
Estimated Fuel Use Summary for the Modified Project

System	Units	Per Hour	Per Day	Per Year
Auxiliary Boiler (each)	mmscf	0.2441	0.9764	313.8
Night Preservation Boiler (each)	mmscf	0.0098	0.1373	47.8
Large Fire Pump Engine (each)	gallons	12	12	2,388

Common Area FP Engine	gallons	8	8	1,592
Large Emergency Generator (each)	gallons	175	175	34,825
Common Area EG	gallons	20	20	400
MWM systems	gallons	-	-	3,212,000

Natural gas at 1020 btu/scf (HHV). Diesel fuel at 139,000 BTU/gal. See Appendix 4, Table-1 for specific information. NG sulfur at 0.75 gr S/100 scf.

Each engine will only be tested for ~30-60 minutes on any given day (typically one day per week), and only one engine will be tested during any one 60-minute period. Maximum annual hours and fuel use for each engine is based on 199 per year.

Annual values include fuel use totals for all operating modes, while hourly and daily (except for the aux boilers) values are for normal full load firing mode only.

4.1.1.1 Climate and Meteorology

The site is located approximately 10 miles east of the Desert Center area (California), within the eastern portion of Riverside County, and experiences the following climate and meteorology patterns.

The Project site is located in the Mojave Desert Air Basin (MDAB) in California's Colorado Desert, which is a part of the larger Sonoran Desert that extends across southwest North America. The Colorado Desert region encompasses approximately seven million acres, extending from the Mexican border in the south to the higher-elevation Mojave Desert in the north and from the Colorado River in the east to the Peninsular mountain range in the west. The majority of the Colorado Desert is classified as a “low desert” and lies at a relatively low elevation, below 1,000 feet (above mean seal level), with the lowest point of the desert floor at 275 feet below sea level in the Salton Trough.

Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet, most of the region's mountains do not exceed 3,000 feet. These ranges block moist coastal air and rains, producing an arid climate.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. The mean maximum temperature in July and August exceed 100°F. In addition, the Colorado Desert, especially toward the southern portion of the region, experiences two rainy seasons per year, in the winter and late summer,

while the more northerly Mojave Desert has only winter rains. During the summer, the Project Site will be generally influenced by a Pacific Subtropical High cell that sits off the coast, inhibiting cloud formation and encouraging daytime solar heating. The Colorado Desert is rarely influenced by cold air masses moving south from Canada and Alaska, as these frontal systems are typically weak and diffuse by the time the reach the desert. Most desert moisture arrives from infrequent warm, moist, and unstable air masses from the south.

The most significant large-scale phenomena affecting air quality in the Project area are the transport winds from the west. These prevailing winds are due to the proximity of the Colorado Desert to the coastal region; air masses pushed onshore in Southern California by differential heating are channeled through the San Gorgonio Pass into the Project area. (Palen 2009)

The climatic pattern for the region is a typical desert climate within the Mediterranean climate classification. The warmest month for the region is typically July, with the coldest month being December. The month with the highest precipitation is usually February. The eastern Mojave Desert region experiences a large number of days each year with sunshine, generally 345+ days per year. The region also traditionally experiences excellent visibility, *i.e.,* greater than 10 miles or more 95 percent of the time.

Representative climatic data for the Project Area was derived from the Blythe CAA Airport Station (#040927, Period of Record 7-1-1948 to 12-31-2008) located east of the Project Site. A summary of data from this site indicates the following:

- Average maximum daily temperature 87.7°F
- Average minimum daily temperature 59.7°F
- Highest mean maximum annual temperature 111.1°F
- Lowest mean minimum annual temperature 32.3°F
- Mean annual precipitation 4.02 inches

Air quality is determined primarily by the type and amount of pollutants emitted into the atmosphere, the nature of the emitting source, the topography of the air basin, and the local meteorological conditions. In the Project area, inversions and light winds can result in conditions for pollutants to accumulate in the region.

Winds in the Project region are generally south-southwest with a less frequent component of northerly winds (north through northwest).

4.1.1.2 Regulatory Environment

Although a regulatory compliance analysis is presented in Section 4.1.5, there are several SCAQMD regulations that directly affect the permitting and review process, such as the Determination of Compliance (DOC) for the Modified Project as follows:

- New Source Review (NSR) Regulation XIII, Rule 1303 requires that Best Available Control Technology (BACT) be applied to:
- Any new Permit Unit which emits, or has the Potential to Emit, any increase of any Nonattainment Air Pollutant.
- Per Regulation XIII, Rule 1303, provide all required emissions mitigations prior to the issuance of the Permit to Construct.
- Provide an impact analysis per Regulation XIII, Rule 1303.
- Per Regulation XIII, Rule 1303, demonstrate prior to the issuance of the Authority to Construct (ATC) that all major stationary sources owned or operated by the Applicant, which are subject to emissions limitations, are either in compliance or on a schedule for compliance with all applicable emissions limitations under the Clean Air Act (CAA).
- Per Regulation XIII, Rule 1304, emergency equipment such as the proposed fire-pump systems, and emergency electrical generator systems are exempt from the districts modeling and emissions offset requirements.

In addition, the following should be noted:

The SCAQMD NSR rule (Regulation XIII) does not define “cargo carriers”, but rather defines “mobile source” which includes the major cargo carrier modes, i.e., roadways, waterways, rail, and air.

For purposes of calculating potential to emit, fugitive emissions from facility paved/unpaved roads are not included for the source.

For purposes of calculating potential to emit, secondary emissions from facility operations are not included in the sources PTE calculations, except for in-plant vehicles which are “accumulated” per Rule 1306.

As such, the operational emissions from fugitive sources are not included in the source’s potential to emit calculations, while in-plant vehicle emissions are accumulated, but not counted in the facility PTE values. These emissions have been quantified and are presented in Appendix 4, Table-1.

4.1.2 Environmental Impacts

Potential impacts for the Modified Project are discussed in the following sections.

4.1.2.1 Facility Emissions

Installation and operation of the Modified Project will result in a change in the emissions signature for the site. Criteria pollutant emissions from the proposed auxiliary boilers, night preservation boilers, fire pump engines, emergency generator engines, wet-SACs, and on-site mobile equipment are delineated in the following sections, while emissions of hazardous air pollutants (HAPs) are quantified in Appendix 4, Table-1.

4.1.2.2 Normal Operations

Operation of the Modified Project will result in emissions to the atmosphere of both criteria and toxic air pollutants. Criteria pollutant emissions will consist primarily of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), sulfur oxides (SO_x), sub 10-micron particulate matter (PM_{10}), and sub 2.5-micron particulate matter particulate matter ($PM_{2.5}$). Air toxic pollutants will consist of a combination of toxic gases and toxic particulate matter species. Table 4.1-2 lists the pollutants that may potentially be emitted from the Project.

Table 4.1-2
Criteria and Toxic Pollutants Potentially Emitted from the Modified Project

Criteria Pollutants	Toxic Pollutants	
NO_x	Acetaldehyde	PAHs
CO	Acrolein	Propylene
VOCs	Benzene	Propylene Oxide
SO_x	1-3 Butadiene	Toluene
$PM_{10}/PM_{2.5}$	Ethylbenzene	Xylene
Lead	Formaldehyde	Diesel Particulate Matter
	Hexane Naphthalene	Beryllium
	Copper	

4.1.2.3 Criteria Pollutant Emissions

Tables 4.1-3 through 4.1-7 present data on the criteria pollutant emissions expected from the plant equipment and systems under normal operating scenarios. Tables 4.1-8 through 4.1-11 present the summaries of total facility operational emissions

Table 4.1-3
Fire Pump Engine Emissions for the Modified Project

Pollutant	Emission Factor (g/hp-hr)	Max Hourly Emissions for Each Engine (lbs)	Max Daily Emissions for Each Engine (lbs)	Max Annual Emissions for All Engines (tons)
~204 HP FP Engines (2)				
NO_x	2.475	1.11	1.11	0.22
CO	1.193	0.54	0.54	0.11
VOCs	0.062	0.03	0.03	0.006
SOx	15 ppmw S	0.002	0.002	0.0005
$PM_{10/2.5}$	0.111	0.05	0.05	0.010
~129 HP FP Engine (1)				
NO_x	2.522	0.72	0.72	0.071
CO	0.746	0.21	0.21	0.021
VOCs	0.092	0.03	0.03	0.003
SOx	15 ppmw S	0.002	0.002	0.0002
$PM_{10/2.5}$	0.098	0.03	0.03	0.003

* All particulate matter is classified as diesel particulate matter (DPM).

g/hp-hr – grams per horsepower-hour

lbs – pounds

These engines are not run during the same hour as the Emergency Generator Engines noted below. Secondly, testing is for <60 minutes only, so the maximum hourly emissions above represent the maximum daily emissions as well. Each engine is run <=199 hours per year.

Per NSPS Subpart IIII, FP engines rated at 175 to 300 hp, with rpm values greater than 2650, may comply with the engine category emissions limits for 2008.

.

Table 4.1-4
Emergency Generator Engine Emissions for the Modified Project

Pollutant	Emission Factor (g/hp-hr)	Max Hourly Emissions for Each Engine (lbs)	Max Daily Emissions for Each Engine (lbs)	Max Annual Emissions for All Engines (tons)
~3633 HP EGS Engines (2)				
NO_x	0.59	4.72	4.72	0.94
CO	0.03	0.24	0.24	0.05
VOCs	0.01	0.08	0.08	0.016
SOx	15 ppmw S	0.04	0.04	0.007
$PM_{10/2.5}$	0.03	0.24	0.24	0.048
~398 HP EGS Engine (1)				
NO_x	2.97	2.6	2.6	0.26
CO	0.36	0.32	0.32	0.031
VOCs	0.1	0.09	0.09	0.009
SOx	15 ppmw S	0.001	0.001	0.0004
$PM_{10/2.5}$	0.079	0.07	0.07	0.007

* All particulate matter is classified as diesel particulate matter (DPM).

g/hp-hr – grams per horsepower-hour

lbs – pounds

These engines are not run during the same hour as the Fire Pump Engines noted above. Secondly, testing is for <60 minutes only, so the maximum hourly emissions above represent the maximum daily emissions as well. Each engine is run <=199 hours per year.

Table 4.1-5
Auxiliary Boilers, Night Preservation Boilers, and Wet-SAC Emissions for the Modified Project

Auxiliary Boilers (2)				
Pollutant	Max Hourly Emissions for Each Boiler (lbs)	Max Daily Emissions for Each Boiler (lbs)	Max Annual Emissions for Each Boiler (tons)	Max Annual Emissions for Both Boilers (tons)
NOx	2.74	11.71	1.99	3.98
CO	4.48	27.81	4.39	8.78
VOC	1.34	8.24	1.31	2.62
SOx	0.747	2.86	0.486	0.972
PM10/PM2.5	1.25	4.87	0.823	1.65
Low plus high load emissions for daily and annual, including SU. Appendix 4 Table-1 presents emissions data for each boiler.				
Night Preservation Boilers (2)				
NOx	0.11	1.54	0.268	0.536
CO	0.366	5.12	0.892	1.78
VOC	0.054	0.756	0.132	0.263
SOx	0.0093	0.129	0.0225	0.045
PM10/PM2.5	0.05	0.70	0.122	0.244
Emissions data at full load, 14 hours per day, 4872 hours per year each. Appendix 4, Table-1 presents emissions data for each boiler. Annual emissions are for all operating modes.				
Wet-SAC Units (2)				
Pollutant	TDS, mg/L	Max Hourly Emissions for Each WSAC (lbs)	Max Daily Emissions for Each WSAC (lbs)	Max Annual Emissions for Both WSAC (tons)
PM_{10}/ $PM_{2.5}$	~1500	0.015	0.18	0.03

Drift fraction – 0.000005

Emissions are a total from 4 cells, assuming operational time of 12 hr/day and 2000 hrs/year (each WSAC).

Auxiliary boiler startup emissions are presented in Table 4.1-6.

Table 4.1-6
Aux Boiler Startup Emissions

Pollutant	lbs/SU Event	Lbs/SU Hour**	Tons Per Year (Both Boilers)
NOx	1.37	1.54	0.48
CO	2.27	4.50	0.79
VOC	0.67	1.32	0.23
SOx	0.05	0.09	0.02
PM10/PM2.5	0.15	0.23	0.05
*SU period is 30 minutes **SU hour is 30 minutes at SU, plus 30 minutes at low load. 348 SU/yr, 174 SU hrs/yr			

Table 4.1-7 presents the emissions estimates for the mirror washing equipment and in-plant dedicated vehicles.

Table 4.1-7
Operations Mobile Source Emissions

Pollutant	lbs/hr	lbs/day	tons/year
Mirror Washing Equipment (Exhaust)			
NO_x	0.222	4.44	0.811
CO	0.095	1.91	0.348
VOCs	0.103	2.05	0.375
SO_x	0.092	1.85	0.337
PM_{10}	0.007	0.133	0.024
$PM_{2.5}$	0.007	0.133	0.024
In-Plant Support Vehicles (Exhaust)			
NO_x	0.183	4.39	0.8

Table 4.1-7
Operations Mobile Source Emissions

Pollutant	lbs/hr	lbs/day	tons/year
CO	0.167	4.01	0.73
VOCs	0.022	0.52	0.1
SO_x	neg	0.011	0.002
PM_{10}	neg	0.234	0.043
$PM_{2.5}$	neg	0.233	0.043
Fugitive Dust Emissions from Onsite Operations Activities			
Unpaved Road Use (PM10/PM2.5)	n/a	61.3/12.99	11.2/2.4
Paved Road Use (PM10/PM2.5)	n/a	0.26/0.04	0.05/0.008

Table 4.1-8
Summary of Facility Emissions for the Modified Project For CEC/CEQA

Pollutant	Max, lbs/hr	Max, lbs/day	Max, tons/year
NO_x	24.85	50.31	7.65
CO	30.02	73.87	11.85
VOCs	8.52	20.96	3.39
SO_x	2.06	7.92	1.36
PM_{10}	9.52	130.87	23.66
$PM_{2.5}$	4.93	31.27	5.44

Fugitive emissions from onsite paved and unpaved roads, as well as mobile equipment exhaust emissions are included.

Table 4.1-9
Summary of Facility Emissions for the Modified Project For SCAQMD

Pollutant	Max, lbs/hr	Max, lbs/day	Max, tons/year
NO_x	24.44	41.48	6.04
CO	29.76	67.95	10.77
VOCs	8.39	18.39	2.92
SO_x	1.97	6.07	1.03
PM_{10}	4.08	12.18	1.99
$PM_{2.5}$	4.08	12.18	1.99

Fugitive emissions from onsite paved and unpaved roads, as well as mobile equipment exhaust emissions are not included. Emissions of exempt ICEs and WSACs included.

Table 4.1-10
Summary of Facility Emissions for the Modified Project For SCAQMD Offset Determination

Pollutant	Max, lbs/hr	Max, lbs/day	30DA	Max, tons/year
NO_x	9.46	26.50	27.38	4.55
CO	27.67	65.86	68.06	10.56
VOCs	8.05	17.99	18.59	2.88
SO_x	1.88	5.98	6.18	1.02
PM_{10}	3.40	11.50	11.88	1.92
$PM_{2.5}$	3.40	11.50	11.88	1.92

Fugitive emissions from onsite paved and unpaved roads, as well as mobile equipment exhaust emissions are not included. Emissions from exempt ICEs and WSACs also not included.

Table 4.1-11
Summary of Modified Project PSD Status

Pollutant	Max, TPY	PSD Threshold, TPY (Major/SER)	PSD Applicable
NO_x	6.04	250/40	No
CO	10.77	250/100	No
VOCs	2.92	250/40	No
SO_x	1.03	250/40	No
PM_{10}	1.99	250/15	No
$PM_{2.5}$	1.99	250/10	No
CO2e	44462	100,000	No

Emissions from the use of on-site mobile equipment are not included in Table 4.1-7, per the following:

These emissions, per Rule 1303 are classified as “secondary” and are not to be included in the source’s potential to emit.

Mobile sources, such as the vehicles proposed for on-site operations use are clearly exempt from the AQMD permitting regulations. Appendix 4, Table-1 contains a delineation of the estimated mobile source on-site operational emissions.

These vehicles, depending upon type, will be properly licensed and registered through the California Department of Motor Vehicles.

Both the AQMD and State emissions inventories clearly anticipate and forecast emissions for motor vehicles for future years. Therefore, it is reasonable to assume these emissions are already included in the AQMD and State emissions projections and air quality planning analyses. As such, the emissions are not “new” or “un-anticipated.” Appendix 4, Table-1 presents summary data on the vehicle emissions and use growth rates for the SCAQMD.

Pursuant to District Rule 1304, the offset thresholds are applied on a facility basis at the following threshold values:

- CO 29 tons per year (tpy)
- $PM_{10/2.5}$ 4 tpy
- NOx 4 tpy
- SOx 4 tpy
- VOC 4 tpy

Based on the above noted offset thresholds, and the values in Table 4.1-10, the facility would be required to obtain offsets, for NOx only, pursuant to Rule 1304. The criteria pollutant mitigation strategy for the Modified Project is discussed in Appendix 4, Table-7.

Based on the values in Tables 4.1-9 and 4.1-10, the Modified Project will not be a "major polluting facility" per SCAQMD NSR Regulation XIII for any criteria pollutant, since the facility lies in the non-Palo Verde portion of Riverside County within the MDAB, which has the following major polluting facility emissions threshold levels:

- NOx, CO, VOC, SOx, PM10 100 tpy

Detailed emissions data on the facility are presented in Appendix 4, Table-1. The Modified Project will not trigger the Prevention of Significant Deterioration (PSD) program requirements; therefore, a PSD increment and impact analysis protocol is not required (see Appendix 4, Table-3).

4.1.2.3.1 Greenhouse Gas Emissions

Operational emissions of greenhouse gases (GHGs) will be primarily from the combustion of fuels in the auxiliary and night preservation boilers, fire pumps, emergency generator engines, and on-site mobile equipment use. Emissions factors derived from the California Climate Action Registry General Reporting Protocol (GRP) (6/2006).

Total operational emissions of GHG (CO2e) from stationary source equipment are estimated to be 44,462 tons/yr.

Total operational emissions of GHG (CO2e) from dedicated on-site mobile source equipment are estimated to be 36,377 tons/yr.

In addition, a typical 500 MW combined-cycle gas turbine based power plant, operating at approximately 4000 hours per year would produce approximately 1,071,000 tons of CO2e, while the PSEG facility will produce less than 45,000 tons of CO2e per year, for a differential of approximately 1,026,000 tons CO2e per year.

See Appendix 4, Table-1 for emissions support data and calculations.

4.1.2.4 Hazardous Air Pollutants

See Appendix 4, Table-1 for a quantification of hazardous air pollutant emissions from the Modified Project. See Appendix 4, Table-4 for the public health analysis support materials. Section 4.5 also discusses the need for Risk Management Plans pursuant to 40 CFR 68 and the California Accidental Release Program (CalARP) regulations.

A Health Risk Assessment compliant with SCAQMD requirements will be submitted as part of the revised air quality impact analysis and submitted under separate cover.

4.1.2.5 Construction

Construction-related emissions are based on the following:

- The site total acreage to be disturbed during construction that was assumed for this air quality analysis is 5200 acres and therefore conservative since the Modified Project will only disturb up to 3,794 acres. The maximum acreage expected to be actively used on any single day is less than or equal to 260 acres.
- Moderate site preparation will be required prior to construction of the array fields, power blocks, control building foundations, support structures, and other project features.
- Construction activity is expected to last for a total of 34 months.

Construction-related issues and emissions at the Project site are consistent with issues and emissions encountered at any construction site. Compliance with the provisions of the following permits (as incorporated in the CEC Conditions of Certification) will generally result in minimal site emissions: (1) grading permit, (2) Storm Water Pollution Prevention Plan (SWPPP) requirements (construction site provisions), (3) use permit, (4) building permits, and (5) the SCAQMD ATC permit, which will require compliance with the provisions of all applicable fugitive dust rules that pertain to the site construction phase. An analysis of construction site emissions is presented in Appendix 4, Table-5. This analysis incorporates the following mitigation measures or control strategies:

- The Applicant will have an on-site construction mitigation manager who will be responsible for the implementation and compliance of the construction mitigation program. The documentation of the ongoing implementation and compliance with the proposed construction mitigations will be provided on a periodic basis.

- All unpaved roads and disturbed areas in the Project and laydown construction sites will be watered as frequently as necessary to control fugitive dust. The frequency of watering will be on an average schedule of every three-four hours during the daily construction activity period. Watering may be reduced or eliminated during periods of precipitation.

- On-site vehicle speeds will be limited to less than or equal to 15 miles per hour (mph) on unpaved areas within the Project construction site.

- The construction site entrance(s) will be posted with visible speed limit signs.

- All construction equipment vehicle tires will be inspected and cleaned as necessary to be free of dirt prior to leaving the construction site via paved roadways.

- Gravel ramps will be provided at the tire cleaning area.

- All unpaved exits from the construction site will be graveled or treated to reduce track-out to public roadways.

- All construction vehicles will enter the construction site through the treated entrance roadways, unless an alternative route has been provided.

- Construction areas adjacent to any paved roadway will be provided with sandbags or other similar measures as specified in the construction SWPPP to prevent runoff to roadways.

- All paved roads within the construction site will be cleaned on a periodic basis (or less during periods of precipitation), to prevent the accumulation of dirt and debris.

- The first 500 feet of any public roadway exiting the construction site will be cleaned on a periodic basis (or less during periods of precipitation), using wet sweepers or air-filtered dry vacuum sweepers, when construction activity occurs or on any day when dirt or runoff from the construction site is visible on the public roadways.

- Any soil storage piles and/or disturbed areas that remain inactive for longer than 10 days will be covered, or treated with appropriate dust suppressant compounds.

- All vehicles used to transport solid bulk material on public roadways and have the potential to cause visible emissions will be covered, or the materials will be sufficiently wetted and loaded onto the trucks in a manner to minimize fugitive dust emissions. A minimum freeboard height of two feet will be required on all bulk materials transport.

- Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) will be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition will remain in place until the soil is stabilized or permanently covered with vegetation.

- Disturbed areas will be re-vegetated or covered with gravel or other dust suppressant material as soon as practical and restored in accordance with BLM requirements.

To mitigate exhaust emissions from construction equipment, the Applicant is proposing the following:

- The Applicant will work with the construction contractor to use, to the extent feasible, EPA/Air Resources Board (ARB) Tier II/Tier III engine compliant equipment for equipment over 100 hp.

- Ensure periodic maintenance and inspections per the manufacturer's specifications.

- Reduce idling time through equipment and construction scheduling.

- Use California low sulfur diesel fuels (<=15 ppmw S).

Based on the temporary nature and the time frame for construction, the Applicant believes these measures will reduce construction emissions and impacts to levels that are less than significant. Use of these mitigation measures and control strategies will ensure the site does not cause any violations of existing air quality standards as a result of construction-related activities. Appendix 4, Table-5 presents the evaluation of construction related emissions. Appendices 4, Tables-2 and 5 present data on the construction related temporary ambient air quality impacts.

Table 4.1-12 presents data on the regional air quality significance thresholds currently being implemented by the SCAQMD.

Table 4.1-12
SCAQMD CEQA Significance Thresholds

Pollutant	Construction, lbs/day	Operation, lbs/day
Carbon Monoxide	550	550
Oxides of Nitrogen	100	55
Volatile Organic Compounds	75	55
Oxides of Sulfur	150	150
Particulate Matter (PM10)	150	150
Source: SCAQMD, Localized Significance Threshold Methodology, June 2003.		

A comparison of preliminary construction and operational emissions to the significance values in Table 4.1-12 indicates the following:

- On-site construction emissions may exceed the daily significance thresholds for NOx, CO, VOC, and PM10.
- Operational emissions are not expected to exceed the daily significance thresholds for any pollutant.

A conformity analysis per the Code of Federal Regulations (40 CFR Parts 6 and 51), and SCAQMD Regulation XIX is not required since the project is located in an area which has a status of “unclassified/attainment” for all federal air quality standards.

4.1.3 Best Available Control Technology Evaluation

4.1.3.1 Proposed Facility Control Technologies

Table 4.1-13 presents the proposed BACT levels and technologies for the new boilers, fire pumps emergency generator engines, and wet-SACs.

Table 4.1-13
BACT for the Project Boilers, Fire Pump and Emergency Generator Engines, and Wet-SACs

Emergency Generator IC Engines (3633 bhp)			
Pollutant	BACT Emissions Level	BACT System(s)	Meets Current BACT Requirements
NO_x	2.6 g/hp-hr	Engine Design	Yes
CO	2.6 g/hp-hr	Engine Design	Yes
VOCs	0.3 g/hp-hr	Engine Design and Low Aromatic Fuel	Yes
SO_x	Fuel S <= 15 ppmw S	Fuel S <= 15 ppmw S	Yes
PM_{10}/ $PM_{2.5}$	0.07 g/hp-hr	Engine design and ultra low sulfur diesel (ULSD)	Yes
Emergency Generator IC Engine (398 bhp)			
NO_x	2.7 g/hp-hr	Engine Design	Yes
CO	2.6 g/hp-hr	Engine Design	Yes
VOCs	0.3 g/hp-hr	Engine Design and Low Aromatic Fuel	Yes
SO_x	Fuel S <= 15 ppmw S	Fuel S <= 15 ppmw S	Yes
PM_{10}/ $PM_{2.5}$	0.15 g/hp-hr	Engine design and ultra low sulfur diesel (ULSD)	Yes
Emergency Fire Pump Engines (~204 bhp)			
NO_x	2.7 g/hp-hr	Engine Design	Yes
CO	2.6 g/hp-hr	Engine Design	Yes
VOCs	0.3	Engine Design and Low Aromatic Fuel	Yes
SO_x	Fuel S <= 15 ppmw S	Fuel S <= 15 ppmw S	Yes

Table 4.1-13
BACT for the Project Boilers, Fire Pump and Emergency Generator Engines, and Wet-SACs

Emergency Generator IC Engines (3633 bhp)			
Pollutant	BACT Emissions Level	BACT System(s)	Meets Current BACT Requirements
PM_{10}/ $PM_{2.5}$	0.15 g/hp-hr	Engine design and ultra low sulfur diesel (ULSD)	Yes
Emergency Fire Pump Engine (~129 bhp)			
NO_x	2.7 g/hp-hr	Engine Design	Yes
CO	3.7 g/hp-hr	Engine Design	Yes
VOCs	0.3	Engine Design and Low Aromatic Fuel	Yes
SO_x	Fuel S <= 15 ppmw S	Fuel S <= 15 ppmw S	Yes
PM_{10}/ $PM_{2.5}$	0.22 g/hp-hr	Engine design and ultra low sulfur diesel (ULSD)	Yes
Auxiliary Boilers (240 mmbtu/hr)			
NO_x	9 ppm, 0.0110 lb/mmbtu	ULNB, FGR, GCP, Natural Gas	Yes
CO	50 ppm, 0.0366 lb/mmbtu	ULNB, FGR, GCP, Natural Gas	Yes
VOCs	12.6 ppm, 0.0054 lb/mmbtu	ULNB, FGR, GCP, Natural Gas	Yes
SO_x	0.33 g S/100 scf, 0.000924 lb/mmbtu	ULNB, FGR, GCP, Natural Gas	Yes
PM_{10}/ $PM_{2.5}$	0.33 g S/100 scf, 0.005 lb/mmbtu	ULNB, FGR, GCP, Natural Gas	Yes
ppm at 3% O2 dry, VOC as CH4			
Night Preservation Boilers (10 mmbtu/hr)			

Table 4.1-13
BACT for the Project Boilers, Fire Pump and Emergency Generator Engines, and Wet-SACs

Emergency Generator IC Engines (3633 bhp)			
Pollutant	BACT Emissions Level	BACT System(s)	Meets Current BACT Requirements
NO_x	9 ppm, 0.0110 lb/mmbtu	LNB, FGR, GCP, Natural Gas	Yes
CO	50 ppm, 0.0366 lb/mmbtu	LNB, FGR, GCP, Natural Gas	Yes
VOCs	12.6 ppm, 0.0054 lb/mmbtu	LNB, FGR, GCP, Natural Gas	Yes
SO_x	0.33 g S/100 scf, 0.000924 lb/mmbtu	LNB, FGR, GCP, Natural Gas	Yes
PM_{10}/ $PM_{2.5}$	0.33 g S/100 scf, 0.005 lb/mmbtu	LNB, FGR, GCP, Natural Gas	Yes
ppm at 3% O2 dry, VOC as CH4			
Wet-SACs			
PM_{10}/ $PM_{2.5}$		Drift Eliminators at 0.0005%	Yes
ULNB = ultra low NOx burners, FGR-flue gas recirc, GCP-good combustion practices, see Appendix 4, Table-1 for boiler specifications, etc.			

Based on the above data, the proposed emissions levels for the new boilers, fire pumps, emergency generator engines, and wet-SACs meet the BACT requirements of the SCAQMD.

4.1.4 Air Quality Impact Analysis

A complete Air Quality Impact Analysis is currently being prepared and will be provided under separate cover.

4.1.5 Compliance with Laws, Ordinances, Regulations, and Statutes (LORS)

Table 15 in Appendix 4 presents a listing of local, State, and Federal air quality LORS deemed applicable to the Modified Project. Conformance and/or compliance for each identified LORS are noted in the table. Involved Agencies and Agency Contacts

Table 4.1-14 presents data on the following: (1) air quality agencies that may or will exercise jurisdiction over air quality issues resulting from the Modified Project, (2) the most appropriate agency contact for the Modified Project, (3) contact address and phone information, and (4) the agency involvement in required permits or approvals.

Table 4.1-14
Agencies, Contacts, Jurisdictional Involvement, Required Permits for Air Quality

Agency	Contact	Jurisdictional Area	Permit Status
California Energy Commission (CEC)	Assigned Project Manager 1516 Ninth Street Sacramento, CA 95814	Primary reviewing and certification agency.	Will certify the facility under the energy siting regulations and CEQA. Certification will contain a variety of conditions pertaining to emissions and operation.
SCAQMD	Mohzen Nazemi Deputy EO 21865 E. Copley Dr. Diamond Bar, CA 91765 (909) 396-2662	Prepares Determination of Compliance (DOC) for CEC, Issues SCAQMD Permit to Construct (PTC) and Permit to Operate (PTO), Primary air regulatory and enforcement agency.	DOC will be prepared subsequent to AFC submittal. The AFC contains the AQMD permitting application forms. The AFC plus these forms will constitute the required AQMD permitting application.
California Air Resources Board (CARB)	Mike Tollstrup Chief, Project Assessment Branch 1001 I Street, 6th Floor Sacramento, CA 95814 (916) 322-6026	Oversight of AQMD stationary source permitting and enforcement program	CARB staff may provide comments on applicable AFC sections affecting air quality and public health. CARB staff will also have opportunity to comment on draft ATC.
Environmental Protection Agency, Region IX	Gerardo Rios Chief, Permits Section USEPA-Region 9 75 Hawthorne Street San Francisco, CA 94105 (415) 947-3974	Oversight of all AQMD programs, including permitting and enforcement programs	USEPA Region 9 staff will receive a copy of the DOC. USEPA Region 9 staff will have opportunity to comment on draft ATC.

4.1.6 References

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4.2 WORKER SAFETY/FIRE PROTECTION

This section discusses the reduction in impacts to worker safety and fire protection for the Modified Project.

4.2.1 Project Changes Related to Worker Safety and Fire Protection

The Modified Project proposes to eliminate the use of solar trough technology and replace it with BrightSource's LPT Solar Power Tower technology. The most relevant modifications are that the Modified Project eliminates (a) the use, transportation, and on-site storage of LPG, and (b) the use, transportation and storage of millions of gallons of Therminol, the HTF utilized by the heliotrough technology. LPG will be replaced by natural gas delivered to the site via underground pipeline to be constructed by SoCal Gas and delivered to the project site boundary. Therminol was to be used by the Approved Project throughout the solar field, is flammable, and its uses, transport, storage and management was the focus of potential impacts to worker safety and fire protection during Licensing of the Approved Project.

4.2.2 Changes in Environmental Impacts

4.2.2.1 Worker Safety

The relative risks to worker health and safety for all aspects of the Modified Project are similar to the Approved Project, except for the reduced risk due to the elimination of therminol and LPG, and the potential increased risk to those workers that will be working in elevated positions while constructing and maintaining the towers.

4.2.2.1.1 Construction

For the vast majority of construction activities, the relative risks to worker health and safety are the same as those identified and analyzed by the Commission in the Final Decision. The only potential risk that is different for the Modified Project is that construction of the towers will involve some workers to be exposed to potential hazards associated with working in elevated positions. PSH and its EPC contractor will employ a comprehensive set of plans and procedures to ensure that all workers adhere to LORS and follow all safety management procedures to mitigate these and other construction related risks. The Conditions of Certification for the Approved Project already incorporate these safety management procedures, plans and LORS and, therefore, will mitigate this and other risks to workers during construction to less than significant levels.

4.2.2.1.2 Operation

With the elimination of Therminol and LPG, workers no longer have to implement safety measures related to the transportation, storage, use and management of these highly combustible materials. Therefore, the potential impacts to workers during facility operation are less than for the Approved Project.

4.2.2.2 Fire Protection

The largest potential change to the Final Decision analysis is whether the on-going contribution to Riverside County Fire Department (RCFD) remains necessary since the level of service needed to respond to a HTF fire in the solar field, or a fire or explosion within the power block, has been eliminated. PSH has commissioned a fire needs assessment from an expert who was previously employed by RCFD. The fire needs assessment will be submitted under separate cover and thereafter PSH will work with RCFD to negotiate appropriate mitigation to offset the impacts from the reduced risk posed by the Modified Project.

4.2.3 Changes in LORS Conformance and Other Permits

In the Final Decision, the Commission concluded that, with the implementation of the Conditions of Certification, the Approved Project would comply with all applicable LORS. As with the Approved Project, the Modified Project would comply with all applicable LORS, and no new or additional LORS have been identified.

4.2.4 Conditions of Certification

No new or more severe impacts requiring additional mitigation would result from the Modified Project and, therefore, no new Conditions of Certification are necessary.

PSH recommends modifying Condition of Certification **WORKER SAFETY-6** to remove the requirement for providing a secondary access road to the site because there is no longer a need to access the solar field from a different location due to the elimination of a therminol-related conflagration in the solar field. PSH still proposes to install secondary access to the site through a secondary access gate along Corn Springs Road.

WORKER SAFETY-6 The project owner shall:

A. Provide a secondary site access gate for emergency personnel to enter the site. This secondary site access gate shall be at least one-quarter mile from the main gate.

B. ~~Provide a second access road which provides entry to the site. This road shall be at a minimum an all-weather gravel road, at least 20 feet wide, and shall come from the Interstate-10 right-of-way to the project site at the location of where the fence line of the eastern solar field comes the nearest to the I-10 right-of-way, if approved by Caltrans, a locked gate shall be placed in the I-10 right-of way fence. The RCFD, the California Highway Patrol, and the Riverside County Sheriff's Department shall be given access to the gate.~~

C. Maintain the main access road ~~and the second access road~~ and provide a plan for construction and implementation.

Plans for the secondary access gate, the method of gate operation, ~~secondary gravel road~~, and maintenance of the roads shall be submitted to the Riverside County Fire Department for review and comment and to the CPM for review and approval.

Verification: At least 60 days prior to the start of site mobilization, the project owner shall submit to the RCFD and the CPM preliminary plans showing the location of a secondary site access gate to the site, a description of how the secondary site access gate will be opened by the fire department and other emergency services, and a description and map showing the location dimensions, and composition of the main road, and the gravel road to the secondary site access gate.

At least 30 days prior to the start of site mobilization, the project owner shall submit the secondary site access gate final plans plus the road maintenance plan to the CPM for review and approval. The final plan submittal shall also include a letter containing comments from the Riverside County Fire Department or a statement that no comments were received.

~~At least 30 days after approval by Caltrans, the project owner shall submit final plans for the gate in the I-10 right-of-way to the Riverside County Fire Department for review and comment and to the CPM for review and approval.~~

PSH also proposes that Condition of Certification **WORKER SAFETY-7** be eliminated and replaced with a condition that summarizes the agreement with Riverside County

which will be finalized after the fire needs assessment is performed and submitted to Riverside County for review.

~~**WORKER SAFETY-7** The project owner shall either:~~

~~A. Reach an agreement with the Riverside County Fire Department regarding funding of its project related share of capital costs to build fire protection/response infrastructure and provide appropriate equipment as mitigation of project related impacts on fire protection services, **or**, if no agreement can be reached shall~~

~~B. Fund its share of the capital costs in the amount of $850,000 and shall provide an annual payment of $375,000 to the RCFD for the support of three fire department staff commencing with the date of site mobilization and continuing annually thereafter on the anniversary until the final date of power plant decommissioning.~~

~~**Verification:** At least 30 days prior to the start of site mobilization, the project owner shall provide to the CPM for review and approval either:~~

~~1. A copy of the agreement with the RCFD or~~

~~2. Documentation that a letter of credit in the amount of $850,000 has been provided to the RCFD and documentation that a letter of credit in the amount of $375,000 will be provided to RCFD each year at the start of commercial operations.Proof of the annual $375,000 letter of credit shall be included each year in the Project Owner's Annual Report to the CPM.~~

PSH also recommends that Condition of Certification **WORKER SAFETY-8** be deleted because the Modified Project will no longer use or store LPG on site.

~~**WORKER SAFETY-8** The project owner shall place a water spray system on the two LPG storage tanks. The engineering design plans shall comply with NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection* and be provided to the CPM for review and approval prior to commencing construction of the water spray system.~~

~~Verification~~: ~~At least 30 days prior to site mobilization, the project owner shall provide the engineering design plans to the CPM for review and approval. At least 30 days prior to the delivery of any LPG to the facility, the project owner shall provide a written statement to the CPM that the LPG tank water spray system has been built and successfully tested.~~

4.3 HAZARDOUS MATERIALS MANAGEMENT

As described in detail below, impacts of the Modified Project to hazardous materials management are expected to be less than or equal to those of the Approved Project and will remain less than significant.

4.3.1 Project Changes Related to Hazardous Materials Management

The Modified Project proposes to eliminate the use of solar trough technology and replace it with BrightSource's solar tower technology. The most relevant modifications are that the Modified Project eliminates the storage and use, transportation, and on-site storage of LPG and the use, transportation and storage of millions of gallons of Therminol, the HTF utilized by the heliotrough technology. LPG will be replaced by the use of natural gas delivered to the site via underground pipeline. Therminol was used by the Approved Project throughout the solar field, is flammable and its uses, transport, storage and management and potential for leaks was the focus of the Hazardous Materials analysis during Licensing of the Approved Project. Since the therminol has been eliminated the Modified Project no longer has Land Treatment Units to handle and contain soil contaminated by spills or leaks of therminol throughout the solar field.

Hazardous materials used during construction will be the same for the Modified Project as for the Approved Project.

4.3.2 Changes in Environmental Impacts

4.3.2.1 Construction

The types and amounts of hazardous materials to be used during construction for the Modified Project are the same in type and amount as the hazardous materials as contemplated for the Approved Project. Therefore, the Modified Project's impacts to public health and safety associated with the use of hazardous materials during construction would be similar to the impacts from the Approved Project and would remain less than significant.

4.3.2.2 Operations

The types of hazardous materials that would be used during operation under the Modified Project would be less than those assumed for the Approved Project because the HTF and LPG would be completely eliminated. The Commission noted in its Final Decision at Page 2, Hazardous Materials:

Condition **HAZ-1** prohibits the project owner from using hazardous materials not listed in **Attachment A**, or storing them in greater quantities than specified, without prior approval of the Energy Commission's Compliance Project Manager (CPM). (Ex. 301, p. C.4-7.) None of these materials, except for liquefied petroleum gas (LPG) and Therminol VP-1TM, the proposed heat transfer fluid (HTF) as discussed below, pose significant potential for off-site impacts as a result of the quantities on-site, their relative toxicity, their physical state, and/or their environmental mobility. (Ex. 301, pp. C.4-7 to C.4-9.)

4.3.3 Compliance with LORS

In the Commission Final Decision, the Commission concluded that, with the implementation of the Conditions of Certification, the Approved Project would comply with all applicable LORS. As with the Approved Project, the Modified Project would comply with all applicable LORS, and no new or additional LORS have been identified.

4.3.4 Conditions of Certification

Condition of Certification **HAZ-1** includes a list of the types and quantities of hazardous materials the Modified Project would be allowed to use (Appendix A). The current list in Appendix A should be replaced with the list below.

Hazardous Materials Management
Appendix A
Hazardous Materials Proposed for Use at the PSEGS
Hazardous Materials Usage and Storage During Operation Based on Title 22 Hazard Characterization

Material	Hazard Characteristics[1]	Purpose	Storage Location	Maximum Stored[2]	Storage Type
Nalco Elimin-OX (Oxygen scavenger)	Ignitability	Oxygen scavenger for boiler chemistry control	Power Block: Containers near power tower	1,600 gal	400 gallon totes
Aqueous Ammonia (19% concentration)	Reactivity, toxicity	pH control for boiler chemistry	Power Block: Containers near power tower	1,600 gal	400 gallon totes
Sulfuric Acid 93% (66° Baumé)	Corrosivity, reactivity, toxicity	pH control	Power Block and Common Area: Containers located in Water Treatment Building	2,400 gal	400 gallon totes

Hazardous Materials Usage and Storage During Operation Based on Title 22 Hazard Characterization

Sulfuric Acid (Batteries)	Corrosivity, reactivity, toxicity	Electrical power	Power Block: Contained within the main electrical room and the power tower Common Area: Contained within main electrical room	12,000 gal	Batteries
Sodium Hydroxide (50% concentration)	Corrosivity, reactivity, toxicity	pH control	Power Block and Common Area: Containers located in Water Treatment Building	2,400 gal	400 gallon totes
Diesel Fuel (No. 2)	Ignitability	Emergency generator	Power Block: Near fire pump, beneath emergency diesel generator, and adjacent to the mirror wash machines water filling station Common Area: beneath emergency diesel generator and near fire pump	40,000 gal	Aboveground storage tanks and in equipment
Paint, solvents, adhesives, cleaners, sealants, lubricants	Toxicity	Equipment Maintenance,	Power Block: Maintenance Shop	500 gal	1 gal and 5 gal containers

Source: BrightSource Engineers, 2011.

Notes:

1 Hazardous characteristics based on material properties and potential health hazards provided by those properties

2 All numbers are approximate. Typically assumes two totes could be required per chemical and location. Operational volumes are expected to vary but not to exceed maximum stored.

cf = cubic feet

gal = gallons (s)

WSAC = Wet-Surface Air Cooler

WWTS = Wastewater Treatment System

Hazardous Materials Usage and Storage During Operation Based on Material Properties					
Material	Hazard Characteristics[1]	Purpose	Storage Location	Maximum Stored[2]	Storage Type

Hazardous Materials Usage and Storage During Operation Based on Material Properties					
Material	Hazard Characteristics[1]	Purpose	Storage Location	Maximum Stored[2]	Storage Type
Cleaning Chemicals and Detergents	Toxicity, irritant	Periodic cleaning of steam turbine	Power Block: Maintenance shop	3,000 gal	Misc. Manufacturer's containers
Nalco 5200M (Anti-scalant	Irritant, mildly toxic	Wastewater treatment anti-scalant	Power Block: Containers near WWTS Common Area: Containers in Water Treatment Building (storage)	1,500 gal	300 gal totes
Nalco 3DT-187 (Corrosion Inhibitor)	Irritant, mildly toxic	Wet-Surface Air Cooler (WSAC) Corrosion inhibitor	Power Block: Containers near WSAC Common Area: Containers in Water Treatment Building (storage)	2,100 gal	300 gallon totes
Nalco 73801WR (Dispersant)	Irritant, mildly toxic	WSAC Dispersant	Power Block: Containers near WSAC Common Area: Containers in Water Treatment Building (storage)	2,100 gal	300 gallon tote
Nalco TRAC107 (Corrosion Inhibitor)	Irritant, mildly toxic	Closed cooling water Corrosion Inhibitor	Power Block: Contained within CCW system Common Area: Containers in water treatment building (storage)	500 gal	55 drums
Avista Vitec (Scale Inhibitor)	Irritant, mildly toxic	Reverse osmosis scale inhibitor	Power Block and Common Area: Containers in Water Treatment Building	900 gal	300 gallon totes
Sodium Bisulfite	Irritant, mildly toxic	Dechlorination	Power Block and Common Area: Containers in Water Treatment Building	900 gal	300 gallon totes
Nalco 7468 (Anti-foaming agent)	Irritant, mildly toxic	Wastewater treatment system anti-foaming agent	Power Block: Containers near WWTS Common Area: Containers in Water Treatment Building (storage)	1,500 gal	300 gallon totes

Hazardous Materials Usage and Storage During Operation Based on Material Properties					
Material	Hazard Characteristics[1]	Purpose	Storage Location	Maximum Stored[2]	Storage Type
Lubricating Oil	Mildly toxic	Miscellaneous equipment lubrication	Power Block: Contained within equipment, drums during replacement Common Area: Contained within equipment, spare capacity stored in Maintenance shop	30,000 gal	Contained within equipment and misc. drums during replacement
Mineral Transformer Insulating Oil	Mildly toxic	Provides overheating and insulation protection for transformers	Power Block: Contained within transformers Common Area: Contained within transformers	112,000 gal	Transformers
Hydraulic Oil	Mildly toxic	Miscellaneous equipment control oil	Power Block: Contained within equipment, drums during replacement Common Area; Contained within equipment, spare capacity stored in Warehouse	6,000 gal	Contained within equipment and misc. drums during replacement
Sodium Hypochlorite 12% (trade) solution	Irritant, Corrosivity, reactivity	Biocide	Power Block: Containers in water treatment building Common Area: Potable water treatment area	2,400 gal	300 gal totes

Source: BrightSource Engineers, 2011.

Notes:

1 Hazardous characteristics based on material properties and potential health hazards provided by those properties

2 All numbers are approximate

cf = cubic feet

gal = gallons (s)

WSAC = Wet-Surface Air Cooler
WWTS = Wastewater Treatment System

PSH recommends that Condition of Certification **HAZ-2** be modified below to make it consistent with the current version recommended by Staff in its Preliminary Staff Assessment (PSA) for the Rio Mesa Project. The modifications reflect the elimination of Therminol and LPG from the Modified Project.

HAZ-2 The project owner shall concurrently provide a Hazardous Materials Business Plan (HMBP), ~~and Spill Prevention, Control, and Countermeasure Plan (SPCC), and a Process Safety Management Plan (PSMP) to the Riverside County Department of Environmental Health (RCDEH),~~ to the Hazardous Materials Division of the Riverside County Fire Department (RCFD), and the CPM for review. After receiving comments from the ~~RCDEH,~~ Hazardous Materials Division of the RCFD and the CPM, the project owner shall reflect all received recommendations in the final documents. If no comments are received from the county within 30 days of submittal, the project owner may proceed with preparation of final documents upon receiving comments from the CPM. Copies of the final HMBP~~,~~ ~~RCFD~~ shall then be provided to the Hazardous Materials Division of the Fire Department for information and to the CPM for approval.

Verification: At least 30 days prior to receiving any hazardous material on the site for commissioning or operations, the project owner shall provide a copy of a final Hazardous Materials Business Plan ~~Spill Prevention, Control, and Countermeasures Plan, and the Process Safety Management Plan~~ to the CPM for approval.

PSH recommends Condition of Certification **HAZ-3** be modified as follows to reflect the elimination of therminol and LPG.

HAZ-3 The project owner shall develop and implement a Safety Management Plan for the delivery and handling of liquid and gaseous hazardous materials delivered by tanker truck. The plan shall include procedures, protective equipment requirements, training and a checklist. It shall also include a section describing all measures to be implemented to prevent mixing of incompatible hazardous materials. This plan shall be applicable during construction, commissioning, and operation of the power plant.

Verification: At least 30 days prior to the delivery of any liquid or gaseous hazardous material to the facility, the project owner shall provide a Safety Management Plan as described above to the CPM for review and approval.

PSH proposes deletion of Condition of Certification **HAZ-4** as it pertains solely to use of HTF which will be eliminated from the Modified Project.

PSH proposes the following modifications to Condition of Certification **HAZ-6** to make it consistent with a similar Condition of Certification from the PSA recently issued for the Rio Mesa Project modified by the Applicant's Comments on the PSA, and to remove requirements applicable to the use of HTF and LPG which are no longer applicable to the Modified Project.

Modified Project.

HAZ-6 The project owner shall ~~also~~ prepare a site-specific ~~security plan~~ Operation Security Plan for the ~~commissioning and~~ operational phase~~s~~ ~~that will~~ and shall be made available to the CPM for review and approval. The project owner shall implement site security measures that address physical site security and hazardous materials storage. The level of security to be implemented shall not be less than that described below (as per NERC 2002[1]).

The Operation Security Plan shall include the following:

1. ~~p~~Permanent full perimeter fence or wall, at least eight feet high ~~and topped with barbed wire or the equivalent~~ around the Power Block and Solar Field;

2. ~~m~~Main entrance security gate, either hand operata~~ed~~able or motorized;

3. ~~e~~Evacuation procedures;

4. ~~p~~Protocol for contacting law enforcement and the CPM in the event of suspicious activity or emergency;

5. ~~w~~Written standard procedures for employees, contractors, and vendors when encountering suspicious objects or packages on site or off site;

6. A. ~~a~~A statement (refer to sample, **ATTACHMENT A**), signed by the project owner certifying that background investigations

[1] North American Electric Reliability Council, www.nerc.com/files/VA-Communications.pdf

have been conducted on all project personnel. Background investigations shall be restricted to determine the accuracy of employee identity and employment history and shall be conducted in accordance with state and federal laws regarding security and privacy;

B. ~~a~~A statement(s) (refer to sample, **ATTACHMENT B**), signed by the contractor or authorized representative(s) for any permanent contractors or other technical contractors (as determined by the CPM after consultation with the project owner), that are present at any time on the site to repair, maintain, investigate, or conduct any other technical duties involving critical components (as determined by the CPM after consultation with the project owner) certifying that background investigations have been conducted on contractors who visit the project site. Background investigations shall be restricted to ascertaining the accuracy of employee identity and employment history, and shall be conducted in accordance with state and federal law regarding security and privacy.;

7. ~~s~~Site access controls for employees, contractors, vendors, and visitors;

8. ~~a statement(s) (refer to sample, **ATTACHMENT C**), signed by the owners or authorized representative of propane transport vendors, certifying that they have prepared and implemented security plans in compliance with 49 CFR 172.802, and that they have conducted employee background investigations in accordance with 49 CFR Part 1572, subparts A and B;~~

~~9~~8. ~~c~~Closed circuit TV (CCTV) monitoring system, recordable, and viewable in the power plant control room and security station (if separate from the control room) ~~with cameras able to pan, tilt, and zoom, have low-light capability, and are able to view~~ capable of viewing, at a minimum, the main entrance gate ~~the outside entrance to the control room, the propane/LPG tank, and the front gate~~; and

~~10~~9. ~~a~~Additional measures to ensure adequate perimeter security consisting of either:

A. ~~s~~Security guard~~(s)~~ present 24 hours per day, ~~7~~ seven days per week; **OR**

B. ~~p~~Power plant personnel on site 24 hours per day, 7 days per week and **one** of the following:

~~**and**~~

~~perimeter breach detectors **or** the CCTV able to view 100% of the entrance gates and the power block areas.~~

1) The CCTV monitoring system required in number 8 above shall include cameras that are able to pan, tilt, and zoom (PTZ), have low-light capability, are recordable, and are able to view 100% of the perimeter fence to the power block, the outside entrance to the control room, and the front gate from a monitor in the power plant control room; **OR**

2) Perimeter breach detectors **or** on-site motion detectors for the power block.

The project owner shall fully implement the security plans and obtain CPM approval of any substantive modifications to those security plans. The CPM may authorize modifications to these measures, or may require additional measures, such as protective barriers for critical power plant components (e.g. transformers, gas lines, compressors, etc.) ~~or cyber security~~ depending upon circumstances unique to the facility or in response to industry-related standards, security concerns, or additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or the North American Electrical Reliability Council, after consultation with both appropriate law enforcement agencies and the applicant.

Verification: At least 30 days prior to the initial receipt of ~~HTF or propane/LPG~~ hazardous materials on site, the project owner shall notify the CPM that a site-specific ~~o~~Operations ~~s~~Site ~~s~~Security ~~p~~Plan is available for review and approval. In the ~~a~~Annual ~~c~~Compliance ~~r~~Report, the project owner shall include a statement that all current project employee and

appropriate contractor background investigations have been performed, and ~~that~~ updated certification statements have been appended to the ~~o~~Operations ~~s~~Security ~~p~~Plan. In the ~~a~~Annual ~~c~~Compliance ~~r~~Report, the project owner shall include a statement that the ~~o~~Operations ~~s~~Security ~~p~~Plan includes all current hazardous materials transport vendor certifications for security plans and employee background investigations.

4.4 WASTE MANAGEMENT

This section describes the changes proposed by the Modified Project that may affect the analysis, conclusions or Conditions of Certification of the Final Decision for the Approved Project.

4.4.1 Project Changes Related to Waste Management

The only changes proposed by the Modified Project relevant to waste management are the elimination of the wastes associated with the solar field's use of HTF. Elimination of the Land Treatment Units for HTF spills will also affect the need for a waste management program tailored specifically to address such spills.

Construction wastes are expected to be the same as those identified in the Commission Final Decision for the Approved Project.

4.4.2 Changes in Environmental Impacts

4.4.2.1 Construction

The types and quantities of wastes generated and the management methods for such wastes during construction of the Modified Project would be consistent with the wastes and management methods contemplated for the Approved Project. For both the Approved Project and the Modified Project, solid waste, non-recyclable waste, and hazardous and non-hazardous waste would be treated in a similar manner. Therefore, the Modified Project's waste management impacts would be less than or equal to impacts under the Approved Project and would be less than significant.

4.4.3 Operations

The types of wastes generated and the management methods for such wastes during operation of the Modified Project would be consistent with the wastes and management methods contemplated for the Approved Project although the quantities of wastes would be reduced and there would be no need to manage the waste associated with releases of HTF. Therefore, the Modified Project's waste management impacts from operation are anticipated to be less than or equal to the impacts under the Approved Project and would be less than significant.

4.4.4 Changes in LORS Conformance and Other Permits

In the Final Decision the Commission concluded that, with the implementation of the Condition of Certification, the Approved Project would comply with all applicable LORS. As with the Approved Project, the Modified Project would comply with all applicable LORS, and no new or additional LORS have been identified. The Modified Project would no longer be required to comply with LORS which address the delivery, storage, handling and disposal of HTF-related wastes.

4.4.5 Changes in Conditions of Certification

Condition of Certification **WASTE-8** should be deleted since HTF and the land treatment units have been removed from the Modified Project.

Section 5 ENVIRONMENTAL ANALYSIS

The following sections provide a description of the modifications proposed to the PSEGS as they may affect the assumptions, rationale, and Conditions of Certification in the Final Decision. In general, all of the impacts related to ground disturbing activities are reduced because the overall footprint of the Modified Project encompasses less acreage than the Approved Project. Additionally, the BrightSource technology requires very little mass grading, resulting in significantly less water consumption during construction activities and significantly less drainage work.

The overall footprint of the facility is within the boundaries of the Approved Project except for SoCal Gas's proposed extension of its existing distribution line to serve the project and a slight re-routing of the Modified Project's generation tie-line near its western end and the Red Bluff Substation.

The BrightSource technology also incorporates water saving measures that will reduce the amount of water consumed during operations to two-thirds of the amount of the Approved Project.

The following sections evaluate these and other reduction in impacts and also address the potential for new and different impacts associated with the heliostat and tower technology.

5.1 BIOLOGICAL RESOURCES

PSH is currently developing a Revised Biological Assessment and Revised 2081 Permit Application. Copies of those documents will be forwarded to the Commission under separate cover when completed in early 2013. All potential impacts associated with physical ground disturbance at the site were thoroughly analyzed and mitigated with the implementation of the existing Conditions of Certification as outlined in the Final Decision for the Approved Project. The Modified Project introduces the use of two 750 foot solar towers and heliostat technology. The Commission and the Resource Agencies have expressed concern in other projects using solar tower technology relating to solar flux impacts to avian species (Hidden Hills and Rio Mesa Projects). To address these potential impacts PSH will be providing analysis of solar flux issues as well as modification to the species impact acreages related to the reduction in the Modified Project footprint in its Supplemental Filing after completion of the Revised Biological Assessment and Revised 2081 Permit Application.

PSH believes that the surveys performed for the Approved Project were sufficient to support the Final Decision and Biological Opinion and are suitable to support this Petition because (1) The Modified Project is not expanding the original site footprint except for a slight modification to the generation tie-line route, which was previously surveyed by the Desert Sunlight Project (currently under construction) and the Eagle Mountain Pumped Storage Project.; and (2) analyses for changes in technology can be accomplished using the surveys already completed. PSH will file survey results from the Desert Sunlight and Eagle Mountain pumped storage projects under separate cover.

Additionally the amount of habitat compensation for all species will be lower for the Modified Project than currently required in the Conditions of Certification for the Approved Project since the disturbance area for the Modified Project has been reduced and impacts to groundwater and groundwater dependent species will be reduced because water usage will be decreased substantially.

5.2 WATER RESOURCES

The following paragraphs describe the characteristics of the Modified Project that could affect water resources in a different manner than the Approved Project.

5.2.1 Project Changes Related to Water Resources

Characteristics of the Modified Project that have the potential to impact water resources differently than the Approved Project include the following:

- reduction in the acreage of evaporation ponds from up to two 4-acre ponds for each power block to two-2-acre ponds for both Unit 1 and Unit 2 of the Modified Project
- less intensive grading of the site in the solar field
- elimination of the large drainage control channels
- reduction of water use during operation from up to 300 AFY to 201 AFY
- reduction of water use during construction from 1,917 AFY (total of 5,750 acre feet) to 400 AFY (total of 1,130 acre feet)
- elimination of Therminol from the site reducing the potential for groundwater contamination associated with spills and leaks and
- elimination of the LTUs for treatment of Therminol-contaminated soils further reducing the potential for ground contamination

5.2.2 Changes in Environmental Impacts

The Final Decision concluded that, with the implementation of the Conditions of Certification, the Approved Project would comply with all applicable LORS, and would not result in any unmitigated and significant direct, indirect or cumulative adverse impacts related to water resources.

The Final Decision addressed three areas within the context of water resources. Those areas are: 1) potential storm water impacts related to flooding/drainage, erosion and sedimentation; 2) water supply and use, including groundwater; and 3) groundwater quality. As described below, in all cases the Modified Project results in less potential impacts than the Approved Project.

5.2.3 Storm Water: Flooding, Erosion and Sedimentation

Since the grading of the site is less extensive, stormwater can be controlled without the need for large drainage channels around the entire site as was proposed in the Approved Project. A Preliminary Grading Plan is presented in The Preliminary Civil Design Appendix 2-D of this Petition. PSH is currently preparing a post-development conditions hydrologic study that was not available at the time of the filing of this Petition and will be submitted under separate cover. The study will also address the scour and erosion potential of the Preliminary Grading Design. Based on the preliminary results, PSH estimates that the depths of the heliostat pylons would not need to exceed 12 feet in penetration depth in order to provide adequate lateral support and to guard against the potential for scour during a significant flood event.

5.2.4 Water Supply and Use

The Modified Project would use up to the same number of groundwater wells as the Approved Project. However, because less extensive grading is required for the solar field, the amount of groundwater to be used during construction is reduced from 5,750 acre feet to between approximately 1,130 acre feet. Additionally the amount of groundwater used for operations will be reduced from 300 AFY for the Approved Project to a maximum of 201 AFY for the Modified Project. A water balance is shown in Figures 2.4-1A-D and the water uses are summarized in Table 2.4-1.

This reduction in groundwater use for the Modified Project would therefore reduce the potential effects on nearby well owners or on the Palo Verde Valley water basin. With the Conditions of Certification contained in the Final Decision which fully mitigated the Approved Project groundwater use, the Modified Project will not have a significant impact on groundwater.

5.2.5 Wastewater

The following paragraphs demonstrate that the impacts associated with the Modified Project on sanitary wastewater, construction wastewater, and process wastewater systems are reduced and less than significant with the implementation of the existing Conditions of Certification.

5.2.5.1 Sanitary Wastewater

The Modified Project would require approximately 34 less fewer workers during operation than would the Approved Project, so lower demands would be imposed on sanitary systems. The Modified Project, like the Approved Project, would include the installation of a septic tank and leach field.

5.2.5.2 Construction Wastewater

Wastewater generated during construction would consist of similar types and quantities as in the Approved Project.

5.2.5.3 Process Wastewater

The Modified Project will produce less process wastewater than the Approved Project which results in a reduction in the number and size of the evaporation ponds necessary to dispose of the waste. The Approved Project had two 4-acre ponds at each power block for a total of 16 acres of evaporation ponds. The Modified Project maximizes recycling and reuse of process water, including use of a thermal evaporator. The process wastewater stream from both Solar Plants can thus be disposed of in two 2-acre evaporation ponds that will be located in the common facilities area. The evaporation ponds will be constructed in accordance with the Commission Final Decision which includes the Waste Discharge Requirements (WDRs) from the Colorado River Basin Regional Water Quality Control Board.

A preliminary analysis of the discharge stream to the evaporation ponds is provided in Table 5-2.1. The constituents and their concentrations cannot be finalized until the final groundwater analysis is completed and the water and wastewater treatment systems have been fully designed.

Table 5.2-1
Maximum Residue Dissolved Constituent Concentrations for Discharge to Evaporation Ponds

Constituent	Concentration (mg/L)
Arsenic	0.43
Barium	3
Chromium	0.2
Copper	2
Molybdenum	2
Nickel	0.4
Selenium	0.2
Zinc	12
Calcium	3,000
Magnesium	640
Sodium	20,500

Table 5.2-1 Maximum Residue Dissolved Constituent Concentrations for Discharge to Evaporation Ponds	
Constituent	Concentration (mg/L)
Potassium	370
Iron	11
Manganese	0.7
Fluoride	140
Chloride	25,000
Nitrate, as N	0.15
Sulfate	15,000
Phosphate	2
Alkalinity, as CaCO3	4,200
Silica	1,200
pH	5-7
TDS	72,000

The components of the wastewater system are described in Section 2.4.2 and 2.8.1 of this Petition.

5.2.6 Compliance with LORS

In the Commission Final Decision, the Commission concluded that, with the implementation of the Conditions, the Approved Project would comply with all applicable LORS. The same conclusion can be made for the Modified Project as there are neither changed circumstances nor new LORS applicable to the Modified Project since the Final Decision.

5.2.7 Conditions of Certification

PSH recommends the following modification to Condition of Certification **SOIL&WATER-3** to reflect the lower water consumption estimates for the Modified Project.

> **SOIL&WATER-3** The proposed Project's use of groundwater during construction shall not exceed ~~1,917~~ 400 afy (total of ~~5,750~~ 1,130 af during the ~~39~~34 months) during construction and ~~300~~ 201 afy during operation. Water quality used for project construction and operation shall be reported in accordance with Condition of

Certification **SOIL&WATER-18** to ensure compliance with this condition Prior to the use of groundwater for construction, the project owner shall install and maintain metering devices as part of the water supply and distribution system to document Project water use and to monitor and record in gallons per day the total volume(s) of water supplied to the Project from this water source. The metering devices shall be operational for the life of the Project.

Verification: At least 60 days prior to the start of construction of the proposed Project, the project owner shall submit to the CPM a copy of evidence that metering devices have been installed and are operational.

Beginning six months after the start of construction, the project owner shall prepare a semi-annual summary of amount of water used for construction purposes. The summary shall include the monthly range and monthly average of daily water usage in gallons per day.

The project owner shall prepare an annual summary, which shall include daily usage, monthly range and monthly average of daily water usage in gallons per day, and total water used on a monthly and annual basis in acre-feet. For years subsequent to the initial year of operation, the annual summary shall also include the yearly range and yearly average water use by source. For calculating the total water use, the term "year" shall correspond to the date established for the annual compliance report submittal.

Condition of Certification **SOIL&WATER-6** requires compliance with Waste Discharge Requirements (WDRs) included in Appendix B, C and D of the Revised Staff Assessment. The WDRs will be revised to reflect the reduction in evaporation ponds and the elimination of the LTUs. PSH will be meeting with Regional Water Quality Control Board, Colorado River Basin (CRBRWQCB), to understand the filing requirements for revising the WDRs. If a revised Report of Waste Discharge (ROWD) is required PSH will file with the Commission and the CRBRWQCB in the first quarter of 2013.

Additionally once the developed-conditions hyrdrology report is completed, it may result in the need to revise Conditions of Certification **SOIL&WATER-8, 9, 10, 11, and 12.**

No other modifications to the Conditions of Certification are required to accommodate the Modified Project.

5.3 CULTURAL RESOURCES

This section describes and compares the potential impacts to cultural resources between the Modified Project and the Approved Project. As demonstrated below,the Modified Project's potential environmental impacts are less than or equal to those identified in the Commission Final Decision for the Approved Project.

5.3.1 Summary of Project Changes Related to Cultural Resources

As described in Section 2 of this Petition, PSH is proposing to replace the parabolic trough technology with solar tower power generation technology. As detailed in Section 2 of this Petition, the footprint for the Modified Project will be entirely within the footprint of the Approved Project, except for the a minor shift of the western portion of the generation tie-line to the west approximately 1125 feet and the addition of a natural gas line that will be part of an network expansion by SoCal Gas to extend service to the PSEGS site. The overall footprint of the site and linears will be reduced by approximately 572 acres and the private parcels that were part of the Approved Project layout will not be developed as part of the PSEGS.

In addition to the reduction in the acreage of the Modified Project, as described in Section 2.13 of this Petition, the grading of the site to accommodate the Modified Project is significantly less than the Approved Project. Total cut and fill for the Modified Project is expected to be approximately 0.2 million cubic yards whereas the total cut and fill for the Approved Project was 4.5 million cubic yards.

5.3.2 Summary of Prior Surveys/Studies

5.3.2.1 Original Footprint

EDAW/AECOM completed a Class III cultural resources survey (Tennyson and Apple 2010). The EDAW/AECOM Class III cultural resources survey recorded fifty sites, 7 prehistoric and 32 historic. The Modified Project removed 5 prehistoric sites and 6 historic sites from impacts.

AECOM completed a Class III addendum survey for the Approved Project footprint and the generation tie-line (Tennyson 2010).The AECOM Class III addendum survey recorded 1 multi-component site and 34 historic sites (two historic sites were previously recorded in the EDAW/AECOM survey). The Modified Project has removed 18 of these historic sites from of the project.

5.3.2.2 Generation Tie-line Shift

ECORP (2010) completed a Class III cultural resources survey for four alternatives for the generation tie-line for the Desert Sunlight Solar Farm Project. The ECORP survey overlaps with the Modified Project shift to the west. No cultural resources were recorded in this 1125 foot shift to the west. One historic site was in the Approved Project generation-tie alignment and is now removed for the Modified Project.

Maps showing the Modified Project and prehistoric and historic site locations will be provided to the Commission in January 2013.

5.3.2.3 Geoarchaeology Study

A geoarchaeological study was conducted in 2012 to evaluate previously identified prehistoric sites and geomorphologic interpretations. This study consisted of a literature review of the Palen Lake basin, examination of high-resolution satellite and traditional aerial imagery, and in-field examination of the Project footprint area and greater Palen basin. A report of findings of this study is in preparationby PSH for submission in January 2013. The report will include a discussion of geologic history, geomorphic setting, and quaternary paleo environments pertinent to archaeology of the project area. In addition, resource distributions, dominate geomorphic processes, and archaeological site formation and transformation processes will be addressed as they pertain to archaeological site locations and conditions in specific depositional environments. Preliminary findings of this study are summarized as follows:

- Soil designation dates (Kenney 2010) suggest that virtually all land surfaces within the footprint area are younger than 5kya (5,000 years old), and most are younger than 3kya.
- There is no evidence of pluvial lakes in or immediately adjacent to the PSEGS that could be contemporary with human occupation. Paleoindian sites in the Chuckwalla Valley are highly unlikely except perhaps the lower parts of Ford Dry Lake basin.
- Playa lakes appear to have been ephemerally present in the lowest part of the valley during most or all of the Holocene and would have offered undependable, temporary resources for prehistoric occupants. No playa environments are present within the revised footprint of PSEGS, and sites that appear to be indirectly associated with those environments are also mostly outside the boundary. Dune/playa sites appear to have been uniformly small, temporary camps. They are highly eroded, have little spatial integrity, no stratigraphic integrity and virtually no opportunity for dating.

- The Modified Project is situated on an alluvial fan having few flora or faunal resources and no water resources other than very occasional runoff. Localized niche environments caused by dune damming of small washes are the most resource-rich locations in the immediate area. Because of surface and subsurface flow, relatively thick sands, and numerous niche environments, the most productive area for cultural resources is located on the eastern/northern side of the drainage between Palin basin and Ford Dry Lake basin (ACEC area), one mile or more outside the Modified Project.
- Most prehistoric sites in and near the Modified Project are situated on alluvial fan surfaces. These surfaces, and associated prehistoric and historic sites, have been modified by channel shift, channel erosion and deposition, aeolian deflation and deposition, bioturbation, and pedogenic processes. As a result, archaeological sites of all ages located on the alluvial fans have little, if any, spatial or stratigraphic integrity.
- There are three prehistoric sites located in or immediately adjacent to the Modified Project. Prehistoric sites SMP-P-2023, SMP-P-2018 and SMP-M-MT-001 are located between 460 and 490 feet in elevation. All are located near the distal end of an alluvial fan that is also significantly impacted by aeolian transport. These sites have low recorded artifact densities (less than one/square meter), appear to be significantly disturbed by natural processes, and have poor spatial and stratigraphic integrity.

5.3.3 Changes in Environmental Impacts

5.3.3.1 Original Footprint

Within the original footprint, blading and construction activities will still occur. Blading will be significantly less for the Modified Project. The Approved Project required the removal of up to seven feet of sediments in order to completely level the ground surface for the solar trough construction. The technology for the Modified Project, does not require a completely level project area, but will require some blading concentrated in the power blocks and roadways. Trenching will occur on site for the underground utilities with the deepest trenches for the underground transmission lines to depths of 10 feet below grade. Due to the reduced blading, there is the potential to avoid some smaller archaeological sites. This possibility will be evaluated during the design phase.

5.3.3.2 Modified Footprint

There is a reduction of 572 acres for the Modified Project. This resulted in removing some prehistoric/historic sites as well as adding some sites for potential impacts.Six

prehistoric sites (SMP-P-1015, 1016, 1017, 1018, 2014 and 2015) are now out of the Modified Project.Eighteen historic sites were removed for the Modified Project.

Approximately 240 acres of private land in the southeastern area of the Approved Project were dropped from the Modified Project. Although no cultural resources field inventory was done for this parcel, it can be assumed that prehistoric/historic sites would have been recorded and are now out of the Modified Project.

The generation tie-line shift will avoid one historic site.

The Modified Project will no longer use a redundant telecom line that would have been routed south under Interstate 10. This removes two historic sites from impacts.

The solar tower power generation technology will require the construction of two 750-foot-tall power towers. This will increase the visual effects for this technology. New visual simulations will be necessary to evaluate these effects. Currently, a map showing the viewshed for these towers is being prepared by PSH. Once this is available, key observation points (KOPs) will be identified with interested parties and tribes to conduct visual simulations. It is anticipated that simulations will be necessary from some of the following: Corn Springs, the nearby Cocomaricopa Trail segment, Alligator Rock, Palen Lake ACEC, McCoy Springs, Chuckwalla Petroglyph site and selected DTC sites. In addition, other geologic features that may be sensitive to tribes will be evaluated for simulations. These simulations will then be shared to discuss and develop possible mitigation measures, if warranted.

The Approved Project did not include a natural gas supply pipeline. The Modified Project includes a 1.8-mile-long natural gas pipeline that will be constructed and permitted by SoCal Gas. This gas pipeline will tie into an existing gas pipeline owned by SoCal Gas located south of Interstate 10. A small segment of the existing distribution gas pipeline will be upgraded from 4” to 8” diameter pipe. This pipeline corridor has not been surveyed for cultural resources. Part of the pipeline is located within the Interstate 10 corridor which was surveyed for cultural resources in 1981 (Hammond 1981). If necessary, a Class III cultural resources inventory can be completed for this right-of-way.

5.3.4 Changes in LORS

There are no new LORS that would affect the Commission’s findings that the Approved Project would comply with cultural-resource related LORS. The BLM’s FEIS did include conditions for approval for the right-of-way grant for the project included compliance with the NHPA section 106 requirements and the Programmatic Agreement (PA).

However, since the project's technology is changing, BLM has indicated that it may amend the PA to accommodate the new "undertaking." Under Stipulation XI for the PA, Amendments to the Agreement, BLM will notify all consulting parties and initiate a 30 day period of consultation on the amendment. With an amendment, the Modified Project will be under the jurisdiction of the PA.

In discussions with BLM, it is possible that BLM may terminate or end the Programmatic Agreement (Stipulation XIII) and draft a Memorandum of Agreement (MOA). If so, the Modified Project will meet the terms of the MOA for mitigation/treatment.

The Commission was an invited signatory for the PA. The PA includes language to address Commission's concerns and involve them at all steps for identification, evaluation and assessment of effects for the project. It is likely that BLM will invite the Commission to be a signatory to any MOA, if pursued. However, if provisions in the BLM's PA or MOA conflict with or duplicate the Ccommission's condition, the BLM provisions will take precedence. If the Commission's conditions are additional to or exceed the BLM provisions, the Commission's CEQA responsibilities will continue to apply to the project's activities, contingent on BLM's approval as authorized under federal law.

5.3.5 Changes in Conditions of Certification

According to the Final Decision , the adoption and implementation of the Conditions of Certification **CUL-1** through **CUL-16** would put the Approved Project in conformity with all applicable LORS.For the Modified Project, Conditions **CUL-11**, **CUL-12**, and **CUL-13** would change based on the project boundaries having changed. The change in the acreage size of the project to remove 572 acres would reduce the funding to be contributed under **CUL-1**, Prehistoric Trails Network Cultural Landscape (PTNCL) Documentation and Possible NRHP Nomination and **CUL-2**, Desert Training Center California-Arizona Maneuver Area Cultural Landscape (DTCCL) Documentation and Possible NRHP Nomination. However, if there are negotiations with the CEC and BLM to renegotiate these conditions, then the **CUL-1** and **CUL 2**requirementswould be amended.Based on the Geoarchaeology Study, the conditions will be modified to incorporate findings that all archaeological sites in the area appear to have no spatial or stratigraphic integrity, and that individual artifacts have frequently been severely abraded by wind-blown sand. For these reasons, it is deemed that monitoring is highly unlikely to reveal additional archaeological manifestations. In addition, the conditions should be modified to reflect that there are no shorelines associated with pluvial lakes within 4.25 miles of the Modified Project.

LITERATURE CITED

ECORP Consulting, Inc. 2010 “Class III Cultural Resources Inventory of the Desert Sunlight Solar Farm Project Desert Center Vicinity, Riverside County, California. Volume I Technical Report. September, 2010; Redlands.

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Nials, Fred L. 2013 “Geoarchaeology of the PSEGS Project Area.” In preparation.

Tennyson, Matthew 2010 “Addendum 1 Cultural Resources Class III Report for the Proposed Palen Solar Power Project Riverside County, California. AECOM; San Diego, August 2010.

Tennyson, Matthew and Rebecca Apple 2010 “Cultural Resources Class III Report for the Proposed Palen Solar Power Project Riverside County, California. EDAW/AECOM; San Diego, February 2010.

5.4 GEOLOGICAL AND PALEONTOLOGICAL RESOURCES

This section describes the portions of the Modified Project that may affect the analysis, rationale, conclusions, and Conditions of Certification contained in the Final Decision for the Approved Project as it relates to geological and paleontological resources.

5.4.1 Summary of Project Changes

The Modified Project does not involve the quantity of mass grading of the site (approximately 4.5 million cubic yards of cut and fill) required for the Approved Project. Mass grading will occur only in the power blocks, common facilities area and road building. The depths of excavation for foundations in the power blocks are similar to those anticipated for the Approved Project. Earthwork for the Modified Project will employ the methods discussed in Section 2.13 of this Petition. Earthwork cuts and fills will be balanced such that there will be no need for importing of fill material or disposal of cut material off site. Grading of the site will include cuts and fills of approximately 0.2 million cubic yards.

A new component of the Modified Project is the onsite electric transmission system, which will consist of underground cables to convey power from the power blocks to the switchyard. The cables will be routed under the paved access roads. A cable serving Solar Plant #2 will be routed to Solar Plant #1 and the cables will be routed in parallel to the common switchyard before transitioning to overhead structures and exiting the site. The Modified Project will therefore involve new trenching to accommodate the underground electric transmission lines. The trench depth is expected to be up to 10 feet. Manholes located at intervals of approximately 1,000 to 2,000 feet may require excavation up to depths of 12 feet. The location of the onsite electric transmission system is shown on Figure 2.1-3.

The Modified Project has a slight re-routing of the generation tie-line near its western end as shown on Figure 2.1-4. The re-routing does not increase any potential to discover paleontological resources because the shift is within a quarter mile of the original location and will be within the same geologic units as the Approved Project.

5.4.2 Changes in Environmental Impacts

The only change in environmental impacts to geological and paleontological resources is a reduction in the potential to discover paleontological resources for the Modified Project due to elimination of the mass grading within the solar fields necessary for the Approved Project.

5.4.3 Compliance With LORS

There are no differences in the LORS analysis between the Modified Project and the Approved Project. LORS relating to the design of the Modified Project as contained in the Final Decision would ensure the Modified Project is designed to minimize impacts to and from geologic hazards.

Similarly, there are no specific LORS designed to protect paleontological resources that would be applicable to the Modified Project in a manner different than would be applicable to the Approved Project.

5.4.4 Changes in Conditions of Certification

No changes to Conditions of Certification in the areas of Geological or Paleontological Resources are necessary for the Modified Project.

5.5 SOIL RESOURCES

This section describes the portions of the Modified Project that may affect the analysis, rationale, conclusions, and Conditions of Certification contained in the Final Decision for the Approved Project as it relates to soil resources.

5.5.1 Summary of Project Changes

As described in Section 2.13, the grading for the Modified Project is less extensive than the grading for the Approved Project. Although the Modified Project may include a slight shift in the western end of the generation tie-line, no different soil types than those analyzed for the Approved Project will be encountered.

5.5.2 Changes in Environmental Impacts

The only change in environmental impact to soil resources is a reduction in the potential soil loss due to grading activities, and therefore the Approved Project's soil loss calculations will be greater than those anticipated for the Modified Project.

5.5.3 Compliance With LORS

There are no specific LORS designed to protect soil resources that would be applicable to the Modified Project in a manner different than would be applicable to the Approved Project. Therefore, the analysis contained in the Final Decision should remain unchanged for the Modified Project.

5.5.4 Changes in Conditions of Certification

No changes to Conditions of Certification in the area of Soil Resources are necessary for the Modified Project.

Section 6 LOCAL IMPACT ANALYSIS

The following sections provide a description of the modifications proposed to the Approved Project as they may affect the assumptions, rationale, and Conditions of Certification in the Final Decision for the technical areas of Land Use, Socioeconomics, and Noise. An analysis of Visual Resources will be submitted under separate cover because PSH is currently working with stakeholders, CEC Staff and BLM to select appropriate Key Observation Points to develop visual simulations to aid in the evaluation of potential visual related impacts associated with the use of the heliostat and solar tower technology.

6.1 LAND USE

As described in below impacts of the Modified Project to land use are expected to remain the same as those of the Approved Project.

6.1.1 Summary of Project Changes Related to Land Use

The only change proposed by the Modified Project that is relevant to land use is the elimination of development of project facilities on any private land.

6.1.2 Changes in Environmental Impacts

The only change in Land Use analysis contained in the Final Decision is the elimination of any discussion of compliance with Riverside County LORS as the Modified Project does not involve the use of private land that would be subject to the jurisdiction of Riverside County.

6.1.3 Changes in LORS Conformance and Other Permits

In its Final Decision, the Commission concluded that the Project is consistent with all applicable LORS. There are no new LORS that would be applicable to the Modified Project—and any new Riverside County LORS are inapplicable to development entirely within federally managed land.

6.1.4 Changes in Conditions of Certification

The Final Decision contains Condition of Certification **LAND-1** which requires the project to obtain a ROW Grant and an amendment to the California Desert Conservation Area Plan (CDCA). PSH proposes a minor modification to change the name from the previous project to that of the Modified Project.

> **LAND-1** Prior to the start of construction, the Applicant shall provide to the Compliance Project Manager (CPM) documentation of the U.S. Bureau of Land Management (BLM) Right-of-Way grant and the BLM-approved project-specific amendment to the California Desert Conservation Area Plan (CDCA) permitting the construction/operation of the proposed Palen Solar Power Project.

Verification: Prior to the start of construction, the Applicant shall submit to the CPM a copy of the BLM approved project specific amendment to the CDCA Plan permitting the Palen Solar Electric Generating System~~Power Project~~.

6.2 SOCIECONOMICS

As described below, the impacts of the Modified Project to socioeconomics are expected to remain the same as those of the Approved Project.

6.2.1 Summary of Project Changes Related to Socioeconomics

The only changes proposed by the Modified Project that are relevant to socioeconomics are (a) a reduction in operations workforce, from 134 to 100 employees, and (b) an increase in the number of peak workers during construction, from an average of approximately 566 daily construction workers with a peak workforce of 1,145 workers to an average of approximately 998 daily construction workers with a peak workforce of 2,311 workers.

6.2.2 Changes in Environmental Impacts

The only change in socioeconomic analysis results from a reduction in operations workforce and an increase in the number of peak workers during construction. The anticipated construction schedule is similar (39-months for the Approved Project and 34 months for the Modified Project).

While the Modified Project reduces the estimated number of operation personnel from 134 to 100, the project still produces a beneficial economic impact to the community by creating new jobs for skilled and unskilled workers.

The number of peak workers during construction will increase from an average of approximately 566 daily construction workers with a peak workforce of 1,145 workers to an average of approximately 998 daily construction workers with a peak workforce of 2,311 workers. The Final Decision found that even with the simultaneous construction of several large proposed renewable projects within the local and regional study areas, the area is capable of supporting a peak workforce much higher (estimated to be 4,291 workers) than that anticipated by the Modified Project with no adverse impacts.

A summary of the Modified Project's total economic impacts from construction and operation is presented in Tables 6.2-1 and 6.2-2, respectively. The economic benefits associated with anticipated construction payrolls, local purchases of materials and supplies and sales tax revenues generated by expenditures will be equal to or greater than the Approved Project. Therefore, the Modified Project will still have a beneficial effect on the local and regional economy.

TABLE 6.2-1
Summary of Total Economic Impacts from Construction

Capital Cost	$2,000,000
Local Materials and Supply Purchases	$71,400,000
Total Construction Payroll	$462,400,000
Construction Payroll (Disposable)	$323,700,000
Annual Local Construction Expenditures	$23,800,000
Annual Average Local Construction Payroll	$154,100,000
Annual Average Local Construction Payroll (Disposable)	$107,900,000
Average Monthly Direct Construction Employment	840
Indirect Employment	172
Induced Employment	3,274
Construction Employment Multiplier	5.1
Indirect Income	$11,000,000
Induced Income	$159,100,000
Construction Income Multiplier	1.37
Total Sales Taxes	$70

All values are approximate.

TABLE 6.2-2
Summary of Total Economic Impacts from Operations and Maintenance

Riverside County	
Annual Local Operations and Maintenance (O&M) Purchases	$589,600
Total Annual O&M Payroll (in millions)	$12,300,000
Annual O&M Employment	100
Indirect Employment	8
Induced Employment	69
O&M Employment Multiplier	1.7
Indirect Income	$36,605
Induced Income	$2,778,257
O&M Income Multiplier	1.2
Total Sales Tax (during 3 year construction period)	$70,000,000
Total Annual Property Taxes	$4,300,000

Notes: All values are approximate. Operations and Maintenance (O&M)

6.2.3 Changes in LORS Conformance and Other Permits

There are no changes to LORS that would be applicable to the Modified Project. Therefore, the analysis contained in the Final Decision should remain unchanged for the Modified Project.

6.2.4 Changes in Conditions of Certification

There were no Conditions of Certification in the area of Socioeconomics. Consequently, no changes or additions to the Conditions of Certification are necessary for the Modified Project.

6.3 TRAFFIC AND TRANSPORTATION

As described below, the impacts of the Modified Project to traffic and transportation are expected to remain the same as those of the Approved Project.

6.3.1 Summary of Project Changes Related to Traffic and Transportation

The changes to Traffic and Transportation result from the Modified Project's reduction in the operations workforce, from 134 to 100 employees, and the greater number of peak workers during construction, which will increase from an average of approximately 566 daily construction workers to with a peak workforce of 1,145 workers to an average of approximately 998 daily construction workers with a peak workforce of 2,311 workers. In addition, use of tower technology will change the glint and glare profile of the project from the viewpoint of traffic traveling on the I-10 freeway. Anticipated construction daily and peak traffic estimates are provided in Appendix 2-C.

The Modified Project will construct two towers to heights of 750 feet. Included in Appendix 6 is a letter of non-objection from the Department of Defense for placement of towers at the PSEGS site. PSH has consulted with FAA and will be filing a request for Determination of No Hazard.

6.3.2 Changes in Environmental Impacts

Over the course of the 34-month construction period, the average workforce is estimated to be about 998 workers a day. If each worker is commuting in his or her own vehicle, approximately 1996 trips per day would be generated. Peak construction is expected to occur during Month 22 (Year 2015) of the 34-month construction period. The workforce during this peak month is estimated to be about 2,311 workers a day to support onsite and offsite construction activities. If each worker is commuting in his or her own vehicle, approximately 4,622 trips per day would be generated during this peak time from all workers assuming one vehicle for each worker is used.

All of the vehicle trips associated with these trips will not occur simultaneously since construction activities will occur in two or three different shifts. In addition, some of these workers will be supporting offsite construction activities for the transmission and gas line linears. The average number day shift workers would be 790. The peak number of day shift workers will be 1,700. Assuming 7.5% of all day-shift workers utilize carpooling, the number of average daily trips generated will be 1,461 per day and peak daily trips generated will be 3.145. Construction activities during the day shift will be scheduled to begin at 5 am, which should not occur simultaneously with peak travel on the I-10 Freeway or peak commuting traffic from nearby Blythe and Desert Center.

As with the Approved Project, construction of the Modified Project would require that oversized equipment, such as the SRSG, steam turbine generator and main transformers, be transported to the site via multi-axle trucks. With the Modified Project, truck trips are forecasted to generate an average of 20 daily truck trips per hour with a peak of 45 daily truck trips per hour. The Approved Project was forecasted to generate an average of approximately 20 to 30 daily one-way truck trips, with a peak of approximately 40 daily one-way truck trips.

The Modified Project will incorporate Conditions of Certification **TRANS-1, TRANS-2, TRANS-3, and TRANS-4**. Together, these conditions will ensure the Modified Project has no impacts to Traffic and Transportation. Although peak construction traffic will increase, the project will develop a Traffic Control Plan (TCP) which will include measures designed to ensure that stacking does not occur at intersections necessary to enter and exit the project site. The Modified Project also incorporates adequate space in the construction laydown area to use for vehicle staging to avoid negatively impacting the I-10/Corn Springs interchange.

The workforce for the Modified Project during operations will be reduced from the Approved Project. The total labor force of about 134 employees to staff the facility 24 hours a day, 7 days a week will be reduced in the Modified Project to 100 employees. Because Traffic & Transportation impacts during operation have been reduced from the Approved Project, no impacts result from the change in the operations workforce.

As with the Approved Project, operation of the Modified Project will generate minor truck traffic during operations such as supply delivery and off-site waste shipments. Project operation for the Approved Project anticipated generating up to 6 truck trips per day for this purpose. With anticipated truck trips per day of 6 for the Modified Project, there will be no operation-related impacts.

PSH proposes additional Conditions of Certification adopted for the Rice Solar Energy Project (RSEP) to address the potential for glint and glare to drivers of I-10. These Conditions of Certification are appropriate since the tower locations of PSEGS and RSEP are approximately the same distance from a highway.

6.3.3 Changes in LORS Conformance and Other Permits

There are no changes to LORS that would be applicable to the Modified Project. Therefore, the analysis contained in the Final Decision should remain unchanged for the Modified Project.

6.3.4 Changes in Conditions of Certification

The Commission incorporated Condition of Certification **TRANS-6** specifically to mitigated the impacts associated with glint and glare potentially caused by the parabolic troughs. PSH proposes that Condition of Certification **TRANS-6** be deleted and replaced with the following set of Conditions of Certification that were incorporated into the RSEP Decision.

HELIOSTAT POSITIONING PLAN

TRANS-6 The project owner shall prepare and implement a Heliostat Positioning Plan in coordination with the Avian Protection Plan specified in Condition of Certification **BIO-25** that would minimize potential for human health and safety hazards and bird injury or mortality from solar radiation exposure.

Verification: Within 90 days before PSEGS commercial operation, the project owner shall submit a Heliostat Positioning Plan (HPP) to the CPM for review and approval. The project owner shall also submit the plan to potentially interested parties that may include CalTrans, CHP, FAA, and the Department of Defense (DOD) Southwest Renewable Energy Work Group for review and comment and forward any comments received to the CPM. The Heliostat Positioning Plan shall accomplish the following:

1. Identify the heliostat movements and positions (including reasonably possible malfunctions) that could result in potential exposure of observers at various locations including in aircraft, motorists, pedestrians and hikers in nearby wilderness areas to reflected solar radiation from heliostats;
2. Describe within the HPP how programmed heliostat operation would address potential human health and safety hazards at locations of observers, and would limit or avoid potential for harm to birds;
3. Prepare a monitoring plan that would: a) obtain field measurements in candela per meters squared and watts per meter squared to validate that the Heliostat Positioning Plan would avoid potential for human health and safety hazards consistent with the methodologies detailed in the 2010 Sandia Lab document presented by Clifford Ho, et al[1], including those referenced studies and materials within related to ocular damage, and b) provide requirements and procedures to document, investigate and resolve legitimate human health and safety hazard complaints

prioritizing localized response (e.g., screening at location of complaint) regarding daytime intrusive light.

4. The monitoring plan should be made available to interested parties including CalTrans, CHP, FAA, and the Department of Defense (DOD) Southwest Renewable Energy Work Group and be updated on an annual basis for the first 5 years, and at 2-year intervals thereafter for the life of the project.

POWER TOWER LUMINANCE MONITORING PLAN

TRANS-7 The project owner shall prepare a Power Tower LMVR Plan to provide procedures to conduct measurements and to document complaints regarding distraction effects to aviation, vehicular and pedestrian traffic associated with the RSEP solar receiver tower.

Verification: No later than 60 days prior to PSEGS commercial operation, the project owner shall provide a Power Tower LMVR Plan applicable to PSEGS for review and approval by the CPM. The plan shall specify procedures to document and investigate complaints regarding intrusive light, and report these to the CPM within 10 days of receiving a complaint.

The project owner shall measure the intensity of the luminance of light in candelas per meter squared and watts per meter squared reflected from the solar receiver tower according to the following:

A. Within 90 days following commercial operation;
B. If a major design change is implemented that results in an increase of the reflective luminance of the RSEP solar receiver tower; and

C. After receiving a complaint regarding a distraction associated with the central solar receiver from a location where previous measurements were not taken.

The Power Tower LMVR Plan shall include provisions for the following:

1. Provide measurement data within 30 days to potentially interested parties that may include CalTrans, CHP, FAA, and the Department of Defense (DOD) Southwest Renewable Energy Work Group for review and comment, and to the CPM for review and approval.

2. Measurement of luminance at the locations where any distraction effects have been reported and at the locations nearest the solar receiver tower from the four sides of the power plant boundary, and the nearest public road, which may be substituted for one of the sides of the solar receiver tower during the time of day when values would be highest;
3. Measurement of luminance using an illuminance meter, photometer, or similar device and reporting of data in photometric units (candelas per meter squared and watts per meter squared); the measurements are intended to provide a relative and quantifiable measure of luminance that can be associated with any observed and reported distraction effect from the solar receiver tower.
4. Provisions for documenting reported distraction and if the solar receiver tower is identified as a safety concern; the project owner shall consider reasonable localized mitigation measures that are technically and financially feasible. The localized mitigation measures may include signage for or screening of the affected area or other reasonable measures.
5. Post-mitigation verification; Within 30 days following the implementation of mitigation measures designed to reduce localized impact of the solar receiver tower, the project owner shall repeat the luminance measurements to demonstrate the effectiveness of mitigation measures and provide the new measurement data for review and comment by interested parties that may include CalTrans, CHP, FAA, and the Department of Defense (DOD) Southwest Renewable Energy Work Group, and for review and approval by the CPM.

SOLAR RECEIVER TOWER OBSTRUCTION MARKING AND LIGHTING

TRANS-8 The project owner shall install obstruction marking and lighting on the solar receiving tower, consistent with both the FAA and DOD requirements, as expressed in the following documents:

- FAA Advisory Circular 70/7460-1K, Change 2: Obstruction Marking and Lighting, 24-hour medium-strobes;
- Air Force Aviation Safety: Flight Safety Flash 09-01; and
- FAA Safety Alert for Operators (SAFO) 09007.

Temporary lighting shall be installed on the top of the structure once the construction height has exceeded 200 feet AGL, activated within five

days of installation, and maintained in operation 24 hours a day, 7 days a week until construction is complete. Permanent lighting consistent with all requirements shall be installed and activated within five days of completion of construction. Lighting shall be operational 24 hours a day, 7 days a week, for the life of the project and until such time as the tower no longer exists at a height exceeding 200 feet AGL. Upgrades to the required lighting configurations, types, location, or duration shall be implemented consistent with any changes to FAA or DOD obstruction marking and lighting requirements.

Verification: At least 60 days prior to the start of construction, the project owner shall submit final design plans for the power plant solar receiving tower that depict the required air traffic obstruction marking and lighting to the CPM for approval.

Within five days of completion of the solar receiving tower to a height exceeding 200 feet AGL, the project owner shall install and activate temporary obstruction marking and lighting at the top of the structure and shall maintain temporary lighting at the top of said structure until construction of the tower is complete. The project owner shall inform the CPM in writing within 10 days of the time the lighting is first installed and activated.

Within five days of completion of the tower construction, the project owner shall install and activate permanent obstruction marking and lighting consistent with both FAA and DOD requirements and shall inform the CPM in writing within 10 days of installation and activation. The lighting shall be inspected and approved by the CPM (or designate inspector) within 30 days of activation.

6.4 NOISE AND VIBRATION

This section describes the portions of the Modified Project that may affect the analysis, rationale, conclusions, and Conditions of Certification contained in the Final Decision for the Approved Project as it relates noise and vibration.

6.4.1 Summary of Project Changes

The Modified Project includes two power blocks similar in size and types of equipment as the Approved Project. However, the location of the power block to the closest sensitive receptor LT1 is farther away from the sensitive receptor than the location of the closest power block for the Approved Project.

6.4.2 Changes in Environmental Impacts

Construction noise from the Modified Project is expected to be the same as the Approved Project. There are no new pieces of equipment or methods of construction that were not analyzed previously for the Approved Project.

Operational noise from the steam turbines and equipment located within the power blocks is expected to be similar to the equipment analyzed for the Approved Project. The Modified Project's Solar Plant 1 power block is located approximately 2,000 feet southeast of the closest sensitive receptor, LT1 located near the northwest corner of the site. The Commission Decision concluded that due to the distance from the closest noise source the Approved Project would not result in significant noise impacts to LT1 or sensitive receptors located further away. However, the power block for the Approved Project was closer to LT1 than the Modified Project's closest power block. The noise generated by the Modified Project when measured at LT1 will be lower than for the Approved Project. Therefore, the Modified Project will not result in significant operational noise impacts at LT1 or any other sensitive receptor.

6.4.3 Compliance With LORS

The only noise-related LORS applicable to the Modified Project are the same as those that would be applicable to the Approved Project. The Modified Project will comply with all applicable noise-related LORS as enforced by the Conditions of Certification.

6.4.4 Changes in Conditions of Certification

PSH does not propose any modifications to the Conditions of Certification.

Section 7 POTENTIAL EFFECTS ON PROPERTY OWNERS

The Commission's Power Plant Siting Regulations require a Petition For Amendment to include 1) a discussion of how the modification affects the public; 2) a list of property owners potentially affected by the modification; and 3) a discussion of the potential effect on nearby property owners, the public and the parties in the application proceedings.

The Modified Project incorporates two towers that will glow when in operation. As discussed in Section 6, PSH is currently working with stakeholders to develop Key Observation Points (KOPs) where visual simulations can be prepared to assess the effects of the change in technology on sensitive visual receptors.

The Commission has previously approved the Ivanpah Project and the Rice Solar Energy Project which incorporate similar tower technology. In Traffic and Transportation, PSH has recommended the Commission incorporate the same Conditions of Certification as Ivanpah and Rice to mitigate any potential glint and glare-related impacts to motorists on I-10. As described in every other technical area evaluated in Sections 3, 4, 5 and 6 of this Petition, after mitigation the impacts of the Modified Project are either the same or less than the Approved Project. Therefore, PSH believes that with the incorporation of those conditions, the PSEGS would not affect the public differently than the Approved Project. In addition to reducing impacts, the Modified Project would still result in the overall public benefits described in the Final Decision.

APPENDICES

APPENDIX 2

ENGINEERING

APPENDIX 2-A

EQUIPMENT DIMENSIONS

TABLE 1
Building and Structure Dimensions, Common Area

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Administration Building including Control Room	106, 108	80	180	34	14,400	N 3,728,336.443 m E 664,136.147 m EL 645. ft	Sloped Roof[4]
Mechanical/Maintenance Shop, Electrical/ Instrument Maintenance Shop, Vehicle Maintenance Shop and Warehouse Building	101, 102, 104, 109	90	120	48	10,800	N 3,728,336.950 m E 664,191.309 m EL 645. ft	Sloped Roof[4]
Firewater Storage Tank	113	25	N/A	15	N/A	N 3,728,396.776 m E 664,195.235 m EL 643. ft	Round[5], ~50,000 gal
Fire Water Pump House	114	12	36	10	432	N 3,728,391.360 m E 664,184.305 m EL 643. ft	
Emergency Diesel Generator Enclosure	112	12	18	10	216	N 3,728,394.589 m E 664,163.538 m EL 643. ft	250 kWe

Notes:
1 Reference Drawing P-1001, Attachment D
2 Building area provided for enclosed buildings only.
3 Location: Coordinates of southwest corner of rectangular objects and center of round objects.
4 Height for sloped roof is to peak.
5 For round structures the length is the structure's diameter.

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TABLE 2
Building and Structure Dimensions, Power Block #1

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Solar Tower including Solar Receiver Steam Generator	1, 11	75	N/A	750	N/A	N 3,730,027.350 m E 664,445.796 m EL 548. ft	Round[5]
Steam Turbine Generator Enclosure	2	34	46	52	1,564	N 3,730,022.149 m E 664,486.191 m EL 546. ft	Sloped Roof[4]
Air Cooled Condenser	3	220	300	120	N/A	N 3,729,935.559 m E 664,508.453 m EL 548. ft	Open Structure
Steam Turbine Enclosure	4	40	56	52	2,240	N 3,730,023.776 m E 664,503.080 m EL 545. ft	
Steam Turbine Generator Lube Oil Enclosure	15	22	38	18	836	N 3,730,034.145 m E 664,486.103 m EL 546. ft	
Deaerator/Feedwater Heater Structure	5, 25, 26	56	66	80	N/A	N 3,729,973.803 m E 664,443.137 m EL 549. ft	Open Structure
Emergency Diesel Generator Enclosure	12	12	32	12	384	N 3,730,018.444 m E 664,583.054 m EL 542. ft	2,500 kWe

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TABLE 2
Building and Structure Dimensions, Power Block #1

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Plant Service Building	13	56	100	16	5,600	N 3,730,048.461 m E 664,532.247 m EL 543. ft	Sloped Roof[4]
ACC Power Distribution Center – North	22	14	50	16	700	N 3,729,977.490 m E 664,559.371 m EL 544. ft	Under ACC (Item 3)
ACC Power Distribution Center – South	22	14	50	16	700	N 3,729,945.609 m E 664,559.606 m EL 546. ft	Under ACC (Item 3)
Fire Water Pump House	28	36	12	12	432	N 3,729,957.189 m E 664,387.737 m EL 552. ft	
Demineralized Water Storage Tank	31	26	N/A	26	N/A	N 3,729,964.043 m E 664,421.182 m EL 551. ft	Round[5], ~95,000 gal
Service/ Firewater Storage Tank	34	40	N/A	30	N/A	N 3,729,964.177 m E 664,400.918 m EL 551. ft	Round[5], ~260,000 gal
Mirror Wash Water Storage Tank	54	25	N/A	21	N/A	N 3,729,959.152 m E 664,465.022 m EL 549. ft	Round[5], ~70,000 gal

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TABLE 2
Building and Structure Dimensions, Power Block #1

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Boiler Pump Power Distribution Center	80	50	14	16	700	N 3,729,960.409 m E 664,476.769 m EL 548. ft	
Waste Water Storage Tank	42	25	N/A	23	N/A	N 3,729,936.747 m E 664,420.459 m EL 550. ft	Round[5], ~75,000 gal
Water Treatment Power Distribution Center	43	30	14	16	420	N 3,729,942.641 m E 664,418.727 m EL 551. ft	
Night Preservation Auxiliary Boiler	9	10	12	12	N/A	N 3,729,983.509 m E 664,424.848 m EL 550. ft	~ 10,000 lbs/hr, 10 MMBtu/hr
Start-up Auxiliary Boiler	8	14	56	16	N/A	N 3,729,976.244 m E 664,387.466 m EL 552. ft	~ 185,000 lbs/hr, 249 MMBtu/hr
Mirror Wash Vehicle Refueling and Storage Area Canopy	6	74	116	24	N/A	N 3,729,918.912 m E 664,454.038 m EL 550. ft	Open Structure, Flat Roof
Mirror Wash Vehicle Storage Area Canopy	44	40	184	20	N/A	N 3,729,908.891 m E 664,498.891 m EL 549. ft	Open Structure, Flat Roof

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TABLE 2
Building and Structure Dimensions, Power Block #1

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Wet Surface Air Cooler (WSAC)	36	48	36	26	N/A	N 3,729,914.616 m E 664,397.197 m EL 552. ft	
Thermal Evaporation Unit	72	34	18	64	N/A	N 3,729,920.876 m E 664,417.418 m EL 552. ft	Open Structure
Residue Tank	70	12	N/A	13	N/A	N 3,729,913.861 m E 664,417.583 m EL 552. ft	Round[5], ~ gal
Water Treatment Building	N/A	66	90	26	5940	N 3,729,931.545 m E 664,382.049 m EL 552. ft	Sloped Roof[4]
Generator Step-up Transformer	23	12	26	22	N/A	N 3,730,057.938 m E 664,504.480 m EL 545. ft	
Drains Tank	75	12	N/A	13	N/A	N 3,729,970.911 m E 664,467.001 m EL 552. ft	Round[5], ~ gal

Notes:
1 Reference Drawing P-1000B, Attachment C
2 Building area provided for enclosed buildings only.
3 Location: Coordinates of southwest corner of rectangular objects and center of round objects.
4 Height for sloped roof is to peak.
5 For round structures the length is the structure's diameter.

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TABLE 3
Building and Structure Dimensions, Power Block #2

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Solar Tower including Solar Receiver Steam Generator	1, 11	75	N/A	750	N/A	N 3,728,606.614 m E 666,555.824 m EL 538. ft	Round[5]
Steam Turbine Generator Enclosure	2	34	46	52	1,564	N 3,728,601.413 m E 666,596.219 m EL 536. ft	Sloped Roof[4]
Air Cooled Condenser	3	220	300	120	N/A	N 3,728,514.822 m E 666,618.481 m EL 537. ft	Open Structure
Steam Turbine Enclosure	4	40	56	52	2,240	N 3,728,603.040 m E 666,613.108 m EL 535. ft	
Steam Turbine Generator Lube Oil Enclosure	15	22	38	18	836	N 3,728,613.409 m E 666,596.131 m EL 536. ft	
Deaerator/Feedwater Heater Structure	5, 25, 26	56	66	80	N/A	N 3,728,553.066 m E 666,553.164 m EL 539. ft	Open Structure
Emergency Diesel Generator Enclosure	12	12	32	12	384	N 3,728,597.707 m E 666,693.083 m EL 532. ft	2,500 kWe

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TABLE 3
Building and Structure Dimensions, Power Block #2

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Plant Service Building	13	56	100	16	5,600	N 3,728,627.725 m E 666,642.276 m EL 533. ft	Sloped Roof[4]
ACC Power Distribution Center – North	22	14	50	16	700	N 3,728,556.752 m E 666,669.399 m EL 534. ft	Under ACC (Item 3)
ACC Power Distribution Center – East	22	14	50	16	700	N 3,728,524.871 m E 666,669.634 m EL 536. ft	Under ACC (Item 3)
Fire Water Pump House	28	36	12	12	432	N 3,728,536.452 m E 666,497.764 m EL 542. ft	
Demineralized Water Storage Tank	31	26	N/A	26	N/A	N 3,728,543.306 m E 666,531.209 m EL 541. ft	Round[5], ~95,000 gal
Service/ Firewater Storage Tank	34	40	N/A	30	N/A	N 3,728,543.440 m E 666,510.945 m EL 541. ft	Round[5], ~260,000 gal
Mirror Wash Water Storage Tank	54	25	N/A	21	N/A	N 3,728,538.415 m E 666,575.050 m EL 539. ft	Round[5], ~70,000 gal

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TABLE 3
Building and Structure Dimensions, Power Block #2

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Boiler Pump Power Distribution Center	80	50	14	16	700	N 3,728,539.672 m E 666,586.797 m EL 538. ft	
Waste Water Storage Tank	42	25	N/A	23	N/A	N 3,728,516.010 m E 666,530.486 m EL 540. ft	Round[5], ~75,000 gal
Water Treatment Power Distribution Center	43	30	14	16	420	N 3,728,521.904 m E 666,528.754 m EL 541. ft	
Night Preservation Auxiliary Boiler	9	10	12	12	N/A	N 3,728,562.772 m E 666,534.875 m EL 540. ft	~ 10,000 lbs/hr, 10 MMBtu/hr
Start-up Auxiliary Boiler	8	14	56	16	N/A	N 3,728,555.508 m E 666,497.493 m EL 542. ft	~ 185,000 lbs/hr, 249 MMBtu/hr
Mirror Wash Vehicle Refueling and Storage Area Canopy	6	74	116	24	N/A	N 3,728,498.175 m E 666,564.065 m EL 540. ft	Open Structure, Flat Roof
Mirror Wash Vehicle Storage Area Canopy	44	40	184	20	N/A	N 3,728,488.153 m E 666,608.918 m EL 539. ft	Open Structure, Flat Roof

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TABLE 3
Building and Structure Dimensions, Power Block #2

Description	Item Number[1]	Length N to S (feet)	Width E to W (feet)	Height (feet)	Building Area[2] (sq. feet)	Location[3] UTM Coordinates (m) (NAD 83) Elevation (ft)	Remarks
Wet Surface Air Cooler (WSAC)	36	48	36	26	N/A	N 3,728,493.879 m E 666,507.223 m EL 542. ft	
Thermal Evaporation Unit	72	34	18	64	N/A	N 3,728,500.139 m E 666,527.445 m EL 542. ft	Open Structure
Residue Tank	70	12	N/A	13	N/A	N 3,728,493.124 m E 666,527.610 m EL 542. ft	Round[5], ~ gal
Water Treatment Building	N/A	66	90	26	5940	N 3,728,510.808 m E 666,492.076 m EL 542. ft	Sloped Roof[4]
Generator Step-up Transformer	23	12	26	22	N/A	N 3,728,637.201 m E 666,614.508 m EL 535. ft	
Drains Tank	75	12	N/A	13	N/A	N 3,728,550.174 m E 666,577.028 m EL 542. ft	Round[5], ~ gal

Notes:
1 Reference Drawing P-1000A, Attachment B
2 Building area provided for enclosed buildings only.
3 Location: Coordinates of southwest corner of rectangular objects and center of round objects.
4 Height for sloped roof is to peak.
5 For round structures the length is the structure's diameter.

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APPENDIX 2-B

EVAPORATION POND DESIGN BASIS

Evaporation Ponds

Overview

To reduce water usage the Palen Solar Electric Generating System (PSEGS) will treat and recycle water. The water that cannot be recycled will be evaporated in two, two-acre evaporation ponds located adjacent to the permanent common area facilities.

Project Description

The PSEGS consists of two power blocks each surrounded by a solar field of heliostats reflecting the sun's energy to the solar receiver steam generator (SRSG) located atop the solar tower in the power block. Energy in the form of steam flows from the SRSG to a steam turbine generator where it is converted into electrical energy and transmitted to the electrical grid.

This process requires water for the steam cycle and for washing the heliostat mirrors periodically. Groundwater used as the water source for this process must be treated to reduce the concentrations of non-water constituents. The recycling of water also requires the reduction of non-water constituents. These two streams of non-water constituents are considered waste water and will be further concentrated and disposed of through evaporation.

The PSEGS also includes a common area consisting of an administration building and control room, maintenance shops, parking and supporting facilities. The use and treatment of ground water in this area will also result in a waste water stream that will have to be concentrated and disposed of through evaporation.

Waste Water

According to the water balance prepared for the PSEGS the following estimated quantities of waste water will be generated.

PSEGS Waste Water Quantities	
Source	**Quantity (Gallons/Minute)**
Power Block 1	1.94
Power Block 2	1.94
Common Area	0.35
TOTAL	4.23

The following Table provides the estimated maximum concentrations of the non-water constituents of this waste water:

Maximum Residue Dissolved Constituent Concentrations for Discharge to Evaporation Ponds			
Constituent	**Concentration (mg/L)**	**Constituent**	**Concentration (mg/L)**
Arsenic	0.43	Iron	11

Maximum Residue Dissolved Constituent Concentrations for Discharge to Evaporation Ponds			
Constituent	**Concentration (mg/L)**	**Constituent**	**Concentration (mg/L)**
Barium	3	Manganese	0.7
Chromium	0.2	Fluoride	140
Copper	2	Chloride	25,000
Molybdenum	2	Nitrate, as N	0.15
Nickel	0.4	Sulfate	15,000
Selenium	0.2	Phosphate	2
Zinc	12	Alkalinity, as $CaCO_3$	4,200
Calcium	3,000	Silica	1,200
Magnesium	640	pH	5-7
Sodium	20,500	TDS	72,000
Potassium	370		

Evaporation

The PSEGS's desert location with high evaporation rates and low rainfall are ideal for the use of evaporation ponds. The following Table quantifies the monthly evaporation and precipitation rates in the vicinity of the project.

Project Site Evaporation and Precipitation Data		
Month	**Pan Evaporation[1] (Inches/Month)**	**Precipitation[2] (Inches/Month)**
January	3.39	0.52
February	4.88	0.61
March	8.13	0.45
April	11.49	0.13
May	14.75	0.09
June	16.98	0.01
July	17.97	0.48
August	16.23	0.81
September	12.38	0.40
October	8.69	0.20

Project Site Evaporation and Precipitation Data		
Month	**Pan Evaporation[1] (Inches/Month)**	**Precipitation[2] (Inches/Month)**
November	4.76	0.20
December	3.12	0.58
TOTAL	122.77	4.48
Sources: 1 Pan evaporation data averaged for Death Valley and Indio Fire Station, http://www.wrcc.dri.edu/htmlfiles/westevap.final.html 2 Precipitation data used for Joshua Tree National Park, http://www.weather.com/weather/wxclimatology/monthly/graph/CANPJT:13		

While the data indicates an estimated net yearly evaporation rate of 118.29 inches (122.77 – 4.48), a salinity correction factor (SCF) is applied based on the concentration of total dissolved solids (TDS). With a maximum TDS concentration of 72,000 mg/L, the SCF is estimated to be 0.954. This adjustment reduces the net yearly evaporation rate to 112.64 inches (122.77 x 0.954 – 4.48).

Codes and Regulations

The primary code requirements for the evaporation ponds are contained in California Code of Regulations (CCRs), Title 27, CCR §20200 et seq. Under this code the evaporation ponds are considered Class II Surface Impoundment Waste Management Units. This code requires that each pond include a leachate collection recovery system to aid in the monitoring of the upper (primary) liner and pond maintenance.

Pond Sizing

The ponds will be designed to accumulate the solids over the 30 year life of the plant without need for periodic removal of solids. Based on the inflow of 4.23 gallons per minute and net yearly evaporation rate of 112.64 inches per year a pond size of 1.5 acres is necessary. The ponds will be 6.0 feet deep. Over the 30 year life of the ponds, this will result in a maximum water depth of 1.0 feet and an ultimate salt depth of 3.2 feet. A 100-yr, 24-hour storm event is estimated by NOAA to yield 0.4 feet (4.22 inches) of rain. A minimum freeboard of 1.0 foot will be maintained during the life of the ponds.

While a single 1.5 acre pond would be adequate for the project, two ponds of 2.0 acres each will be constructed. This approach includes both a 25 percent safety factor for each pond and redundancy in the event that a pond becomes unusable.

Pond Design

The evaporation ponds will be constructed in accordance the applicable requirements of California Code of Regulations (CCRs), Title 27. The containment design for the evaporation ponds, from the surface of the evaporation ponds downwards, consists of the following:

- A primary liner protective layer;
- A primary 60 mil high density polyethylene (HDPE) liner;
- A leachate collection and recovery system (LCRS) comprising a geonet and collection sump;
- A secondary HDPE liner (minimum of 40 mil);

- A base layer consisting of either a geosynthetic clay liner (GCL) or 2 feet of onsite material with a hydraulic conductivity of less than 1 x 10-6 cm/sec of which at least 30%, by weight, shall pass through a No. 200 Standard sieve; and
- An adequately prepared subgrade.

The area where each pond is constructed will be graded level. The design will balance the amount of material excavated to the area filled to provide the pond's earthen berms. The berm slopes will be appropriate for the soils used and no greater than 3 horizontal to 1 vertical. Each berm will be 12 to 15 feet wide at the top. The pond design will incorporate the applicable seismic design requirements.

Pond Location

The ponds will be located north and adjacent to the common area permanent facilities.

Leachate Collection and Recovery System

A leachate collection and recovery system will be designed and installed in accordance with the requirements of CCR, Title 27 Section 20340, SWRCB—Leachate Collection and Removal System (LCRS).

Bird Netting

A bird netting system to preclude water fowl from accessing the evaporation ponds will be installed. The system will include supporting wooden poles, a cable array and a net of the appropriate mesh size made from synthetic material.

Monitoring Wells

Test wells will be installed adjacent to the evaporation ponds in accordance with the applicable regulations to monitor the pond liner's performance.

APPENDIX 2-C

CONSTRUCTION PERSONNEL AND TRAFFIC BY MONTH

Construction Personnel and Traffic by Month[1]

CLIENT: BrightSource Industries Israel
PROJECT: Palen Solar Electric Generating System
DOCUMENT: 459892-PSEGS-DOC-006

BY: CH2M HILL
REV: 0
DATE: 4 DEC 2012

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	TOTAL
	10/13	11/13	12/13	1/14	2/14	3/14	4/14	5/14	6/14	7/14	8/14	9/14	10/14	11/14	12/14	1/15	2/15	3/15	4/15	5/15	6/15	7/15	8/15	9/15	10/15	11/15	12/15	1/16	2/16	3/16	4/16	5/16	6/16	
PROJECT SITE																																		
Craft Day Shift																																		
Boilermaker	0	0	4	4	5	7	9	11	11	11	12	14	30	33	45	53	64	84	110	139	163	192	191	179	152	126	98	73	53	38	30	26	16	**1,967**
Carpenters	1	3	8	10	16	30	50	57	67	79	82	93	88	90	87	82	78	73	69	63	53	52	44	36	33	28	23	17	13	11	9	8	5	**1,453**
Cement Finisher	0	3	1	2	2	5	7	8	10	12	13	13	13	13	13	13	13	11	10	9	7	7	6	5	4	4	3	2	1	1	1	1	1	**213**
Electrician	1	4	5	8	10	20	34	38	37	34	36	38	45	60	70	76	85	106	136	173	209	255	250	240	220	191	159	119	93	76	60	51	31	**2,939**
Iron Worker	0	0	0	5	10	3	13	18	26	35	41	49	53	59	64	67	72	77	81	82	76	75	65	52	53	42	33	24	17	13	11	11	7	**1,227**
Laborer	4	6	13	15	23	37	58	67	74	80	93	95	90	91	83	80	80	81	81	77	65	59	49	41	42	36	30	21	18	15	13	13	8	**1,630**
Millwright	0	0	0	2	3	5	1	1	1	0	2	2	21	27	42	50	55	64	73	81	87	95	101	97	89	75	62	48	35	30	26	26	16	**1,201**
Equipment Operator	1	4	8	10	13	23	34	40	41	44	47	52	52	53	51	53	56	62	67	71	70	71	65	58	52	43	35	26	19	16	13	13	8	**1,263**
Pipefitter	0	0	11	13	17	33	41	46	51	57	63	69	80	89	104	119	141	179	226	272	314	368	361	339	294	247	200	146	110	88	67	59	36	**4,204**
Teamster	1	3	3	3	4	7	10	13	13	13	14	16	17	18	17	17	18	19	20	20	19	18	16	14	12	10	8	6	5	4	4	4	2	**366**
Craft-Day Shift Subtotal	**8**	**23**	**53**	**72**	**103**	**170**	**257**	**299**	**331**	**365**	**403**	**441**	**489**	**533**	**576**	**610**	**662**	**756**	**873**	**987**	**1063**	**1192**	**1148**	**1061**	**951**	**802**	**651**	**482**	**364**	**292**	**234**	**212**	**130**	**16,463**
Non-craft Day Shift[2]																																		
Subcontractors	15	31	39	52	77	93	93	100	100	108	110	116	116	116	116	116	154	162	177	193	231	280	270	231	193	162	154	116	100	93	77	39	23	**4,030**
Owner + Others (non-manual)	13	13	27	28	32	47	64	66	70	75	84	93	99	103	104	104	105	108	108	108	108	111	107	107	94	93	91	65	56	44	35	27	16	**2,389**
Startup (non-manual) Labor	0	0	0	0	0	0	0	2	2	3	3	4	5	4	4	4	4	4	4	5	6	6	6	6	6	6	5	5	5	5	3	3	2	**110**
Compliance Support	77	77	29	29	29	29	29	29	29	29	29	29	29	29	29	77	77	29	29	19	19	20	10	10	5	5	5	5	5	5	5	5	3	**861**
Transmission Line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	36	0	0	0	0	0	0	0	0	0	0	**73**
Gas Line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	**30**
Linear Compliance Support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	0	0	0	0	0	0	0	0	0	0	**9**
Non-craft Day Shift Subtotal	**105**	**121**	**95**	**109**	**138**	**169**	**186**	**197**	**201**	**215**	**226**	**242**	**249**	**252**	**253**	**301**	**340**	**303**	**318**	**325**	**364**	**490**	**432**	**354**	**298**	**266**	**255**	**191**	**166**	**147**	**120**	**74**	**44**	**7,502**
TOTAL PROJECT SITE DAY SHIFT	**113**	**144**	**148**	**181**	**241**	**339**	**443**	**496**	**532**	**580**	**629**	**683**	**738**	**785**	**829**	**911**	**1,002**	**1,059**	**1,191**	**1,312**	**1,427**	**1,682**	**1,580**	**1,415**	**1,249**	**1,068**	**906**	**673**	**530**	**439**	**354**	**286**	**174**	**23,965**
Craft Swing Shift																																		
Boilermaker	0	0	0	0	2	2	2	3	3	3	3	4	9	11	14	17	22	30	40	51	61	72	72	67	66	54	42	31	22	16	13	12	7	**744**
Carpenters	1	1	4	5	7	9	13	16	20	24	26	32	33	33	32	31	31	30	29	27	23	23	20	17	14	12	10	7	6	5	4	4	2	**549**
Cement Finisher	0	1	1	1	1	1	2	2	3	3	3	4	4	4	4	5	4	4	4	4	3	2	2	2	2	1	1	1	1	1	1	1	1	**73**
Electrician	0	1	2	3	5	9	14	16	17	16	18	18	23	27	31	34	37	44	57	72	86	104	102	97	94	82	67	51	40	33	25	22	13	**1,247**
Iron Worker	0	0	0	0	5	19	22	25	27	33	35	35	38	40	42	44	46	48	51	51	49	51	46	40	23	18	14	10	7	6	5	4	2	**834**
Instrument Tech	0	0	0	0	0	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	0	0	0	0	0	0	0	**228**
Laborer	2	5	6	6	8	3	12	16	18	21	25	27	28	29	27	27	27	28	30	28	24	23	18	15	18	15	13	10	8	7	6	6	4	**536**
Millwright	0	0	0	0	1	9	10	10	10	10	10	11	16	18	24	26	28	32	36	40	42	46	48	46	38	32	27	21	15	13	12	12	7	**643**
Equipment Operator	0	2	3	4	6	6	11	13	14	15	17	19	19	21	21	21	23	26	29	31	30	31	28	26	22	18	15	11	9	7	6	5	3	**509**
Pipefitter	0	0	6	7	9	2	9	11	13	15	20	21	24	28	35	40	48	64	81	100	119	140	137	126	124	107	86	64	47	37	29	24	14	**1,573**
Teamster	0	0	1	1	2	2	3	4	4	4	6	6	6	6	6	6	6	7	7	8	7	7	6	5	5	4	3	2	2	2	1	1	1	**130**
Craft-Day Shift Subtotal	**3**	**10**	**23**	**27**	**46**	**74**	**110**	**128**	**141**	**156**	**175**	**189**	**212**	**229**	**248**	**263**	**284**	**325**	**376**	**424**	**456**	**511**	**491**	**453**	**406**	**343**	**278**	**208**	**157**	**127**	**102**	**91**	**54**	**7,066**
Non-craft Swing Shift[2]																																		
Subcontractors	4	8	10	13	19	23	23	25	25	27	29	29	29	29	29	29	39	40	44	48	58	70	67	58	48	40	39	29	25	23	19	10	6	**1,008**
Owner + Others (non-manual)	3	4	7	7	8	12	15	16	17	19	23	23	25	26	26	26	26	27	27	27	27	28	27	27	24	23	23	16	13	11	9	7	4	**599**
Startup (non-manual) Labor	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	**29**
Non-craft Swing Shift Subtotal	**7**	**12**	**17**	**20**	**27**	**35**	**38**	**41**	**43**	**47**	**53**	**53**	**55**	**56**	**56**	**56**	**66**	**68**	**72**	**76**	**87**	**100**	**96**	**87**	**74**	**64**	**63**	**46**	**39**	**35**	**29**	**18**	**11**	**1,636**
TOTAL PROJECT SITE SWING SHIFT	**10**	**22**	**40**	**47**	**73**	**109**	**148**	**169**	**184**	**203**	**228**	**242**	**267**	**285**	**304**	**319**	**350**	**393**	**448**	**500**	**543**	**611**	**587**	**540**	**480**	**407**	**341**	**254**	**196**	**162**	**131**	**109**	**65**	**8702**
SUBTOTAL ONSITE	**123**	**166**	**188**	**228**	**314**	**448**	**591**	**665**	**716**	**783**	**857**	**925**	**1,005**	**1,070**	**1,133**	**1,230**	**1,352**	**1,452**	**1,639**	**1,812**	**1,970**	**2,293**	**2,167**	**1,955**	**1,729**	**1,475**	**1,247**	**927**	**726**	**601**	**485**	**395**	**239**	**32,667**
OFFSITE LINEARS																																		
Transmission Line	0	3	3	3	14	35	39	28	10	10	6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**156**
Gas Line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	12	12	12	12	12	8	0	0	0	0	0	0	0	0	0	**72**
Linear Compliance Support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6	6	7	4	4	4	0	2	0	0	0	0	0	**45**
TOTAL OFFSITE LINEARS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**5**	**29**	**40**	**61**	**18**	**19**	**12**	**4**	**4**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**273**
TOTAL WORKFORCE	**123**	**166**	**188**	**228**	**314**	**448**	**591**	**665**	**716**	**783**	**857**	**925**	**1,005**	**1,070**	**1,133**	**1,230**	**1,357**	**1,457**	**1,668**	**1,852**	**2,031**	**2,311**	**2,186**	**1,967**	**1,733**	**1,479**	**1,247**	**929**	**726**	**601**	**485**	**395**	**239**	**32,940**
Car Pool % (Day-shift Only)[3]	**7.5%**																																	
Worker (day shift)	100	131	121	153	209	292	379	428	460	502	542	586	634	678	721	803	893	947	1079	1199	1313	1492	1428	1302	1149	969	810	603	469	390	316	256	156	**21,254**
Worker Vehicles	93	121	112	142	193	270	351	396	426	464	501	542	586	627	667	743	826	876	998	1109	1215	1380	1321	1204	1063	896	749	558	434	361	292	237	144	**19,660**

Construction Personnel and Traffic by Month[1]

CLIENT: BrightSource Industries Israel | BY: CH2M HILL
PROJECT: Palen Solar Electric Generating System | REV: 0
DOCUMENT: 459892-PSEGS-DOC-006 | DATE: 4 DEC 2012

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	TOTAL
	10/13	11/13	12/13	1/14	2/14	3/14	4/14	5/14	6/14	7/14	8/14	9/14	10/14	11/14	12/14	1/15	2/15	3/15	4/15	5/15	6/15	7/15	8/15	9/15	10/15	11/15	12/15	1/16	2/16	3/16	4/16	5/16	6/16	
Monthly Truck Traffic																																		**TOTAL**
Equipment & Materials	35	35	440	440	420	407	472	438	411	112	120	133	148	141	137	165	171	135	127	122	98	94	91	65	55	43	36	28	28	10	8	6	4	**5,136**
Concrete[4]	0	20	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	5	5	0	0	0	0	0	0	0	0	0	**130**
Heliostat Components	0	0	0	0	245	245	245	245	245	245	246	246	246	246	246	246	246	245	245	245	245	245	245	0	0	0	0	0	0	0	0	0	0	**4,662**
TOTAL TRUCK TRAFFIC	35	55	480	440	665	652	717	683	656	357	366	379	394	387	383	411	417	400	382	377	353	349	341	70	55	43	36	28	28	10	8	6	4	**9,928**
Average Daily Trucks (rounded)	**2**	**3**	**30**	**28**	**42**	**41**	**45**	**43**	**41**	**22**	**23**	**24**	**25**	**24**	**24**	**26**	**26**	**25**	**24**	**24**	**22**	**22**	**21**	**4**	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**0**	**0**	

Notes: [1] Based on revised Hidden Hills Project Data submitted to CEC on 1 October 2012

[2] Non-craft workers are the non-union superintendents and construction personnel on site.

[3] Car Pool includes Day-shift Craft Workers + Subcontractor Non-craft Workers + Compliance Support

[4] Concrete deliveries based on concrete deliveries from an onsite concrete batch plant from months 4 to 17.

APPENDIX 2-D

PRELIMINARY CIVIL DESIGN PACKAGE

PALEN
SOLAR ELECTRIC GENERATION STATION
RIVERSIDE COUNTY, CALIFORNIA

PROJECT INFORMATION

SITE ADDRESS:	PALEN SOLAR ELECTRIC GENERATION STATION RIVERSIDE COUNTY, CALIFORNIA
OWNER/DEVELOPER:	BRIGHT SOURCE ENERGY 1999 HARRISON STREET SUITE 2150 OAKLAND, CALIFORNIA 94612 ATTN: MICHAEL ROJANSKY, PE TEL. (925) 451-9569
ENGINEER:	CH2MHILL 1000 ABERNATHY ROAD SUITE 1600 ATLANTA, GEORGIA 30328 ATTN: DAVID E. MICKANEN, PE TEL. (678) 530-4495
HYDROLOGY:	VTN CONSULTING 2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 DATED SEPT. 29, 2010 ATTN: BRIAN T. RUIZ, PE TEL. (702) 873-7550
SOILS/GEOTECTNICAL ENGINEER:	KLEINFELDER WEST, INC. 1370 VALLEY VISTA DRIVE DIAMOND BAR, CALIFORNIA 91765 REPORT DATED: SEPTEMBER 16, 2009 ATTN: DARRIN G. HASHAM, PG, CEG TEL. (909) 396-0335
UNDERGROUND UTILITY LOCATOR:	UNDERGROUND SERVICE ALERT (USA) OF SOUTHERN CALIFORNIA P.O. BOX 77070 CORONA, CALIFORNIA 92877 (800) 227-2600

PROJECT LOCATION

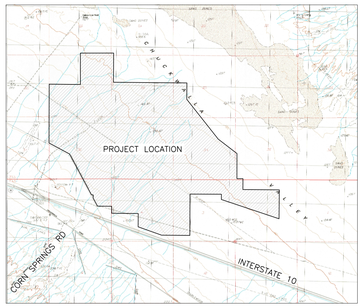
THE PROJECT SITE IS LOCATED ON THE NORTH SIDE OF INTERSTATE 10 AT CORN SPRINGS ROAD WITHIN SECTIONS 27, 28, 29, 32, 33, AND 34 OF TOWNSHIP 5 SOUTH, RANGE 17 EAST AND SECTIONS 2, 3, 4, AND 5 OF TOWNSHIP 6 SOUTH, RANGE 17 EAST.

BENCHMARK

BENCHMARK IS THE SIDEWINDER NGS MONUMENT SOUTH OF INTERSTATE 10 NEAR CORN SPRINGS ROAD.

NAD83, CCS83, ZONE 6, IN FEET
N 2,191,644.389
E 6,869,272.108

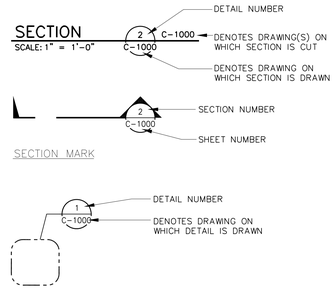
PLANT GRID SYSTEM IN FEET
N 70,000.00
E 30,000.00



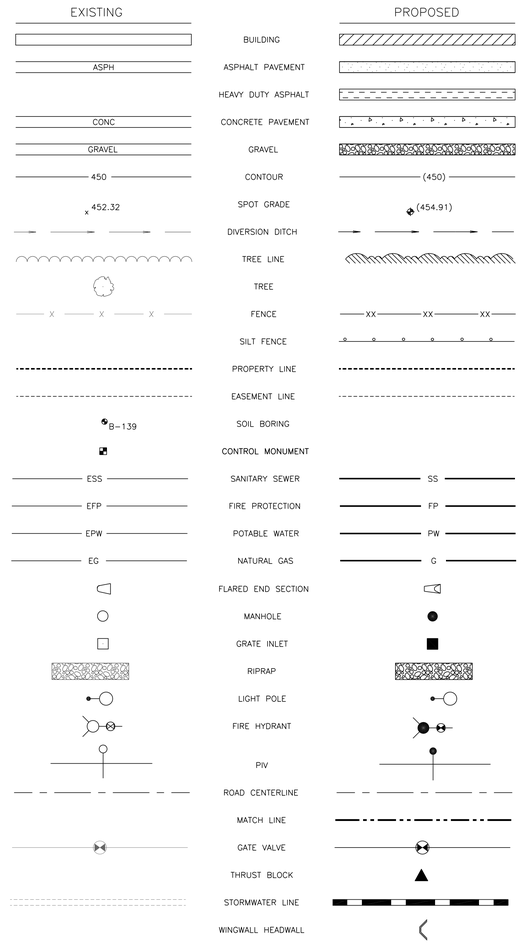
VICINITY MAP
SCALE: NTS

NORTH

DRAWING SYMBOLS



CIVIL LEGEND



DRAWING LIST

C-0001	CIVIL PROJECT INFORMATION, ABBREVIATIONS, LEGEND, NOTES, VICINITY MAP AND CONTROL DATA
C-0010	CIVIL MANUFACTURING AREA CONSTRUCTION PHASE SITE PLAN
C-0020	CIVIL SOLAR TOWER UNIT-1 CONSTRUCTION PHASE SITE PLAN
C-0030	CIVIL SOLAR TOWER UNIT-2 CONSTRUCTION PHASE SITE PLAN
C-1000	CIVIL OVERALL SITE PLAN
C-1001	CIVIL PARTIAL SITE PLAN 1
C-1002	CIVIL PARTIAL SITE PLAN 2
C-1003	CIVIL PARTIAL SITE PLAN 3
C-1004	CIVIL PARTIAL SITE PLAN 4
C-1005	CIVIL PARTIAL SITE PLAN 5
C-1010	CIVIL COMMON AREA ENLARGED SITE PLAN
C-1020	CIVIL SOLAR TOWER UNIT-1 ENLARGED SITE PLAN
C-1030	CIVIL SOLAR TOWER UNIT-2 ENLARGED SITE PLAN
C-2000	CIVIL OVERALL GRADING AND DRAINAGE PLAN
C-2010	CIVIL COMMON AREA ENLARGED GRADING AND DRAINAGE PLAN
C-2020	CIVIL SOLAR TOWER UNIT-1 ENLARGED GRADING AND DRAINAGE PLAN
C-2030	CIVIL SOLAR TOWER UNIT-2 ENLARGED GRADING AND DRAINAGE PLAN
C-6000	CIVIL SECTIONS AND DETAILS SHEET 1
C-6001	CIVIL SECTIONS AND DETAILS SHEET 2

ABBREVIATIONS

ADA	AMERICAN WITH DISABILITIES ACT	LP	LIGHT POLE
ASPH	ASPHALT	MH	MANHOLE
ASTM	ASTM INTERNATIONAL	N	NORTH OR NORTHING
AWWA	AMERICAN WATER WORKS ASSOCIATION	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
BM	BENCHMARK	NG	NATURAL GAS
BP	BEGINING POINT	NTS	NOT TO SCALE
CI	CURB INLET	OC	ON CENTER
CL	CLASS OR CENTERLINE	OD	OUTSIDE DIAMETER
CO	COMPANY	OE	OVERHEAD ELECTRICAL
CONC	CONCRETE	PC	POINT OF CURVATURE
CONTR	CONTRACTOR	PI	POINT OF INTERSECTION
COR	CORNER	PIV	POST INDICATOR VALVE
DIP	DUCTILE IRON PIPE	PP	UTILITY POLE
DWG	DRAWING EL ELEVATION	PRC	POINT OF REVERSE CURVE
E	EAST OR EASTING	PSI	POUNDS PER SQUARE INCH
ECE	END CENTER ELEVATION	PSF	POUNDS PER SQUARE FEET
ELEC	ELECTRICAL	PT	POINT OF TANGENCY
EOP	EDGE OF PAVEMENT	PVC	POLY VINYL CHLORIDE
EP	END POINT	PVC	POINT OF VERTICAL CURVE
EQ	EQUAL	PVI	POINT OF VERTICAL INTERSECTION
EW	EACH WAY	PVMT	PAVEMENT
EXIST	EXISTING	PVT	POINT OF VERTICAL TANGENCY
FFE	FINISHED FLOOR ELEVATION	PW	POTABLE WATER
FH	FIRE HYDRANT	R	RADIUS
FP	FIRE PROTECTION	RCP	REINFORCED CONCRETE PIPE
FT	FEET	R.O.W	RIGHT-OF-WAY
G	GAS	S	SOUTH
GALV	GALVANIZED	SAN	SANITARY
GI	GRATE INLET	SCE	START CENTER ELEVATION
GM	GAS METER	SD	STORM DRAIN
GR	GRADE (SLOPE)	SQ	SQUARE
GV	GAS VALVE	SS	SECTION SECT SANITARY SEWER
HD	HEAVY DUTY	STA	STATION
HDAP	HEAVY DUTY ASPHALT PAVEMENT	T/C	TOP OF CURB ELEVATION
HDPE	HIGH DENSITY POLYETHYLENE	T/G	TOP OF GRATE ELEVATION
HP	HIGH POINT	T/P	TOP OF PAVEMENT ELEVATION
IE	INVERT ELEVATION	THW	TOP OF HEADWALL
INV	INVERT	TYP	TYPICAL
L	LENGTH	U/G	UNDERGROUND
		W	WEST

CALTRANS STANDARD SPECIFICATIONS

SECTION	TITLE
16	CLEARING AND GRUBBING
19	EARTHWORK
21	EROSION CONTROL
22	FINISHING ROADWAY
25	AGGREGATE SUBBASES
26	AGGREGATE BASES
28	CONCRETE BASES
37	BITUMINOUS SEALS
39	HOT MIX ASPHALT
40	CONCRETE PAVEMENT
61	CULVERT AND DRAINAGE PIPE JOINTS
65	CONCRETE PIPE
73	CONCRETE CURBS AND SIDEWALKS
80	FENCES
84	TRAFFIC STRIPES AND PAVEMENT MARKINGS
88	GEOSYNTHETICS
90	CONCRETE
91	PAINT
92	ASPHALTS
93	LIQUID ASPHALTS
94	ASPHALTIC EMULSIONS
95	EPOXY

GENERAL NOTES

1. PALEN PLANT GROSS DEVELOPABLE LAND AREA = ±3,794 ACRES.
2. SITE IS LOCATED APPROXIMATELY 10 MILES EAST OF DESERT CENTER, RIVERSIDE COUNTY, NORTH OF INTERSTATE HIGHWAY 10 (I-10) NEAR THE CORN SPRINGS EXIT, APPROXIMATELY HALFWAY BETWEEN THE CITIES OF INDIO AND BLYTHE, CALIFORNIA.
3. ALL EXISTING SITE INFORMATION: TOPOGRAPHY, BUILDING LOCATIONS, ROADS AND PAVEMENT LOCATIONS, SITE UTILITIES, AND PROPERTY LINE INFORMATION WERE OBTAINED FROM OWNER PROVIDED DOCUMENTS/DRAWINGS.
4. ALL WORK SHALL BE PERFORMED IN A WORKMANLIKE MANNER TO THE ENTIRE SATISFACTION OF THE OWNER AND IN ACCORDANCE WITH THE BEST RECOGNIZED TRADE PRACTICES.
5. IT IS RECOMMENDED THAT CONTRACTOR VISIT THE SITE AND MAKE ANY INVESTIGATIONS NECESSARY TO DETERMINE THE EXTENT OF THE WORK REQUIRED TO CONSTRUCT THE PROJECT.
6. ANY DAMAGE TO EXISTING IMPROVEMENTS, SUCH AS, BUT NOT LIMITED TO, DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURB, ETC. CAUSED BY THE CONTRACTOR DURING CONSTRUCTION, SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
7. ENGINEER SHALL BE NOTIFIED A MINIMUM OF FORTY-EIGHT (48) HOURS FOR SITE INSPECTIONS, TESTING VERIFICATIONS, AND FOR ANY OTHER PORTION OF THE WORK REQUIRING ENGINEERS SERVICES AT SITE.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR THE GENERAL SAFETY DURING CONSTRUCTION, AND ALL WORK SHALL CONFORM TO PERTINENT SAFETY REGULATIONS AND CODES. CONTRACTOR SHALL FENCE AND/OR BARRICADE THE CONSTRUCTION AREA AS REQUIRED TO PROTECT ADJACENT PLANT AREAS, VEHICULAR TRAFFIC, AND PEDESTRIAN TRAFFIC. CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE PROVISIONS OF OSHA AND NRS CHAPTER 618, IN THE CONSTRUCTION PRACTICES FOR ALL EMPLOYEES DIRECTLY ENGAGED N THE CONSTRUCTION ON THIS PROJECT.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE SITE IN A NEAT AND ORDERLY MANNER THROUGHOUT THE CONSTRUCTION PROCESS. ALL MATERIALS SHALL BE STORED WITHIN APPROVED CONSTRUCTION AREAS.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LAYOUTS OF LINES AND GRADES FROM CONTROL PROVIDED BY A SURVEYOR, LICENSED IN THE STATE OF CALIFORNIA.
11. ALL WORK SHALL COMPLY WITH APPLICABLE STATE, FEDERAL AND LOCAL CODES. ALL NECESSARY LICENSES AND/OR PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AT HIS EXPENSE.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL MEASUREMENTS AND DIMENSIONS PRIOR TO ORDERING ANY MATERIALS OR CONDUCTING ANY WORK.
13. CONSTRUCTION ACCESS TO BE AT DESIGNATED LOCATIONS ONLY. CONTACT OWNER'S REP. FOR SPECIFIC INSTRUCTIONS.
14. HAUL PERMITS, WHEN REQUIRED, MUST BE OBTAINED BY CONTRACTOR PRIOR TO WORK.
15. WORK SHALL BE IN ACCORDANCE WITH THE 2010 CALTRANS STANDARD SPECIFICATIONS.
16. ALL WORK SHALL COMPLY WITH RIVERSIDE COUNTY STANDARDS AND SPECIFICATIONS ORDINANCE 461.
17. ALL WORK SHALL COMPLY WITH THE 2010 CALIFORNIA BUILDING CODE.

DEMOLITION NOTES

1. VISIT SITE AND DETERMINE EXTENT OF DEMOLITION REQUIRED.
2. COORDINATE AND SCHEDULE DEMOLITION WORK WITH OTHER WORK ALREADY UNDER CONTRACT. COORDINATE DEMOLITION TO ACCOMMODATE OWNER'S OPERATIONS AND MAINTAIN SITE SECURITY/SAFETY.
3. LOCATE AND MARK ALL EXISTING UTILITY LINES WHETHER TO BE PROTECTED OR ABANDONED.
4. CONTRACTOR SHALL REMOVE ALL DEMOLISHED MATERIALS FROM THE SITE, DISPOSE OF UNSALVAGED DEMOLISHED MATERIALS OFF SITE IN A LEGAL MANNER. ALL FEES REQUIRED FOR DISPOSAL ARE TO BE INCLUDED AS PART OF THIS PROJECT.
5. STOCKPILE SALVAGED DEMOLISHED MATERIALS ON SITE AS DIRECTED BY OWNER OR OWNERS AGENT.
6. DO NOT DISTURB EXISTING UTILITIES TO REMAIN IN SERVICE. DO NOT REMOVE EXISTING UTILITES TO BE DEMOLISHED UNTIL PROPOSED UTILITY CONSTRUCTION IS COMPLETED AND IN SERVICE.
7. SAW CUT EXISTING PAVEMENT AT LIMITS OF DEMOLITION OR REMOVE TO THE NEXT NEAREST JOINT BEYOND LIMITS OF DEMOLITION, IF CONCRETE. REPLACE PAVEMENT WHEN REMOVAL EXTENDS BEYOND LIMITS OF DEMOLITION.
8. ANY DAMAGE TO EXISTING FACILITIES, PAVEMENT, UTILITIES OR STRUCTURES AS A RESULT OF DEMOLITION OPERATIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
9. REPAIR OR REPLACE DAMAGED ITEMS NOT DESIGNATED TO BE DEMOLISHED. RESTORE TO ORIGINAL CONDITION AT NO ADDITIONAL COST TO OWNER.
10. PROTECT VEGETATION NOT IDENTIFIED FOR REMOVAL..

GRADING AND DRAINAGE NOTES

1. THE SOILS ENGINEER SHALL CERTIFY THAT THE REQUIRED INSPECTIONS AND TESTS HAVE BEEN PERFORMED AND THAT SUCH TESTS COMPLY WITH CODE.
2. CONSTRUCTION SHALL COMPLY WITH GOVERNING CODES AND REQUIREMENTS. CONTRACTOR SHALL CONDUCT ALL REQUIRED TESTS TO THE SATISFACTION OF THE UTILITY COMPANIES AND OWNERS INSPECTING AUTHORITIES.
3. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE EXCAVATION AND BUILDING CODE REQUIREMENTS OF RIVERSIDE COUNTY. ANY VIOLATION WILL RESULT IN THE STOPPAGE OF ALL WORK UNTIL THE VIOLATION IS CORRECTED.
4. EXERCISE SUFFICIENT SUPERVISORY CONTROL DURING GRADING AND CONSTRUCTION TO ENSURE COMPLIANCE WITH THE APPROVED PLANS.
5. SLOPES SHALL BE NO STEEPER THAN 3 HORIZONTAL TO 1 VERTICAL UNLESS OTHERWISE NOTED ON THE PLANS.
6. FILLS SHALL BE COMPACTED THROUGHOUT TO AT LEAST 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM SOIL COMPACTION TEST D1557.
7. FILL AREAS SHALL BE CLEARED OF ALL VEGETATION AND DEBRIS, SCARIFIED, HAVE SUBDRAINS INSTALLED (IF ANY) AND APPROVED BY THE GRADING INSPECTOR AND SOILS ENGINEER PRIOR TO THE PLACING OF FILL.
8. APPROVED PROTECTION MEASURES AND TEMPORARY DRAINAGE PROVISIONS MUST BE USED TO PROTECT ADJOINING PROPERTIES DURING THE GRADING PROJECT.
9. DUST SHALL BE CONTROLLED BY WATERING TO THE SATISFACTION OF THE GRADING INSPECTOR.
10. ALL PUBLIC STREETS SHALL BE MAINTAINED FREE OF DUST AND MUD CAUSED BY GRADING OPERATIONS.
11. COMPLY WITH ALL REQUIREMENTS OF THE KLEINFELDER GEOTECHNICAL INVESTIGATION REPORT DATED 16 SEPTEMBER 2009.
12. NO ROCK OR SIMILAR MATERIAL GREATER THAN 6" IN DIAMETER SHALL BE PLACED IN THE FILL UNLESS APPROVED BY THE ENGINEER.
13. ALL NEWLY GRADED SURFACES SHALL HAVE A MINIMUM SLOPE OF 1% AWAY FROM FOUNDATIONS OR AS SHOWN ON PLANS.
14. CONTRACTOR SHALL INCORPORATE ADEQUATE DRAINAGE PROCEDURES DURING THE CONSTRUCTION PROCESS TO ELIMINATE EXCESSIVE PONDING AND/OR EROSION.
15. DEGREE OF COMPACTION OR RELATIVE COMPACTION SHALL BE DETERMINED BY ASTM SOIL COMPACTION TEST D1557.

TRAFFIC CONTROL NOTES

1. COMPLY WITH THE 2010 EDITION OF THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CA MUTCD).
2. SUBMIT A TRAFFIC CONTROL PLAN TO THE LOCAL AUTHORITY IN ACCORDANCE WITH CA MUTCD REQUIREMENTS.
3. CONTRACTOR SHALL PROVIDE AND MAINTAIN ALL NECESSARY TRAFFIC CONTROL, THROUGHOUT CONSTRUCTION, IN ACCORDANCE WITH APPLICABLE PARTS OF CA MUTCD.
4. ALL TRAFFIC CONTROL DEVICES SHALL BE MADE AND ERECTED IN ACCORDANCE WITH REQUIREMENTS OF CA MUTCD.
5. FLAGGERS SHALL BE PROVIDED AS NECESSARY TO PROHIBIT WRONG DIRECTION OF TRAFFIC THRU WORK AREAS.
6. ALL PORTABLE MOUNTED SIGNS SHALL BE MOUNTED SO THAT BOTTOM OF SIGN IS BETWEEN 1' AND 3' ABOVE PAVEMENT EDGE. ALL TEMPORARY POST MOUNTED SIGNS SHALL BE MOUNTED SO THAT BOTTOM OF SIGN IS 7' MIN. ABOVE PAVEMENT EDGE.
7. WHEN CONSTRUCTION AREA HAS ENTRANCES/EXITS OR INTERSECTIONS, WORK SHALL BE PERFORMED IN SUCH A MANNER TO PERMIT TRAFFIC TO OPERATE WITH THE LEAST AMOUNT OF INCONVENIENCE AS POSSIBLE. ADDITIONAL CHANNELIZATION AND SIGNAGE SHALL BE INSTALLED, AS REQUIRED, TO ALLOW TRAFFIC TO REMAIN AS OPERATIONAL AS POSSIBLE. WHEN ENTRANCES/EXITS OR INTERSECTIONS ARE INOPERABLE, FLAGGERS SHALL BE UTILIZED TO CONTROL AND PROHIBIT MOVEMENT INTO THE PROJECT AT THAT POINT UNTIL CONSTRUCTION HAS CLEARED THE RESTRICTION SUFFICIENT TO RETURN TO OPERATIONAL STATUS.
8. WHEN NOT IN USE, PORTABLE SIGNS SHALL BE REMOVED FROM THE TRAVELWAY SO THAT THE MESSAGE IS NOT VISIBLE TO THE MOTORIST.
9. FOR NIGHTTIME OPERATIONS ALL CHANNELIZING DEVICES SHALL HAVE RETROREFLECTIVE MATERIAL OR FLASHING LIGHTS. SPACING AND TYPE OF DEVICE SHALL BE AS PER CA MUTCD. DURING DAYTIME HOURS ONLY, CONES (28" MIN.) MAY BE USED AS LONGITUDINAL CHANNELIZATION ONLY.
10. SIGN LOCATIONS SHALL BE AS PER CA MUTCD REQUIREMENTS, BUT MAY BE ADJUSTED TO MEET FIELD CONDITIONS, BUT MUST BE WITHIN LIMITATIONS SET FORTH IN CA MUTCD.

UTILITY PLAN NOTES

1. ALL UNDERGROUND UTILITIES SHOWN ON THESE DRAWINGS SHOULD BE CONSIDERED APPROXIMATE ONLY AND THE CONTRACTOR MUST NOTIFY A UTILITY LOCATOR SERVICE PRIOR TO CONSTRUCTION.
2. THE INFORMATION SHOWN ON THESE DRAWINGS CONCERNING TYPE AND LOCATION OF UNDERGROUND AND OTHER UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL-INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND AND OTHER UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. CONTRACTOR SHALL USE EXTREME CARE WHEN PERFORMING ANY DEMOLITION OR GRADING OPERATIONS IN THE PROXIMITY OF THESE EXISTING UTILITIES. ANY DAMAGE TO EXISTING UTILITIES WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. NOTIFY OWNER WHEN ANY UNIDENTIFIED UTILITIES ARE DISCOVERED.
3. OBTAIN WRITTEN AUTHORIZATION FROM THE OWNER'S REPRESENTATIVE AND FROM THE UTILITY OWNERS PRIOR TO INTERRUPTING ANY EXISTING UTILITY (IE: WATER, SEWER, GAS, ELECTRICAL, OR TELEPHONE).
4. TWO WORKING DAYS BEFORE YOU DIG, DRILL, OR BORE, CALL ONE-CALL SERVICE, DIGALERT 1-800-227-2600. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ONE CALL SERVICE.
5. VERIFY LOCATIONS AND INVERT ELEVATIONS AT ALL PIPE CROSSINGS, INTERSECTIONS, PLUGS, BENDS, AND ENDS OF PIPE FOR ALL NEW UTILITY CONSTRUCTION AND ANY EXISTING LINES PRIOR TO START OF CONSTRUCTION. MAKE MODIFICATIONS, IF REQUIRED, TO ENSURE THE CLEARANCE BETWEEN ALL UTILITES IS ADEQUATE, MEETS SPECIFICATIONS, AND TO AVOID CONFLICTS.
6. THE TOP ELEVATION OF MANHOLES CONSTRUCTED IN PAVED AREAS SHALL MATCH FINISH GRADE. THE TOP ELEVATION OF MANHOLES CONSTRUCTED IN GRASS AREAS SHALL BE SIX (6") INCHES ABOVE FINISH GRADE.
7. CONTRACTOR SHALL COORDINATE INSPECTION WITH APPROPRIATE AUTHORITIES PRIOR TO COVERING TRENCHES AT INSTALLATION.
8. CONSTRUCTION SHALL COMPLY WITH GOVERNING CODES AND REQUIREMENTS. CONTRACTOR SHALL CONDUCT ALL REQUIRED TESTS TO THE SATISFACTION OF THE UTILITY COMPANIES AND OWNERS INSPECTING AUTHORITIES.
9. THE MINIMUM HORIZONTAL SEPARATION BETWEEN PARALLEL WATER AND SEWER LINES IS TEN (10') FEET AND THE MINIMUM VERTICAL SEPARATION BETWEEN CROSSING WATER AND SEWER LINES IS EIGHTEEN (18") INCHES.
10. CONTRACTOR SHALL COMPLY TO THE FULLEST EXTENT WITH THE LATEST STANDARDS OF OSHA DIRECTIVES, INCLUDING 29 CFR PART 1926 SUBPART P, OR ANY OTHER AGENCY HAVING JURISDICTION FOR EXCAVATION AND TRENCHING PROCEDURE. CONTRACTOR SHALL USE SUPPORT SYSTEMS, SLOPING, BENCHING AND OTHER MEANS OF PROTECTION. THIS IS TO INCLUDE, BUT NOT LIMITED FOR ACCESS AND EGRESS FROM ALL EXCAVATION AND TRENCHING. CONTRACTOR IS RESPONSIBLE TO COMPLY WITH PERFORMANCE CRITERIA FOR OSHA.
11. SANITARY SEWER WORKS SHALL COMPLY WITH THE 2010 CALIFORNIA PLUMBING CODE AND ANY RIVERSIDE COUNTY AMMENDMENTS TO THE CODE.
12. BEDDING AND BACK FILL FOR UTILITY PIPE LATERALS SHALL CONFORM TO RIVERSIDE COUNTY SPECIFICATIONS.
13. NEW PRIVATE FIREWATER YARD MAIN SHALL BE IN ACCORDANCE WITH THE 2010 CALIFORNIA FIRE CODE AND RIVERSIDE COUNTY AMENDMENTS, THE RIVERSIDE COUNTY FIRE DEPARTMENT, AND NFPA 24 AND 850.
14. FIRE HYDRANTS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE RIVERSIDE COUNTY FIRE DEPARTMENT.
15. ALL FIRE PROTECTION AND POTABLE WATER LINES SHALL HAVE A MINIMUM 3.0' OF COVER.
16. CONTRACTOR SHALL GROUT AROUND ALL PIPE ENTRANCES TO SANITARY SEWER MANHOLES WITH NON-SHRINKING GROUT TO ASSURE WATER-TIGHT CONNECTION.
17. THRUST BLOCKS SHALL BE IN ACCORDANCE WITH NFPA 24, CONCRETE SHALL BE 3,000 PSI AT 28 DAYS.

UTILITY WARNING

1. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM VISIBLE FIELD EVIDENCE INFORMATION ONLY. ENGINEER MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. ENGINEER FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THERE EXACT LOCATION. ADDITIONAL BURIED UTILITY LINES AND/OR STRUCTURES MAYBE ENCOUNTERED. NO EXCAVATIONS WERE MADE DURING THE PRELIMINARY SITE OBSERVATIONS TO LOCATE BURIED UTILITY LINES AND/OR STRUCTURES.

SOIL EROSION & SEDIMENTATION CONTROL NOTES

1. CONTRACTOR SHALL COMPLY WITH THE PROJECT APPROVED STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND DRAINAGE, EROSION, AND SEDIMENT CONTROL PLAN (DESCP).
2. EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMP) SHALL BE IN ACCORDANCE WITH THE 2009 CALIFORNIA STORMWATER BMP HANDBOOK FOR CONSTRUCTION.
3. PERFORM ALL LAND DISTURBANCE ACTIVITIES IN SUCH A MANNER AS TO CONTROL EROSION AND PREVENT SEDIMENTATION FROM LEAVING SITE, OR BEING TRACKED ONTO ROADWAYS.
4. CONSTRUCTION EQUIPMENT/VEHICLES SHALL BE MAINTAINED IN A CONDITION WHICH PREVENTS TRACKING OR FLOW OF MUD ONTO ROADS AT THE SITE. THIS MAY REQUIRE PERIODIC REPAIR AND/OR CLEAN OUT OF ANY STRUCTURES USED TO TRAP SEDIMENT. ALL MATERIALS DROPPED, WASHED, OR TRACKED FROM VEHICLE ONTO ROADS OR INTO STORM DRAIN SHALL BE REMOVED IMMEDIATELY.
5. EROSION AND SEDIMENT CONTROL DEVICES SHALL BE INSTALLED AND INSPECTED PRIOR TO ANY LAND DISTURBANCE ON SITE.
6. ALL SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN CALENDAR DAYS AND AFTER ANY SIGNIFICANT STORM EVENT OF GREATER THAN 0.5 INCHES OF PRECIPITATION DURING ANY 48-HOUR PERIOD. ALL SEDIMENT CONTROL FEATURES SHALL BE MAINTAINED UNTIL FINAL STABILIZATION HAS BEEN OBTAINED.
7. MAKE NEEDED REPAIRS TO CONTROL STRUCTURES IMMEDIATELY UPON DETECTION OF DEFICIENCIES.
8. REMOVE SEDIMENT FROM SILT FENCES WHEN THE DEPTH REACHES APPROXIMATELY 4". SILT FENCES SHALL BE REPAIRED AS NECESSARY TO MAINTAIN A BARRIER.
9. STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. BUT IN NO CASE MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED, UNLESS ACTIVITY IN THAT PORTION OF THE SITE WILL RESUME WITHIN 21 DAYS.
10. REMOVE ALL TEMPORARY SEDIMENTATION CONTROL DEVICES NOT DESIGNATED TO REMAIN FROM SITE UPON COMPLETION OF GRADING AND FINAL ACCEPTANCE OF GRASSING, BUT NO LATER THAN 30 DAYS AFTER FINAL SITE STABILIZATION.
11. FAILURE TO INSTALL OPERATE OR MAINTAIN ALL EROSION CONTROL MEASURES SHALL RESULT IN ALL CONSTRUCTION BEING STOPPED ON THE JOB UNTIL SUCH MEASURES ARE CORRECTED TO LOCAL JURISDICTION STANDARDS.
12. ANY ADDITIONAL CONSTRUCTION OTHER THAN SHOWN ON THIS PLAN MAY REQUIRE SEPARATE AND ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES AND APPROVAL.
13. WHEN HAND PLANTING, MULCH (HAY OR STRAW) SHALL BE UNIFORMLY SPREAD OVER SEEDED AREA WITHIN 24 HOURS OF SEEDING.
14. USE WATER SPRINKLING AND/OR DUST PALLIATIVES AS NECESSARY TO LIMIT THE AMOUNT OF DUST RISING AND SCATTERING IN THE AIR, TO THE LOWEST LEVEL OF AIR POLLUTION PRACTICAL FOR THE CONDITION OF WORK.

DIGALERT
800-227-2600
Call 2 Full Working Days In Advance

PRELIMINARY
NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
B	13-DEC-2012	ISSUE FOR PERMIT	T.O.C.	D.E.M.	C.S.H.
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DESIGNED BY	T.O.C
CHECKED BY	D.E.M
APPR. BY	C.S.H.
CLIENT APPR.	

CH2MHILL
Atlanta, Georgia

SHEET TITLE: CIVIL – PROJECT INFORMATION ABBREVIATIONS, LEGEND, NOTES, VICINITY MAP AND CONTROL DATA

JOB NAME: PALEN SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892	REV. NO. B
FILENAME C-0001.dwg	
SCALE NONE	DWG. NO. C-0001

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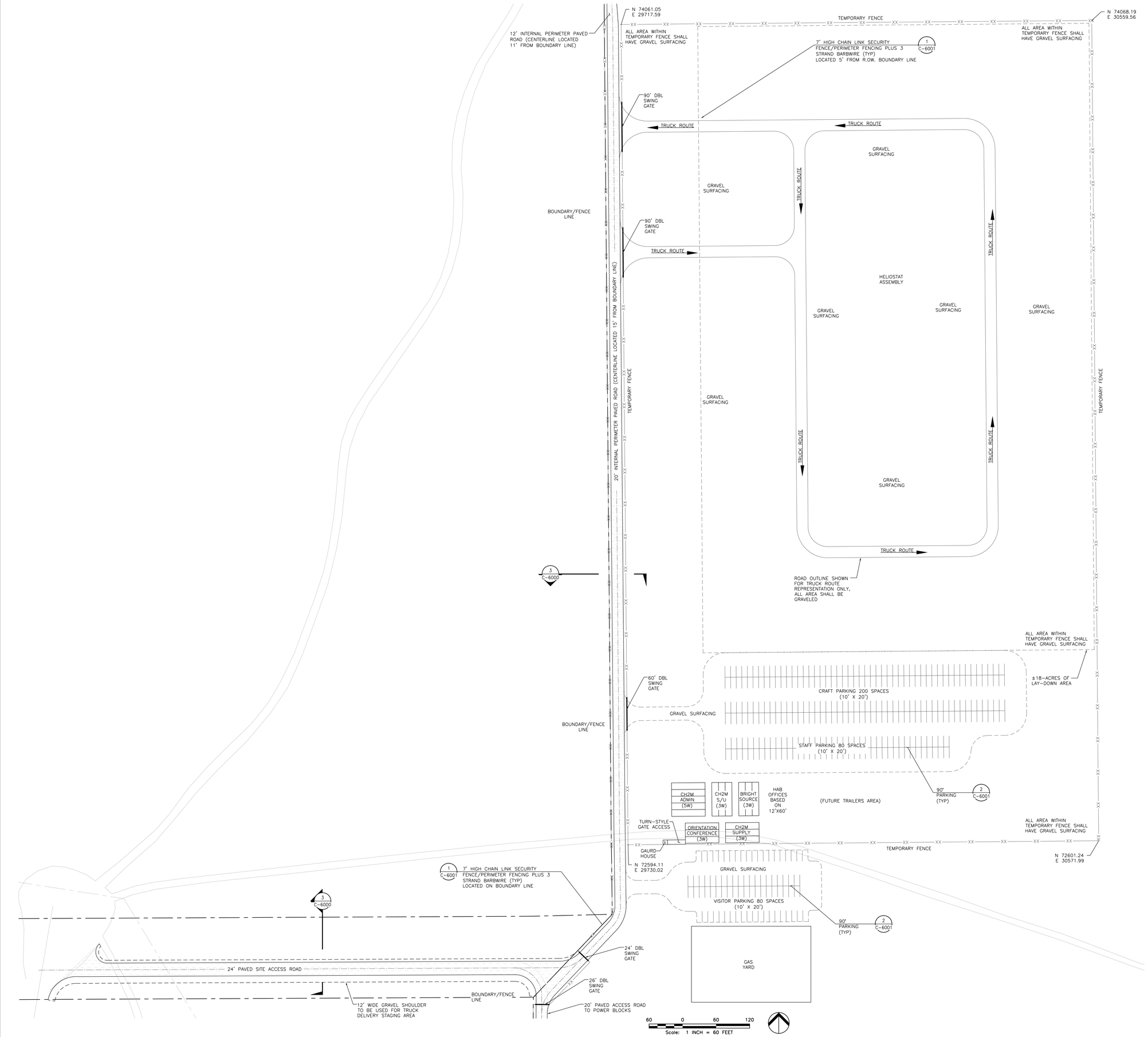

GENERAL NOTES:

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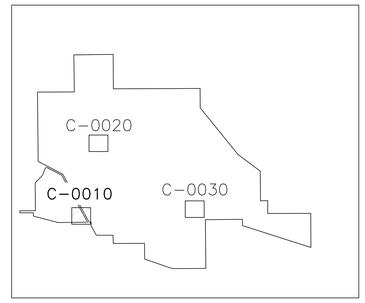
2. ALL EXISTING SITE INFORMATION: TOPOGRAPHY, BUILDING LOCATIONS, ROADS & PAVEMENT LOCATIONS, SITE UTILITIES, AND PROPERTY LINE INFORMATION WERE OBTAINED FROM OWNER PROVIDED DOCUMENTS/DRAWINGS.
3. FOR CIVIL OVERALL GRADING AND DRAINAGE PLAN SEE SHEET C-2000.
4. ALL NECESSARY LICENSES SHALL BE OBTAINED PRIOR TO COMMENCEMENT OF WORK.
5. VERIFY ALL MEASUREMENTS AND DIMENSIONS PRIOR TO ORDERING ANY MATERIALS OR CONDUCTING ANY WORK.
6. ALL WORK SHALL BE PERFORMED IN A FINISHED AND WORKMAN LIKE MANNER AND CONSISTENT WITH THE BEST RECOGNIZED TRADE PRACTICES.
7. COORDINATES SHOWN ARE IN PALEN / PROJECT LOCAL GRID SYSTEM.
8. NO BOUNDARY SURVEY INFORMATION IS SHOWN OR IMPLIED ON THESE DRAWINGS.

LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH



KEY PLAN
NTS
NORTH

DIGALERT 811
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CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
MANUFACTURING AREA
CONSTRUCTION PHASE SITE PLAN

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION
STATION

JOB NO. 459892
FILENAME C-0010.dwg
SCALE 1" = 60'
REV. NO. B
DWG. NO. C-0010

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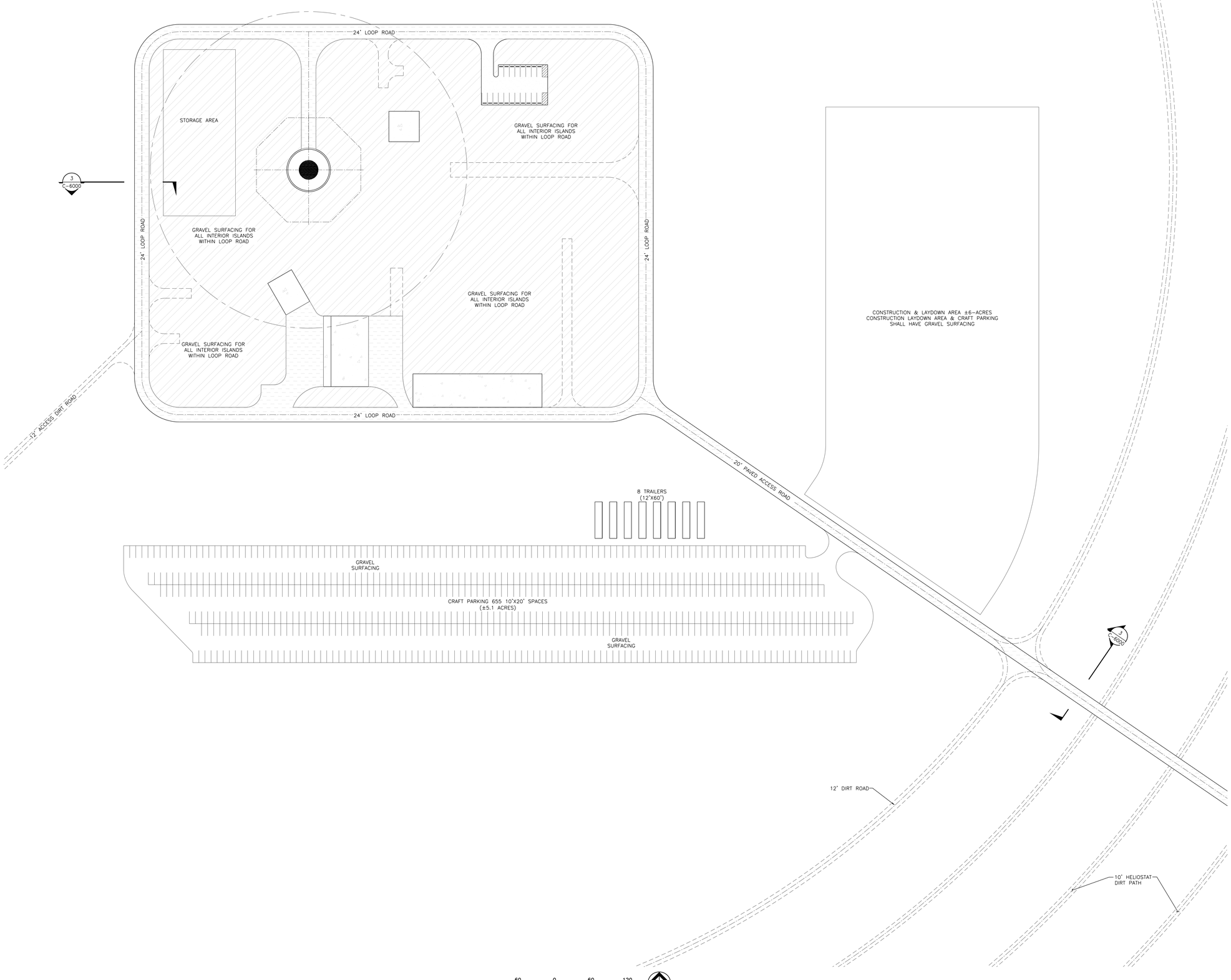

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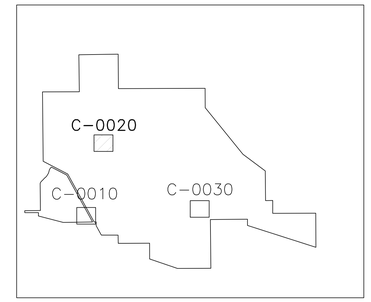
LEGEND

- 4" — CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH



KEY PLAN
NTS
NORTH

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CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
SOLAR TOWER UNIT-1
CONSTRUCTION PHASE SITE PLAN

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-0020.dwg
SCALE 1" = 60'
REV. NO. B
DWG. NO. C-0020

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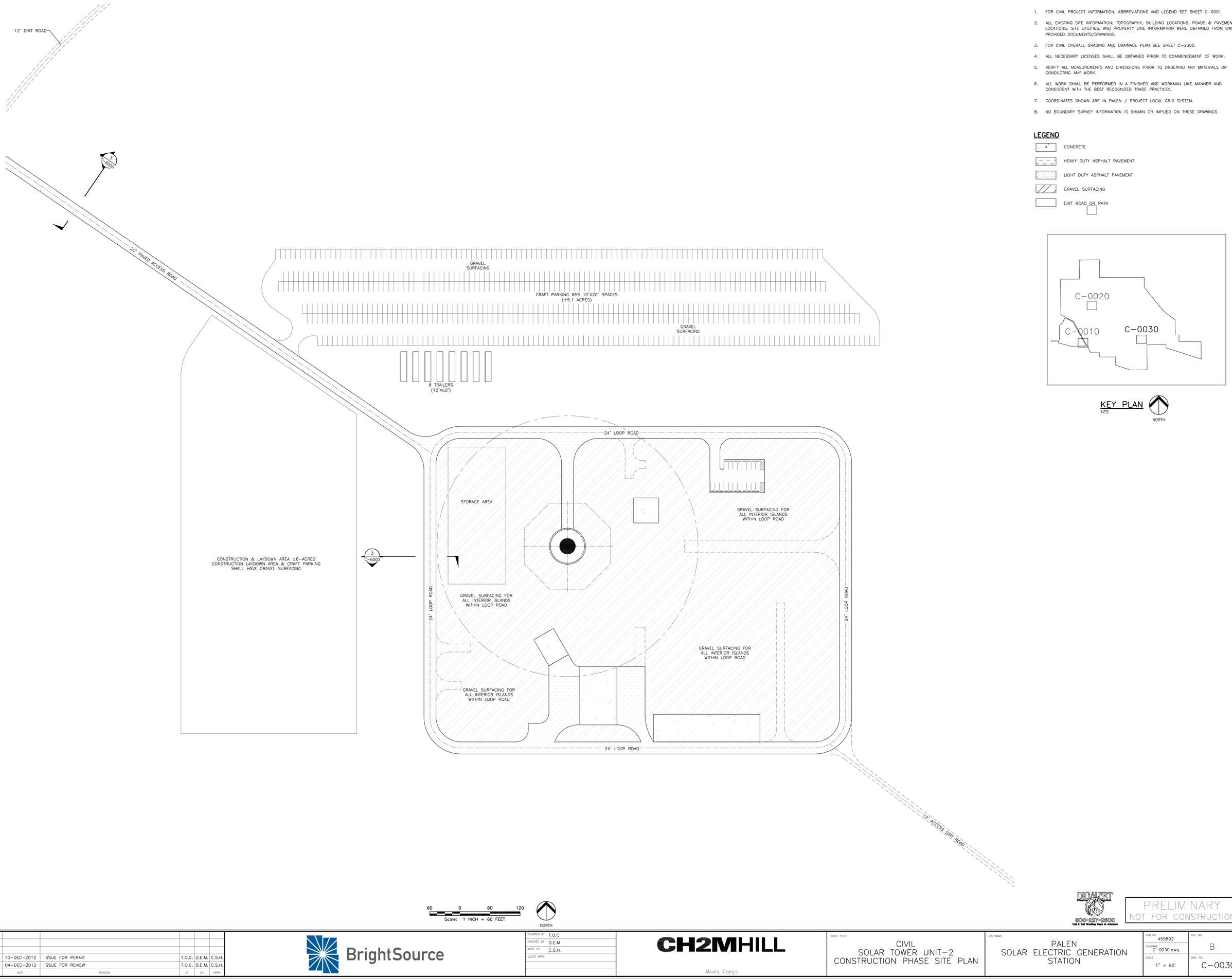

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LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH

KEY PLAN
NTS
NORTH

60 0 60 120
Scale: 1 INCH = 60 FEET
NORTH

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Atlanta, Georgia

SHEET TITLE
CIVIL
SOLAR TOWER UNIT-2
CONSTRUCTION PHASE SITE PLAN

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION
STATION

JOB NO. 459892
FILENAME C-0030.dwg
SCALE 1" = 60'
REV. NO. B
DWG. NO. C-0030

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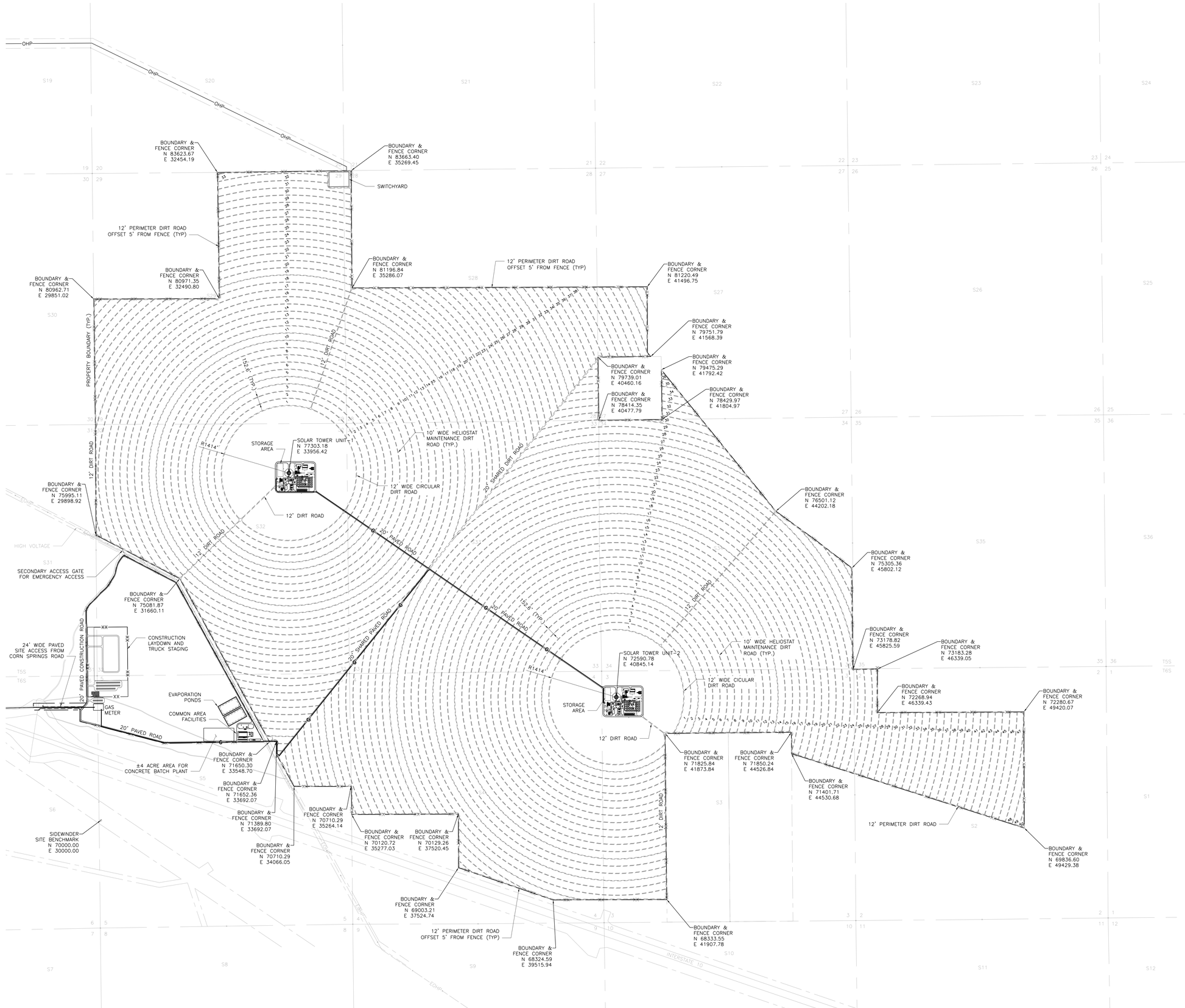

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*NOTE:

QUANTITIES SHOWN ARE FOR PRELIMINARY INTERNAL ESTIMATING AND NOT TO BE USED FOR BIDING PURPOSES. IT IS THE CONTRACTORS RESPONSIBILITY TO ESTABLISH THERE OWN QUANTITY TAKE-OFF'S FROM APPROVED PLANS.

*HARDSCAPE AREA DATA:

1. TOWER UNIT #1
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±10,100 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±900 S.Y.
   CONCRETE PAVEMENT AREA: ±2,850 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±47,000 S.Y.
2. TOWER UNIT #2
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±10,100 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±900 S.Y.
   CONCRETE PAVEMENT AREA: ±2,850 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±47,000 S.Y.
3. PAVED ROADS
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±45,000 S.Y.
4. COMMON AREA
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±8,900 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±1,450 S.Y.
   CONCRETE PAVEMENT AREA: ±100 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±5,300 S.Y.

*EARTHWORK QUANITITIES:

1. TOWER UNIT #1
   CUT: 9,260 CUBIC YARDS
   FILL: 45,589 CUBIC YARDS
   NET (FILL) 36,329 CUBIC YARDS
2. TOWER UNIT #2
   CUT: 3,169 CUBIC YARDS
   FILL: 95,925 CUBIC YARDS
   NET (FILL) 92,756 CUBIC YARDS
3. COMMON AREA-ADMIN/MAINTENANCE WAREHOUSE BLDG.
   CUT: 35,665 CUBIC YARDS
   FILL: 23,459 CUBIC YARDS
   NET (CUT) 12,206 CUBIC YARDS

DIGALERT 800-227-2600 Call 2 Full Working Days In Advance

PRELIMINARY NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	CK.	APPR.
D	13-DEC-2012	ISSUE FOR PERMIT	T.O.C.	D.E.M.	C.S.H.
C	04-DEC-2012	ADDED EARTHWORK QUANTITIES	T.O.C.	D.E.M.	C.S.H.
B	27-NOV-2012	REVISED PER MEETING ON 19-NOV-2012	T.O.C.	D.E.M.	C.S.H.
A	19-NOV-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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CHECKED BY D.E.M
APPR. BY C.S.H.
CLIENT APPR.

CH2MHILL
Atlanta, Georgia

SHEET TITLE: CIVIL OVERALL SITE PLAN

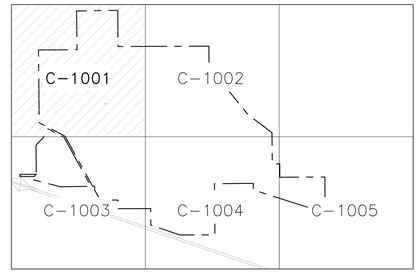
JOB NAME: PALEN SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-1000.dwg
SCALE 1" = 750'
REV. NO. D
DWG. NO. C-1000

LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

1. FOR CIVIL GENERAL NOTES, ABBREVIATIONS AND LEGEND REFER TO SHEET C-0001.
2. FOR SITE PLAN NOTES REFER TO SHEET C-1000.



KEY PLAN
NTS
NORTH

LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH

BOUNDARY & FENCE CORNER N 83623.67 E 32454.19
BOUNDARY & FENCE CORNER N 83663.40 E 35269.45
12' INTERNAL PERIMETER DIRT ROAD (CENTERLINE LOCATED 11' FROM BOUNDARY/FENCE LINE)
OHP
SWITCHYARD
R50'
R56'
7' HIGH CHAIN LINK SECURITY FENCE PLUS 3 STRAND BARB WIRE (TYP)
BOUNDARY & FENCE CORNER N 81196.84 E 35286.07
BOUNDARY & FENCE CORNER N 80971.35 E 32490.80
BOUNDARY & FENCE CORNER N 80962.71 E 29851.02
12' INTERNAL PERIMETER DIRT ROAD (CENTERLINE LOCATED 11' FROM BOUNDARY/FENCE LINE)
12' DIRT ROAD
10' HELIOSTAT MAINTENANCE DIRT PATH (TYP.)
152.6' (TYP.)
PROPERTY BOUNDARY (TYP.)
SOLAR TOWER UNIT-1 N 77303.18 E 33956.42
STORAGE AREA
R1420'
12' CIRCULAR DIRT ROAD (CENTER LINE RADIUS 1420')
GRAVEL SURFACING SHALL BE PLACED WITHIN ALL INTERIOR ISLANDS AND SHALL EXTEND 5' FROM EXTERIOR ROADS, EQUIPMENT AND BUILDINGS.
R59' (TYP.)
R56' (TYP.)
20' PAVED ROAD
20' SHARED DIRT ROAD
R50' (TYP.)
BOUNDARY & FENCE CORNER N 75995.11 E 29898.92
56' WIDE DOUBLE-SWING SECONDARY MANUAL ACCESS GATE FOR EMERGENCY ACCESS
12' PERIMETER PAVED ROAD OFFSET 5' FROM FENCE (TYP)
BOUNDARY & FENCE CORNER N 75081.87 E 31660.11
EDHP
MATCHLINE SEE SHEET C-1002
MATCHLINE SEE SHEET C-1003

300 0 300 600
Scale: 1 INCH = 300 FEET

NORTH

DIGALERT 811
800-227-2600
Call 2 Full Working Days In Advance

PRELIMINARY
NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
B	13-DEC-2012	ISSUE FOR PERMIT	T.O.C.	D.E.M.	C.S.H.
A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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CHECKED BY	D.E.M
APPR. BY	C.S.H.
CLIENT APPR.	

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Atlanta, Georgia

SHEET TITLE
CIVIL
PARTIAL SITE PLAN 1

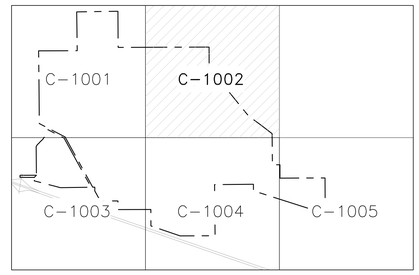
JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO.	459892
FILENAME	C-1001.dwg
SCALE	1" = 300'
REV. NO.	B
DWG. NO.	C-1001

LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

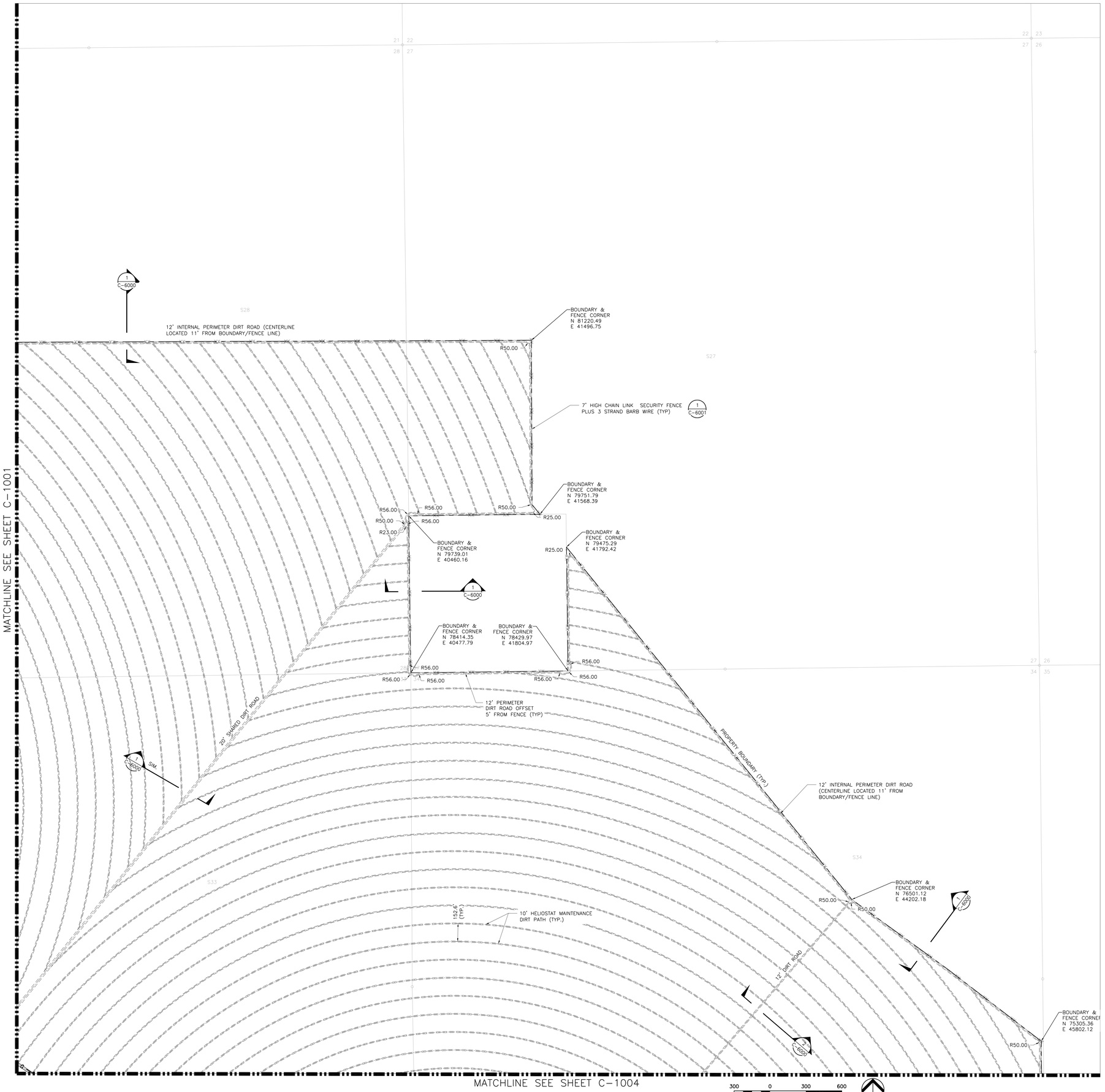
1. FOR CIVIL GENERAL NOTES, ABBREVIATIONS AND LEGEND REFER TO SHEET C-0001.
2. FOR SITE PLAN NOTES REFER TO SHEET C-1000.



KEY PLAN
NTS
NORTH

LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH



DIGALERT 811
800-227-2600
Call 2 Full Working Days In Advance

PRELIMINARY
NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
B	13-DEC-2012	ISSUE FOR PERMIT	T.O.C.	D.E.M.	C.S.H.
A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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APPR. BY	C.S.H.
CLIENT APPR.	

CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
PARTIAL SITE PLAN 2

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO.	459892
FILENAME	C-1002.dwg
SCALE	1" = 300'
REV. NO.	B
DWG. NO.	C-1002

LGAE_3, ANSI E, 34 x 44 in.

MATCHLINE SEE SHEET C-1001

12' PERIMETER PAVED ROAD OFFSET 5' FROM FENCE (TYP)

SIM. 3/C-6000

1/C-6001 7' HIGH CHAIN LINK SECURITY FENCE PLUS 3 STRAND BARB WIRE (TYP)

10' HELIOSTAT MAINTENANCE DIRT PATH (TYP.)

152.6' (TYP.)

12' PERIMETER DIRT ROAD OFFSET 5' FROM FENCE (TYP)

CONSTRUCTION LAYDOWN AND TRUCK STAGING

TEMPORARY FENCING AROUND CONSTRUCTION AREA PERIMETER

20' PAVED CONSTRUCTION ROAD

12' DIRT ROAD

12' PAVED ROAD

30' SHARED PAVED ROAD

6/C-6000 PAVEMENT TRANSITION

24' WIDE DOUBLE-SWING MANUAL GATE

26' WIDE DOUBLE-SWING MANUAL GATE

24' WIDE PAVED SITE ACCESS FROM CORN SPRINGS ROAD

GAS METER

EVAPORATION PONDS

COMMON AREA FACILITIES

7/C-6000 GRAVEL SURFACING SHALL BE PLACED WITHIN ALL INTERIOR ISLANDS AND SHALL EXTEND 5' FROM EXTERIOR ROADS, EQUIPMENT AND BUILDINGS.

±4 ACRE AREA FOR CONCRETE BATCH PLANT

20' PAVED ROAD

34' WIDE DOUBLE-SWING MANUAL GATE

24' WIDE DOUBLE-SWING MANUAL GATE

BOUNDARY & FENCE CORNER N 71652.36 E 33692.07

BOUNDARY & FENCE CORNER N 71650.30 E 33548.70

BOUNDARY & FENCE CORNER N 71389.80 E 33692.07

PROPERTY BOUNDARY (TYP.)

BOUNDARY & FENCE CORNER N 70710.29 E 34066.05

BOUNDARY & FENCE CORNER N 70710.29 E 35264.14

BOUNDARY & FENCE CORNER N 70120.72 E 35277.03

BENCHMARK SIDEWINDER N 70000.00 E 30000.00

INTERSTATE 10

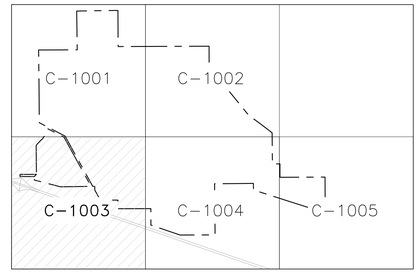
MATCHLINE SEE SHEET C-1004

300 0 300 600
Scale: 1 INCH = 300 FEET

NORTH

GENERAL NOTES:

1. FOR CIVIL GENERAL NOTES, ABBREVIATIONS AND LEGEND REFER TO SHEET C-0001.
2. FOR SITE PLAN NOTES REFER TO SHEET C-1000.



KEY PLAN
NTS
NORTH

LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH

DIGALERT 800-227-2600 Call 2 Full Working Days In Advance

PRELIMINARY NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
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A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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CLIENT APPR.

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Atlanta, Georgia

SHEET TITLE
CIVIL
PARTIAL SITE PLAN 3

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-1003.dwg
SCALE 1" = 300'

REV. NO. B
DWG. NO. C-1003

LGAE_3, ANSI E, 34 x 44 in.

MATCHLINE SEE SHEET C-1002

MATCHLINE SEE SHEET C-1003

MATCHLINE SEE SHEET C-1005

152.6' (TYP.)

20' PAVED ROAD

R59.00 (TYP.)

R1420'

STORAGE AREA

SOLAR TOWER UNIT-2
N 72590.78
E 40845.14

12' DIRT ROAD

R50.00 (TYP.)

10' HELIOSTAT MAINTENANCE DIRT PATH (TYP.)

152.6' (TYP.)

12' CIRCULAR DIRT ROAD (CENTER LINE RADIUS 1420')

BOUNDARY & FENCE CORNER
N 73178.82
E 45825.59

R56.00

R56.00

R56.00

GRAVEL SURFACING SHALL BE PLACED WITHIN ALL INTERIOR ISLANDS AND SHALL EXTEND 5' FROM EXTERIOR ROADS, EQUIPMENT AND BUILDINGS.

R56.00 (TYP.)

BOUNDARY & FENCE CORNER
N 71825.84
E 41873.84

12' INTERNAL PERIMETER DIRT ROAD (CENTERLINE LOCATED 11' FROM BOUNDARY/FENCE LINE)

BOUNDARY & FENCE CORNER
N 71850.24
E 44526.84

R56.00

R56.00

R50.00

BOUNDARY & FENCE CORNER
N 71401.71
E 44530.68

12' INTERNAL PERIMETER DIRT ROAD (CENTERLINE LOCATED 11' FROM BOUNDARY/FENCE LINE)

PROPERTY BOUNDARY (TYP.)

7' HIGH CHAIN LINK SECURITY FENCE PLUS 3 STRAND BARB WIRE (TYP)

R56.00

R56.00

R56.00

BOUNDARY & FENCE CORNER
N 70129.26
E 37520.45

R50.00

BOUNDARY & FENCE CORNER
N 69003.21
E 37524.74

R50.00

R50.00

12' PERIMETER DIRT ROAD OFFSET 5' FROM FENCE (TYP)

BOUNDARY & FENCE CORNER
N 68333.55
E 41907.78

BOUNDARY & FENCE CORNER
N 68324.59
E 39515.94

INTERSTATE 10

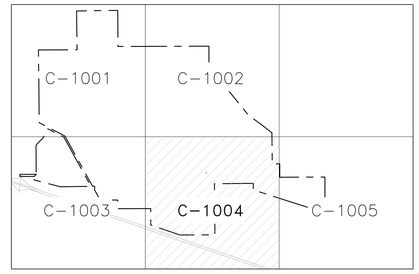
EDHP

300 0 300 600
Scale: 1 INCH = 300 FEET

NORTH

GENERAL NOTES:

1. FOR CIVIL GENERAL NOTES, ABBREVIATIONS AND LEGEND REFER TO SHEET C-0001.
2. FOR SITE PLAN NOTES REFER TO SHEET C-1000.



KEY PLAN
NTS
NORTH

LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH

DIGALERT 800-227-2600 Call 2 Full Working Days In Advance

PRELIMINARY
NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
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A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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CLIENT APPR.

CH2MHILL
Atlanta, Georgia

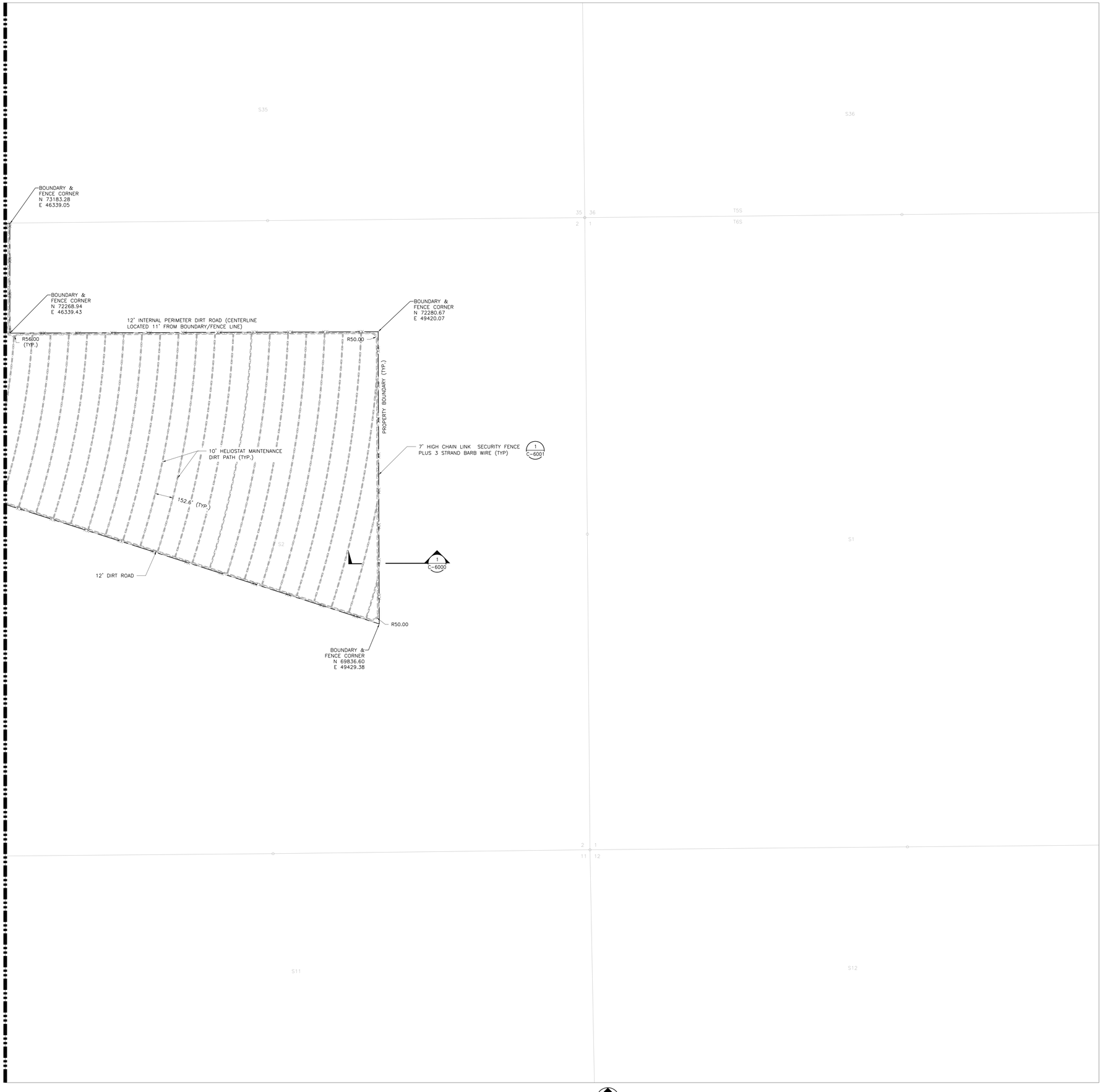
SHEET TITLE
CIVIL
PARTIAL SITE PLAN 4

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-1004.dwg
SCALE 1" = 300'

REV. NO. B
DWG. NO. C-1004

LGAE_3, ANSI E, 34 x 44 in.



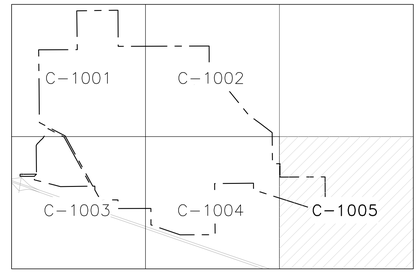
300 0 300 600

Scale: 1 INCH = 300 FEET

NORTH

GENERAL NOTES:

1. FOR CIVIL GENERAL NOTES, ABBREVIATIONS AND LEGEND REFER TO SHEET C-0001.
2. FOR SITE PLAN NOTES REFER TO SHEET C-1000.



KEY PLAN
NTS

NORTH

LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH

DIGALERT
800-227-2600
Call 2 Full Working Days In Advance

PRELIMINARY
NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
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A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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CLIENT APPR.

CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
PARTIAL SITE PLAN 5

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION
STATION

JOB NO. 459892
FILENAME C-1005.dwg
SCALE 1" = 300'

REV. NO. B
DWG. NO. C-1005

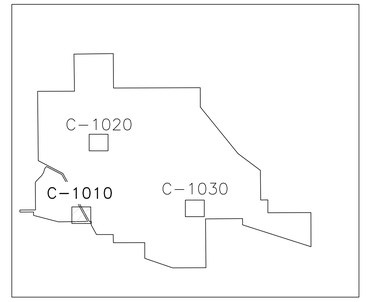
LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

1. FOR CIVIL GENERAL NOTES, ABBREVIATIONS AND LEGEND REFER TO SHEET C-0001.
2. FOR SITE PLAN NOTES REFER TO SHEET C-1000.

LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH



KEY PLAN
NTS

NORTH

7' HIGH CHAIN LINK SECURITY FENCE/PERIMETER FENCING PLUS 3 STRAND BARBWIRE (TYP) LOCATED 5' FROM R.OW. BOUNDARY LINE (1 / C-6001)

10' HELIOSTAT DIRT PATH (TYP.)

BOUNDARY/FENCE LINE

12' INTERNAL PERIMETER DIRT ROAD (CENTERLINE LOCATED 11' FROM BOUNDARY LINE)

12' INTERNAL PERIMETER PAVED ROAD (CENTERLINE LOCATED 11' FROM BOUNDARY LINE)

EVAPORATION POND

EVAPORATION POND

SIM. (3 / C-6000)

HEAVY DUTY PVMT (TYP) (9 / C-6000)

20' ACCESS PAVED ROAD

TRAVERSE JOINT (TYP) (13 / C-6000)

LONGITUDINAL JOINT (TYP) (13 / C-6000)

JOINTED PLAIN CONC. PVMT (13 / C-6000)

20 PARKING SPACES (9' X 20')

±4 ACRE AREA FOR CONCRETE BATCH PLANT

WHEEL STOP (16 / C-6000 (TYP))

8' CONC. SIDEWALK (12 / C-6000)

ADMIN/MAINTENANCE WAREHOUSE BUILDING

90° PARKING (TYP) (2 / C-6001)

38 PARKING SPACES (9' X 20')

LIGHT-DUTY ASPHALT PVMT (10 / C-6000)

20' ACCESS PAVED ROAD

20' INTERNAL PERIMETER PAVED ROAD (CENTERLINE LOCATED 15' FROM BOUNDARY LINE)

BOUNDARY/FENCE LINE

34' DBL SWING GATE (1 / C-6001)

24' DBL SWING GATE (1 / C-6001)

GRAVEL SURFACING SHALL BE PLACED WITHIN ALL INTERIOR ISLANDS AND SHALL EXTEND 5' FROM EXTERIOR ROADS, EQUIPMENT AND BUILDINGS. (7 / C-6000)

7' HIGH CHAIN LINK SECURITY FENCE/PERIMETER FENCING PLUS 3 STRAND BARBWIRE (TYP) LOCATED 5' FROM R.OW. BOUNDARY LINE (1 / C-6001)

Scale: 1 INCH = 40 FEET (40 0 40 80)

NORTH

DIGALERT 800-227-2600 Call 2 Full Working Days In Advance

PRELIMINARY
NOT FOR CONSTRUCTION

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A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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CHECKED BY	D.E.M
APPR. BY	C.S.H.
CLIENT APPR.	

CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
COMMON AREA
ENLARGED SITE PLAN

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO.	459892
FILENAME	C-1010.dwg
SCALE	1" = 40'
REV. NO.	B
DWG. NO.	C-1010

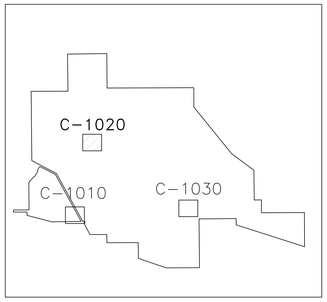
LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

1. FOR CIVIL GENERAL NOTES, ABBREVIATIONS AND LEGEND REFER TO SHEET C-0001.
2. FOR SITE PLAN NOTES REFER TO SHEET C-1000.

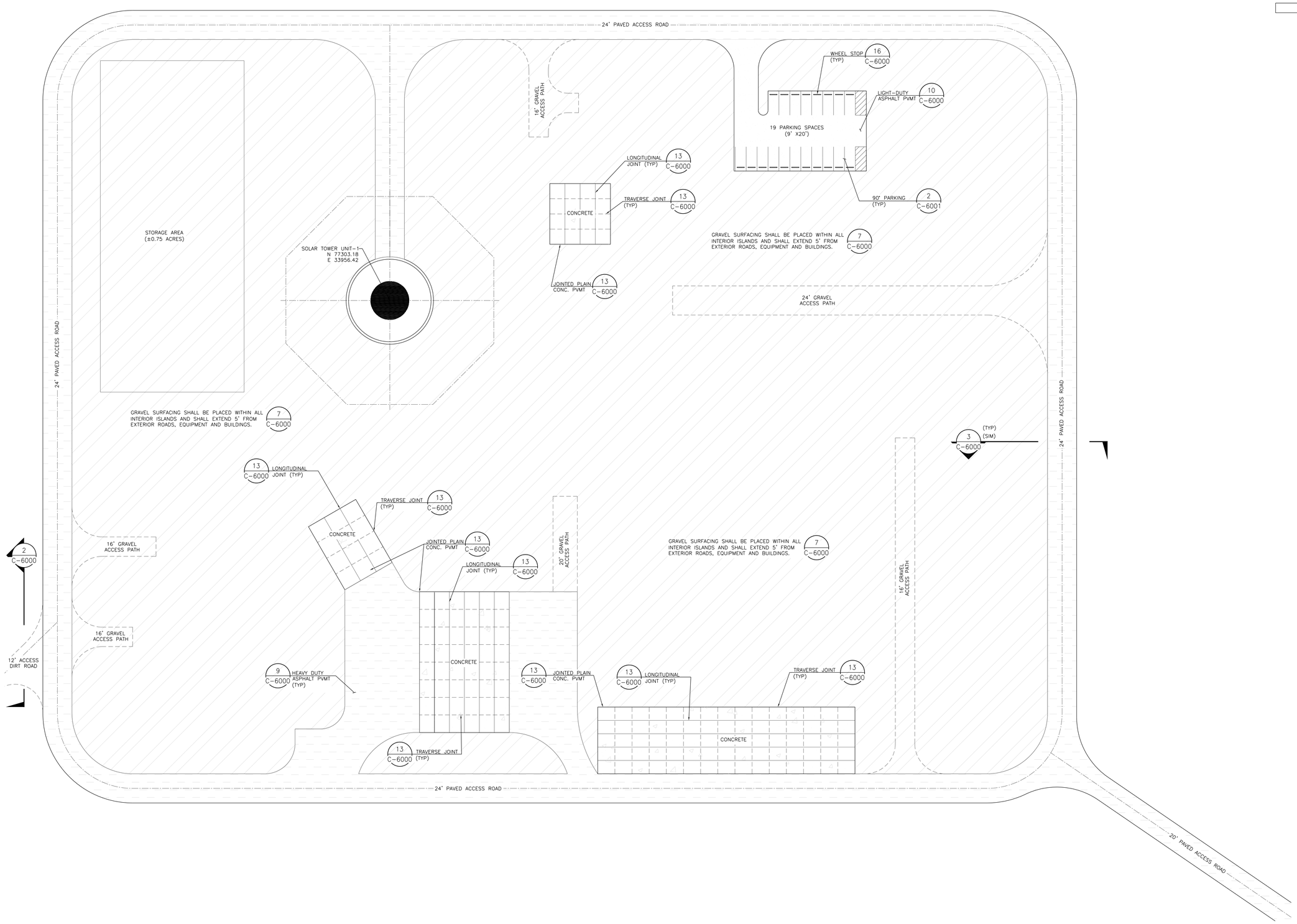
LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH



KEY PLAN
NTS

NORTH



30 0 30 60
Scale: 1 INCH = 30 FEET

NORTH

DIGALERT 800-227-2600 Call 2 Full Working Days In Advance

PRELIMINARY
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DESIGNED BY	T.O.C
CHECKED BY	D.E.M
APPR. BY	C.S.H.
CLIENT APPR.	

CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
SOLAR TOWER UNIT-1
ENLARGED SITE PLAN

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO.	459892
FILENAME	C-1020.dwg
SCALE	1" = 30'
REV. NO.	B
DWG. NO.	C-1020

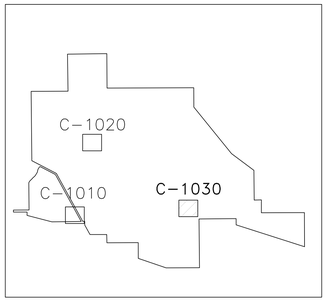
LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

1. FOR CIVIL GENERAL NOTES, ABBREVIATIONS AND LEGEND REFER TO SHEET C-0001.
2. FOR SITE PLAN NOTES REFER TO SHEET C-1000.

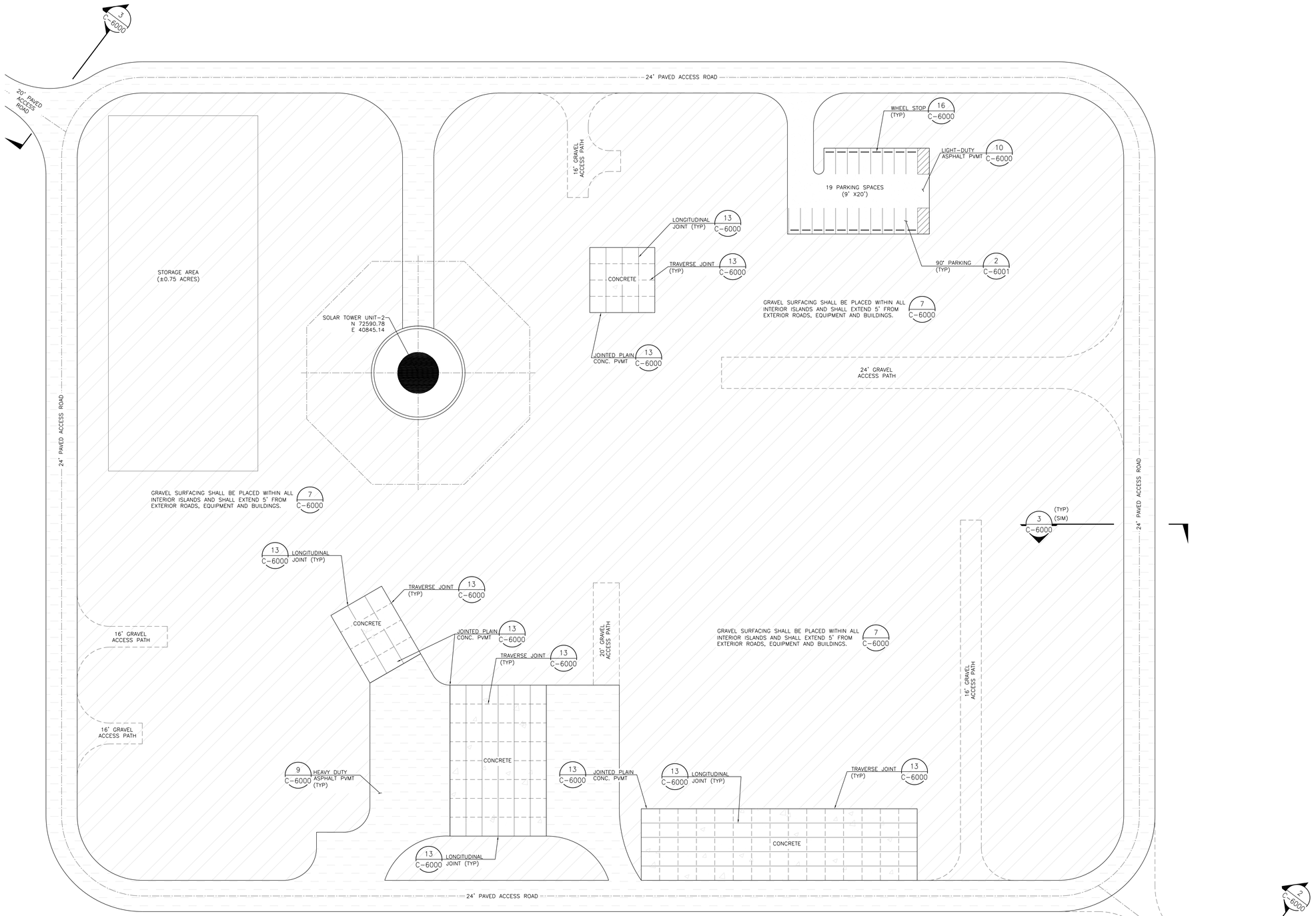
LEGEND

- CONCRETE
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- GRAVEL SURFACING
- DIRT ROAD OR PATH



KEY PLAN
NTS

NORTH



30 0 30 60
Scale: 1 INCH = 30 FEET

NORTH

DIGALERT 800-227-2600 Call 2 Full Working Days In Advance

PRELIMINARY
NOT FOR CONSTRUCTION

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A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

BrightSource

DESIGNED BY	T.O.C
CHECKED BY	D.E.M
APPR. BY	C.S.H.
CLIENT APPR.	

CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
SOLAR TOWER UNIT-2
ENLARGED SITE PLAN

JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO.	459892
FILENAME	C-1030.dwg
SCALE	1" = 30'
REV. NO.	B
DWG. NO.	C-1030

LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE APPROVED PLANS AND SPECS.
2. THE CONTRACTOR SHALL EXERCISE SUFFICIENT SUPERVISORY CONTROL DURING GRADING AND CONSTRUCTION TO INSURE COMPLIANCE WITH THE APPROVED PLANS.
3. SLOPES SHALL BE NO STEEPER THAN 3 HORIZONTAL TO 1 VERTICAL, OR AS DETERMINED BY THE GEOTECHNICAL ENGINEER UNLESS OTHERWISE NOTED ON THE PLANS.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL GEOTECHNICAL TESTING NECESSARY FOR THE WORK.
5. NO ROCK OR SIMILAR MATERIAL GREATER THAN 6" IN DIAMETER SHALL BE PLACED IN THE FILL.
6. ALL NEWLY GRADED SURFACES SHALL HAVE A MINIMUM SLOPE OF 1% TOWARDS ADJACENT DRAINAGE AREAS, SWALES, OR DITCHES.
7. ALL NEW PAVED SURFACES SHALL BE SLOPED TO DRAIN. CONTRACTOR SHALL MAKE ADJUSTMENTS TO PAVING AND GRADING ELEVATIONS AS NECESSARY.
8. ALL PROPOSED SPOT ELEVATIONS & CONTOURS REPRESENT FINISH GRADE (TOP OF PAVING, GRAVEL SURFACE, FINISH SURFACE/FLOOR, OR EARTH).
9. CONTRACTOR SHALL INCORPORATE ADEQUATE DRAINAGE PROCEDURES DURING THE CONSTRUCTION PROCESS TO ELIMINATE EXCESSIVE PONDING AND/OR EROSION. CONTRACTOR SHALL ALSO INSTALL EROSION AND RUN-OFF CONTROL MEASURES AT THE COUNTY ROADS AND DRAINAGE WAYS.
10. CLEARING AND GRUBBING, SUB-GRADE PREPARATION AND EARTHWORK, SHALL BE PERFORMED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, RIVERSIDE COUNTY, AND CALEPA REQUIREMENTS.
11. ALL CONSTRUCTION WASTE, INCLUDING VEGETATIVE MATERIAL, MAY NEITHER BE BURNED NOR BURIED AND MUST BE TAKEN TO A STATE APPROVED LANDFILL.
12. INTERNAL ROADS TO MATCH EXISTING GRADE EXCEPT WHERE NOTED.
13. ALL CULVERTS SHALL BE CLASS III RCP PIPE (MIN.).

HIGH VOLTAGE EASEMENT

SWITCH YARD

DRAINAGE FLOW

SOLAR TOWER UNIT-1
N 77303.18
E 33956.42

SOLAR TOWER UNIT-2
N 72590.78
E 40845.14

CONSTRUCTION LAYDOWN AREA

GAS YARD

EVAPORATION PONDS

BATCH PLANT

COMMON AREA

SIDEWINDER
N 70000.00
E 30000.00

INTERSTATE 10

750 0 750 1500
Scale: 1 INCH = 750 FEET

NORTH

DIGALERT 800-227-2600 Call 2 Full Working Days In Advance

PRELIMINARY
NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
B	13-DEC-2012	ISSUE FOR PERMIT	T.O.C.	D.E.M.	C.S.H.
A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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APPR. BY C.S.H.
CLIENT APPR.

CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
OVERALL GRADING AND DRAINAGE PLAN

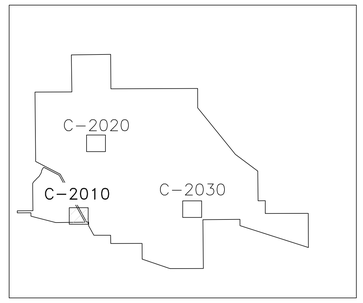
JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-2000.dwg
SCALE 1" = 750'
REV. NO. B
DWG. NO. C-2000

LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

1. FOR CIVIL GRADING AND DRAINAGE PLAN GENERAL NOTES AND LEGEND REFER TO SHEET C-2000.



KEY PLAN
NTS

NORTH

EVAPORATION POND

EVAPORATION POND

4:1 SLOPE

DRAINAGE FLOW (TYP)

2% SLOPE

20' DIVERSION SWALE AT 1% SLOPE MIN

5
C-6000

BUILDING PAD ELEVATION 645'

Scale: 1 INCH = 40 FEET

NORTH

DIGALERT
800-227-2600
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APPR. BY	C.S.H.
CLIENT APPR.	

CH2MHILL
Atlanta, Georgia

SHEET TITLE
CIVIL
COMMON AREA ENLARGED GRADING AND DRAINAGE PLAN

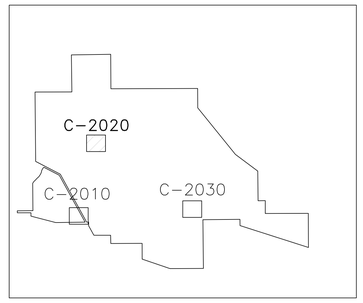
JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO.	REV. NO.
459892	B
FILENAME: C-2010.dwg	DWG. NO.
SCALE: 1" = 40'	C-2010

LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

1. FOR CIVIL GRADING AND DRAINAGE PLAN GENERAL NOTES AND LEGEND REFER TO SHEET C-2000.



KEY PLAN
NTS

NORTH

20' DIVERSION SWALE AT 1% SLOPE MIN

5 C-6000

DRAINAGE FLOW (TYP)

4:1 SLOPE

1.6% SLOPE

SOLAR TOWER UNIT-1
N 77303.18
E 33956.42

DRAINAGE FLOW (TYP)

20' DIVERSION SWALE AT 1% SLOPE MIN

40 0 40 40
Scale: 1 INCH = 40 FEET

NORTH

DIGALERT
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PRELIMINARY
NOT FOR CONSTRUCTION

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SHEET TITLE
CIVIL
SOLAR TOWER UNIT-1 ENLARGED GRADING AND DRAINAGE PLAN

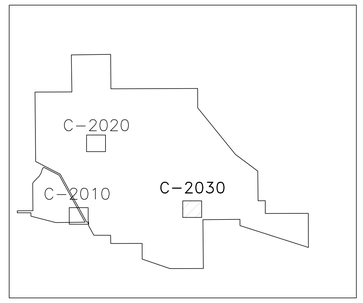
JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-2020.dwg
SCALE 1" = 40'
REV. NO. B
DWG. NO. C-2020

LGAE_3, ANSI E, 34 x 44 in.

GENERAL NOTES:

1. FOR CIVIL GRADING AND DRAINAGE PLAN GENERAL NOTES AND LEGEND REFER TO SHEET C-2000.



KEY PLAN
NTS

NORTH

4:1 SLOPE

1.6% SLOPE

SOLAR TOWER UNIT-2
N 72590.78
E 40845.14

20' DIVERSION SWALE AT 1% SLOPE MIN

DRAINAGE FLOW (TYP)

5 C-6000

40 0 40 40
Scale: 1 INCH = 40 FEET

NORTH

DIGALERT 811
800-227-2600
Call 2 Full Working Days In Advance

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NOT FOR CONSTRUCTION

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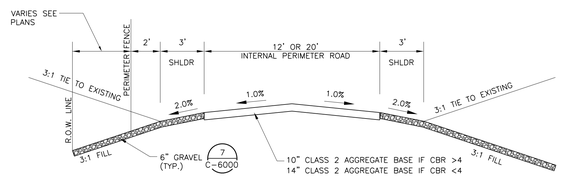
Atlanta, Georgia

SHEET TITLE
CIVIL
SOLAR TOWER UNIT-2 ENLARGED GRADING AND DRAINAGE PLAN

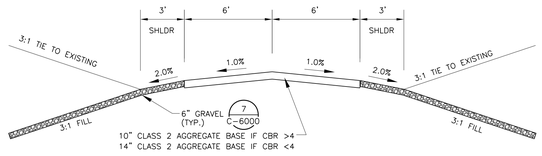
JOB NAME
PALEN
SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-2030.dwg
SCALE 1" = 40'
REV. NO. B
DWG. NO. C-2030

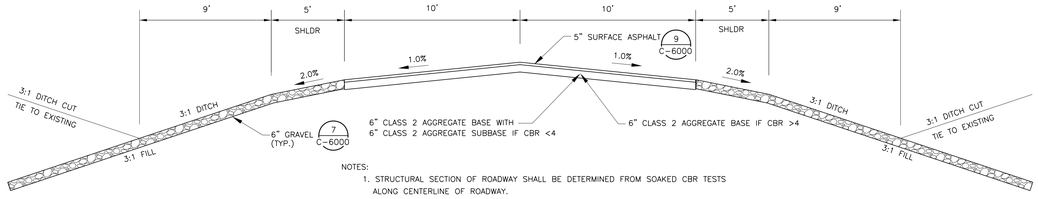
LGAE_3, ANSI E, 34 x 44 in.



TYPICAL SECTION ALONG PROPERTY/BOUNDARY LINE
SCALE: NTS — 1 C-6000

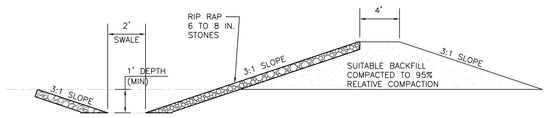


12' DIRT ROAD SECTION
SCALE: NTS — 2 C-6000

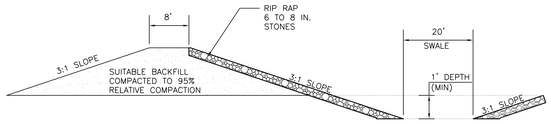


NOTES:
1. STRUCTURAL SECTION OF ROADWAY SHALL BE DETERMINED FROM SOAKED CBR TESTS ALONG CENTERLINE OF ROADWAY.

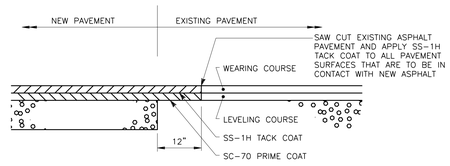
20' PAVED ROAD SECTION
SCALE: NTS — 3 C-6000



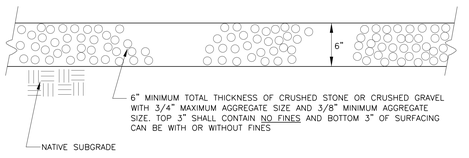
BERM AND SWALE CROSS-SECTION
SCALE: NONE — 4 C-6000



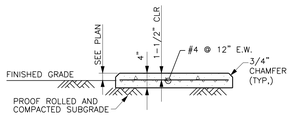
BERM AND SWALE CROSS-SECTION
SCALE: NONE — 5 C-6000



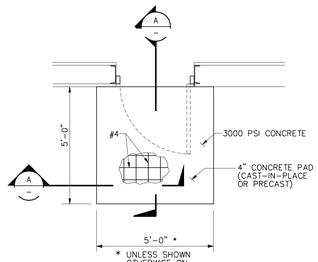
PAVEMENT TRANSITION DETAIL
SCALE: NTS — 6 C-6000



GRAVEL SURFACE SECTION
SCALE: NTS — 7 C-6000

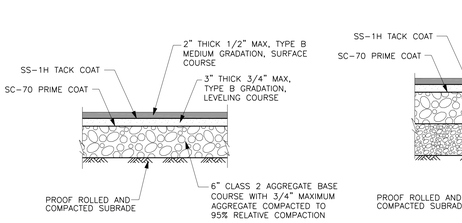


SECTION
SCALE: NTS — A

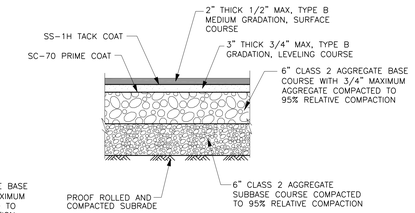


NOTES:
1. CENTER DOOR PAD WITH DOOR OPENING.

DOOR PAD DETAIL
SCALE: NTS — 8 C-6000



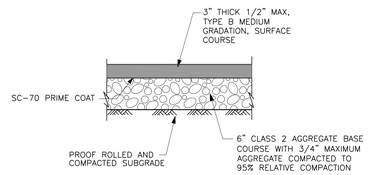
TYPE A: SUBGRADE CBR > 4



TYPE B: SUBGRADE CBR < 4

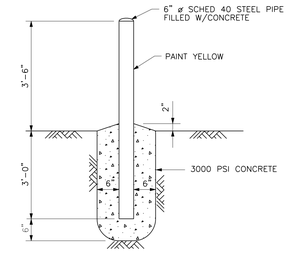
NOTES:
1. ASPHALT CONCRETE, PRIME COAT, AND TACK COAT SHALL CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 39.
2. AGGREGATE BASE COURSE SHALL CONFORM TO CALTRANS STANDARD SPECIFICITION, SECTION 26.
3. AGGREGATE SUBBASE COARSE SHALL CONFORM TO CALTRANS STATNDARD SPECIFICATION, SECTION 25.
4. ASPHALT TO CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 92.
5. PRIME COAT TO CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 93.
6. TACK COAT TO CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 94.

TYPICAL HEAVY DUTY ASPHALT PAVEMENT DETAIL
SCALE: NTS — 9 C-6000

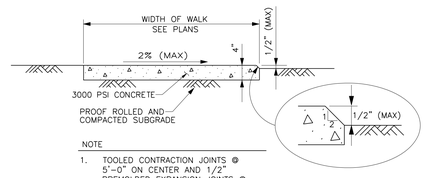


NOTES:
1. ASPHALT CONCRETE, PRIME COAT, AND TACK COAT SHALL CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 39.
2. AGGREGATE BASE COURSE SHALL CONFORM TO CALTRANS STANDARD SPECIFICITION, SECTION 26.
3. AGGREGATE SUBBASE COARSE SHALL CONFORM TO CALTRANS STATNDARD SPECIFICATION, SECTION 25.
4. ASPHALT TO CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 92.
5. PRIME COAT TO CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 93.
6. TACK COAT TO CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 94.

TYPICAL LIGHT DUTY ASPHALT PAVEMENT DETAIL
SCALE: NTS — 10 C-6000

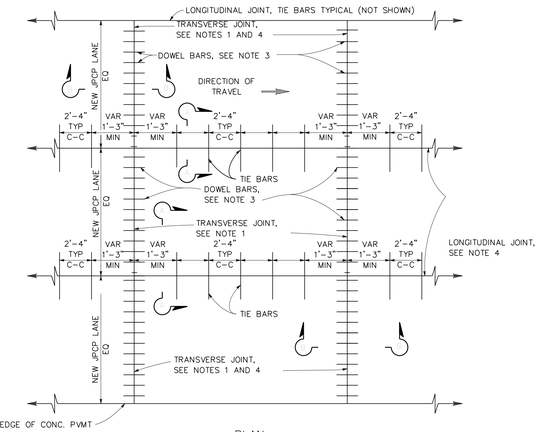


GUARD POST DETAIL
SCALE: NTS — 11 C-6000

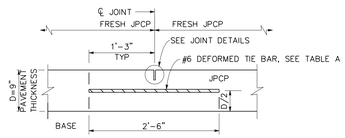


NOTE
1. TOOLED CONTRACTION JOINTS @ 5'-0" ON CENTER AND 1/2" PREMOLDED EXPANSION JOINTS @ 30'-0" ON CENTER AND AT BUILDINGS, STEPS, AND INTERSECTIONS.
2. SIDEWALKS TO CONFORM TO CALTRANS STANDARD SPECIFICATION, SECTION 73.

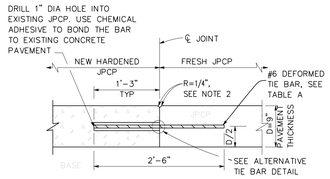
CONCRETE WALK DETAIL
SCALE: NTS — 12 C-6000



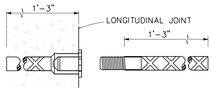
PLAN



LONGITUDINAL WEAKENED PLANE

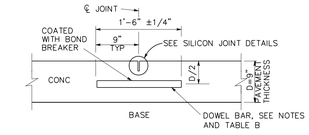


LONGITUDINAL CONSTRUCTION JOINT

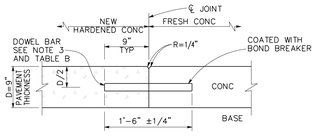


ALTERNATIVE TIE BAR SPLICE DETAIL
(SPLICE COUPLER)

TIE BAR DETAILS
SECTION A-A



TRANSVERSE WEAKENED PLANE



TRANSVERSE CONSTRUCTION JOINT DETAIL

DOWEL BAR DETAILS
SECTION B-B

TABLE A

TIE BAR SPACING TABLE

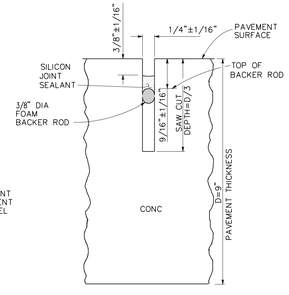
PANEL LENGTH	TOTAL TIE BARS PER SLAB	CLEARANCE TIE BAR TO TRANSVERSE JOINT
9'-0"	3	2'-2"
10'-0"	4	1'-6"
11'-0"	4	2'-0"
12'-0"	5	1'-4"
12'-4"	5	1'-6"
12'-6"	5	1'-7"
13'-0"	5	1'-10"
14'-0"	5	2'-4"
14'-4"	6	1'-4"
15'-0"	6	1'-8"

TABLE B

DOWEL BAR TRANSVERSE SPACING TABLE

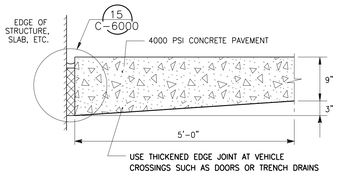
WIDTH BETWEEN LONGITUDINAL JOINTS	NUMBER OF DOWELS BETWEEN LONGITUDINAL JOINTS
15'-0"	15
14'-0"	14
13'-0"	13
12'-0"	12
11'-0"	11
10'-0"	10
8'-0"	8
5'-0"	5
4'-0"	4

NOTES
1. TRANSVERSE JOINTS SHALL BE CONSTRUCTED AT RIGHT ANGLES TO THE LONGITUDINAL PAVEMENT JOINTS.
2. IF FRESH CONCRETE IS PLACED ADJACENT TO EXISTING CONCRETE, THE TOP CORNER OF THE NEW HARDENED CONCRETE DOES NOT NEED TO BE ROUNDED TO THE 1/4" RADIUS, AS SHOWN.
3. 1-1/2" DIA SMOOTH DOWEL BARS ARE TO BE USED WITH A PAVEMENT THICKNESS, D, EQUAL TO OR GREATER THAN 8 INCHES. FOR PAVEMENT THICKNESS, D, LESS THAN 8 INCHES, USE 1-1/4" DIA SMOOTH DOWEL BARS.
4. MAXIMUM JOINT SPACING NOT TO EXCEED 15 FEET.
5. SUBMIT JOINTING PLAN FOR ENGINEERS APPROVAL.
6. USE 4000 PSI CLASS 3 CONCRETE CONFORMING TO CALTRANS STANDARD SPECIFICATIONS SECTIONS 40 AND 90.
7. PLACE CONCRETE PAVEMENT ON 4-INCH (MINIMUM) THICKNESS OF CLASS 2 AGGREGATE BASE COURSE WITH ¾" MAXIMUM AGGREGATE COMPACTED TO 95% RELATIVE COMPACTION.

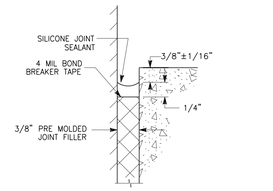


SILICON JOINT SEALANT

JOINTED PLAIN CONCRETE PAVEMENT
NO SCALE — 13 C-6000

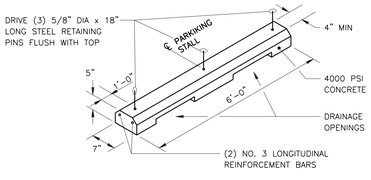


THICKENED CONCRETE EDGE DETAIL
SCALE: NONE — 14 C-6000



EDGE EXPANSION JOINT
SCALE: NONE — 15 C-6000

NOTE:
1. LOCATE CENTERLINE OF WHEEL STOP 3' FROM PAVEMENT EDGE OR END OF PARKING STALL UNLESS OTHERWISE INDICATED.



PRECAST CONCRETE WHEEL STOP DETAIL
SCALE: NTS — 16 C-6000

PRELIMINARY
NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
B	13-DEC-2012	ISSUE FOR PERMIT	T.O.C.	D.E.M.	C.S.H.
A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

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CHECKED BY D.E.M
APPR. BY C.S.H.
CLIENT APPR.

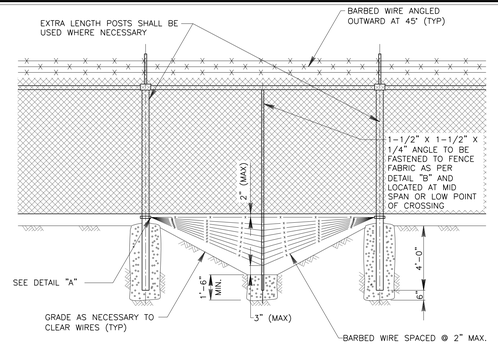
CH2MHILL
Atlanta, Georgia

SHEET TITLE: CIVIL SECTIONS AND DETAILS 1

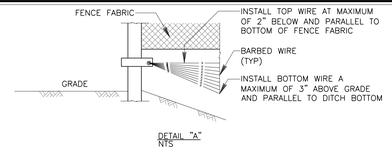
JOB NAME: PALEN SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892
FILENAME C-6000.dwg
SCALE NONE
REV. NO. B
DWG. NO. C-6000

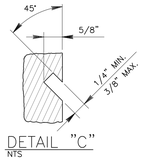
LGAE_3, ANSI E, 34 x 44 in.



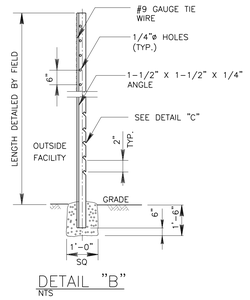
FENCE CROSSING @ DITCH
NTS



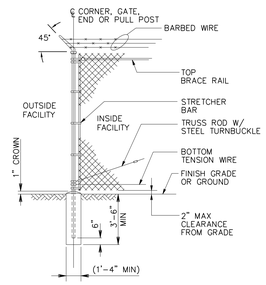
DETAIL "A"
NTS



DETAIL "C"
NTS



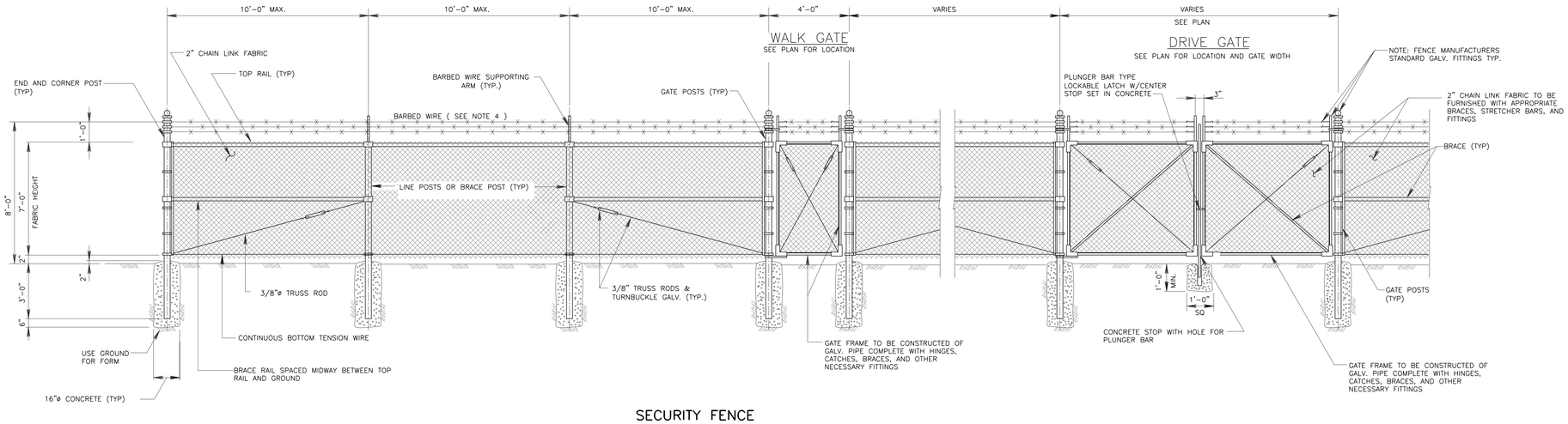
DETAIL "B"
NTS



CHAIN LINK FENCE CORNER GATE, END, OR PULL POST
NTS

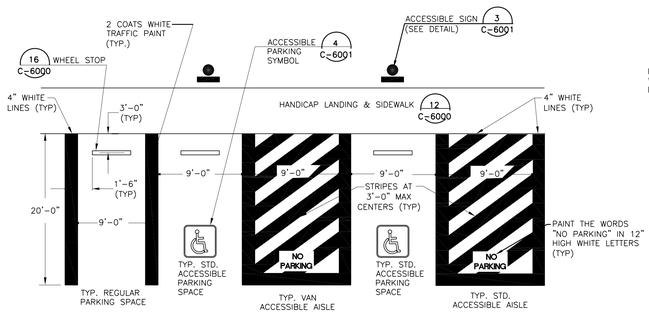
NOTES

1. WHERE BREAKS IN PROFILE OF FENCE ARE NECESSARY IN ROUGH TERRAIN THEY SHALL BE MADE IN THE LEAST NUMBER OF INTERVALS PRACTICAL. BREAKS SHALL BE SPREAD OVER VERTICAL CURVES OF SUFFICIENT LENGTHS TO INSURE A PLEASING APPEARANCE.
2. FABRIC SHALL BE FASTENED TO LINE POSTS WITH #9-GAUGE TIE WIRE SPACED APPROXIMATELY 12" APART. FABRIC SHALL BE ATTACHED TO TOP RAIL WITH #9-GAUGE TIE WIRES SPACED APPROXIMATELY 15" APART AND TO BOTTOM TENSION WIRE AT 2'-0" C/C
3. WHEN BARBED WIRE IS DESIGNATED FOR USE ABOVE FENCE IT SHALL ALSO BE USED ABOVE GATES.
4. WHERE THE ITEM PROVIDED INDICATES BARBED WIRE BEING REQUIRED, PLACE THREE LINES OF TWO (2) STRAND 12-1/2 GAUGE WIRE, WITH LOCKED FOUR (4) POINT BARBS, 5" SPACING. BARBED WIRE SHALL CONFORM TO REQUIREMENTS OF ASTM A121.
5. PULL POST ASSEMBLY REQUIRED EVERY 500 FEET OF FENCE AND AT ABRUPT VERTICAL CHANGES IN GRADE.



SECURITY FENCE INSTALLATION DETAILS

SCALE: NTS — 1 / C-6001

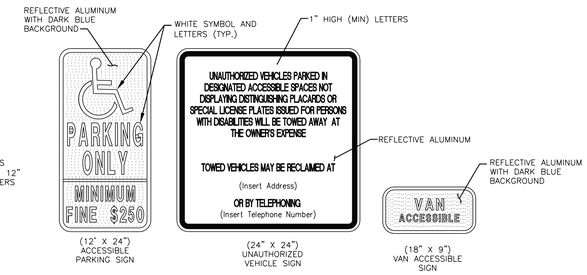


NOTES:

1. ACCESSIBLE RAMP & PARKING SPACE CONSTRUCTION & INSTALLATION SHALL CONFORM TO ALL ADA SPECIFICATIONS & STATE & LOCAL CODES.
2. VAN ACCESSIBLE SIGN SHALL BE MOUNTED BELOW THE ACCESSIBLE PARKING SIGN.
3. WHERE ACCESSIBLE PARKING SIGN OR VAN ACCESSIBLE SIGN ARE INSTALLED, THE BOTTOM OF THE SIGN OR PLAQUE PANEL SHALL BE A MINIMUM OF 7'-0" ABOVE THE SURROUNDING SURFACE.
4. AN "UNAUTHORIZED VEHICLE" SIGN SHALL BE POSTED IN A CONSPICUOUS PLACE IMMEDIATELY ADJACENT TO AND VISIBLE FROM EACH STALL. THE SIGN SHALL INCLUDE THE ADDRESS WHERE THE TOWED VEHICLE MAY BE RECLAIMED AND THE TELEPHONE NUMBER OF THE LOCAL TRAFFIC LAW ENFORCEMENT AGENCY.

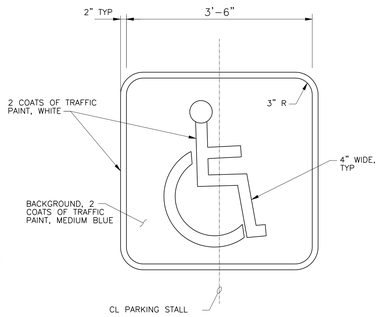
90° PARKING DETAIL

SCALE: NTS — 2 / C-6001



ACCESSIBLE PARKING SIGNS DETAIL

SCALE: NTS — 3 / C-6001



NOTES

1. PAINT SHALL BE WHITE CHOLORINATED RUBBER BASED, FACTORY-MIXED, QUICK-DRYING, AND NON-BLEEDING, COMPLYING WITH FEDERAL SPECIFICATION TT-P-115.
2. THICKNESS SHALL BE 15 MILS.

ACCESSIBLE PARKING SYMBOL DETAIL

SCALE: NTS — 4 / C-6001

PRELIMINARY
NOT FOR CONSTRUCTION

NO	DATE	REVISION	BY	CK.	APPR.
B	13-DEC-2012	ISSUE FOR PERMIT	T.O.C.	D.E.M.	C.S.H.
A	04-DEC-2012	ISSUE FOR REVIEW	T.O.C.	D.E.M.	C.S.H.

BrightSource

DESIGNED BY	T.O.C
CHECKED BY	D.E.M
APPR. BY	C.S.H.
CLIENT APPR.	

CH2MHILL
Atlanta, Georgia

SHEET TITLE: CIVIL SECTIONS AND DETAILS 2

JOB NAME: PALEN SOLAR ELECTRIC GENERATION STATION

JOB NO. 459892 | REV. NO. B
FILENAME C-6001.dwg | SCALE NONE | DWG. NO. C-6001

LGAE_3, ANSI E, 34 x 44 in.

APPENDIX 2-E

CIVIL ENGINEERING DESIGN CRITERIA

Appendix 2-E Civil Engineering Design Criteria

1.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of civil engineering systems for the Palen Solar Electric Generating System. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification and construction specifications.

1.2 Codes and Standards

The design of civil engineering systems for the project will be in accordance with the laws and regulations of the federal government, the State of California, and the Riverside County Code of Building Regulations. The current issue or edition of the documents at the time of filing this Application for Certification (AFC) will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

1.3 Civil Engineering Codes and Standards

The following codes and standards have been identified as applicable, in whole or in part, to civil engineering design and construction of power plants and related offsite improvements.

- American Association of State Highway and Transportation Officials (AASHTO)—Standards and Specifications
- American Concrete Institute (ACI) - Standards and Recommended Practices
- American Institute of Steel Construction (AISC) - Standards and Specifications
- American National Standards Institute (ANSI) - Standards
- American Society of Testing and Materials (ASTM) - Standards, Specifications, and Recommended Practices
- American Water Works Association (AWWA) - Standards and Specifications
- American Welding Society (AWS) - Codes and Standards
- Americans with Disabilities Act (ADA)
- Asphalt Institute (AI) - Asphalt Handbook
- California Energy Commission - Recommended Seismic Design Criteria for Non-Nuclear

Generating Facilities in California, 1989

- Concrete Reinforcing Steel Institute (CRSI) - Standards
- Factory Mutual (FM) - Standards
- National Fire Protection Association (NFPA) - Standards
- California Building Standards Code (CBC) 2001
- State of California Department of Transportation (CALTRANS) Standard Specification
- Steel Structures Painting Council (SSPC) - Standards and Specifications

1.4 Engineering Geology Codes, Standards, and Certifications

Engineering geology activities will conform to the applicable federal, state and local laws, regulations, ordinances and industry codes and standards.

1.4.1 Federal

None are applicable.

1.4.2 State

The Warren-Alquist Act, PRC, Section 25000 et seq. and the California Energy Commission (CEC) Code of Regulations (CCR), Siting Regulations, Title 20 CCR, Chapter 2, require that an AFC address the geologic and seismic aspects of the site.

The California Environmental Quality Act (CEQA), PRC 21000 et seq. and the CEQA Guidelines require that potential significant effects, including geologic hazards, be identified and a determination made as to whether they can be substantially reduced.

1.4.3 Local

California State Planning Law, Government Code Section 65302, requires each city and county to adopt a general plan, consisting of nine mandatory elements, to guide its physical development. Section 65302(g) requires that a seismic safety element be included in the general plan.

The site development activities will require certification by a Professional Geotechnical Engineer and a Professional Engineering Geologist during and following construction, in accordance with the California Building Code (CBC), Chapter 70. The Professional Geotechnical Engineer and the Professional Engineering Geologist will certify the placement of earthen fills and the adequacy of the site for structural improvements, as follows:

- Both the Professional Geotechnical Engineer and the Professional Engineering Geologist will

address CBC Chapter 70, Sections 7006 (Grading Plans), 7011 (Cuts), 7012 (Terraces), 7013 (Erosion Control), and 7015 (Final Report).

- The Professional Geotechnical Engineer will also address CBC Chapter 70, Sections 7011 (Cuts) and 7012 (Terraces).

Additionally, the Professional Engineering Geologist will present findings and conclusions pursuant to PRC, Section 25523 (a) and (c); and 20 CCR, Section 1752 (b) and (c).

APPENDIX 2-F

STRUCTURAL ENGINEERING DESIGN CRITERIA

Appendix 2-F Structural Engineering Design Criteria

1.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of structural engineering systems for the Palen Solar Electric Generating System. More specific project information will be developed during execution of the project to support detail design, engineering, material procurement specification and construction specifications.

1.2 Codes and Standards

The design of structural engineering systems for the project will be in accordance with the laws and regulations of the federal government, the State of California, Riverside County ordinances, and the industry standards. The current issue or edition of the documents at the time of filing of this Application for Certification (AFC) will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

The following codes and standards have been identified as applicable, in whole or in part, to structural engineering design and construction of power plants.

- California Building Code (CBC)
- American Institute of Steel Construction (AISC):
  - Manual of Steel Construction—13th Edition
  - Specification for Structural Steel Buildings—AISC 360
  - Specification for Structural Joints Using ASTM A325 or A490 Bolts
  - Code of Standard Practice for Steel Buildings and Bridges –AISC 303
  - Seismic Provisions for Structural Steel Buildings – AISC 341
- American Concrete Institute (ACI):
  - ACI 318, Building Code Requirements for Structural Concrete
  - ACI 301, Specifications for Structural Concrete
  - ACI 543R, Design, Manufacture, and Installation of Concrete Piles
  - ACI 530/ASCE 5/TMS 402, Building Code Requirements for Masonry Structures
- American Society of Civil Engineers (ASCE):

  - ASCE 7, Minimum Design Loads for Buildings and Other Structures

- American Welding Society (AWS):
  - D1.1—Structural Welding Code—Steel
  - D1.3—Structural Welding Code—Sheet Steel
- Code of Federal Regulations, Title 29—Labor, Chapter XVII, Occupational Safety and Health Administration (OSHA).
  - Part 1910—Occupational Safety and Health Standards
  - Part 1926—Construction Safety and Health Regulations
- National Association of Architectural Metal Manufacturers (NAAMM)—Metal Bar Grating Manual.
- Hoist Manufacturers Institute (HMI), Standard Specifications for Electric Wire Rope Hoists (HMI 100).
- National Electric Safety Code (NESC), C2
- National Fire Protection Association (NFPA Standards)
  - NFPA 850 Fire Protection for Electric Generating Plants
- OSHA Williams-Steiger Occupational Safety and Health Act of 1970.
- Steel Deck Institute (SDI)—Design Manual for Floor Decks and Roof Decks
- AWWA D-100 or D-102 Welded Carbon Steel Tanks for Water Storage, or Factory Coated Bolted Steel Carbon Storage Tanks for Water Storage.

1.3 CEC Special Requirements

Prior to the start of any increment of construction, the proposed lateral-force procedures for project structures and the applicable designs, plans and drawings for project structures will be submitted for approval.

Proposed lateral-force procedures, designs, plans, and drawings shall be those for:

- Major project structures
- Major foundations, equipment supports, and anchorage
- Large, field-fabricated tanks
- Switchyard structures

1.4 Structural Design Criteria

1.4.1 Datum

Site topographic elevations will be based on an elevation survey conducted using known elevation benchmarks. Topo map will extend away from the site as needed to determine Kzt (Topographic Factor) for use in ASCE section 6.5.7.2.

1.4.2 Frost Penetration

The site is located in an area free of frost penetration. Bottom elevation of all foundations for structures and equipment, however, will be maintained at a minimum of 12 inches below the finished grade.

1.4.3 Temperatures

The design basis temperatures for civil and structural engineering systems will be as follows:

Maximum	104°F
Minimum	28°F

1.5 Design Loads

1.5.1 General

Design loads for structures and foundations will comply with all applicable building code requirements.

1.5.2 Dead Loads

Dead loads will consist of the weights of structure and all equipment of a permanent or semi-permanent nature including tanks, bins, wall panels, partitions, roofing, drains, piping, cable trays, bus ducts, and the contents of tanks and bins measured at full operating capacity. The contents of the tanks and bins, however, will not be considered as effective in resisting structure uplift due to wind forces; but will be considered as effective for seismic forces.

1.5.3 Live Loads

Live load will consist of uniform floor live loads and equipment live loads. Uniform live loads are assumed equivalent unit loads that are considered sufficient to provide for movable and transitory loads, such as the weights of people, portable equipment and tools, small equipment or parts, which may be moved over or placed on the floors during maintenance operations, and planking. The uniform live loads will not be applied to floor areas that will be permanently occupied by equipment.

Lateral earth pressures, hydrostatic pressures, and wheel loads from trucks, will be considered as live loads.

Uniform live loads will be in accordance with ASCE Standard 7-05, but will not be less than the following:

- Roofs 20 pounds per square foot (psf)

- Floors and Platforms (steel grating and checkered plates) 100 psf

In addition, a uniform load of 50 psf will be used to account for piping and cable trays, except that where the piping and cable loads exceed 50 psf, the actual loads will be used.

Furthermore, a concentrated load of 5 kips will be applied non-concurrently to the supporting beams of the floors to maximize stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

- Floors (elevated concrete floors) 100 psf

In addition, elevated concrete slabs will be designed to support an alternate concentrated load of 2 kips in lieu of the uniform loads, whichever governs. The concentrated load will be treated as a uniformly distributed load acting over an area of 2.5 square feet, and will be located in a manner to produce the maximum stress conditions in the slabs.

- Control Room Floor 150 psf
- Stairs, Landings, and Walkways 100 psf

In addition, a concentrated load of 1 kip will be applied non-concurrently to the supporting beams for the walkways to maximize the stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

- Pipe Racks 50 psf

Where the piping and cable tray loads exceed the design uniform load, the actual loads will be used. In addition, a concentrated load of 8 kips will be applied concurrently to the supporting beams for the walkways to maximize the stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

- Hand Railings

Hand railings will be designed for either a uniform horizontal force of 20 pounds per linear foot (plf) applied in any direction, or a 200-pound concentrated load applied at any point and in any direction, whichever governs.

- Slabs on Grade 250 psf
- Truck Loading Surcharge Adjacent to Structures 250 psf
- Truck Support Structures AASHTO-HS-20-44
- Special Loading Conditions Actual loadings

Laydown loads from equipment components during maintenance and floor areas where trucks, forklifts or other transports have access, will be considered in the design of live loads.

Live loads may be reduced in accordance with the provisions of CBC Section 1607.

Posting of the floor load capacity signs for all roofs, elevated floors, platforms and walkways will be in compliance with the OSHA Occupational Safety and Health Standard, Walking and Working Surfaces, Subpart D. Floor load capacity for slabs on grade will not be posted.

1.5.4 Earth Pressures

Earth pressures will be in accordance with the recommendations contained in the project-specific geotechnical report.

1.5.5 Groundwater Pressures

Hydrostatic pressures due to groundwater or temporary water loads will be considered.

1.5.6 Wind Loads

The wind forces will be calculated in accordance with CBC 2007, Section 1609.1.1,with a basic wind speed of 85 miles per hour (mph), an Importance Factor of 1.15 and an exposure category of 'C.' Site specific special wind zones will be verified with the County Building Official.

1.5.7 Seismic Loads

Structures will be designed and constructed to resist the effects of earthquake loads as determined in CBC 2007, Section 1613 and applicable sections of ASCE 7-05. The occupancy category of all the structures is III. The Importance Factor (I) is 1.25 for all the structures except those related to fire safety and hazardous materials; the importance for theses structures is 1.50. Other seismic parameters will be obtained from the geotechnical report.

1.5.8 Snow Loads

Snow loads will not be considered.

1.5.9 Turbine-Generator Loads

The steam turbine-generator loads for pedestal and foundation design will be furnished by the equipment manufacturers, and will be applied in accordance with the equipment manufacturers' specifications, criteria, and recommendations.

1.5.10 Special Considerations for Steel Stacks

Steel stacks will be designed to withstand the normal and abnormal operating conditions in combination with wind loads and seismic loads, and will include the along-wind and across-wind effects on the stacks. The design will meet the requirements of ASME/ANSI STS-1-1992, "Steel Stacks," using allowable stress design

method, except that increased allowable stress for wind loads as permitted by AISC will not be used.

1.5.11 Special Considerations for Structures and Loads during Construction

For temporary structures, or permanent structures left temporarily incomplete to facilitate equipment installations, or temporary loads imposed on permanent structures during construction, the allowable stresses may be increased by 33 percent.

Structural backfill may be placed against walls, retaining walls, and similar structures when the concrete strength attains 80 percent of the design compressive strength (f'c), as determined by sample cylinder tests. Restrictions on structural backfill, if any, will be shown on the engineering design drawings.

Design restrictions imposed on construction shoring removal that are different from normal practices recommended by the ACI Codes will be shown on engineering design drawings.

Metal decking used as forms for elevated concrete slabs will be evaluated to adequately support the weight of concrete plus a uniform construction load of 50 psf, without increase in allowable stresses.

1.6 Design Bases

1.6.1 General

Reinforced concrete structures will be designed by the strength design method, in accordance with the California Building Code and the ACI 318, "Building Code Requirements for Structural Concrete."

Steel structures will be designed by the working stress method, in accordance with the California Building Code and the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

Allowable soil bearing pressures for foundation design will be in accordance with the "Final Subsurface Investigation and Foundation Report" for the Facility.

1.6.3 Allowable Stresses

Calculated stresses from the governing loading combinations for structures and equipment supports will not exceed the allowable limits permitted by the applicable codes, standards, and specifications.

1.7 Construction Materials

1.7.1 Concrete and Grout

The design compressive strength (f'c) of concrete and grout, as measured at 28 days, will be as follows:

Electrical ductbank encasement and lean concrete backfill (Class L-1)	1000 psi
Structural concrete (Class S-1)	3000 psi

Structural concrete (Class S-2)	4000 psi
Grout (Class G-1)	5000 psi

The classes of concrete and grout to be used will be shown on engineering design drawings or indicated in design specifications.

1.7.2 Reinforcing Steel

Reinforcing steel bars for concrete will be deformed bars of billet steel, conforming to ASTM A 615, Grade 60. Use ASTM A706 for reinforcing steel that will be welded or is required in order to meet requirements of Chapter 21 of the ACI code.

Welded wire fabric for concrete will conform to ASTM A 185.

1.7.3 Structural and Miscellaneous Steel

Structural and miscellaneous steel will generally conform to ASTM A 36, ASTM A 572, or ASTM A992 except in special situations where higher strength steel is required.

High strength structural bolts, including nuts and washers, will conform to ASTM A 325 or ASTM A 490.

Bolts other than high-strength structural bolts will conform to ASTM A307, Grade A.

1.7.4 Concrete Masonry

Concrete masonry units will be hollow, normal weight conforming to ASTM C90-02 with compressive strength = 1900psi

Mortar will conform to ASTM C 270, Type S.

Grout will conform to ASTM C 476, with compressive strength= 2000psi

Assembly design strength f'm=1500 psi

1.7.6 Other Materials

Other materials for construction, such as anchor bolts, shear connectors, concrete expansion anchors, embedded metal, etc., will conform to industry standards and will be identified on engineering design drawings or specifications.

APPENDIX 2-G

MECHANICAL ENGINEERING DESIGN CRITERIA

Appendix 2-G Mechanical Engineering Design Criteria

1.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of mechanical engineering systems for the Palen Solar Electric Generating System. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification, and construction specifications.

1.2 Codes and Standards

The design of the mechanical systems and components will be in accordance with the laws and regulations of the federal government, state of California, Riverside County ordinances, and industry standards. The current issue or revision of the documents at the time of the filing of this Application for Certification (AFC) will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirements shall apply.

The following codes and standards are applicable to the mechanical aspects of the power facility.

- California Building Standards Code
- American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code
- ASME/ANSI B31.1 Power Piping Code
- ASME Performance Test Codes
- ASME Standard TDP-1
- American National Standards Institute (ANSI) B16.5, B16.34, and B133.8
- American Boiler Manufacturers Association (ABMA)
- American Gear Manufacturers Association (AGMA)
- Air Moving and Conditioning Association (AMCA)
- American Society for Testing and Materials (ASTM)
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- American Welding Society (AWS)
- Cooling Tower Institute (CTI)
- Heat Exchange Institute (HEI)
- Manufacturing Standardization Society (MSS) of the Valve and Fitting Industry

- National Fire Protection Association (NFPA)
- Hydraulic Institute Standards (HIS)
- Tubular Exchanger Manufacturer's Association (TEMA)

1.3 Mechanical Engineering General Design Criteria

1.3.1 General

The systems, equipment, materials, and their installation will be designed in accordance with the applicable codes; industry standards; and local, state, and federal regulations, as well as the design criteria; manufacturing processes and procedures; and material selection, testing, welding, and finishing procedures specified in this section.

Detailed equipment design will be performed by the equipment vendors in accordance with the performance and general design requirements to be specified later by the project A/E firm. Equipment vendors will be responsible for using construction materials suited for the intended use.

1.3.2 Materials

Asbestos will not be used in the materials and equipment supplied. Where feasible, materials will be selected to withstand the design operating conditions, including expected ambient conditions, for the design life of the plant. It is anticipated that some materials will require replacement during the life of the plant due to corrosion, erosion, etc.

1.3.3 Pumps

Pumps will be sized in accordance with industry standards. Where feasible, pumps will be selected for maximum efficiency at the normal operating point. Pumps will be designed to be free from excessive vibration throughout the operating range.

1.3.4 Tanks

Large outdoor storage tanks will not be insulated except where required to maintain appropriate process temperatures or for personnel protection.

Overflow connections and lines will be provided. Maintenance drain connections will be provided for complete tank drainage.

Manholes, where provided, will be at least 24 inches in diameter and hinged to facilitate removal. Storage

tanks will have ladders and cleanout doors as required to facilitate access/maintenance. Provisions will be included for proper tank ventilation during internal maintenance.

1.3.5 Heat Exchangers

The surface condenser will be designed in accordance with Heat Exchange Institute (HEI) standards. Other heat exchangers will be provided as components of mechanical equipment packages and may be shell-and-tube or plate type. Heat exchangers will be designed in accordance with TEMA or manufacturer's standards. Fouling factors will be specified in accordance with TEMA.

1.3.6 Pressure Vessels

Pressure vessels will include the following features/appurtenances:

- Process, vent, and drain connections for startup, operation, and maintenance
- Materials compatible with the fluid being handled
- A minimum of one manhole and one air ventilation opening (e.g., handhole) where required for maintenance or cleaning access
- For vessels requiring insulation, shop-installed insulation clips spaced not greater than 18 inches on center
- Relief valves in accordance with the applicable codes

1.3.7 Piping and Piping Supports

Stainless steel pipe may be Schedule 10S where design pressure permits. Underground piping may be high-density polyethylene (HDPE) or polyvinyl chloride (PVC) where permitted by code, operating conditions, and fluid properties. In general, water system piping will be HDPE or PVC where embedded or underground and carbon steel where aboveground. Appropriately lined and coated carbon steel pipe may alternately be used for buried water piping.

Threaded joints will not normally be used in piping used for lubricating oil, and LPG service. LPG piping components will not use synthetic lubricants. Victaulic, or equal, couplings may be used for low-energy aboveground piping, where feasible.

Piping systems will have high-point vents and low-point drains. Drains with restricting orifices or steam traps with startup and blowdown drains and strainers will be installed in low points of steam lines where

condensate can collect during normal operation.

Steam piping systems and steam drain lines in the plant will typically be sloped in the direction of steam flow. Condensate collection in piping systems will be avoided by installing automatic drain devices and manual devices as appropriate.

Steam lines fitted with restricting devices, such as orifices in the process runs, will include adequate drainage upstream of the device to prevent condensate from collecting in lines.

Hose and process tubing connections to portable components and systems will be compatible with the respective equipment suppliers' standard connections for each service.

Stainless steel piping will be used for portions of the lubricating oil system downstream of the filters. Carbon steel piping may be used elsewhere.

1.4 Valves

1.4.1 General Requirements

Valves will be arranged for convenient operation from floor level where possible and, if required, will have extension spindles, chain operators, or gearing. Hand-actuated valves will be operable by one person. Gear operators will be provided on manual valves 8 inches or larger.

Valves will be arranged to close when the handwheel is rotated in a clockwise direction when looking at the handwheel from the operating position. The direction of rotation to close the valve will be clearly marked on the face of each handwheel.

The stops that limit the travel of each valve in the open or closed position will be arranged on the exterior of the valve body. Valves will be fitted with an indicator to show whether they are open or closed; however, only critical valves will be remotely monitored for position.

Valve materials will be suitable for operation at the maximum working pressure and temperature of the piping to which they are connected. Steel valves will have cast or forged steel spindles. Seats and faces will be of low-friction, wear-resistant materials. Valves in throttling service will be selected with design characteristics and of materials that will resist erosion of the valve seats when the valves are operated partly closed.

Valves operating at less than atmospheric pressure will include means to prevent air in-leakage. No provision will be made to repack valve glands under pressure.

1.4.2 Drain and Vent Valves and Traps

Drains and vents in 600-pound class or higher piping and 900ºF or higher service will be double-valved.

Drain traps will include air cock and easing mechanism. Internal parts will be constructed from corrosion-resistant materials and will be renewable.

Trap bodies and covers will be cast or forged steel and will be suitable for operating at the maximum working pressure and temperature of the piping to which they are connected. Traps will be piped to drain collection tank or sumps and returned to the cycle if convenient.

1.4.3 Low Pressure Water Valves

Low-pressure water valves will be the butterfly type of cast iron construction. Ductile iron valves will have ductile iron bodies, covers, gates (discs), and bridges; the spindles, seats, and faces will be bronze. Fire protection valves will be Underwriters Laboratories (UL)-approved butterfly valves meeting NFPA requirements.

1.4.4 Instrument Air Valves

Instrument air valves will be the ball type of bronze construction, with valve face and seat of approved wear-resistant alloy.

1.4.5 Nonreturn Valves

Nonreturn valves for steam service will be in accordance with ANSI standards and properly drained. Nonreturn valves in vertical positions will have bypass and drain valves. Bodies will have removable access covers to enable the internal parts to be examined or renewed without removing the valve from the pipeline.

1.4.6 Motor-Actuated Valves

Electric motor actuators will be designed specifically for the operating speeds, differential and static pressures, process line flowrates, operating environment, and frequency of operations for the application. Electric actuators will have self-locking features. A handwheel and declutching mechanism will be provided to allow handwheel engagement at any time except when the motor is energized. Actuators will automatically revert back to motor operation, disengaging the handwheel, upon energizing the motor. The motor actuator will be placed in a position relative to the valve that prevents leakage of liquid, steam, or corrosive gas from valve joints onto the motor or control equipment.

1.4.7 Safety and Relief Valves

Safety valves and/or relief valves will be provided as required by code for pressure vessels, heaters, and boilers. Safety and relief valves will be installed vertically. Piping systems that can be over-pressurized by a higher-pressure source will also be protected by pressure-relief valves. Equipment or parts of equipment that can be over-pressurized by thermal expansion of the contained liquid will have thermal relief valves.

1.4.8 Instrument Root Valves

Instrument root valves will be specified for operation at the working pressure and temperature of the piping to which they are connected. Test points and sample lines in systems that are 600-pound class or higher service will be double-valved.

1.5 Heating, Ventilating, and Air Conditioning (HVAC)

HVAC system design will be based on site ambient conditions specified in Section 2.0, Project Description.

Except for the HVAC systems serving the control room, maintenance shop, lab areas, and administration areas, the systems will not be designed to provide comfort levels for extended human occupancy.

Air conditioning will include both heating and cooling of the inlet-filtered air. Air velocities in ducts and from louvers and grills will be low enough not to cause unacceptable noise levels in areas where personnel are normally located.

Fans and motors will be mounted on anti-vibration bases to isolate the units from the building structure. Exposed fan outlets and inlets will be fitted with guards. Wire guards will be specified for belt-driven fans and arranged to enclose the pulleys and belts.

Air filters will be housed in a manner that facilitates removal. The filter frames will be specified to pass the air being handled through the filter without leakage.

Ductwork, filter frames, and fan casings will be constructed of mild steel sheets stiffened with mild steel flanges and galvanized. Ductwork will be the sectional bolted type and will be adequately supported. Duct joints will be leaktight.

Grills and louvers will be of adjustable metal construction.

1.6 Thermal Insulation and Cladding

Parts of the facility requiring insulation to reduce heat loss or afford personnel safety will be thermally insulated. Minimum insulation thickness for hot surfaces near personnel will be designed to limit the outside lagging surface temperature to a maximum of 140°F.

The thermal insulation will have as its main constituent calcium silicate, foam glass, fiber glass, or mineral wool, and will consist of pre-formed slabs or blankets, where feasible. Asbestos-containing materials are prohibited. An aluminum jacket or suitable coating will be provided on the outside surface of the insulation. Insulation system materials, including jacketing, will have a flame spread rating of 25 or less when tested in accordance with ASTM E 84.

Insulation at valves, pipe joints, steam traps, or other points to which access may be required for maintenance will be specified to be removable with a minimum of disturbance to the pipe insulation. At each flanged joint, the molded material will terminate on the pipe at a distance from the flange equal to the overall length of the flange bolts to permit their removal without damaging the molded insulation. Outdoor aboveground insulated piping will be clad with textured aluminum of not less than 30 mil. thickness and frame-reinforced. At the joints, the sheets will be sufficiently overlapped and caulked to prevent moisture from penetrating the insulation. Steam trap stations will be “boxed” for ease of trap maintenance.

Design temperature limits for thermal insulation will be based on system operating temperature during normal operation.

Outdoor and underground insulation will be moisture-resistant.

1.7 Testing

Hydrostatic testing, including pressure testing at 1.5 times the design pressure, or as required by the applicable code, will be specified and performed for pressure boundary components where an in-service test is not feasible or permitted by code.

1.8 Welding

Welders and welding procedures will be certified in accordance with the requirements of the applicable codes and standards before performing any welding. Records of welder qualifications and weld procedures will be maintained.

1.9 Painting

Except as otherwise specified, equipment will receive the respective manufacturer’s standard shop finish.

Finish colors will be selected from among the paint manufacturer's standard colors.

Finish painting of uninsulated piping will be limited to that required by OSHA for safety or for protection from the elements.

Piping to be insulated will not be finish painted.

1.10 Lubrication

The types of lubrication specified for facility equipment will be suited to the operating conditions and will comply with the recommendations of the equipment manufacturers.

The initial startup charge of flushing oil will be the equipment manufacturer's standard lubricant for the intended service. Subsequently, such flushing oil will be sampled and analyzed to determine whether it can also be used for normal operation or must be replaced in accordance with the equipment supplier's recommendations.

Rotating equipment will be lubricated as designed by the individual equipment manufacturers. Oil cups will be specified. Where automatic lubricators are fitted to equipment, provision for emergency hand lubrication will also be specified. Where applicable, equipment will be designed to be manually lubricated while in operation without the removal of protective guards. Lubrication filling and drain points will be readily accessible.

APPENDIX 2-H

ELECTRICAL ENGINEERING DESIGN CRITERIA

Appendix 2-H Electrical Engineering Design Criteria

1.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of electrical engineering systems for the Palen Solar Electric Generating System. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification, and construction specifications.

1.2 Codes and Standards

The design of the electrical systems and components will be in accordance with the laws and regulations of the federal government and the State of California, Riverside County ordinances, and industry standards. The current issue or revision of the documents at the time of filing this Application for Certification will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirement will apply.

The following codes and standards are applicable to the electrical aspects of the power facility:

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Anti-Friction Bearing Manufacturers Association (AFBMA)
- California Building Standards Code
- California Electrical Code
- Insulated Cable Engineers Association (ICEA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Illuminating Engineering Society (IES)
- National Association of Corrosion Engineers (NACE)
- National Electrical Code (NEC)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories, Inc. (UL)

1.3 Switchyard and Transformers

1.3.1 Switchyard

The Palen Solar Electric Generating System consists of two solar tower power plants which will tie into a 230 kV on site switchyard. The plant has a steam turbine generator that will connect to the switchyard via

a generator step-up transformer, a generator circuit breaker, and a high voltage switchyard breaker. The generator and generator circuit breaker will conform to IEEE C50.13 and IEEE C37.013 respectively. A disconnect switch will be included with the generator circuit breaker for generator disconnect and transformer maintenance. Isolated phase bus duct will connect the generator to the generator circuit breaker and the generator circuit breaker to the generator step-up transformer. High voltage disconnect switches and bus will conform to IEEE C37.32-2002.

The switchyard will require an underground line for the connection to the GSUs. The high voltage circuit breaker and switchyard protection scheme will conform to IEEE C37 standards. All instrument transformers associated with the plant will comply with IEEE 57.13. The design and construction of the plant switchyard will conform to all applicable codes and standards including, but not limited to IEEE 1127, 1267, 1427, and 1527 and the NESC.

A switchyard grounding grid will be provided to control step and touch potentials in accordance with IEEE Standard 80, Safety in Substation Grounding. Metallic equipment, structures, and fencing will be connected to the grounding grid of buried conductors and ground rods will be installed as required for personnel safety. The substation ground grid will be tied to the plant ground grid.

Lightning protection will be provided by shield wires or lightning masts and surge arrestors. The lightning protection system will be designed in accordance with IEEE 998 guidelines.

All faults will be detected, isolated, and cleared in a safe and coordinated manner as soon as practical to ensure the safety of equipment, personnel, and the public. Protective relaying will meet IEEE C37 requirements for each piece of equipment and will be coordinated with the utility.

Revenue metering will be provided on the 230 kV switchyard bus to record net power to or from the Southern California Edison Red Bluff substation. Meters and a metering panel will be provided. Metering will conform to IEEE C51.1 and utility standards.

1.3.2 Transformers

The generators will be connected to the 230 kV switchyard through GSU transformers and the plant auxiliary transformers will supply the plant loads. These transformers will be designed in accordance with ANSI C57 standards.

APPENDIX 2-I

CONTROL ENGINEERING DESIGN CRITERIA

Appendix 2-I Control Engineering Design Criteria

1.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and installation of instrumentation and controls for the Palen Solar Electric Generating System. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification and construction specifications.

1.2 Codes and Standards

The design specification of all work will be in accordance with the laws and regulations of the federal government, the state of California, and local codes and ordinances. A summary of general codes and industry standards applicable to design and control aspects of the power facility follows.

- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- The Institute of Electrical and Electronics Engineers (IEEE)
- Instrumentation, Systems, and Automation Society (ISA)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- American Society for Testing and Materials (ASTM)

1.3 Control Systems Design Criteria

1.3.1 General Requirements

Electronic signal levels, where used, will be 4 to 20 milliamps (mA) for analog transmitter outputs, controller outputs, electric-to-pneumatic converter inputs, and valve positioner inputs.

The switched sensor full-scale signal level will be between 0 volt (V) and 125 volt (V).

1.3.2 Pressure Instruments

In general, pressure instruments will have linear scales with units of measurement in pounds per square inch, gauge (psig).

Pressure gauges will have either a blowout disk or a blowout back and an acrylic or shatterproof glass face.

Pressure gauges on process piping will be resistant to plant atmospheres.

Siphons will be installed on pressure gauges in steam service as required by the system design. Steam pressure-sensing transmitters or gauges mounted above the steam line will be protected by a loop seal.

Pressure test points will have isolation valves and caps or plugs. Pressure devices on pulsating services will have pulsation dampers.

1.3.3 Temperature Instruments

In general, temperature instruments will have scales with temperature units in degrees Fahrenheit. Exceptions to this are electrical machinery resistance temperature detectors (RTDs) and transformer winding temperatures, which are in degrees Celsius.

Bimetal-actuated dial thermometers will have 4.5- or 5-inch-diameter (minimum) dials and white faces with black scale markings and will consist of every angle-type. Dial thermometers will be resistant to plant atmospheres.

Temperature elements and dial thermometers will be protected by thermowells except when measuring gas or air temperatures at atmospheric pressure. Temperature test points will have thermowells and caps or plugs.

RTDs will be 100-ohm platinum, 3-wire type. The element will be spring-loaded, mounted in a thermowell, and connected to a cast iron head assembly.

Thermocouples will be Type J or K dual-element, grounded, spring-loaded, for general service. Materials of construction will be dictated by service temperatures. Thermocouple heads will be the cast type with an internal grounding screw.

1.3.4 Level Instruments

Reflex-glass or magnetic level gauges will be used. Level gauges for high-pressure service will have suitable personnel protection.

Gauge glasses used in conjunction with level instruments will cover a range that includes the highest and lowest trip/alarm set points.

1.3.5 Flow Instruments

Flow transmitters will typically be the differential pressure-type with the range similar to that of the primary element. In general, linear scales will be used for flow indication and recording.

Magnetic flow transmitters may be used for liquid flow measurement below 200 degrees F.

1.3.6 Control Valves

Control valves in throttling service will generally be the globe-body cage type with body materials, pressure

rating, and valve trims suitable for the service involved. Other style valve bodies (e.g., butterfly, eccentric disk) may also be used when suitable for the intended service.

Valves will be designed to fail in a safe position.

Control valve body size will not be more than two sizes smaller than line size, unless the smaller size is specifically reviewed for stresses in the piping.

Control valves in 600-Class service and below will be flanged where economical. Where flanged valves are used, minimum flange rating will be ANSI 300 Class.

Critical service valves will be defined as ANSI 900 Class and higher in valves of sizes larger than 2 inches.

Severe service valves will be defined as valves requiring anticavitation trim, low noise trim, or flashing service, with differential pressures greater than 100 pounds per square inch (psi).

In general, control valves will be specified for a noise level no greater than 90 decibel A-rated (dBA) when measured 3 feet downstream and 3 feet away from the pipe surface.

Valve actuators will use positioners and the highest pressure, smallest size actuator, and will be the pneumatic-spring diaphragm or piston type. Actuators will be sized to shutoff against at least 110 percent of the maximum shutoff pressure and designed to function with instrument air pressure ranging from 80 to 125 psig.

Handwheels will be furnished only on those valves that can be manually set and controlled during system operation (to maintain plant operation) and do not have manual bypasses.

Control valve accessories, excluding controllers, will be mounted on the valve actuator unless severe vibration is expected.

Solenoid valves supplied with the control valves will have Class H coils. The coil enclosure will normally be a minimum of NEMA 4 but will be suitable for the area of installation. Terminations will typically be by pigtail wires.

Valve position feedback (with input to the DCS for display) will be provided for all control valves.

1.3.7 Instrument Tubing and Installation

Tubing used to connect instruments to the process line will be stainless steel for primary instruments and sampling systems.

Instrument tubing fittings will be the compression type. One manufacturer will be selected for use and will be standardized as much as practical throughout the plant.

Differential pressure (flow) instruments will be fitted with three-valve manifolds; two-valve manifolds will be

specified for other instruments as appropriate.

Instrument installation will be designed to correctly sense the process variable. Taps on process lines will be located so that sensing lines do not trap air in liquid service or liquid in gas service. Taps on process lines will be fitted with a shutoff (root or gauge valve) close to the process line. Root and gauge valves will be main-line class valves.

Instrument tubing will be supported in both horizontal and vertical runs as necessary. Expansion loops will be provided in tubing runs subject to high temperatures. The instrument tubing support design will allow for movement of the main process line.

1.3.8 Pressure and Temperature Switches

Field-mounted pressure and temperature switches will have either NEMA Type 4 housings or housings suitable for the environment.

In general, switches will be applied such that the actuation point is within the center one-third of the instrument range.

1.3.9 Field-Mounted Instruments

Field-mounted instruments will be of a design suitable for the area in which they are located. They will be mounted in areas accessible for maintenance and relatively free of vibration and will not block walkways or prevent maintenance of other equipment.

Field-mounted instruments will be grouped on racks. Supports for individual instruments will be prefabricated, off-the-shelf, 2-inch pipestand. Instrument racks and individual supports will be mounted to concrete floors, to platforms, or on support steel in locations not subject to excessive vibration.

Individual field instrument sensing lines will be sloped or pitched in such a manner and be of such length, routing, and configuration that signal response is not adversely affected.

Liquid level controllers will generally be the nonindicating, displacement-type with external cages.

1.3.10 Instrument Air System

Branch headers will have a shutoff valve at the takeoff from the main header. The branch headers will be sized for the air usage of the instruments served, but will be no smaller than 3/8 inch. Each instrument air user will have a shutoff valve, filter, outlet gauge, and regulator at the instrument.

APPENDIX 2-J

GEOTECHNICAL ENGINEERING AND FOUNDATION DESIGN CRITERIA

Appendix 2-J Geotechnical and Foundation Design Criteria

1.1 Introduction

This appendix contains a description of the site conditions and preliminary foundation related subsurface conditions. Soil-related hazards addressed include soil liquefaction, hydro-compaction (or collapsible soils), and expansive soils. Preliminary foundation and earthwork considerations are addressed based on the results of general published information available for the project area and collected for the AFC, and established geotechnical engineering practices.

Information contained in this appendix reflects the codes, standards, criteria, and practices that will be used in the design and construction of site and foundation engineering systems for the facility. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification and construction specifications. This information will be included in a geotechnical engineering study, which, if requested, will be provided to the CEC upon completion.

1.2 Site Conditions

The proposed Palen Solar Electric Generating System project site will cover approximately 3794 acres and is located approximately 10 miles east of Desert Center along Interstate 10 in Chuckwalla Valley in Palen, California.

1.3 Site Subsurface Conditions

1.3.1 Stratigraphy

Generalized descriptions of the materials encountered are given in the project geotechnical study based on the review of background documents, field exploration, and laboratory testing. Exploratory borings and test pits were used to determine subsurface conditions. The values and findings of these efforts will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.3.2 Seismicity/Ground-Shaking

The project site lies within a seismically active region. The proximity of the nearest active fault and fault zones along with their direction, earthquake potential and peak ground accelerations will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.3.3 Ground Rupture

Based on the information collected from a preliminary geotechnical report for the project site, the potential for fault related surface rupture at the site is low. Verification will be provided in the final geotechnical report provided by the project geotechnical engineer.

1.3.4 Groundwater

The depth to groundwater at the project site is relatively deep. A preliminary geotechnical study notes that groundwater was encountered within two of the exploratory borings at depths of 68 ft and 73 ft below ground surface. This occurrence of groundwater was attributed to perched water and not representative of the water table. Several wells have been drilled on site and will provide the most reliable groundwater data. Further information regarding groundwater elevations at the project site will be explained and defined in the ground water report provided by the project hydro-geologist.

1.4 Assessment of Soil-Related Hazards

1.4.1 Liquefaction and Dynamic Compaction

Soil liquefaction is a process by which loose, saturated, granular deposits lose a significant portion of their shear strength due to pore water pressure buildup resulting from cyclic loading, such as that caused by an earthquake. Soil liquefaction can lead to foundation bearing failures and excessive settlements. A preliminary geotechnical report indicated the level of liquefaction potential for this site to be low. The same preliminary geotechnical report indicated that loose sand layers could at the site could occur at the ground surface and as buried layers with the potential for seismically induced dynamic compaction and should be verified during the design geotechnical investigation. The level of liquefaction potential and dynamic compaction at the site will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.4.2 Expansive Soils

Expansive soils shrink and swell with wetting and drying. The shrink-swell capacity of expansive soils can result in differential movement beneath foundations. Laboratory test results for representative soil samples below grade were tested by the geotechnical engineer to determine overall soil expansiveness. The level of expansive soil and possible corrective techniques will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.4.3 Collapsible Soils

Soil collapse (hydro-compaction) is a phenomenon that results in relatively rapid settlement of soil deposits due to addition of water. The level of collapsible soil and possible corrective techniques will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.5 Preliminary Foundation Considerations

1.5.1 General Foundation Design Criteria

For satisfactory performance, the foundation of any structure or equipment must satisfy two independent design criteria. First, each system must exhibit sufficient capacity as either a shallow or deep foundation under maximum design loads in conformance with established and code-compliant safety factors. Second, settlements during the life of the structure must not be of a magnitude that will cause structural damage, endanger piping connections or impair the operational efficiency of the facility. Selection of the foundation type to satisfy these criteria depends on the nature and magnitude of dead and live loads, the base area of the structure and the settlement tolerances. Where more than one foundation type satisfies these criteria, then cost, scheduling, material availability and local practice will probably influence or determine the final selection of the type of foundation.

Based on the information collected from the preliminary geotechnical report no adverse foundation-related subsurface and groundwater conditions would be encountered that would preclude the construction and operation of the proposed structures. The site can be considered suitable for development of the proposed structures, pursuant to completion of a geotechnical investigation, and the preliminary foundation and earthwork considerations discussed in this appendix.

1.5.2 Shallow Foundations

Completion of the geotechnical investigation will verify if the proposed structures can be supported directly on the native soils. A preliminary geotechnical report indicates that the upper 1.5 ft to 2 ft are unsuitable for support of fill or structures and will require over-excavation and recompaction in areas to receive fill, shallow spread foundations, and pavement subgrades, with the over-excavation extending a minimum of 5 ft beyond the perimeter of foundations or paving subgrade. The preliminary geotechnical report also indicates that the allowable bearing capacity will be governed by tolerable settlement considerations – hence heavily loaded areas such as around the power block area will require further investigation. Shallow foundation construction, along with its associated earthwork measures, allowable bearing pressures, minimum dimensions, minimum embedment, frost depth and settlement potential will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.5.3 Deep Foundations

Completion of the geotechnical investigation will determine if the proposed structures will require deep foundations. A preliminary geotechnical report considered cast in drilled hole pier foundations to a depth of 20 ft. Deep foundation construction, along with its associated length, size, allowable bearing, uplift, and lateral capacity will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.5.4 Corrosion Potential and Ground Aggressiveness

Based on the information collected from the preliminary geotechnical report the results of resistivity tests indicate the on-site soils are potentially moderate to severely corrosive to steel. Corrosion reduction methods are recommended for steel in contact with on-site soils. The level of corrosion potential, as well as, the soluble sulfate content, soluble chloride content, and applicable corrective techniques should be described in the final geotechnical report provided by the project geotechnical engineer.

1.6 Preliminary Earthwork Considerations

1.6.1 Site Preparation and Grading

The subgrade preparation would include limited areas where the complete removal of all vegetation and topsoil will be done. The proper preparation and grading techniques will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.6.2 Temporary Excavations

All excavations should be sloped in accordance with Occupational Safety and Health Act (OSHA) requirements. The need for internal supports in the excavation will be determined based on the final depth of the excavation. Any excavation below the water table should be dewatered using well points or other suitable system installed prior to the start of excavation. The proper excavation, shoring and dewatering techniques will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.6.3 Permanent Slopes

The proper construction of permanent slopes will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.6.4 Backfill Requirements

The proper backfill requirements including fill material, compaction and moisture content will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

1.7 Inspection and Monitoring

A California-registered Geotechnical Engineer or Engineering Geologist will monitor geotechnical aspects of foundation construction and/or installation and fill placement. At a minimum the Geotechnical Engineer/Engineering Geologist will monitor all the activities recommended in the building code and the final geotechnical report provided by the project geotechnical engineer.

1.8 Foundation Design Criteria

1.8.1 General

Reinforced concrete structures (spread footings, mats, and deep foundations) will be designed consistent with Appendix 2B, Structural Engineering Design Criteria.

Design criteria for either shallow or deep foundations will be in accordance with final detailed geotechnical investigation for the site.

1.8.2 Groundwater Pressures

Hydrostatic pressures due to groundwater or temporary water loads will be considered, if required.

1.8.3 Factors of Safety

The factor of safety for structures, tanks and equipment supports with respect to overturning, sliding, and uplift due to wind and buoyancy will be as defined in Appendix 2B, Structural Engineering Design Criteria.

1.8.4 Load Factors and Load Combinations

For reinforced concrete structures and equipment supports, using the strength method, the load factors and load combinations will be in accordance with Appendix 2B, Structural Engineering Design Criteria.

1.9 References

California Building Code. 2010.

Kleinfelder (September 16, 2009), “Preliminary Geotechnical Investigation Report, Solar Millennium Concentrating Solar Power Project Palen, Riverside County, California”, Kleinfelder Job No.: 104961.Pal 104961/DBA9R075, Copyright 2009 Kleinfelder.

APPENDIX 4

AIR QUALITY, GREENHOUSE GASES AND PUBLIC HEALTH

SUPPORTING DOCUMENTS

Table-1 Auxiliary Boilers #1 and #2 Page 1

Calculation of Criteria Pollutant Emissions for Boilers Firing Gaseous Fuels

Boiler Operation Mode: 25-100% MCR Load Case # of Units: 2

Ops Hr/Day: 3.5 eq to full load ops Fuel Type: Nat Gas

Ops Hr/Yr: 1202 eq to full load ops

1446 actual annual hours at all loads (not eq full load)

Calculation of Criteria Pollutant Emissions from Each Identical Unit

Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	All Units: Maximum Hourly Emissions, lb/hr	All Units: Maximum Daily Emissions, lb/day	All Units: Maximum Annual Emissions, lbs/yr	All Units: Annual Emissions, ton/yr
NOx	11.220	2.74E+00	9.59E+00	3.29E+03	1.65E+00	5.48E+00	1.92E+01	6.58E+03	3.29E+00
CO	18.360	4.48E+00	1.57E+01	5.39E+03	2.69E+00	8.96E+00	3.14E+01	1.08E+04	5.39E+00
VOC	5.508	1.34E+00	4.71E+00	1.62E+03	8.08E-01	2.69E+00	9.41E+00	3.23E+03	1.62E+00
SOx	3.060	7.47E-01	2.61E+00	8.98E+02	4.49E-01	1.49E+00	5.23E+00	1.80E+03	8.98E-01
PM10	5.100	1.25E+00	4.36E+00	1.50E+03	7.48E-01	2.49E+00	8.72E+00	2.99E+03	1.50E+00
PM2.5	5.100	1.25E+00	4.36E+00	1.50E+03	7.48E-01	2.49E+00	8.72E+00	2.99E+03	1.50E+00
	lbs/mmbtu								
CO2	116.95	2.91E+04	1.02E+05	3.50E+07	1.75E+04	5.82E+04	2.04E+05	7.00E+07	3.50E+04
Methane	0.0130	3.24E+00	1.13E+01	3.89E+03	1.95E+00	6.47E+00	2.27E+01	7.78E+03	3.89E+00
N2O	0.0002	5.49E-02	1.92E-01	6.60E+01	3.30E-02	1.10E-01	3.84E-01	1.32E+02	6.60E-02
CO2e									3.51E+04

Notes:

(1) natural gas criteria pollutant EF factors

(2) Based on maximum hourly boiler fuel use of 249 MMBtu/hr/boiler

and fuel HHV of 1020 Btu/scf gives 0.2441 MMscf/hr/boiler.

(3) Based on maximum annual boiler fuel use of 299,298 MMBtu/yr/boiler

and fuel HHV of 1020 Btu/scf gives 293.4294 MMscf/yr/boiler.

(4) LNBs with FGR and GCPs

(5) PM2.5 = PM10

(6) NG fuel S at 0.75 grains/100scf

Refs:

(1) EFs from Palen project team 11-15-12

(2) GHG EFs from CCAR General Protocol, January 2009.

Table-1 Auxiliary Boilers #1 and #2 Page 2

Calculation of Criteria Pollutant Emissions for Boilers Firing Gaseous Fuels

Boiler Operation Mode: 12.5% Low Load Case # of Units: 2

Ops Hr/Day: 1.7 Fuel Type: Nat Gas

Ops Hr/Yr: 580

Calculation of Criteria Pollutant Emissions from Each Identical Unit

Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	All Units Maximum Hourly Emissions, lb/hr	All Units Maximum Daily Emissions, lb/day	All Units Maximum Annual Emissions, lbs/yr	All Units Annual Emissions, ton/yr
NOx	11.220	3.42E-01	5.82E-01	1.98E+02	9.92E-02	6.84E-01	1.16E+00	3.97E+02	1.98E-01
CO	146.880	4.48E+00	7.61E+00	2.60E+03	1.30E+00	8.96E+00	1.52E+01	5.19E+03	2.60E+00
VOC	42.840	1.31E+00	2.22E+00	7.58E+02	3.79E-01	2.61E+00	4.44E+00	1.52E+03	7.58E-01
SOx	3.060	9.33E-02	1.59E-01	5.41E+01	2.71E-02	1.87E-01	3.17E-01	1.08E+02	5.41E-02
PM10	5.100	1.56E-01	2.64E-01	9.02E+01	4.51E-02	3.11E-01	5.29E-01	1.80E+02	9.02E-02
PM2.5	5.100	1.56E-01	2.64E-01	9.02E+01	4.51E-02	3.11E-01	5.29E-01	1.80E+02	9.02E-02
	lbs/mmbtu								
CO2	116.95	3.64E+03	6.18E+03	2.11E+06	1.05E+03	7.27E+03	1.24E+04	4.22E+06	2.11E+03
Methane	0.0130	4.04E-01	6.87E-01	2.34E+02	1.17E-01	8.09E-01	1.37E+00	4.69E+02	2.34E-01
N2O	0.0002	6.86E-03	1.17E-02	3.98E+00	1.99E-03	1.37E-02	2.33E-02	7.95E+00	3.98E-03
CO2e									2.12E+03

Notes:

(1) natural gas criteria pollutant EF factors

(2) Based on maximum hourly boiler fuel use of 31.1 MMBtu/hr/boiler

and fuel HHV of 1020 Btu/scf gives 0.0305 MMscf/hr/boiler.

(3) Based on maximum annual boiler fuel use of 18,038 MMBtu/yr/boiler

and fuel HHV of 1020 Btu/scf gives 17.6843 MMscf/yr/boiler.

(4) LNBs with FGR and GCPs

(5) PM2.5 = PM10

(6) NG fuel S at 0.75 grains/100scf

Refs:

(1) EFs from Palen project team 11-15-12

(2) GHG EFs from CCAR General Protocol, January 2009.

Table-1 Aux Boiler Startup Emissions Estimates Page 3

			SU/yr:	348
Boiler Operation Mode:	Startup		# of Units:	2
Startup Period, hrs:	0.5	low load case	SU hrs/yr:	174
Remainder of SU hour:	0.5	assumed at low load Ops case (12.5% load)		
		These emissions hours are accounted for under the low load Ops case.		

Emissions Factors:

Pollutant	SU lb/mmscf		Fuel use rate for SU low load case:	
Nox	89.76		31.1	mmbtu/hr low load case hour
CO	148.92		15.55	mmbtu per SU period
VOC	43.86		0.0152	mmscf per SU period
SOx	3.06			
PM10/2.5	10.1			
CO2e	117.285	lb/mmbtu (composite NG boiler factor)		

Startup Emissions Estimates

	Single Unit			All Units		
Pollutant	lbs/SU	lbs/yr	TPY	lbs/SU hr	lbs/yr	TPY
Nox	1.37	476.20	0.24	2.74	952.41	0.48
CO	2.27	790.06	0.40	4.54	1580.13	0.79
VOC	0.67	232.69	0.12	1.34	465.38	0.23
SOx	0.05	16.23	0.01	0.09	32.47	0.02
PM10/2.5	0.15	53.58	0.03	0.31	107.17	0.05
CO2e	1824	634676	317	3648	1269352	635

Startup Hour Emissions(0.5 hr SU and 0.5 hr low load)

	lbs/hr
Nox	1.54
CO	4.51
VOC	1.32
SOx	0.09
PM10/2.5	0.23
CO2e	3642

Notes:

1. EFs and ops data supplied by Palen project engineers, 11-15-12.
2. SU EFs derived from Hidden Hill Solar Project, Table 5.1B-2R, April 2012.

Table-1 Aux Boiler Daily Emissions Estimates Page 4

Daily Emissions Estimate (SU, low load, high load)

Emissions Values by Load

	SU lbs/hr	Low lbs/hr	High lbs/hr
Nox	1.54	0.342	2.74
CO	4.51	4.48	4.48
VOC	1.32	1.31	1.34
SOx	0.09	0.0933	0.747
PM10	0.23	0.156	1.25
PM2.5	0.23	0.156	1.25

SU hour = 0.5 hr in SU mode plus 0.5 hr at low load
1 SU hr per day
1.7 hrs per day of low load ops
3.5 hrs per day of high load ops

Estimated Maximum Daily Emissions (each aux boiler)

	lbs/day
Nox	11.71
CO	27.81
VOC	8.24
SOx	2.86
PM10	4.87
PM2.5	4.87

Table-2 Aux Boilers #1 and #2

Calculation of Hazardous Air Pollutant Emissions for Boilers Firing Gaseous Fuels

Boiler Operation Mode:	All modes-Annual		# of Units:	2
Max Hourly Fuel Use:	0.24412	mmscf	Fuel Type:	Nat Gas
Max Daily Fuel Use:	0.9765	mmscf at 4 hrs/day	Hrs/day:	4
Max Annual Fuel Use:	293.43	mmscf/yr	Hrs/Yr:	1956

Calculation of Hazardous Air Pollutant Emissions from Each Identical Unit

HAP	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr	All Units: Maximum Hourly Emissions, lb/hr	All Units: Maximum Daily Emissions, lb/day	All Units: Maximum Annual Emissions, lbs/yr	All Units: Annual Emissions, ton/yr
Acetaldehyde	9.00E-04	2.20E-04	8.79E-04	2.64E-01	1.32E-04	4.39E-04	1.76E-03	5.28E-01	2.64E-04
Acrolein	8.00E-04	1.95E-04	7.81E-04	2.35E-01	1.17E-04	3.91E-04	1.56E-03	4.69E-01	2.35E-04
Ammonia		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	1.70E-03	4.15E-04	1.66E-03	4.99E-01	2.49E-04	8.30E-04	3.32E-03	9.98E-01	4.99E-04
1,3-Butadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	2.00E-03	4.88E-04	1.95E-03	5.87E-01	2.93E-04	9.76E-04	3.91E-03	1.17E+00	5.87E-04
Formaldehyde	3.60E-03	8.79E-04	3.52E-03	1.06E+00	5.28E-04	1.76E-03	7.03E-03	2.11E+00	1.06E-03
Hexane	1.30E-03	3.17E-04	1.27E-03	3.81E-01	1.91E-04	6.35E-04	2.54E-03	7.63E-01	3.81E-04
Naphthalene	3.00E-04	7.32E-05	2.93E-04	8.80E-02	4.40E-05	1.46E-04	5.86E-04	1.76E-01	8.80E-05
PAHs (4)	1.00E-04	2.44E-05	9.77E-05	2.93E-02	1.47E-05	4.88E-05	1.95E-04	5.87E-02	2.93E-05
Propylene	1.55E-02	3.78E-03	1.51E-02	4.55E+00	2.27E-03	7.57E-03	3.03E-02	9.10E+00	4.55E-03
Propylene oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	7.80E-03	1.90E-03	7.62E-03	2.29E+00	1.14E-03	3.81E-03	1.52E-02	4.58E+00	2.29E-03
Xylene	5.80E-03	1.42E-03	5.66E-03	1.70E+00	8.51E-04	2.83E-03	1.13E-02	3.40E+00	1.70E-03
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:
(1) natural gas HAPs emission factors
(2) Fuel HHV 1020 btu/scf
(3) Polycyclic aromatic hydrocarbons, excluding naphthalene (treated separately).
(4) LNB with FGR and GCPs
(5) all fuel values based on full load equivalents per Palen Aux boiler data sheets

Refs: Efs derived from Hidden Hill Solar AFC, Table 5.1B-14R, April 2012

Table-3 NTP Boilers #1 and #2

Calculation of Criteria Pollutant Emissions for Boilers Firing Gaseous Fuels

Boiler Operation Mode:	Normal firing mode		# of Units:	2
Ops Hr/Day:	14	includes 1 hr SU (7)	Fuel Type:	Nat Gas
Ops Hr/Yr:	4872	includes SU (7)		

Calculation of Criteria Pollutant Emissions from Each Identical Unit

						All Units			
Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr
NOx	11.220	1.10E-01	1.54E+00	5.36E+02	2.68E-01	2.20E-01	3.08E+00	1.07E+03	5.36E-01
CO	37.332	3.66E-01	5.12E+00	1.78E+03	8.92E-01	7.32E-01	1.02E+01	3.57E+03	1.78E+00
VOC	5.508	5.40E-02	7.56E-01	2.63E+02	1.32E-01	1.08E-01	1.51E+00	5.26E+02	2.63E-01
SOx	0.943	9.25E-03	1.29E-01	4.50E+01	2.25E-02	1.85E-02	2.59E-01	9.01E+01	4.50E-02
PM10	5.100	5.00E-02	7.00E-01	2.44E+02	1.22E-01	1.00E-01	1.40E+00	4.87E+02	2.44E-01
PM2.5	5.100	5.00E-02	7.00E-01	2.44E+02	1.22E-01	1.00E-01	1.40E+00	4.87E+02	2.44E-01
	lbs/mmbtu								
CO2	116.95	1.17E+03	1.64E+04	5.70E+06	2.85E+03	2.34E+03	3.27E+04	1.14E+07	5.70E+03
Methane	0.0130	1.30E-01	1.82E+00	6.33E+02	3.17E-01	2.60E-01	3.64E+00	1.27E+03	6.33E-01
N2O	0.0002	2.21E-03	3.09E-02	1.07E+01	5.37E-03	4.41E-03	6.17E-02	2.15E+01	1.07E-02
CO2e									5.71E+03

Notes:

(1) natural gas criteria pollutant EF factors

(2) Based on maximum hourly boiler fuel use of 10 MMBtu/hr/boiler
and fuel HHV of 1020 Btu/scf gives 0.0098 MMscf/hr/boiler.

(3) Based on maximum annual boiler fuel use of 48,720 MMBtu/yr/boiler
and fuel HHV of 1020 Btu/scf gives 47.7647 MMscf/yr/boiler.

(4) LNBs with FGR and GCPs

(5) PM2.5 = PM10

(6) Fuel S at 0.75 grains/100 scf

(7) this unit is so small that SU hour emissions are considered to be equivalent to full load hourly emissions

Refs:

(1) EFs and Ops data from Palen project team NTP boiler data sheets

(2) GHG EFs from CCAR General Protocol, January 2009.

Table-4 NTP Boilers #1 and #2

Calculation of Hazardous Air Pollutant Emissions for Boilers Firing Gaseous Fuels

Boiler Operation Mode:	All modes-Annual		# of Units:	2
Max Hourly Fuel Use:	0.009804	mmscf	Fuel Type:	Nat Gas
Max Daily Fuel Use:	0.1373	mmscf	Hrs/day:	14
Max Annual Fuel Use:	47.765	mmscf	Hrs/Yr:	4872

Calculation of Hazardous Air Pollutant Emissions from Each Identical Unit

HAP	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr	All Units: Maximum Hourly Emissions, lb/hr	All Units: Maximum Daily Emissions, lb/day	All Units: Maximum Annual Emissions, lbs/yr	All Units: Annual Emissions, ton/yr
Acetaldehyde	3.10E-03	3.04E-05	4.26E-04	1.48E-01	7.40E-05	6.08E-05	8.51E-04	2.96E-01	1.48E-04
Acrolein	2.70E-03	2.65E-05	3.71E-04	1.29E-01	6.45E-05	5.29E-05	7.41E-04	2.58E-01	1.29E-04
Ammonia		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	5.80E-03	5.69E-05	7.96E-04	2.77E-01	1.39E-04	1.14E-04	1.59E-03	5.54E-01	2.77E-04
1,3-Butadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	6.90E-03	6.76E-05	9.47E-04	3.30E-01	1.65E-04	1.35E-04	1.89E-03	6.59E-01	3.30E-04
Formaldehyde	1.23E-02	1.21E-04	1.69E-03	5.88E-01	2.94E-04	2.41E-04	3.38E-03	1.18E+00	5.88E-04
Hexane	4.60E-03	4.51E-05	6.32E-04	2.20E-01	1.10E-04	9.02E-05	1.26E-03	4.39E-01	2.20E-04
Naphthalene	3.00E-04	2.94E-06	4.12E-05	1.43E-02	7.16E-06	5.88E-06	8.24E-05	2.87E-02	1.43E-05
PAHs (4)	1.00E-04	9.80E-07	1.37E-05	4.78E-03	2.39E-06	1.96E-06	2.75E-05	9.55E-03	4.78E-06
Propylene	5.30E-01	5.20E-03	7.28E-02	2.53E+01	1.27E-02	1.04E-02	1.46E-01	5.06E+01	2.53E-02
Propylene oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	2.65E-02	2.60E-04	3.64E-03	1.27E+00	6.33E-04	5.20E-04	7.28E-03	2.53E+00	1.27E-03
Xylene	1.97E-02	1.93E-04	2.70E-03	9.41E-01	4.70E-04	3.86E-04	5.41E-03	1.88E+00	9.41E-04
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:
(1) natural gas HAPs emission factors
(2) Fuel HHV 1020 btu/scf
(3) Polycyclic aromatic hydrocarbons, excluding naphthalene (treated separately).
(4) LNB with FGR and GCPs

Refs: Efs derived from Hidden Hills AFC, Table 5.1B-16R, April 2012

Table-5 EXPECTED INTERNAL COMBUSTION ENGINE EMISSIONS

Liquid Fuel

Large Emergency Generators

of Identical Engines: 2

Mfg:	Caterpillar	
Engine #:	3516C or equiv.	
Kw	2500	approx.
BHP:	3633	
RPM:	-	
Fuel:	#2 Diesel	
Fuel Use:	175	Gph (1)
Fuel HHV:	139000	Btu/gal
mmbtu/hr:	24.33	HHV
EPA Tier:	4	

Stack Data

Height:	20	Ft.
Diameter:	1.67	Ft.
Temp:	925	deg F
ACFM:	19600	

input the mfg ACFM or calculate per Exhaust sheet)

Area:	2.190	Sq.Ft.
Velocity:	149	Ft/Sec
Max Daily Op Hrs:	1	
Max Annual Op Hrs:	199	

Fuel Wt:	6.9	Lbs/gal
Fuel S:	0.0015	% wt.
Fuel S:	0.1035	Lbs/1000 gal
SO2:	0.207	Lbs/1000 gal

			Single Engine				All Engines			
EFs (g/bhp-hr) (5)			**Lb/Hr**	**Lb/Day**	**Lbs/Yr**	**Tons/Yr**	***Lb/Hr***	***Lb/Day***	***Lbs/Yr***	***Tons/Yr***
NOx	0.59		4.72	4.72	939.54	0.470	*9.44*	*9.44*	*1879.08*	*0.94*
CO	0.03		0.24	0.24	47.77	0.024	*0.48*	*0.48*	*95.55*	*0.05*
VOC	0.01		0.08	0.08	15.92	0.008	*0.16*	*0.16*	*31.85*	*0.016*
PM10	0.03	(2,3)	0.24	0.24	47.77	0.024	*0.48*	*0.48*	*95.55*	*0.048*
SOx	NA lbs/gal (4)		0.04	0.04	7.21	0.0036	*0.07*	*0.07*	*14.42*	*0.007*
CO2	22.38		3917	3917	779384	390	*7833*	*7833*	*1558767*	*779*
Methane	0.00066		0.12	0.12	22.98	0.011	*0.23*	*0.23*	*45.97*	*0.023*
N2O	0.00022		0.04	0.04	7.66	0.0038	*0.08*	*0.08*	*15.32*	*0.0077*
CO2e						391.1				*782.2*

Notes:

1. fuel consumption based on 0.055 gal/hp-hr (avg EPA and SCAQMD values) if no value given by mfg for specific engine.
2. PM10 equals PM2.5.
3. PM10 used in HRA to represent DPM emissions.
4. GHG EFs from CCAR General Protocol, January 2009.
5. EFs from Cat data sheet (nominal emissions values), EPD0028-E, Oct 2011.

Table-6 EXPECTED INTERNAL COMBUSTION ENGINE EMISSIONS

Liquid Fuel

of Identical Engines: 2

Large Emergency Fire Pumps

Mfg:	Cummins	
Engine #:	CFP7E-F30 or equiv.	
Kw	0	approx.
BHP:	204	
RPM:	2600	
Fuel:	#2 Diesel	
Fuel Use:	12	Gph (1)
Fuel HHV:	139000	Btu/gal
mmbtu/hr:	1.67	HHV
EPA Tier:	3	

Stack Data

Height:	20	Ft.
Diameter:	0.33	Ft.
Temp:	959	deg F
ACFM:	1615	

input the mfg ACFM or calculate per Exhaust sheet)

Area:	0.086	Sq.Ft.
Velocity:	315	Ft/Sec
Max Daily Op Hrs:	1	
Max Annual Op Hrs:	199	

Fuel Wt:	6.9	Lbs/gal
Fuel S:	0.0015	% wt.
Fuel S:	0.1035	Lbs/1000 gal
SO2:	0.207	Lbs/1000 gal

			Single Engine				All Engines			
EFs (g/bhp-hr) (5)			**Lb/Hr**	**Lb/Day**	**Lbs/Yr**	**Tons/Yr**	***Lb/Hr***	***Lb/Day***	***Lbs/Yr***	***Tons/Yr***
NOx	2.475		1.11	1.11	221.31	0.111	*2.22*	*2.22*	*442.62*	*0.22*
CO	1.193		0.54	0.54	106.68	0.053	*1.07*	*1.07*	*213.35*	*0.11*
VOC	0.062		0.03	0.03	5.54	0.003	*0.06*	*0.06*	*11.09*	*0.006*
PM10	0.111	(2,3)	0.05	0.05	9.93	0.005	*0.10*	*0.10*	*19.85*	*0.010*
SOx	NA lbs/gal (4)		0.002	0.002	0.49	0.0002	*0.00*	*0.00*	*0.99*	*0.0005*
CO2	22.38		269	269	53443	27	*537*	*537*	*106887*	*53*
Methane	0.00066		0.008	0.008	1.58	0.001	*0.016*	*0.016*	*3.15*	*0.002*
N2O	0.00022		0.003	0.003	0.53	0.0003	*0.005*	*0.005*	*1.05*	*0.0005*
CO2e						26.8				*53.6*

Notes:

1. fuel consumption based on 0.055 gal/hp-hr (avg EPA and SCAQMD values) if no value given by mfg for specific engine.
2. PM10 equals PM2.5.
3. PM10 used in HRA to represent DPM emissions.
4. GHG EFs from CCAR General Protocol, Janaury 2009.
5. EFs derived from Cummins data sheet (nominal emissions values) March 2010.

Table-7 Wet SAC #1 and #2 Emissions Estimates

Wet SAC Particulate Emissions

# of Identical WSACs:	2			**Per Wet SAC**	**Per Cell**	**All WSACs**
Operational Schedule:	Hrs/day	Days/Yr	Hrs/Yr			
	12	n/a	2000			
Cells per WSAC:	4					
Pumping rate of recirculation pumps (gal/min)				4,000.0		
Flow of cooling water (lbs/hr)				1,999,200.0		
Avg TDS of circ water (mg/l or ppmw)				1,500.0		
Flow of dissolved solids (lbs/hr)				2998.80		
Fraction of flow producing drift*				1.00		
Control efficiency of drift eliminators, %	0.0005			0.000005		
Calculated drift rate (lbs water/hr)				10.0		
PM10 emissions (lbs/hr)				**0.015**	**0.004**	**0.030**
PM10 emissions (lbs/day)				**0.180**	**0.045**	**0.360**
PM10 emissions (tpy)				**0.015**	**0.004**	**0.030**
PM2.5 fraction of PM10				1.00		
PM2.5 emissions (lbs/hr)				**0.015**	**0.004**	**0.030**
PM2.5 emissions (lbs/day)				**0.180**	**0.045**	**0.360**
PM2.5 emissions (tpy)				**0.015**	**0.004**	**0.030**

Notes:
Based on Method AP 42, Section 13.4, Jan 1995
*Technical Report EPA-600-7-79-251a, Page 63
Effects of Pathogenic and Toxic Materials Transported Via Cooling Device Drift - Volume 1.

Table-8

Calculation of Hazardous and Toxic Pollutant Emissions from Wet SACs

Cells per Wet SAC:	4	Max Tower Drift Rate:	10	lbs/hr	Op Hrs/Day: 12
# of Identical WSACs:	2				Op Hrs/Yr: 2000

			Total Single Tower			Single Cell			Total All Towers		
Constituent	Concentration in Cooling Tower Water		Emissions, lb/hr	Emissions, lb/day	Emissions, ton/yr	Emissions, lb/hr	Emissions, lb/day	Emissions, ton/yr	Emissions, lb/hr	Emissions, lb/day	Emissions, ton/yr
Ammonia	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	0.01	ppm	1.00E-07	1.20E-06	1.00E-07	2.50E-08	3.00E-07	2.50E-08	2.00E-07	2.40E-06	2.00E-07
Silver	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	0.0025	ppm	2.50E-08	3.00E-07	2.50E-08	6.25E-09	7.50E-08	6.25E-09	5.00E-08	6.00E-07	5.00E-08
Cadmium	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vanadium	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Antimony	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Thallium	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Molybdenum	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0	ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:

(1) Water analysis data supplied by project applicant. See support data on next page.

(2) analysis values for 800 bgs well

(3) mg/l = ppmw

Table-9 Palen Solar Mirror Washing Activity Emissions

Activity Schedule:
Days/yr: 365
Hrs/day: 20

Data supplied by Palen project engineers, 11-15-12.
*East and West power sites combined w/o TES.

Input Values

FFT MWM Ops:

# of vehicles on site:*	24
HP/each unit:	310
Fuel use, gal/hr/FFT:	17.6
Fuel use, gal/day/FFT:	352
VMT/yr/FFT:	2700
2013 On-road certified engines	
Fuel type:	Std Diesel

NT MWM Ops:

# of vehicles on site:*	2
HP/each unit:	145
Fuel use, gal/hr/FFT:	8.8
Fuel use, gal/day/FFT:	176
VMT/yr/FFT:	4000
Tier 4 certified non-road engines	
Fuel type:	Std Diesel

*Calculated Values**

Total VMT/year:	64800	Total VMT/year:	8000
Total Ops hrs/yr:	7300	Total Ops hrs/yr:	7300
Fuel use, 10^3 gal/yr:	3083.52	Fuel use, 10^3 gal/yr:	128.48
		Total bhp-hr/yr:	2117000

Emissions Factors

Pollutant	gm/VMT		Pollutant	gm/bhp-hr	
Nox	2.332		Nox	0.276	
CO	2.027		CO	0.087	
VOC	0.951		VOC	0.1314	
SO2	0.21	lb/10^3 gal	SO2	0.21	lb/10^3 gal
PM10/2.5	0.038		PM10/2.5	0.0092	
CO2e	22.51	composite lbs/gal per CCAR, 1/09, Ver 3.1, Tables C.5 and C.6.			

Emissions Estimates-By MWM Type

Pollutant	lbs/hr	lbs/day	lbs/yr	TPY	Pollutant	lbs/hr	lbs/day	lbs/yr	TPY
Nox	0.0456	0.91	333.2	0.167	Nox	0.1765	3.53	1288.2	0.644
CO	0.0397	0.79	289.6	0.145	CO	0.0556	1.11	406.0	0.203
VOC	0.0186	0.37	135.9	0.068	VOC	0.0840	1.68	613.3	0.307
SO2	0.0887	1.77	647.5	0.324	SO2	0.0037	0.07	27.0	0.013
PM10/2.5	0.0007	0.01	5.4	0.003	PM10/2.5	0.0059	0.12	42.9	0.021
CO2e				34705	CO2e				1446

Total Facility Emissions Estimates

Pollutant	lbs/hr	lbs/day	lbs/yr	TPY
Nox	0.222	4.442	1621.300	0.811
CO	0.095	1.906	695.625	0.348
VOC	0.103	2.052	749.132	0.375
SO2	0.092	1.848	674.520	0.337
PM10/2.5	0.007	0.133	48.367	0.024
CO2e				36151

Fugitive Dust Emissions for MWM Activities

PM10, lb/VMT:	0.3	PM10, lb/VMT:	0.17
PM2.5, lb/VMT:	0.03	PM2.5, lb/VMT:	0.02

Emissions Estimates-By MWM Type

Pollutant	lbs/hr	lbs/day	lbs/yr	TPY	Pollutant	lbs/hr	lbs/day	lbs/yr	TPY
PM10	2.663	53.26	19440	9.72	PM10	0.186	3.73	1360	0.68
PM2.5	0.266	5.33	1944	0.97	PM2.5	0.020	0.40	146	0.073

Total Facility Emissions Estimates-Fugitive Dust

Pollutant	lbs/hr	lbs/day	lbs/yr	TPY
PM10	2.85	56.99	20800.00	10.40
PM2.5	0.29	5.73	2090.00	1.05

Table E.1-10 Onsite Operations Support Vehicle Emissions

Ref: Riverside County, Emfac 2007, V2.3, Nov 2006

Emissions data on this page is for both power block units, i.e., the entire facility.

LDTs (1970-2014)

Onsite Operations Support Vehicle Use Data

			Emissions Factors (lbs/vmt)						
			NOx	CO	VOC	SOx	PM10	CO2	
Vehicle Type:	LDT (gasoline)		0.000684	0.00677	0.000567	0.00001	0.000107	1.0893	LDT
# of Vehicles used on facility:	8								
Avg VMT/day/vehicle:	50		Daily Emissions (lbs)						
Total daily VMT:	400		**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**CO2**	**PM2.5**
Total Annual VMT:	146000		0.2736	2.7080	0.2268	0.0040	0.0428	435.7200	0.0424 LDT
% of Annual VMT on unpaved roads:	30	0.30							
% of Annual VMT on paved roads:	70	0.70	Tons per Year						
Annual VMT on unpaved roads:	43800		0.0499	0.4942	0.0414	0.0007	0.0078	79.5189	0.0077 LDT
Annual VMT on paved roads:	102200								

Fugitive Dust Emissions from Onsite Support Vehicle Use

			Unpaved Road Fugitive Emissions			
				lbs/day	lbs/yr	TPY
Avg Unpaved road PM10 EF, lbs/VMT:	0.197	(1)				
Avg PM2.5 fraction of PM10:	0.212	per CARB CEIDARS, 2011	PM10	23.64	8628.6	4.31
Avg Unpaved road PM2.5 EF, lbs/VMT:	0.041764		PM2.5	5.01	1829.3	0.91
Avg Paved road PM10 EF, lbs/VMT:	0.0009	(1)	Paved Road Fugitive Emissions			
Avg PM2.5 fraction of PM10:	0.169	per CARB CEIDARS, 2011		lbs/day	lbs/yr	TPY
Avg Paved road PM2.5 EF, lbs/VMT:	0.0001521		PM10	0.25	92.0	0.046
			PM2.5	0.04	15.5	0.008

Notes:

1. fugitive dust factors for paved and unpaved roads from PSPP Appendix E.3, Tables E.3-7b and E.3-8c, 2009.
   (assumes unpaved onsite and offsite access roads have been stabilized or watered, and speed is controlled)
   (assumes paved road areas are periodically cleaned and speed is controlled)

Table-10 Onsite Operations Support Vehicle Emissions

Ref: Riverside County, Emfac 2007, V2.3, Nov 2006

Emissions data on this page is for both power block units, i.e., the entire facility.

HDDTs (1970-2014)

Onsite Operations Support Vehicle Use Data

			Emissions Factors (lbs/vmt)						
			NOx	CO	VOC	SOx	PM10	CO2	
Vehicle Type:	HDDT (water trucks)		0.020568	0.006521	0.001482	0.000037	0.000958	4.0073	HDDT
# of Vehicles used on facility:	4								
Avg VMT/day/vehicle:	50		Daily Emissions (lbs)						
Total daily VMT:	200		**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**CO2**	**PM2.5**
Total Annual VMT:	73000		4.1136	1.3042	0.2964	0.0074	0.1916	801.4600	0.1899 HDDT
% of Annual VMT on unpaved roads:	95	0.95							
% of Annual VMT on paved roads:	5	0.05	Tons per Year						
Annual VMT on unpaved roads:	69350		0.7507	0.2380	0.0541	0.0014	0.0350	146.2665	0.0347 HDDT
Annual VMT on paved roads:	3650								

Fugitive Dust Emissions from Onsite Support Vehicle Use

			Unpaved Road Fugitive Emissions			
				lbs/day	lbs/yr	TPY
Avg Unpaved road PM10 EF, lbs/VMT:	0.197	(1)				
Avg PM2.5 fraction of PM10:	0.212	per CARB CEIDARS, 2011	PM10	37.43	13662.0	6.83
Avg Unpaved road PM2.5 EF, lbs/VMT:	0.041764		PM2.5	7.94	2896.3	1.45
Avg Paved road PM10 EF, lbs/VMT:	0.0009	(1)	Paved Road Fugitive Emissions			
Avg PM2.5 fraction of PM10:	0.169	per CARB CEIDARS, 2011		lbs/day	lbs/yr	TPY
Avg Paved road PM2.5 EF, lbs/VMT:	0.0001521		PM10	0.009	3.3	0.0016
			PM2.5	0.002	0.6	0.0003

Notes:

1. fugitive dust factors for paved and unpaved roads from PSPP Appendix E.3, Tables E.3-7b and E.3-8c, 2009.
   (assumes unpaved onsite and offsite access roads have been stabilized or watered, and speed is controlled)
   (assumes paved road areas are periodically cleaned and speed is controlled)
2. max water truck speed is 5 mph, at 10 hrs/day, = 50 VMT/day

Table-11 Offsite Operations Delivery and Commute Emissions

Ref: Riverside County, Emfac 2007, V2.3, Nov 2006
MDGT and HDDT (1970-2014)

Operations Site Delivery Emissions

Deliveries per Avg Month:	46		Emissions Factors (lbs/vmt)							
			NOx	CO	VOC	SOx	PM10	CO2		
Per trip delivery VMT:	60		0.02057	0.006521	0.001482	0.000037	0.000958	4.0073	HDDT	
Total monthly VMT:	2760		0.001246	0.00818	0.000772	0.000015	0.000108	1.4979	MDGT	
Total annual VMT:	33120		Daily Emissions (lbs)							
Fraction annual VMT (MDGT):	0.5		**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**CO2**	**PM2.5**	
Fraction annual VMT (HDDT):	0.5	Daily VMT*	1.3102	0.4153	0.0944	0.0024	0.0610	255.2342	0.0605	HDDT
Annual gasoline VMT:	16560	64	0.0794	0.5210	0.0492	0.0010	0.0069	95.4047	0.0068	MDGT
Annual diesel VMT:	16560	64	Tons per Year							
			0.1703	0.0540	0.0123	0.0003	0.0079	33.1804	0.0079	HDDT
*Daily VMT based on 260 days/year.			0.0103	0.0677	0.0064	0.0001	0.0009	12.4026	0.0009	MDGT

Employee Commute Emissions

Ref: Riverside County, Emfac 2007, V2.3, Nov 2006
LDP/LDT (1970-2014)

# of FTE's:	120						
Avg Commute VMT/day roundtrip):	75	(1)	Emissions Factors (lbs/vmt)				
Carpool ratio:	1.2		NOx	CO	VOC	SOx	PM10	CO2
Avg Daily VMT:	7500		0.00049	0.00548	0.00047	0.00001	0.00009	0.95934
Avg Annual VMT:	2737500		Daily Emissions (lbs)					
			NOx	CO	VOC	SOx	PM10	CO2
			3.68	41.10	3.53	0.08	0.68	7195.05
(1) commute from Blythe regional area			Tons per Year					
			NOx	CO	VOC	SOx	PM10	CO2
			0.67	7.50	0.64	0.01	0.12	1313.10

Table-12

FIXED ROOF TANK EMISSION CALCULATION

Reference: AP-42, Section 7.1, 9/97

Emissions Scenario				
	X	: PTE		
***** Input *****		: Actual		
Number of Similar Tanks:	3	Year:	Any	
Stored Substance ID:	Diesel Fuel	Tank Cap.	8000	gallons
Tank ID:	n/a	Kn =	842.1	* Eq 41
Vapor Molecular Wt.:	130	Table 6*		
Vapor Pressure (psia):	0.00648	Table 6*		
Tank Diameter (ft):	5	or equivalent diameter if tank is not round		
Tank Height/Length (ft):	16			
Avg. Vapor Space Height (ft):	2			
Avg. Diurnal Temp Change (degF):	28	Table 4 (Phoenix data used to simulate site)*		
Paint Factor:	1			
Small Tank Adj. Factor:	1			
Product Factor:	1	* Section 19.1.2.2.3.3		
Turnover Factor:	0.20			
Throughput (gals/yr):	1200000			

Intermediate Calculations

TP =	1200.00
Q =	0.01
D =	16.19
H =	1.42
T =	5.29

***** Output *****	Single Tank	All Tanks
Uncontrolled Emissions		
Breathing Loss (lb/yr):	1.87	5.62
Working Loss (lb/yr):	4.91	14.72
Total VOC Losses (lb/yr):	6.78	20.34
Controlled Emissions		
Control System Eff. (frac):	0	0
Total VOC Losses (lb/yr):	6.78	20.34
(lb/day):	0.0186	0.0557
(lb/hr):	0.0008	0.0023
(TPY):	0.0034	0.0102

Additional References: *API Bulletin #2518, October 1991
ConVault or equivalent (above ground vault type tanks)

Table -13 Palen Source Emissions Summary **2 Pages**

(Before using the values on this table, the notes presented below should be carefully considered.)

	lbs/hr						lbs/day						TPY						
Source	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**CO2e**
aux blr 1 high	2.74	4.48	1.34	0.747	1.25	1.25	11.71	27.81	8.24	2.86	4.87	4.87	1.65	2.69	0.808	0.449	0.748	0.748	17550
aux blr 1 low	0.342	4.48	1.31	0.0933	0.156	0.156	0	0	0	0	0	0	0.0992	1.3	0.379	0.0271	0.0451	0.0451	1060
aux blr 1 SU	1.54	4.51	1.32	0.09	0.23	0.23	0	0	0	0	0	0	0.24	0.4	0.12	0.01	0.03	0.03	317
aux blr 2 high	2.74	4.48	1.34	0.747	1.25	1.25	11.71	27.81	8.24	2.86	4.87	4.87	1.65	2.69	0.808	0.449	0.748	0.748	17550
aux blr 2 low	0.342	4.48	1.31	0.0933	0.156	0.156	0	0	0	0	0	0	0.0992	1.3	0.379	0.0271	0.0451	0.0451	1060
aux blr 2 SU	1.54	4.51	1.32	0.09	0.23	0.23	0	0	0	0	0	0	0.24	0.4	0.12	0.01	0.03	0.03	317
ntp blr 1	0.11	0.366	0.054	0.00925	0.05	0.05	1.54	5.12	0.756	0.129	0.7	0.7	0.286	0.892	0.132	0.0225	0.122	0.122	2855
ntp blr 2	0.11	0.366	0.054	0.00925	0.05	0.05	1.54	5.12	0.756	0.129	0.7	0.7	0.286	0.892	0.132	0.0225	0.122	0.122	2855
L-EGS-1	4.72	0.24	0.08	0.04	0.24	0.24	4.72	0.24	0.08	0.04	0.24	0.24	0.47	0.024	0.008	0.0036	0.024	0.024	391.1
L-EGS-2	4.72	0.24	0.08	0.04	0.24	0.24	4.72	0.24	0.08	0.04	0.24	0.24	0.47	0.024	0.008	0.0036	0.024	0.024	391.1
S-EGS	2.6	0.32	0.09	0.001	0.07	0.07	2.6	0.32	0.09	0.001	0.07	0.07	0.259	0.031	0.009	0.0004	0.007	0.007	44.7
L-FP-1	1.11	0.54	0.03	0.002	0.05	0.05	1.11	0.54	0.03	0.002	0.05	0.05	0.111	0.053	0.003	0.0002	0.005	0.005	26.8
L-FP-2	1.11	0.54	0.03	0.002	0.05	0.05	1.11	0.54	0.03	0.002	0.05	0.05	0.111	0.053	0.003	0.0002	0.005	0.005	26.8
S-FP	0.72	0.21	0.03	0.002	0.03	0.03	0.72	0.21	0.03	0.002	0.03	0.03	0.071	0.021	0.003	0.0002	0.003	0.003	17.9
WSAC 1	0	0	0	0	0.015	0.015	0	0	0	0	0.18	0.18	0	0	0	0	0.015	0.015	0
WSAC 2	0	0	0	0	0.015	0.015	0	0	0	0	0.18	0.18	0	0	0	0	0.015	0.015	0
Diesel tanks	0	0	0.0023	0	0	0	0	0	0.0557	0	0	0	0	0	0.0102	0	0	0	0
MWMs Exhaust	0.222	0.095	0.103	0.092	0.007	0.007	4.442	1.906	2.052	1.848	0.133	0.133	0.811	0.348	0.375	0.337	0.024	0.024	36151
MWM Fug Dust	0	0	0	0	2.85	0.29	0	0	0	0	56.99	5.73	0	0	0	0	10.4	1.05	0
LDT Exhaust	0.0114	0.1128	0.00945	0	0.00178	0.00177	0.274	2.708	0.2268	0.004	0.0428	0.0424	0.0499	0.4942	0.0414	0.0007	0.0078	0.0077	79.52
LDT Fug Dust	0	0	0	0	0.9954	0.21	0	0	0	0	23.89	5.05	0	0	0	0	4.36	0.92	0
Water Trks Exhaust	0.1714	0.0543	0.0124	0	0.00798	0.00791	4.114	1.3042	0.2964	0.0074	0.1916	0.1899	0.7507	0.238	0.0541	0.0014	0.035		146.3
Water Trk Fug Dust	0	0	0	0	1.574	0.331	0	0	0	0	37.44	7.94	0	0	0	0	6.84	1.45	0
Max Sum Total	24.85	30.02	8.52	2.06	9.52	4.93	50.31	73.87	20.96	7.92	130.87	31.27	7.65	11.85	3.39	1.36	23.66	5.44	80839

	lbs/hr						lbs/day						TPY						
	NOx	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**CO2e**
aux blr 1 high	2.74	4.48	1.34	0.747	1.25	1.25	11.71	27.81	8.24	2.86	4.87	4.87	1.65	2.69	0.808	0.449	0.748	0.748	17550
aux blr 1 low	0.342	4.48	1.31	0.0933	0.156	0.156	0	0	0	0	0	0	0.0992	1.3	0.379	0.0271	0.0451	0.0451	1060
aux blr 1 SU	1.54	4.51	1.32	0.09	0.23	0.23	0	0	0	0	0	0	0.24	0.4	0.12	0.01	0.03	0.03	317
aux blr 2 high	2.74	4.48	1.34	0.747	1.25	1.25	11.71	27.81	8.24	2.86	4.87	4.87	1.65	2.69	0.808	0.449	0.748	0.748	17550
aux blr 2 low	0.342	4.48	1.31	0.0933	0.156	0.156	0	0	0	0	0	0	0.0992	1.3	0.379	0.0271	0.0451	0.0451	1060
aux blr 2 SU	1.54	4.51	1.32	0.09	0.23	0.23	0	0	0	0	0	0	0.24	0.4	0.12	0.01	0.03	0.03	317
ntp blr 1	0.11	0.366	0.054	0.00925	0.05	0.05	1.54	5.12	0.756	0.129	0.7	0.7	0.286	0.892	0.132	0.0225	0.122	0.122	2855
ntp blr 2	0.11	0.366	0.054	0.00925	0.05	0.05	1.54	5.12	0.756	0.129	0.7	0.7	0.286	0.892	0.132	0.0225	0.122	0.122	2855
L-EGS-1	4.72	0.24	0.08	0.04	0.24	0.24	4.72	0.24	0.08	0.04	0.24	0.24	0.47	0.024	0.008	0.0036	0.024	0.024	391.1
L-EGS-2	4.72	0.24	0.08	0.04	0.24	0.24	4.72	0.24	0.08	0.04	0.24	0.24	0.47	0.024	0.008	0.0036	0.024	0.024	391.1
S-EGS	2.6	0.32	0.09	0.001	0.07	0.07	2.6	0.32	0.09	0.001	0.07	0.07	0.259	0.031	0.009	0.0004	0.007	0.007	44.7
L-FP-1	1.11	0.54	0.03	0.002	0.05	0.05	1.11	0.54	0.03	0.002	0.05	0.05	0.111	0.053	0.003	0.0002	0.005	0.005	26.8
L-FP-2	1.11	0.54	0.03	0.002	0.05	0.05	1.11	0.54	0.03	0.002	0.05	0.05	0.111	0.053	0.003	0.0002	0.005	0.005	26.8
S-FP	0.72	0.21	0.03	0.002	0.03	0.03	0.72	0.21	0.03	0.002	0.03	0.03	0.071	0.021	0.003	0.0002	0.003	0.003	17.9
WSAC 1	0	0	0	0	0.015	0.015	0	0	0	0	0.18	0.18	0	0	0	0	0.015	0.015	0
WSAC 2	0	0	0	0	0.015	0.015	0	0	0	0	0.18	0.18	0	0	0	0	0.015	0.015	0
Diesel tanks	0	0	0.0023	0	0	0	0	0	0.0557	0	0	0	0	0	0.0102	0	0	0	0
SCAQMD Base Total	24.44	29.76	8.39	1.97	4.08	4.08	41.48	67.95	18.39	6.07	12.18	12.18	6.04	10.77	2.92	1.03	1.99	1.99	44462

	lbs/hr						lbs/day						TPY						
	NOx	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**CO2e**
aux blr 1 high	2.74	4.48	1.34	0.747	1.25	1.25	11.71	27.81	8.24	2.86	4.87	4.87	1.65	2.69	0.808	0.449	0.748	0.748	17550
aux blr 1 low	0.342	4.48	1.31	0.0933	0.156	0.156	0	0	0	0	0	0	0.0992	1.3	0.379	0.0271	0.0451	0.0451	1060
aux blr 1 SU	1.54	4.51	1.32	0.09	0.23	0.23	0	0	0	0	0	0	0.24	0.4	0.12	0.01	0.03	0.03	317
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aux blr 2 low	0.342	4.48	1.31	0.0933	0.156	0.156	0	0	0	0	0	0	0.0992	1.3	0.379	0.0271	0.0451	0.0451	1060
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WSAC 1	0	0	0	0	0.015	0.015	0	0	0	0	0.18	0.18	0	0	0	0	0.015	0.015	0
WSAC 2	0	0	0	0	0.015	0.015	0	0	0	0	0.18	0.18	0	0	0	0	0.015	0.015	0
SCAQMD Offset Total	9.46	27.67	8.05	1.88	3.40	3.40	26.50	65.86	17.99	5.98	11.50	11.50	4.55	10.56	2.88	1.02	1.92	1.92	43564
SCAQMD 30DA							27.38	68.06	18.59	6.18	11.88	11.88							
			lbs/hr						**lbs/day**							**TPY**			
	NOx	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**PM2.5**	**CO2e**
aux blr 1 high	2.74	4.48	1.34	0.747	1.25	1.25	11.71	27.81	8.24	2.86	4.87	4.87	1.65	2.69	0.808	0.449	0.748	0.748	17550
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aux blr 2 high	2.74	4.48	1.34	0.747	1.25	1.25	11.71	27.81	8.24	2.86	4.87	4.87	1.65	2.69	0.808	0.449	0.748	0.748	17550
aux blr 2 low	0.342	4.48	1.31	0.0933	0.156	0.156	0	0	0	0	0	0	0.0992	1.3	0.379	0.0271	0.0451	0.0451	1060
aux blr 2 SU	1.54	4.51	1.32	0.09	0.23	0.23	0	0	0	0	0	0	0.24	0.4	0.12	0.01	0.03	0.03	317
ntp blr 1	0.11	0.366	0.054	0.00925	0.05	0.05	1.54	5.12	0.756	0.129	0.7	0.7	0.286	0.892	0.132	0.0225	0.122	0.122	2855
ntp blr 2	0.11	0.366	0.054	0.00925	0.05	0.05	1.54	5.12	0.756	0.129	0.7	0.7	0.286	0.892	0.132	0.0225	0.122	0.122	2855
L-EGS-1	4.72	0.24	0.08	0.04	0.24	0.24	4.72	0.24	0.08	0.04	0.24	0.24	0.47	0.024	0.008	0.0036	0.024	0.024	391.1
L-EGS-2	4.72	0.24	0.08	0.04	0.24	0.24	4.72	0.24	0.08	0.04	0.24	0.24	0.47	0.024	0.008	0.0036	0.024	0.024	391.1
S-EGS	2.6	0.32	0.09	0.001	0.07	0.07	2.6	0.32	0.09	0.001	0.07	0.07	0.259	0.031	0.009	0.0004	0.007	0.007	44.7
L-FP-1	1.11	0.54	0.03	0.002	0.05	0.05	1.11	0.54	0.03	0.002	0.05	0.05	0.111	0.053	0.003	0.0002	0.005	0.005	26.8
L-FP-2	1.11	0.54	0.03	0.002	0.05	0.05	1.11	0.54	0.03	0.002	0.05	0.05	0.111	0.053	0.003	0.0002	0.005	0.005	26.8
S-FP	0.72	0.21	0.03	0.002	0.03	0.03	0.72	0.21	0.03	0.002	0.03	0.03	0.071	0.021	0.003	0.0002	0.003	0.003	17.9
WSAC 1	0	0	0	0	0.015	0.015	0	0	0	0	0.18	0.18	0	0	0	0	0.015	0.015	0
WSAC 2	0	0	0	0	0.015	0.015	0	0	0	0	0.18	0.18	0	0	0	0	0.015	0.015	0
Diesel tanks	0	0	0.0023	0	0	0	0	0	0.0557	0	0	0	0	0	0.0102	0	0	0	0
PSD Total	24.44	29.76	8.39	1.97	4.08	4.08	41.48	67.95	18.39	6.07	12.18	12.18	6.04	10.77	2.92	1.03	1.99	1.99	44462

Notes:

Hourly Values

1. this table does not account for the run "spacing" of the various IC engines, i.e., only one engine is run in any hour.
2. for each aux boiler, it should be noted that you cannot have a SU/low load hour and a full load hour at the same time.

Daily Values

3. this table assumes that all the IC engines are run for readiness/maintenance testing on the same day.
4. this table assumes each aux boiler has one cold start per day, with all other transient starts at warm conditions (i.e., a low load hour for emissions purposes).
5. for SCAQMD 30 DA, the maximum days per month is 31.

Annual Values

6. annual values incorporate all operating modes.

Table-14 Palen Solar - Commissioning Activity Emisisons Estimates

Assumptions:

1. no commissioning activity for the various stationary diesel engines is required.
2. no commissioning activity for the various mobile site support vehicles is required.
3. no commissioning activity will be required for the WSACs
4. commissioning activities will be confined to the Aux and NTP boilers

Commissioning Schedule:

Aux Boilers (each):

4 hours (cold start mode)	
4 hours (warm start mode)	
12 hours (at low load-25%)	
12 hours (at medium load-50%)	
8 hours (at high load-100%)	
Total hours:	40

1. for startups (cold or warm) use SU emissions factors
2. for low loads<=25% use the low load emissions factors.
3. for loads >25%, use the 25-100% load emissions factors.
4. assume 31.1 mmbtu/hr for SU
3. assume 63 mmbtu/hr for low load hours (<=25%)
4. assume 125 mmbtu/hr for medium load hours (50%)
5. Assume 249 mmbut/hr for high load hours (100%)

Emissions Factors:

Pollutant	SU	Low load	High Load	
Nox	0.088	0.011	0.011	lb/mmbtu
CO	0.146	0.144	0.018	lb/mmbtu
VOC	0.043	0.042	0.0054	lb/mmbtu
SOx	0.003	0.003	0.003	lb/mmbtu
PM10/2.5	0.01	0.005	0.005	lb/mmbtu

Calculated heat input during commissioning period:

SU:	249	mmbtu/period
Low load:	756	mmbtu/period
Medium load:	1500	mmbtu/period
High load:	1992	mmbtu/period
Total	4497	mmbtu/period

Commissioning Emissions for One Plant:

	Emissions per Period, lbs				
	Nox	CO	VOC	SOx	PM10/2.5
SU	21.89	36.32	10.70	0.75	2.49
Low Load	8.32	108.86	31.75	2.27	3.78
Med Load	16.50	27.00	8.10	4.50	7.50
High Load	21.91	35.86	10.76	5.98	9.96
Total	68.62	208.04	61.31	13.49	23.73

Commissioning Emissions for Two Plants:

Nox	CO	VOC	SOx	PM10/2.5
137.2448	416.0896	122.6144	26.9808	47.456

Total All Boiler Commissioning Emissions:

LBS per Period					
Nox	CO	VOC	SOx	PM10/2.5	CO2e
140	424	130	28	49	540309
					270.2 tons

Commissioning Schedule:

NTP Boilers (each):

4 hours (cold start mode)	
4 hours (at low load-25%)	
6 hours (at medium load-50%)	
6 hours (at high load-100%)	
Total hours:	20

1. use high load emissions factors for all hours
2. assume 2.5 mmbtu/hr for low load and SU hours (25%)
3. assume 5 mmbtu/hr for medium load hours (50%)
4. assume 10 mmbtu/hr for high load hours (100%)

Emissions Factors:

Pollutant	High Load	
Nox	0.011	lb/mmbtu
CO	0.036	lb/mmbtu
VOC	0.033	lb/mmbtu
SOx	0.003	lb/mmbtu
PM10/2.5	0.005	lb/mmbtu

Calculated heat input during commissioning period:

Low load:	20	mmbtu/period
Medium load:	30	mmbtu/period
High load:	60	mmbtu/period
Total	110	mmbtu/period

Commissioning Emissions for One Plant:

Emissions per Period, lbs					
	Nox	CO	VOC	SOx	PM10/2.5
	1.21	3.96	3.63	0.33	0.55

Commissioning Emissions for Two Plants:

Nox	CO	VOC	SOx	PM10/2.5
2.42	7.92	7.26	0.66	1.1

Cumulative CO2e EF: 117.285 lbs/mmbtu

Table 15
. Laws, Ordinances, Regulations, and Standards

Applicable LORS	LORS Requirement Summary	LORS Compliance/Conformance
Federal LORS[1]		
Title 40 CFR, Parts 51 and 52	Prevention of Significant Deterioration for new and modified major stationary sources.	The facility will not be a major stationary source per the PSD regulations. PSD will not apply.
Title 40 CFR, Parts 51 and 52	New Source Review for new and modified major stationary sources.	The facility will be subject to the local air district NSR rules and review process, including but not limited to, BACT determination, offset analysis, air quality impact assessment, etc. See AQMD Rule XIII.
Title 40 CFR, Parts 71-75	Acid Rain program provisions applicable to NOx and SOx emissions compliance, reporting, monitoring, and record keeping.	The AQMD DOC will discuss the final applicability of the Title IV provisions. The facility is not expected to be subject to the Title IV provisions. See AQMD Rule 1210.
Title 40 CFR, Part 70	Federal operating permits requirements.	The Title V application forms are included with the District permitting applications in Appendix 4, Table-9.
Title 40 CFR, Part 60	New Source Performance Standards (NSPS) Subparts Db, Dc, IIII	The facility will work with SCAQMD staff to assess final NSPS Subpart applicability during the DOC review. The facility will comply with all compliance and operational limits, reporting, and record keeping requirements in the final applicable NSPS. See AQMD Rule IX.
Title 40 CFR, Part 63	National Emissions Standards for Hazardous Air Pollutants (NESHAPs)	The facility is not expected to be a major source of HAPs, and as such, the NESHAPs regulations are not applicable at this time. See AQMD Regulation X.
State LORS[2]		
Air Toxics Hot Spots Program HSC 44300-44384	Requires preparation and submittal of air toxics plans and reports to the AQMD on the District delineated schedule per the HSC provisions.	The facility will comply with all submittals, plans and reports, as required by the SCAQMD upon a determination of program applicability by the AQMD.
CCR 1752, 2300-2309	Requires the CEC decision on the AFC to consider air quality compliance and protection of the environment.	The SCAQMD will issue a DOC prior to the CEC approval of the AFC. The DOC will contain the AQMD's compliance requirements and conditions. The CEC certification and approval will also contain numerous conditions relating to compliance limits, procedures, reporting, monitoring, and record keeping.
17 CCR 93115	ATCM for Stationary CI Engines, established emissions and operational requirements for diesel fueled stationary CI engines.	The emissions and impact sections of the air quality and public health analyses of the AFC establish compliance with the provisions of the ATCM. Also see the BACT determination in Appendix 4, Table-6.
California Global Warming Solutions Act-2006 (AB 32)	State-wide regulation for measures to reduce GHG emissions by 2020 to 1990 levels.	The facility will comply with all applicable provisions of AB 32 including, but not limited to, GHG emissions reporting, GHG cap-and-trade program, etc.

GHG Performance Standard (SB 1368)	Establishes the GHG emissions performance stds based on emissions of GHG per unit of power output.	The facility processes will comply with the performance standards, as applicable.
Local SCAQMD LORS[3]		
Regulation XIII-NSR	Requires pre-construction review for all proposed new or modified stationary sources. Review includes a BACT determination, mitigation analysis, air quality impact analysis, etc.	The air quality analysis presented in the AFC air section and Appendices E.1 through E.9 fulfill the filing and analysis requirements of NSR. The SCAQMD will issue a DOC with conditions insuring compliance with all provisions of the NSR rule.
Regulation XIV-Rule 1401-Toxics NSR	Requires pre-construction review for all proposed new or modified stationary sources emitting toxic pollutants. Establishes risk significance levels and review procedures.	The public health analysis presented in Section 5.10, Public Health and Appendices E.1 through E.9 fulfill the filing and analysis requirements of toxics NSR. The SCAQMD will issue a DOC with conditions ensuring compliance with all provisions of the toxics NSR rule.
Regulation XXX-Title V	Implements the provisions of the federal operating permits program and the requirements of the CAA Title V.	The Title V application forms are included with the District permitting applications in Appendix 4, Table-9.
Regulation XXXI-Acid Rain Permit Program	Implements the provisions of the federal Acid Rain Program. See rule provisions Subpart A-I.	If Title IV is deemed applicable per the AQMD DOC, the DOC will contain conditions insuring compliance with all applicable provisions of 40 CFR 71-75, including but not limited to permit application filing, monitoring, reporting, record keeping, etc.
Rule 401-Visible Emissions	Limits visible emissions from applicable processes to values no darker than Ringelmann #1 for periods greater than 3 minutes in any hour.	SCAQMD DOC will ensure compliance with Rule 401. Use of solar technology and clean fuels will also insure compliance.
Rule 402-Nuisance	Prohibits emissions in quantities that would adversely affect public health, other businesses, or property.	The facility is not expected to use or operate any equipment or process that would have the capability to cause a public nuisance.
Rule 403-Fugitive Dust	Limits fugitive PM emissions from construction and construction related activities.	The SCAQMD DOC conditions coupled with the facility proposed mitigation measures should insure compliance with the provisions of Rule 403. See also Appendix 4, Table-5.
Rule 404-Particulate Matter	Limits PM concentration in exhaust from boilers, heaters, IC engines, etc.	Use of clean fuels and application of BACT in the boilers and IC engines will insure compliance with this rule.
Rule 409-Combustion Contaminants	Limits PM emissions from combustion sources.	Use of clean fuels in the boilers and IC engines will insure compliance with this rule. See Appendix 4, Table-1.
Rule 429-Nox Exemptions for Startup/Shutdown	Provides NOx emissions exemptions for boiler subject to Rule 1146 for periods of startup and shutdown.	Use of clean fuel in the boilers (natural gas) and application of BACT will insure compliance with this rule.
Rule 431-Sulfur Content of Fuels (431.1-431.3)	Limits the sulfur content of fuels combusted in stationary sources.	Use of clean fuels (natural gas and low sulfur fuel oil) in the boilers and IC engines will insure compliance with this rule. See Appendix 4, Table-1.
Rule 433-Natural Gas Quality	Applies to all natural gas distribution system operators that convey natural gas to end users within the District.	The provisions of this regulation do not apply to the proposed facility.
Rule 442-Organic Solvents	Limits emissions of VOC from materials or processes using VOC	Normal operation of the facility is not expected to use amounts of

	containing products.	materials that would result in emissions above the prohibitory rule limits.
Rule 463-Storage of Organic Liquids	Limits VOC emissions from the storage and transfer of VOC containing materials.	The facility will only store diesel fuel for the emergency engines, and a small amount of degreasing solvent for the maintenance shop. All such materials will be stored and used in compliance with the rule provisions.
Rule 474-Fuel Burning Equipment-NOx	Limits NOx emissions from non-mobile fuel burning equipment.	Use of clean fuels (natural gas) in the boilers and implementation of BACT for NOx will insure compliance with this rule. This rule does not apply to the emergency engines.
Regulation IX-NSPS	New Source Performance Standards (NSPS) Potentially applicable Subparts: Db, Dc, IIII	The facility will work with SCAQMD staff to assess final NSPS Subpart applicability during the DOC review. The facility will comply with all compliance and operational limits, reporting, and record keeping requirements in the final applicable NSPS.
Rule 1110.2-Gaseous and Liquid Fueled Engines	Limits NOx, VOC, and CO emissions from gaseous and liquid fueled IC engines.	The use of clean liquid fuels (CA LS diesel) in the emergency engines, coupled with low use rates, and certified Tier 3/4 engines will insure compliance with this rule.
Rule 1121-NOx Control from NG Fired Water Heaters	Limits NOx emissions from natural gas fired residential type water heaters.	The facility control/administration building may have such a heater. This heater will not exceed the standards set by the rule.
Rule 1146-NOx Emissions from IIC Boilers and Process Heaters	Limits NOx from boilers, steam generators, and heaters rated at greater than 5 mmbtu/hr.	The boilers will comply with the NOX limits, reporting, and compliance plans requirements. The rule limits do not apply during startup and shutdown per Rule 429.
Rule 1171-Solvent Cleaning Operations	Limits VOC, TAC, and SODS emissions from solvent use in cleaning operations activities.	The facility will comply with the rule provisions by purchasing and using approved solvents, in approved manners. The facility may also use non-VOC solvents.
Regulation XIX-Federal Conformity	Implements the General Conformity requirements of 40 CFR Parts 6 and 51.	Due to the attainment/unclassified status of the project region a conformity analysis is not required.
Regulating agencies with respect to Federal LORS are EPA, and the SCAQMD with EPA oversight. In some instances, the SCAQMD has been granted program authority (via rule adoption or MOU) to act in the place of EPA. These instances are noted in the Local LORS. Regulating agencies with respect to State LORS are the SCAQMD with CARB oversight, and the CEC. Regulating agency with respect to Local LORS is the SCAQMD with either CARB and/or EPA oversight. The Determination of Compliance (DOC) issued by the SCAQMD will contain conditions insuring compliance with all adopted air quality related LORS (local rules, federal rules for which the AQMD has authority to implement and enforce, and state rules for which the AQMD has authority to implement and enforce.		

APPENDIX 6

TRAFFIC AND TRANSPORTATION

APPENDIX 6-A

LETTER FROM DEPARTMENT OF DEFENSE

OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION,
TECHNOLOGY
AND LOGISTICS

17 August 2012

Krista Kisch
Vice President – Project Development
Bright Source, Inc.
1999 Harrison St.
Suite 2150
Oakland, CA 94612

Dear Ms. Kisch:

At your request, the DoD Siting Clearinghouse has coordinated an initial review of your proposal for two solar towers at the proposed Palen Towers project in Riverside County, California. While we predict the project will impact the training we conduct in military training routes VR-296, VR-1265, VR-1268, and IR-218, we believe those impacts can be mitigated. Therefore, the Department of Defense will not oppose construction of the project; however, we ask you to continue to coordinate with us as you make micrositing decisions. Your continued cooperation will help us preserve our military's operational, training, and testing capabilities.

Note that this informal review by the DoD does not constitute an action under 49 U.S.C. § 44718 and that neither the DoD nor the Secretary of Transportation are bound by the determination made under the informal review. Please call me at (703) 697-7301 with any questions, and feel free to share this letter with any of your investors or community partners.

Sincerely,

Michael A. Aimone

Michael A. Aimone, P.E.
Executive Director,
DoD Siting Clearinghouse