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11-AFC-04
DATE DEC 09 2011
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December 9, 2011

Pierre Martinez
Project Manager
Systems Assessment & Facility Siting Division
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

SUBJECT: Supplement #1A to the Application for Certification
Rio Mesa Solar Energy Generating Facility (11-AFC-4)

Dear Mr. Martinez:

Rio Mesa Solar I, LLC, Rio Mesa Solar II, LLC, and Rio Mesa Solar III, collectively the "Applicant" for the Rio Mesa Solar Electric Generating Facility project ("Rio Mesa SEGF"), are pleased to provide the attached Supplement #1A in response to the Data Adequacy Review of the Application for Certification for RMS SEGF. As set forth in the Executive Director's Data Adequacy Review, the Application is Data Adequate in 18 of the 23 technical areas. On November 18, 2011, Applicant submitted a Supplement to the Application for Certification. The Attached Supplement #1A provides responses to additional items regarding Water Resources.

With the information in the Application and the Supplements, the Application fully satisfies all of the informational requirements set forth in Appendix B.

Sincerely,

Todd Stewart
Senior Director of Project Development

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

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BrightSource

DATA ADEQUACY SUPPLEMENT 1A

Response to Data Adequacy Review
of the **APPLICATION FOR CERTIFICATION**
for the **Rio Mesa Solar Electric Generating Facility**

(11-AFC-04)




Submitted to:

CALIFORNIA ENERGY COMMISSION
1516 9th Street, MS15
Sacramento, CA 95814-5504

Submitted by:

RIO MESA SOLAR I, LLC
RIO MESA SOLAR II, LLC
RIO MESA SOLAR III, LLC
1999 Harrison Street, Suite 2150
Oakland, CA 94612

DECEMBER 2011

Supplement 1A

Water Responses to Data Adequacy Review

of the

Application for Certification

for the

Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF)

(11-AFC-04)

Submitted to the
California Energy Commission

Submitted by
Rio Mesa Solar I, LLC,
Rio Mesa Solar II, LLC,
and Rio Mesa Solar III, LLC

December 2011

Contents

Introduction

This Supplement (1A) to the Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF) Application for Certification (AFC) (11-AFC-04) responds to comments that California Energy Commission (CEC) Staff have made as a result of their data adequacy review of the AFC. This Supplement provides all additional information necessary for Staff to find that the AFC contains sufficient and adequate data to begin a 12-month power plant site certification proceeding under Title 20, California Code of Regulations and the Warren-Alquist Energy Resources Conservation and Development Act.

This Supplement provides additional information in the areas of Water Resources.

5.15 Water Resources

1. *Waste Discharge Requirements; National Pollutant Discharge Elimination System Permit; and/or a Section 401 Certification or Waiver from the appropriate Regional Water Quality Control Board (RWQCB); [Appendix B(g)(14)(A)(i)]*

Information required for the AFC to conform to the regulations:

In support of the development of Waste Discharge Requirements for discharge of industrial wastewater to the proposed evaporation ponds, provide a complete characterization of the discharge including but not limited to:

- *Design ~~and actual flows;~~*
- *~~A list of constituents and the discharge concentration of each constituent;~~*
- *~~A list of other appropriate waste discharge characteristics;~~*
- *~~A description and schematic drawing of all treatment processes;~~*
- *~~A description of any Best Management Practices used; and~~*
- *~~A description of disposal methods.~~*

~~To facilitate a more timely review and agency coordination, this information may be presented using the Regional Water Quality Control Board Application/Report of Waste Discharge General Information Form for Waste Discharge Requirements or NPDES Permit (Form 200).~~

Response: The list below confirms the items necessary to fulfill the Data Adequacy requirements for Water Resources on the Rio Mesa Project. All are attached (or were previously submitted):

- CEC Requirement (1): Design data for the Evaporation Ponds.
  - Submittal includes Bechtel's Evaporation Pond Design Narrative that describes in detail the pond designs including:
    - General Evaporation Pond Design Concepts
    - Detailed description of the various layers that make up the pond (Hard Surface Protective Layer, Primary Liner, LCRS, Secondary Liner, Underliner Construction considerations)
    - Bird Netting Design
  - Submittal includes a cross-sectional diagram of the evaporation ponds showing the various layers including the natural soil layer directly under the ponds.
- CEC Requirement(2): Evaporation Pond Monitoring and Reporting Plan
  - Submittal includes a DRAFT Monitoring and Reporting Plan
- CEC Requirement (3): Evaporation Pond Residual Handling Statement
  - BSE's previous submittal on 11/18/11 is sufficient for Data Adequacy.
- CEC Requirement (4): Basis of design for the monitoring wells and general location depicted on a drawing.
  - Submittal includes a Monitoring Well Design Narrative describing the basis for monitoring well designs.
  - Submittal includes a drawing showing 3 proposed monitoring well locations (1 upstream and 2 downstream).

CEC Requirement (1): Design data for the Evaporation Ponds.

The two, two (2) acre evaporation ponds will be designed with a primary and secondary liner system and an intervening leak collection and recovery system (LCRS). The LCRS design provides for capture and conveyance of the seepage through the upper primary liner to a collection sump. LCRS sumps will be included in the design of each evaporation pond cell. Solution collected in the LCRS sumps will be pumped using a mobile pump, and returned to the evaporation ponds. These evaporation ponds will be designated as Class II Surface Impoundments Waste Management Units (WMU) and will meet the requirements of the California Code of Regulations (CCRs), Title 27, CCR §20200 et seq.

General Evaporation Pond Design Concepts

The evaporation ponds are designed to provide contingency storage for the 100-year storm event acting over the respective pond area, with an additional one foot of freeboard (above the required design capacities). Pond berms with a minimum crest width of 15 feet are designed between ponds to allow access from all sides, as well as installation of bird netting supports. Leak collection and recovery system (LCRS) sumps will be included in the design of each evaporation pond cell. Solution collected in the LCRS sumps will be pumped using a mobile pump, and returned to the evaporation ponds.

Measures taken to limit water fowl from accessing the evaporation ponds included design of a bird netting system. The individual pond cell dimensions of 140 feet by 280 (nominal) feet were selected based on a reasonable and practical span for the bird netting system. The bird netting system will consist of wooden support poles spaced approximately 48 feet apart along the 15-foot wide pond divider berms, designed to elevate and support the primary cable system. A secondary cable system will link the primary cables, creating a cable grid over which the netting can then be placed. The base of each wooden support pole will be sealed to prevent infiltration around the liner at the pole locations. The bird netting is designed with two-inch openings to prevent access from water fowl.

Surface water run-on into the evaporation ponds includes surface water run-off from the perimeter berms and direct precipitation onto the evaporation pond area.

The evaporation pond design utilizes a double liner system with an intervening Leak Collection and Recovery System (LCRS) for groundwater protection and enhanced seepage protection, as follows (from top to bottom):

- Hard surface Protective Layer
- Non-woven geotextile
- 60-mil high density polyethylene (HDPE) upper (primary) geomembrane;
- An interstitial LCRS consisting of HDPE geonet;
- 60-mil HDPE lower (secondary) geomembrane;
- Reinforced geosynthetic clay liner (GCL) as the underliner component of the secondary composite liner system; and
- Prepared subgrade

An aggregate road base material will be placed along the top of each berm to provide an all weather access location for maintenance vehicles. The material will conform to the Cal DOT Specifications for Class II Aggregate Base. This will be installed to a minimum thickness of 6 inches and will be placed and compacted in accordance with the Cal DOT requirements.

Hard Surface Protective Layer:

A hard surface / protective layer will be constructed over a non-woven geotextile that covers the primary liner. The hard surface will allow for vehicular traffic during unscheduled or emergency maintenance or cleanout. Hard surface types to be considered and assessed include compacted clay, roller compacted concrete, or an approved equivalent (formed concrete, gunite, or other alternates).

Prior to the placement of the hard surfacing, a 1 foot thick sub-base layer consisting of granular fill with a maximum particle size of ½" shall be placed and spread over the non-woven geotextile. The sub-base layer will be spread carefully and sequentially to avoid damage to the underlying liner system. After placement, the granular layer will be proof rolled using light compaction equipment.

Upper (Primary) Liner:

The upper primary liner will consist of a conductive smooth 60-mil HDPE geomembrane sheet. An HDPE liner was chosen for its long term performance due to its chemical resistance properties, resistance to ultraviolet radiation, high tensile strength, and high stress-crack resistance.

To facilitate quality assurance during installation of the liner system, the upper primary geomembrane liner will be conductive to facilitate spark testing of the liner surface upon completion of the installation. This liner will be installed in accordance with current practices and will employ the use of wedge welding and extrusion welding procedures. In addition, destructive and non-destructive testing procedures will be used to ensure liner quality and continuity.

Leak Collection and Recovery System (LCRS):

As part of the evaporation pond design, a leak collection and recovery system (LCRS) will be incorporated. If a leak occurs in the upper primary geomembrane, the LCRS is designed to minimize the hydraulic heads on the lower geomembrane liner.

The LCRS layer is designed with a thickness of 200 mil. In the event that leakage occurs through the upper geomembrane liner, it will be collected in the LCRS layer and routed (via gravity flow) to a LCRS sump located in each evaporation pond cell. The LCRS sumps will be conservatively sized using a minimum base dimension of approximately 10 feet for constructability. The sump for each evaporation pond cell is designed to have base dimensions of approximately 10 feet by 30 feet, with 3H:1V side slopes, and a 5-foot depth based on the designed grading for the pond cells (i.e., flat portions of the cell are underlain by the LCRS sump). The LCRS sump provides for sampling, removal of leak solution, and return to the evaporation ponds by use of portable pump. This design is consistent with CCR, Title 27, Section 20340.

Lower (Secondary) Composite Liner System:

Beneath the LCRS layer is a 60 mil smooth HDPE secondary geomembrane liner. This liner provides secondary containment of process solutions should leakage occur through the upper primary geomembrane liner. This liner will be installed in accordance with current practices and will employ the use of wedge welding and extrusion welding procedures. In addition, destructive and non-destructive testing procedures will be used to ensure liner quality and continuity.

The lower secondary geomembrane liner will be underlain by a GCL, which consists of a layer of sodium bentonite encapsulated between two geotextiles with an upper woven geotextile and lower non-woven

geotextile which is subsequently needle-punched together to form a hydraulic barrier material (i.e., CETCO Bentomat ST, or equivalent). The GCL is approximately 0.4 inches thick with a reported hydraulic conductivity of $5x10^{-9}$ centimeters per second (cm/sec). The sub grade under the GCL system will be scarified, moisture conditioned, compacted, and proof-rolled with a smooth drum roller to form a competent working surface. Use of the existing in-situ soils as a sub-base will be evaluated from geotechnical investigation and tests performed during the detailed design phase. Should the existing material be deemed not-suitable as a sub-base, imported fill material will be imported and placed according to the geotextile and GCL manufacturer's specifications.

Leak Collection and Recovery System Design:

Two sloped LCRS riser pipes will be provided within each sump to add redundancy to the system. The risers consist of 10-inch diameter, SDR-17 HDPE pipes. The lower ends of the pipes are slotted in the sump area to provide solution access into the risers. Solution is recovered via a mobile submersible pump which will be installed in the riser as needed. Recovered solutions will be returned to the evaporation pond system.

Bird Netting Design:

The acidic solution contained within the evaporation ponds represents a potential threat to endangered birds and migratory waterfowl. Birds view these ponds as an opportunity to rest and feed. If allowed to land, the birds may become poisoned by getting into contact with chemicals present in the evaporation ponds. In order to limit bird mortality, a bird netting system will be designed to reduce water fowl access to the evaporation ponds.

GCL Underliner Construction Considerations:

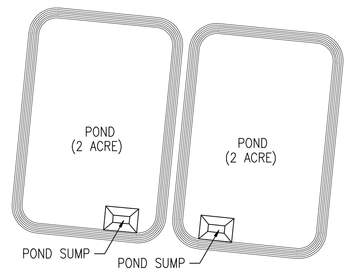
A geosynthetic clay liner (GCL) will be provided as the underliner component of the secondary composite liner system for the evaporation ponds. The design drawings and Technical Specifications will include increasing the manufacturer-recommended longitudinal overlap of the GCL (from 6 to 12 inches) and increasing the manufacturer-recommended end-of-roll overlaps (from 2 to 4 feet) to limit effects of GCL shrinkage within the evaporation pond liner system.

In addition to the construction considerations discussed previously, pre-hydration of the GCL is provided during the construction process to enhance the permeability characteristics of the GCL. Prior to GCL placement, the subgrade soils will be moisture conditioned and compacted to a minimum 95 percent of the standard Proctor (ASTM D 698) maximum dry density at optimum to plus 4 percent of the optimum moisture content. This recommended specification is based on the results obtained from research which shows that prehydration of the GCL is obtained via subgrade moisture absorption.

See Figure 1. Cross-sectional diagram of the evaporation ponds.

NOTES:

1. USE OF THE EXISTING IN-SITU SOILS AS A SUB-BASE WILL BE EVALUATED FROM GEOTECHNICAL INVESTIGATION AND TEST PERFORMED DURING THE DETAILED DESIGN PHASE. SHOULD THE EXISTING MATERIAL BE DEEMED NOT-SUITABLE AS A SUB-BASE, IMPORTED FILL MATERIAL WILL BE IMPORTED AND PLACED ACCORDING TO THE GEOTEXTILE AND GCL MANUFACTURERS' SPECIFICATIONS.
2. PRIMARY AND SECONDARY GEOMEMBRANE LINERS SHALL CONSIST OF SMOOTH BLACK HIGH DENSITY POLYETHYLENE GEOMEMBRANE. PRIMARY MEMBRANE SHALL BE CONDUCTIVE TO FACILITATE SPARK TESTING.
3. TOP OF BERM TO BE HIGHER THAN SURROUNDING GRADE SUFFICIENT TO PREVENT STORM WATER INFILTRATION INTO THE EVAPORATION POND (100 YEAR STORM).



KEY PLAN
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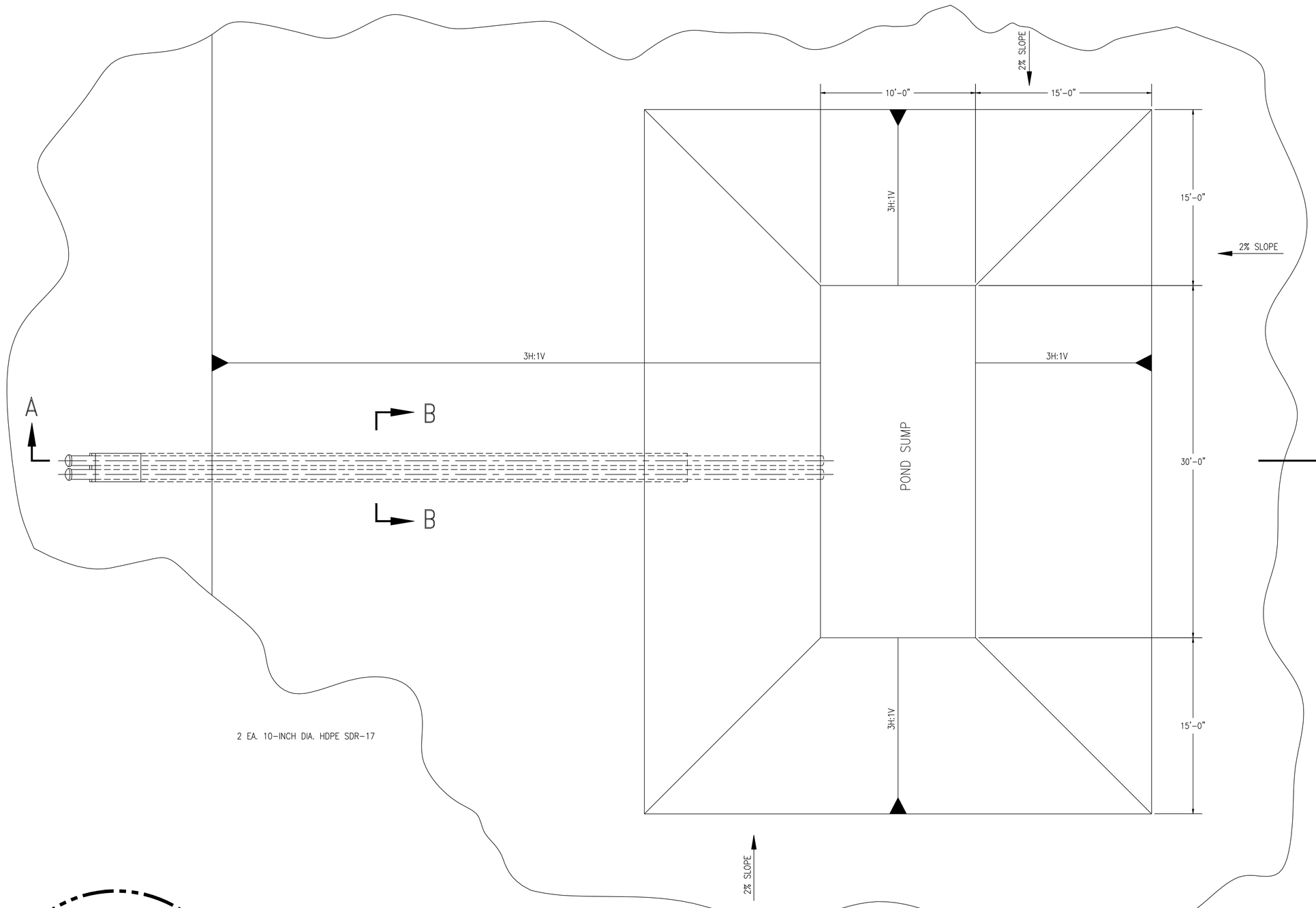
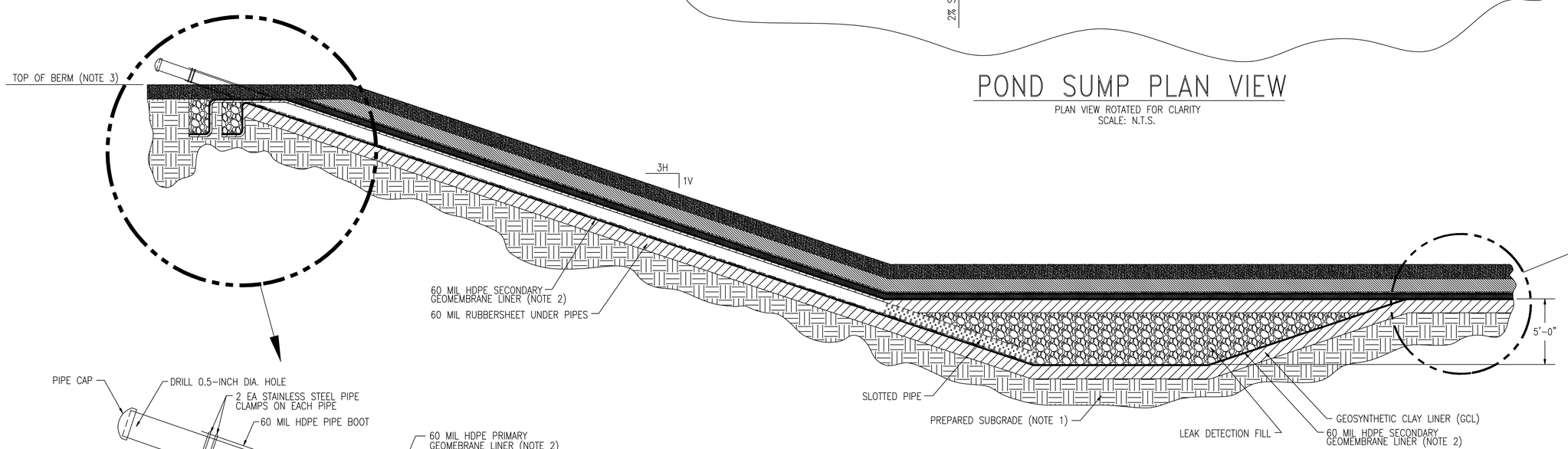


POND SUMP PLAN VIEW
PLAN VIEW ROTATED FOR CLARITY
SCALE: N.T.S.



SECTION A-A
TYPICAL LCRS RISER PIPE AND POND PROFILE
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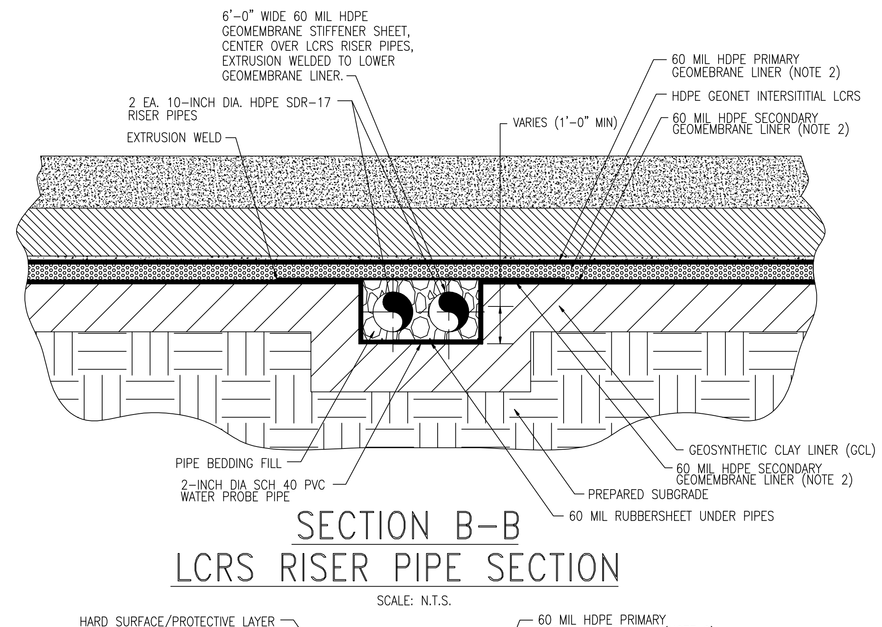
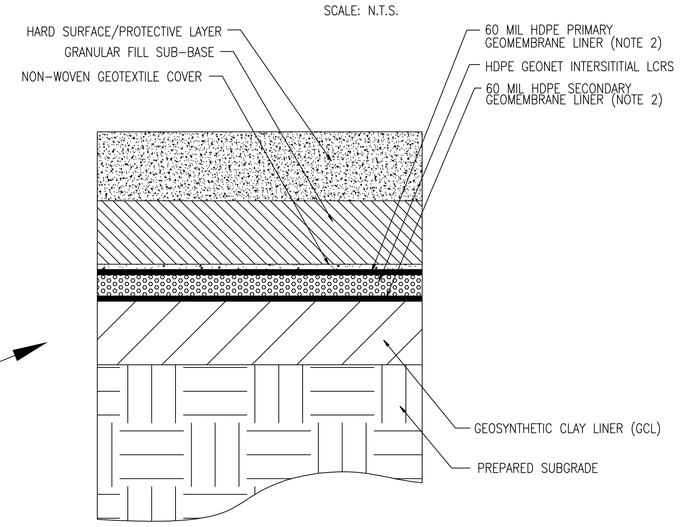
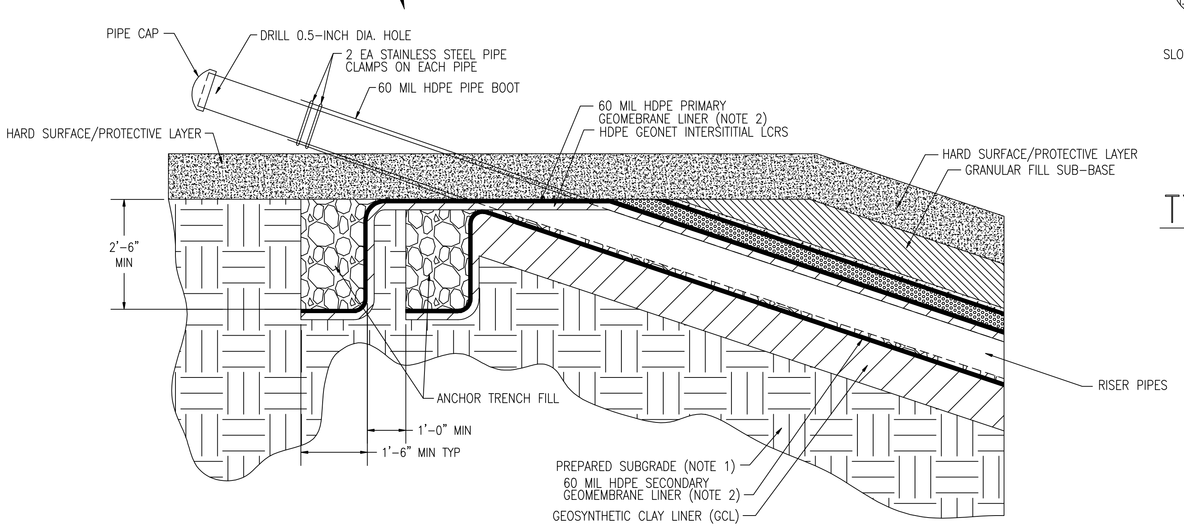


SECTION B-B
LCRS RISER PIPE SECTION
SCALE: N.T.S.



POND PROFILE DETAIL
(TYPICAL FOR ENTIRE POND)
SCALE: N.T.S.



LCRS RISER OUTLET DETAIL
SCALE: N.T.S.

NO.	DATE	REVISIONS	BY	CHK	DES SUPV.	ENGR	PROJ ENGR	APPR
0	9/DEC/11	ISSUED FOR INFORMATION	RPT	TWA	RPT		TWA	

SCALE: AS SHOWN | DATE: 08SEP11 | DESIGNED: AKS | DRAWN: AKS | CHIEF ENGR.:

BrightSource

BECHTEL POWER CORP.
DEDICATED TO SAFETY EXCELLENCE - ZERO ACCIDENTS
FREDERICK, MARYLAND

RIO MESA
SOLAR ELECTRIC GENERATING FACILITY

LEAK COLLECTION AND RECOVERY SYSTEM POND SECTION & DETAILS

BSII (Ltd.)	OWNER DRAWING NO.	
	TBD	
JOB NO.	DRAWING NO.	REV.
25670	009-CGK-0010-00001	A

34"X44"E SIZE

CEC Requirement (2): Evaporation Pond Monitoring and Reporting Plan.

Application Form

See previously submitted Form 200 with the Application for Certification.

Introduction

See previously supplied project introduction submitted with the Application for Certification and Form 200.

Physical Setting

Site Location [21600(B)(3)(D)]

The Rio Mesa SEGF site will be located in an unincorporated area of eastern Riverside County, California, situated 13 miles southwest of Blythe, California. It is located partially on private land owned by the Metropolitan Water District of Southern California (MWD), a California public agency, and partially on public land administered by the BLM.

The project site and linear features are located in the Palo Verde Valley, south of Interstate 10 (I-10) freeway and north of the Imperial County line. The site is west of State Route 78. There is an existing SCE transmission line along State Route 78 through agricultural fields. The existing Imperial Irrigation District (IID) transmission line and the Western Area Power Administration (WAPA) transmission line border the project site on the northwest and east, respectively. The existing TransCanada Gas Transmission Company (TCGT) North Baja Pipeline borders the site on the east. Bradshaw Trail intersects the project site at an east-west orientation (see Figure 5.6-1). The Colorado River borders eastern Riverside County and Arizona approximately 5 miles to the southeast at its nearest point.

The Palo Verde Valley is situated between the project site on the Palo Verde Mesa to the west and the Colorado River to the east. The area is comprised primarily of open space and agricultural land. There is some very low density residential use in the vicinity of the project site. Palo Verde is the closest community to the project site, which is approximately 2.3 miles east of the southeast corner of the project site boundary on the border of Riverside and Imperial Counties but located within Imperial County.

Land Use [21600(B)(3)(E), 21750(H)]

The Project will include three solar concentrating thermal power plants and a shared common area to include shared systems. Each plant will have a nominal output of 250 MW. The Project will be executed in three phases. Each 250 MW plant requires about 1,850 acres (2.9 square miles), for a total project area of approximately 5,750 acres required for all three plants.

The legal description of the land administered by BLM on which a portion of the Rio Mesa SEGF will be located is:

> *Portions of Sections 2, 3, 10, 11, 14, and 15, Township 08 South, Range 21 East, San Bernardino Meridian, Riverside County, California.*

The legal description of the land administered by BLM on which the gen-tie line will be located is:

> *Portions of Sections 7, 8, 9, 15, 16, 17, 22, 23, 25, 26, and 35, Township 07 South, Range 21 East, San Bernardino Meridian, Riverside County, California.*

Four additional features, including linear corridors used for site access and electrical service lines, are also part of the Project. For purposes of defining the approximate ROW for each 200-foot corridor, the areas extending 100 feet on either side of centerline are included in the ROW descriptions. The legal description of the land on which these four linear features will be located is as follows:

Bradshaw Trail Access Road Corridor:

Portions of Sections 12 through 14, Township 08 South, Range 21 East, and Portions of 7 and 18, Township 08 South, Range 22 East, San Bernardino Meridian, Riverside County, California.

33 kV Service Line Corridor New ROW:

Portions of Sections 12 through 14, and 23, Township 08 South, Range 21 East, San Bernardino Meridian, Riverside County, California.

33 kV Service Line Corridor Existing ROW Overbuild:

Portions of Sections 3 through 10, 17, and 18, Township 08 South, Range 22 East, San Bernardino Meridian, Riverside County, California.

34th Avenue Access Road Corridor:

Portions of 23 through 26, Township 08 South, Range 21 East, San Bernardino Meridian, Riverside County, California.

The legal description of the private lands under lease from MWD on which the Project will be located is:

All of Section 28 and portions of Sections 15, 16, 20, 21, 22, 23, 27, 29, 33, and 34, Township 08 South, Range 21 East, San Bernardino Meridian, Riverside County, California.

The site is currently mostly undeveloped and is surrounded primarily by undeveloped land to the north, south, and west with agricultural lands located to the east. The project site is comprised primarily of creosote desert scrub with areas of desert wash scrub within the on-site washes. Portions of the site are disturbed due to existing infrastructure (transmission lines, pipelines, past military training activities, etc.). The gen-tie line passes through BLM lands and other private lands and is mainly comprised of desert scrub habitat and disturbed lands associated with existing infrastructure. The project site has several utility lines with maintenance roads running through it and has been subject to disturbance from illegal off-road vehicle use, dumping of trash, and historic use for military training during World War II including tank training.

Soil Contamination

A Phase I Environmental Site Assessment was completed for the Rio Mesa SEGF in September 2011 (URS, 2011). No contaminated soils have been specifically identified in the areas of the site inspected as part of this assessment.

Topography [21750(D)(1)]

The project site is mapped within the Thumb Peak and Roosevelt Mine, California, 7½-minute topographic quadrangles (EDR, 2010, 2011). The site is located on Palo Verde Mesa which lies on the eastern flank of the Mule Mountains to the west and Palo Verde Valley (the floodplain of the Colorado River) to the east (Figure 1). The ground surface elevation across the main project site ranges from approximately 245 feet above mean sea level (amsl) at the southeastern corner to approximately 500 feet amsl near the northwestern corner. The ground surface elevation at the northwestern end of the corridor is

approximately 475 feet amsl and approximately 300 feet amsl at the southern junction with the main project site.

Floodplain [21750(D)(2)]

The project site generally slopes to the east. The average slope is approximately one percent. Sparse desert vegetative brush covers most of the area within the project site, with the exception of barren, hilly areas located along the north-western boundary of the site. The project site and tributary area runoff discharges east through several ephemeral washes on site. The washes convey runoff to Hodges Drain (a man-made drainage canal), which borders the project site to the east. Hodges Drain conveys runoff approximately two miles south to the Palo Verde Outfall Drain. Runoff continues south approximately 6.5 miles within the Palo Verde Outfall Drain where it discharges to the Colorado River. No dams or levees are located upstream of the project site. With the exception of Hodges Drain and Palo Verde Outfall Drain, there are no other identified large scale existing or proposed offsite flood control projects in the vicinity of the Rio Mesa SEGF.

Climatology [21750(E)]

Annual rainfall amounts in the Colorado River Hydrologic Region range from less than 3 to approximately 6 inches. Most of the precipitation for the region occurs in the winter and spring. However, monsoonal thunderstorms, created by the movement of subtropical air from the south, do occur in the summer and have generated significant rainfall in some years. Higher annual rainfall and milder summer temperatures occur in the mountains to the north and west of the hydrologic region. Clear and sunny conditions typically prevail, and the region receives 85 to 90 percent of the maximum possible sunshine each year; the highest value in the U.S. Table 1 provides average historical rainfall from the meteorological station at the Blythe Airport weather station, approximately 10 miles northeast of the project site.

Table 1
Rainfall near the Proposed Project Site (1948-2010)

Precipitation (inches)	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	3.54	0.49	0.44	0.36	0.15	0.02	0.02	0.23	0.62	0.35	0.26	0.19	0.41
Maximum	9.16	2.48	3.03	2.15	3.00	0.22	0.91	2.44	5.92	2.14	1.89	1.84	3.33
Minimum	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Western Regional Climate Center, 2010

The mean annual precipitation (1948 to 2010) recorded at the Blythe Airport weather station is 3.54 inches per year. The minimum and maximum annual precipitation for the period of record is 0.59 inches and 9.16 inches, respectively. According to the National Oceanic and Atmospheric Administration Atlas 14 for Southeastern California (2003), between 3 and 3.5 inches of rain are expected to fall in a 100-year, 24-hour storm event.

Geology and Seismicity [21750(F)]

The project area is located in southeastern California along the western flank of the Colorado River floodplain. According to Note 36 from the California Geological Survey (CGS), which outlines California's Geomorphic Provinces, the general area is within the Mojave Desert Physiographic Province (CGS, 2002). The Mojave Desert Physiographic Province is described as a high desert, whereas the project area is in an area that would be described as a low desert, which is more typical of the characteristics of the Colorado Desert Physiographic Province (Norris and Webb, 1990). For this reason, there is some debate about which physiographic province the project area fits.

In general, the region consists of desert mountain ranges surrounded by extensive alluvial fans and plains. However, the Colorado River has played a major role in reworking the landforms in its path and plays an intricate part in the local geology.

In 1967, Jennings mapped the Needles 30' by 60' quadrangle at a scale of 1:100,000. Until recently, this was the most detailed geologic map that encompassed the entire project area. In 2006, the United States Geological Survey (USGS) produced an in-depth geologic study with a geologic map at a scale of 1:24,000 that covered the western Blythe area and extended south into the northern portion of the project area (USGS, 2006). Expansion of this data southward to encompass the entire project site was performed in March of 2010 by Jay Rehor of URS Corporation (URS, 2011b). This additional mapping effort was initially done using GIS and aerial photographic analysis, and was followed up with verification field mapping.

The project area is primarily situated on the Palo Verde Mesa. The Palo Verde Mesa is bounded to the south and west by the volcanic and plutonic rocks that form the Mule Mountains, to the north by an extension of the Chuckwalla Valley that separates the Mule and McCoy Mountains, and to the east by the broad floodplain of the Colorado River. The rock outcrops of the Mule Mountains are heavily eroded and mantled by a series of Quaternary-age alluvial fans. Alternatively, the Colorado River floodplain is composed of more recent alluvial material deposited by the river. Between these two areas lies the Palo Verde Mesa, which is primarily composed of inset Pleistocene terraces of the Colorado River (URS, 2011b).

The project area can be divided into two dominant structural sections. One section consists of the Mule Mountains and associated coalescing alluvial fans (western area) gradually sloping down to the east. These alluvial fans have varying degrees of desert pavement development on the surface. The second dominant structural section is formed by several inset alluvial terraces which form the Palo Verde Mesa (central area), and the modern Colorado River floodplain (eastern area). These alluvial terraces were formed by successive aggradations and degradations of the Colorado River (URS, 2011b).

Ninyo & Moore performed a Preliminary Geotechnical Evaluation for the Project (Ninyo & Moore, 2011). Subsurface investigations included borings, Cone Penetration Tests (CPTs), and test pits through much of the main project area. The explorations encountered primarily silty fine sands with gravel and coarse sands. The materials ranged in density from loose to very dense; however, the majority of the subsurface investigations reported medium dense to dense silty sands. None of the subsurface investigations encountered groundwater. The depth to groundwater is anticipated to be approximately equivalent to the surface of the nearby Hodges Drain located east of the project site.

The project area is located in seismically active Southern California, a region that has experienced numerous earthquakes in the past. According to the AP Earthquake Fault Zone Maps (CGS, 2000), there are no EFZs within the project area. In addition, no active fault zones are present within 20 miles of the Project. The majority of fault activity in the region is to the west of the project area. The nearest active fault (showing movement in the last 11,000 years) is the San Andreas Fault, located approximately 55 miles to the southwest. Inactive faults exist in the mountains that border the western edge of the project area but none are mapped within its boundaries. The nearest fault to have shown activity in the Quaternary period is the Blythe Graben located approximately 20 miles north of the project area. The tectonic significance and age of this fault is unknown.

The project area is subject to an estimated peak ground acceleration (PGA) between approximately 0.10 percent of gravity (g) and 0.12g with a 10 percent probability of being exceeded in 50 years, and a PGA between 0.12g and 0.16g with a 2 percent probability of being exceeded in 50 years (Ninyo & Moore, 2011).

The following subsections discuss the potential geological hazards that might occur in the Project area.

Ground Rupture

The site is not located within an area delineated by the AP Earthquake Fault Zone Act. Based on the referenced sources reviewed, no faults have been mapped transecting the proposed project site or linear elements. The potential for ground rupture to impact the Project is considered low.

Seismic Shaking

During an earthquake, seismic waves are produced that emanate in all directions from the fault rupture. Seismic waves can produce strong ground shaking that is typically strongest near the fault and attenuates as the waves move away from the source. The severity of ground shaking is controlled by the interaction of magnitude, distance, and the type, thickness, and condition of underlying geologic materials. Areas underlain by unconsolidated, recent alluvium or fill may amplify the strength and duration of strong ground motion.

Based on the seismic setting, the Project is likely to experience strong seismic shaking within the lifetime of the Project.

Liquefaction and Seismic Settlement

During strong ground-shaking, loose, saturated, cohesionless soils can experience a temporary loss of shear strength. This phenomenon is known as liquefaction. Liquefaction is dependent on grain size distribution, relative density of the soils, degree of saturation, and intensity and duration of the earthquake. Potential hazards associated with liquefaction are seismically induced settlement and lateral spreading. Large scale GIS based natural hazard mapping performed by Earth Consultants International (ECI) in 2000 delineates the Colorado River Valley area to have a liquefaction susceptibility as high (ECI, 2000). However, based on recent groundwater data collected that shows groundwater to be greater than 150 feet deep on the mesa, the susceptibility is low (Ninyo & Moore, 2011). According to Ninyo & Moore (2011), the majority of the subsurface soil on the Palo Verde Mesa and in the alluvium to the east, is medium dense to dense silty sands. Furthermore, shallow groundwater conditions are not expected

along the proposed linear elements. Due to the geologic setting of the project area, the site is considered to have a low potential for liquefaction.

Settlement of dry sands can occur during a seismic shaking event, potentially resulting in settlement of the ground surface and supported structures. One of the most important parameters affecting the settlement of dry sands is the relative density of the soil (Silver & Seed, 1971). Subsurface evaluations (Ninyo & Moore, 2011) indicated subsurface materials are generally medium dense to very dense. However, in some locations loose sands extended to depths up to 10 feet below the ground surface. The active alluvial channels that transect the project area, as well as the areas underlain by eolian sands may be relatively loose at or near the ground surface. Foundation design considers the potential presence of loose sands.

Subsidence

Subsidence can be caused by natural phenomena during tectonic movement, consolidation, hydro-compaction, liquefaction and seismic settlement, or rapid sedimentation. Subsidence can also result from human activities, such as withdrawal of water and/or hydrocarbons in the subsurface soils. As of 2000, no documented subsidence has been noted in the area of the project site (ECI, 2000). Based on the geologic setting, the potential for widespread subsidence is considered low inasmuch as there is no significant fluid withdrawal in the project area.

Expansive Soils

Expansive soils are clay-rich soils that have the ability to shrink and swell with wetting and drying. The shrink-swell capacity of expansive soils can result in differential movement beneath foundations. Based on the preliminary geotechnical evaluation by Ninyo & Moore (2011), the soils in the project area are primarily composed of coarser grained material, such as sands and silty sands, with minor amounts of gravel. A minor clay layer was noted to exist within the project site as observed during field mapping in March of 2011 (URS, 2011b). In general, the potential for expansive soils in the main project area is low.

Subsurface data is not available in the within the gen-tie line corridor. However, this area is mapped with similar geology as the main project area and is likely to have similar non-expansive soil characteristics. Similarly, geotechnical data is not available for the linear elements that extend eastward into the Colorado River Plain. There is considered to be some potential for finer grained-materials with expansive properties along these linear elements. Further geotechnical studies and the engineering design for the Project will consider the potential for expansive soil. Expansive soils, if present, can be mitigated by removing the soil and backfilling with non-expansive soil, instituting chemical stabilization of the soil, or designing foundations to resist uplift of the expansive soil.

Slope Stability

Slope instability depends on slope inclination, underlying geology, surface soil strength, and pore pressures in the soil. Significant excavating, grading, or fill work during construction could also introduce temporary slope stability hazards.

Slope stability hazards are not expected to be a concern across the majority of the project area where topographic relief is minimal (ECI, 2000). Further, significant earthwork consisting of large cuts and fills

is not planned for the Project. However, areas where the alluvial washes have incised relatively steep walls in the existing Palo Verde Mesa, as well as the eastern edge of the Palo Verde Mesa where it rises above the Colorado River Basin, have a higher potential for slope instability as a result of natural erosion. Site-specific slope stability evaluations will be required for development adjacent to these slopes, if impacted by the Project.

Hydrogeology [21750(G)]

The project site, which is underlain by the Palo Verde Mesa Groundwater Basin (PVMGB), lies on a mesa at a higher elevation than the Colorado River floodplain. The boundary between the PVMGB and the Palo Verde Valley Groundwater Basin (PVVGB) is not a barrier, but appears to be defined based on surface water flow and topography. The PVMGB is bounded by non-water-bearing rocks of the Big Maria and Little Maria Mountains on the north, the McCoy and Mule Mountains on the west, the edge of the Palo Verde Mesa on the east, and the Palo Verde Mountains on the south. The northwest boundary and parts of the western boundary are drainage divides (Metzger et al. 1973; Jennings 1967). Groundwater is derived primarily from a surficial alluvial aquifer that is connected to the Colorado River. In the PVMGB, groundwater is also derived from the surficial alluvial aquifer and older Tertiary deposits, including Miocene-age fanglomerate and the Bouse Formation.

Quaternary Alluvium. Alluvium is the water-bearing material that forms the basin and includes unconsolidated Holocene age deposits and overlying unconsolidated to semi-consolidated Pleistocene deposits (DWR 1954, 1963). Holocene alluvium is composed of poorly sorted gravel, sand, silt, and clay that typically lie above the water table (DWR 1963). Pleistocene alluvium is composed of well sorted sand, interbedded with gravel, silt, and clay that, where saturated, yields water freely to wells (DWR 1963).

Jennings (1967) mapped the sediments of the Palo Verde Mesa as Qc and Qal (Pleistocene nonmarine deposits and Quaternary alluvium). Metzger et al. (1973) mapped them as QTa and Qa (older alluviums and younger alluvium). Jennings (1977) mapped them as Qoa and Qal (older Quaternary alluvium and Quaternary alluvium). Stone (1990) mapped them as QTa (alluvial fan and fluvial deposits) and Stone (2006) mapped them as Qpv (alluvial deposits of Palo Verde Mesa).

According to Metzger et al. (1973), the Palo Verde Mesa consists of five alluviums (units A through E). Unit B (subsurface) has Pliocene roundstone gravels of exotic provenance. The rounded pebbles and cobbles of the Pliocene unit B are polymineralic. They are composed of various sedimentary, metamorphic, and igneous rock types.

Pliocene Bouse Formation. The regionally extensive Pliocene Bouse Formation has been identified as underlying the Quaternary Alluvium in the area. Metzger (1968) reported that erosional remnants of the Bouse Formation are present in a belt approximately 20 to 30 miles wide extending along the Lower Colorado River for approximately 190 miles from Lake Mohave to near Yuma, Arizona.

The Bouse Formation includes a marine to brackish-water estuarine sequence deposited in an arm of the proto-Gulf of California (Metzger 1968; Wilson and Owen-Joyce, 1994). This formation has alternatively been interpreted as, or may include, lacustrine sediments deposited in a closed, brackish basin (Stone, 2006). It is reported to be composed of a basal limestone (marl) overlain by interbedded

clay, silt, sand and tufa. The top of the Bouse Formation is relatively flat lying with a reported dip of approximately 2 degrees south of Cibola (Metzger and others, 1973).

Natural recharge of the PVMGB is chiefly from percolation of precipitation and subsurface inflow from the Chuckwalla Valley Groundwater Basin to the west and the PVVGB to the east (DWR, 2004). Irrigation water percolation contributes approximately 10% of the PVMGB and PVVGB recharge. Recharge to the PVMGB and PVVGB totals approximately 424,600 acre-feet (af) (WP 2011). Groundwater movement is generally in the southeast direction

Groundwater flow in the PVMGB is generally toward the southeast to Palo Verde Valley. Depth to groundwater on site ranges from about 140 to 160 feet below the ground surface (bgs) based on information in the National Water Information System (NWIS) database (USGS 2010-2011). This corresponds with groundwater elevations ranging from approximately 224 to 232 feet above mean sea level (amsl).

The total storage capacity of the PVMGB is estimated at 6,840,000 af (DWR 1975). The total amount of groundwater in storage is unknown. Despite drier than normal conditions in the past 10 years, consumption of surface water from the Colorado River and groundwater has remained constant through the period.

Groundwater is calcium-sodium chloride or calcium-sodium sulfate in character. Groundwater quality impairments in the basin consist of arsenic, selenium, fluoride, chloride, boron, sulfate, and total dissolved solids (TDS) concentrations are above their respective maximum contaminant levels (MCLs) for drinking water in California. Because of the higher than recommended values of TDS, some groundwater in the basin is unsuitable for domestic and irrigation purposes. Fluoride concentrations above the MCL for drinking water has been found in the older geologic units such as the Bouse Formation and Miocene-age fanglomerate (DWR 2004). The water quality in the surficial deposits is generally of slightly better quality than the Bouse Formation (DWR 2004).

The main project site is not located within the service area of any municipal or commercial water supplier. According to the "Law of the River", which includes several compacts, agreements, court decisions, decrees, contracts and regulatory guidelines, consumptive use of Colorado River water can occur through direct diversions of surface water, as well as through withdrawal of water from the river by underground pumping.

Water Use [21750(H)]

In the mid-1970s, the project site was considered as a possible location for a nuclear power plant (SunDesert Project). Extensive studies were conducted as part of a Final Site Environmental Statement (ES) on behalf of San Diego Gas & Electric Company (SDG&E) (U.S Nuclear Regulatory Commission 1978). As part of this effort, many wells were installed to evaluate the characteristics of the underlying aquifers as a potential source for water supply. A report (Stone and Webster 1976) was prepared that analyzed the groundwater table elevations. WorleyParsons (WP) also analyzed the groundwater table elevations within the project vicinity in the *Assessment of Groundwater Conditions Report* provided in the Rio Mesa SEGF Application for Certification (AFC) Appendix 5.15D (WP 2011). Groundwater table

elevations decrease in a southeasterly direction to an outfall drain located within the agricultural area east of the project site at a gradient of approximately 2 to 3 feet per mile (0.0004 to 0.0006 foot per foot).

In addition to the wells that appear to be associated with the SunDesert Project, the USGS NWIS database indicates that there are many observation, destroyed, abandoned, and pumping wells in the PVMGB and the adjacent PVVGB. A *Report of Groundwater Sampling and Monitoring* at the Rio Mesa SEGF site, prepared by URS, includes the results of water-level monitoring for 19 wells and groundwater quality analyses for two wells sampled in the project area (URS 2011). WP also analyzed several wells within the PVMGB and PVVGB to determine groundwater level trends in the *Assessment of Groundwater Conditions Report* for the Project (WP 2011). The report indicated that groundwater levels within the PVMGB have remained relatively stable, with some localized water level declines due to pumping.

Facility Description

Refer to the AFC submittal.

Waste Classification and Management [21600(2),21740, 21760(B)]

See previously submitted proposed waste discharge parameters.

Design and Construction Standards

General Design Description [21600(4)(A) & (B), 2170 (A), 20320, 20330, 20360]

Overview

The containment strategy for the evaporation ponds is summarized as follows:

- Size the ponds to achieve sufficient evaporative capacity under annual average and peak discharge conditions, allow for storage of evaporative residue for the full 30 year operating life of the facility, maintain a minimum of 2 feet freeboard at all times, and to allow one pond to be taken out of service for one year for maintenance without impacting the operation of the plant.
- Meet or exceed regulatory requirements for containment of liquid designated wastes.
- Select materials that are compatible with the physical, chemical and thermal characteristics of the wastewater and evaporation residue being contained.
- Include the ability to monitor the integrity of the containment system, to collect and recover leakage through the primary liner, and to transfer fluids from one evaporation pond to another.

The proposed design for the evaporation ponds has been selected to optimize performance based on these operating criteria. The location of the evaporation ponds are shown in the attached figure.

The following sections contain further information about each layer of the containment system.

Hard Surface / Protective Layer

A ramp consisting of a hard surface / protective layer shall be provided for the length of each pond to allow access by equipment into the evaporation pond for maintenance purposes. The ramp will extend at an angle down the side slopes, to provide a shallower slope than 3:1 for access by equipment. This layer will provide protection of the HDPE if access by equipment is necessary, such as for insertion of pumps or launching of floatation devices.

Various hard surface media such as reinforced concrete, gunite, roller compacted concrete, revetments, or combinations of these media will be assessed prior to the selection of the preferred option for ramp construction. A compacted granular fill base course and non-woven geotextile are required between the HDPE liner and concrete to act as a supporting base to the hard surfacing and protection to the HDPE.

6.1.4 LINER SYSTEM

HDPE was selected as the preferred material for the primary and secondary liners for the following reasons:

- It is chemically resistant to potentially high concentrations of dissolved salts;
- It is very durable during installation;
- It is strong and possesses desirable stress-strain characteristics; and
- It is the most common synthetic liner material and as such there is a broad base of practical experience associated with the installation of HDPE amongst construction contractors.

A 60 mil primary liner was selected to provide appropriate balance between strength and ductility characteristics, which is very important during liner installation. This liner will consist of white, UV-resistant geomembrane or equivalent. White co-extruded HDPE geomembrane reflects light and does not absorb radiant heat energy as does an exposed black (standard) HDPE geomembrane liner. In addition, the liner will be textured on both sides, for safety purposes and to increase the frictional strength of the installation.

The secondary liner, with a minimum thickness of 40 mil, was selected to provide slightly better ductility and handling characteristics during installation, as strength is of lesser importance for the secondary liner. The secondary liner will also be textured on both sides.

HDPE possesses large thermal expansion and contraction characteristics, and exhibits stress when liner temperature exceeds 122°F. The temperature of the blowdown water is not expected to exceed 122°F.

The liner system will be installed in accordance with current practices and will employ the use of wedge welding and extrusion welding procedures. In addition destructive and non-destructive testing procedures will be used to ensure liner quality and continuity.

6.1.5 BASE LAYER

A base layer is required to protect the underlying groundwater in the unlikely event that both synthetic liner materials are punctured during construction or operation of the evaporation ponds. This base layer also serves to provide a smooth, competent surface to support the overlying synthetic liners and leak detection system layers

The preferred design for the base layer is 2 feet of onsite material with a hydraulic conductivity of less than 1×10^{-6} cm/s, of which at least 30% of the material, by weight, shall pass through a No. 200 U.S. Standard sieve. If this material is unavailable on site, then a geosynthetic clay liner (GCL) or approved equivalent is the alternative design for the base layer. For the project, GCL is proposed as an engineered alternative. GCL's are relatively simple to install and there are a number of manufacturers that provide a GCL product adequate to meet the project requirements (for example Bentomat by CETCO).

Title 27 of the CCR, Section 20330 outlines the requirements for clay liners. GCL's are not referenced in this section, therefore explanation to this engineering alternative is provided in Section 6.2.

6.1.6 LEAK DETECTION, COLLECTION AND REMOVAL SYSTEM

A HDPE geonet drainage layer, with an option for non-woven geotextile heat bonded to one or both sides, will be used in the leak detection and collection layer between the primary and secondary liners. HDPE geonet used in combination with geotextile materials has been selected because polyethylene is not reactive with the fluids and provides a highly conductive layer, it is readily available, and is easily installed with minimal potential for damage to the liner system during installation.

The base of the evaporation pond leak detection and collection layer will slope at a minimum inclination of 1% to a leak collection trench. The trench will contain screened sand (with no fines) and a perforated pipe that will slope at a minimum inclination of ¾% towards a leak detection and collection sump, located at the lowest point in the pond. The water in the collection sump will drain by gravity to a monitoring well that is constructed for each evaporation pond (one well per pond). Automated pneumatic pumping systems in the monitoring wells will automatically return water collected in the sump to that evaporation pond, which in turn minimizes the hydraulic pressures across the secondary liners and therefore the risk of leakage through the secondary liner. Leakage rates will be measured using a flow totalizer.

The collection sump, pipe, and monitoring well, will include prefabricated and field-fabricated HDPE components with water tight, extrusion welded and wedge welded seams and penetrations. The liner system will be installed in accordance with current practices. Destructive and non-destructive testing procedures will be used to verify sump and penetration tightness and continuity.

This design is consistent with CCR, Title 27, Section 20340, which requires a LDRS between the liners for surface impoundments.

6.1.7 BERMS AND SIDESLOPES

The side slopes around the evaporation ponds will contain the same liner system as the base of the ponds, except that leak collection pipes will not be located on the pond side slopes.

The berms shall be covered with a minimum 6-inch thickness of road base or approved equivalent. The top of the berms will be a minimum of 2 feet above the surrounding existing grade to prevent potential inflow of storm water.

6.1.8 MATERIAL COMPATABILITY [20320]

The wastewater will come into contact with the primary liner. HDPE is chemically resistant to

saline solutions and long term contact between the wastewater in the evaporation ponds and the HDPE liner system will not compromise liner integrity. Further explanation for HPDE selection is provided in Section 6.1.4.

The liner system and base layer will have the ability to withstand the dissolved solids content of the water without degradation. These systems will not fail due to pressure gradients from physical contact with the wastewater and residue or undergo chemical reactions or degradation.

6.2 ENGINEERED ALTERNATIVE

6.2.1 REGULATORY REQUIREMENT

The performance standard for the liner system is outlined in CCR, Title 27, Section 20330:

> *"Liners shall be designed and constructed to contain the fluid, including landfill gas, waste and leachate, as required by Article 3 of this subchapter (Section 20240 et seq.., and section 20310"*

Under Section 20240 *et seq*., the relevant section to liner design is Section 20250, 'Class II: Waste Management Units for Designated Waste" (emphasis added):

> *(4) Class II surface impoundments are not required to comply with the requirements of (b)(1), but shall have a liner system designed in accordance with the applicable SWRCB-promulgated provisions of Article 4 of this subchapter (Section 20310 et seq.). The RWQCB can allow Class II surface impoundments which are designed and constructed with a double liner system in accordance with that article to use natural geologic materials which comply with (b)(1) for the outer liner.*

Under Article 4, Section 20320 (d) requires that soils used within containment structures must have the following characteristics:

> *(1) At least 30 percent of the material, by weight, shall pass a No. 200 U.S Standard Sieve*
>
> *(2) The materials shall be fine grained soils with a significant clay content without organic matter, and which is a clayey sand, clay, sandy or silty clay, or sandy clay under a soil classification system having industry-wide use.*

In addition, Table 4.1 in this section requires clay liners to have a hydraulic conductivity of not more than $1x10^{-6}$ cm/sec.

Section 20330 also outlines the requirements for liners:

> (b) *Clay Liners: Clay liners for a Class II Unit shall be a minimum of 2 feet thick and shall be installed at a relative compaction of at least 90 percent.*

(d) Lined Area - Liners shall be installed to cover all natural geologic materials (at the Unit) that are likely to be in contact with waste (including landfill gas or leachate).

6.2.2 ALTERNATIVE DESIGN

As outlined in Section 6.1.5, the preferred design for the base layer is 2 feet of on-site material with a hydraulic conductivity of less than 1 x 10^{-6} cm/s, of which at least 30 percent of the material, by weight, shall pass through a No. 200 U.S. standard sieve.

Tests have not been made on the hydraulic conductivity of the soil on site. Without a proper grain size distribution, it is not known whether the material can be placed to achieve a hydraulic conductivity of less than 1 x 10^{-6} cm/s.

It is not known, at this time how much effort and expense will be required to generate enough material to meet the requirements (maximum hydraulic conductivity and minimum quantity passing the No. 200 standard sieve). Trucking the material from an off-site source to meet the gradation and hydraulic conductivity would prove very costly. Therefore a GCL is proposed as an alternative design for the base layer. The GCL is not mentioned specifically in the regulations and therefore would be considered an alternative design.

GCL is an acceptable alternative for many reasons;

- GCL has been demonstrated as a suitable base under HDPE liner systems, and has been used as a primary containment layer in many applications. GCL has been used successfully as an alternate to soil layers in many Class II impoundments in the State of California (Buena Vista Landfill in Watsonville and the Desert Valley Center Landfill to

  name several recent projects). Additionally, GCL was used in a similar application at the Carlota Heap Leach Containment in Arizona.

- Performance of GCL as a fluid barrier has been well documented. A report by the industry and academic professionals has been developed to support the design and use of GCL as a fluid barrier. The paper found at the following link discusses this subject.: http://www.rsgengineers.com/docs/2002-GCL%20design%20series%20part%201%20gcl%20performance%20as%20a%20fluid%20barrier.pdf

- GCL is equivalent or superior to placement of a compacted low permeability base liner in several key respects:

  - GCL liners are constructed in a factory setting and subject to rigorous QA/QC protocols to assure uniform properties throughout the application. In situ construction of a compacted low permeability liner is also subject to rigorous field QA/QC, but is inherently more subject to variation than GCL as a result of the field construction process.

  - The permeability of GCL liners is designed to be equal to or less than a 2-foot layer of low permeability material with a hydraulic conductivity of 1 x 10^{-6} cm/s.

- GCL liners will not contain coarse-grained particles that could potentially puncture the secondary HDPE liner during installation. Even with rigorous QA/QC, the presence of such particles in low permeability native or imported materials cannot be ruled out.
- If a hole forms in the secondary HDPE liner, the GCL will swell with contact of wastewater and fill in the hole in the HDPE liner, to help prevent wastewater from escaping in the containment system. Native or locally imported low permeability materials may have less swell and hole plugging capability than the materials used in GCLs.

As this system has been previously demonstrated at many sites, no pilot studies are proposed for this location if GCL is used. Carrier pipes are located below the base liner which shall be scanned with neutron probes semi-annually to detect moisture (refer to Section 10.5 for further monitoring information). Leak detection monitoring reports that present the results from the neutron probe moisture detection system will be submitted to the CRBRWQCB.

6.3 CONSTRUCTION METHODS AND SEQUENCE [21600(4)(C) & 20310]

6.3.1 OVERVIEW

The containment construction process will follow these general steps:

a) Stripping, grubbing and clearing of organic materials and topsoil from the construction area;

b) Excavation and rough grading of the pond area, construction of berms, stockpiling of excess soil for later reuse;

c) Installation of carrier pipe for the moisture detection (neutron probe) system beneath the base of the ponds;

d) Construction of finish grading to sub grade, as needed, and excavation of the leak collection trench and detection/collection sumps;

e) Scarification, moisture conditioning, compaction, proof rolling and testing of sub grade materials;

f) Supplemental moisture conditioning of subgrade and placement of the GCL or on-site material base layer;

g) Installation of secondary HDPE liner;

h) Installation of leak detection layer, sump, and leak detection monitoring wells/extraction risers;

i) Installation of primary HDPE liner;

j) Installation of hard surface / protective layer ramp; and

k) Installation of protective material on top the berm.

6.3.2 MOISTURE DETECTION SYSTEM

The moisture detection system below the liner system consists of continuous carrier pipes installed at the sides and low point of each pond (one carrier pipe per pond) at a depth of approximately 5 feet below the secondary liner. The carrier pipes will be terminated at the surface on each side of the pond and will be equipped with a pull cable system for conveyance of a neutron probe for moisture detection.

6.3.3 SITE PREPARATION, EXCAVATION AND COMPACTION

The excavation and berm construction will use standard cut and fill techniques. The subgrade is to be scarified and moisture conditioned to 2 percent above the optimum moisture content, compacted to at least 90 percent relative compaction as determined by American Society for Testing and Materials (ASTM) D1557, and proof-rolled using a smooth drum roller prior to placement of the GCL or the 2 feet of low permeable onsite material.

6.3.4 LINER SYSTEM INSTALLATION

6.3.4.1 SUBGRADE

The sub grade under the liner system will be scarified, moisture conditioned, compacted, and proof-rolled with a smooth drum roller to form a competent working surface. The subgrade beneath the GCL needs to have an adequate moisture content to ensure effectiveness of the GCL layer. Therefore, additional moisture conditioning will be specified immediately prior to installation of the GCL layer. The purpose of this is to add additional moisture beneath the GCL to provide moisture for hydration of the GCL material.

6.3.4.2 GCL / ONSITE MATERIAL

The GCL liner or onsite material base will be installed in accordance with current practices and will employ the use of proper installation requirements, following manufacturer requirements for the GCL and proper QA/QC during installation to ensure proper continuity of the base layer.

6.3.4.3 SECONARY LINER

The secondary liner or lower liner will consist of a 40 mil thick HDPE geomembrane liner. This liner will be installed in accordance with current practices and will employ the use of wedge welding and extrusion welding procedures. In addition destructive and non-destructive testing procedures will be used to ensure liner quality and continuity.

6.3.4.4 LEAK DETECTION SYSTEMS

The leak detection system between the upper and lower liners consists of a geonet drainage media and a trench containing piping and sand bedding. The sand bedding in the trench, including the perforated piping system will have to be carefully placed on top of the underlying 40 mil HDPE liner. The geonet shall be placed across the top of the trench to avoid strain on the material. The construction sequence will have to be developed with the emphasis of material placement, spreading, and consolidation techniques that will ensure that damage to the liner does not occur.

6.3.4.5 PRIMARY LINER

The upper or primary liner will consist of a 60 mil thick HDPE geomembrane liner. Consistent with installation of the secondary 40 mil HDPE liner, current installation, quality control monitoring, testing, and quality assurance measures and techniques will be employed to ensure liner quality and continuity.

6.3.5 HARD SURFACE / PROTECTIVE LAYER - RAMP

A ramp consisting of a hard surface / protective layer shall be provided for the length of each pond to allow access by equipment into the evaporation pond for maintenance purposes.

Hard surface types to be considered and assessed include roller compacted concrete, or an approved equivalent (formed concrete, gunite, or other alternates, all of which must be submitted for approval). Prior to the placement of the hard surfacing, a 1 foot thick sub-base layer consisting of granular fill with a maximum particle size of ½" shall be placed and spread over a non-woven geotextile. The sub-based layer will be spread carefully and sequentially to avoid damage to the underlying liner system. After placement, the granular layer will be proof rolled using light compaction equipment.

Roller compacted concrete (RCC) can be transported in dump trucks and can be spread with a dozer or motor grader and compacted with a vibratory roller. Additionally, the RCC can be placed without joints, forms, reinforcing steel, and is not required to be finished. This will make the application of the hard surface/protective layer relatively economical.

63.6 BERM SURFACE

An aggregate road base material will be placed along the top of each berm to provide an all weather access location for maintenance vehicles. The material will conform to the California Department of Transportation Standard Specifications for Class II Aggregate Base, or be of similar gradation and durability to suit the requirements for all weather access. This will be installed to a minimum thickness of 6 inches and will be placed and compacted in accordance with the Department of Transportation Standard Specifications.

6.4 CONSTRUCTION QUALITY ASSURANCE [20323 & 20324]

6.4.1 INTRODUCTION

The quality assurance program is based on the State Water Resources Control Board- Construction Quality Assurance (CQA) Requirements under CCR, Title 27. The requirements themselves will be highlighted and an explanation of how the requirements will be met will follow immediately afterwards.

The evaporation ponds will be constructed as per the construction specifications that will be developed in accordance with the CQA plan provided herein. The CQA program will be implemented to ensure that construction is completed in accordance with design specifications. CQA testing will be performed on the sub-grade, GCL, HDPE liners, granular/free draining native soil, and hard surface materials.

Construction inspection requirements will include approving of each layer to ensure that there are no deficiencies in that layer prior to placement of the next material based on observation and field tests. This will also include review of other CQA results to ensure that they are within the project's specifications.

Change authorization will flow through the on-site construction manager and will ensure that the Engineer of Record, as well as other required personnel have input in the decision of any change. Daily reports will be kept to ensure that activities are documented and personnel involved in the project are updated daily.

6.4.2 PERFORMANCE STANDARD

Quoting from the State Water Resources Control Board CQA requirements section (a):

> *The construction quality assurance (CQA) program, including all relevant aspects of construction quality control (CQC), shall provide evidence that materials and procedures utilized in the placement of the any containment feature at a waste management unit (Unit) will be tested and monitored to assure the structure is constructed in accordance with the design specifications approved by the RWQCB.*

Rice Solar Energy LLC will implement quality control procedures that incorporate inspection and test procedures to make sure that the containment facilities are constructed properly and that they are monitored appropriately throughout the life of the project. These tests and procedures will be documented in detail throughout the project.

6.4.3 PROFESSIONAL QUALIFICATIONS

Quoting from the State Water Resources Control Board CQA requirements section (b):

> *(1) The design professional who prepares the CQA plan shall be a registered civil engineer or certified engineering geologist; and*
>
> *(2) The construction quality assurance program shall be supervised by a registered civil*

engineer or certified engineering geologist who shall be designated the CQA officer.

Rice Solar Energy LLC will ensure that a design professional will prepare the CQA plan and will provide a design professional that will act as a CQA officer whose responsibility is to supervise the CQA program.

Construction activities and operations will be directed and supervised by qualified individuals and the design will be conceived and presented in accordance with recognized civil, mechanical and electrical engineering procedures and practices.

6.4.4 REPORTS

Quoting from the State Water Resources Control Board CQA requirements section (c):

(1) The project's CQA report shall address the construction requirements, including any vegetation procedures, set forth in the design plan for the containment system. For each specified phase of construction, this report shall include, but not be limited to:

(A) a delineation of the CQA management organization, including the chain of command of the CQA inspectors and contractors;

(B) a detailed description of the level of experience and training for the contractor, the work crew, and CQA inspectors for every major phase of construction in order to ensure that the installation methods and procedures required in the containment system design will be properly implemented;

(C) a description of the CQA testing protocols for preconstruction, construction, and postconstruction which shall include at

1. the frequency of inspections by the operator;

2. the sampling and field testing procedures and equipment to be utilized, and the calibration of field testing equipment;

3. the frequency of performance audits determined by the design professional and examined by the CQA officer;

4. the size, method, location and frequency of sampling, sampling procedures for laboratory testing, the soils or geotechnical laboratory to be used, the laboratory procedures to be utilized, the calibration of laboratory equipment and quality assurance and quality control of laboratory procedures;

5. the pass/fail criteria for sampling and testing methods used to achieve containment system design; and

6. a description of the corrective procedures in the event of test failure.

Rice Solar Energy LLC will provide the following:

- An outline of the chain of command of the CQA inspectors and contractors in the CQA

management organization.

- A description of the CQA testing procedures for the preconstruction, construction, and post construction phases of the RSEP.
- A CQA report that includes construction quality control requirements included in the design plan for each specified phase of construction of the RSEP.

6.4.5 DOCUMENTATION

Quoting from the State Water Resources Control Board CQA requirements section (d):

> *Construction quality assurance documentation requirements shall include, at the minimum: reports bearing unique identifying sheet numbers for cross referencing and document control, the date, project name, location, descriptive remarks, the data sheets, inspection activities, and signature of the designated authorities with concurrence of the CQA officer.*
>
> *(1) The documentation shall include:*
>
> > *(A) Daily Summary Reports — daily record keeping, which shall include preparation of a summary report with supporting inspection data sheets, problem identification and corrective measures reports. Daily summary reports shall provide a chronological framework for identifying and recording all other reports. Inspection data sheets shall contain all observations (i.e., notes, charts, sketches, or photographs), and a record of field and/or laboratory tests. Problem identification and corrective measures reports shall include detailed descriptions of materials and/or workmanship that do not meet a specified design and shall be cross referenced to specific inspection data sheets where the problem was identified and corrected;*
> >
> > *(B) Acceptance Reports — all reports shall be assembled and summarized into Acceptance Reports in order to verify that the materials and construction processes comply with the specified design. This report shall include, at a minimum, inspection summary reports, inspection data sheets, problem identification and corrective measures reports;*
> >
> > *(C) Final Documentation — at the completion of the project, the operator shall prepare a Final Documentation which contains all reports submitted concerning the placement of the containment system. This document shall provide evidence that the CQA plan was implemented as proposed and that the construction proceeded in accordance with design criteria, plans, and specifications. The discharger shall submit copies of the Final Documentation report to the RWQCB as prepared by the CQA officer*
>
> *(2) Once construction is complete, the document originals shall be stored by the discharger in a manner that will allow for easy access while still protecting them from any*

damage. All documentation shall be maintained throughout the post closure maintenance period.

These documents will include daily summary reports with supporting inspection data sheets that contain all observations. A record of field and laboratory tests will also be kept. Acceptance reports will be documented to ensure construction and materials comply with the original design and specifications. At the completion of the project, project closure documentation will be submitted to provide evidence that the CQA plan was implemented as proposed and that construction met design criteria, plans and specifications. The evaporation ponds will undergo clean-closure therefore the post-closure maintenance period will not be applicable to the RSEP.

6.4.6 LABORATORY TESTING REQUIREMENTS

Quoting from the State Water Resources Control Board CQA requirements section (e):

(1) Analysis of earthen materials shall be performed prior to their incorporation into any containment system component. Representative samples for each layer within the containment system shall be evaluated. The following minimum laboratory testing procedures shall be performed:

(A) ASTM Designation: D 1557 91 [1/91], "Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m3)" which is incorporated by reference;

(B) ASTM Designation: D 422 63 (Reapproved) [9/90], "Standard Method for
Particle Size Analysis of Soils," which is incorporated by reference; and

(C) ASTM Designation: D 2487 93 [11/93], "Standard Classification of Soils for
Engineering Purposes," which is incorporated by reference.

(2) In addition to the tests listed in (e and f), the following minimum laboratory tests shall be performed on low-hydraulic-conductivity layer components constructed from soil:

(A) ASTM Designation: D 4318 93 [11/93], "Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils," which is incorporated by reference; and

(B) United States Environmental Protection Agency (USEPA) Test Method 9100 [Approved 9-86], "Triaxial-CellMethod with Back Pressure," which is incorporated by reference.

Rice Solar Energy LLC will send materials proposed for construction to an accredited laboratory so that the quality and characteristics can be confirmed and compared to project specifications.

The tests will include the following as per section (e) of the State Water Resources Control Board CQA requirements above:

- ASTM Designation: D 1557 91 [1/91], "Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m3)"
- ASTM Designation: D 422 63 (Reapproved) [9/90], "Standard Method for Particle Size Analysis of Soils,"
- ASTM Designation: D 2487 93 [11/93], "Standard Classification of Soils for Engineering Purposes,"

For permeability (hydraulic conductivity) layers the following tests will be taken at a minimum:

- ASTM Designation: D 4318 93 [11/93], "Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils,"
- United States Environmental Protection Agency (USEPA) Test Method 9100 [Approved 9-86], "Triaxial-Cell Method with Back Pressure,"

Periodic laboratory and In-situ analysis may be completed to supplement the CQA.

6.4.7 FIELD TESTING REQUIREMENTS

Quoting from the State Water Resources Control Board CQA requirements section (f):

> *The following minimum field test procedure shall be performed for each layer in the containment system: ASTM Designation: D 2488 93 [9/93], Standard Practice for Description and Identification of Soils (Visual Manual Procedure), which is incorporated by reference.*

Rice Solar Energy LLC will use the following test on each layer in the containment systems associated with the evaporation ponds:

- ASTM Designation: D 2488 93 [9/93], Standard Practice for Description and Identification of Soils (Visual Manual Procedure)

In addition, in place nuclear densiometer testing ASTM D2922 will be performed paired with maximum density and optimum moisture content test, ASTM D 698.

6.4.8 TEST FILL PAD REQUIREMENTS

Quoting from the State Water Resources Control Board CQA requirements section (g):

Before installing the compacted soil barrier layer component of a final cover system, or the compacted soil component of a liner system, the operator shall accurately establish the correlation between the design hydraulic conductivity and the density at which that conductivity is achieved.

To accomplish this, the operator shall:

(1) Provide a representative area for a test on any compacted foundation and low-hydraulic conductivity layers. The following minimum testing procedures shall be performed:

> *(A) the test pad foundation and, for final covers, the barrier layers shall be compacted with the designated equipment to determine if the specified density/moisture-content/ hydraulic conductivity relationships determined in the laboratory can be achieved in the field with the compaction equipment to be used and at the specified lift thickness;*

(2) perform laboratory tests as specified in State Water Resources Control Board CQA requirements subsection (e); and

(3) perform field tests as specified in State Water Resources Control Board CQA requirements subsection (f). The discharger shall perform hydraulic conductivity tests in the test area under saturated conditions by using the standard test method ASTM Designation: D 3385 94 [9/94], "Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer," which is incorporated by reference, for vertical hydraulic conductivity measurements. A sufficient number of tests shall be run to verify the results. Other methods that provide an accurate and precise method of measuring field hydraulic conductivity may be utilized as approved by the RWQCB.

(4) Correlations between laboratory tests and test pad results shall be established for each of the various types of fill materials and blends to be used in construction of the actual cover.

When constructing compacted soil barrier layers, or a compacted soil component of a liner system, Rice Solar Energy LLC will provide a representative area for a test. The soil layers will be compacted with equipment that can achieve density, moisture content, and hydraulic-conductivities, where applicable at specified lift thicknesses. The laboratory tests mentioned in State Water Resources Control Board CQA requirements section (e) will all be performed.

Results from lab tests and field tests will be compared to ensure that the specified requirements can be met and that the methods and procedures selected and used achieve the required construction quality standard.

6.4.9 EARTHERN MATERIAL REQUIREMENTS

Quoting from the State Water Resources Control Board CQA requirements section (h):

(1) The following minimum tests shall include, but not be limited to:

(A) Laboratory tests as specified in State Water Resources Control Board CQA requirements subsection (e); and

(B) Field tests as specified in State Water Resources Control Board CQA requirements subsections (f and g).

(2) The following minimum testing frequencies shall be performed:

(A) Four (4) field density tests shall be performed for each 1,000 cubic yards of material placed, or at a minimum of four (4) tests per day;

(B) Compaction curve data (ASTM Designation: D 1557 91) graphically represented, and Atterberg limits (ASTM Designation: D 4318 93) shall be performed on the barrier layer material once a week and/or every 5,000 cubic yards of material placed;

(C) For field hydraulic conductivity tests, representative samples shall be performed on barrier layer material;

1. The frequency of testing may be increased or decreased, based on the pass/failure status of previous tests, as approved by the RWQCB.

2. Field infiltration tests shall be performed for the duration necessary to achieve steady conditions for the design hydraulic conductivity.

3. The following interpretive equation shall be used to determine the design hydraulic conductivity:

The infiltration rate (I) is defined as:

where:

Q = volume of flow;
I = Q/(tA)
t = interval of time corresponding to flow Q; and

A = area of the ring;

then the hydraulic conductivity (k) can be calculated from Darcy's law as follows:

where:k = I/i
I = infiltration rate; and

i = hydraulic gradient.

When testing any soils used for construction, the tests mentioned in State Water Resources Control Board CQA requirements section e) above, will be performed as a minimum. There will be four field density tests performed per 1000 cubic yards of material placed or at least four tests per day.

Compaction curve data including Atterberg Limits, will be performed at least once per week or every 5000 cubic yards of material placed. For field hydraulic conductivity tests (critical for the onsite material used in the base layer), the frequency of testing will be based on the pass/failure status of previous tests. They will be performed for the amount of time necessary to make sure steady conditions for the design hydraulic conductivity are met. The above equation I = Q /(tA) will be used to determine design hydraulic conductivity.

During construction, all compacted soils and granular material will be tested using a nuclear density / moisture gauge (densiometer) (ASTM D2922 and D3017) to determine compaction percentage and moisture content. Nuclear densiometer testing will be performed to ensure compaction and moisture condition requirements as outlined in the project specifications are being achieved. Each material will be tested following compaction in multiple locations to ensure compliance to projects specifications prior to proceeding with placement of the next material.

6.4.10 GEOSYNTHETIC MEMBRANE REQUIREMENTS

Quoting from the State Water Resources Control Board CQA requirements section (i):

> *(1) Performance requirements for the geosynthetic membrane include, but are not limited to, the following:*
>
> > *(A) a need to limit infiltration of water, to the greatest extent possible;*
> >
> > *(B) a need to control landfill gas emissions;*
> >
> > *(C) for final covers, mechanical compatibility with stresses caused by equipment traffic, and the result of differential settlement of the waste over time; and*
> >
> > *(D) for final covers, durability throughout the post closure maintenance period.*
>
> *(2) Minimum Criteria — The minimum construction quality assurance criteria to ensure that geosynthetic membranes will meet or exceed all design specifications shall include, but not be limited to:*
>
> > *(A) Preconstruction quality control program:*
> >
> > > *1. inspection of the raw materials (e.g., density, melt flow index, percent carbon Black);*
> > >
> > > *2. manufacturing operations and finished product specifications (e.g., thickness, puncture resistance, multi axial stress/strain tests),*
> > >
> > > *3. fabrication operations (e.g., factory seaming);*
> > >
> > > *4. observations related to transportation, handling, and storage of the geosynthetic membrane; and*
> > >
> > > *5. inspection of foundation preparation;*

(B) Construction activities:

1. the geosynthetic membrane shall have thickness strength sufficient to withstand the stresses to which it shall be subjected, including shear forces, puncture from rocks or, for final covers, penetration from roots.

2. inspection of geosynthetic membrane placement (e.g., trench corners, monitoring systems).

3. seaming of the material; and

4. installation of anchors and seals;

(C) Post construction Activity — post construction activity includes checking for material and placement imperfections in the installed geosynthetic membrane. Imperfections that jeopardize the integrity of the membrane's function as an impermeable barrier (i.e., pin holes, rips, creases created during placement) shall be repaired to the original manufacturer's specifications and reinspected by the CQA officer; and

(D) Evaluation — evaluation of the personnel and equipment to be used to install and inspect the geosynthetic membrane, and pass/fail criteria and corrective procedures for material and installation procedures shall be specified as required in State Water Resources Control Board CQA requirements subsection (c).

Rice Solar Energy LLC will make sure that the geosynthetic membrane (geomembrane) used for containment will limit the infiltration of water to the greatest extent possible and be designed to maintain durability throughout the life of the project. Rice Solar Energy LLC will ensure that a preconstruction quality control program is in place to ensure that manufactured geomembrane products conform to the project specifications.

Once construction activities begin, Rice Solar Energy LLC will make sure that the proper material is used and supervise and inspect the placement of the geomembrane and the seaming of the material in the evaporation ponds. After construction, Rice Solar Energy LLC will check for imperfections in the installed geomembrane and ensure that repairs are completed in accordance with project specifications. The HDPE liners will be manufactured and installed according to industry standards and test procedures and the installer's CQA methods and procedures. Typical quality assurance methodologies include the review and inspection of the following:

- Copy of the mill certificates;
- Coupons from every seam;
- Perform air pressure tests;
- Inspections to ensure the absence of tears, punctures, and blisters;
- Liner production tests, thickness, dimensions, visual inspection;
- Product testing, tensile properties, tear resistance, etc;

- Sub-grade preparation sign-off; and
- Wedge welding and extrusion welding seam logs and weld tests;

6.4.11 RELEVANT SPECIFICATIONS

The following specifications from the Construction Specification Institute will be developed, as a minimum:

- 31 14 13 Soil Stripping and Stockpiling;
- 31 14 11 Earthwork and Related Work;
- 31 23 10 Excavating, Trenching and Backfilling;
- 32 11 23 Aggregate Base Courses;
- 31 32 21 Geotextiles;
- 31 32 22 Geomembranes;
- 32 12 16 Asphalt Paving (If applicable);
- 32 13 23 Roller Compacted Concrete Paving (If applicable); and
- 32 21 13 or 32 31 25 Fencing.

Grading and Drainage

See site grading and drainage plans included in the AFC and supplements.

Operating Criteria

Site Records [21600(B)(5)(A), 20375 & 21720]

In accordance with Title 27 CCR 20510, key site records will be kept in the office at the Rio Mesa SEGF site. Records will be available for inspection by authorized representatives of the LEA (Local Enforcement Agency) and CRBRWQCB during the Rio Mesa SEGF regular working hours. Alternatively, an inspection can be arranged by notifying the Rio Mesa SEGF site manager. All required records will be properly completed, filed for retention and maintained throughout the operating life of the evaporation ponds.

Operating Record

The operating record maintained at the project site will include the following information:

- Discharge Volumes - Date and volume of discharges into each evaporation pond.
- Monitoring Results - Results of sampling, monitoring, analyses, and testing required by permit or regulatory requirement (including the daily water level measurements, a hydrometer for daily salinity measurements, and a direct reading thermometer with the temperature data recorded at least diurnally required for avian management).
- Waste Manifests – Volume of precipitated solids removed from the evaporation pond if cleanout is required, sampling results and completed non-hazardous or hazardous waste manifests for all precipitated solids which were removed from the facility for off-site disposal.
- Inspection Forms - Inspection results that include a description of any required maintenance or remedial action and the date of implementation.
- Contingency Implementation - Written reports prepared in response to any incident requiring implementation of the Contingency Plan.
- Correspondence with Local Agencies - Correspondence associated with emergency arrangements agreed to or refused by local authorities.
- Employee Information Records - Records documenting employee information such as job title for each position, job description, names of employees in each job, and introductory and continuing training received.
- Notifications of Violations - Notices of deficiency, abatement orders or any other notification of violation by any regulatory agency.
- Complaints – The Facility manager will record public complaints received regarding operation of the evaporation ponds, including:
    - the nature of the complaint;
    - the date the complaint was received;

- if available, the name, address, and telephone number of the person or persons making the complaint; and
- actions taken to respond to the complaint.

Wastewater Discharge volumes

In accordance with Title 27 CCR 21720(f), all discharges into the evaporation ponds will be recorded in the Operating Record. The following items will be recorded include:

- Volume in million gallons per day (mgd)
- Cumulative total of wastewater flow, in million gallons, per month
- The maximum daily flow rate, in mgd, each month

Wastewater Levels

The water level in the pond will be dependent on the quantity of wastewater discharged in to the pond, evaporation rate and sludge accumulation. The evaporation ponds will be outfitted with a level gauge for daily water level information. Discharge to the evaporation ponds will be managed as needed to discourage wading birds from using the evaporation ponds.

Monitoring Results

Monitoring Plan results will be retained at the Facility as part of the Operating Record.

Inspection and Operations Record

Site personnel will complete the inspection logs and other required operation documentation and the facility management will review the applicable documents for completeness and accuracy. Completed inspection logs and notations of needed repairs will be maintained for a minimum of three years.

Further information regarding Inspection and Maintenance requirements are outlined in Section 10.

Record of Contingency Plan Implementation

Following any incident which requires implementation of the Rio Mesa SEGF Site Contingency Plan, a report will be prepared containing the information described in Title 27 CCR Section 21760(b)(2). As a minimum, the report will be submitted to the LEA and the CRBRWQCB. In addition, a copy will be retained on filed at the Facility as part of the Operating Record.

Further information regarding the Contingency Plan requirements is outlined in Section 11 .

Correspondence Redgardomg Arrangements with Local Authorities

Copies of all correspondence with local authorities regarding emergency response arrangements and revisions of the Contingency Plan will be maintained at the Facility.

Training Records

In accordance with Title 27 CCR Section 20610, the following records will be retained for each position related to waste management as part of the Operating Record:

- A job title and written job description including assigned duties and required qualifications;
- Name of the employee filling each job;
- Description of initial and continuing training; and
- Documentation of initial and continuing training received.

Whenever a training course is conducted, the records for each employee who completed the course will be updated. When a new employee is hired, a training record file will be initiated for the new employee. Personnel training records on current employees are retained until final closure of the Facility. Records on former employees are retained for three years after the employees' leave date.

Design Documents

In accordance with the requirements of Title 27 CCR Section 21760, design, as-built, and operating documentation related to the evaporation ponds will be retained at the project site as part of the Operating Records.

Other Required Technical Documents

In accordance with Title 27 CCR Section 20510 and 20517, all other technical records associated with the evaporation ponds will be retained at the project site as part of the Operating Record.

Operator / Responsible Party Records

Records of written notification to the LEA, local health agency, and fire authority of names, addresses and telephone number of the operator or responsible party of the Rio Mesa SEGF, as required by 27 CCR, Section 20510(e), will be kept in the operating record.

Security [21600(B)(5)(B)]

In accordance with Title 27 CCR Section 21600(b)(5)(B) and 20530, security measures will be provided to ensure the safest environment for employees working at the Rio Mesa SEGF. Security measures include barriers and warning signs. In the unlikely event of an unplanned (forced) outage situation that causes a long-term cessation of facility operations, security of the facilities will be maintained on a 24-hour basis, and the CEC will be notified.

Barriers

The entire site will be fenced appropriately to restrict public access during construction and operations. Chain-link security fencing will be installed around the site perimeter, switchyard and other areas requiring controlled access. The security fence will be 8 feet tall, topped with 1 foot of barbed wire (three strands) mounted on 45-degree extension arms and posts set in concrete.

Controlled access gates will be located at the entrances to the facility. Site gates will be swing or rolling type access gates. Access through the main gate will require an electronic swipe card, preventing unaccompanied visitors from accessing the project site. All Rio Mesa SEGF personnel, contractors and visitors will be logged in and out of the Rio Mesa SEGF site at the main office during normal business hours. Visitors and non-Rio Mesa SEGF employees will be allowed entry only with approval from a staff member at the Facility.

Warning Signs

Each point of access from a public road shall be posted with sign indicating the facility name, and other pertinent information as required by the WDR.

Sanitary Facilities [21600(B)(5)(C)]

In accordance with Title 27 CCR Section 21600(b)(5)(C), sanitary facilities will be provided at the project site for Rio Mesa SEGF employees in the office. The project site will maintain all sanitary and hand-washing facilities which may be required, by applicable state or local requirements, in a reasonably clean and adequately supplied condition.

Communication Systems [21600(B)(5)(D)]

Communication facilities will be provided at the site for facility employees that meet the requirements specified in the AFC and Title 27 CCR Section 21600(b)(5)(D).

Internal Communication

The internal communication system for the project site will include the following devices:

- Alarm system
- Two-way radios
- Telephones
- Intercoms

Each Rio Mesa SEGF building will also be equipped with telephones. Operations supervisors and other key personnel may carry hand-held two-way radios that can be used to contact the Rio Mesa SEGF site office or other site personnel in an emergency. The selected frequency of the radios will be chosen as not to interfere with frequencies used by the military.

External Communication

Twenty-four hour access to outside emergency services, including police and fire departments and emergency response teams, is available through the commercial telephone system at the project site.

Lighting [21600(B)(5)(E)]

Plant lighting will be provided throughout the facility at the minimum luminescence in any given area as required for personnel and plant safety and will meet the requirements of Title 27 CCR Section 21600(b)(5)(E) and other relevant codes and standards that dictate design with due regard to minimize spillage and lighting efficiency. Lighting will generally be applied in the following areas:

- Building interior equipment, office, control, shop maintenance, water treatment, and steam generation buildings.
- Building exterior entrances and driveways.
- Outdoor equipment within the power block and switchyard areas including the steam turbine, pipe rack and air cooled condenser.
- Power block area, including around the thermal storage tank containment areas to observe for leakage, power transformers, outdoor power and control panels, and the roadway and internal driveways.
- Administration building parking, parking areas within the power block.
- Plant entrance road, signage, and main gate.
- Water treatment building exterior where any cycle treatment chemical tanks are located. Emergency lighting shall be provided for safe egress from all plant areas.

Outdoor lighting shall be photocell controlled through contactors that feed or control the outdoor lighting. To reduce the visual impact created by outdoor lighting, the following mitigation measures shall be adopted:

- Even though the project is in the remote area, according to CEC requirements, lighting on the project site shall be limited to areas required for safety and shall be shielded from public view to the extent possible.
- Lights shall be directed on site so that significant light or glare shall not be created.
- Nighttime backscatter illumination shall be avoided by directional shielding of lights.
- Lighting in the evaporation pond area will be provided when needed using portable light stands.

Safety Equipment [21600(B)(5)(F)]

In accordance with 27 CCR Section 21600(b)(5)(F), safety equipment will be provided for the health and safety of employees at the Facility. As specified in the AFC (Section 5.16, Worker Safety), a Personnel Protective Equipment (PPE) Program will be developed for the facility, which will apply to all contractor and subcontractor employees, as well as direct Rio Mesa SEGFemployees during operation.

Specific requirements of the PPE Program include:

- Hazard analysis and prescription of PPE
- Personal protective devices
- Head protection
- Eye and face protection
- Body protection
- Hand protection
- Foot protection
- Skin protection
- Sanitation
- Safety belts and life lines for fall protection
- Protection for electric shock
- Medical services and first aid/bloodborne pathogens
- Respiratory protective equipment
- Hearing protection
- Employee ocular exposure to glint/glare hazards
- Hazards associated with hot salt Training

Required PPE will be approved for use and distinctly marked to facilitate identification. The type of PPE required to operate, maintain and monitor the evaporation ponds will be described in the job safety analysis undertaken prior to the commencement of operations.

Required Equipment

The following equipment shall be available at the Rio Mesa SEGF to minimize hazards associated with Project operations:

- Alarm systems and internal communications;
- Radio and telephone systems;
- Emergency equipment for fires and spills; and
- Water supplies for firefighting

Emergency Equipment

In accordance with the Emergency Action Plan as specified in the AFC, the Facility will include obtaining emergency response equipment. This equipment will be strategically located throughout the project site in order to respond to emergencies in a timely fashion.

Water Supplies for Equipment

In accordance with the Fire Protection and Prevention Plan as specified in the AFC, the project site will be equipped with water at adequate volume and pressure to supply water hose streams. The fire projection water system will be supplied from a dedicated 360,000-gallon portion of the raw water storage tank located on the plant site.

Equipment Testing and Maintenance

In accordance with the Emergency Action Plan as specified in the AFC, all emergency equipment at the project site, including communications and alarm systems and fire and spill prevention equipment, will be tested and maintained.

Personnel Requirements [21600(B)(5)(G)]

In accordance with Title 27 CCR Section 21600(b)(5)(G), written job descriptions will be maintained for each position at the Rio Mesa SEGF related to management of waste in the permitted evaporation ponds. These descriptions will be updated periodically by facility managers and supervisors to reflect the changing needs of the Rio Mesa SEGF. Job descriptions will be kept on file at the facility and include the following information:

- Job title/position
- Duties/responsibilities
- Job prerequisites and qualifications

All Rio Mesa SEGF employees will receive training in general project site procedures and operations and emergency response procedures. Personnel receive job-specific training during on-the-job training as required. This training ensures that personnel are sufficiently proficient in the particular skills required to perform their assigned duties and that they are aware of the inherent hazards. The management, planning, and operations personnel will have varying backgrounds with respect to the management and operation of the evaporation ponds at the project site. Technical staff will gain experience with these systems mainly through on-the-job training. A record of training and experience of each employee will be maintained at the Rio Mesa SEGF office.

Personnel Training [21600(B)(5)(H)]

An Operations & Maintenance Health and Safety Health Program (Operations Safety Program)for employees and contractors will be developed for Rio Mesa SEGF as specified in the AFC (Section 5.16, Worker Safety) that will meet the requirements of Title 27

CCR Section 21600(b)(5)(H). The Operations Safety Program will be revised as required to include any additional training necessary as Rio Mesa SEGF equipment or operations change. Additional job-specific training may be completed by Project personnel as needed.

The staff person overseeing the portion of the training program pertinent to the evaporation ponds will be experienced in the operation of such units, waste management procedures and applicable regulations, emergency response and contingency plan implementation.

All Rio Mesa SEGF employees will be required to receive training in the following areas:

- Injury and Illness Prevention
- Emergency Action Plan
- PPE
- Hearing Conservation Training
- Back Injury Prevention Training
- Fire Protection and Prevention Training
- First Aid, Cardiopulmonary Resuscitation (CPR), and Automated External Defibrillator (AED) Training.

In addition, employees who work in the relevant work fields will receive training in the following areas:

- Excavation/Trenching Safety Training for employees involved with trenching or excavation.
- Scaffolding/Ladder Safety Training for employees required to erect or use scaffolding.
- Fall Protection Training for employees required to use fall protection.
- Forklift Operation Training for employees operating forklifts.
- Crane Safety Training for employees supervising or performing crane operations.
- Workplace Ergonomics for employees performing repetitive activities.
- Fire Protection and Prevention Training for employees responsible for the handling and storage of flammable or combustible liquids or gasses.
- Hot Work Safety Training for employees performing hot work.
- Electrical Safety Training for employees performing "lock out / tag out" and employees required to work on electrical systems and equipment.
- Permit-required Confined-space Entry for employees required to supervise or perform confined-space entry.

- Hand and Portable Power Tool Safety Training for employees that will be operating hand and portable power tools.
- Heat Stress and Cold Stress Safety Training for employees exposed to temperature extremes.
- Safe Driving Training for employees supervising or driving motor vehicles.
- Hazard Communication Training for employees handling or working around hazardous materials.
- Pressure Vessel and Pipeline Safety Training for employees supervising or working on pressurized systems or equipment.
- Respiratory Protection Program for employees required to wear respiratory protection.

Additional training will be required for specific tasks related to evaporation ponds which may include:

- Evaporation Pond Operation
- Mobile Equipment Safety
- Inspection and Monitoring Program
- Sludge and Water Sampling
- Equipment Inspections
- Employee Exposure Monitoring Program
- Housekeeping and Material Handling

Supervisory Structure [21600(B)(5)(I)]

In accordance with 27 CCR Section 21600(b)(5)(I), the Rio Mesa SEGF Site Supervisor will be experienced in solar facilities operations and maintenance to ensure that the facility is properly operated in accordance with all applicable laws, regulations, permit conditions and other requirements. All shift managers and equipment operators will report to the Rio Mesa SEGF Site Supervisor.

Environmental Controls – To be determined.

Inspection, Sampling and Maintenance Programs [21760(B)] – To be determined.

Contingency Plan - To be determined.

Record Keeping and Reporting Program

General Reporting

A semi-annual and annual report will be submitted to the CRBRWQCB. Each report will contain the following statement:

> *"I declare under the penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment for knowing violations."*

Further information regarding requirements for the semi-annual and annual reports are provided in the following section.

Semi-Annual Report

A semi-annual monitoring report will be submitted to the CRBRWQCB containing the results from the sampling of the evaporation ponds and groundwater detection monitoring program.

The semi-annual periods and report submittal dates are:

January 1 to June 30 ~ report due by August 1; and

July 1 to December 31 ~ report due March 1.

The detection monitoring report (refer Appendix B) will include the following:

- A letter transmitting the essential points in each report, signed by a principle executive officer at a level of vice-president or above, or by his/her authorized representative and will include:
    - A discussion of any violations noted since the previous report submittal and a description of the actions taken or planned for correcting those violations. If no violations have occurred since the last submittal, that should be so stated;
    - If a detailed time schedule or plan for correcting any violations has been previously submitted, a progress report on the time schedule and status of the corrective actions being taken; and
    - A statement by the official, under penalty of perjury, that to the best of the signer's knowledge the report is true, complete, and correct.
- A Compliance Evaluation Summary which will include:

- A description and graphical presentation of the velocity and direction of groundwater flow under/around the Rio Mesa SEGF, based upon water level elevations taken during the collection of the water quality data submitted in the report;
- Methods used for water level measurement and pre-sampling purging for each monitoring well; and
- Methods used for sampling each monitoring point.

- A map or aerial photograph showing the locations of observation stations, monitoring points, and background monitoring points;
- Results of sampling analysis, including statistical limits for each monitoring point;
- An evaluation of the effectiveness of the leakage monitoring and control facilities, and of the runoff/run-on control facilities; and
- A summary of reportable spills/leaks occurring during the reporting period; including estimated volume of liquids/solids discharged outside designated containment area, a description of management practices to address spills/leaks, and actions taken to prevent reoccurrence.

Annual Report

The annual reporting period is from January 1 to December 31. By March 15th of each year, BrightSourcewill submit an Annual Report to the CRBRWQCB including:

- Detection Monitoring Report:
  - A graphical presentation of analytical data for each monitoring point for all samples taken within at least the previous five calendar years. Each such graph shall plot the concentration of one or more constituents over time for a given monitoring point, at a scale appropriate to show trends or variations in water quality.
  - A tabular presentation of all monitoring analytical data obtained during the previous two monitoring and reporting periods, submitted on hard copy within the annual report as well as digitally on electronic media in a file format acceptable to the Regional Water Board Executive Officer.
  - A comprehensive discussion of the compliance record and any corrective actions taken or planned, which may be needed to bring the Rio Mesa SEGF into full compliance with WDRs.
  - A written summary of the groundwater analyses, indicating changes made since the previous annual report.
  - An evaluation of the effectiveness of the run on/run-off control facilities.
- Records of the evaporation pond wastewater and precipitated sludge residue including:

- The date, exact place and time of sampling or measurement
- The individual performing the sampling or measurement
- The date the analysis was performed
- The initials of the individual performing the analysis
- The analytical technique or method uses
- Results of the analysis

- Financial Assurance:
  - Evidence that adequate financial assurance for closure, post-closure, and reasonably foreseeable releases is still in effect and may be verified by including a copy of the renewed financial instrument or a copy of the receipt for payment of the financial instrument.
  - Evidence that the amount is still adequate or if not, that the amount of financial assurance has been increased by the appropriate amount, due to inflation, a change in the approved closure plan, or other unforeseen events.
- A review of the closure plan and a statement that the closure activities described are still accurate or an updated closure plan.

Vector Control Reporting Requirements

At the conclusion of every operational year, the ECM will prepare a report for submittal to the CEC Compliance Project Manager (CPM), summarizing the results of the various tests and monitoring efforts, described as a part of the evaporation pond monitoring plan. The summary report will include copies of the water quality tests, a chronological listing of the overnight water temperatures, water levels and salinity measurements for the active evaporation ponds, and any results of necropsies performed on birds salvaged from in or around the ponds.

Recommendations for changes to the monitoring program or pond management approach will be made, as warranted.

Unscheduled Reports to be Filed with the Regional Board

Incidents that result in implementation of the Contingency Plan will be reported to the appropriate agencies. If such incidents threaten to result in an off-site discharge or may present a potential threat to human health or the environment, immediate verbal notification shall be made as specified in the Contingency Plan. A record of such verbal communications will be maintained in the operating record.

Any spill shall be reported to the CRBRWQCB within 48 hours of discovery, regardless of the type or size. After reporting the spill, written notification will be provided to the CRBRWQCB by certified mail within seven days of such determination which contains the following information:

- A map showing the location(s) of the discharge/spill
- A description of the nature of the discharge (all pertinent observations and analyses including quantity, duration, etc.)
- Corrective measures underway or proposed

Additional reporting may be required under the Waste Discharge Requirements and Monitoring and Reporting Program established by the CRBRWQCB. Further discharge situations are outlined in the following sections.

Release from the Evaporation Ponds

The CRBRWQCB will be immediately notified (verbally) whenever a determination is made that there is a physical or statistically significant evidence of a release from the evaporation ponds. The verbal notification will be followed by a written notification, via certified mail, within seven days of such determination. The notification shall include the following information:

- Evaporation pond that may have released or be releasing;
- General information including the date, time, location and cause of the release;
- An estimate of the flow rate and volume of the waste involved;
- A procedure for collecting samples and description of laboratory tests to be conducted;
- Identification of any water bearing media affected or threatened;
- A summary of proposed corrective actions; and
- For statistically significant evidence of a release - monitoring parameters and/or constituents of concern that have indicated statistically significant evidence of a release from the evaporation pond; or
- For physical evidence of a release - physical factors that indicate physical evidence of a release.

Upon notification, BrightSource may initiate verification procedures, or demonstrate that a source other than the evaporation ponds, caused the evidence of a release. A supporting technical report must be provided to the CRBRWQCB within 90 days demonstrating the different source of the discharge.

Exceeding the Action Leakage Rate

If the Action Leakage Rate (ALR) is exceeded, the CRBRWQCB will be notified within 24 hours of the determination. The verbal notification shall be followed by a written notification via certified mail, within seven days of such determination. This written notification shall be followed by a technical report via certified mail within thirty days of such determination. The technical report shall describe the actions taken to address the adverse condition, and shall describe any proposed future actions to abate the adverse condition.

Material Change

Pursuant to California Water Code Section 13260 (c), any proposed material change in the character of the waste, manner or method of treatment or disposal, increase of discharge, or location of discharge, shall be reported to the Regional Board at least 120 days in advance of implementation of any such proposal. This shall include, but not be limited to, all significant soil disturbances.

Standalone Documents

Under Title 27 Environmental Protection, Division 2 Solid Waste, several documents supporting the RoWD/JTD are to be submitted as standalone documents. These documents have been provided in the Appendix to the RoWD/JTD in the following sections:

- Appendix A – Action Leakage Rates
- Appendix B – Detection Monitoring Program
- Appendix C – Corrective Action Plan
- Appendix D – Preliminary Closure Maintenance Plan
- Appendix E – Financial Assurance

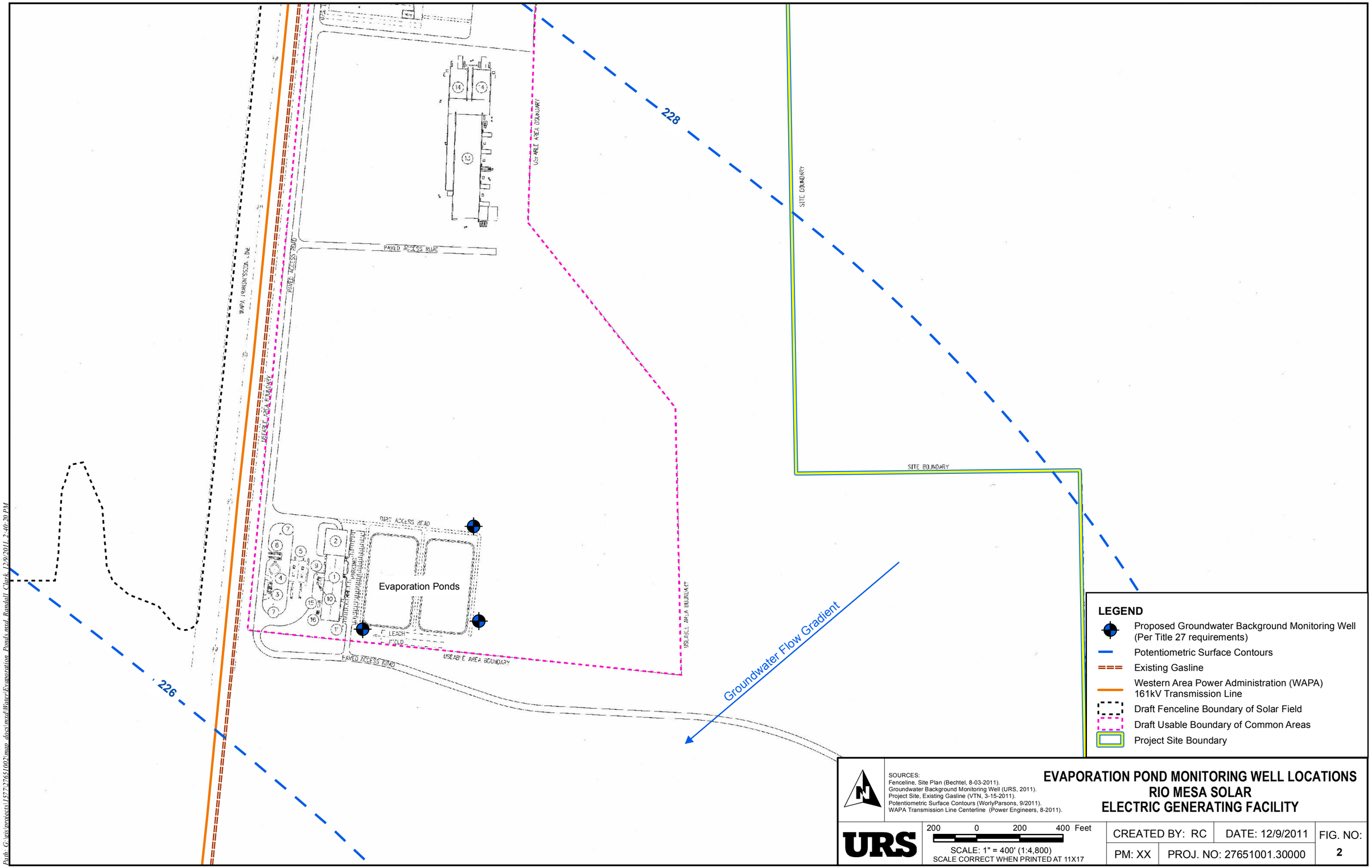
A Post-Closure Maintenance Plan for the evaporation ponds is not required as the evaporation ponds will have a clean-closure.

CEC Requirement (3): Evaporation Pond Residual Handling Statement.

- BSE's previous submittal on 11/18/11 is sufficient for Data Adequacy.

CEC Requirement (4): Basis of design for the monitoring wells and general location depicted on a drawing.

Monitoring wells will be installed per Riverside County requirements and will be installed within the first encountered groundwater and be screened within approximately 5 feet above the water surface elevation and extend 25 feet below the water surface elevation. See Figure 2 for the proposed well locations.



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