5.4 Water Resources

This section describes the water resources in the Genesis Solar Energy Project (the Project) vicinity and discusses the Project's potential affects on water resources. It discusses applicable Laws, Ordinances, Regulations, and Standards (LORS), required permits, existing water resources, potential Project environmental impacts, and proposed mitigation measures.

Appendix D contains data from water resources investigations performed at the Site. Publically available information was also gathered from the United States Geological Survey (USGS), California Department of Water Resources (DWR), California State Water Resources Control Board (SWRCB), California Department of Prisons, Metropolitan Water District of Southern California, Palo Verde Irrigation District, local water districts, local wastewater treatment facilities, and published articles and professional society publications. Inquiries were made of all agencies managing groundwater in the vicinity of the Project, and of local property owners. The data from these sources are summarized herein.

5.4.1 Affected Environment

The Project is located between the communities of Blythe, California (approximately 25 miles east) and Desert Center, California (approximately 27 miles west). The Site is situated within the northeastern portion of Chuckwalla Valley, an east-southeast trending valley in California's Mojave Desert Geomorphic Province, and is bounded by the Chuckwalla, Little Chuckwalla, and Mule Mountains on the south, the Eagle Mountains on the west, the Mule and McCoy mountains on the east, and the Coxcomb, Granite, Palen, and Little Maria mountains on the north. The elevation of Chuckwalla Valley ranges from under 400 feet at Ford Dry Lake to approximately 1,800 feet above mean sea level (amsl) west of Desert Center and along the upper portions of the alluvial fans that ring the valley flanks. The surrounding mountains rise to approximately 3,000 and 5,000 feet amsl.

Physiographically the Site lies near the toe of alluvial fans emanating from the Palen Mountains to the north and the McCoy Mountains to the east, and is bisected by a broad valley-axial drainage that extends southward between these mountains and drains to the Ford Dry Lake playa located a short distance south of the site. The site is relatively flat and generally slopes from north to south with elevations of approximately 400 to 370 feet above mean sea level. It is occupied by a community of low creosote and bursage scrub vegetation.

The site is located within the Colorado River Basin, within the Chuckwalla Valley Drainage Basin. There are no perennial streams in Chuckwalla Valley. Chuckwalla Valley is an internally drained basin, and all surface water flows to Palen Dry Lake in the western portion of the valley and Ford Dry Lake in the eastern portion of the valley. Palen Dry Lake is a "wet playa" with significant shallow groundwater discharge at the ground surface by evaporation; whereas, Ford Dry Lake is a "dry playa," with groundwater occurring well below the ground surface. Palen Dry Lake is located in the central portion of Chuckwalla Valley about 11 miles west of the proposed plant location at the site. The only perennial surface water resources in the eastern portion of Chuckwalla Valley are McCoy Spring, at the foot of the McCoy Mountains approximately 6.5 miles northeast of the site and 7.5 miles northeast of the proposed well field, and Chuckwalla Spring, approximately 15 miles south of the site at the foot of the Chuckwalla Mountains.

The site is located within the Chuckwalla Valley Groundwater Basin (DWR Basin No. 7-5), which has a surface area of 940 mi^2 (2,435 km^2) underlying Chuckwalla Valley (DWR, 2004). The site location in the basin is shown on Figure 5.4-1. The basin is bounded by consolidated rocks of the surrounding

mountains. Three water-bearing Quaternary- and Tertiary-age sedimentary units overly non-water bearing bedrock in the Chuckwalla Valley Groundwater Basin (DWR, 2004; DWR, 1963). DWR reports the maximum thickness of these deposits as about 1,200 feet in the Chuckwalla Valley Basin (DWR 1979); however, modeling of Bouger gravity data obtained from USGS suggest greater depths to bedrock exist in some parts of the basin (Appendix D). The hydrostratigraphy and bedrock topography are discussed in more detail in Section 5.4.1.3.

Groundwater provides the only available water resource in Chuckwalla Valley. Designated and potential beneficial uses of groundwater in the basin include domestic, municipal, agricultural and industrial use (Colorado River RWQCB, 2006).

Because the linear facilities (transmission line and gas pipeline) associated with the Project will not require water as part of their operations and only minimal amounts during construction, the following discussion focuses on the plant site.

5.4.1.1 Climate and Precipitation

The Project is located in an arid desert climate, therefore has extreme daily temperature changes, low annual precipitation, strong seasonal winds and mostly clear skies. Evaporation rates are higher than precipitation rates. In this region of California, temperatures are extreme with cool winters accompanied by sporadic rainfall from Pacific frontal storms and hot, dry summers with infrequent, but occasionally intense monsoonal thunderstorms.

Based on 60 years of data from Blythe Airport, the mean maximum temperatures in June to September exceed 100°F. Winter months are more moderate with mean maximum temperatures of high 60's to low 70's °F and minimum temperatures in the low to mid 40's °F. Although there are no average minimal temperatures below freezing point (32°F) the temperature has historically dropped below freezing point between November and March. Table 5.4-1 presents a Climate and Precipitation Summary, based on information from meteorological stations at Blythe Airport and Indio Fire Station.

Table 5.4-1. Climate and Precipitation Summary

Parameter	Jan	Feb	Mar	Apr	Mar	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temp. (^{o}F)	66.7	72	78.5	86.4	95.2	104.6	108.4	106.6	101.3	89.8	75.9	66.6	87.7
Average Min. Temp. (^{o}F)	41.5	45.4	50.2	56.5	64.4	72.7	81	80.2	73	60.9	48.6	41.2	59.7
Average Temperature (^{o}F)	54.1	58.7	64.4	71.5	79.8	88.7	94.7	93.4	87.2	75.4	62.3	53.9	73.7
Published Evaporation (inches)	2.85	4.38	7.15	9.98	12.73	14.85	14.95	13.59	10.80	7.60	3.98	2.49	105.35
Monthly Precipitation (inches)	0.47	0.43	0.36	0.16	0.02	0.02	0.24	0.63	0.36	0.26	0.20	0.40	3.55

Sources: Blythe CAA Airport for Average Temperatures (from http://www.wrcc.dri.edu/cgibin/cliMAIN.pl?ca0927)
Data from 1948 to 2008
Indio Fire Station, CA for Evaporation - Average 1927 – 2005
Blythe CAA Airport for Precipitation - Average 1948 to 2008

Average annual precipitation in the Project area, based on the gauging station at Blythe Airport, is 3.55 inches, with August recording the highest monthly average of 0.63 inches and June recording the lowest monthly average of 0.02 inches. Per the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for the Southern California area, 3.51 inches of rain fall in the 100-year, 24-hour storm event and extreme events in the nearby area have recorded over 10 inches of rain in 24 hours.

Average annual evaporation in the Project area, based on published data at the Indio Fire Station, 70 miles west of the site, is 105 inches. Eighty-seven percent of annual evaporation occurs between March and October.

5.4.1.2 Surface Water Resources

The site is located on alluvial sediments within the Chuckwalla Valley Basin. There are no perennial streams in Chuckwalla Valley and a vast majority of the time, the area is dry and devoid of any surface flow anywhere. Water runoff occurs only in response to infrequent intense rain storms. Much of the area is subject to inundation either by sheet flow or flow confined to an expansive network of ephemeral washes. The entire area drains to Palen and Ford Dry Lakes, but runoff generally infiltrates to groundwater before reaching these dry lakes. During large rainfall events, Ford Dry Lake and Palen Dry Lake will retain water in shallow ponds for days or weeks. This occurs on average approximately once every 20 years (RCFCWCD, 2009). There are no named ephemeral washes within the Project site, however, there is evidence that sheet flow and minor ephemeral washes do traverse the site. The washes traversing the Site have no or poorly developed banks. A waters survey has concluded that there are no wetlands meeting the definition found in the USACE Wetlands Delineation Manual (1997) traversed by any portions of the Project site. However, ephemeral washes traverse the Project area and linear facility routes and would be potentially affected during construction and operation (see Sections 5.3.4 and 5.3.6.5.2).

As shown on Figures 5.5-1 and 5.5-4 in Section 5.5, the Project site lies on a broad, relatively flat, sloping surface underlain by alluvial deposits derived from the Palen Mountains to the north and the McCoy Mountains to the east. The deposits immediately adjacent to the mountains have formed alluvial fans from multiple identifiable sources, and multiple fan surfaces have coalesced into a single bajada surface that wraps around each of these mountain fronts. Between the bajada surfaces from each mountain chain lies a broad valley-axial drainage that extends southward between the mountains and drains to the Ford Dry Lake playa, located about one mile south of the site. The site itself is relatively flat and generally slopes from north to south with elevations of approximately 400 to 370 feet above mean sea level. It is occupied by a community of low creosote and bursage scrub vegetation.

The lower or “distal” portions of the alluvial fans underlying the site occur downstream of where washes that are incised into the upper alluvial fans emerge to spread out in small distributary channels and sheet flood deposits to form lower alluvial fan lobes. A broad valley axial drainage crosses the site in a broad area that is about 3 ½ miles wide and is characterized by subdued bar and swale morphology generally lacking water erosional features and indicative of a depositional surface under sheet flood conditions. Very few small washes cross the site in the area of the valley axial drainage. In these types of environments, catchment boundaries and channels are known to continually shift over time based on the ground conditions, intensity of the storm event, velocity of the flow and sediment transportation; however, the general processes noted above may be expected to persist for the life of the Project.

The soil on site is classified by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) as typical durorthids, loamy-skeletal mixed, hyperthermic and shallow, and typical torripsamments, mixed, hyperthermic. In general, these soils are very poorly

developed beneath the site, and the soils are relatively permeable to infiltration. Refer to Section 5.6, Agriculture and Soils for further discussion of soil types on the Project plant site.

The project site is within “RIVERSIDE COUNTY AND INCORPORATED AREAS” as designated by the Federal Emergency Management Agency (FEMA); however there are no flood insurance maps developed for this area, and there are no designated flood plain areas. A review of the 2008 Riverside County General Plan Safety Element (Riverside County, 2008) indicates the site is not located in a county-designated flood hazard area.

5.4.1.3 Groundwater Resources

Water-Bearing Formations

The following water-bearing formations have been identified in the Chuckwalla Valley Groundwater Basin. These extent and relationship of these formations is presented in hydrostratigraphic cross sections A-A’ and B-B’, included as Figures 5.4-2 and 5.4-3. The location of these cross sections is shown on Figure 5.4-4.

Quaternary Alluvium. Quaternary alluvial fill in the basin consists of Holocene to Pleistocene alluvial fan and fluvial (stream) deposits, as well as lacustrine (lake) and playa (ephemeral lake) deposits (DWR, 2004). These deposits consist of gravel, sand, silt and clay (DWR, 1963). In general, coarser alluvial fan deposits are expected near the valley edges and grade into finer distal fan deposits that interfinger with fine grained lacustrine and playa deposits near the center of the basin. These deposits are typically heterogeneous. Valley axial drainages tend to be more uniform and continuous, and contain a greater proportion of sand and fine gravel. Portions of the basin are also occupied by aeolian (wind blown) sand deposits, but the identified aeolian deposits occur at the ground surface and are of limited thickness. Therefore, they are not believed to be an important water bearing unit.

The Quaternary sediments include the Pleistocene-age Pinto Formation, which consists of coarse fanglomerate (cemented, consolidated or semi-consolidated alluvial fan gravels) containing boulders and lacustrine clay with some interbedded basalt (DWR 2004). The fanglomerate would likely yield water freely to wells, but the basalt would likely yield only small amounts of water (DWR, 1963). The depth of the Quaternary alluvium is estimated to be approximately 260 feet below ground surface (bgs) (approximately 125 feet above mean sea level [amsl]) beneath the site based on site-specific investigation (Appendix D).

Pliocene Bouse Formation. The Pliocene Bouse Formation underlies the Quaternary sediments. 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). The Bouse Formation is widely reported in the Colorado Valley and tributary basins in southeastern California and descriptions of this formation come from occurrences outside of Chuckwalla Valley. 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). The Bouse Formation in the Chuckwalla Valley Basin is estimated to extend to approximately 1,900 feet bgs (approximately -1,500 feet amsl) beneath the site based on geophysical modeling (Appendix D). These unconsolidated to semi-consolidated sediments are reported to yield several hundred gallons per minute (gpm) to wells perforated in coarse grained units (Wilson and Owen-Joyce, 1994).

Miocene Fanglomerate. The Bouse Formation is unconformably underlain by a fanglomerate composed chiefly of angular to subrounded and poorly sorted partially to fully cemented pebbles with a sandy matrix (Metzger and others, 1973). The fanglomerate is likely Miocene-age; however, it may in part be Pliocene-age (Metzger and others, 1973). The Fanglomerate represents composite alluvial fans built from the mountains towards the valley and the debris of the fanglomerate likely represent a stage in the wearing down of the mountains following the pronounced structural activity that produced the basin and range topography in the area (Metzger and others, 1973). Bedding surfaces generally dip from the mountains towards the basin. The fanglomerate reportedly dips between 2 and 17 degrees near the mountains due to structural warping (Metzger and others, 1973). The amount of tilting indicates a general decrease in structural movements since its deposition (Metzger and others, 1973). The Fanglomerate is estimated to extend to approximately 2,800 feet bgs (-2,400 feet amsl) beneath the site based on geophysical modeling (Appendix D).

Bedrock. Bedrock beneath the site consists of metamorphic and igneous intrusive rocks of pre-Tertiary age that form the basement complex (DWR, 1963). In some areas of the basin, volcanic rocks of Tertiary age overlie the basement complex (DWR, 1963). These rocks are considered non-water bearing. The bedrock topography in the study area as interpreted by modeling of Bouger gravity data obtained from USGS is illustrated in Figures 5.4-5 and 5.4-6. The methods used to model the bedrock topography are discussed in more detail in Appendix D.

Groundwater Levels and Flow

In general, groundwater flow in the basin is south-southeastward (Figure 5.4-1). Groundwater flow is directed southward from the basin's boundary with the Cadiz Valley Basin and east-southeastward from its boundary with the Pinto Valley Basin, toward the eastern basin boundary where it flows into the adjacent Palo Verde Mesa Basin (Steinemann, 1989). The groundwater gradient is the steepest in the western half of the basin and is nearly flat in the central portion of the basin (DWR, 1963). Near Ford Dry Lake and east of Ford Dry Lake the gradient becomes steeper as groundwater approaches the narrows in the southeast portion of the basin (Steinemann, 1989; DWR 1963).

Groundwater levels exceed 500 feet amsl in the western portions of the basin and fall to less than 275 feet amsl near the eastern end of the basin in the narrows between the Mule and McCoy Mountains (Steinemann, 1989). Near Palen Lake, groundwater occurs near the ground surface, resulting in groundwater discharge by evapotranspiration at the land surface. Near Ford Dry Lake, groundwater is reported at depths of 50 feet below ground surface or shallower. Beneath the site, groundwater occurs at depths ranging from approximately 70 to 90 feet bgs (approximately 298 to 315 feet amsl) based on site-specific investigation (Appendix D).

As summarized in Table 5.4-2, measurement of water level elevations in the test well, observation well and buried pressure transducers installed at the Site indicates a vertical downward gradient exists at the site across the alluvium and upper Bouse Formation (Appendix D).

Table 5.4-2. Groundwater Level Elevations Measured at the Site

Well ID	Measurement Date	Approximate Groundwater Elevation (feet amsl)	Midpoint Filter Pack Depth (feet bgs)
OBS-1	5/25/2009	306	125
OBS-2 -270	7/9/2009	304	270
OBS-2 -315	7/9/2009	302	315.5

Table 5.4-2. Groundwater Level Elevations Measured at the Site

Well ID	Measurement Date	Approximate Groundwater Elevation (feet amsl)	Midpoint Filter Pack Depth (feet bgs)
OBS-2 -370	7/9/2009	301	366.5
OBS-2 -400	7/9/2009	297	402.5
TW-1	5/23/2009	297	452

Groundwater Level Trends

The DWR reports that groundwater levels in the basin are generally stable (DWR, 2004). In order to further assess groundwater level trends in the basin, hydrographs were constructed for selected wells for which time-series water level data were available from the USGS National Water Information System (NWIS) and compared to precipitation trends. Precipitation records from the nearest meteorological station for which long-term data were available (located near Blythe, California,) were examined to help determine if fluctuations in groundwater levels were related to climatic trends or other factors. The period of record for this meteorological station extends to 1910. The data were used to calculate the cumulative departure from average precipitation, which was plotted with the well hydrographs. An upward trend in the cumulative departure curve indicates a wetter than normal period; whereas, a downward trend indicates a drier than normal period. Table 5.4-3 summarizes the water levels that were graphed. The locations of these wells are illustrated on Figure 5.4-1.

The hydrographs for two wells located upgradient from the site (48 and 49) indicate that water levels are generally stable north of Palen Lake as indicated by well 49; however, water levels west of Palen Lake have declined over 50 feet since 1979 as indicated by well 48 (Figure 5.4-7). This decline in water levels may be related to increased groundwater pumping in the Desert Center area combined with a drier than normal climatic period.

The hydrographs for two wells located near the Site (9 and 15) reflect very limited water level measurements at this location (Figure 5.4-8). At well 15, water levels increased by approximately 8 feet between 1992 and 2000 and may be related to a wetter than normal climatic period or the recovery of water levels after a decrease in agricultural pumping since the early 1990s (see discussion below under Groundwater Budget).

The hydrographs for five downgradient wells (32, 33, 36, 39, and 43) reflect variable trends (Figure 5.4-9). The water levels in well 32 remained relatively stable over the period of record from 1961 to 1970 and the water levels in well 43 have remained relatively stable between 1992 and 2009 after an approximately 15-foot increase between 1982 and 1992. However, water levels in well 39 declined approximately 10 feet between 1985 and 1992, water levels in well 33 declined approximately 4 feet between 1987 and 1992, and water levels in well 36 declined approximately 13 feet between 1992 and 2000. These declines appear to be independent of climatic trends are likely related to groundwater pumping for Chuckwalla Valley and Ironwood State Prisons which began in 1988 (Section 5.4.2.1).

Groundwater Budget

The reported basin hydrologic balance based on available literature and information obtained from the California State Prison Authority is summarized in Table 5.4-4, below. Additional information regarding published historical water budget information is presented in Appendix D.

Table 5.4-4. Chuckwalla Valley Groundwater Basin Groundwater Budget

Groundwater Budget Component	Approximate Quantity of Groundwater (acre-feet per year)
Inflow	
Infiltration of Precipitation [1]	29,530
Agricultural Irrigation Return Flow [2]	1,000
Subsurface Inflow from Pinto Basin [1]	290
Subsurface Inflow from Cadiz Basin	Unknown
Treated Prison Effluent Return Flow [3]	600
Total Reported	**31,420**
Outflow	
Pumpage for Agricultural Irrigation Use [2]	2,600
Pumpage for Domestic Use [2]	1,800
Prison Water Demand [3]	2,100
Subsurface Outflow to Palo Verde Mesa [1]	1,162
Evapotranspiration from Palen Lake	Unknown
Total Reported	**7,662**

Notes:

1. Engineering Science 1990; Woodward-Clyde Consultants, 1986
2. SWRCB, 2005; includes prison agricultural return flow
3. California State Prison Authority, 2009
4. Average calculated water demand based on prison population at 85% capacity (in eight of the last nine years) of 8,500 inmates and a daily water demand of 220 gallons per inmate per day, all uses (California Department of Corrections, 2009).

Groundwater Inflow/Recharge. Groundwater recharge is mainly from infiltration of runoff from the slopes of the surrounding mountains and to a lesser extent from infrequent precipitation on the valley floor and subsurface inflow from the Pinto Groundwater Basin on the northwest and from the Cadiz Valley Groundwater Basin on the north. Woodward-Clyde Consultants (WCC) (1986) reported approximately 29,530 acre-ft/yr of precipitation infiltrates into the basin and subsurface inflow from the Pinto Basin amounts to 290 acre-feet per year (acre-ft/yr). The subsurface inflow from the Cadiz Basin has not been reported. Current agricultural return flow is estimated to be approximately 38 percent of applied irrigation water, or approximately 1,000 acre-ft/yr. In addition, the Chuckwalla Valley State Prison disposes treated wastewater to an unlined pond and it is estimated that recharge from this pond is approximately 600 acre-feet/yr when the prison is at peak inmate capacity.

Groundwater Outflow/Discharge. Groundwater discharge from the basin occurs by evapotranspiration from Palen Lake, by subsurface flow eastward out of the basin to the Palo Verde Mesa Groundwater Basin, and by pumping for prison, domestic and agricultural use (Steinemann, 1989). Palen Lake is a wet playa, where groundwater discharges and evaporates at the lake surface, leaving salt deposits. The volume of water discharged from the basin through evapotranspiration has not been reported, but is likely significant. Engineering Science (1990) reported that approximately 1,162 acre-ft/yr of groundwater underflow discharges annually through the narrows between the McCoy and Mule Mountains into the Palo Verde Mesa Groundwater Basin after the construction of the prison.

The most recent estimate of agricultural pumpage in the basin was made by the SWRCB for updates to the California Water Plan. The SWRCB estimated basin agricultural pumpage as 2,600 acre-ft/yr in

2001. The maximum reported agricultural pumpage in the basin was 48,000 acre-ft/yr in 1986 (WCC, 1986). This decrease is related to the cessation of agricultural pumping for jojoba farming that occurred in Chuckwalla Valley in the 1980s through the 1990s. Domestic groundwater pumping in the basin is estimated to be approximately 150 acre-ft/yr and has remained relatively constant since the 1980s. Prison groundwater pumping is reported to be approximately 2,100 acre-ft/yr (California Department of Corrections, 2009). Prison agricultural pumping is assumed to be included in the total agricultural pumpage reported by DWR.

Groundwater Storage Changes

A change in groundwater levels corresponds with a change in groundwater storage. Based on the groundwater level data and changes in pumpage discussed above, groundwater storage in the basin appears to have decreased somewhat in the 1980s and possibly the early 1990s, but has recovered since that time due to the curtailment of most agricultural pumping.

Groundwater Quality

Groundwater quality varies markedly in the basin. Groundwater in the western portion of the basin near Desert Center generally contains lower concentrations of total dissolved solids (TDS) than groundwater in the eastern, downgradient portion of the basin near Ford Dry Lake (Steinemann, 1989). Groundwater to the south and west of Palen Lake is typically sodium chloride to sodium sulfate-chloride in character (DWR, 2004). The detected concentrations of TDS in the basin ranges from 274 milligrams per liter (mg/L) to 8,150 mg/L with an average concentration of 2,100 mg/L (Steinemann, 1989). In general, the groundwater in the basin has concentrations of sulfate, chloride, fluoride, and dissolved solids too high for domestic use and concentrations of sodium, boron and dissolved solids too high for irrigation use (DWR, 1975). Several of the wells sampled in the basin contain high levels of fluoride and boron.

Reported water quality of samples collected from wells near the Site is summarized in Table 5.4-5. This table indicates that water quality varies laterally and vertically in the area. Generally, water quality improves vertically with depth and laterally to the south. Vertically, TDS concentrations are generally highest in the alluvium followed by the Bouse Formation and finally by the Fanglomerate. Calculated TDS concentrations from borehole geophysical logging indicate TDS concentrations as high as 30,500 mg/L within finer grained units (silt and clay) in the alluvium decreasing to less than 5,000 mg/L TDS in more transmissive sediments in the Bouse Formation at depths of 800 to 900 feet bgs (Appendix D). Laterally, TDS concentrations in groundwater decrease south and southeast of the Site within all three water bearing units in the basin, and are lowest in the are south of I-10, as referenced in Figure 5.4-10.

Groundwater Wells

An inventory of groundwater wells in the area was compiled from published literature, review of data from the National Water Information System (NWIS), and by obtaining well completion records from the DWR for wells registered in the eastern Chuckwalla Valley Groundwater Basin. A total of 50 wells were identified, the majority of which are likely abandoned or disused. Information regarding the completion depths, construction details, and status of these wells, to the extent available, is presented in Table 5.4-6.

Aquifer Properties

The basin fill sediments within the Chuckwalla Valley Groundwater Basin include three aquifers: the alluvium, the Bouse Formation, and the Fanglomerate. Groundwater in the alluvium likely occurs

under unconfined conditions but could locally be semi-confined. Groundwater in the Bouse Formation and the Fanglomerate occurs under confined conditions based on stratigraphic data and storativity values derived from aquifer pumping tests. Table 5.4-7 summarizes the reported and estimated aquifer properties for these aquifers based on data from specific capacity tests and aquifer pumping tests performed on 14 wells in the eastern Chuckwalla Valley Groundwater Basin (including an aquifer pumping test performed at the site as discussed in Appendix D.4), and two aquifer pumping tests performed on wells in the Palo Verde Mesa Groundwater Basin. Data regarding the laboratory-measured porosity, effective permeability, and hydraulic conductivity values of soil samples collected from the Bouse Formation during drilling at the Site is presented in Appendix D.

Table 5.4-7. Aquifer Parameters

Geologic Unit	Well ID	Specific Capacity (gpm/ft)	Trans-missivity[5] (square-ft/ft)	Hydraulic Conductivity[6] (ft/day)	Storativity	Basis
Alluvium	--	75	6,958	2	0.04	Aquifer Test conducted for Blythe Energy Project in Palo Verde Mesa Groundwater Basin
	- -	100	7,972	2	0.04	
Average		**87.5**	**- -**	**2**	**0.04**	
Bouse Formation	TW-1	2.6	2880	8 to 16		Aquifer test and lab analysis conducted for the Project.
	3	5	1,337	4	**- -**	Specific capacity test.
	26	1.5	401	1	**- -**	Specific capacity test.
	29	1.6	428	1	**- -**	Specific capacity test.
	43	35.0	9,358	49	**- -**	Specific capacity test.
Average		**9**	**- -**	**14**	**- -**	
Bouse Formation/ Fan-glomerate	33	14.8	3,957	8	**- -**	Specific capacity test.
	34	26.7	7,139	14	**- -**	Specific capacity test.
	35	51.6	13,797	28	**- -**	Specific capacity test.
	36	15.6	4,171	8	**- -**	Specific capacity test.
	37	12.9	3,450	12	0.0002	Aquifer test conducted at Chuckwalla Valley and Ironwood State Prisons
	39	11.1	2,971	13	**- -**	Specific capacity test.
	40	10.3	2,754	5	**- -**	Specific capacity test.
	42	19.7	5,273	15	**- -**	Specific capacity test.
Average		**20**	**- -**	**13**	**0.0002**	
Fan-glomerate	14	2.6	695	14	**- -**	Specific capacity test.

Notes:

Sources include CEC, 2005; WCC, 1986; DWR Well Completion Records, and Site Specific Investigation (Appendix D).

Transmissivity from Specific Capacity Tests calculation by multiplying value by 2,000.

Hydraulic conductivity calculated by dividing T by screened interval length.

5.4.1.4 Water Supply

Water to supply the Project will be derived from a minimum of two groundwater supply wells located near each unit's power block area. The Project well field will also include a sufficient number of standby wells to provide the Project with water in the event the primary wells are shut down for maintenance. As currently planned, the wells will pump groundwater from the Bouse Formation and/or the underlying Fanglomerate within the Chuckwalla Valley Groundwater Basin. The Bouse Formation occurs at a depth of approximately 260 feet below ground surface (bgs) at the site and extends to approximately 2,050 feet bgs, and the Fanglomerate is inferred to extend from approximately 2,050 to 2,950 feet bgs. On a preliminary basis, the wells are proposed to pump groundwater from below 800 feet bgs. The quality of groundwater sampled from this depth is summarized in Table 5.4-8. As discussed previously, water quality generally improves with depth, and it is reasonable to expect that further investigation to support detailed project design will reveal depths within the aquifer that can be developed to produce a lower TDS water supply that is still in the brackish range (greater than 1,000 mg/L TDS), but the use of which would result in similar impacts based on the aquifer properties discussed above. The final well design will be based on a pilot well drilling program implemented for detailed project design.

5.4.1.5 Project Water Demand

Construction activities for a single 125 MW unit are expected to take place over a period of approximately 25 months with a 12-month delay between the start of construction for Unit 1 and the start of construction for Unit 2, for a total of 37 months construction period. It is anticipated that water use during this period will be from on-site groundwater using the production wells that will be installed for the Project. It is anticipated that water usage for the construction period will proceed along the following schedule:

- Average water usage during earthwork (Month 1 to Month 5): 1.7 million gallons per day (MGD),
- Average water usage during post earthwork phase (Month 6 to Month 37: 0.55 MGD.
- Peak water usage: 3 MGD
- Total construction water demand: approximately 2,440 acre feet over approximately 3 years.

Initial construction water usage will be in support of site preparation and grading. Subsequent to Month Five of construction, water usage will be in support of dust suppression and normal construction water requirements that are associated with construction of the buildings, power block, and solar array.

The Project proposes to use a wet cooling tower for power plant cooling. Water for cooling tower makeup, process water makeup, and other industrial uses such as mirror washing will be supplied from selected onsite groundwater wells. Water from the on-site wells also will be used to supply non-potable water for employees (*e.g.,* showers, sinks, toilets). A water treatment system will be used to treat the groundwater pumped for domestic use.

The estimated operational water requirements for the power plant are presented in Table 3.4-2. The average total annual water usage for each 125 MW power plant is estimated to be about 822 acre-ft/yr, or 1,644 acre-ft/yr for the entire Project, which corresponds to an average daily flow rate of about 1,000 gallons per minute (gpm). Usage rates will vary during the year and will be higher in the summer months when the peak maximum daytime usage rate could be as high as about 2,013 gpm

for each 125 MW power plant, or 4,026 for the Project. The water use schedule, shown in Table 5.4-7, estimates average water usage rates during each month over the year as summarized below.

- The four months of May through August are referred to as summer, and the makeup flow rate calculations are based on the peak summer cooling tower evaporation rate of 1729 gpm. At this evaporation rate during power operating conditions, the site makeup flow rate is 2013 gpm.
- March, April, September and October are referred to as average, and the makeup flow rate calculations are all based on the annual average evaporation rate of 1459 gpm. At this evaporation rate during power operating conditions, the site makeup flow rate is 1710 gpm.
- November through February are referred to as winter with an evaporation flow rate of 1189 gpm. At this evaporation rate during power operating conditions, the site makeup flow rate is 1408 gpm.

Month-to-month differences in flows within the summer, average and winter months are due to differences in the incident radiation onto the mirrors and therefore differences in the power generated for each month. As a result, each month has a different makeup water usage volume.

Furthermore, during the course of a day as the power plant cycles from zero to maximum power, and the makeup flow rate also cycles (e.g., in summer from 0 to 2013 gpm), so the values 2013, 1710 and 1408 gpm represent the maximum flow rate when the power plant is generating maximum power output. However, assuming that the makeup operates at a constant flow rate throughout the night and day, then the makeup flow rate can be averaged. Table 5.4-9 represents the average makeup flow rate (gpm) by month as well as the acre-feet per month.

Table 5.4-9. Makeup Water Flow Rates per 125 MW Plant

Makeup Flow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
gal/min (24-hour average)	180	202	491	596	820	907	799	718	563	426	213	161
acre-feet per month	24.6	24.9	67.2	78.9	112	120	110	98.2	74.6	58.3	28.2	22.1

5.4.2 Environmental Impacts

Project water supply impacts would be considered significant if the Project resulted in:

- Substantial depletion of groundwater resources and interference with local wells.
- Substantial interference with groundwater recharge.
- Use of water in a wasteful manner.
- Depletion of surface water resources that results in significant biological or air quality impacts (*i.e.,* through impacts to springs or wet playas).

Project water quality or erosion/flooding-related impacts would be considered significant if the Project resulted in:

- Degradation of groundwater quality.
- Discharge into surface waters resulting in any alteration of surface water quality.
- Activities that cause or contribute to substantial erosion or flooding off the site.

The direct potential effects of the Project on local water resources are those associated with using groundwater for construction (specifically for demands during site grading) and with the plant's operational process water demand. No surface water will be used, though Project construction and operation may have an effect on the ephemeral washes traversing the site, or springs and wet playas.

Potential impacts on water resources during construction and operation include drawdown and related impacts, depletion of water resources, water quality impacts, erosion, and drainage impacts.

To support the evaluation of environmental impacts, the following activities were undertaken and are summarized in the following sections.

- A numerical and analytical groundwater modeling study is being undertaken, and the methods and results of the analytical modeling study are included herein as a conservative representation of worst case impacts.
- A Dust, Erosion and Sediment Control Plan (DESCP) was prepared, including Best Management Practices (BMPs) to reduce erosion and soil loss below levels of significance.
- A conceptual drainage study was conducted which included hydrologic modeling to provide a preliminary design of stormwater drainage and detention structures. The drainage study and conceptual grading and drainage plan are presented as an appendix to the DESCP, which is included in Appendix A of the AFC.

5.4.2.1 Groundwater Impacts

Evaluation Approach

Groundwater impacts are evaluated through review of available data, Site-specific evaluation and computer modeling to assess:

- The extent of pumping-induced drawdown and its potential impact on the groundwater basin and existing wells in the site vicinity.
- Changes in the groundwater budget of the Chuckwalla Valley Groundwater Basin.
- Potential impacts to surface water resources such as wet playas and surface water springs.
- Potential solute transport that could be induced by the Project, particularly vertical migration of saline groundwater, and/or lateral migration of saline groundwater from beneath Ford Dry Lake.

The groundwater modeling task for the Project includes development of a numerical groundwater flow and transport model of the Chuckwalla Valley Groundwater Basin. The model is constructed using Groundwater Vistas® software and utilizes an "impact modeling" approach, based on a flat water table datum. Impact modeling is a robust numerical modeling approach that allows the modeler to incorporate boundary conditions, variable aquifer parameters, and diverse geological layers. The use of impact modeling in hydrogeologic literature is well established and this approach has been widely used to evaluate the impacts of water supply pumping. Its use for impact evaluation at the Ford Dry Lake site is appropriate and well suited to meeting the identified modeling objectives.

The following steps are included in the groundwater modeling approach.

- Development of a conceptual model based on previous studies completed within the basin (*e.g.,* by the US Geological Survey, California Department of Water Resources and for Chuckwalla Valley State Prison), public records regarding well completions in the area, and information gained from the Ford Dry Lake Test Well program (Appendix D.2).
- Construction of an analytical drawdown model following a simplified modeling approach that uses the USGS modeling code, THWELLS (Van der Heijde, P.K.M, 1996). The analytical drawdown model is included with this AFC to present a worst-impact analysis that meets the CEC's Data Adequacy Requirements.
- Construction of a numerical model in Groundwater Vistas, including the appropriate boundary conditions, lithologic layers and aquifer parameters.
- Calibration of the numerical model with the transient aquifer pumping tests at the Site and at Chuckwalla Valley State Prison. Numerical evaluation of the on-site pumping test using the model.
- Addition of a solute transport component to the numerical groundwater model using the code MT3D.
- Performance of a sensitivity analysis.
- Predictive simulations to assess the impacts of pumping on water levels, the basin water budget and solute transport.
- If significant drawdown is predicted near reported bedrock springs at the margins of the basin, separate analytical modeling to assess potential impacts to spring discharge.

Analytical Modeling Approach

The analytical model described in this section uses the Theis non-equilibrium equation for describing drawdown from a pumping well (Driscoll, 1986). Parameters for the analytical model were derived from aquifer pumping and specific capacity tests carried out in the vicinity of the site (see Table 5.4-7). The model is intended to constrain potential worst case groundwater impacts resulting from the Project. The approach incorporates several conservative assumptions that tend to result in overestimation of drawdown impacts. Specifically, the following conservative assumptions are incorporated.

- The model is based on Theis assumptions which do not allow for consideration of recharge or vertical flow, which will tend to decrease drawdown. This essentially means that all water pumped by the wells at the site is assumed to come from storage in the basin, and the drawdown cone will continue to expand indefinitely. In reality, this will not be the case.
- The model predicts drawdown in a deep confined aquifer which is separated from the water table by several hundred feet of clay. The presence of these overlying materials will greatly attenuate drawdown at the water table.
- The model simulates the Project's average pumping rate (1,000 gpm) assuming a single pumping well. This will tend to slightly overestimate drawdown close to the well.
- For simplicity, we have assumed the same pumping rate applies during the construction and operating periods. The annual construction pumping rate is actually lower.

The Theis non-equilibrium well equation incorporates the following additional standard assumptions:

- The aquifer being pumped is homogeneous and isotropic. Although the Bouse Formation aquifer is neither homogeneous nor isotropic, we are assuming for purposes of this analysis the aquifer's parameters can be represented by the transmissivity values obtained from Table 5.4-7. This assumption appears reasonable for the purposes of this analysis since a variety of data sources point to an average hydraulic conductivity of 14 feet/day throughout the Bouse Formation and the underlying Fanglomerate.
- The aquifer is uniform in thickness and infinite in areal extent. The lateral extent of drawdown from the proposed pumping well(s) depends on the lateral extent and interconnectivity of the transmissive units within the aquifer tapped by the well(s). While the Bouse Formation is laterally extensive in the basin, it is surrounded by mountains composed on essentially non-water bearing bedrock. Interaction of the drawdown cone produced by pumping the wells at the site with these no-flow boundaries will tend to increase the drawdown in these areas. However, as discussed below, this effect is expected to be secondary to the conservative nature of the assumptions discussed earlier.
- Additional assumptions include a well that fully penetrates the aquifer, instantaneous release of water from storage, laminar flow and a potentiometric surface with no slope.

Model Inputs

The following inputs were utilized in constructing the analytical model of groundwater pumping at the site.

Table 5.4-10. Model Inputs

Parameter	Parameter Value	Units	Source
Well Screen Length	1,000	feet	Well assumed to be screened in the Bouse Formation from a depth of 800 to 1,800 feet bgs
Hydraulic Conductivity	14	ft/day	Average hydraulic conductivity for Bouse Formation (Table 5.4-7)
Transmissivity	14,000	ft^2/d	Multiply K by aquifer thickness
Storativity	0.0002 [1]	NA	WorleyParsons; Freeze and Cherry, 1979
Pumping Rate	1,000	gpm	Average long-term pumping rate
Pumping Time	33	years	The model encompasses the three-year construction period and 30-year life of project

1. Storativity value from a pumping test conducted at the Chuckwalla Valley State Prison (WCC, 1986).

Analytical Modeling Results

Figure 5.4-11 presents the model-predicted drawdown with distance from the pumping center at the Site (the location half way between the pumping wells at the power blocks) after one, five, and 33 years. As shown on this figure, drawdown decreases approximately logarithmically with distance and increases approximately logarithmically with time. The figure also shows vertical lines at the nearest site boundary, selected nearby active and inactive wells, the Palen Mountains, McCoy Spring, and Palen Lake. The drawdown predicted by THWELLS at these features is summarized below. Also presented is drawdown corrected using a factor developed using known pumping rates and measured drawdown at Chuckwalla Valley and Ironwood State Prisons, as discussed later in this section.

Table 5.4-11. Model Results

Location	Approximate Distance from Pumping Center Feet (Miles)	THWELLS Predicted Drawdown / Corrected Predicted Drawdown (feet)		
		1 Year	5 Years	33 Years
Nearest Site Boundary	1,700 (0.3)	11.0/2.8	12.8/3.2	15.0/3.8
Closest Well – Inactive (WP-4)	18,480 (3.5)	5.7/1.4	7.5/1.9	9.6/2.4
Palen Mountains	20,064 (3.8)	5.6/1.4	7.4/1.9	9.4/2.4
Closest Active Well – Froats (WP-14)	26,400 (5.0)	4.8/1.2	6.6/1.7	8.7/2.2
Wileys Well Rest Stop Well (WP-22)	38,280 (7.25)	4.1/1.0	5.9/1.5	8.0/2.0
Mc Coy Spring	39,600 (7.5)	4.0/1.0	5.8/1.5	7.9/2.0
Prison Wells (WP-33-38, 40, 41)	42,240 (8.0)	3.9/1.0	5.6/1.4	7.7/1.9
Palen Dry Lake	63,360 (12.0)	3.0/0.8	4.7/1.2	6.8/1.7

1. Drawdown corrected using a factor developed from long-term groundwater level monitoring at the Chuckwalla Valley and Ironwood State Prisons. See text for discussion. All values approximate.

As discussed previously, the assumptions inherent in the analytical modeling approach presented above tend to result in an overestimation of drawdown impacts. In order to better understand and interpret the results of the analytical modeling, the results are compared to similar modeling conducted for the Chuckwalla Valley and Ironwood State Prisons (WCC, 1986). These prisons pump groundwater at a similar rate and from a similar depth as is proposed for the Project, and the pumping wells are located at similar distances from no-flow boundaries at the margins of the basin. Given that the hydraulic properties of the basin fill materials appear to be generally similar between the Site and the location of the prisons, the where long-term groundwater level monitoring data are available from the prison area are offer a useful perspective to better interpret the modeling results and assess actual drawdown impacts. The Chuckawalla Valley and Ironwood State Prisons are located approximately seven miles southeast of the proposed power plant locations at the site in the southeastern portion of the Chuckwalla Valley Groundwater Basin. Chuckawalla Valley State Prison began operation in December 1988 and the Ironwood State Prison began operation in February 1994.

Combined, the prisons use eight wells for prison industrial and domestic, landscape irrigation, and agricultural water supply (wells 33, 34, 35, 36, 37, 39, 40, and 41 – refer to Figure 5.4-1 for well locations and Table 5.4-6 for well completion details). There are no additional sources of water supply for the prison. Five wells supply water for prison industrial and domestic use, one well supplies water for landscape irrigation, and two wells supply water for agricultural irrigation. All of these wells are screened within the lower Bouse Formation and the upper Fanglomerate between approximately 690 and 1,200 feet bgs.

Prior to the construction of the Chuckwalla Valley State Prison, WCC (1986) completed an analysis to evaluate the impacts to water levels in the basin and nearby wells resulting from pumpage at the prison. The approach involved development of a distance drawdown estimate based on analytical modeling using the Jacob method, which used a derivation of the Theis equation and incorporates all of the same basic assumptions that are inherent in the THWELLS modeling program (Driscoll, 1986). Three different pumping alternatives were evaluated and included pumpage for prison domestic and industrial demand of 620 acre-ft/yr plus varying amounts of pumpage for agricultural irrigation for a total pumpage of 620, 1,470 and 2,920 acre-ft/yr for Alternatives 1, 2 and 3, respectively. Drawdown was predicted after one year of pumping.

It should be noted that drawdown estimates were considered conservative because recharge from the infiltration of treated wastewater and agricultural return flow were not included in the estimates; however, including this recharge in a drawdown analysis for a deep pumped aquifer assumes that all of the recharge from these sources remains within the capture zone of the wells and percolates to the pumping depth of the Bouse Formation aquifer. In reality, this is not likely to be the case. In addition, the percolation of recharge to the pumping depth would likely take significantly more than one year, which was the prediction horizon of WCC's analysis. Nevertheless, some recharge may be occurring and WCC's evaluation may still be considered conservative due to the conservative nature of the underlying Theis assumptions, as discussed earlier.

The results of WCC's drawdown impact modeling are summarized below and compared to long-term water level measurements in well 39, located within the prison well field, and well 43, located approximately 1 ½ miles southeast of the well field (see Table 5.4-2 and Figure 5.4-9). Well 39 is screened within the pumped interval of the well field and well 43 has two screened intervals, one within the upper 100 feet of the pumped interval, and one that extends from approximately 100 to 200 feet above the pumped interval. Actual pumping by the prison differed somewhat from the alternatives that were evaluated. Between 1988 and 1994, industrial and domestic pumping by the prison is estimated to have been between 600 and 700 acre-ft/year and pumping for agricultural use is estimated to have been 500 acre-ft/yr, for a total pumping rate of approximately 1,100 to 1,200 acre-ft/yr (ES, 1990). Between 2000 and 2009, average pumping for prison domestic and industrial use reportedly increased to approximately 2,100 acre-ft/yr (California Department of Corrections, 2009), while agricultural pumping likely remained at approximately 500 acre-ft/yr, for a total demand of 2,600 acre-ft/yr.

Table 5.4-12 Prison Drawdown Predictions and Observations

Distance From Well Field (miles)	Predicted Drawdown (feet)			Observed Drawdown (feet)
	Alternative 1 (620 acre-ft/yr)	Alternative 2 (1,470 acre-ft/yr)	Alternative 3 (2,900 acre-ft/yr)	
0	9	20	34	10.56 [1]
1	4.5	10.5	18.5	- -
1.5	4	9	16	4.56 [2]
5	1.5	4	8	- -

Notes:
1. Drawdown measured in on-Site well 39 between 6/12/1985 and 2/9/1992 after four years of pumping
2. Maximum drawdown measured in off-Site well 43 between 2/13/1992 and 9/5/2007 after 16 years of pumping
3. - - = data not available

Considering the data presented above and the hydrographs for wells 39 and 43 shown on Figure 5.4-9, the following observations may be made.

- The observed drawdown in well in well 39 after four years of pumping (between 1988 and 1992) was 10.56 feet. Pumping during this time period is estimated to have been between the rates modeled for Alternative 1 and Alternative 2, which correspond with predicted drawdowns of 9 feet and 20 feet. Note that these drawdowns are predicted to occur after one year of pumping, but drawdown would be expected to increase over the additional three years of the pumping period. Therefore, the actual difference between the observed and predicted drawdowns would be greater.
- Groundwater levels in well 43 show a slow rate of decline between 1992 and 2007, with a maximum decline of 4.56 feet. Water levels have recovered somewhat since that time. Pumping during this time period is estimated to have been between the rates modeled for Alternative 2 and Alternative 3, which correspond with predicted drawdowns after one year of 9 feet and 16 feet, respectively, at a distance of 1 ½ miles. Note that these drawdowns are predicted to occur after one year of pumping, but drawdown would be expected to increase over the additional three years of the pumping period. Therefore, the actual difference between the observed and predicted drawdowns would be greater.
- The hydrograph of well 43 is suggestive of long-term stabilized groundwater levels; thus, drawdown exceeding 5 feet within the pumped interval appear be limited to distances closer than approximately 1 ½ miles from the prison well field.

To further evaluate the degree to which drawdown may have been over-estimated at the prison, the predicted drawdown induced by pumping at the prison was modeled using THWELLS. This evaluation included developing drawdown predictions in the well field after four years of pumping at a rate of 1,100 acre-ft/yr, and at a distance of 1 ½ miles from the well field after 16 years of pumping at a rate of 1,650 acre-ft/yr (the average estimated pumping rate between 1992 and 2007). Other model input parameters include an aquifer thickness of 510 feet, a hydraulic conductivity of 14 feet/day and a storativity of 0.0002. The predicted drawdown in the well field after four years of pumping at 1,100 acre-ft/yr was 40.5 feet compared to a measured drawdown of 10.56 feet in well 39, indicating drawdown in the well field was overestimated by approximately 300 percent. The predicted drawdown after 16 years of pumping at 1,650 acre-ft/yr at a distance of 1 ½ miles was 19.6 feet compared to a measured drawdown of 4.56 feet, indicating that drawdown at this distance was also overestimated by approximately 300 percent.

Based on the data summarized above, the drawdown shown in Figure 5.4-11 and Table 5.4-11 is likely overestimated on the order of 300 percent. Drawdown predictions using this number as a correction factor are included for perspective in Table 5.4-11. On this basis, it is reasonable to conclude that, drawdown in nearby wells resulting from Project pumping is expected to be less than 5 feet. Drawdown in the shallower water-bearing zones is expected to be significantly less due to impedance in vertical groundwater flow from low transmissivity aquitards and the addition of recharge at the water table. Although the amount of drawdown at the water table cannot be quantified with certainty at this time, based on the available data, it is unlikely that significant water table drawdown that will adversely affect Palen Lake or McCoy Spring will occur.

Summary of Groundwater Impacts Resulting from Groundwater Pumping

Based on the results of the drawdown impact modeling, groundwater pumping for the project is not predicted to significantly impact nearby water supply wells. Some limited drawdown in off-site wells may be observed; however, this will not render the wells unusable or interfere with their use for their intended purpose.

Drawdown is expected to attenuate in shallower water-bearing zones due to impedance in vertical groundwater flow and the addition of recharge near the water table. As such, the project is not expected to result in significant impacts to the water table at McCoy Spring or Palen Lake. The static water table will not be drawn down below the Colorado River Accounting Surface.

The proposed pumping represents less than five percent of the reported water budget for the basin. Substantial depletion of water resources is not anticipated. The cone of depression from pumping at the site will likely migrate laterally to intercept groundwater that is currently being discharged by evapotranspiration at Palen Lake or by underflow to Palo Verde Mesa Groundwater Basin, resulting in some decrease in groundwater discharge at these locations.

The interval proposed for groundwater pumping at the site is separated from overlying sediments that contain higher TDS concentrations by over 200 feet of clay. Downward vertical gradients exist within the basin, and modest increase in these gradients that will result from pumping for the Project is not predicted to induce significant TDS transport across this substantial aquitard. Water quality generally improves with depth and laterally to the south of the site. Induced lateral migration of high TDS groundwater is not anticipated.

5.4.2.2 Surface Water Quality and Flooding Impacts

A conceptual drainage study was prepared by WorleyParsons to evaluate existing grading and drainage patterns associated with pre-developed conditions and the future post development grading requirements and drainage flows through and around the site. The objective of the study was to ensure the solar thermal development minimizes its overall impact within the site and on the downstream properties and drainage system. The following sections outline the proposed impacts to the surface water during construction and operation of the Project.

Construction

Water quality impacts could result from grading activities and releases of chemicals used during construction, such as motor oil, fuel, and solvents.

Overall, the Project will result in disturbance of approximately 1,800 acres, including both permanent and temporary disturbance at the plant site. A Drainage, Erosion and Sediment Control Plan (DESCP, Appendix A), which includes a construction phase Storm Water Pollution Prevention Plan (SWPPP), will contain a series of management controls and BMPs to minimize erosion and impacts to drainage. The BMPs include:

- Initially grading will only proceed in those areas needed for site construction and operation of the facility. Areas that are undisturbed will remain so and be clearly marked so that any existing vegetation will remain in-place.
- Gravel berms will be used at the base of slopes or check structures to control sediment loss and erosion. Rip-rap or other erosion control measures will be used to minimize scour and erosion.

- Roads and paved areas will be kept free of dust, dirt and visible soil materials. An entrance/outlet vehicle wash pad will be developed to help prevent dirt from being tracked into the public right-of-way. Water will be used to control dust but water application will be minimized to control runoff.
- Erosion control measures will be used for the rerouted channels for the ephemeral washes. Measures will be designed to maintain the infiltration characteristics of the channel reach similar to pre-construction conditions.
- BMPs will be applied and repaired as soon as possible when erosion is evident. Temporary erosion control measures will be implemented as needed to control erosion. Temporary sediment control materials will be maintained on site throughout the term of the Project for responding to unforeseen conditions as they arise.
- Hydraulic mulch and/or soil binders to protect soil from wind and water erosion at the source.
- Velocity dissipation, both in channels and on the surfaces.
- Silt fencing, rock check dams, fiber rolls, and stabilized construction entrances.
- Sediment basins, street sweeping, and stabilized roadways.
- Designated vehicle fueling locations, designated material delivery areas, and waste management areas.

With the implementation of BMPs, it is anticipated the Project will effectively minimize impacts to drainage and/or control flood conditions.

Grading Design

Currently, construction plans are to clear and grade the site with heavy equipment to provide a uniform gently southwest sloping grade and to construct drainage channels and roads. The total site earth work quantities for the Project site, including the evaporation and retention ponds excavations and the protective berm fill placement, will result in a balanced cut-and-fill earthwork of approximately 712,000 cubic yards of cut and 1 million cubic yards of fill, based on the preliminary site design and layout (Plan of Development, 2009). More exact earthwork quantities will be determined after the detailed aerial and ground survey is completed. Final site design and layout will take into account additional environmental, land use, and engineering constraints. The final grading design will include adjustments to the grades to provide balanced earthwork cut and fill quantities. This will be accomplished by raising/lowering the grades to obtain a balanced site. Therefore, there are no plans to import fill material during general grading operations.

Site grading activities will be ongoing for the first five months of the construction schedule. During that time the site will be broken into areas and grading will proceed from one area to the next until the entire site grading has been completed. Though infiltration at the site is expected to be rapid, mitigation measures will include local soil berms and a detention area that will contain storm water runoff during construction. Heavy grading will occur within the plant site boundaries. Temporary erosion controls including crushed rock, silt fences and fiber rolls will be used as needed to minimize erosion in active grading areas. Additionally, water will be used to control dust and will be applied at a rate so as to minimize runoff. Activities and products that have the potential to contaminate groundwater and surface water will be properly stored and used in a manner consistent with the approved grading plan, SWPPP, and DESCP.

Drainage Design

The Project site slopes from the northeast to the southwest at a grade of less than one percent. As outlined in the Operation section, upstream off-site drainage will be routed around the Project site. The outfalls of the realigned washes will be designed to match the sheet flow conditions of the ephemeral washes in the Colorado Desert.

The channels will be constructed to their ultimate size and configuration. Therefore, they will operate in the final designed condition during construction of the remaining portions of the Project. Soil scour and deposition will be evaluated during the detailed design and the channel slope will provide water velocities within the channel that will not create an excessive amount of scour or deposition. If necessary, gabion or rip rap drop structures will be used to form a channel with the proper gradient. Additionally, rock check dams and rip rap pads will be used to control erosion where higher flows are expected. Silt fencing and/or fiber rolls will also be used within the channel, but only where expected flows are minimal, such as along the top edge, where the drainage area in minimal.

Water Quality

Chemicals can potentially contaminate surface waters during heavy storm events, or groundwater through infiltration. A number of mitigation measures are in place to prevent spills of chemicals, as well as to respond to spills should they occur. The DESCP, which includes the SWPPP, will require storm water BMPs, and temporary erosion control measures including revegetation, dust suppression and construction of berms and ditches, which will prevent accelerated soil erosion or dust generation. Adhering to proper material handling procedures and complying with the SWPPP will ensure that construction-related water quality impacts are less than significant.

Good housekeeping and prompt removal of spills and leaks will be implemented to minimize storm water contact with contaminated materials. With the implementation of BMPs and procedures and protocols provided in the DESCP, it is anticipated that during construction, drainage and erosion control measures will adequately protect surface and resources and impacts will be less than significant.

Operation

Water Quality

Operation of the Project has the potential to impact water quality through improper storage and use of materials and from soil erosion. As discussed in Section 5.6, Agriculture and Soils, soil erosion during the operation of the Project will be minor due to implementation of the BMPs. Adhering to proper material storage and handling procedures and complying with the General Industrial Stormwater NPDES Permit and Project SWPPP will result in impacts to water quality that are less than significant. An operational SWPPP will be developed for the operation of the facility; however, operational BMPs that would be included in the SWPPP have been outlined in the DESCP (Appendix A). The SWPPP will identify BMPs to mitigate pollutants and conditions of concern including spill and leak prevention, waste handling, and employee training. Through compliance with the General Industrial Stormwater NPDES Permit, all potential pollutants generated during the industrial phase will be sufficiently mitigated such that water quality standards will not be violated. Thus, surface water quality impacts during the operations phase will be less than significant.

Drainage Design

Under operation conditions, it is proposed to divert the off-site watershed in three channels (refer to Appendix A, DESCP):

- Flows from the sub-basin 1 (northwestern) will be diverted through a channel on the west side of the west 125 MW module.
- Flows from sub-basin 2 (north) will be diverted through a channel between the two 125 MW modules.
- Flows from sub-basin 3 (north-eastern) will be diverted though a channel along the east side of the east 125 MW module.

All these three main channels will divert flows downstream of the Site following their existing drainage paths, causing no impact to the site. The main purposes of the diversion are to prevent interaction with off-site storm water and on-site storm water which will:

- Allow natural groundwater recharge of the off-site storm water with no contact with the changed flow conditions of the on-site water.
- Protect the site infrastructure from flash flood events, which have the potential to damage the solar parabolic troughs.
- Control treatment of the on-site flows from the solar collector array (location of heat transfer fluid within the solar parabolic troughs).
- Protect the site from upstream sediment loading.
- Control on-site flows in detention basin to ensure there is no increase in post-developed flow discharging from the site, minimizing the impact on downstream drainage features (lake playas etc).
- Maximize the developable area within the solar field.

A comprehensive system of controls including operations phase BMPs will be used to manage storm water runoff and to control erosion and sedimentation. The controls will be detailed in an Industrial SWPPP document prepared for the Project.

Soil scour and deposition will be evaluated during the detailed design and the channel slope will provide water velocities within the channel that will not create an excessive amount of scour or deposition. If necessary, gabion or rip rap drop structures will be used to form a channel with the proper gradient. Additionally, rock check dams and rip rap pads will be used to control erosion where higher flows are expected. Silt fencing and/or fiber rolls will also be used within the channel, but only where expected flows are minimal, such as along the top edge, where the drainage area in minimal.

Sheet flow in the solar field will be managed through the construction of internal drainage facilities that will route water to the south west, directing it towards a detention pond which then discharges stormwater as sheet flow into the downstream ephemeral drainage system. The power block will drain via sheet flow away from equipment foundations to the solar field. Local area containments will be provided around certain locations, such as oil-filled transformers and chemical storage areas. The water from these areas and from other plant drains will be sent to an on-site oil-water separator and then added to the plant cooling water.

5.4.2.3 Water Supply Impacts

The only water supplies currently available in Chuckwalla Valley are groundwater supplies. The potential impacts of the project on groundwater supplies are discussed in Section 5.4.2.1, and are considered less than significant.

5.4.2.4 Wastewater Treatment Impacts

There will only be wastewater treatment impacts during operation of the site. Wastewater is segregated into two separate collection systems, one for industrial streams and the other for sanitary wastes. Industrial wastewater from the water supply pre-treatment and post-treatment systems will be discharged into three 8-acre evaporation ponds (total combined pond top area of 24 acres) for disposal for each 125 MW unit (refer to Section 3.0, Facility Description and Location for information on the water treatment process). There will be 48 acres (top pond area) of evaporation ponds on the Project site to cater for both 125 MW units.

On average, blowdown to the evaporation ponds will be approximately 90,000 gallons per day (182 gpm) for both units, increasing to 162,000 gallons per day (215 gpm) during peak summer conditions. Water balances for peak and annual instantaneous rates are included in Section 3.0, Facility Description and Location.

Multiple ponds are planned to allow plant operations to continue in event that a pond needs to be taken out of service for some reason, *e.g.,* needed maintenance. Each pond will have enough surface area so the evaporation rate exceeds the cooling tower blowdown rate at maximum design conditions and at annual average conditions.

The average pond depth is eight feet and residual precipitated solids will be removed approximately every seven years to maintain a solids depth no greater then three feet for operational and safety purposes. The precipitated solids will be sampled and analyzed to meet the characterization requirements of the receiving disposal facility. The characteristics of the precipitated solids will determine the transportation and disposal methodology. It is anticipated the pond solids and other non-hazardous wastes would be classified as Class II non-hazardous industrial waste. Genesis Solar will test the pond solids using appropriate test methods in advance of removal from the evaporation ponds to confirm this determination however preliminary estimates show the material will be non-hazardous. Approximately 7,150 tons of evaporative residue will be accumulated yearly, which equates to approximately 50,000 tons of evaporative residue being removed during each cleanout and a total amount of 214,500 tons over 30 years.

The Water Discharge Requirement (WDR) permit obtained from the Colorado Regional Water Quality Control Board (RWQCB) in coordination with the California Energy Commission (CEC) will require the preparation of a Water Quality Monitoring and Response Plan that includes monitoring of the Project pond liner to detect leaks, as well as groundwater monitoring. Groundwater monitoring will be done using existing wells where possible and may include additional monitoring wells as needed to provide adequate monitoring of groundwater quality.

Sanitary wastewater from sinks, toilets, and other sanitary facilities is handled on site by a septic system and leach field that will be permitted under a WDR from the RWQCB. Other water streams like plant drains and other miscellaneous water waste streams are collected and recycled back into the cooling towers. No water quality impacts from the treatment and discharge of these small quantities of wastewater to the evaporation pond is expected. Table 5.4-13 shows the estimated constituent concentrations for various waste streams within the plant and the discharge to the evaporation ponds.

Table 5.4-13: Predicted Chemistry of Wastewater Stream

	Makeup Water (as mg/L)	Cooling Tower Blowdown	Three Streams that feed into the Evaporation Ponds			Combined Discharge to Evaporation Pond
Arsenic	0.009	0.006	0.009	0.030	0.114	0.089
Barium	0.03	0.02	0.03	0.11	0.41	0.32
Calcium	66	42	66	213	818	641
Chloride	2,300	1,449	2,300	7,408	28,496	22,349
Dissolved Silica	15	9	15	48	186	146
Fluoride	1.1	0.7	1.1	3.5	13.6	10.7
Iron	0.46	0.29	0.46	1.48	5.70	4.47
Magnesium	14	9	14	45	173	136
Manganese	0.03	0.02	0.03	0.09	0.36	0.28
Molybdenum	0.2	0.15	0.24	0.77	2.97	2.33
Nitrate	0.50	0.31	0.50	1.61	6.19	4.86
Potassium	12	8	12	39	149	117
Sodium	1,500	945	1,500	4,831	18,585	14,575
Sulfate	810	510	810	2,609	10,036	7,871
TDS	5,000	3,150	5,000	16,105	61,948	48,584
Total Alkalinity (as CaCO3)	150	94	150	483	1,858	1,458
Total Hardness (as CaCO3)	220	139	220	709	2,726	2,138
pH	7.80	8.20				
Specific Cond (uS/cm@25C)	8,800	5,543	8,800	28,345	109,029	85,508

5.4.2.5 Compliance with California State Water Policy and Water Rights

The Project proposes to pump groundwater containing over 1,000 mg/L TDS for use as a wet cooling water supply. The use of brackish water for power plant cooling is consistent with California State Water Policy as articulated in SWRCB Resolution 75-58. Other alternative water sources considered include raw water, reclaimed wastewater or irrigation return water obtained from the vicinity of Blythe.

As explained further in Section 3.0, the use of these water resources for the Project is environmentally unsound. Specifically, there would be impacts from additional land disturbance, the use of alternative water supplies would conflict with SWRCB resolutions or policies, and/or there would be an increase in impacts to allocation of Colorado River water resources. Additionally, there would be an unsustainable increase in Project construction and pumping costs and decreased net plant electrical output due to increased pumping loads.

In addition to using on-site groundwater, Genesis Solar, LLC is continuing to explore options that may utilize local industrial facility treated wastewater. Due to the limited quantity of treated water, this would be pursed in order to supplemental the groundwater source. Genesis Solar, LLP is currently investigating a possible agreement with Chuckwalla Valley State Prison to treat the obtained reclaimed wastewater from that facility; however, the amount of water available will be insufficient to meet the Project needs.

As discussed in detail in Section 3.0, the Project underlies the Palen Valley and the Chuckwalla Valley in eastern Riverside County, within the Chuckwalla Valley Groundwater Basin. The Chuckwalla Valley Groundwater Basin is in an unadjudicated groundwater basin, and thus, the owners of the Project have the right to pump percolating groundwater from the basin for reasonable and beneficial use. Given that the Project property is owned by the Bureau of Land Management (BLM), and agency of the United States Government, and likely has since California became a state, it is highly unlikely that the Project property's water rights have been reserved or severed (Best Best & Krieger, 2009).

As the Project is in the Chuckwalla Valley Groundwater Basin, being in an unadjudicated groundwater basin, the Project will receive water rights in accordance with California Water Code, Division 2 of Part 5.

5.4.3 Mitigation Measures

The following mitigation measures will be implemented to ensure the Project will not have significant impacts on water resources. Water quality will be protected through implementation of the SWPPP and DESCP for construction and operations. To ensure that no significant adverse effects to water quality or supply are caused by the Project, Genesis Solar, LLC proposes the following mitigation measures during construction and operation.

5.4.3.1 Construction

WTR-1: The Project owner will comply with the requirements of the general National Pollution Discharge Elimination System (NPDES) permit for discharge of storm water associated with construction activity. Prior to site mobilization, the Project owner will develop and obtain Compliance Project Manager (CPM) approval of a Storm Water Pollution Prevention Plan (SWPPP) for the construction of the site. The SWPPP will be implemented by the project owner to meet NPDES requirements.

WTR-2: The Project owner will obtain final WDRs issued from the Colorado River RWQCB by the CEC for the project's proposed wastewater discharge.

WTR-3: The Project owner will obtain permits for construction of sanitary waste disposal facilities such as septic systems and leach fields prior to construction of the plant. A copy of the permits will be provided to the CEC CPM 60 days prior to the beginning of construction activities.

WTR-4: The Project owner will obtain monitoring well permits from Riverside County and install a monitoring well network around the evaporation ponds at the Site consistent with the WDRs issued from the Colorado River RWQCB by the CEC.

5.4.3.2 Operation

WTR-5: The Project owner shall comply with the requirements of the general NPDES permit for discharge of storm water associated with industrial activity. Prior to commercial operation, the project owner shall develop and obtain CPM approval of a SWPPP for the operation of the Project site. The SWPPP will be implemented by the Project owner to meet NPDES requirements.

WTR-6: The Project owner will record on a monthly basis the amount of groundwater pumped by the project. This information will be supplied to the CEC and the State Water Resources Control Board delegated agency in accordance with the Groundwater Recordation Program as required.

WTR-7: The Project owner will measure groundwater levels in the onsite monitoring wells on a monthly basis for the first six months following the project start up and thereafter on a semi-annual basis during spring and fall, and submit periodic monitoring reports to the CEC.

WTR-8: The Project owner will sample groundwater quality monitoring wells consistent with the WDRs issued from the Colorado River RWQCB by the CEC.

5.4.4 Significant Unavoidable Adverse Impacts

Based on the analysis presented in this section, there are no significant and unavoidable groundwater, water supply, waste water treatment, surface water quality and flooding impacts associated with the construction or operation of the proposed project.

5.4.5 Cumulative Impacts

The potential for cumulative water resources impacts exists where there are multiple individual existing or reasonably foreseeable projects in an area that, when considered cumulatively with the Project, could result in an impact to water resources. For example, projects with overlapping construction schedules and/or operations collectively could result in a demand for water that cannot be met by the Project area water supply resources or could result in water quality impacts to surface or groundwater resources. Three projects, the Chuckwalla Valley State Prison wastewater treatment facility improvements, the Blythe Energy Project Phase II Transmission Project and Chevron 1 Solar Energy Project, have been identified within the Project area as projects to consider cumulatively for potential impacts.

As discussed above, the Project proposes to use groundwater as its primary water source during construction and operation. The Chuckwalla Valley State Prison wastewater treatment facility improvements project does not propose to use additional groundwater as a supply for water during construction of the improvements to their facilities nor does the facility anticipate an expansion to the

facility which would require additional groundwater use above their current peak usage. The Chevron 1 Solar Energy Project is in early stages of the environmental review process therefore water use data are unavailable. Transmission line projects are not generally heavy consumers of water and no significant impacts to groundwater supply should be expected with the Blythe Energy Project Phase II Transmission Project. Therefore, when considered cumulatively with the projects proposed in the Project area, the Genesis Solar Energy Project will not contribute to a significant cumulative water supply impact.

The cumulative impacts on surface water quality associated with the Genesis Solar Energy Project are expected to be less than significant. The other cumulative projects each would be required to comply with the requirements of the California Storm Water Permitting Program, as would Genesis Solar Energy Project. Further, the location of construction activities for the Chevron 1 Solar Energy Project, the Blythe Energy Project Phase II Transmission Project and the Chuckwalla Valley State Prison wastewater treatment facilities upgrade projects are sufficiently separated from the Genesis Solar Energy Project site such that runoff from the various projects would not cause significant cumulative effects.

5.4.6 Applicable Laws, Ordinances, Regulations, and Standards (LORS)

Federal, State, County and local LORS applicable to water resources are summarized on Table 5.4-14 and discussed in text following the table. Some of these LORS are also applicable to the *Waste Management* section.

Table 5.4-14: LORS Applicable to Water Resources

LORS	Applicability	Where Discussed in AFC
Federal:		
Clean Water Act (CWA), Section 402, 33 USC Section 1342; 40 CFR Parts 112, 122 through 136	The objective of the CWA (1977) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The CWA regulates both direct and indirect discharges, including storm water discharges from construction and industrial activities.	Section 5.4.6.1
State:		
California Constitution, Article 10, Section 2	Prohibits waste or unreasonable use of water, regulates use and of diversion of water, and requires conservation and reuse of water to the maximum extent possible.	Section 5.4.6.2
The Porter-Cologne Water Quality Control Act, California Water Code Section 13000 et seq.	Requires the SWRCB and the nine RWQCBs to adopt water quality criteria to protect State waters, including identification of beneficial uses, narrative and numerical water quality standards, and implementation procedures. These are presented in Water Quality Control Plans (Basin Plans) for each RWQCB.	Section 5.4.6.2

Table 5.4-14: LORS Applicable to Water Resources

LORS	Applicability	Where Discussed in AFC
Federal CWA, implemented by the State of California - California Storm Water Permitting Program: California Construction Storm Water Program, California Industrial Storm Water Program	Construction activities that disturb equal to or greater than one acre are required to obtain coverage under California's General Construction Permit, which requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). Industrial activities with the potential to impact storm water discharges are required to obtain a NPDES permit for those discharges.	Section 5.4.6.2
California Water Code Section 461	Stipulates primary interest of the people of the state is conservation of available water resources. Requires the maximum reuse of reclaimed water.	Section 5.4.6.2
California Water Code Section 1200 – Water Rights	Defines California water rights as in one of three categories: surface water, percolating groundwater, and "subterranean streams that flow through known and definite channels". Percolating groundwater has two sub-classifications: overlying land use, and surplus groundwater. Land owners overlying percolating groundwater share a right to reasonable use of the groundwater aquifer but, cannot take unlimited quantities without regard to the needs of other users.	Section 5.4.6.2
California Water Code Section 13260 et seq.	Requires filing with the appropriate RWQCB a Report of Waste Discharge that could affect the water quality of the state, unless the requirement is waived pursuant to California Water Code section 13269 (a). RWQCB has the authority to issue Waste Discharge Requirements (WDRs) for construction and industrial stormwater activities.	Section 5.4.6.2
California Water Code Sections 13550, 13551, 13552.6.	Requires the use of recycled water for industrial purposes subject to recycled water availability, quality, quantity, cost, public health impacts. Prohibits use of potable domestic quality water for non-potable uses if suitable recycled water available and allows public agency to require use of reclaimed water in cooling towers if availability and other criteria are met.	Section 5.4.6.2
California Water Code Section 13571	Requires well completion report for constructing, altering, or destroying a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well.	Section 5.4.6.2
State Water Resources Control Board Resolution 75-58	Encourages the use of wastewater for power plant cooling and sets an order of preference for water use for cooling purposes.	Section 5.4.6.2
State Water Resources Control Board Resolution 77-01	Encourages reclamation and reuse of water in water-short areas. Reclaimed water will replace or supplement the use of fresh water or better quality.	Section 5.4.6.2

Table 5.4-14: LORS Applicable to Water Resources

LORS	Applicability	Where Discussed in AFC
State Water Resources Control Board Resolution 88-63	Designates all groundwater and surfaces waters of the States drinking waters except where the total dissolved solids are greater than 3,000 milligrams per liter, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices of best economically achievable treatment practices.	Section 5.4.6.2
California Code of Regulations, Title 23, Division 3, Chapter 9 and Chapter 15	Establishes requirements for waste discharge report and requirements specifying conditions for protection of water quality. Outlines classification and siting and construction criteria for waste management units and discharges of waste to land. Provides guidance for surface impoundments and Land Treatment Units, also stipulates operational and maintenance procedures to minimize mobility of waste materials.	Section 5.4.6.2
California Code of Regulations, Title 27, Division 2, Chapter 3 and 4	Provides guidance for surface impoundments and Land Treatment Units.	Section 5.4.6.2
California Code of Regulations, Title 22 Sections 64400.80 through 64445	Requires periodic monitoring of water quality for potable water wells (non-transient, non-community water systems).	Section 5.4.6.2
Public Resources Code, Section 25300 et seq., 25523(a)	The CEC will approve the use of "fresh inland" water for cooling purposes by power plants only under certain circumstances. Requires submission of information to the CEC concerning proposed water resources and water quality protection in the AFC.	Section 5.4.6.2
Local:		
Riverside County Ordinance 682	Describes requirements for permitting, siting, constructing and destroying groundwater wells.	Section 5.4.6.3
Riverside County Ordinance 650.5	Describes general management requirements, installation regulation, cleaning and termination or abandonment of onsite water treatment systems	Section 5.4.6.3

5.4.6.1 Federal Authorities and Administering Agencies

Clean Water Act of 1977 (including 1987 amendments) Sections 402 and 402, 33 USC Section 1342; 40 CFR Parts 112, 122 – 136

The primary objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's surface waters. Pollutants regulated under the CWA

include “priority” pollutants, including various toxic pollutants; “conventional” pollutants, such as biochemical oxygen demand, total suspended solids, oil and grease, and pH; and “non-conventional” pollutants, including any pollutant not identified as either conventional or priority.

The CWA regulates both direct and indirect discharges. The National Pollutant Discharge Elimination System (NPDES) Program (CWA §502) controls the direct discharges and storm water discharges into waters of the United States. NPDES permits contain industry-specific, technology-based limits and may also include additional water quality-based limits, and establish pollutant-monitoring requirements. A NPDES permit may also include discharge limits based on Federal or State water quality criteria or standards. In 1987, the CWA was amended to include a program to address storm water discharges for industrial and construction activities. The Colorado Regional Water Quality Control Board (RWQCB) administers both the NPDES and storm water discharge permits under the CWA in the Project area.

A waters survey has concluded that there are no wetlands meeting the definition found in the USACE Wetlands Delineation Manual (1997) traversed by any portions of the Project site. However, ephemeral washes traverse the Project area and linear facility routes and would be potentially affected during construction and operation (see Sections 5.3.4 and 5.3.6.5.2).

5.4.6.2 State Authorities and Administering Agencies

State of California Constitution Article 10, Section 2

Article 10, Section 2 prohibits the waste or unreasonable use of water, regulates the method of use and method of diversion of water and requires all water users to conserve and reuse available water supplies to the maximum extent possible.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act of 1967, Water Code Section 13000 *et seq.* requires the State Water Resources Control Board (SWRCB) and the nine RWQCBs to adopt water quality criteria to protect State waters. Those criteria include the identification of beneficial uses, narrative and numerical water quality standards, and implementation procedures. Water quality criteria for the proposed project area are contained in the Water Quality Control Plan for the Colorado River Basin - Region 7 (Basin Plan) which was adopted in 1993 and is in the process of being amended. This plan sets numerical and/or narrative water quality standards controlling the discharge of wastes to the State’s waters and land.

California Storm Water Permitting Program

California Construction Storm Water Program. Construction activities that disturb equal to or greater than one acre are required to obtain coverage under California’s General Permit for Discharges of Storm Water Associated with Construction Activity, Water Quality Order 99-08-DWQ (General Construction Permit CAS 000002). Activities subject to permitting include clearing, grading, stockpiling, and excavation.

The General Construction Permit requires the development and implementation of a SWPPP that specifies BMPs that will reduce or prevent construction pollutants from leaving the site in storm water runoff and will also minimize erosion associated with the construction project. The SWPPP must contain site map(s) that show the construction site perimeter; existing and proposed structures and roadways; storm water collection and discharge points, general topography both before and after

construction; and drainage patterns across the site. Additionally, the SWPPP must describe the monitoring program to be implemented.

California Industrial Storm Water Program. Industrial activities with the potential to impact storm water discharges are required to obtain a NPDES permit for those discharges. In California, an Industrial Storm Water General Permit, Order 97-03-DWQ (General Industrial Permit CAS 000001) may be issued to regulate discharges associated with 10 broad categories of industrial activities, including electrical power generating facilities. The General Industrial Permit requires the implementation of management measures that will protect water quality. In addition, the discharger must develop and implement a SWPPP and a monitoring plan. Through the SWPPP, sources of pollutants are to be identified and the means to manage the sources to reduce storm water pollution described. The monitoring plan requires sampling of storm water discharges during the wet season and visual inspections during the dry season. A report must be submitted to the RWQCB each year by July 1 documenting the status of the program and monitoring results.

California Water Code

Section 461. Stipulates that the primary interest of the people of the State of California is the conservation of all available water resources and requires the maximum reuse of reclaimed water as an offset to using potable resources.

Section 1200 "Water Rights". The law in California requires that water be identified as in one of three categories: surface water, percolating groundwater, and "subterranean streams that flow through known and definite channels". Only surface water and subterranean stream water are within the permitting jurisdiction of the SWRCB. Appropriation of those waters requires a SWRCB permit, and is subject to various permit conditions.

Water subject to appropriation is defined in Water Code Section 1201, as "all water flowing in any natural channel", except water that is or may be needed for use upon riparian land or water that is otherwise appropriated. The SWRCB's authority over groundwater extends only to the water in un-appropriated subterranean streams that flow through known or define channels, except as it is or may be reasonably be needed for useful and beneficial purposes upon lands riparian to the channel through which it is flowing. In establishing whether there is a condition of subterranean streams, the SWRCB uses a finding that there must be evidence of bed and banks and water flowing along a line of a surface stream (Sax, 2002). Based on a review of the subsurface conditions, there is no evidence to support that the groundwater is flowing in subterranean streams, and as such, there is no permit required for appropriation from the SWRCB.

"Percolating groundwater" has two sub-classifications: overlying land use, and surplus groundwater. Land owners overlying percolating groundwater may use it on an equal basis and share a right to reasonable use of the groundwater aquifer. In this right, a user cannot take unlimited quantities without regard to the needs of other users. Surplus groundwater may be appropriated for use on non-overlying lands, provided such use will not create an overdraft condition.

Water rights in California can be held by any legal entity. There are no restrictions on who can hold water rights, thus the owner can be an individual, related individuals, non-related individuals, trusts, corporations and/or government agencies. Water rights are considered real property (they can be owned separately from the land on which the water is used or diverted) and can be transferred from one owner to another (SWRCB 2007 WRIMIS internet reference).

Section 13260 et seq. Requires filing with the appropriate RWQCB a report of waste discharge (ROWD) that could affect the water quality of the State, unless the requirement is waived pursuant to Water Code section 13269 (a). The report shall describe the physical and chemical characteristics of the waste that could affect its potential to cause pollution or contamination. The report shall include the results of all tests required by regulations adopted by the board, any test adopted by the Department of Toxic Substances Control (DTSC) pursuant to Section 25141 of the Health and Safety Code for extractable, persistent, and bio-accumulative toxic substances in a waste or other material, and any other tests that the SWRCB or RWQCB may require.

Section 13550. Requires the use of recycled water for industrial purposes subject to recycled water being available and upon a number of criteria including provisions that the quality and quantity of the recycled water are suitable for the use, the cost is reasonable, the use is not detrimental to public health, and the use will not impact downstream users or biological resources.

Section 13551. A person or public agency, including a State agency, city, county, city and county, district, or any other political subdivision of the State, shall not use water from any source of quality suitable for potable domestic use for non-potable uses if suitable recycled water is available as provided in Section 13550.

Section 13552. Specifically identifies the use of potable domestic water for cooling towers is an unreasonable use of water within the meaning of Section 2 of Article 10 of the California Constitution, if suitable recycled water is available and the water meets the requirements set forth in Section 13550.

Section 13571. Requires that anyone who constructs, alters, or destroys a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well, file a well completion report with the DWR.

State Water Resources Control Board Resolution 75-58

On June 19, 1975, the SWRCB adopted the Water Quality Control Policy on the Use and Disposal of Inland Waters used for Power Plant Cooling. The purpose of the policy is to provide consistent statewide water quality principles and guidance for adoption of discharge requirements, and implementation actions for power plants that depend on inland waters for cooling. State policy encourages the use of wastewater for power plant cooling and sets the following order of preference for cooling purposes:

- Wastewater being discharged to the ocean;
- Ocean water;
- Brackish water or irrigation return flows;
- Inland waste waters of low total dissolved solids (TDS); and
- Other inland waters.

The criteria for the selection of water delivery options involves economic feasibility; engineering constraints, such as cooling water composition and temperature; and environmental considerations such as impacts on riparian habitat, groundwater levels, and surface and subsurface water quality.

State Water Resources Control Board Resolution 77-01

On January 6, 1977, the SWRCB adopted the Policy with respect to Water Reclamation in California. The purpose of the policy was to encourage water reclamation projects which do not adversely impact vested water rights or unreasonably impair in stream beneficial uses or place an unreasonable burden on present water supply systems. The SWRCB and Regional Boards also encourage reclamation and reuse of water in water-short areas of the State, encourage water conservation measures which further extend the water resources of the State and encourage other agencies to assist in implementing the policy.

State Water Resources Control Board Resolution 88-63

On May 19, 1988, the SWRCB adopted the Policy entitled "Sources of Drinking Water", which was later revised by Resolution No. 2006-0008. The purpose was to provide sufficient detail to be incorporated into the RWQCB Water Quality Control Plans (Basin Plan) to judge clearly what is or is not a source of drinking water for various purposes. All surface and ground waters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Boards with the exception of surface and ground waters where:

- The TDS exceed 3,000 mg/L (5,000 uS/cm, electrical conductivity) and it is not reasonably expected by RWQCB to supply a public water system, or
- There is contamination, either by natural processes or by human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable treatment practices, or
- The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

Any body of water which has a current specific designation previously assigned to it by a RWQCB may retain that designation at the RWQCB's discretion. Where a body of water is not currently designated as MUN but, in the opinion of a Regional Board, is presently or potentially suitable for MUN, the RWQCB shall include MUN in the beneficial use designation.

California Code of Regulations

Title 23, Waters, Division 3, Chapter 9. Requires the RWQCB issue a report of waste discharge for discharges of waste to land pursuant to the Water Code. The report requires submittal of information regarding the proposed discharge and waste management unit design and monitoring program. Waste Discharge Requirements (WDRs) issued by the RWQCB provide construction and monitoring requirements for the proposed discharge. The SWRCB has adopted general waste discharge requirements (97-10-DWQ) for discharge to land by small domestic wastewater treatment systems.

Title 23, Waters, Division 3, Chapter 15. Regulates all discharges of hazardous waste to land that may affect water quality. Class I Waste Management Units are required for hazardous waste, Class II Waste Management Units are for Designated Waste and Class III landfills are required for non-hazardous solid waste.

Title 27, Division 2, Chapter 3. Outlines siting design, waste classification and management, construction standards and quality assurance, liner design, precipitation and drainage control, seismic design, special requirements for surface impoundments and land treatment units, water monitoring requirements, operation procedures, closure and post-closure maintenance plan requirements.

Title 27, Division 2, Chapter 4. Outlines documentation and reporting requirements for Waste Discharge Requirements (WDR's) and Solid Waste Facility Permits.

Title 22, Article 3, Water Wells, Sections 64400.80 through 64445. Require monitoring for potable water wells, defined as non-transient, non-community water systems (serving 25 people or more for more than six months); the Project will employ 40-50 fulltime equivalent workers during full scale operation. Regulated wells must be sampled for bacteriological quality once a month and the results submitted to the California Department of Health Services (DHS). The wells must also be monitored for inorganic chemicals once and organic chemicals quarterly during the year designated by the DHS. DHS will designate the year based on historical monitoring frequency and laboratory capacity.

Public Resources Code

Section 25300 et seq. In the 2003 "Integrated Energy Policy Report", consistent with SWRCB Policy 75-58 and the Warren-Alquist Act, the CEC adopted a policy stating they will approve the use of "fresh inland" water for cooling purposes by power plants only where alternative water supply sources and alternative cooling technologies are shown to be "environmentally undesirable" or "economically unsound."

Section 25523(a). The Public Resources Code provides for the inclusion of requirements in the CEC decision on an Application for Certification (AFC) to assure protection of environmental quality and requires submission of information to the CEC concerning proposed water resources and water quality protection.

The administering agencies for the State LORS are the CEC, the SWRCB, and the Colorado RWQCB. The Project will comply with the applicable State LORS related to water use and quality during construction and operation.

5.4.6.3 Local Authorities and Administering Agencies

Riverside Ordinance Code, 682: Construction, Reconstruction, Abandonment and Destruction of Wells

This ordinance provides minimum standards for construction, reconstruction, abandonment, and destruction of all wells. Permits shall be issued after compliance with the standards provided and incorporated by reference in this ordinance. Plans shall be submitted to the Department demonstrating compliance with such standards.

Standards for the construction, reconstruction, abandonment, or destruction of wells shall be the standards recommended in the Bulletins of the California Department of Water Resources as follows: Bulletin NO 74-81 Chapter II Water Wells, and Bulletin NO 74-90 (Supplement to Bulletin 74-81) and as these Bulletins may be amended by the State of California from time to time.

Water from all new, repaired, and reconstructed community water supply wells, shall be tested for and meet the standards for constituents required in the California Code of Regulations, Title 22, *Domestic Water Quality and Monitoring.*

Riverside Ordinance Code, 650.5 – Septic System

This ordinance regulates the discharge of sewage in the unincorporated areas of Riverside Country. An on-site water treatment system (OWTS) means any individual or community onsite wastewater treatment, pretreatment and dispersal system including, but not limited to, a conventional or alternative OWTS having a subsurface discharge. An application must be submitted to the Riverside

Country Department of Environmental Health for approval. All new or repaired Alternative OWTS shall be subject to an annual operating permit.

5.4.7 Involved Agencies and Agency Contacts

Agencies involved include the Colorado RWQCB (WDRs, storm water permitting) and Riverside County (groundwater well and septic system permits). Contacts for these agencies are provided in Table 5.4-15.

Table 5.4-15: Water Resources Agencies and Contact Information

Contact	Phone/Email	Permits/Issue
Herbert Jackson Cliff Raley Senior Water Resources Control Engineer Colorado River Basin Region (7) Colorado River Basin RWQCB 73-720 Fred Waring Drive, Ste., 100 Palm Desert, CA 92260	(760) 776-8963 hjackson@waterboards.ca.gov craley@waterboards.ca.gov	Waste Discharge Requirements, Storm Water Pollution Prevention Plans
Jackie Jones County of Riverside Department of Environmental Health 38686 El Cerrito Road Palm Springs, CA 92211	(760) 393-3390 jjones@co.riverside.ca.us	Groundwater Supply Well Permits
Riverside County Department of Environmental Health 38-686 El Cerrito Road Palm Desert, CA 92211 (760)-393-3390 http://www.rivcoeh.org/opencms/rivcoeh/ProgServices/ERM_Program/Land_Use.html		Septic System

5.4.8 Permits Required and Permit Schedule

Water resources-related permits include a WDR as part of the proposed effluent discharge to onsite evaporation ponds; per discussions with RWQCB staff (July 22nd 2009 Meeting with Applicant and Cliff Raley and Herbert Jackson), this WDR is expected also to cover the bioremediation land treatment unit associated with treatment of soil from cleanup of spills of heat transfer fluid (HTF). Storm water permits also are required for the construction and operation of the facility.

Groundwater produced from onsite wells will be used for plant cooling, other process and domestic uses. Onsite wells require well installation permits prior to construction and will be classified, permitted, installed and inspected in accordance with Riverside County Department of Environmental Health Well Installation Ordinances and associated permitting requirements.

Table 5.4-16 lists the water related permits that are required for the Project. This table also provides the schedule for when applications for these permits are needed.

Table 5.4-16: Required Water Resources Permits and Schedule

Permit/Approval	Schedule
WDR, Evaporation Ponds, Bioremediation Land Treatment Unit	WDR's from the Colorado RWQCB is required for discharge of effluent to the evaporation ponds. The WDR application will be submitted with the AFC submittal and the permitting process is expected to take six to nine months. WDR's will either be provided directly by the RWQCB or through the CEC Conditions for Certification. One permit application will be prepared that includes the evaporation ponds, bioremediation land treatment unit.
Notice of Intent (NOI) - Construction Phase Storm Water Permit	A Construction General Permit is required. A SWPPP that specifies BMPs will identify measures to reduce or prevent construction pollutants from leaving the site. The NOI will be submitted shortly prior to commencing construction. It is anticipated that the NOI will be secured within one month of submittal.
Storm Water Pollution Prevention Plan Operations Phase Storm Water Permit	An Industrial General permit will be required for the Project operations phase. A separate SWPPP is required that outlines the monitoring and reporting plan, along with BMPs for the facility. The permit application package will be submitted to the RWQCB prior to commencing operations.
Well Permits	Well permits will be needed for the construction of supply or monitor wells. These permits are ministerial and obtaining them is not a lengthy or complicated process. This will be done after AFC submittal. Wells not used for supply or to monitor pumping will be constructed consistent with Riverside County and DWR requirements.
Septic System	Permitting of the septic system would be through the Riverside County Department of Environmental Health. This will be done prior to the start of construction. It is anticipated that it would take one to two months to complete the permitting of the septic system.

5.4.9 References

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