DOCKET	
09-AFC-7	
DATE	MAR 11 2010
RECD.	MAR 15 2010

March 11, 2010

Alan Solomon
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

RE: **Palen Solar Power Project, Docket No. 09-AFC-7**
Responses to January 14, 2010 CEC Workshop Queries (Groundwater)
Technical Areas: Soil & Water Resources

Dear Mr. Solomon:

During the January 14, 2010, CEC Workshop staff requested additional information and clarification on several matters in the technical area of Soil and Water Resources and specific to local groundwater issues. Attached please find our responses to those specific questions.

If you have any questions on these data responses to the staff's workshop queries, please feel free to contact me directly.

Sincerely,

Alice Harron
Senior Director, Development

Responses to CEC Workshop, January 14, 2010

Soil and Water Resources (Groundwater)

Palen Solar Power Project

Docket No. 09-AFC-7

Alice Harron
Senior Director of Project Development
1625 Shattuck Avenue, Suite 270
Berkeley, CA 94709-1161

Groundwater Data Responses to January 14, 2010 CEC Workshop Queries – Palen Solar Power Project

Is RO permissible for dust control?

In an email to Paul Marshall of the CEC on February 11, 2010, Jennie Snyder of the Colorado River Regional Water Quality Control Board (RWQCB) indicated the discharge of RO brine for dust control would not be allowed. Solar Millennium is planning to have additional discussion of the decision with the RWQCB, though for the time being alternative options for brine management are being considered. In the event that the brine is managed using an evaporation pond or for any discharge of brine to land, the Board will require a Report of Waste Discharge (ROWD). Further, the RWQCB will also require a ROWD for the discharge to the septic and leach field even though the County of Riverside will permit the septic systems for the Project. This is because the proposed discharge is in excess of 5,000 gallons per day, and as per protocol the County would refer the project to the RWQCB who would require a ROWD. The ROWD for septic will be prepared in conjunction with the RO brine discharge ROWD and will be submitted upon determination by Solar Millennium of the brine management option.

Further discussion of where the LTU leachate/runoff will be discharged/disposed and analysis required prior to discharge (DR-S&W-199).

Excess wastewater or rain fall may occasionally accumulate in the land treatment unity (LTU). The LTU has been constructed with 2-foot high berms such that storm water will not drain into or from the LTU. Based on the frequency of storms in the area, it is anticipated that accumulation of rainwater within the containment would occur on a yearly basis. Each LTU is designed with a sump which will collect storm water runoff and/or leachate within the bermed area. Any storm water that accumulates within the LTU will be sampled for HTF (biphenyl and diphenyl ether) and amendment constituents (i.e., nitrate, phosphate, TDS). Sampling of the storm water will be conducted within 24 hours of the storm event and laboratory analyses will be run on a 24-hour turn-around-time. Standing water will be removed from the LTU within 48 hours. Following analytical results, free liquids will either be used as raw water feed in the process supply or removed using a vacuum truck. If HTF is not detected above the practical quantitation limit (PQL) and amendment concentrations are at or near background groundwater concentrations and below State of California primary or secondary maximum contaminant levels the water may be used as raw water feed in the plant process. If HTF is detected and amendment concentrations exceed background or drinking water standards, the waste will be properly disposed of at a licensed treatment storage and disposal facility.

Update the runoff recharge estimates (DR-S&W-194) to reflect 2, 5, and 10% of total calculated runoff value. Use the Basin inflow/outflow example from Genesis (WorleyParsons 2009b).

A revision to the water balance provided in the January 6, 2010 response to Data Request (DR)S&W-194 for the Chuckwalla Valley Groundwater Basin (Basin) was made to reflect a change in the estimate of infiltration from precipitation after Hely and Peck (1964) and to reflect the results of fieldwork in the northern portion of Palen Dry Lake completed by WorleyParsons (2009b). No other changes were made to the water balance estimates included in the January 6 response to DR-S&W-194.

In revising the infiltration estimate, the first step was to overlay the average annual isoheytal contours shown on Figure 6 from Hely and Peck (1964) onto the topography of the Chuckwalla Valley Groundwater Basin (Basin) (Figure DR-S&W-194-1 [rev1]). The second step was to multiply the average annual precipitation within each contour times the area of the contour to derive an estimate of total precipitation in acre-feet for the Basin. Lastly, the total within each contour is multiplied by percentages of 3%, 5% and 10% representing an estimate of infiltration from precipitation within the contour and summing the individual areas to a total annual infiltration volume (acre-feet) for the Basin. Table DR S&W-194-1 (rev1) presents the estimate of total annual infiltration for the Chuckwalla Valley Groundwater Basin for these estimates of infiltration which vary from about 8,600 acre-feet (3%) to 28,600 acre-feet (10%). The infiltration estimate of 3% of precipitation compares favorably to the value estimated by WorleyParsons (2009a, Table DR-151-2) of 9,440 acre-feet.

In addition to changes made to the estimate of infiltration, the estimate of evapotranspiration (ET) and discharge through Palen Lake was revised, as the prior estimate appears to have been overly conservative. In the water balance provided on January 6, 2010, a discharge estimate of between about 1,000 and 2,000 acre-feet per year was provided under the assumption of ET rates of four to six inches, that shallow groundwater was present below the entirety of Palen Lake (4,260 acres), and with the entire lake acting as a wet playa. This estimate has been revised to reflect field work completed by WorleyParsons (2009b), and the mapping provided by Steinemann (1989) whose data suggests that water may be present at shallow depths below only about one half of the dry lake. In their investigation of Palen Lake in December 2009 (WorleyParsons 2009b), shallow hand-augured borings dug in the northern part of the lake encountered groundwater at a depth of about 8 feet below ground surface. In general, with uniform fine-grained soil conditions, at this depth, groundwater can discharge through capillary action and evaporation through a playa to a depth of about 10 feet (Lohman 1972, Todd 1980). Water level data from 1989 tend to corroborate shallow groundwater conditions below the north part of the lake (Steinemann 1989). However, water level contours suggest groundwater is present at depth of about 20 to 25 feet below the central and southern part of the lake. This suggests that only a portion of the lake, may be acting as a wet playa rather than the entire lake.

From their field survey of salt occurrence, results of the shallow boring program, and the absence of vegetation, Worley Parsons (2009b) concluded that 2,000 acres or about one-half of Palen Lake could be acting as a wet playa. Using Franklin Playa in Death Valley (Czarnecki 1997) as a model and revising the estimates of ET reported at Franklin considering the differences in water level data between the two areas, and adjusting for conditions in seasonality, WorleyParsons (2009b) concluded that about 350 acre feet per year (afy) could be discharging through the playa. This appears to be a reasonable estimate given that many of the features attributable to wet playas are absent from Palen Dry Lake.

From these changes, Table DR-S&W-194-2(rev1) approximating the Basin water balance was updated. The results of the update under an assumption that mountain front recharge would be about 3% of precipitation within the Basin, shows that there is a net surplus of water of about 2,200 acre-feet in the Basin water balance without the Palen Solar Power Project (PSPP), and about 1,900 acre-feet with the PSPP. Given the changes in water balance, the forecast water budget for the Basin as shown in Table 5.17-12(rev1) was updated using the revised balance as the baseline for year 2010. In the revised forecast, the recharge and discharge elements were not changed over the baseline year. This provides a conservative estimate in the forecast in that water use in parts of the Basin may decline through reduction in agriculture and at the Ironwood prison (GEI 2009). The forecast shows that during the construction period between 2011 and 2013, the PSPP will be about 35% of the total renewable water (i.e., amount of water recharge) during that period, and about 5% of the total water demand. Following construction of the PSPP, the operational water supply of about 300 acre-feet/year will represent between 3% and 8% of the total renewable water use, depending on the pumping schedule from other projects in the Basin after 2013. During operation, PSPP water supply represents about 1% to 2% of the total estimated demand within the Basin.

The cumulative demand from all the current and expected future sources result in a net annual and cumulative water budget deficit for the Basin beginning in 2014 and extending through 2043. The maximum annual deficit is about 7,500 acre-feet, and is coincident with the onset of the proposed Eagle Crest Pump Storage project and the initial infilling of the lower ponds of the Eagle Crest project. Upon completion of all the proposed renewable projects, the annual deficit is about 1,300 acre-feet per year. Depending on the assumption of aquifer storativity, the cumulative decline in the average water level across the Basin after 30 is between less than about 0.5 foot and about 2 feet (Table 5.17-12[rev1]). It is anticipated that the water level decline would be greater in the areas of higher water demand both adjacent to current pumping centers and in the area of the renewable projects, and lesser further away from the pumping locations. Given its fractional contribution to the total water use, the PSPP does not represent a cumulatively considerable contribution to the water resource impacts to the Basin.

GEI, 2009, Eagle Mountain Pumped Storage Project No 13123 - Final License Application, Technnical Appendices for Exhibit E, Volume 3 of 6 Groundwater Supply Pumping Effects.

A.G. Hely and E.L. Peck, Precipitation, Runoff and Water Loss in the Lower Colorado River-Salton Sea Area, Geological Survey Professional Paper 486-B, 1964 (Hely & Peck, 1964).

Lohman, S. W., 1972, Ground-Water Hydraluics: Geological Survey Professional Paper 708: United States Geological Survey, Alexandria, Virginia.

Steinemann, A.C., 1989, Evaluation of Non-potable Groundwater in the Desert Area of Southeastern California for Powerplant Cooling. U.S., Geological Survey Water Supply Paper 2343. 44 pages.

Todd, D. K., 1980, Groundwater Hydrology, Second Edition: John Wiley and Sons, New York, New York.

WorleyParsons, 2009a, Data Requests – Response Set 1A, Genesis Solar Power Project, Riverside County, California. December 14.

WorleyParsons, 2009b, Technical Memorandum – Groundwater Resources Cumulative Impacts Analysis for Genesis Solar Power Project, Riverside County, California. December 30.

Provide evidence that Project water demand can be met without impact to nearby wells or creating Basin overdraft.

The groundwater model that was provided in the data response dated January 6, 2010, was revised to reflect an updated interpretation of the distribution of transmissivity within the Basin. Bedinger et al 1989, in their mapping of the Chuckwalla Valley show a zone of fine-grained sediment below Palen Dry Lake extending from the surface to the Mesozoic basement rock (Cross Section E-E'). Simoni (1981) described two test well borings (Palen Lake No.1 and No.2) dug south-southeast of the lake, just north of the PSPP site as being predominantly fine-grained to depths of 425 and 505 feet below the ground surface, respectively. The results of the borings by Simoni (1981) generally reflect similar fine-grained conditions that were encountered in the drilling of the observation wells dug as part of the PSPP AFC pumping test program. Additionally, the low-well yield experienced during the pumping test on former agricultural well 5S/17E-33N01 is suggestive of lower transmissivity conditions and fine-grain materials, although it is probable that the well condition and age (installed in 1958) contributed to well performance.

These data along with published data from across the Basin were used to refine and remap the transmissivity zones for the groundwater model (see Figure DR-S&W-207-3). The lower transmissivity value from the Project's recent aquifer test (1,000 ft^2/d) was applied to Zone 1, which includes the PSPP site and Palen Dry Lake, as well as the area around Ford Dry Lake. Apart from this area, the lower transmissivity value previously determined by USGS (6,300 ft2/d) (Leake et al. 2007) was applied to Zone 2, which includes areas east and west of the central low-transmissivity zone. This value appears to be a reasonable approximation of transmissivity data reported in these areas in the western and eastern portions of the Chuckwalla Valley. In addition to the published transmissivity data shown on Figure DR-S&W-207-3, available pumping data and specific capacity data were used to map the transmissivity across the Valley (see Figure DR-S&W-207-4). Higher pumping rates reported in the area of CocoPah Farms were used to demark higher transmissivity zones due west of the PSPP site. It is important to emphasize that the numerical modeling is a 2-D simulation and as such the transmissivity values are uniformly applied through the model domain and assumed constant through the vertical extent of saturated sediments. This represents a conservative approach to the analysis of water supply and impacts from the Project, as it presumes vertical uniformity of aquifer characteristics that are not documented in the hydrostratigraphy for the Basin. The Basin shows significant heterogeneity and possibly higher transmissive sediments at depth below the Project and in the central portion of the Basin.

The "Project Only" and "Cumulative Projects" simulations were modeled following the pumping schedule shown on Table DR-S&W-207-1(rev1). The pumping schedule was updated based on information provided on the BLM Palm Springs South Coast Field Office website posted on December 21, 2009, under the "First-in-Line" Solar Applications and approved project applications. The PSPP pumping was distributed among four wells within the Project Right-of-Way (ROW), as this would more closely approximate actual conditions and because multiple wells will be required in what appears to be a low-transmissive aquifer both for construction and operational water supply. No other parameters within the model were changed over what was provided in the January 6, 2010 data response. The results of the modeling were provided for transient simulations of post- construction (model year 2013), mid-Project operations (year 2029) and at the end of 30 years of Project operation (year 2043). The electronic model files are provided in Attachment A.

Project-Only Simulation

The "Project Only" simulation presents the predictive results from the stress applied to the model from the proposed project pumping as shown on the schedule provided in Table DR-S&W-207-1(rev1). The radius of influence for the "Project Only" simulation shows that after construction period and proposed water use of about 480 afy over three years the drawdown to the one-foot contour remains within the PSPP (Figure DR-S&W-207a[rev1]). At the end of operation the one-foot contour extends outward to encompass the area of CocoPah Farms, but the five-foot contour remains within the PSPP (Figure DR-S&W-207b[rev1]). The one-foot contour does not encroach into the northern portion of Palen Dry Lake and into the area where there are reportedly mesquite trees.   These simulations show that the PSPP would not be expected to significantly impact offsite water supply wells using a significance threshold of a drawdown of five feet or more.

The storage change was also calculated using the model flow budget. The largest net change occurs at the end of operation and the change represents about 10,500 acre-feet (Table DR-S&W-207-2 [rev1]). Assuming a total recoverable storage of 15,000,000 acre-ft in the basin (DWR, 1979), the impact of basin storage is insignificant even for the largest storage change at the end of Project operation (0.07%). As described above, the Project would not induce overdraft of the groundwater basin, as there is an estimated net surplus of water of about 2,000 acre-feet per year based on current estimates of recharge and discharge within the Basin (Table DR-S&W-194-2(rev1)).

Cumulative Projects Simulation

The "Cumulative Projects" simulation presents the predictive results from the stresses applied to the model from the multiple projects proposed for the Basin at the pumping schedule shown on the schedule provided in Table DR-S&W-207-1(rev1). The projects listed are those that have been identified as planned and reasonably foreseeable projects located with the Basin. The cumulative impacts assessment begins with current conditions and applied the pumping stresses as scheduled to the model through a period of 30 years. The model results are shown in Table DR-S&W-207-2(rev1). As shown on Figure DR-S&W-208a(rev1) at the end of construction the drawdown to the one-foot contour remains within the PSPP. While the figure does not show it, as the model was tied to the water supply schedule for the PSPP, a cone of depression would be anticipated in the area of the pumping well or wells that would provide the initial water supply for the Eagle Crest Pump Storage project. At the end of the operation the influence from pumping at the PSPP extends beyond the site to within an area of CocoPah farms, but the five- foot drawdown contour remains within the site (see Figure 208b[rev1]). Similar to the results of the project-only simulation, offsite water supply wells are not impacted by the PSPP to a threshold of significance greater than five feet of drawdown. Additionally, the model suggests that there could be a water level change of between one and five feet in the area of the Mesquite population on the northern margin of Palen Dry Lake. The model shows that the influence for this change comes from pumping to the west and the Eagle Mountain Pumped Storage project and not the PSPP.

Larger cones of depression are developed around the Genesis and Eagle Mountain Pump Storage Project as would be anticipated given their higher operational water supply requirements. The concept of depression developed around the Genesis is likely exaggerated due to the application of a low transmissivity value for Zone 1 in this area. As noted above, the uniform application of transmissivity in a 2-D model is a conservative approach and the model prediction should not be considered a water table response. Site conditions would suggest that water for the PSPP would be produced from deeper sediments below an upper fine-grained zone that serves as an aquitard within the central and eastern portion of the Basin.

Storage change was also calculated using the model flow budget. As can be seen, the largest net change occurs at the end of operation (year 2043) and the change from all the Projects represents about 142,000 acre-feet. Assuming a total recoverable storage of 15,000,000 acre-ft in the basin (DWR 1979), the impact of basin storage is insignificant even for the largest storage change at the end of operation (about one %). As noted above, given its minor contribution, the PSPP does not contribute significantly to the change in storage for the Basin.

Provide site specific well testing at yield levels that support Project water demand.

Access for additional well testing was requested through the BLM on February 19, 2010. Initial discussions with the BLM indicate that because of past PSPP survey work on the site, a Determination of NEPA Adequacy (DNA) could be utilized to conduct the additional investigation. The request has been was made for multiple additional test wells with the initial test well proposed in the PSPP Unit #2 Power Block. Additional wells and their location will be based on the results of the installation and pumping test on the initial test well in the Unit #2 Power Block. A surface geophysical program, extending the work done for the Genesis Project westward onto the PSPP site will be conducted prior to the installation of the first test well. The investigation will be conducted to better characterize the hydrostratigraphy below the site, the depth of the bedrock and the water table to the north of the site in the direction of Palen Dry Lake.

Discuss thresholds of significance for impacts associated with drawdown (DR-S&W-233).

Discussion during the workshop revealed that a threshold of significance was not necessarily appropriate given concern over potential drawdown in the northern portion of Palen Dry Lake in an area of dissected playa where a population of mesquite trees has been mapped. It is important to note that a drawdown of five feet is appropriate for assessment of significance with respect to the potential for impact to adjacent water wells. As noted above, a drawdown of five feet or more is not predicted beyond the PSPP boundary even after 30 years. This five-foot drawdown value has been used in many other CEC projects as a measure of significance, and as the basis for needing mitigation measures.

As regards consideration of a drawdown that could affect vegetation in the area of the dissected playa on the north margin of Palen Lake the following are offered:

- The population of mesquite trees is many miles (about five to eight miles) north of the PSPP. The recent groundwater model shows that pumping will not induce a drawdown of more than 0.1 foot in the northern portion of the playa.
- Below Palen Dry Lake, shallow groundwater (<10 feet in depth) is probably present on the northern portion of the lake. Mapping by Steinemann (1989) showed that water is present at depths below 10 feet in the central and southern part of the playa.
- For most Phreatophytes, the depth to groundwater is an important factor and variations of 2 to 6 feet in ground water levels could have adverse affects in root growth as well as survival. Vegetation of this type was not reported by WorleyParsons (2009a) in their assessment of the Palen Dry Lake. As noted above, no such drawdown variation is predicted by the PSPP groundwater model.
- In comparison, mesquite, which are present in the dissected area of the playa are a deep rooted plant known to send roots 50 feet or more in search of water. This effectively buffers the plant to slight variations in groundwater levels, particularly in the case of adult trees that are established (Pers. Communication, Jonathan Campbell February 2, 2010).
- Well data from well 5S/17E-6C01 indicate stable groundwater conditions on the north side of Palen Dry Lake. The water level history for this well has spanned several years including periods of higher pumping in support of agriculture both in the area of Desert Center and pumping at CocoPah Farms west of the PSPP. The hydrograph however, appears to reflect a regional response to changes in basin wide pumping not the local pumping to the west. Similarly, it would be anticipated that the pumping at the PSPP would not affect the water levels this far north of the site.

Given the distance to the mesquite tress, their deep rooted character, absence of other vegetation on the northern margin of the playa, and the model prediction showing that the PSPP will not induce drawdown of 1 foot or more in the areas of the trees, a threshold of significance less than five feet does not appear justified.

Campbell, Jonathan, Personal Communications, Dr. Campbell, Campbell and Associates, Los Angles California. February 3, 2010.

Steinemann, A.C., 1989, Evaluation of Nonpotable Groundwater in the Desert Area of Southeastern California for Powerplant Cooling. U.S., Geological Survey Water Supply Paper 2343. 44 pages.

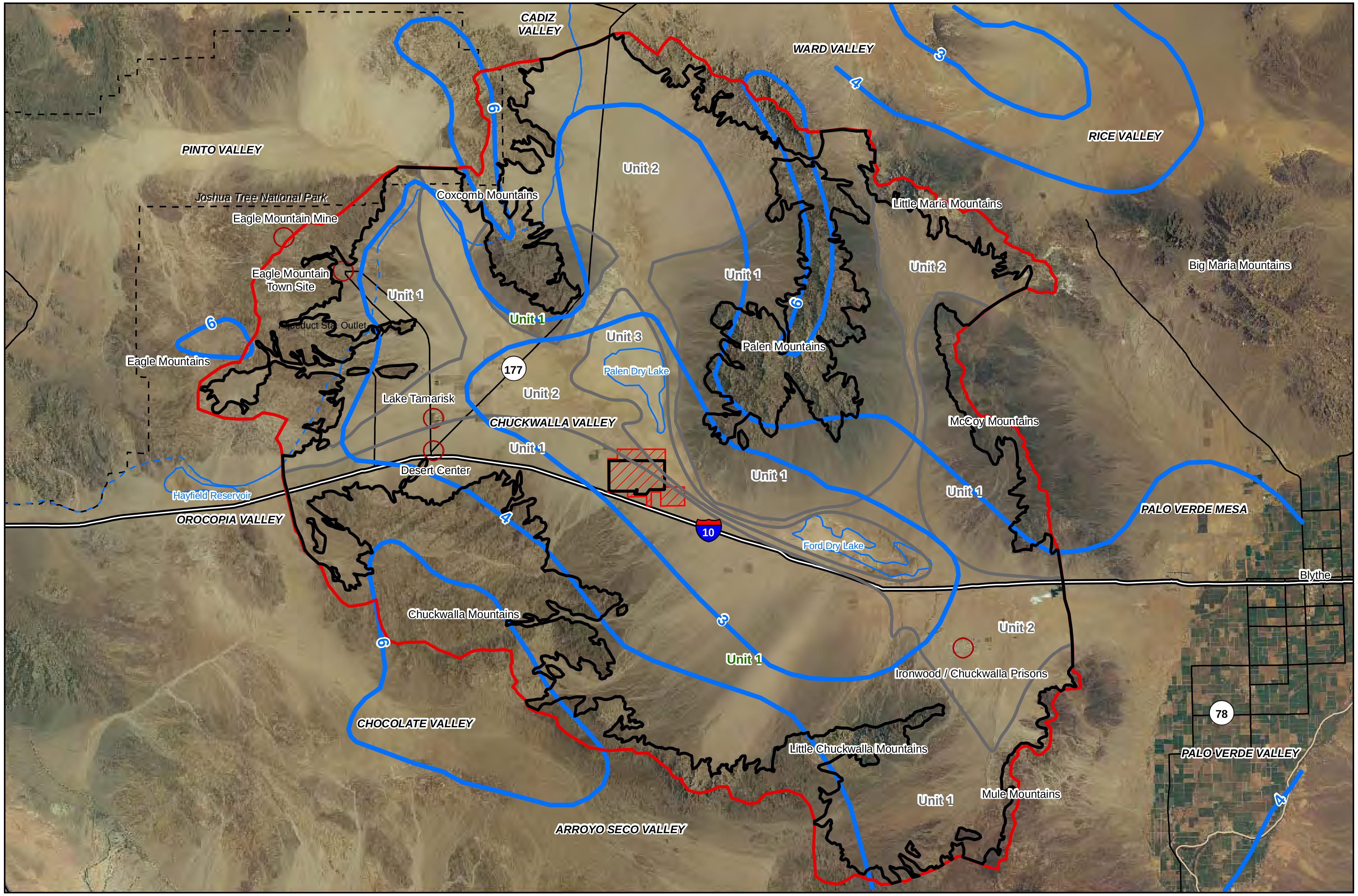
WorleyParsons, 2009b, Technical Memorandum – Groundwater Resources Cumulative Impacts Analysis for Genesis Solar Power Project, Riverside County, California. December 30.

Attachment A

MODFLOW Files

(See Modeling Files)

Figures



Map Location

Legend

- Project Right-of-Way
- Facility Footprint
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Freeway
- Highway / Major Road
- Geographic/Cultural Area of Interest
- Chuckwalla Valley Groundwater Basin
- Chuckwalla Valley Watershed
- Average Annual Precipitation
- Runoff Curves (Distribution) Figure 10 After hely and Peck 1964)
  - Mountains
  - Unit 1 - Alluvium Steep Slope
  - Unit 2 - Alluvium Flat Slope
  - Unit 3 - Valley Alluvium

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

Water Basins, Department of Water Resources Website groundwater basin map file B118v3NAD27UTM10.zip

N W E S

0 6 12 Miles
1 inch = 380,160 inches

Palen Solar Power Project

Figure DR-S&W-194-1 (Rev. 1)
Average Annual Precipitation 1931-1961 (Hely & Peck, (1964)
Chuckwalla Valley Groundwater Basin

Palen Solar I, LLC

AECOM

Project: 60139694
Date: February 2010

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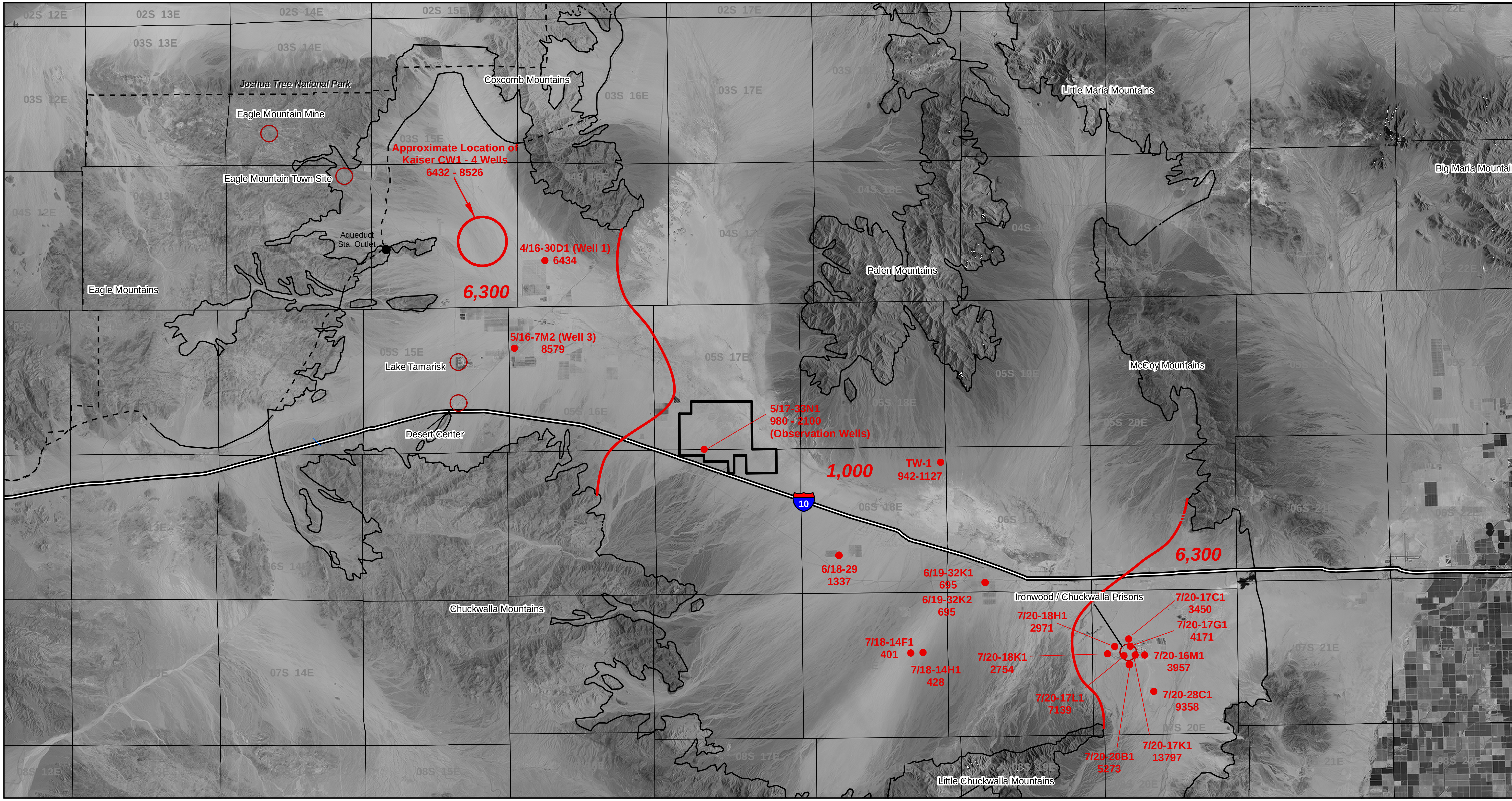

Map Location

Legend

- Project Right-of-Way
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Chuckwalla Valley Groundwater Basin Boundary
- Freeway
- Geographic/Cultural Area of Interest
- 1337 — Groundwater Well with Reported Transmissivity Data (feet squared per day (ft^2/d))
- 6,300 — Transmissivity (ft^2/d)
- Boundary between Transmissivity Zones

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

Water Basins, Department of Water Resources Website groundwater basin map file B118v3NAD27UTM10.zip

N W E S

0 4 8 Miles

1 inch = 21,120 feet

Palen Solar Power Project

Figure DR-S&W-207-3
Transmissivity in the Chuckwalla Valley

Palen Solar I, LLC

AECOM

Project: 60139694
Date: February 2010

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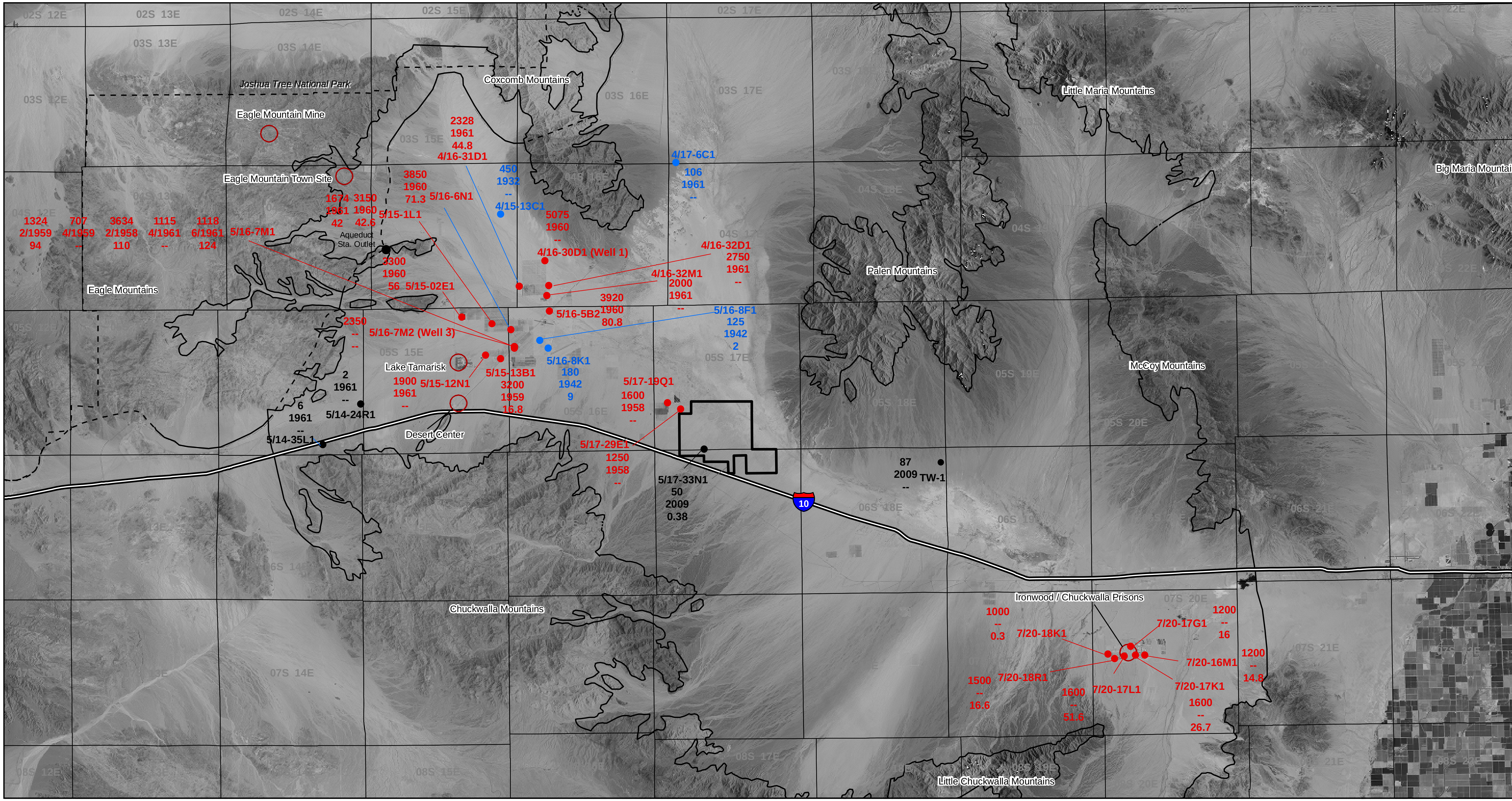

Map Location

OR
ID
NV
UT
CA
AZ

Legend

- Project Right-of-Way
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Chuckwalla Valley Groundwater Basin Boundary
- Freeway
- Geographic/Cultural Area of Interest
- Groundwater Well with Pumping Rates 0 - 100 gpm
- Groundwater Well with Pumping Rates 100 - 1000 gpm
- Groundwater Well with Pumping Rates >1000 gpm

50 — Pumping Rate (gpm)
2009 — Date Pumping Rate Reported
0.38 — Specific Capacity (gpm/ft) Estimated from data provided on the date reported. (--) Insufficient information to estimate specific capacity.

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

Water Basins, Department of Water Resources Website groundwater basin map file B118v3NAD27UTM10.zip

N S E W

0 4 8 Miles

1 inch = 21,120 feet

Palen Solar Power Project

Figure DR-S&W-207-4
Reported Pumping Rates in the Chuckwalla Valley

Palen Solar I, LLC

AECOM

Project: 60139694
Date: January 2010

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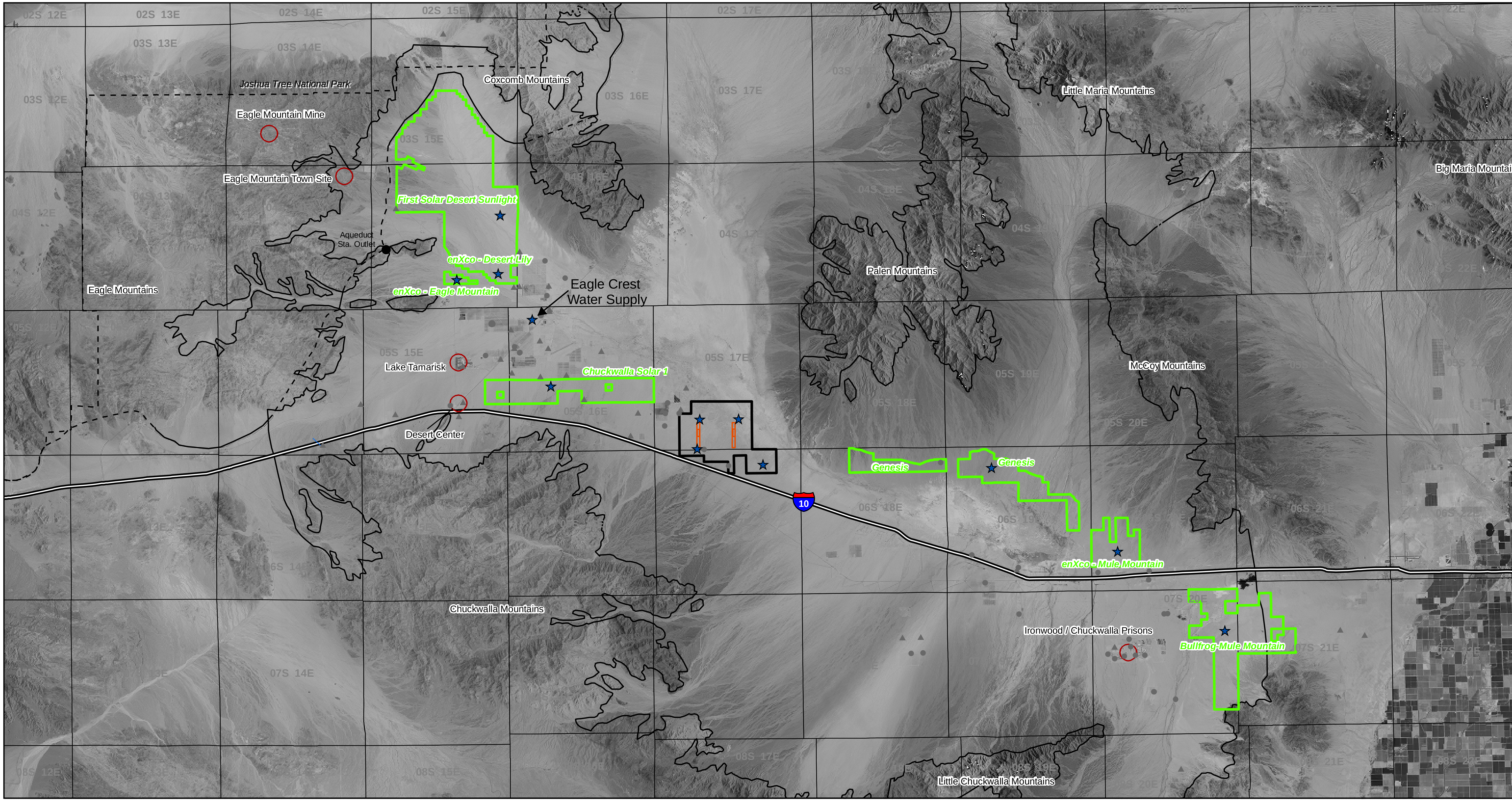

Map Location

Legend

- Project Right-of-Way
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Chuckwalla Valley Groundwater Basin Boundary
- Freeway
- Geographic/Cultural Area of Interest
- Groundwater Well Location based on Latitude and Longitude in USGS Database
- Groundwater Well Location based on the State Well Number (approximate)
- Location of Pumping Well Use in Cumulative Impacts Assessment
- Proposed Renewable Projects as of 12/09

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

Water Basins, Department of Water Resources Website groundwater basin map file B118v3NAD27UTM10.zip

0 4 8 Miles

1 inch = 21,120 feet

N E S W

Palen Solar Power Project

Figure 5.17-17 (rev1)
Renewable Projects in the Chuckwalla Valley

Palen Solar I, LLC

AECOM

Project: 60139694
Date: March 2010

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Map Location

Legend

- Project Right-of-Way
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Chuckwalla Valley Groundwater Basin Boundary
- Freeway
- Geographic/Cultural Area of Interest
- Groundwater Well Location based on Latitude and Longitude in USGS Database
- Groundwater Well Location based on the State Well Number (approximate)
- Location of Pumping Well Used in the Model
- Model Predicted Drawdown; Negetive Indicates Reduction In Water Level

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

Water Basins, Department of Water Resources Website groundwater basin map file B118v3NAD27UTM10.zip

N W E S

0 4 8 Miles

1 inch = 21,120 feet

Palen Solar Power Project

Figure DR-S&W-207a (rev1)
Project Only
Construction Water Supply

Palen Solar I, LLC

AECOM

Project: 60139694
Date: March 2010

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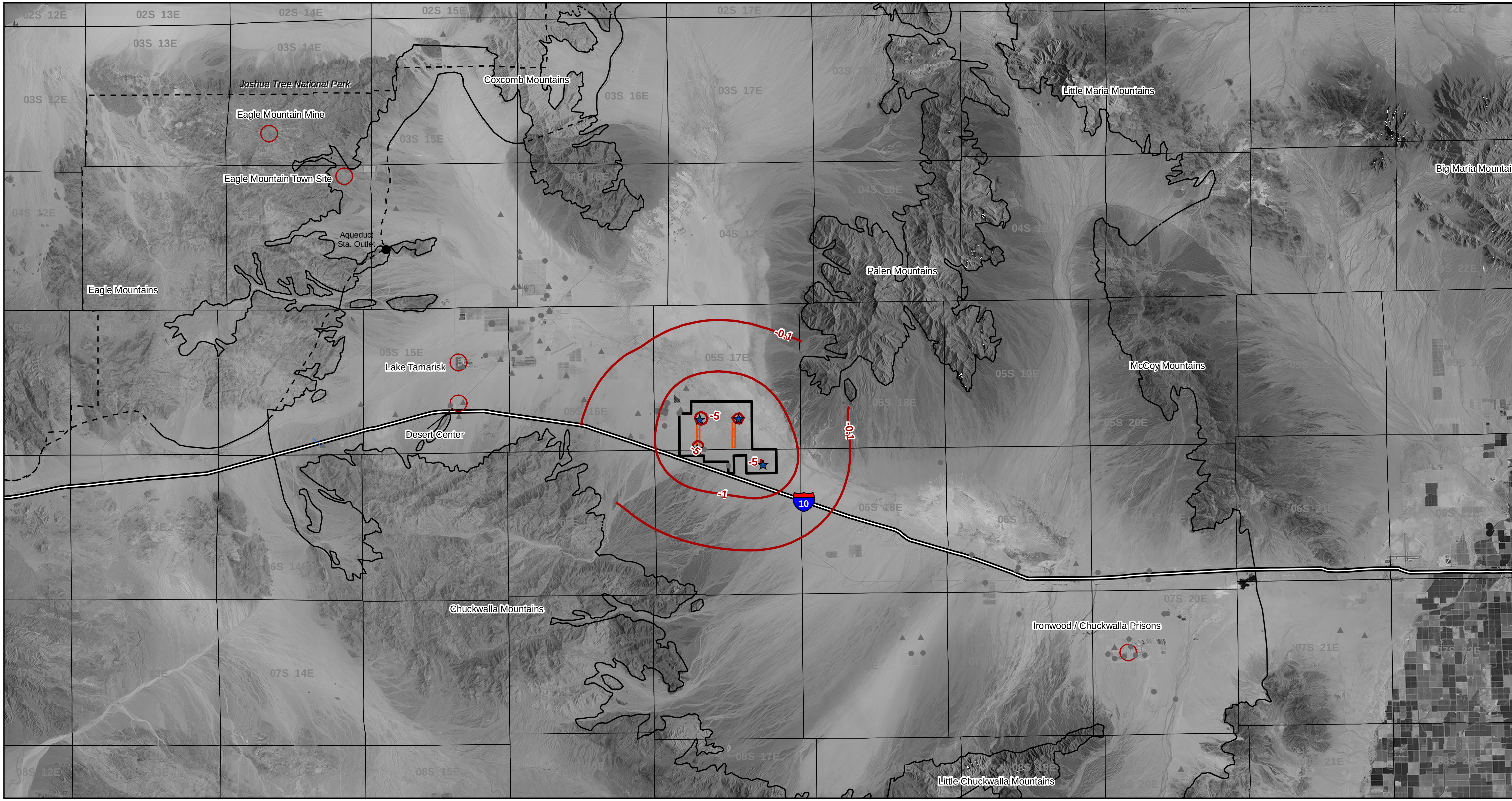

Map Location

OR
ID
NV
UT
CA
AZ

Legend

- Project Right-of-Way
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Chuckwalla Valley Groundwater Basin Boundary
- Freeway
- Geographic/Cultural Area of Interest
- Groundwater Well Location based on Latitude and Longitude in USGS Database
- Groundwater Well Location based on the State Well Number (approximate)
- Location of Pumping Well Used in the Model
- Model Predicted Drawdown; Negetive Indicates Reduction In Water Level

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

Water Basins, Department of Water Resources Website groundwater basin map file B118v3NAD27UTM10.zip

0 4 8 Miles

1 inch = 21,120 feet

N E S W

Palen Solar Power Project

Figure DR-S&W-207b (rev1)
Project Only
Operational Supply
End of 30 Years

Palen Solar I, LLC

AECOM

Project: 60139694
Date: March 2010

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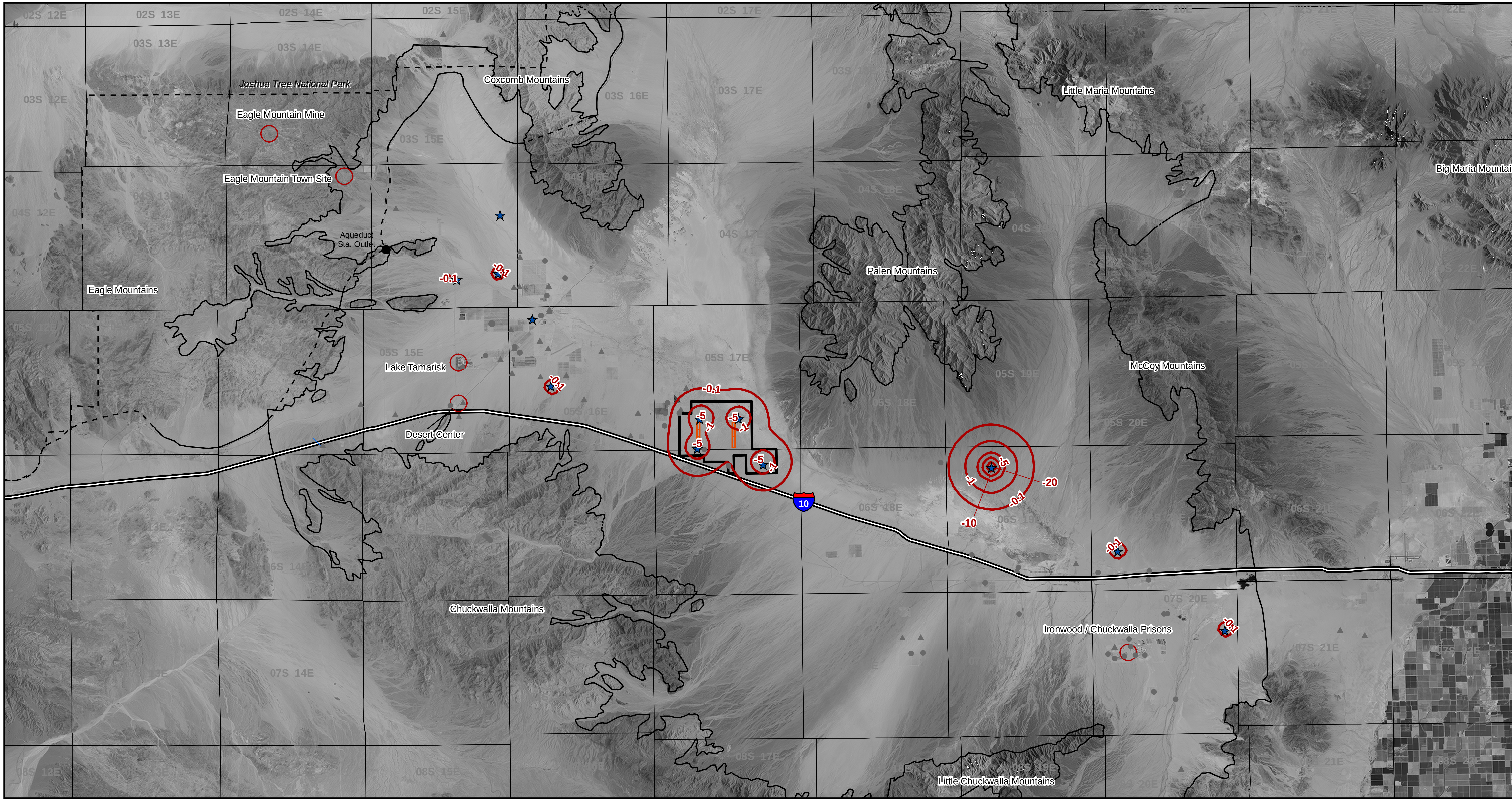

Map Location

Legend

- Project Right-of-Way
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Chuckwalla Valley Groundwater Basin Boundary
- Freeway
- Geographic/Cultural Area of Interest
- Groundwater Well Location based on Latitude and Longitude in USGS Database
- Groundwater Well Location based on the State Well Number (approximate)
- Location of Pumping Well Used in the Model
- Model Predicted Drawdown; Negetive Indicates Reduction In Water Level

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

Water Basins, Department of Water Resources Website groundwater basin map file B118v3NAD27UTM10.zip

0 4 8 Miles

1 inch = 21,120 feet

Palen Solar Power Project

Figure DR-S&W-208a (rev1)
Cumulative Impacts
Constructionl Supply
End of Palen Construction

Palen Solar I, LLC

AECOM

Project: 60139694
Date: March 2010

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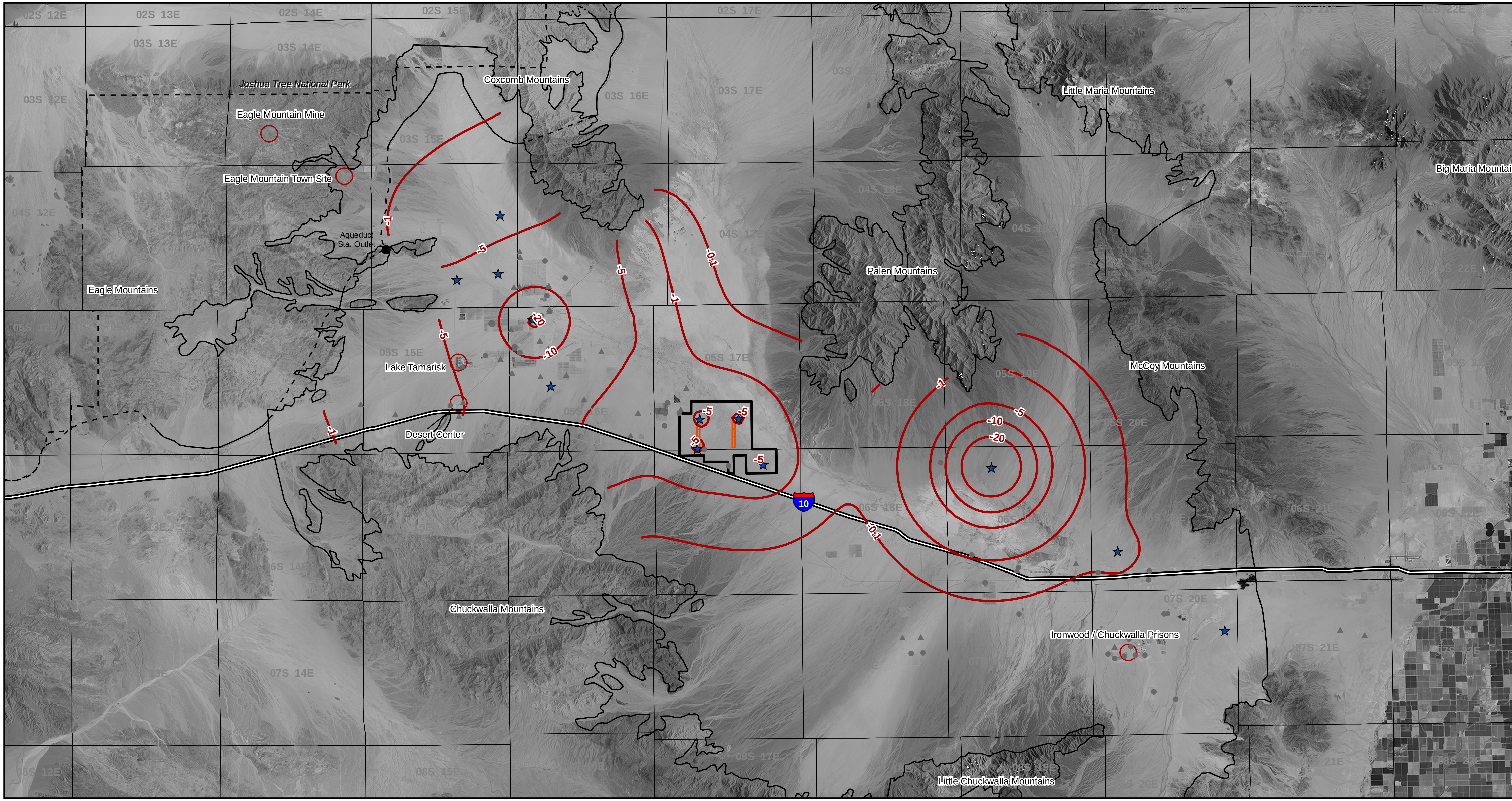

Map Location

Legend

- Project Right-of-Way
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Chuckwalla Valley Groundwater Basin Boundary
- Freeway
- Geographic/Cultural Area of Interest
- Groundwater Well Location based on Latitude and Longitude in USGS Database
- Groundwater Well Location based on the State Well Number (approximate)
- Location of Pumping Well Used in the Model
- Model Predicted Drawdown; Negetive Indicates Reduction In Water Level

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

Water Basins, Department of Water Resources Website groundwater basin map file B118v3NAD27UTM10.zip

0 4 8 Miles

1 inch = 21,120 feet

Palen Solar Power Project

Figure DR-S&W-208b (rev1)
Cumulative Impacts
Operational Supply
End of 30 Years

Palen Solar I, LLC

Project: 60139694
Date: March 2010

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Tables

TABLE DR-S&W-194-1 (rev1)
SUMMARY OF INFILTRATION ESTIMATES
CHUCKWALLA VALLEY GROUNDWATER BASIN
PALEN SOLAR POWER PROJECT
RIVERSIDE, CALIFORNIA

Layer[1]	Area (acres)	Mean Annual Precipitation (inches)	Total Volume of Rainwater from Mean Annual Precip (AcFt)	Runoff Curve Classification	Total Volume of Infiltration (AcFt) Based on 2% of Annual Precip	Total Volume of Infiltration (AcFt) Based on 3% of Annual Precip	Total Volume of Infiltration (AcFt) Based on 5% of Annual Precip	Total Volume of Infiltration (AcFt) Based on 10% of Annual Precip
unit1-cw	30,303	5	12,626	Alluvium, Steep Slope	253	379	631	1,263
unit1-cw	211,498	4	70,499	Alluvium, Flat Slope	1,410	2,115	3,525	7,050
unit1-cw	41,073	3.5	11,980	Alluvium, Steep Slope	240	359	599	1,198
unit1-cw	12,077	4	4,026	Alluvium, Steep Slope	81	121	201	403
unit1-cw	910	4	303	Alluvium, Steep Slope	6	9	15	30
unit1-cw	194	4	65	Alluvium, Steep Slope	1	2	3	6
unit1-cw	81,233	5	33,847	Alluvium, Steep Slope	677	1,015	1,692	3,385
bedrock-chuckwalla	32,001	5	13,334	Mountains	267	400	667	1,333
bedrock-chuckwalla	21,456	5	8,940	Mountains	179	268	447	894
bedrock-chuckwalla	11,050	5	4,604	Mountains	92	138	230	460
bedrock-chuckwalla	109	5	46	Mountains	1	1	2	5
bedrock-chuckwalla	9,246	4	3,082	Mountains	62	92	154	308
bedrock-chuckwalla	10,042	4	3,347	Mountains	67	100	167	335
bedrock-chuckwalla	282	4	94	Mountains	2	3	5	9
bedrock-chuckwalla	3,480	4	1,160	Mountains	23	35	58	116
bedrock-chuckwalla	275	4	92	Mountains	2	3	5	9
bedrock-chuckwalla	90	4	30	Mountains	1	1	1	3
bedrock-chuckwalla	398	4	133	Mountains	3	4	7	13
bedrock-chuckwalla	316	4	105	Mountains	2	3	5	11
bedrock-chuckwalla	39,340	5	16,392	Mountains	328	492	820	1,639
bedrock-chuckwalla	194	5	81	Mountains	2	2	4	8
unit3-cw	28,973	3	7,243	Alluvium, Flat Slope	145	217	362	724
unit2-cw	198,558	3	49,640	Alluvium, Steep Slope	993	1,489	2,482	4,964
bedrock-chuckwalla	89,161	6	44,581	Mountains	892	1,337	2,229	4,458
Totals	**822,257**		**286,248**		**5,725**	**8,587**	**14,312**	**28,625**

Notes

1 Bedrock and unit distribution within the Chuckwalla Valley Groundwater Basin are shown on Figure Dr-S&W-194-1(rev1).

Palo Verde

Layer ID See Figure J3-1	Area (acre	Mean Annual Precipitation (inches)	Total Volume of Rainwater from Mean Annual Precip (AcFt)	Runoff Curve Classification	Runoff Curve Number	Runoff (% of preciptation)	Total Annual Volume of Runoff (AcFt)	Total Volume of Infiltration (AcFt) Based on 2% of Annual Precip	Total Volume of Infiltration (AcFt) Based on 5% of Annual Precip	Total Volume of Infiltration (AcFt) Based on 10% of Annual Precip
unit1-pvm	23,695	4	7,898	Alluvium, Steep Slope	74	3.5%	276	158	395	790
bedrock-pvm	5,624	4	1,875	Mountains	93	29.1%	546	37	94	187
bedrock-pvm	16,819	6	8,409	Mountains	93	29.1%	2,447	168	420	841
bedrock-pvm	13,571	4	4,524	Mountains	93	29.1%	1,316	90	226	452
bedrock-pvm	18,298	4	6,099	Hills	83	10%	610	122	305	610
unit1-pvm	79,574	5	33,156	Alluvium, Steep Slope	74	3.5%	1,160	663	1,658	3,316
unit2-pvm	382	4	127	Hills	83	10%	13	3	6	13
unit2-pvm	122,370	4	40,790	Alluvium, Flat Slope	69	2%	816	816	2,039	4,079
Totals	**280,332**		**102,878**				**7,184**	**2,058**	**5,144**	**10,288**

Layer	acreage	area_sqft
unit1-cw	30,303	1320002743.44
unit1-cw	211,498	9212833369.72
unit1-cw	41,073	1789142528.84
unit1-cw	12,077	526058812.18
unit1-cw	910	39641479.81
unit1-pvm	23,695	1032152345.57
unit1-cw	194	8443225.22
unit1-cw	81,233	3538514482.92
bedrock-chuckwalla	32,001	1393943702.58
bedrock-chuckwalla	21,456	934623172.53
bedrock-chuckwalla	11,050	481350332.09
bedrock-chuckwalla	109	4767047.89
bedrock-chuckwalla	9,246	402742865.63
bedrock-chuckwalla	10,042	437418376.08
bedrock-chuckwalla	282	12276607.76
bedrock-chuckwalla	3,480	151571007.92
bedrock-chuckwalla	275	11964135.40
bedrock-chuckwalla	90	3912598.02
bedrock-chuckwalla	398	17318994.45
bedrock-chuckwalla	316	13784939.02
bedrock-chuckwalla	39,340	1713660284.08
bedrock-chuckwalla	194	8443225.22
bedrock-pvm	5,624	244970650.36
bedrock-pvm	16,819	732615560.10
bedrock-pvm	13,571	591160710.00
bedrock-pvm	18,298	797066150.51
unit1-pvm	79,574	3466236442.09
unit2-pvm	382	16626030.69
unit3-cw	28,973	1262054663.00
unit2-cw	227,531	9911247064.79
unit2-cw	28,973	1262054663.00
unit2-pvm	122,370	5330421580.05
bedrock-chuckwalla	89,161	3883866675.68

TABLE DR-S&W 194-2 (rev1)

WATER BALANCE
CHUCKWALLA VALLEY GROUNDWATER BASIN
PALEN SOLAR POWER PROJECT
RIVERSIDE COUNTY, CALIFORINA

RECHARGE AND DISCHARGE		APPLICATION FOR CERTIFICATION (AUGUST 2009)	MOUNTAIN FRONT RECHARGE AFTER HELY AND PECK (1964) - RECHARGE 3% OF RUNOFF	MOUNTAIN FRONT RECHARGE AFTER HELY AND PECK (1964) - RECHARGE 2% OF RUNOFF	BASIS FOR ESTIMATE	WATER BALANCE ESTIMATES REPORTED BY OTHERS (Acre-feet pre year)					
						Metzger, et al., 1973 USGS Professional Paper 486-G	CH2MHill, 1996[9]	B&V, 1998	URS, 2000	GEI, 2009	WorleyParsons (2009a)[11]
		Acre-feet per year	Acre-feet per year	Acre-feet per year							
RECHARGE (INFLOW)											
UNDERFLOW from OROCOPIA[1]		1,000	100	100	After URS (2000). Selected lower of the two estimates to provide a conservative estimate of recharge from this source.	--	1,700	--	100 to 1,000	1,700	3,500
UNDERFLOW from PINTO VALLEY[2]		2,500	2,500	2,500	After CH2M-Hill (1996) and GEI (2009).	--	2,500	--	--	2,500 - 3,200	
UNDERFLOW from CADIZ[3]		0	0	0	Assumed no inflow from Cadiz, though CH2M-Hill (1996) concluded flux into the Chuckwallla from this basin	--	2,500	0	--	0	
PERCOLATION from						--	--	--	--	--	--
	AGRICULTURE RETURN	584	639	639	Estimated to be 10% of the annual usage of 6,389 AFY (GEI 2009) - assumed drip irrigation efficiency of 90%.	--	--	--	--	--	800
	LAKE TAMARISK LEAKAGE	0	0	0	Assumed to be zero. Construction of Lake Tamarisk uncertain, as such assume complete containment.	--	--	--	--	--	--
	MOUNTAIN FRONT[4]	5,540	8,587	5,725	See Table DR-S&W-194-1(rev1)	--	--	--	--	5,540	9,440
	LEACHFIELD RETURN[5]	834	834	834	After GEI (2009)	--	--	--	--	834	831
BEDROCK		0	0	0	Although recharge to the alluvial aquifer is possible from the bedrock there is insufficient well data to determine flux.	--	--	--	--	--	--
	TOTAL (INFLOW)[6]	10,458	12,660	9,798		--	**12,240**	--	--	**10,571 to 11,331**	**14,571**
DISCHARGE (OUTFLOW)											
UNDERFLOW to PALO VERDE MESA[6]		400	400	400	After Metzger (1973). Value assumed over multiple investigations.	400	400	400	--	400	400
DIVERSION						--	--	--	--	--	--
	AGRICULTURE	5,840	6,389	6,389	After GEI (2009) Table 10 - Technical Exhibit E, Volume 3 of 6.	--	--	--	--	6389	10471
	MUNICIPALand DOMESTIC[7,8]	3,351	3,351	3,351	After GEI (2009) - compilation of estimates for Desert Center, Lake Tamarisk (CSA 51) and Prisons	--	--	--	--	3351	
EVAPOTRANSPIRATION						--	--	--	--	--	--
	Palen Dry Lake[10]	0	350	350	After WorleyParsons 2009b. Evaporation from Palen Dry Lake based on assumption that 1/2 the lake is acting as a wet playa (2,000 acres), and the discharge is seasonal occuring 3 months during the year with an ET rate of about 2 inches.	--	--	--	--	--	350
	Ford Dry Lake	0	0	0	Evaporation from Ford Dry Lakes assumed to be zero as depth of water estimated to be greater than 50 feet bgs.	--	--	--	--	--	--
EXPORT		0	0	0	No export is indicated in published reports	--	--	--	--	--	--
PALEN SOLAR POWER PROJECT		300	300	300	Operational requirements (mirror, process and domestic supply)/Dry Cooled Project.	--	--	--	--	--	--
	TOTAL (OUTFLOW)	9,591	10,490	10,490		**400**	**400**	**400**		**10,140**	**11,221**
	NET WITHOUT PSPP	867	2,170	-692		--	**0**	--	--	**765 to 1,525**	**3,350**
	NET WITH PSPP WATER USE	567	1,870	-992							

NOTES

1 CH2MHill (1996) and GEI (2009) underflow estimates from "Groundwater Conditions in the Eagle Mountain Area" after Mann J. C., 1986 (no confirmation estimates provided).
URS calculation based on hydraulic conductivity range of 10 to 100 ft/day, gradient of 0.0002ft/ft, an aquifer width of 11,000 feet and a saturated thickness of 500 feet.
Lower value used in the estimate as noted by the analysis provided in Data Request DR-194 for analysis in the Hely and Peck (1964) analysis of recharge.

2 CH2MHill (1996) and GEI (2009) underflow estimates from "Groundwater Conditions in the Eagle Mountain Area" after Mann J. C., 1986 (no confirmation estimates provided).

3 CH2MHill (1996)underflow estimate based on Cadiz Valley being similar size to Pinto Valley.

4 GEI (2009) assumed 10% of precipitation falling on the mountain front would recharge groundwater (value used in the AFC - September 2009). For estimates of recharge after Hely and Peck (1964) refer to Table DR-Soil and Water-194-1.

5 This estimate reflects personal communication from GEI with Department of Public Health and personnel for prisons and assuming 150 gallons/person/day for Lake Tamarisk/Desert Center/Eagle Mountain.

6 Underflow calculated by Metz, et. al(1973). using transmissivity of 30,000 gpd/ft (for Bouse Formation), gradient of 3 feet/mile, and a 4-mile width and 500 foot depth for the saturated section.

7 Water supply well for Eagle Mountain School is screened in bedrock aquifer, not included in GEI (2009) estimate

8 CSA 51 - County Service Area 51

9 Total estimated inflow reported by CH2MHill (1996) from BLM and Riverside County EIS/EIR for the Eagle Mountain Landfill.

10 Loss from Palen Dry Lake is discussed in detail in response to the work shop request to consider revision to the water balance and the estimate of runoff (February 2010).

11 Estimate of water balanced after WorleyParsons (2009a). Total Diversion (agriculture and domestic) of 10,471 afy (Table DR-148/DR-151-2) differs from future water budget estimate of 9,871 afy (Table 2, WorleyParsons 2009b))

REFERENCES

Application for Certification for the Palen Solar Power Project, September 2009.
Black and Veatch and Woodward-Clyde, 1998, Phase I Technical Feasibility Report for Off-Stream Storage on the Colorado River Aqueduct.
CH2M-Hill, 1996, Appendix C1 - Technical Memorandum, Elaboration on Specific Hydrogeologic Concepts Discussed in the Eagle Mountain Landfill and Recycling Center Environmental Impact Study/Environmental Impact Report.
GEI, 2009, Eagle Mountain Pumped Storage Project No 13123 - Final License Application, Techninical Appendices for Exhibit E, Volume 3 of 6 Groundwater Supply Pumping Effects.
Hely and Peck, 1964, Precipitation, Runoff and Water Loss in the Lower Colorado River - Salton Sea Area, Geological Survey Professional Paper 486-B (prepared in cooporation with the US Weather Bureau.
Metzger and others, 1973, Geohydology of the Needles area, Arizona, California and Nevada: U.S. Geological Survey Professional Paper 486-J.
Steinemann, 1989,
URS Corporation, 2000, Feasibility Assessment Hayfield Lake/Chuckwalla Valley Groundwater Conjunctive-Use Project, Prepared for Metropolitan Water District of Southern California, Volumes I-III.
WorleyParsons, 2009a, Data Requests – Response Set 1A, Genesis Solar Power Project, Rivreside County, California. December 14 (Table DR-148 and DR-151-2).
WorleyParsons, 2009b,Technical Memorandum – Groundwater Resources Cumulative Impacts Analysis for Genesis Solar Power Project, Riverside County, California. December 30.

TABLE 5.17-12 (rev1)
CUMULATIVE WATER BUDGET
CHUCKWALLA GROUNDWATER BASIN
RIVERSIDE COUNTY, CALIFORNIA

PROJECT[1]	PROPONENT	BLM SERIAL ID	TECHNOLOGY	SOURCE	USE	WATER USE - SOLAR and OTHER RENEWABLE PROJECTS (AFY)															COMMENTS
						2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2043	
Chuckwalla Solar I	Chuckwalla Solar I LLC	CA 48808	Photovoltaic (200MW)	Groundwater	Construction	--	20	20	10	--	--	--	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	5	7	10	10	10	10	10	10	10	10	10	10	**10**	
Eagle Mountain Soleil [8]	enXco	CA 49491	Photovoltaic (100MW)	Groundwater	Construction	--	--	10	10	--	--	--	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	5	5	5	5	5	5	5	5	5	5	**5**	
Desert Lily Soleil [8]	enXco	CA 49492	Photovoltaic	Groundwater	Construction	--	--	20	20	20	--	--	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	--	5	5	5	5	5	5	5	5	5	**5**	
Solel Mohave Solar Park	Deset Lily	CA 49494	Parabolic Trough (500MW)	Groundwater	Construction	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Project withdrawn. Application rejected (First-In-Line Solar Applications, BLM (12-21-09))
					Operational	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Desert Sunlight Solar Farm	First Solar	CA 48649	Photovoltaic (550MW)	Groundwater	Construction	--	9	9	9	--	--	--	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	**3.8**	
Eagle Mountain Pump Storage	Eagle Crest Energy Company, LLC	PAD/FERC (January 2009)	Pump - Storage (1300MW)	Groundwater	Construction	--	--	--	--	8,066	8,066	8,066	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	--	--	--	1802	1802	1802	1802	1802	1802	1802	**1,802**	
Genesis Solar Energy	Genesis Solar LLC	CA 48880	Parabolic Trough (250MW)	Groundwater	Construction	--	813	813	813	--	--	--	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	1,644	1,644	1,644	1,644	1,644	1,644	1,644	1,644	1,644	1,644	1,644	
Mule Mountain Solar Project	Bullfrog Green Energy, LLC	CA 49097	Photovoltaic (500MW)	Groundwater or water trucked in for mostly mirror washing	Construction	--	20	20	20	--	--	--	--	--	--	--	--	--	--		Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	0.25	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	**0.7**	
Mule Mountain Soleil	enXco	CA 49488	Photovoltaic (200MW)	Groundwater	Construction	--	--	10	10	--	--	--	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	5	5	5	5	5	5	5	5	5	5	**5**	
Palen Solar Power	Solar Millennium LLC	CA 48810	Parabolic Trough (484MW)	Groundwater	Construction	--	480	480	480	--	--	--	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projects - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	303	303	303	303	303	303	303	303	303	303	**303**	
TOTAL WATER USE - RENEWABLE PROJECTS (AFY)[2]						0	1,342	1,388	1,380	9,755	9,740	9,740	3,476	3,476	3,476	3,476	3,476	3,476	3,476	**3,476**	
DISCHARGE FROM OTHER SOURCES (AFY)[3]						10,490	10,490	10,490	10,490	10,490	10,490	10,490	10,490	10,490	10,490	10,490	10,490	10,490	10,490	**10,490**	
RECHARGE (AFY)[4]						12,660	12,660	12,660	12,660	12,660	12,660	12,660	12,660	12,660	12,660	12,660	12,660	12,660	12,660	**12,660**	
YEARLY BALANCE (AFY)[5]						2,170	828	782	790	-7,585	-7,570	-7,570	-1,306	-1,306	-1,306	-1,306	-1,306	-1,306	-1,306	**-1,306**	
CUMULATIVE CHANGE (AFY)[6]						2,170	2,998	3,780	4,570	-3,014	-10,584	-18,153	-19,459	-20,764	-22,070	-23,375	-24,681	-25,986	-27,292	**-53,402**	
CUMULATIVE BASINWIDE CHANGE IN WATER LEVEL (assuming a storage coefficient of 0.20) (INCHES)[7]						0.2	0.30	0.4	0.5	-0.3	-1.0	-1.8	-1.9	-2.1	-2.2	-2.3	-2.4	-2.6	-2.7	**-5.3**	
CUMULATIVE BASINWIDE CHANGE IN WATER LEVEL (assuming a storage coefficient of 0.05) (INCHES)[7]						0.9	1.2	1.5	1.8	-1.2	-4.2	-7.2	-7.7	-8.2	-8.8	-9.3	-9.8	-10.3	-10.8	**-21.2**	

NOTES

1. Chuckwalla Solar I (Chuckwalla Solar I LLC) - Plan of Development, Chuckwalla Solar I, february 2009.
   Desert Lily Soleil (enXco5) - Plan of Development, Desert Lily Soleil Project, October 2008.
   Desert Lily (Solel) - Plan of Development, Mojave Solar Park/Desert Lily Project, October 2007.
   Desert Sunlight Solar Farm (First Solar) - Plan of Development Optisolar, October 2008.
   Eagle Mountain Pump Storage Project - Estimates provided from the Eagle Mountain Pumped Storage Project No. 13123 - Final License Application, Eagle Crest Energy Company June 2009 (EIS Table 14).
   Genesis Solar Energy (Genesis Solar LLC) - Plan of Development, Genesis Solar Energy Project, June 2009.
   Mule Mountain Solar Project (Bullfrog Green Energy, LLC) - Plan of Development, Mule Mountain Solar Project, May 2009
   Mule Mountain Soleil (enXco2) - Plan of Development, Mule Mountain Soleil Project, enXco February 2009.
   Palen Solar Power Plant - Estimates provided from the AECOM Water, "Water Wastewater Report - Palen Solar Power Project July 2009 (Appendix L).
2. Sum of projected water use by year for the identified renewable energy projects.
3. Discharge from other sources other than solar or renewable energy projects (see Table DR-S&W-194-2 (rev1)). Assumption is that the discharge kept constant over the term of the analysis (30 years).
4. Estimate of recharge from basin water balance provided on Table DR-S&W-194-2 (rev1). Recharge was assumed to be constant over 30 years.
5. Difference between discharge (inclusive of renewable projects and other sources) and recharge.
6. Cumulative difference between recharge and discharge.
7. Change in the regional water level following the equation shown below (Fetter 1988). Negative numbers indicate a decline or reduction in the water level by the amount shown.
8. There is conflict between the CEC and BLM lists as to whether these projects will be permitted. They have been included for completeness though they may well not be part of the cumulative water budget for the Chuckwalla Valley Groundwater Basin.

DEFINITIONS

- **AFY** Acre feet per year
- **AF** Acre feet - (325,829 gallons)
- **FERC** Federal Energy Regulatory Commission
- **LLC** Limited Liability Corporation
- **MW** Megawatts

ESTIMATE OF BASINWIDE WATER LEVEL CHANGE

V = A*S*dh
V - volume of water released or taken into storage
A - area of the aquifer (605,000 acres)
S- aquifer storage (assumed to be 0.10)
dh - change in water level (inches)

TABLE DR-S&W-207-1 (rev1)
PUMPING SCHEDULE FOR CUMULATIVE WATER BUDGET ASSESSMENT
PALEN SOLAR POWER PROJECT

PROJECT[1]	PROPONENT	BLM SERIAL ID	TECHNOLOGY	SOURCE	USE	WATER USE - RENEWABLE PROJECTS (AFY)									COMMENTS [3]
						2010	2011	2012	2013	2014	2015	2016	2017	2018-2043	
Chuckwalla Solar I	Chuckwalla Solar I LLC	CA 48808	Photovoltaic (200MW)	Groundwater	Construction	--	20	20	10	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	5	7	10	10	10	10	**10**	
Eagle Mountain Soleil [1]	enXco	CA 49491	Photovoltaic (100MW)	Groundwater	Construction	--	--	10	10	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09).
					Operational	--	--	--	--	5	5	5	5	**5**	
Desert Lily Soleil [1]	enXco	CA 49492	Photovoltaic	Groundwater	Construction	--	--	20	20	20	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	--	5	5	5	**5**	
Solel Mohave Solar Park [2]	Deset Lily	CA 49494	Parabolic Trough (500MW)	Groundwater	Construction	--	--	--	--	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09). Project Withdrawn.
					Operational	--	--	--	--	--	--	--	--	**--**	
Desert Sunlight Solar Farm	First Solar	CA 48649	Photovoltaic (550MW)	Groundwater	Construction	--	9	9	9	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	3.8	3.8	3.8	3.8	**3.8**	
Eagle Mountain Pump Storage	Eagle Crest Energy Company, LLC	PAD/FERC (January 2009)	Pump - Storage (1300MW)	Groundwater	Construction	--	--	--	--	8,066	8,066	8,066	8,066	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	--	--	--	--	**1,802**	
Genesis Solar Energy	Genesis Solar LLC	CA 48880	Parabolic Trough (250MW)	Groundwater	Construction	--	813	813	813	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	1,644	1,644	1,644	1,644	**1,644**	
Mule Mountain Solar Project	Bullfrog Green Energy, LLC	CA 49097	Photovoltaic (500MW)	Groundwater	Construction	--	20	20	20	--	--	--	--		Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	0.25	0.5	0.7	0.7	0.7	0.7	**0.7**	
Mule Mountain Soleil	enXco	CA 49488	Photovoltaic (200MW)	Groundwater	Construction	--	--	10	10	--	--	--	--	**--**	Updated from CEC email (12-16) transmitting Table "Cumulative Projests - I-10 Corridor" and First-In-Line Solar Applications, BLM (12-21-09)
					Operational	--	--	--	--	5	5	5	5	**5**	
Palen Solar Power	Solar Millennium LLC/Chevron	CA 48810	Parabolic Trough (484MW)	Groundwater	Construction	--	480	480	480	--	--	--	--	**--**	As proposed in the AFC (August 2009)
					Operational	--	--	--	--	303	303	303	303	**303**	

NOTES

1 **There is conflict between the CEC and BLM lists as to whether these projects will be permitted. They have been included for completeness though they may well not be part of the cumulative water budget for the Chuckwalla Valley Groundwater Basin.**

2 **This project has been withdrawn. The application has been rejected.**

3 **First-In-Line Solar Applications - http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/pa/energy/solar.Par.45875.File.dat/Renew_Energy_2_09_solar.pdf**

TABLE DR-S&W-207-2 (rev1)
RESULTS FROM PREDICTIVE SIMULATIONS
NUMERICAL GROUNDWATER MODEL
PALEN SOLAR POWER PROJECT
CHUCKWALLA VALLEY GROUNDWATER BASIN
RIVERSIDE, CALIFORNIA

Model Runs[1]	Zone 1[3]		Zone 2[3]		Zone 3[3]		Period of interest	Max drawdown, ft				Change in storage, af[4]
	T, ft2/d	S	T, ft2/d	S	T, ft2/d	S		Well 1	Well 2	Well 3	Well 4	
Run 7	1,000	0.2	6,300	0.2	26,000	0.2	2013	11.67	6.49	11.69	6.50	1,440
							2029	9.78	5.97	9.96	6.48	6,288
							2043	10.76	6.75	10.96	7.51	10,530
Run 15[2]	1,000	0.2	6,300	0.2	26,000	0.2	2013	11.67	6.49	11.69	6.50	4,109
							2029	9.80	5.97	10.00	6.48	89,633
							2043	10.93	6.76	11.23	7.54	142,526

Notes

1 Run 7 is the "Project Only" simulation and Run 15 is the "Cumulative Impacts" Assessment
2 Refer to Table DR-S&W-207-1 (rev1) for the water use schedule for the renewable projects identified in the model
3 Figure DR-S&W-207-3 shows the areal distribution of transmissivities used in the model
4 Model input and output files provided in Attachment A

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

In the Matter of: **APPLICATION FOR CERTIFICATION for the *PALEN SOLAR POWER PROJECT***	**Docket No. 09-AFC-7** **PROOF OF SERVICE** ***(Revised 12/28/2009)***

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DECLARATION OF SERVICE

I, Arrie Bachrach, declare that on, March 11, 2010, I served and filed copies of the attached Palen Solar Power Project Data Response materials:

Responses to January 14, 2010 CEC Workshop Queries (Groundwater)
Technical Area: Soil & Water Resources

The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at:

[http://www.energy.ca.gov/sitingcases/solar_millennium_palen]

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(C*heck all that Apply*)
For service to all other parties:

______ sent electronically to all email addresses on the Proof of Service list;

__X__ by personal delivery or by overnight delivery service or depositing in the United States mail at Camarillo, California with postage or fees thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

__X_ sending an original paper copy and one electronic copy, mailed respectively, to the address below (preferred method);

OR

_____ depositing in the mail an original and 12 paper copies, along with 13 CDs, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-7
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Arrie Bachrach
____