5.17 Water Resources

This section addresses the potential impacts of the Ridgecrest Solar Power Project (RSPP or Project) on surface and groundwater water resources. The section provides a narrative of applicable laws, ordinances, regulations and standards (LORS) and discusses their applicability to the Project, describes existing conditions with respect to surface and groundwater resources, and evaluates potential Project impacts to these resources.

The water resources evaluation presented in the following pages is intended to support compliance both by the California Energy Commission (CEC) with the requirements of the California Environmental Quality Act (CEQA), and by the Bureau of Land Management (BLM) with the requirements of the National Environmental Policy Act (NEPA). The two agencies are conducting a joint review of the Project and a combined CEQA/NEPA document will be prepared

Summary

The RSPP would not have significant impacts on either groundwater or surface water resources. The Project is a dry-cooled facility that will use about 150 acre-feet of groundwater per year (afy) supplied by the Indian Wells Valley Water District (IWVWD). Water will be conveyed from wells north of the Project to the Ridgecrest Heights Booster Station. From there, a new five-mile long, 12-inch diameter pipeline will be constructed along China Lake Boulevard south to the Project site. A Memorandum of Understanding (MOU) has been approved by the IWVWD Board, and is in the process of being finalized. In total, the Project demand is about 1.6 percent of the total demand for water from IWVWD. In order to keep water use as low as practicable, the Project will recycle the process makeup water for a savings of about 25 percent of the annual consumptive use. Further, the RSPP is exploring several alternatives to offset the proposed operational water usage with the IWVWD and others within the valley.

As discussed in Section 4.0, Alternatives, there is no feasible water supply option other than groundwater to meet Project construction and operation supply requirements. The Project site is located in the Indian Wells Valley Groundwater Basin (IWV Groundwater Basin), which is part of the South Lahontan Hydrologic Region. According to the DWR, based on a 1985 estimate there is less than approximately two million acre-feet (af) of groundwater in storage, and the Basin is in overdraft. A numerical groundwater model that was developed by Brown and Caldwell for the IWVWD was used to assess impacts from proposed Project pumping. The modeling revealed that the operational use would not increase drawdown over the life of the Project (30-year period) by comparison to a non-Project condition.

No significant impacts related to drainage, water quality or stormwater runoff are expected. Several existing drainage courses will be rerouted in new channels around and through the RSPP plant site. Re-routed channels will return flow to their original courses prior to exiting the Project site. The new channels will be re-vegetated with native vegetation, designed to be wildlife friendly, and their condition restored as best as possible to their pre-existing condition. A Storm Water Pollution Prevention Plans (SWPPP) and a CEC-mandated Drainage Erosion Sediment Control Plan (DESCP), which contain Best Management Practices (BMPs), will be implemented to avoid significant runoff and water quality impacts during Project construction and operations.

The section discusses both potential water supply and water quality issues during Project construction and operation. More specifically, the section focuses on:

- Project water use and existing groundwater basin conditions and surface hydrology;

- Sources of groundwater to meet the dry-cooled Project's modest water needs;
- Project design to effectively manage storm water drainage across the 3,920-acre facility (1,760 acres of disturbance);
- Impacts associated with proposed groundwater use and with the diversion of a number of ephemeral washes through and around the Project;
- Identification of potential mitigation measures to offset proposed groundwater usage.

Appendix J contains the data used for the groundwater study gathered from various public and private sources. The appendix provides the results of a numerical groundwater model to assess potential groundwater use impacts, as well as a conceptual engineering report on Project Water/Wastewater requirements and system design. The hydrologic study and conceptual engineering report for surface water channel diversion and a preliminary construction SWPPP/DESCP are provided in Appendix L.

5.17.1 LORS Compliance

Applicable Federal, State, and local LORS are summarized on Table 5.17-1 and discussed in text following the table. Non-applicable Federal and State LORS area also discussed to explain why they are not applicable.

Table 5.17-1 Summary of Applicable Water Resources LORS

LORS	Applicability	Where Discussed in AFC
Federal		
Clean Water Act (CWA): 33 United States Code (USC) Section 1257 et seq.	The CWA regulates both direct and indirect discharges, including stormwater discharges from construction and industrial activities. Section 404 regulates dredge or fill to jurisdictional "waters of the U.S.; Section 401 requires protection of navigable waters of the U.S. and the state (including ephemeral drainages and washes; Section 402 regulates wastewater and stormwater discharges through the National Pollutant Discharge Elimination System [NPDES]).	Section 5.17.1
Federal Land Policy Management Act (FLPMA) of 1976: 43 USC Section 1765 and implementing regulations. Title: 43 Code of Federal Regulations (CFR) Parts 2800 and 2920	Provides regulations for BLM to grant right of ways (ROWs) for use of public lands in a manner that: a) protects the natural resources associated with public and adjacent lands; b) prevents unnecessary or undue degradation; c) promotes the use considering engineering and technological compatibility, national security, and land use plans.	Section 5.17.1

LORS	Applicability	Where Discussed in AFC
Resource Conservation and Recovery Act (RCRA) of 1976: 42 USC Section 6901 et seq., and implementing regulations. Title 40 CFR Part 260	RCRA seeks to prevent surface and groundwater contamination, sets guidelines for determining hazardous wastes and identifies proper methods for handling and disposing of those wastes.	Sections 5.17.1 and 5.16, Waste Management
Title 44 CFR Parts 65 and 72	Part 65 contains the Federal Emergency Management Agency's (FEMA) regulations for the identification and mapping of special hazard areas and imposes requirements for areas identified as FEMA Special Flood Hazard Areas. Part 72 provides administrative procedures for processing Conditional Letter of Map Revision (CLOMR).	Section 5.17.1
State		
California Constitution, Article X, 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 5.17.1
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 one acre or more are required to obtain coverage under California's General Construction Permit, which requires the development and implementation of a SWPPP. Industrial activities (operation phase) with the potential to impact storm water discharges are required to obtain a NPDES permit	Section 5.17.1
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 5.17.1
California Water Code Section 1200 – Water Rights	Divides California water rights into three categories: surface water, percolating groundwater, and "subterranean streams that flow through known and definite channels".	Section 5.17.1
The Porter-Cologne Water Quality Control Act: California Water Code Section 13000 et seq.	Requires the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs) to adopt water quality criteria to protect State waters, including identification of beneficial uses, definition of narrative and numerical water quality criteria, and implementation procedures.	Section 5.17.1

LORS	Applicability	Where Discussed in AFC
Title 22 California Code of Regulations (CCR) Sections 64400.80 through 64445	Requires periodic monitoring of water quality for potable water wells (non-transient, non-community water systems).	Section 5.17.1
Title 23 CCR Division 3, Chapter 9, Chapter 15	Establishes requirements for Waste Discharge Report and requirements specifying conditions for protection of water quality. Outlines classification, siting and construction criteria for waste management units and discharges of waste to land. Provides guidance for surface impoundments and Land Treatment Units (LTU).	Section 5.17.1
Title 27 CCR Division 2, Chapter 3	Provides guidance for surface impoundments and LTUs. Specifies siting and construction requirements and sets forth monitoring protocols and statistical measures to detect and evaluate LTU performance and determine if groundwater has been impacted by the facility.	Section 5.17.1
California Public Resources Code, Section 25300 et seq., including Section 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.	Sections 5.17.1
SWRCB	A series of policies adopted by the SWRCB including the following: 1) Anti-Degradation Policy; 2) Power Plant Cooling Water Policy; 3) Water Reclamation Policy; 4) Sources of Drinking Water Policy; 5) Procedures and Policies for Investigation, Clean-up and Abatement of Discharges; 6) Recycled Water Policy; and 7) Water Quality Enforcement Policy.	Section 5.17.1
Local		
Kern County Ordinance Code, Title 17, Chapter 17.48 - Floodplain Management	Establishes provisions to protect public health, safety and general welfare, and private property losses due to flood conditions. Sets forth restrictions and administrative procedures to control development that may increase flood damage. Provides compliance with relevant portions of 44 CFR and the National Flood Insurance Program (NFIP).	Section 5.17.1
Kern County Ordinance Code, Title 4, Chapter 14.08 – Water Supply Systems	Describes requirements for permitting, siting, constructing and destroying groundwater wells. Stipulates conditions for abandonment and taking wells out of service.	Section 5.17.1

LORS	Applicability	Where Discussed in AFC
Kern County Ordinance Code, Title 14, Chapter 12 – Sewer Systems	Addresses general management requirements, installation regulation, cleaning and termination or abandonment of private sewer systems.	Section 5.17.1
Kern County Uniform Plumbing Code, Chapter 17	Describes installation and inspection requirements for locating disposal/leach fields, seepage pits.	Section 5.17.1

5.17.1.1 Federal LORS

Clean Water Act of 1977 (including 1987 amendments) Sections 401, 402, and 404

The primary objective of the 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.

Clean Water Act Section 401

Section 401 of the CWA requires certification from the RWQCB that the proposed project is in compliance with established water quality standards. Projects that have the potential to discharge pollutants are required to comply with established water quality objectives. These requirements include the implementation of BMPs during site grading activities and other activities associated with construction of the facility.

Section 401 provides the SWRCB and the RWQCB with the regulatory authority to waive, certify, or deny any proposed federally permitted activity, which could result in a discharge to waters of the State. To waive or certify an activity, these agencies must find that the proposed discharge will comply with State water quality standards. According to the CWA, water quality standards include beneficial uses, water quality objectives/criteria, and compliance with the United State Environmental Protection Agency's (EPA) non-degradation policy.

No license or permit may be issued by a Federal agency until certification required by Section 401 has been granted. Under the CWA, U.S. Army Corps of Engineers (USACE) Section 404 permits are subject to RWQCB Section 401 Water Quality Certification (Title 23 CCR Sections 3830 through 3869). As such, a determination of "waters of the United States" under Section 404 is required by the USACE. A report documenting the results of the evaluation for the presence of jurisdictional waters of the U.S. is provided in Appendix F. Although the study concludes that there are no Federal jurisdictional waters on the Project site, the USACE must concur with this finding. At the time of Application for Certification (AFC) submittal, the USACE has not yet provided such concurrence although the process is underway.

While there is not a direct requirement under a 404 jurisdiction, the RWQCB, under the Porter-Cologne ACT, has authority to regulate discharge of waste to "waters of the State". The definition of the waters of the State is broader than that for waters of the U.S. in that all waters are considered to be a water of the State regardless of circumstances or condition. The term "discharge of waste" is also broadly defined in Porter-Cologne, such that discharges of waste include fill, any material resulting from human activity, or any other "discharge" that may directly or indirectly impact waters of the State relative to implementation of Section 401 of the CWA.

Porter-Cologne authorizes the RWQCB to regulate discharges of waste and fill material to waters of the State, including "isolated" waters and wetlands, through the issuance of WDRs. Under Porter-Cologne all parties proposing to discharge waste that could affect the quality of waters of the State, other than into a community sewer system, shall file with the appropriate RWQCB a Report of Waste Discharge (ROWD) containing such information and data as may be required by the RWQCB. As such, the Project will file a ROWD for evaluation of 401 water quality impacts and in association with the proposed Land Treatment Unit (LTU) for management of soils impacted by a release of heat transfer fluid (HTF). The schedule for filing of such document is provided in Section 5.17.1.5.

Clean Water Act Section 402

Direct and indirect discharges and stormwater discharges into waters of the U.S. must be made pursuant to a NPDES permit (CWA Section 402). 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 stormwater discharges for industrial and construction activities. Stormwater discharge is covered by an NPDES permit, either as an individual or general permit. The Lahontan RWQCB administers the NPDES permit program under the CWA in the Project area. Appendix L of this AFC includes a combined construction SWPPP/DESCP, a requirement of the CEC that is the functional equivalent of a SWPPP; both include BMPs and fulfill the requirements of Section 402.

Clean Water Act Section 404

Activities resulting in the dredging or filling of jurisdictional waters of the U.S. require authorization under a Section 404 permit issued by the USACE. The USACE may grant authorization under either an individual permit or a nationwide permit to address operations that may affect the ephemeral washes on the Project site. Section 404 permits are also subject to CWA Section 401 water quality certification by the RWQCB, in that projects that have the potential to discharge pollutants are required to comply with established water quality objectives.

An evaluation for jurisdictional waters on the Project site was performed by the Applicant. The ephemeral drainages were found not to conform to the requirements for designation as jurisdictional waters of the U.S. This finding must be formally confirmed by the USACE and the process of obtaining confirmation is underway. Several drainages on the Project Site delineated as jurisdictional waters of the State and are discussed in Section 5.17.1.2. A report documenting the results of the evaluation of the presence of jurisdictional waters of the U.S. is provided in Appendix F.

Resource Conservation and Recovery Act – Title 40 CFR Part 260 et seq.

RCRA establishes requirements for the treatment, storage, and disposal of hazardous wastes. These requirements include seismic and floodplain protection standards that must be followed by treatment, storage, and/or disposal facilities constructed, operated, or maintained for hazardous wastes that are located within certain distances of fault lines and floodplains. The portion of the El Paso Wash that crosses the Project site is located within a designated 100-year floodplain (see Section 5.17.2.8).

No active fault lines are present on the Project site according to maps and databases published by the United States Geological Survey (USGS) and the California Division of Mines and Geology (DMG). One inactive fault crosses the Project site. In addition, no active fault zones are present within one mile of the Project site. Regardless of whether there are faults across the Project site, because the Project is located in a seismically active area, all Project structures must be designed to comply with the California Building Code (CBC) and Uniform Building Code (UBC) Zone 3 requirements. The CBC and UBC base seismic

design on minimum lateral seismic forces ("ground shaking"). The goals of the Codes are to provide structures that will: 1) resist minor earthquakes without damage; 2) resist moderate earthquakes without structural damage but with some non-structural damage; and 3) resist major earthquakes without collapse but with some structural and non-structural damage. Section 5.5.2.2 discusses seismicity issues affecting the property in more detail. Portions of the Project site are located within a 100-year floodplain as designated by FEMA (see Section 5.17.2.8).

Bureau of Land Management Regulations – Title 43 CFR Part 2800, et seq.

The BLM currently manages the land where the Project is proposed in the Indian Wells Valley. Part 2800 of Title 43 CFR sets forth application requirements through the BLM for granting a ROW for the Project. Pending Project approval, a site-wide inspection will be performed by a certified professional soil scientist and specific requirements pertaining to Project grading and soil erosion will be developed as part of the joint BLM/CEC review process for the Project. These regulations may include implementation of BMPs to prevent the discharge of pollutants (i.e., sediment) into waterways. Applicable BMPs will be incorporated into the preliminary construction SWPPP/DESCP in Appendix L.

FEMA Regulations – Title 44 CFR Part 65 and 72

This regulation provides steps for communities or an individual through the community to request FEMA's comment on whether a proposed project would justify a Flood Insurance Rate Map (FIRM) revision. Such entity would provide information to FEMA for analysis in consideration of a map revision for special hazard areas. A CLOMR is FEMA's comment on a proposed project that would, upon construction, affect the hydrologic or hydraulic characteristics of a flooding source, and thus result in the modification of the existing regulatory floodway, the effective base flood elevations, or the Special Flood Hazard Area. The letter does not revise an effective NFIP map rather it indicates whether the Project, if built as proposed, would be recognized by FEMA.

Once the Project has been completed, the community must request a revision to the FIRM to reflect the Project change. All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. A detailed hydrologic analysis of proposed Project channel re-alignments have been performed consistent with applicable guidelines and engineering standards, including those in the Kern County Hydrology Manual (Appendix L). These data will be compiled, and a CLOMR application will be filed as part of the proposed Project.

5.17.1.2 State LORS

California Constitution Article X, Section 2

Article X, 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.

California Storm Water Permitting Program

California Construction Storm Water Program. Construction activities that disturb one acre or more are required to be covered 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 stormwater runoff and will also minimize erosion associated with the construction phase. The SWPPP must contain site map(s) that show the construction site perimeter; existing and proposed structures and roadways; stormwater 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. The Project will also prepare a DESCP to meet CEC requirements. A preliminary construction SWPPP/DESCP is provided in Appendix L.

California Industrial Storm Water Program. Industrial activities with the potential to impact stormwater discharges during operation are required to obtain an 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 ten 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 stormwater pollution described. The monitoring plan requires sampling of stormwater discharges during the wet season and visual inspections during the dry season. A report documenting the status of the program and monitoring results must be submitted to the RWQCB annually by July 1.

The General Industrial Permit, which requires the development and implementation of a SWPPP, is required for the Project's operation phase. The Applicant will prepare a separate operation phase SWPPP that outlines the monitoring and reporting plan, along with BMP-based stormwater mitigation measures for the facility.

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. Although there are no plans for this Project to used reclaimed water, the Project will attempt to recycle process makeup water for a savings of about 25 percent of the annual total consumptive use. Additional water use mitigation measures are proposed as part of the Project and outlined in Section 5.17.4 of the AFC.

Section 1200 "Water Rights". All water in California falls within one of three categories: surface water, percolating groundwater, or "subterranean streams flowing through known and definite channels." California's water rights law is a hybrid system in that the use of certain types of water requires a permit from the SWRCB, while other types of uses are governed by common law. Only surface water and subterranean stream water are within the permitting jurisdiction of the SWRCB. Since 1914, appropriation of such waters has required a SWRCB permit, and is subject to various permit conditions.

Pre-1914 appropriative and riparian rights do not require a permit. Riparian rights are correlative rights of equal priority among all riparian right holders. The place of use of such water is limited to riparian property (property that is contiguous to a watercourse) that has not had its riparian rights severed. Riparian rights are senior to any appropriative rights, and may not be separated from the riparian parcel and used elsewhere.

Groundwater can be: a) the underground portion of a surface water course (subject to the same rights/permits as the affiliated water course); b) a wholly underground water course which is treated like a water course; or c) percolating groundwater. 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 underground portion of a surface stream and to the water in un-appropriated subterranean streams that flow through known or defined channels, except as it is or may be reasonably needed for useful and beneficial purposes upon lands riparian to the channel through which it is flowing. The traditional test to establish SWRCB jurisdiction over groundwater was whether there is sufficient

evidence of bed and banks and water flowing along a line of a surface stream. Recent case law has redefined the boundaries of an underground stream to mean the bedrock bottom and side boundaries that are materially less permeable than the alluvium holding groundwater found within an alluvial valley across which flows a surface stream. If there is insufficient evidence to support a finding that the groundwater fits this definition, the SWRCB has no jurisdiction and no permit is required to appropriate the water.

Percolating groundwater has no SWRCB permit requirement and supports two kinds of rights: a) overlying rights, a correlative right of equal priority shared by all who own overlying property and use groundwater on the overlying property; and b) groundwater appropriative rights for use of the overlying property or on overlying property for which the water rights have been severed. The right to use groundwater on property that is not an overlying right is junior to all overlying rights, but has priority among other appropriators on a first in time use basis. Overlying users cannot take unlimited quantities of water 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.

Riparian water rights, groundwater rights and appropriative rights are all subject to modification to some degree if there is a basin-wide adjudication, which proceeding can be commenced before the SWRCB as an adjudicative body (not a permitting role) or before a Court. In an adjudication, unused riparian rights and unused overlying rights can be subordinated to appropriative rights.

Water rights in California can be held by any legal entity. Thus the owner can be an individual, related individuals, non-related individuals, trusts, corporations, and/or government agencies. Water rights are considered real property. Riparian rights and overlying groundwater rights are lost if severed from the land, while appropriative rights can be preserved and transferred to other properties. Transfers of water for use elsewhere are permissible without transfers of water rights, subject to many other conditions and approvals, including a "non-injury" to other water rights holders test, assessment of environmental impacts, and for post-1914 appropriative rights, SWRCB approval of any change in place of use, diversion point and/or purpose of use.

The RSPP is in Kern County, which has no perennial streams. The Project site is located on BLM land that overlies the IWV Groundwater Basin, which has a surface area of about 382,000 acres. Project water will be supplied by the IWVWD that pumps its water from the IWV Groundwater Basin. The water would be used on property overlying the groundwater basin.

The California Water Code allows any local public agency that provides water service whose service area includes a groundwater basin or portion thereof that is not subject to groundwater management pursuant to a judgment or other order, to adopt and implement a groundwater management plan (California Water Code Sections 10750 et. seq.) Groundwater Management Plans often require reports of pumping and some restrictions on usage. In 2006, the major water service providers and stakeholders in the IWV Groundwater Basin formed the Indian Wells Valley Cooperative Groundwater Management Group and published the Cooperative Groundwater Management Plan. Participants in the plan include the IWVWD, the China Lake Naval Air Weapons Station (NAWS), the BLM, Searles Valley Minerals, the Kern County Water Agency, and other local agencies and stakeholders. The plan outlines seven objectives with the intent to extend the useful life of the groundwater resources to meet current and foreseeable future needs. The seven objectives are as follows:

1) Limit additional large scale pumping in areas that appear to be adversely impacted. Under this objective, no signatory producing water will increase its annual production of water from the groundwater depression in the area in T26S R40E Sections 29, 30, 32, and parts of sections 31, and 33; and T27S R40E Sections 4, 5, and northern part of Section 9; and T26S R39E part of Section 25. This applies to extractions greater than 5 afy.

2) Distribute new groundwater extraction within the Valley in a manner that will minimize adverse effects to existing groundwater conditions (levels and quality), and maximize the long-term supply within the IWV. Under this objective, the participants will consider developing wells in the outlying areas of the IWV.

3) Aggressively pursue the development and implementation of water conservation and education programs. Under this objective, the Signatories have collectively developed a written policy regarding water conservation (Water Conservation Public Advisory) and will continue to develop water conservation guidelines and education programs.

4) Encourage the use of treated water, reclaimed water, recycled, gray and lower quality water where appropriate and economically feasible. The Signatories will consider the use of non-potable water, such as treated sewage effluent or poor quality sources, for appropriate re-use applications.

5) Explore the potential for other types of water management programs that are beneficial to the IWV. Under this objective, the Signatories will consider projects such as water transfers, water banking, water importation, groundwater replenishment, and other programs that will enhance or prolong groundwater reserves in the IWV.

6) Continue cooperative efforts to develop information and data which contributes to further defining and better understanding the groundwater resources in the IWV. Under this objective, the Signatories will continue to efforts to gather data and analyze projects focusing on groundwater recharge, discharge, storage, quality, transmissivity, and storativity with respect to groundwater resources of the IWV.

7) Develop an interagency management framework to implement objectives of this Plan. This objective lists the Signatories to the Plan and provides for the further development of this cooperative agreement to define the roles, responsibilities, rights, and obligations of all participants. It also affords the opportunity to enlist new members and provides the administrative framework for implementing applicable elements of this Plan.

Negotiations have been ongoing with the IWVWD to secure water supply for the RSPP. An MOU has been approved by the IWVWD Board, and is in the process of being finalized, that will secure a reliable source of water for the Project.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act of 1967, Water Code Section 13000 et seq. requires the SWRCB and the nine RWQCBs to adopt water quality standards to protect State waters. Those standards include the identification of beneficial uses, narrative and numerical water quality criteria, and implementation procedures. Water quality standards for the proposed project area are contained in the Water Quality Control Plan for the Lahontan Region - North and South Basins, which was adopted by the Lahontan RWQCB in 1995 and amended in 2005. This plan sets numeric and/or narrative water quality criteria controlling the discharge of wastes to the State's waters and land.

The Applicant proposes to construct an LTU as part of the facility. The LTU will be used to receive, temporarily store, and treat (through bioremediation or land farming) soil impacted with HTF that is released from the process to the environment. The Project will comply with Title 23 CCR Division 3, Chapters 9 and 15, regarding the establishment of requirements for waste discharge and reporting along with requirements specifying conditions for the protection of water quality. Under Chapter 9, the RWQCB is required to issue a ROWD for discharges of waste to land pursuant to the Water Code. The report requires the submittal of information regarding the proposed discharge and waste management unit design and

monitoring program. WDRs issued by the RWQCB provide construction and monitoring requirements for the proposed discharge. Chapter 15 outlines the siting, construction, and monitoring requirements for waste discharges to land for landfills, surface impoundments, LTUs, and waste piles. The Chapter provides closure and post-closure maintenance and monitoring requirements for Class II designated waste facilities that are applicable to this Project.

The Project will also comply with Title 27 CCR Division 2, Chapter 3. Section 20377 provides guidance for LTUs, referencing general criteria (Section 20320), precipitation and drainage control (Section 20365), and seismic design requirements (Section 20370). Section 20250 stipulates operational and maintenance procedures to minimize mobilization of waste materials. Additional information regarding the HTF for this Project is discussed in Section 5.6, Hazardous Materials.

Preliminary discussions with the Lahontan RWQCB indicate that because of the deep groundwater table below the site estimated to be greater than 450 feet below the ground surface (bgs), unsaturated zone monitoring will be considered appropriate in response to Title 27 monitoring requirements and as part of the ROWD for the LTU.

Section 13050. The surface waters, including ephemeral washes, affected by the Project are waters of the State and are subject to State requirements and the RWQCB's authority to issue WDRs for construction and industrial stormwater activities.

Section 13260 et seq. This section requires filing with the appropriate RWQCB a ROWD for activities in which waste is discharged that could affect the water quality of the State. The report shall describe the physical and chemical characteristics of the waste and 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 13173 (Designated Wastes). This section defines designated waste as either: a) Hazardous waste that has been granted a variance from hazardous waste management requirements pursuant to Section 14142 of the Health and Safety Code, or, b) Non-hazardous waste that consists of, or contains, pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives or could reasonably be expected to affect beneficial uses of the waters of the State contained in the appropriate state water quality control plan.

The Applicant proposes to construct a LTU as part of the facility for bioremediation or land farming of HTF-impacted soils. In 1995, the California DTSC determined that soils containing HTF up to 10,000 milligrams per kilogram were considered non-hazardous. However, recently the DTSC indicated that any determination of waste classification needs to be site-specific. Wastes containing HTF are discussed in detail in Section 5.6, Hazardous Wastes.

Section 13240 et seq. (Water Control Plan). The Water Quality Control Plan for the Lahontan Region establishes water quality objectives, including narrative and numerical standards that protect the beneficial uses of surface and ground waters in the region. The Plan describes implementation plans and other control measures designed to ensure compliance with state-wide plans and policies and provides comprehensive water quality planning. The following chapters are applicable to determining appropriate control measures and cleanup levels to protect beneficial uses and to meet the water quality objectives: Chapter 2, Beneficial Uses; Chapter 3, Water Quality Objectives; and the sections of Chapter 4, Implementation, entitled "Point Source Controls" and "Non-Point Source Controls."

- Beneficial Uses: Chapter 2 of the Water Quality Control Plan describes beneficial uses of surface and ground waters. The beneficial uses of surface waters of Indian Wells Valley (Hydrologic Unit No. 624.00) are municipal and domestic supply, agricultural supply, groundwater recharge,

freshwater replenishment, water recreational purposes, wildlife habitat support, and warm freshwater habitat support. The beneficial uses of ground waters of the IWV Groundwater Basin are municipal and domestic supply, agricultural supply, industrial service supply, and freshwater replenishment.

- Water Quality Objectives: Region-wide numeric and narrative objectives for general surface waters are described in Chapter 3 of the Water Quality Control Plan under the "Water Quality Objectives for Surface Water" and region-wide objectives for groundwater under the "Water Objectives for Ground Water."
- Waste Discharge Requirements: Chapter 4 of the Water Quality Control Plan describes the measures that are to be implemented to protect the beneficial uses and to achieve the water quality objectives of the Plan. The chapter discusses general control actions and describes the Region's Nonpoint Source Program. Specific types of activities and their related control actions are discussed including Waste Discharge Prohibitions, Stormwater Runoff, Erosion, and Sedimentation, Land Development, Groundwater Protection & Management, and Mining, Industry, and Energy Production.
- Section 13243: Under this section, the Regional Water Boards are granted authority to specify conditions or areas where the discharge of waste will not be permitted. The discharge of designated waste can only be discharged to an appropriately designed waste management unit.

Section 13263 (Waste Discharge Requirements). The Lahontan RWQCB will regulate the proposed discharge of fill material, including structural material and/or earthen wastes into wetlands and other waters of the State through WDRs. The Lahontan RWQCB considers WDRs necessary to adequately address potential and planned impacts to waters of the State and to require mitigation for these impacts to comply with the water quality standards specified in the Water Quality Control Plan for the Lahontan Region – North and South Basins.

WDRs from the Lahontan RWQCB are required for the LTU that will be used to treat (through bioremediation and land farming techniques) HTF-impacted soil. The Applicant will submit a ROWD application to the RWQCB after AFC submittal.

Section 13271 (Discharge Notification). CWC Section 13271 requires any person who, without regard to intent or negligence, causes or permits any hazardous substance or sewage to be discharged in or on any waters of the State, or discharge or deposited where it is, or probably will be, discharged in or on any waters of the State to notify the Office of Emergency Services (OES) of the discharge as specified in that section. The OES then immediately notifies the appropriate regional board and the local health officer and administrator of environmental health of the discharge.

Section 13510. "It is hereby declared that the people of the state have a primary interest in the development of facilities to recycle water containing waste to supplement existing surface and underground water supplies and to assist in meeting the future water requirements of the state."

Section 13550. "The Legislature hereby finds and declares that the use of potable domestic water for non-potable uses, including, but not limited to, cemeteries, golf courses, parks, highway, landscaped areas, and industrial and irrigation uses, is a waste or an unreasonable use of the water within the meaning of Section 2 of Article X of the California Constitution if recycled water is available which meets all of the following conditions, as determined by the State Board." This section 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. This section prohibits a person or public agency, including a State agency, city, county, city and county, district, or any other political subdivision of the State, from using 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. This section specifically identifies the use of potable domestic water for cooling towers as an unreasonable use of water within the meaning of Article X, Section 2 of the California Constitution, if suitable recycled water is available and the water meets the requirements set forth in Section 13550.

The Project will use dry-cooling methods and does not propose to use groundwater for power plant cooling. The Project will use groundwater for mirror washing, auxiliary equipment cooling, process makeup, dust suppression and potable supply.

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. Water for the Project for construction and operational supply will be conveyed from the IWVWD from their Ridgecrest Booster Station through a pipeline along China Lake Boulevard.

California Code of Regulations

Title 22 Article 3, Sections 64400.80 through 64445. This section requires monitoring for potable water wells, defined as non-transient, non-community water systems (serving 25 people or more for longer than six months); the Project will employ 134 workers during operations. 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.

Title 23 Division 3, Chapter 9. Requires the RWQCB to issue a ROWD 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. 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 Division 3, Chapter 15. Regulates all discharges of hazardous waste to land that may affect water quality. Chapter 15 broadly defines a waste management area as “an area of land, or a portion of a waste management facility, at which waste is discharged.” Therefore, unless exempted, all discharges of hazardous waste to land that may affect water quality are regulated by Chapter 15. This chapter outlines siting, construction and monitoring requirements for waste discharges to land for landfills, surface impoundments, land treatment units, and waste piles. The chapter provides closure and post-closure maintenance and monitoring requirements for surface impoundments that are applicable to the Project.

Title 27 Section 2000 et seq. and Title 23 Section 2510 et seq. These sections include requirements for siting and minimum waste management standards for discharges of waste to land. They also establish monitoring and corrective action requirements for discharges to land, including spills and leaks and other unauthorized discharges. These sections require assurances of financial responsibility for closure and post-closure activities and corrective actions for all known or reasonably foreseeable releases.

As discussed above, the Project will employ an LTU to manage releases of HTF. WDR will be obtained from the RWQCB.

Provisions of Title 27 CCR apply to designated and non-hazardous solid waste. Provisions of Title 23 apply to hazardous waste. Engineered alternatives that are consistent with Title 27 and Title 23 performance goals may be considered for approval by the RWQCB.

Section 20375 provides guidance for surface impoundments, including construction requirements (Table 4.1), operation, maintenance, and inspection. Section 20377 provides guidance for LTUs, referencing general criteria (Section 20320) and precipitation and drainage control (Section 20365) and seismic design requirements (Section 20370). The regulations stipulate operational and maintenance procedures to minimize mobilization of the waste materials (Section 20250).

Public Resources Code Section 25300 et seq.

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 it 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." As noted above, the Project will use dry-cooling methods and does not propose to use site groundwater for power plant cooling. Water needs for the Project, including mirror washing, potable needs, etc., will be met by supplied water from the IWVWD.

State Water Resources Control Board Policies

Anti-Degradation Policy (Resolution No. 68-16). Requires that the RWQCBs, in regulating the discharge of waste, to: a) maintain existing high quality waters of the State until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial uses, and will not result in water quality less than that described in State or Regional Water Boards policies; and b) require that any activity, which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters, must meet waste discharge requirements that will result in the best practicable treatment or control of the discharge necessary to assure that a pollution or nuisance will not occur and the highest water quality consistent with maximum benefit to the people of the State will be maintained.

Power Plant Cooling Water Policy (Resolution No. 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: 1) wastewater being discharged to the ocean; 2) ocean water; 3) brackish water or irrigation return flows; 4) inland waste waters of low total dissolved solids (TDS); and 5) 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.

The Project will use dry-cooling methods and does not propose to use site groundwater for power plant cooling. Water for other Project uses (e.g., mirror washing, feedwater make up, domestic uses, etc.) will be supplied from the IWVWD.

Water Reclamation Policy (Resolution No. 77-01). Under this policy, the SWRCB and the RWQCBs shall encourage reclamation and reuse of water in water-short areas. Reclaimed water will replace or supplement the use of fresh water or better quality water.

Sources of Drinking Water Policy (Resolution No. 88-63). This policy designates all groundwater and surface waters of the State as drinking water, except where: a) the TDS are greater than 3,000 milligrams per liter (mg/L); b) the well yield is less than 200 gallons per day (gpd) from a single well; c) the water is a geothermal resource, or in a water conveyance facility; or d) the water cannot reasonably be treated for domestic use using either BMPs or best economically achievable treatment practices.

Policies and Procedures for Investigations and Clean-up and Abatement of Discharges under California Water Code Section 13304 (Resolution No. 92-49). This policy establishes requirements for investigation and clean-up and abatement of discharges. Under this policy, clean-up and abatement actions are to implement applicable provisions of Title 23 CCR Chapter 15, to the extent feasible. The policy also requires the application of Section 2550.4 of Chapter 15 when approving any alternative cleanup levels less stringent than background. It requires remediation of the groundwater to the lowest concentration levels of constituents technically and economically feasible, which must at least protect the beneficial uses of groundwater, but need not be more stringent than is necessary to achieve background levels of the constituents in groundwater.

5.17.1.3 Local LORS

Kern County Ordinance Code, Title 17, Chapter 17.48 – Floodplain Management

In 1968, the U.S. Congress passed the National Flood Insurance Act, which created the NFIP. The NFIP was designed to reduce future flood losses through local floodplain management and to provide protection for property owners against potential losses through an insurance mechanism. As part of the agreement for making flood insurance available to a community, the NFIP requires the community to adopt floodplain management ordinances that meet certain minimum requirements intended to reduce future flood losses. The Municipal Code of Kern County, General Ordinances, Title 17 (Buildings and Construction), Chapter 17.48, “Floodplain Management”, contain the provisions to protect public and private property from flood hazards within the county. The chapter contains administrative procedures for management, design of structures, standards for construction and development within areas of flood hazard. The ordinance also provides for identification of high hazard areas, including those areas identified by FEMA and the DWR, Division of Flood Management. Further information can be accessed at: http://www.co.kern.ca.us/bid/pdfs/2008CodeOfRegs.pdf

Kern County Ordinance Code, Title 14, Chapter 14.08 – Water Supply Systems

Section 14.08.160 Report of Excavation. This section requires that a report of well excavation for all wells dug or bored for which a permit has been issued be submitted to the Kern County Environmental Health Services Department within 60 days after completion of the drilling. DWR Form 188 shall satisfy this requirement as stipulated under California Water Code Section 13571.

Section 14.08.260 Annular Seal- Sealing off Strata. This section outlines the requirements for placement of the annular seal for water supply wells including stipulation for running an electric log, location of the seal and type of sealing materials. Further, requires that the drill cuttings be made available for inspection at the request of the Kern County Environmental Health Services Department.

Section 14.08.330 Water Quality Testing. This section requires that water from wells that provide water for beneficial use shall be tested radiologically, bacteriologically and chemically as indicated by the Kern County Environmental Health Services Department. Laboratory testing must be performed by a State of California-certified laboratory. The results of the testing shall be provided to the Kern County Environmental Health Services Department within 90 days of pump installation.

Section 14.08.360 Well Destruction. This section provides that all abandoned wells shall be destroyed in such a way that they will not produce water or act as a channel for the interchange of water, and will not present a hazard to the safety and well-being of people or animals. Destruction of the well shall follow

requirements stipulated in DWR Bulletin No.74-81, provided that at a minimum the top 50 feet shall be sealed with concrete, or other approved sealing material. Applications for well destruction must be submitted 90 days following abandonment of the well and in accordance with Section 14.08.170.

Section 14.08.370 Out of Service Wells. Requires that any well that has not been used for a period of one year shall be properly destroyed unless the owner has filled a "Notice of Intent" with the Kern County Environmental Health Services Department declaring the well out of service and declaring his intention to use the well again.

Section 14.08.500 Inspections. No water from a well shall be used pending final inspection on the well and the water quality data are approved by the Kern County Environmental Health Services Department

Kern County Ordinance Code, Title 14, Chapter 14.12 – Sewer Systems

Section 14.12.360, Private system installation – Applicable regulations. The type, capacity, location and layout of each private system shall comply with the rules and regulations of the Kern County Environmental Land/Water/Housing Division, and the waste discharge requirements of the RWQCB. A private system shall be constructed and maintained on the lot which is the site of the building it serves, unless the County authorizes a different location.

Section 14.12.370, Private systems – General management requirements. Each private system shall be managed, cleaned, regulated, repaired, modified and replaced from time to time by the owner or owner's representatives, in accordance with the rules, regulations and other reasonable requirements of the health officer in conformity with the WDR issued by the regional board and in a manner which will safeguard against and prevent pollution, contamination or nuisance.

Kern County Title 17 Chapter 17.20 – Uniform Plumbing Code

Section 17.20.170, Appendix K, Section K1 amended –Private Sewage Disposal – General. In certain areas of the County which have poor soils or other problems relative to sewage disposal, the sewage disposal system shall be installed and inspected before the building foundation inspection is made.

Section 17.20.180 Appendix K, Section K6(i) amended – Disposal fields. Disposal fields, trenches, and leaching beds shall not be paved over or covered by concrete or any material that can reduce or inhibit any possible evaporation of the sewer effluent unless the area of the disposal fields, trenches and leaching beds is increased by a minimum of 25 percent.

The administering departments for the Local LORS are within the Kern County Resource Management Agency. The Project will comply with the applicable local LORS related to water use and quality.

5.17.1.4 Involved Agencies

Agencies with jurisdiction over water resource issues include the following: BLM (land-use permit/lease agreement) the Lahontan RWQCB (WDRs, 401 Water Quality Certification, NPDES and storm water permitting) and Kern County (flood control and septic system permits). Contacts for these agencies are provided in Table 5.17-2.

Table 5.17-2 Water Resources Agencies and Contact Information

Contact	Phone/Email	Permits/Issue
Hector Villalobos BLM - Ridgecrest Field Office 300 S. Richmond Road Ridgecrest, CA 93555	(760) 384-5405 Hector_Villalobos@ca.blm.gov	Land-Use Permit/Lease Agreement
Richard Booth, Senior Engineering Geologist Lahontan Regional Water Quality Control Board South Lake Tahoe Office 2501 Lake Tahoe Boulevard South Lake Tahoe, CA 96150	(530) 542-5574 Rbooth@waterboards.ca.gov	Waste Discharge Requirements, NPDES and Storm Water Permits, Clean Water Act 401
Beverly Briano, Permit Specialist Kern County Environmental Health Services Department Bakersfield Office 2700 M Street, Suite 300 Bakersfield, CA 93301-2370	(661)862-8797 bbriano@co.kern.ca.us	Groundwater Supply Well Permits
Nina Brennan, Permit Specialist Kern County Environmental Land/Water/Housing Division Bakersfield Office 2700 M Street, Suite 300 Bakersfield, CA 93301-2370	(661).862-8700 brennan@co.kern.ca.us	Septic System

Permits associated with water resource protection include a ROWD and WDRs as part of the proposed LTU, and stormwater permits required for the construction and operation of the facility. Additionally, because there are State jurisdictional waters through the Project, and the USACE has not yet rendered an opinion if there are Federal jurisdictional waters, a CWA Section 401 water quality certification will be prepared for submittal to the Lahontan RWQCB.

According to the DWR database of wells in California, there is one well on the Project site. This has been confirmed in the field and the well appears to be an old “stock” well. The well is filled with rocks and debris and will be abandoned consistent with the Kern County and DWR requirements.

Table 5.17-3 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 5.17-3 Required Water Resources Permits and Schedule

Permit/Approval	Schedule
WDRs	ROWD application for re-alignment of washes and the LTU will be submitted to the Lahontan RWQCB about three months after AFC submittal.
401 Water Quality Certification	A CWA 401 application will be submitted to the Lahontan RWQCB about three months after AFC submittal.

Table 5.17-3 Required Water Resources Permits and Schedule

Permit/Approval	Schedule
California General Construction Permit CAS 000002	Permit application must be submitted to the Lahontan RWQCB at least eight weeks prior to the start of construction activities.
General Industrial Permit CAS 000001	The permit application package will be submitted to the Lahontan RWQCB at least eight weeks prior to commencing operations.
Septic System	The permit application must be submitted to the Kern County Land/Water/Housing/Division at least six months prior to the start of field mobilization for construction activities.

5.17.2 Affected Environment

The RSPP site is located in the Indian Wells Valley in the southern end of the Basin and Range province. The valley is east of the Sierra Nevada, south of the Caso range, north of the El Paso Mountains, and the west of the Argus Range. The valley is characterized by broad alluvial basin of Cenozoic-age sedimentary and volcanic materials overlying older plutonic and metamorphic rocks. Quaternary lacustrine deposits are also found in the region as a result of playas in the northeastern portion of the valley. Indian Wells Valley is underlain with alluvial deposits up to 2,000 feet thick.

Surface water in the Indian Wells Valley drains from the surrounding mountains toward China Lake just north of Ridgecrest, a dry lake or playa, which is located approximately 12 miles northeast of the RSPP site. Groundwater beneath the plant site and surrounding area is contained within the IWV Groundwater Basin. This basin encompasses an area of about 597 square miles or 382,000 acres. Water resources, their occurrence and use are complicated issues within the region. In this desert environment, groundwater provides an important resource for domestic, agricultural, commercial and industrial use. Groundwater is the sole source for municipal, agricultural, and domestic water supply in the IWV Groundwater Basin.

Because the linear facilities (transmission line and water supply 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 within Indian Wells Valley.

5.17.2.1 Climate and Precipitation

The climate in the Basin and Range province is characterized is dry and arid and characterized by low precipitation. The region experiences a wide variation in temperature, with very hot summer months with mean maximum temperatures exceeding 100 degrees Fahrenheit (°F) occurring in July and August and cold dry winters with mean maximum temperatures in the 60s °F and lows in the 30s °F occurring in December. The average annual precipitation in the Project area is less than five inches with over 77 percent of the precipitation occurring between November and March with January being the wettest month. May and June are usually the driest months.

Annual precipitation in Indian Wells Valley ranges from four to six inches. Table 5.17-4 displays the average monthly and annual minimum and maximum temperatures and total precipitation from 1940 to 2008, collected from a gauging station in Inyokern (Station 044278), about seven miles northwest of the Project. An average annual precipitation of four inches per year was determined to be appropriate for the IWV Groundwater Basin floor.

Table 5.17-4 Inyokern, California Climate and Precipitation Summary[1] 1940 through 2008

Climate	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual[2]
Ave. Max. Temp (°F)	59.6	64.9	70.4	77.8	87.0	96.8	102.7	101.3	94.2	83.3	69	59.7	80.6
Ave. Min. Temp (°F)	30.7	34.6	38.8	44.5	52.9	60.5	66.2	64.6	58.1	48.2	37.3	59.7	47.2
Ave. Total Precip (in)	0.74	0.97	0.57	0.17	0.07	0.02	0.17	0.23	0.21	0.1	0.39	0.59	4.22

Notes:
[1] Source - Western Regional Climate Center, http://www.wrcc.dri.edu/ (Climate Station 044278 – Inyokern, CA).
[2] Refers to the annualized average of monthly temperature and precipitation values.

Key:
Ave – Average
Max – Maximum
Temp - Temperature
°F - degrees Fahrenheit
Precip – Precipitation
in – inches

5.17.2.2 Groundwater

The Project site is within the South Lahontan Hydrologic Region, which covers about 33,100 square miles of eastern California. The South Lahontan Hydrologic Region is bound to the west by the crest of the Sierra Nevada; to the north by the watershed divide between Mono Lake and East Walker River drainages; to the east by the California-Nevada border; and to the south by the crest of the San Gabriel and San Bernardino mountains and the divide between watersheds draining south toward the Colorado River and those draining to the north. The South Lahontan Hydrologic Region includes the Owens, Mojave, and Amargoso River systems, the Mono Lake drainage system, and numerous other internally drained basins.

The South Lahontan Hydrologic Region is subdivided into 76 groundwater basins that cover approximately 18,100 square miles. The IWV Groundwater Basin is located in the west-central portion of the South Lahonton Hydrologic Region and is bounded to the east by the Argus Range, to the south by the El Paso Mountains; to the west by the Sierra Nevada Range; and to the north by the Coso Range. Other groundwater basins that are adjacent to the IWV Groundwater Basin include the Coso Valley Groundwater Basin to the north, the Rose Valley Groundwater Basin to the northwest, the Searles Valley Groundwater Basin to the east, and the Fremont Valley Groundwater Basin to the southwest (Figure 5.17-1).

The lowest point of the IWV Groundwater Basin is China Lake at an elevation of 2,150 feet above mean sea level (msl). The topography of the Project site is characterized by low relief and elevations that gently slope toward China Lake at grades between one and three percent. China Lake is approximately 12 miles to the northeast of the Project site. Two smaller playas, Mirror and Satellite Lakes, are south of China Lake in the east-central portion of the valley and are the primary surface water and groundwater discharge points. Surface elevations in the valley floor range from approximately 2,153 above msl in the northeast to 2,400 feet above msl in the southwest.

Topography at the RSPP site slopes gently away from the El Paso Mountains from the south to the north-northwest across the site (Figure 5.17-2). The topography show an average slope of about one foot in 80 feet (1.2 percent) on the west side of the central drainage (El Paso Wash) crossing the Project site. There

are steeper grades east of the El Paso Wash on the Project site. Grades of 1.5 percent to 2.3 percent to the north and northwest are measured from an unnamed topographic high on the eastern boundary of the Project site.

The IWV Groundwater Basin is virtually closed, and there is very little groundwater underflow to or from adjacent valleys. As a closed basin, surface drainage does not "exit" the basin and flow from the surrounding mountains drain toward China Lake, or other small playas in the area. Evapotranspiration (ET) from the playa areas was the primary outflow from the IWV Groundwater Basin until the about 1950s or 1960s. At this time, groundwater pumping began to exceed ET rates. Prior to this time, ET from the China Lake area (playa) was the primary outflow of groundwater from the IWV Groundwater Basin. Current groundwater pumping rates have intercepted water flowing east towards the playa, reducing the amount of ET from the IWV Groundwater Basin.

5.17.2.3 Hydrogeology

Recent studies have led to a better understanding of the hydrogeology of the IWV Groundwater Basin. A comprehensive groundwater monitoring program for Indian Wells Valley was undertaken by the Indian Wells Valley Cooperative Groundwater Technical Advisory Committee and Geochemical Technologies Corporation (Groundwater Management Group) culminating in a final report that was published in March 2008. Through a local groundwater assistance program (AB 303 Grant), eight wells were installed and sampled to provide data in Indian Wells Valley where historical groundwater data was lacking. The Groundwater Management Group study also included the sampling of 46 wells for water quality parameters including: general chemistry, general physical parameters, stable and radio-isotopic parameters. Details of this study were used to develop the hydrogeology of the IWV Groundwater Basin described below.

In 2009, a report was published that focused on a groundwater flow model and hydrogeologic study of the IWV Groundwater Basin. The study was performed for the IWVWD by Brown and Caldwell. Using existing data and previous studies by the USGS, United States Bureau of Reclamation (USBR), and studies conducted for China Lake NAWS, four key hydrostratigraphic features were identified that were critical to understanding the basin-wide water budget and in developing the hydrogeologic conceptual model. These features include: the existence of a north-south fine-grained sediment plug in the west-central basin, an east-west high permeability gravel zone in the Ridgecrest-Inyokern area, high groundwater gradient between the neighboring El Paso Sub-basin and the southwest area of the IWV Groundwater Basin, and playa ET losses and changes over time. The groundwater flow model led to the estimation and refinement of the water budget for the IWV Groundwater Basin that concluded that groundwater storage in the aquifer has been in overdraft condition averaging approximately 20,000 afy and totaling about 900,000 af since 1920. Most of which has occurred since the 1950s.

The Indian Wells Valley is composed of two broad geologic units, consolidated rocks and unconsolidated deposits (Figure 5.17-3a and Figure 5.17-3b). The consolidated rocks consist of Mesozoic igneous and metamorphic rocks, which form the basement complex (Sierra Nevada Batholith); Tertiary continental deposits; and Miocene volcanic rocks. The Mesozoic basement complex exists below 2,000 feet to as much as 6,000 feet of alluvial fill, underlie the groundwater basin, and crop out in the surrounding hills. The Tertiary continental deposits overlie the basement complex and fill the valley to approximately 1,000 feet below ground surface. Miocene volcanic rocks crop out along the perimeter of the basin, more specifically, near the El Paso and Coso Mountains. The consolidated rocks are nearly impermeable except for areas where fracturing or weathering has occurred. These rocks are believed to yield little water to the overlying alluvial aquifer system.

The unconsolidated deposits are composed of Quaternary-age fan, lacustrine, alluvium, playa, and sand-dune deposits. The thickest sequence of unconsolidated deposits are approximately 2,000 feet near the west-central part of the valley. Wells exceeding 7,000 feet have been drilled in the valley; however, sediments below 2,000 feet where observed to be consolidated Pliocene and Miocene continental deposits

and are not considered to be water producing. Unconsolidated deposits vary throughout the valley, but in general, deposits consist of gravel, sand, silt, and clay, with the percentage of silt and clay increasing toward the central and eastern parts of the valley. Holocene sedimentation has been dominated by sand and gravel deposited in steep alluvial fans to gentle alluvial plain settings, and by silt and clay deposited primarily in dry, ephemeral lakes. A general depiction of the Valley sediments is shown on the cross-section in Figure 5.17-4.

Previous investigations have divided the unconsolidated Quaternary deposits into two main aquifers: the shallow aquifer and the deep aquifer. The shallow and deep aquifers are different in quality and aerial extent, and are separated by the lacustrine aquitards over the eastern part of the valley. The shallow aquifer extends from China Lake westward to the center of the valley and from the area south of Airport Lake southward to the community of China Lake. Sediments of the shallow aquifer are as much as 300 feet thick and generally do not yield water readily. Water quality of the shallow aquifer is characterized by high concentrations of total dissolved solids. The deep aquifer is confined or partly confined by the lucustrine sediments of the shallow aquifer. In the past, water from the shallow aquifer was used only for fire protection and maintenance of a few buildings on China Lake NAWS.

The deep aquifer occurs beneath the shallow aquifer on the east side of the valley; however, the thickness of the deep aquifer is uncertain due to a lack of data. Wells drilled in the Intermediate Wellfield area between Inyokern and Ridgecrest indicate that the deep aquifer is at least 1,750 feet deep. The deep aquifer is the sole drinking water supply in the valley and is used by the China Lake NAWS, public water districts, private well owners, industrial, and agricultural user.

A recent study by Brown and Caldwell identified four hydrostratigraphic features in the IWV Groundwater Basin. The features are: 1) Fine-Grained Sediment Plug, 2) Gravel Zone, 3) High Gradient, and 4) Playa. The Figure (Figure 5.17-5) shows the location of these features.

- The Fine-Grained Sediment Plug located approximately three to four miles east of the Sierra Nevada mountain front and trends north-south. The upper contact of this feature begins at depth of approximately 340 feet bgs and sediments may be as much as 1,340 feet thick. The areal extent of this deposit is not well defined due to limited borehole data.
- The Gravel Zone is a west-east trending area of coarse-grained high permeability sediments. This area is located from the mouth of Indian Wells Canyon to approximately the northwest portion of Ridgecrest, extends approximately two miles north-south, and fines to the east. This region is referred to the Inyokern and Intermediate Areas and contains high volume production wells. Wells within the Ridgecrest city limits are believed to be associated with this Gravel Zone; however, wells in this area have a higher percentage of fines and, therefore, their groundwater production is lower than the wells to the west.
- The High Gradient area extends from the El Paso sub-Basin into the main IWV Groundwater Basin near the southwestern portion of the valley. Groundwater gradients in this area have been measured at approximately 100 feet per mile. Brown and Caldwell propose that the high gradient may be caused by a combination of a narrowing of the area available for flow and the influx of recharge from Freeman Canyon. In addition, the high hydraulic gradient could be related to the contrast in aquifer transmissivity from the narrows to the high permeability zone to the north.
- The Playa feature identified by Brown and Caldwell is located in the area of China Lake. The thickness of these sediments is not known, but are likely several tens of feet thick. Deposits are highly micaceous, silt sandy silt, and fine sand with occasional plastic clays. Shallow water beneath China Lake is highly saline and unfit for most uses.

The majority of the wells in the IWV Groundwater Basin are located northeast of the Project in the City of Ridgecrest and are located within the IWVWD (Figure 5.17-6). It is important to note that while there is one

well (27S/39E-35B001M) on the plant site and a nearby well approximately one mile to the west of the site, no lithologic information could be obtained as the well logs were unavailable for review. Drillers logs provide only generalized descriptions of subsurface geology, reporting repetitive sequences of alluvial sands and clays and inter-bedded shales and granite.

5.17.2.4 Groundwater Occurrence and Flow

Prior to pumping, groundwater within the IWV Groundwater Basin flowed toward the China Lake playa, the area of lowest altitude in the Indian Wells Valley (2,153 feet above msl). As discussed in Section 5.17.2.2 above, the IWV Groundwater Basin is considered to be a virtually closed basin; with the majority of the water flowing into the basin remaining within the basin. Groundwater subflow is believed to enter the IWV Groundwater Basin from the Rose Valley and the Coso Groundwater Basins. Conservative estimates of potential subflow out of Rose Valley Groundwater Basin range from a few hundred to between 2,000 and 3,000 afy. Based on the dry nature of the region and the absence of alluvial fill in the Coso Groundwater Basin, estimates for the subflow coming from the IWV Groundwater Basin are thought to be “very low”. Subflow out of the IWV Groundwater Basin has been hypothesized; however, this has not been formally documented and is considered insignificant. The other natural mechanism for water to exit is through evaporation. ET rates at China Lake prior to pumping (1920s) in the valley were estimated at approximately 8,000 to 11,000 afy. In the 1960s, groundwater flow and ET rates began to decrease due to excessive groundwater pumping that caused lowering of the groundwater table and regional cones of depression. ET is largely absent from the playa area due to interception of the groundwater by pumping wells. If groundwater levels continue to drop near the playa area, ET will eventually cease.

Groundwater in the lower aquifer of the IWV Groundwater Basin is reportedly contained under generally unconfined conditions, except in the vicinity of China Lake, where silt and clay lenses, lake deposits, and playa deposits locally create confined conditions. The upper aquifer does not yield water freely to wells and consists of poor quality water. Wells in the lower aquifer yield more than 1,000 gallons per minute (gpm), with some wells up to 2,000 gpm. This aquifer is used as the primary aquifer due to the better water quality.

The depth to groundwater below the southern portion of the site, measured in 1959 from the one onsite well, is estimated to be approximately 230 feet bgs. That same year groundwater was measured at 451 feet bgs in a well approximately one mile west of the northern portion of the Project (Figure 5.17-7). The difference in the depth to groundwater in these two wells is approximately 220 feet. One possible explanation for the difference in groundwater elevations is that there is a groundwater barrier across the Project site, more specifically, a fault. In 1969, Kunkel and Chase reported a probable groundwater barrier approximately two miles south of Inyokern in the southwest portion of the Valley. This description appears to be in the general area of the Project site and corresponds to the general area of an unnamed, inactive fault that crosses the center of the site (Figure 5.17-7). Based on personal communication with Glen Harris, site features, and observation made during a field reconnaissance (July 2009), the more probable location of the unnamed fault is just north of, and parallel to Brown Road, and trends roughly east-west (Figure 5.17-7). This fault location and trend runs between the two wells described above and appears to be acting as a groundwater barrier, thus explaining the difference in groundwater depths seen in the two wells.

Historic water level data for selected wells within the IWV Groundwater Basin are provided in Appendix J.1. Figure 5.17-8, Figure 5.17-9, and Figure 5.17-10 show groundwater level contours from selected wells within the IWV Groundwater Basin from 1920, 1985, and 2006, respectively. Between 1920 and 1985, groundwater levels dropped throughout the Valley and are reflective of pumping within the City of Ridgecrest and west in the direction of Inyokern. The lowering of groundwater levels is again evident in the 2006 groundwater elevation map were an increase in the effects of pumping continued to lower groundwater levels and caused a cone of depression beneath the City of Ridgecrest.

Current depth to groundwater west of the eastern Project boundary and north of Brown Road (based on 2006 data) is estimated at 480 feet below the ground surface. The contours show that groundwater flows in

a radial pattern toward China Lake and toward the cone of depression beneath the City of Ridgecrest. Based on regional groundwater trends and topography, groundwater flow beneath the plant site is expected to flow to the northeast towards the cone of depression. The groundwater gradient beneath the site is not currently known due to the lack of groundwater data in the area.

Prior to China Lake NAWS operations (late 1940s), the primary use for groundwater in the IWV Groundwater Basin was for mining operation in the adjacent Searles Valley and to a much lesser extent for irrigation of agriculture. Between 1920 and 1937, annual groundwater pumping increased from 1,000 af to slightly less than 2,000 af, respectively. By 1950 pumping had increased to 6,000 af and by the early 1960s, groundwater pumping had exceeded the natural recharge and subflow of the IWV Groundwater Basin. At that time, total inflow into the basin was estimated to be between 9,000 to 11,000 afy. Currently, groundwater pumping within the IWV Groundwater Basin is estimated to total approximately 25,000 afy. With groundwater pumping increasing over the years, lowering of water levels are apparent throughout the valley; however, the natural flow of the basin continues to be toward China Lake.

5.17.2.5 Recharge and Discharge in the Indian Wells Valley Groundwater Basin

The current conceptual model for the hydrogeologic system in the IWV Groundwater Basin is that the basin is closed and that the bulk of groundwater inflows are primarily from the mountain front recharge from the Sierra Nevada and subflow from the north and north-central portions of the IWV Groundwater Basin. Recharge to the IWV Groundwater Basin is derived from the infiltration of precipitation and runoff from the Sierra Nevada and anthropogenic recharge. Anthorpogenic recharge is recharge that occurs form excess water applied for domestic or agricultural irrigation, or from wastewater treatment system percolation ponds. The estimates of total basin recharge have varied from 9,000 to 11,000 afy. Brown and Caldwell estimated total mountain front recharge into the basin to be 9,400 afy.

Recharge to the IWV Groundwater Basin is also derived from underflow from the Rose Valley Basin and the Coso Valley Basin. Sub-flow from the Rose Valley Basin occurs through the Little Lake Gap and possibly from underneath or through the basalt flow located approximately five miles east of the Little Lake Gap. Based on available information, recharge through sub-flow from the Rose Valley Basin is estimated to be between a few hundred to between 2,000 and 3,000 afy. Sub-flow from the Coso Valley Basin is believed to be very low.

In addition, during wet years, some surface flow enters the IWV Groundwater Basin through the Little Lake Gap; however, this flow is anomalous and intermittent and is not included in the long-term water balance calculation.

Groundwater in the IWV Groundwater Basin is used for municipal, domestic, industrial and agricultural purposes. The principle entities pumping groundwater are the IWVWD, China Lake NAWS, and the Searles Valley Minerals Company, which uses water to support mining operations in the adjacent Searles Valley. In 2007 – the latest year for which this data was available, groundwater pumping in the IWV Groundwater Basin was about 25,000 afy. Municipal and agricultural uses account for 32 percent each, industrial uses account for 12 percent and miscellaneous private well owners account for 24 percent of the total production. Less well documented groundwater pumping is conducted by smaller water providers and domestic wells used both for potable use and domestic irrigation. In 1993, the USBR estimated there were 3,000 private wells in the IWV Groundwater Basin with approximately 550 of those operational and producing approximately 2,099 afy of groundwater. In 1996, the residential groundwater pumping was estimated to be 1,728 afy. The Indian Wells Valley Groundwater Cooperative Management Group estimated in 1997, there were 670 individual domestic wells and 120 residential cooperative wells.

Historically, the annual pumping throughout the IWV Groundwater Basin increased from about 1,000 af in 1920 to 6,000 af by 1950. Prior to the development of NAWS in the late 1940s the primary documentable use of groundwater was for mining operations in Searles Valley. Groundwater use for irrigated agriculture

was also occurring but the information on the irrigated acreage and volume of water pumped was not well documented. A published report on the hydrogeologic study of the IWV Groundwater Basin cited an estimate for total inflow into the basin of between 9,000 to 11,000 afy and that by the late 1950s to early 1960s groundwater pumping equaled or exceeded the sum of natural recharge and subflow. Although the number of wells has in the basin has increased from the 1950s through 2006, pumping has remained concentrated in similar regions over the past 60 years with the exception of an expansion of production wells in the southwest area of the basin.

5.17.2.6 Indian Wells Valley Water District

The Project site lies within the IWVWD (Figure 5.17-1), which serves customers in Ridgecrest and the surrounding areas. Water from the IWVWD comes from ten wells that draw from the Indian Wells Valley aquifer. Water is pumped from the wells to ten water reservoirs with a combined storage capacity of about 16.6 million gallons. In the summer months when water demand is highest, the average monthly water use in the district is about 360 million gallons (1,105 af). During the winter months when water demand is lowest, the average monthly water use is 125 million gallons (384 af).

Aquifer Properties

Properties used to define the aquifer characteristics include hydraulic conductivity, transmissivity, and storage coefficient. Hydraulic conductivity is the property of the aquifer material to transmit water, and is expressed in units of feet per day (ft/d). Transmissivity is the hydraulic conductivity multiplied by the thickness of the sediments capable of storing water, and is expressed in units of gallons per day per foot or feet squared per day (ft2/d). Storage coefficient refers to the percentage of water that can be released from the aquifer material pore space, and is used for unconfined or water table conditions.

In the development of a groundwater flow model and hydorgologic study for the IWV Groundwater Basin, Brown and Caldwell used hydraulic conductivity values ranging from 0.1 ft/d to 100 ft/d. These values were based on geologic logs, pre-existing groundwater modeling studies, and interpretations based on local geology, depositional environments, and groundwater flow regime. The model showed that the areas with the highest hydraulic conductivities are generally located immediately east of the Sierra Nevada. Areas of the IWV Groundwater Basin with lower hydraulic conductivities are localized and distributed throughout the Basin.

Published aquifer testing data report transmissivity values from of less than 1,400 ft2/d to 36,800 and 44,000 ft2/d to 155,000 ft2/d. Both sets of values were based on aquifer testing and geologic data. The Brown and Caldwell (2009) model used specific yield ranges of 0.05 to 0.15. Reported well yields in the lower aquifer are more than 1,000 gpm and some wells consistently yield more than 2,000 gpm. The IWV Groundwater Basin has an estimated storage capacity of about 2,200,000 af and 5,120,000 af. The calculated storage of 2,200,000 af is based on 1921 water levels as a steady state limit and 200 feet below this level as the economically feasible limit to extract groundwater

Project Water Supply Wells

The RSPP proposes to use groundwater supplied by the IWVWD. Water from the wells will be piped to an existing tank and transmitted via pipeline that will be built by the RSPP to the Project site. The well locations are shown on Figure 5.17-6. Table 5.17-5 is a summary of the available information on these wells. The wells are currently used by the IWVWD as water supply wells for the district. Additional details for these wells are provided in Appendix J.

Table 5.17-5 Well Completion Data for Water Supply Wells that will Supply Water to the Project.

Well Number	Well Construction		Screen Interval		Pumping Rate
	Ground Surface[1] (ft msl)	Total Depth[2] (ft bgs)	Top[3] (ft bgs)	Bottom (ft bgs)	(gpm)
Well 18	2,540	1,020	560	1,000	470
Well 33	2,540	1,020	560	1,000	816
Well 34	2,570	955	550	865	1200
			895	935	

From the information provided, the total depth of the onsite wells range from 955 to 1,020 feet bgs. Wells vary from 16 to 20 inches in diameter and are gravel packed and screened from depths below 560 to 895 feet to the total depth of each well. The most recent water levels were collected during the annual groundwater sampling conducted by the IWVWD in 2008. The data collected during this effort indicates that the saturated thickness in these wells is between about 1,500 feet depending on the total depth of the well. The information provided by the IWVWD reveals that three wells are pumped at rates between 470 to 1,200 gpm.

5.17.2.7 Groundwater Geochemistry

The groundwater quality in Indian Wells Valley varies throughout the Basin. According to the DWR report, TDS ranges from less than 600 mg/L to more than 1,000 mg/L. Analyses of water from ten public supply wells in the IWV Groundwater Basin show that TDS content ranges from 220 to 720 mg/L. In general, the highest quality water is in the deep aquifer (Groundwater Management Group 2008). TDS concentrations for wells in the IWV Groundwater Basin were mapped by the Indian Wells Valley Cooperative Groundwater Management Group. Groundwater considered to have the best quality (TDS of 500 mg/L or lower) is found in the southwestern part of the Valley and the western part of the Valley along the area of recharge.

A review of the water quality data for the IWV Groundwater Basin show that eight major types of groundwater quality occur in the Basin:

- Alpine waters, characteristically calcium-sodium-magnesium-bicarbonate. These are characteristic of the Sierra Nevada.
- Sodium-chloride waters, characteristic of China Lake, southeastern parts of the City of Ridgecrest, and the Coso Geothermal Area.
- Sodium-carbonate waters, principally occurring in the southwestern part of Indian Wells Valley.
- Sodium-bicarbonate waters, occurs in an extensive horseshoe-shaped area in the north and southwestern parts of the basin.
- Sodium-bicarbonate-chloride waters, east of the horseshoe area and may represent mixing of easterly moving groundwater with the groundwater of the China Lake Playa.
- Sulfate waters from geothermal areas, mineralized areas, and sewage pond seepage.
- Calcium-(sodium-magnesium)-bicarbonate-chloride-sulfate waters, these water probably represent a mixture of Alpine and Coso geothermal waters.

- "Waters of the well fields. Usually sodium-calcium, but sometimes calcium-sodium-bicarbonate-chloride waters. These water could represent Alpine waters concentrated by ET mixed with sodium chloride geothermal leakage".

A review of the water quality data for the ten wells pumped for the IWVWD water supply shows the following:

- TDS concentrations (280 to 5,640 mg/L) generally exceeded the recommended standard of 500 mg/L, for a drinking water resource in California.
- Arsenic was reported in general water quality data for 2008 at concentrations between 0.0024 – 0.025 mg/L. Some concentrations exceeded the primary State and Federal Maximum Contaminant Level (MCL) for Arsenic (0.010 mg/L). The IWVWD began compliance testing for arsenic in December 2007. At that time, three wells were placed on quarterly monitoring. Two wells violated the MCL based on samples collected in March, July, and October 2008. Arsenic is a naturally occurring element commonly found in drinking water sources in California.
- Boron concentrations range from 0.18 mg/L to 1.2 mg/L. Boron was reported in two District wells at concentrations of 1.2 mg/L and 1.1 mg/L. The Action Level for boron is 1.0 mg/L. The Action Level is the concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

The IWVWD serves the City of Ridgecrest and the surrounding areas. Ten wells are pumped by the IWVWD for their water supply and these wells are tested on regularly for the presence of radioactive, biological, inorganic volatile organic, and synthetic organic compounds. The results of the 2008 Annual Water Quality Report are presented on Table 5.17-6. Table 5.17-6 also presents the analytical results for three wells that are proposed to be pumped for the Project water supply and are located approximately four miles from the center of the Project site. Given the long screen interval for these wells, these data likely represent an average water quality of the more permeable sediments over the screen interval.

Table 5.17-6 Summary of Water Quality Data
(all values reported in mg/L)

Analyte	IWVWD Wells[1]	Proposed Project Supply Wells[2]		
	General Water Quality	Well 18	Well 33	Well 34
Arsenic	0.0024 – 0.025	ND	ND	0.004
Bicarbonates (HCO_3)	87 – 150	150	140	140
Boron	0.180 – 1.20	0.26	0.29	0.29
Calcium	7.5 – 68	36	36	38
Chloride	21 – 210	25	30	31
Fluoride	0.43 – 1.20	0.94	0.73	0.62
Magnesium	ND	4.8	5.1	6.3
Nitrate (N)	6.5	1.7	1.8	2
Sodium	35 - 180	41	41	49
Sulfate	ND	43	43	46

Table 5.17-6 Summary of Water Quality Data (all values reported in mg/L)

Analyte	IWVWD Wells[1]	Proposed Project Supply Wells[2]		
Total Hardness ($CaCO_3$)	21 - 250	110	110	120
Total Dissolved Solids (TDS)	220 – 720	290	280	290
Uranium (in pCi/L)	2.1 – 6.1	NS	NS	NS
Gross Alpha Particle Activity (in pCi/L)	0.8 – 7.8	NS	NS	NS
Vanadium	ND - .04	0.014	0.012	0.016
pH	7.2 – 9.0	7.8	7.9	7.2

Key:
mg/L – milligrams per liter
ND – not detected at the practical quantitation limit shown
NS – not sampled
1. IWVWD, 2008.
2. Data provided by the IWVWD.

5.17.2.8 Surface Water

The Project site is located on the southern edge of the Indian Wells Valley and north of the El Paso Mountains. The topography slopes gently downward to the northwest at a gradient of approximately 0.2 percent (see Section 5.5.2.1). Ground surface elevations at the Project site range from approximately 2,890 feet above mean sea level (msl) in the southeast to 2,580 feet above msl in the northwest. Because of the high temperatures, low precipitation, and permeable soils, local drainage is intermittent and occurs as dry washes.

Surface runoff and water discharged from the El Paso Mountains move toward lower altitudes where there are alluvial deposits and gentle slopes. As the surface water descends, seepage into the permeable deposits occurs and evaporation increases. The lack of protective vegetation combined with a large amount of solar energy results in limited surface water flow into the Indian Wells Valley. The major watercourse in the Project area is El Paso Wash, which drains approximately 20 square miles from the El Paso Mountains and trends generally from the southeast to the northwest through the Southern Solar Field across South Brown Road then over the Northern Solar Field (Figure 5.17-11). The storm water flows ultimately reach China Lake. There are also several unnamed watersheds which are adjacent to and parallel El Paso Wash. See Section 5.12, Soils for further discussion of soil types on the RSPP plant site.

According to the FIRM, the plant site contains areas predisposed for minimal flooding and areas within the 100-year flood zone. The 100-year flood zones onsite follow the trend of the El Paso Wash and other unnamed drainages through the Project site (Figure 5.17-12).

5.17.3 Environmental Impacts

The direct effects of the Project on local water resources associated with using groundwater from the IWVWD for construction, specifically for demands during the site grading and dust control, and operational process water needs, and the effects of site grading and re-routing of washes that cross the Project were

evaluated to assess the potential environmental impacts. 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, or
- Use of water in a wasteful manner.

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, or
- Activities that cause or contribute to substantial erosion or flooding off the site.

Currently, construction plans are to clear and grade the site with heavy equipment to provide a uniform, gently northwesterly sloping grade and to construct drainage channels and roads. The preliminary cut and fill volume is estimated to be 7,500,000 cubic yards, and the grading period is estimated to be 28 months (2.33 years). Upon completion of the geotechnical investigation, the grading plan will be revised to reflect soil shrinkage or other losses. The current estimate of grading volume assumes no import of fill material. Due to the amount of soils and vegetation affected by grading activities, substantial water erosion control and dust control measures will be required to minimize offsite impacts. Overall, the Project will result in disturbance of approximately 1,760 acres at the Project site. A preliminary construction SWPPP/DESCP was prepared to address site management during construction (see Appendix L), and includes a series of management controls and BMPs to minimize erosion and drainage impacts.

The Project is a dry-cooled facility that will use about 150 afy of groundwater supplied by the IWVWD for all operational activities. The peak water usage during the summer months is about 190,000 gpd or about 132 gpm under an assumption of continuous pumping. The average water use over the 30-year life of the Project is about 90 gpm, with a total water use of about 4,500 af. Winter usage will be less owing to the lower ambient temperature, and lesser requirements for process water and water for dust suppression. During construction, the Project will use an average of approximately 630 afy over a 28-month period or an average of about 780 gpm under an assumption of pumping 12-hours per day. The total use during construction will be about 1,500 af.

To support the evaluation of environmental impacts, both a numerical groundwater and conceptual drainage study were completed. The conceptual drainage study included hydrologic modeling of current surface water flow and the preliminary design of the proposed re-routing of El Paso Wash and un-named washes and drainage structures (Appendix J). Numerical modeling using a previously developed and published groundwater model for the IWV Groundwater Basin was done to evaluate impacts from proposed pumping of groundwater below the site.

Groundwater Model

A published three-dimensional (3-D) numerical groundwater model that was developed by Brown and Caldwell (2009) for the IWVWD was selected as the mechanism to provide an evaluation of Project impacts from proposed construction and operation pumping. The groundwater model was provided by IWVWD to the Applicant and was developed as part of a program to update the conceptual model for the IWV Groundwater Basin, provide a numerical flow model for the updated interpretation and establish a digital data management system from available water level and groundwater pumping data. The IWV Groundwater Flow Model Committee, comprised of representatives from the IWVWD, Searles Valley Minerals and China Lake NAWS, provided oversight during development of the model, and in review of technical deliverables. Additionally, representatives from the Indian Wells Valley Cooperative Groundwater

Management Group participated in the development and review of the numerical groundwater model. The following is a brief summary of the numerical model and its development. The complete model report from Brown and Caldwell is provided in Appendix J.

The groundwater model is a three-dimensional numerical groundwater flow model developed using MODFLOW 2000. The site conceptual model was built on existing data that was integrated with GIS and 3-D data visualization programs to provide a comprehensive basin-wide interpretation of hydrogeologic conditions. From this interpretation, the numerical model was developed, necessarily including simplifying assumptions of aquifer distribution and boundaries, physical characteristics, and adaptations of recharge and discharge within the numerical structure. The model domain encompasses the area of the IWV Groundwater Basin (288,000 acres) to a depth of 2,000 feet bgs and is comprised of four layers, developed from the interpretation of lithostratigraphic conditions within the IWV Groundwater Basin. Layer thickness and distribution were developed from the 3-D geologic model and cross sections, and in part, interpolation of the geologic contacts through kriging managed in Surfer™. The model grid was established at a uniform cell size of 1,320 feet by 1,320 feet (1/4 mile on a side, 16 cells per square mile).

The model was calibrated to historical groundwater elevations from 1920 to 2006. During the calibration process, aquifer physical properties, recharge, and discharge were varied to best match available groundwater elevation data. The calibration used both qualitative and quantitative methods to match historic water levels for years 1920 (assumed steady-state condition), 1953, 1985 and 2006. Calibration targets for the transient portion of the model included measurements from seven periods beginning in 1946 and ending in 2006, with targets ranging from 22 to 225 well locations. From the calibration, Brown and Caldwell concluded that the model can be employed to for future predictive simulations and planning purposes.

The numerical groundwater model developed for the IWVWD was selected to evaluate the impacts from proposed Project pumping because:

- The model provided the most up-to-date interpretation of the groundwater basin, summarizing historical data and providing current methodology in interpreting geologic data.
- The model is of sufficient detail and complexity to adequately evaluate impacts from the modest pumping proposed for the Project.
- It had undergone review by the stakeholders within the IWV Groundwater Basin and IWVWD. As such, the model had undergone significant peer review prior to being published.
- The model is based on MODFLOW 2000, a well established and commonly used computer code developed for numerical groundwater modeling.

While the model incorporated the Project site, several changes were required for it to be used to adequately evaluate Project pumping and the influence from the pumping on adjacent water supply wells within a one-mile radius of the pumping wells. Three wells, No. 18, 33 and 34 (Figure 5.17-6) that are operated by the IWVWD, all with the capacity to pump at about 1,200 gpm, are proposed to provide water for the Project. The wells may be used in rotating fashion though the period of rotation is not known. Therefore, to assess impacts one well was selected to provide the water for both construction and operation. Well No. 18 was selected to evaluate impacts from pumping to deliver water to the Project, since as at this time, the well is operated at about 470 gpm and it has a reported capacity of 1,200 gpm. This well has more available capacity than wells No. 33 and No. 34, which are pumping at about 816 gpm and 1,200 gpm, respectively. It is also important to note that all IWVWD wells proposed for water supply are screened in Layer 2 of the model.

For the analysis of pumping influence, the model grid was modified and grid spacing tightened or made much smaller around the proposed pumping well (Well No. 18). This allowed for a better assessment of

influence from the Project pumping as the grid spacing around the pumping well was varied from about 30 feet around the well and gradually increased to a spacing of 100 feet one mile away from the pumping well, then gradually increased to 1,320 feet for the remainder of the modeling domain. Additionally, the predictive scenarios only changed the pumping rate in Well No. 18, and did not change the default pumping rates for the wells within the IWVWD model. The pumping rates for other water supply wells in the model from 2006 were brought forward without variation for the predictive scenarios.

The calibrated model was used to provide an assessment of the changes in the cone of depression over a base line condition from pumping at IWVWD Well No. 18. The results of the model for construction and operational water use scenarios are provided in Sections 5.17.3.1, Construction Water Use and 5.17.3.2, Operational Water Use. A technical memorandum summarizing the modifications and the modeling of the proposed pumping, along with the electronic model files, is provided in Appendix J.

Conceptual Drainage Study

A conceptual drainage study was performed to evaluate site hydrologic conditions and provide a preliminary design basis for onsite drainage structures, detention area, and the re-routing of El Paso Wash and two other unnamed washes. The evaluation was designed following guidance provided in the Kern County Hydrology Manual and the Kern County Division Four – Standards for Drainage.

Proposed drainage modifications to the Project site seek to replicate the existing flow patterns as nearly as possible. For this reason three channels have been proposed adjacent to or across the site (Figure 5.17-13). These channels are hereafter referred to as Channels 1, 2, and 3. The proposed channels do not substantially add or subtract natural flow amounts as it simply routes natural drainage around the solar fields. These channels intercept the flows prior to their entry to the site then convey them in natural re-aligned channels through the site to approximately the same locations where they exit the site under existing conditions.

The Project site will be substantially occupied by long rows of solar collectors, but these collectors are elevated above the ground and thus the ground below the mirrors remains as a pervious surface. The only portions of the site that will be impervious to surface water are the administration building, the main warehouse, portions of the power block area, the access road between these areas, and the parking lots associated with these areas. The amount of impervious area being created as a result of this Project is less than one percent difference from the existing condition.

The proposed solar field improvements will not change the existing upstream offsite drainage patterns. Offsite flow of up to a 100-year event will be collected in peripheral drainage ditches and conveyed around and/or through the Project site. Each of the proposed channels are sized to contain the peak flow of the 100-year, 24-hour storm event and will include necessary earth compaction and riprap side-slope protection along key reaches (e.g., directional transitions, proposed-to-natural channel transitions, and reaches with significant design velocities).

Existing Conditions. Runoff from local topographic highs located south of the Project site discharges onto the Project site northward to relatively more gradual-sloped areas at the southern and northern solar fields. The location of the watershed in the El Paso Mountains and the existing drainage flow paths on the Project site are shown in Figure 5.17-11. There are three major watercourses that run through the Project site. The El Paso Wash drains 22 square miles upstream of the Project and runs approximately through the center of the site. This wash drains water from the south hills and crosses Brown Road inside the property boundary. The second major watercourse consists of an unnamed watercourse that drains an area of four square miles southwest of the Project site. This watercourse crosses the southwest section of the Project area continuing in the northwest direction toward Brown Road.

The third major watercourse consists of the eastern drainage area, which extends east and west of the U.S. Route 395 (Three Flags Highway).covering about 10 square miles. Drained water crosses U.S. Route 395 at several points in both east-west and west-east directions, hydraulically connecting all the catchments in this drainage area. Water collected in this eastern drainage area flows westward toward the Project site from near the intersection of Brown Road and U.S. Route 395. This watercourse crosses the Project site changing flow direction from the westward direction to a more northward direction midway through the Project site.

An elevated railroad grade is located south of the Project site. The railroad grade interrupts several natural drainage paths connecting flows to several watercourses that cross the railroad grade through pipes, concrete culverts, and timber bridges. Aerial photography and vegetation patterns indicate that the overall drainage pattern inside the Project area concentrates flows in several well-defined washes through the area. Storm flow generated by the existing site itself generally sheet to washes in the northeast and northwest directions. Existing flow patterns in the Project site drainage area and water crossings beneath the U.S. Route 395 and the railroad are shown in Figure 5.17-13.

To provide a preliminary design basis for drainage control structures and rerouting of the washes on the Project site, the drainage analysis followed U.S. Department of Agriculture (USDA) Natural Resource Conservation Service Technical Release 55 for estimating runoff. Onsite ditches and channels, and the rerouting of the washes were sized using the Muskingum Cunge Method (Appendix L). Hydrology calculations were performed using the USACE's Hydrological Modeling System (HMS 3.3.0). Documentation and program downloads for HMS 3.3.0 can be found online at: http://hec.usace.army.mil/software/hec=hms/documentation.html.

Channel 1

Proposed Realigned Drainage Channel Route. The rerouted and reshaped dry desert wash (herein referred to as Channel 1) re-directs southwestern runoff around the southwest corner of the proposed southern solar field and back into the natural channel at a point where the natural water course leaves the solar field. This channel also receives concentrated drainage that underpasses the railroad at a point close to the southwest corner of the southern solar field.

The proposed Channel 1 will be approximately 6,329 feet long, designed to meet Kern County requirements, and also revegetated with native vegetation to minimize habitat disturbance. The routing of Channel 1 was designed to convey the 100-year storm event along the entire south side of the site, returning the flow to its natural course along the west side of the Project site. To accommodate the velocities produced by a 100-year event, modeling indicated that the channel depth would need to be about 5.5 feet, while the average channel velocity would be about 6.7 feet per second (ft/s).

Channel 2

El Paso Wash is re-directed by Channel 2 around the east side of the southern solar field, then across Brown Road through a proposed concrete box culvert at a point near the northwest corner of the proposed northern solar field. The box culvert, proposed to improve transfer of the channelized flows from the southern side to the northern side of Brown Road, is located west of the Brown Road's low point, where El Paso Wash currently crosses the road. Channel 2 collects additional onsite runoff from the northern solar field.

The proposed Channel 2 will be approximately 14,350 feet long designed to meet Kern County requirements and revegetated with native vegetation to minimize habitat disturbance. The routing of Channel 2 was designed to convey the 100-year storm event along the east side of the Southern Solar Field, returning the flow to its natural course along the west side of the Northern Solar Field (Figure 5.17-13). To accommodate the velocities produced during a 100-year storm event, modeling indicated that the

channel depth would need to be about 7.7 feet wide while the average channel velocity would be about 10.1 ft/s.

A concrete box culvert is proposed to convey re-directed flows from El Paso Wash (Channel 2) under Brown Road. The culvert will be configured to avoid overtopping of the road for the 100-year storm, taking into consideration the proposed channel conditions upstream and downstream of the structure.

Channel 3

Channel 3 intercepts the natural water course that conveys drainage from the east side of the Project site, re-directing flows northward along the east side of the proposed northern solar field and back into the natural channel at a point just north of the proposed northern solar field.

The proposed Channel 3 will be approximately 9,853 feet long, designed to meet Kern County requirements and revegetated with native vegetation to minimize habitat disturbance. The routing of Channel 3 was designed to convey the 100-year storm event along the east side of the Northern Solar Field, returning the flow to its natural course along the north side of the Northern Solar Field (Figure 5.17-13). To accommodate the velocities produced during a 100-year storm event, modeling indicated that the channel depth would need to be about 8.8 feet wide while the average channel velocity would be about 11.7 ft/s.

Erosion Mitigation Measures

Calculations indicate that the proposed channels might experience erosive effects associated with the 100-year storm event. To help mitigate the erosion of the banks, the channels will be designed with 4:1 side slopes rather than the more conventional 2:1 side slope. Moreover, channels will be constructed with native material, and erosion control for the 100-year event is proposed for the channels' stress areas. A stress area is defined as a location where the erosion potential is greater than a straight, uniform channel reach, and includes junctions, transitions, and curves. The extent of the channel bank protections will be at least a distance equal to ten (10) times the design water depth and will be extended into the channel bottom to provide protection from potential bottom scour. Stress areas with erosion potential in the proposed set of channels include: 1) major changes of direction in the proposed channel, 2) three transitions from natural to improved channels, 3) three junctions where solar field collectors drain to the improved channels, and 4) three transitions from improved to natural channels. No scour protection is proposed for the channel bottom in the straight sections of the channels. This is to allow the low flows to meander across the bottom replicating as nearly as possible the flow regimes under current conditions.

The outfall (downstream) end of the channels will be established such that flow is returned to the down stream offsite condition as close as possible to that which existed prior to the project. At the improved channel to natural channel connections, the flow velocity will be reduced by widening the cross section and/or using rip-rap size material prior to the discharge to the existing channel to minimize erosion.

5.17.3.1 Construction

Construction activities are expected to take place over a period of approximately 28 months. It is anticipated that water use during this period will be potable water provided by the IWVWD. While the Project lies outside of the IWVWD service area, it is within about four miles of the District boundary. Water from the IWVWD will be used during construction for:

- Dust suppression during grading and along roadways as necessary,
- Grading and compaction for the solar field and power block areas, infrastructure and building foundations, and
- Concrete work and other uses.

The majority of water use will be for grading, which will be managed at a steady rate over the term of the construction period. There are no anticipated highs or lows in the water volume required to support grading of 7.5 million cubic yards of soil over an area of about 1,760 acres. The average water usage equates to about 561,000 gpd or a pumping rate of about 390 gpm under an operational assumption that pumping will occur 24-hours per day.

Water Use

The Project proposes to use water supplied by the IWVWD, to support site pre-watering, grading and normal construction activities (e.g., mixing concrete, dust control). To evaluate the impacts from the pumping, the groundwater model was run under the assumption that Well 18 would solely provide water continuously over a 28-month period at its current rate of pumping plus the average construction supply requirement of 561,000 gpd. The daily construction water supply equates to about 390 gpm, which assumes a continuous supply from this well over the construction period. Two model scenarios were evaluated:

- A base condition where Well No. 18 is pumped at 470 gpm without additional Project pumping, and
- The Project condition, where Well No. 18 is pumped at 860 gpm, with the additional supply (390 gpm) to support Project pumping.

Figure 5.17- 14 show the results of the numerical modeling for the calibrated groundwater model for the base condition without the proposed Project and the Project condition. Drawdown for the pumping at the base rate of 470 gpm continuously for a period of 28 months, the model predicted a drawdown at the pumping well of about 19 feet with a radius of influence of about 8,320 feet to the five-foot contour (see Appendix J). Adding the additional supply requirements for construction the drawdown at the pumping well is about 21 feet and the distance to the five-contour changes at most to about 9,600 feet. The change in the cone of depression to a drawdown of 5 feet from the proposed pumping is about 15 percent over the baseline condition. However, the change in the cone of depression induced by the proposed pumping for construction water supply did not greatly alter the configuration of the cone of depression (Figure 5.17-14). There are one or two additional water supply wells that may be affected beyond the baseline condition by a drawdown greater than five feet at the end of the 28-month construction period. These results show that pumping to provide construction water for the Project will not generally affect additional wells beyond those currently within the cone of depression for Well No. 18 over a period of 28 months.

Water Quality

Water quality impacts could result from releases of chemicals used during construction, such as motor oil, fuel, and solvents. These 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 SWPPP and DESCP will require storm water BMPs, and temporary erosion control measures including revegetation, dust suppression and construction of beams and ditches, which will prevent accelerated soil erosion or dust generation. Adhering to proper material handling procedures and complying with the SWPPP/DESCP will ensure that construction-related water quality impacts are less than significant.

Drainage Impacts

As noted above, site grading activities will be ongoing through the period of construction. During that time the site will be broken into areas and grading will proceed from one area to the next until the entire site has been graded. During this time, site drainage will be managed according to the BMPs provided in the construction SWPPP and DESCP in order to minimize erosion and manage storm water runoff. 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. 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.

Materials 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. 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 other measures provided in the SWPPP and DESCP, it is anticipated that drainage and erosion control measures will adequately protect surface and groundwater resources during construction and impacts will be less than significant.

5.17.3.2 Operation

This section describes potential environmental impacts on water resources related to Project operation.

Water Use

The Project is a dry-cooled facility that will use about 150 afy of groundwater from the IWVWD for operational supply. This represents about 1.6 percent of the IWVWD's total annual production. Assuming continuous uninterrupted supply and continuous usage, a yearly volume of 150 af equates to an average pumping rate of about 90 gpm. Peak water usage during the summer months is about 190,500 gpd or about 130 gpm assuming continuous pumping. Water use during the winter months is estimated to be between about 40,700 gpd, or a pumping rate of about 30 gpm, assuming continuous use. Over the Project's 30-year life, water use will total about 4,500 af.

Operation. The Project will be dry-cooled and water from two onsite wells will be used for:

- Solar mirror wash water to maintain solar collector efficiency,
- Domestic potable uses include drinking water, showering, toilets, hand washing, etc,
- Power cycle makeup water to supply the steam driving the steam turbine generators (this water is recycled and thus is not actually consumptive use),
- Ancillary equipment heat rejection, for cooling generators, pumps and other equipment, and
- Dust suppression.

Table 5.17-7 presents the anticipated water requirements associated with various uses for each month of the year. Estimates for water usage are based on:

- Solar mirror washing – experience at other locations with similar climatic conditions,
- Power cycle makeup water and ancillary heat rejection – expected monthly power production rates,
- Domestic potable use – number of employees and number of hours expected to be worked during the year. An average consumption of 37 gallons per person per day was assumed, and
- Dust suppression – concentrate from the water treatment process will be used for this purpose.

Table 5.17-7 Estimated Water Usage

Month	Approximate Water Usage Acre-Feet (gpm)[1]	Month	Approximate Water Usage Acre-Feet (gpm)[1]
January	3.67 (28.25)	July	16.24 (118.55)
February	8.29 (60.48)	August	16.23 (118.48)

Table 5.17-7 Estimated Water Usage

Month	Approximate Water Usage Acre-Feet (gpm)[1]	Month	Approximate Water Usage Acre-Feet (gpm)[1]
March	11.34 (82.80)	September	14.35 (104.73)
April	15.58 (113.71)	October	10.24 (74.75)
May	17.43 (127.20)	November	7.94 (57.95)
June	17.54 (128.07)	December	6.67 (48.68)

[1] The estimated groundwater usage gpm is based on average daily consumption and assumes continuous pumping. Peak groundwater pumping rates during summer months will be up to 128 gpm.

Water Quality

Water Quality. Operation of the Project has the potential to impact water quality through improper storage and use of materials and from soil erosion. Adhering to proper material storage and handling procedures and complying with the DESCP will result in impacts to water qualities that are less than significant. The DESCP identifies BMPs to manage pollutant releases including spill and leak prevention, waste handling and employee training. Through compliance with the General Industrial 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 and groundwater quality impacts during the operations phase will be less than significant.

Groundwater use. Figure 5.17-15 presents the Project water balance for both peak (maximum) summer usage and for typical annualized operation (i.e., average). Water from IWVWD will be pumped to a 1.5 million gallon storage tank and from there directed for domestic use or to the reverse osmosis (RO) treatment unit. Water from the RO unit will be stored in a 600,000-gallon permeate tanks for plant operations and fire protection. The concentrate from the RO treatment unit will be stored in one 10,000-gallon tank and used for dust control. Power cycle makeup water from each power block will be recycled over a range of 34,000 gpd (average) to 53,000 gpd (maximum) as feed water to the RO treatment system. Water from the permeate tank will be used for solar mirror washing and fire control. A detailed discussion of water balance, treatment requirements, and wastewater management is provided in the Water/Wastewater Report in Appendix J.

Extraction of groundwater to support power plant requirements can result in changes to local groundwater elevations. This, in turn, could potentially reduce the pumping capacities of nearby wells and increase the energy costs of pumping from those wells. As discussed in Section 4.0, Alternatives, groundwater is the only source of process water whose availability and feasibility has been established.

The Project proposes to use water supplied by the IWVWD, to support operational requirements. To evaluate the impacts from the pumping, the groundwater model was run under the assumption that Well 18 would solely provide water continuously over a 30-year period at its current rate of pumping plus the average operational supply requirement of 90 gpm. The additional volume requirement represents a little less than a 20 percent increase in the base pumping condition (470 gpm). Two model scenarios were evaluated over a 30 year period:

- A base condition, where Well No. 18 is pumped at 470 gpm without additional Project pumping.
- The Project condition, where Well No. 18 is pumped at 560 gpm, with the added additional supply (90 gpm) to support Project pumping.

Figure 5.17- 16 show the results of the numerical modeling for the calibrated groundwater model for the base condition without the proposed Project and the Project condition. As shown, drawdown for the pumping at the base rate of 470 gpm continuously for a period of 30 years, the model predicted a drawdown at the pumping well of about 51 feet with a radius of influence of about 23,400 feet to the five-foot contour. Adding the additional operational supply requirements for Project did not change the drawdown or size (diameter) of the cone of depression beyond the base condition. These results show that pumping to provide operational water for the Project over a period of 30 years will not affect additional wells beyond those currently within the cone of depression for Well No. 18.

Process and Sanitary Waste Water Management

Sanitary wastes will be collected for treatment in a septic tank and disposed via a leach field located within the boundaries of the main power block. If separate control rooms with restrooms are located at the remote power blocks, smaller septic systems will be provided to receive sanitary wastes at those locations. The configuration of the power blocks being remote from the office would indicate that at least five leach fields will be required. Based on the current estimate of 2,800 gallons of sanitary wastewater production per day a total leach field area of approximately 5,600 square feet will be required. It is recommended that an additional 5,600 square feet of land be kept undeveloped for purposes of constructing replacement leach fields should that be necessary.

Drainage and Flood Control

The proposed solar field improvements will not change the existing upstream offsite drainage patterns. The existing downstream drainage patterns and flow rates will be slightly changed due to minor adjustments in the sub-basin size, which is relocated to the drainage pattern of the onsite flows. The proposed channels have been designed to contain surface flow from the 100-year storm.

The proposed onsite drainage improvements seek to replicate the existing flow patterns as nearly as possible. For this reason, three channels have been proposed across the site: Channels 1, 2, and 3. All three channels intercept the flows prior to their entry to the site, then re-direct them around or through the site and convey them to the same locations where they exit under existing conditions as shown in Figure 5.17-16.

The offsite upstream flow rates do not change in the proposed condition. However, the resultant downstream offsite flow rates do change slightly. The changes in peak flow rates in the three proposed channels are attributed to the difference in the duration of flow between the existing condition and the proposed condition and slight shifting in contributing drainage areas from the existing to the proposed condition. In the existing condition, the flows are sheeting across the desert more slowly resulting in a longer duration of flow. In the proposed condition, the onsite flows are routed to the channel in secondary channels which are shorter than the existing channels and result in a shorter duration of flow. This shorter duration of flow results in the onsite peak flow entering the channel earlier and further in time from the peak in the offsite watershed. This results in a smaller additive total (Table 5.17-8).

Table 5.17- 8. Existing Peak Drainage Flow Rate vs. Proposed Channel Design Total Flow Rate for 100-Year Event

Watercourse	Existing Flow Rate at Outlet of the Site (cfs)	Proposed Channel Design Total Flow Rate (cfs)
Channel 1	2,270	2,100

Table 5.17- 8. Existing Peak Drainage Flow Rate vs. Proposed Channel Design Total Flow Rate for 100-Year Event

Watercourse	Existing Flow Rate at Outlet of the Site (cfs)	Proposed Channel Design Total Flow Rate (cfs)
Channel 2	9,166	9,293
Channel 3	4,952	4,650

A comprehensive system of controls including operation phase BMPs will be used to manage stormwater runoff and to control erosion and sedimentation. The controls will be detailed in the DESCP and SWPPP documents prepared for the Project and are summarized below:

- 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 existing vegetation will remain in-place.
- Gravel berms will be used at the bases of slopes or check structures to control sediment loss and erosion. As indicated for the channel diversion structure, 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 tire wash will be developed. Water will be used to control dust but water application will be minimized to control runoff.
- BMPs will be applied as soon as possible when erosion is evident and damaged areas will be repaired. Temporary erosion control measures will be implemented as needed to control erosion. Temporary sediment control materials will be maintained onsite throughout the term of the Project for responding to unforeseen conditions as they arise.

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

5.17.3.3 Cumulative Impacts

The potential for cumulative water resources impacts exists where there are two or more individual projects proposed in an area that, when considered together with the proposed Project, could result in an impact to water resources. 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.

As described in Section 5.1, there are several projects that could contribute along with the RSPP to cumulative impacts to water resources within the IWV Groundwater Basin. A listing of the local cumulative projects and their analysis of water supply impacts is provided below:

Proposed Project	Water Supply and Analysis of Impacts
Numerous Hotels under Construction along China Lake Boulevard (Construction Complete Mid- to Late 2010)	Projects' water supply requirements will be realized before the RSPP begins construction. Projects do not contribute to cumulative impacts.

Proposed Project	Water Supply and Analysis of Impacts
China Lake NAWS BRAC Realignment (EIS); Expected Realignment by 2011.	EIS indicates no significant impacts from expected population growth the NAWS. The expected increase in operations is anticipated to create 4,085 new jobs. Assuming 1.5 people of a family of four would find work in these new jobs, a total of about new 2700 households would be added to the Basin. Assuming that a single-family home requires about one acre-foot of water per year, this equates to about 2,700 afy.
City of Ridgecrest Planning Commission Approval of 1970 tract/housing lots in anticipation of BRAC	Assuming that a single-family home requires about one acre-foot of water per year, if all housing were built as proposed, increased water supply requirement would be about 2000 afy.
City of Ridgecrest - Super Wal-Mart (draft EIR)	According to the draft EIR (2009), “the Project would involve relocation of uses (from the existing Wal-Mart) to the new site, and there could be a slight increase in water demand due to changes in irrigation and fire protection requirements." But, it is not expected to exceed the current supply.

From these generalized assumptions, the BRAC re-alignment may increase the demand on the IWV Groundwater Basin by between 2,000 and 2,700 afy. The amount of increase in water demand will depend on the actual population growth in response to the number of additional jobs that are realized at the base. By comparison, the RSPP annual use is 150 afy, which represents between about five and eight percent of the potential additional water requirements associated with the additional housing construction. This is not a significant increase by comparison to the potential requirements in support of BRAC realignment and thus, the Project’s impacts would not be cumulatively considerably. It is important to note, that the RSPP is actively exploring ways to offset the Project’s expected water use.

5.17.4 Mitigation Measures

The RSPP would not have significant adverse impacts on water resources. To ensure that no significant adverse effects to water quality or supply are caused by the proposed Project pumping for operational supply, the following mitigation measures are proposed for construction and operation.

Water quality will be protected through implementation of the SWPPP and DESCP for construction and operations. If is important to note that in order to keep water use as low as practicable, the Project will attempt to recycle the process makeup water for a savings of about 25 percent of the annual total consumptive use.

5.17.4.1 Construction

WTR-1 Prior to beginning any clearing, grading or excavation activities associated with construction of the project, the Project owner will develop and implement an approved construction-phase SWPPP as required under the General Storm Water Construction Activity Permit, as well as a DESCP that meets CEC and Lahontan RWQCB requirements. A copy of the permits will be

provided to the CEC Compliance Project Manager 60 days prior to the beginning of construction activities.

WTR-2 The project owner will obtain and comply with final WDRs issued by the Lahontan RWQCB for the Project's proposed wastewater discharge and LTU.

WTR-3 The Project owner will obtain and comply with permits for construction of a septic system prior to construction of the plant. A copy of the permits will be provided to the CEC Compliance Project Manager 60 days prior to the beginning of construction activities.

WTR-4 In accordance with Kern County's Floodplain Management Ordinance and 44 CFR 65, the project owner shall prepare all necessary engineering plans and documents to support a CLOMR application submittal to FEMA. The project shall not commence construction in the Special Flood Hazard Area until the Kern County receives from FEMA a CLOMR. Following construction the Project owner shall prepare all necessary documents required for a final Letter of Map Revision (LOMR).

5.17.4.2 Operation

WTR-5 Prior to commercial operation, the project owner, as required under the General Industrial Activity Storm Water Permit, will develop and implement an operations phase SWPPP.

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, Kern County, and other interested agencies including a Notice of Extraction and Diversion of Water consistent with the SWRCB requirements (Water Code Sections 4999 et seq.).

WTR-7 The project owner will measure groundwater levels on a monthly basis for the proposed water supply wells and those wells that might be affected by proposed project pumping for the first six months following the Project start up, and thereafter on a quarterly basis. These monitoring data shall be compiled and provided to the CEC on a periodic basis.

WTR-8 The project owner proposes to provide offsets to the anticipated annual operational water usage. The following approaches are currently being explored and the selected approach may include one or more of the following:

- Fallowing of agricultural land
- Establishing or supporting tamarisk removal program
- Replacing high water use landscaping with xeriscaping
- Add new xeriscaping to community areas
- Participate in IWVWD mitigation programs.

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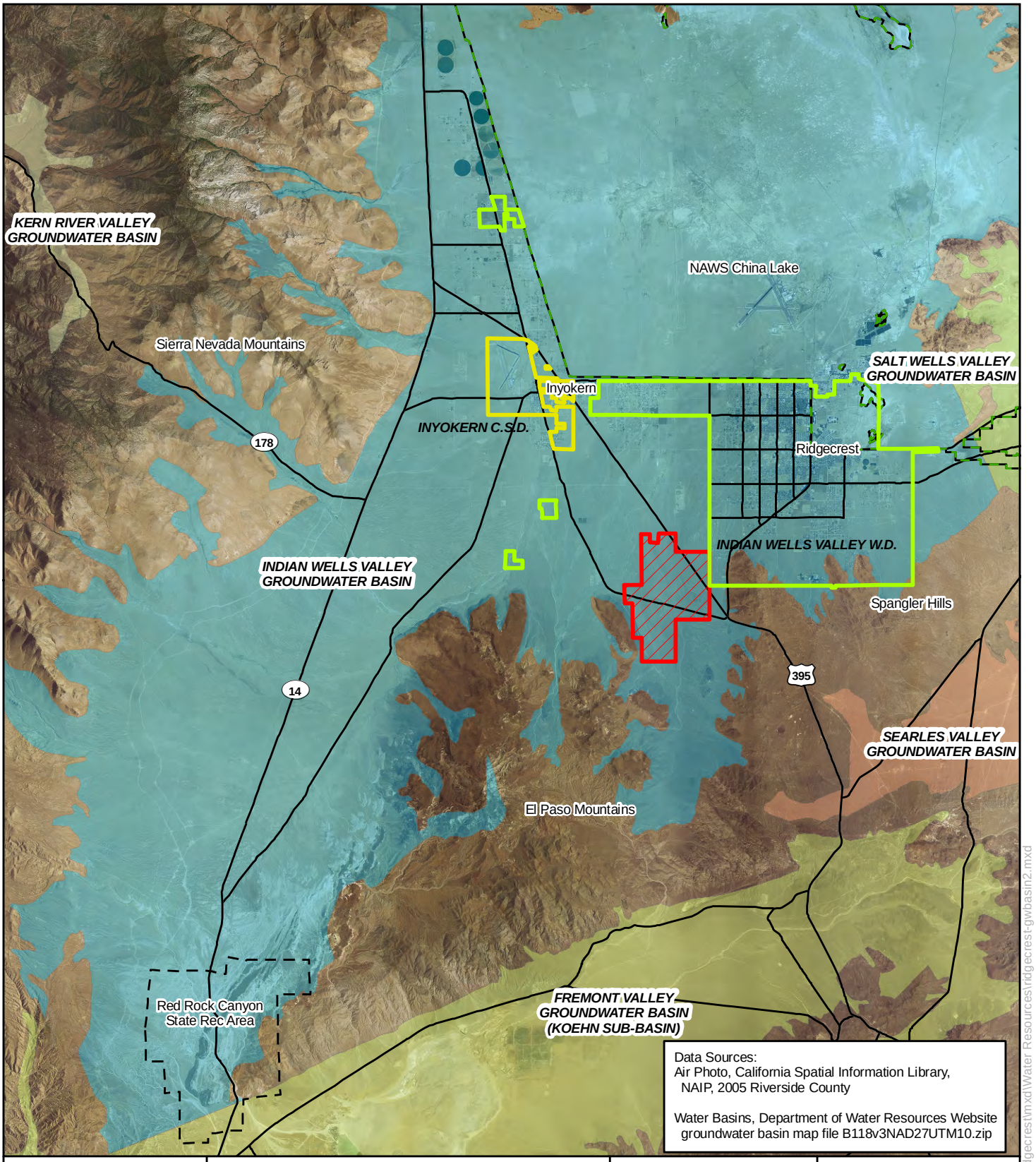

Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

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Map Location

Legend

- Project Right-of-Way
- Indian Wells Valley Groundwater Basin Adjacent Basins Shown with Different Colors
- NAWS China Lake Boundary
- Inyokern C.S.D.
- Indian Wells Valley Water District

0 4 8 Miles

N W E S

Ridgecrest Solar Power Plant

Figure 5.17-1 Regional Groundwater Basin

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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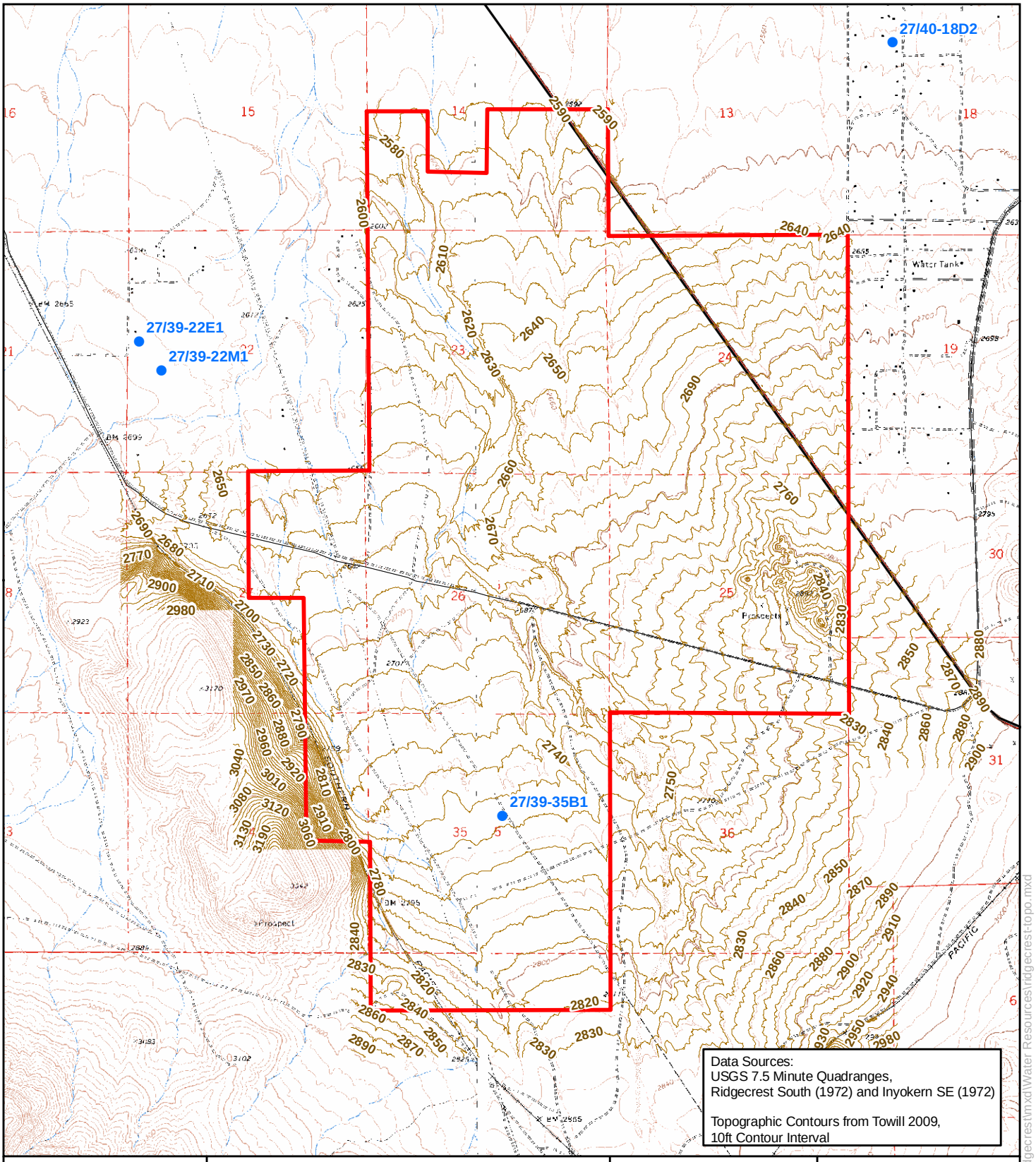

Map Location

Legend

Project Right-of-Way

Groundwater Well Location based on Latitude and Longitude in USGS Database

0 3,000 6,000 Feet

N W E S

Ridgecrest Solar Power Plant

Figure 5.17-2
Site Topographic Map

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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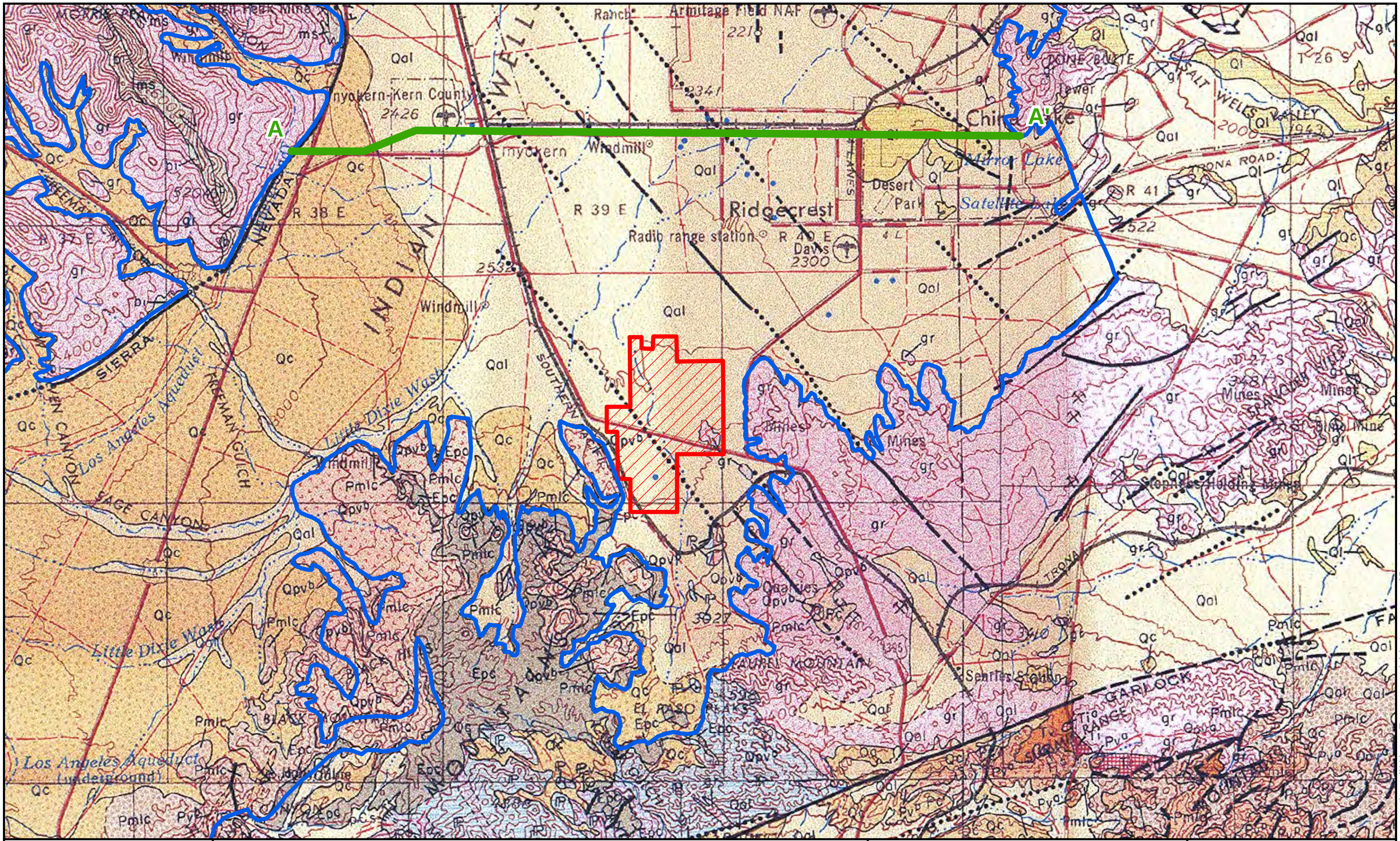

Legend

- Project Right-of-Way
- Indian Wells Valley Groundwater Basin
- A A' Cross Section Line (See Figure 5.17-5)

See Figure 5.17-3b for Geologic Legend

Sources:
Division of Mines and Geology, Geologic Map of California, Trona Sheet, Scale 1:250,000, 1963

1 in = 3 miles

0 3 6 Miles

Ridgecrest Solar Power Plant

Figure 5.17-3a
Regional Geologic Map

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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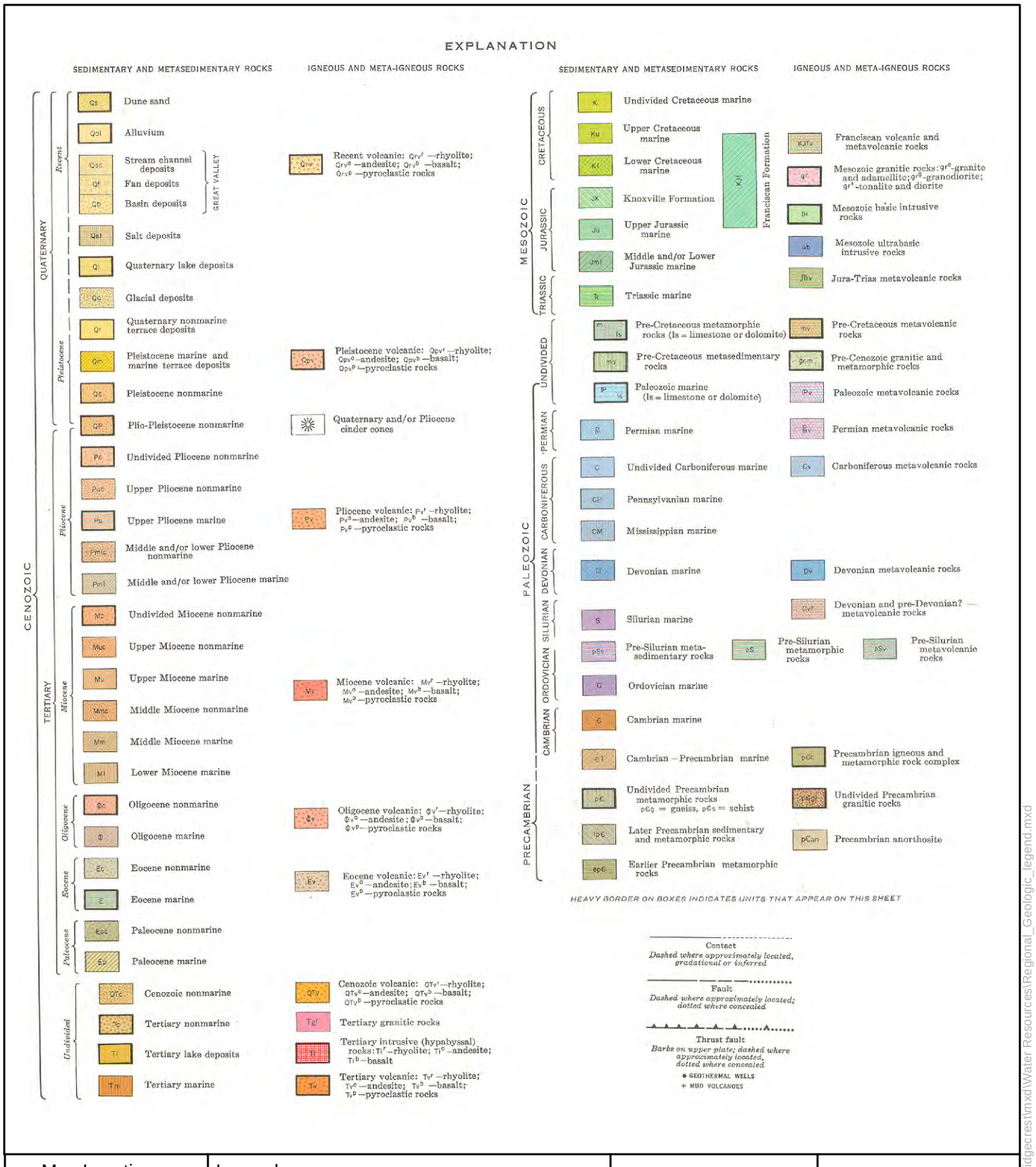

Map Location

Legend

Sources:
Division of Mines and Geology, Geologic Map of California, Trona, Scale 1:250,000, 1963

Ridgecrest Solar Power Project

Figure 5.17-3b Regional Geologic Map Legend

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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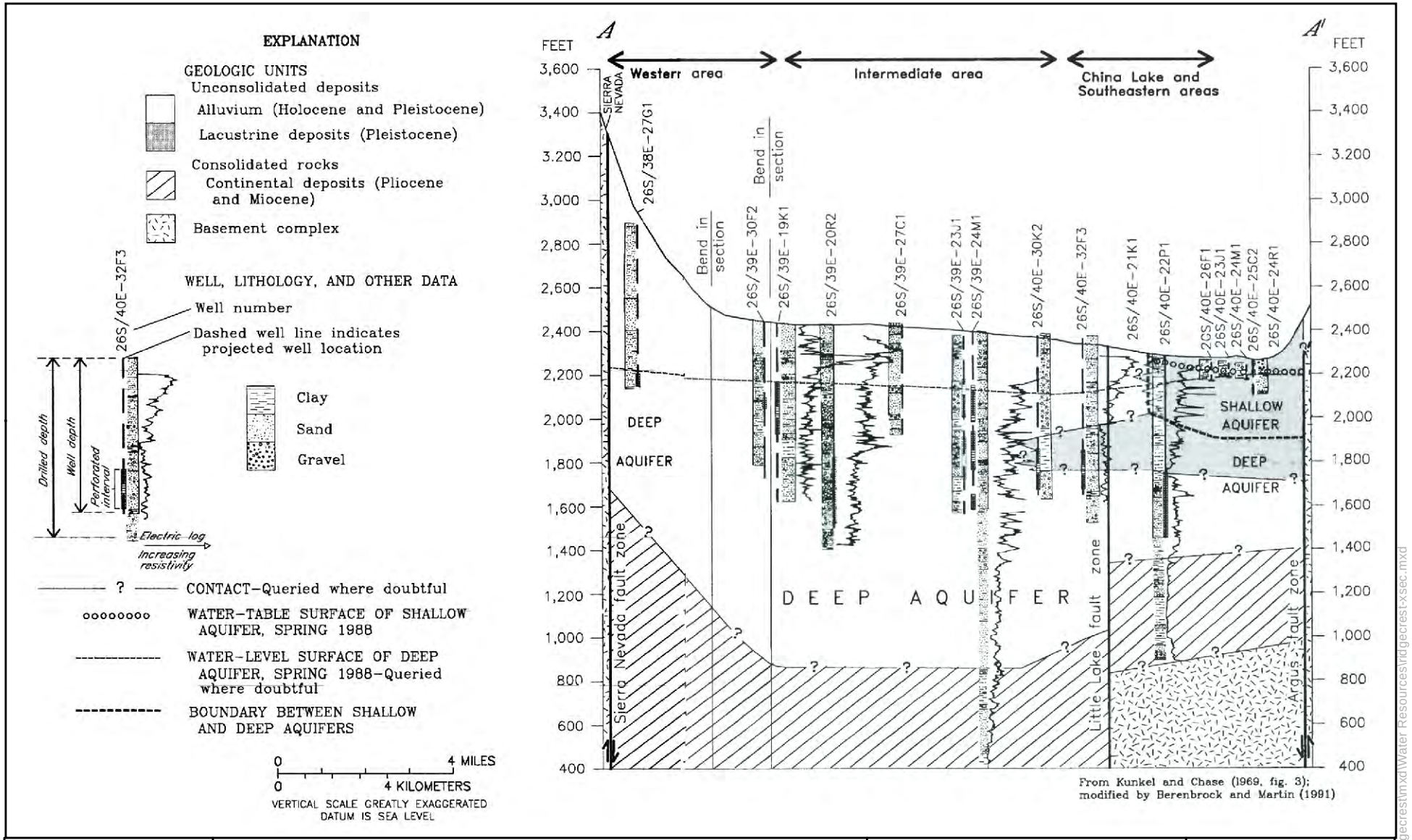

Map Location

Note:
Cross-Section line shown on Figure 5.17-3a Regional Geologic Map.

Source:
Berenbrock, Charles and Schroeder. 1994, Groundwater Flow and Quality, and Geochemical Processes, in Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, CA 1987-88

Ridgecrest Solar Power Plant

Figure 5.17-4
Cross Section
A-A'

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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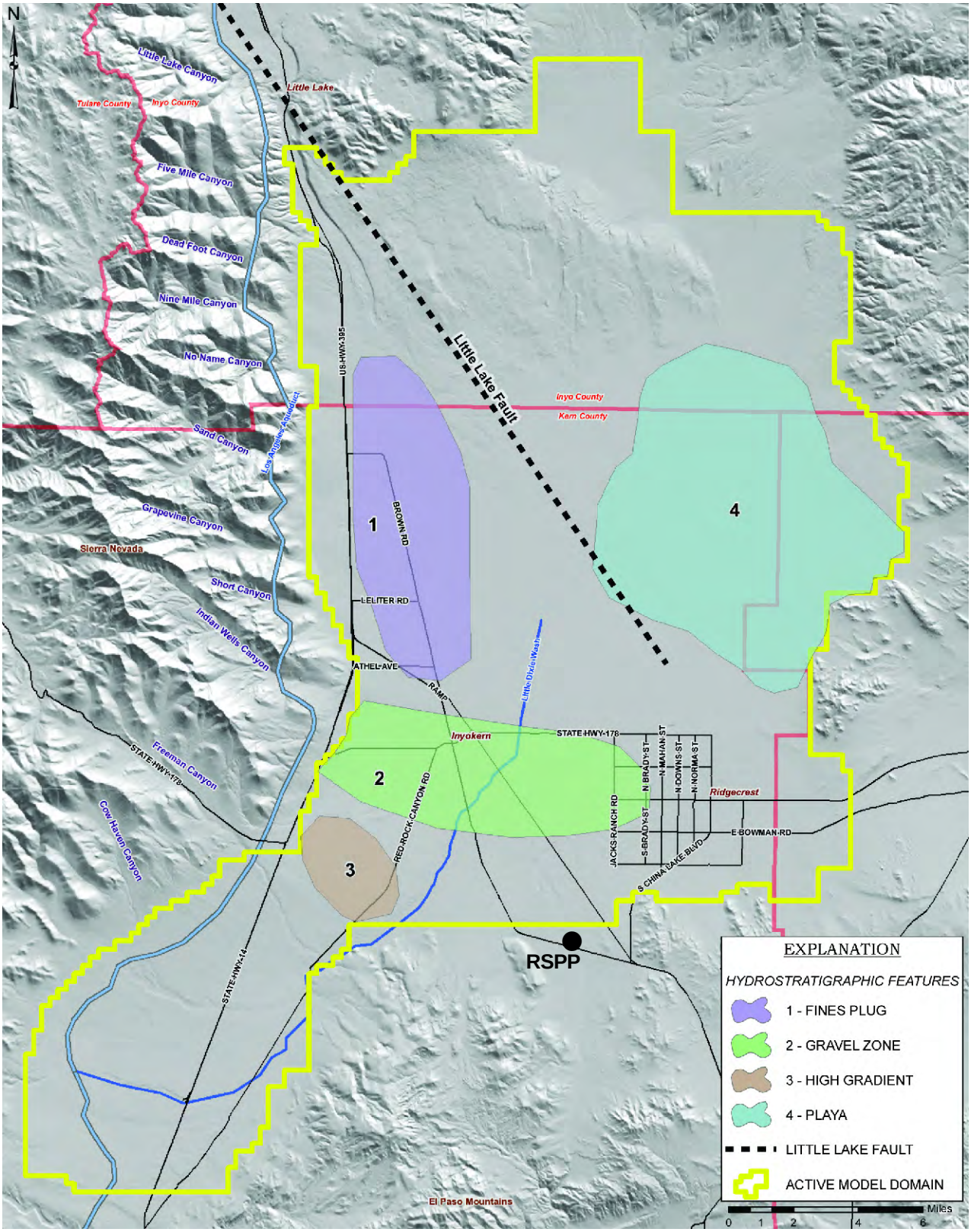


Map Location

Sources:
Modified from Brown and Caldwell Indian Wells Valley Basin Groundwater Flow Model and Hydrogeologic Study, March 27, 2009

Ridgecrest Solar Power Project

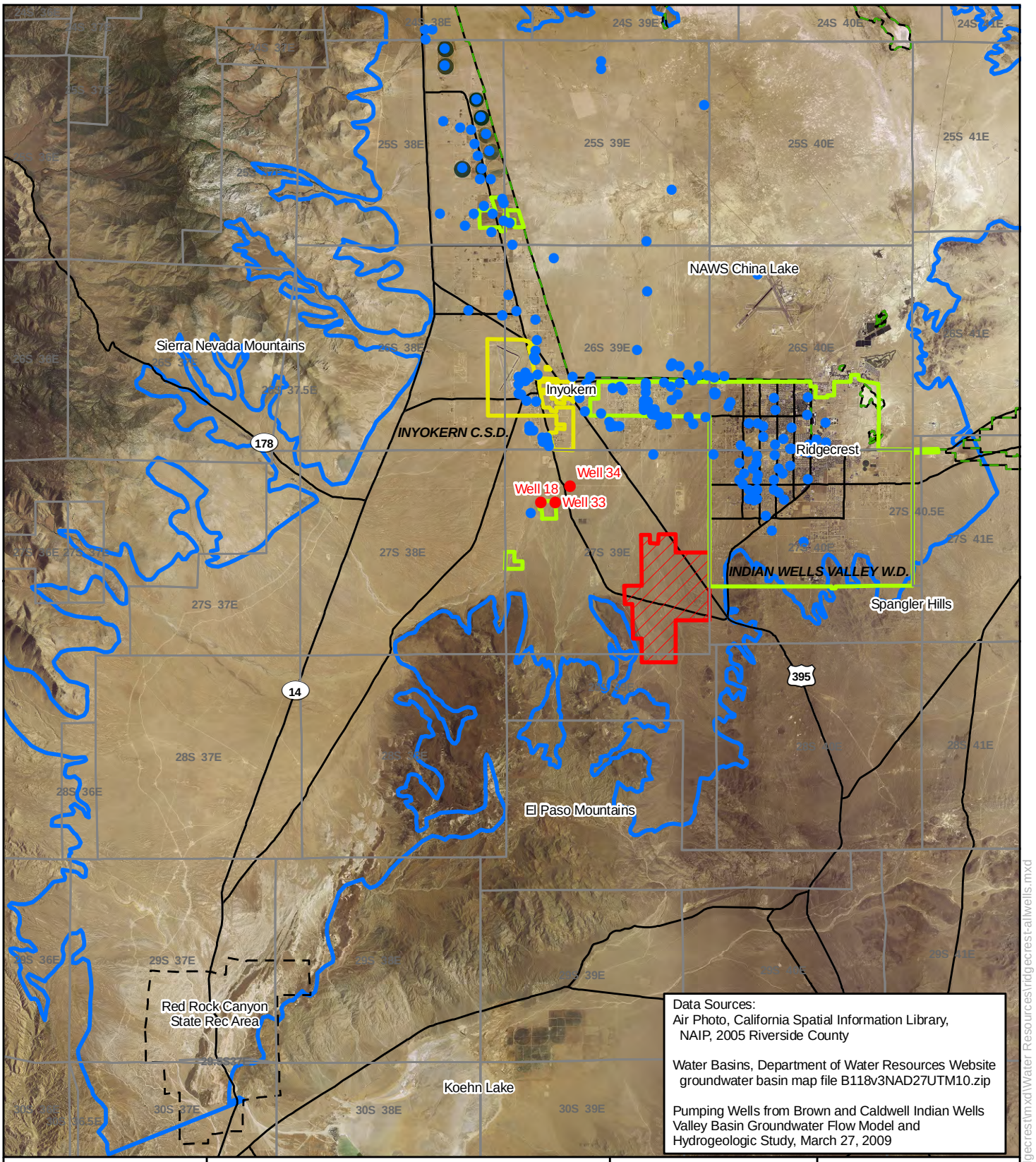
Figure 5.17-5 Hydrostratigraphic Features in the Indian Wells Valley Groundwater Basin

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

J:\GIS\Projects\SolarMillinneum\Ridgecrest\mxd\Water Resources\ridgecrest-hydrostratigraphic.mxd



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

Pumping Wells from Brown and Caldwell Indian Wells Valley Basin Groundwater Flow Model and Hydrogeologic Study, March 27, 2009

Map Location

Legend

- Project Right-of-Way
- Indian Wells Valley Groundwater Basin
- NAWS China Lake Boundary
- Inyokern C.S.D.
- Pumping Well Locations based on Brown and Caldwell Pumping Well Database
- Proposed Project Supply Wells
- Indian Wells Valley Water District

0 4 8 Miles

N W E S

Ridgecrest Solar Power Plant

Figure 5.17-6a Pumping Wells in the Indian Wells Valley Groundwater Basin

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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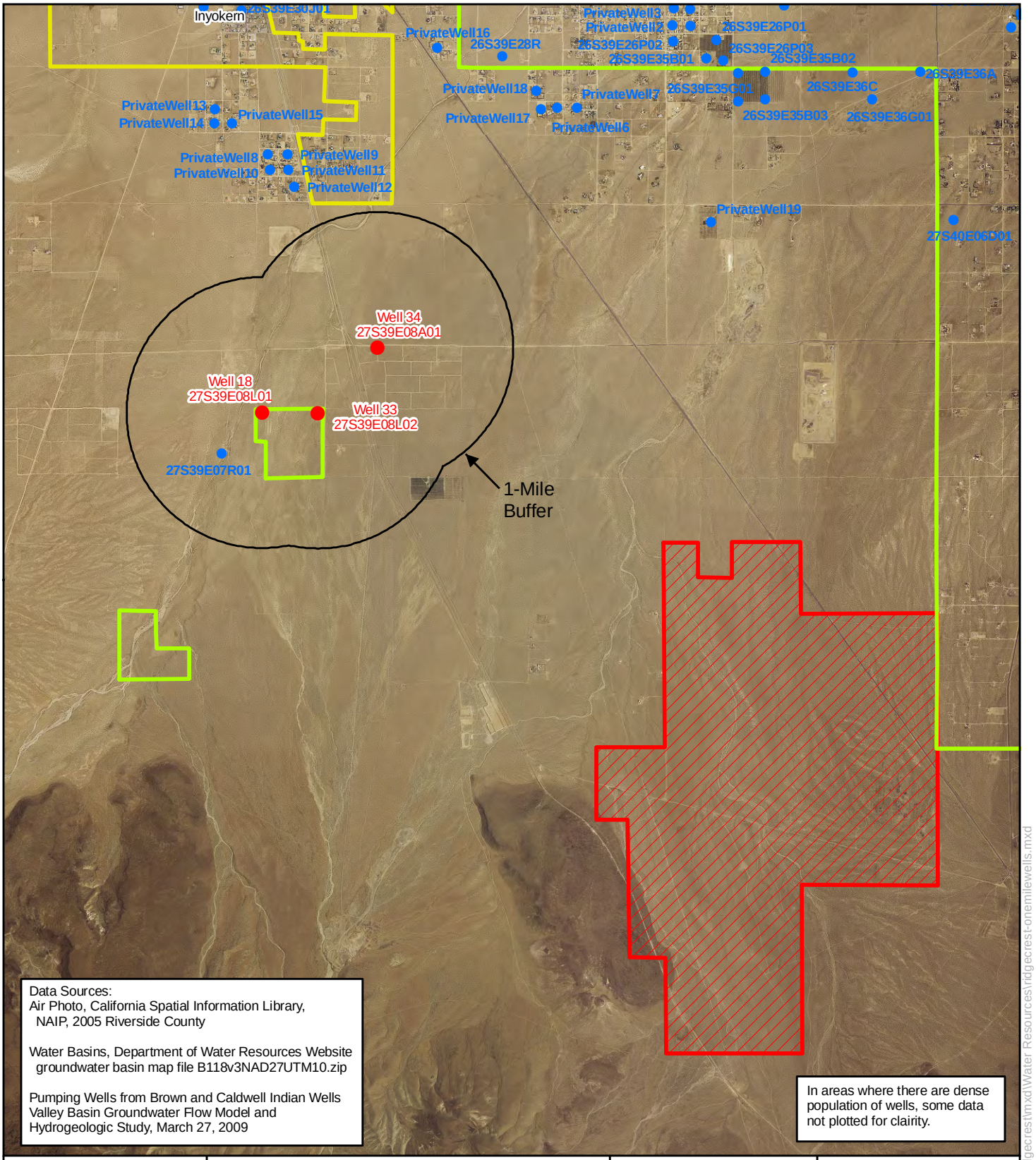


Data Sources:
Air Photo, California Spatial Information Library, NAIP, 2005 Riverside County

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

Pumping Wells from Brown and Caldwell Indian Wells Valley Basin Groundwater Flow Model and Hydrogeologic Study, March 27, 2009

In areas where there are dense population of wells, some data not plotted for clairity.

Map Location

Legend

- Project Right-of-Way
- Inyokern C.S.D.
- Indian Wells Valley Water District
- Pumping Well Locations based on Brown and Caldwell Pumping Well Database
- Proposed Project Supply Wells

0 1 2 Miles

N W E S

Ridgecrest Solar Power Plant

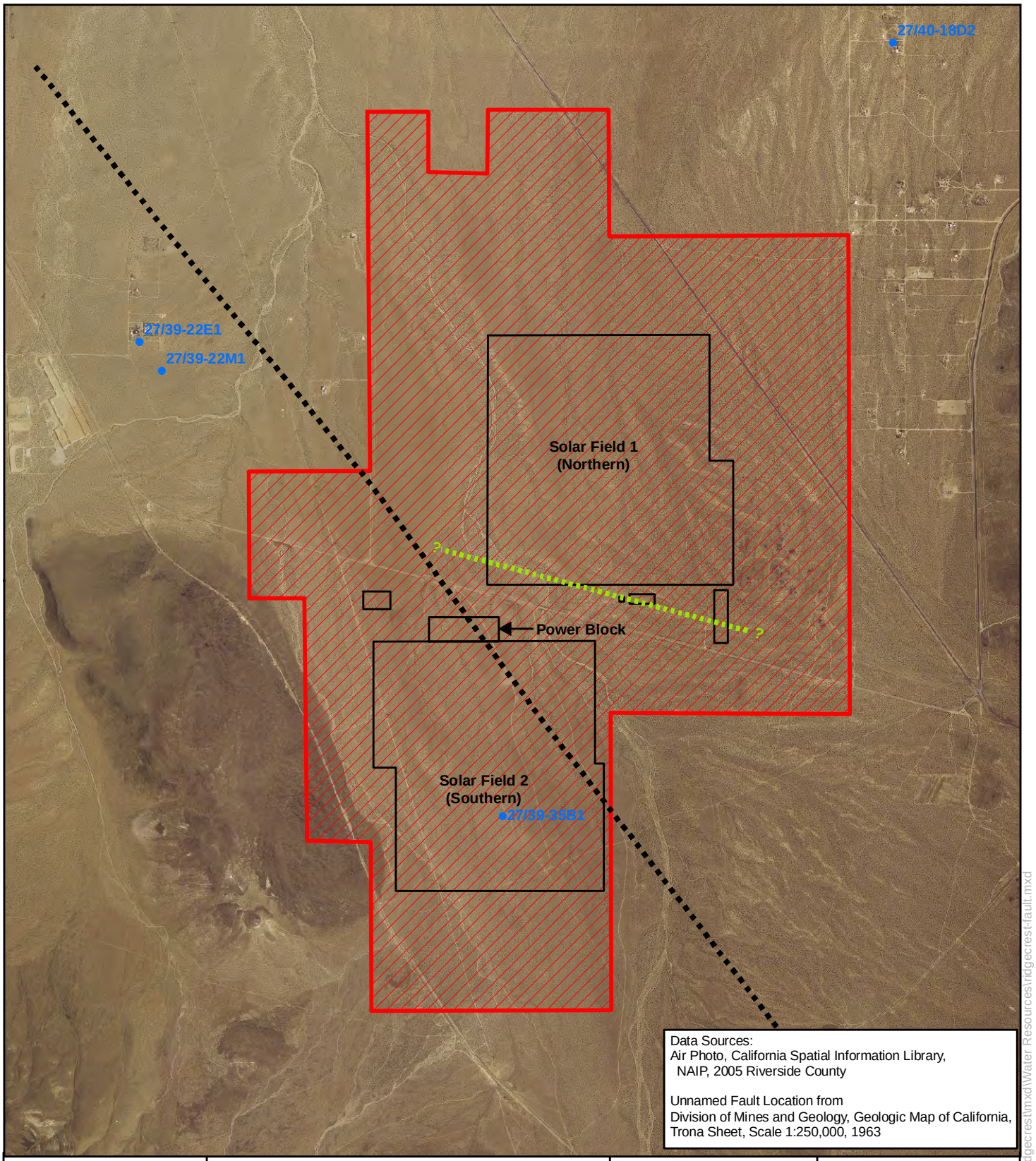
Figure 5.17-6b Groundwater Wells within One Mile Buffer of Proposed Project Supply Wells

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

J:\GIS\Projects\SolarMillinneum\Ridgecrest\mxd\Water Resources\ridgecrest-onemilewells.mxd



Map Location

Legend

- Project Right-of-Way
- Unnamed Fault (DMG, 1963)
- Approximate Location Fault Trace Based on Field Reconnaissance and Discussions with Glenn Harris (BLM) in July 2009
- Groundwater Well Location based on Latitude and Longitude in USGS Database

0 3,000 6,000 Feet

N W E S

Ridgecrest Solar Power Plant

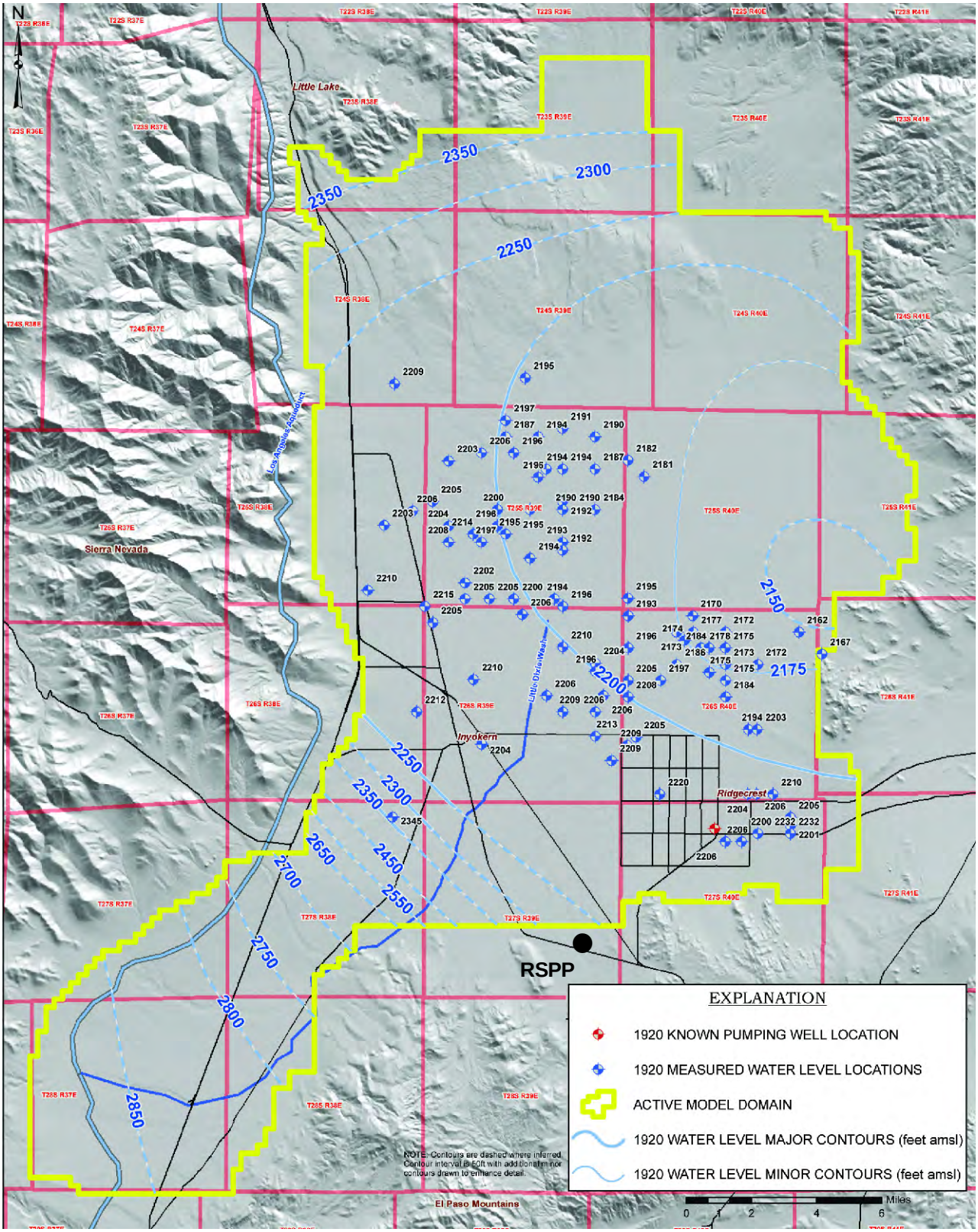
Figure 5.17-7
Site Layout vs. Inactive Fault Mapped Onsite

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

J:\GIS\Projects\SolarMillinneum\Ridgecrest\mxd\Water Resources\ridgecrest-fault.mxd



Map Location

Sources:
Modified from Brown and Caldwell Indian Wells Valley Basin Groundwater Flow Model and Hydrogeologic Study, March 27, 2009

Ridgecrest Solar Power Project

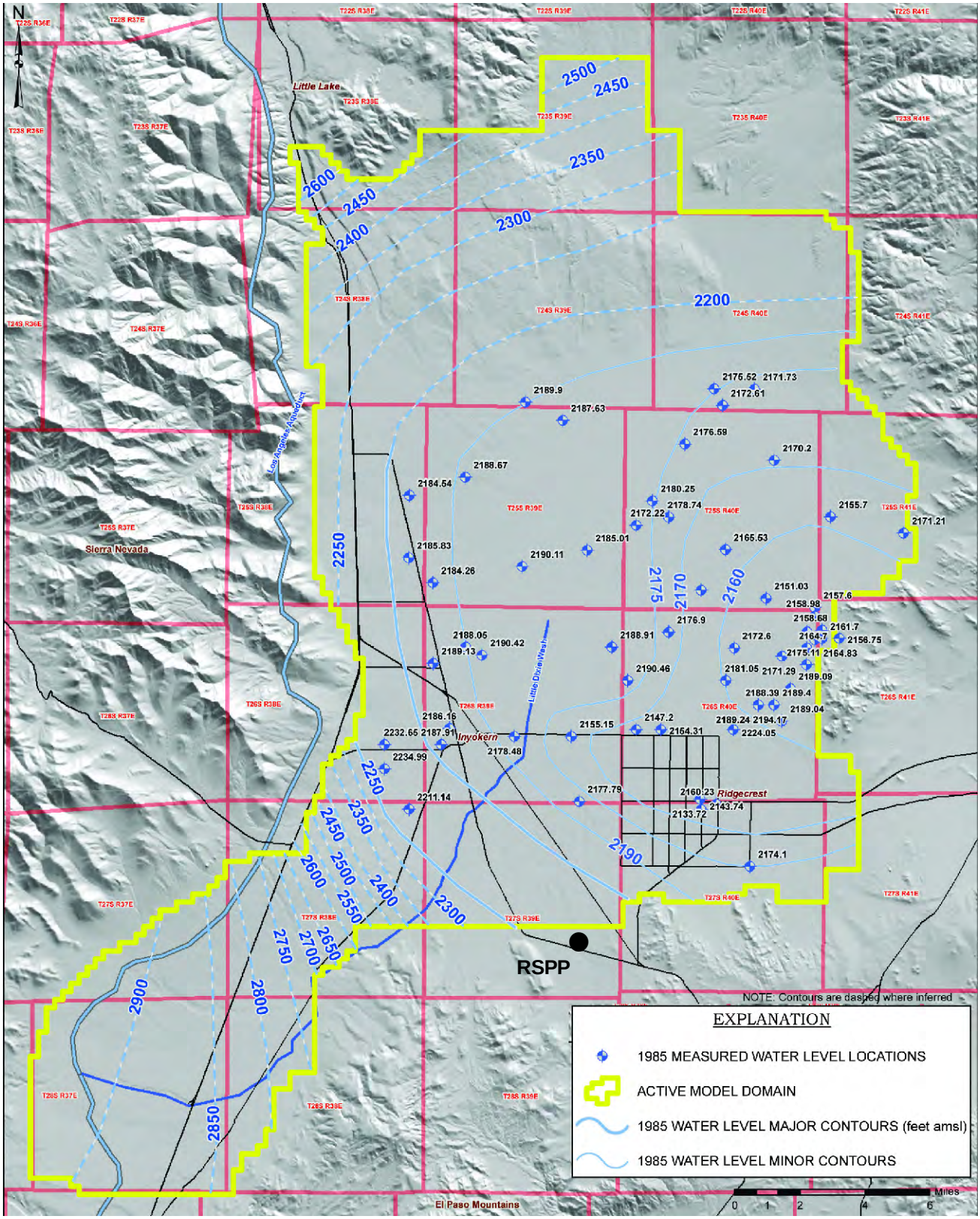
Figure 5.17-8 Groundwater Level Map - 1920

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

J:\GIS\Projects\SolarMillinneum\Ridgecrest\mxd\Water Resources\ridgecrest-waterlevel-1920.mxd



Map Location

Sources:
Modified from Brown and Caldwell
Indian Wells Valley Basin Groundwater
Flow Model and Hydrogeologic Study,
March 27, 2009

Ridgecrest Solar Power Project

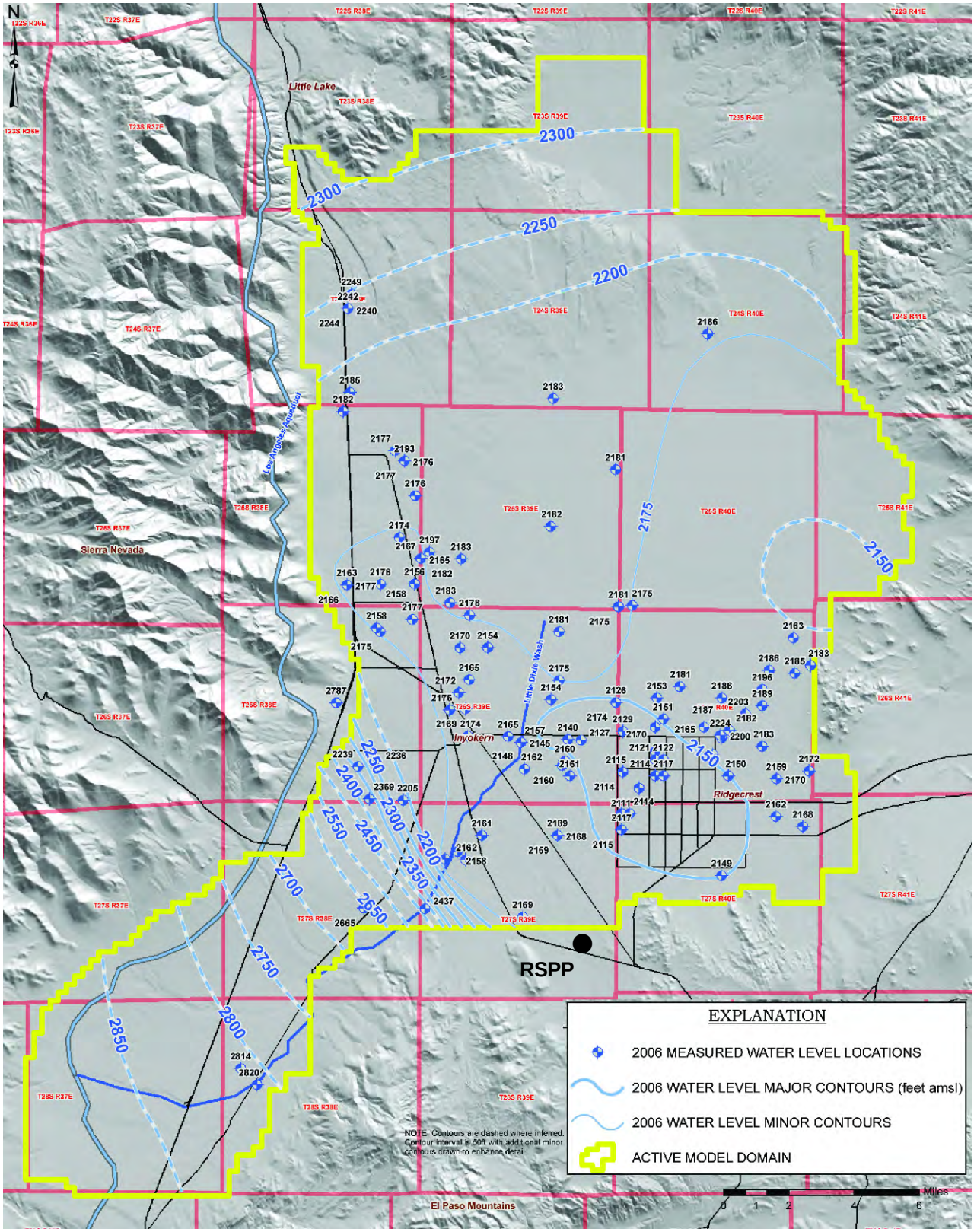
Figure 5.17-9
Groundwater Level Map - 1985

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

J:\GIS\Projects\SolarMillinneum\Ridgecrest\mxd\Water Resources\ridgecrest-waterlevel-1985.mxd



Map Location

Sources:
Modified from Brown and Caldwell
Indian Wells Valley Basin Groundwater
Flow Model and Hydrogeologic Study,
March 27, 2009

Ridgecrest Solar Power Project

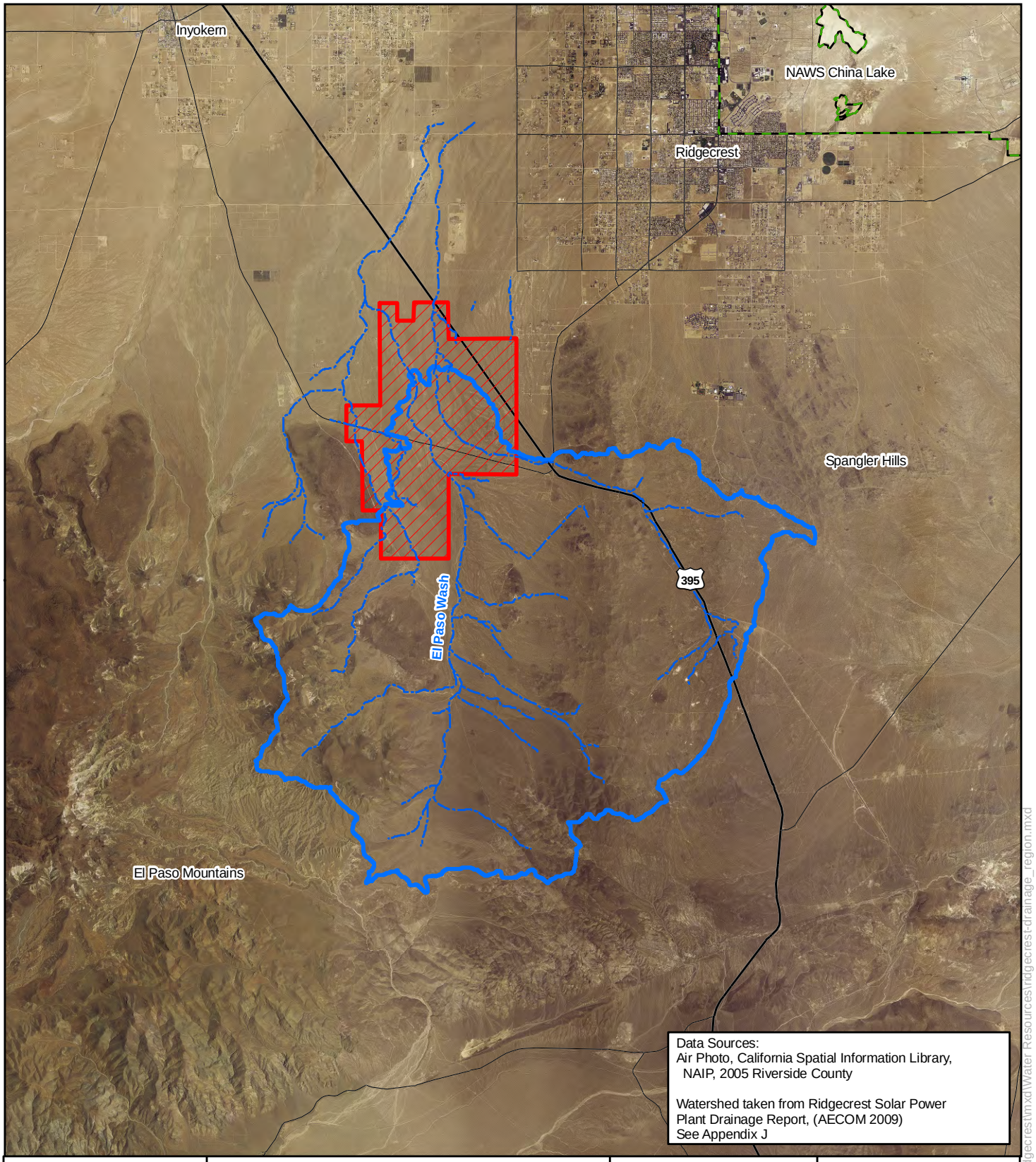
Figure 5.17-10 Groundwater Level Map - 2006

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

J:\GIS\Projects\SolarMillinneum\Ridgecrest\mxd\Water Resources\ridgecrest-waterlevel-2006.mxd



Map Location

Legend

- Project Right-of-Way
- Watershed Boundary
- Drainage Flow Path
- NAWS China Lake Boundary

0 2 4 Miles

N W E S

Ridgecrest Solar Power Plant

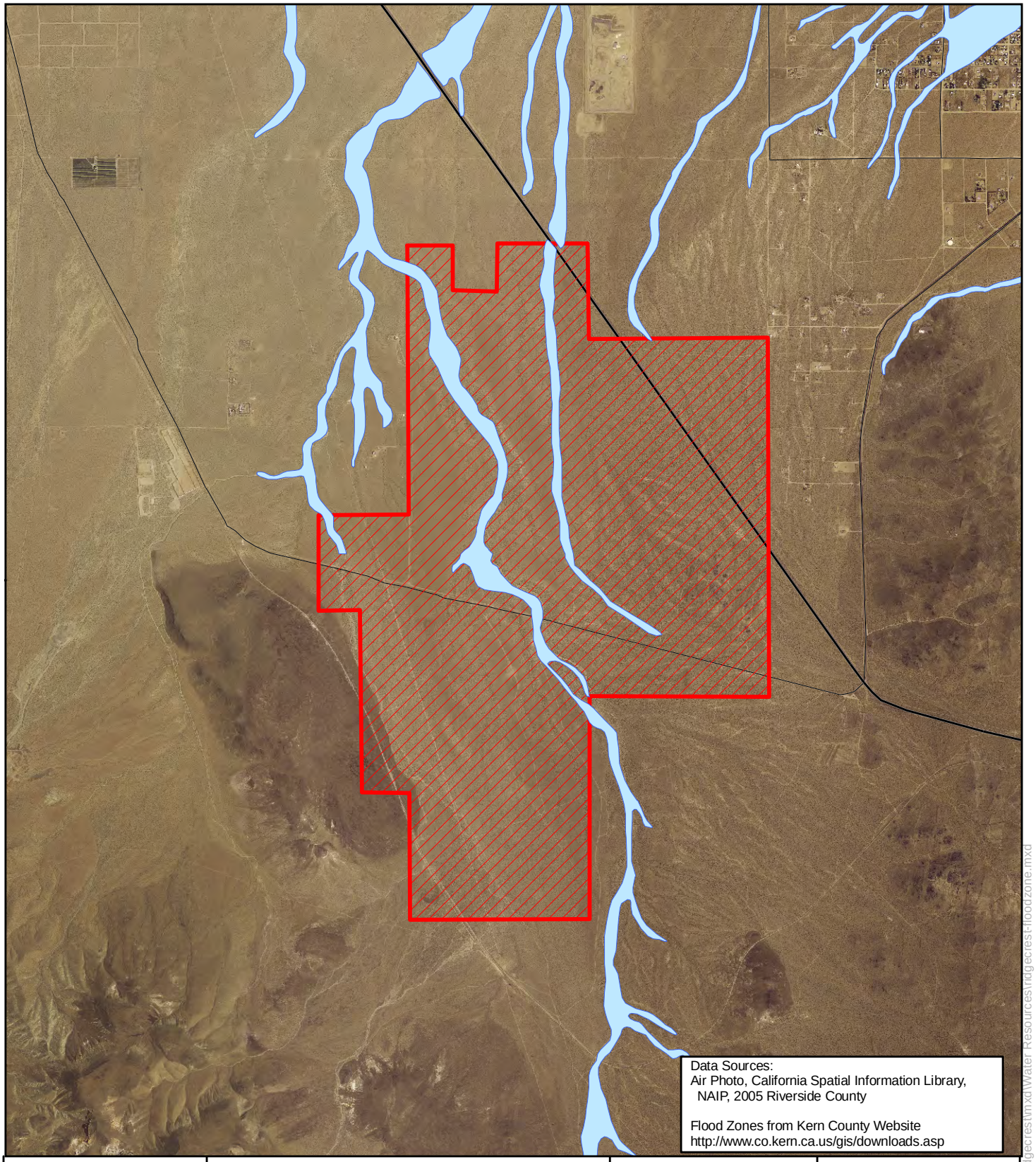
Figure 5.17-11 Watershed and Existing Drainage Flow Paths at Project Site

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

J:\GIS\Projects\SolarMillinneum\Ridgecrest\mxd\Water Resources\ridgecrest-drainage_region.mxd



Map Location

Legend

Project Right-of-Way

100 Year Floodzone

0 4,000 8,000 Feet

N W E S

Ridgecrest Solar Power Plant

Figure 5.17-12
FEMA Flood Zones

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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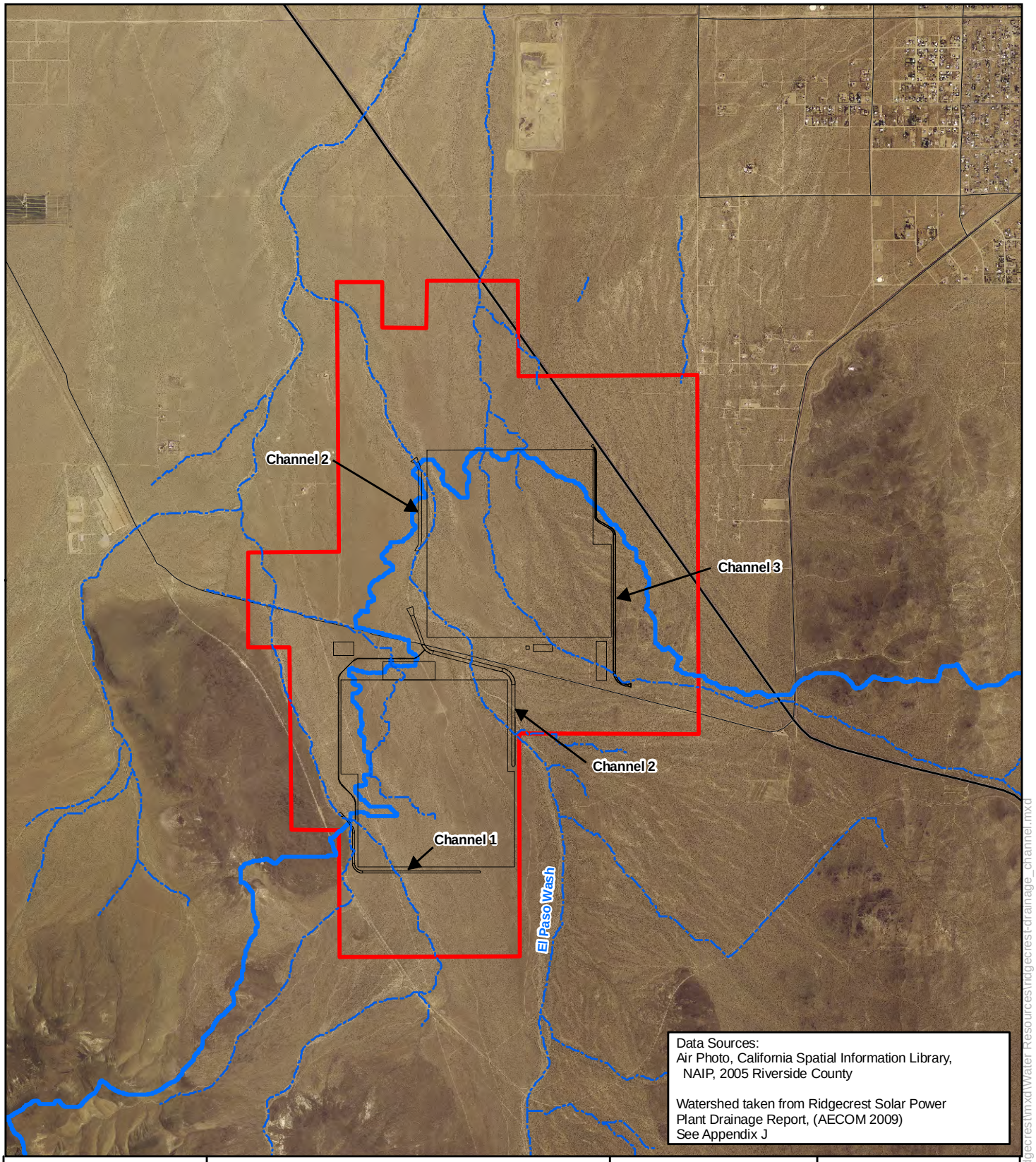

Map Location

Legend

Project Right-of-Way

Drainage Flow Path

0 4,000 8,000 Feet

N W E S

Ridgecrest Solar Power Plant

Figure 5.17-13 Proposed Channel Realignment

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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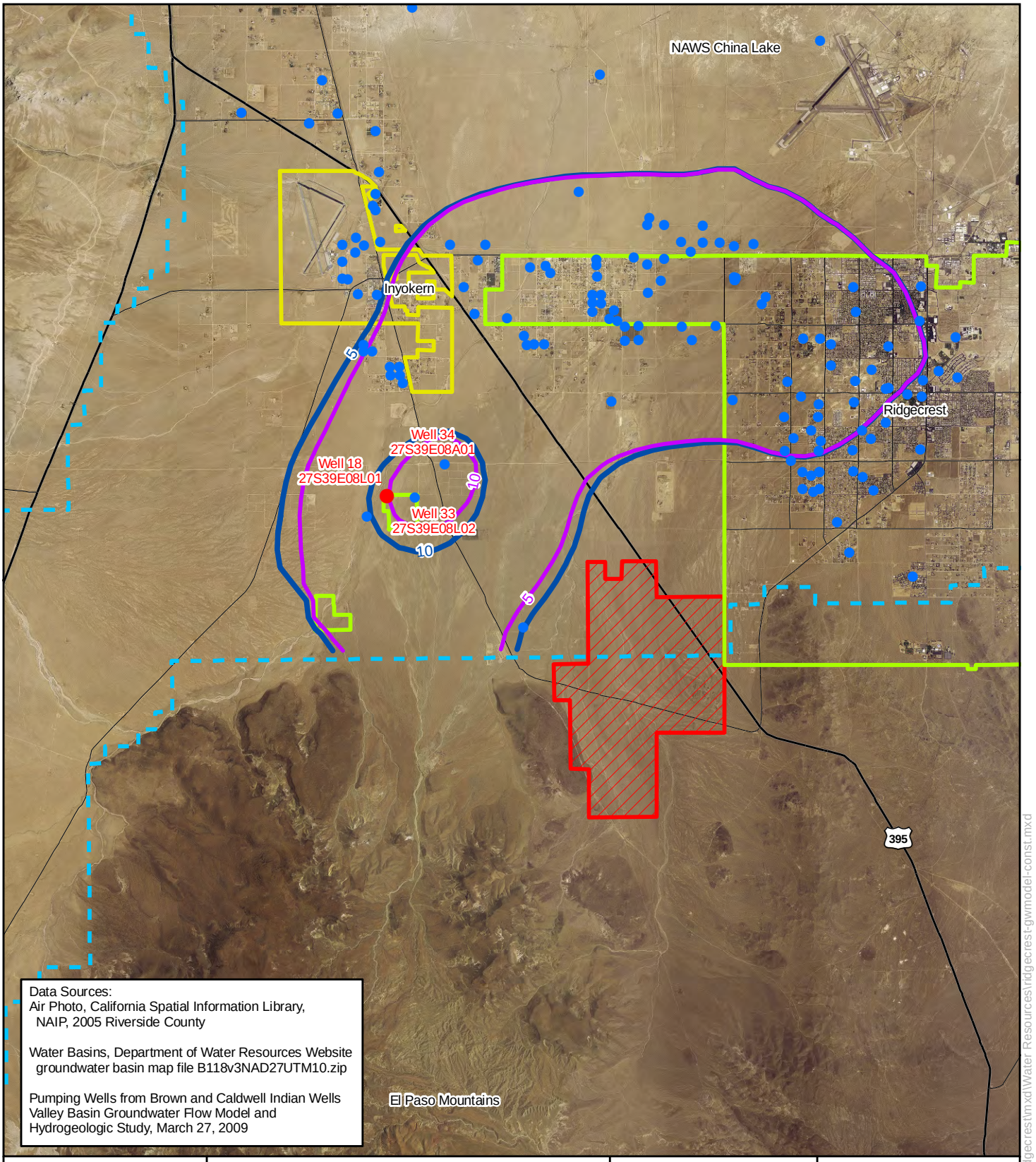

Map Location

Legend

- Project Right-of-Way
- Inyokern C.S.D.
- Indian Wells Valley Water District
- Model Boundary
- Model Predicted Drawdown - Baseline
- Pumping Well Locations based on Brown and Caldwell Pumping Well Database
- Pumping Well used in the Simulation (Well No. 18)
- Model Predicted Drawdown - With Project

0 2 4 Miles

N W E S

Ridgecrest Solar Power Plant

Figure 5.17-14
Radius of Influence from Proposed Construction Pumping (28 Months)

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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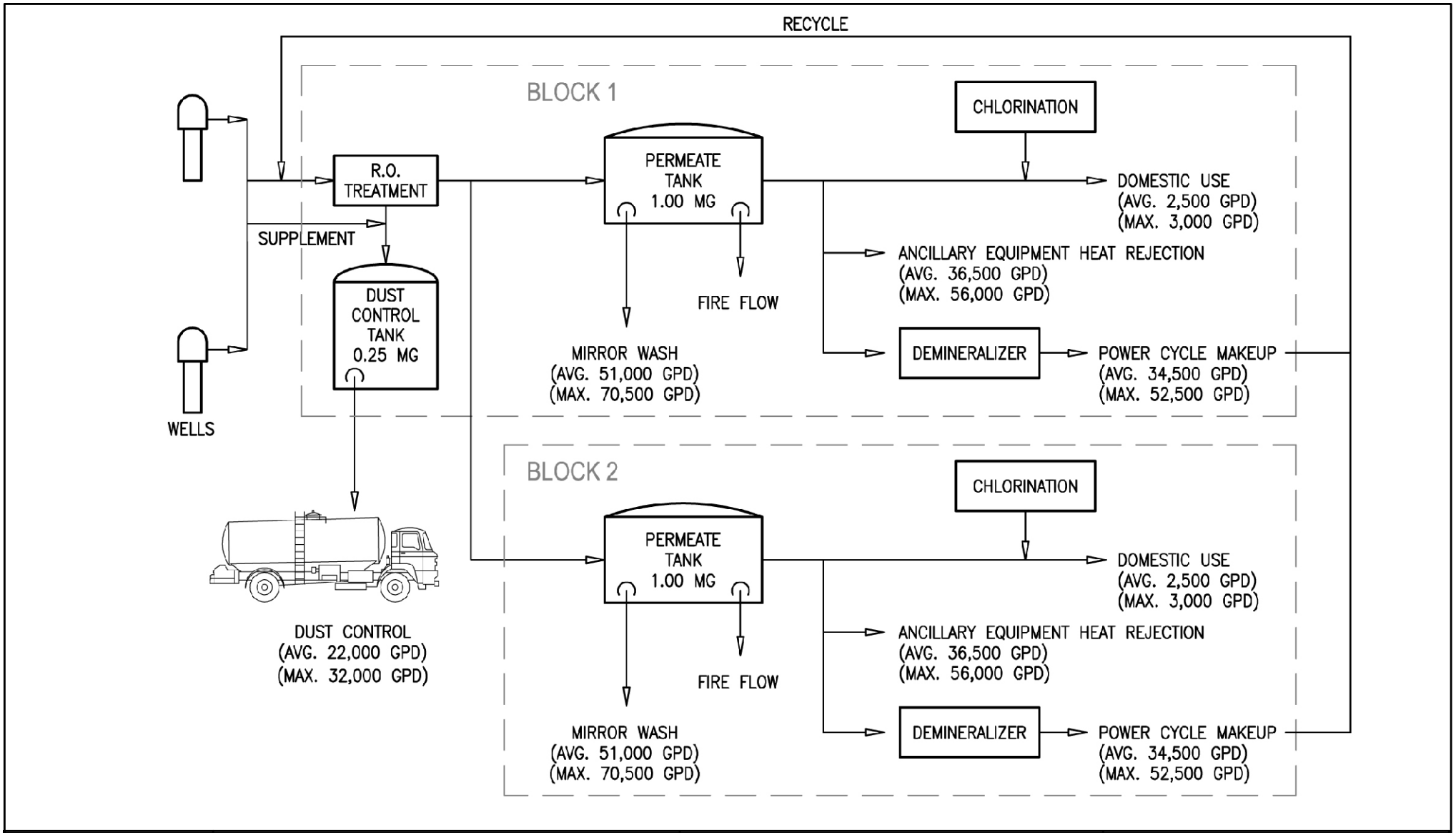
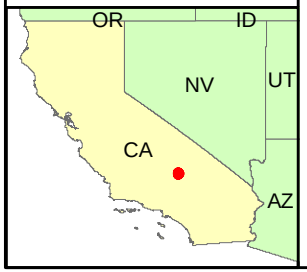


Project Location



Data Sources:
Water / Wastewater Report Appendix J

Ridgecrest Solar Power Project

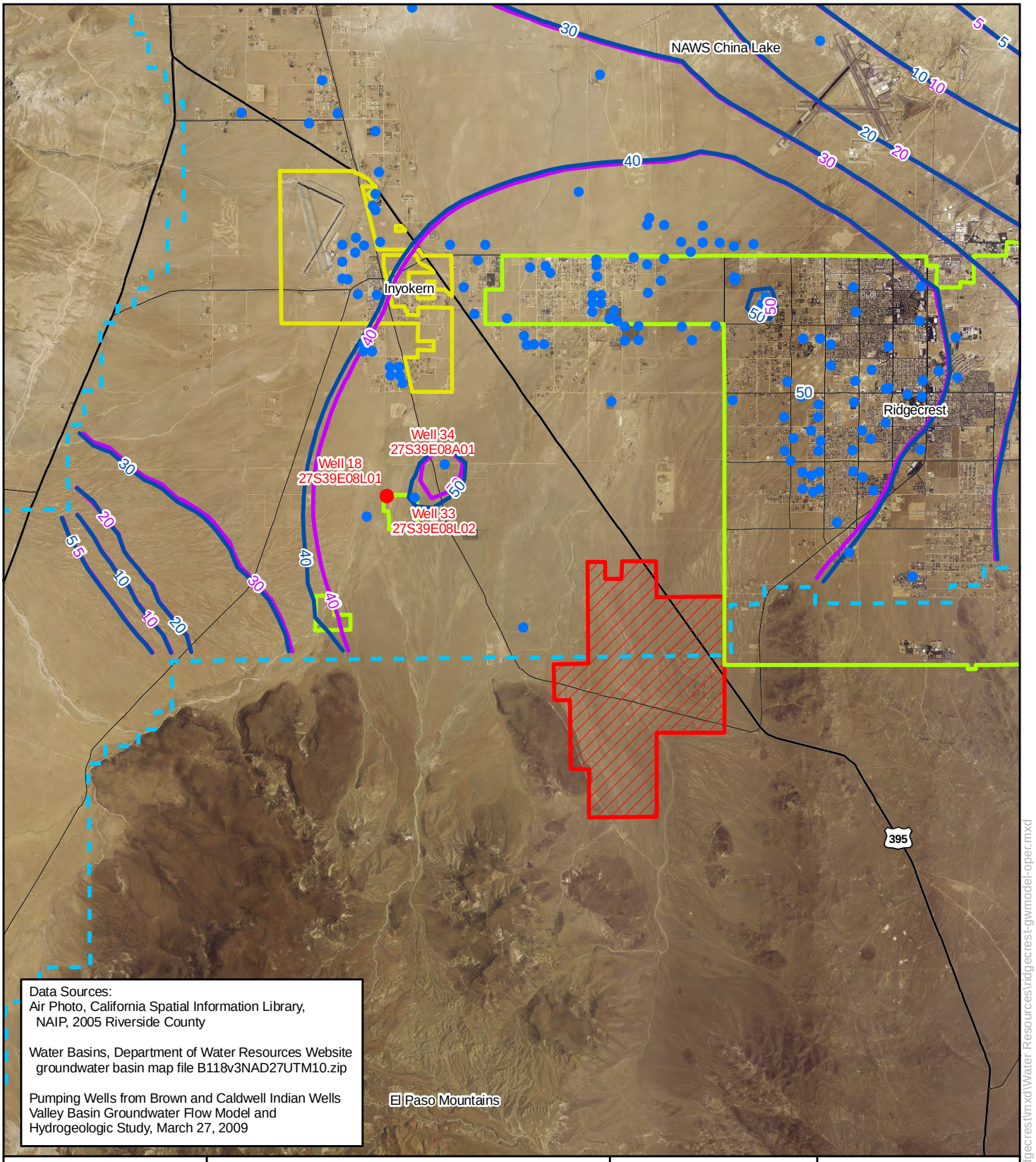
Figure 5.17-15
Water Balance

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

J:\GIS\Projects\SolarMillinneum\Ridgecrest\mxd\Water Resources\water balance.mxd



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

Pumping Wells from Brown and Caldwell Indian Wells Valley Basin Groundwater Flow Model and Hydrogeologic Study, March 27, 2009

Map Location

Legend

- Project Right-of-Way
- Inyokern C.S.D.
- Indian Wells Valley Water District
- Model Boundary
- Model Predicted Drawdown - Baseline
- Pumping Well Locations based on Brown and Caldwell Pumping Well Database
- Pumping Well used in the Simulation (Well No. 18)
- Model Predicted Drawdown - With Project

0 2 4 Miles

N W E S

Ridgecrest Solar Power Plant

Figure 5.17-16
Radius of Influence from Proposed Operational Pumping (30 Years)

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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