UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

June 27, 2019

Kenneth A. Harris Jr.
State Oil and Gas Supervisor
Division of Oil, Gas, and Geothermal Resources
California Department of Conservation
801 K Street, MS 18-05
Sacramento, CA 95814-3530

Re: Approval of Aquifer Exemption for the Edison Oil Field, Phase 2 Area, Kern County, California

Dear Mr. Harris:

Based on a thorough review of the supporting documents submitted by the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) and the State Water Resources Control Board (SWRCB), the U.S. Environmental Protection Agency (EPA) hereby approves the aquifer exemption request for a portion of the Chanac Formation in the Edison Oil Field, Phase 2 Area, in Kern County, California.

In accordance with applicable regulations at 40 C.F.R. Parts 144, 145, and 146, we find that this aquifer exemption request is a non-substantial program revision, and the requested formation meets the following federal exemption criteria:

- The portion of the formation proposed for exemption in the field does not currently serve as a source of drinking water; and
- The portion of the formation proposed for exemption in the field cannot now and will not in the future serve as a source of drinking water because it is commercially hydrocarbon-producing.

The approved aquifer exemption boundaries and depths, along with the EPA's analysis and rationale in support of the approval, are detailed in the enclosed Record of Decision. In addition, we are enclosing the application and other documents submitted by the DOGGR and SWRCB to the EPA that were considered in this approval decision. Due to the size of these additional enclosures, we are providing, via email, a link to an electronic folder containing all the remaining documents.

If you have any questions, or if you have any difficulty accessing the electronic folder, please contact David Albright, Manager of our Groundwater Protection Section, at (415) 972-3971.

Sincerely,

Tomás Torres June 27, 2019
Director, Water Division

Enclosures: Aquifer Exemption Record of Decision for Phase 2 Edison Oil Field
GIS Shape Files of Approved Aquifer Exemption
Final Edison Phase 2 Exemption Application
Letter from Kenneth Harris to David Albright dated June 26, 2019

cc: Jonathan Bishop, Chief Deputy Director, State Water Resources Control Board

US Environmental Protection Agency Region 9

Underground Injection Control (UIC) Program

AQUIFER EXEMPTION RECORD OF DECISION

CHANAC FORMATION – EDISON OIL FIELD

This Record of Decision (ROD) provides the United States Environmental Protection Agency's (EPA's) decision to approve an aquifer exemption (AE) for a portion of the Chanac Formation in the Edison Oil Field, background information concerning the AE request, and the basis for the AE decision.

Primacy Agency: California Division of Oil, Gas, & Geothermal Resources (DOGGR)

Date of Aquifer Exemption Request: February 14, 2019

Exemption Criteria: DOGGR requests this exemption because it has determined that it meets the criteria at 40 CFR § 146.4(a) and § 146.4(b)(1).

Substantial or Non-Substantial Program Revision: Non-Substantial

Although the EPA must approve all revisions to EPA-approved state Underground Injection Control (UIC) programs, the process differs depending on whether the EPA finds the revision to be a substantial or non-substantial program revision. The EPA determined that this is a non-substantial program revision because it is associated with an active oil field and is not a state-wide programmatic change or a program revision with unique or significant implications for the State's UIC program. The decision to treat this AE request as a non-substantial program revision is also consistent with the EPA's "Guidance for Review and Approval of State Underground Injection Control Programs and Revisions to Approved State Programs" ("Guidance 34"), which explains that the determination of whether a program revision is substantial or non-substantial is made on a case-by-case basis.

Current Operators: Naftex Operating Company, LLC; R&R Resources, LLC; California Resources Production Corporation; and Hathaway, LLC.

Well/Project Name: The Chanac Formation in the Edison Oil Field.

Well/Project Permit Number: Currently there are 39 Class II enhanced oil recovery (EOR) wells in the Edison Oil Field within the portion of the aquifer proposed for exemption. In the future, the State anticipates there will be additional Class II wells permitted to inject within the portion of the aquifer proposed for exemption.

Well/Project Location: The aquifer proposed for exemption underlies portions of Township 29 South Range 29 East, Sections 8, 16, 17, 20, 21, 22, 26, 27, 28, 29, 30, 32, 33, 34, and 35, Mount Diablo Base and Meridian (MDB&M) in the Race Track Hill and Edison Groves areas of the field. [Refer to Figure 1.]

County: Kern **State:** California

Current Well Class/Type: Class II EOR.

DESCRIPTION OF PROPOSED AQUIFER EXEMPTION

Aquifer to be Exempted: A portion of the Chanac Formation in the Edison Oil Field.

Areal Extent of Aquifer Exemption: The total areal extent of the existing AE and the proposed expansion in the Chanac Formation in the Edison Oil Field is approximately 7,989 acres. This acreage includes 4,539 oil-productive acres within the boundaries of the AE approved by the EPA at the time California's Class II program received primacy to implement the Class II program in 1983. DOGGR proposes to extend the current exemption and add approximately 3,450 acres outside of the existing exempted areas. DOGGR provided GIS shape files that delineate the AE boundary, which are included in the administrative record for this ROD. Refer to Figure 2 for a depiction of the proposed exempt formation.

Lithology, Total Dissolved Solids (TDS), Depth, Thickness, Porosity, and Permeability of the Aquifer: The following table presents the lithology, range of TDS levels, depth, thickness, and average porosity and permeability information about the aquifer proposed for exemption.

Formation	Chanac Formation
Lithology	Interbedded unconsolidated poorly sorted sands, silts, and shales with occasional conglomerates.
TDS (mg/L)	953 mg/L (average of ten (10) samples ranging from 570 to 2,000 mg/L).
Depth to Top (feet bgs)	57 to 1,377 feet (averaging 770 feet) below ground surface (bgs); +700 to -790 feet (averaging -43 feet) relative to mean sea level.
Thickness (feet)	Average of approximately 450 feet (ranges from 350 to 600 feet).
Average Porosity and Permeability	Porosity averages 24% to 35%. Permeability averages 50 millidarcies (mD) to 5 Darcy.

Confining Zone(s): In the Edison Oil Field, the portion of the Chanac Formation that is proposed for exemption is confined above and below by low-permeability formations consisting of shales, clays, and silts. Lateral confinement is provided by faults. In addition, there is an inward pressure gradient (i.e., a "pressure sink" caused by the withdrawal of fluids). See Figures 3.1 through 3.4.

BACKGROUND

On February 14, 2019, the EPA received a request from DOGGR for approval to exempt a portion of the Chanac Formation in the Edison Oil Field, in Kern County, California. DOGGR reviewed the operator's request and proposed this AE based on the criteria at 40 CFR §146.4(a): it does not currently serve as a source of drinking water; and at 40 CFR §146.4(b)(1): it cannot now and will not in the future serve as a source of drinking water because it is mineral, hydrocarbon, or geothermal energy-producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that, considering their quantity and location, are expected to be commercially producible. After the EPA's approval of the AE, the exempt formation would not be protected as an "underground source of drinking water" (USDW) under the Safe Drinking Water Act (SDWA), and DOGGR

would be authorized, subject to state regulatory requirements, to approve additional Class II injection into the identified formation. As noted above, 39 Class II EOR wells are currently permitted for injection into the portion of the formation proposed for exemption. Upon EPA's approval of the AE, injection into these wells will be into an exempt aquifer.

BASIS FOR DECISION

Regulatory Criteria under which the AE is Requested and Approved

40 CFR § 146.4(a) *It does not currently serve as a source of drinking water.*

State Water Resources Control Board (State Water Board) Concurrence:

In their concurrence on this AE request, the State Water Board determined that the portion of the Chanac Formation proposed for exemption does not currently serve as a source of drinking water and is not hydraulically connected to any domestic or public water supply wells. The State Water Board based its determination on an evaluation of information about water supply wells in the area, groundwater flow patterns, and confinement of groundwater flow. These reviews demonstrate that the portion of the aquifer proposed for exemption does not currently serve as a source of drinking water because there are no existing drinking water supply wells, public or private, that currently or in the future would draw water from the portion of the aquifer that is proposed for exemption. In addition, the formation is vertically and laterally confined (i.e., separated) from other USDWs and no aquifers that serve as sources of drinking water are hydraulically connected to the formation. Further, within the State's water well search area (described more fully below), the portion of the Chanac Formation that is proposed for exemption is not currently a source of drinking water.

Water Supply Wells: DOGGR's AE request included information about wells in the area proposed for exemption to establish that no drinking water wells draw from the portion of the aquifer proposed for exemption. The operator searched well records to identify wells within a water supply well search area ("study area") that includes a one-mile buffer around the boundary of the area proposed for exemption. This study area was selected to extend beyond geologic features, such as sealing faults, that confine the portion of the aquifer proposed for exemption and to include areas of potential surface recharge in order to ensure that a complete review of all water wells was performed.

The water well inventory was compiled based on data from the Kern County Water Agency, the Kern County Department of Public Health, Environmental Division, the GeoTracker database, and the Department of Water Resources Water Quality Library. The operator and DOGGR staff performed field inspections to supplement the data review.

The State's water well study identified 204 wells within the study area (see Table 1), including 58 drinking water wells. Of the 58 drinking water wells, 43 are screened in the Alluvium, Kern River Formation, or the Transition/Santa Margarita Formation, which are not proposed for exemption and are not hydraulically connected to the Chanac Formation. Of the remaining 15 drinking water wells, 2 are destroyed, 2 are completed in the Chanac Formation but are in the area exempted at primacy (and will not be affected by Class II injected fluids because of the inward pressure gradient, described under the confinement section, and because they are more than one-quarter mile away from any injection activities), and 10 are located on the opposite side

of the sealing faults that form the northeast and northwest boundaries of the AE area. For the final well, which is completed in the Chanac Formation, the State prepared a capture zone analysis (CZA), which resulted in the exclusion from the area proposed for exemption of a 538-foot radius around the well. In preparing the CZA, DOGGR evaluated the portion of the aquifer from which the well would draw water over its predicted 30-year lifetime, following the 1999 California Drinking Water Source Assessment and Protection Program's (DWSAPP) guidelines. DOGGR also provided information about the well's construction that demonstrates that the well draws from the shallowest water bearing sands of the Chanac Formation, which are isolated by a cement plug at the bottom of the well from the deeper oil-bearing layers into which injection occurs. The Statement of Basis prepared by the State adds that injectate volumes and pressure are, and would for any potential future wells be, limited by the regulatory requirements of any DOGGR-issued Class II well permits to ensure that injected fluids do not migrate into the area around this well and affect the quality of water drawn from the well.

The other well types include 84 agricultural/irrigation wells, 7 industrial wells, 4 monitoring/test wells, 1 corrosion protection well, and 50 wells whose type could not be ascertained. These 50 wells include 49 that are screened in the Alluvium or Kern River Formation, which are not proposed for exemption, and one well that is hydraulically isolated by sealing faults from the portion of the formation that is proposed for exemption and therefore will not be affected by Class II injection activities. The other wells, e.g. those utilized for agricultural/irrigation, industrial, monitoring/test, or corrosion protection purposes, are not used for drinking water purposes.

The nearest municipal service company-owned drinking water wells are operated by the East Niles Community Services District (ENCSD). Two ENCSD-operated drinking water supply wells are located approximately 3 miles southwest and 4.3 miles west of the area proposed for exemption; both of these wells are screened in the Kern River Formation and are outside of the area proposed for exemption. A third ENCSD well, located approximately 1.1 miles southwest of the area proposed for exemption, is used for monitoring only. The AE request includes documentation of a discussion with staff of the ENCSD who confirmed that no drinking water wells draw water from the portion of the formation that is proposed for exemption.

Groundwater Flow Patterns: Fluid flow in the formation proposed for exemption is toward the producing wells in the field (i.e., from high to low pressure) and away from the boundaries of the area proposed for exemption. This flow pattern results from more fluid being withdrawn from the aquifer than is injected. The State's AE request included injection and production data and pressure gradient maps that are based on net fluid withdrawal and static fluid level data.

Confinement of the Formation to Groundwater Flow: Vertical confinement above the portion of the Chanac Formation that is proposed for exemption is provided by a clay/shale layer separating it from the overlying Kern River Formation that is the source of drinking water in the area. This clay/shale, which has been mapped throughout the area proposed for exemption, ranges in thickness from 15 to 50 feet and has an estimated permeability that ranges from less than 5 mD to approximately 50 mD with an average of 24 mD. The permeability calculations are based on samples taken when wells in the Edison Oil Field were drilled and studies of other formations in the field. This clay/shale is depicted in cross sections that were developed based on geophysical logging and thickness maps provided in the AE request. Additional evidence of the

confining nature of this layer is the absence of hydrocarbons above it. (See Figures 3.1 through 3.4.)

Below the Chanac Formation, the Lower Chanac silt/shale provides confinement. This lower confining unit has an average thickness of 30 feet and its permeability, based on core data, varies from less than 5 mD to approximately 50 mD, with an average of 24 mD. The lower confining layer is presented on thickness maps and cross sections in the application. This lower confining layer is above the Santa Margarita Formation, portions of which EPA exempted in May 2019.

The Edison Oil Field consists of a series of rock layers dipping to the southwest (known as a "homocline"), cut by sealing faults that create barriers ("traps") to fluid and hydrocarbon migration within the productive areas. Lateral confinement of the Chanac Formation is provided by faulting to the east, northeast, southeast, and northwest, as follows:

- *To the east and northeast:* confinement of the Chanac Formation is provided by the Ant Hill fault system. Evidence for the sealing nature of these faults is provided by a change in the oil-water contact across the fault system; oil is present in wells west of the fault system and water in the wells to the east of the fault system.
- *To the southeast:* confinement of the Chanac Formation is provided by an unnamed northeast/southwest trending fault. The Chanac Formation is documented to be productive on the northwest side of the fault and is barren or desaturated on the southeastern side of the fault, as shown in well logs from wells on either side of the fault and well histories that show an absence of oil in the wells outside of the fault.
- *To the northwest:* confinement is provided by the Bartow USGS and Section 20 faults, which are demonstrated to be sealing by the presence of hydrocarbons in wells inside of the fault boundary and the lack of oil in wells outside of the faults.

To the southwest and south, the lateral boundary of the area proposed for exemption is defined by an inward pressure gradient caused by differences in the volumes of water injected versus the fluids produced from the field. DOGGR provided Chanac Formation injection and production data showing that between 1992 and 2016, a total of 7,092,957 barrels (bbl) of oil and 81,272,987 bbl of water have been produced. Over that same period, 17,987,477 bbl of steam have been injected. This results in a net withdrawal of 70,378,467 bbl from the Chanac Formation within the Edison Oil Field. The application also includes a pressure gradient map showing that the direction of flow is toward the center of the field. This inward pressure gradient would continue throughout injection operations. According to DOGGR, when oil field operations cease, the gradient will continue until pressure equalizes, after which any water well would produce water from outside the oil field and not fluids that were previously injected into the oil field.

After reviewing information regarding the location and depth of the existing drinking water wells, groundwater flow within the Chanac Formation, and the lateral and vertical confinement of the formation as described in the AE request, the EPA concludes that the portion of the formation that is proposed for exemption is not currently a source of drinking water and is not hydraulically connected to any domestic or public drinking water supply wells. Therefore, the EPA has determined that the portion of the aquifer proposed for exemption meets the criteria at 40 CFR § 146.4(a).

40 CFR § 146.4(b)(1) *It cannot now and will not in the future serve as a source of drinking water because it is mineral, hydrocarbon, or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.*

DOGGR provided information on hydrocarbon production in the area proposed for exemption along with supporting documentation such as historic production data, the locations of current and historical producing wells, and well logs and core data to demonstrate the presence of commercially producible quantities of oil in the portion of the Chanac Formation that is proposed for exemption within the Edison Oil Field.

History of the Edison Oil Field

Production from the Chanac Formation within the Edison Oil Field began in 1953. Oil production by steam injection (steaming) has been underway in the Chanac Formation since 1964 in both areas (i.e., Race Track Hill, a surface portion of the field, and Edison Groves, a separate administrative area) of the Edison Oil Field. Both steaming and water flood operations in the Chanac Formation occur in the Edison Oil Field. On May 14, 2019, EPA approved an AE for portions of the Transition/Santa Margarita Formation, Main Wicker Sand, Pyramid Hill Sands, and Vedder Formation, all of which are hydrocarbon-bearing zones in the Edison Oil Field.

The Chanac Formation is the shallowest hydrocarbon-bearing zone in the Edison Oil Field. Since its discovery, the Chanac Formation within the area of the Edison Oil Field that is proposed for exemption has produced an estimated 12,909,255 bbl of oil. Figure 4 shows the location of the production wells within the area proposed for exemption. To date, the Edison Oil Field has produced nearly 148 million bbl of oil and 72 billion cubic feet of gas, field-wide, from all the hydrocarbon-producing formations.

Throughout the field, the presence of hydrocarbons in the Chanac Formation is demonstrated through production data, well logs, and the physical properties (including the presence of oil) in cores that were generated when wells in the field were drilled. The average oil saturation of the Chanac Formation within the Edison Oil Field is approximately 20%, ranging up to about 72%; this is based on core data provided in the application.

Based on a review of information including well logs, production data, oil saturation, the history of oil production, and the effective implementation of enhanced recovery techniques such as steaming, the EPA has determined that the portion of the aquifer that is proposed for exemption meets the criteria at 40 CFR § 146.4(b)(1).

PUBLIC NOTICE AND COMMENT

DOGGR provided public notice of this proposed AE on September 14, 2018, and held a public hearing on October 18, 2018 in Bakersfield, CA. The public comment period closed on October 18, 2018. DOGGR provided the EPA a summary of the single written public comment it received, a copy of the written public comment, a transcript of the public hearing (at which no comments were provided), and DOGGR's written responses to the written comment.

In making this decision, the EPA considered all the information submitted by the State, including the written comment submitted to the State during its public comment process. Specific responses not addressed by DOGGR are provided below.

The commenter (The Center for Biological Diversity) wrote to DOGGR and commented that the EPA should reject the aquifer exemption request before an environmental review has occurred under the National Environmental Policy Act (NEPA). The EPA believes that the public comment and hearing process afforded by DOGGR, the technical analysis to protect USDWs required in the aquifer exemption proposal process under the EPA's UIC regulations, and the enabling legislation in the SDWA provide a functionally equivalent environmental review for this decision, thus an environmental review under NEPA is not required.

The same commenter also raised concerns regarding protection of listed species and critical habitat under the federal Endangered Species Act (ESA). After consideration of this issue, the EPA has determined that ESA consultation is not required because the AE approval has no effect on any listed threatened or endangered species or the designated critical habitat of such species. The EPA's conclusion is based on a number of considerations. First, the AE approval under the SDWA changes the jurisdictional status of a confined aquifer that is hundreds of feet underground. No species of concern are present in the subsurface portions of the aquifer considered in the EPA's approval action, and it is unclear or speculative whether any listed species or critical habitat overlaps with the surface-level activities. In addition, the EPA's approval of the AE is only one preliminary step in the process leading to potential fluid injection into the aquifer, with many additional steps (including state actions and decisions and actions by third party operators) that must occur prior to injection and prior to any potential effects to protected species or habitat at the surface. Thus, EPA approval of the aquifer exemption would not be the legal cause of potential effects to listed species or designated critical habitat, if any.

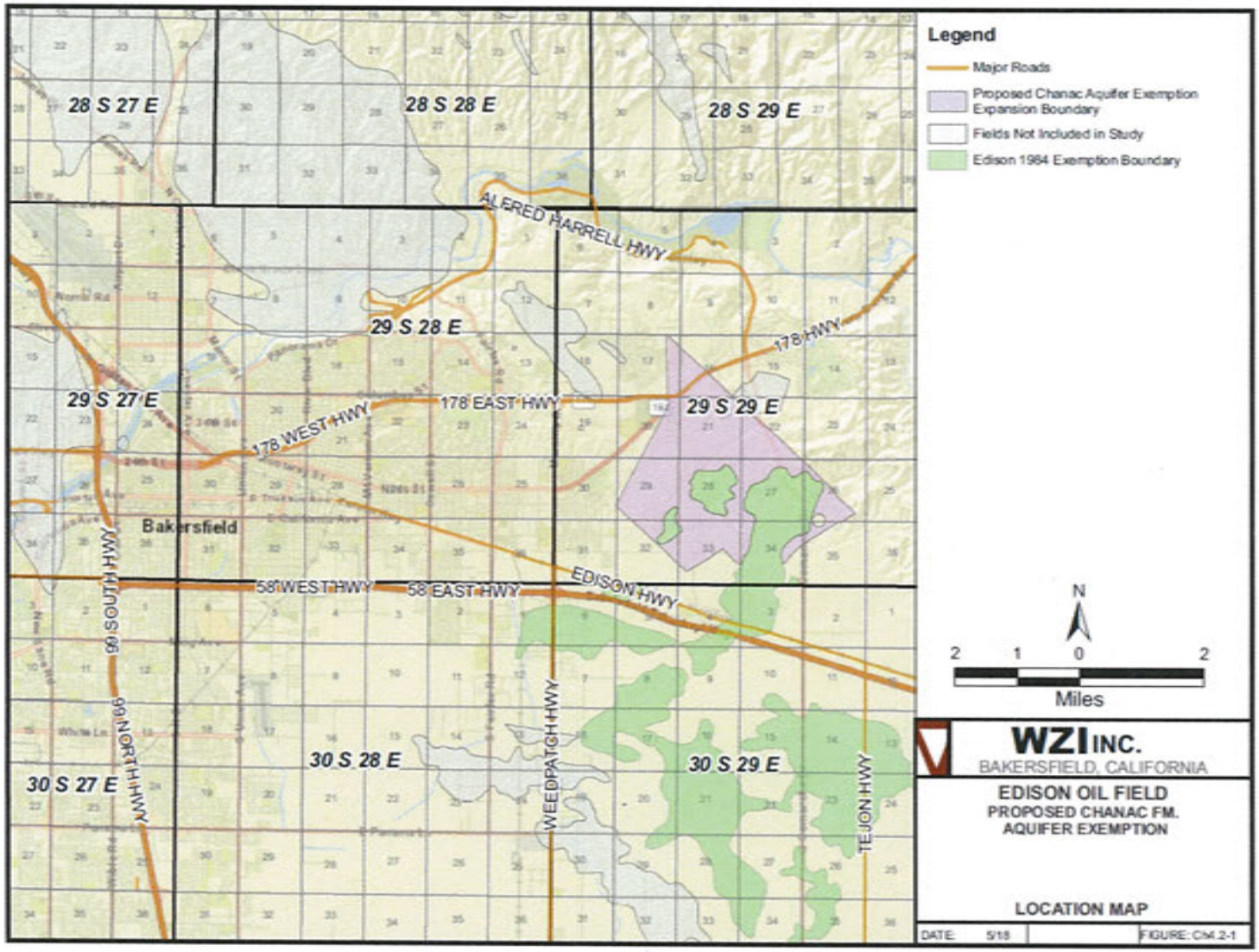
Additionally, the commenter questioned whether the current AE criteria reflect changing climate conditions and modern water treatment technologies. In considering whether the aquifer proposed for exemption cannot now and will not in the future serve as a source of drinking water because it is hydrocarbon producing, the EPA reviewed data about hydrocarbon production in the portion of the Chanac Formation that is proposed for exemption. Based on a review of historic production data, well logs, and core data, the EPA concludes that the formation will continue to be commercially producible into the foreseeable future and meets the existing requirements at 40 CFR § 146.4(b)(1).

CONCLUSION AND DECISION

Based on a review of the entire record, including all written and oral comments submitted to DOGGR during its public comment process, EPA finds that the exemption criteria at 40 CFR § 146.4(a) and § 146.4(b)(1) have been met, and EPA approves the AE request as a non-substantial program revision.

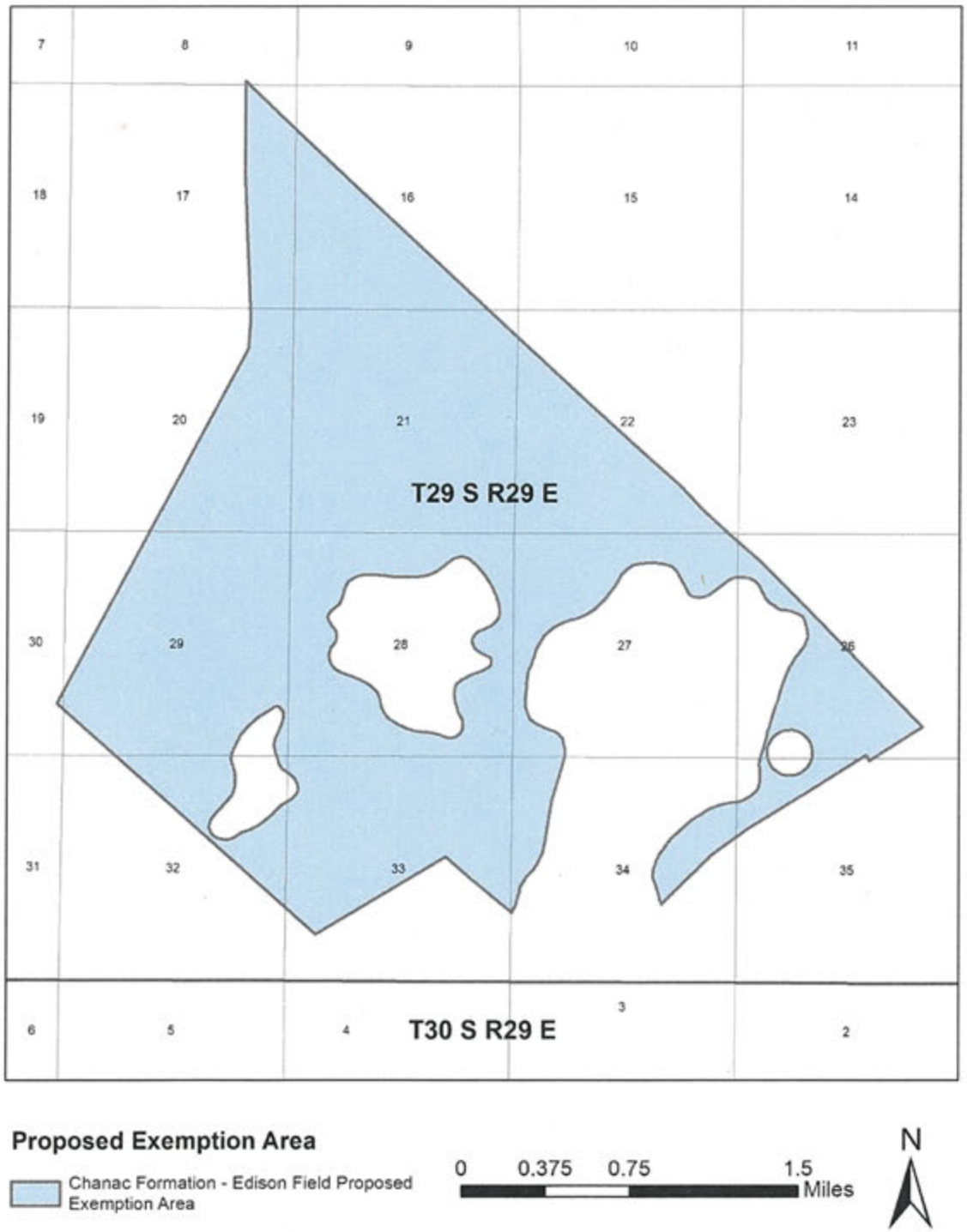
Effective Date: June 27, 2019

Figure 1: Location of the Edison Oil Field, Kern County, California



Source: Figure Ch4.2-1, DOGGR's Aquifer Exemption Application for the Edison Oil Field

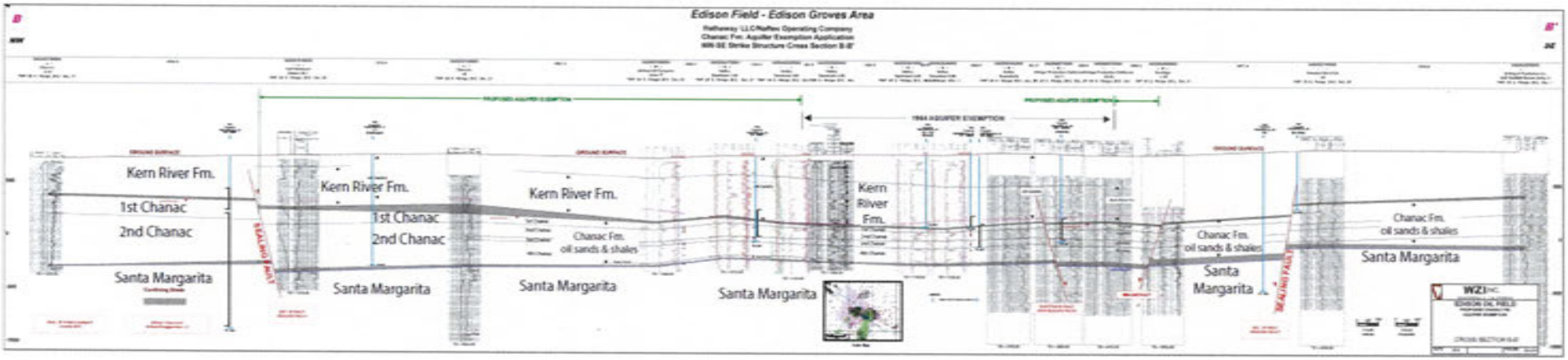
Figure 2: Chanac Formation Aquifer Exemption Location Map, Edison Oil Field, Kern County, California



Source: DOGGR's Aquifer Exemption Application for the Edison Oil Field

Figure 3.1: Cross Section B-B' across the Chanac Formation Aquifer Exemption Area

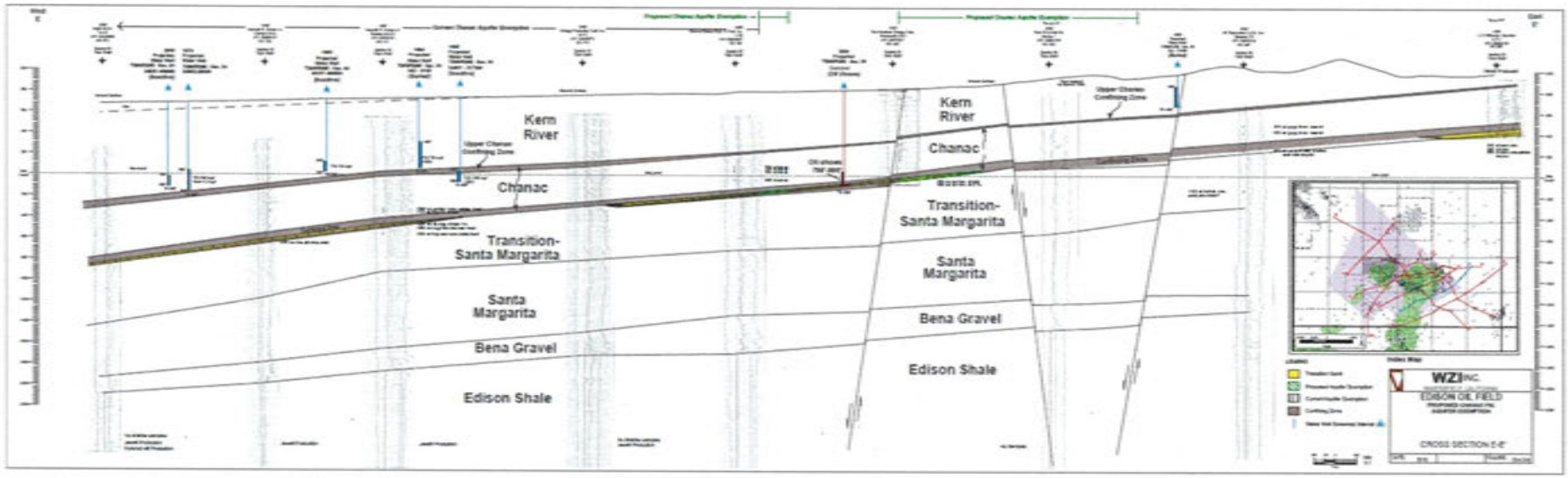
Edison Oil Field, Kern County, California



Source: Figure Ch4.3-5, DOGGR's Aquifer Exemption Application for the Edison Oil Field

Figure 3.2: Cross Section E-E' across the Chanac Formation Aquifer Exemption Area

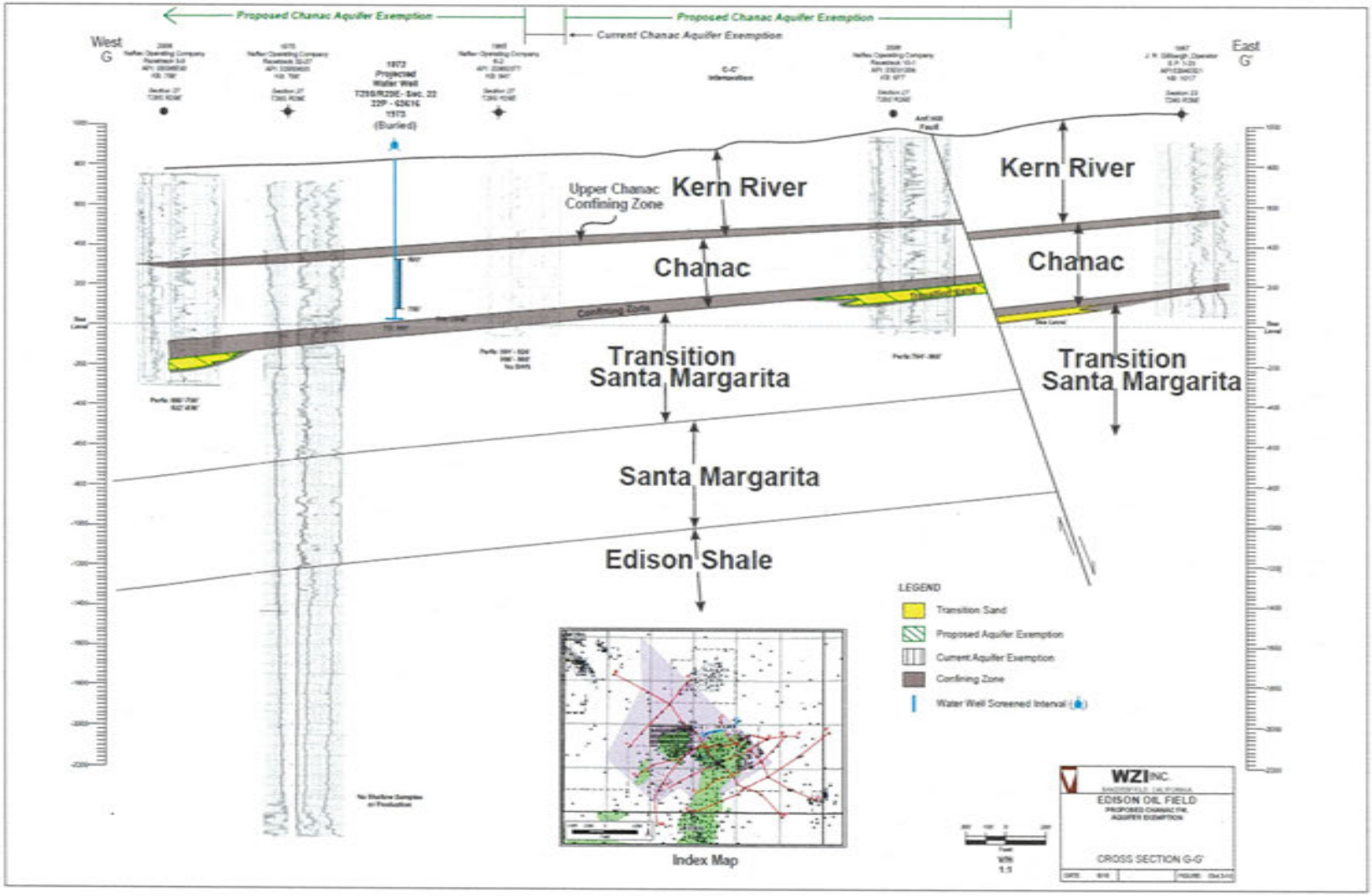
Edison Oil Field, Kern County, California



Source: Figure Ch4.3-8, DOGGR's Aquifer Exemption Application for the Edison Oil Field

Figure 3.3: Cross Section G-G' across the Chanac Formation Aquifer Exemption Area

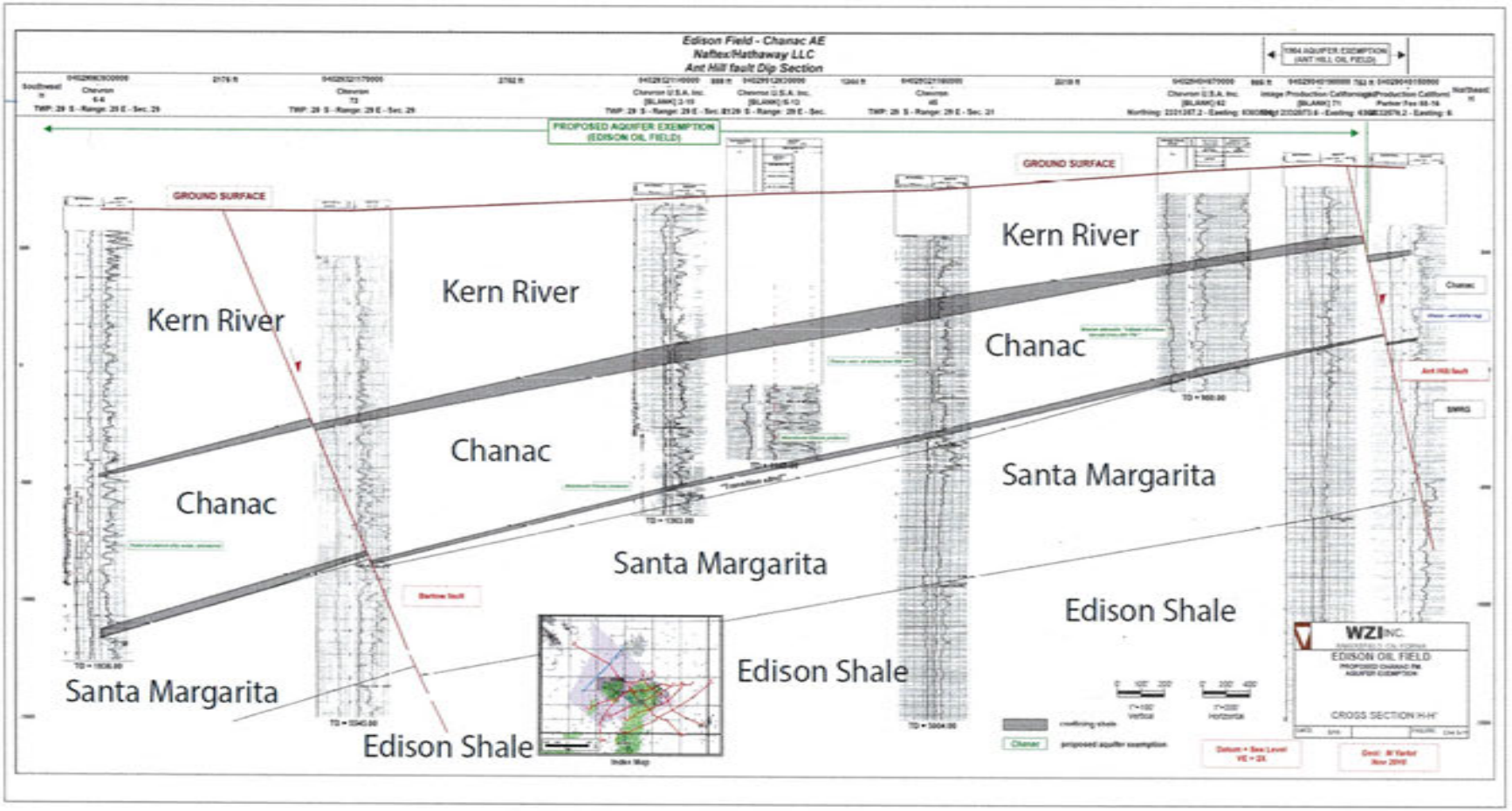
Edison Oil Field, Kern County, California



Source: Figure Ch4.3-10, DOGGR's Aquifer Exemption Application for the Edison Oil Field

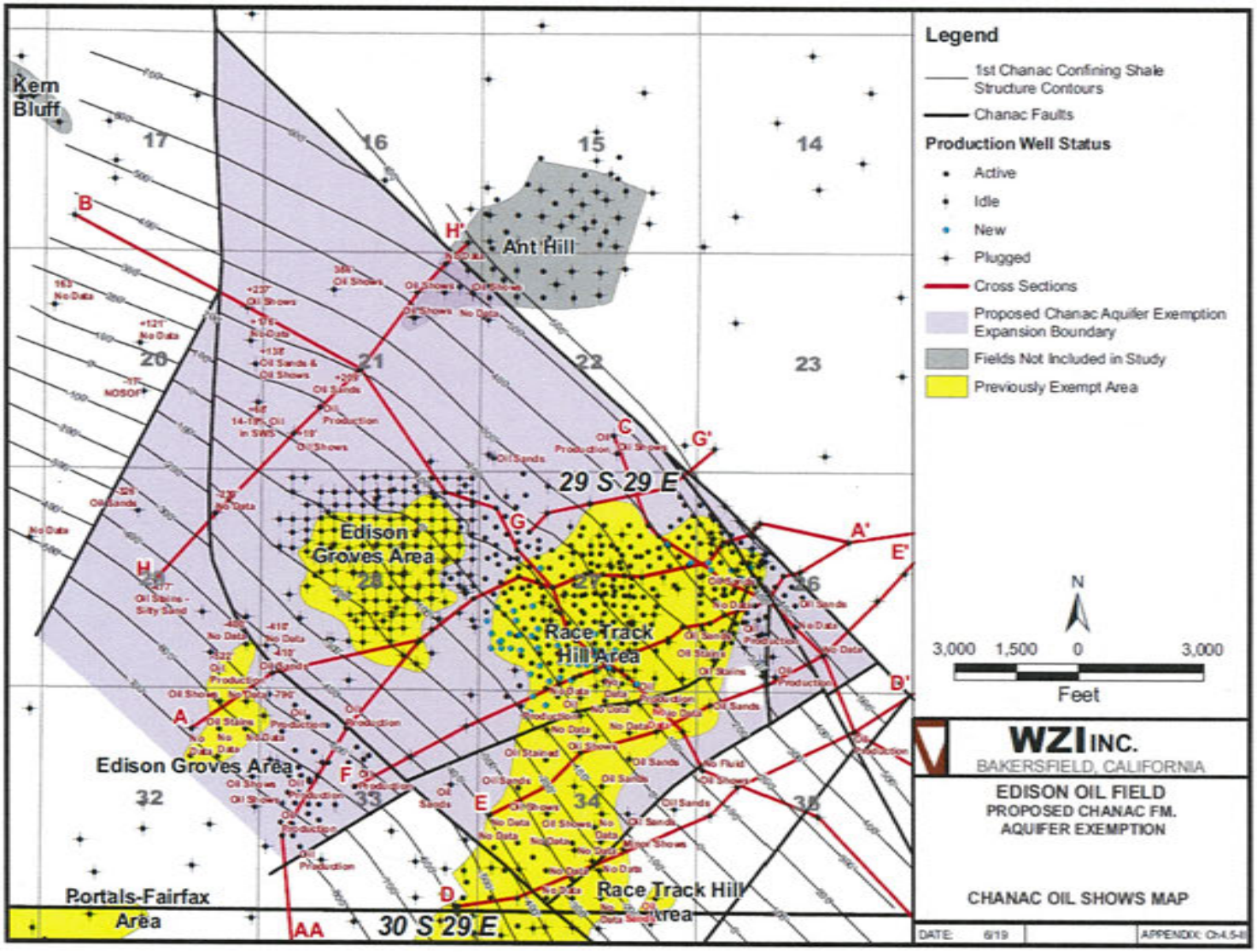
Figure 3.4: Cross Section H-H' across the Chanac Formation Aquifer Exemption Area

Edison Oil Field, Kern County, California



Source: Figure Ch4.3-11, DOGGR's Aquifer Exemption Application for the Edison Oil Field

Figure 4: Chanac Formation Oil Shows Map, Edison Oil Field, Kern County, California



Source: Appendix 4.5-II, DOGGR's Aquifer Exemption Application for the Edison Oil Field

Table 1: List of Water Supply Wells

Map ID	Record ID	Permit Number	APN	Program/ Element	Township	Range	Section	Well Number	Status	Date Drilled	Total Depth (ft)	Screen Interval (ft)	Zone
EC01				Domestic	29	29	16	G	UNK	4/4/1977	741	380-580, 640-741	Kern River/Chanac
EC02				Domestic	29	29	16	H4	UNK	9/14/1972	480	340-480	Kern River
EC03	WP0010905	WP 10905	387-160-12	Domestic	29	29	16	J	Destroyed	UNK	500	N/A	Kern River
EC04				Domestic	29	29	16	K1	UNK	4/25/1975	741	350-741	Kern River/Chanac
EC05	WP0004880	EH-116-96		Domestic	29	29	16	K2	Destroyed	6/26/1996	1200	80-1200	Kern River/Chanac/Santa Margarita
EC06				Domestic	29	29	16	K		2/7/1977	750	450-750	Kern River/Chanac
EC07				Domestic	29	29	20	B		7/31/1981	1600	300-500;540-1600	Chanac/Transition/Santa Margarita-
EC08				Domestic	29	29	20	C	UNK	4/29/1974	673	60-140, 160-180, 200-	Kern River/Chanac
EC09				Domestic	29	29	20	E	UNK	7/6/1988		375-675	Kern River /Chanac outside exemption area
EC10	WP0005154	EH-141-97	387-050-01	Industrial	29	29	21	E	Destroyed	6/6/1997	1040	UNK	Chanac
EC11				Domestic	29	29	22	J	UNK	12/28/1974	618		Kern River/Chanac
EC12				Agricultural	29	29	22	P	No Well	8/23/1973	800	500'-750'	Chanac
EC13					29	29	24						Kern River[1]
EC14	WP0000227	EH-347-89	387-060-12	Domestic	29	29	24	J	Inactive code	10/25/1989	600	240-360	Chanac
EC15	WP0002684	EH-044-91	387-060-07	Domestic	29	29	24	N1	Inactive code	9/14/1991	460	360-460	Chanac
EC16				Agricultural	29	29	24	N2		3/15/1971	400	180-400	Chanac
EC17	WP0007333	EH-1717	388-010-14	DOMESTIC / I	29	29	26	B01	Completed	10/31/2003	820	600-800	Transition/Santa Margarita- outside exemption area
EC18				Domestic	29	29	26	C	UNK	2/12/1980	455	250-455	Kern River/Chanac
EC19				Agricultural	29	29	26	J		12/22/1954	300	108-300	Kern River
EC28	WP0009352	EH-3703	388-140-11	Agricultural	29	29	31	A	Destroyed	6/21/2006	205	UNK	Kern River
EC21	WP0008570	EH-2951	388-010-28	DOMESTIC / I	29	29	26	N	Destroyed	5/11/2005	820	620-680	Kern River/Chanac
EC22	e067899	WP1167	388-010-29	Domestic	29	29	26	N2		8/28/2008	900	570-750	Kern River/Chanac
EC23	WP0007629	EH-2001	388-020-27	(none)	29	29	28	P01	Inactive code	4/13/2004	775	670-750	Kern River
EC24	WP0008828	EH-3186	388-072-10	st Hole/Agricultu	29	29	30	A	Destroyed	9/3/2005	1200	N/A	Chanac
EC29	WP0009351	EH-3702	388-140-11	Agricultural	29	29	31	A1	Destroyed	6/21/2006	1000	UNK	Kern River
EC43				Agricultural	29	29	32	F		7/7/1975	750	505-720	Kern River
EC27	WP0009101	EH-3434	388-720-10	APPL: AGRICUL	29	29	30	G01	Destroyed	6/28/2006	1100	500-1100	Kern River
EC53				Agricultural	29	29	33	N2	UNK	0/00/1909	375		Kern River
EC57			388-050-08	Agricultural	29	29	34	C02		7/11/1973	800	550-800	Kern River
EC30					29	29	31	E	UNK	0/00/1909	279		Kern River
EC31					29	29	31	F	UNK	0/00/1909	188		Kern River
EC32					29	29	31	G	UNK	0/00/1909	376		Kern River
EC58				Agricultural	29	29	34	C03		8/18/1954	672	420-666	Kern River
EC34					29	29	31	H01					Kern River[1]
EC35	WP0007203	EH-1586	388-150-04	Test Well	29	29	31	L	Destroyed	7/29/2003	850		Kern River
EC36	WP0007624	EH-1997	388-150-04	Monitor	29	29	31	L1	Inactive code	8/26/2004	695		Kern River
EC37				Municipal	29	29	31	L2	UNK	3/20/1956	1002	432-1002	Kern River
EC38					29	29	31	N1	UNK	3/00/1947	300		Kern River
EC39					29	29	31	N02	UNK				Kern River[1]
EC64	USBR 29/29-36M1			Agricultural	29	29	36	M1		6/1/1949	1502	1037-1502	Transition/Santa Margarita- outside exemption area
EC41					29	29	32	A1	UNK	4/30/1905	660		Kern River

Table 1: List of Water Supply Wells (continued)

Map ID	Record ID	Permit Number	APN	Program/ Element	Township	Range	Section	Well Number	Status	Date Drilled	Total Depth (ft)	Screen Interval (ft)	Zone
EC65	USBR 29/29-36M2			Agricultural	29	29	36	M2		8/15/1956	2125	UNK	Transition/Santa Margarita- outside exemption area
EC20				Irrigation	29	29	26	M	UNK	1/22/1980	406	200-400	Kern River
EC44				Domestic	29	29	32	H1	UNK	1/13/1977	422	222-422	Kern River
EC25	e052131	WP 9887	388-072-10	Irrigation	29	29	30	A1	UNK	12/2/2006	940	420-930	Kern River/Chanac
EC46					29	29	32	L01					Kern River[1]
EC26				Irrigation	29	29	30	E	UNK	2/21/1966	1006	546-1006	Kern River
EC33				Irrigation	29	29	31	H	UNK	3/16/1959	2150	500-1005, 944-2150	Kern River/Chanac/Santa Margarita
EC49					29	29	33	E1	UNK		382		Kern River
EC40				Irrigation	29	29	31	R1	UNK	7/12/1949			Kern River[1]
EC42				Irrigation	29	29	32	A2	UNK	3/7/1958	1250		Kern River/Chanac
EC52					29	29	33	N1	UNK		680+		Kern River at 680
EC45				Irrigation	29	29	32	H	UNK	2/7/1958	1000	488-1000	Kern River
EC47				Irrigation	29	29	32	M	UNK	11/16/1964	860	580-860	Kern River
EC55	WP0005392	EH-048-98	388-050-30	Domestic	29	29	34	B	Inactive code	4/17/1998	800	700-800	Kern River/Chanac
EC56	WP0003630	EH-419-92	388-050-05	(none)	29	29	34	C01	Inactive code	12/18/1992	700	600-700	Kern River
EC48				Irrigation	29	29	32	M1	UNK	12/31/1951	600	381-594	Kern River
EC50				Irrigation	29	29	33	F2	UNK	12/2/1957	1957	1388-1957	Chanac/Transition/Santa Margarita- outside exemption area
EC59	WP0009019	EH-336	388-050-08	DOMESTIC / I	29	29	34	E1	Inactive code	2/15/2000	800	700-800	Kern River
EC60				Domestic	29	29	34	E2		3/1/1979	850	650-850	Kern River/ Chanac
EC51				Irrigation	29	29	33	H01	UNK	10/1/1945	700		Kern River
EC62	e0086600	WP 1151	388-060-04	Industrial	29	29	36	E2	UNK	12/15/2008	1800	720-800, 850-1780	Transition/Santa Margarita- outside exemption area
EC54				Irrigation	29	29	33	R1	UNK	5/28/1951	830	402-744, 750-830	Kern River/Chanac
EC63				Irrigation	29	29	36	E1	UNK	9/12/1959	2200	797-2200	Transition/Santa Margarita- outside exemption area
EC66				Irrigation	29	29	36	N1	UNK	10/11/1950	1308	918-1308	Transition/Santa Margarita- outside exemption area
EC67				Irrigation	29	29	36		UNK		1140		No well present
EC68				Irrigation	30	28	1	A	UNK	7/11/1959	356		Kern River
EC69				Irrigation	30	28	1	C	UNK	6/00/1952	171	92-170	Kern River
EC74				Irrigation	30	28	1	P3	UNK	3/9/1952	675		Kern River
EC70				Domestic	30	28	1	E	UNK	12/30/1966	394	374-390	Kern River
EC71				Domestic	30	28	1	F	UNK	1/26/1967	750	350-750	Kern River
EC72	e0094116	WP 11906			30	28	1	L	Destroyed		600	450-600	Kern River
EC73				Domestic	30	28	1	P2	UNK	7/20/1970	405	250-310, 370-390	Kern River
EC79				Irrigation	30	28	12	C1	UNK	4/6/959	423	270-423	Kern River
EC75				Domestic	30	28	1		UNK	1/30/1975	620	360-600	Kern River
EC76				Domestic	30	28	12	A1	UNK	9/16/1966	550	300-550	Kern River
EC77				Domestic	30	28	12	A2	UNK	5/13/1959	584	328-584	Kern River

Table 1: List of Water Supply Wells (continued)

Map ID	Record ID	Permit Number	APN	Program/ Element	Township	Range	Section	Well Number	Status	Date Drilled	Total Depth (ft)	Screen Interval (ft)	Zone
EC78				Domestic	30	28	12	B	UNK	5/1/1978	700	358-700	Kern River
EC86				Irrigation	30	28	12	J2	UNK	9/1/1954	378	180-378	Kern River
EC80				Domestic	30	28	12	C2	UNK	1/31/1963	300	240-300	Kern River
EC81				Domestic	30	28	12	D	UNK	9/5/1973	457	307-457	Kern River
EC82					30	28	12	E1	UNK	2/9/1946	575+		Kern River[1]
EC83				Domestic	30	28	12	F	UNK	11/23/1977	519	400-500	Kern River
EC84				Domestic	30	28	12	H	UNK	2/7/1977	471	271-471	Kern River
EC85					30	28	12	J1	UNK				Kern River[1]
EC97				Irrigation	30	29	2	D	UNK	12/30/1968	750	513-693, 674-739	Kern River
EC87		EH-155-97	173-290-03	Domestic	30	28	12	K	UNK	6/19/1997	520	400-500	Kern River
EC88				Domestic	30	28	12	L	UNK	3/14/1977	500	260-500	Kern River
EC89	e0228225	3105	173-291-04	Domestic	30	28	12	M	UNK	8/14/2005	500	420-500	Kern River
EC90				Domestic	30	28	12	N	UNK	5/17/1974	430		Kern River
EC91				Domestic	30	28	12	N1	UNK	12/7/1973	417	317-417	Kern River
EC92			173-293-07	Domestic	30	28	12	N2	UNK	9/24/1996	400	340-400	Kern River
EC93		WP 9976	173-293-03	Industrial	30	28	12	N3	UNK	2/21/2007	450	370-450	Kern River
EC94		EH-031-94		Domestic	30	28	12	N4	UNK	2/1/1994	405		Kern River
EC95				Domestic	30	28	12	P	UNK	11/13/1987	644	324-624	Kern River
EC96					30	28	12	Q1	UNK	0/00/1949			Kern River[1]
EC101				Irrigation	30	29	2	L1	UNK	10/2/1946	706		Kern River
EC98				Other	30	29	2		UNK	3/1/1964	516	410-510	Kern River
EC99					30	29	2	J1					Kern River[1]
EC100					30	29	2	K1	UNK	7/12/1949	796	425-796	Kern River
EC102				Irrigation	30	29	3	B	UNK	11/10/1951	1212	800-1212	Kern River/Chanac
EC105				Irrigation	30	29	3	K2	UNK	11/3/1955	811	0-794	Kern River
EC103					30	29	3	F	UNK		430	272-424	Kern River
EC104					30	29	3	K	UNK		795	393-795	Kern River
EC108				Irrigation	30	29	3		UNK	12/5/1961	830	256-824	Kern River
EC106					30	29	3	L1		7/12/1949			Kern River[1]
EC107					30	29	3	Q1	Destroyed	5/15/1909	431	202-431	Alluvium/Kern River
EC113				Irrigation	30	29	4	F1	UNK	3/26/1958	879	479-879	Kern River
EC109					30	29	4	C1	UNK		300	176.5-280.5	Kern River
EC110	e0180280	WP 14110	177-030-30	Domestic	30	29	4	E	Active	5/28/2013	825	500-800	Kern River
EC111					30	29	4	E1	UNK	7/13/1949	500		Kern River
EC112				Domestic	30	29	4	F	UNK	3/11/1966	900	450-900	Kern River
EC114				Irrigation	30	29	4	G	UNK	9/14/1970	810	510-800	Kern River
EC122				Irrigation	30	29	4		UNK		1140		Kern River
EC115					30	29	4	J1	UNK	0/00/1947			Kern River[1]
EC116				Industrial	30	29	4	K	UNK	10/8/1959	600	150-600	Alluvium/Kern River
EC117					30	29	4	K1	UNK	0/00/1944			Kern River[1]
EC118					30	29	4	P1	UNK	12/31/1943			Kern River[1]
EC119					30	29	4	Q1	UNK		1008	252-542	Kern River

Table 1: List of Water Supply Wells (continued)

Map ID	Record ID	Permit Number	APN	Program/ Element	Township	Range	Section	Well Number	Status	Date Drilled	Total Depth (ft)	Screen Interval (ft)	Zone
EC120				Industrial	30	29	4	R	UNK	7/17/1968	715	402-708	Kern River
EC121				Industrial	30	29	4		UNK	1/16/1957	700	544-694	Kern River
EC124				Irrigation	30	29	4		UNK	11/10/1954	528	288-522	Kern River
EC123					30	29	4		UNK		350		Kern River
EC125		EH 36-99	127-130-24	Irrigation	30	29	5	A	UNK	3/18/1999	630	302-606	Kern River
EC129				Irrigation	30	29	5	C	UNK	7/26/1991	600	300-600	Kern River
EC126					30	29	5	B1	UNK	07/00/1947	600		Kern River
EC127					30	29	5	B3	UNK	08/00/1946	660		Kern river
EC128					30	29	5	B4	UNK	0/00/1938	352	22-322	Alluvium/Kern River
EC131				Irrigation	30	29	5	D1	UNK	8/8/1956	400	306-400	Kern River
EC130				Domestic	30	29	5	D	UNK	12/19/1959	452	0-452	Alluvium/Kern River
EC135				Irrigation	30	29	5	J	UNK	9/14/1958	663	513-657	Kern River
EC132					30	29	5	D2		01/00/1950	300		Kern River
EC133					30	29	5	E		0/00/1914			Kern River[1]
EC134					30	29	5	H1	UNK		1336	304-619 (illegible)	Kern River
EC136				Irrigation	30	29	5	L	UNK	9/6/1974	1040	564-1040	Kern River
EC138				Irrigation	30	29	5	R	UNK	3/8/1988	603	362-603	Kern River
EC137				Domestic	30	29	5	N	UNK	1/17/1897	397	0-367	Alluvium/Kern River
EC140				Irrigation	30	29	5		UNK	2/17/1962	800	360-800	Kern River
EC139					30	29	5	R1	UNK	0/00/1950			Kern River[1]
EC145				Irrigation	30	29	6	H1	UNK	2/25/1954	562	350-556	Kern River
EC141				Cathodic	30	29	6	A	UNK	2/12/1978	120		Kern River
EC142				Domestic	30	29	6	C	UNK	3/17/1966	500	400-500	Kern River
EC143				Irrigation / Domesti	30	29	6	E	UNK	11/8/1975	500	350-500	Kern River
EC144				Domestic	30	29	6	F	UNK	11/5/1976	500	207-227, 250-270,	Kern River
EC146				Irrigation	30	29	6	H2	UNK	7/8/1969	501	291-497	Kern River
EC155				Irrigation	30	29	7	K3	UNK	12/15/1952	330	174-324	Kern River
EC147				Domestic	30	29	6	N	UNK	9/30/1966	406	346-406	Kern River
EC148				Irrigation / Domesti	30	29	6	P	UNK	4/3/1956	402	234-396	Kern River
EC149				Domestic	30	29	6	Q	UNK	10/1/1986	720	600-700	Kern River
EC150				Domestic	30	29	6	Q2		4/10/1970	400	300-400	Kern River
EC151				Domestic	30	29	6	R	UNK	10/18/1960	402	252-402	Kern River
EC152				Domestic	30	29	7	C	UNK	9/15/1976	496	300-500	Kern River
EC153					30	29	7	F	UNK	10/4/1978	500	241-500	Kern River
EC154				Domestic	30	29	7	K1	UNK	7/11/1986	608	410-608	Kern River
EC156				Irrigation	30	29	7	L2	UNK	1/22/1957	360	204-354	Kern River
EC158				Irrigation	30	29	7	M1	UNK	6/24/1980	614	338-614	Kern River
EC157					30	29	7	M					Kern River[1]
EC161				Irrigation	30	29	7	P	UNK	3/8/1995	615	400-600	Kern River
EC159				Monitor	30	29	7	M2	UNK	7/16/2004	885	440-835	Kern River
EC160				Domestic	30	29	7	N	UNK	3/18/1978	500	250-500	Kern River
EC163				Irrigation	30	29	7	Q1	UNK	0/00/1954	605		Kern River
EC162				Domestic	30	29	7	Q	UNK	5/5/1977	500	300-496	Kern River

Table 1: List of Water Supply Wells (continued)

Map ID	Record ID	Permit Number	APN	Program/ Element	Township	Range	Section	Well Number	Status	Date Drilled	Total Depth (ft)	Screen Interval (ft)	Zone
EC167				Irrigation	30	29	8	A	UNK	7/6/1965	800	500-800	Kern River
EC164					30	29	7	R1	UNK				Kern River
EC165				Domestic	30	29	7	unk	UNK	6/17/1980	600	400-600	Kern River
EC166				Domestic	30	29	7	unk	UNK	8/11/1976	500	200-280, 300-420,	Kern River
EC168				Irrigation	30	29	8	A1	UNK	10/00/1951	490	219-464	Alluvium/Kern River
EC170		WP 14191	177-210-29	Irrigation	30	29	9	F1	UNK	6/11/2013	820	400-800	Kern River
EC169					30	29	9	C2	UNK		603	294-600	Kern River
EC172				Irrigation	30	29	9	K1	UNK	11/8/1956	1200	402-1200	Kern River
EC171					30	29	9	H1	UNK	3/14/1947	1001		Kern River
EC173		EH 3573	177-210-33	Irrigation	30	29	9	M	UNK	5/1/2006	1220	400-550, 570-1180	Kern River
EC174		EH 3574	177-210-33	Irrigation	30	29	9	N	UNK	3/15/2006	1220	400-590, 610-1180	Kern River
EC175		EH 3409	177-210-33	Irrigation	30	29	9	N1	UNK	12/1/2005	1210	400-580, 610-1189	Kern River
EC176		EH 3410	177-210-33	Irrigation	30	29	9	N2	UNK	12/1/2005	1180	300-470, 500-1170	Kern River
EC177				Irrigation	30	29	10	N1	UNK	3/10/1951	524	207-501	Alluvium/Kern River
EC178				Irrigation	30	29	10	N3	UNK	6/2/1954	1243	500-1210	Kern River
EC180				Irrigation	30	29	10		UNK	10/1/1990	1099	510-1080	Kern River
EC179					30	29	10	Q1	UNK		600		Kern River
EC181		EH 483-91		Irrigation	30	29	10		UNK	12/26/1991	1080	355-1050	Kern River
EC183				Irrigation	30	29	15	D1	UNK	12/1/1955	604	300-552	Kern River
EC182					30	29	15	C1	UNK	10/12/1956		290-469	Kern River
EC185				Irrigation	30	29	15	G	UNK	12/3/1959	700	468-700	Kern River
EC184					30	29	15	F1	UNK		474		Kern River
EC186				Irrigation	30	29	15	G1	UNK	10/20/1974	850	440-840	Kern River
EC187				Irrigation	30	29	15	H1	UNK	10/25/1951	700	545-700	Kern River
EC188				Irrigation	30	29	15	H2	UNK	10/18/1951	598	242-592	Alluvium/Kern River
EC189				Irrigation	30	29	15	K1	UNK	9/5/1953	300	336-600	Kern River
EC190				Irrigation	30	29	15	L2	UNK	6/28/1955	599	192-599	Alluvium/Kern River
EC191		110201		Irrigation	30	29	15	N	UNK	8/23/1977	850	450-840	Kern River
EC193				Irrigation	30	29	16	B1	UNK	12/8/1951	564	260-564	Alluvium/Kern River
EC192					30	29	16	A1	UNK	10/22/1936	400+		Kern River at 400'
EC196				Irrigation	30	29	16	K	UNK	8/1/1972	902	480-816	Kern River
EC194					30	29	16	E1	UNK	11/19/1946	467		Kern River
EC195					30	29	16	J2	UNK		1010		Kern River
EC197				Irrigation	30	29	16	L	UNK	11/00/1946	480		Kern River
EC199				Irrigation	30	29	16		UNK	11/26/1974	919	500-900	Kern River
EC198	e0086598	WP 11415	177-240-36	Industrial	30	29	16	R1	UNK	2/9/2009	960	500-930	Kern River
EC200				Irrigation	30	29	17	B3	UNK	5/12/1964	600	400-600	Kern River
EC201				Irrigation	30	29	17	G1	UNK	2/4/1960	790	0-400	Alluvium/Kern River
EC202				Irrigation	30	29	17	H1	UNK	2/22/1951	600	350-600	Kern River
EC203				Irrigation	30	29	17		UNK	6/30/1986	884	400-871	Kern River
EC61				Irrigation	29	29	35	B		8/4/1949	1300		Transition/Santa Margarita- outside exemption area
EC204				Unknown	29	29	15	L1	UNK	8/17/1994	640		Chanac/ Santa Margarita

[1] Based on the surrounding well data these wells are suspected to be completed in the Kern River Formation.

Source: DOGGR's Aquifer Exemption Application for the Edison Oil Field (Volume 2)