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**Data in Support of the
Aquifer Exemption Boundary
Expansion Application for the
Kern River Reservoir including
the Kern River Formation and
Upper Chanac Formation
Kern River Field
Kern County, California**

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26 March 2025

This report was prepared by the staff of Kennedy/Jenks Consultants, Inc. in association with Chevron U.S.A. Inc., under the supervision of the geologist whose seal and signature appear below.

The findings, recommendations, specifications or professional opinions presented in this report were prepared in accordance with the generally accepted professional geologic practice and within the scope of the project. No other warranty, either expressed or implied, is provided.

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Executive Summary

In accordance with Code of Federal Regulations, Title 40, Chapter 1, Subchapter D, Part 146.4 (40 CFR §146.4), Kern River Field operators (Chevron U.S.A. Inc., E&B Natural Resources Management Corporation, Gray Development Co. LLC, Kern River Holdings, Inc., and California Resources Corporation) request that the California Department of Conservation, Geologic Energy Management Division (CalGEM) expand the currently exempted aquifer boundary for the hydrocarbon producing portion of the Kern River Reservoir which throughout this document is considered to consist of both the Kern River Formation and Upper Chanac Formation beneath the Kern River Field (Figure 1). The Kern River Field exempted aquifer was included in the 1981 Primacy Application submitted by the California Department of Oil, Gas and Geothermal Resources (DOGGR, now CalGEM) to the U.S. Environmental Protection Agency (USEPA), and approved by the USEPA on 29 September 1982 as part of the Memorandum of Agreement between CalGEM and the USEPA Region IX. The exempted aquifer boundary is based on 1973-74 CalGEM maps of the oil/water contact. As stated in Section 3106 of Article 2 in Chapter 1 of Division 3 of the State of California Public Resources Code, the Supervisor of the CalGEM is directed to encourage the wise development of oil and gas resources to best meet oil and gas needs in California.

The Kern River Field operators have been permitted to produce oil from wells located outside the 1982-approved aquifer exemption boundary (Figure 4) using enhanced oil recovery (EOR) methods (e.g., steam injection). Continuing production operations outside the current exempted aquifer boundary will require that portions of the Kern River and Upper Chanac Formations that contain producible oil be exempted from an underground source of drinking water, under 40 CFR §146.4. Based on field evidence, and past practices, commercially producible quantities of oil exist outside the current exempted aquifer boundary. As such, the Kern River Field operators are requesting that the proposed exemption area include those zones containing producible oil.

Upon recommendation from the State, the USEPA may exempt an aquifer from a potential underground source of drinking water (USDW) if it satisfies 40 CFR §146.4, which states “An aquifer or a portion thereof which meets the criteria for a USDW in §146.3 may be determined under §144.7 of this chapter to be an “exempted aquifer” for Class I-V wells if it meets the criteria in paragraphs (a) through (c) of this section.” In accordance with §146.4, the relevant criteria for the subject exemption for Class II injection (subsurface injection of liquids associated with oil and gas production) include:

- a. It does not currently serve as a source of drinking water; and
- b. It cannot now and will not in the future serve as a source of drinking water because it is hydrocarbon producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II operation to contain hydrocarbons that considering their quantity and location are expected to be commercially producible.

In order to submit a proposal by the State to the USEPA, the CalGEM shall consult with the appropriate Regional Water Quality Control Board and the State Water Resources Control Board to ensure that the subject proposal meets California Public Resources Code (PRC) 3131(a), which states that the State must “...ensure the appropriateness of [the] proposal...” concerning the conformity with all of the following:

- a) Criteria set forth in Section 146.4 of Title 40 of the Code of Federal Regulations;

- b) The injection of fluids will not affect the quality of water that is, or may reasonably be, used for any beneficial use; and
- c) The injected fluid will remain in the aquifer or portion of the aquifer that would be exempted.

The main body of the Kern River Field occupies approximately 17,900 acres in the southern San Joaquin Valley, approximately 2 miles northeast of Bakersfield, California (Figure 1). In the Kern River Field, oil is produced from the Kern River and Upper Chanac Formations. Commercial production occurs at depths ranging from less than 100 feet below ground surface (bgs) near the eastern extent of the field, where the Kern River Formation outcrops, to more than 1,600 feet bgs at the western extent of the field.

The faults along the southwestern, western, northern, and northeastern proposed exemption boundaries, the updip outcrop of the Kern River Formation to the east, and the tar seals along the southern and southeastern proposed exemption boundaries limit lateral fluid movement into and out of the Kern River Field. The vertical upward (decreasing) pressure gradient prevents fluid flow vertically downward out of the Kern River Reservoir. The absence of fluids in the upper portion of the Kern River Formation, and presence of nine field-wide silts, which are continuous across the eastern subcrop area, prevent fluid flow vertically upward out of the oil production zone. These physical features establish the Kern River Field as a closed hydrologic basin. The relatively low recharge from meteoric water and the Kern River, the significant volume of fluid removed from the reservoir, and the overall decline in fluid elevation in the Kern River and Upper Chanac Formations across the field further demonstrates that the fluids are hydraulically controlled and contained in a closed basin.

Oil extracted from the Kern River Field is classified as heavy oil, with an API gravity between 10° and 16°. Kern River Field operators use EOR methods to produce oil from the Kern River Field.

Oil at the Kern River Field is currently produced from over 10,000 production wells, of which 157 (1 percent) exist outside the 1982-approved exempted aquifer boundary (Table 1, Figure 56). In 2014, approximately 440,500 barrels of oil (1.7 percent) of the oil produced from the Kern River Field was from wells outside the 1982-approved exempted aquifer boundary. The following summarizes information and provides data supporting the aquifer exemption request for the Kern River and Upper Chanac Formations in the Kern River Field:

1. The best use of the oil-bearing formations in the Kern River Field is its current use, oil and gas extraction. A portion of the Kern River Formation in the Kern River Field is included as an exempted aquifer, due to hydrocarbon production, in the 1981 Primacy Application and in the Memorandum of Agreement between CalGEM and the USEPA Region IX, dated 29 September 1982. This request seeks to expand that exempted aquifer boundary laterally and vertically based on the presence of commercially producible oil in the expanded productive zone.
2. There are multiple bounding conditions for the lateral limits of the requested aquifer exemption area (Figure 17). The west, north, northeast and southwest limits are bounded by faults that represent barriers to flow. In the east, the oil-bearing formations outcrop within the Kern River Field administrative boundary, limiting the eastern extent of

- fluid flow through the proposed exempted aquifer boundary. The southeast and south proposed aquifer exemption boundaries are established by areas containing tar seals. The north and northeast boundaries are also defined by the highest known oil limit; and the southwest boundary is defined by the lowest known oil limit. Oil field operations through fluid extraction activities related to hydrocarbon production have formed a low pressure zone in the center of the field, creating an inward hydraulic gradient and establishing hydraulic control within the oil field boundaries (Figure 33).
3. Production in the Kern River Field, a heavy oil reservoir, cannot economically occur without the use of EOR methods, primarily steam injection, which was first used in 1961. Results have shown significant increase in production using EOR methods (Figure 56). Water is produced in conjunction with the EOR process and is separated from the hydrocarbons before it is treated and beneficially reused for steam generation or other oil field operations (Figure 61). Produced water not needed for in-field uses is further treated and provided to a local water district for beneficial reuse.
 4. One municipal and nine private/irrigation wells exist within the 1982-approved aquifer exemption boundary. Five private wells located at the eastern extent of the oil field are screened within the oil-bearing zone (Appendix F) and are isolated and protected from impact from oil field operations by the strong inward hydraulic gradient toward the center of the field. Two private/irrigation and the one municipal well within the 1982-approved aquifer exemption boundary are screened within the Kern River Formation at elevations above the oil-bearing zone (Table 3) and are physically separated from the oil-bearing formations by pervasive silt and clay (shale) layers that represent vertical barriers to flow. These wells extract water from a zone above and not hydraulically connected to the hydrocarbon-bearing formation. Two private wells have unknown completion depths.
 5. Based on water well database searches, well records review, and site reconnaissance, there are no private or municipal drinking water supply wells within the proposed expanded aquifer exemption area. Twenty domestic/municipal water supply wells exist outside but in close proximity to the proposed expanded aquifer exemption boundary (Appendix F). These wells are protected hydraulically by the strong hydraulic gradient towards the center of the field created by production operations. Additionally, zone of contribution calculations were completed for each of these 20 wells, based on well-specific information, to confirm that the origin of the water potentially extracted from these wells is outside the proposed expanded aquifer exemption boundary.

Section 1: Field Information

1.1 Project/Field Name and Location

Kern River and Upper Chanac Formations,
Kern River Field,
Kern County, California

1.2 Well Class and Purpose of Injection

Class II
Enhanced Oil Recovery

1.3 Areal and Vertical Extent/Dimensions of Study Area

The Kern River Field is located in the north central portion of Kern County (southern San Joaquin Valley), approximately 2 miles northeast of Bakersfield, California (Figure 1), within Township 28 South / Range 27 East (T28S/R27E), T28S/R28E, and T29S/R28E, Mount Diablo Basin and Meridian (M.D. B.&M.). The requested expansion will result in a total exempted aquifer lateral area that is approximately 25,300 feet wide near its southern extent, 9,400 feet at the northern extent, 36,900 feet long in the north-south direction, and totals approximately 15,335 acres. The differential area between the existing approved aquifer exemption boundary and the new proposed boundary is approximately 3,900 acres. The areal extent of the proposed aquifer exemption boundary is shown on Figure 2.

The vertical extent of the aquifer exemption top, as expanded, will cover the Kern River and the base of the Upper Chanac Formations that range from approximately 740 feet true vertical depth subsea (TVDSS) to 40 feet TVDSS near the eastern side of the oil field and from approximately 40 TVDSS to -1,500 TVDSS on the western side of the oil field. The gross thickness of the proposed aquifer exemption is shown on Figure 3. The upper limit of this proposed aquifer exemption is limited to strata below the C Silt. Up-dip, along the east margin of the field, the C Silt of the Kern River Formation outcrops and is absent eastward. In this region, the top of the proposed aquifer exemption is further limited. Where the C Silt is 50 feet or less from the surface, the top of the exemption and future injection would be limited to 150 feet below ground surface. The lower limit of this proposed aquifer exemption is defined by a confining silt in the Chanac Formation that separates confined aquifers below from the oil-bearing, unconfined aquifer above. The depths are illustrated in the cross-sections included in Figures 6 through 10 and the structure contour maps included as Figure 13.

1.4 Name and Address of the Owners/Operators

Chevron U.S.A. Inc. (Chevron) is the largest operator in the Kern River Field and is responsible for more than 95 percent of the exploration and production activities within its administrative boundaries. Operators within the Kern River Field include:

Chevron U.S.A. Inc.
Chevron North America Exploration and Production Company
San Joaquin Valley Business Unit
1546 China Grade Loop
Bakersfield, California 93308

Kern River Holdings, Inc.
7700 Downing Avenue
P.O. Box 10207
Bakersfield, California 93389

E&B Natural Resources Management Corporation
1400 Easton Drive, Suite 141
Bakersfield, California 93309

California Resources Corporation
9600 Ming Avenue, Suite 300
Bakersfield, California 93311

Gray Development Co. LLC
2701 Patton Way
Bakersfield, California 93308

Section 2: Aquifer Exemption Description

As Chevron is the largest operator in the Kern River Field, this application support package has been compiled by Chevron, with the concurrence of the other operators identified in Section 1.4. Letters in support of the application to expand the aquifer exemption boundary, prepared by the other operators in 2020, are included in Attachment 1.

2.1 Aquifer/Zone Name

Kern River and Upper Chanac Formations

2.2 Depth/Thickness of Aquifer

The depth to the top of the aquifer ranges from approximately 0 to 790 feet below ground surface. The thickness of the aquifer generally ranges from 700 to 1200 feet, within the Kern River and Upper Chanac Formations, and is limited physically to the area immediately around the Kern River Field.

2.3 Lateral Extent of the Area Proposed for Exemption

The Kern River Field has multiple defined boundaries. The CalGEM established a field boundary in 1973-74 which established the limits of the Kern River and upper Chanac Formations as an exempt aquifer (Figure 4). In 1982, the boundary was modified to reflect field activity and expansion. Notwithstanding this field boundary expansion of the Kern River Field, no expansion of the exempt aquifer boundary was made at that time. Additionally, the CalGEM has an Administrative Boundary which serves as the official boundary between the Kern River Field and neighboring oil fields for permitting and other controls.

Permitted drilling and operational activities targeting the Kern River and Upper Chanac Formations have extended beyond both the 1973-74 and 1982 field boundaries as well as the Administrative Boundary. For Chevron and other operators to continue to enhance development of the Kern River and Upper Chanac Formations beyond the 1973-74 boundary, by means of steam injection, an application to extend the limits of the exempted aquifer is being submitted. As expanded, the total exempted aquifer lateral area is approximately 25,300 feet wide near the southern extent of the field; about 9,400 feet in the east-west direction at northern extent of the field; and approximately 36,900 feet long in the northwest-southeast direction along the center of the field. This proposed expansion of the aquifer exemption boundary will expand the existing approved boundary by approximately 3,900 acres.

The proposed exempted aquifer boundaries extend to the east to the edge of the existing aquifer exemption boundary; to the northeast to a series of unnamed faults and to the limit of known oil; to the north to the limits of known oil; to the west to the limits of practical oil production; to the southwest to the limits of lowest known oil; and to the south and southeast to the limits of oil production (Figure 2). Each of the six lateral boundaries, as well as the two vertical boundaries, are described in detail in Section 4.

2.4 Description of Aquifer/Zone Containment

Detailed descriptions of the varying hydraulic barriers that control fluid flow in and around the Kern River Field are provided in Section 4. In general, hydraulic containment is provided by sealing faults, pressure boundaries (pressure gradients), geologic structure and tar seals.

- To the west, flow is controlled by the Kern Front Fault (Figures 5 and 19), which separates the Kern River Field from the Kern Front Field, and by a sustained inward pressure gradient created by production operations (more fluid is extracted than injected, creating an inward hydraulic gradient; Figures 33 and 34).
- To the north, the Poso Creek Fault, an east-west normal fault, acts as a hydraulic barrier. The proposed northern limit of the aquifer exemption lies south of the Poso Creek Fault and is established by the northern-most extent of oil.
- Hydraulic control at the northeast extent of the Kern River Field is created by multiple unnamed normal faults that act as barriers to fluid flow along the westward dipping regional hydraulic gradient (Figures 5 and 19). The proposed northeast limit is positioned downdip (southwest) of the sealing normal faults and is established by the northeast extent of known oil.
- At the eastern extent of the field, the Kern River Formation outcrops, creating a natural stratigraphic hydraulic barrier (Figure 30).
- To the south and southeast, containment for most of the Kern River Field is controlled by tar seals (immobile cold oil) that exist within the Kern River Reservoir outside the limits of production (see Section 4.3); and by the strong inward pressure gradient created by production operations (Figures 33 through 35). In the southeast portion of the field, south of the Kern River, the proposed boundary extension is established by the limits of production (Figure 57).
- To the southwest, the proposed aquifer exemption boundary is limited to the lowest known oil (Figures 38 and 39), with containment being provided by the strong inward hydraulic gradient resulting from production operations (Figure 40). In the southwest portion of the field, west of the Kern River, the proposed boundary extension is established by the limits of production (Figure 39).

Vertical containment of injected fluid is controlled in the upward direction by the water/oil surface, and by fine-grained silt and clay layers that persist throughout the Kern River Field. Vertical containment in the downward direction is controlled by a silt unit within the Chanac Formation that provides vertical hydraulic separation between the overlying unconfined aquifer that extends into the Kern River Formation and the underlying confined aquifer that extends deeper into the Chanac Formation as illustrated on Figure 56 (Coburn and Gillespie, 2002).

2.4.1 Cross-Section Descriptions

Five field-wide geologic cross-sections have been produced for this report, along with numerous smaller localized sections. The cross-sections display geologic, hydrogeologic and oil

production information relative to the request to expand the aquifer exemption boundary for the Kern River Reservoir. The locations of the field-wide generalized geologic cross-section are illustrated on Figure 3, and cross-sections are included as Figures 6 through 10. Additional cross-sections illustrating the relationship of the aquifer exemption zone and water source wells are included in Section 6.3. The following are brief descriptions of the information illustrated on the five field-wide geologic cross-sections.

Cross-Section FW1-FW1' (Figure 6) trends northeast through the northern part of the Kern River Field. As expanded, the aquifer exemption area is approximately 14,000 feet wide in this area. The westward dipping C-Silt top seal to base Upper Chanac interval is generally 1,000 to 1,200 feet thick. The depths of the C-Silt top seal and base Upper Chanac are shallowest near the updip east side at approximately 200 feet bgs and 1,300 feet bgs, and deepest on the west side at approximately 600 feet bgs and 1,800 feet bgs, respectively. Lateral fluid containment is controlled by the regional southwestward groundwater gradient on the east side, by the Kern Front Fault on the west side, and by the inward hydraulic gradient created by field operations (Section 2.4). Vertical fluid containment is controlled in the upward direction by silt and clay barriers. Confinement of fluids is enhanced by highly viscous heavy oil which is immobile and acts as a plug and barrier to fluid flow at ambient conditions. Fluid containment is controlled in the downward direction by a confining silt in the Chanac Formation.

Cross-Section FW2-FW2' (Figure 7) trends northeast through the north-central part of the Kern River Field. As expanded, the aquifer exemption area is approximately 16,900 feet wide in this area. The westward dipping C-Silt top seal to base Upper Chanac interval is generally 1,000 to 1,200 feet thick. The depths of the C-Silt top seal and base Upper Chanac are shallowest near the updip east side at 0 feet bgs (outcrop edge) and 1,100 feet bgs, and deepest on the west side at approximately 900 feet bgs and 2,200 feet bgs, respectively. Lateral fluid containment is controlled by the regional southwestward groundwater gradient on the east side, by the Kern Front Fault on the west side, and by the inward hydraulic gradient created by field operations (Figures 33 and 34). Vertical fluid containment is controlled in the upward direction by silt and clay barriers. Confinement of fluids is enhanced by highly viscous heavy oil which is immobile and acts as a plug and barrier to fluid flow at ambient conditions. Fluid containment is controlled in the downward direction by a confining silt in the Chanac Formation.

Cross-Section FW3-FW3' (Figure 8) trends northeast through the southcentral portion of the Kern River Field, and, as expanded, the aquifer exemption is approximately 21,000 feet wide in this area. The westward dipping C-Silt top seal to base Upper Chanac interval is generally 725 to 825 feet thick in the eastern portion of the field and thickens to approximately 1,500 at the western expanded aquifer exemption edge. The depths of the C-Silt top seal and base Upper Chanac are shallowest near the updip east side at 0 feet bgs (outcropping) and 850 feet bgs, and deepest on the west side at approximately 850 feet bgs to 2,500 feet bgs, respectively. Lateral fluid containment is controlled by the regional southwestward groundwater gradient on the east side, and by the inward hydraulic gradient created by field operations (Figures 33 and 34). Vertical fluid containment is controlled in the upward direction by silt and clay barriers. Confinement of fluids is enhanced by highly viscous heavy oil which is immobile and acts as a plug and barrier to fluid flow at ambient conditions. Fluid containment is controlled in the downward direction by a confining silt in the Chanac Formation.

Cross-Section FW4-FW4' (Figure 9) trends northeast through the southern part of the Kern River Field, and, as expanded, the aquifer exemption area is approximately 19,000 feet wide in this area. The westward dipping C-Silt top seal to base Upper Chanac interval is 550 feet thick at the eastern aquifer exemption edge, with a maximum thickness of approximately 1,400 feet at the western aquifer exemption edge. The depths of the C-Silt top seal and base Upper Chanac are shallowest near the updip east side at 0 feet bgs (outcropping) and 600 feet bgs, respectively. On the west side, the depths of the C-Silt top seal and base Upper Chanac are 600 feet bgs and 1,900 feet bgs, respectively, at well KOS 1TO (API 03051487), and then deepens to 650 and 2,100 feet bgs, respectively, at the western edge of the aquifer exemption area. Lateral fluid containment is controlled by the regional southwestward groundwater gradient on the east side, and by the inward hydraulic gradient created by field operations (Figures 33 and 34). Vertical fluid containment is controlled in the upward direction by silt and clay barriers. Confinement of fluids is enhanced by highly viscous heavy oil which is immobile (i.e. tar seals) and acts as a plug and barrier to fluid flow at ambient conditions. Fluid containment is controlled in the downward direction by a confining silt in the Chanac Formation.

Cross-Section FW5-FW5' (Figure 10) trends southeast down the length of the Kern River Field (parallel to strike of the Kern River Formation), and, as expanded, the proposed aquifer exemption area is approximately 39,200 feet long. In this strike-parallel view, the C-Silt top seal to base Upper Chanac interval is generally 1,100 to 1,200 feet thick. The depths of the C-Silt top seal and base Upper Chanac, in this view, are influenced by the southward sloping ground surface. At the north end, the depths of the C-Silt top seal and base Upper Chanac are approximately 600 feet bgs and 1,700 feet bgs, respectively, at well KRU 511 (API 03051476). At the down-slope south end, the C-Silt top seal and base Upper Chanac are 0 feet bgs (outcropped) and 1,100 feet bgs, respectively, at well MCM 229 (API 03049871). Lateral fluid containment is controlled by the inward hydraulic gradient resulting from field operations and the net negative fluid balance, the Poso Creek Fault to the north (Figure 26), and the tar seals to the south of the Kern River Field. Vertical fluid containment is controlled in the upward direction by silt and clay barriers. Confinement of fluids is enhanced by highly viscous heavy oil which is immobile and acts as a plug and barrier to fluid flow at ambient conditions. Fluid containment is controlled in the downward direction by a confining silt in the Chanac Formation.

Section 3: Justification for Aquifer/Zone Exemption

40 CFR §146.4, states that “An aquifer or a portion thereof which meets the criteria for an “underground source of drinking water” in §146.3 may be determined under §144.7 of this chapter to be an “exempted aquifer” for Class I-V wells if it meets the criteria in paragraphs (a) through (c) of this section.” In accordance with §146.4, the relevant criteria for the subject exemption for Class II well (subsurface injection of liquids associated with oil and gas production) include:

- a. It does not currently serve as a source of drinking water; and
- b. It cannot now and will not in the future serve as a source of drinking water because it is hydrocarbon producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II operation to contain hydrocarbons that considering their quantity and location are expected to be commercially producible.

In accordance with 40 CFR §146.4, the Kern River Field operators request the CalGEM expand the currently exempted aquifer boundary for the hydrocarbon producing portion of the Kern River and Upper Chanac Formations in the Kern River Field to the lateral limits illustrated on Figure 2. The current aquifer exemption boundary for the Kern River Formation in the Kern River Field (Appendix A, Exhibit A-4) was included in the 1981 Primacy Application submitted by the CalGEM to the USEPA, and approved by the USEPA on 29 September 1982 in the Memorandum of Agreement between the CalGEM and the USEPA.

In accordance with State of California Public Resources Code, Division 3, Chapter 1, Article 2.5, Section 3131(a), this report demonstrates that:

- a. The criteria set for an aquifer exemption in 40 CFR §146.4 have been met for the proposed aquifer exemption boundary;
- b. The injection of fluids will not impact the quality of water in the municipal and private wells in the laterally expanded aquifer exemption area due to vertical confinement provided by impermeable silt and clay layers; and
- c. The physical and hydrogeologic barriers that define the proposed aquifer exemption boundary will be adequate to contain the injected fluids within the exempted portion of the aquifer.

As stated in Section 3106 of Article 2 in Chapter 1 of Division 3 of the State of California Public Resources Code, the Supervisor of the CalGEM is directed to encourage the wise development of oil and gas resources to best meet oil and gas needs in California. Commercially producible and expected producible quantities of oil exist outside the 1982-approved limits for the aquifer exemption boundary. The Kern River Field operators are seeking the expansion of the aquifer exemption boundary to include those commercially producible and expected producible areas that exist outside the current exempted aquifer (Figure 2). Increasing the production from the Kern River Field necessitates expansion of the currently exempted area to include these additional portions of the Kern River and Upper Chanac Formations.

Using produced water for steam generation and other beneficial use purposes associated with oil production preserves groundwater as a natural resource and eliminates the need to use freshwater for the same purpose. As produced water is treated (oil removal and softening) prior to being used as steam, the quality of the water being injected back into the oil-bearing zone is the same or better than the quality of the raw produced water from that same zone.

Section 4: Aquifer/Zone Characterization

This section describes the primary geologic formations beneath the Kern River Field identifies significant structural features found in the project area and presents information to demonstrate that fluids injected into the oil-bearing strata can be safely contained and controlled within the designated formation. Supplemental information, including geologic and geophysical logs, and field pressure data are included in Appendices A through C.

4.1 Basis for Proposed Aquifer Exemption Area

The Kern River Field is located in the southern San Joaquin Valley, approximately 2 miles northeast of Bakersfield, California (Figure 1). The commercially producible and expected producible oil-bearing zone defines the limits of the proposed aquifer exemption area, and occupies approximately 15,335 acres (Figure 2). The oil-bearing zone includes only the Kern River and Upper Chanac Formations throughout the proposed aquifer exemption area (Figures 3 and 6 through 10). Currently, production occurs at depths ranging from less than 100 feet bgs near the eastern extent of the field, where the Kern River Formation outcrops, to greater than 1,600 feet bgs at the western extent of the field. The proposed aquifer exemption boundary extends to the north and northeast to include specific wells that have historical oil production at commercially producible rates. Boundaries are also constrained by investigative dry holes that have been drilled at the periphery of the Kern River Field.

4.2 Kern River Field Geology and Stratigraphy

The Kern River Field is located on the gently westward dipping west flank of the Sierra Nevada block, east of the San Joaquin Valley. The Kern River waterway flows through the southern portion of the oil field. The Kern River Field is bounded on the west, north and east by multiple oil fields, including the Fruitvale, Kern Front, Poso Creek, Mount Poso, Round Mountain and Kern Bluff (Figure 1). The stratigraphic formations related to oil production are the Upper Miocene to Pliocene Kern River and Upper Chanac Formations (Figure 11). The geology of the Kern River Field is illustrated on the generalized geologic cross-sections FW-1 through FW-5 (Figures 6 through 10).

The Kern River Formation stratigraphy is well documented in readily available, peer-reviewed literature, and is summarized herein from Coburn and Gillespie (2002) and several other papers. The Kern River Formation has been divided into nine producing sand layers which vary from 50 to 170 feet thick and generally thicken to the west. The Chevron-established nomenclature is illustrated in the stratigraphic column presented on Figure 11 and a cross-section illustrating the specific zones and their relationship in the field is presented on Figure 12. The upper Kern River Formation includes zones C, C1, G, K, K1, and K2. The lower Kern River Formation includes the R, R1, and R2 zones.

The Chanac Formation stratigraphy is also well documented in readily available, peer-reviewed literature, and is summarized herein from Olson et al (1986) and several other papers. The Chanac Formation comprises a maximum total thickness of 700 feet in the western area of the Kern River Field. The Chanac Formation thins to the east and has unconformable contacts with

the underlying Santa Margarita and overlying Kern River Formations. There are no observable differences between the Chanac and Kern River Formations in the Kern River Field making the contact an arbitrary decision on the part of the interpreter with continuous sedimentation across the boundary.

Contour maps depicting the top and base elevation (TVDS), and gross thickness of the oil-bearing zone (i.e., the proposed aquifer exemption area) are presented on Figures 13 and 14.

The Kern River and Upper Chanac Formations compose the primary oil-bearing reservoir beneath the Kern River Field, with producing zones ranging from less than 100 feet bgs to greater than 1,600 feet bgs (Bartow and Pittman, 1983). The Kern River and Upper Chanac Formations form an arcuate, thickening fan wedge that extends from surface outcrops along the east side of the Kern River Field westward 12 miles into the San Joaquin Valley (Figure 12). Surface exposures of the Kern River Formation extend along the foothills on the east side of the field. The formation dips approximately 3 to 6 degrees to the southwest due to uplift and westward tilting of the Sierra block. The top of the Chanac roughly parallels the top of the Kern River Formation (Figure 15).

The Kern River and Upper Chanac Formations represent a non-marine, fluvial, braided stream system deposited during Late Miocene to Pleistocene time (Figure 11). Both formations consist of two primary lithofacies: 1) channelized, amalgamated sand lobes; and 2) overbank/floodplain interbeds composed of finer grained silt and clay.

The Kern River Formation has informally been subdivided into nine zones, designated C, C1, G, K, K1, K2, R, R1 and R2, with each zone composed of one or more sand beds separated by relatively impermeable silt/clay zones (Figure 11). The "C Sand" is the uppermost mapped sand unit of the Kern River series, stratigraphically the youngest and shallowest. The Kern River Formation is generally considered to extend to the ground surface with a veneer of alluvium. The channel sand packages behave as semi-continuous reservoirs, with each zone containing commercial quantities of oil, separated by relatively impermeable silt and clay interbeds. The sands within the Kern River Formation tend to have high porosities (approximately 32 percent) and permeabilities in the thousands of millidarcies (Coburn and Gillespie, 2002).

The Chanac Formation lithology, porosity and permeability are similar to the Kern River Formation. Net-to-Gross sand distribution in the Chanac Formation decreases from southeast to northwest resulting in additional sand unit divisions within the formation.

The Kern River flows through the southern part of the field and the ancestral river was itself in-part or in-whole responsible for deposition of the Kern River Reservoir.

4.3 Oil Field Structural Features

A dominant structural feature in the southern San Joaquin Basin is the southwest-plunging Bakersfield Arch (Figure 16). The Kern River Field and other oil fields lie along the crest of this structural salient. Hydrocarbons, sourced in deep rocks to the northwest and southeast, migrated up the flanks of the arch to the structural high formed at its crest. Numerous, mostly down-to-the-basin, normal faults exist in and around the Kern River Field.

The Kern Front Fault, China Grade/Gun Club Fault complex (Figure 5), Poso Creek Fault (Figure 19), and unnamed fault complex to the northeast represent significant geologic features that control fluid flow beneath and in the vicinity of the Kern River Field. Several other unnamed fault systems within the field boundaries displace strata and impact fluid flow to varying degrees within the field. Figure 17 illustrates the lateral extent of the proposed aquifer exemption boundary. Detailed descriptions of the lateral and vertical boundaries are provided below.

4.3.1 West, North and Northeast Proposed Aquifer Exemption Limits

Normal faults bounding the field to the west, north and northeast provide the most direct means of hydraulic confinement. On the northeast margin of the field, this confinement is augmented by the southwest dipping regional groundwater gradient. Within these confining conditions, the proposed aquifer exemption boundary is further constrained by the extent of known oil. In particular, a line separating oil-bearing versus non-oil bearing formations on the north and northeast margins of the field is drawn based on the exploration data illustrated on Figure 18. To be considered as having no oil, a well has to have zero trace in any of the drilling records. The proposed west, north and northeast boundaries are illustrated on Figure 19.

4.3.1.1 West, North and Northeast Oil Field Lateral Confinement

The proposed limit of the exempt aquifer along these field margins is based on a combination of fluid confinement by sealing (barriers to hydraulic flow) faults and the southwest dipping regional groundwater gradient (Figure 20). Based on published literature, where oil is present, virtually all north-to-south or northwest-to-southeast trending normal faults in surrounding fields are sealing faults. Examples of the published literature include:

- California Oil and Gas Fields, Volume 1, TR11, 1998 (CalGEM)
- Multiple individual field reports published as *Summary of Operations* volumes (CalGEM)
- United States Department of the Interior Geological Survey, Professional Paper 1245, Plate 1
- Multiple articles published by the American Association of Petroleum Geologists (AAPG) and Pacific Section of the AAPG

Examples of normal faults as sealing faults at other oil fields within the area are illustrated on Figure 21. In addition to faults published by CalGEM and the United States Geological Survey, private industry (including Chevron) has mapped, identified and interpreted similar faults in the same region and with generally the same conclusion, that the faults associated with this extensional structural style in this part of Kern County are sealing (barriers to fluid flow). In some cases, faults shown in Figure 22 may represent the same dipping surface but mapped at different levels (i.e., ground level, subcrop sand level, etc.) as those shown in Figures 5 and 21.

Further evidence that these faults are sealing is noted when oil-well location and production maps are overlain with fault maps. Figure 23 illustrates oil production wells in the Kern River Field and surrounding fields, and shows a compelling correlation between faults and abrupt

terminations of field limits. The same evidence is seen within the Kern River Field, with local small normal faults displaying sealing behavior (Figure 24).

The specific faults or fault complexes observed or interpreted to be sealing features responsible for aquifer containment on the west, north and northeast sides of the Kern River and Upper Chanac Formations are illustrated in Figure 25. The Kern Front Fault defines the western extent of the oil bearing zone in the Kern River Formation. The Kern Front Fault is a normal fault striking nearly north-south with the western block displaced down. It is nearly coincident with the western administrative boundary of the Kern River Field and separates oil bearing formations in the Kern River Field from those in the Kern Front Field. Cross-section FW1-FW1' (Figure 6) illustrates that the Kern Front Fault provides a truncating boundary for the Kern River Field's western boundary. Figure 6 also illustrates that the Kern Front Fault provides an updip seal trapping oil in the Etchegoin and Chanac formations west of the Kern River Field (Link et al., 1990) and blocking groundwater flowing westward out of Kern River Field (Coburn and Gillespie, 2002).

The proposed exempted aquifer boundary to the north is constrained by the Poso Creek Fault as well as by the northernmost and structurally highest known oil, as described below. The Poso Creek Fault is an east-west trending strike-slip fault north of the CalGEM administrative boundary for the Kern River Field. The fault separates the Kern River Field from the Mount Poso Field (to the north), and appears to provide a hydraulic boundary at the northern extent of the reservoir (Coburn and Gillespie, 2002). However, natural regional-scale hydraulic gradients in the vicinity of the Kern River Field dip to the southwest. As such, significant fluid flow under natural (non-production) conditions is not expected to migrate to the north, making it difficult to demonstrate the restricting nature of the fault to fluid flow.

The proposed exempted aquifer boundary to the northeast is constrained by an unnamed series of normal faults (Figure 25), the southwest dipping regional groundwater gradient (Figure 26), and the northernmost and structurally highest known oil, as described below. The proposed exempted aquifer boundary expansion to the northeast has also been adjusted to account for a water supply well in the area (Section 6.3).

4.3.1.2 North and Northeast Known Oil Limits

In an effort to chart the extent of known hydrocarbons within the area bounded by sealing faults, drilling records from Chevron and CalGEM sources were extensively researched. These records include historical production records, open- and cased-hole geophysical logs, whole core and sidewall core samples, mudlogs and driller's logs. The objective was to document the extent of oil, including liquid oil or tar, oil staining or drilling-mud shows such that future efforts can potentially be made to recover the oil. Figure 18 illustrates a summary of a portion of this data. Cross-section HO1-HO1', drawn roughly along strike through several updip wells (Figure 27) near the proposed aquifer exemption boundary illustrates the presence of oil in wells outside the current aquifer exemption boundary.

4.3.2 East Proposed Aquifer Exemption Limits

The Kern River Formation crops out along the eastern side of the field and is completely eroded approximately one to two miles east of the field (Figures 29 and 30). The aquifer exemption boundary along the eastern edge of the field (Figure 31) is a combination of the C Silt outcrop

edge and the existing aquifer exemption boundary (Figure 26). As discussed earlier, in this region, the top of the proposed expanded exemption is further limited. Where the C Silt is 50 feet or less from the surface, the top of the exemption and future injection would be limited to 150 feet below ground surface. Along this margin the formation is characterized by air-filled sands, shallow perched oil and little to no groundwater (Figure 28) except in areas proximal to the Kern River. In places, exposed formation contains degraded and dry oil.

Near the eastern boundary limits, fluids within the field are confined by the southwest dipping regional groundwater gradient (Figure 26). Confinement of fluids is enhanced by tar seals (Figure 28). As demonstrated by current and historic field practices, Kern River heavy oil remains immobile unless heated by steam.

4.3.3 Southeast and South Proposed Aquifer Exemption Limits

Fluids within this boundary are confined primarily by a strong pressure gradient as well as by tar seals.

4.3.3.1 Oil Field Pressure Gradients

Figure 33 illustrates the decreasing pressure gradient (green arrows) toward the interior of the field. This inward gradient is attributed to a net fluid withdrawal occurring for more than a century. As with the eastern and northeastern proposed aquifer exemption boundaries, the southwest dipping regional groundwater gradient enhances the hydraulic control along the proposed southeast boundary (Exhibits C-1, C-2 and C-3) and would restrict water from migrating to the south under natural (non-operating) conditions.

Pressure surveillance and mapping is a primary element of reservoir management in the Kern River Field. Reservoir pressure is acquired using open-hole wireline tools and continuous monitoring in multiple dedicated pressure monitoring wells. This data is carefully mapped to support tactical reservoir management decisions, including steamflood design and operations. This practice enables Chevron to delineate the pressure regime of the Kern River and Upper Chanac Formations, including pressure gradients within and around the field.

An example of a mapped pressure surface, in this case the 50 pounds per square inch absolute pressure (PSIA) surface, is illustrated in Figure 33. Pressure monitoring locations are also illustrated on Figure 33. Cross-section RP1-RP1' (Figure 34) represents a northeast-southwest oriented pressure profile through the center of the field. Both figures illustrate a bowl-shaped region of depressed pressure aligned with the central and western portions of the field. This region corresponds to the portion of the field that is most actively produced currently and has experienced the highest level of net fluid withdrawal over the past several decades. Two conclusions can be drawn from this observation:

1. Pressure gradients exist on all fronts of the field with pressure decreasing from the periphery to the center of the field; and
2. Fluid introduced into the field, in the form of condensed steam (softened produced formation water), will flow inward toward the zone of low pressure (away from the margins of the field) and remain contained within the limits of operation and therefore within the proposed aquifer exemption boundary.

An examination of field data provides an empirical example of this pressure relationship. Figure 35 is an example of open-hole pressure data acquired in two wells at approximately the same time along the southern boundary of the field. The pressure differential between the updip and downdip wells demonstrates that pressure is lower toward the interior of the field, in this case a 185 PSIA decrease over a structural difference of 265 ft. A portion of the pressure differential can be related to the China Grade Fault, which separates these two wells. The China Grade Fault is considered an internal sealing feature with oil saturation on both the north and south sides. To the north side of the fault, oil occurrence and production is limited to the central part of the field with little to no oil occurring on the north side of the fault system near its lateral limits. The China Grade and Gun Club Faults are nearly east-west trending strike-slip faults, similar to the Poso Creek Fault, and are located just inside the southern administrative field boundary. Kodl et al. (1990) show potentiometric contours of the regional water table bending to the east as the China Grade Fault is approached from the north, and conclude the fault is a “sealing” fault at the south end of the field.

4.3.3.2 Cold Low Viscosity Oil

Fluid confinement is enhanced at the southern boundary by low viscosity, heavy oil which acts as a plug and barrier to fluid flow unless heated by steam. This “tar seal” becomes more effective to the south where oil is described as very high viscosity tar and degraded/dead oil (Figure 36). This hydrocarbon does not flow under ambient conditions and dead oil may not flow even if heated.

4.3.4 Southwest Proposed Aquifer Exemption Limits

The southwest boundary (Figure 37) is extended to the contour of lowest known oil (LKO) as illustrated on Figure 38. LKO occurs in the basal section of the Kern River Formation (top of K2 to the base of R2) and ranges in gross thickness from 0' to 400' (Figure 39). Fluids are confined by a decreasing pressure gradient to the northeast toward the interior of the field. As described in the previous section, empirical data provides an example of the pressure relationship near the southwestern extent of the field boundary. Figure 40 illustrates open-hole pressure data acquired in two wells at approximately the same time along the southwest boundary of the field. The pressure differential between the updip and downdip wells demonstrates that pressure is lower toward the interior of the field, in this case a 107 PSIA decrease over a structural difference of 250 ft.

Additional confinement is provided by downdip sealing faults including the possible extension and intersection of the Kern Front and China Grade Faults and trapping-faults in the Fruitvale Field (Figure 41). The presumed extensions of these faults are based on mapped traces in the Kern Front and Fruitvale Fields but have not been confirmed by Chevron.

4.3.5 Vertical Proposed Aquifer Exemption Limits

In addition to defining the lateral boundaries of the proposed aquifer exemption area, both the upper and basal surfaces of this zone have been mapped. The contour maps of these surfaces are displayed in Figure 13. Figure 14 illustrates the gross thickness map for the area between the two surfaces. The surfaces were delineated using control points in and around the Kern River Field, including open- and cased-hole geophysical logs and available core data. Fundamentally the upper and basal surfaces correspond to the top of oil and base of oil,

respectively. In some cases, the upper portion of the zone may represent the processed reservoir containing steam vapor and residual oil. Five field-wide cross-sections were generated: four dip sections; and one strike section (Figures 6 through 10). The area shaded in dark green on these figures corresponds to the limits of oil and the proposed aquifer exemption zone. These cross-sections illustrate the southwest-dipping, lozenge-shaped zone with lateral termination either by pinch-out or fault-truncation.

Detailed field-wide cross-sections are also presented in Appendix B. Three versions of each cross-section were prepared to illustrate the stratigraphic correlation of key layers, faults where present, estimated vadose zone thickness and current and proposed aquifer exemption zone lateral boundaries. The vadose zone is characterized as that portion of the Upper Kern River Formation, and overlying alluvium, which is either air-filled or contains perched water. The three versions of each cross-section include the following elements:

- Version (a) illustrates open- and cased-hole log data, including vapor saturation (air or steam) and oil saturation. The proposed aquifer exemption zone is shaded in pale green.
- Version (b) illustrates the proposed aquifer exemption zone including areas that contain producible oil (shaded dark green) and areas that have been produced and contain only residual oil (shaded light green and referred to as “Previously Produced”). These cross-sections are also included as Figures 6 through 10. This version does not include log data. Shallow groundwater, where present, is labeled as “FIRST WATER”. First encountered fluid (oil or water) at the logged locations is also shown. The (b) cross sections highlight the pervasive nature of the field-wide “C Silt”, a low-permeability barrier to vertical flow.
- Version (c), similar to version (a), illustrates open- and cased-hole log data, including vapor saturation (air or steam) and oil saturation. However, this version correlates the low-permeability silts throughout the entire Upper Kern River Formation, including several that are pervasive across the field.

As presented in Section 4.2, the Kern River and Upper Chanac Formations consist of two basic lithofacies: channelized, amalgamated sand lobes and fine-grained overbank/floodplain deposits. Figure 42 illustrates this stratigraphic pattern as seen in the Kern River Formation at both a field-wide and a project-level view. As noted, the interbedded fine-grained material is predominantly silt with some clay. It is these interbedded silts that provide a high degree of vertical confinement and represents barriers to flow for oil, water, gas and steam. Figure 43 shows horizontal effective permeability expressed as “permeability relative to sand”. According to the relationship shown in Figure 43 these interbedded silt layers are expected to have effective horizontal permeabilities approximately 35 to 40 percent of the sand beds they separate. This differential is adequate to prevent fluid and vapor from communicating across a silt/clay barrier. As such, communication between sands is hindered by the pervasive fine-grained layers separating the sand units (Figure 42). Vertical flow is further impeded by the aggregate-effect of the multiple stacked sequences of sand and silt layers. Contour maps illustrating the structural top of the nine most prominent silt layers (C, C1, G, K, K1, K2, R, R1 and R2) which also provide upward vertical confinement are included as Figures 44 through 52.

The effectiveness of these fine-grained layers as confining barriers is demonstrated through abundant and varied examples. An examination of open-hole pressure data illustrates the presence of vertical compartmentalization resulting from the lack of communication between

highly permeable sands. Figure 53 shows the open-hole logs and pressure data for well KOS 1 TO (API 03051487). At this location, the Kern River Reservoir is vertically divided into at least seven pressure compartments by silt layers as thin as 2 to 3 feet. This vertical isolation operates in both upward and downward directions, with vertically downward flow being further restricted by the pressure gradient created by field operations.

Another example of zonal isolation resulting from interbedded silt can be made by examining temperature data. Figure 54 illustrates steam injection areas and resulting steam-chest areas under the Kern River waterway. On this figure, the red highlighted wellbores depict the interval into which steam has been injected and the red-shaded log trace on the three Temperature Observation (TO) wells shows where elevated temperatures (i.e. steam) have been recorded. The data indicate that, with good wellbore mechanical integrity, the injected steam remains vertically isolated in the zone into which it was injected due to the presence of the confining silt beds.

A robust 3-dimensional (3D) full field model of the Kern River Field allows for detailed mapping of silt layers within the Kern River Formation. This intricate model allows for detailed 3D characterization and mapping of subsurface lithofacies, providing a comprehensive understanding of fluid behavior and flow within the various field structures. It is this comprehensive understanding of subsurface rock formation architecture and fluid flow that provides the basis for demonstrating the vertical fluid isolation to water source wells (Section 6.3).

4.3.6 Hydrogeology Within the Study Area

The hydrogeologic characteristics of the Kern River and Upper Chanac Formations in the Kern River Field are described below. The information in this section demonstrates that fluids within the Kern River and Upper Chanac Formations are naturally constrained to the boundaries of the oil field, on the north, west and south sides by fault systems, and on the east by the outcropping formations. Detailed geologic cross-sections illustrating hydrogeologic features of the Kern River Reservoir are presented in Appendix B. Historical groundwater contour maps for select stratigraphic units within the Kern River and Upper Chanac Formations are presented in Appendix C.

Field data indicate thick, extensive silt and clay barriers exist within the K2 zone, which acts to separate the upper and lower Kern River Formation into different aquifers over most of the Kern River Field. According to Coburn and Gillespie (2002), the silt and clay barriers thin to the west in the southern part of the field and are absent in the southwest down-dip part of the field so that in those areas the K, K1, K2 zones are saturated and in hydraulic communication with the lower Kern River unit. The unconfined aquifer in the Lower Kern River Formation extends downward to a confining silt within the Chanac Formation (Coburn and Gillespie, 2002).

4.3.6.1 Groundwater Gradients

Coburn and Gillespie (2002) presented potentiometric maps using 1992-1993 data based on a vadose zone contact derived from neutron logs and water agency water level data. The maps show the potentiometric surface generally following the regional structural dip, indicating water flowing generally downdip (from northeast to southwest), with the surface along the eastern edge of the field dipping west at 10-100 feet per mile. The potentiometric surface is shown to be

flattening in the western part of the field as the Kern Front Fault is approached. The change in gradient to nearly zero indicates that the downdip flow of fluids is stopped by the Kern Front Fault. Preparing a shallow groundwater surface contour map for current conditions is not appropriate as production and field operations have removed water from the field and reduced the potentiometric surface down to the top of the oil-bearing formation, leaving only perched groundwater zones separated by unsaturated soils (commonly referred to as “air sands”). As illustrated on Figure 55, geophysical well logs and data collected from temperature observation wells demonstrate that, over time, fluids are being drained from the upper lithologic units (G, K, and K1 sands) as a result of field operations.

Coburn and Gillespie (2002) also presented potentiometric maps of 1992-1993 data from the Upper Chanac and the R1 zones of the lower Kern River Formation (Appendix C). The map illustrates the effect of the Kern Front Fault and the local effect of other faults within the field on fluid flow by interrupting the groundwater gradient and influencing the flow pattern and gradient magnitude.

4.3.6.2 Field Pressure Gradients

As described above, part of Chevron’s reservoir management process includes pressure surveillance and mapping is a primary element of reservoir management in the Kern River Field. Reservoir pressure is acquired using open-hole wireline tools and continuous monitoring in multiple dedicated pressure monitoring wells. This field is carefully mapped to support tactical reservoir management decisions, including steamflood design and operations. The results of this practice enable delineation of the pressure regime of the Kern River and Upper Chanac Formations, including pressure gradients within and around the field. These data are also used to characterize vertical and horizontal flow barriers, individualize reservoir lenses, and monitor steam flood performance. Discrete pressure data is obtained as part of Chevron’s drilling program in 5 to 20 wells each year. Measurements are taken at 10 to 25 points in each well across multiple zones. In addition, seven dedicated pressure monitoring wells actively measure pressure in 2 to 5 zones each. The map on Figure 33 shows the network of measurements taken in 2013 and 2014, and active pressure monitoring wells.

The contoured results of pressure monitoring on Figure 33 show that a zone of low pressure exists in the interior of the field. This pressure regime establishes an inward flow pattern for reservoir fluids and injected fluids from all directions. It is an important controlling mechanism for containment of fluids in the proposed aquifer exemption boundary. This pressure regime is maintained by ongoing production of the field. This pressure differential represents an important isolation mechanism between field production and water source wells (Section 6.3).

The pressure monitoring results illustrated on Figure 56 show that pressures generally increase across the stratigraphic breaks to successively higher regimes with depth. Figure 34 represents a northeast-southwest oriented profile through the center of the field and reveals a bowl-shaped region of depressed pressure aligned with the western half of the field. This region corresponds to the portion of the field that has experienced the highest level of net fluid withdrawal over the past several decades. The information displayed in Figures 33 and 34 demonstrate that pressure gradients exist on all fronts of the field with pressure decreasing from the periphery to the center of the field; and fluid introduced into the field will flow away from the margins of the field and remains contained within the limits of the proposed aquifer exemption boundary. Coburn and Gillespie (2002) plotted formation pressure measurements and groundwater

elevations in the Lower Kern River Formation and Upper Chanac (Figure 56) to show there is a confining silt within the Chanac Formation that separates confined aquifers below from the unconfined aquifer above. The unconfined aquifer extends from the Chanac up through the Lower Kern River Formation including units R2, R1, R, and K2. Above the K2 in the Upper Kern River Formation, groundwater occurs as perched zones on the shallow silts. Pressures at the bottom of the unconfined aquifer indicate upward flow from the Chanac into the Lower Kern River Formation. Coburn and Gillespie (2002) note that significant depletion in water level in the K2, R, and R1 in the up-dip part of the field demonstrates hydraulic connectivity between those zones.

4.3.6.3 Surface and Groundwater Recharge

Groundwater recharge from precipitation will occur updip of the field, at the Kern River Formation outcropping. Currently, the area around the Kern River Field receives on average approximately 6 inches of precipitation annually and has an evapotranspiration rate of approximately 73 inches annually (RWQCB 2005). Therefore, very little recharge will occur by precipitation at the outcrop along the east edge of the field. This conclusion agrees with those reached by Dale et al. (1966), which showed that precipitation in the area does not infiltrate below the root zone.

Groundwater inflow into the field is considered to be negligible because of the presence of major faults on the west, south, north and northeast boundaries of the field (Figure 5). The Kern Front Fault provides a seal, eliminating fluids in the Etchegoin, Chanac and Kern River Formations west of the Kern River Field from crossing the boundary (Link et al., 1990). Cross-sections prepared by Kodl (1990) across the China Grade Fault show that this fault changes air-oil and oil-water contact elevations on either side of the fault, indicating that it presents a barrier to flow.

The Kern River waterway is the largest potential source of recharge, as it directly flows over the K2, R1, and R2 zones in the eastern and southeastern parts of the Kern River Field; hence, infiltration of surface water would generally be expected to reach groundwater. However, recharge from the river, on a field-scale basis, is low. Low recharge is shown by the drainage of fluids from wells near the river and potentiometric contours that do not dip away from the river (Appendix C). Low recharge and lack of communication between the Kern River and groundwater is also supported by field temperature logs, which indicate a significant separation and lack of connection between the Kern River and the producing zone beneath the river (Figure 56).

Colburn and Gillespie (2002) note that total water production from the Kern River Field in Section 3 (Township 28S, Range 28E) dropped since 1990, whereas oil production increased (Figure 57). They also observed that the volume of water produced after 1992 matches injected water volumes, suggesting minimal influx from the nearby Kern River. Similar production results from four leases adjacent to the river were observed by Jones et al. (1995). Ginger et al. (1995) noted that the intervals that make up the perched aquifer (the C1, G, and K zones) are very silt rich relative to the underlying zones in the regional unconfined aquifer. This may also contribute to the low amounts of river-derived recharge to the producing zones in the unconfined aquifer.

Empirical data, principally open-and cased-hole neutron logs, show that the Kern River and Upper Chanac Formations have experienced net depletion (more fluids extracted than naturally

recharged resulting in declining fluid levels throughout the field) since at least the beginning of the 20th century. This demonstrates that recharge from precipitation and/or infiltration from Poso Creek and the Kern River is inadequate to refill pore space vacated by fluid withdrawal associated with oil field operations, resulting in a vadose zone that contains only air and isolated perched water. Figure 55 is one of many examples of open- and cased-hole geophysical logs, in this case historic and recent logs from well Oakland 1TO in the northwest part of the field (Section 24, T28S/R28E, M.D.B. &M.) show depletion of unheated water and heated oil over an 18-year period. Appendix C contains additional examples of historic and current fluid and vapor conditions within the Kern River Field, including:

- a. Cross-section AR1-AR1' (Exhibits C-6 through C-8, Appendix C) at the northeast edge of the field (Sections 20 & 21, T28S/R28E, M.D.B.&M.) showing:
 - i. Original groundwater and oil emplacement
 - ii. Water depletion over time
 - iii. Remaining perched oil and air sand
- b. Cross-section AR2-AR2' (Exhibits B-2 and B-3, Appendix B) at the southeast corner of the field (Sections 2, 3 & 11, T29S/R28E, M.D.B.&M.) showing:
 - i. Air-filled, fluid-depleted, shallow sand in immediate proximity to the river bed of the Kern River
 - ii. Correlation of openhole well logs, specifically of fine-grained, impermeable silt and clay layers

4.3.7 Field Drainage

Potentiometric maps indicate that groundwater flow is predominantly westward in the lower Kern River Formation. However, faults on the northern, western, and southern boundaries of the field act as barriers to groundwater outflow along these boundaries. Therefore, groundwater outflow is considered to be negligible. Coburn and Gillespie (2002) note the regional 1992-1993 groundwater table surface (Appendix C) is lower than the surface published in 1966 (Dale 1966), and some zones in the eastern updip part of the field have been drained, further supporting the evidence that the water table within the field boundaries is decreasing with time. Coburn and Gillespie (2002) conclude that over time, production from the field is removing water from production zones and lowering the reservoir pressure, further illustrating the laterally confined nature of the aquifers within the oil field boundary. Figures 58 through 60 illustrate changes in water level over time on geologic cross-section AR1-AR1', located near the eastern extent of the Kern River Field. Figure 58 represents historic water levels prior to oil emplacement and assumes that static shallow groundwater level historically is approximately equal to the known top of oil surface. Figure 59 illustrates the emplacement of oil to the top of the ground water table as it existed at this point in geologic time. This is consistent with the "floating oil" concept for the Kern River Field. Figure 60 illustrates the condition of fluids within the reservoir today. The water table has dramatically retracted leaving only a deep-water table and perched water and oil.

The main source of water removal from the Kern River Reservoir is oil field production activities. Coburn and Gillespie (2002) reported the average production reported to the CalGEM for the

period 1986 to 1994 was 121,000 BOPD and 880,000 BWPD (California Division of Oil, Gas and Geothermal Resources, 1986–1994).

The assumption that the amount of natural recharge to the producing zones is negligible is supported by the observation that the upper zones of the Kern River Formation are virtually drained of fluids in the updip areas along the eastern edge of the field. In addition, nuclear logs indicate that zones in the lower Kern River Formation are partially drained in these updip areas. Pressure logs indicate that fluid pressures are low, suggesting that only limited quantities of mobile liquids remain in the zones of the lower Kern River Formation in the updip part of the aquifer. These quantities should decrease as more water is removed by production in the downdip areas of the field.

4.3.7.1 Field Water Balance

A volumetric balance for the study area can be defined as:

$$\text{Recharge} - \text{Discharge} = \Delta V \text{ (Change in Reservoir Fluid Volume)}$$

Potential recharge sources in the study area include:

- Effective precipitation (i.e., that precipitation not lost to evaporation and transpiration)
- Groundwater inflow around the perimeter of the study area
- Infiltration from the Kern River
- Water (as steam) injected into the Kern River Formation associated with EOR activities.

Potential discharge sources in the study area include:

- Groundwater outflow
- Water extracted from the Kern River Formation as part of EOR activities.

The change in fluid volume (ΔV) in the reservoir can be determined from observations of the change in fluid level in the reservoir over time. Using an effective porosity of 22%, an estimated area of 24,000 acres (area bounded by faults and outcrop), and the average water influx and removal rates (above), Coburn and Gillespie (2002) calculated a fluid level change (decrease) of approximately 4.5 feet per year between 1986 and 1994. In five non-producing locations in the field, the average fluid level change per year was measured during the same time period. The measured change from these five locations averaged 6.65 feet per year (decrease). Additionally, Coburn and Gillespie (2002) report that fluid level declines measured at water supply wells over a 30-year period averaged approximately 5.6 ft/year. Although the measured decreases in fluid level in the reservoir are slightly greater than those predicted by the mass balance, the results support the conclusion that the Kern River Field is essentially a hydraulically closed system (at least on the timescale required for producing operations) and receives minimal recharge from natural sources, including the Kern River.

4.4 Summary

The faults along the southwestern, western, northern, and northeastern proposed exemption boundaries, the updip outcrop of the Kern River Formation to the east, and the tar seals along the southern and southeastern proposed exemption boundaries limit lateral fluid movement into and out of the Kern River Field. A confining silt in the Chanac Formation separates confined aquifers below from the unconfined aquifer above that comprises the Kern River Reservoir. The absence of fluids in the upper portion of the Kern River Formation, and presence of nine field-wide silts, which are continuous across the eastern subcrop area, prevent fluid flow vertically upward out of the oil production zone. These physical features establish the Kern River Field as a closed hydrologic basin. The relatively low recharge from meteoric water and the Kern River, the significant volume of fluid removed from the reservoir, and the overall decline in fluid elevation in the Kern River and Upper Chanac Formations across the field further demonstrates that the fluids are hydraulically controlled and contained in a closed basin.

Section 5: Kern River Field Production

Oil production started in 1899 from a hand-dug well in the eastern part of the Kern River Field and has grown over the past 116 years to encompass most of the CalGEM administrative field boundary. A graph of oil production over time is included as Figure 61.

5.1 Oil Field Production

Oil extracted from the Kern River Field is classified as heavy oil, with an API gravity between 10° and 16°. To date, more than 2 billion barrels of oil have been extracted from the Kern River Field. Figure 62 illustrates the development of the Kern River Field from before 1975 and as of June 2015. Comparing the two maps indicates that a significant number of infill wells have been added in the last 40 years, and that an increasing number of permitted wells are located outside the existing aquifer exemption boundary. Currently, there are more than 10,000 permitted production wells in operation, of which 157 (1 percent) exist outside the 1982-approved exempted aquifer boundary (Figure 62 and Table 1). In 2014, approximately 1.7 percent of the oil produced from the Kern River Field was from permitted wells outside the 1982-approved aquifer exemption boundary.

5.2 Oil Saturation

The current aquifer exemption boundary is based on the 1973-1974 production limits for the Kern River Formation in the Kern River Field as defined by CalGEM, which existed at the time the USEPA approved the application for Primacy in 1982. The proposed extension of the existing aquifer exemption boundary is based on historical and current oil production and from key oil saturation control points located outside the current exemption boundary that indicate the presence of commercially producible volumes of oil. This application seeks the expansion of the currently exempted aquifer area to include those oil-bearing strata that exist outside the current exempted aquifer area (Figures 6 through 10). Continuing commercial production of the Kern River Field necessitates expanding the currently exempted area to include additional portions of the Kern River and Upper Chanac Formations where oil is known to exist.

Hydrocarbon saturations were derived from various locations (Figure 63) and sources of information. In some cases, actual oil production data is used. In other cases, indirect methods are used to evaluate saturation, including side-wall cores, whole core and log correlations, and cased-hole carbon/oxygen logs. These logs provide accurate estimates of oil saturation and have been calibrated throughout the field with hundreds of wells using industry standards and methodologies. The data are collected from over 700 dedicated temperature observation wells (TOWs), approximately 50 other monitoring wells and stratigraphic test wells. That data combined with well data from the periphery of the Kern River Field was used to delineate the proposed extension of the existing aquifer exemption boundary for the Kern River and Upper Chanac Formations. There are total of 858 wells with calculated oil saturation ranging up to greater than 100 feet in thickness in the Upper Chanac interval (Figure 64) within the proposed aquifer exemption boundary. The presence of oil saturation within the Upper Chanac exists across the field from the southwest to northeast boundaries of the proposed aquifer exemption boundary (Figure 65).

Appendix B provides examples of various downhole information that was used to assess oil saturation. Exhibits in Appendix B illustrate oil saturation and geophysical logging data on the geologic cross-sections to demonstrate expected production and illustrate that the lateral extent of the field is undefined in certain areas.

5.3 Kern River Reservoir Extraction and Injection

On a daily and annual basis, the Kern River Field produces excess fluids resulting in a net negative fluid balance. In 2014, Chevron produced approximately 24,560,000 barrels of oil and 273,750,000 barrels of formation water; and re-injected approximately 77,015,000 barrels of water (as steam) into the field.

Water sources at the Kern River Field include produced formation water, groundwater (for minimal daily operational uses) and interdiction water (Figure 66). Interdiction water is deep formation water that is extracted to reduce pressures throughout the productive portions of the field and help maintain the steam chest in the middle of the field. Produced and interdicted water are pumped to Station 36, where water is separated from the oil and treated. After treatment, the produced and interdicted waters are used for steam generation, as lease water (routine field operations), as a permitted beneficial reuse (e.g., treated water supplied for agricultural use), or disposed into deep permitted Class II injection wells.

5.3.1 Enhanced Oil Recovery/Steam Injection

Operators in the Kern River Field use steam injection to heat and mobilize heavy oil so it can be recovered (this process is referred to as enhanced oil recovery or EOR). Steam is generated on-site from softened produced water and injected into the Kern River Formation (Figure 67 and Appendix E). This mobilizes the heavy oil thereby accelerating production and improving overall recovery as part of this EOR technique. In Chevron's operations, roughly 380 injection wells injected a continuous flow of approximately 137,000 BPD of steam in 2020.

5.3.2 Produced Water

Using Chevron as an example, Chevron's Station 36 is the central gathering facility for the produced fluids generated at the Kern River Field. Produced fluids are transported to Station 36 where the oil and water are separated. The produced water is treated before it is beneficially reused for general oilfield operations (i.e., well servicing) known as "lease water", treated and filtered (Figure 68) before it is beneficially reused for steam generation (after water softening) in Chevron's operations at the Kern River Field, or for agricultural irrigation in the Cawelo Water District. The water Chevron conveys to the Cawelo Water District is regulated by a permit issued by the Central Valley Regional Water Quality Control Board (R5-2012-0058).

5.3.3 Interdiction Water

Chevron's operations in Kern River Field include extracting and handling interdiction water (Figures 66 and 68). Interdiction water is deep formation water that is extracted from high water-cut oil wells in the western (downdip) portion of the oil field, to reduce hydrostatic field pressures and help maintain and promote the low-pressure zone/steam chest in the middle of the field. Figure 66 illustrates the locations of the water interdiction wells along the western edge

of the field and the relative extraction volumes from each well. Interdiction well information is summarized in Table 2.

5.3.4 Lease Water

Lease water is produced water that is used for routine field operations, such as flushing vessels during well testing at some Automatic Well Testing sites or in well servicing operations. It is also used to flush pipelines and for various other maintenance and operational activities. Approximately 20,000 to 30,000 bbls of lease water is used on a daily basis.

5.3.5 Water Disposal

Excess produced water that cannot be used for any other purpose is disposed of in permitted Class II disposal wells.

Section 6: Water Quality and Protection

6.1 Beneficial Use

The Water Quality Control Plan for the Tulare Lake Basin, Second Edition – revised January 2004, (Basin Plan) (CRWQCB, 2004) designates beneficial uses, establishes water quality objectives and contains implementation plans and policies for protecting waters of the basin.

6.1.1 Designated Beneficial Uses

The Kern River Field is located in the South Valley Floor Hydrologic Unit and within Detailed Analysis Units 254 and 257 as defined in the Basin Plan (CRWQCB, 2004). The beneficial uses of groundwater, as stated in the Basin Plan for Detailed Analysis Unit 254 within the Kern County Basin hydrologic unit, are municipal and domestic supply, agricultural supply, industrial service and process supply, water contact recreation, non-contact water recreation and wildlife habitat. The beneficial uses of groundwater in Detailed Analysis Unit 257 are municipal and domestic supply, agricultural supply, industrial service and water contact recreation. Both of these units encompass areas outside of the Kern River Field and proposed new aquifer exemption boundary.

The Basin Plan establishes narrative water quality objectives for chemical constituents, tastes and odors, and toxicity in groundwater. The Basin Plan's narrative water quality objectives for chemical constituents, at a minimum, require waters designated as domestic or municipal supply to meet the maximum contaminant levels (MCLs) specified in Title 22 of the California Code of Regulations (Title 22). The narrative toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, animal, plant, or aquatic life associated with designated beneficial uses.

6.1.2 Water Wells

Groundwater in portions of the Kern River Formation within the Kern River Field is currently used for industrial supply (e.g., oil field operations), municipal and domestic water supply and irrigation. Available data indicates the municipal and domestic water supply and irrigation wells are located within the lateral extents of the 1982-approved aquifer exemption boundary; and several of the domestic water wells are screened within the oil-bearing zone.

CalGEM performed a water well search and capture zone analysis and published its findings and conclusions in a memo dated 22 March 2019. A copy of the memo is provided in Appendix F. The water well search used a combination of California Department of Water Resources (DWR) water well completion reports, Kern County Environmental Health (KCEH) water well completion reports, Geotracker GAMA, and field reconnaissance to identify water wells that are located in or near the Kern River Field. CalGEM reviewed the information to determine the three-dimensional proximity of the wells to the proposed aquifer exemption area. CalGEM used the well data to analyze and map the capture zone for each of the wells, and recommended adjustments of the aquifer exemption area boundary to accommodate the capture zones. The proposed aquifer exemption area presented in the figures of this report incorporate CalGEM's recommendation based on their analysis. Following is a brief summary of CalGEM's findings that are presented in greater detail along with the tables and figures in Appendix F.

Table F-1 lists a total of 67 water wells that were identified in the CalGEM well search, and Figure F-1 shows the locations of the wells with respect to the Kern River Field and a previously proposed aquifer exemption area. Based on review of the well construction details, CalGEM differentiated the wells into the following four categories and mapped them accordingly on Figure F-1:

- 3 wells penetrating or with high probability for hydraulic connection to the proposed aquifer exemption interval.
- 30 wells in the shallower, A and/or B Kern River Interval.
- 21 wells in shallow perched aquifer laterally separated from the exemption interval.
- 13 wells in shallow perched aquifer vertically above the exemption interval.

6.1.3 Capture Zone Analysis

CalGEM analyzed the capture zone for each of the wells listed above using the following formula:

$$R_t = \sqrt{\frac{Qt}{\pi\phi H}}$$

where:

- R_t = Radius (feet) for time period
- Q = pumping rate of well (ft³/year), where ft³/year = gpm x 70,267
- t = travel time
- π = 3.1416
- φ = effective porosity (decimal percent)
- H = screened interval of well (feet)

The length of the well screen interval is typically identified in the DWR Well Completion Reports; however, some of the wells evaluated did not have well completion reports on file with DWR. For these wells, a well screen interval of 40 feet was selected, which was the minimum documented well screen interval within the dataset.

CalGEM describes the methodology for the calculation, assumptions, and their rationale for the selection of values for these parameters in the memo in Appendix F. The resulting 30-year capture zones for individual wells are depicted on Figure F-4.1 through F-4.4, and for combined pumping effects of wells on Figure F-4.2 and F-5.2.

In addition, CalGEM used the Neuman equation for zone of endangering influence (ZEI) calculations for stem injection to establish a 300-foot buffer zone around each of the wells. The proposed aquifer exemption boundary was then adjusted to either the 30-year capture zone of the well or the 300-foot buffer, whichever was greater. The resulting recommended aquifer exemption boundary adjustments are shown on Figures F-5.1, F-5.2, and F-5.3.

Accepting CalGEM's recommendations, the resulting proposed aquifer exemption area is shown on Figure 2 and on the subsequent figures of this report.

6.2 Water Quality Evaluation

Water quality information has been collected from individual wells, as well as from Chevron's Station 36 (the central treatment facility for the produced fluids Chevron generates within the Kern River Field). Water quality data are summarized in Tables 4 through 8, and presented in Appendices D and E. The following evaluates the water quality data for several groups of wells, based on use and location relative to the oil-bearing formations and proposed aquifer exemption zone.

6.2.1 Water Quality from Wells Within the 1982-Approved Aquifer Exemption Boundary

There are 10 water supply wells within the 1982-approved aquifer exemption boundary: one municipal, one irrigation and eight domestic supply wells (Table 3). Three of the 10 water wells within the 1982-approved aquifer exemption boundary are screened above the top of the oil-bearing formation, with the base of each well extending to within 500 feet (vertically) of the oil-bearing formation (Table 3). Two wells have unknown completion depths, and five wells have screened intervals completed within the oil-bearing formation.

The potential for water quality impacts has been evaluated through review of available water quality data. Table 6 summarizes water quality data available for wells within the 1982-approved aquifer exemption boundary, and includes results from three wells (well ID 6 screened within the oil-bearing zone and well IDs 12 and 14 screened above the oil-bearing zone). Comparison of the two data sets shows that wells screened within the oil bearing formation have similar median concentrations of manganese (2.0 mg/L versus 4.8mg/L) potassium (3.0 mg/L versus 2.2 mg/L), chloride (16 mg/L versus 28 mg/L), sulfates (48 mg/L versus 28 mg/L), boron (0.20 mg/L versus 0.08 mg/L) and EC (378 μ homs/cm versus 357 μ homs/cm). Similar results are apparent when comparing the water quality data from inside the oil-bearing zone to wells outside the proposed aquifer exemption boundary (Table 7).

6.2.1.1 Municipal Wells Within 1982-Approved Aquifer Exemption Boundary

Two municipal wells, owned by River Ranch Home Owner's Association (RRHOA), are within the 1982-approved exemption boundary and screened within 500 feet of the oil-bearing zone. The wells are co-located in the southwest portion of the Kern River Field and are listed as Well ID 14 in Table 3. The deeper of the two wells is screened approximately 42 feet above the top of the proposed aquifer exemption boundary and separated from the oil-bearing units by multiple fine-grained layers. Two water quality samples were recently collected from the RRHOA well and are summarized in Table 5. Comparison of the laboratory results to primary and secondary drinking water standards demonstrates that the water in this well is of good quality and has not been adversely impacted by the presence of the oil-bearing formation or past or present oil field operations.

6.2.1.2 Domestic/Irrigation Wells Within 1982 Approved Aquifer Exemption Boundary

Five of the nine domestic/irrigation wells within the 1982-approved aquifer exemption boundary are screened within the oil-bearing zone. Table 6 summarizes the water quality data collected from Well ID 6 and provides a comparison to other samples collected from wells within proximity to the oil-bearing zone. Laboratory data of samples collected from the wells demonstrates that water quality has not been adversely impacted by the presence of the oil-bearing formation or past or present oil field operations.

6.2.2 Kern River Reservoir Water Quality

The water quality in the Kern River Reservoir below the C silt (primary unit from which produced and interdiction water are captured) ranges from good to moderate. As described in Section 4.3.6.3, given the low recharge and lack of communication between the Kern River and groundwater, the waters of the Kern River likely have a minimal effect on groundwater quality in the Kern River Reservoir.

6.2.2.1 Historical Water Quality

Amec/Foster Wheeler (Amec 2015) evaluated historical water quality data from 40 wells screened in the Kern River Formation collected from a period of 1967 to 2008 (Appendix D). The geochemistry of groundwater samples collected from the lower Kern River is predominately represented by the cations sodium and calcium and the anions bicarbonate and chloride. Total dissolved solids (TDS) data from the wells studied range from 187 to 1,380 mg/L with an average of 579 mg/L (Appendix D). The average TDS concentration exceeds the recommended secondary MCL for TDS of 500 mg/L and the maximum TDS concentration exceeds the secondary upper MCL for TDS of 1,000 mg/L. Sulfate concentrations ranged from non-detect to 459 mg/L with an average of 30 mg/L. Neither the average nor the maximum sulfate concentrations exceeded the secondary upper MCL of 500 mg/L. Chloride concentrations ranged from 26 to 530 mg/L with an average of 120 mg/L. Only one groundwater sample exceeded the secondary upper MCL of 500 mg/L. Nitrate concentrations (reported as nitrate) ranged from non-detect to 1.53 mg/L with an average of 0.47 mg/L. The average and maximum nitrate concentrations did not exceed the MCL of 10 mg/L. Fluoride concentration data was not available for these supply wells.

Dissolved magnesium concentrations ranged from 0.36 to 19.3 mg/L with an average of 5.38 mg/L. The minimum, average, and maximum concentrations of magnesium exceed the secondary MCL of 0.05 mg/L. Historical data for Title 22 metals were limited to arsenic and barium. Barium ranged from non-detect to 9 mg/L with an average of 0.61 mg/L. Only one groundwater sample out of 19 exceeded the MCL of 1 mg/L for barium.

6.2.2.2 Interdiction Well Water Quality

The water interdiction wells owned by Chevron that are perforated in the lower Kern River Formation are high water-cut oil wells. Typically, high water-cut wells would be operated minimally, to reduce operating costs; however, operation of the interdiction wells provide several benefits, such as reducing hydrostatic pressures in the production field and providing water for beneficial reuse. These wells are located along the western portion of the oil field and extract oil and water from the Lower Kern River Formation. Table 8 summarizes analytical data from water

samples collected from the interdiction wells. The TDS in water interdiction wells ranges from 176 mg/L to 2,084 mg/L, which is comparable to other oil field operations wells. Arsenic and boron concentrations are low, below their respective MCLs. Two of the 16 samples exceeded the secondary MCL of 500 mg/L for chloride. One sample contained an elevated sulfate concentration of 459 mg/L, which is still below its secondary MCL. Water quality data from the interdiction wells is graphically represented on Exhibit D-3.

6.2.3 Station 36

Station 36 is Chevron's central fluids gathering facility. Produced water from Chevron's operations in the Kern River Field is pumped to Station 36 for treatment prior to reuse or disposal. In 2014, Chevron produced approximately 750,000 BPD of produced water from the Kern River Field and transported it to Station 36 for processing and treatment. Treated produced water leaving Station 36 is split into three streams; with approximately 211,000 BPD used in steam generation, 24,000 BPD used for routine field operations and over 515,000 BPD provided to the Cawelo Water District.

Water chemistry data collected from Station 36 provides representative quality information for steam injected into the field as part of the EOR program. Water quality data associated with Station 36 operations are presented in Table 4 and Appendix E, Exhibit E-2. The TDS in Station 36 influent water is around 600 mg/L, which is comparable to oil field operations wells. Bicarbonate alkalinity averages around 250 mg/L, chlorides are approximately 124 mg/L and sulfates are approximately 34 mg/L. Copies of the lab reports are included in Appendix D.

6.3 Potential Migration of Injected Fluids

Geologic and hydrogeologic information also demonstrates that the Kern River Field is situated in a closed system bounded on three sides by faults that represent barriers to fluid flow; and on the fourth side by the outcropping for the oil-bearing formations. Information presented in Section 4 demonstrates that fluids contained in the Kern River and Upper Chanac Formations within the Kern River Field are hydrogeologically constrained laterally and flowing towards the center of the field under an induced pressure gradient caused by production operations. Fluids are also constrained vertically, being separated by continuous or semi-continuous, relatively impermeable, silt and clay beds. Therefore, under operating conditions, there is no potential for fluids to migrate outside the proposed exemption area, and vertical migration is constrained. Steam injected into the Kern River Formation condenses into water and will migrate towards the low pressure zone created near the center of the field where it will be extracted from the Kern River Formation from nearby production wells. As such, no additional monitoring of the proposed exempted aquifer, or water wells within close proximity to the proposed exempted aquifer, is warranted or proposed.

A conduit analysis was performed to identify abandoned, idle, or active wells in the proposed Aquifer Exemption expansion area that could potentially represent conduits for the vertical migration of fluids from the oil-bearing zone to USDW. A Potential Conduit Well Assessment was prepared that documents plugging and abandonment of potential conduit wells that were identified in the revised Aquifer Exemption Boundary. A copy of the revised Potential Conduit Well Assessment dated 26 March 2025 is provided in Appendix G.

6.4 Summary

The origin of the water injected into the Kern River Formation (as steam) for EOR is the oil-bearing zone of the Kern River and Upper Chanac Formations. The extracted water is separated from the crude oil at Station 36 and then softened prior to being generated into steam and re-injected back into the oil-bearing zone. The water (as steam) used for the EOR process meets the Basin Plan Water Quality Objectives for the Tulare Lake Basin (Amec 2015). Because the water is treated and softened prior to re-use for EOR, its quality is higher than when it was extracted from the Kern River and Upper Chanac Formations.

Available analytical data from water supply wells within the proposed aquifer exemption boundary have not been degraded by oil field operations. Some wells are completed in zones where water quality has been impacted by the presence of the oil in the subsurface (elevated TDS, EC, metals), but there is no indication that water quality has been degraded from EOR operations.

Water wells that are perforated in the Kern River Formation also appear to be unaffected by EOR practices. The geochemistry of water supply wells in the Kern River Field is comparable to what is found in neighboring domestic, municipal and industrial water wells (Amec 2015). A comparison of historic and recently collected analytical data from the RRHOA water supply well indicates that EOR activities south of the China Grade Fault have not impacted water quality in nearby water supply wells.

The available lithologic information indicates that the screened intervals for three of the ten domestic, irrigation and municipal water wells located within the 1982-approved aquifer exemption boundary are not within the vertical limits of the aquifer exemption boundary for the Kern River Formation, and are physically isolated from the oil-bearing zone by the pervasive low-permeability fine-grained layers that separate the various sand zones within the Kern River Field. Five of the wells screened within the 1982-approved aquifer exemption boundary are screened within the oil-bearing zone at the eastern upgradient extent of the oil field and are protected from impacts by the inward hydraulic gradient created by oil field operations.

Section 7: Summary of the Data in Support of the Aquifer Exemption Application

The Kern River Formation in the Kern River Field was included in the 1981 Primacy Application submitted by the CalGEM to the USEPA, and approved by the USEPA on 29 September 1982. The 1982 exempted aquifer boundary is based on 1973-1974 CalGEM maps of the oil/water contact. Exploration and production activities conducted since 1973-1974 have demonstrated that commercially producible quantities of oil exist outside the existing exempted aquifer boundary.

Oil extracted from the Kern River Field is classified as heavy oil, with an API gravity between 10° and 16°. Kern River Field operators use EOR methods to produce oil from the Kern River Field. As such, continuing production outside the 1982-approved exempted aquifer boundary will require the expansion of that boundary. Therefore, the Kern River Field operators, in accordance with 40 CFR §146.4 and PRC 3131(a), request that CalGEM propose to the USEPA expanding the currently exempted aquifer boundary to include the hydrocarbon-containing portions of the Kern River and Upper Chanac Formations beneath, and in the immediate vicinity of, the Kern River Field. The requested expansion will result in a total exempted aquifer lateral area that is approximately 25,300 feet wide near its southern extent, 9,400 feet at the northern extent, and 36,900 feet long in the north-south direction (approximately 15,335 acres). The differential area between the existing 1982-approved aquifer exemption boundary and the new proposed boundary is approximately 3,900 acres.

The vertical extent of the aquifer exemption, as expanded, will cover the Kern River and Upper Chanac Formational units that range from approximately -940 feet TVDSS to 40 feet TVDSS near the eastern side of the oil field and from approximately -40 TVDSS to -1,400 TVDSS on the western side of the oil field. The upper limit of this exemption expansion is limited to strata below the C Silt. Where the C Silt is 50 feet or less from the surface, the top of the exemption and future injection would be limited to 150 feet below ground surface. The lower limit is defined by a confining silt in the Chanac Formation that separates confined aquifers below from the unconfined aquifer above, which extends up into the Lower Kern River Formation.

In accordance with §146.4, the relevant criteria for the subject exemption for Class II wells include:

- 1) The exempted zone does not currently serve as a source of drinking water; and
- 2) It cannot now and will not in the future serve as a source of drinking water because it is hydrocarbon producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II operation to contain hydrocarbons that considering their quantity and location are expected to be commercially producible.

As presented in Sections 3 through 6 above, the following points support the request to expand the existing aquifer exemption boundary of the Kern River and Upper Chanac Formations in the Kern River Field:

- 1) The best use of the oil-bearing Kern River and Upper Chanac Formations in the Kern River Field is its current use, oil and gas extraction. A portion of the Kern River Formation in the Kern River Field is included as an exempted aquifer in the 1981 Primacy Application and in the Memorandum of Agreement between CalGEM and the USEPA Region IX.
- 2) Expansion of the exempted aquifer boundary is required to continue EOR methods at the lateral extents of the field.
- 3) Production of the Kern River Field cannot economically occur without the use of EOR methods, which include steam injection. Water, produced in conjunction with and separated from the hydrocarbons, is treated (softened) and beneficially reused for steam generation. The quality of the water being injected as steam into the exempted aquifer is better than the quality of the water naturally present and removed during oil production.
- 4) The Kern River and Upper Chanac Formations within the Kern River Field are hydraulically separated from those areas outside the field boundaries.
 - a) Hydraulic containment to the west is controlled by the Kern Front Fault;
 - b) To the north and northeast, hydraulic containment is provided by the Poso Creek Fault and a series of un-named normal faults;
 - c) To the east, hydraulic control is established by the outcropping of the Kern River Formation;
 - d) To the southeast and south, containment for the field is controlled by the pressure gradient generated by production activities (more fluid is extracted than injected, creating an inward hydraulic gradient) and by tar seals;
 - e) To the southwest, hydraulic control is established by the pressure gradient generated by production activities and by the presence of the sealing faults to the southwest and west of the Kern River Field;
 - f) Vertical containment is provided in the upward direction by the water/oil surface and the presence of the silt and clay layers that persist throughout the Kern River Field. Vertical containment in the downward direction is controlled by a confining silt in the Chanac Formation that separates confined aquifers below from the unconfined aquifer above; and
 - g) The overall decline in groundwater elevation in the Kern River and Upper Chanac Formations across the field results in lower fluid pressures within the interior of the field driving fluids toward the center of the Kern River Field, and further demonstrates that the geologic features near the boundaries of the Kern River and Upper Chanac Formations create a closed system.
- 5) On a daily and annual basis, the Kern River Field produces excess fluids resulting in a net negative fluid balance and the inward hydraulic pressure gradient. Water sources at the Kern River Field include produced formation water, groundwater (for minimal daily operational uses) and interdiction water. After treatment, some of the produced and

interdicted waters are treated and beneficially reused for EOR operations and in routine field activities. These waters meet the Basin Plan water quality objectives for the Tulare Lake Basin.

- 6) There are no known private or municipal drinking water supply wells located within the Kern River Reservoir within the proposed exemption area that have been impacted by EOR operations that have occurred over the past 50 years. Some of the water wells are separated from the oil-bearing zone by fine-grained silt and clay (shale) layers; while other wells are screened in the oil-bearing zone and are protected from downgradient field operations by an inward hydraulic gradient toward the center of the field. Water wells screened within the same zone as the oil-bearing strata but outside the oil-bearing zone, and outside the proposed aquifer exemption boundary, are protected by the inward hydraulic gradient toward the center of the field created by production operations.
- 7) Twenty domestic/municipal water supply wells exist outside but in close proximity to the proposed expanded aquifer exemption boundary. These wells are protected hydraulically by the inward hydraulic gradient created by production operations. Additionally, zone of contribution calculation estimates for each of these 20 wells based on well-specific information confirm that the origin of the water potentially extracted from these wells is outside the proposed expanded aquifer exemption boundary.

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Tables

Table 1: Production Wells Outside 1982 Aquifer Exemption Boundary

API No. ^(a)	Well ID	Well Status	Operator	Lease Name	Section	Township	Range	Base Meridian	Elevation ^(b)	Coordinates ^(c)		Location Description ^(d)
										X	Y	
02900089	6	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	970 DF	-119.00481400000	35.48742500000	Fr SW cor 970N 1965E
02900094	16-25	I	Chevron U.S.A. Inc.	Chaparral	18	28S	28E	MD		-119.00666300000	35.49917000000	Fr NW cor 545S 1642E
02900463	16-21	A	Chevron U.S.A. Inc.	Chaparral	18	28S	28E	MD		-119.00667600000	35.49734700000	Fr NW cor 710S 1356E
02900554	5-31	I	Vintage Production California LLC	KRU	12	28S	27E	MD		-119.01603400000	35.50186800000	Fr SE cor 940N 1430W
02900555	10-42	I	Chevron U.S.A. Inc.	Bakersfield Fuel & Oil	12	28S	27E	MD		-119.01258400000	35.50687700000	Fr SE cor 2755N 422W
02940013	8	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	996 DF	-119.00710600000	35.48783200000	Fr S/4 cor 1110N 1150W
02940097	3-13	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01825800000	35.49374800000	Fr NE cor 2030S 2076W
02940098	4-16	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01730900000	35.49512000000	Fr NE cor 1535S 1790W
02940110	7-15	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01437700000	35.49463200000	Fr NE cor 1705S 924W
02940112	13-14	I	Chevron U.S.A. Inc.	Chaparral	18	28S	28E	MD		-119.00955600000	35.49416700000	Fr NW cor 1865S 498E
02940121	13	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	1011 DF	-119.00483100000	35.48962200000	Fr S/4 cor 1790N 485W
02940124	5-15	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01636500000	35.49466700000	Fr NE cor 1700S 1504W
02940211	16	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	1044 DF	-119.00609000000	35.49043100000	Fr S/4 cor 2110N 810W
02940212	17	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	1035 DF	-119.00373800000	35.49048600000	Fr S/4 cor 2095N 145W
02940214	12	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	990 DF	-119.00388300000	35.48886900000	Fr S/4 cor 1500N 180W
02940236	18	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	1030 DF	-119.00491700000	35.49151700000	Fr S/4 cor 2465N 500W
02940237	19	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	1048 DF	-119.00701400000	35.49156900000	Fr S/4 cor 2455N 1115W
02940779	3-17	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01834700000	35.49557200000	Fr NE cor 1370S 2076W
02940838	4-12	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01733400000	35.49328900000	Fr NE cor 2195S 1790W
02940839	6-10	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01540800000	35.49237500000	Fr SE cor 2525N 1218W
02940840	8-10	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01349000000	35.49238700000	Fr NE cor 2525S 646W
02940856	3	A	Chevron U.S.A. Inc.	U.S.A.	18	28S	28E	MD	1037 DF	-119.00262000000	35.48778600000	Fr S/4 cor 1120N 200E
02949640	4-10	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01738200000	35.49236400000	Fr NE cor 2525S 1790W
02950055	6-32	I	Vintage Production California LLC	KRU	12	28S	27E	MD		-119.01492100000	35.50277200000	Fr SE cor 1270N 1100W
02950056	16-10	I	Chevron U.S.A. Inc.	Chaparral	18	28S	28E	MD		-119.00664400000	35.49245600000	Fr W/4 cor 150S 1399E
02950201	7-13	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01442700000	35.49376300000	Fr SE cor 2030N 932W
02950202	3-15	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01829000000	35.49469000000	Fr NE cor 1700S 2076W
02950203	3-11	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01827400000	35.49286700000	Fr NE cor 2360S 2076W
02950204	12-10	I	Chevron U.S.A. Inc.	Chaparral	18	28S	28E	MD		-119.01049500000	35.49245000000	Fr W/4 cor 450S 255E
02950206	14-10	I	Chevron U.S.A. Inc.	Chaparral	18	28S	28E	MD		-119.00857200000	35.49244900000	Fr W/4 cor 150N 827E
02950267	5-7	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01636000000	35.49103100000	Fr NE cor 3020S 1504W
02950270	11-14	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01157100000	35.49414900000	Fr NE cor 1865S 74W
02950272	5-9	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01635000000	35.49194600000	Fr NE cor 2690S 1504W
02950273	8-12	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01346400000	35.49328400000	Fr NE cor 2195S 646W
02952805	13-11	I	Chevron U.S.A. Inc.	Chaparral	18	28S	28E	MD		-119.00971200000	35.49279100000	Fr NW cor 2360S 498E
02952807	22	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	983 DF	-119.00603000000	35.48801400000	Fr S/4 cor 1100N 830W
02955754	6-16	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01532800000	35.49515800000	Fr SE cor 1510N 1210W
02955755	7-9	I	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01444900000	35.49214200000	Fr E/4 cor 20S 930W
02959235	7-41	I	Chevron U.S.A. Inc.	Bakersfield Fuel & Oil	12	28S	27E	MD		-119.01444800000	35.50658100000	Fr NE cor 2625S 990W
02959738	18-5	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.00949700000	35.49162000000	Fr SW cor 2480N 550E
02962059	11-10	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01154500000	35.49234700000	Fr NE cor 2525S 74W
02962686	25-43	I	Chevron U.S.A. Inc.		25	28S	27E	MD		-119.02377500000	35.46008100000	Fr NW cor 3705S 1715E
02963273	18-502	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.01001300000	35.48988200000	Fr NW cor 3420S 390E
02963291	18-7	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.01061100000	35.49149500000	Fr NW cor 2835S 200E
02963292	18-8	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.00832700000	35.49147300000	Fr NW cor 2835S 878E
02963293	18-9	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.01064200000	35.49042400000	Fr NW cor 3226S 200E
02963294	18-10	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.00944900000	35.49041200000	Fr NW cor 3226S 555E
02963295	18-11	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.00832300000	35.49040200000	Fr NW cor 3226S 885E
02963297	18-13	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.00830700000	35.48934400000	Fr NW cor 3618S 900E
02963599	25-56	I	Chevron U.S.A. Inc.		25	28S	27E	MD	822 MAT	-119.02253200000	35.46104700000	Fr NW cor 3350S 2065E
02963605	25-64	I	Chevron U.S.A. Inc.		25	28S	27E	MD	801 MAT	-119.02255700000	35.45906900000	Fr NW cor 4070S 2081E
02964073	37	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	920 MAT	-119.01648200000	35.48111700000	Fr NW cor 1298S 3785E
02965412	5-14	A	Chevron U.S.A. Inc.	KRU	13	28S	27E	MD		-119.01625700000	35.49377800000	Fr NE cor 2037S 1467W
02968658	106	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1073 DF	-119.01191900000	35.49051200000	Fr SE cor 2067N 165W
02968659	107	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1051 DF	-119.01190200000	35.49157800000	Fr SE cor 2455N 165W
02968662	205	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1045 DF	-119.01304300000	35.48953900000	Fr SE cor 1709N 495W

Data in Support of the Aquifer Exemption Boundary Expansion Application, Kern River Formation
Kern River Field, Kern County, California

Table 1: Production Wells Outside 1982 Aquifer Exemption Boundary

API No. ^(a)	Well ID	Well Status	Operator	Lease Name	Section	Township	Range	Base Meridian	Elevation ^(b)	Coordinates ^(c)		Location Description ^(d)
										X	Y	
02968663	206	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1047 DF	-119.01302500000	35.49059900000	Fr SE cor 2095N 495W
02968664	207	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1235 DF	-119.01301200000	35.49166000000	Fr SE cor 2481N 495W
02968938	406	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1037 KB	-119.01524300000	35.49062500000	Fr SE cor 2095N 1155W
02972340	18-515	A	Chevron U.S.A. Inc.		18	28S	28E	MD		-119.00885000000	35.48974300000	Fr NW cor 3474S 750E
02973164	23	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD		-119.00742800000	35.49052400000	Fr S/4 cor 2080Nly 1272Wly
02973210	156	A	Chevron U.S.A. Inc.	Government 3	18	28S	28E	MD		-118.99763100000	35.49571400000	Fr NE cor 1325S 925W
02973211	157	A	Chevron U.S.A. Inc.	Government 3	18	28S	28E	MD		-118.99679100000	35.49571800000	Fr NE cor 1325S 675W
02974970	304	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1030 KB	-119.01410200000	35.48853300000	Fr SE cor 1333N 808W
02974971	305	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1050 KB	-119.01408400000	35.48959000000	Fr SE cor 1719N 804W
02974972	306	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1031 KB	-119.01406100000	35.49065100000	Fr SE cor 2105N 798W
02974973	307	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1086 KB	-119.01401300000	35.49169800000	Fr SE cor 2491N 794W
02974974	407	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1058 KB	-119.01512500000	35.49171900000	Fr SE cor 2495N 1125W
02975058	815	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1043 KB	-119.01361000000	35.48900900000	Fr SE cor 1523N 642W
02975063	820	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1042 KB	-119.01469900000	35.48902200000	Fr SE cor 1529N 971W
02975064	821	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1010 KB	-119.01465600000	35.48800900000	Fr SE cor 1142N 975W
02975067	824	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	993 KB	-119.01587500000	35.48690500000	Fr SE cor 754N 1317W
02975069	403	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1006 KB	-119.01523400000	35.48748200000	Fr SE cor 952N 1143W
02975070	404	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1039 KB	-119.01521400000	35.48854500000	Fr SE cor 1339N 1138W
02975071	405	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1034 KB	-119.01519700000	35.48963300000	Fr SE cor 1724N 1133W
02975073	503	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1028 KB	-119.01633300000	35.48749800000	Fr SE cor 957N 1469W
02975074	504	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1031 KB	-119.01631700000	35.48836900000	Fr SE cor 1272N 1464W
02987357	603	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	995 DF	-119.01740300000	35.48737900000	Fr SE cor 907Nly 1782Wly
02987360	604	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1018 DF	-119.01748400000	35.48826600000	Fr SE cor 1228Nly 1811Wly
02987714	116	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1057 DF	-119.01257400000	35.49052100000	Fr SE cor 2068Nly 360Wly
02987715	117	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1057 DF	-119.01240300000	35.49161500000	Fr SE cor 2517Nly 315Wly
02987717	702	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	959 DF	-119.01858600000	35.48635800000	Fr SE cor 530Nly 2130Wly
02987718	703	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	973 DF	-119.01853800000	35.48734500000	Fr SE cor 890Nly 2120Wly
02987719	704	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	975 DF	-119.01854100000	35.48816900000	Fr SE cor 1190Nly 2125Wly
03009550	48	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	928 MAT	-119.01637000000	35.48320600000	Fr NW cor 538S 3805E
03009930	6	A	Chevron U.S.A. Inc.	U.S.A.	18	28S	28E	MD	1056 KB	-118.99930300000	35.48707900000	Fr NW cor 4435S 3609E
03010188	49	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	966 MAT	-119.01547600000	35.48446600000	Fr NW cor 72S 4065E
03010189	50	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	930 MAT	-119.01547200000	35.48332600000	Fr NW cor 488S 4072E
03010190	51	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	923 GL	-119.01648200000	35.48219900000	Fr NW cor 904S 3778E
03010224	25	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	1006 GL	-119.00701400000	35.49041500000	Fr NW cor 3222S 1295E
03010225	26	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	992 MAT	-119.00656700000	35.48934400000	Fr NW cor 3611S 1433E
03010226	27	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	977 MAT	-119.00660100000	35.48822600000	Fr NW cor 4017S 1428E
03010229	30	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	1011 MAT	-119.00486400000	35.49045700000	Fr NW cor 3199S 1934E
03010230	31	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	986 MAT	-119.00488400000	35.48824600000	Fr NW cor 4010S 1945E
03010232	33	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	955 MAT	-119.00353300000	35.48966300000	Fr NW cor 3483S 2334E
03010233	34	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	975 MAT	-119.00343400000	35.48811500000	Fr NW cor 4004S 2364E
03010567	901	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	967 KB	-119.02006600000	35.48516200000	Fr SE cor 2567W 88N
03011118	509	A	Chevron U.S.A. Inc.	Mitchell	18	28S	28E	MD	1030 MAT	-119.00421000000	35.49005300000	Fr NW cor 3332S 2122E
03012891	53	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	988 KB	-119.01762000000	35.48324200000	Fr NW cor 529S 3433E
03036069	201	A	Chevron U.S.A. Inc.	Government 3	18	28S	28E	MD	1069 GL	-118.99947647400	35.49304371280	Fr NE cor 2268S 1511W
03036070	202	A	Chevron U.S.A. Inc.	Government 3	18	28S	28E	MD	1058 GL	-118.99674836600	35.49678226650	Fr NE cor 926S 677
03036071	203H	A	Chevron U.S.A. Inc.	Government 3	18	28S	28E	MD	1060 GL	-119.00064811500	35.49323819360	Fr NE cor 2190S 1865W
03036072	204H	A	Chevron U.S.A. Inc.	Government 3	18	28S	28E	MD	1058 GL	-119.00063355100	35.49315103900	Fr NE cor 2222S 1860W
03036073	205H	A	Chevron U.S.A. Inc.	Government 3	18	28S	28E	MD	1057 GL	-119.00061991900	35.49307016470	Fr NE cor 2254S 1856W
03036194	702H	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	982 KB	-119.01900084000	35.48716580000	Fr NW cor 4421Sly 3013Ely
03036195	703H	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	990 KB	-119.01901416000	35.48806206000	Fr NW cor 4096Sly 3006Ely
03036196	710H	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	951 KB	-119.01914078000	35.48522962000	Fr NW cor 5129Sly 2976Ely
03036197	712H	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	984 KB	-119.01932078000	35.48718437000	Fr NW cor 4417Sly 2916Ely
03036198	713H	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	990 KB	-119.01945218000	35.48809077000	Fr NW cor 4082S 2897E
03036518	74H	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	920 KB	-119.01849248000	35.48048943000	Fr NW cor 1456S 3234E
03036622	73H	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	922 KB	-119.01811938000	35.48069744000	Fr NW 1375S 3340E
03036986	206	A	Chevron U.S.A. Inc.	Government 3	18	28S	28E	MD	1064 GL	-118.99901857700	35.49500479240	Fr NE cor 1558S 1364W

Data in Support of the Aquifer Exemption Boundary Expansion Application, Kern River Formation
Kern River Field, Kern County, California

Table 1: Production Wells Outside 1982 Aquifer Exemption Boundary

API No. ^(a)	Well ID	Well Status	Operator	Lease Name	Section	Township	Range	Base Meridian	Elevation ^(b)	Coordinates ^(c)		Location Description ^(d)
										X	Y	
03038232	701H	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	952 KB	-119.01912257100	35.48603192500	Fr NW cor 4831Sly 2974Ely
03038233	711H	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	963 KB	-119.01964368900	35.48603667700	Fr NW cor 4831Sly 2819Ely
03042522	83	N	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	984 KB	-119.01753930000	35.48440136000	Fr NW cor 20Sly 3455Ely
03042523	84	N	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	959 KB	-119.01634194800	35.48444510300	Fr NW cor 175Sly 3798Ely
03042553	904	N	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	990 KB	-119.01921200000	35.48830900000	Fr NW cor 4054Sly 2869Ely
03042554	903	N	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	990 KB	-119.01951500000	35.48755300000	Fr NW cor 4328Sly 2776Ely
03043930	13	N	Chevron U.S.A. Inc.	U.S.A.	18	28S	28E	MD	1089 GL	-119.00078720900	35.48809482100	Fr NW cor 4044S 3161E
03043931	14	N	Chevron U.S.A. Inc.	U.S.A.	18	28S	28E	MD	1054 GL	-118.99930910600	35.48809843200	Fr NW cor 4037Sly 3601Ely
03043932	15	N	Chevron U.S.A. Inc.	U.S.A.	18	28S	28E	MD	1067 GL	-118.99982108300	35.48810750900	Fr NW cor 4073Sly 3556Ely
03043933	16	N	Chevron U.S.A. Inc.	U.S.A.	18	28S	28E	MD	1119 GL	-118.99819854300	35.48709374600	Fr NW cor 4375Sly 3626Ely
03043934	17	N	Chevron U.S.A. Inc.	U.S.A.	18	28S	28E	MD	1116 GL	-118.99818619900	35.48605797900	Fr NW cor 4824Sly 3596Ely
03045314	526	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	947 KB	-119.01764826300	35.48219200000	Fr NW cor 1002S 3400E
03045774	167	N	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1035 KB	-118.99306383000	35.48421746900	
03045775	168	A	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1020 KB	-118.99356750400	35.48333442000	
03045777	170	N	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1014 KB	-118.99196829400	35.48216434600	
03045778	171	N	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1000 KB	-118.99207000000	35.48358900000	
03045779	172	N	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1000 KB	-118.99210183800	35.48408998700	
03045780	173	A	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1002 KB	-118.99138789900	35.48417077400	
03045781	174	A	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1002 KB	-118.99135561400	35.48367154100	
03045782	175	N	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1008 KB	-118.99135329000	35.48229446800	
03045783	176	A	Chevron U.S.A. Inc.	Wilmar	20	28S	28E	MD	1020 KB	-118.99390375200	35.48334005500	
03046076	19-282	N	Chevron U.S.A. Inc.	U.S.A.	19	28S	28E	MD	1005 KB	-118.99567056700	35.48409847400	
03046077	19-283	N	Chevron U.S.A. Inc.	U.S.A.	19	28S	28E	MD	1006 KB	-118.99562349900	35.48355962600	
03046080	19-287	N	Chevron U.S.A. Inc.	U.S.A.	19	28S	28E	MD	1001 KB	-118.99448182300	35.48440634200	
03049036	25-47R	A	Chevron U.S.A. Inc.	U.S.A.	25	28S	27E	MD	792 KB	-119.02245136200	35.46307594100	Fr NW cor 2610 S'LY & 2095 E'LY
03049037	25-52R	A	Chevron U.S.A. Inc.	U.S.A.	25	28S	27E	MD	810 KB	-119.02230313300	35.46185593900	Fr NW cor 3054 S'LY & 2143 E'LY
03049325	433	N	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1031 KB	-119.01612471300	35.48751409600	Fr NW cor 4356 S'LY & 3792 E'LY
03049326	444	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1042 KB	-119.01596200000	35.48822800000	Fr NW cor 4093 S'LY & 3836 E'LY
03049327	533	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1002 KB	-119.01755609800	35.48763675500	
03049328	544	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1036 KB	-119.01635270800	35.48816458800	
03049329	634	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1002 KB	-119.01774138800	35.48759438400	
03049330	644	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	984 KB	-119.01844313400	35.48816664800	Fr NW cor 4107 S'LY & 3095 E'LY
03049831	333	N	Chevron U.S.A. Inc.	Angus	25	28S	27E	MD	10100 KB	-119.01464151000	35.48742794700	
03051464	101	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	978	-119.01943014700	35.48445647600	171' S, 2881' E from NW corner
03051465	102	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	908	-119.01845824300	35.48446559900	171' S, 3171' E from NW corner
03051467	104	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	908	-119.01863203800	35.48326948400	605' S, 3109' E from NW corner
03051469	106	N	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	966 KB	-119.01860145700	35.48215562800	
03051471	91H	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	929 KB	-119.01858299900	35.48078907100	
03051472	92H	A	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	929 KB	-119.01855573300	35.48092935600	
03052146	86	N	Chevron U.S.A. Inc.	Chanslor	24	28S	27E	MD	930 KB	-119.01764596500	35.48123351600	
03052557	26	A	Chevron U.S.A. Inc.	Government 1	18	28S	28E	MD	1024	-119.00217100000	35.49064600000	3128'S 2741'E fr NW cor
03052682	534	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1034 KB	-119.01617950100	35.48802042200	
03052683	633	A	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	981 KB	-119.01844280500	35.48787488100	
03052925	260	N	Chevron U.S.A. Inc.	Angus	13	28S	27E	MD	1044 KB	-119.01244300000	35.49132600000	2976'S 4895'E fr NW cor
03053537	25H	N	Chevron U.S.A. Inc.	Hotchkiss	10	29S	28E	MD	465	-118.96644897000	35.42203636340	

Notes:
Source: California Department of Oil, Gas, and Geothermal Resources, Online Database
(a) American Petroleum Institute
(b) Datum Elevation in feet relative to Mean Sea Level.
(c) Coordinates in Longitude and Latitude.
(d) Location in feet from indicated Section corner.

Key:
A Active
DF Derrick Floor
GL Ground Level
I Idle
KB Kelly Bushing
MAT Rig Mat
MD Mount Diablo
N New

Table 2: Oil Field Water Supply Well Information

API ^(a)	Well ID	Type and Purpose	Owner	Coordinates ^(b)		Perforated Interval ^(c)	Elevation ^(d)	TD ^(e)	Comments
				X	Y				
03050972	CAU 300 WW	Industrial - Cogeneration Cooling - Active	Chevron	1696397	710435	649-768	668	908	
03050259	WIN 200	Industrial - Cogeneration Cooling - Active	Chevron	1696019	706866	608-810	581	950	
03038798	GRY WS-1	Industrial - General Oilfield Operations - Active	Gray Development	1717923	705380	Chanac: 405-445; 485-525	497	565	Confirmed water production w/ DOGGR through 7/2014; SWS core data; completed in the Chanac below base of oil; likely water is for lease use
03041568	GRY WS-2	Industrial - General Oilfield Operations - Active	Gray Development	1717623	702988	Chanac: 450-706	508	706	Confirmed water production w/ DOGGR through 7/2014
02992042	PRD 106 WW	Industrial - General Oilfield Operations - Inactive	Chevron	1697870	709174		668	856	Possible Active KR Water Source Well (D. Priddy/L Knauer); no data in DOGGR
NA	PRO 105 WW	Industrial - General Oilfield Operations - Inactive	Chevron	1697857	708179		NA	NA	Possible Active KR Water Source Well (D. Priddy/L Knauer); no data in DOGGR
03090001	PRO 107 WW	Industrial - General Oilfield Operations - Inactive	Chevron	1697597	708657		629	848	No data in DOGGR
03090002	RAS 1 WW	Industrial - General Oilfield Operations - Inactive	Chevron	1711236	702802		449	1117	No data in DOGGR
03090003	RAS 2 WW	Industrial - General Oilfield Operations - Inactive	Chevron	1711676	702844		449	1094	No data in DOGGR
03090004	RAS 3 WW	Industrial - General Oilfield Operations - Inactive	Chevron	1711112	703090		453	1111	No data in DOGGR
03090005	RAS 5 WW	Industrial - General Oilfield Operations - Inactive	Chevron	1711446	703088		452	1094	No data in DOGGR
02930256	SJ 101	Industrial - General Oilfield Operations - Inactive	Chevron	1702451	703218	825-1332	496	1955	Possible Active KR Water Source Well (D. Priddy/L Knauer)
03026757	SJ 102R	Industrial - General Oilfield Operations - Inactive	Chevron	1702722	703222	806-1388	504	1530	Possible Active KR Water Source Well (D. Priddy/L Knauer)
02991819	SP 7 WW	Industrial - General Oilfield Operations - Inactive	Chevron	1697728	700331		470	1843	
02900079	USA 1	Industrial - General Oilfield Operations - Inactive	Chevron	1701822	724277	1007-1128	1065	1192	
	EH-345-91	Industrial - General Oilfield Operations - Inactive	Chevron	1700800	703051	590-750	496	750	Former domestic well - previously owned by Gerald Lucas
03007476	25 1001	Water Interdiction Well - Active	Chevron	1696064	714694	1370-1810	844	1870	
03039453	JER1000	Water Interdiction Well - Active	Chevron	1700268	704941	1085-1775	526	2041	
02984447	M1 D 1-5	Water Interdiction Well - Active	Chevron	1701488	705644	672-1735	576	2399	
03003310	PRO 1000	Water Interdiction Well - Active	Chevron	1698010	709215	1169-1655	667	1655	
03038726	PRO 1002	Water Interdiction Well - Active	Chevron	1697776	708259	1200-1791	623	1885	
03006661	SJ 1002	Water Interdiction Well - Active	Chevron	1702995	702888	1060-1700	494	1700	
03035919	SJ 1003	Water Interdiction Well - Active	Chevron	1701651	702939	1335-1611	504	1845	
03002969	TEJ 1000	Water Interdiction Well - Active	Chevron	1697710	711015	1086-1628	699	1632	
03007170	WIN 1000	Water Interdiction Well - Active	Chevron	1699031	706833	1037-1678	577	1690	
03035918	CORTEZ 1000	Water Interdiction Well - Inactive (shut in or abandoned)	Chevron	1703248	704230	1364-1593	534	1686	
03038875	FEB 1000	Water Interdiction Well - Inactive (shut in or abandoned)	Chevron	1700169	706781	830-1594	563	1758	
02983025	FEB 2WD	Water Interdiction Well - Inactive (shut in or abandoned)	Chevron	1700169	707603	654-1370	602	2549	
03006660	SJ 1001	Water Interdiction Well - Inactive (shut in or abandoned)	Chevron	1701690	702899	1100-1740	504	1800	
03003311	TEJ 1001	Water Interdiction Well - Inactive (shut-in or abandoned)	Chevron	1697734	712648	1142-1676	794	1680	
03006331	TM 1001	Water Interdiction Well - Inactive (shut in or abandoned)	Chevron	1704178	701118	1170-1540	466	1565	

Notes:

- (a) API = American Petroleum Institute
- (b) Coordinates are northings and eastings in feet.
- (c) Perforated Interval in feet below ground surface.
- (d) Elevation in feet relative to Mean Sea Level.
- (e) TD = Total Depth in feet below ground surface

Table 3: Water Supply Well Summary

Map ID	Well ID	Township	Range	Section	State Well ID	Owner	Well Type	Well Completion Depth ^(a)	Ground Surface Elevation (TVDS) ^(b)	Well Bottom Elevation (TVDS)	Top of Oil Elevation (TVDS)	Top of C Silt Elevation (TVDS)	Well Bottom Above (+) or Below (-) Top of Oil	Well Bottom Above (+) or Below (-) Top of C Silt
Wells Inside Proposed Aquifer Exemption Boundary														
5	T29S/R28E-06C	29S	28E	6		Dexzel Inc.	Domestic	750	592	-158	-495	-143	337	-15
6	T29S/R28E-02F1	29S	28E	2	29S28E02F001M	John Wilson	Domestic	273	484	250	434	Not present	-184	
7	T29S/R28E-02F2	29S	28E	2		Roger Hatch	Domestic	170	493	313	443	Not present	-130	
8	T29S/R28E-02G3	29S	28E	2		Francis B. Perry	Domestic	200	482	282	307	Not present	-25	
9	T29S/R28E-02L	29S	28E	2		Terry DeLaMater	Domestic	220	461	241	356	Not present	-115	
10	T29S/R28E-02L	29S	28E	2		Dwight Bowers	Domestic	175	465	290	372	Not present	-82	
11	T29S/R28E-08F2	29S	28E	8		Alon Asphalt Bakersfield Inc.	Domestic		468	468	-141	10		458
12	T29S/R28E-08F1	29S	28E	8		Alon Asphalt Bakersfield Inc.	Domestic		474	474	-53	10		464
13	T29S/R28E-08K	29S	28E	8		John Hershey	Irrigation	1001	435	-568	-574	-168	6	-400
14	T29S/R28E-08L01	29S	28E	8		River Ranch HOA	Municipal	970	445	-505	-547	-108	42	-397
Wells Outside Proposed Aquifer Exemption Boundary														
1	T28S/R28E-07Q1	28S	28E	7			Unknown		1122		286	668		
2	T28S/R27E-24K1	28S	27E	24		Dwight Grimes	Domestic	800	924	124	12	230	112	-106
3	T28S/R27E-36N	28S	27E	36		Oildale Mutual Water Company	Municipal	970	608	-362	-882	-154	520	-208
4	T29S/R27E-01K1	29S	27E	1		Vincent Antogiovanni	Irrigation	450	538	88	-1225	-300	1313	388
15	T29S/R28E-10M	29S	28E	10	WWDR 381241	Derrel's Mini Storage	Domestic	460	474	14	-200	284	214	-270
16	1503392-001	29S	28E	10		Rep. Kevin Flem (420 Club)	Domestic	420	483	63	-60	384	123	-321
17	T29S/R28E-10K1	29S	28E	10		Terry J. Easton	Domestic	248	505	255	-46	415	300	-160
18	T29S/R28E-10K2	29S	28E	10		Tom & Donna Chisum	Domestic	300	513	213	-43	418	256	-205
19	T29S/R28E-10K	29S	28E	10		Ace Stables	Domestic	310	503	173	-10	443	182	-270
20	T29S/R28E-07Q	29S	28E	7		Val Butler	Domestic	250	424	174	-1368	-338	1542	511
21	T29S/R28E-18B	29S	28E	18		Irma Roberston	Irrigation	415	419	4	-1521	-357	1525	361
22	T29S/R28E-18	29S	28E	18		Wm Robertson	Domestic	300	419	119	-1525	-358	1645	477
23	T29S/R28E-18	29S	28E	18		Priscilla Mueller	Domestic	300	423	123	-1345	-326	1467	449
24	T29S/R28E-18A	29S	28E	18		Riviera Stables	Irrigation	300	422	122	-1465	-343	1587	465
25	T29S/R28E-18A	29S	28E	18		Rancho Not So Grande	Domestic	50	422	372	-1366	-329	1739	702
26	1503310-001	29S	28E	17		Ranchos Rio Equestrian Center	Unknown		645		-1085	-349		
27	T29S/R28E-18G	29S	28E	18		Bill Norman	Domestic	250	419	169	-1722	-356	1891	524
28	1500553-003	29S	28E	17		Ranchos Del Rio Mutual Water Company	Municipal	382	433	51	-1638	-357	1689	408
29	T29S/R28E-18	29S	28E	18		Ranchos Del Rio Mutual Water Company	Municipal	420	435	35	-1638	-357	1673	392
30	T29S/R28E-17H1	29S	28E	17		Greenlawn Memorial Park	Irrigation	390	616	226	-1237	-335	1463	561

Notes:

(a) Completion depth in feet below ground surface, bottom of screen where available, otherwise total depth.

(b) Elevations are in feet relative to Mean Sea Level.

Blank cells in table indicate data not available.

Table 4: Water Quality Data Summary for Water Sources Identified in Proximity to Proposed Aquifer Exemption Boundary

Well GIS_ID3	Within 500 ft.	Well ^(a) ID	Sampling Date	Ca ^(b) mg/l ^(j)	Mg ^(c) mg/l	Na ^(d) mg/l	K ^(e) mg/l	Iron µg/l ^(k)	Mn ^(f) µg/l	Bicarbonate Alkalinity mg/l	Chloride mg/l	Nitrate (NO ₃) mg/l	Sulfate mg/l	As ^(g) µg/l	Boron mg/l	EC ^(h) umhos/cm ⁽ⁱ⁾	TDS ^(l) mg/l
2	1	T28S/R27E-24K01	4/30/2003	1.4	0.06	60	0.6	<100 ^(m)	<20	83	27	<2.0	2.1	<2.0	<0.1	320	230
6	-	29S28E02F001M	11/16/1955	NA	2	NA	3	NA	NA	NA	16	0.1	48	NA	0.2	378	NA
12	1	29S28E08F001M	12/6/1955	NA	8	NA	3	NA	NA	NA	55	0	45	NA	0.15	530	NA
14	0	29S/28E-08L01 (RRHOA)	10/28/2013	20	3	29	2	<100	<20	77	17	6	20	<2.0	NA ⁽ⁿ⁾	270	170
14	0	29S/28E-08L01 (RRHOA)	12/19/2014	19	3	30	2	65	58	100	12	6	20	0.76J	0	270	170
26	0	1503310-001	7/9/1997	NA	NA	NA	NA	NA	101	NA	NA	0	NA	NA	NA	NA	NA
26	0	1503310-001	4/15/1998	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	0	1503310-001	3/29/2000	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	0	1503310-001	9/23/2005	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	0	1503310-001	6/22/2006	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA
26	0	1503310-001	5/8/2008	NA	NA	NA	NA	NA	NA	NA	NA	< 0	NA	NA	NA	NA	NA
26	0	1503310-001	5/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	< 0	NA	NA	NA	NA	NA
26	0	1503310-001	5/5/2011	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
26	0	1503310-001	5/24/2012	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
26	0	1503310-001	12/17/2013	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	0	1503310-001	12/11/2014	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
28	0	1500553-003	3/18/2002	NA	NA	NA	NA	NA	48	0	5	< 0.4	13	< 1	NA	210	135
28	0	1500553-003	12/8/2005	NA	NA	NA	NA	NA	71	0	5	< 0.44	12	< 2	NA	190	120
28	0	1500553-003	6/11/2008	NA	NA	NA	NA	NA	44	0	6	< 0.44	15	< 2	NA	204	140
28	0	1500553-003	12/8/2014	NA	NA	NA	NA	NA	52	0	5	1	14	< 2	NA	211	140
Station 36 Influent				30.8	5.3	125	5.5	3.9	0.1	254	123.8	ND	34.1	NA	NA	1100	583
Station 36 Effluent				27.4	5.6	113	5.8	3.5	0.1		112	NA	1.7	NA	NA	7181	614
Statistics																	
Count				3	5	3	5	1	6	7	9	11	9	0	3	9	7
Average				13	3.29	40	2.02	65	62	37	16	1.63	21	0	0.12	287	158
Maximum				20.0	8	60	3	65	101	100	55	6.1	48	0	0.2	530	230
Minimum				1.4	0.06	29	0.6	65	44	0.034	4.5	0	2.1	0	0	190	120

Notes:

(a) Well identification number as provided in Table 3

(b) Ca = Calcium

(c) Mg = Magnesium

(d) Na = Sodium

(e) K = Potassium

(f) Mn = Manganese

(g) As = Arsenic

(h) EC = Electrical Conductivity

(i) TDS = Total Dissolved Solids

(j) mg/l = milligrams per liter

(k) µg/l = micrograms per liter

(l) umhos/cm = micromhos per centimeter

(m) "<" indicates analyte not detected above listed reporting limit.

(n) "NA" indicates not available or not analyzed.

Table 5: Water Quality Data Summary for River Ranch Home Owner's Association Well

Well ^(a) ID	Sampling Date	Ca ^(b) mg/l ^(j)	Mg ^(c) mg/l	Na ^(d) mg/l	K ^(e) mg/l	Iron µg/l ^(k)	Mn ^(f) µg/l	Bicarbonate Alkalinity mg/l	Chloride mg/l	Nitrate (NO ₃) mg/l	Sulfate mg/l	As ^(g) µg/l	Boron mg/l	EC ^(h) umhos/cm ^(l)	TDS ⁽ⁱ⁾ mg/l
29S/28E-08L01	10/28/2013	20	3.4	29	1.5	<100 ^(m)	<20	77	17	6.1	20	<2.0	NA ⁽ⁿ⁾	270	170
29S/28E-08L01	12/19/2014	19	3.0	30	1.7	65	58	100	12	5.5	20	0.76J	0.15	270	170

- Notes:**
- (a) Well identification number as provided in Table 3
 - (b) Ca = Calcium
 - (c) Mg = Magnesium
 - (d) Na = Sodium
 - (e) K = Potassium
 - (f) Mn = Manganese
 - (g) As = Arsenic
 - (h) EC = Electrical Conductivity
 - (i) TDS = Total Dissolved Solids
 - (j) mg/l = Milligrams per liter
 - (k) ug/l = micrograms per liter
 - (l) umhos/cm = micromhos per centimeter
 - (m) "<" indicates analyte not detected above listed reporting limit.
 - (n) "NA" indicates not available.

Table 6: Water Quality Data Summary for Water Wells within 1982-Approved Aquifer Exemption Boundary

Well GIS ID3	Within 500 ft.	Well ^(a) Number	Sampling Date	Ca ^(b) mg/l ^(j)	Mg ^(c) mg/l	Na ^(d) mg/l	K ^(e) mg/l	Iron µg/l ^(k)	Mn ^(f) µg/l	Bicarbonate Alkalinity mg/l	Chloride mg/l	Nitrate (NO ₃) mg/l	Sulfate mg/l	As ^(g) µg/l	Boron mg/l	EC ^(h) umhos/cm ^(l)	TDS ⁽ⁱ⁾ mg/l
Well Screened Within Oil bearing Zone																	
6	-	29S28E02F001M	11/16/1955	NA	2	NA	3	NA	NA	NA	16	0.1	48	NA	0.2	378	NA
Well Screened Above Oil bearing Zone																	
12	1	29S28E08F001M	12/6/1955	NA	8	NA	3	NA	NA	NA	55	0	45	NA	0.15	530	NA
14	0	29S/28E-08L01 (RRHOA)	10/28/2013	20	3	29	2	<100 ^(m)	<20	77	17	6	20	<2.0	NA ⁽ⁿ⁾	270	170
14	0	29S/28E-08L01 (RRHOA)	12/19/2014	19	3	30	2	65	58	100	12	6	20	0.76J	0	270	170

Statistics

Well Screened Within Oil bearing Zone																	
			Count	0	1	0	1	0	0	0	1	1	1	0	1	1	0
			Average	0.00	2.00	0.00	3.00	0.00	0.00	0.00	16	0.10	48	0	0.20	378	0.00
			Maximum	0.0	2	0	3	0	0	0	16	0.1	48	0	0.2	378	0
			Minimum	0.0	2	0	3	0	0	0	16	0.1	48	0	0.2	378	0
Well Screened Above Oil bearing Zone																	
			Count	2	3	2	3	1	1	2	3	3	3	0	2	3	2
			Average	20	4.80	30	2.17	65	58	89	28	4.03	28	0	0.08	357	170
			Maximum	20.0	8	30	3	65	58	100	55	6.1	45	0	0.15	530	170
			Minimum	19.0	3	29	1.5	65	58	77	12	0	20	0	0	270	170
Comprehensive																	
			Count	2	4	2	4	1	1	2	4	4	4	0	3	4	2
			Average	20	4.10	30	2.38	65	58	89	25	3.05	33	0	0.12	362	170
			Maximum	20.0	8	30	3	65	58	100	55	6.1	48	0	0.2	530	170
			Minimum	19.0	2	29	1.5	65	58	77	12	0	20	0	0	270	170

Notes:

(a) Well identification number as provided in Table 3

(b) Ca = Calcium

(c) Mg = Magnesium

(d) Na = Sodium

(e) K = Potassium

(f) Mn = Manganese

(g) As = Arsenic

(h) EC = Electrical Conductivity

(i) TDS = Total Dissolved Solids

(j) mg/l = Milligrams per liter

(k) µg/l = micrograms per liter

(l) umhos/cm = micromhos per centimeter

(m) "<" indicates analyte not detected above listed reporting limit.

(n) "NA" indicates not available.

Table 7: Water Quality Data Summary for Water Wells Completed Above or Outside Oil-Bearing Zone

Well GIS_ID3	Within 500 ft.	Well ^(a) Number	Sampling Date	Ca ^(b) mg/l ^(j)	Mg ^(c) mg/l	Na ^(d) mg/l	K ^(e) mg/l	Iron µg/l ^(k)	Mn ^(f) µg/l	Bicarbonate Alkalinity mg/l	Chloride mg/l	Nitrate (NO ₃) mg/l	Sulfate mg/l	As ^(g) µg/l	Boron mg/l	EC ^(h) umhos/cm ^(l)	TDS ⁽ⁱ⁾ mg/l
Wells Screened Above Oil bearing Zone																	
12	1	29S28E08F001M	12/6/1955	NA	8	NA	3	NA	NA	NA	55	0	45	NA	0.15	530	NA
14	0	29S/28E-08L01 (RRHOA)	10/28/2013	20	3	29	2	<100	<20	77	17	6	20	<2.0	NA ⁽ⁿ⁾	270	170
14	0	29S/28E-08L01 (RRHOA)	12/19/2014	19	3	30	2	65	58	100	12	6	20	0.76J	0	270	170
Wells Screened Outside Oil bearing Zone																	
2	1	T28S/R27E-24K01	4/30/2003	1.4	0.06	60	0.6	<100 ^(m)	<20	83	27	<2.0	2.1	<2.0	<0.1	320	230
26	0	1503310-001	7/9/1997	NA	NA	NA	NA	NA	101	NA	NA	0	NA	NA	NA	NA	NA
26	0	1503310-001	4/15/1998	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	0	1503310-001	3/29/2000	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	0	1503310-001	9/23/2005	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	0	1503310-001	6/22/2006	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA
26	0	1503310-001	5/8/2008	NA	NA	NA	NA	NA	NA	NA	NA	< 0	NA	NA	NA	NA	NA
26	0	1503310-001	5/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	< 0	NA	NA	NA	NA	NA
26	0	1503310-001	5/5/2011	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
26	0	1503310-001	5/24/2012	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
26	0	1503310-001	12/17/2013	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	0	1503310-001	12/11/2014	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
28	0	1500553-003	3/18/2002	NA	NA	NA	NA	NA	48	0	5	< 0.4	13	< 1	NA	210	135
28	0	1500553-003	12/8/2005	NA	NA	NA	NA	NA	71	0	5	< 0.44	12	< 2	NA	190	120
28	0	1500553-003	6/11/2008	NA	NA	NA	NA	NA	44	0	6	< 0.44	15	< 2	NA	204	140
28	0	1500553-003	12/8/2014	NA	NA	NA	NA	NA	52	0	5	1	14	< 2	NA	211	140
Statistics																	
Wells Screened Above Oil bearing Zone																	
		Count		2	3	2	3	1	1	2	3	3	3	0	2	3	2
		Average		0.00	4.80	0.00	2.17	0.00	0.00	0.00	28	4.03	28	0	0.08	357	0.00
		Maximum		20.0	8	30	3	65	58	100	55	6.1	45	0	0.15	530	170
		Minimum		19.0	3	29	1.5	65	58	77	12	0	20	0	0	270	170
Wells Screened Outside Oil bearing Zone																	
		Count		1	1	1	1	0	5	5	5	7	5	0	0	5	5
		Average		1.40	0.06	60	0.60	#DIV/0!	63	17	9.44	0.82	11	0	#DIV/0!	227	153
		Maximum		1.4	0.06	60	0.6	0	101	83	27	2	15	0	0	320	230
		Minimum		1.4	0.06	60	0.6	0	44	0.034	4.5	0.4	2.1	0	0	190	120
Comprehensive																	
		Count		3	4	3	4	1	6	7	8	10	8	0	2	8	7
		Average		13	3.62	40	1.78	65	62	37	16	1.79	18	0	0.08	276	158
		Maximum		20.0	8	60	3	65	101	100	55	6.1	45	0	0.15	530	230
		Minimum		1.4	0.06	29	0.6	65	44	0.034	4.5	0	2.1	0	0	190	120

Notes:

(a) Well identification number as provided in Table 3

(b) Ca = Calcium

(c) Mg = Magnesium

(d) Na = Sodium

(e) K = Potassium

(f) Mn = Manganese

(g) As = Arsenic

(h) EC = Electrical Conductivity

(i) TDS = Total Dissolved Solids

(j) mg/l = Milligrams per liter

(k) µg/l = micrograms per liter

(l) umhos/cm = micromhos per centimeter

(m) "<" indicates analyte not detected above listed reporting limit.

(n) "NA" indicates not available.

Table 8: Chevron Interdiction Well Water Quality Data Summary

API ^(a)		Ca ^(b)	Mg ^(c)	Na ^(d)	K ^(e)	Iron	Mn ^(f)	HCO ₃ ^(g)	CO ₃ ^(h)	OH ⁽ⁱ⁾	Chloride	Nitrate (NO ₃)	Sulfate	As ^(j)	Boron	EC ^(k)	TDS ^(l)
Number		mg/l ^(m)	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm ⁽ⁿ⁾	mg/l
-	Cawelo Discharge	23.2	3.7	147.0	6.3	0.6	-	320.7	0.2	-	122.0	-	9.9	< 0.002	1.0	900.0	634.4
03035918	Well Sample	3.0	0.2	59.2	0.9	0.6	-	119.4	0.2	-	25.0	< 0.010	0.0	< 0.300	0.1	303.5	208.3
03038875	Fee B 1000	176	57	203	20	224	-	235	0	-	1285	-	2	0.209	2	3663	2084
02983025	Fee B 2 WD	6.5	0.2	172.3	1.2	0.6	-	117.3	2.4	0.0	230.9	< 0.010	2.1	0.153	0.3	888.5	536.3
03090007	Fee B, WSW 1	20.9	0.6	134.2	6.0	-	-	205.0	0.0	-	119.1	0.47	13.3	-	-	-	393.5
02984447	MI-DI-5	30.3	3.3	109.5	5.5	0.4	-	329.1	0.2	-	131.6	< 0.010	0.3	< 0.005	0.5	955.0	610.7
03003310	Producers 1000	29.0	7.2	114.7	2.2	0.3	-	339.2	0.1	0.0	81.7	0.14	0.2	< 0.034	0.2	855.7	589.3
03038726	Producers 1002	26.7	6.3	80.3	3.3	0.4	-	275.3	0.2	-	84.5	< 0.010	0.4	5.379	0.1	700.4	480.6
03006660	San Joaquin 1001/Reservoir B Outfall	33.2	8.9	80.5	4.3	1.8	-	240.8	1.0	1.0	67.0	1.53	16.5	-	-	662.0	445.9
03006661	San Joaquin 1002	5.9	0.6	42.0	0.7	0.1	-	79.9	0.2	-	41.1	< 0.010	5.6	< 0.201	0.1	258.3	176.1
03035919	San Joaquin 1003	31.6	3.8	71.7	2.3	0.3	-	157.6	0.2	-	141.2	< 0.010	0.4	0.123	0.2	623.7	409.1
02930257	San Joaquin 102	270	9.8	150	5.8	4.3	0.31	369	6	3.3	245	0.40	459	< 0.001	-	1940	1380
03003458	Sec. 25 1000	5.2	0.4	126.0	0.9	0.0	-	146.2	0.6	0.0	115.5	0.00	0.1	0.000	-	633.5	407.9
03007478	Sec. 25 1003	94.8	19.3	115.0	13.8	65.2	-	45.3	0.0	0.0	530.0	0.00	0.0	0.000	-	1750.0	941.6
03006331	T&M 1001	6.5	0.8	38.4	0.5	0.0	-	79.3	0.0	0.0	25.8	-	3.6	-	-	226.0	186.6
03002969	Tejon 1000	28.7	5.3	104.8	2.6	0.1	-	310.0	0.1	0.0	83.9	< 0.008	0.0	0.193	0.4	779.5	543.3
03003311	Tejon 1001	28.7	5.6	123.0	2.8	0.0	-	313.3	0.0	0.0	77.0	-	0.0	-	-	850.0	591.5
03007170	Winspear 1000	37.8	9.9	96.0	3.1	0.5	-	353.1	0.1	0.0	54.2	0.03	0.3	0.147	0.3	765.2	555.6
02998807	WW #2 Sec. 1 29S/27E	2.3	1.0	82.0	-	-	-	117.4	10.7	0.0	50.4	-	2.6	-	-	-	-
-	Total Interdiction Water (Comingled point) 24" Pipe	23.5	7.0	135.0	1.8	1.0	-	334.1	0.2	-	81.4	0.01	0.5	0.100	0.1	850.0	583.3
Median		26.7	3.8	114.7	2.7	0.4	0.3	234.9	0.2	0.0	84.5	0.0	0.5	0.1	0.3	779.5	539.8
Minimum		2.3	0.2	38.4	0.5	0.0	0.3	45.3	0.0	0.0	25.0	0.0	0.0	0.0	0.1	226.0	176.1
Maximum		270	57	203	20	224	0	369	11	3	1285	2	459	5	2	3663	2084

Notes:
All values are averages of available data collected from each well.
(a) API = American Petroleum Institute
(b) Ca = Calcium
(c) Mg = Magnesium
(d) Na = Sodium
(e) K = Potassium
(f) Mn = Manganese
(g) HCO3 = Bicarbonate
(h) CO3 = Carbonate
(i) OH = Hydroxide
(j) As = Arsenic
(k) EC = Electrical Conductivity
(l) TDS = Total Dissolved Solids
(m) mg/l = Milligrams per liter
(n) umhos/cm = micromhos per centimeter

Figures



Figure 1 – Location Map

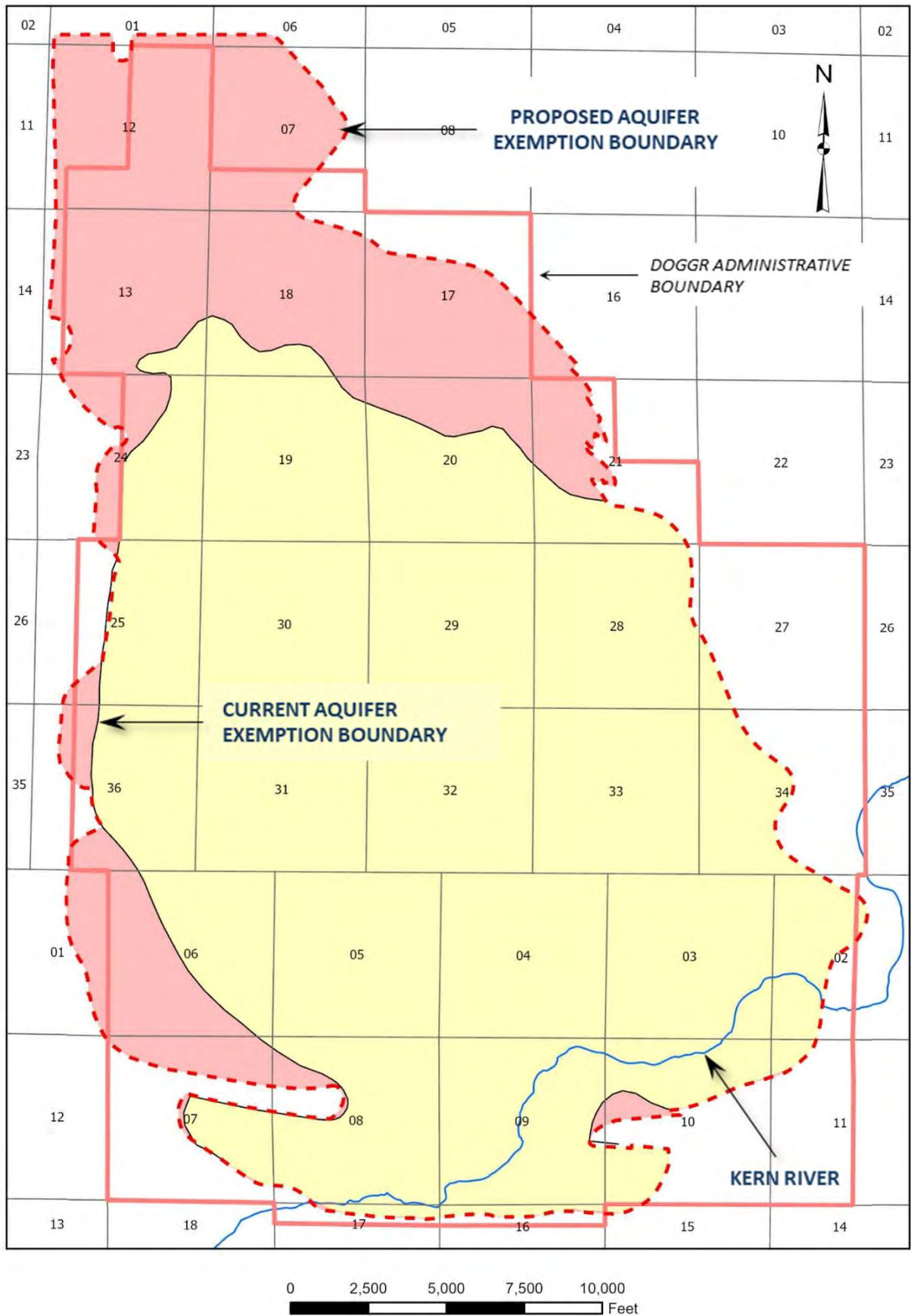


Figure 2 – Proposed Kern River Aquifer Exemption Boundary

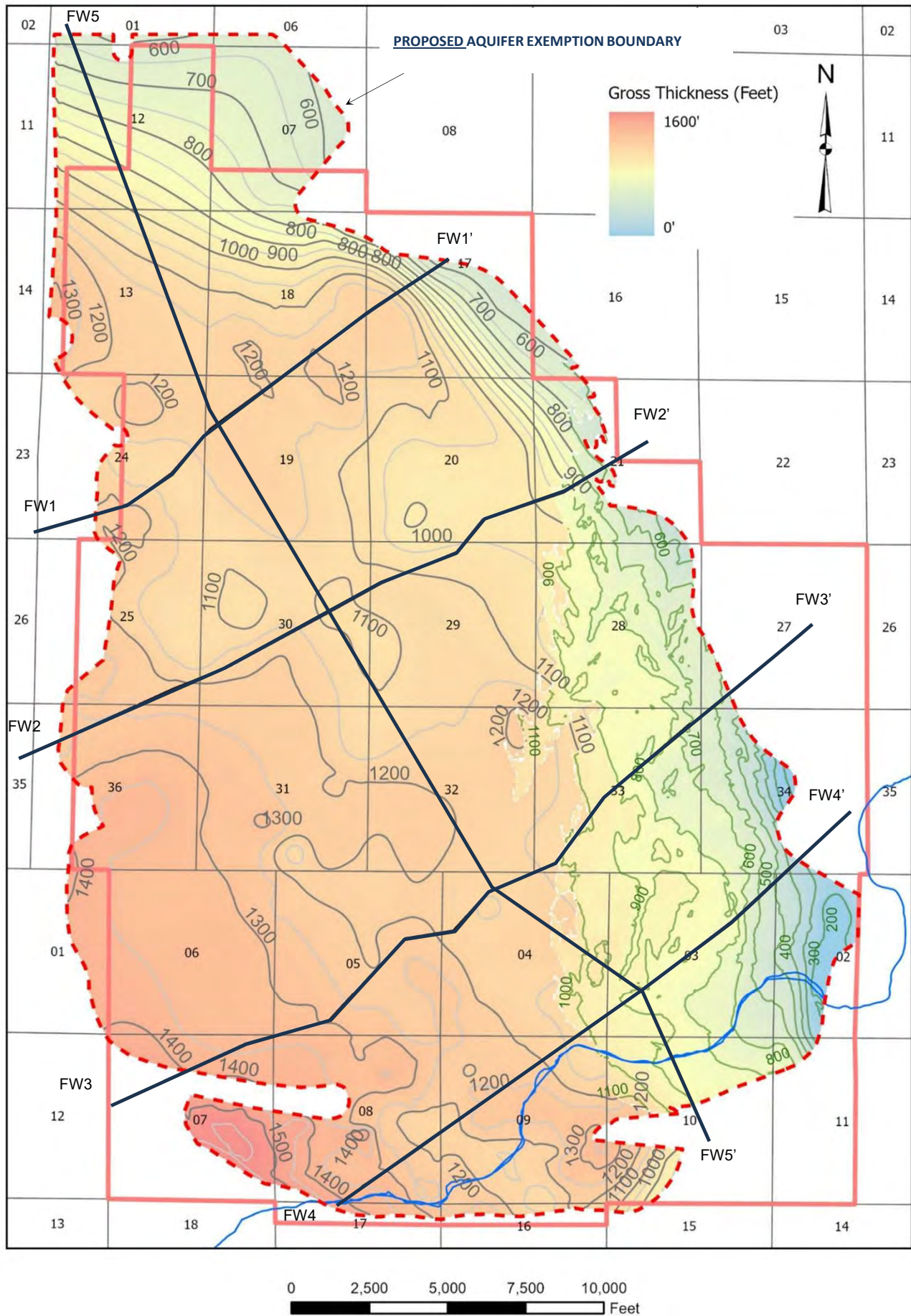
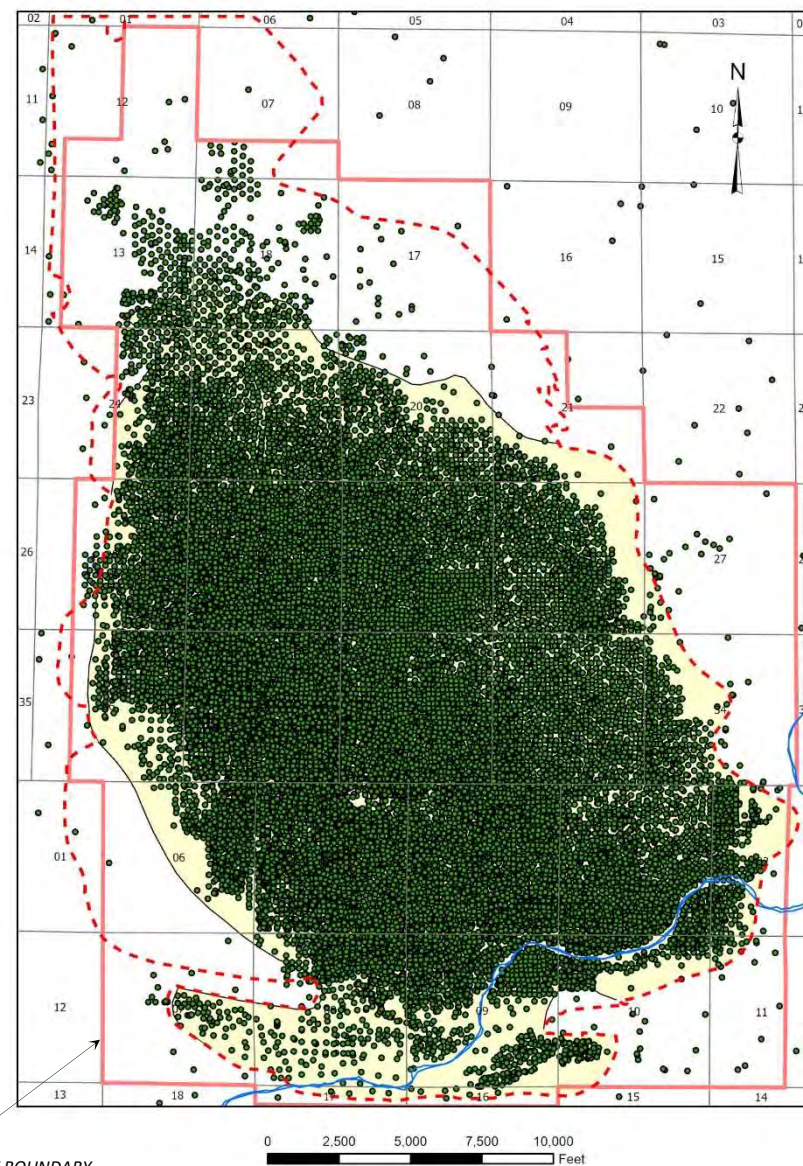
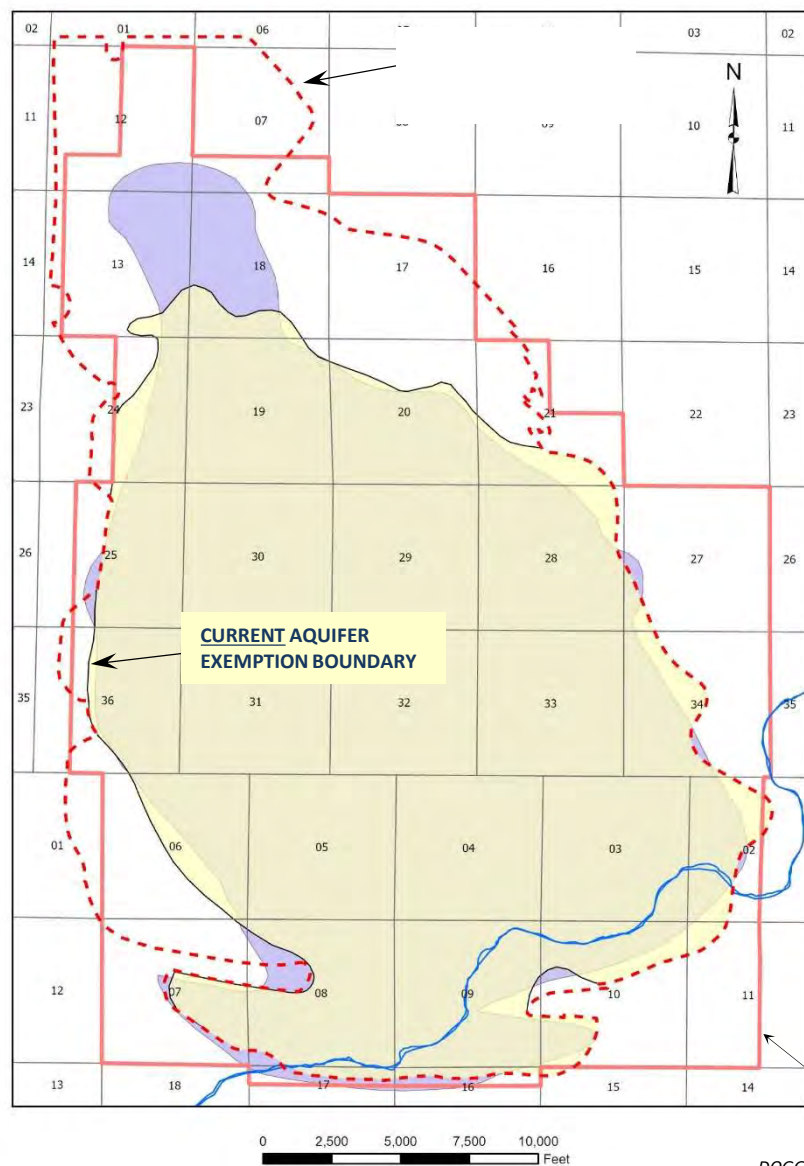


Figure 3 – Gross Interval Thickness Map of Proposed Aquifer Exemption Zone



- 1973-74 DOGGR Field Boundary: The Kern River field limit establishing the exempt aquifer boundary
- 1982 DOGGR Field Boundary: Boundary was modified to reflect field activity and expansion but the aquifer exemption limit was held at the previously established 1973-74 field boundary

Figure 4 – CalGEM Field Boundaries and Well Locations

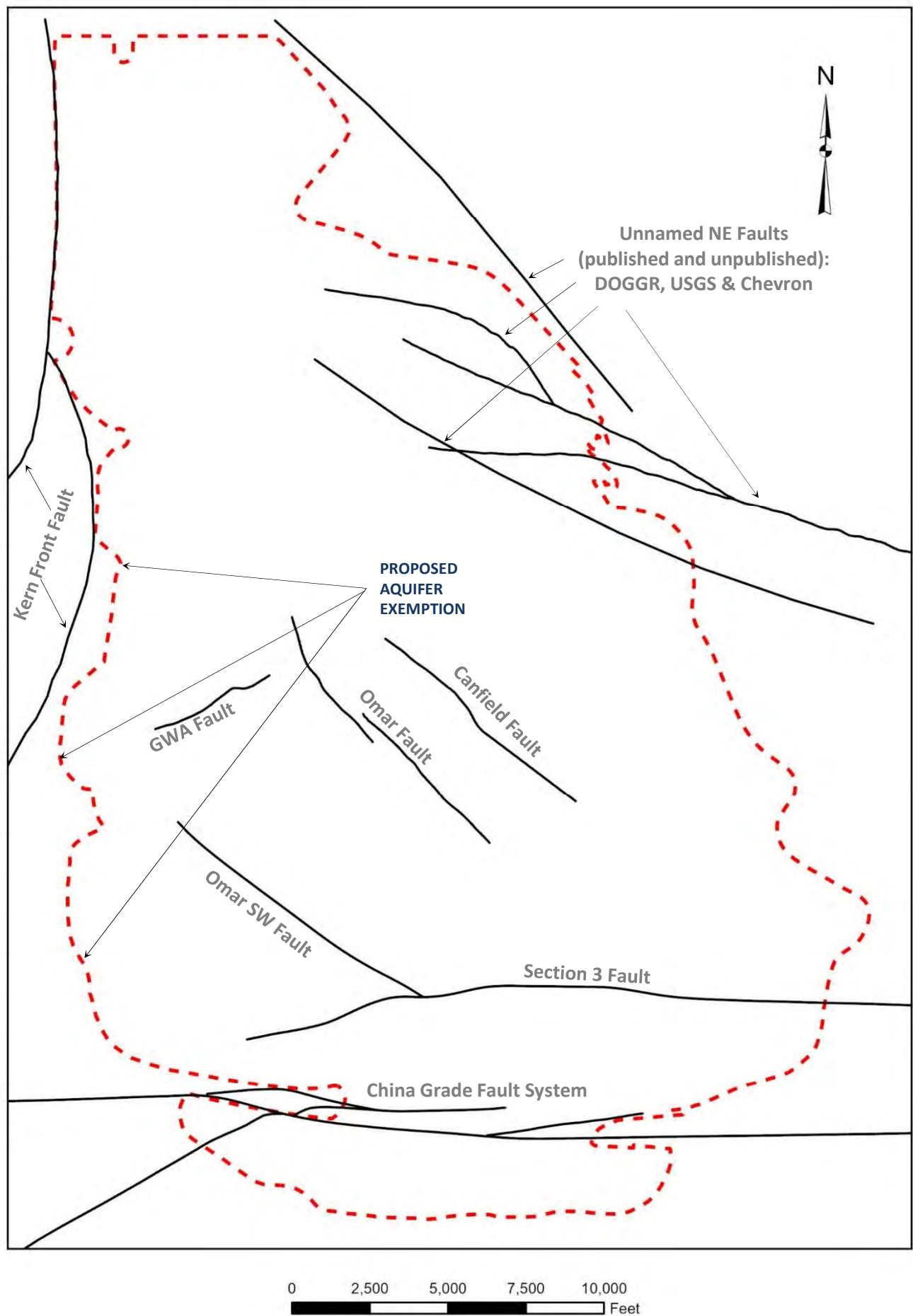


Figure 5 - Faults

FW1

FW1'

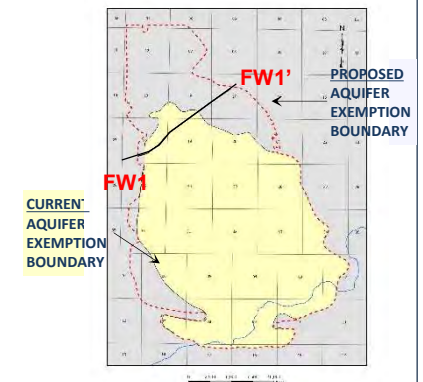
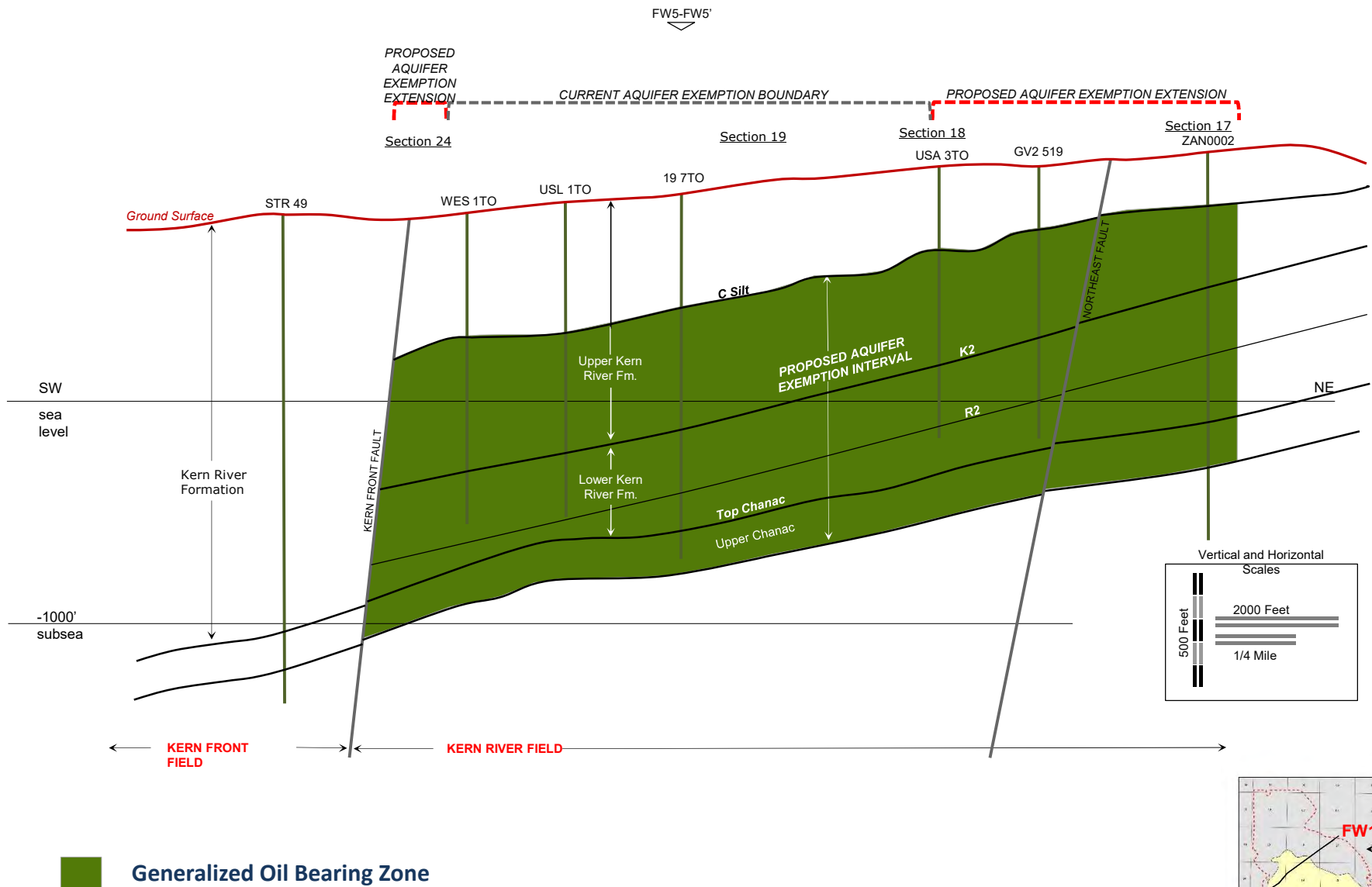


Figure 6 – Cross Section FW1-FW1' Proposed Aquifer Exemption Zone

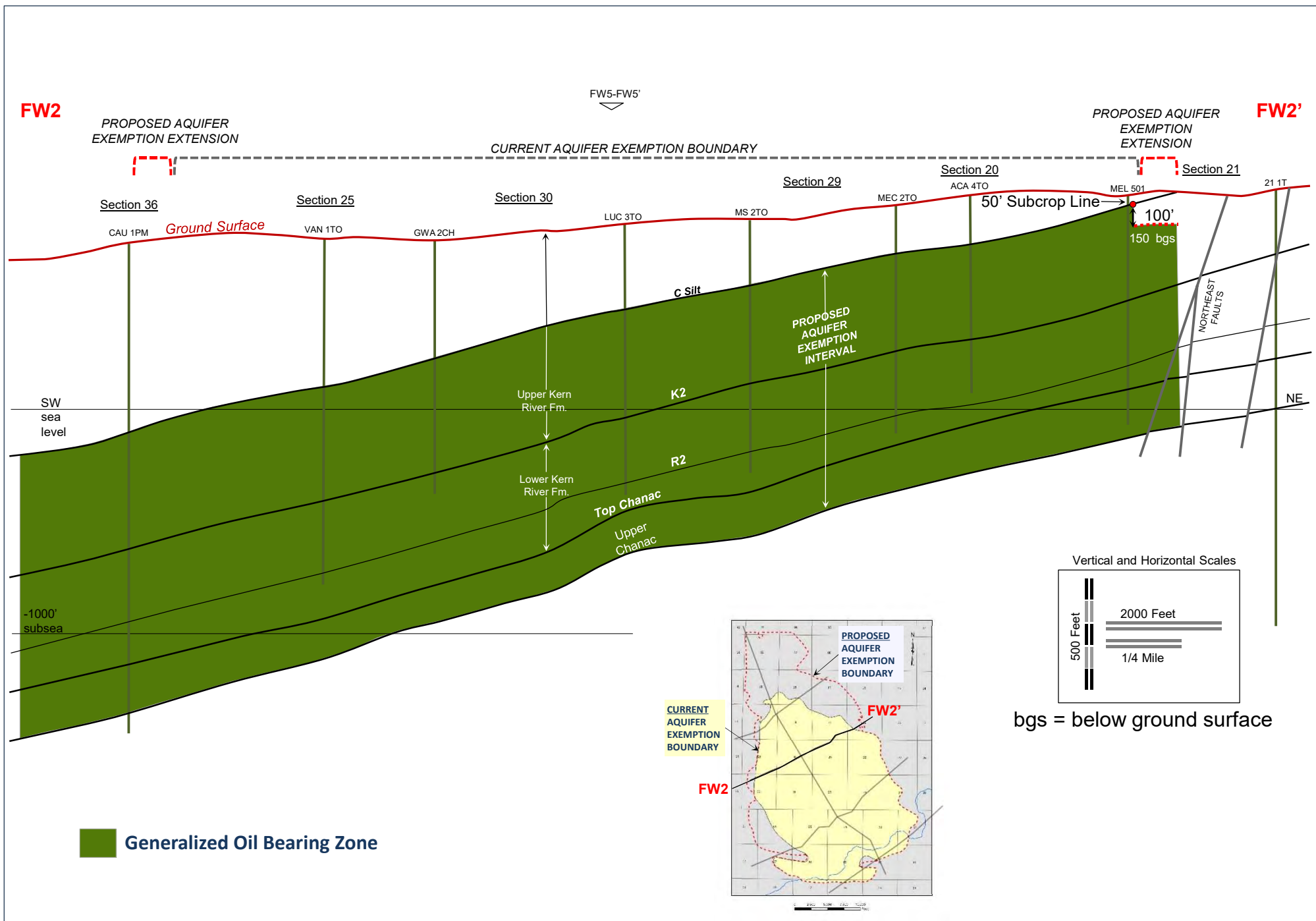


Figure 7 – Cross Section FW2-FW2' Proposed Aquifer Exemption Zone

FW3

FW3'

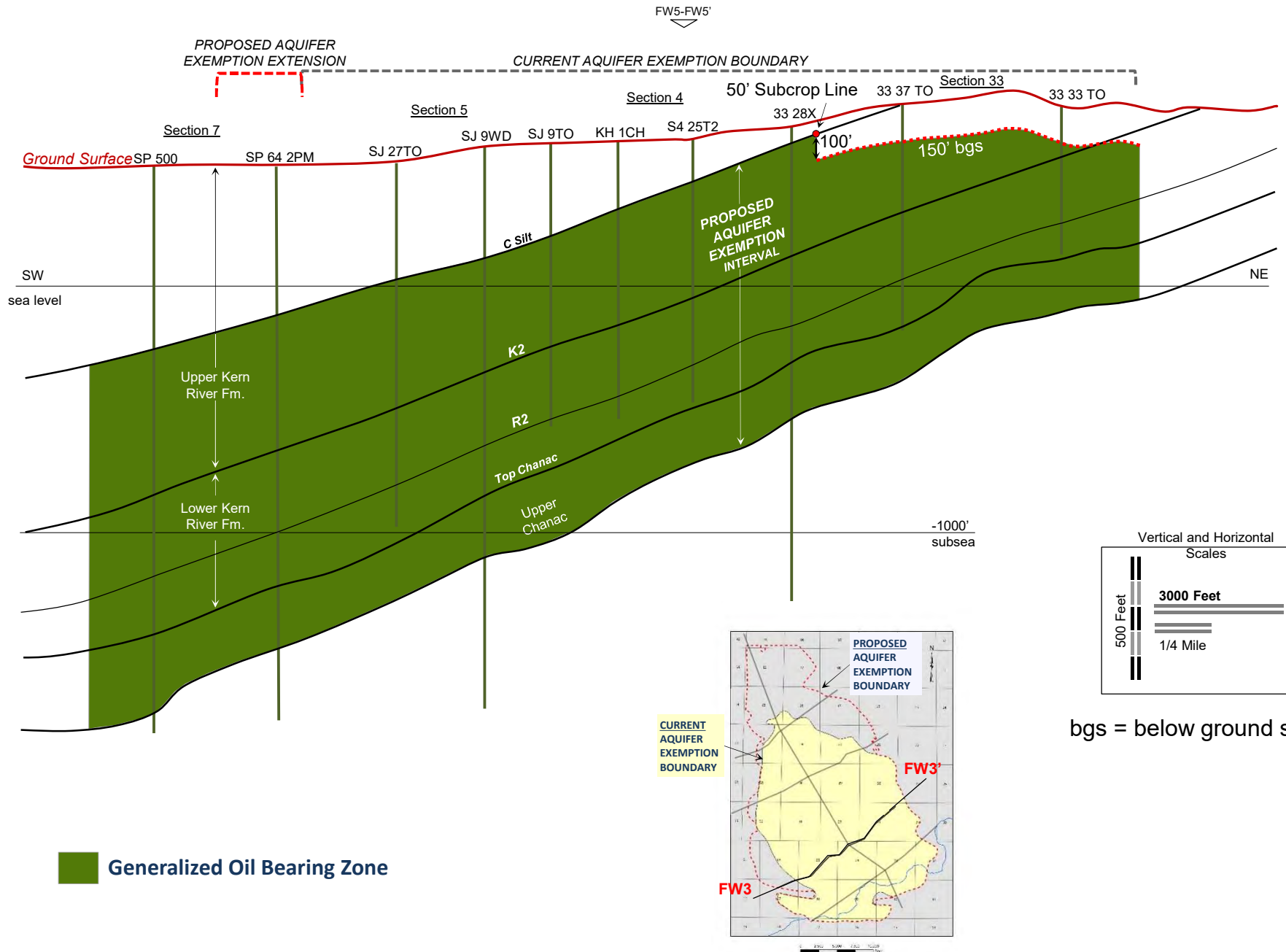


Figure 8 – Cross Section FW3-FW3' Proposed Aquifer Exemption Zone

FW4

FW4'

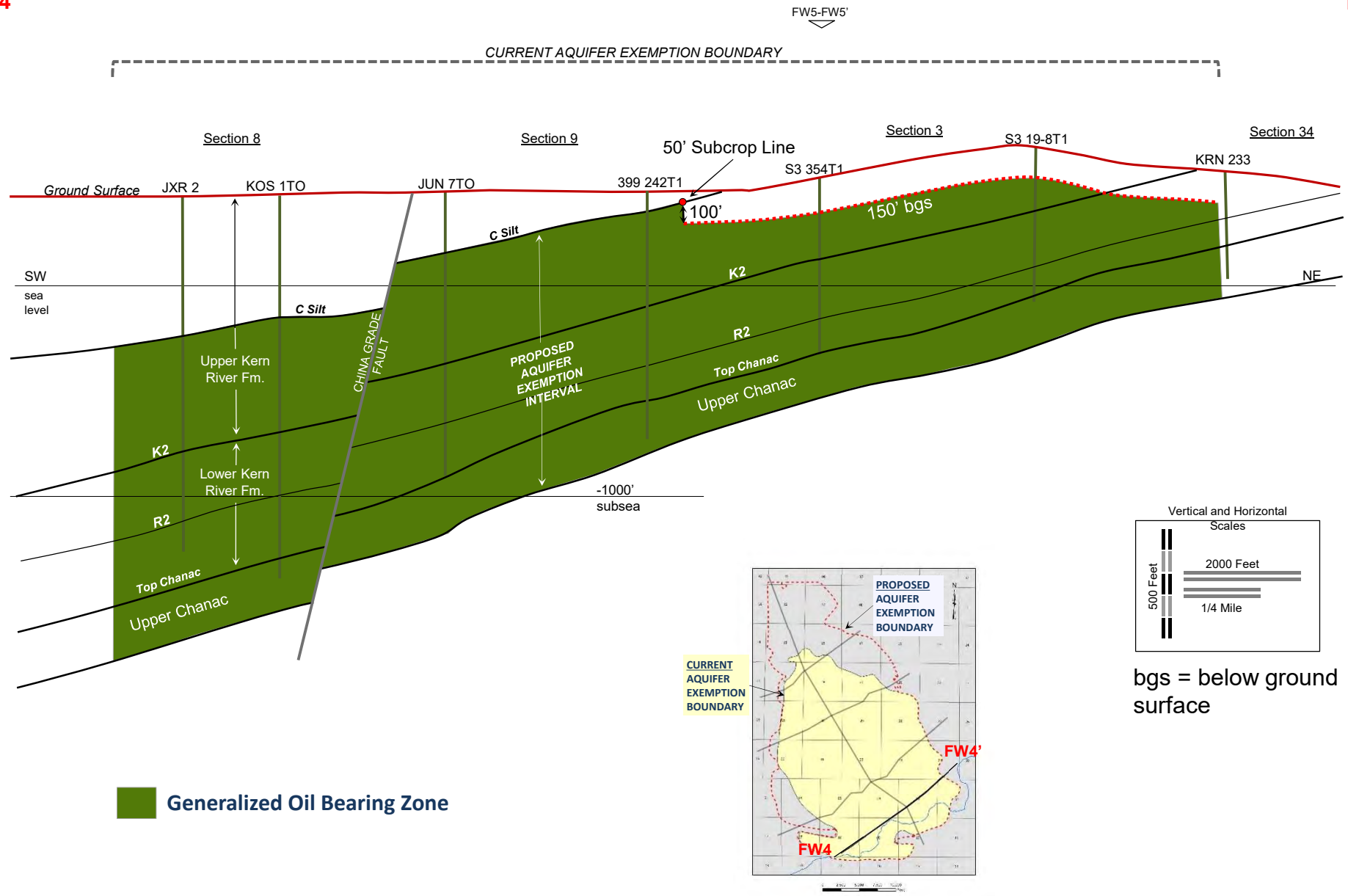
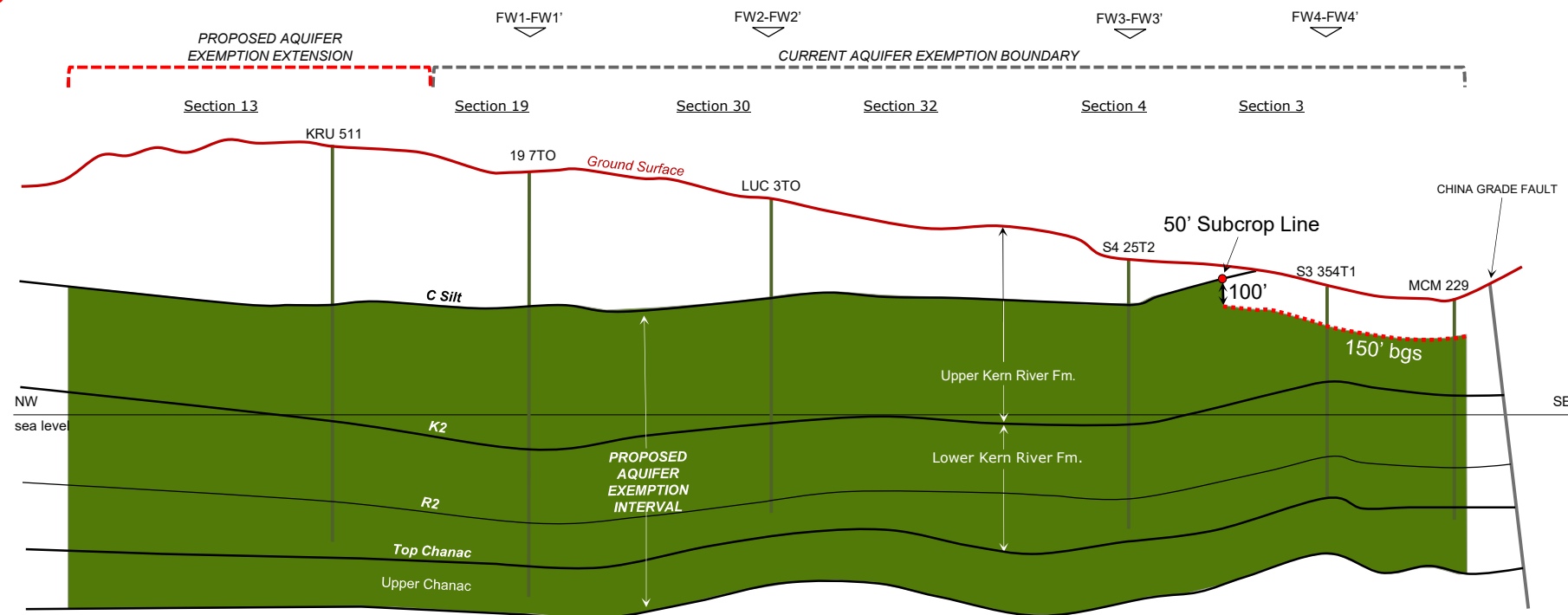


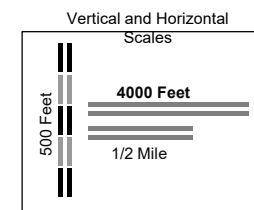
Figure 9 – Cross Section FW4-FW4' Proposed Aquifer Exemption Zone

FW5

FW5'



-1000' subsea



Generalized Oil Bearing Zone

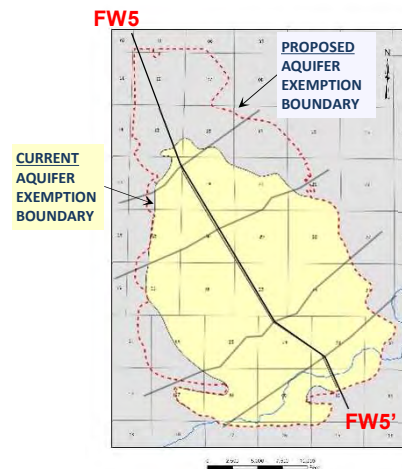


Figure 10 – Cross Section FW5-FW5' Proposed Aquifer Exemption Zone

Kern River - Type Log

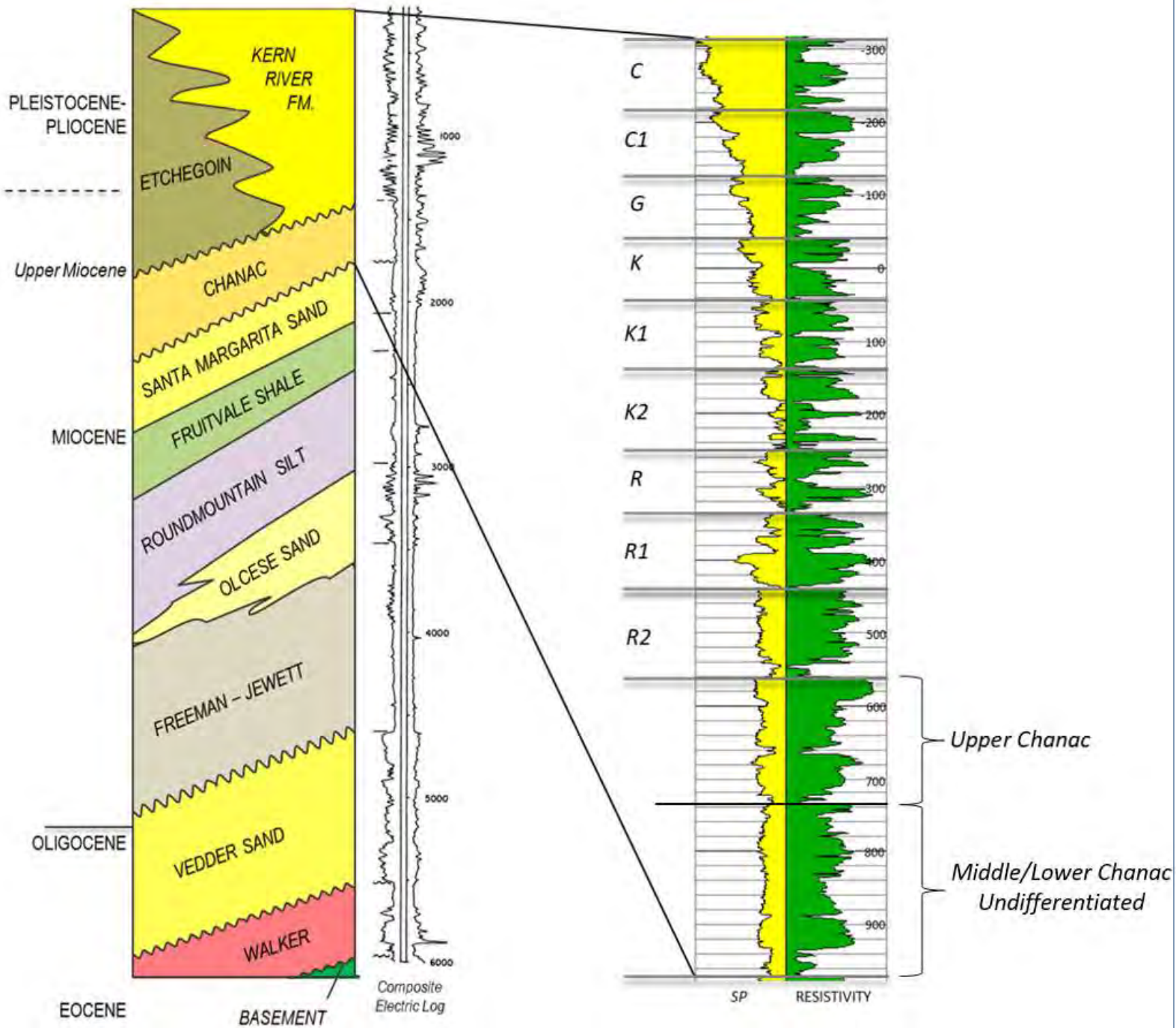


Figure 11 – Lithology and Stratigraphic Framework



Explanation

Field boundary for Kern River Oil Field

Bend in section line

Geology

Qoa2 Older Alluvium (Pleistocene)

Unconformity

QTkr Kern River formation (Pleistocene?, Pliocene, and Upper Miocene)

Te Etchegoin Formation (Upper Miocene)

Tch Chanac formation (Upper Miocene)

Tsm Santa Margarita formation (Upper Miocene)

Unconformity

Tfv Fruitvale Shale (Upper and Middle Miocene)

Trm Round Mountain Silt (Middle and lower? Miocene)

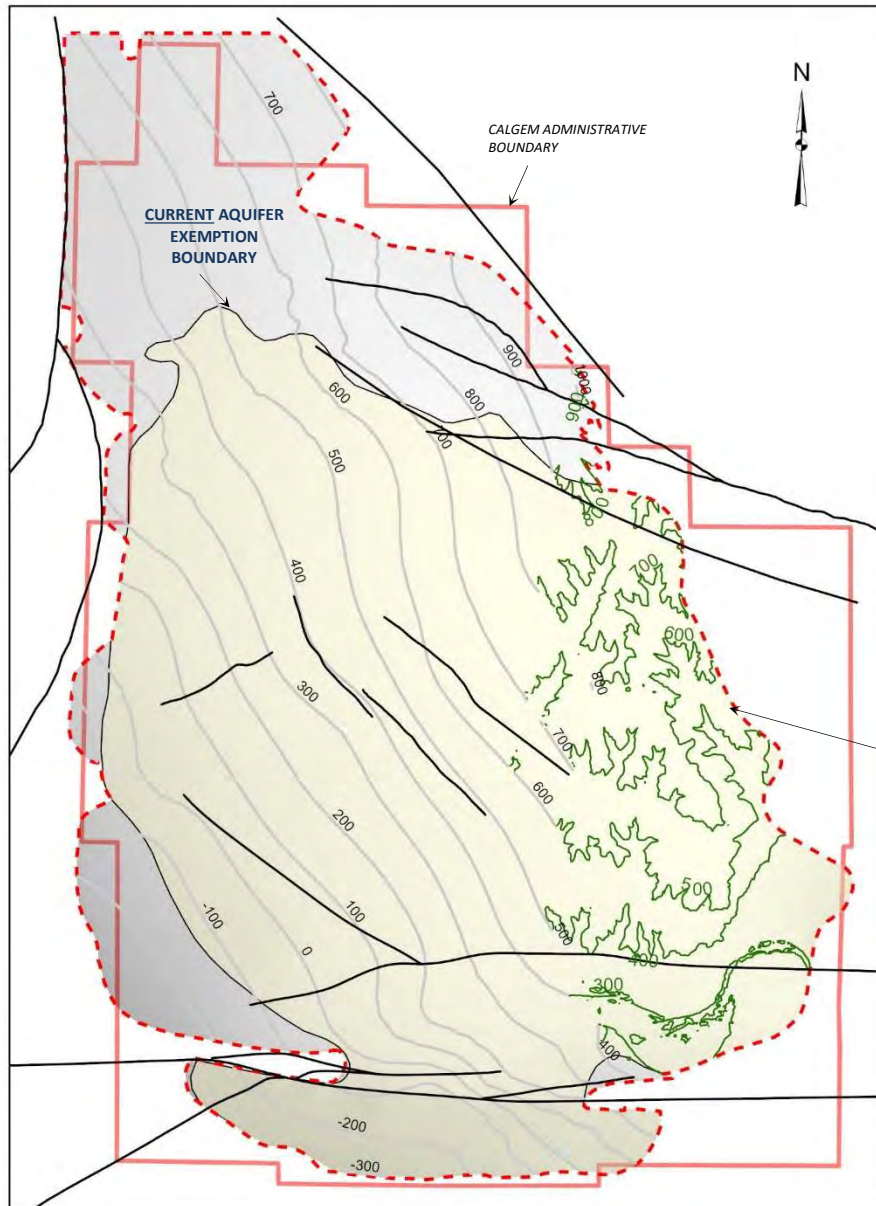
To Olcese (Lower Miocene)

Undifferentiated faults

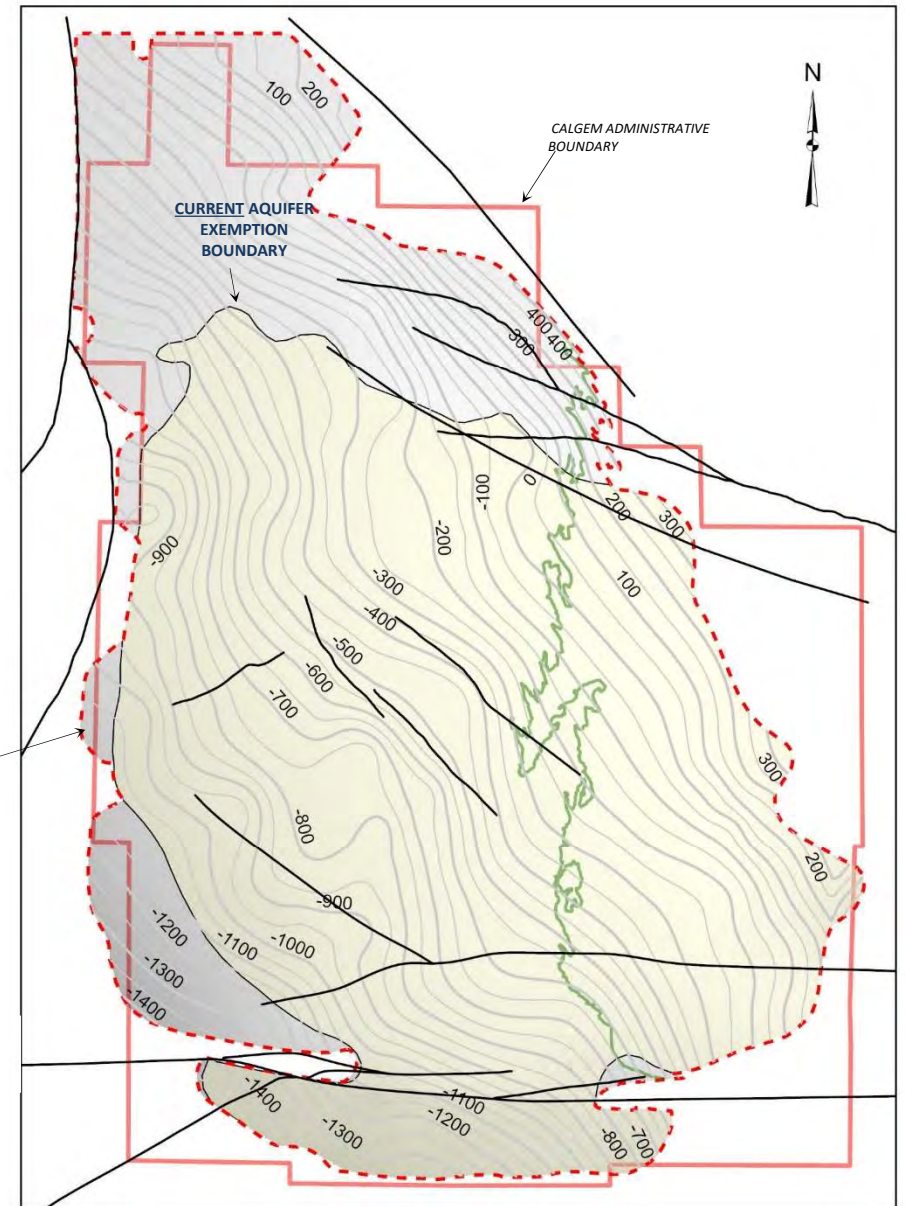
Modified from Amec Foster Wheeler Environment & Infrastructure, Inc. 2015. Technical Report: Injection Well Groundwater Sampling, Kern River Oil Field, Kern County, California. Amec notes: Figure adapted from: Bartow, Alan, J. 1984, Geologic Map and Cross Sections of The ShouthEastern Margin of The San Joaquin Valley, California, United States Geological Survey, Miscellaneous Investigations Series Map I-496 Sheet 2 of 2.

Figure 12 – Generalized Stratigraphic Cross Section

Contours on TOP of Proposed Exempt Aquifer



Contours on BASE of Proposed Exempt Aquifer



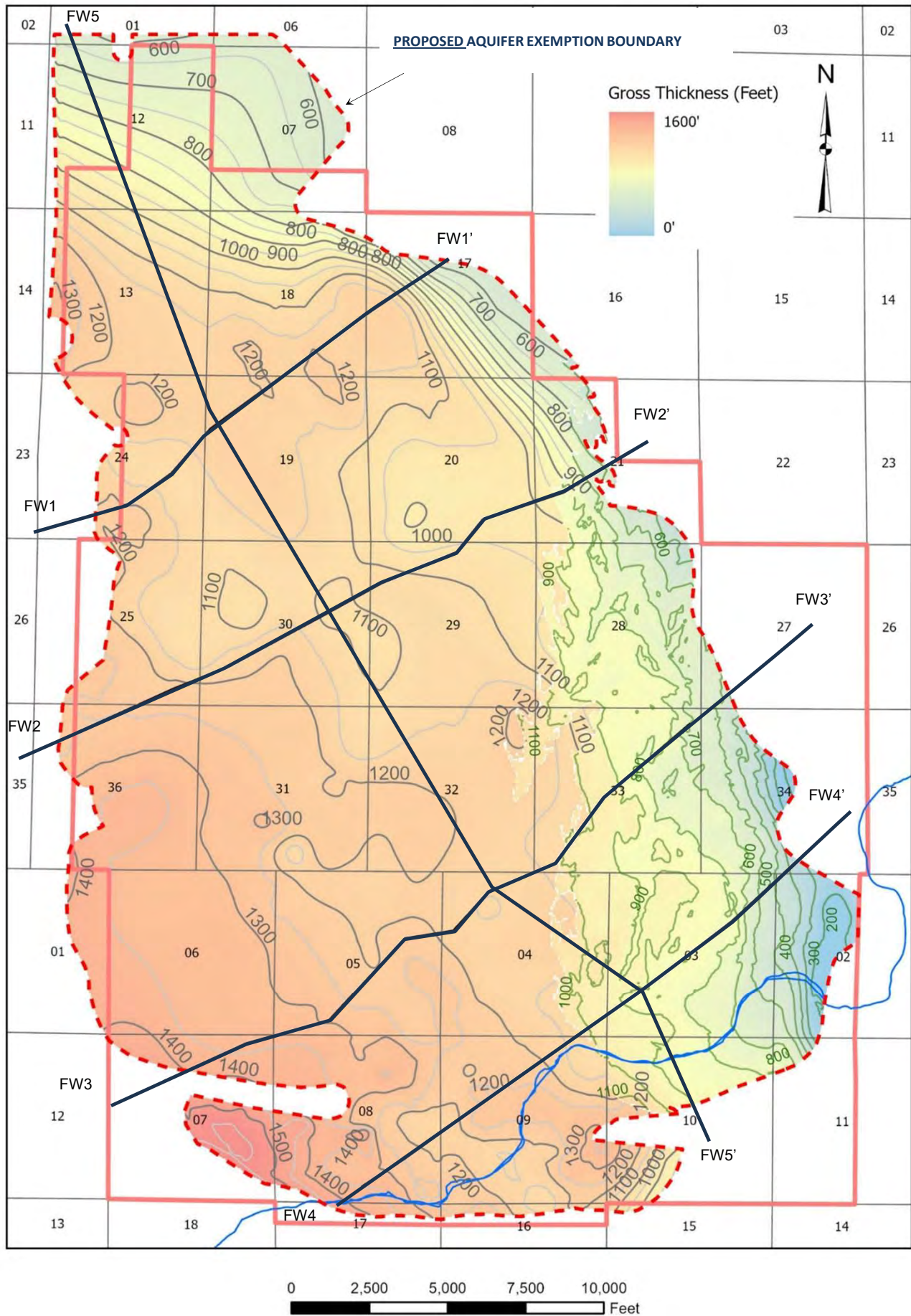
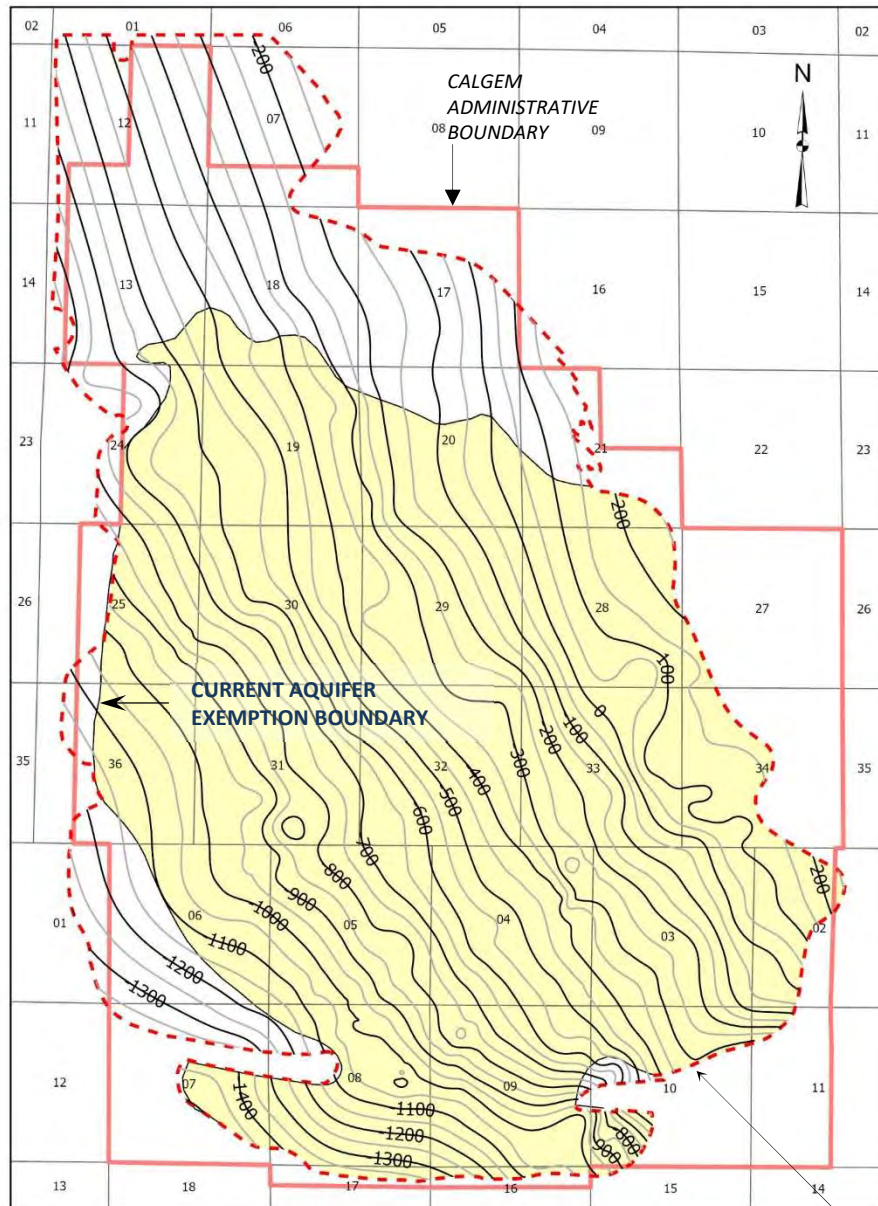


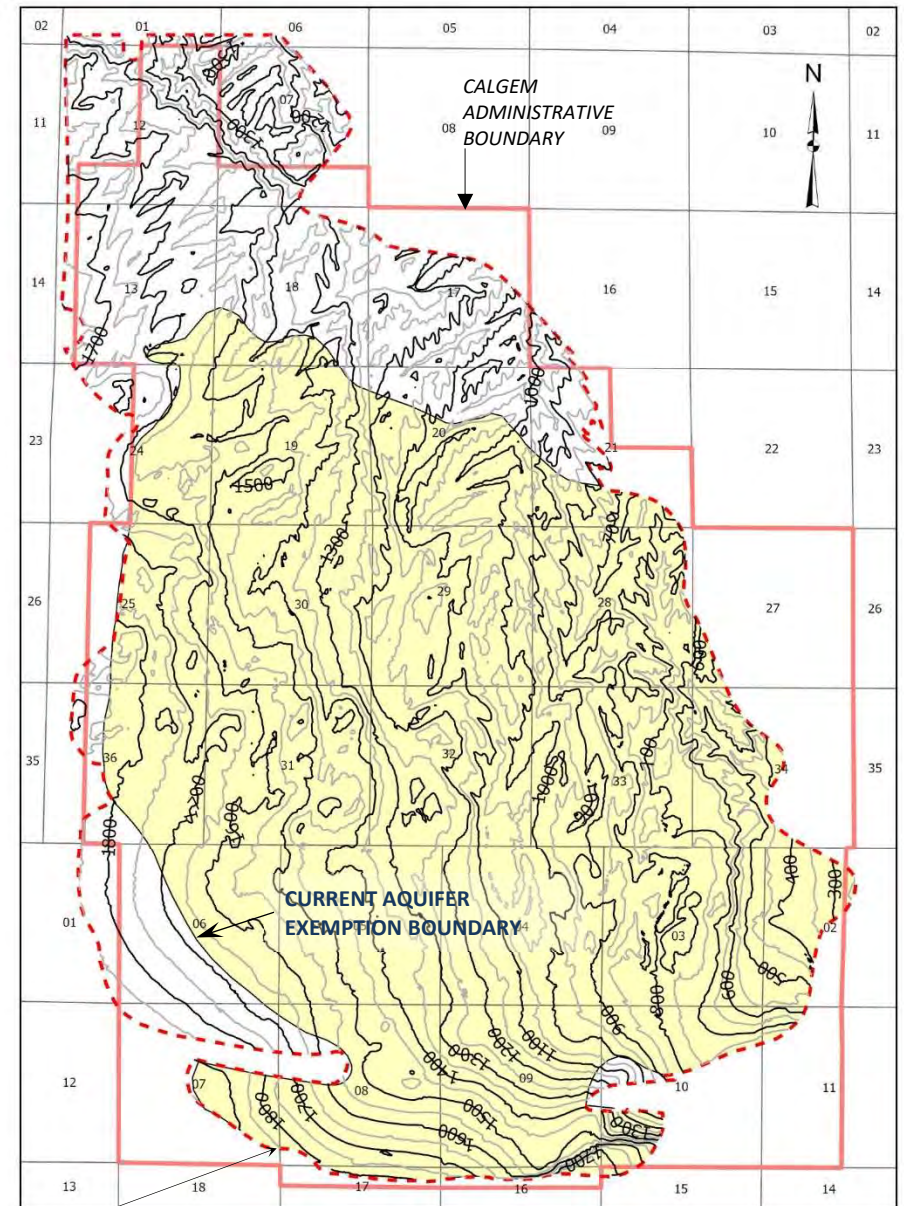
Figure 14 – Gross Interval Thickness Map

Referenced to Sea Level (50 foot contours)



0 2,500 5,000 7,500 10,000
Feet

Referenced to Ground Level (50 foot contours)



0 2,500 5,000 7,500 10,000
Feet

PROPOSED AQUIFER
EXEMPTION BOUNDARY

Figure 15 – Structure Map on Top of Chanac

Southern San Joaquin Basin: Bakersfield Arch

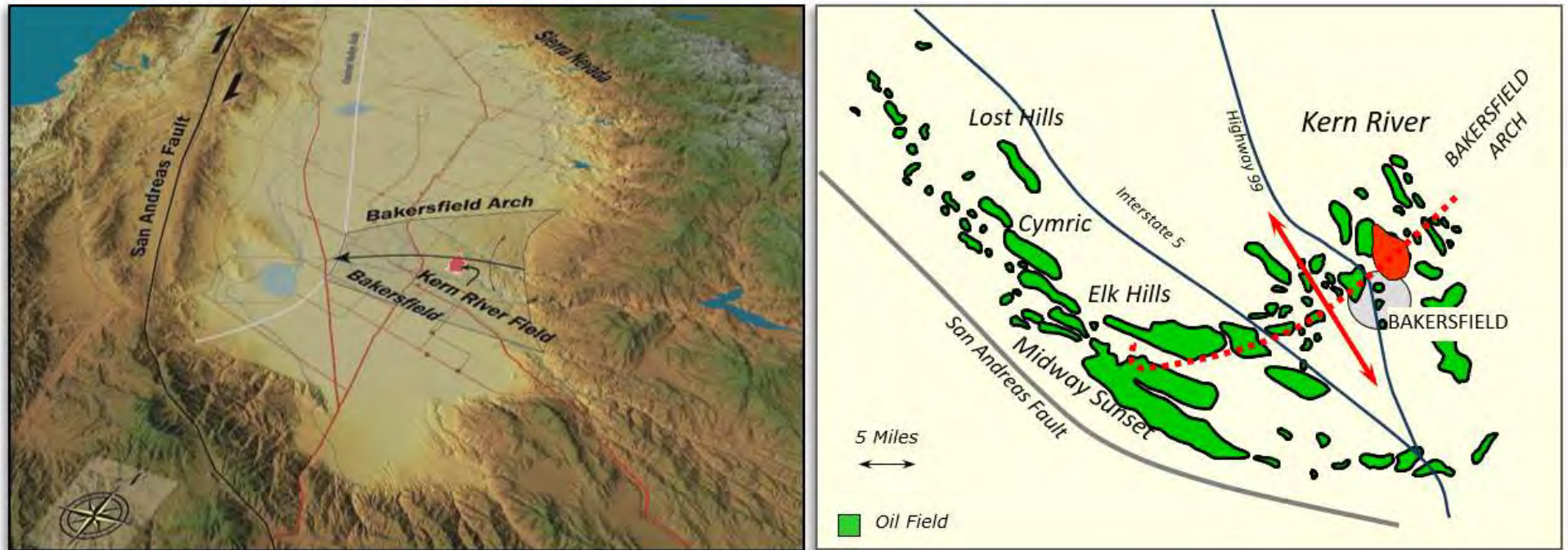
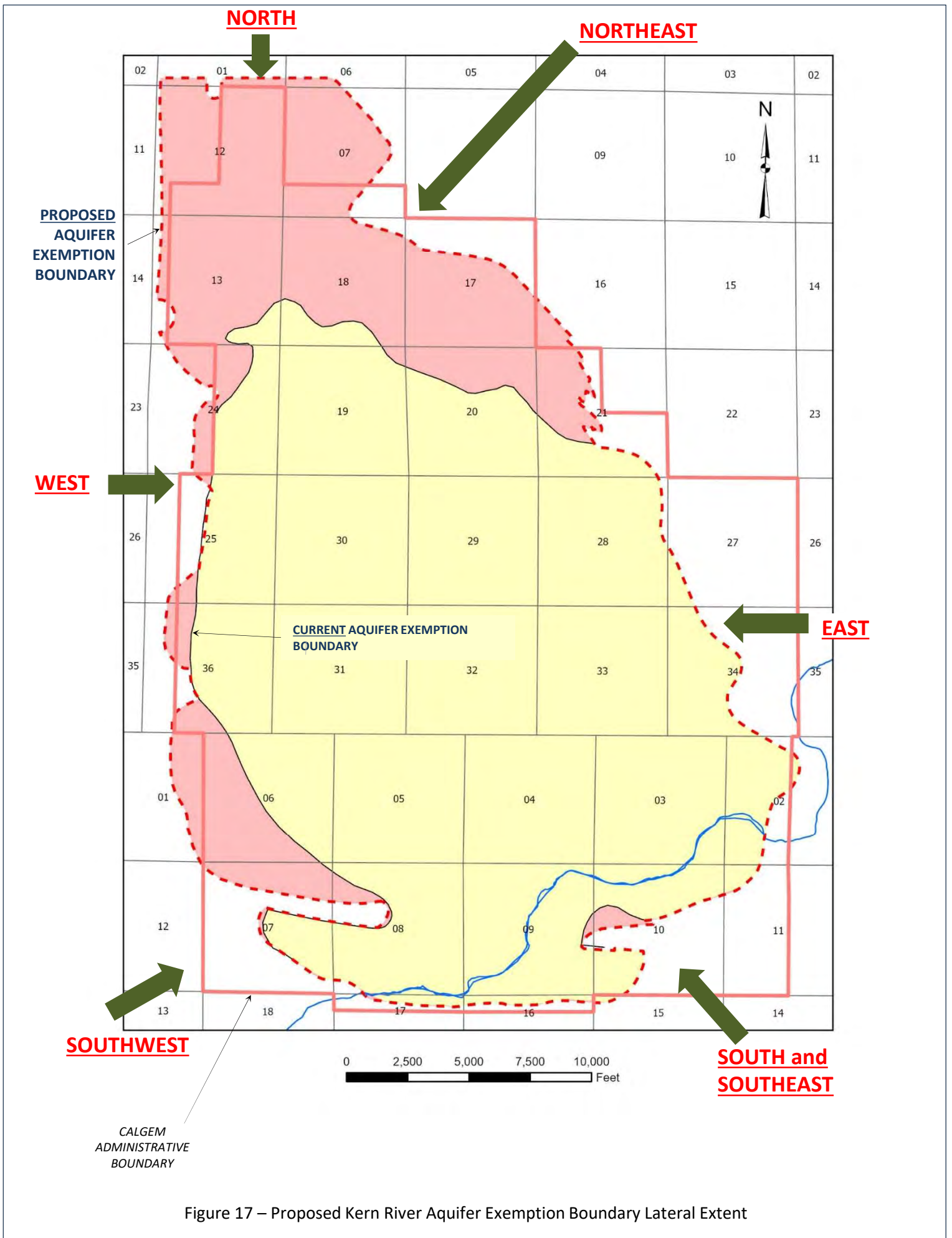


Figure 16 – Structural Setting



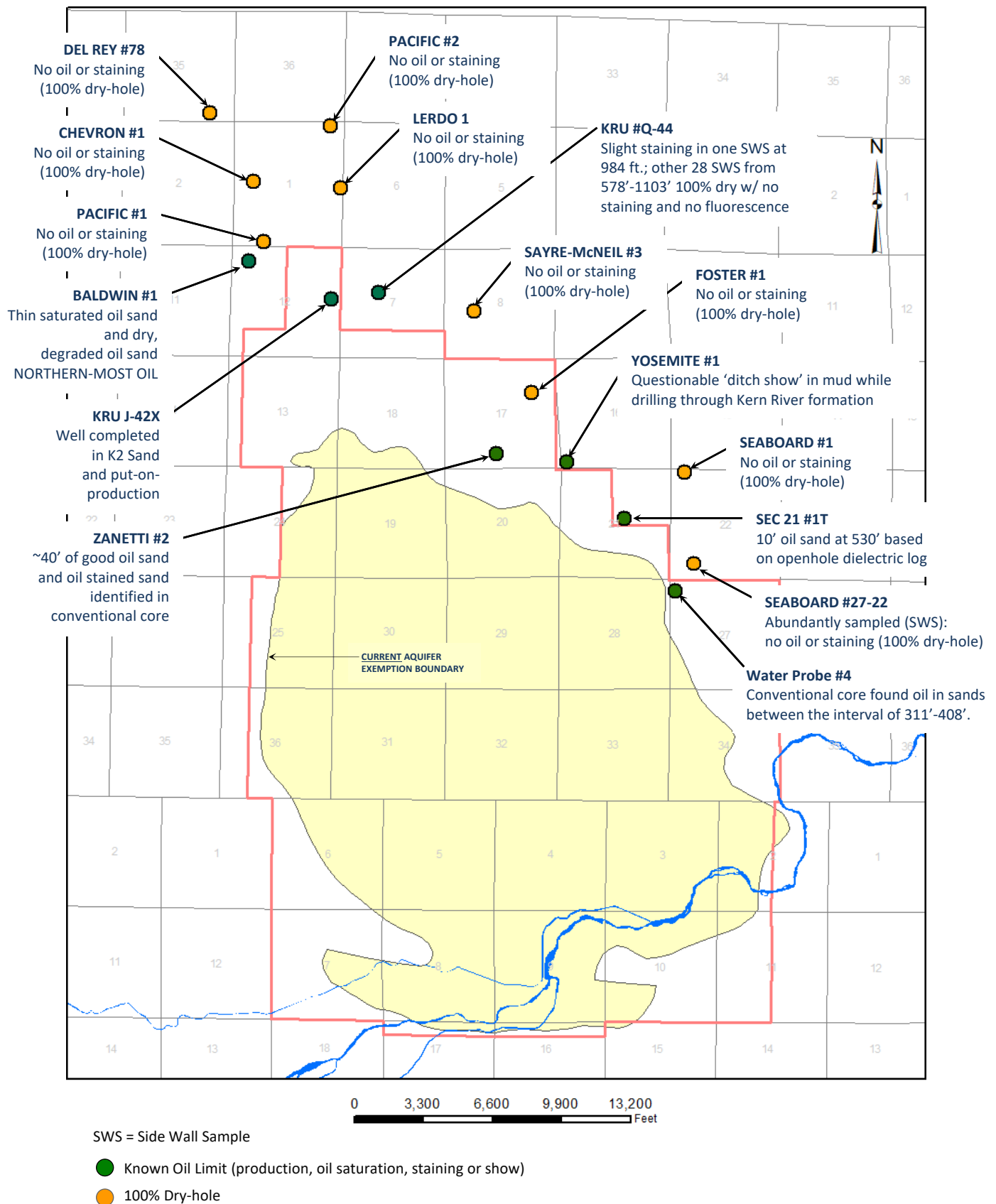


Figure 18 - Known Oil Limit (KOL) on North and Northeast Margins of Field

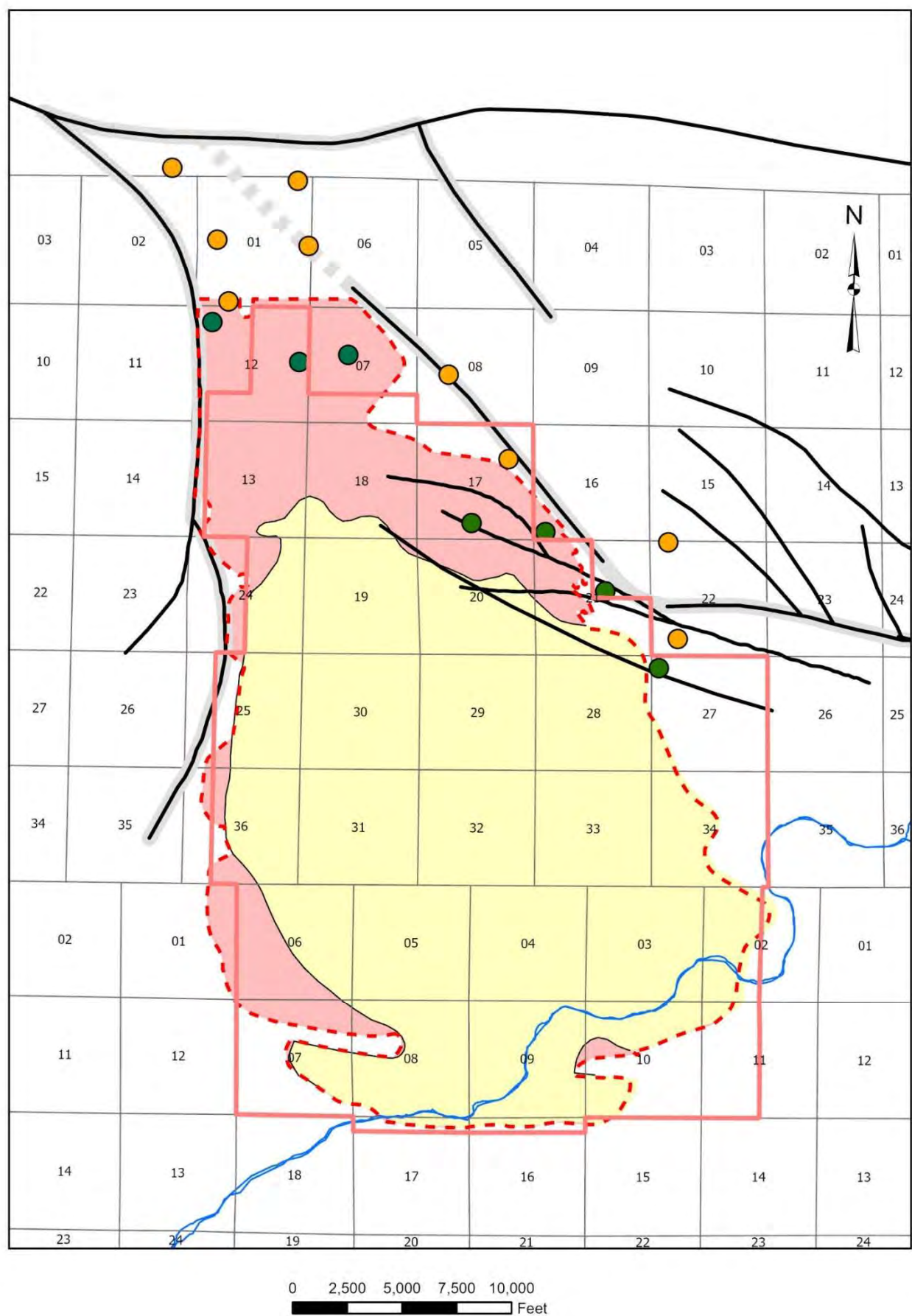


Figure 19 – Sealing Faults and Known Oil Limits on North and Northeast Margins of Field

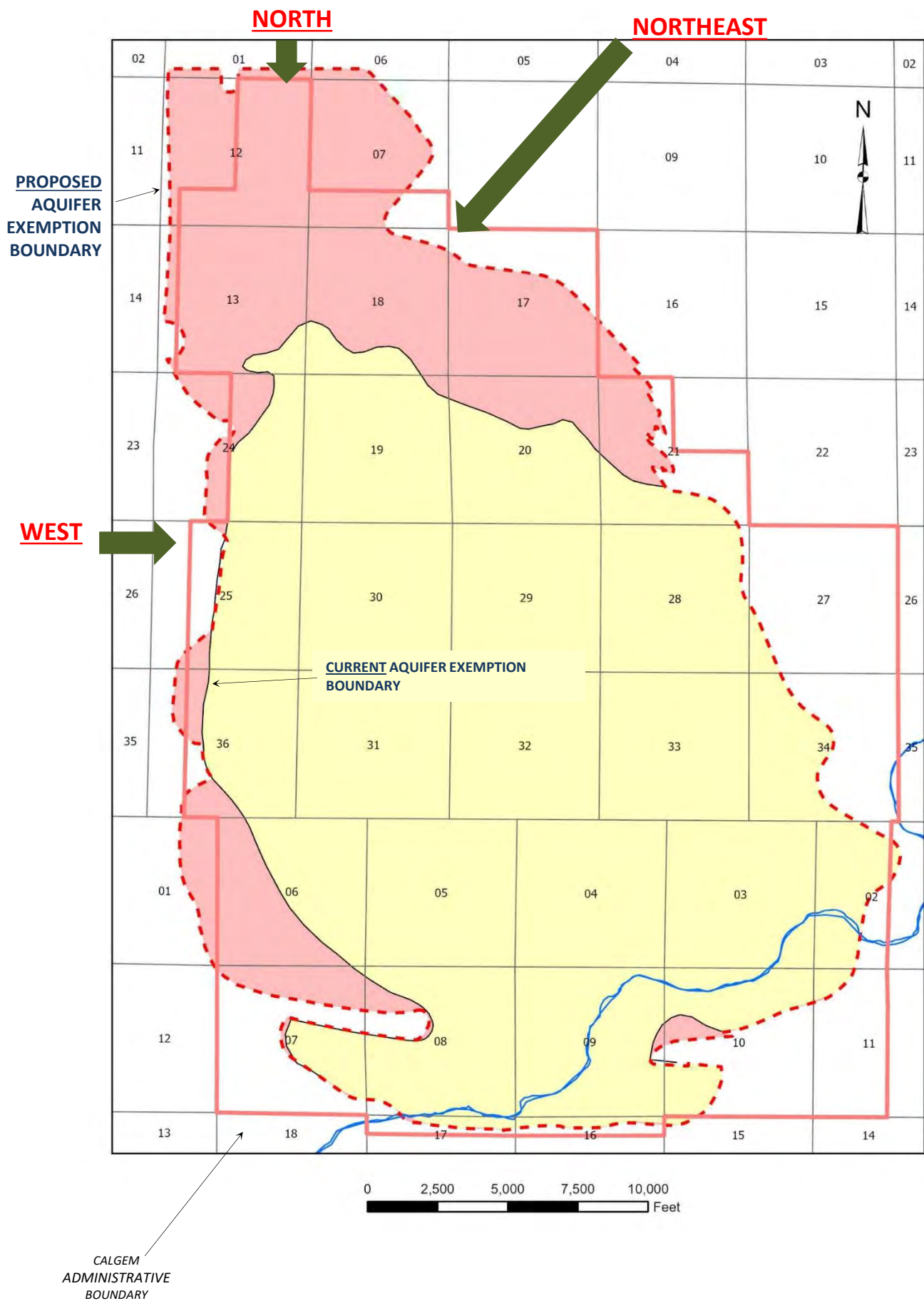


Figure 20 – Proposed Kern River Aquifer Exemption Boundary Lateral Extent

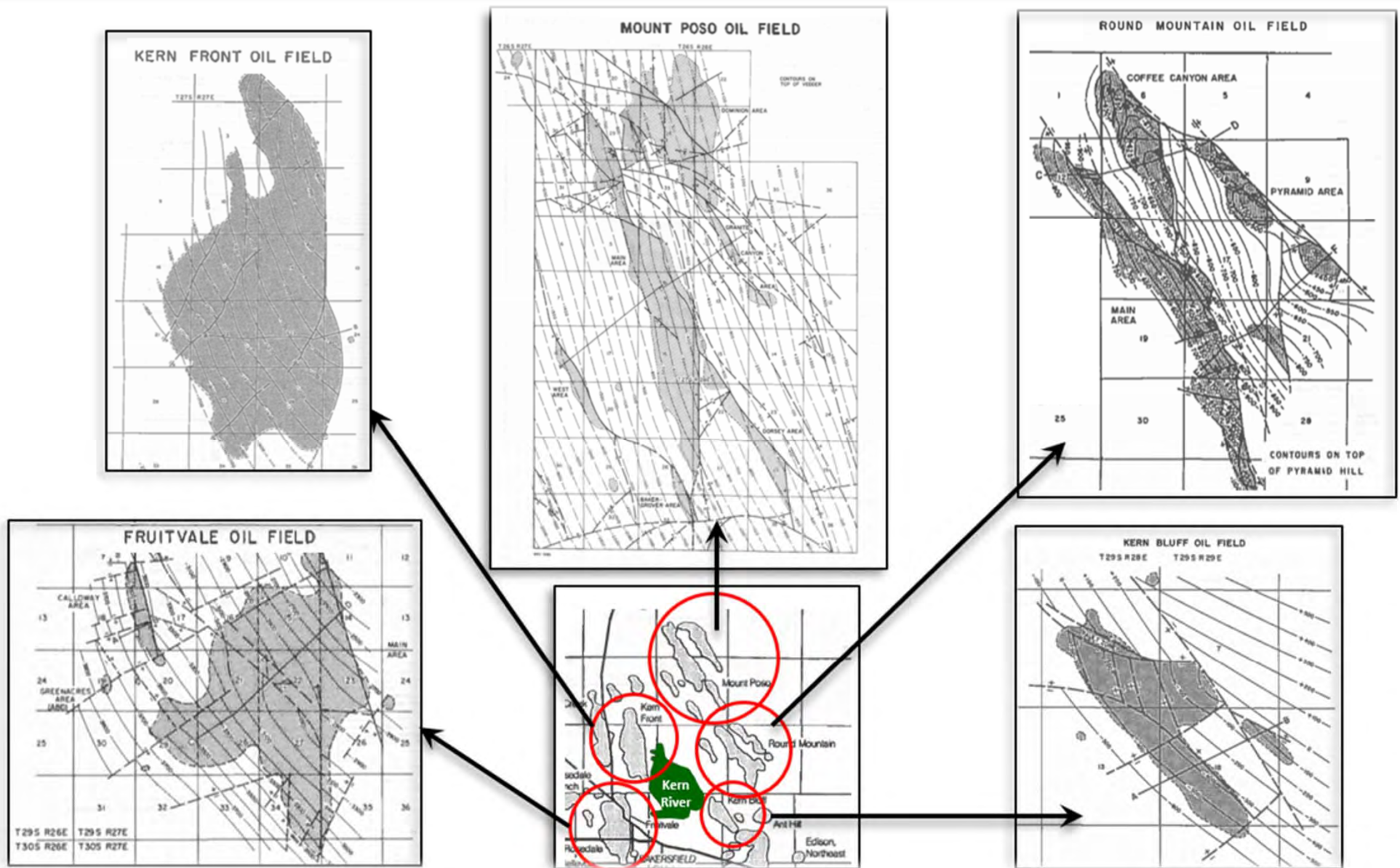
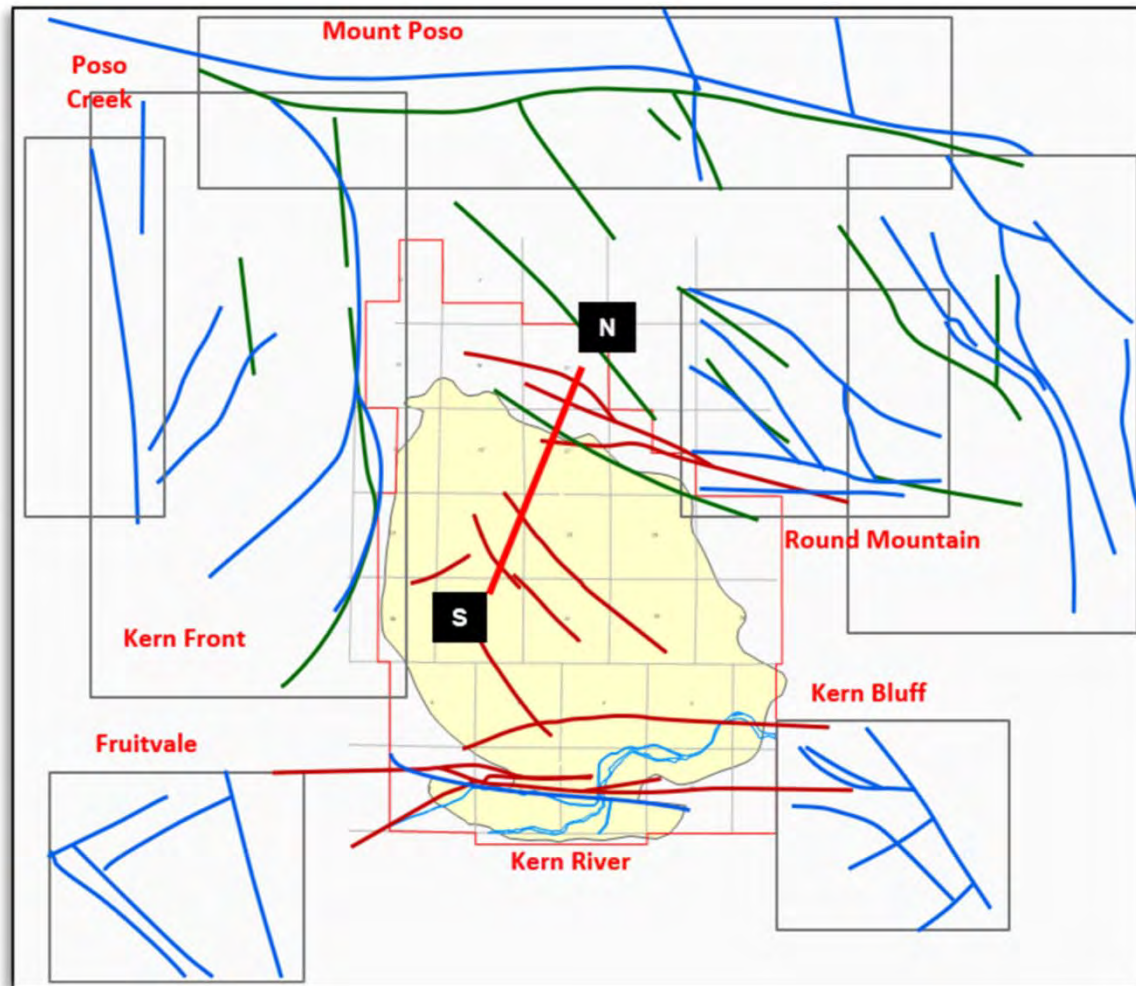


Figure 21 - Regional Sealing Faults



- USGS Published Faults (Professional Paper 1245, Plate 1, 1983)
- CALGEM Published Faults (DOGGR *California Oil and Gas Fields*, Volume 1, TR11, 1998)
- Chevron Faults

2D Seismic Data Acquired in 2007

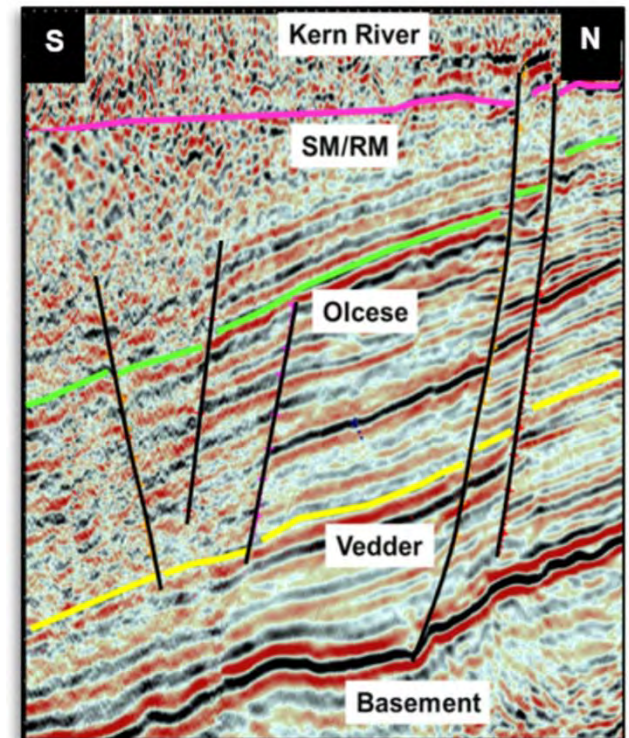
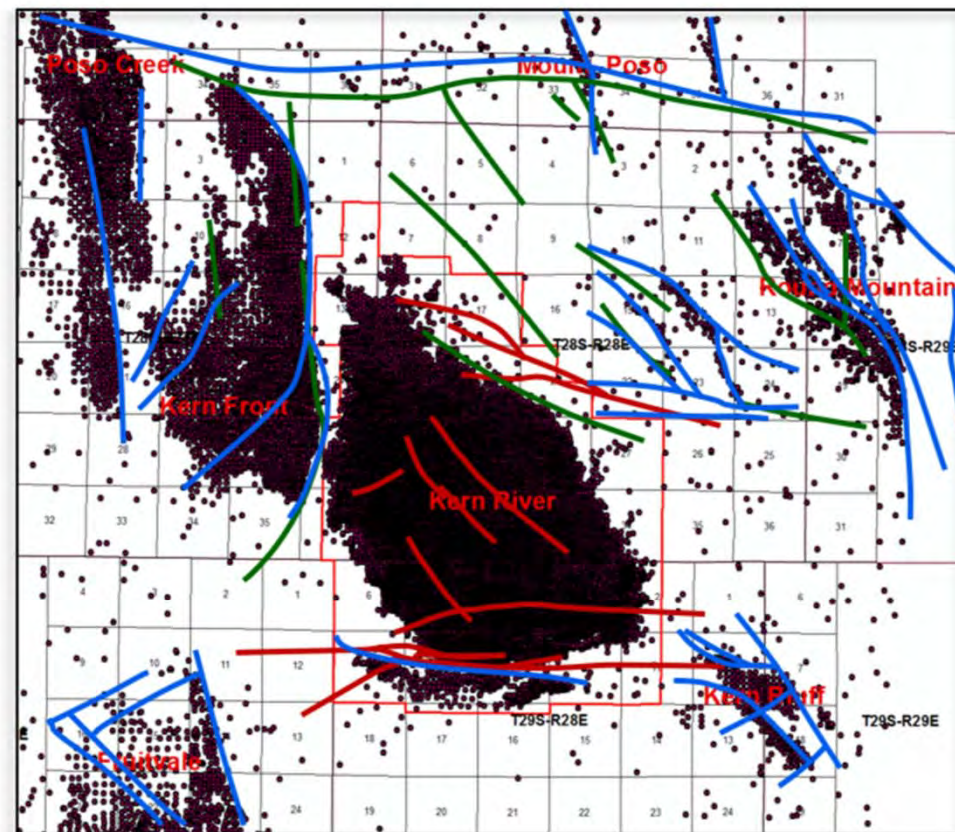
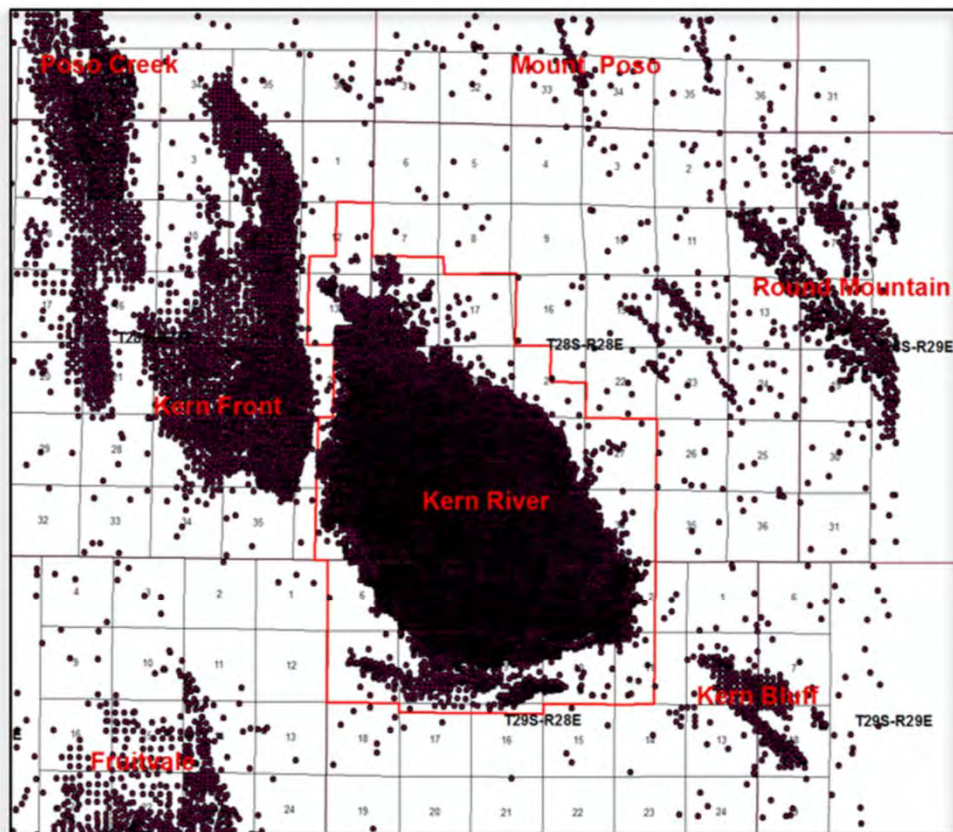


Figure 22 - Faulting in the Kern River and Surrounding Fields



- USGS Published Faults
- DOGGR Published Faults
(DOGGR California Oil and Gas Fields,
Volume 1, TR11, 1998)
- Chevron Faults

Data source: California Division of Oil, Gas & Geothermal Resources



Figure 23 - Oil Production and Fault Control: Kern River Field and Vicinity

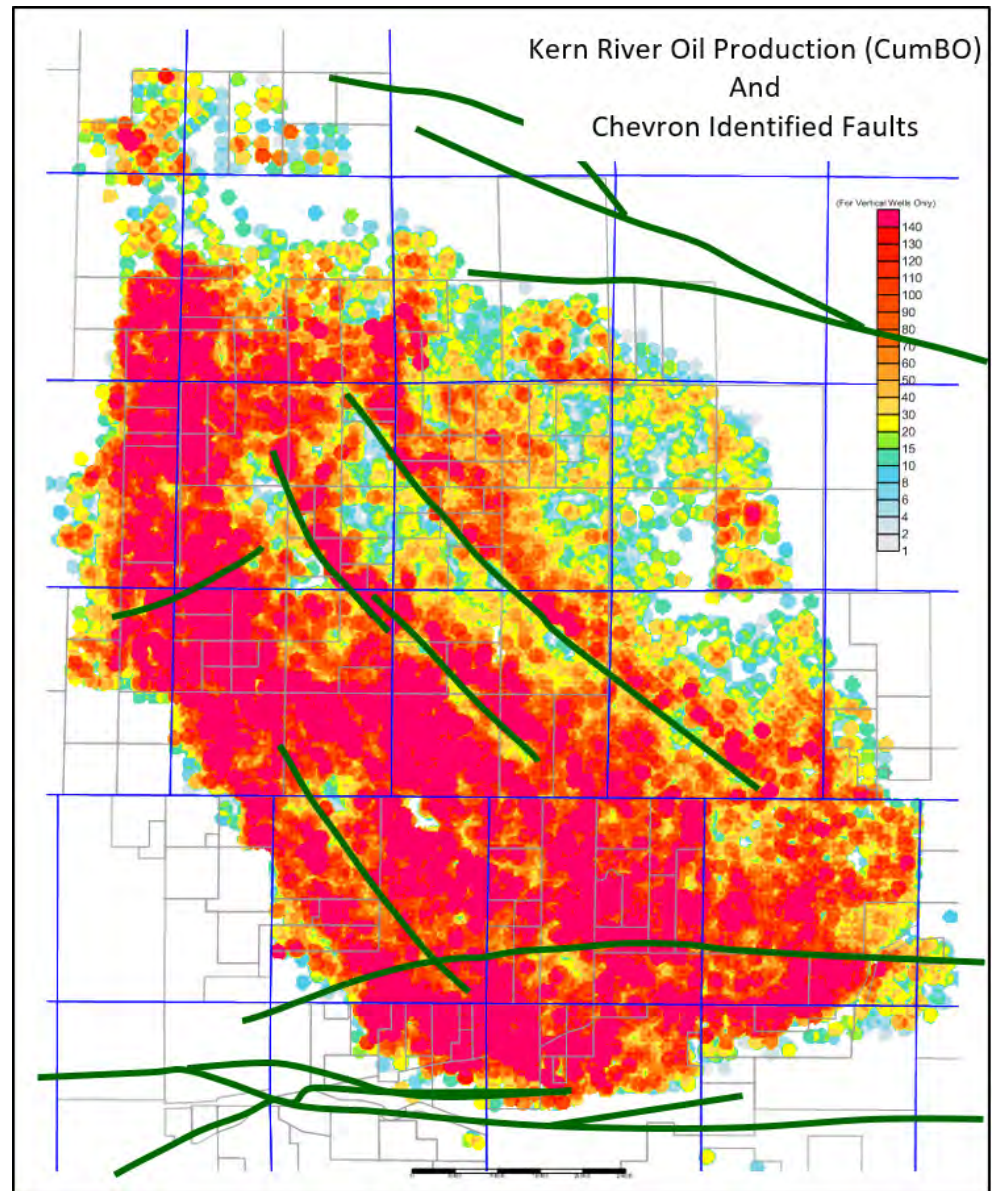
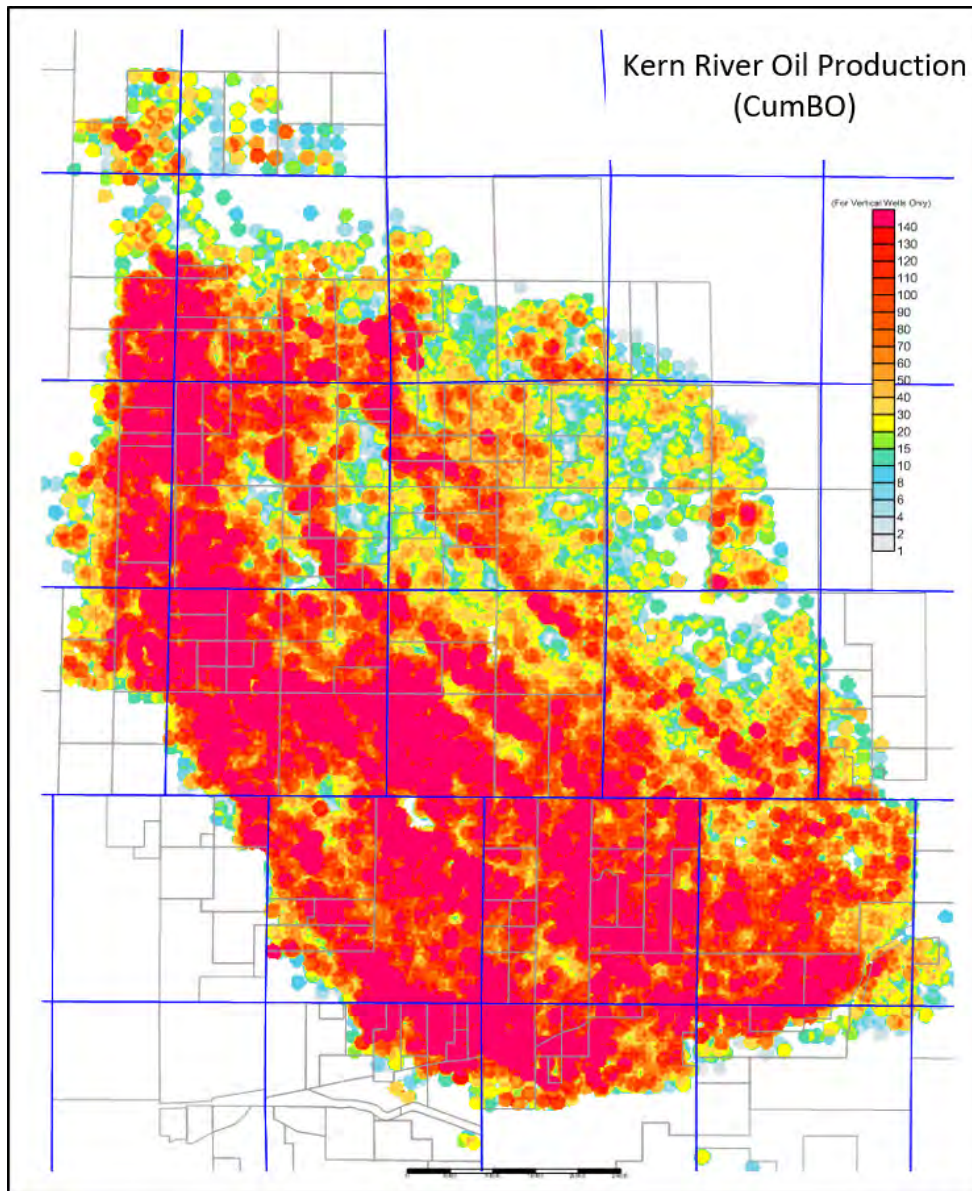


Figure 24 - Oil Field Production In Relation to Fault Occurrence

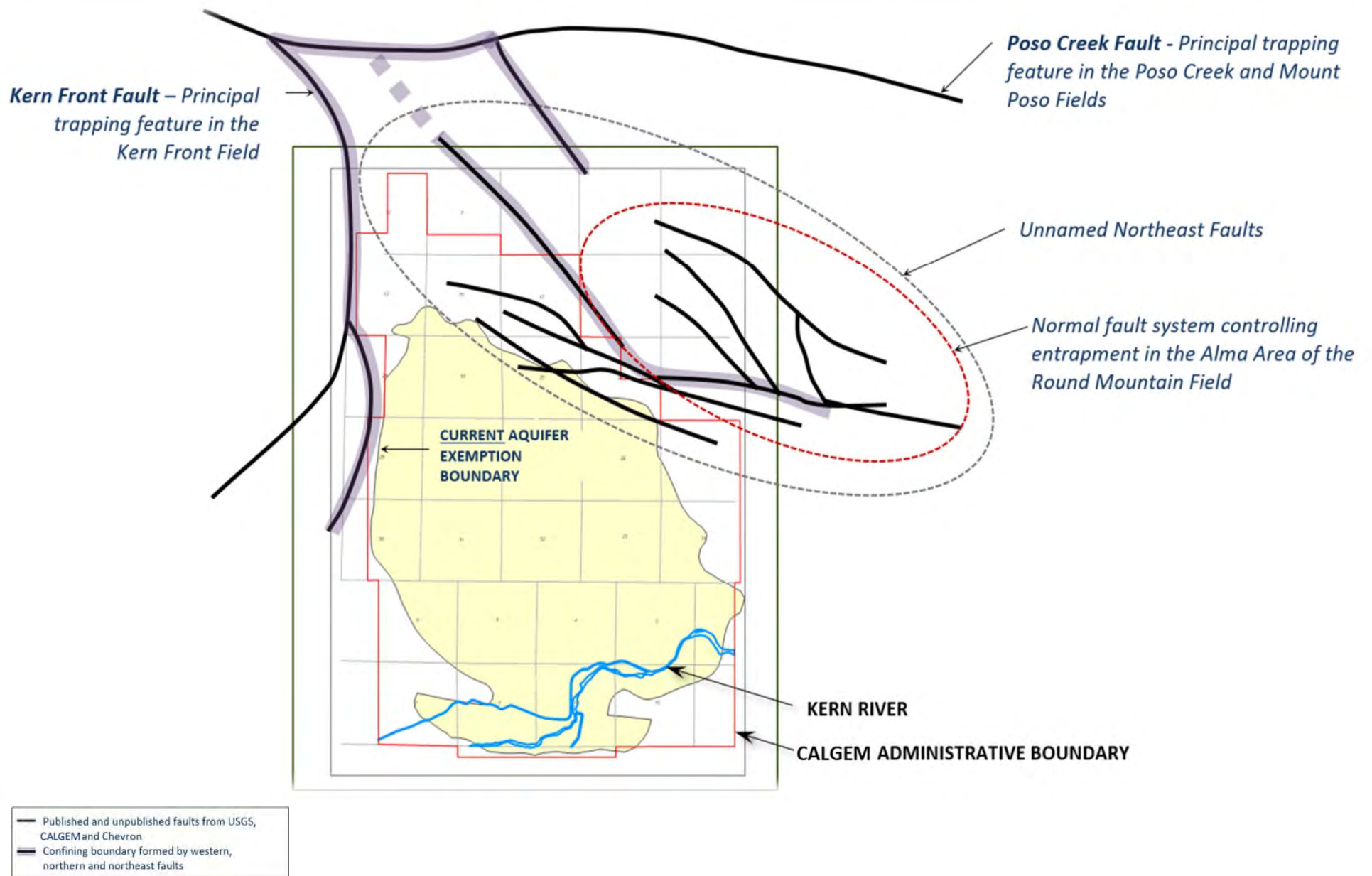


Figure 25 - West, North and Northeast Sealing Faults

TOP C SAND
(uppermost mapped
marker in KR Formation)

EXPOSED KERN RIVER
FORMATION

BASE of KERN RIVER FORMATION

POSO CREEK

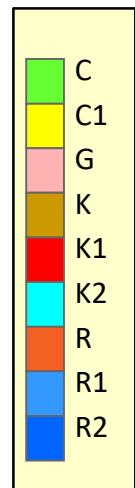
N

PROPOSED
AQUIFER
EXEMPTION
BOUNDARY

CURRENT AQUIFER
EXEMPTION
BOUNDARY

Approximate outcrop line of the R Sand.
This contour represents the stratigraphic
trend-line of the easternmost boundary
of the currently exempted aquifer.

GENERAL
REGIONAL
GROUNDWATER
FLOW DIRECTION



USGS Published Faults
DOGGR Published Faults
Chevron Faults

0 5,000 10,000 15,000 20,000
Feet

Figure 26 – Outcrop of the Kern River Formation Near the Kern River Field

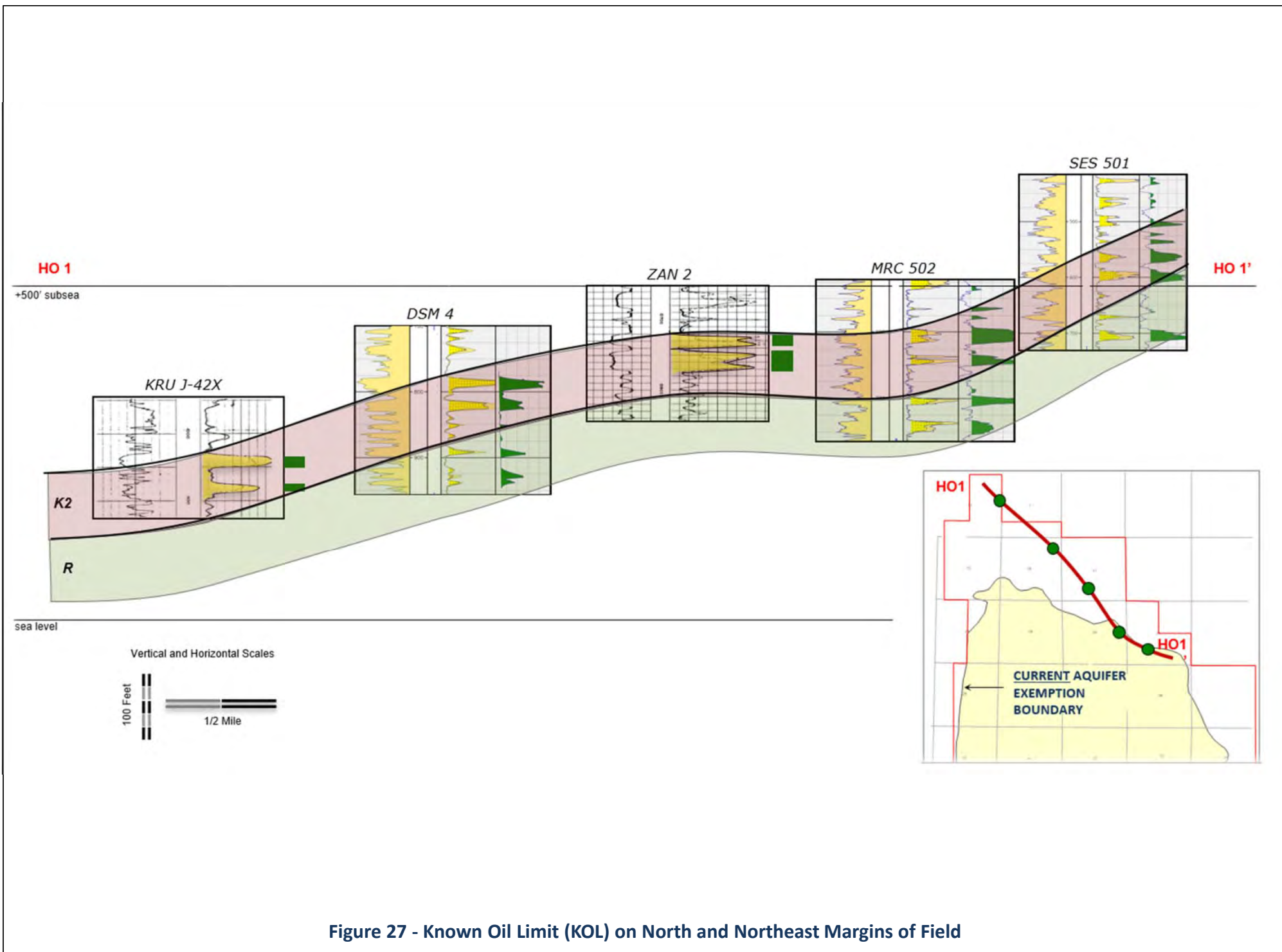


Figure 27 - Known Oil Limit (KOL) on North and Northeast Margins of Field

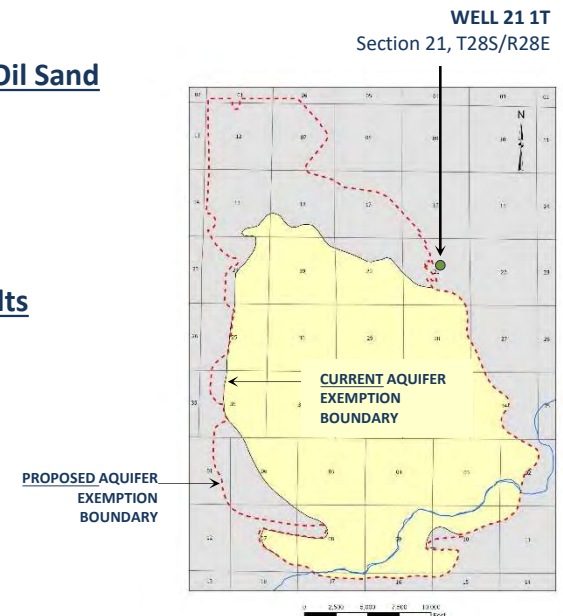
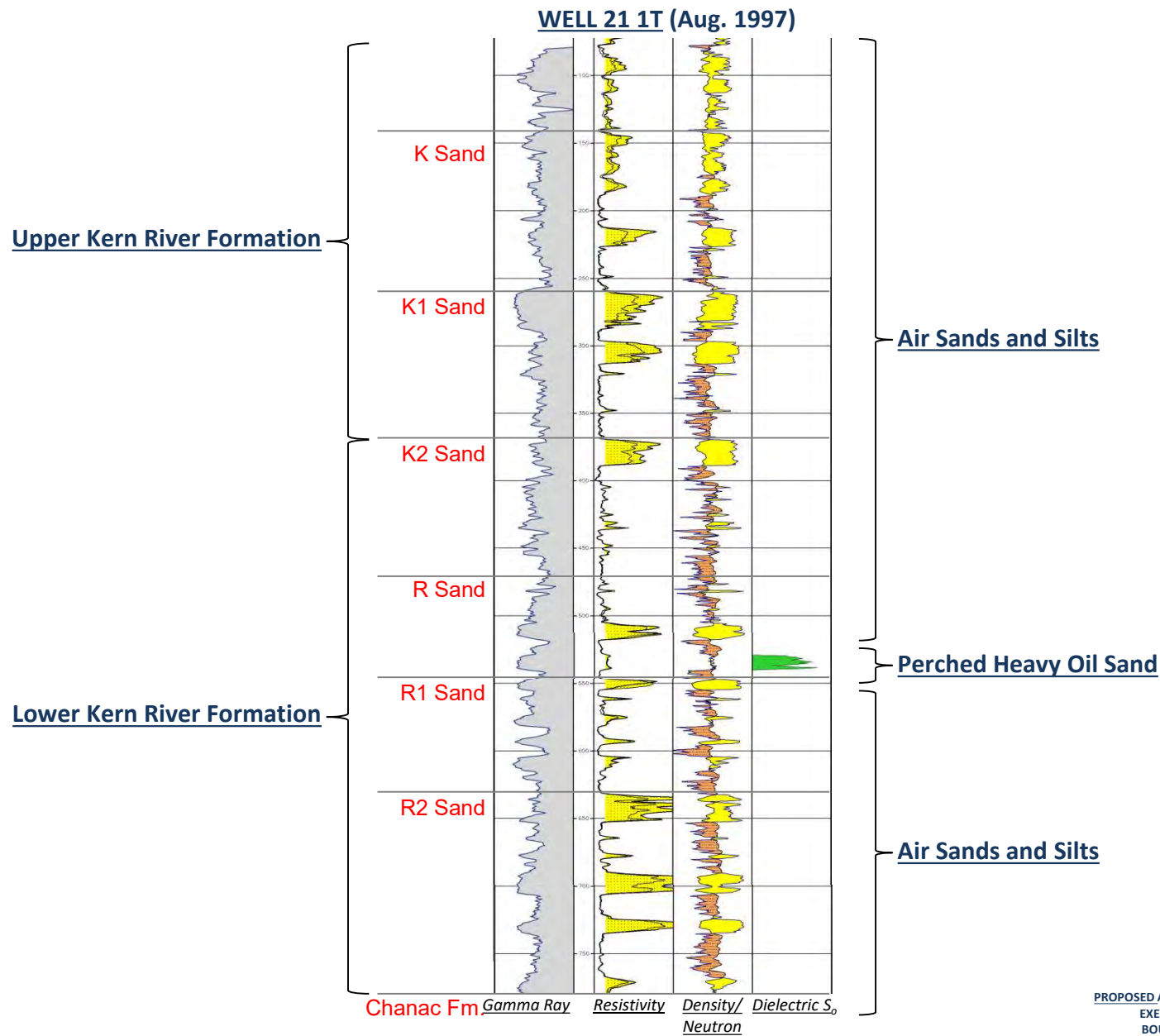


Figure 28 – Example of Updip Perched Oil and Air Sands with No Groundwater

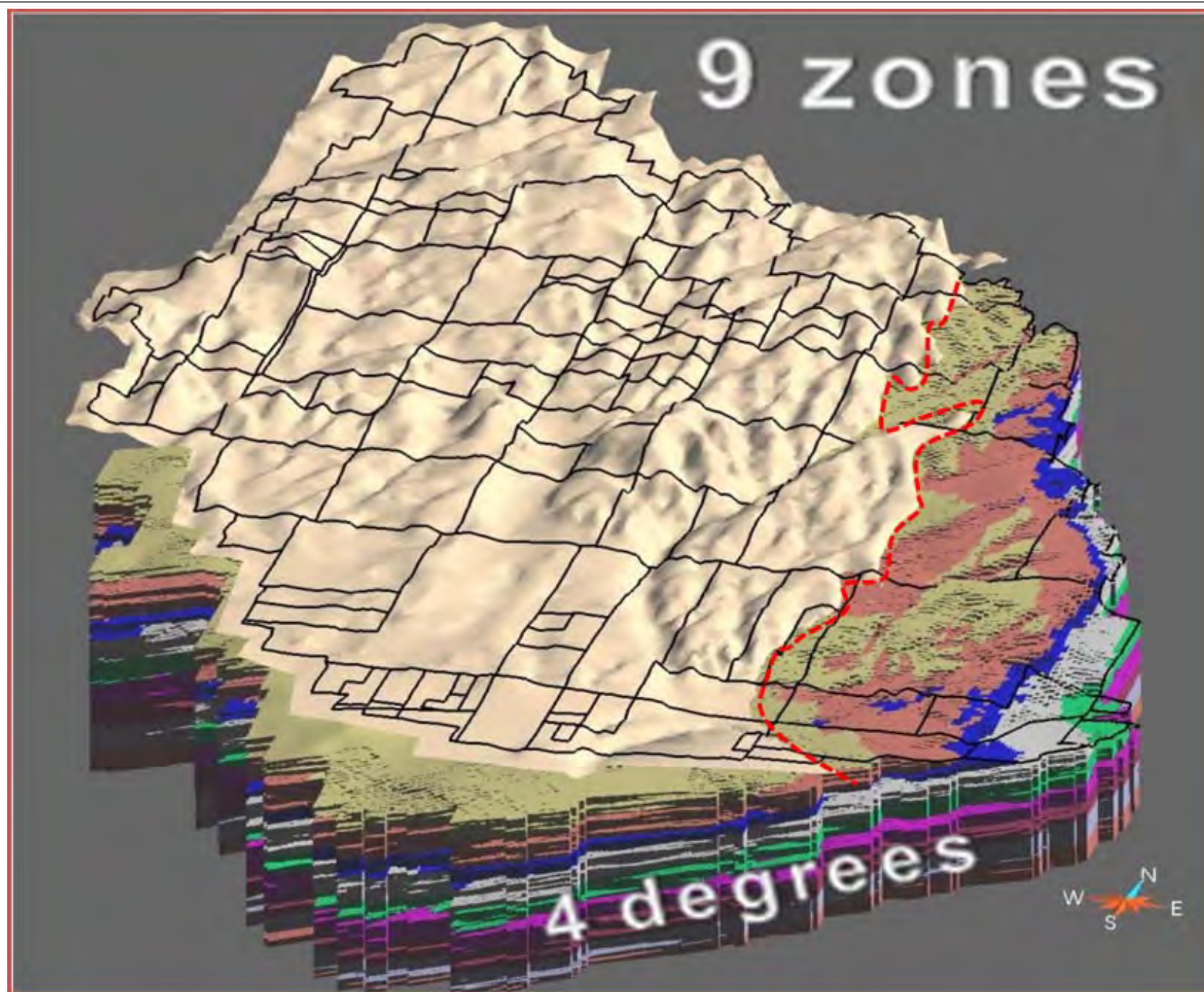


Figure 29 - 3D Structure and Regional Outcrop Area of the Kern River Formation

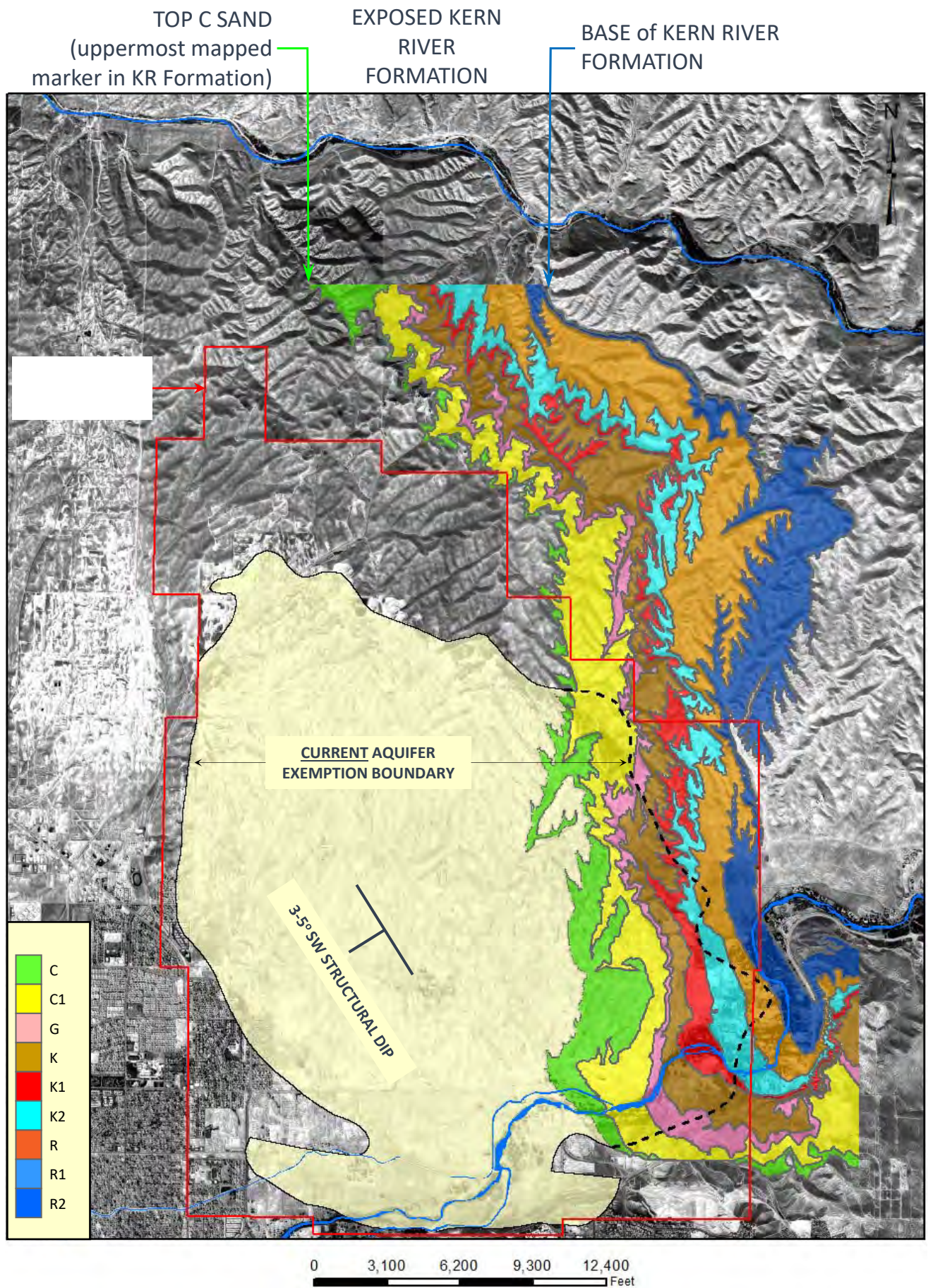


Figure 30 - Regional Outcrop Area of the Kern River Formation

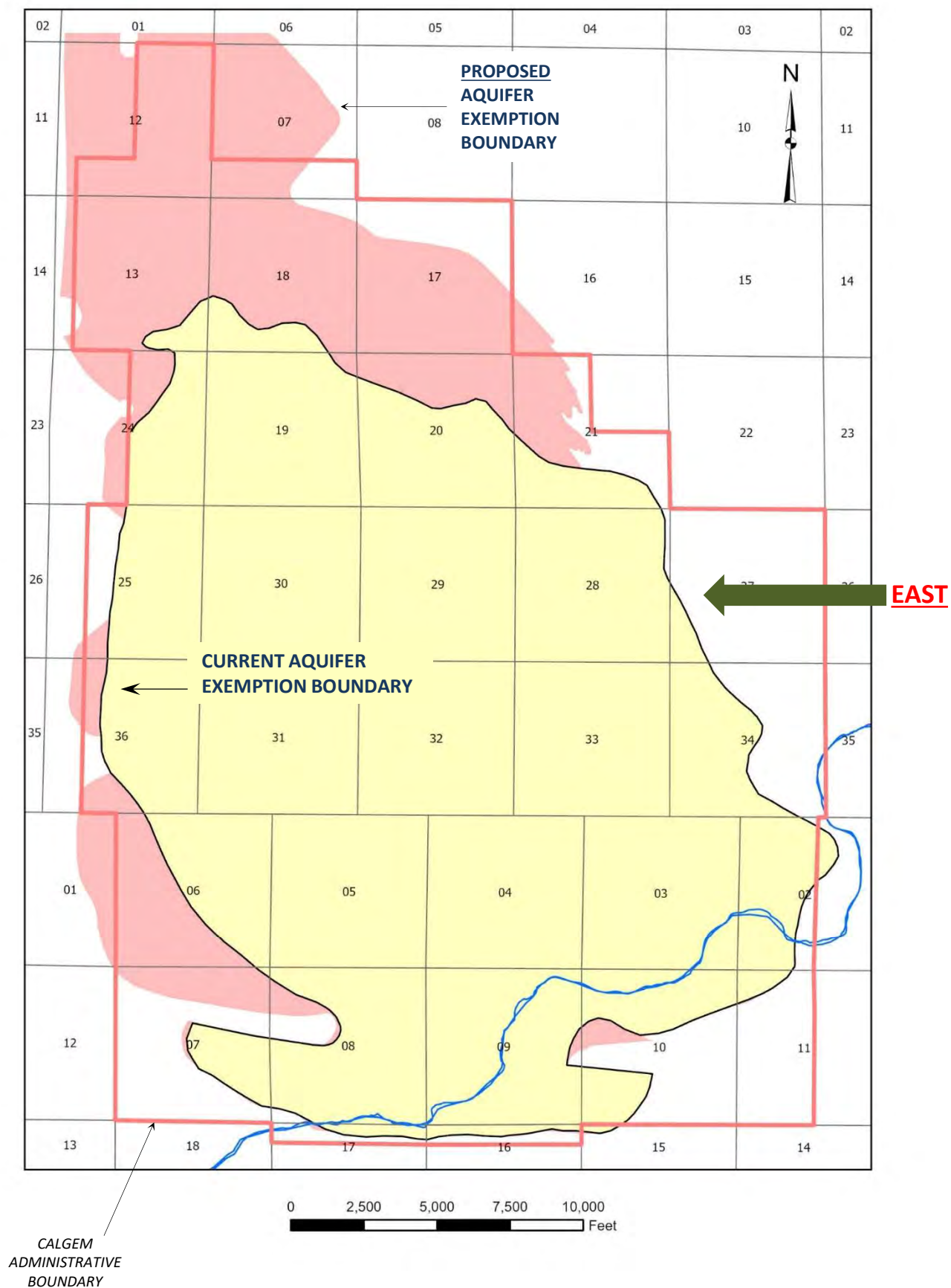


Figure 31 – Proposed Kern River Aquifer Exemption Boundary East Lateral Extent

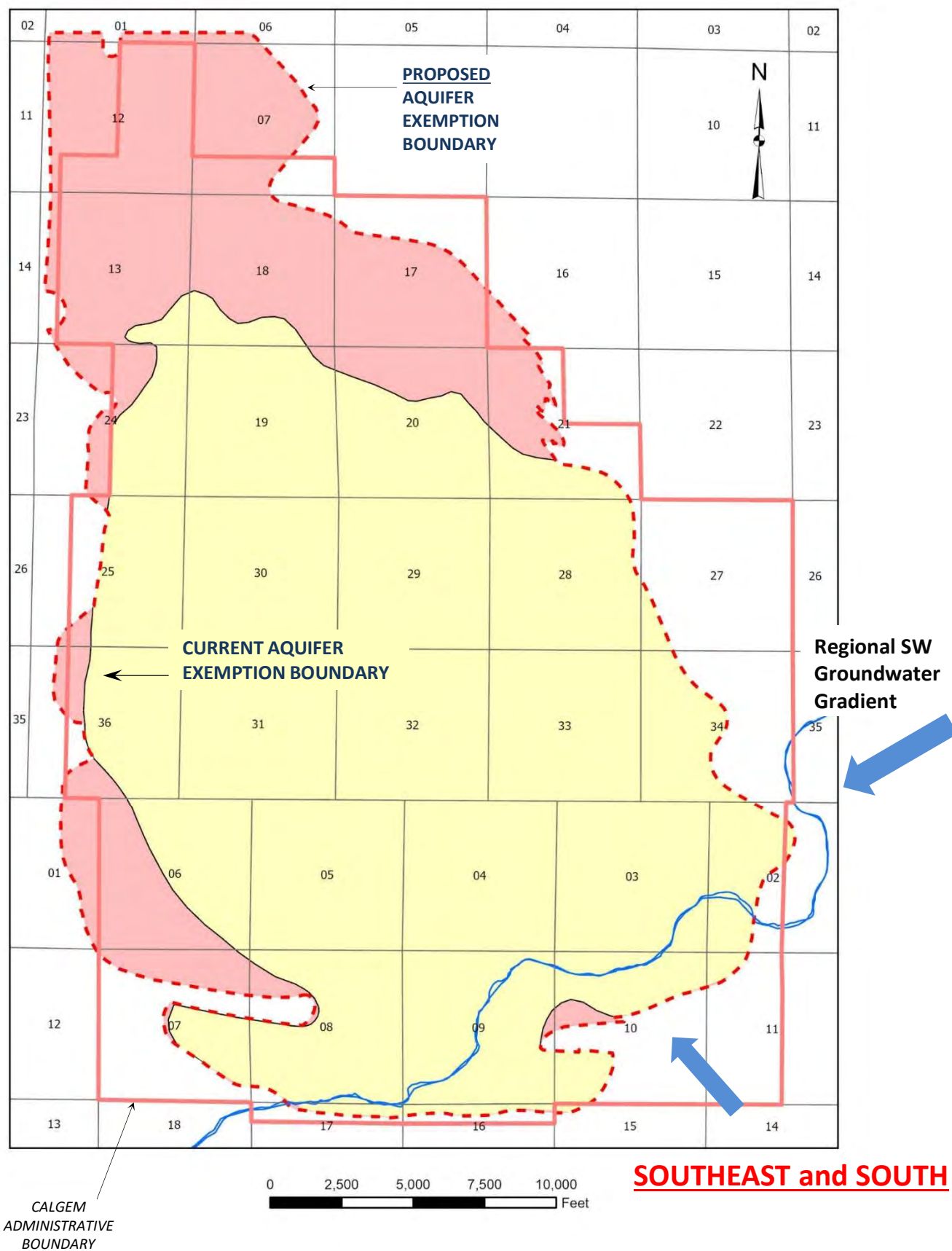


Figure 32 – Proposed Kern River Aquifer Exemption Boundary South and Southeast Lateral Extent

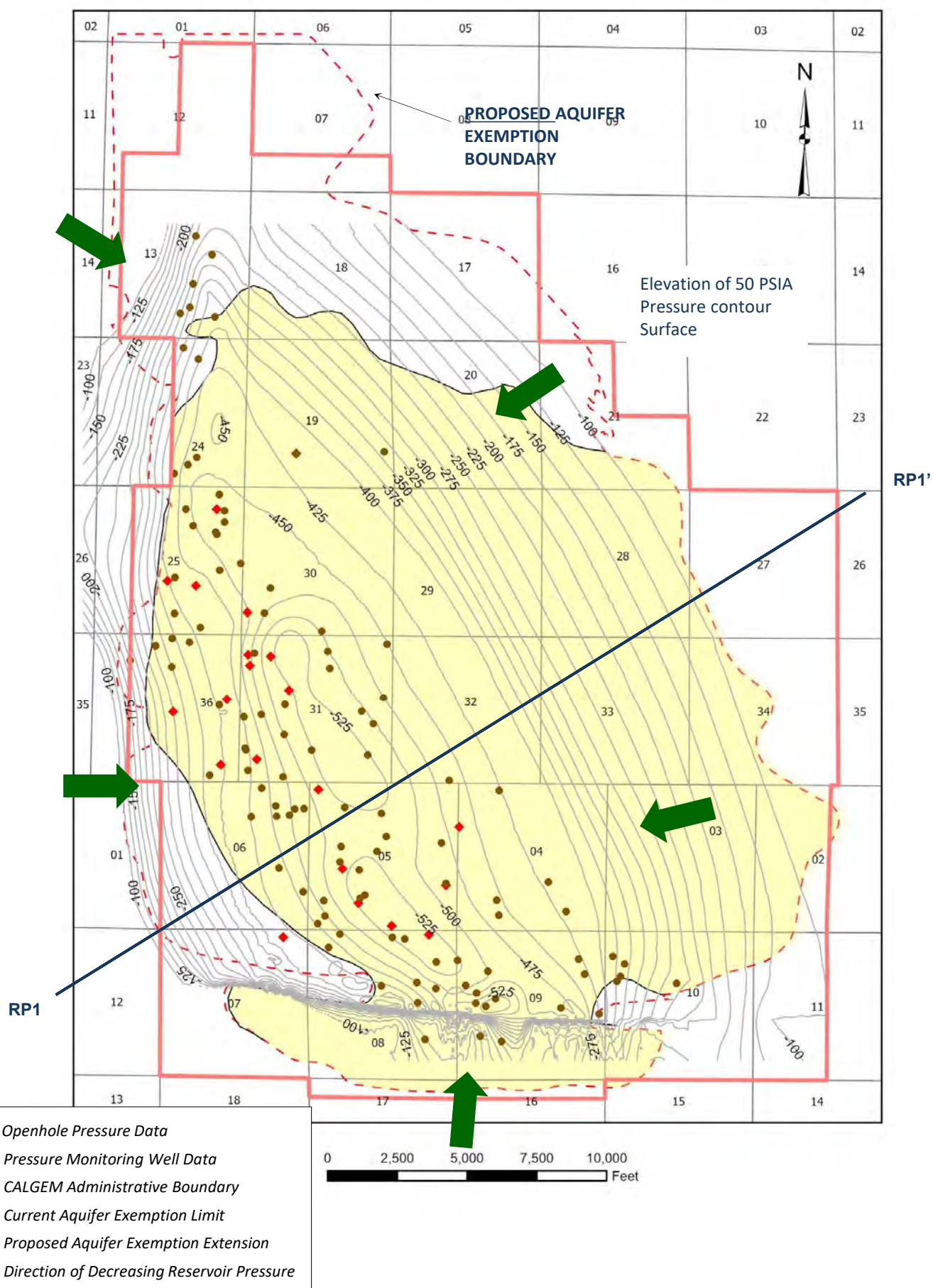


Figure 33 – Reservoir Pressure Monitoring and Mapping

RP1

RP1'

SW

NE

Structural Dip Section and Reservoir Pressure Profiles

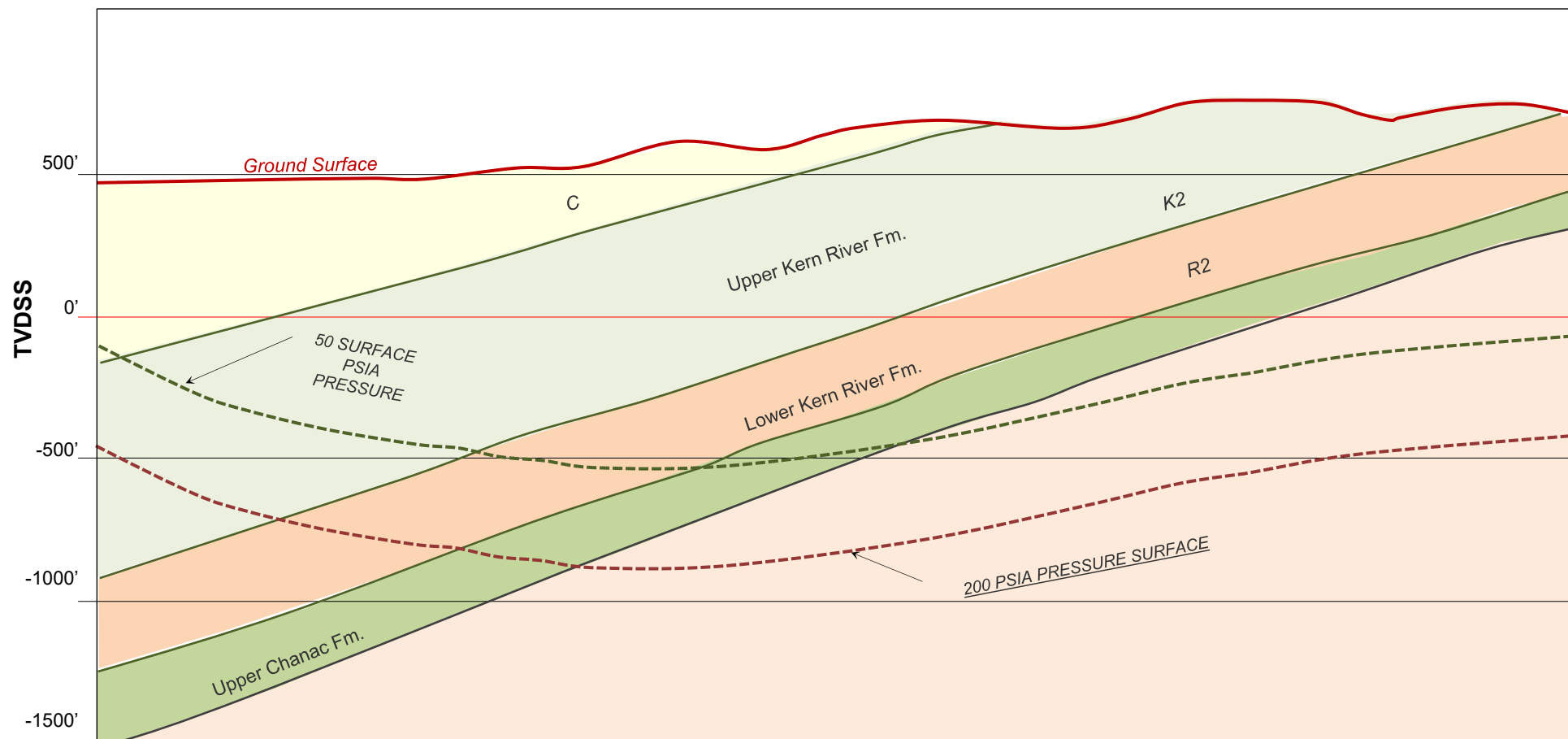
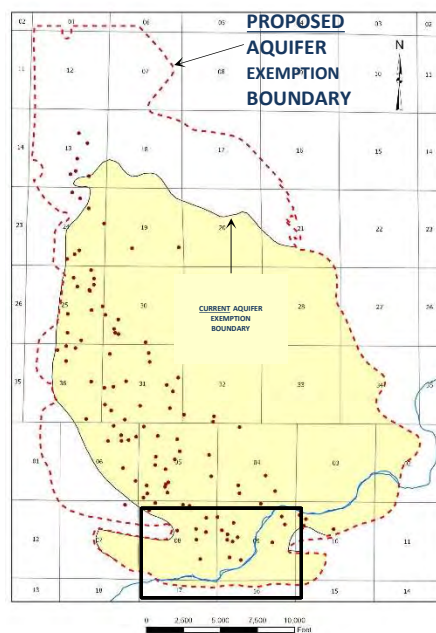


Figure 34 - Reservoir Pressure Profile

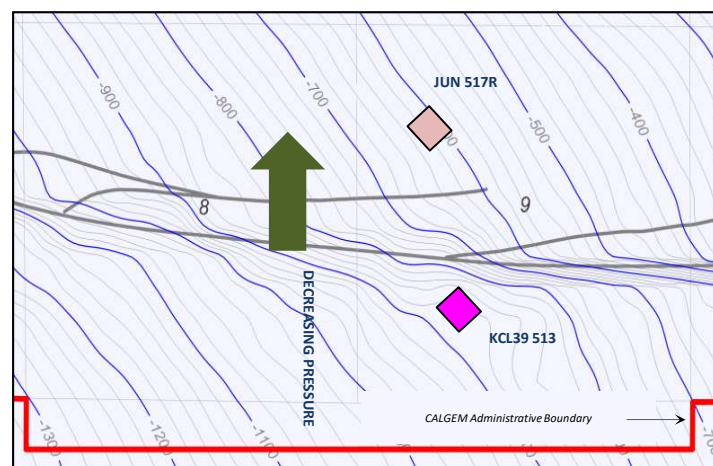
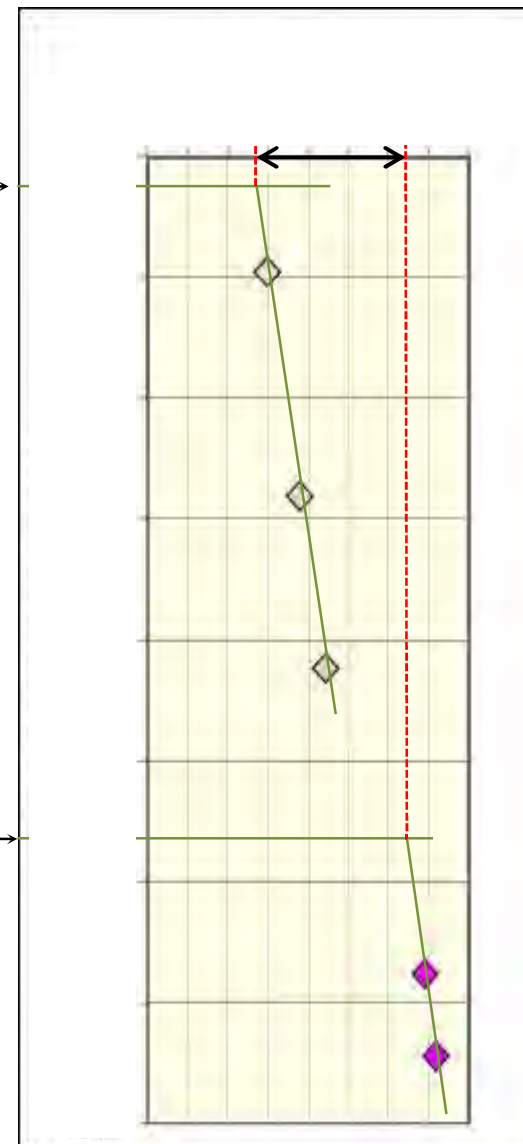


WELLS with OPENHOLE
RESERVOIR PRESSURE DATA

**Openhole
Pressure Data**

Well JUN 517R
Updip & North of
China Grade Fault:
Top of R2 Sand

Well KCL39 513
Downdip & South of
China Grade Fault:
Top of R2 Sand



STRUCTURE CONTOURS
on Top of R2 SAND

Figure 35 – Lateral Reservoir Pressure Gradient

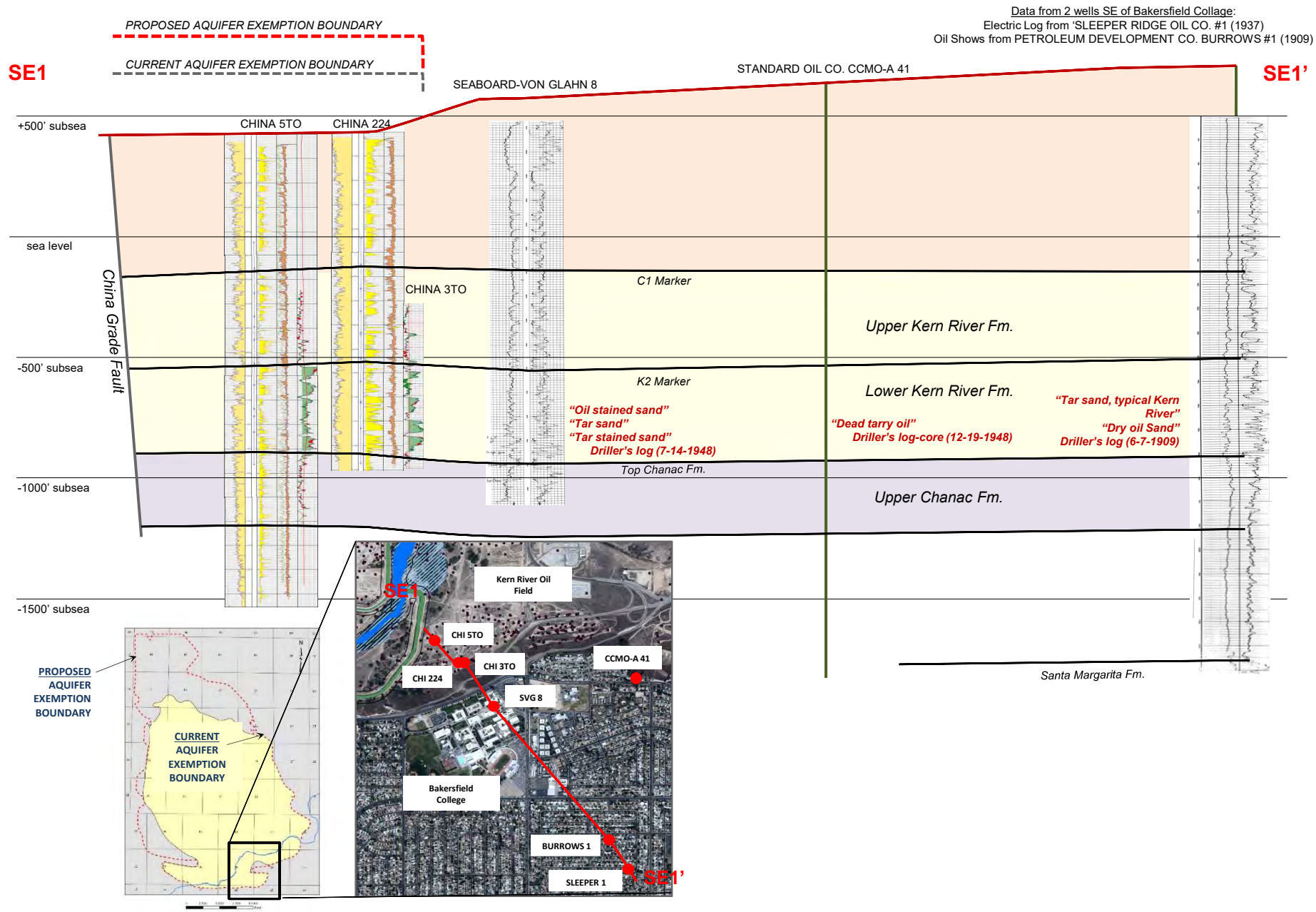


Figure 36 – Extension of Oil along Southeast Boundary of the Kern River Field

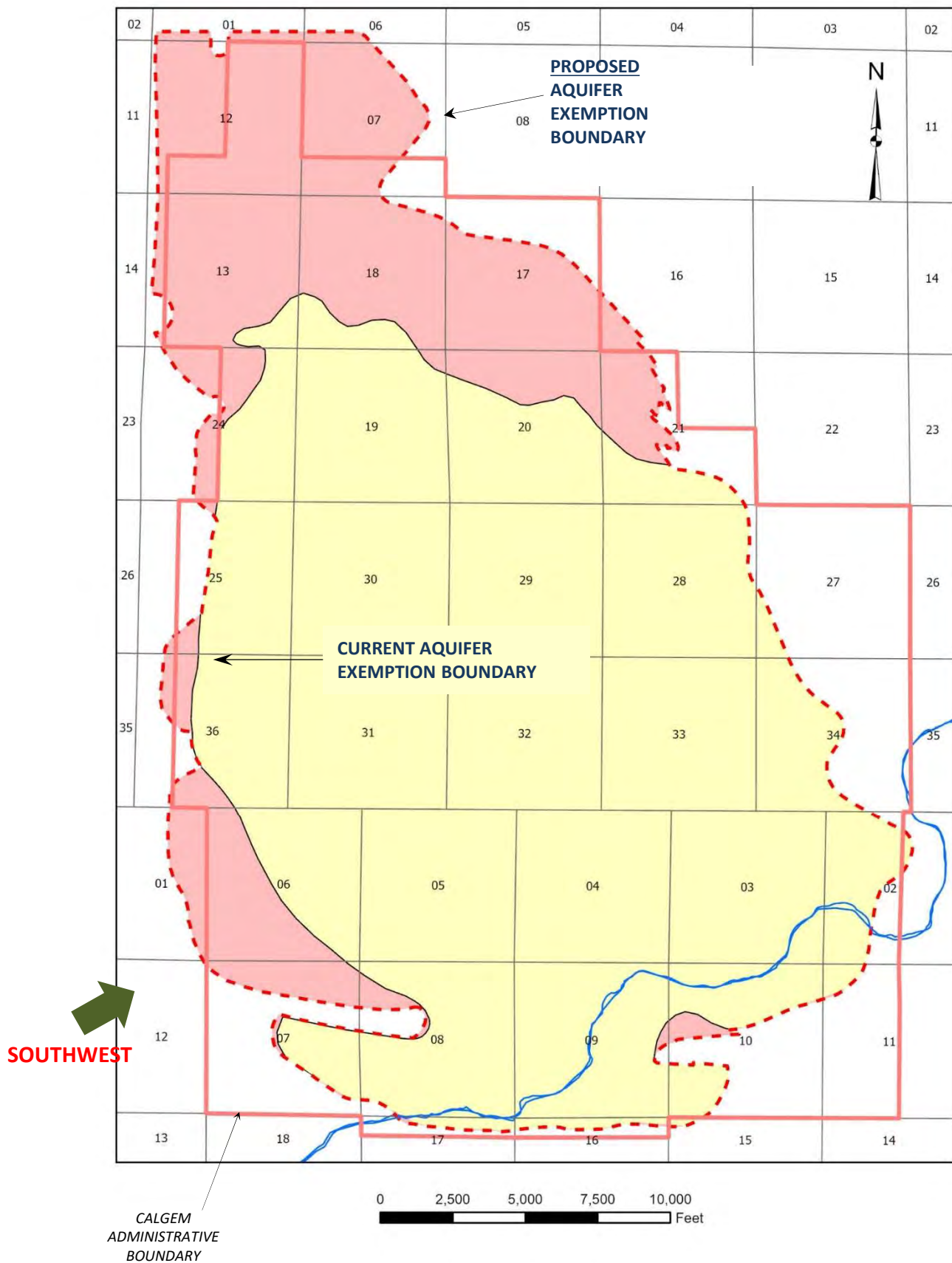


Figure 37 – Proposed Kern River Aquifer Exemption Boundary Southwest Lateral Extent

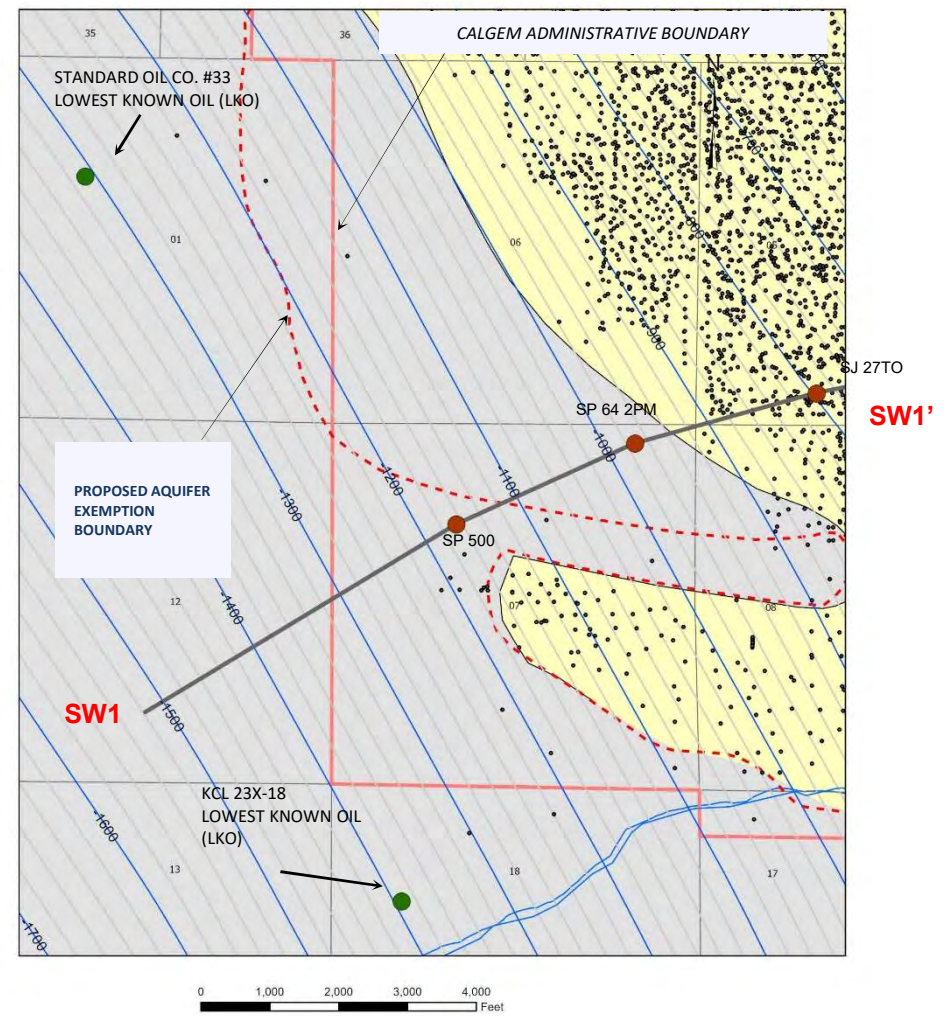
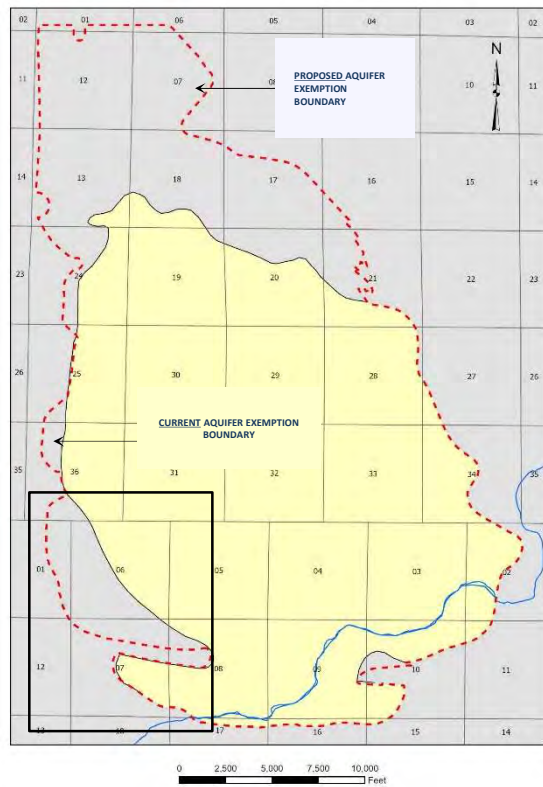


Figure 38 – Cross Section SW1-SW1' Location Lowest Known Oil

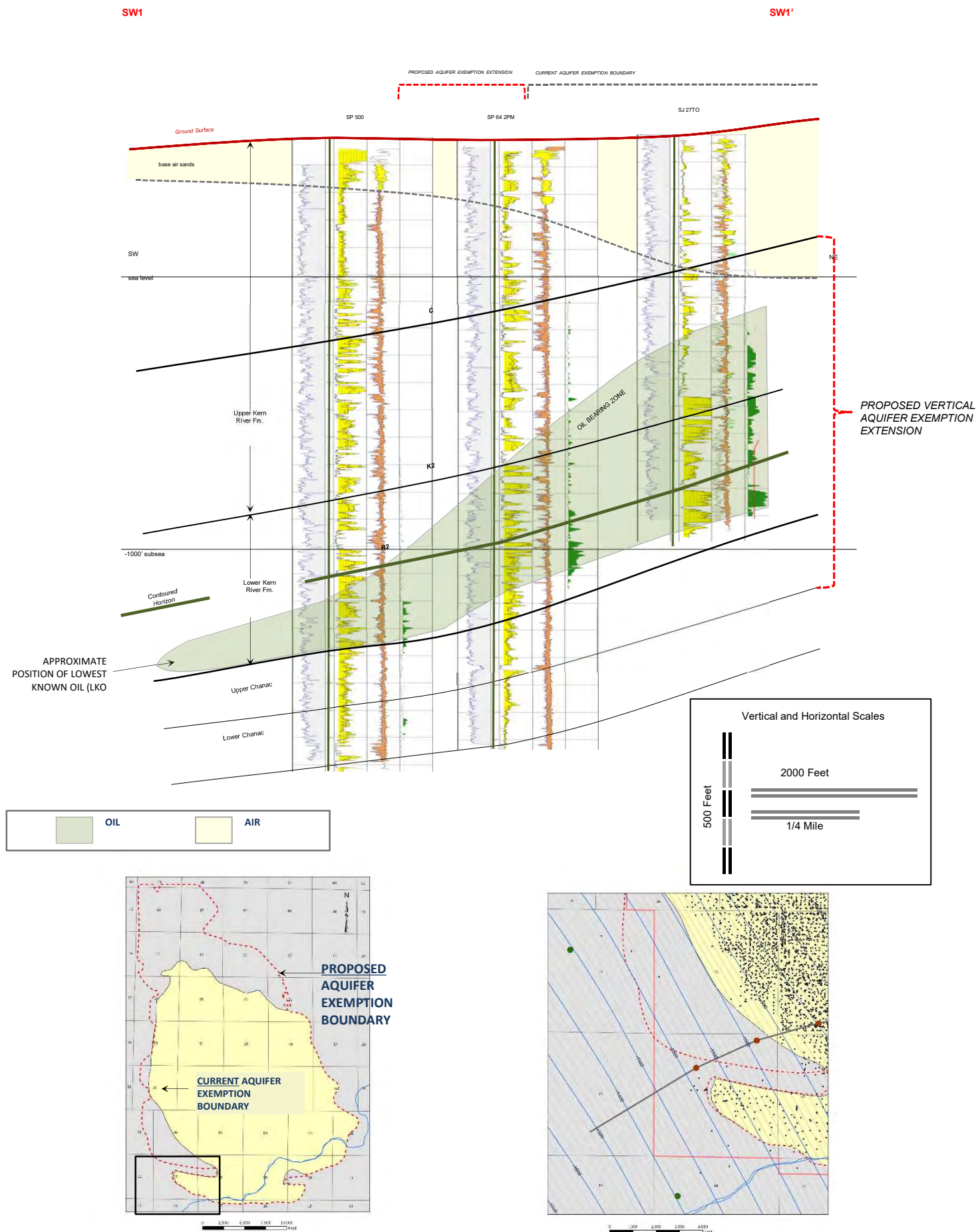
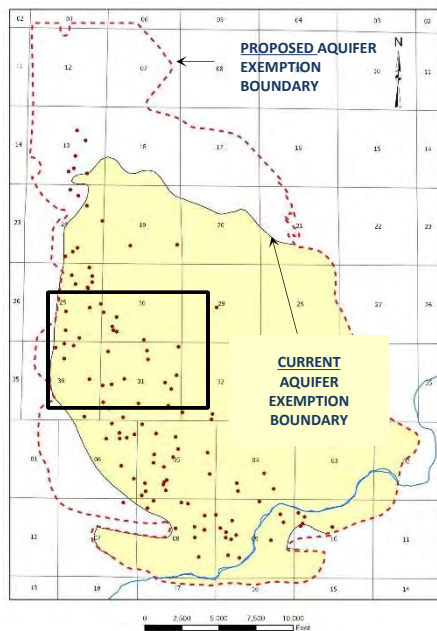
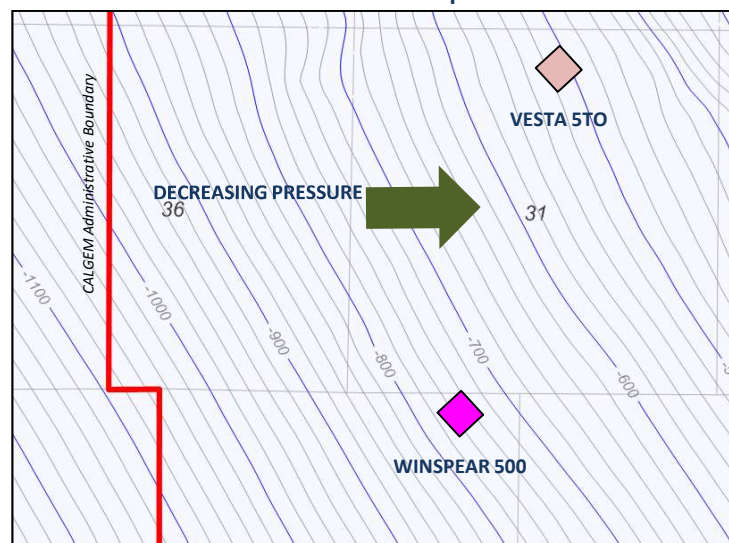


Figure 39 – Cross Section SW1-SW1' Lowest Known Oil

WELLS with OPENHOLE RESERVOIR PRESSURE DATA



STRUCTURE CONTOURS on Top of R2 SAND



Openhole Pressure Data

Updip Well VESTA 5TO:
Top of R2 Sand

Downdip Well WINSPEAR 500:
Top of R2 Sand

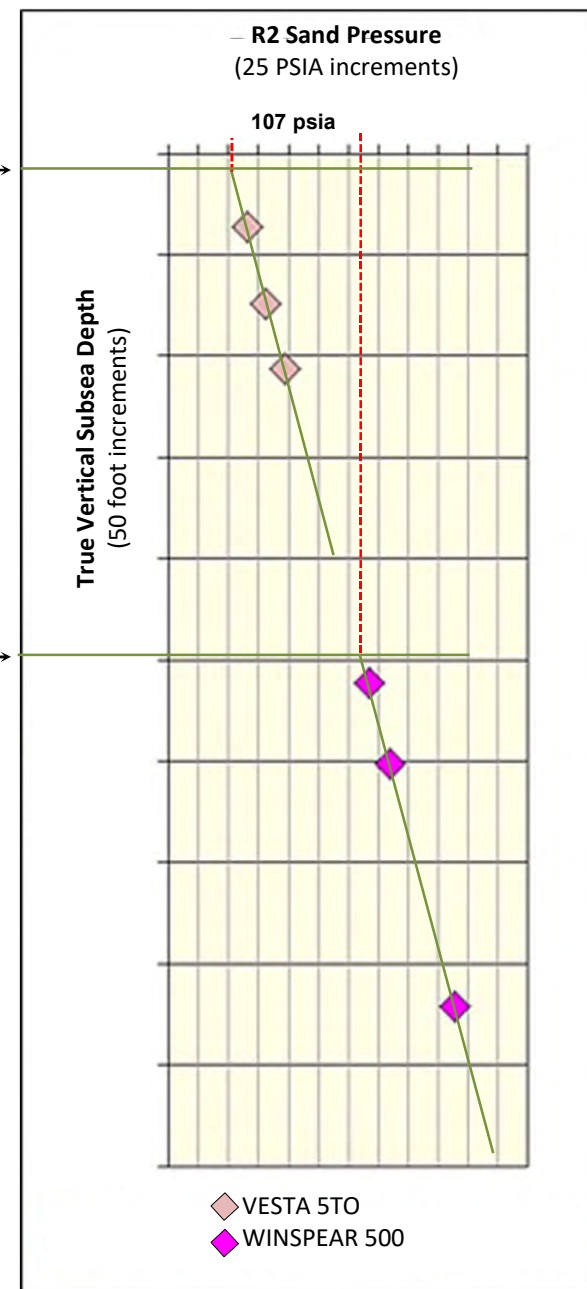


Figure 40 – Openhole Pressure Data

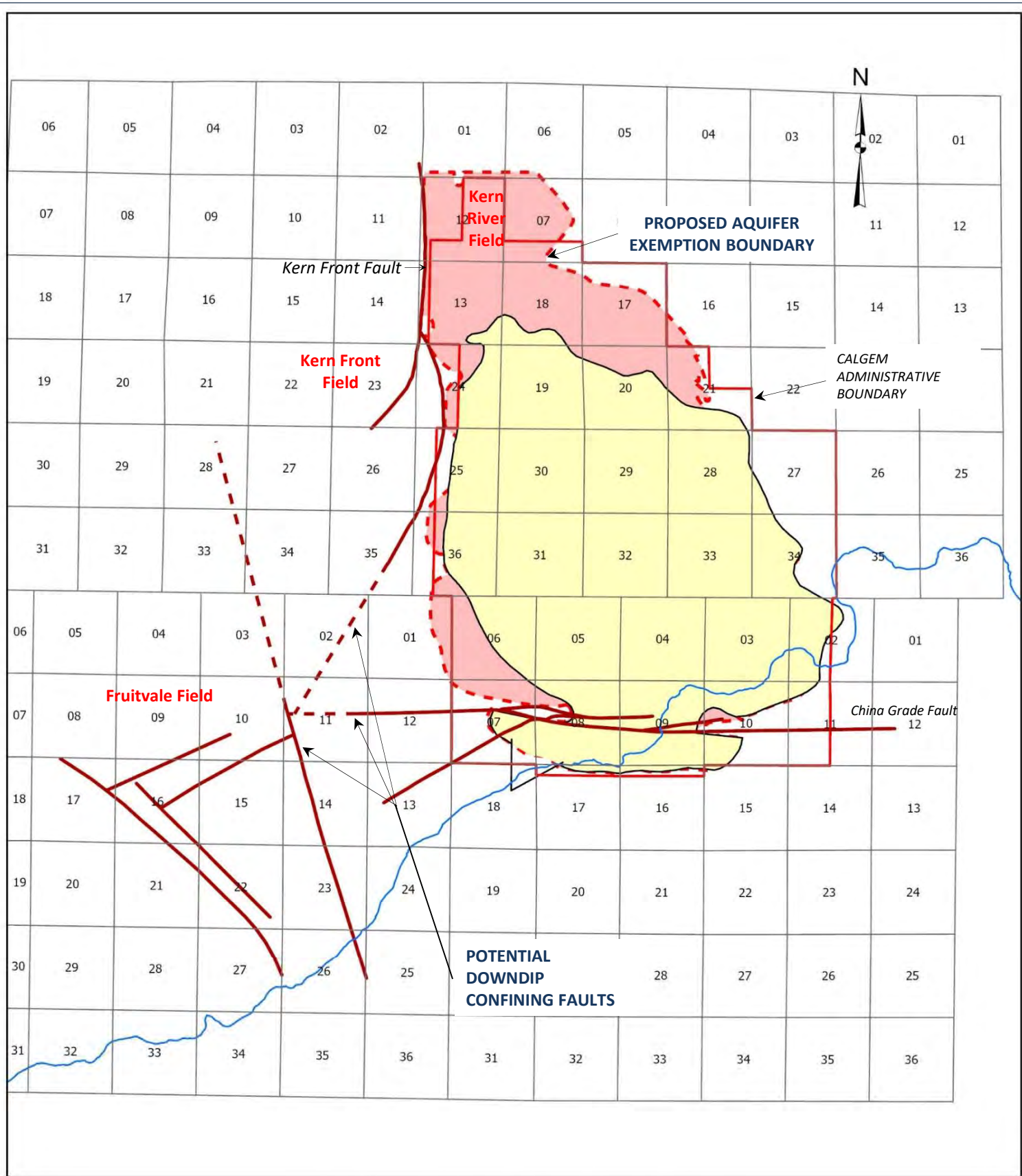
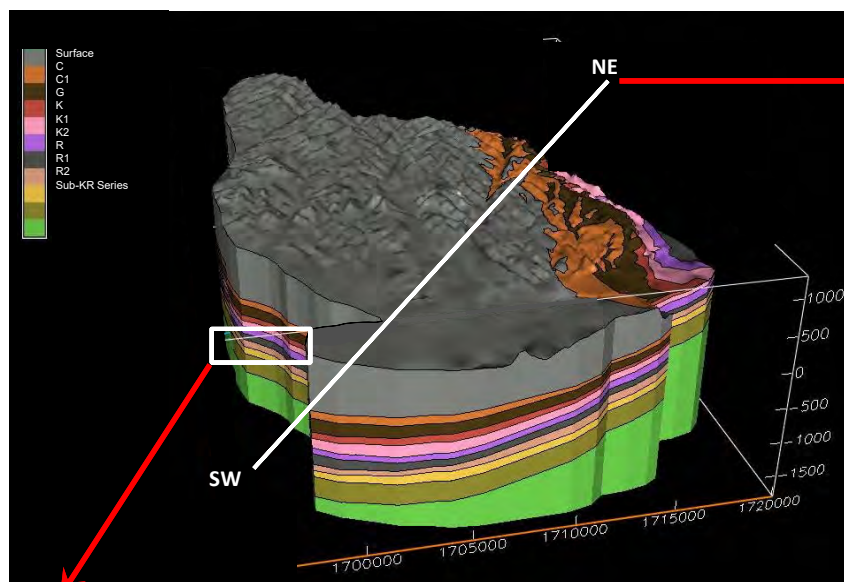
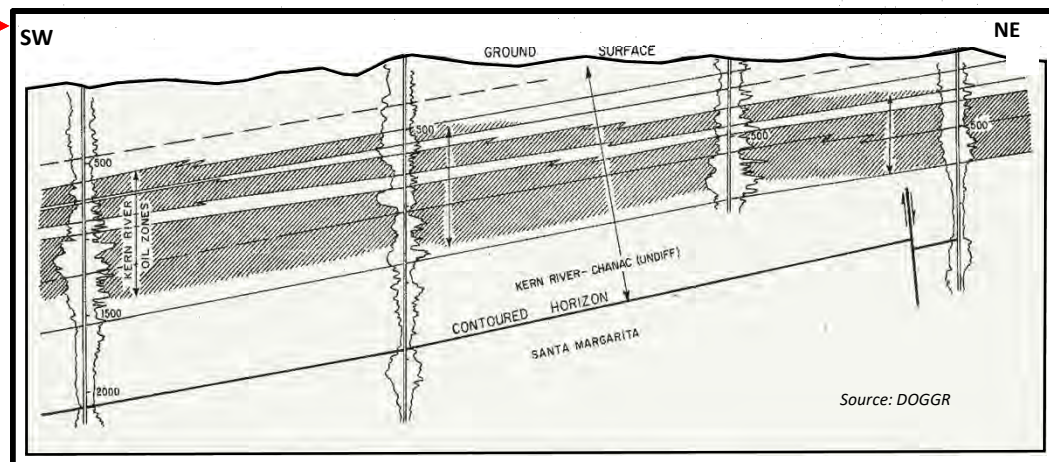


Figure 41 – Sealing Fault Extensions Southwest of Kern River Field



Generalized Fieldwide Cross-Section



Source: DOGGR

Detailed Stratigraphic Cross-Section

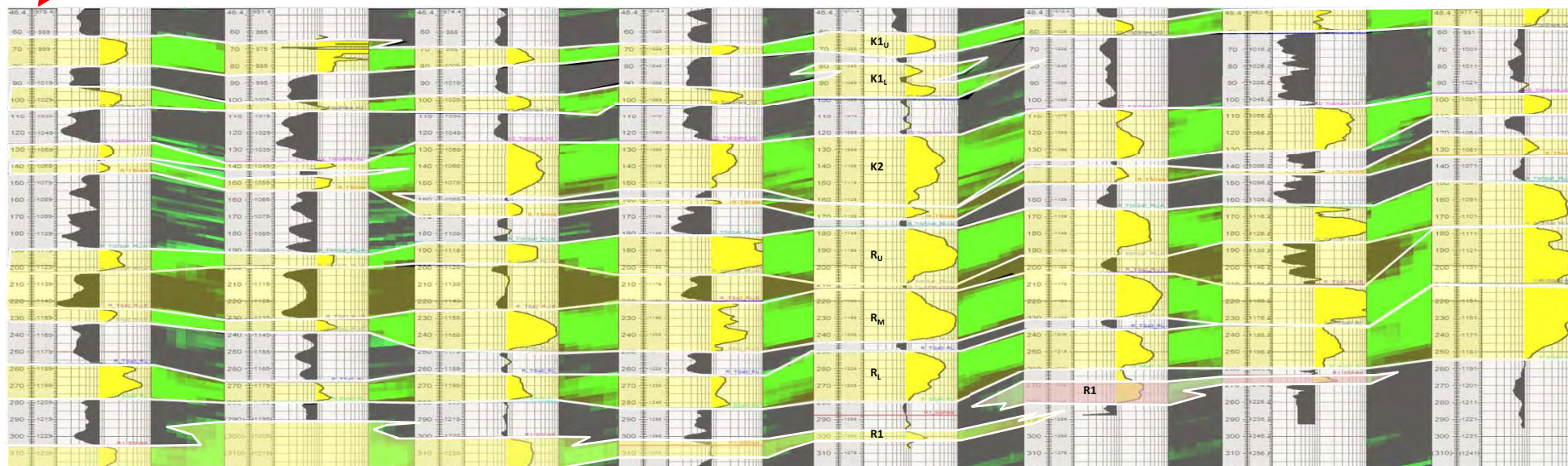


Figure 42 - Formation Architecture

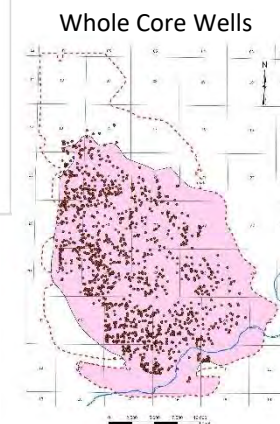
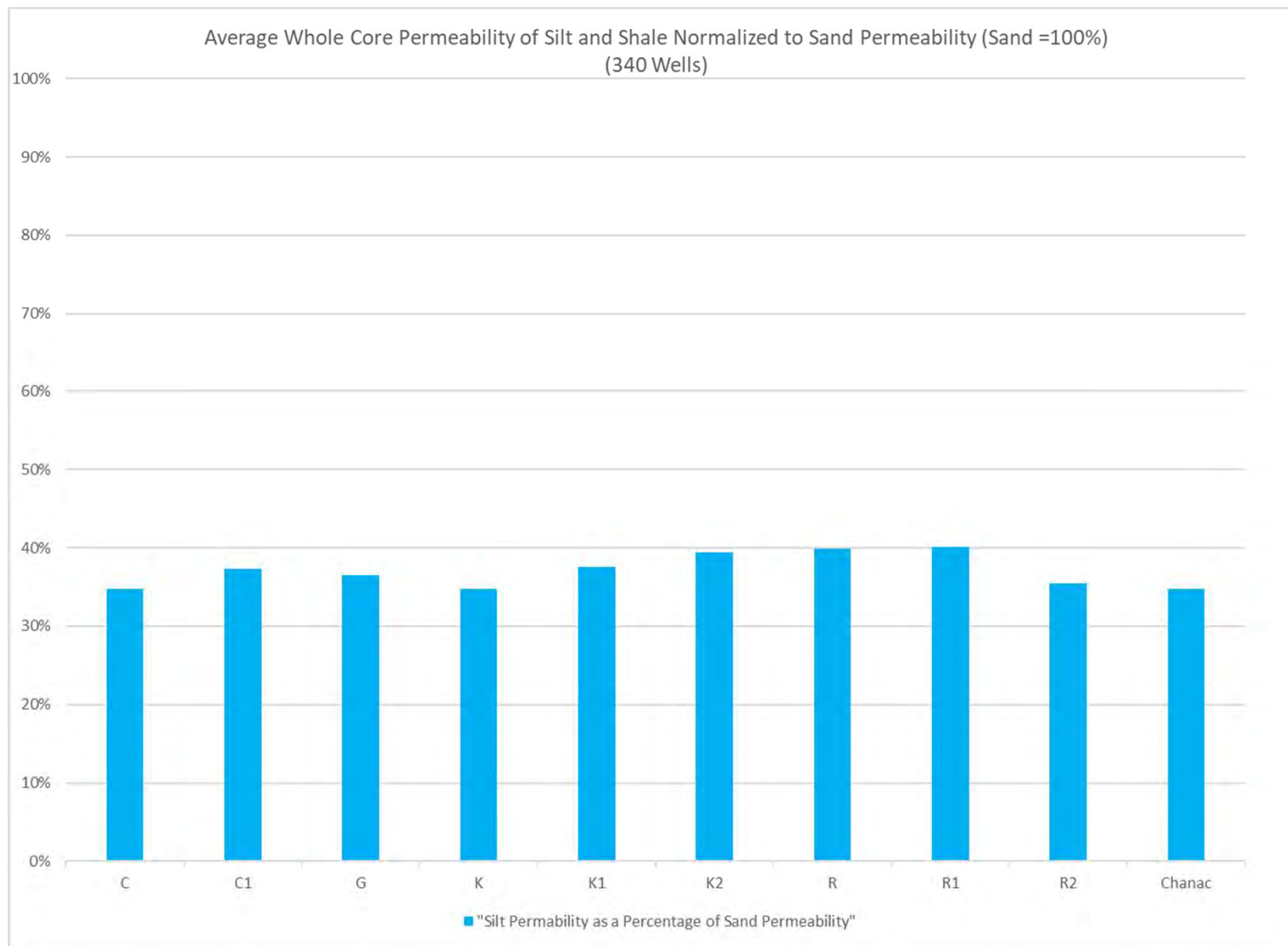
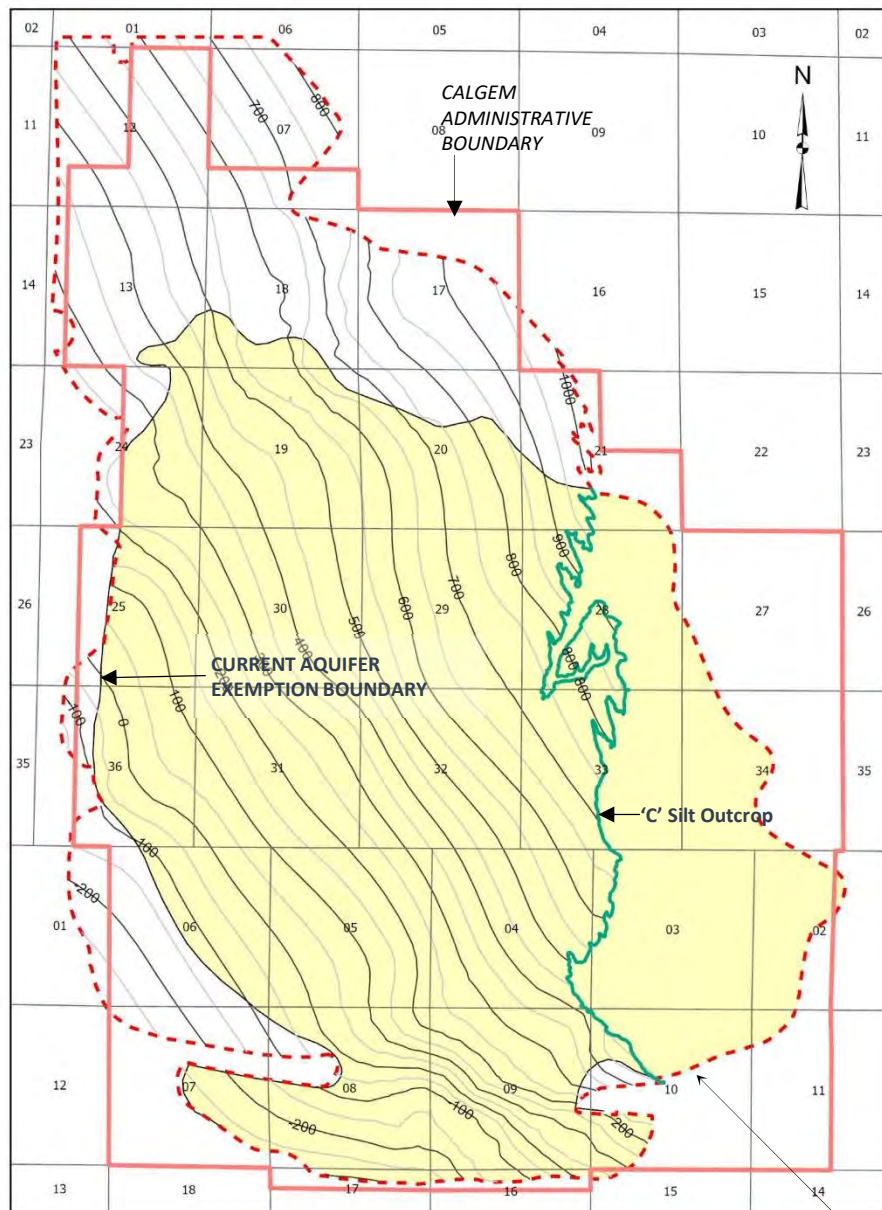
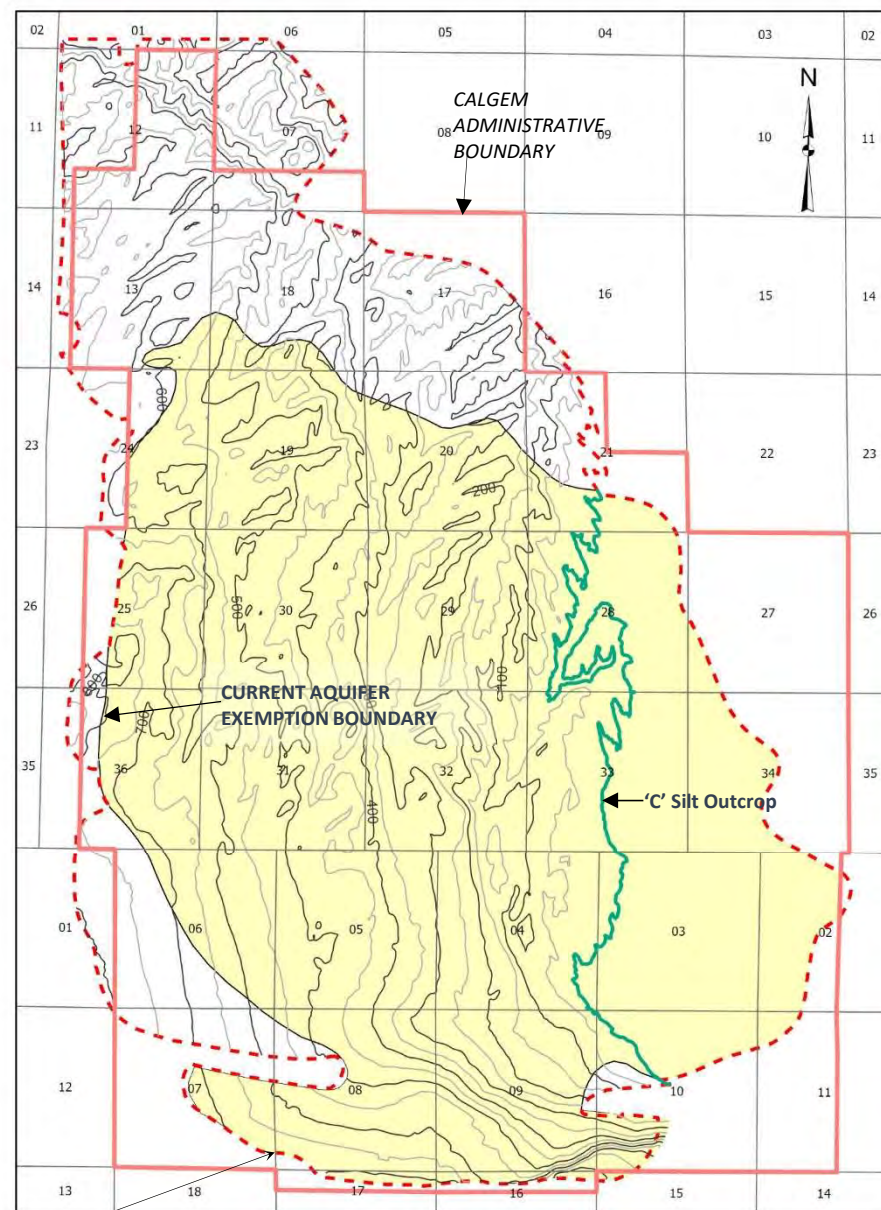


Figure 43 – Silt/Clay Effective Permeability Fraction – Kern River Formation

Referenced to Sea Level (50 foot contours)



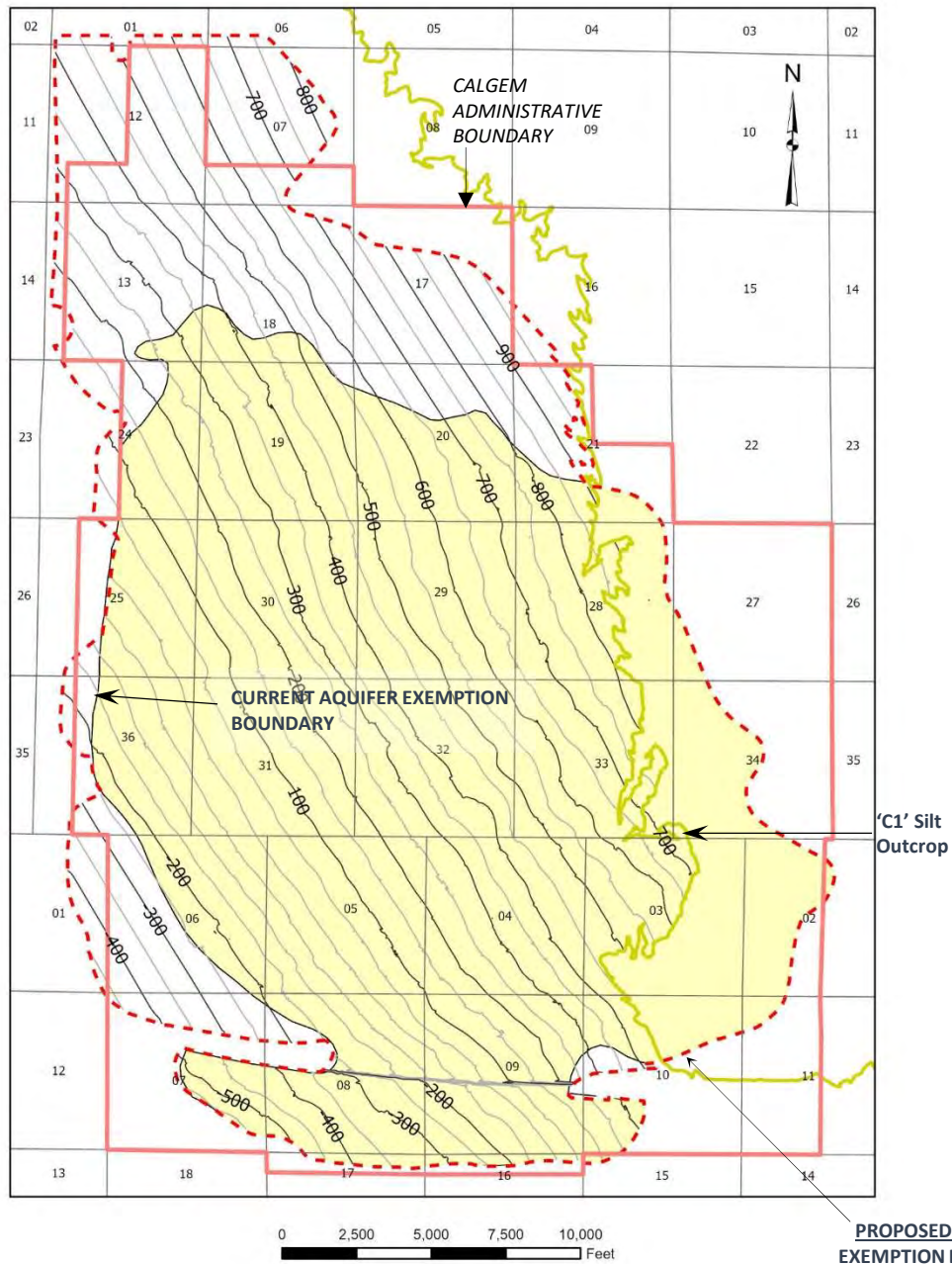
Referenced to Ground Level (50 foot contours)



PROPOSED AQUIFER EXEMPTION BOUNDARY

Figure 44 – Structure Map – Top of Confining 'G' Silt

Referenced to Sea Level (50 foot contours)



Referenced to Ground Level (50 foot contours)

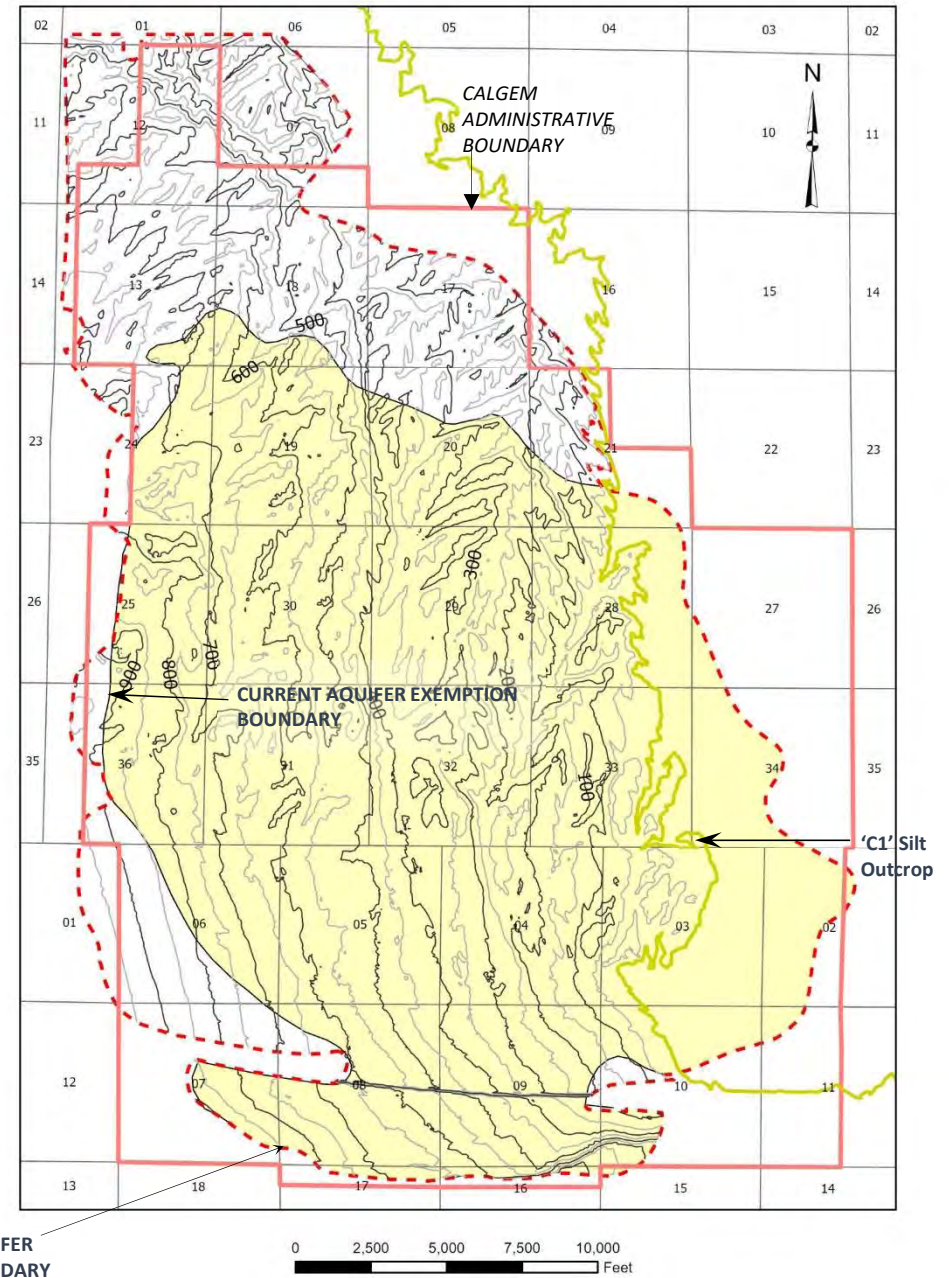
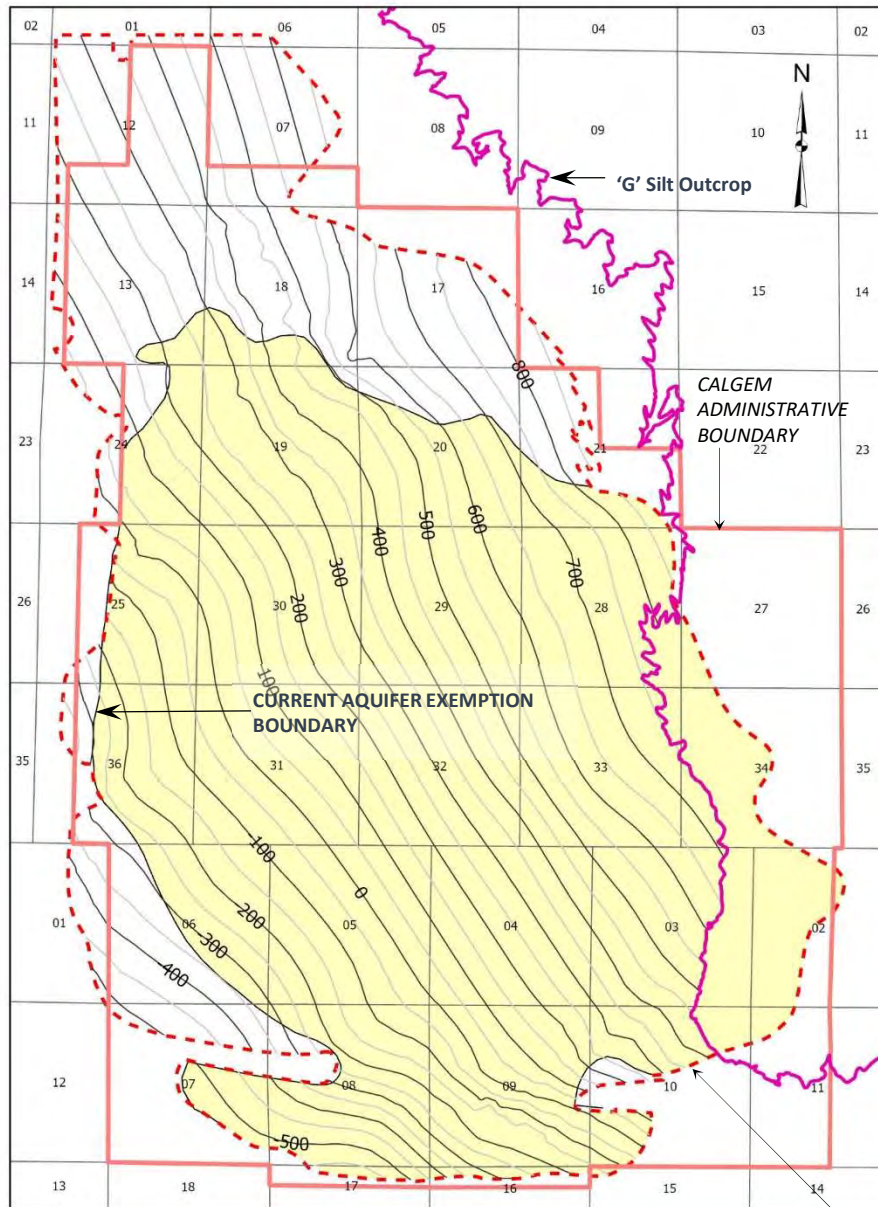
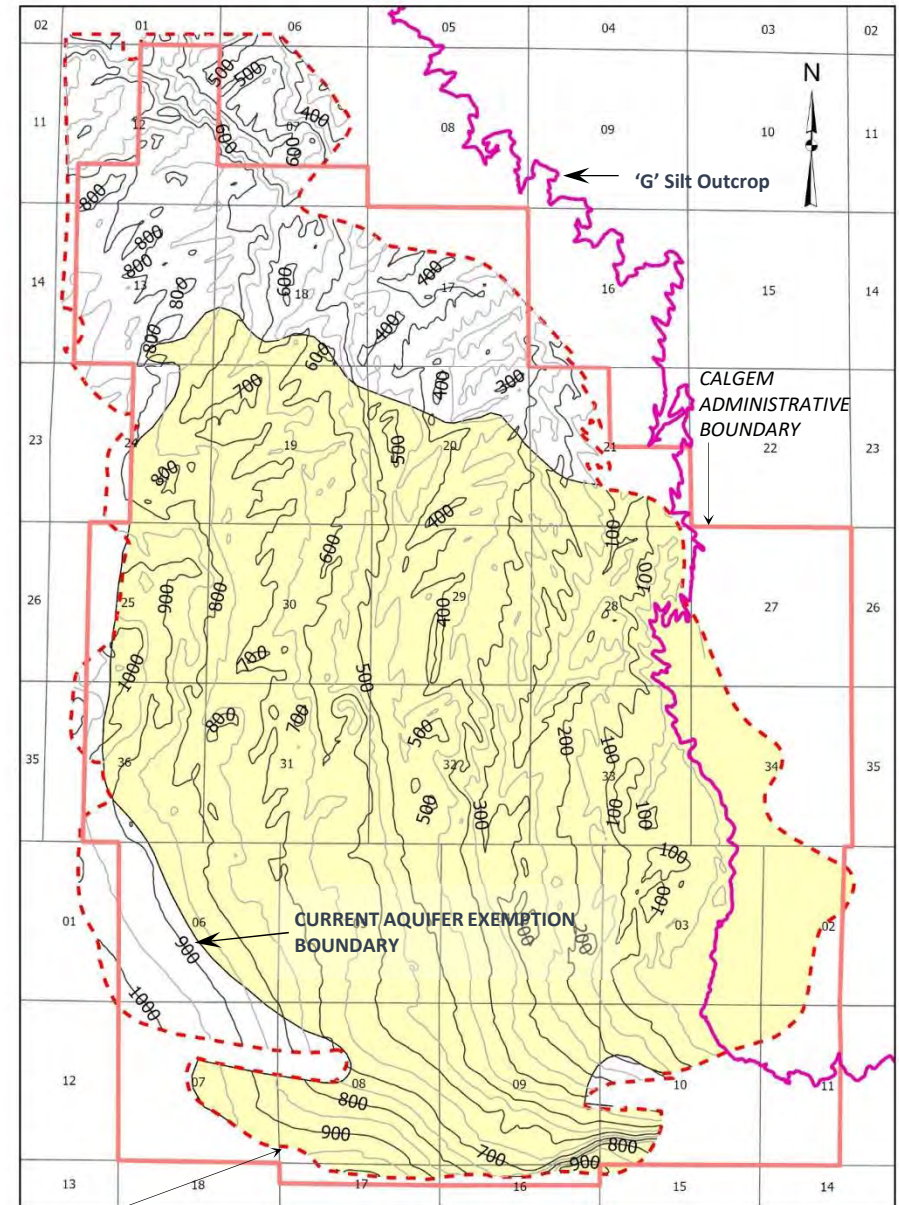


Figure 45 – Structure Map – Top of Confining 'C1' Silt

Referenced to Sea Level (50 foot contours)



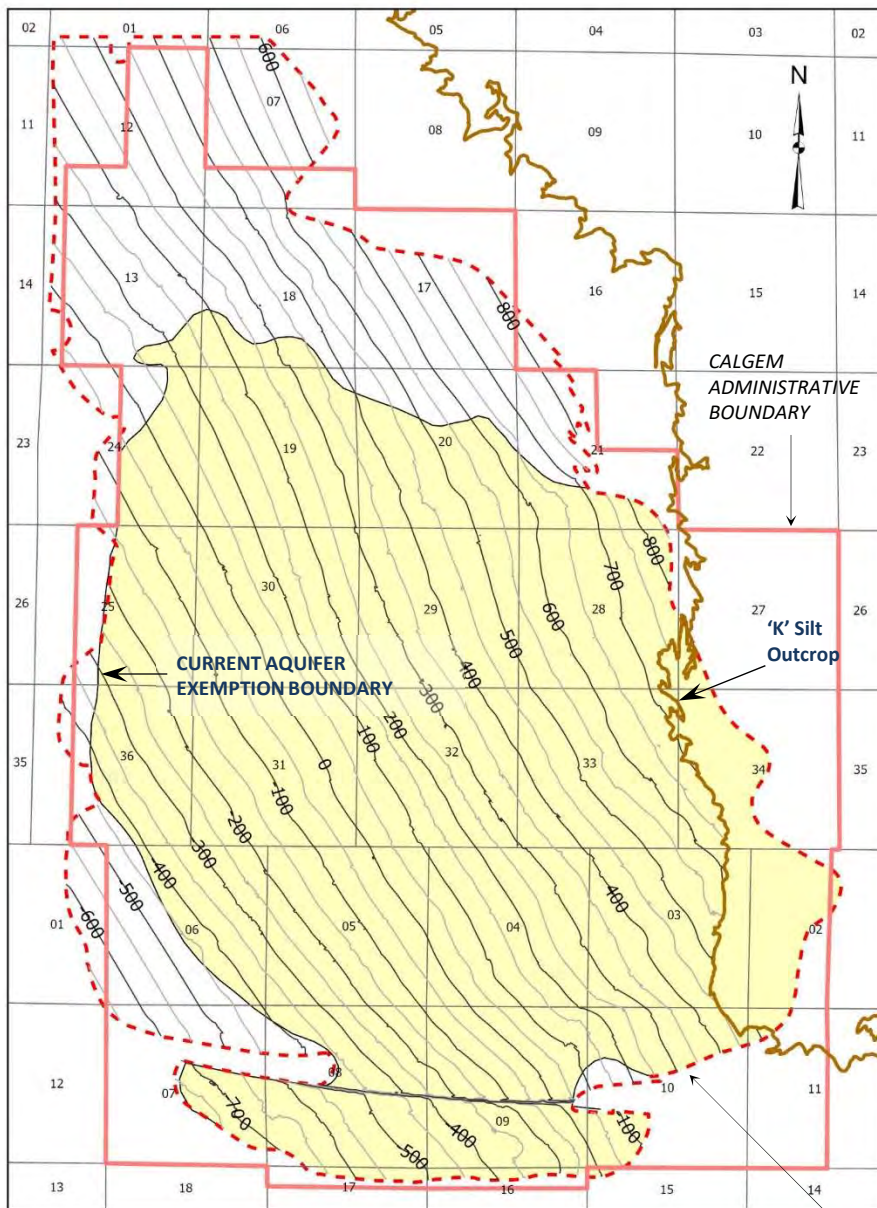
Referenced to Ground Level (50 foot contours)



**PROPOSED AQUIFER
EXEMPTION BOUNDARY**

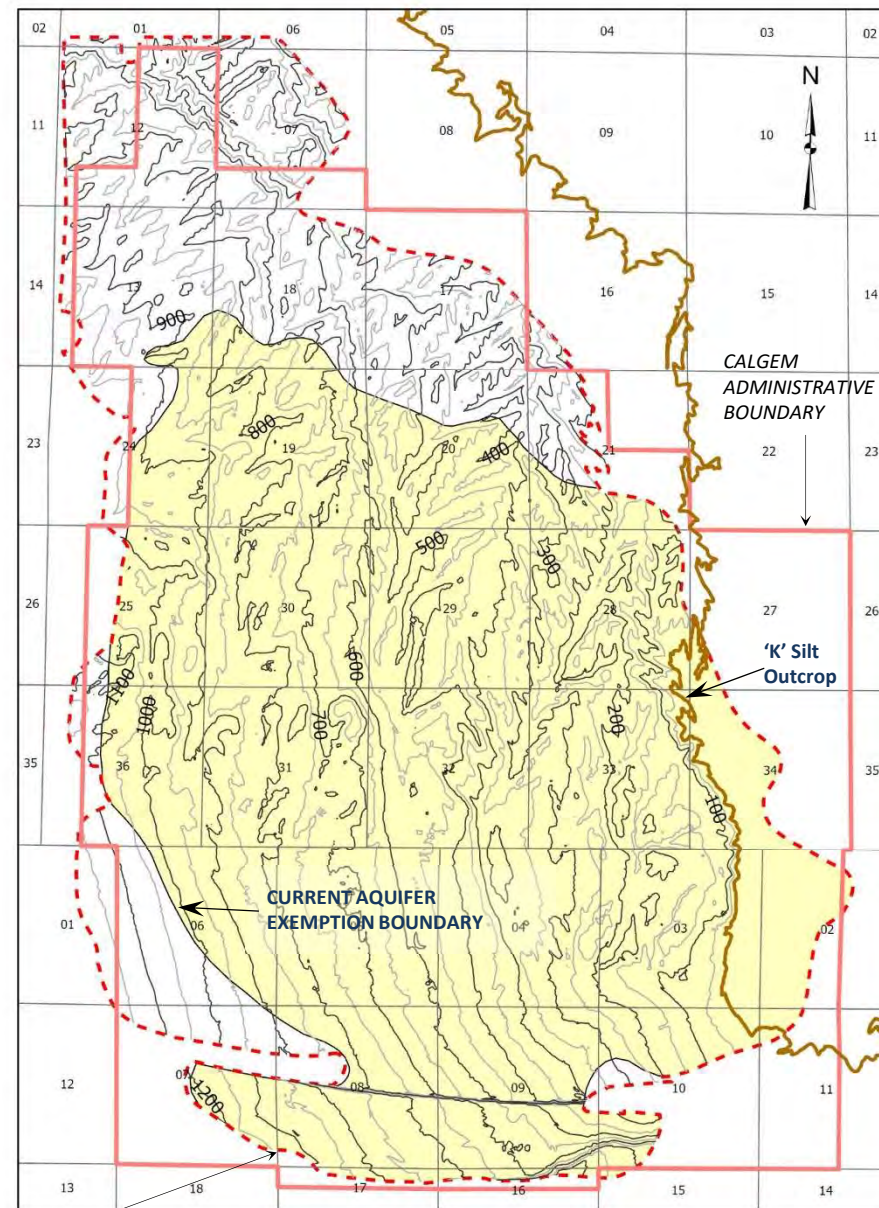
Figure 46 – Structure Map – Top of Confining 'G' Silt

Referenced to Sea Level (50 foot contours)



0 2,500 5,000 7,500 10,000
Feet

Referenced to Ground Level (50 foot contours)

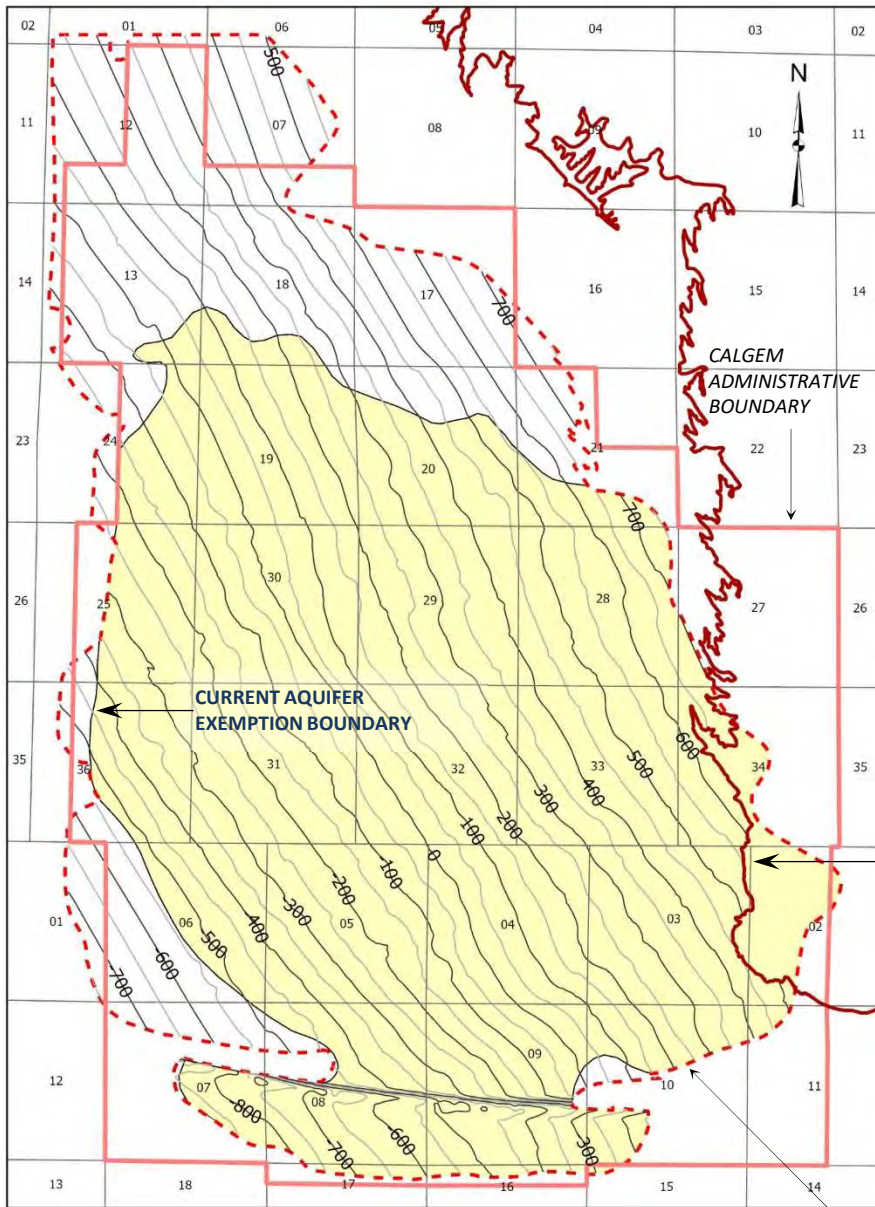


0 2,500 5,000 7,500 10,000
Feet

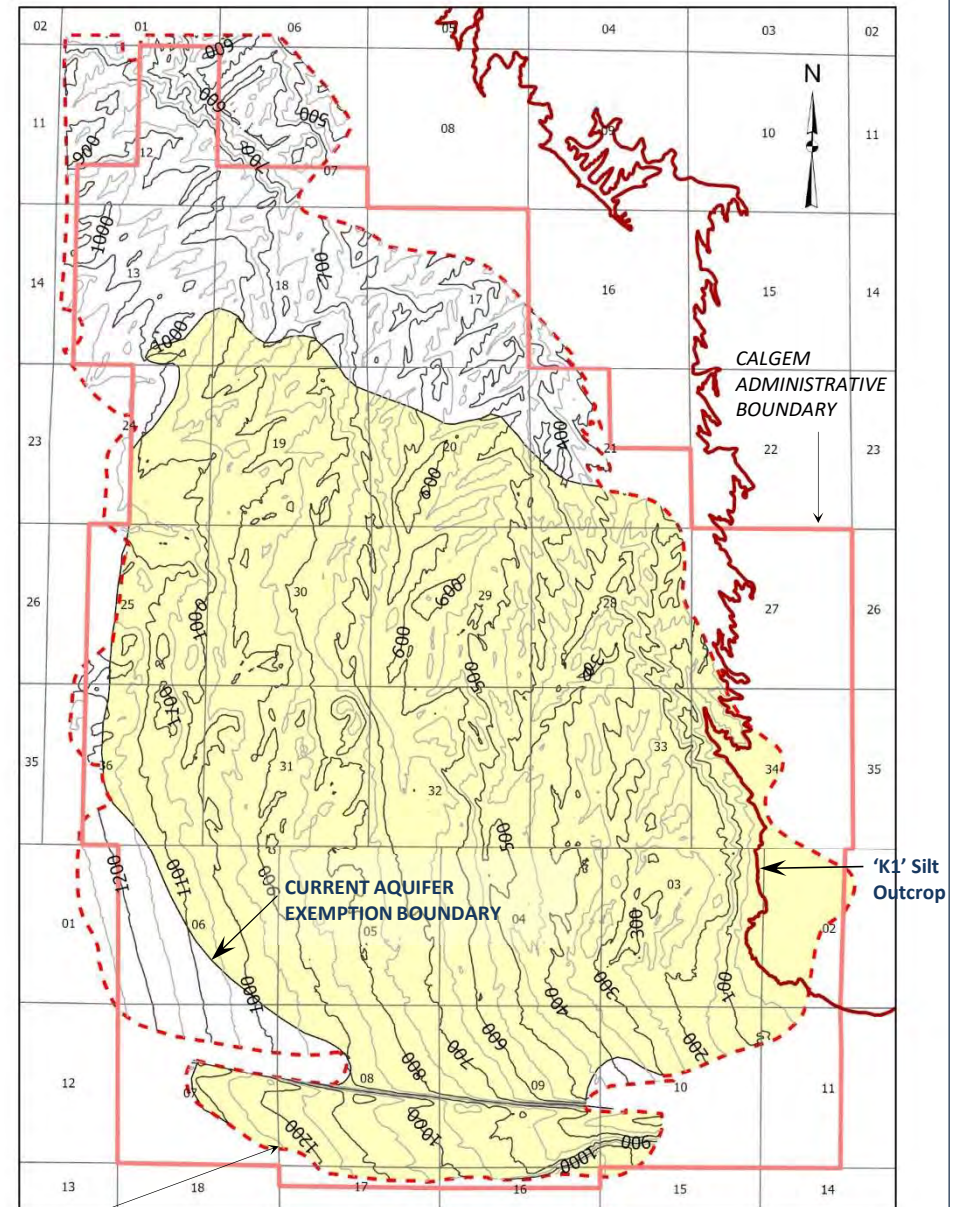
**PROPOSED AQUIFER
EXEMPTION BOUNDARY**

Figure 47 – Structure Map – Top of Confining 'K' Silt

Referenced to Sea Level (50 foot contours)



Referenced to Ground Level (50 foot contours)



'K1' Silt
Outcrop

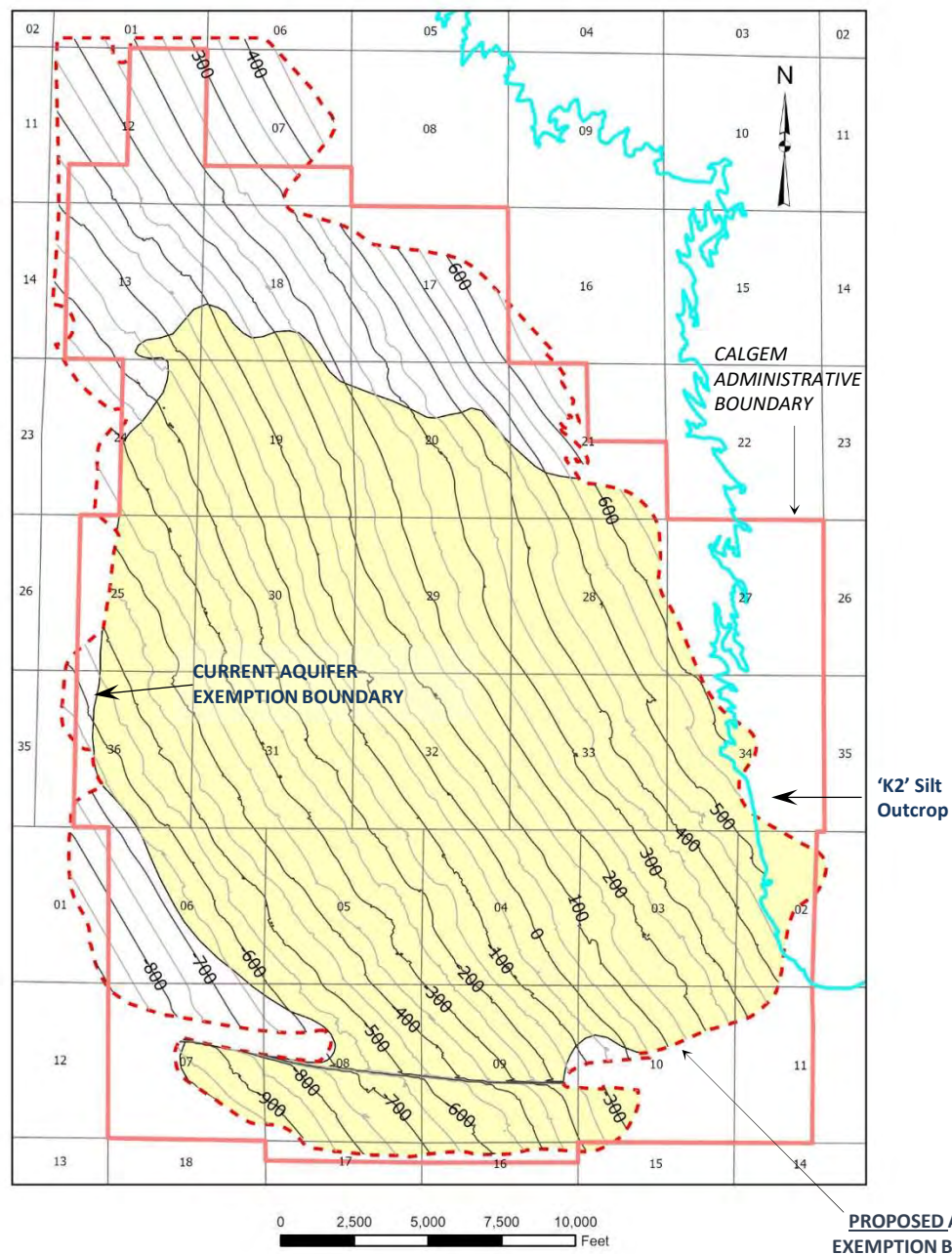
'K1' Silt
Outcrop

PROPOSED AQUIFER
EXEMPTION BOUNDARY

PROPOSED AQUIFER
EXEMPTION BOUNDARY

Figure 48 – Structure Map – Top of Confining 'K1' Silt

Referenced to Sea Level (50 foot contours)



Referenced to Ground Level (50 foot contours)

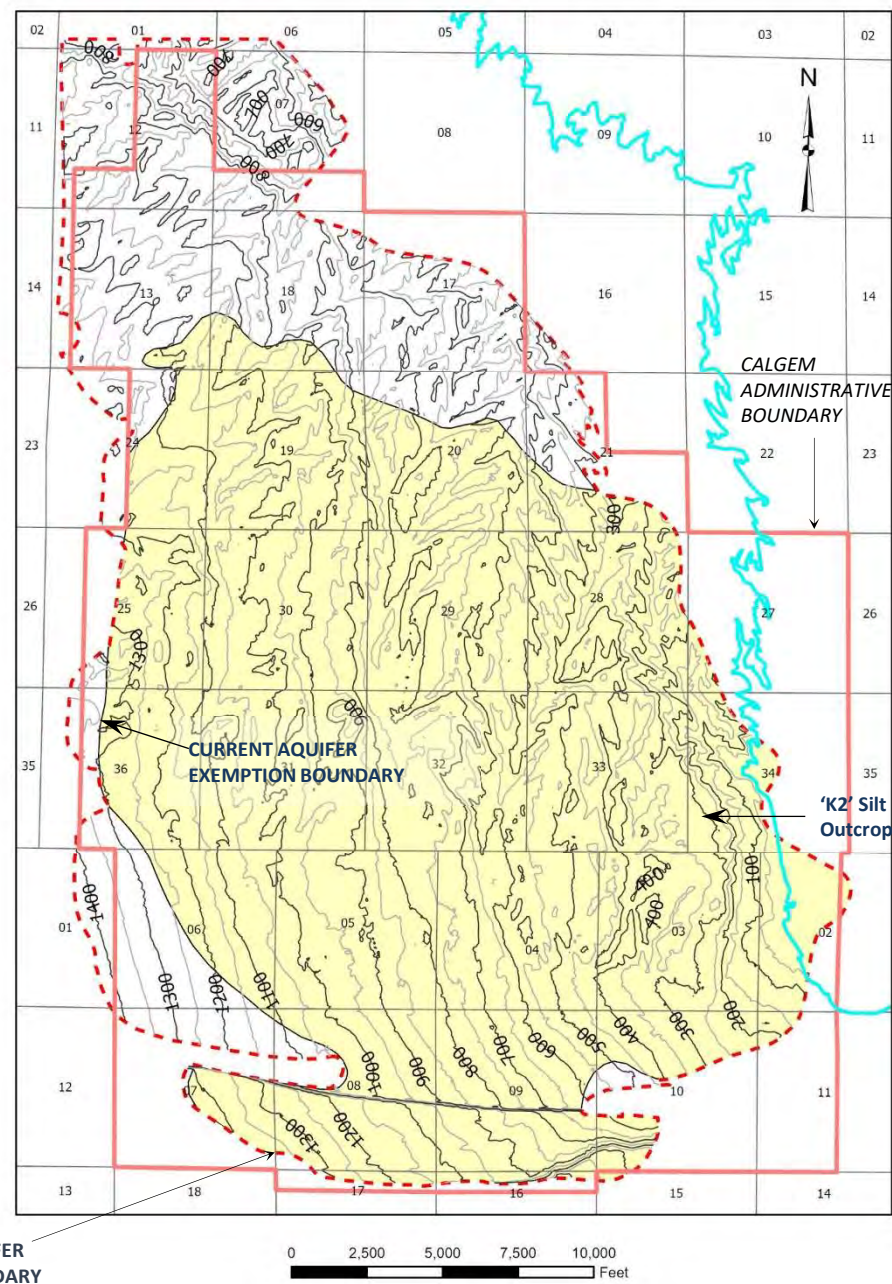
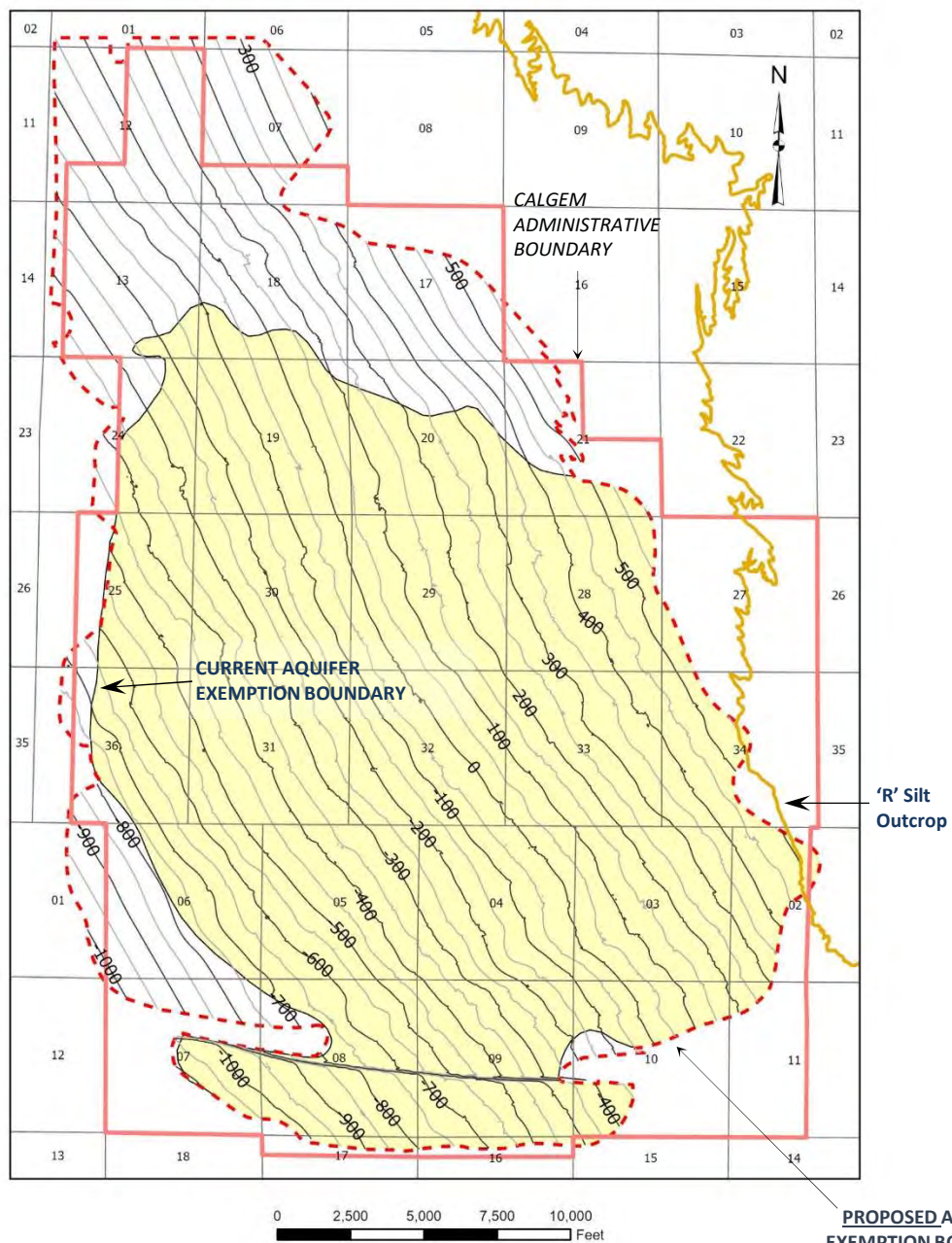


Figure 49 – Structure Map – Top of Confining 'K2' Silt

Referenced to Sea Level (50 foot contours)



Referenced to Ground Level (50 foot contours)

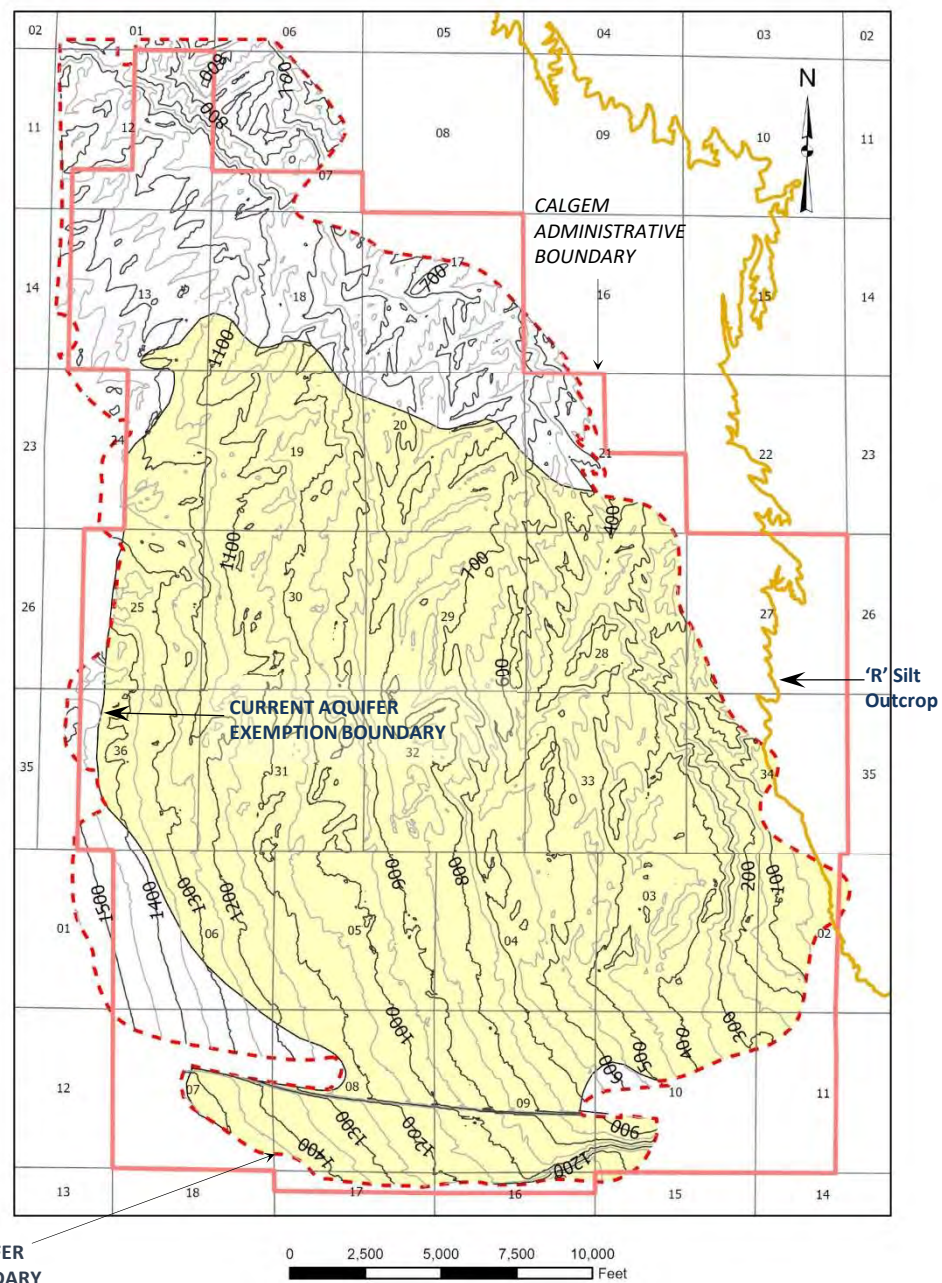
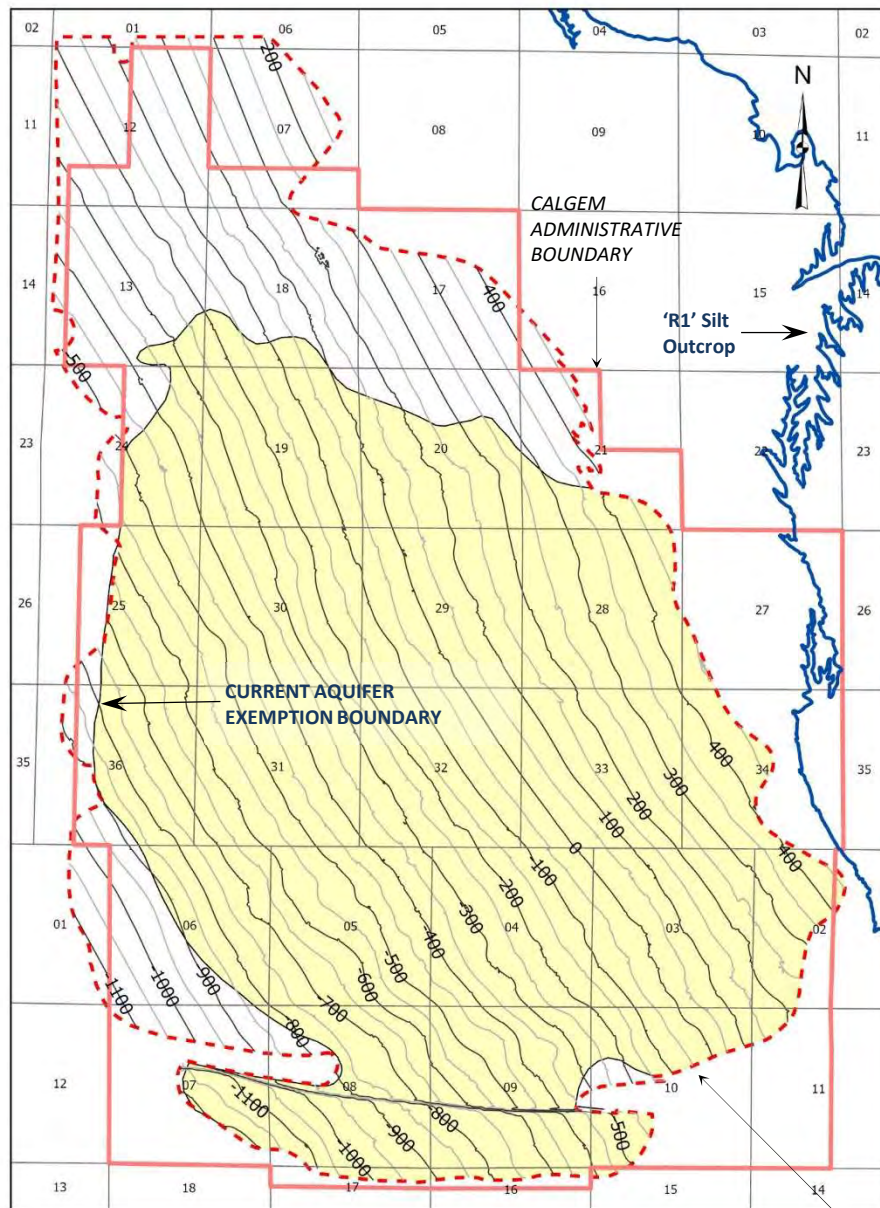
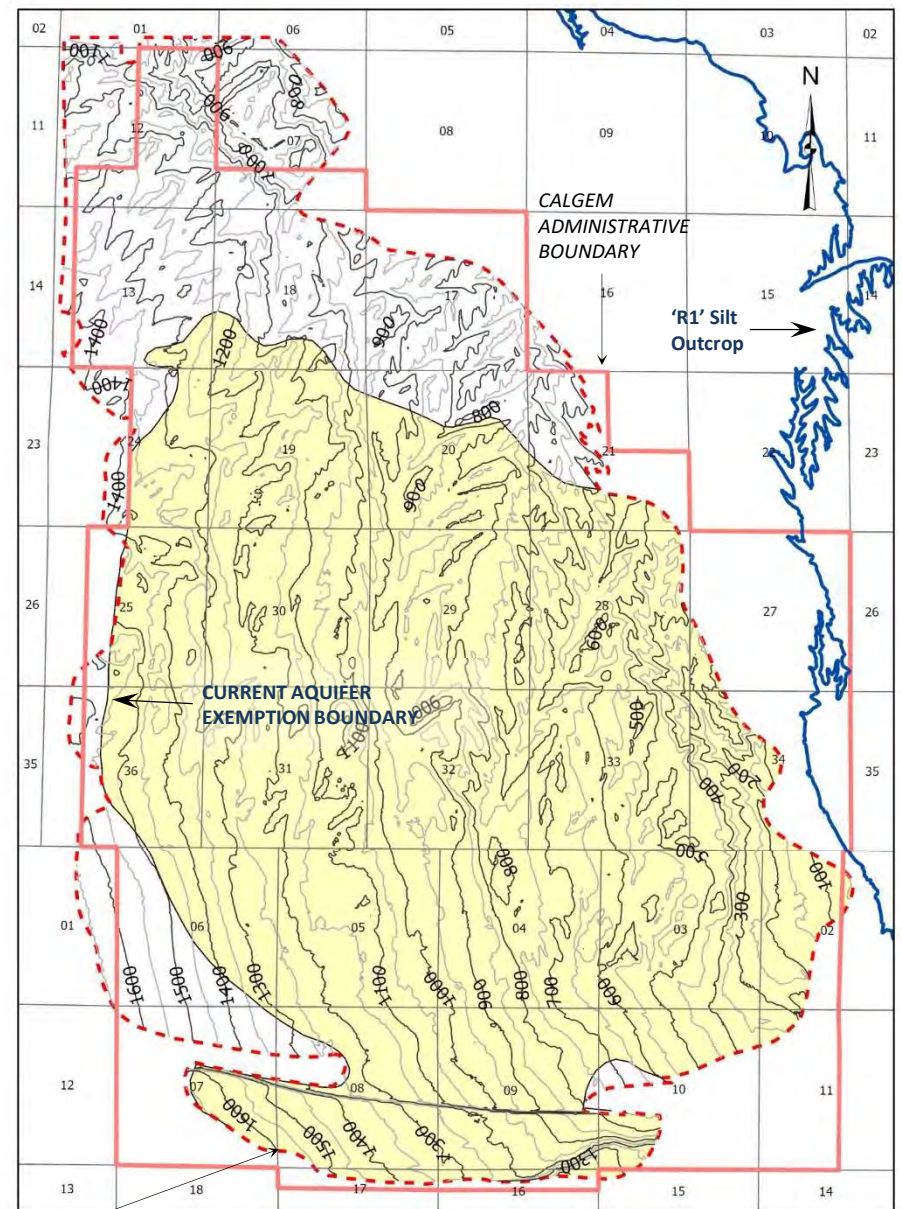


Figure 50 – Structure Map – Top of Confining 'R' Silt

Referenced to Sea Level (50 foot contours)



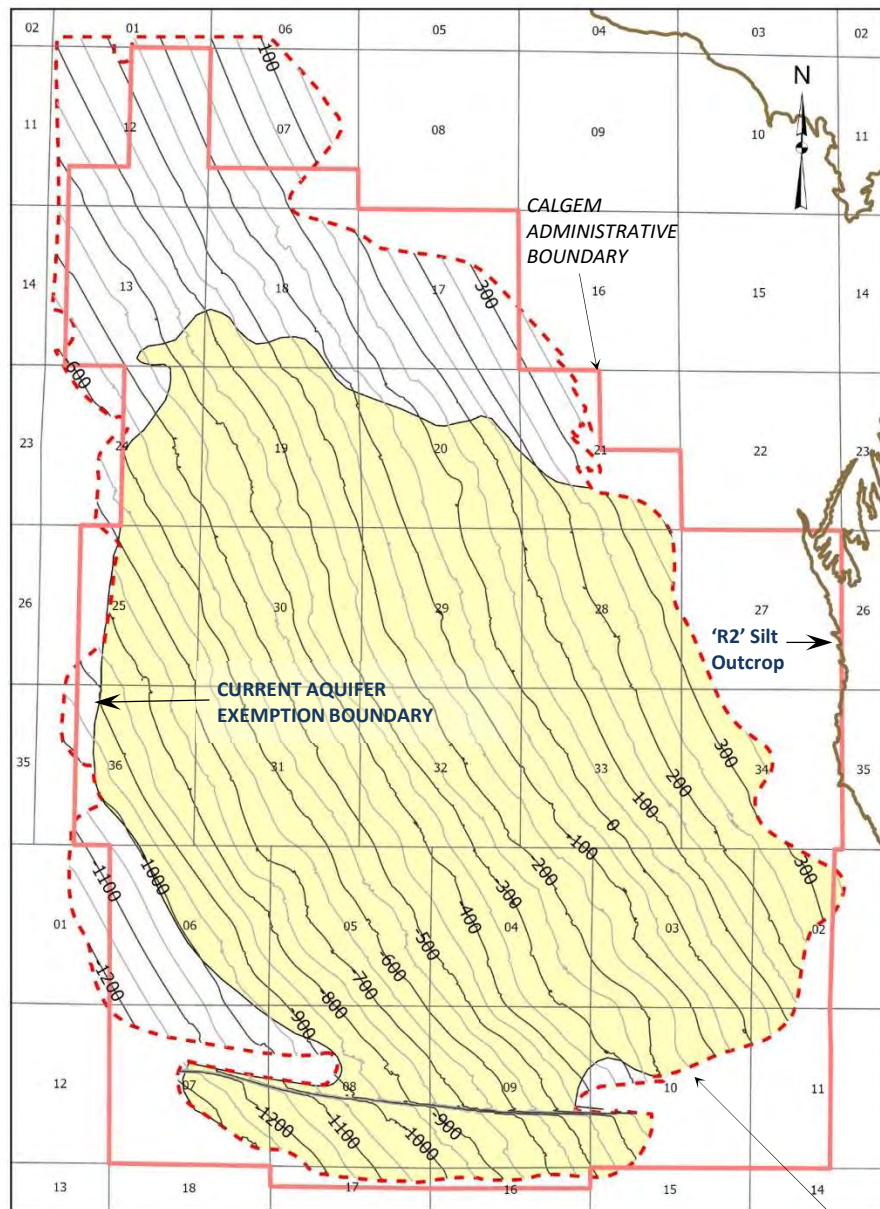
Referenced to Ground Level (50 foot contours)



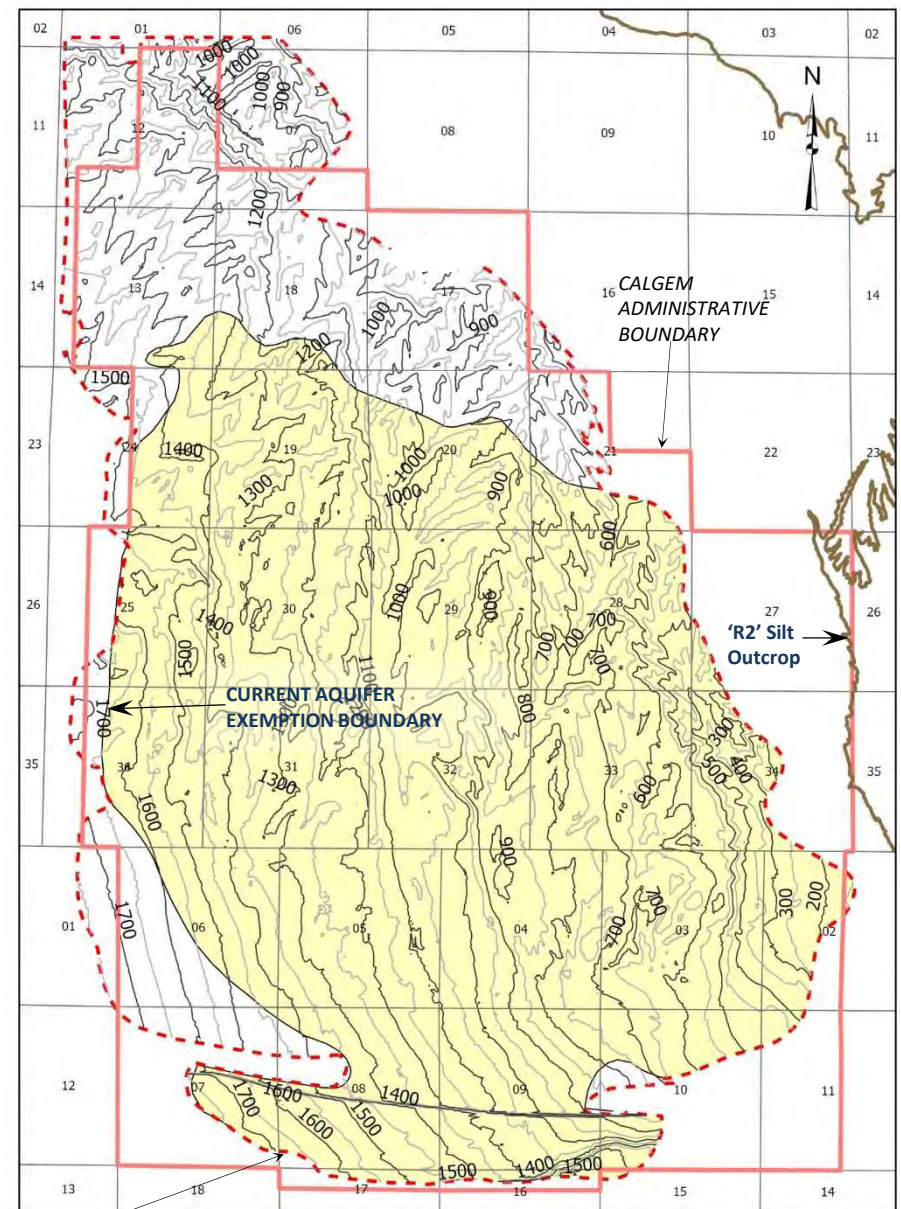
PROPOSED AQUIFER EXEMPTION BOUNDARY

Figure 51 – Structure Map – Top of Confining 'R1' Silt

Referenced to Sea Level (50 foot contours)



Referenced to Ground Level (50 foot contours)



PROPOSED AQUIFER EXEMPTION BOUNDARY

Figure 52 – Structure Map – Top of Confining 'R2' Silt

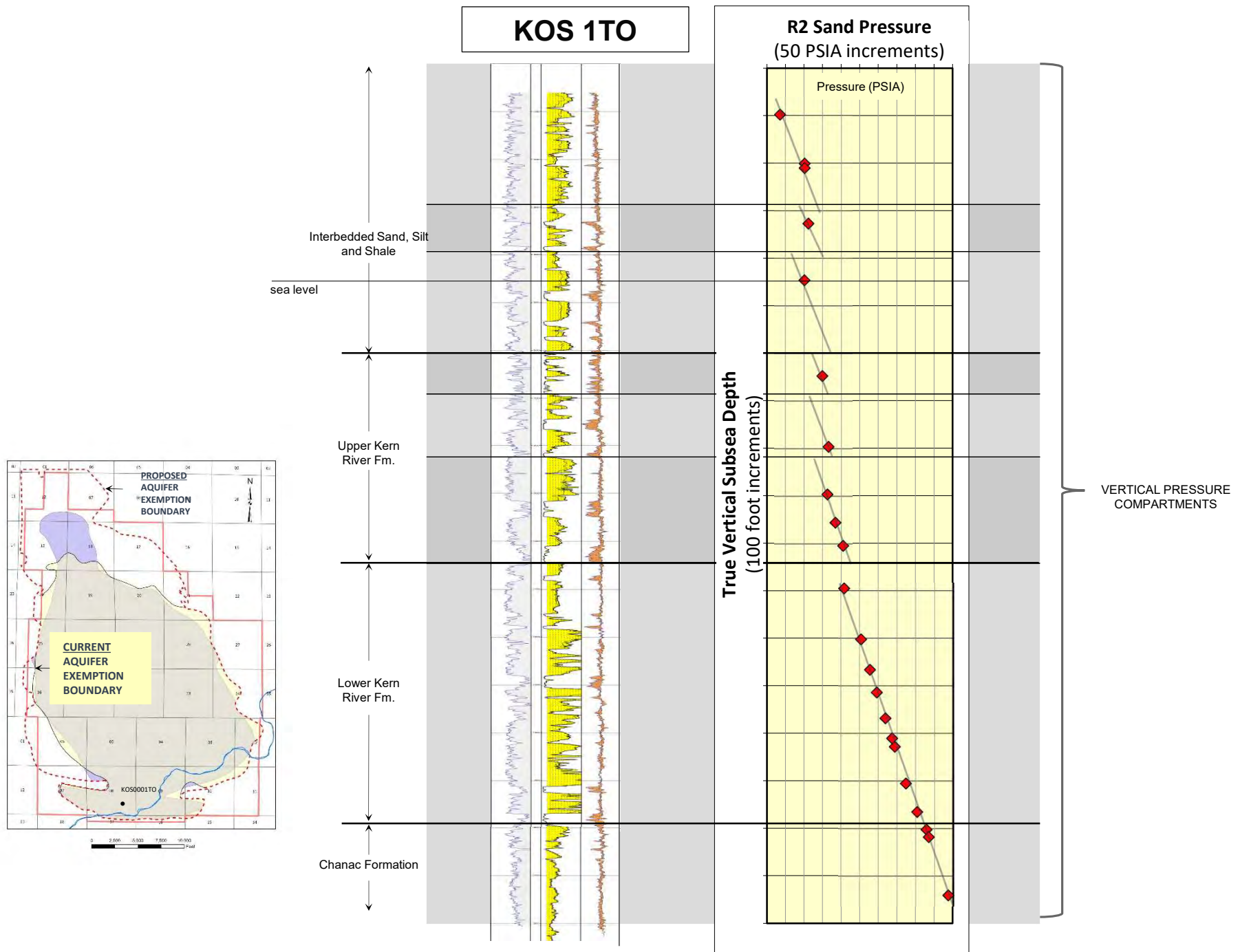


Figure 53 – Pressure Compartmentalization Due to Vertical Permeability Barriers

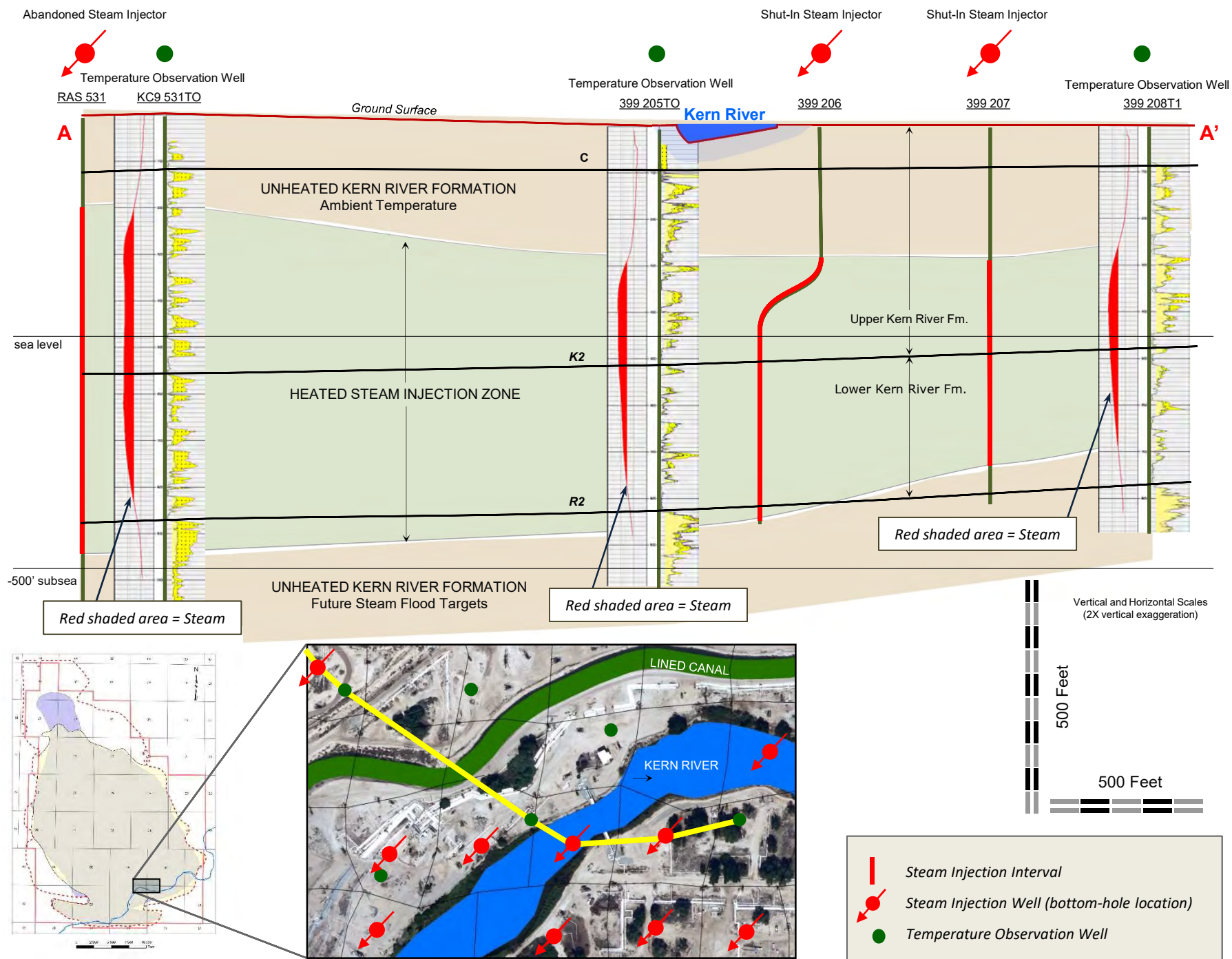


Figure 54 – Injection Zone Isolation Kern River Waterway

WELL OAK 1TO

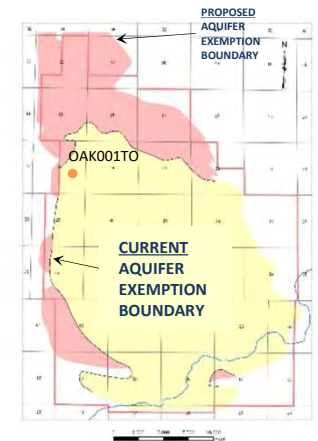
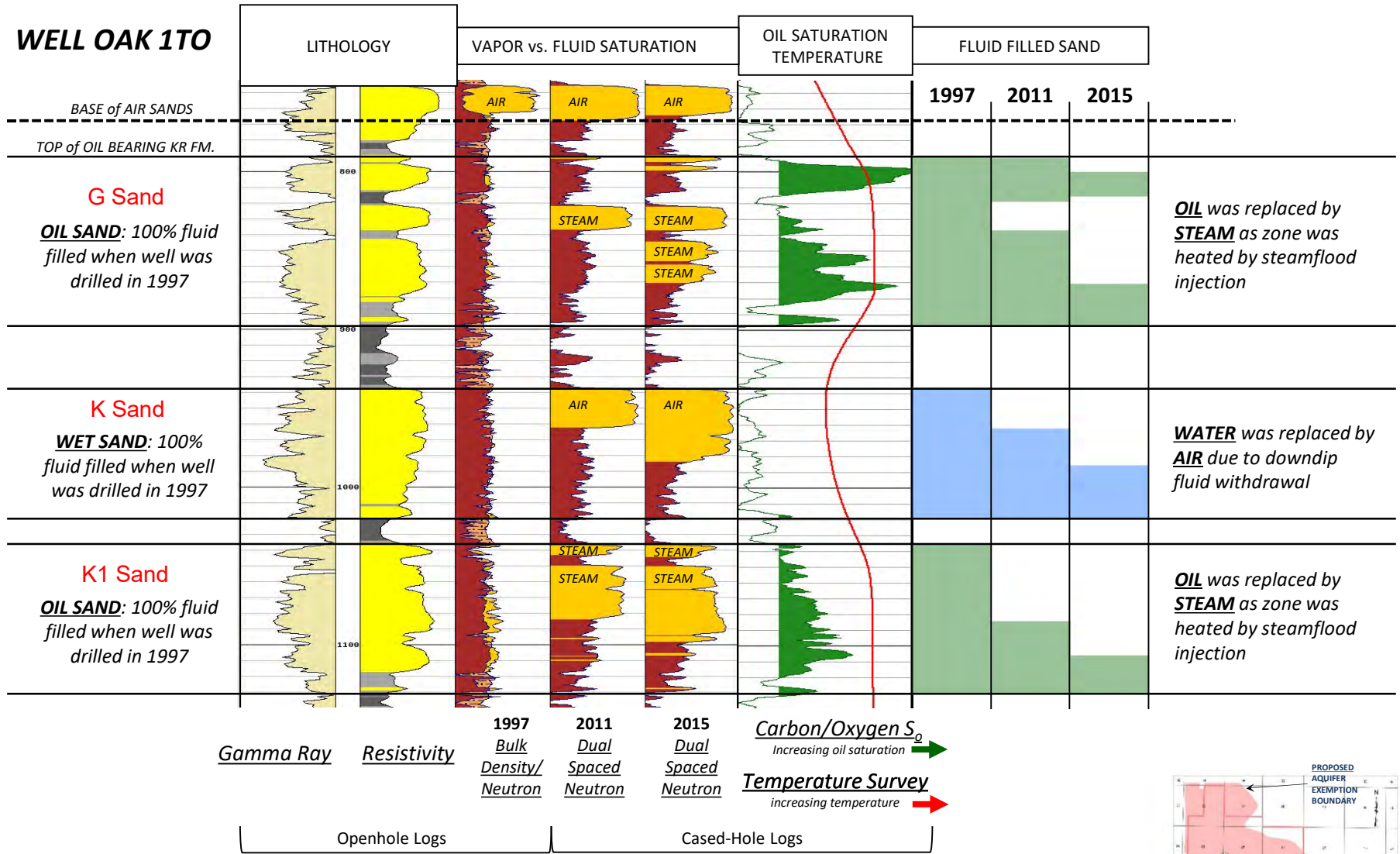
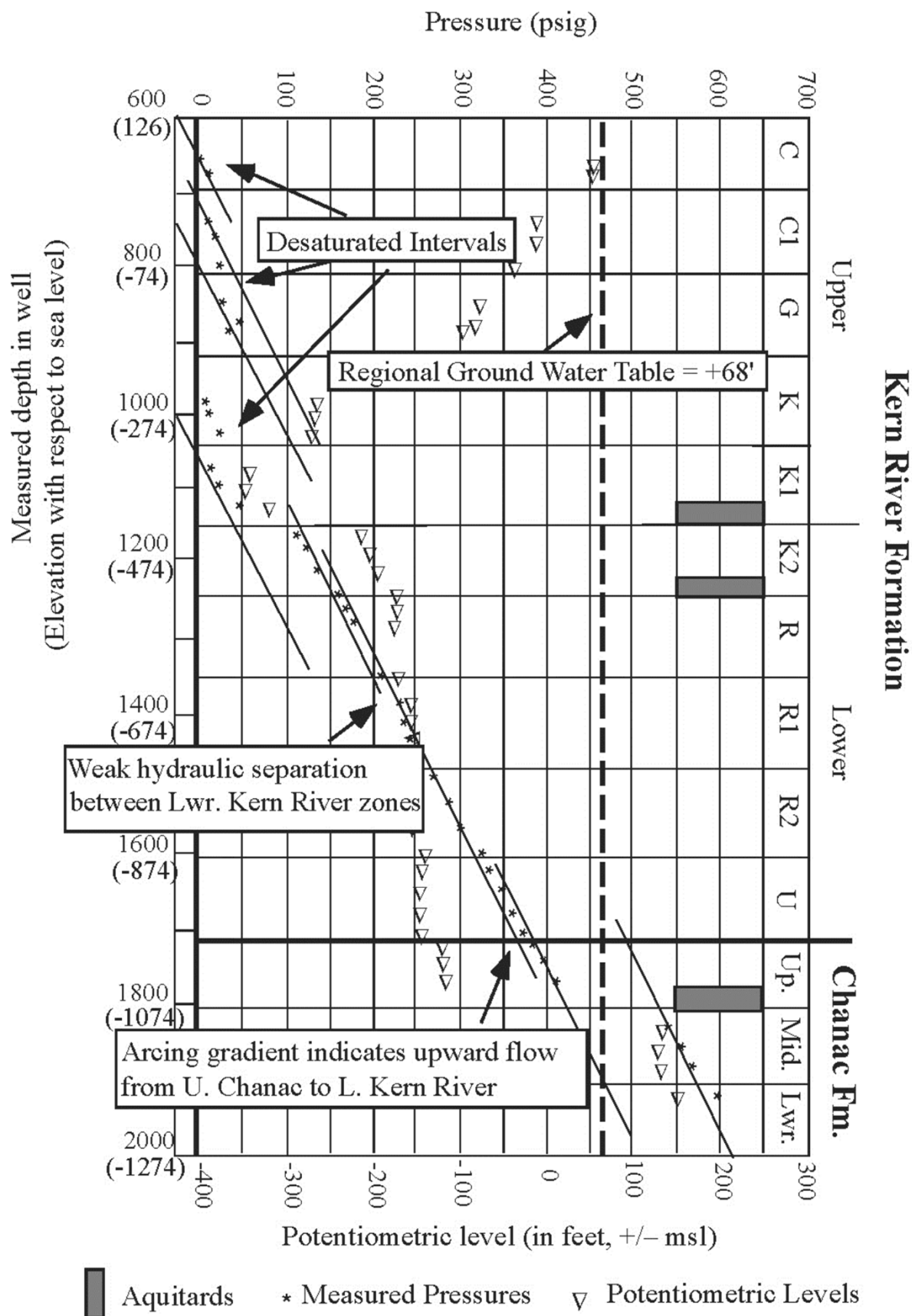


Figure 55 – Example of Reservoir Net Fluid Depletion



Source: Coburn , M.G, Gillespie, J.M. 2002. A Hydrogeologic Study to Optimize Steamflood Performance in a Giant Oilfield: Kern River Field, California . AAPG Bulletin v. 86, no. 8.

Figure 56 - Vertical Reservoir Pressure Data, 2013-2014

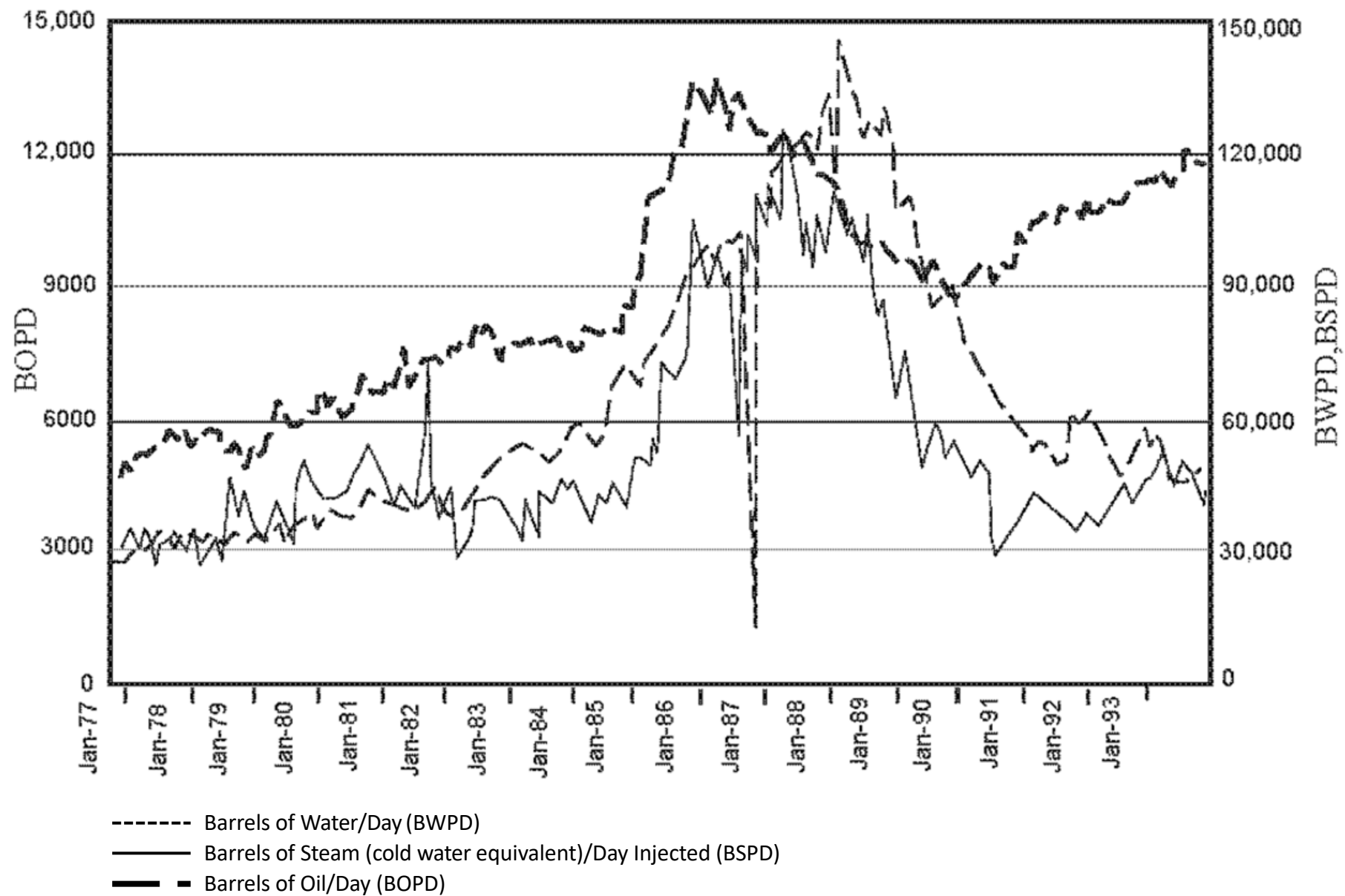


Figure 57 - Production and Steam Injection Curves Section 3 (T28S/R28E)

AR1

AR1'

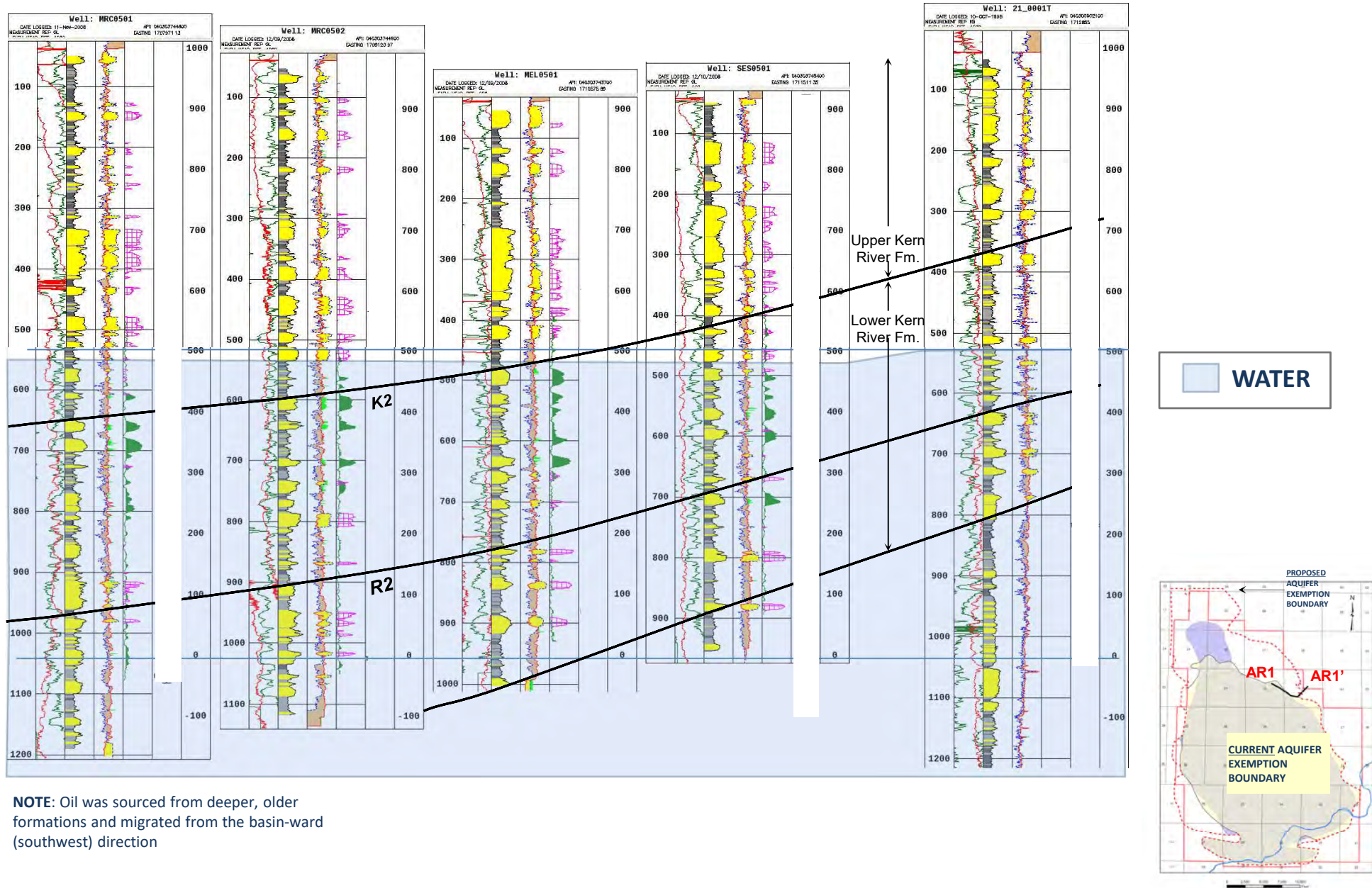


Figure 58 - Regional Groundwater Table Before Oil Emplacement

AR1

AR1'

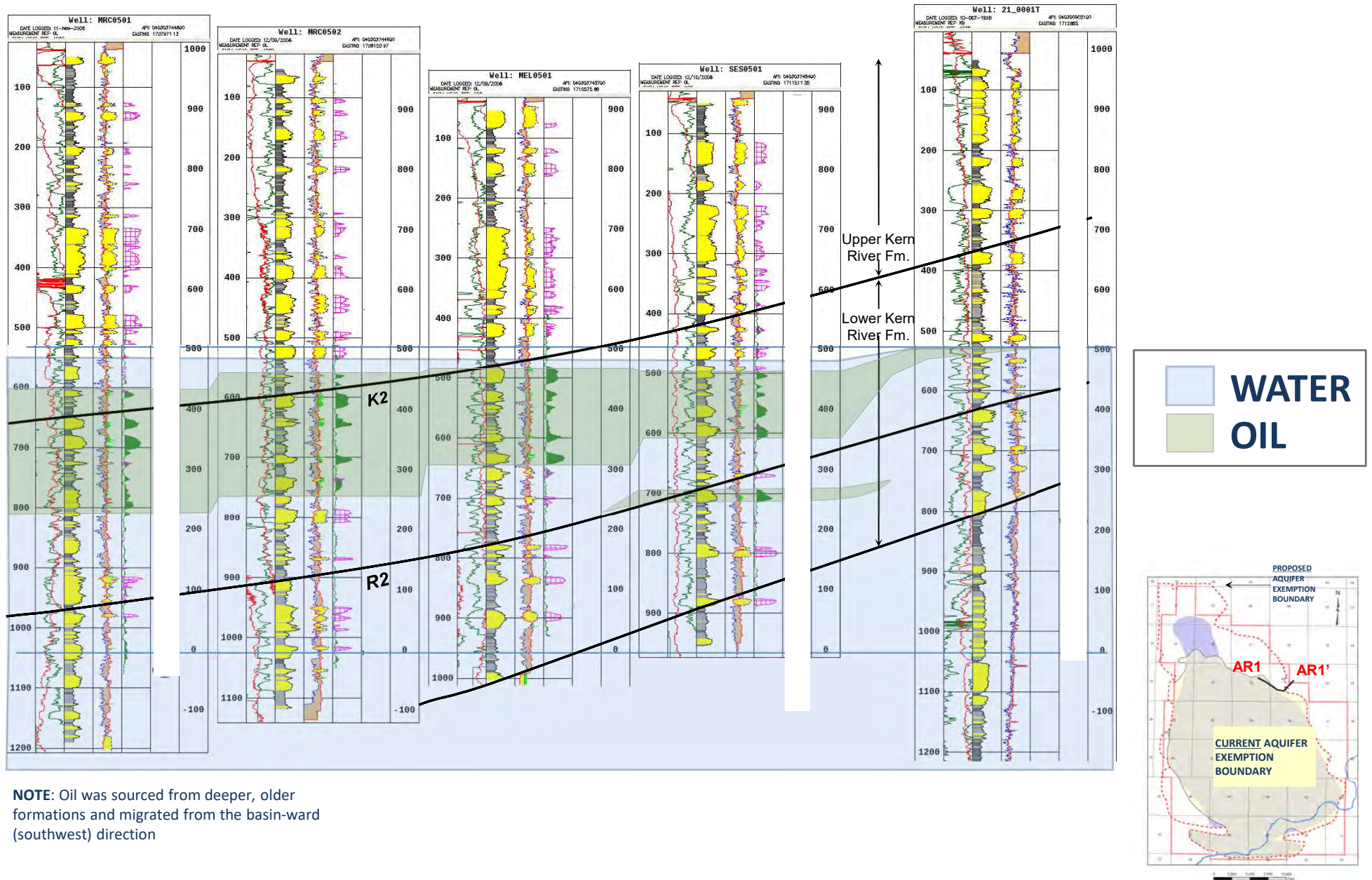


Figure 59 - Regional Groundwater Table After Oil Emplacement

AR1

AR1'

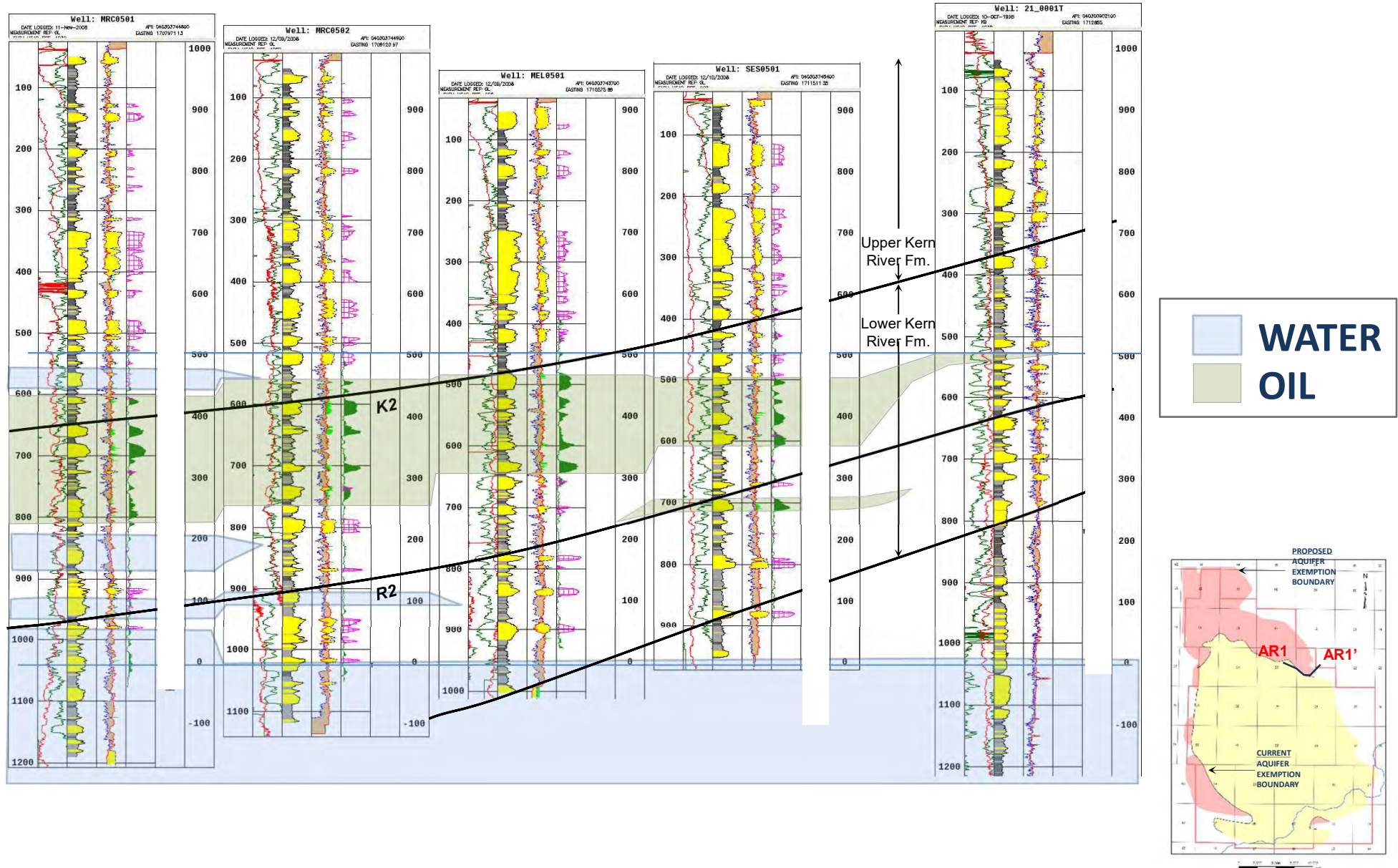


Figure 60 – Current Regional Groundwater Table

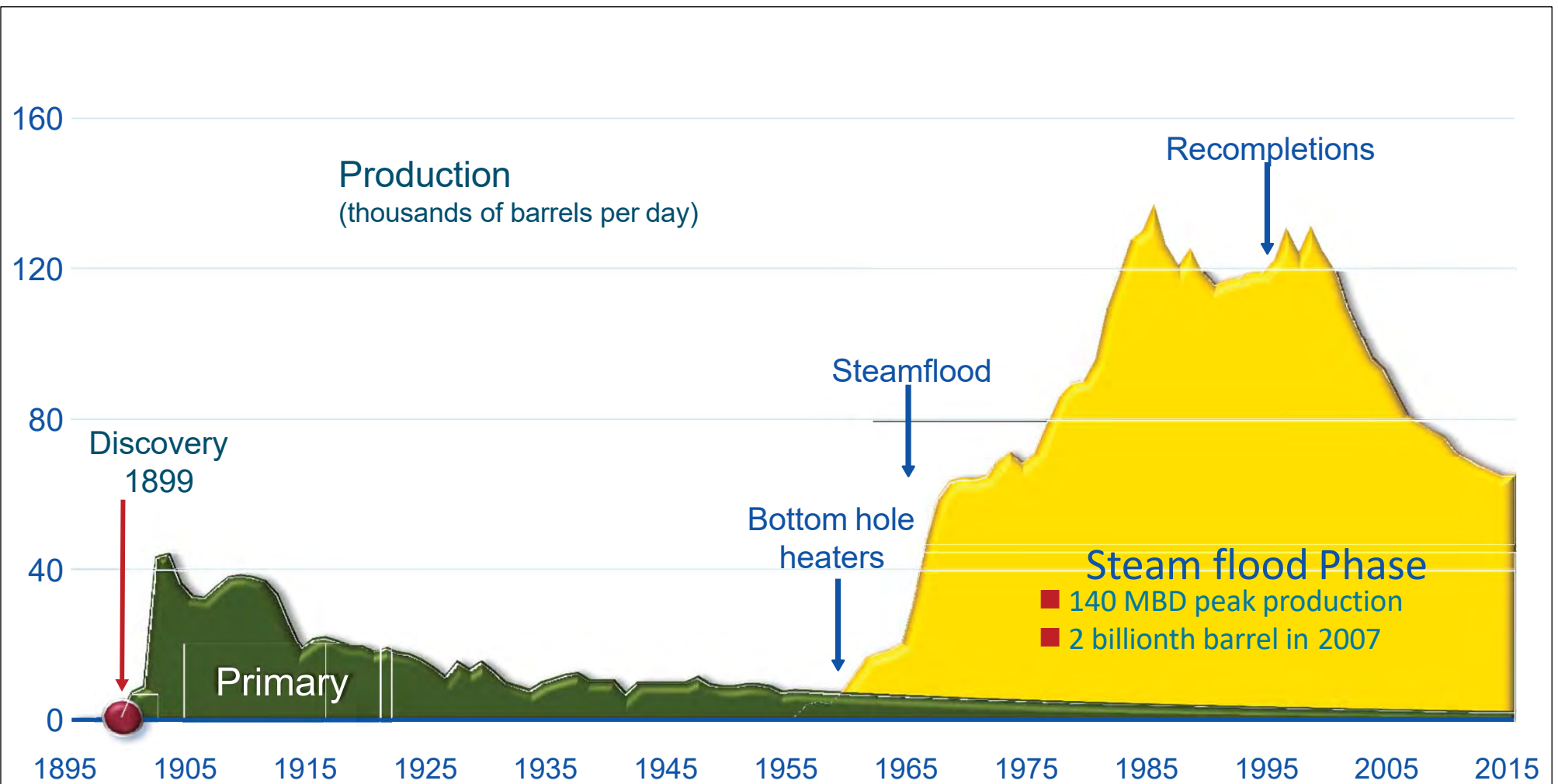
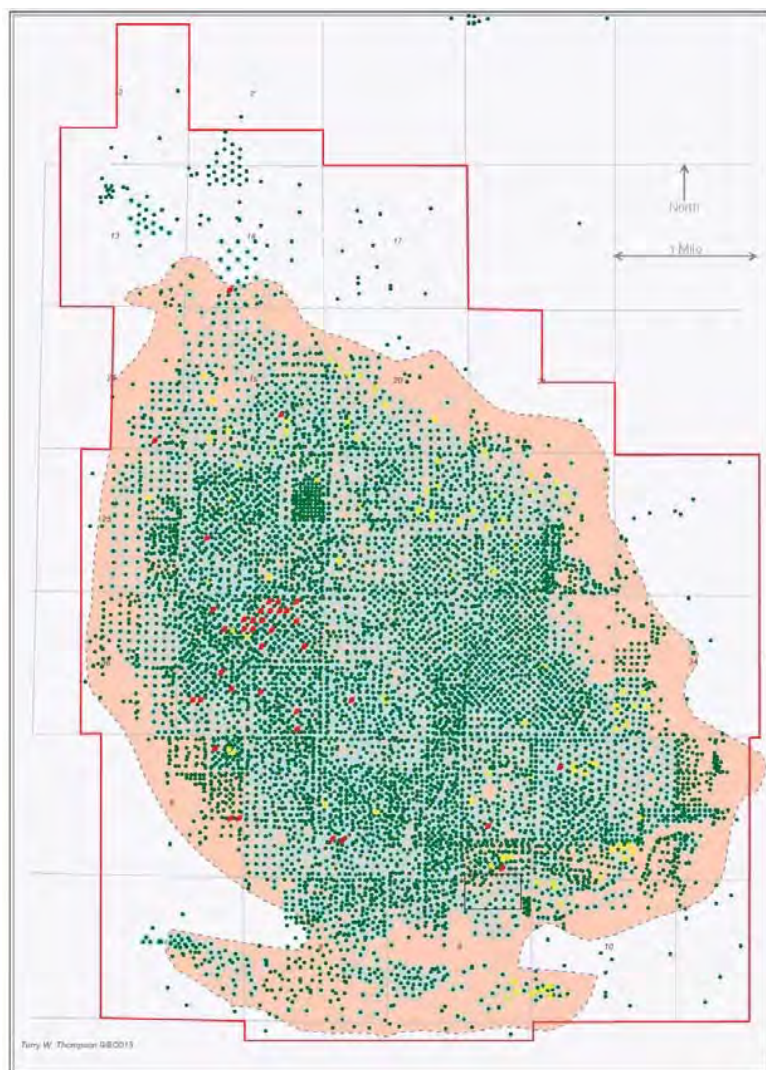
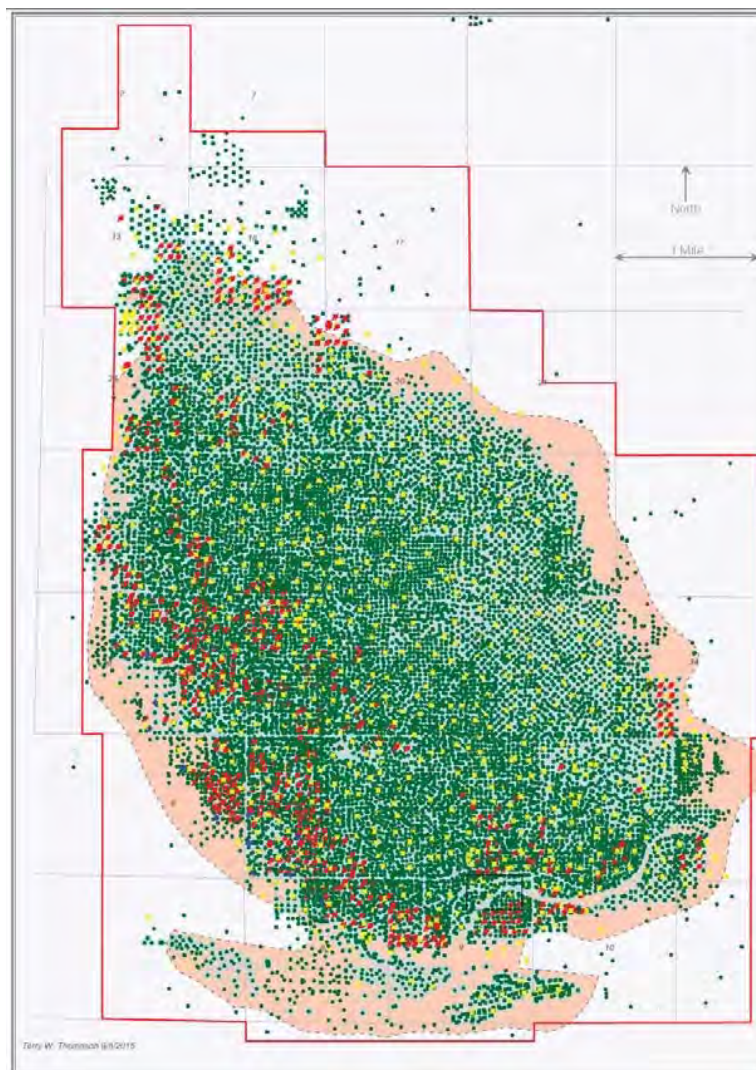


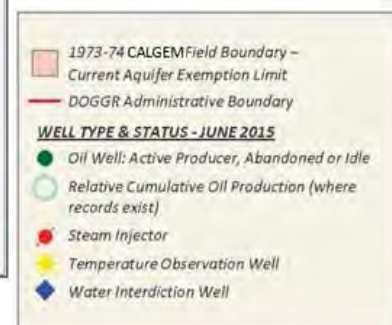
Figure 61 - Kern River Operations Production and the Impact of Steam Flooding



**Current CALGEM Kern River Field
Aquifer Exemption Boundary and
Pre-1975 Well Development**



**Current Kern River Field
Development (June 2015)**



- Cumulative-oil symbols represent relative production for all operators in the Kern River Field
- All production is from the Kern River Formation
- Data is from Chevron, third-party and CALGEM sources
- Because of differing cut-off dates, this information is incomplete and should be regarded only as an approximate record of the limits of known historic field production

Figure 62 - Oil Field Development Pre-1975 and June 2015

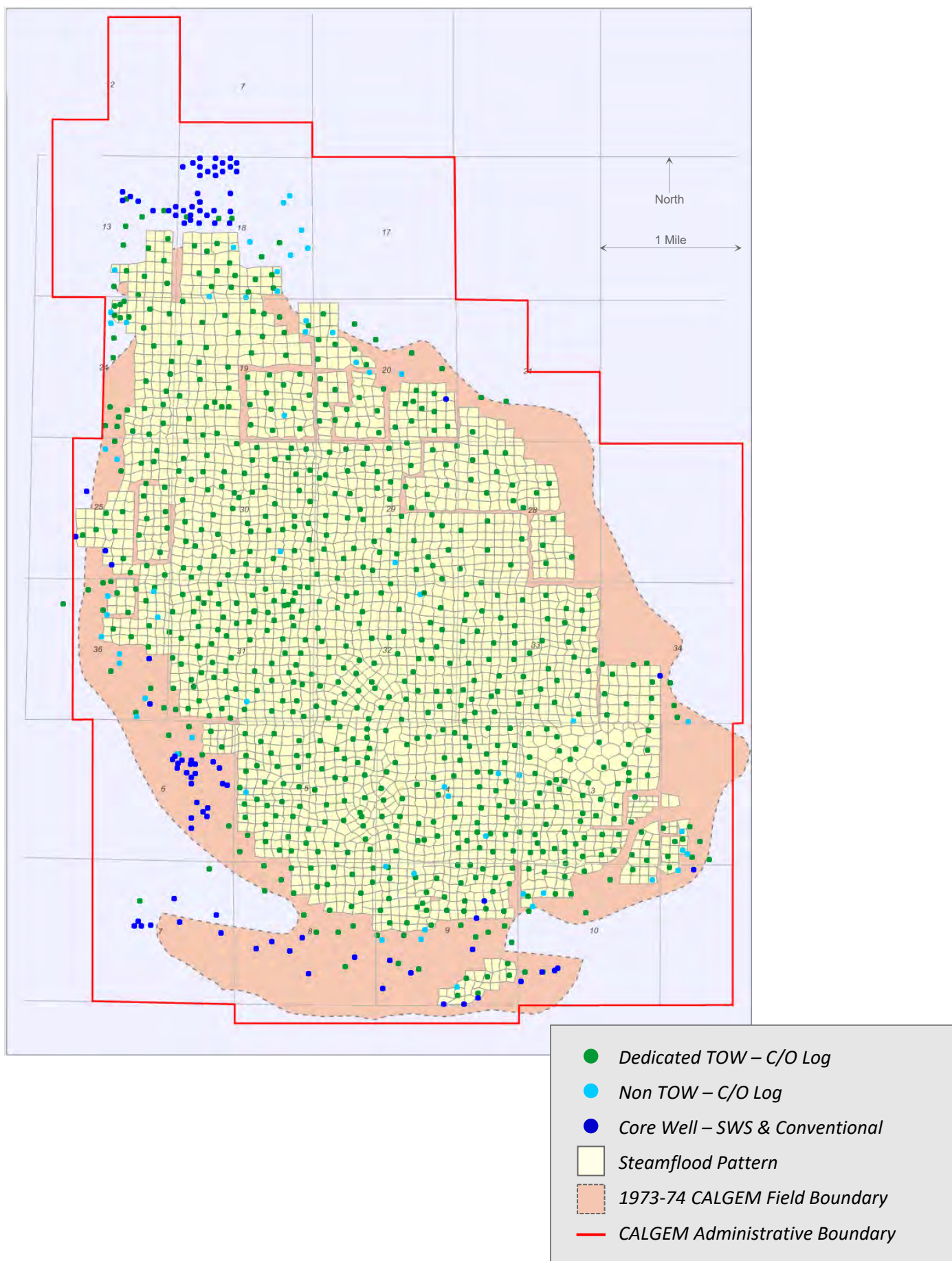
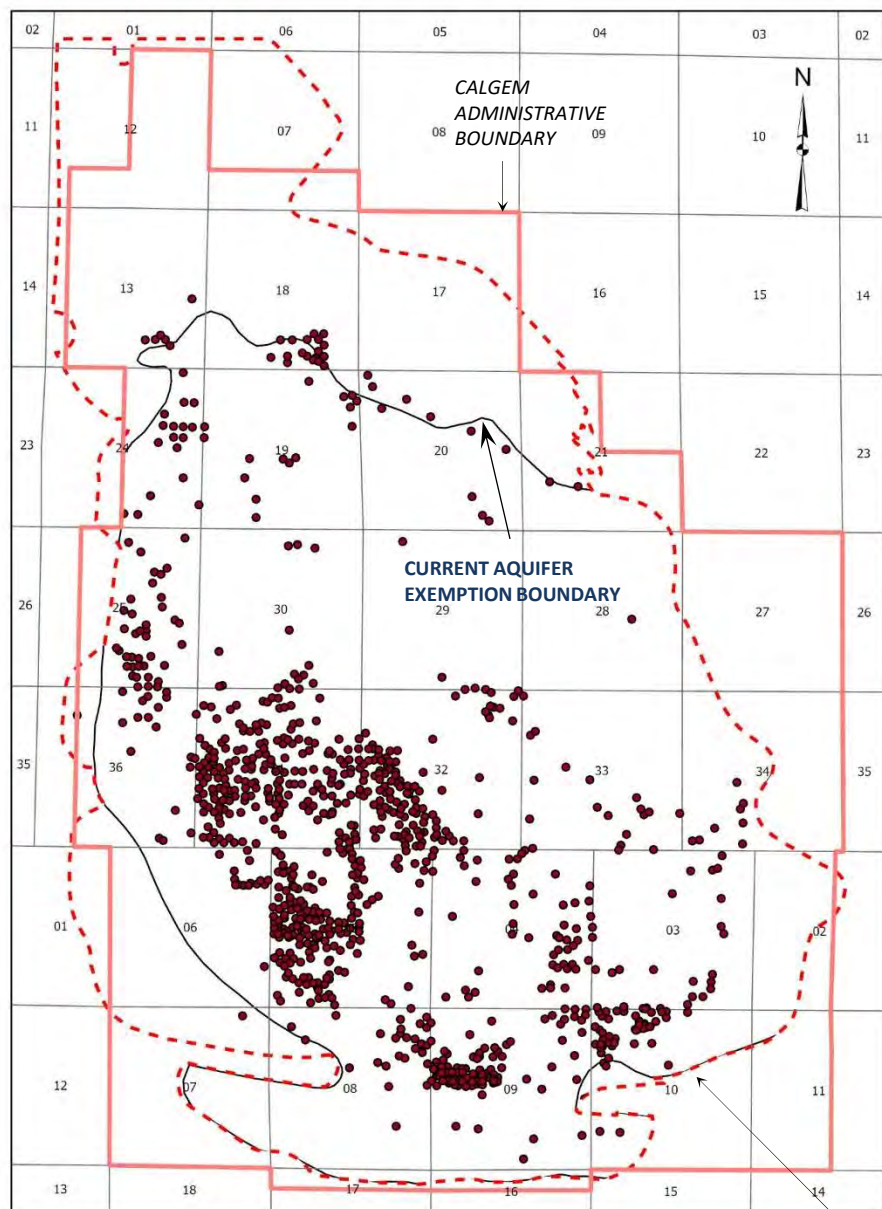


Figure 63 - Oil Saturation Data

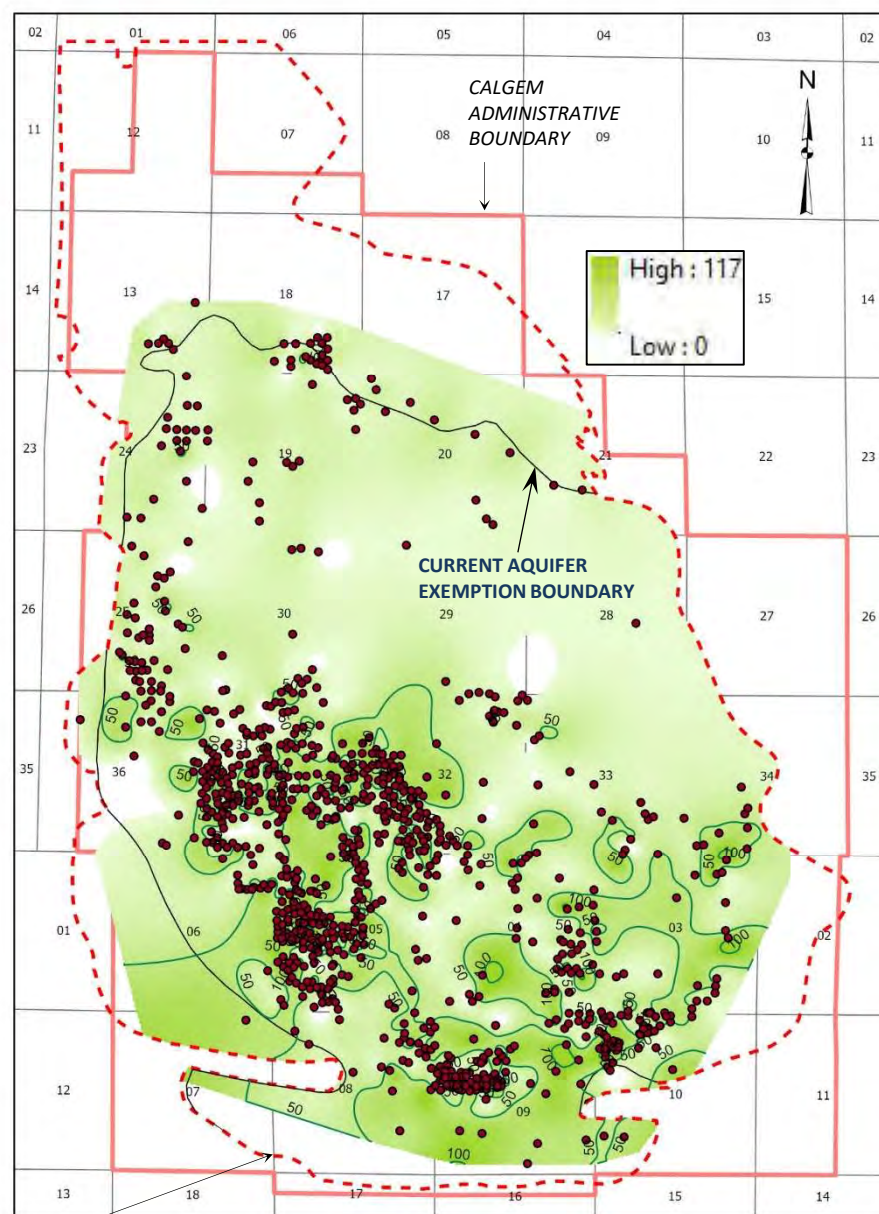
Wells with SODIF>0.0 ft. in Upper Chanac



0 2,500 5,000 7,500 10,000 Feet

PROPOSED AQUIFER EXEMPTION BOUNDARY

Thickness of SODIF>0.0 ft. in Upper Chanac



0 2,500 5,000 7,500 10,000 Feet

Figure 64 – Thickness of Upper Chanac Oil Sands from Dielectric Scanner

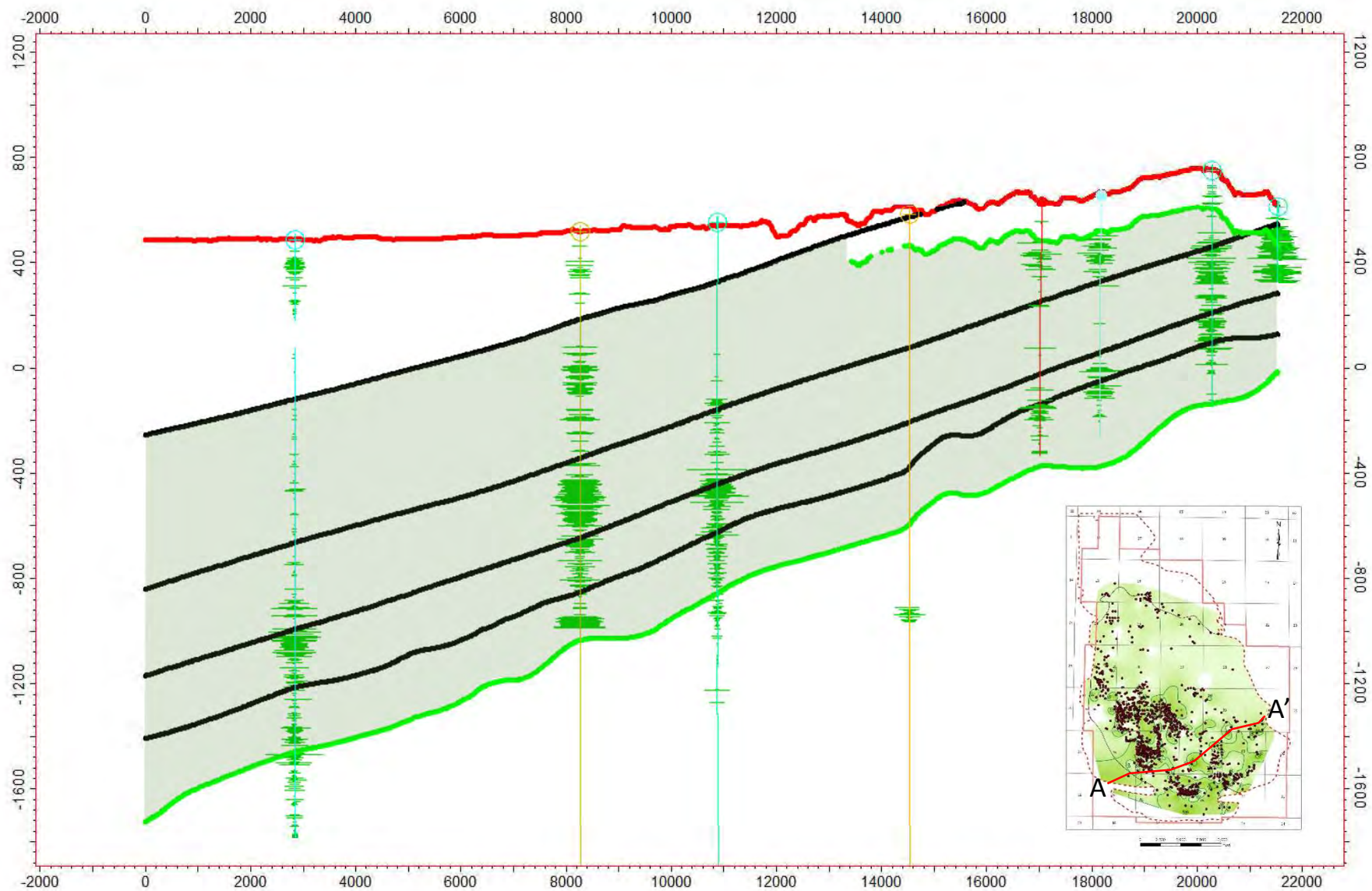


Figure 65 – Structure Section – Presence of Chanac Oil from Dielectric Log

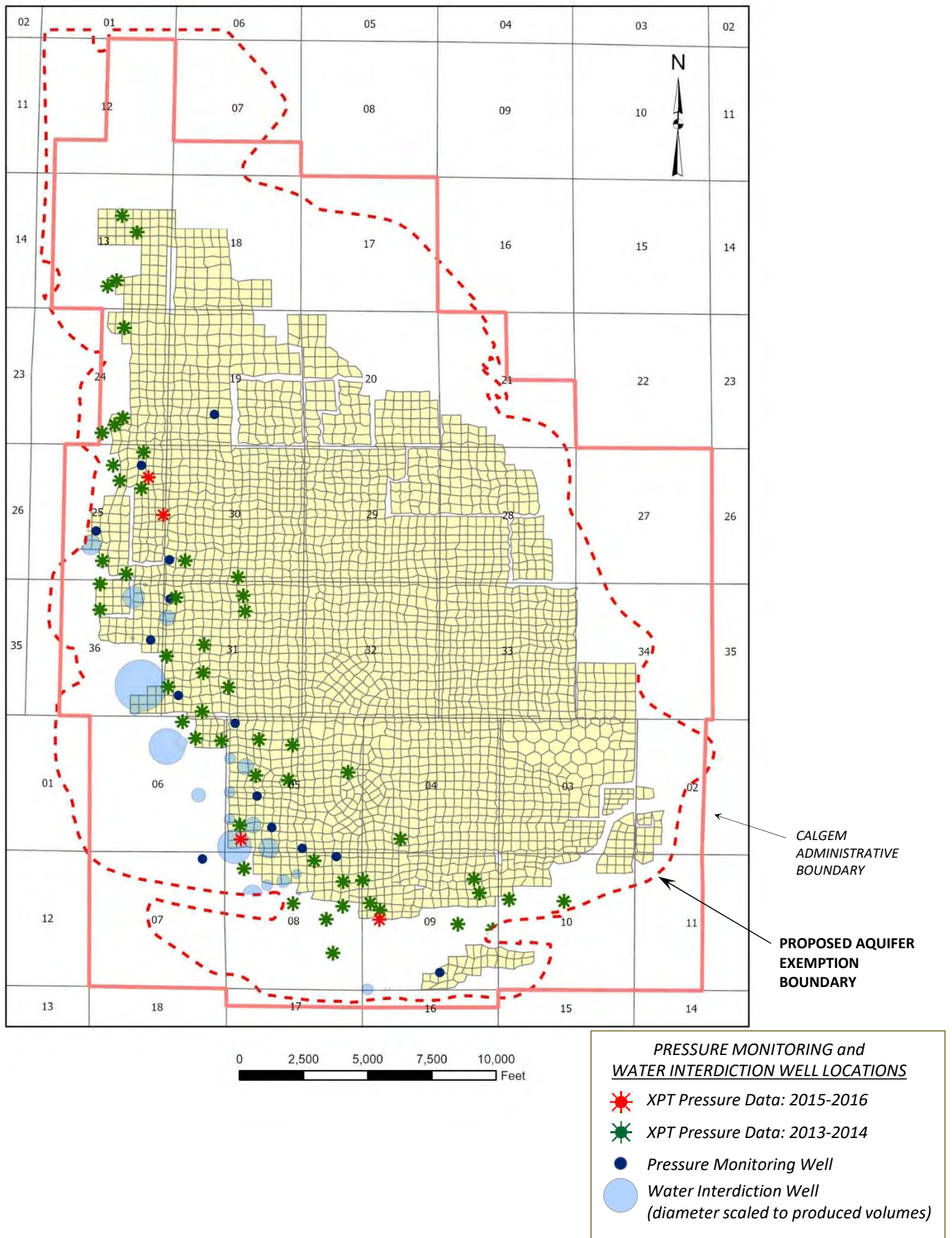
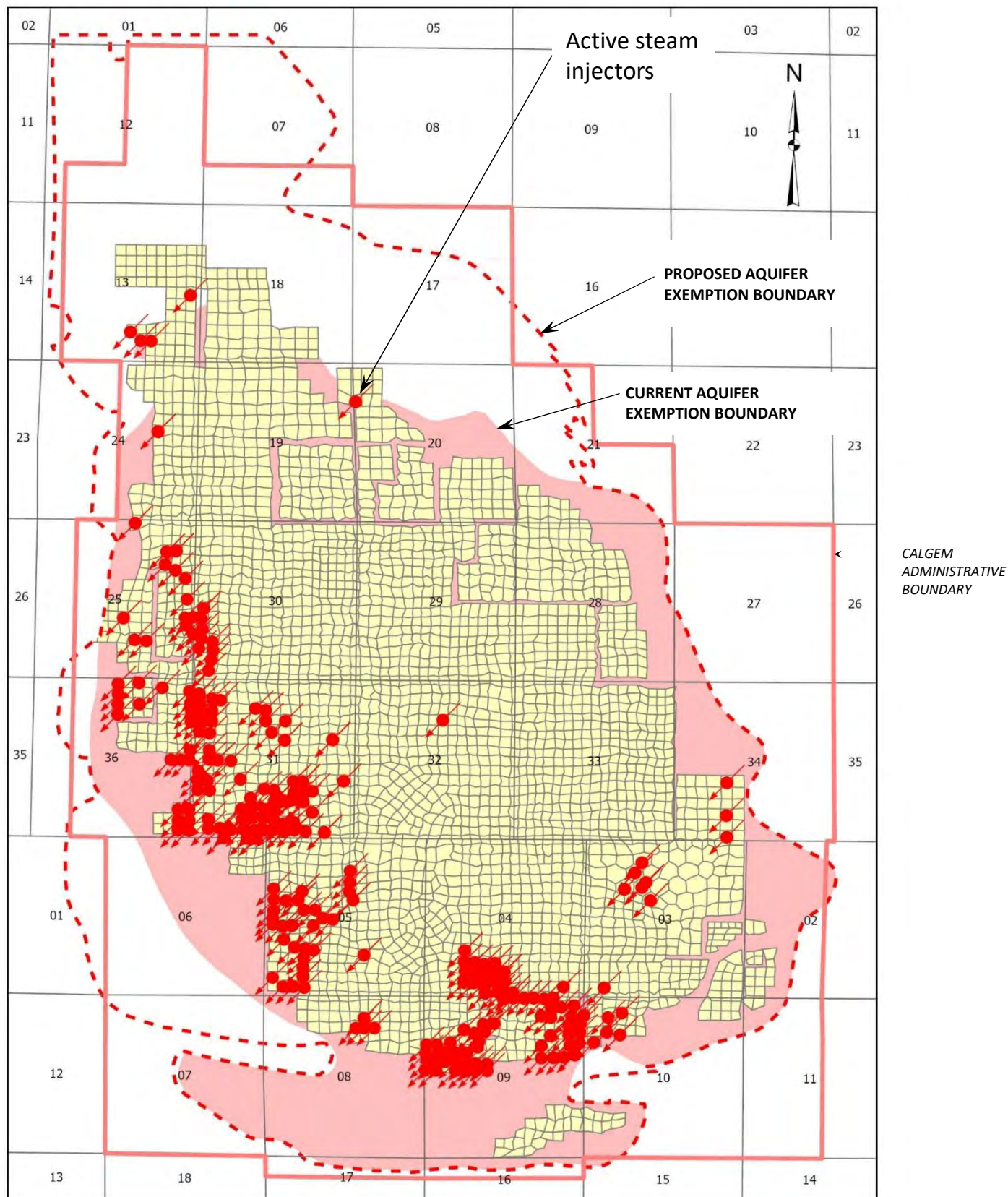


Figure 66 - Interdiction Water Wells - Volumes



0 2,500 5,000 7,500 10,000 Feet

- 1973-74 CALGEM Field Boundary – Current Aquifer Exemption Limit
- CALGEM Administrative Boundary
- Proposed Aquifer Exemption Extension

Figure 67 - Steam Injection Locations

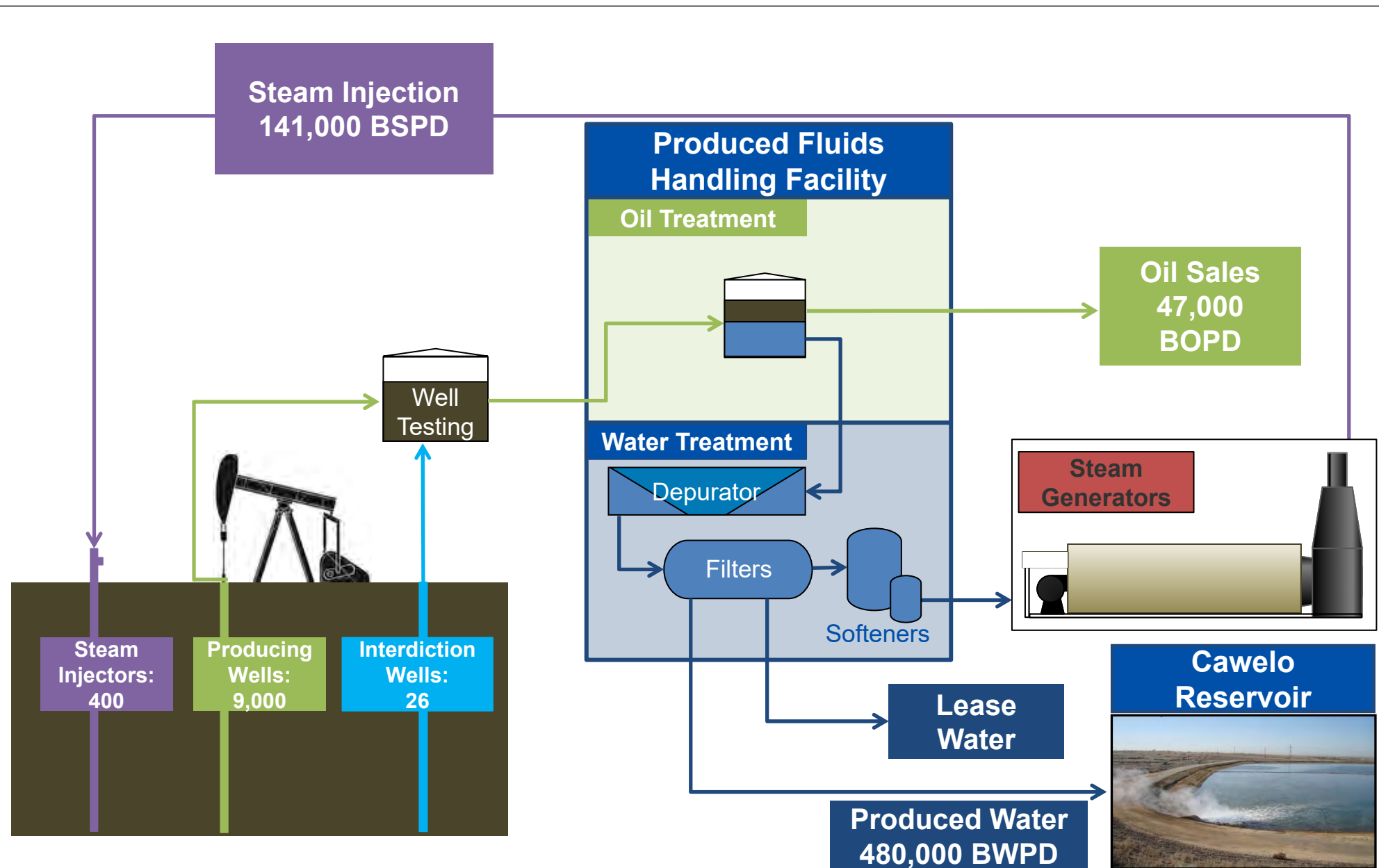


Figure 68 - Kern River Field Produced Water Cycle

Attachment 1

Kern River Operators Letters in Support of Application

From: Smith, Adam <Adam.Smith@crc.com>
Sent: Friday, March 27, 2020 3:43 PM
To: Auffant, Abigale M.
Subject: [**EXTERNAL**] CRC Letter of Support for Aquifer Exemption Boundary Expansion (Kern River Field)
Attachments: KR AE Boundary.pdf

Dear Ms. Auffant:

This e-mail is written in support of Chevron U.S.A. Inc.'s proposed Aquifer Exemption Boundary for the Kern River Field. The proposed boundary expansion would extend the existing aquifer exemption for the Kern River Field as depicted on the attached map. As one of the operators within Kern River Field, California Resources Production Corporation (Vintage's successor in interest) fully supports Chevron's aforementioned application to the DOGGR.

Please contact me should you have any questions regarding this matter.

Regards,

Adam Smith
Vice President, Regulatory Affairs
California Resources Production Corporation



Proposed Kern River Aquifer Exemption Boundary 2020



1608 Norris Road • Bakersfield, CA 93308

September 10, 2020

Geologic Energy Management Division (Cal GEM) (District 4)
4800 Stockdale Hwy, Suite 100
Bakersfield, CA 93309-0279
Attn: District Deputy

Re: Proposed 2020 Kern River Aquifer Exemption Boundary Application
Kern River Field, Kern County, California

Dear District Deputy,

This letter is written in support of the 2020 Kern River Boundary Expansion Application prepared on behalf of Chevron U.S.A. Inc. The revised boundary expansion would extend the existing aquifer exemption for the Kern River Formation to the boundary as indicated on the attached plat. As an operator within the Kern River Field, E&B Natural Resources supports Chevron's application to extend the aquifer exemption boundary as noted.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Gary Richardson', is written over a horizontal line.

Gary Richardson
Vice President of Business Development

Attachment: Chevron Proposed Kern River Aquifer Exemption Boundary 2020

California • Kansas • Louisiana • Wyoming

Bus: (661) 387-8500 • www.ebresources.com • Fax: (661) 687-8690



Proposed Kern River Aquifer Exemption Boundary 2020



Gray Development Co. LLC

2701 Patton Way
Bakersfield, CA 93308

Tel (661) 589-4144

Fax (661) 588-3415

Robert W. Loveless

(661) 331-8997

2RWL49@GMAIL.COM

March 30, 2020

Chris Flail

Sandra Szymanski

San Joaquin Valley Business Unit

California Land Division

Chevron North America Exploration and Production Company

1546 China Grade Loop, D14

Bakersfield, CA 93308

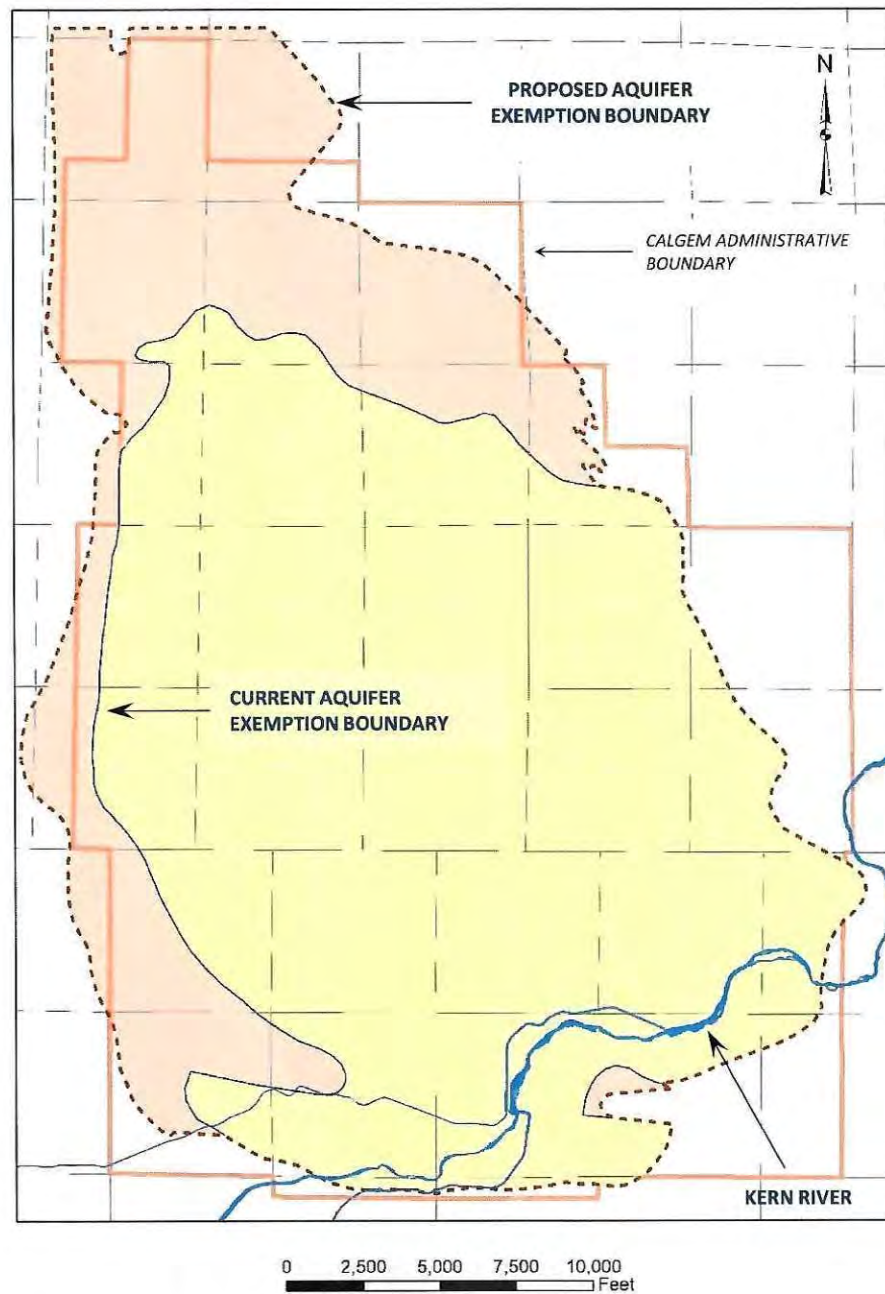
This letter is written in support of the Kern River Boundary Expansion Application prepared by Kennedy/Jenks Consultants on behalf of Chevron U.S.A. Inc. The boundary expansion would extend the existing aquifer exemption for the Kern River formation to the boundary as shown on the enclosed map. As one of the operators within Kern River Field, we fully support Chevron's application to extend the aquifer exemption boundary to the DOGGR's Administrative Boundary.

Sincerely,

A handwritten signature in blue ink that reads "Robert W. Loveless". The signature is fluid and cursive, with a large, stylized "R" and "L".

Robert W. Loveless

Managing Member



Proposed Kern River Aquifer Exemption Boundary
2020



March 27, 2020

California Geologic Energy Management
4800 Stockdale Highway, Suite 100
Bakersfield, CA 93309

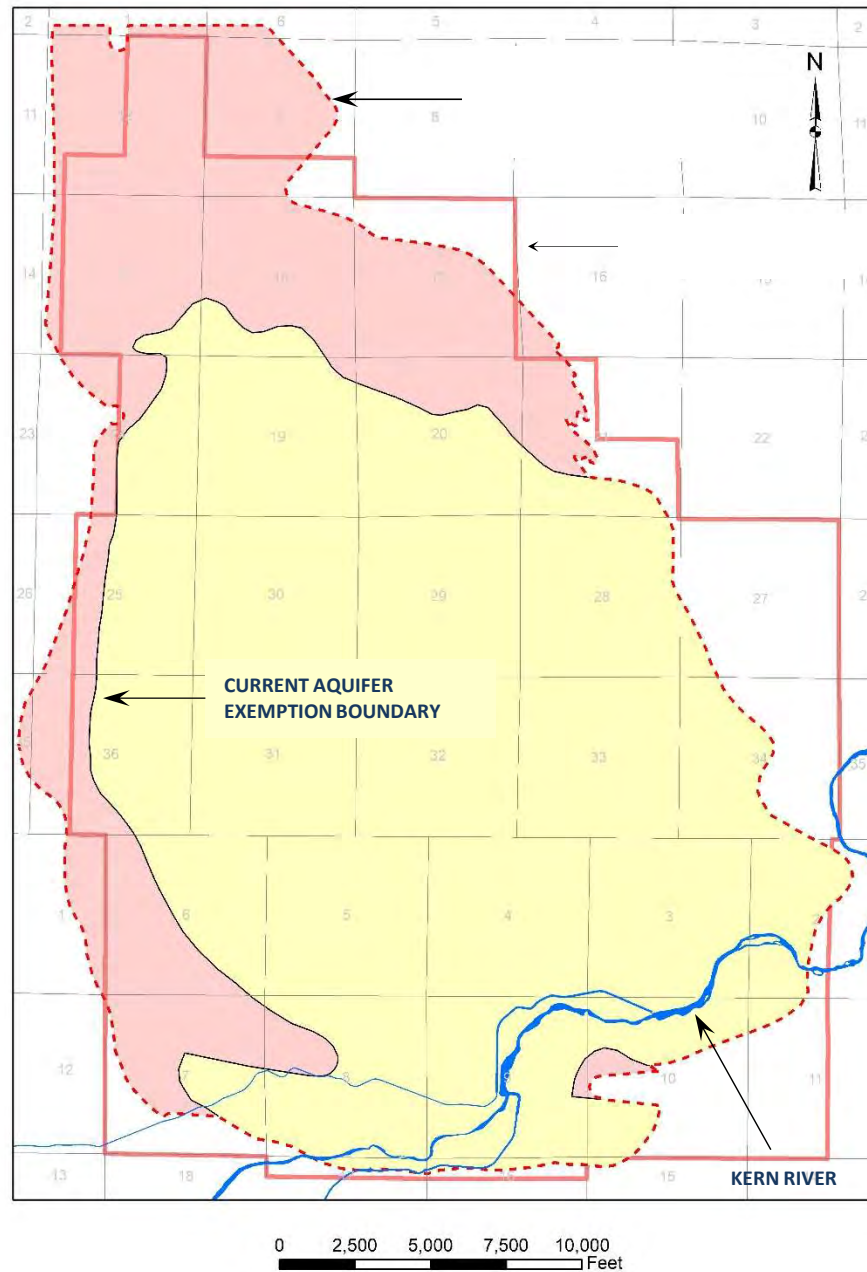
Re: Kern River Filed Boundary Expansion 2020

To Whom it May Concern,

This letter is written in support of Chevron U.S.A. Inc.'s updated proposed Aquifer Exemption Boundary for the Kern River Field. The proposed boundary expansion would extend the existing aquifer exemption for the Kern River Field as depicted on the attached map. As one of the operators within the Kern River Field, Kern River Holdings II, LLC fully supports Chevron's aforementioned application to CalGEM. Please contact the undersigned should you have any questions regarding this matter.

Sincerely,

Eric Dhanens
Asset Manager

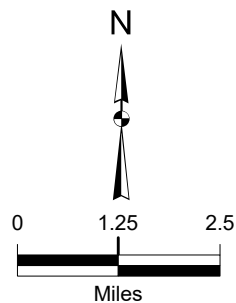
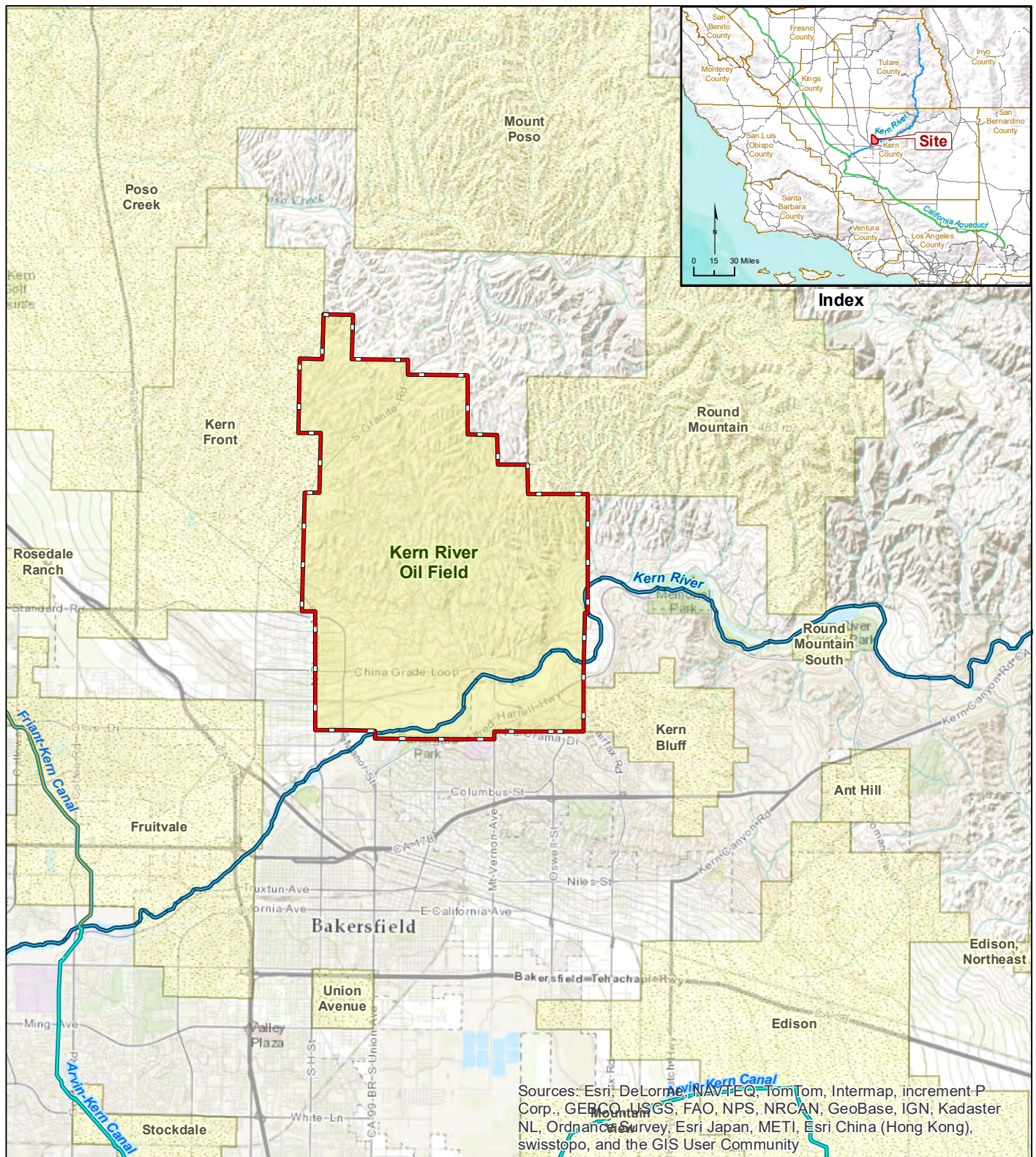


Proposed Kern River Aquifer Exemption Boundary
2020

Appendix A

Geology

A-1	Site Location
A-2	Kern River Oil Field Area Stratigraphic Column
A-3	Type Log
A-4	1982 Aquifer Exemption Boundary and Field Data



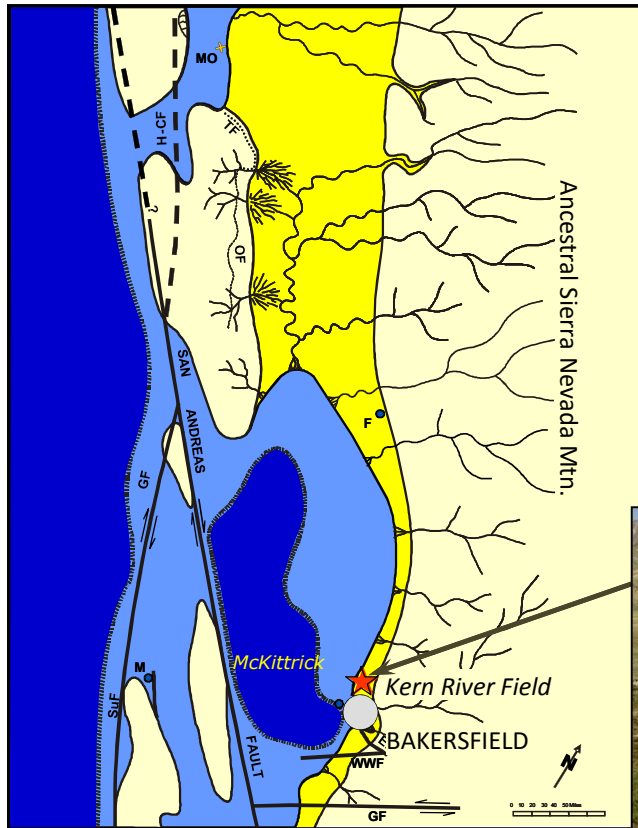
Kennedy/Jenks Consultants

Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

Site Location

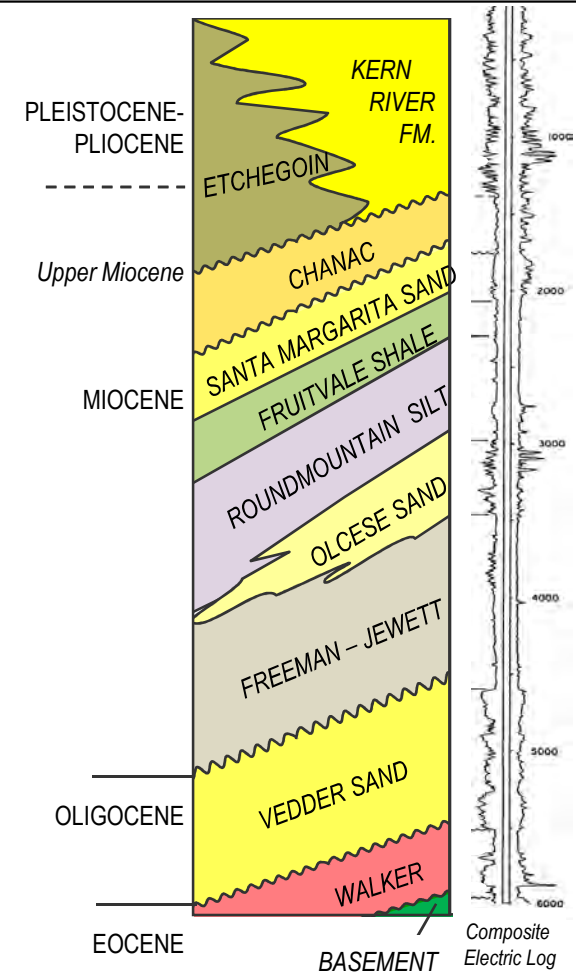
K/J 1565005.00
January 2017
Exhibit A-1

Stratigraphy and Depositional Environment



Western Margin of California
Late Miocene Time

- The Kern River Series is a non-marine, fluvial, braided stream system deposited during Late Miocene to Pliocene time
- The clastic-rich formation was deposited on the eastern shelf of the San Joaquin Basin adjacent to the ancestral Sierra Nevada Mountains



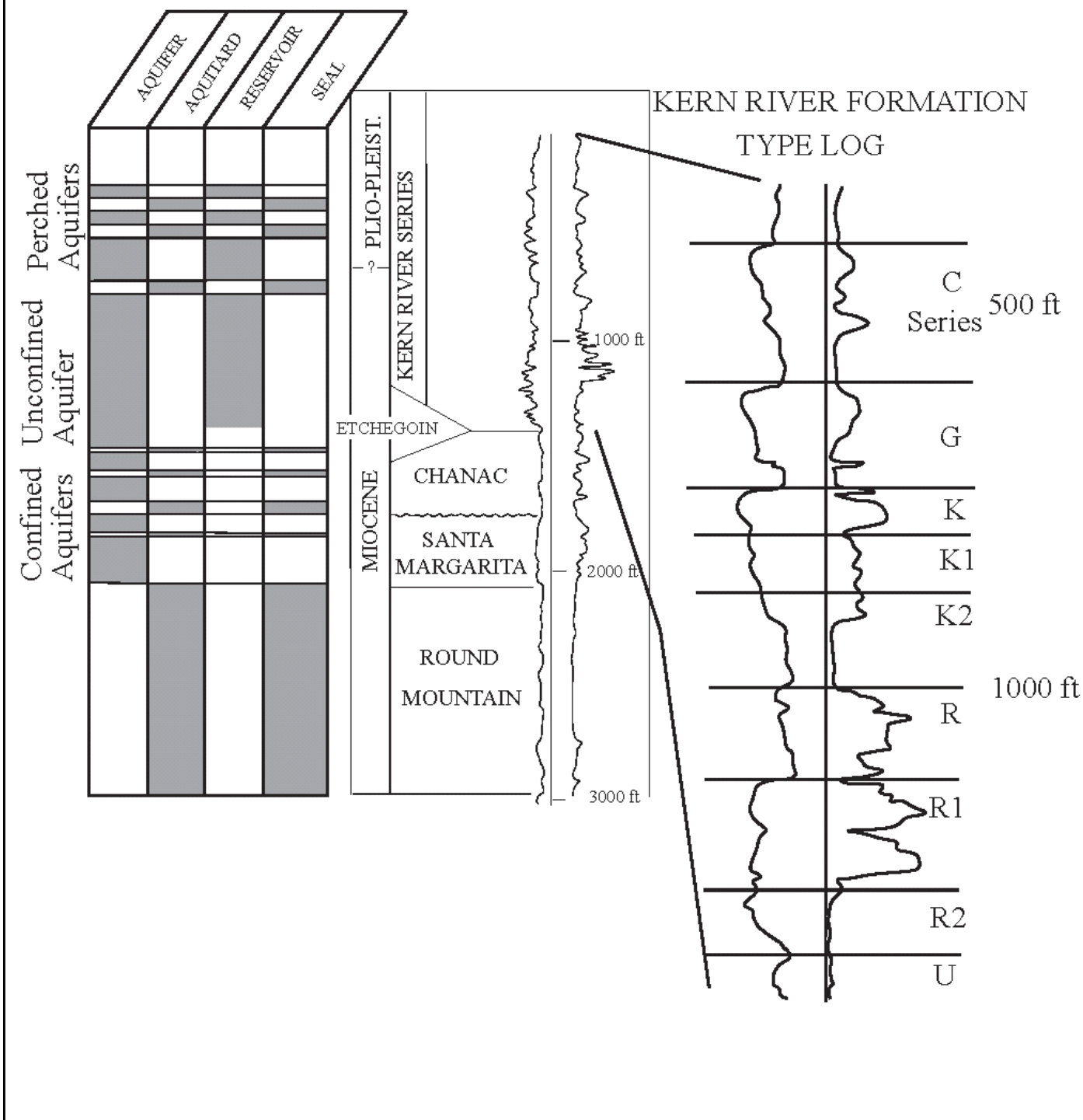
Kennedy/Jenks Consultants

Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

Kern River Oil Field Area Stratigraphic Column

K/J 1565005.00
January 2017

Exhibit A-2



Source: Coburn, M.G, Gillespie, J.M. 2002. A Hydrogeologic Study to Optimize Steamflood Performance in a Giant Oilfield: Kern River Field, California. AAPG Bulletin v. 86, no. 8."

Kennedy/Jenks Consultants

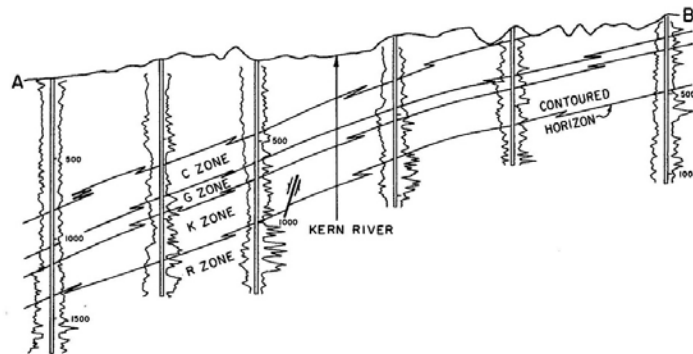
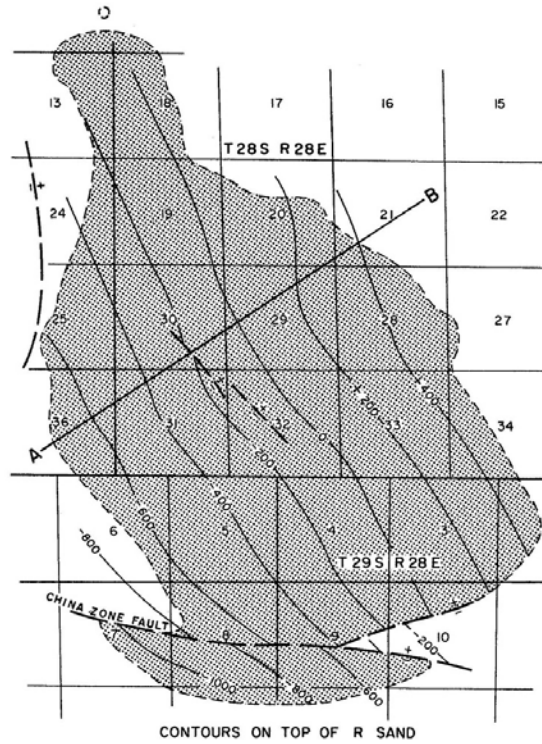
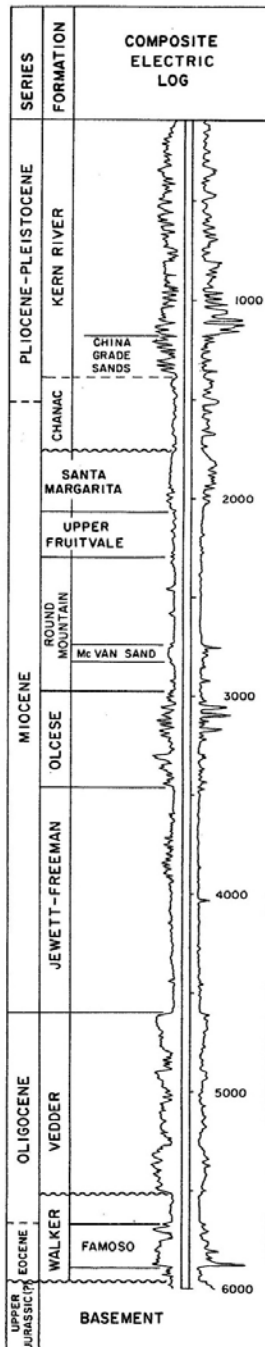
Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

Type Log

K/J 1565005.00
January 2017

Exhibit A-3

KERN RIVER OIL FIELD



Source: Coburn, M.G, Gillespie, J.M. 2002. A Hydrogeologic Study to Optimize Steamflood Performance in a Giant Oilfield: Kern River Field, California. AAPG Bulletin v. 86, no. 8."

Kennedy/Jenks Consultants

Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

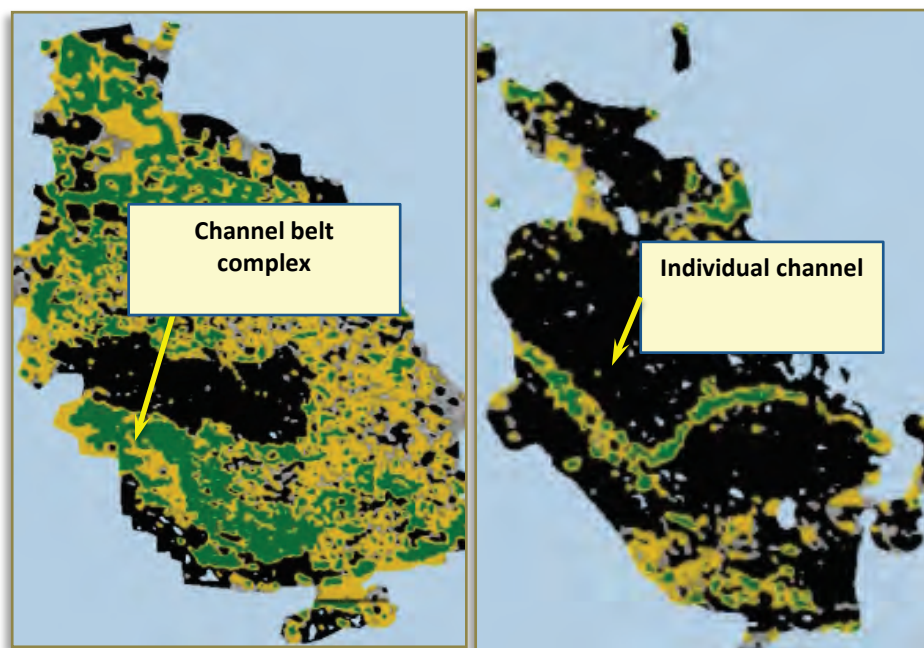
1982 Aquifer Exemption Boundary and Field Data

K/J 1565005.00
January 2017
Exhibit A-4

Appendix B

Lithologic Information

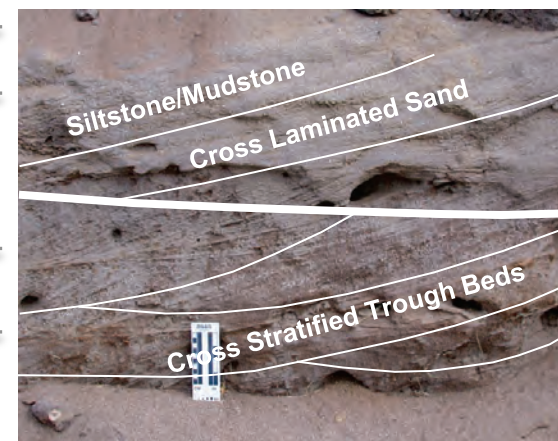
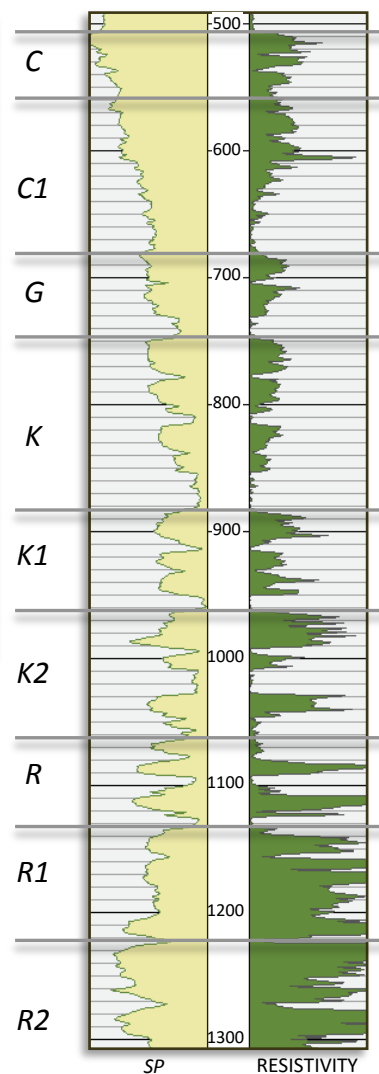
- B-1 Kern River Formation Lithology and Formation Structure
- B-2 Cross Section AR2-AR2': Air Sands in Proximity to the Kern River
- B-3 Cross Section AR2-AR2': Silt/Clay Permeability Barriers
- B-4 Cross Section FW1-FW1': Proposed Aquifer Exemption Zone
- B-5 Cross Section FW1-FW1': Proposed Aquifer Exemption Zone and Capping Silt
- B-6 Cross Section FW1-FW1': Correlated Silt/Clay Barriers
- B-7 Cross Section FW2-FW2': Proposed Aquifer Exemption Zone
- B-8 Cross Section FW2-FW2': Proposed Aquifer Exemption Zone and Capping Silt
- B-9 Cross Section FW2-FW2': Correlated Silt/Clay Barriers
- B-10 Cross Section FW3-FW3': Proposed Aquifer Exemption Zone
- B-11 Cross Section FW3-FW3': Proposed Aquifer Exemption Zone and Capping Silt
- B-12 Cross Section FW3-FW3': Correlated Silt/Clay Barriers
- B-13 Cross Section FW4-FW4': Proposed Aquifer Exemption Zone
- B-14 Cross Section FW4-FW4': Proposed Aquifer Exemption Zone and Capping Silt
- B-15 Cross Section FW4-FW4': Correlated Silt/Clay Barriers
- B-16 Cross Section FW5-FW5': Proposed Aquifer Exemption Zone
- B-17 Cross Section FW5-FW5': Proposed Aquifer Exemption Zone and Capping Silt
- B-18 Cross Section FW5-FW5': Correlated Silt/Clay Barriers



Sand Channel and Flow Path Geometry

Type Log and Reservoir Architecture

- 9 zones (C, C1, G, K, K1, K2, R, R1 and R2) composed of one or more sand beds
- Units consist predominantly of:
 - Channelized, amalgamated sand lobes
 - Overbank/floodplain interbeds
- Channel sand packages behave as semi-continuous reservoirs



RECOVERY METHOD	GRAVITY DRAINAGE
AVG. NET to GROSS	76%
AVG. POROSITY	31%
AVG PERMEABILITY	2,000 mD

Kennedy/Jenks Consultants

Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

Kern River Formation Lithology and Formation Structure

K/J 1565005.00
January 2016

Exhibit B-1

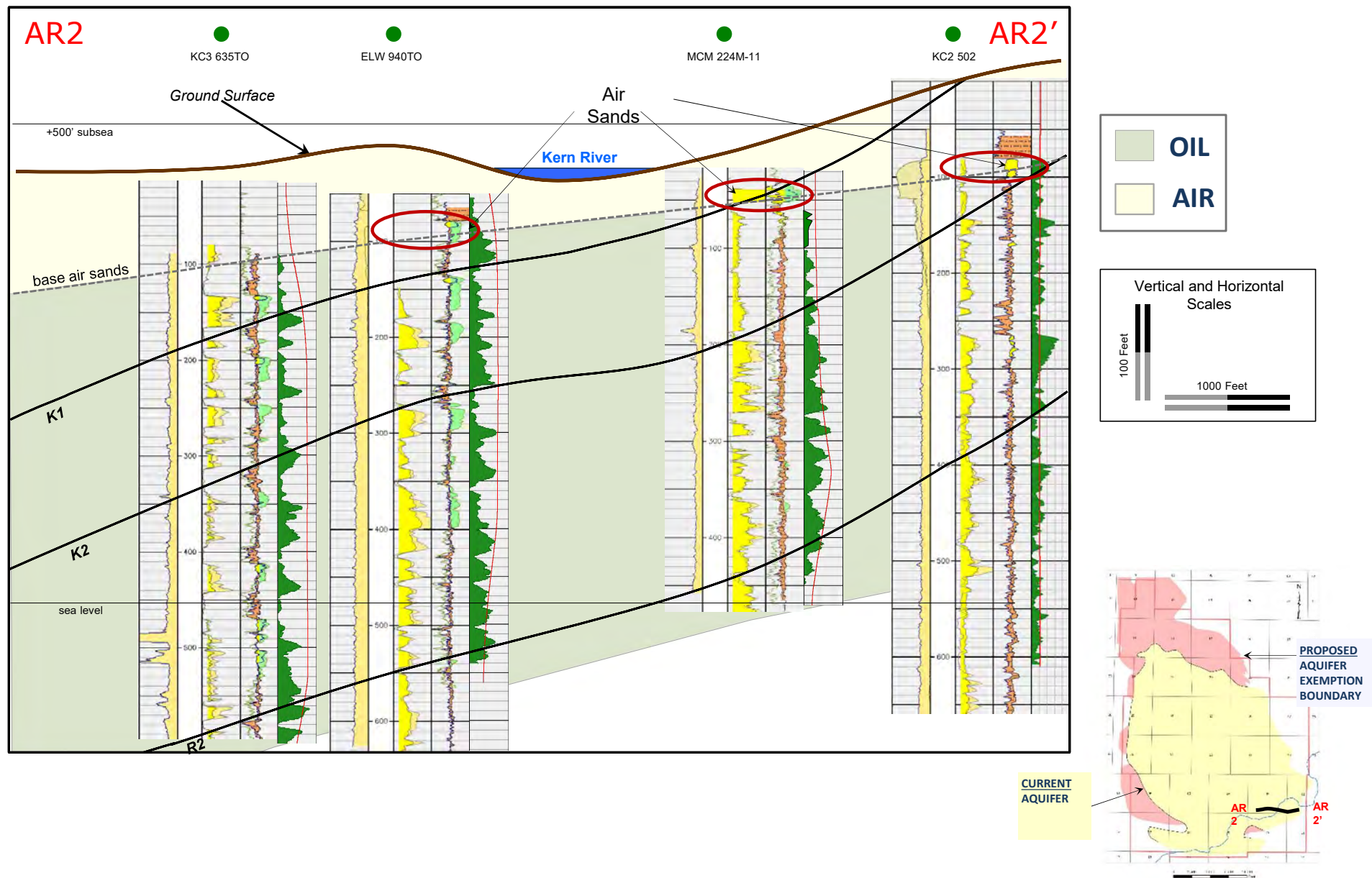


Exhibit B-2 - Cross-Section AR2-AR2': Air Sands in Proximity to the Kern River

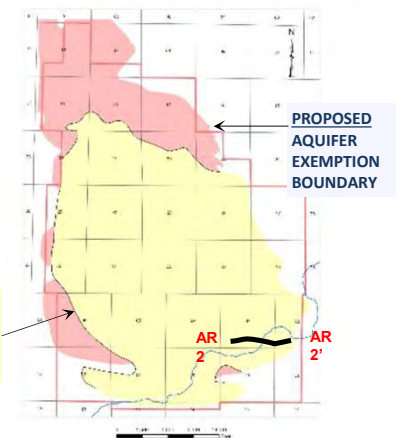
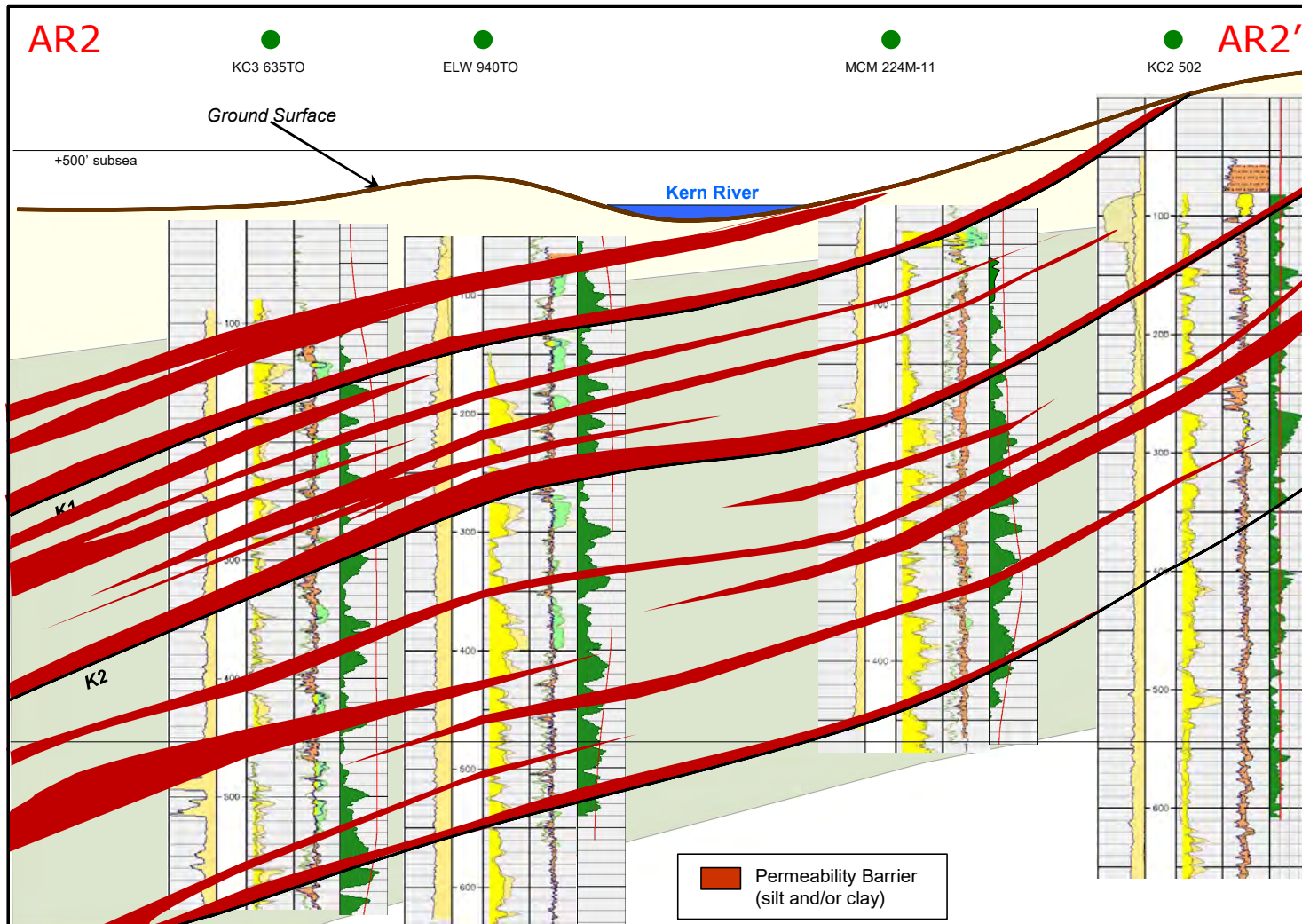


Exhibit B-3 - Cross-Section AR2-AR2': Silt/Clay Permeability Barriers

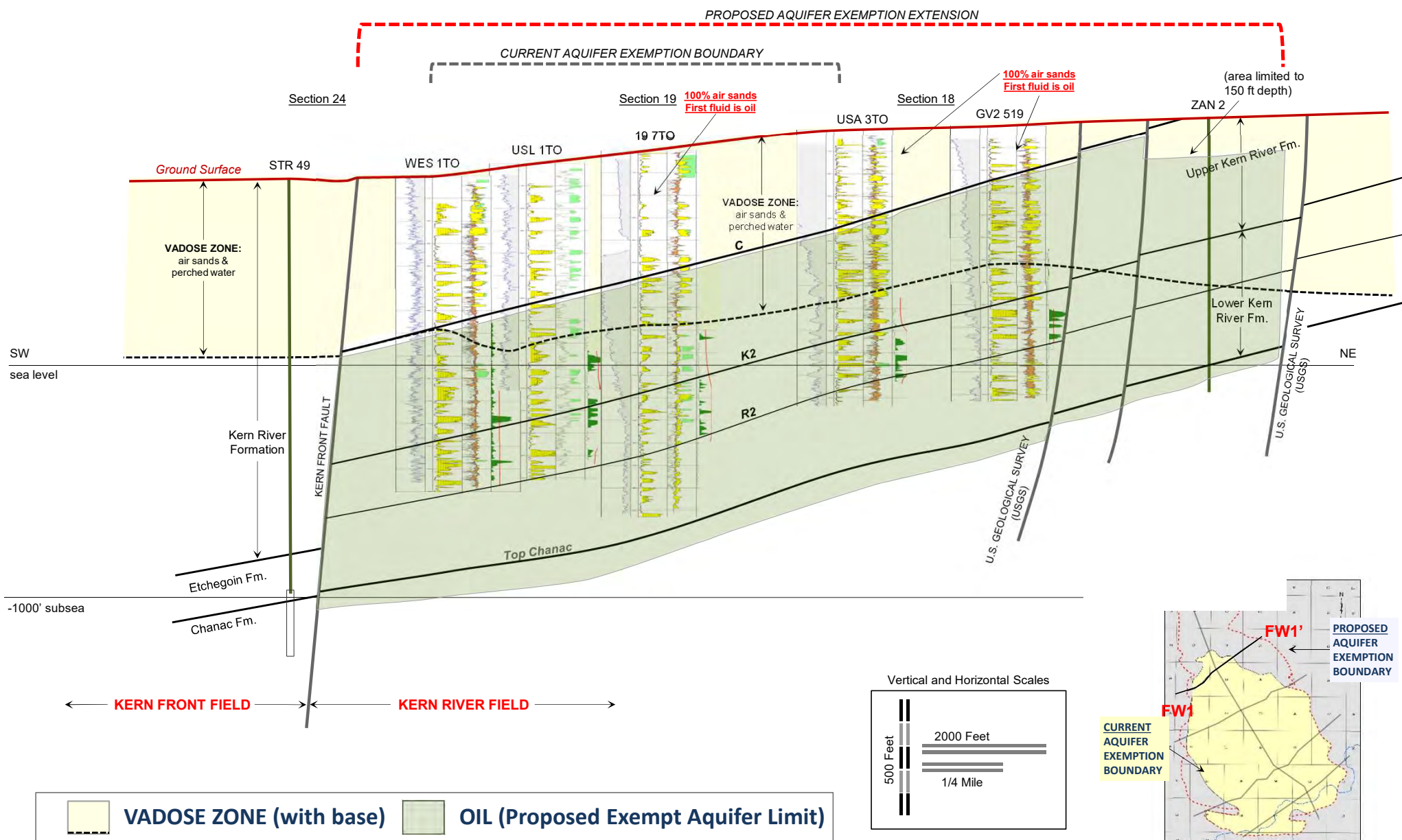


Exhibit B-4 - Cross Section FW1-FW1': Proposed Aquifer Exemption Zone

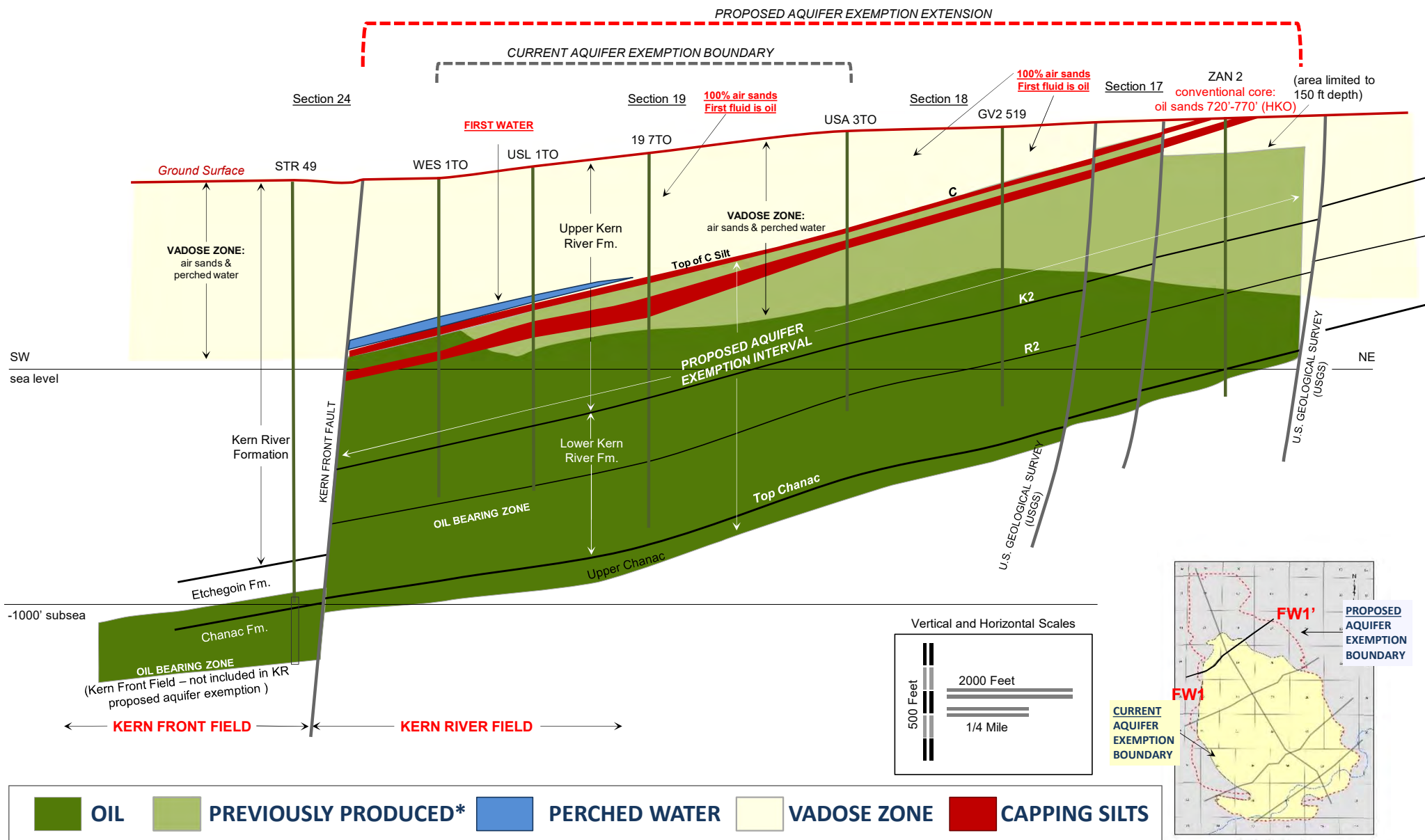


Exhibit B-5 - Cross Section FW1-FW1': Proposed Aquifer Exemption Zone and Capping Silt

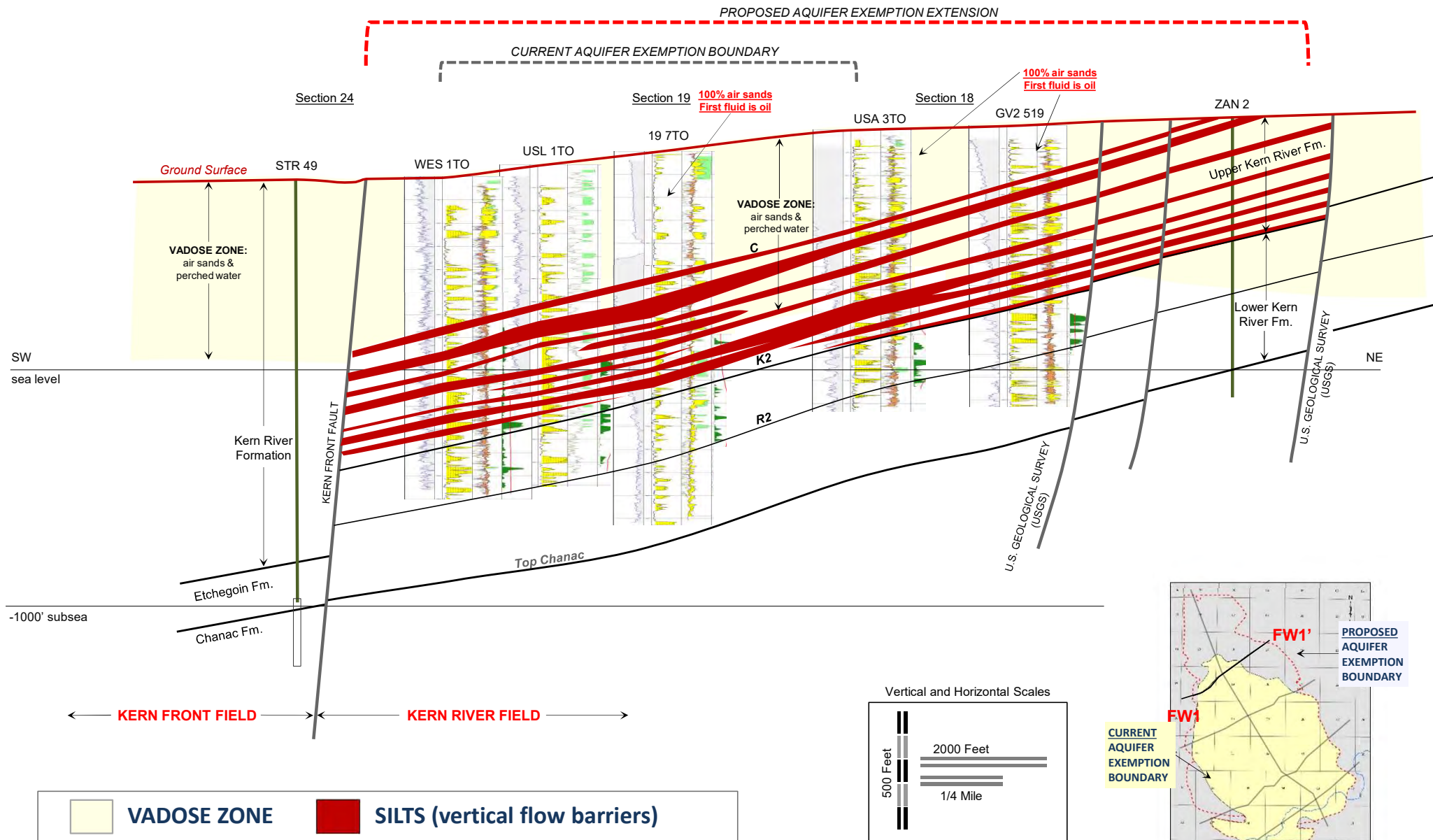


Exhibit B-6 - Cross Section FW1-FW1': Correlated Silt/Clay Barriers (upper KR Formation only)

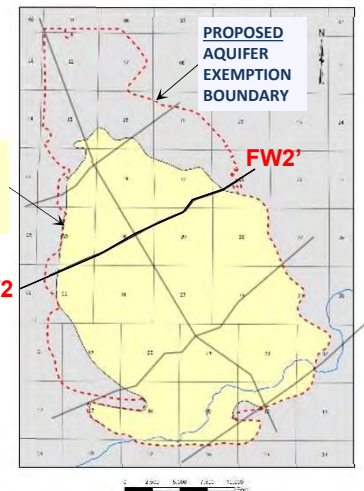


Exhibit B-7 - Cross Section FW2-FW2': Proposed Aquifer Exemption Zone

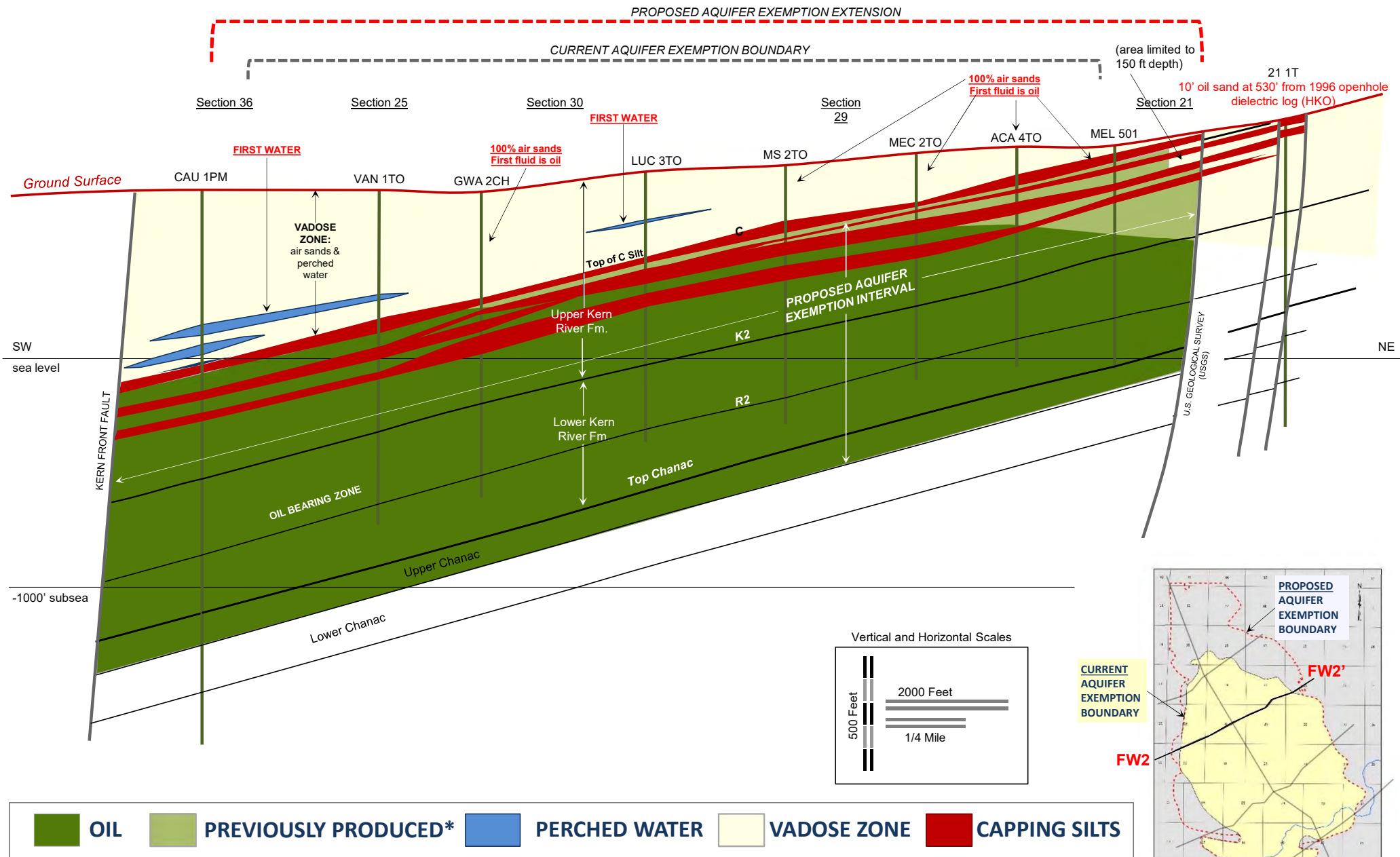


Exhibit B-8 - Cross Section FW2-FW2': Proposed Aquifer Exemption Zone and Capping Silt

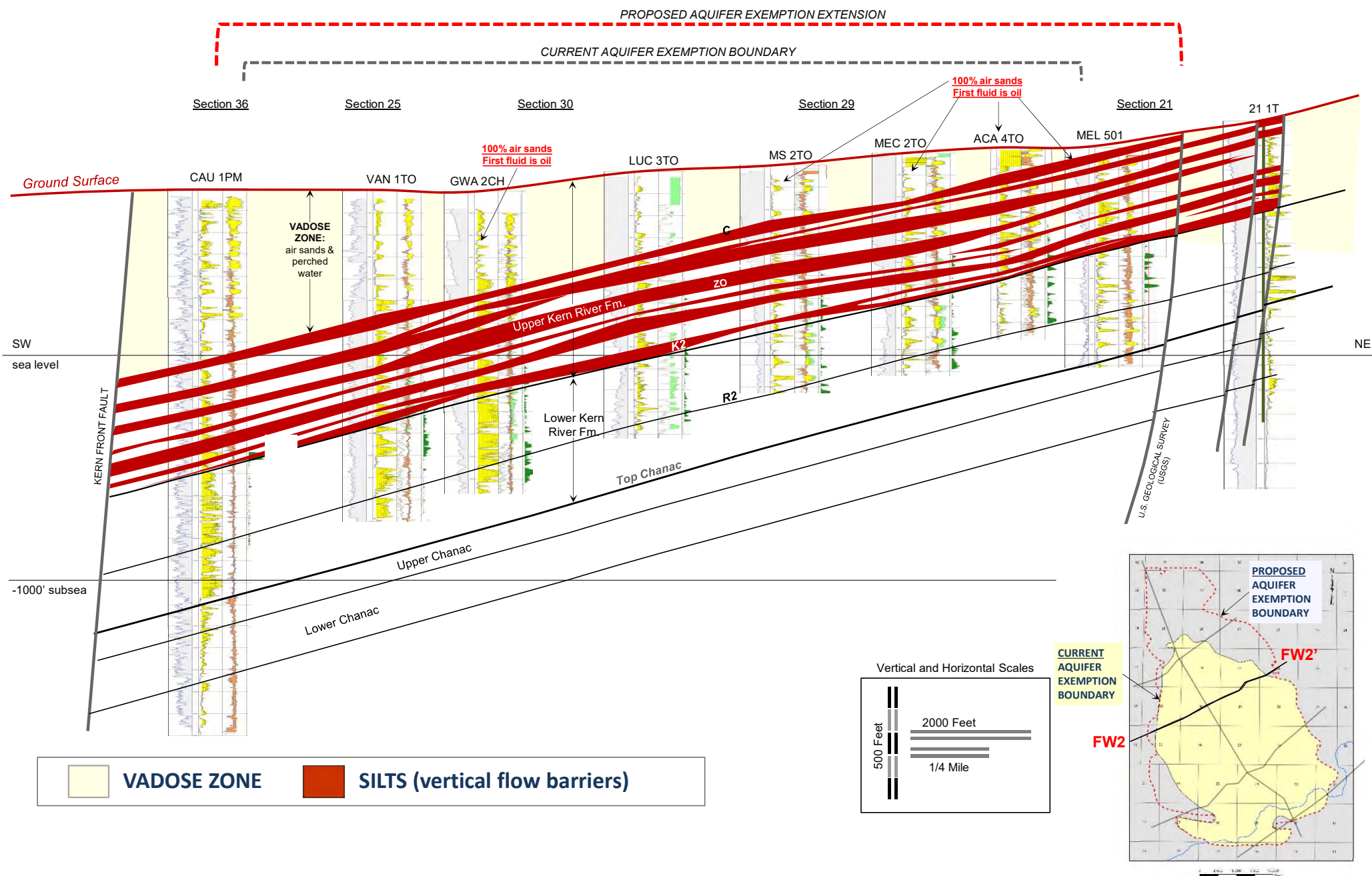


Exhibit B-9 - Cross Section FW2-FW2': Correlated Silt/Clay Barriers (upper KR Formation only)

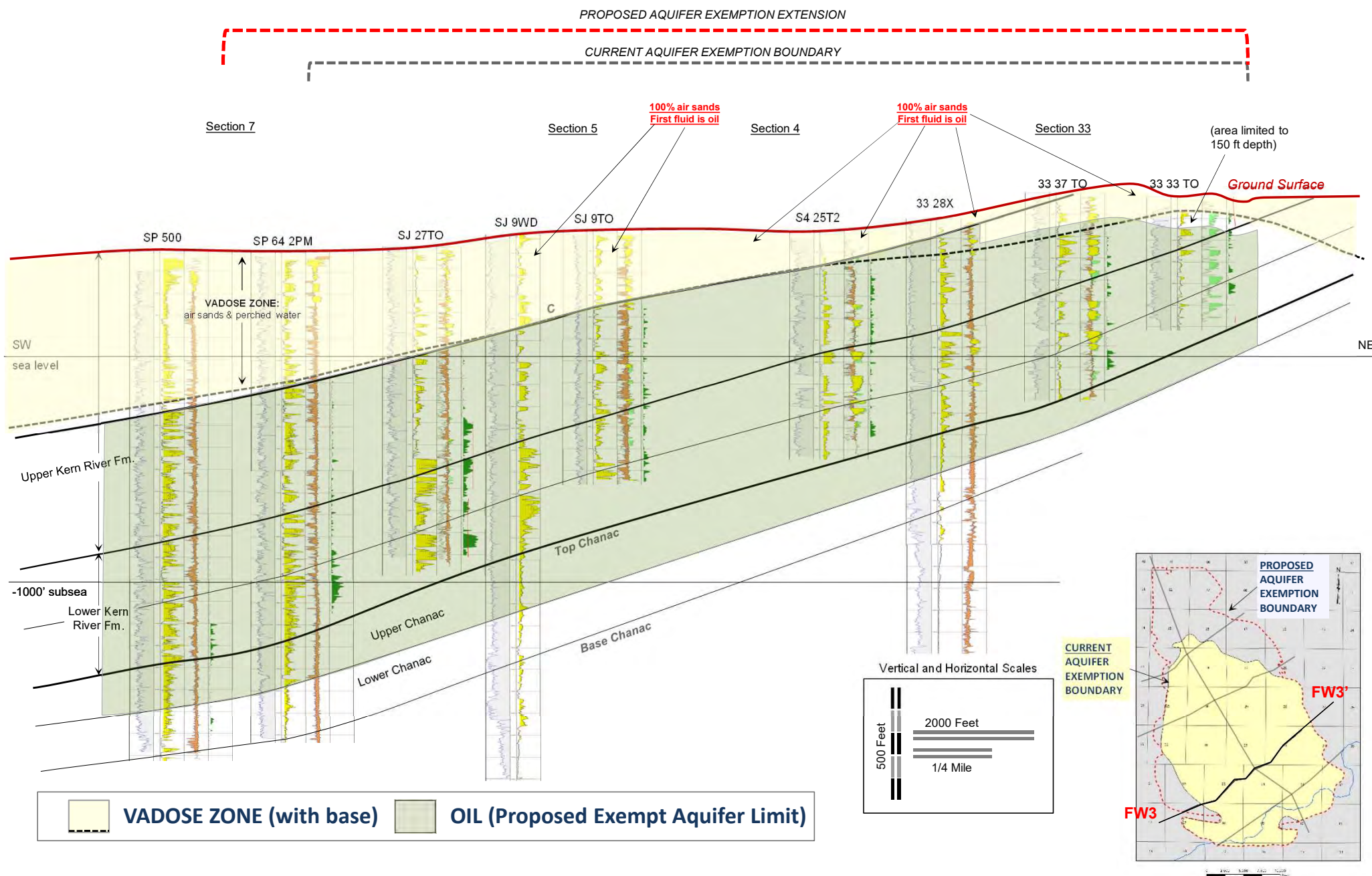
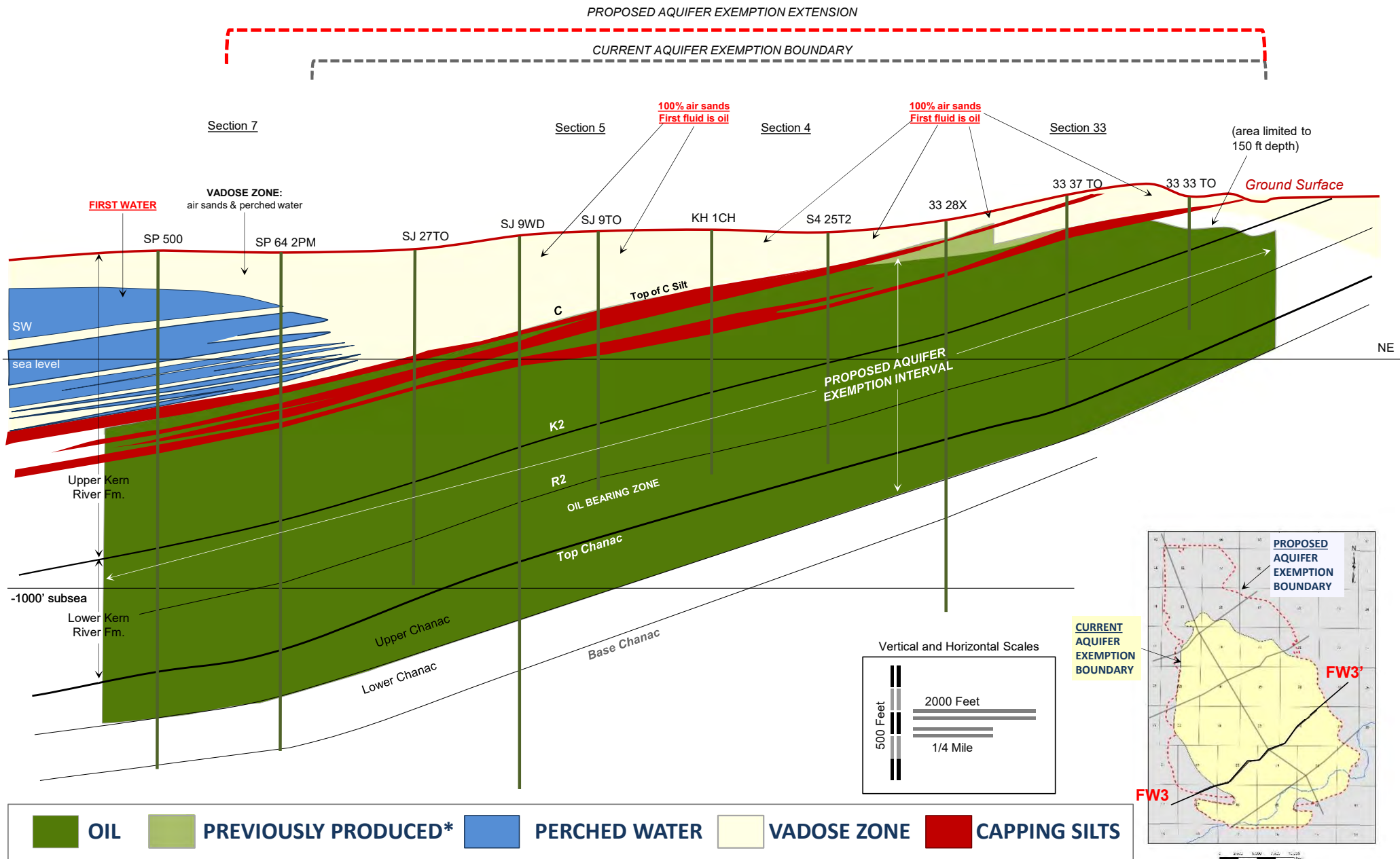


Exhibit B-10 - Cross Section FW3-FW3': Proposed Aquifer Exemption Zone



* Zone contains residual oil saturation.

Exhibit B-11 - Cross Section FW3-FW3': Proposed Aquifer Exemption Zone and Capping Silt

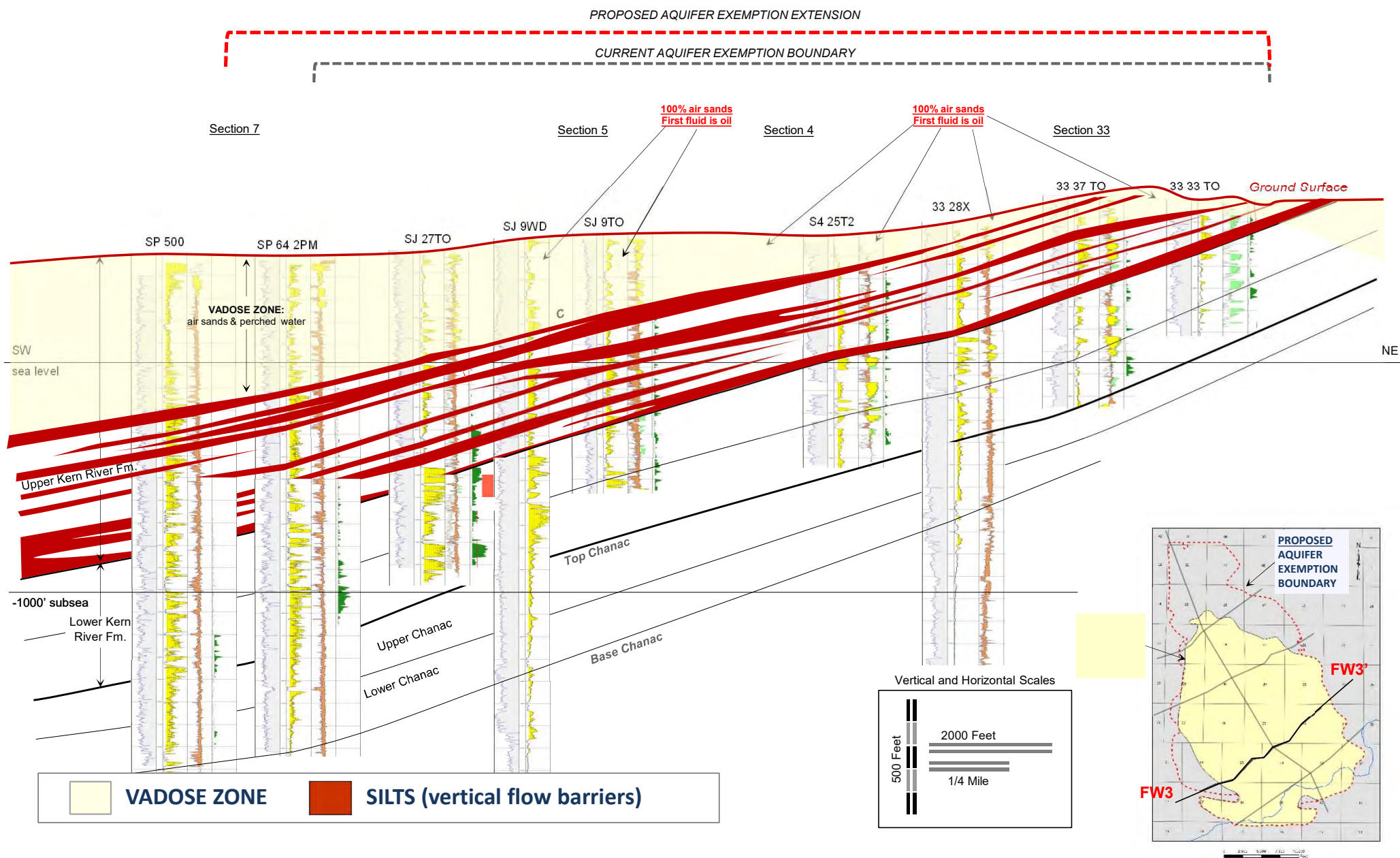


Exhibit B-12 - Cross Section FW3-FW3': Correlated Silt/Clay Barriers (upper KR Formation only)

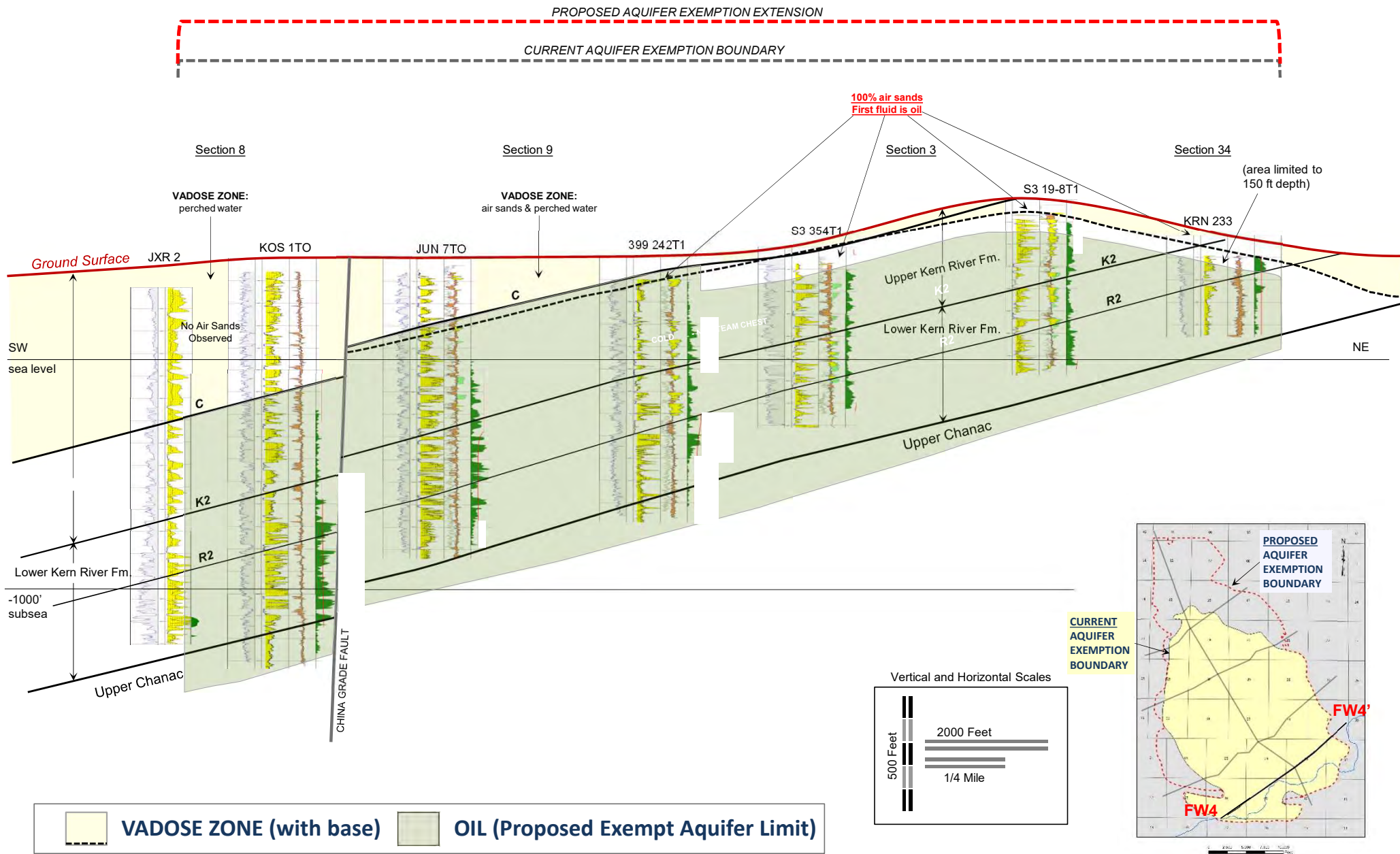


Exhibit B-13 - Cross Section FW4-FW4': Proposed Aquifer Exemption Zone

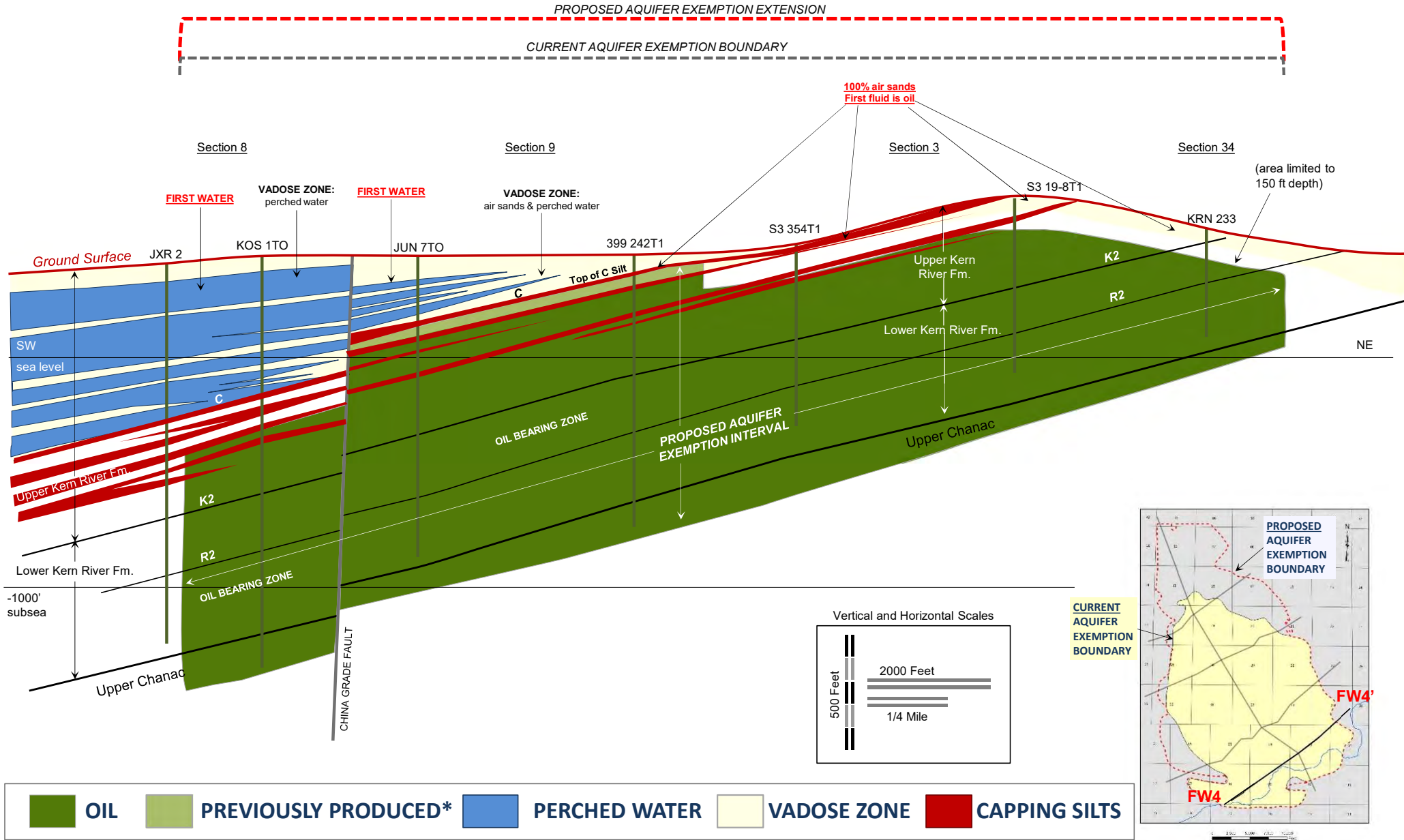


Exhibit B-14 - Cross Section FW4-FW4': Proposed Aquifer Exemption Zone and Capping Silt

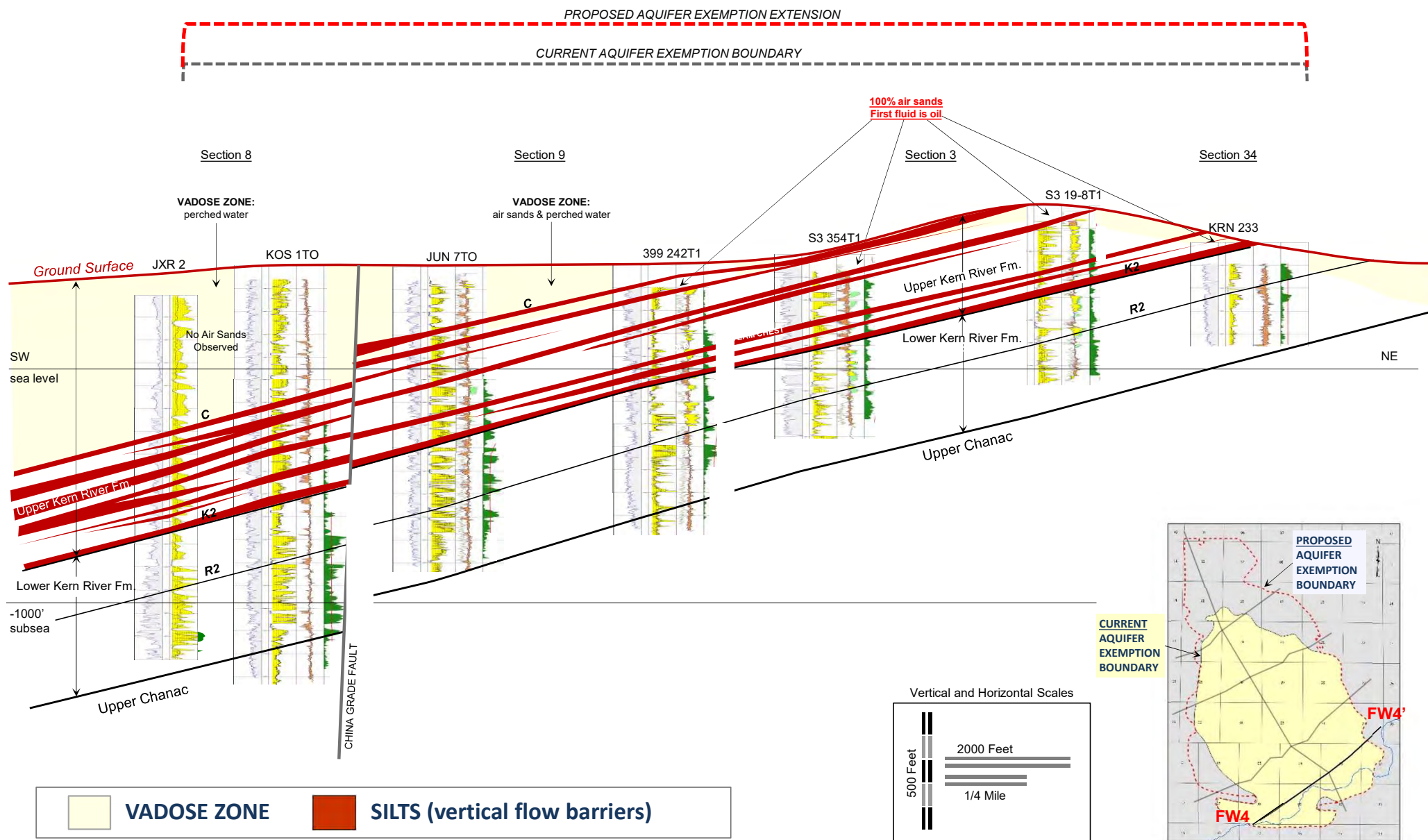


Exhibit B-15 - Cross Section FW4-FW4': Correlated Silt/Clay Barriers (upper KR Formation only)

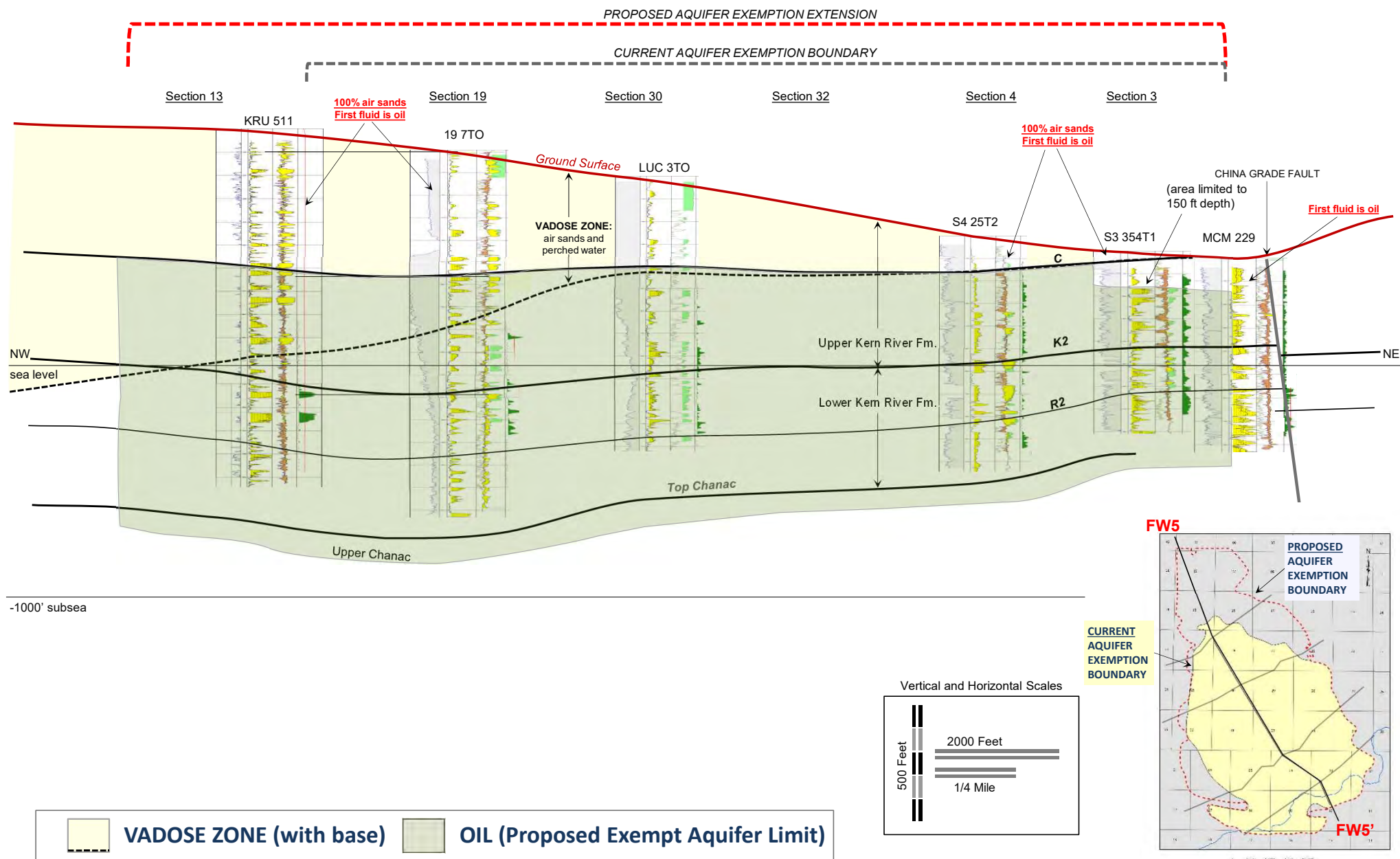


Exhibit B-16 - Cross Section FW5-FW5': Proposed Aquifer Exemption Zone

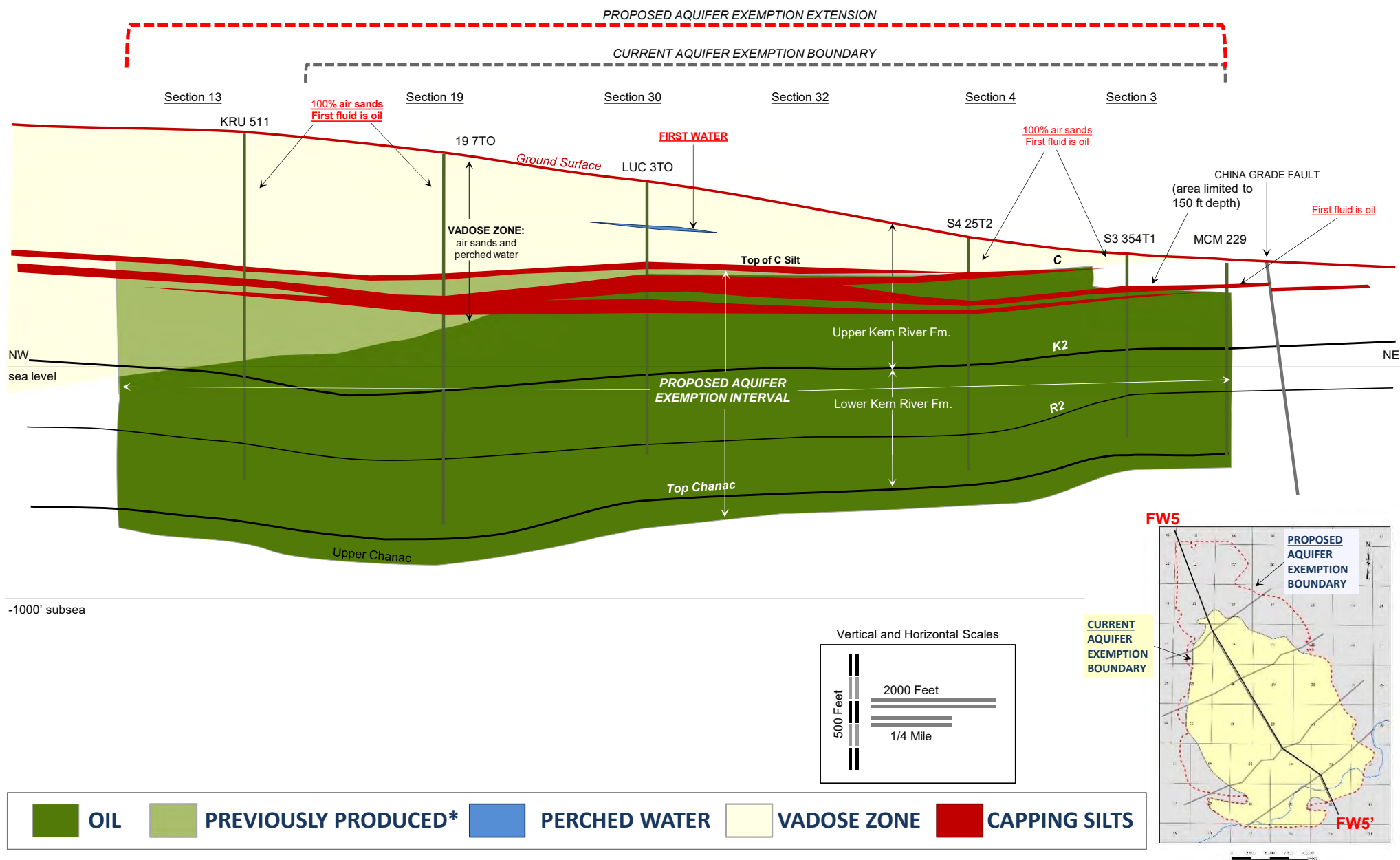


Exhibit B-17 - Cross Section FW5-FW5': Proposed Aquifer Exemption Zone and Capping Silt

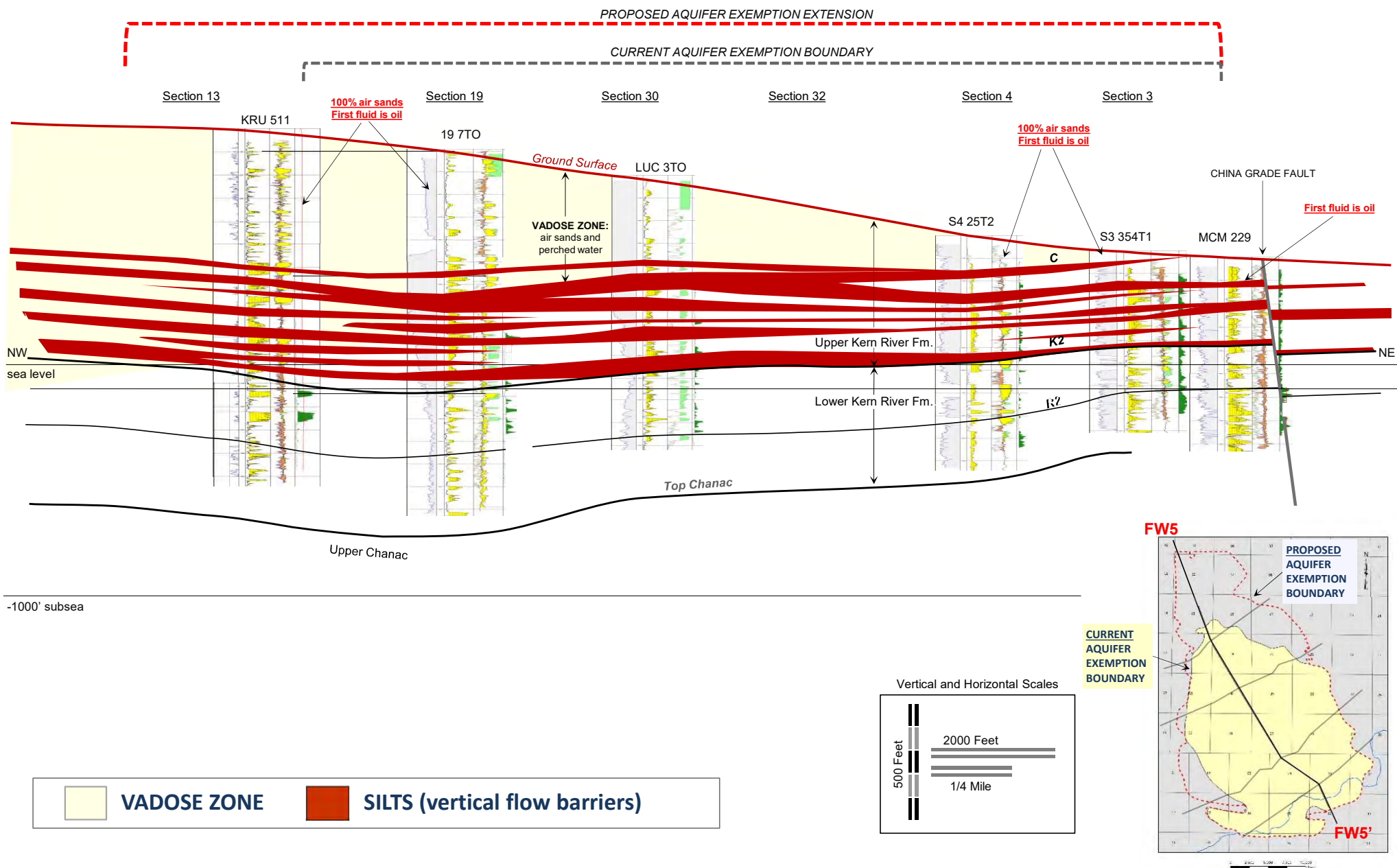
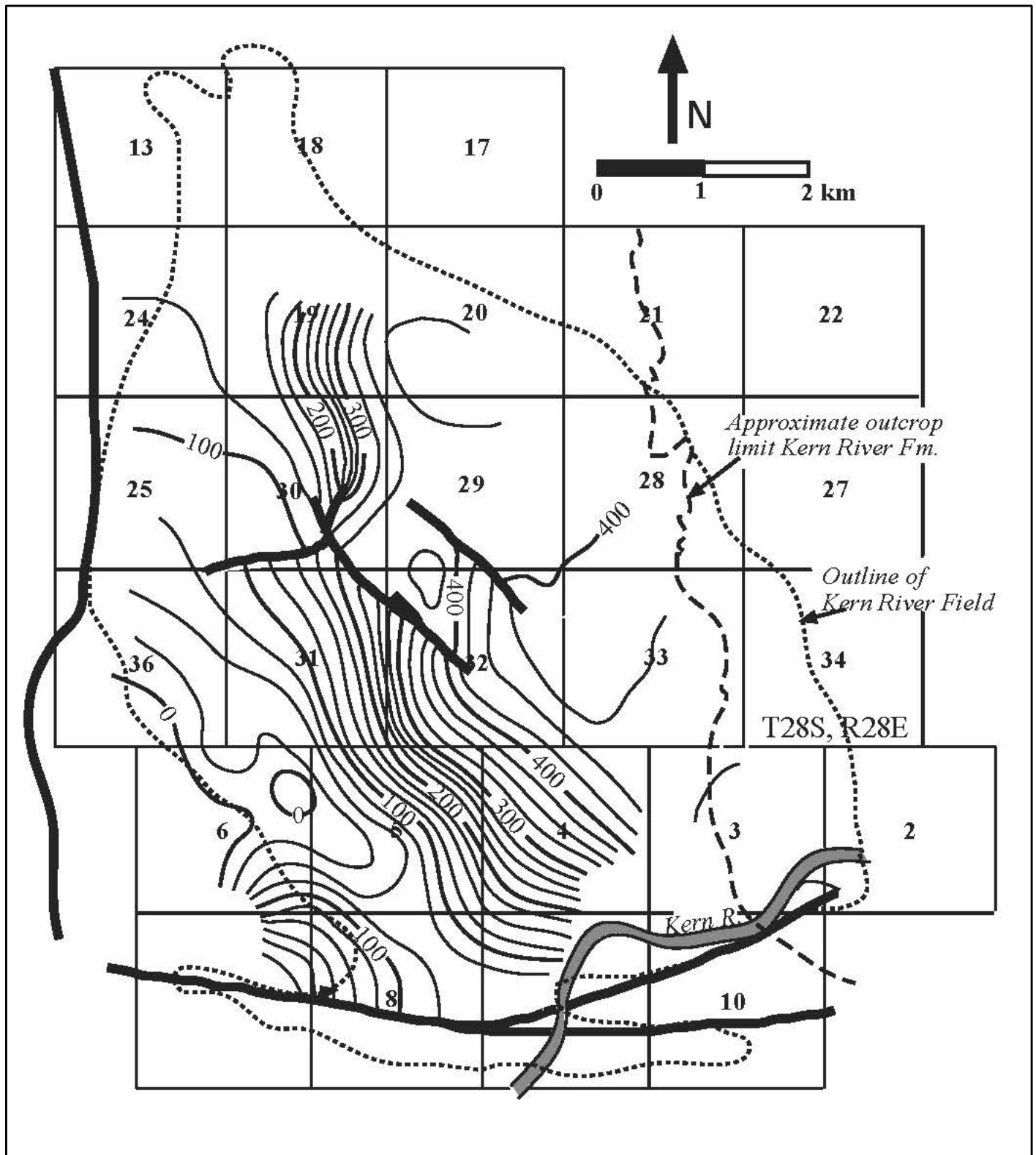


Exhibit B-18 - Cross Section FW5-FW5': Correlated Silt/Clay Barriers (upper KR Formation only)

Appendix C

Aquifer Hydraulics

- C-1 1992 Regional Groundwater Potentiometric Surface Map
- C-2 1992 Kern River R1 Unit Groundwater Potentiometric Surface Map
- C-3 1992 Chanac C1 Groundwater Potentiometric Surface Map
- C-4 Vertical Pressure Log (Openhole Pressure Tool) for Kern River and Upper Chanac
- C-5 Vertical Pressure Log (Openhole Pressure Tool) for Kern River and Upper Chanac
- C-6 Regional Groundwater Table Before Oil Emplacement
- C-7 Regional Groundwater Table After Oil Migration
- C-8 Current Regional Groundwater Table



Source: Coburn, M.G, Gillespie, J.M. 2002. A Hydrogeologic Study to Optimize Steamflood Performance in a Giant Oilfield: Kern River Field, California. AAPG Bulletin v. 86, no. 8."

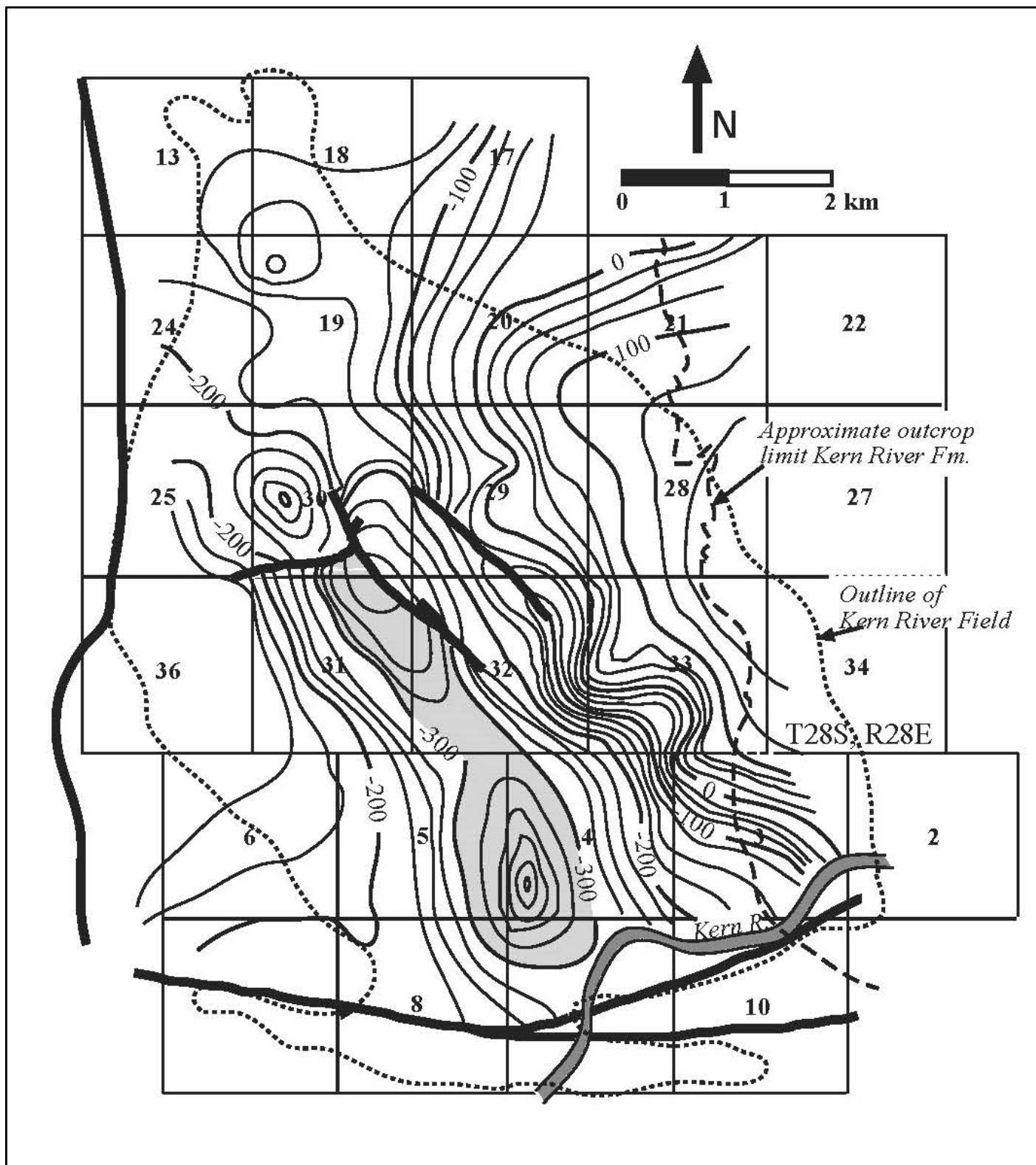
Kennedy/Jenks Consultants

Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

1992 Regional Groundwater Potentiometric Surface Map

K/J 1565005.00
January 2017

Exhibit C-1



Source: Coburn, M.G, Gillespie, J.M. 2002. A Hydrogeologic Study to Optimize Steamflood Performance in a Giant Oilfield: Kern River Field, California. AAPG Bulletin v. 86, no. 8."

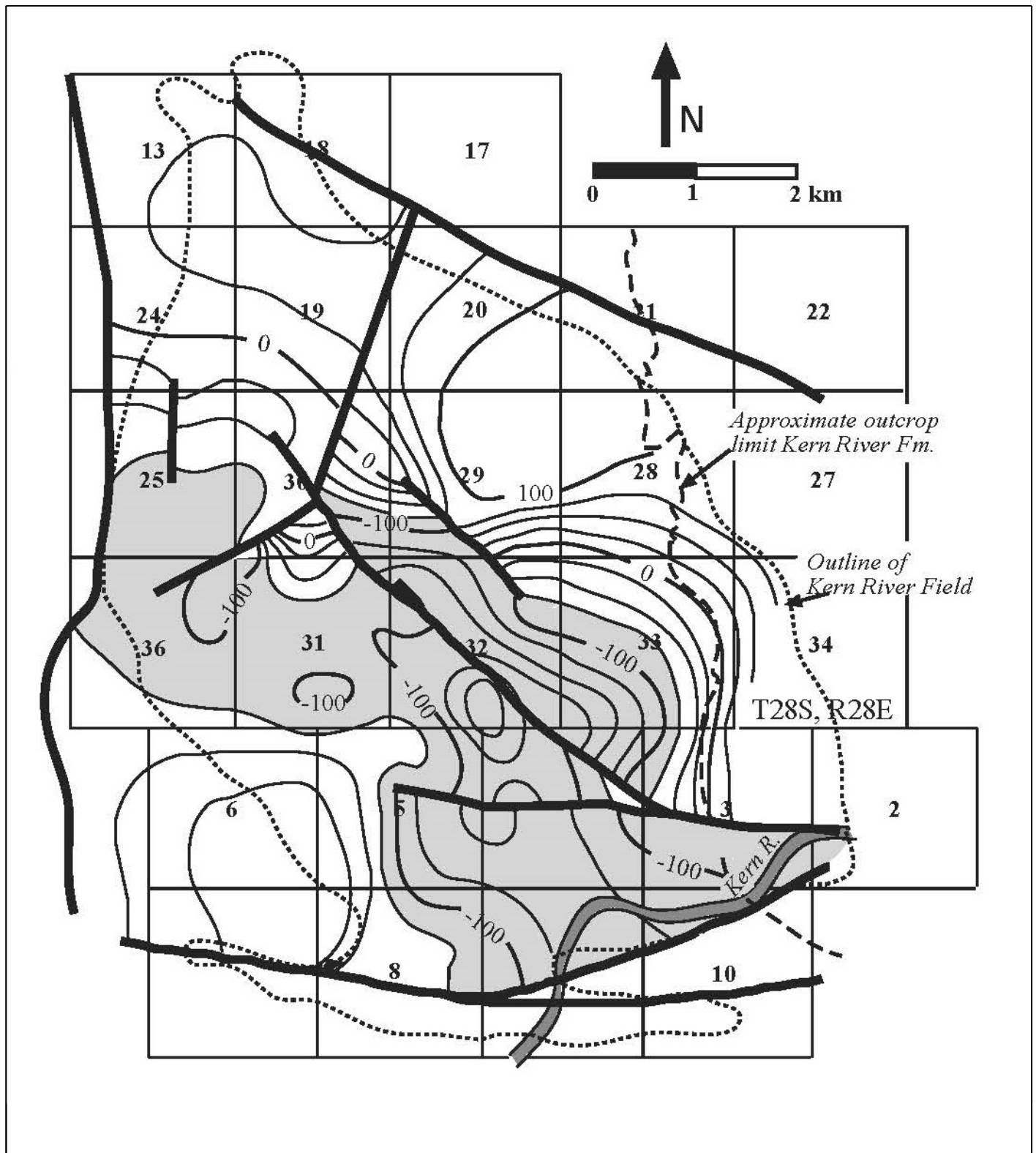
Kennedy/Jenks Consultants

Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

1992 Kern River R1 Unit Groundwater Potentiometric Surface Map

K/J 1565005.00
January 2017

Exhibit C-2



Source: Coburn, M.G, Gillespie, J.M. 2002. A Hydrogeologic Study to Optimize Steamflood Performance in a Giant Oilfield: Kern River Field, California. AAPG Bulletin v. 86, no. 8."

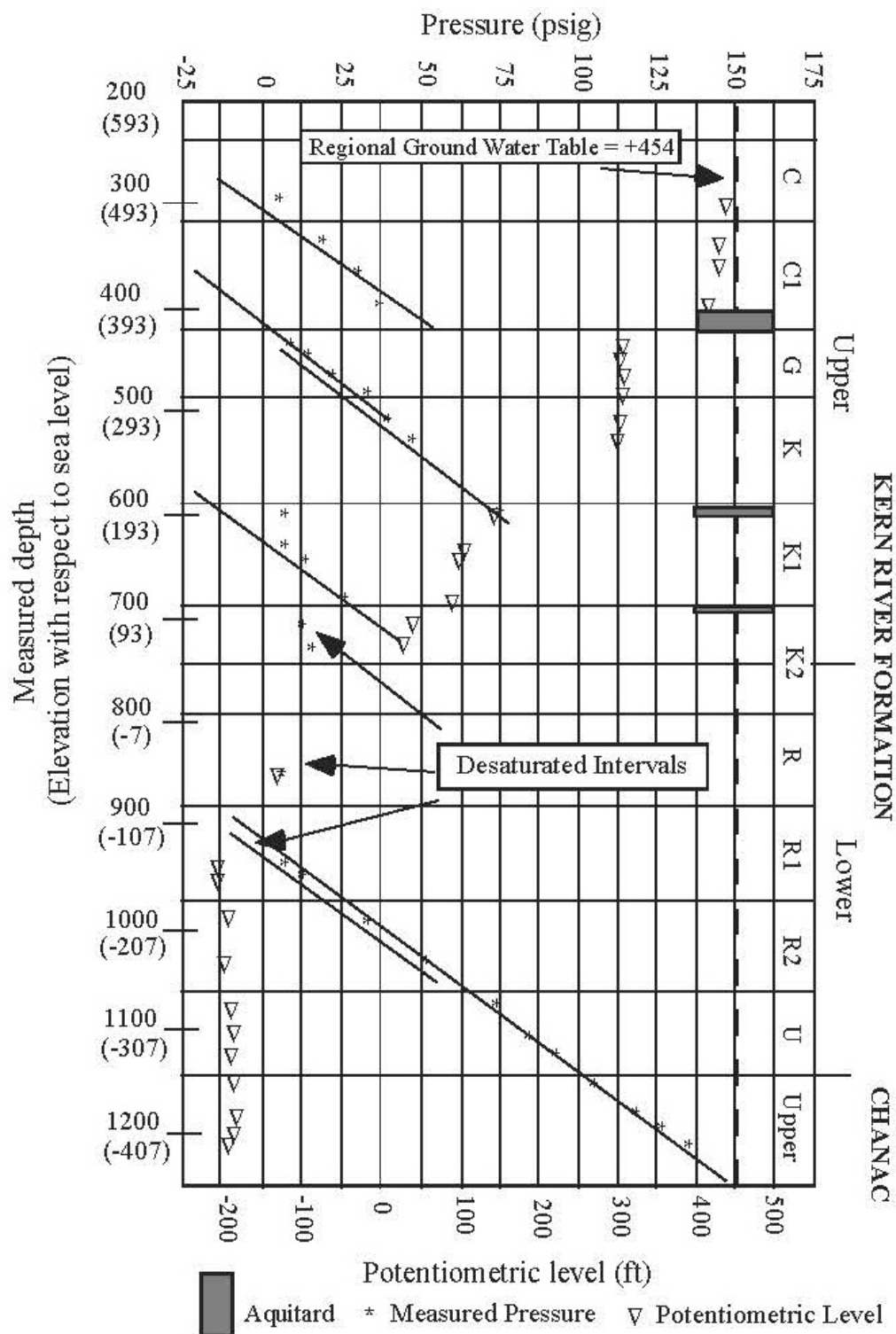
Kennedy/Jenks Consultants

Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

1992 Chanac C1 Groundwater Potentiometric Surface Map

K/J 1565005.00
January 2017

Exhibit C-3



Source: Coburn, M.G, Gillespie, J.M. 2002. A Hydrogeologic Study to Optimize Steamflood Performance in a Giant Oilfield: Kern River Field, California. AAPG Bulletin v. 86, no. 8."

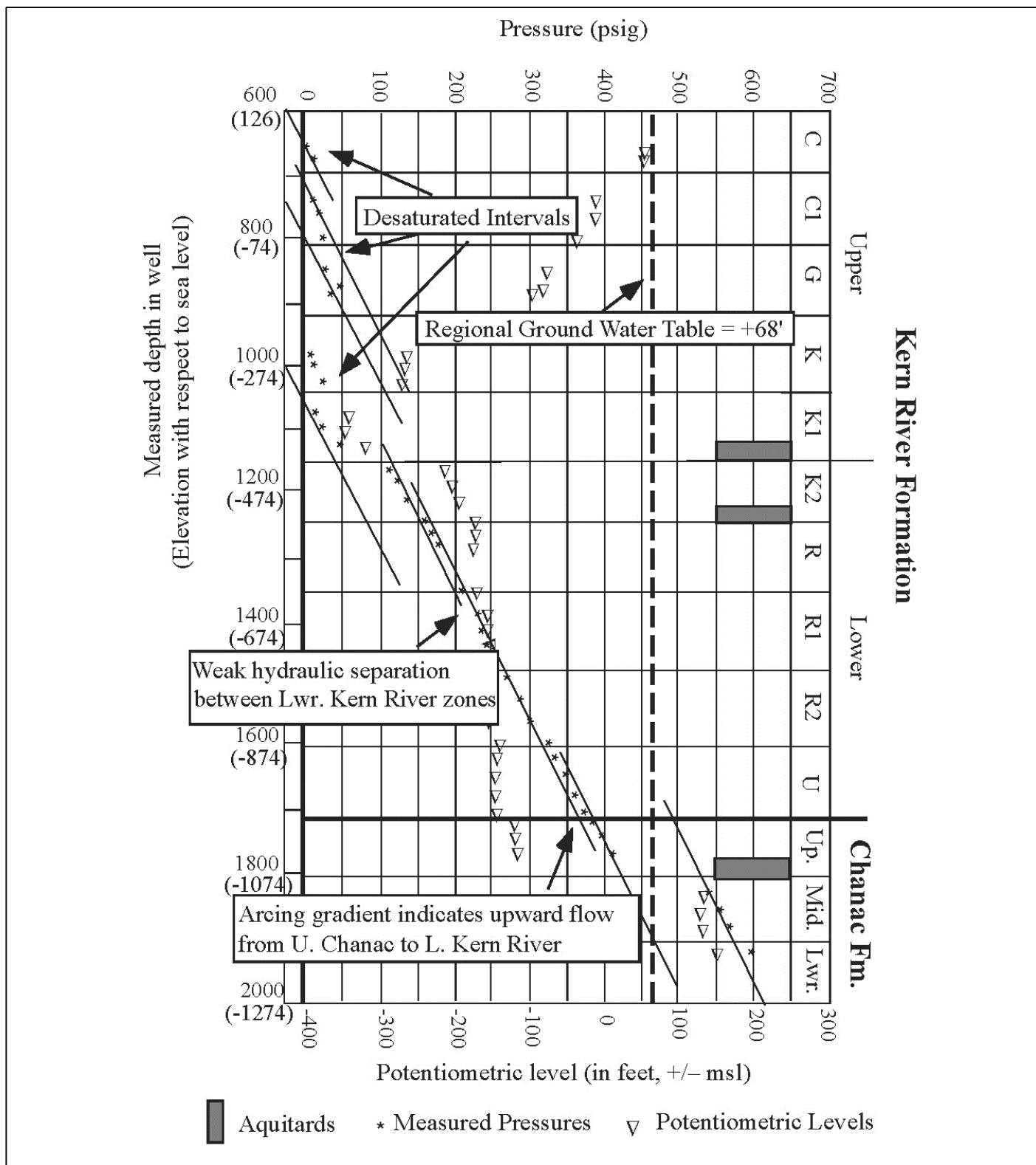
Kennedy/Jenks Consultants

Chevron North America Exploration
 and Production Company
 Kern River Aquifer Exemption

Vertical Pressure Log (Openhole Pressure Tool) for Kern River and Upper Chanac

K/J 1565005.00
 January 2017

Exhibit C-4



Source: Coburn, M.G, Gillespie, J.M. 2002. A Hydrogeologic Study to Optimize Steamflood Performance in a Giant Oilfield: Kern River Field, California. AAPG Bulletin v. 86, no. 8."

Kennedy/Jenks Consultants

Chevron North America Exploration
and Production Company
Kern River Aquifer Exemption

Vertical Pressure Log (Openhole Pressure Tool) for Kern River and Upper Chanac

K/J 1565005.00
January 2017

Exhibit C-5

AR1

AR1'

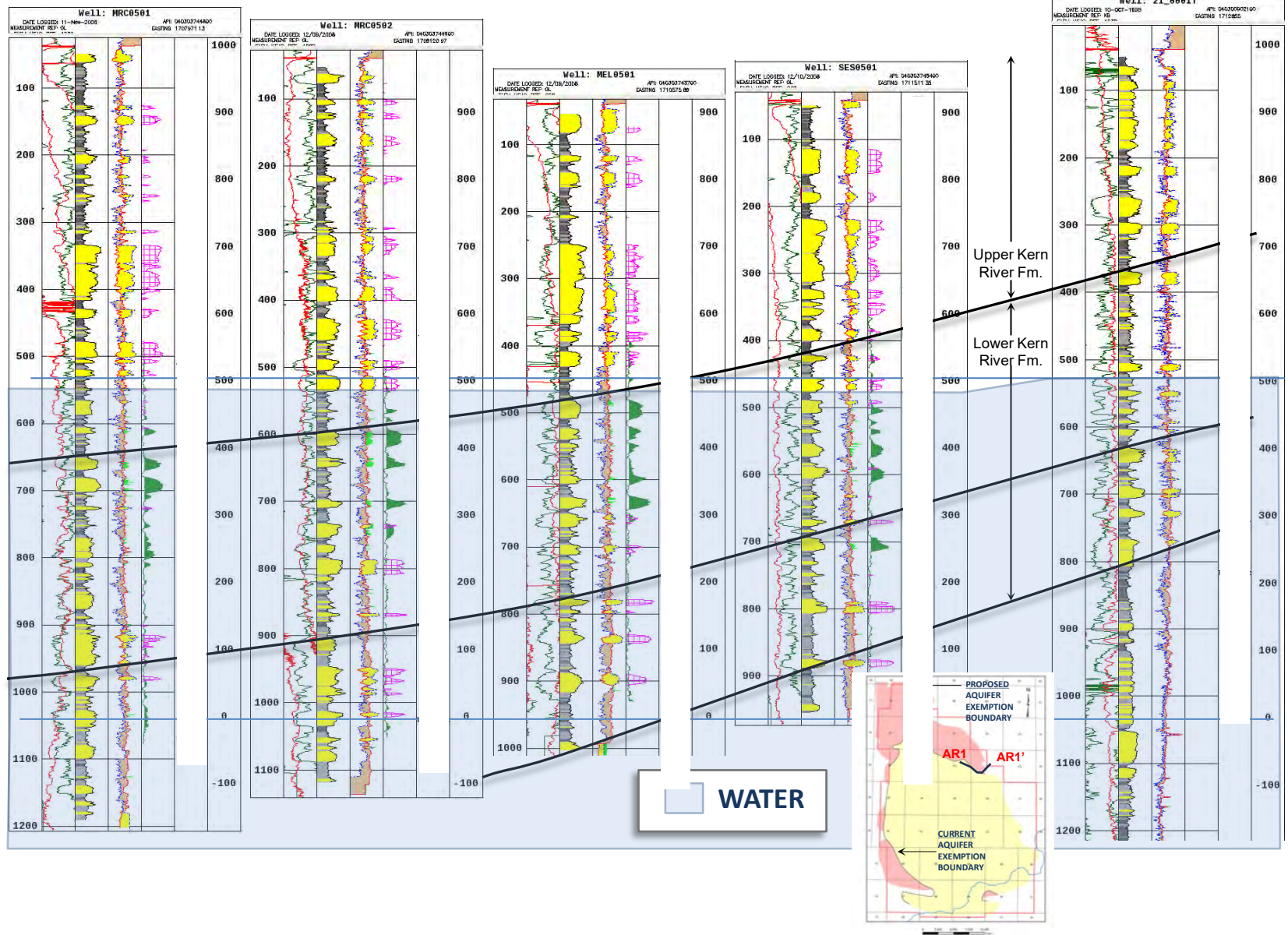


Exhibit C-6 - Regional Groundwater Table Before Oil Emplacement

AR1

AR1'

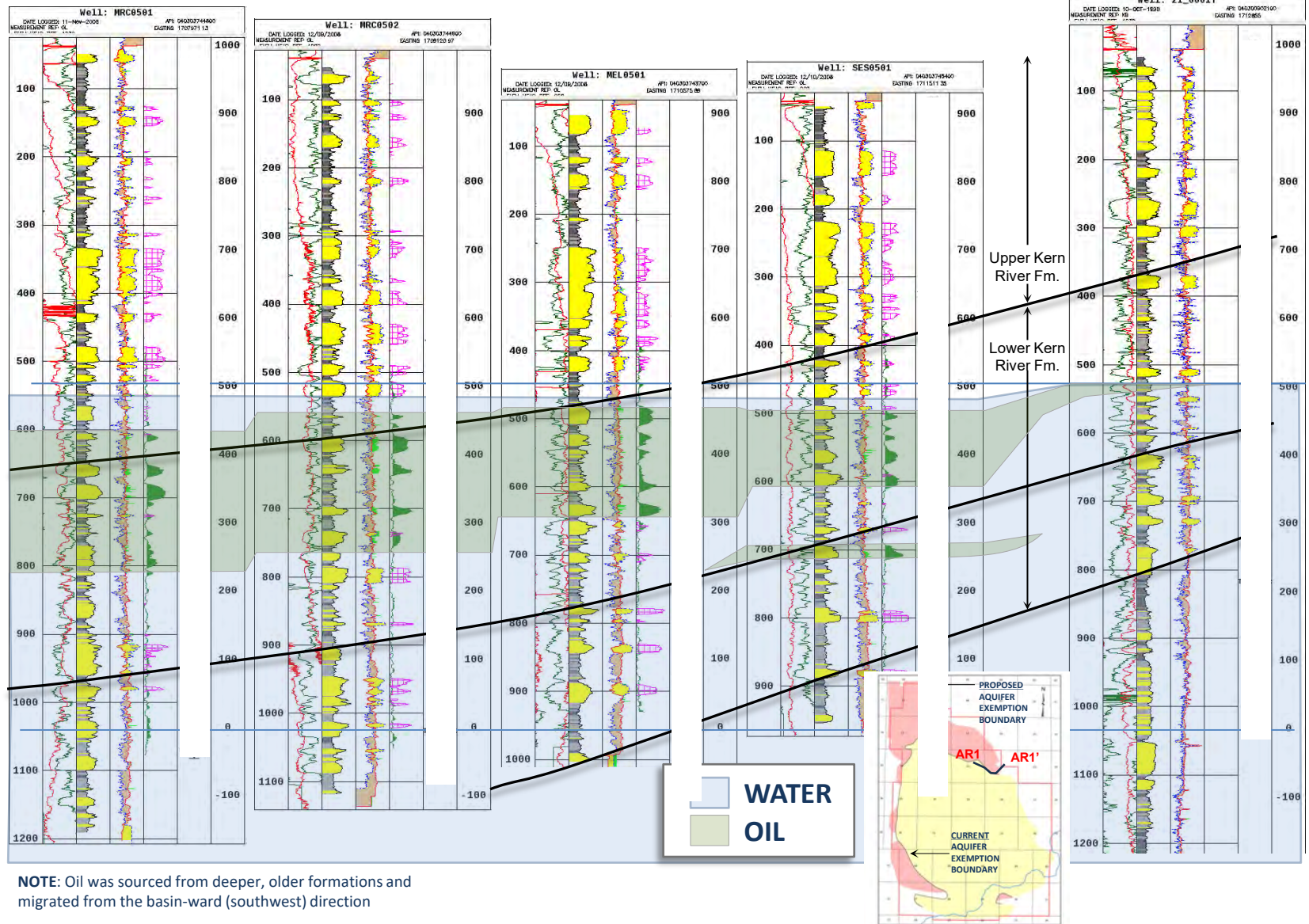


Exhibit C-7 - Oil floating near the top of the regional groundwater table following oil migration
This represents fluid saturation prior to development of the Kern River oil field (1899)

AR1

AR1'

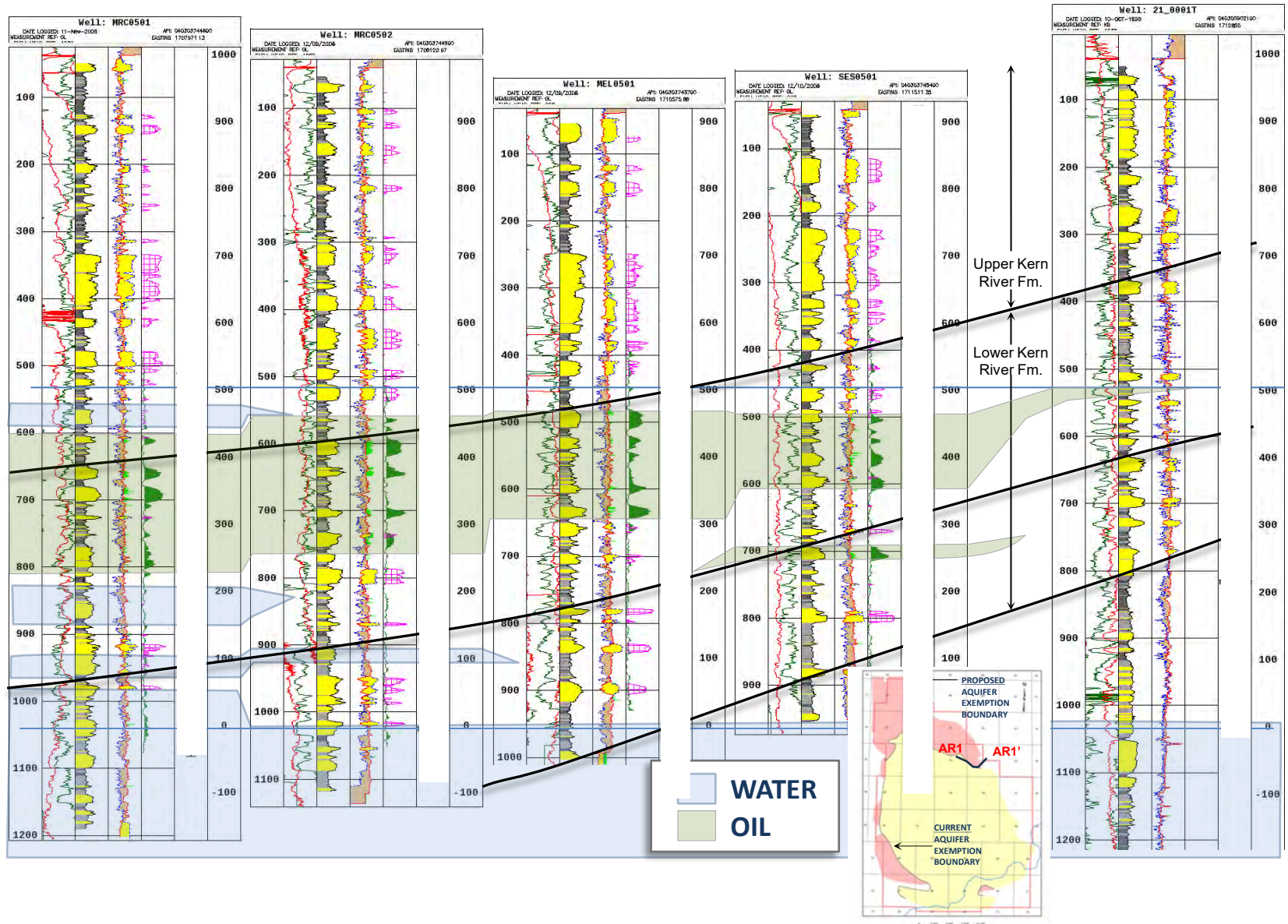


Exhibit C-8 - Current level of oil saturation and regional groundwater table following ~115 years of downdip fluid withdrawal
Heavy, perched oil is immobile unless heated by steam

Appendix D

Water Quality Data

- D-1 Historical Water Quality Data Summary
- D-2 Water Quality Analytical Reports
- D-3 Stiff and Piper Diagrams – Chevron Interdiction Wells

Laboratory Reports for Water Quality Samples at end of Appendix.

See Report Figure 30 for sample locations.

Exhibit D-1: Water Quality Data Summary for Water Wells within 1/4-Mile of Proposed Exemption Boundary

Table 3	Well ^(a)	Sampling	Ca ^(b)	Mg ^(c)	Na ^(d)	K ^(e)	Iron	Mn ^(f)	Bicarbonate Alkalinity	Chloride	Nitrate (NO ₃)	Sulfate	As ^(g)	Boron	EC ^(h)	TDS ⁽ⁱ⁾
Well ID	Number	Date	mg/l ^(j)	mg/l	mg/l	mg/l	µg/l ^(k)	µg/l	mg/l	mg/l	mg/l	mg/l	µg/l	mg/l	umhos/cm ^(l)	mg/l
2	T28S/R27E-24K01	4/30/2003	1.4	0.06	60	0.6	<100 ^(m)	<20	83	27	<2.0	2.1	<2.0	<0.1	320	230
6	29S28E02F001M	11/16/1955	NA ⁽ⁿ⁾	2	NA	3	NA	NA	NA	16	0.1	48	NA	0.2	378	NA
11	29S28E08F001M	12/6/1955	NA	8	NA	3	NA	NA	NA	55	0 ^(o)	45	NA	0.15	530	NA
14	29S/28E-08L01 (RRHOA)	10/28/2013	20	3	29	2	<100	<20	77	17	6	20	<2.0	NA	270	170
14	29S/28E-08L01 (RRHOA)	12/19/2014	19	3	30	2	65	58	100	12	5.5	20	0.76J	0	270	170
26	1503310-001	7/9/1997	NA	NA	NA	NA	NA	101	NA	NA	0	NA	NA	NA	NA	NA
26	1503310-001	4/15/1998	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	1503310-001	3/29/2000	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	1503310-001	9/23/2005	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	1503310-001	6/22/2006	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA
26	1503310-001	5/8/2008	NA	NA	NA	NA	NA	NA	NA	NA	< 0	NA	NA	NA	NA	NA
26	1503310-001	5/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	< 0	NA	NA	NA	NA	NA
26	1503310-001	5/5/2011	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
26	1503310-001	5/24/2012	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
26	1503310-001	12/17/2013	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
26	1503310-001	12/11/2014	NA	NA	NA	NA	NA	NA	NA	NA	< 0.44	NA	NA	NA	NA	NA
28	1500553-003	3/18/2002	NA	NA	NA	NA	NA	48	0	5	< 0.4	13	< 1	NA	210	135
28	1500553-003	12/8/2005	NA	NA	NA	NA	NA	71	0	5	< 0.44	12	< 2	NA	190	120
28	1500553-003	6/11/2008	NA	NA	NA	NA	NA	44	0	6	< 0.44	15	< 2	NA	204	140
28	1500553-003	12/8/2014	NA	NA	NA	NA	NA	52	0	5	1	14	< 2	NA	211	140
-	USGS-352527118594101	12/6/1955	62	7.9	40	2.7	NA	NA	NA	55	0	45	NA	0.15	530	332
-	USGS-352603118561601	7/23/1986	58	0.5	34	2.3	0	0	0.085	45	1.6	58	1	0.19	433	290
-	KERN-22	11/5/2013	46	0.6	150	1.9	170	28	71	180	16	130	<2.0	NA	984	510
-	29S/28E-05N03	average	270	9.8	150	5.8	4.3	0.31	-	245	0.4	-	<0.001	-	1940	1380
-	MW-07	11/7/2005	170	28	83	4.8	2800	2600	0.66	260	NA	1.4	NA	0.56	NA	1000
-	MW-16	11/7/2005	170	24	54	5.3	77	1800	0.12	260	NA	25	NA	0.15	NA	1100
-	MW-16	5/10/2006	170	24	57	5.6	120	1900	0.13	230	NA	16	NA	0.16	NA	1000
-	MW-16	11/8/2006	170	25	89	6	2100	1600	0.05	270	NA	16	NA	0.17	NA	930
-	MW-16	11/7/2007	190	27	69	5.7	790	1100	0.12	180	0	13	NA	NA	NA	920
-	MW-16	4/30/2008	200	29	60	5.6	700	1500	0.14	170	0	4.5	NA	NA	NA	910
-	MW-16	5/5/2009	210	30	62	6	240	1700	0.18	160	0	5.5	NA	NA	NA	860
-	MW-16	11/4/2009	180	26	60	5.4	110	1500	0.18	150	0	6.8	NA	NA	NA	800
-	MW-16	5/5/2010	180	25	58	6	96	1500	0.18	160	0	5.8	NA	NA	NA	840
-	MW-16	5/4/2011	190	28	56	5.5	150	1000	0.17	170	0.585	24	NA	NA	NA	880
-	MW-16	11/2/2011	200	29	67	6.3	360	1700	0.23	180	0	25	NA	NA	NA	820
-	MW-16	11/29/2012	170	27	54	5.5	700	1600	NA	180	0	16	NA	NA	NA	810
-	MW-16	10/4/2013	200	28	62	5.9	450	1300	NA	180	0	21	NA	NA	NA	920
-	MW-16	11/3/2010	180	28	58	5.6	78	1200	0.18	160	0.99	11	NA	NA	NA	910
-	MW-19	5/5/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	MW-19	11/7/2005	160	29	53	3.8	0	84	0.16	64	NA	43	NA	0.2	NA	710
-	MW-19	11/8/2006	180	32	56	3.9	0	46	0.15	100	NA	120	NA	0.18	NA	820
-	MW-19	11/7/2007	160	29	56	3.9	0	73	0.16	79	5.85	84	NA	NA	NA	780

Exhibit D-1: Water Quality Data Summary for Water Wells within 1/4-Mile of Proposed Exemption Boundary

Table 3	Well ^(a)	Sampling	Ca ^(b)	Mg ^(c)	Na ^(d)	K ^(e)	Iron	Mn ^(f)	Bicarbonate	Chloride	Nitrate	Sulfate	As ^(g)	Boron	EC ^(h)	TDS ⁽ⁱ⁾
Well ID	Number	Date	mg/l ^(j)	mg/l	mg/l	mg/l	µg/l ^(k)	µg/l	mg/l	mg/l	mg/l	mg/l	µg/l	mg/l	umhos/cm ^(l)	mg/l
-	MW-19	11/4/2009	170	31	54	3.9	0	170	0.19	140	13.95	120	NA	NA	NA	830
-	MW-19	11/1/2011	250	43	64	4.9	0	270	0.27	290	36.45	160	NA	NA	NA	1200
-	MW-19	11/7/2012	250	43	70	4.7	0	120	NA	240	31.05	170	NA	NA	NA	1200
-	MW-19	10/9/2013	210	39	64	4.8	0	82	NA	190	28.35	160	NA	NA	NA	1100
-	MW-19	11/2/2010	190	36	57	4.4	0	210	0.24	200	24.3	120	NA	NA	NA	1000
-	MW-20	4/27/2005	91	14	73	3.4	0	51	0	33	0.99	57	NA	0.26	NA	NA
-	MW-20	11/9/2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	MW-20	11/7/2006	99	14	78	3.4	0	130	0.1	57	NA	46	NA	0.22	NA	560
-	MW-20	11/6/2007	110	16	93	3.7	0	170	0.13	76	2.295	51	NA	NA	NA	610
-	MW-20	11/3/2009	110	17	93	3.4	0	100	0.17	110	4.32	59	NA	NA	NA	670
-	MW-20	11/2/2010	100	17	96	3.8	0	88	0.19	79	11.7	61	NA	NA	NA	650
-	MW-20	11/1/2011	110	16	92	3.5	0	130	0.18	81	13.05	91	NA	NA	NA	650
-	MW-20	11/5/2012	120	19	94	4.1	0	200	NA	100	10.35	100	NA	NA	NA	690
-	MW-20	11/9/2005	99	14	72	3.6	0	77	0.08	40	NA	54	NA	0.22	NA	520
-	MW-20	10/9/2013	110	17	90	4.1	0	140	NA	100	NA	88	NA	NA	NA	680
-	MW-25	5/4/2005	280	32	95	5.8	0	29	0	310	3.105	440	NA	0.3	NA	NA
-	MW-38	5/4/2005	270	28	86	5.8	0	0	0	190	0.9	380	NA	0.26	NA	NA
-	MW-42	11/10/2005	130	18	48	4	730	1200	0.16	150	NA	23	NA	0.14	NA	680
-	MW-42	5/17/2006	120	18	47	4.1	790	1200	0.16	150	NA	26	NA	0.15	NA	700
-	MW-42	11/15/2006	120	18	46	3.8	810	1200	0.17	170	NA	26	NA	0.14	NA	690
-	MW-42	5/16/2007	130	19	49	4.1	850	1200	0.18	160	0	21	NA	0.16	NA	NA
-	MW-42	11/14/2007	130	19	50	3.9	840	1200	0.18	180	0	23	NA	NA	NA	830
-	MW-42	5/6/2008	140	20	51	4.2	890	1300	0.19	190	NA	27	NA	NA	NA	760
-	MW-42	5/13/2009	150	20	54	4.4	910	1400	0.22	200	0	22	NA	NA	NA	810
-	MW-42	5/12/2010	140	20	50	4.3	570	1300	0.2	200	NA	31	NA	NA	NA	870
-	MW-42	11/10/2010	130	21	49	4.3	430	1200	0.18	180	0	24	NA	NA	NA	850
-	MW-42	5/11/2011	150	22	57	4.8	590	1400	0.19	190	0	21	NA	NA	NA	800
-	MW-42	11/9/2011	160	23	54	4.4	200	1200	0.17	180	0	58	NA	NA	NA	850
-	MW-42	11/9/2011	160	23	54	4.4	200	1200	0.17	180	0	58	NA	NA	NA	850
-	MW-42	11/15/2012	140	23	50	4	170	1200	NA	180	0	31	NA	NA	NA	760
-	MW-42	10/18/2013	150	24	55	4.3	200	1400	NA	190	0	33	NA	NA	NA	830
-	MW-42	11/11/2009	160	25	50	4.4	670	1400	0.22	200	0	25	NA	NA	NA	870
-	MW-43	11/8/2012	210	33	65	8	450	5000	NA	120	0	2.2	NA	NA	NA	940
-	MW-43	10/25/2013	210	33	56	8.1	170	4700	NA	130	0	1.6	NA	NA	NA	980
-	MW-48	11/15/2005	110	4.7	52	4.2	85	0	0.12	140	NA	41	NA	0.2	NA	620
-	MW-48	11/14/2006	110	5	51	4.4	0	0	0.13	160	NA	49	NA	0.21	NA	600
-	MW-48	11/13/2007	110	5.1	50	4.3	86	0	0.14	170	0	45	NA	NA	NA	720
-	MW-48	11/10/2009	120	5.6	52	4.6	170	0	0.15	170	0	46	NA	NA	NA	630
-	MW-48	11/9/2010	110	5.3	47	4.2	190	0	0.13	170	NA	43	NA	NA	NA	670
-	MW-48	11/8/2011	130	5.6	55	4.5	220	0	0.14	180	0	38	NA	NA	NA	730
-	MW-48	11/13/2012	110	4.9	48	4	280	18	NA	180	0	45	NA	NA	NA	750
-	MW-48	10/15/2013	110	5.5	53	4.5	590	18	NA	170	0	39	NA	NA	NA	670

Exhibit D-1: Water Quality Data Summary for Water Wells within 1/4-Mile of Proposed Exemption Boundary

Table 3	Well ^(a)	Sampling	Ca ^(b)	Mg ^(c)	Na ^(d)	K ^(e)	Iron	Mn ^(f)	Bicarbonate	Chloride	Nitrate	Sulfate	As ^(g)	Boron	EC ^(h)	TDS ⁽ⁱ⁾
Well ID	Number	Date	mg/l ^(j)	mg/l	mg/l	mg/l	µg/l ^(k)	µg/l	mg/l	mg/l	mg/l	mg/l	µg/l	mg/l	umhos/cm ^(l)	mg/l
-	MW-52	11/10/2005	83	9.9	39	3.9	53	1100	0.16	120	NA	35	NA	0.13	NA	450
-	MW-52	5/17/2006	87	10	44	4.4	63	1200	0.16	110	NA	23	NA	0.15	NA	470
-	MW-52	5/17/2006	87	10	44	4.4	63	1200	0.16	110	NA	23	NA	0.15	NA	470
-	MW-52	11/15/2006	96	12	43	4.2	140	1500	0.18	120	NA	18	NA	0.15	NA	530
-	MW-52	11/15/2006	96	12	43	4.2	140	1500	0.18	120	NA	18	NA	0.15	NA	530
-	MW-52	5/16/2007	99	13	43	4.1	180	1600	0.2	130	0	28	NA	0.16	NA	NA
-	MW-52	11/14/2007	100	13	45	3.9	230	1700	0.21	130	0	20	NA	NA	NA	630
-	MW-52	11/14/2007	100	13	45	3.9	230	1700	0.21	130	0	20	NA	NA	NA	630
-	MW-52	5/7/2008	110	14	46	4.2	230	1700	0.23	140	0	23	NA	NA	NA	610
-	MW-52	5/13/2009	140	16	52	4.5	190	2000	0.28	180	0	29	NA	NA	NA	780
-	MW-52	11/11/2009	140	19	50	4.7	140	2000	0.29	210	0	42	NA	NA	NA	870
-	MW-52	5/12/2010	120	16	47	4.5	150	1900	0.27	220	NA	55	NA	NA	NA	890
-	MW-52	5/12/2010	120	16	47	4.5	150	1900	0.27	220	NA	55	NA	NA	NA	890
-	MW-52	11/10/2010	120	16	44	4.5	130	1800	0.26	200	0	57	NA	NA	NA	930
-	MW-52	11/10/2010	120	16	44	4.5	130	1800	0.26	200	0	57	NA	NA	NA	930
-	MW-52	5/11/2011	140	19	56	5.3	180	2100	0.29	240	0	69	NA	NA	NA	880
-	MW-52	5/11/2011	140	19	56	5.3	180	2100	0.29	240	0	69	NA	NA	NA	880
-	MW-52	11/9/2011	150	19	55	5.2	210	2100	0.31	260	0	64	NA	NA	NA	1100
-	MW-52	10/21/2013	170	21	52	4.9	190	2300	NA	310	0	68	NA	NA	NA	920
-	MW-52	10/21/2013	170	21	52	4.9	190	2300	NA	310	0	68	NA	NA	NA	920
-	MW-52	11/15/2012	160	20	52	5.1	170	2200	NA	310	0	56	NA	NA	NA	1000
-	MW-53	11/16/2005	190	19	66	5	320	1500	0.1	230	NA	99	NA	0.18	NA	1100
-	MW-53	11/9/2006	170	17	64	4.7	250	1300	0.099	200	NA	96	NA	0.19	NA	960
-	MW-53	11/9/2006	170	17	64	4.7	250	1300	0.099	200	NA	96	NA	0.19	NA	960
-	MW-53	11/8/2007	160	17	66	5	260	1200	0.095	150	0	110	NA	NA	NA	900
-	MW-53	11/3/2010	120	14	58	4.3	150	1100	0.076	99	0	110	NA	NA	NA	660
-	MW-53	11/2/2011	130	13	69	4.4	160	1200	0.082	110	0	130	NA	NA	NA	610
-	MW-53	11/4/2009	130	13	58	4.1	170	1000	0.075	95	0	110	NA	NA	NA	630
-	MW-44	11/14/2005	NA	NA	NA	NA	NA	310	0	35	NA	19	NA	0	NA	250
-	MW-44	5/15/2006	NA	NA	NA	NA	NA	280	0	35	NA	16	NA	0	NA	300
-	MW-44	11/13/2006	NA	NA	NA	NA	NA	270	0	40	NA	15	NA	0	NA	300
-	MW-44	11/12/2007	NA	NA	NA	NA	NA	250	0	46	NA	12	NA	NA	NA	320
-	MW-44	5/11/2009	NA	NA	NA	NA	NA	300	0	54	1	9	NA	NA	NA	330
-	MW-44	11/9/2009	NA	NA	NA	NA	NA	290	0	64	0	9	NA	NA	NA	340
-	MW-44	5/10/2010	NA	NA	NA	NA	NA	250	0	73	0	11	NA	NA	NA	350
-	MW-44	11/8/2010	NA	NA	NA	NA	NA	210	0	65	0	12	NA	NA	NA	330
-	MW-44	5/9/2011	NA	NA	NA	NA	NA	230	0	63	0	14	NA	NA	NA	290
-	MW-44	11/8/2011	NA	NA	NA	NA	NA	210	0	69	0	17	NA	NA	NA	320
-	MW-44	11/12/2012	NA	NA	NA	NA	NA	210	NA	70	0	11	NA	NA	NA	310
-	MW-44	10/21/2013	NA	NA	NA	NA	NA	210	NA	67	0	14	NA	NA	NA	290
-	MW-51A	11/7/2005	NA	NA	NA	NA	NA	160	0	160	NA	42	NA	0	NA	620
-	MW-51A	5/8/2006	NA	NA	NA	NA	NA	180	0	190	NA	48	NA	0	NA	670

Exhibit D-1: Water Quality Data Summary for Water Wells within 1/4-Mile of Proposed Exemption Boundary

Table 3	Well ^(a)	Sampling	Ca ^(b)	Mg ^(c)	Na ^(d)	K ^(e)	Iron	Mn ^(f)	Bicarbonate Alkalinity	Chloride	Nitrate (NO ₃)	Sulfate	As ^(g)	Boron	EC ^(h)	TDS ⁽ⁱ⁾	
Well ID	Number	Date	mg/l ^(j)	mg/l	mg/l	mg/l	µg/l ^(k)	µg/l	mg/l	mg/l	mg/l	mg/l	µg/l	mg/l	umhos/cm ^(l)	mg/l	
-	MW-51A	11/6/2006	NA	NA	NA	NA	NA	190		0	200	NA	49	NA	0	NA	760
-	MW-51A	11/5/2007	NA	NA	NA	NA	NA	150		0	200	0	41	NA	NA	NA	840
-	MW-51A	4/28/2008	NA	NA	NA	NA	NA	140		0	210	0	43	NA	NA	NA	760
-	MW-51A	5/4/2009	NA	NA	NA	NA	NA	140		0	190	0	42	NA	NA	NA	730
-	MW-51A	11/2/2009	NA	NA	NA	NA	NA	130		0	170	0	49	NA	NA	NA	640
-	MW-51A	5/3/2010	NA	NA	NA	NA	NA	120		0	170	0	49	NA	NA	NA	680
-	MW-51A	11/1/2010	NA	NA	NA	NA	NA	120		0	150	0	50	NA	NA	NA	700
-	MW-51A	5/2/2011	NA	NA	NA	NA	NA	110		0	170	0	49	NA	NA	NA	700
-	MW-51A	11/28/2011	NA	NA	NA	NA	NA	780		0	91	0	63	NA	NA	NA	470
-	MW-51A	10/30/2012	NA	NA	NA	NA	NA	320	NA		97	0	51	NA	NA	NA	420
-	MW-51A	10/1/2013	NA	NA	NA	NA	NA	290	NA		83	0	41	NA	NA	NA	430
-	MW-51B	11/7/2005	NA	NA	NA	NA	NA	860		0	220	NA	28	NA	0	NA	940
-	MW-51B	5/8/2006	NA	NA	NA	NA	NA	840		0	220	NA	30	NA	0	NA	710
-	MW-51B	11/6/2006	NA	NA	NA	NA	NA	860		0	230	NA	29	NA	0	NA	920
-	MW-51B	11/5/2007	NA	NA	NA	NA	NA	210		0	240	2	420	NA	NA	NA	1600
-	MW-51B	5/4/2009	NA	NA	NA	NA	NA	190		0	220	0	410	NA	NA	NA	1400
-	MW-51B	11/2/2009	NA	NA	NA	NA	NA	830		0	190	0	25	NA	NA	NA	880
-	MW-51B	5/3/2010	NA	NA	NA	NA	NA	720		0	200	0	23	NA	NA	NA	830
-	MW-51B	11/1/2010	NA	NA	NA	NA	NA	740		0	180	0	22	NA	NA	NA	890
-	MW-51B	5/2/2011	NA	NA	NA	NA	NA	720		0	190	0	17	NA	NA	NA	880
-	MW-51B	10/31/2011	NA	NA	NA	NA	NA	860		0	240	NA	65	NA	NA	NA	990
-	MW-51B	10/30/2012	NA	NA	NA	NA	NA	740	NA		240	0	27	NA	NA	NA	970
-	MW-51B	10/1/2013	NA	NA	NA	NA	NA	690	NA		200	1	28	NA	NA	NA	980
-	MW-51C	11/8/2005	NA	NA	NA	NA	NA	220		0	250	NA	150	NA	0	NA	990
-	MW-51C	5/8/2006	NA	NA	NA	NA	NA	400		0	230	NA	400	NA	0	NA	1300
-	MW-51C	11/6/2006	NA	NA	NA	NA	NA	320		0	260	NA	320	NA	0	NA	1300
-	MW-51C	11/5/2007	NA	NA	NA	NA	NA	830		0	240	0	27	NA	NA	NA	1000
-	MW-51C	4/28/2008	NA	NA	NA	NA	NA	190		0	260	1	370	NA	NA	NA	1500
-	MW-51C	5/4/2009	NA	NA	NA	NA	NA	790		0	190	0	23	NA	NA	NA	830
-	MW-51C	11/2/2009	NA	NA	NA	NA	NA	200		0	210	0	400	NA	NA	NA	1400
-	MW-51C	5/3/2010	NA	NA	NA	NA	NA	160		0	230	0	410	NA	NA	NA	1400
-	MW-51C	11/1/2010	NA	NA	NA	NA	NA	150		0	220	1	330	NA	NA	NA	1500
-	MW-51C	5/2/2011	NA	NA	NA	NA	NA	130		0	260	1	370	NA	NA	NA	1500
-	MW-51C	10/31/2011	NA	NA	NA	NA	NA	160		0	210	NA	610	NA	NA	NA	1400
-	MW-51C	9/30/2013	NA	NA	NA	NA	NA	56	NA		200	0	620	NA	NA	NA	1700
-	MW-51C	10/29/2012	NA	NA	NA	NA	NA	66	NA		230	1	670	NA	NA	NA	1700
-	MW-55AR	11/14/2005	NA	NA	NA	NA	NA	190		0	45	NA	67	NA	0	NA	270
-	MW-55AR	5/15/2006	NA	NA	NA	NA	NA	200		0	48	NA	73	NA	0	NA	300
-	MW-55AR	11/13/2006	NA	NA	NA	NA	NA	180		0	49	NA	71	NA	0	NA	290
-	MW-55AR	11/12/2007	NA	NA	NA	NA	NA	170		0	42	NA	64	NA	NA	NA	270
-	MW-55AR	11/10/2009	NA	NA	NA	NA	NA	NA	NA		29	NA	39	NA	NA	NA	230
-	MW-55AR	5/10/2010	NA	NA	NA	NA	NA	76		0	28	1	33	NA	NA	NA	210

Exhibit D-1: Water Quality Data Summary for Water Wells within 1/4-Mile of Proposed Exemption Boundary

Table 3	Well ^(a)	Sampling	Ca ^(b)	Mg ^(c)	Na ^(d)	K ^(e)	Iron	Mn ^(f)	Bicarbonate	Chloride	Nitrate	Sulfate	As ^(g)	Boron	EC ^(h)	TDS ⁽ⁱ⁾
Well ID	Number	Date	mg/l ^(j)	mg/l	mg/l	mg/l	µg/l ^(k)	µg/l	mg/l	mg/l	mg/l	mg/l	µg/l	mg/l	umhos/cm ^(l)	mg/l
-	MW-55AR	11/8/2010	NA	NA	NA	NA	NA	74	0	23	1	27	NA	NA	NA	190
-	MW-55AR	5/9/2011	NA	NA	NA	NA	NA	82	0	22	1	21	NA	NA	NA	150
-	MW-55AR	11/7/2011	NA	NA	NA	NA	NA	NA	NA	27	1	22	NA	NA	NA	180
-	MW-55AR	11/9/2012	NA	NA	NA	NA	NA	84	NA	28	1	18	NA	NA	NA	180
-	MW-55AR	10/14/2013	NA	NA	NA	NA	NA	88	NA	34	1	19	NA	NA	NA	170
-	MW-55AR	5/11/2009	NA	NA	NA	NA	NA	87	0	36	1	51	NA	NA	NA	230
-	MW-55B	11/14/2005	NA	NA	NA	NA	NA	76	0	26	NA	28	NA	0	NA	210
-	MW-55B	11/13/2006	NA	NA	NA	NA	NA	80	0	29	NA	32	NA	0	NA	200
-	MW-55B	11/12/2007	NA	NA	NA	NA	NA	64	0	29	NA	34	NA	NA	NA	210
-	MW-55B	5/11/2009	NA	NA	NA	NA	NA	36	0	30	0	36	NA	NA	NA	200
-	MW-55B	11/9/2009	NA	NA	NA	NA	NA	31	0	30	0	35	NA	NA	NA	200
-	MW-55B	5/15/2006	NA	NA	NA	NA	NA	67	0	26	NA	29	NA	0	NA	160
-	MW-55B	5/10/2010	NA	NA	NA	NA	NA	0	0	33	0	29	NA	NA	NA	220
-	MW-55B	11/8/2010	NA	NA	NA	NA	NA	0	0	42	0	23	NA	NA	NA	220
-	MW-55B	11/7/2011	NA	NA	NA	NA	NA	0	0	56	0	28	NA	NA	NA	250
-	MW-55B	11/9/2012	NA	NA	NA	NA	NA	14	NA	48	0	21	NA	NA	NA	230
-	MW-55B	10/14/2013	NA	NA	NA	NA	NA	9	NA	55	0	24	NA	NA	NA	210
-	MW-55B	5/9/2011	NA	NA	NA	NA	NA	0	0	47	0	23	NA	NA	NA	200
-	KERN-37	2/15/2006	NA	NA	NA	NA	NA	3	0	10	2	28	2	0	301	195
-	KERNFP-01	1/26/2006	NA	NA	NA	NA	NA	80	0	66	< 0.27	147	0	0	677	436

Statistics

Count	93	95	93	95	90	169	142	175	124	174	3	51	15	168
Average	142	18	60	4.44	278	705	2.49	140	1.93	75	1.09	0.19	497	691
Maximum	280	43	150	8.1	2800	5000	100	310	36.45	670	2	0.56	1940	1700
Minimum	1.4	0.06	29	0.6	0	0	0	4.5	0	1.4	0.26	0.11	190	120

Notes:

- (a) Well number listed as presented in Table 5
(b) Ca = Calcium
(c) Mg = Magnesium
(d) Na = Sodium
(e) K = Potassium
(f) Mn = Manganese
(g) As = Arsenic
(h) EC = Electrical Conductivity
(i) TDS = Total Dissolved Solids
(j) mg/l = milligrams per liter
(k) µg/l = micrograms per liter
(l) umhos/cm = micromhos per centimeter
(m) "<" indicates analyte not detected above listed reporting limit.
(n) "NA" indicates not available or not analyzed.
(o) 0 indicates reporting limit not provided.

Exhibit D-2: Chevron Interdiction Well Water Quality Summary^(a)

API ^(a)		Ca ^(b)	Mg ^(c)	Na ^(d)	K ^(e)	Iron	Mn ^(f)	HCO ₃ ^(g)	CO ₃ ^(h)	OH ⁽ⁱ⁾	Chloride	Nitrate (NO ₃)	Sulfate	As ^(j)	Boron	EC ^(k)	TDS ^(l)
Number	Well/Sample ID	mg/l ^(p)	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm ^(q)	mg/l
-	Cawelo Discharge	23.2	3.7	147.0	6.3	0.6	-	320.7	0.2	-	122.0	-	9.9	< 0.002	1.0	900.0	634.4
03035918	Cortez 1000	3.0	0.2	59.2	0.9	0.6	-	119.4	0.2	-	25.0	< 0.010	0.0	< 0.300	0.1	303.5	208.3
03038875	Fee B 1000	176	57	203	20	224	-	235	0	-	1285	-	2	0.209	2	3663	2084
02983025	Fee B 2 WD	6.5	0.2	172.3	1.2	0.6	-	117.3	2.4	0.0	230.9	< 0.010	2.1	0.153	0.3	888.5	536.3
03090007	Fee B, WSW 1	20.9	0.6	134.2	6.0	-	-	205.0	0.0	-	119.1	0.47	13.3	-	-	-	393.5
02984447	MI-DI-5	30.3	3.3	109.5	5.5	0.4	-	329.1	0.2	-	131.6	< 0.010	0.3	< 0.005	0.5	955.0	610.7
03003310	Producers 1000	29.0	7.2	114.7	2.2	0.3	-	339.2	0.1	0.0	81.7	0.14	0.2	< 0.034	0.2	855.7	589.3
03038726	Producers 1002	26.7	6.3	80.3	3.3	0.4	-	275.3	0.2	-	84.5	< 0.010	0.4	5.379	0.1	700.4	480.6
03006660	San Joaquin 1001/Reservoir B Outfall	33.2	8.9	80.5	4.3	1.8	-	240.8	1.0	1.0	67.0	1.53	16.5	-	-	662.0	445.9
03006661		5.9	0.6	42.0	0.7	0.1	-	79.9	0.2	-	41.1	< 0.010	5.6	< 0.201	0.1	258.3	176.1
03035919	San Joaquin 1003	31.6	3.8	71.7	2.3	0.3	-	157.6	0.2	-	141.2	< 0.010	0.4	0.123	0.2	623.7	409.1
02930257	San Joaquin 102	270	9.8	150	5.8	4.3	0.31	369	6	3.3	245	0.40	459	< 0.001	-	1940	1380
03003458	Sec. 25 1000	5.2	0.4	126.0	0.9	0.0	-	146.2	0.6	0.0	115.5	0.00	0.1	0.000	-	633.5	407.9
03007478	Sec. 25 1003	94.8	19.3	115.0	13.8	65.2	-	45.3	0.0	0.0	530.0	0.00	0.0	0.000	-	1750.0	941.6
03006331	T&M 1001	6.5	0.8	38.4	0.5	0.0	-	79.3	0.0	0.0	25.8	-	3.6	-	-	226.0	186.6
03002969	Tejon 1000	28.7	5.3	104.8	2.6	0.1	-	310.0	0.1	0.0	83.9	< 0.008	0.0	0.193	0.4	779.5	543.3
03003311	Tejon 1001	28.7	5.6	123.0	2.8	0.0	-	313.3	0.0	0.0	77.0	-	0.0	-	-	850.0	591.5
03007170	Winspear 1000	37.8	9.9	96.0	3.1	0.5	-	353.1	0.1	0.0	54.2	0.03	0.3	0.147	0.3	765.2	555.6
02998807	WW #2 Sec. 1 29S/27E	2.3	1.0	82.0	-	-	-	117.4	10.7	0.0	50.4	-	2.6	-	-	-	-
-	Total Interdiction Water (Comingled point) 24" Pipe	23.5	7.0	135.0	1.8	1.0	-	334.1	0.2	-	81.4	0.01	0.5	0.100	0.1	850.0	583.3
Median		26.7	3.8	114.7	2.7	0.4	0.3	234.9	0.2	0.0	84.5	0.0	0.5	0.1	0.3	779.5	539.8
Minimum		2.3	0.2	38.4	0.5	0.0	0.3	45.3	0.0	0.0	25.0	0.0	0.0	0.0	0.1	226.0	176.1
Maximum		270	57	203	20	224	0	369	11	3	1285	2	459	5	2	3663	2084

Notes:

- (a) All values are averages of available data collected from each well.
- (a) API = American Petroleum Institute
- (b) Ca = Calcium
- (c) Mg = Magnesium
- (d) Na = Sodium
- (e) K = Potassium
- (f) Mn = Manganese
- (g) HCO3 = Bicarbonate
- (h) CO3 = Carbonate
- (i) OH = Hydroxide
- (j) As = Arsenic
- (k) EC = Electrical Conductivity
- (l) TDS = Total Dissolved Solids
- (m) Alkalinity as Calcium Carbonate
- (n) Cd = Cadmium
- (o) Cr = Chromium
- (p) mg/l = Milligrams per liter
- (q) umhos/cm = micromhos per centimeter
- (r) If "0" is reported, the sample is assumed to be non-detect and the reporting limit was not available.
- Data plotted on Exhibit D-3

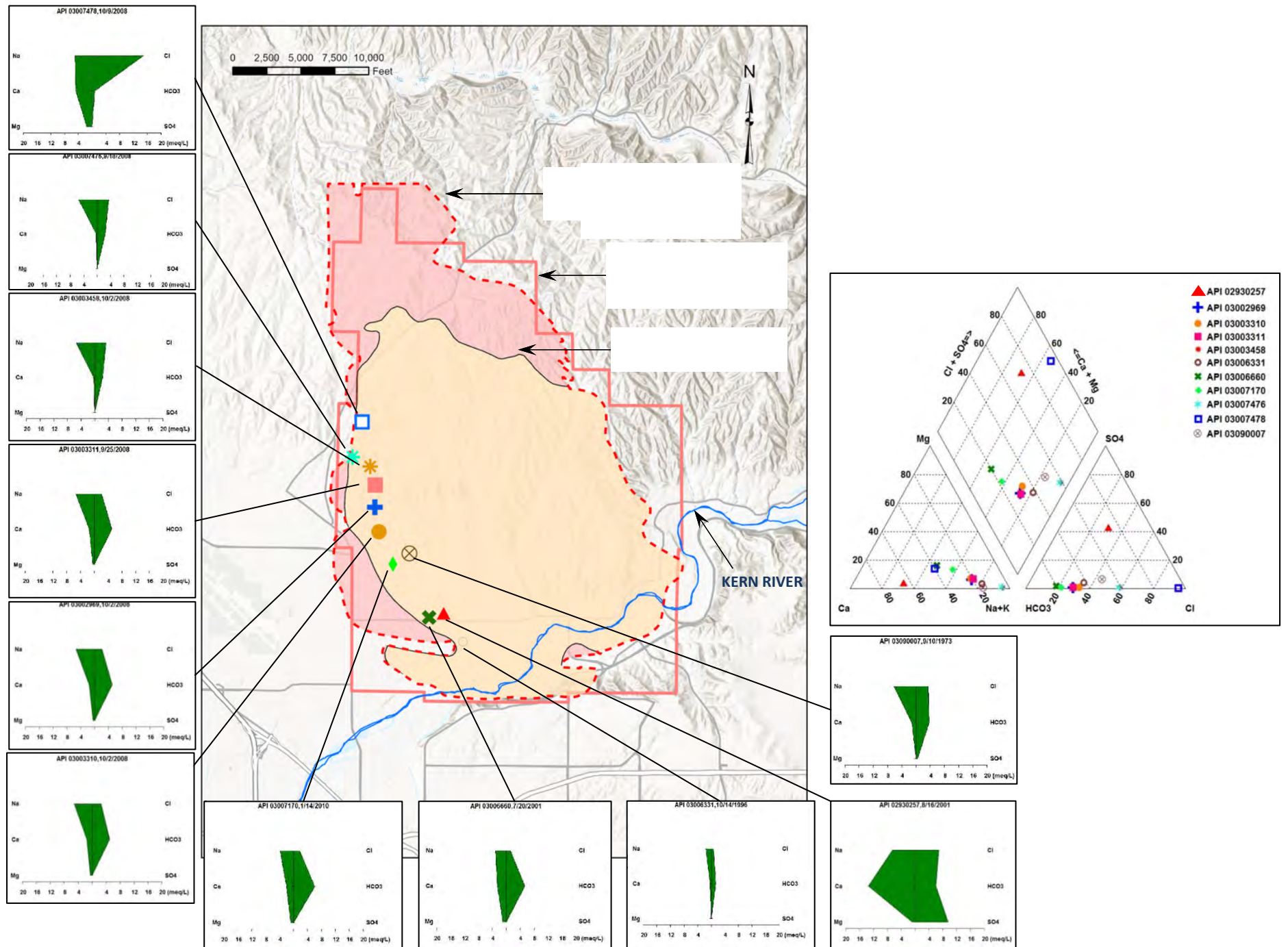


Exhibit D-3 - Water Quality Data From Water Supply Wells and Interdiction Wells

Laboratory Report
ELAP Cert. 1388A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franza, Carla S
Sample Description: Fee B 2 WD

Log #: 16399-5
Date in: 5/7/09
Date out: 5/12/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	110.1	1.80	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	90.3	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	11.0	mg/L	SM 2340 B	0.10
Chloride, Cl	218.0	5.15	EPA 300.0	0.01	Salinity, as NaCl	393.8	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-1.10	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	2.10	0.04	EPA 300.0	0.02	Langelier Saturation Index	-1.01	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.312	NA	ASTM D 6919	0.005					
Barium, Ba	0.00	0.00	EPA 200.7	0.01	Conductivity (Measured)	806.0	µmho/cm	SM 2510 B	0.100
Boron, B	1.05	0.29	EPA 200.7	0.01	Resistivity	12.4069	ohm's	(Calc.)	0.0005
Calcium, Ca	4.40	0.22	EPA 200.7	0.01	Specific Gravity (60/60)	1.0009	units	API RP 45	0.0005
Iron, Fe	0.48	0.03	EPA 200.7	0.01	Ionic strength	0.008	IS (µ)	(Calc.)	0.001
Magnesium, Mg	0.00	0.00	EPA 200.7	0.01	pH	8.09	units	SM 4500 H B	± 0.01
Potassium, K	0.99	0.03	EPA 200.7	0.01	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	164.0	7.13	EPA 200.7	0.01	Total Diss. Solids (TDS)*	501.6	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	mg/L	meq/L	Method #	PQL(mg/L)	QC	Results	Range	Units
Silica, as SiO ₂	21.8	N.A.	SM 3500-SI B		Mass EC - Calc EC	0.9	(0.9-1.1)	EC
Sodium, Na (Calc.)	164.4	7.15	API RP-45 2.10		TDS - EC Ratio	0.62	(0.55-0.70)	>2500 TDS
					Measured EC - Ion Sum	1.0	Cation	(0.9-1.1) EC
						1.0	Anion	(0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Cation and anion estimation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(=) = CaCO₃ is at equilibrium

QC _____ Date _____

References

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol#1 D1-D2
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1020 EPA-800-R-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 43
5. Patton, D.C. "Applied Water Technology," 1988 D. C. Patton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
SLAP Cert. 1296A
Geo-Chemical Water Analysis

Rev 7-10-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze
Sample Description: **Fee B WDM - 2**

Log #: 15691-5
Date In: 7/9/09
Date Completed: 7/14/09
Date Reported: 7/15/09

Anions					Calculations				
	mg/L	meq/L	Method #	PQL		Results	Units	Method #	PQL
Bicarbonate, HCO ₃ ⁻¹	97.9	1.60	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	80.3	mg/l	SM 3320 B	NA
Bromide, Br	0.0 X	0.00	EPA 300.0	0.05	as CaCO ₃ (less Org. Alk.)	80.3	mg/l	SM 3320 B	NA
Carbonate, CO ₃ ⁻²	0.0 X	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Calc.)	12.3	mg/l	SM 2340 B	NA
Chloride, Cl ⁻¹	313.0	8.63	EPA 300.0	0.05	Refractive Index	NA	NA	NA	NA
Fluoride, F ⁻¹	0.00 X	0.00	EPA 300.6	0.20	Salinity, as NaCl	565.5	mg/l	(Calc.)	1.00
Hydroxide, OH ⁻¹	0.0 X	0.00	SM2320 B	0.20	Calcium Carbonate				
Iodide, I ⁻¹ (iodine)	0.0 X	0.00	EPA 300.1	0.05	Stability Index (Langier)	-1.02	(none)	SM 2230 B	NA
Sulfate, SO ₄ ⁻²	1.90	0.04	EPA 300.6	0.05	Stability Index (Sut Davis)	-1.10	NA	Ref. 4	NA
Sulfide, S ⁻²	0.0 X	0.00	SM4500-S ⁻²	1.00					
Sulfite, SO ₃ ⁻²	0.0 X	0.00	SM4500-SO ₃ ⁻²	1.00					
Cations					Physical Data				
	mg/L	meq/L	Method #	PQL		Results	Method #	PQL	
Ammonium, NH ₄ ⁺¹	0.00 X	0.00	ASTM D 5019	0.10	Conductivity (Measured)	1070.0	µmho's	SM 2510 B	1000
Barium, Ba ⁺²	0.00	0.00	EPA 200.7	0.10	Resistivity	9.346	ohm's	(Calc.)	NA
Boron, B ⁺³	0.14	0.04	EPA 200.7	0.02	Specific Gravity (80/80)	1.0001	units	API RP 46	±0.0001
Calcium, Ca ⁺²	4.67	0.23	EPA 200.7	0.05	Ionic strength	0.01	IS (µ)	(Calc.)	NA
Iron, Fe ⁺³	0.29	0.02	EPA 200.7	0.05	pH	8.11	units	SM 4500 H B	± 0.0
Magnesium, Mg ⁺²	0.14	0.01	EPA 200.7	0.10	Temperature	60.0	°F	SM 2590 B	± 0.2
Manganese, Mn ⁺²	0.00 X	0.00	EPA 200.7	0.05	Total Diss. Solids (TDS)*	588.3	mg/L	(An-Cal Sum)	NA
Potassium, K ⁺¹	1.28	0.03	EPA 200.7	0.10	Total Diss. Solids @ 180 °c	NA	mg/L	Chevron	NA
Sodium, Na ⁺¹	169.0	7.35	EPA 200.7	0.10					
Strontium, Sr ⁺²	0.00 X	0.00	EPA 200.7	0.10					
Zinc, Zn ⁺²	0.00 X	0.00	EPA 200.7	0.02					
Other					QC (Quality Control)				
	mg/L	meq/L	Method #	PQL		Results	Criteria	Limit	
Acetate	0.0 X	0.0	ASTM D 4327	1.00	Meas EC - Calc EC =	0.6	*Note (0.9 - 1.1) EC	>2500	
Formate	0.0 X	0.0	ASTM D 4327	1.00	TDS - EC Ratio =	0.55	**Note (0.66 - 0.70)	>2500	
Propionate	0.0 X	0.0	ASTM D 4327	1.00	Measured EC - Ion Sum =	1.0	Cation (0.9 - 1.1) EC		
Organic Alkalinity	0 X	0.0	Chevron Pub.	NA		1.0	Anion (0.9 - 1.1) EC		
Lithium, Li	0.0 X	0.0	EPA 200.7	0.02	Calc. Na - Actual Na =	1.00	Na/Ka (0.98 - 1.02)		
Silica, as SiO ₂	19.3	2.79	EPA 200.7	0.01	NaCl/(NaCl Calc.) =	1.00	NaCl (0.98 - 1.02)		
Sodium, Na ⁺¹ (Calc.)	169.1	7.35	API RP 46	NA					
Notes:					QC - Anion - Cation Balance Criteria				
MDL - Method Detection Limit.					Anion Sum meq/L	meq/L SUM	Acceptable % Difference		
PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5% RSD).					0 - 3.0	NA	± 0.2 meq		
					3.0 - 10.0	NA	± 2 %		
					10.0 - 500	21	± 2 - 5 %		
					Anion - Cation Balance =	0.0	%		

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate this value (Ca⁺², SO₄⁻² etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(±) = CaCO₃ is at equilibrium.

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
5. Parson, C.C., "Applied Water Technology," 1986 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Date

Kurt R. Buckle, B.S. Vice-President, Laboratory Director

Midway Laboratory, Inc.

Laboratory Report
ELAP Cert. 1398A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Fee B WDW - 2

Log #: 16989-4
Date in: 9/10/09
Date out: 9/15/09

Rev 10-3-06

Anions	mg/L	meq/L	Method #	PQL(meq/L)	Calculations	Results	Units	Method #	PQL(meq/L)
Bicarbonate, HCO ₃	79.5	1.30	SM 2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	79.2	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	8.70	0.29	SM 2320 B	0.20	Hardness, as CaCO ₃ (Total)	13.6	mg/L	SM 2340 B	0.10
Chloride, Cl	225.0	6.35	EPA 300.0	0.01	Salinity, as NaCl	406.5	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM 2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Siff Davis)	-0.52	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	3.50	0.07	EPA 300.0	0.02	Langelier Saturation Index	-0.43	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(meq/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6919	0.50					
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	833.0	µmho/s	SM 2510 B	0.100
Boron, B	0.20	0.05	EPA 200.7	0.10	Resistivity	12.0048	ohm's	(Calc.)	0.0005
Calcium, Ca	5.11	0.25	EPA 200.7	0.05	Specific Gravity (60/60)	0.9975	units	API RP 45	0.0005
Iron, Fe	0.29	0.02	EPA 200.7	0.10	Ionic strength	0.008	IS (I)	(Calc.)	0.001
Magnesium, Mg	0.20	0.02	EPA 200.7	0.05	pH	8.66	units	SM 4500 H B	± 0.01
Potassium, K	1.06	0.03	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	172	7.48	EPA 200.7	5.00	Total Diss. Solids (TDS)*	495.6	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	20.2	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	172.2	7.49	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.59	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			1.0	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation.

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(=) = CaCO₃ is at equilibrium

QC _____ Date _____

References

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol11 D1-D2
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1985 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 43.
5. Paton, C.D. "Applied Water Technology," 1996 C.D. Paton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1188A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Fee B 2 WD

Log #: 17104-5
Date in: 10/1/09
Date out: 10/13/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	90.6	1.48	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	74.2	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	13.8	mg/L	SM 2340 B	0.10
Chloride, Cl	225.0	6.35	EPA 300.0	0.01	Salinity, as NaCl	406.5	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Siff Davis)	-1.02	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	6.30	0.13	EPA 300.0	0.02	Langelier Saturation Index	-0.94	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.00	NA	ASTM D 6919	0.10				
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	837.0	µmho's	SM 2510 B
Boron, B	0.16	0.04	EPA 200.7	0.10	Resistivity	11.9474	ohm's	(Calc.)
Calcium, Ca	5.17	0.28	EPA 200.7	0.05	Specific Gravity (80/80)	1.0002	units	API RP 46
Iron, Fe	0.82	0.04	EPA 200.7	0.10	Ionic strength	0.008	IS (µ)	(Calc.)
Magnesium, Mg	0.22	0.02	EPA 200.7	0.05	pH	8.18	units	SM 4500 H B
Potassium, K	1.17	0.03	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B
Sodium, Na	185	7.16	EPA 200.7	5.00	Total Diss. Solids (TDS)*	494.1	mg/L	(Calc.)
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D

Other	QC	Results	Range	Units
Silica, as SiO ₂	19.8	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	165.2	7.18	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.59	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			1.0	Anion (0.9-1.1) EC

Notes

PQL = Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of test analytical methodology.

ND = Not Detected (below PQL)

TDS* = Cation and anion summation.

N.A. = Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 th. Ed. 1992-98
2. ASTM, "Writer," 1993 American Society for Testing and Material Vol 11 01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1983 2nd Ed. American Petroleum Institute, API RP 45
5. Patton, C.C., "Applied Water Technology," 1996 C. C. Patton & Associates, Campbell Petroleum Series

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 13984
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S

Log #: 17104-5
Date in: 10/1/09
Date out: 10/13/09

Sample Description: Fee B 2 WD

Rev 10-3-08

Anions	mg/L	mg/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	90.6	1.48	SM 2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	74.2	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM 2320 B	0.20	Hardness, as CaCO ₃ (Total)	13.8	mg/L	SM 2340 B	0.10
Chloride, Cl	225.0	6.35	EPA 300.0	0.01	Salinity, as NaCl	406.5	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM 2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-1.02	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	6.30	0.13	EPA 300.0	0.02	Langelier Saturation Index	-0.94	(Notes)	SM 203	N.A.

Cations	mg/L	mg/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6819	0.10					
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	837.0	µmho's	SM 2510 B	0.100
Boron, B	0.16	0.04	EPA 200.7	0.10	Resistivity	11.9474	ohm's	(Calc.)	0.0005
Calcium, Ca	5.17	0.28	EPA 200.7	0.05	Specific Gravity (60/60)	1.0002	units	API RP 45	0.0005
Iron, Fe	0.82	0.04	EPA 200.7	0.10	Ionic strength	0.008	IS (µ)	(Calc.)	0.001
Magnesium, Mg	0.22	0.02	EPA 200.7	0.05	pH	8.18	units	SM 4500 H B	± 0.01
Potassium, K	1.17	0.03	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	165	7.18	EPA 200.7	5.00	Total Diss. Solids (TDS)*	494.1	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	19.8	N.A.	SM 3500-SI B	
Sodium, Na (Calc.)	165.2	7.18	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.59	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			1.0	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved with specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report

Calcium Carbonate
Stability Index:

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

References

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 16-20 th. Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol11 01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1969 2nd. Ed. American Petroleum Institute, API RP 45
5. Patton, C.C., "Applied Water Technology," 1968 C. C. Patton & Associates, Campbell Petroleum Series

QC _____ Date _____

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 13064
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Fee B WDW-2

Log #: 17288-4
Date In: 11/5/09
Date out: 11/18/09

Rev 10-3-08

Anions	mg/L	mg/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	99	1.62	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	83.3	mg/l	SM 2320 B	0.10
Carbonate, CO ₃	1.24	0.04	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	13.3	mg/l	SM 2340 B	0.10
Chloride, Cl	226	6.38	EPA 300.0	0.01	Salinity, as NaCl	408.3	mg/l	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.77	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	1.80	0.04	EPA 300.0	0.02	Langelier Saturation Index	-0.69	(Notes)	SM 203	N.A.

Cations	mg/L	mg/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01	Conductivity (Measured)	830.0	µmho/cm	SM 2510 B
Arsenic, As	0.000	0.00	ASTM D 6919	0.002				
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Resistivity	12.0482	ohm-cm	(Calc.)
Boron, B	0.17	0.05	EPA 200.7	0.10	Specific Gravity (60/60)	0.9998	units	API RP 45
Calcium, Ca	5.05	0.25	EPA 200.7	0.05	Ionic strength	0.008	IS (µ)	(Calc.)
Iron, Fe	0.61	0.03	EPA 200.7	0.10	pH	8.39	units	SM 4500 H B
Magnesium, Mg	0.15	0.01	EPA 200.7	0.05	Temperature	65.0	°F	SM 2550 B
Potassium, K	0.99	0.03	EPA 200.7	0.50	Total Diss. Solids (TDS)*	491.2	mg/L	(Calc.)
Sodium, Na	155	5.79	EPA 200.7	5.00	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D
Strontium, Sr	0.00	0.00	EPA 200.7	0.01				

Other	QC	Results	Range	Units
Silica, as SiO ₂	20.3	N.A.	SM 3500-SI B	
Sodium, Na (Calc.)	157	6.83	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.59	(0.65-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			1.0	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(0) = CaCO₃ is at equilibrium

References

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1993 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45
5. Pison, C.C., "Applied Water Technology," 1996 C. C. Pison & Associates, Campbell Petroleum Series

QC _____ Date _____

Laboratory Director
Midway Laboratory, Inc.

_____ Date _____

Laboratory Report
ELAP Cert. 1366A
Geo-Chemical Water Analysis

Rev 12-18-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Semprun
Sample Description: Fee 8 WDW 2

Log #: 17433-B
Date In: 12/3/09
Date Completed: 12/7/09
Date Reported: 12/14/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	88.1	1.44	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	72.2	mg/l	SM 2320 B	NA
Carbonate, CO_3^{-1}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	72.2	mg/l	SM 2320 B	NA
Chloride, Cl^{-1}	239	6.74	SM4500-Cl ²	0.05	Hardness, as CaCO_3 (Calc.)	12.4	mg/l	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. Na+Cl	479.4	mg/l	(Calc.)	NA
Sulfate, SO_4^{-2}	1.1	0.02	SM4500-SO4 ²	1.0	Salinity, from Chlorosity	431.8	mg/l	(Calc.)	NA
Sulfide, S^{-2}	0.0	X	SM4500-S ²	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0	X	SM4500-SO3 ²	1.0	Stability Index (Langier)	-1.04	(Notes)	SM 2330 B	NA
					Stability Index (Stiff Davis)	-1.12	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL	
Ammonium, NH ⁴⁺	0.00 X	0.00	ASTM D-6816	0.10	Conductivity (Measured)	829.0	µmho's	SM 2510 B	1000
Barium, Ba ²⁺	0.00 X	0.00	EPA 200.7	0.05		Resistivity	12.063	ohm's	(Calc.)
Boron, B ³⁺	0.14 .	0.04	EPA 200.7	0.10	Specific Gravity (60/60)	1.0007	units	API RP 45	±0.0001
Calcium, Ca ²⁺	4.66 .	0.23	EPA 200.7	0.05	Ionic strength	0.01	IS (µ)	(Calc.)	NA
Iron, Fe ³⁺	1.83 .	0.10	EPA 200.7	0.10	pH	8.14	units	SM 4500 H-B	± 0.01
Magnesium, Mg ²⁺	0.17 .	0.01	EPA 200.7	0.05	Temperature	68.0	°F	SM 2550 B	± 0.2
Potassium, K ⁺	0.93 .	0.02	EPA 200.7	0.50	Total Diss. Solids (TDS)*	514.9	mg/L	(An-Cal Sum.)	NA
Sodium, Na ⁺	179 .	7.79	EPA 200.7	5.00	Total Diss. Solids @ 180 °c	NA	mg/L	Chevron	NA
Strontium, Sr ²⁺	0.00 X	0.00	EPA 200.7	0.10					

Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Limits
Arsenic, As ⁺³	0.000	0.00	EPA 200.7	0.002	Meas EC - Calc EC =	1.0	*Note (0.9 - 1.1) EC	>2500
Silica, as SiO_2	15.5	2.24	EPA 200.7	0.10	TDS - EC Ratio =	0.82	**Note (0.95 - 0.70)	>2500
Sodium, Na^{+1} (Calc.)	179.1	7.79	API RP 45	NA	Measured EC - Ion Sum =	1.0	Carbon (0.9 - 1.1) EC	
Chloride, Cl^{-1} (Calc.)	238.5	6.73	API RP 45	NA		1.0	Anion (0.9 - 1.1) EC	
Organic Alkalinity	0.0	X	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
					QC - Anion - Cation Balance Criteria			
					Anion Sum meq/L	meq/L BUI	Acceptable % Difference	
					0 - 3.0	NA	± 0.2 meq	
					3.0 - 10.0	NA	± 2 %	
					10.0 - 500	16	± 2 - 5 %	
					Anion - Cation Balance =	-0.1	%	

Notes:

MDL - Method Detection Limit

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(±) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
5. Patton, C.D., "Applied Water Technology," 1986 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date: _____

Laboratory Director Midway Laboratory, Inc

Laboratory Report
SLAP Cert. 1384A
Geo-Chemical Water Analysis

Rev 12-18-08

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Samprun
Sample Description: **Fee B WDW 2**

Log #: 17630-B
Date in: 1/14/10
Data Completed: 1/20/10
Date Reported: 1/21/10

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	203.0	3.32	SM2320-B	0.20	Alkalinity, as CaCO_3 (Total)	166.4	mg/L	SM 2320-B	NA
Carbonate, CO_3^{-1}	6.2	0.21	SM2320-B	0.20	as CaCO_3 (less Org. Alk.)	166.4	mg/L	SM 2320-B	NA
Chloride, Cl^{-1}	145	4.09	SM4500- Cl^{-}	0.05	Hardness, as CaCO_3 (Calc.)	15.8	mg/L	SM 2340-B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320-B	0.20	Salinity, calc. $\text{Na}+\text{Cl}$	444.7	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.1	0.00	SM4500- SO_4^{-2}	1.0	Salinity, from Chlorosity	261.9	mg/L	(Calc.)	NA
Sulfide, S^{-1}	0.0	X	SM4500- S^{-1}	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0	X	SM4500- SO_3^{-2}	1.0	Stability Index (Langier)	-0.16	(Notes)	SM 2330-B	NA
					Stability Index (Stiff-Davis)	-0.25	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL		
Ammonium, NH ₄ ⁺	0.00	X	0.00	ASTM D 5919	0.10	Conductivity (Measured)	853.0	umho/s	SM 2510 B	1000
Barium, Ba ²⁺	0.00	.	0.00	EPA 200.7	0.05		Resistivity	11.723	ohm/s	(Calc.)
Boron, B ³⁺	0.17	.	0.05	EPA 200.7	0.10	Specific Gravity (80/80)		1.0009	units	API RP 45
Calcium, Ca ²⁺	6.04	.	0.30	EPA 200.7	0.05		Ionic strength	0.01	(S) (μ)	(Calc.)
Iron, Fe ³⁺	0.29	.	0.02	EPA 200.7	0.10	pH		8.54	units	SM 4500 H B
Magnesium, Mg ²⁺	0.18	.	0.01	EPA 200.7	0.05		Temperature	68.0	°F	SM 2550 B
Potassium, K ⁺	1.03	.	0.03	EPA 200.7	0.50	Total Diss. Solids (TDS)*		527.1	mg/L	(An-Cat Sum.)
Sodium, Na ⁺	165	.	7.18	EPA 200.7	5.00		Total Diss. Solids @ 180 °c	NA	mol/L	Chevron
Strontium, Sr ²⁺	0.00	X	0.00	EPA 200.7	0.10					

Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Units
Arsenic, As ⁺³	0.000	0.00	EPA 200.7	0.002	Meas EC - Calc EC =	1.1	**Note	(0.9 - 1.1) EC
Silica, as SiO_2	18.8	2.71	EPA 200.7	0.10	TDS - EC Ratio =	0.62	**Note	(0.55 - 0.70) EC
Sodium, Na^{+1} (Calc.)	165.1	7.18	API RP 45	NA	Measured EC - Ion Sum =	0.9	Carbon	(0.9 - 1.1) EC
Chloride, Cl^{-1} (Calc.)	143.5	4.05	API RP 45	NA		0.9	Anion	(0.9 - 1.1) EC
Organic Alkalinity	0.0	X	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na	(0.98 - 1.02)
					NaCl/(NaCl Calc.) =	1.00	Na/Cl	(0.98 - 1.02)
					QC - Anion - Cation Balance Criteria			
					Anion Sum meq/L	meq/L SUM	Acceptable % Difference	
					0 - 2.0	NA	± 0.2 meq	
					2.0 - 10.0	NA	± 2 %	
					10.0 - 800	15	± 2 - 5 %	
					Anion - Cation Balance =	-0.3	%	

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cations and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(*) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(x) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1982-88
2. ASTM: "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA: "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API: "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
5. Patton, D.C.: "Applied Water Technology," 1986 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date: _____

Laboratory Director Midway Laboratory, Inc

Laboratory Report
BLAP Cert. 12345
Geo-Chemical Water Analysis

Rev 12-16-04

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Samprun
Sample Description: Cawella Discharge

Log #: 17666-4
Date In: 1/21/10
Date Completed: 2/11/10
Date Reported: 2/2/10

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO ₃ ⁻¹	320.7	5.25	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	262.8	mg/l	SM 2320 B	NA
Carbonate, CO ₃ ⁻¹	0.0	0.00	SM2320 B	0.20	as CaCO ₃ (less Org. Alk.)	262.8	mg/l	SM 2320 B	NA
Chloride, Cl ⁻¹	122	3.44	SM4500-Cl ⁻¹	0.05	Hardness, as CaCO ₃ (Calc.)	73.2	mg/l	SM 2340 B	NA
Hydroxide, OH ⁻¹	0.0	0.00	SM2320 B	0.20	Salinity, calc. Na+Cl	506.7	mg/l	(Calc.)	NA
Sulfate, SO ₄ ⁻²	9.90	0.21	SM4500-SO ₄ ⁻²	1.0	Salinity, from Chlorosity	220.4	mg/l	(Calc.)	NA
Sulfide, S ⁻¹	0.0 X	0.00	SM4500-S ⁻²	1.0	Calcium Carbonate				
Sulfite, SO ₃ ⁻²	0.0 X	0.00	SM4500-SO ₃ ⁻²	1.0	Stability Index (Langlier)	-0.94	(Notes)	SM 2330 B	NA
					Stability Index (Starr Davis)	-1.02	NA	Rvt. 4	NA
Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL	
Ammonium, NH ₄ ⁺¹	0.00 X	0.00	ASTM D 6619	0.10	Conductivity (Measured)	800	µmho's	SM 2510 B	1000
Barium, Ba ⁺²	0.08	0.00	EPA 200.7	0.05	Resistivity	11.111	ohm's	(Calc.)	NA
Boron, B ⁺³	0.95	0.26	EPA 200.7	0.10	Specific Gravity (60/60)	1.0005	units	API RP 45	±0.0001
Calcium, Ca ⁺²	23.2	1.16	EPA 200.7	0.05	Ionic strength	0.01	IS (p)	(Calc.)	NA
Iron, Fe ⁺³	0.55	0.03	EPA 200.7	0.10	pH	6.98	units	SM 4500 H B	± 0.01
Magnesium, Mg ⁺²	3.70	0.30	EPA 200.7	0.05	Temperature	68.0	°F	SM 2550 B	± 0.2
Potassium, K ⁺¹	6.34	0.16	EPA 200.7	0.50	Total Diss. Solids (TDS)*	634.4	mg/L	[An-Cat Sum.]	NA
Sodium, Na ⁺¹	147	6.39	EPA 200.7	5.00	Total Diss. Solids @ 180 °C	NA	mg/L	Chevron	NA
Strontium, Sr ⁺²	0.00 X	0.00	EPA 200.7	0.10	QC (Quality Control)	Results	Criteria	Units	
					Meas EC - Calc EC =	1.1	*Note (0.9 - 1.1) EC	>2500	
					TDS - EC Ratio =	0.70	**Note (0.65 - 0.70)	>2500	
					Measured EC - Ion Sum =	0.9	Calcn (0.9 - 1.1) EC		
						1.0	Anion (0.9 - 1.1) EC		
					Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)		
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)		
					QC - Anion - Cation Balance Criteria				
					Anion Sum (meq/L)	meq/L SUM	Acceptable % Difference		
					0 - 3.0	NA	± 0.2 meq		
					3.0 - 10.0	NA	± 2 %		
					10.0 - 800	17	± 2 - 5 %		
					Anion - Cation Balance =	-3.4	%		

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

— Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(e) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98.
2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45
5. Patton, C.C., "Applied Water Technology," 1988 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

QC

Date

Laboratory Director

Midway Laboratory, Inc

Date:

Laboratory Report
ELAP Cert. 17964
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Cortez 1000

Log #: 16958-4
Date In: 9/3/09
Date out: 9/14/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	116.3	1.91	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	95.3	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	6.8	mg/L	SM 2340 B	0.10
Chloride, Cl	21.8	0.61	EPA 300.0	0.01	Salinity, as NaCl	39.4	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (SI) (Davis)	-1.51	(Notas)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langlier Saturation Index	-1.42	(Notas)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6818	0.500					
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	295.0	umho's	SM 2510 B	0.100
Boron, B	0.19	0.05	EPA 200.7	0.10	Resistivity	33.8963	ohm's	(Calc.)	0.0005
Calcium, Ca	2.42	0.12	EPA 200.7	0.05	Specific Gravity (60/60)	0.9989	units	API RP 45	0.0005
Iron, Fe	0.54	0.03	EPA 200.7	0.10	Ionic strength	0.003	IS (u)	(Calc.)	0.001
Magnesium, Mg	0.19	0.02	EPA 200.7	0.05	pH	7.92	units	SM 4500 H B	± 0.01
Potassium, K	1.07	0.03	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	60.4	2.63	EPA 200.7	5.00	Total Diss. Solids (TDS)*	202.9	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC		Results	Range	Units
Silica, as SiO ₂	68.4	N.A.	Meas EC - Calc EC	1.1	(0.9-1.1) EC
Sodium, Na (Calc.)	60.1	2.61	TDS - EC Ratio	0.69	(0.55-0.70) >2500 TDS
			Measured EC - Ion Sum	1.0	Cation (0.8-1.1) EC
				0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TCs - Cation and anion summation

N.A. - Not applicable to report

Calcium Carbonate
Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Wastewater," 18-20th. Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Materials Vol 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. AP: "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45
5. Pomon, C.C. "Applied Water Technology," 1996 C. C. Pomon & Associates, Campbell Petroleum Series

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1385A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franza, Carla S
Sample Description: Cortez 1000

Log #: 17104-B
Date In: 10/14/09
Date out: 10/13/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	122.4	2.01	SM 2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	100.3	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM 2320 B	0.20	Hardness, as CaCO ₃ (Total)	9.4	mg/L	SM 2340 B	0.10
Chloride, Cl	28.1	0.79	EPA 300.0	0.01	Salinity, as NaCl	50.8	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM 2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Siff Davis)	-1.06	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	-0.97	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 8919	0.10					
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	312.0	µmho's	SM 2510 B	0.100
Boron, B	0.10	0.03	EPA 200.7	0.10	Resistivity	32.0513	ohm's	(Calc.)	0.0005
Calcium, Ca	3.56	0.18	EPA 200.7	0.05	Specific Gravity (60/60)	1.0002	units	API RP 45	0.0005
Iron, Fe	0.61	0.03	EPA 200.7	0.10	Ionic strength	0.003	IS (µ)	(Calc.)	0.001
Magnesium, Mg	0.12	0.01	EPA 200.7	0.05	pH	8.18	units	SM 4500 H B	± 0.01
Potassium, K	0.81	0.02	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	58.0	2.52	EPA 200.7	5.00	Total Diss. Solids (TDS)*	213.7	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	30.6	N.A.	SM 3500-SI B	
Sodium, Na (Calc.)	58.0	2.52	API RP 45 2.10	
		Meas EC - Calc EC	1.1	(0.9-1.1) EC
		TDS - EC Ratio	0.68	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved with specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Carbon and anion summation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(*) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve

(.) = CaCO₃ is at equilibrium

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Waste Water," 18-20th Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol 11.01-02
3. EPA: "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 45
5. Patton, C.C. "Applied Water Technology," 1988 C. C. Patton & Associates, Campbell Petroleum Series.

QC _____ Date _____

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

_____, Date _____

Laboratory Report
ELAP Cert. 1399A
Geo-Chemical Water Analysis

Rev 12-06-08

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Semprun
Sample Description: Fee B 1000

Log #: 17433-10
Date In: 12/3/09
Date Completed: 12/7/09
Date Reported: 12/14/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	0.0	0.00	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	0.0	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	0.0	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	2440	68.82	SM4500- Cl^{-}	0.05	Hardness, as CaCO_3 (Calc.)	1217.5	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. $\text{Na}+\text{Cl}$	3908.4	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	2.2	0.05	SM4500- SO_4^{-2}	1.0	Salinity, from Chlorosity	4408.0	mg/L	(Calc.)	NA
Sulfide, S^{-1}	0.0 X	0.00	SM4500- S^{-2}	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0 X	0.00	SM4600- SO_3^{-2}	1.0	Stability Index (Langier)	-7.95	(Notes)	SM 2330 B	NA
					Stability Index (Stiff Davis)	-8.03	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL	
Ammonium, NH_4^{+1}	0.00 X	0.00	ASTM D-6819	0.10	Conductivity (Measured)	6510.0	$\mu\text{mho/s}$	SM 2510 B	1000
Barium, Ba^{+2}	0.00 X	0.00	EPA 200.7	0.05	Resistivity	1.536	ohm-cm	(Calc.)	NA
Boron, B^{+3}	4.24	1.18	EPA 200.7	0.10	Specific Gravity (80/60)	1.0031	units	API RP 45	± 0.0001
Calcium, Ca^{+2}	319	15.92	EPA 200.7	0.05	Ionic strength	0.07	IS (u)	(Calc.)	NA
Iron, Fe^{+3}	445	23.90	EPA 200.7	0.10	pH	4.25	units	SM 4500 H B	± 0.01
Magnesium, Mg^{+2}	102	8.40	EPA 200.7	0.05	Temperature	68.0	°F	SM 2550 B	± 0.2
Potassium, K^{+1}	35.9	0.92	EPA 200.7	0.50	Total Diss. Solids (TDS)*	3657.9	mg/L	(An-Cat Sum.)	NA
Sodium, Na^{+1}	310	13.47	EPA 200.7	5.00	Total Diss. Solids @ 180 °c	NA	mg/L	Chevron	NA
Strontium, Sr^{+2}	0.00 X	0.00	EPA 200.7	0.10					
Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Limits	
Arsenic, As ⁺³	0.000	0.00	EPA 200.7	0.002	Meas EC - Calc EC =	0.9	*Note (0.9 - 1.1) EC	>2500	
Silica, as SiO_2	93.8	13.51	EPA 200.7	0.10	TDS - EC Ratio =	0.56	**Note (0.55 - 0.70) EC	>2500	
Sodium, Na^{+1} (Calc.)	309.7	13.47	API RP 45	NA	Measured EC - Ion Sum =	1.0	Cation (0.9 - 1.1) EC		
Chloride, Cl^{-1} (Calc.)	2259.3	63.73	API RP 45	NA		1.1	Anion (0.9 - 1.1) EC		
Organic Alkalinity	0.0 X	0.00	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)		
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)		
QC - Anion - Cation Balance Criteria									
Anion Sum (meq/L)		meq/L SUM	Acceptable % Difference						
0 - 3.0		NA	± 0.2 meq						
3.0 - 10.0		NA	$\pm 2 \%$						
10.0 - 600		133	$\pm 2 - 5 \%$						
Anion - Cation Balance =		-3.8	%						

Notes:
MDL - Method Detection Limit .
PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and occurrence of the analytical methodology (EPA 821.1)

Notes:

MDL - Method Detection Limit

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate (this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate

(-) = CaCO_3 will tend to dissolve

(x) = CaCO_3 is at equilibrium

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
2. ASTM: "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA: "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API: "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
5. Patton, C.C.: "Applied Water Technology," 1998 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date: _____

Laboratory Director Midway Laboratory, Inc

Laboratory Report
ELAP Cert. 1296A
Geo-Chemical Water Analysis

Rev 12-18-08

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franza, Carla Semprun
Sample Description: **Feb B 1000**

Log #: 17830-4
Date In: 1/14/10
Date Completed: 1/20/10
Date Reported: 1/21/10

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	234.9	3.85	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	192.5	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	192.5	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	129	3.64	SM4500-Cl ⁻¹	0.05	Hardness, as CaCO_3 (Calc.)	126.2	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. Na+Cl	425.8	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.0	0.00	SM4500-SO4 ⁻²	1.0	Salinity, from Chlorosity	233.0	mg/L	(Calc.)	NA
Sulfide, S^{-2}	0.0	X	SM4500-S ⁻²	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0	X	SM4500-SO3 ⁻²	1.0	Stability Index (Langlier)	-0.39	(index)	SM 2330 B	NA
					Stability Index (Stiff Davis)	-0.48	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH4 ⁺¹	0.00 X	0.00	ASTM D 6816	0.10	<div>Conductivity (Measured)</div> <div>816.0</div> <div>µmho's</div> <div>SM 2510 B</div> <div>1000</div> <div>Resistivity</div> <div>12.255</div> <div>ohm's</div> <div>(Calc.)</div> <div>NA</div> <div>Specific Gravity (80/80)</div> <div>1.0009</div> <div>units</div> <div>API RP 45</div> <div>±0.0001</div> <div>Ionic strength</div> <div>0.01</div> <div>IS (µ)</div> <div>(Calc.)</div> <div>NA</div> <div>pH</div> <div>7.52</div> <div>units</div> <div>SM 4500 H⁺</div> <div>± 0.01</div> <div>Temperature</div> <div>58.0</div> <div>°F</div> <div>SM 2550 B</div> <div>± 0.2</div> <div>Total Diss. Solids (TDS)*</div> <div>510.2</div> <div>mg/L</div> <div>(An+Cat Sum.)</div> <div>NA</div> <div>Total Diss. Solids @ 180 °C</div> <div>NA</div> <div>mg/L</div> <div>Chevron</div> <div>NA</div>			
Barium, Ba ⁺²	0.08 .	0.00	EPA 200.7	0.05				
Boron, B ⁺³	0.13 .	0.04	EPA 200.7	0.10				
Calcium, Ca ⁺²	32.2 .	1.61	EPA 200.7	0.05				
Iron, Fe ⁺²	3.04 .	0.16	EPA 200.7	0.10				
Magnesium, Mg ⁺²	11.1 .	0.91	EPA 200.7	0.05				
Potassium, K ⁺¹	4.78 .	0.12	EPA 200.7	0.50				
Sodium, Na ⁺¹	95.0 .	4.13	EPA 200.7	5.00				
Strontium, Sr ⁺²	0.00 X	0.00	EPA 200.7	0.10				
					QC (Quality Control)	Results	Criteria	Limits

Other	mg/L	meq/L	Method #	PQL
Arsenic, As+3	0.415	0.02	EPA 200.7	0.002
Silica, as SiO_2	90.7	13.07	EPA 200.7	0.10
Sodium, Na^{+1} (Calc.)	95.0	4.13	API RP 45	NA
Chloride, Cl^{-1} (Calc.)	111	3.13	API RP 45	NA
Organic Alkalinity	0.0	X	Chevron Calc.	NA

QC (Quality Control)	Results	Criteria	Limits
Meas EC - Calc EC =	1.1	Note (0.9 - 1.1) EC	>2500
TDS - EC Ratio =	0.63	Note (0.55 - 0.70)	>2500
Measured EC - Ion Sum =	0.9	Cation (0.9 - 1.1) EC	
	0.9	Anion (0.9 - 1.1) EC	
Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
QC - Anion - Cation Balance Criteria			
Anion Sum meq/L	meq/L SUM	Acceptable % Difference	
0 - 3.0	NA	± 0.2 meq	
3.0 - 10.0	NA	± 2 %	
10.0 - 500	14	± 2 - 5 %	
Anion - Cation Balance =	-3.5	%	

Notes:

MDL - Method Detection Limit

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report

Σ = Sum

** Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(*) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(x) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Wastewater," 16-20 th. Ed. 1992-99
2. ASTM: "Water," 2007 American Society for Testing and Material Vol. 11.04-02
3. EPA: "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API: "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 45.
5. Patton, C.C.: "Applied Water Technology," 1988 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date: _____

Laboratory Director Midway Laboratory, Inc

Laboratory Report

ELAP Cert. 2396A

Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
 Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: MI-DI-5

Log #: 16584-9
Date In: 6/18/09
Date out: 6/22/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(meq/L)	Calculations	Results	Units	Method #	PQL(meq/L)
Bicarbonate, HCO ₃	330.4	5.41	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	270.8	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	90.3	mg/L	SM 2340 B	0.10
Chloride, Cl	56.2	1.59	EPA 300.0	0.01	Salinity, as NaCl	101.5	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (SIW Davis)	0.06	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	0.15	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(meq/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.000	NA	ASTM D 6919	0.005					
Barium, Ba	0.16	0.00	EPA 200.7	0.01	Conductivity (Measured)	810.0	µmho's	SM 2510 B	0.100
Boron, B	0.56	0.16	EPA 200.7	0.01	Resistivity	12.3457	ohm's	(Calc.)	0.0005
Calcium, Ca	30.80	1.54	EPA 200.7	0.01	Specific Gravity (60/60)	0.9984	units	API RP 45	0.0005
Iron, Fe	0.35	0.02	EPA 200.7	0.01	Ionic strength	0.008	IS (µ)	(Calc.)	0.001
Magnesium, Mg	3.22	0.27	EPA 200.7	0.01	pH	7.93	units	SM 4500 H B	± 0.01
Potassium, K	4.95	0.13	EPA 200.7	0.01	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	110.0	4.78	EPA 200.7	0.01	Total Diss. Solids (TDS)*	536.6	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Limits
Silica, as SiO ₂	40.0	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	110.1	4.79	API RP-45 2.10	
		Meas EC - Calc EC	1.1	(0.9-1.1) EC
		TDS - EC Ratio	0.66	(0.65-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summations

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

QC _____ Date _____

References

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992/95
2. ASTM, "Water," 1993 American Society for Testing and Materials Vol11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1993 EPA-600/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45
5. Patton, C.C., "Applied Water Technology," 1986 C. C. Patton & Associates, Campbell Petroleum Series

Kurt R. Buckle
 Laboratory Director
 Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1298A
Geo-Chemical Water Analysis

Rev 7-18-09

Customer: Chevron Corporation
Address: 8525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze
Sample Description: M - DI - 6

Log #: 16681-8
Date In: 7/9/09
Date Completed: 7/14/09
Date Reported: 7/15/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL	
Bicarbonate, HCO_3^{-1}	327.8	5.37	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total) as CaCO_3 (less Org. Alk.)	268.7	mg/l	SM 3320 B	NA	
Bromide, Br	0.0	X	EPA 300.0	0.05		288.7	mg/l	SM 3320 B	NA	
Carbonate, CO_3^{-2}	0.0	X	SM2320 B	0.20	Hardness, as CaCO_3 (Calc.)	88.1	mg/l	SM 2340 B	NA	
Chloride, Cl^{-1}	207.0	5.84	EPA 300.0	0.05		Refractive Index	NA	NA	NA	NA
Fluoride, F^{-1}	0.00	X	EPA 300.0	0.20	Salinity, as NaCl	374.0	mg/l	(Calc.)	1.00	
Hydroxide, OH^{-1}	0.0	X	SM2320 B	0.20		Calcium Carbonate				
Iodide, I^{-1} (Iodine)	0.0	X	EPA 300.1	0.05	Stability Index (Langlier)	0.12	(Notes)	SM 2230 B	NA	
Sulfate, SO_4^{-2}	0.60	0.01	EPA 300.0	0.05		Stability Index (Stiff Davis)	0.04	NA	Ref. 4	NA
Sulfide, S^{-1}	0.0	X	SM500-B ²	1.00						
Sulfite, SO_3^{-2}	0.0	X	SM4500-SO3 ²⁻	1.00						
Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results		Method #	PQL	
Ammonium, NH_4^{+1}	0.00	X	ASTM D 6919	0.10	Conductivity (Measured)	1100.0	umho's	SM 2510 B	1000	
Barium, Ba^{+2}	0.19	0.00	EPA 200.7	0.10		Resistivity	9.091	ohm's	(Calc.)	NA
Boron, B^{+3}	0.38	0.11	EPA 200.7	0.02	Specific Gravity (80/80)	1.0004	units	API RP 45	±0.0001	
Calcium, Ca^{+2}	29.80	1.49	EPA 200.7	0.05		Ionic strength	0.01	IS (μ)	(Calc.)	NA
Iron, Fe^{+2}	0.44	0.02	EPA 200.7	0.05	pH	7.92	units	SM 4500 H B	± 0.01	
Magnesium, Mg^{+2}	3.30	0.27	EPA 200.7	0.10		Temperature	60.0	°F	SM 2550 B	± 0.2
Manganese, Mn^{+2}	0.00	X	EPA 200.7	0.05	Total Diss. Solids (TDS)*	684.7	mg/L	(An-Cat Sum.)	NA	
Potassium, K^{+1}	6.14	0.16	EPA 200.7	0.10		Total Diss. Solids @ 180 °C	NA	mg/L	Chevron	NA
Sodium, Na^{+1}	109.0	4.74	EPA 200.7	0.10						
Strontium, Sr^{+2}	0.00	X	EPA 200.7	0.10						
Zinc, Zn^{+2}	0.00	X	EPA 200.7	0.02						
Other	mg/L	meq/L	Method #	PQL						
Acetate	0.0	X	ASTM D 4327	1.00						
Formate	0.0	X	ASTM D 4327	1.00						
Propionate	0.0	X	ASTM D 4327	1.00						
Organic Alkalinity	0	X	Chevron Pub.	NA						
Lithium, Li	0.0	X	EPA 200.7	0.02						
Silica, as SiO_2	30.8	4.44	EPA 200.7	0.01						
Sodium, Na^{+1} (Calc.)	109.0	4.74	API RP 45	NA						
Notes:										
MDL - Method Detection Limit.										
PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (API MDL)										
					QC (Quality Control)					
					Meas EC - Calc EC =		1.0	*Note	(0.9 - 1.1) EC	>2800
					TDS - EC Ratio =		0.62	**Note	(0.55 - 0.70)	>2500
					Measured EC - Ion Sum =		1.0	Calc	(0.9 - 1.1) EC	
							1.0	Anion	(0.9 - 1.1) EC	
					Calc. Na - Actual Na =		1.00	Na/Na	(0.98 - 1.02)	
					NaCl/(NaCl Calc.) =		1.00	Na/Cl	(0.98 - 1.02)	
					QC - Anion - Cation Balance Criteria					
					Anion Sum meq/L	meq/L SUM	Acceptable % Difference			
					0 - 3.0	NA	± 0.2 meq			
					3.0 - 10.0	NA	± 2 %			
					10.0 - 500	22	± 2 - 5 %			
					Anion - Cation Balance =	0.0	%			

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum..

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(x) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
 2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11.01-02
 3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
 4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
 5. Petton, C. G., "Applied Water Technology," 1988 Campbell Petroleum Series
- The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date: _____

Kurt R. Buckle, B.S. Vice-President, Laboratory Director Midway Laboratory, Inc

Laboratory Report
ELAP Cert. 1388A
Geo-Chemical Water Analysis

Rev 7-10-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Frenze
Sample Description: Producers 1000

Log #: 16812-3
Date In: 8/6/09
Date Completed: 8/10/09
Date Reported: 8/10/09

Anions					Calculations				
	mg/L	meq/L	Method #	PQL	Results	Units	Method #	PQL	
Bicarbonate, HCO ₃ ⁻	281.5	4.61	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	230.7	mg/L	SM 3320 B NA	
Bromide, Br ⁻	0.0	X	EPA 300.0	0.05	as CaCO ₃ (1000 Org. Alk.)	230.7	mg/L	SM 3320 B NA	
Carbonate, CO ₃ ⁻	0.00	X	SM2320 B	0.20	Hardness, as CaCO ₃ (Calc.)	88.8	mg/L	SM 2340 B NA	
Chloride, Cl ⁻	73.7	2.08	EPA 300.0	0.05	Refractive Index	NA	NA	NA NA	
Fluoride, F ⁻	0.00	X	EPA 300.0	0.20	Salinity, as NaCl	133.1	mg/L	(Calc.) 1.00	
Hydroxide, OH ⁻	0.0	X	SM2320 B	0.20	Calcium Carbonate				
Iodide, I ⁻ (iodine)	0.0	X	EPA 300.1	0.05	Stability Index (Langier)	0.04	(Notes)	SM 2230 B NA	
Sulfate, SO ₄ ⁻²	0.00	0.00	EPA 300.0	0.05	Stability Index (Self Davis)	-0.05	NA	Ref. 4 NA	
Sulfide, S ⁻	0.0	X	SM4500-S ⁻²	1.00					
Sulfite, SO ₃ ⁻²	0.0	X	SM4500-SO ₃ ⁻²	1.00					
Cations					Physical Data				
	mg/L	meq/L	Method #	PQL	Results	Method #	PQL		
Ammonium, NH ₄ ⁺	0.00	X	ASTM D 6810	0.10	Conductivity (Measured)	599.0	µmhos SM 2510 B 1000		
Barium, Ba ⁺²	0.00	0.00	EPA 200.7	0.05	Resistivity	16,694	ohm's (Calc.) NA		
Boron, B ⁺³	0.17	0.05	EPA 200.7	0.10	Specific Gravity (50/50)	1.0020	units API RP 45 ±0.0001		
Calcium, Ca ⁺²	26.3	1.31	EPA 200.7	0.05	Ionic strength	0.01	IS (µ) (Calc.) NA		
Iron, Fe ⁺³	0.18	0.01	EPA 200.7	0.10	pH	7.96	units SM 4500 H B ± 0.01		
Magnesium, Mg ⁺²	5.59	0.46	EPA 200.7	0.05	Temperature	60.0	°F SM 2550 B ± 0.2		
Manganese, Mn ⁺²	0.00	X	EPA 200.7	0.05	Total Diss. Solids (TDS)*	405.7	mg/L (An-Cat) Sum. NA		
Potassium, K ⁺	1.97	0.05	EPA 200.7	0.50	Total Diss. Solids @ 180 °C	NA	mg/L Chevron NA		
Sodium, Na ⁺	16.3	0.71	EPA 200.7	5.00					
Strontium, Sr ⁺²	0.00	X	EPA 200.7	0.10					
Zinc, Zn ⁺²	0.00	X	EPA 200.7	0.02					
Other					QC (Quality Control)				
	mg/L	meq/L	Method #	PQL	Results	Criteria	Units		
Acetate	0.0	X	0.0	ASTM D 4327	1.00	Meas EC - Calc EC =	1.1	Note (0.8 - 1.1) EC >2500	
Formate	0.0	X	0.0	ASTM D 4327	1.00	TDS - EC Ratio =	0.66	Note (0.55 - 0.70) >2500	
Propionate	0.0	X	0.0	ASTM D 4327	1.00	Measured EC - Ion Sum =	1.1	Cation (0.8 - 1.1) EC	
Organic Alkalinity	0	X	0.0	Chevron Pub.	NA		1.1	Anion (0.8 - 1.1) EC	
Lithium, Li	0.0	X	0.0	EPA 200.7	0.02	Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
Silica, as SiO ₂	28.4	4.10	EPA 200.7	0.50	NaCl/(NaCl Calc.) =	1.00	NaCl (0.86 - 1.02)		
Sodium, Na ⁺ (Calc.)	16.3	0.71	API RP 45	NA					
Notes:					QC - Anion - Cation Balance Criteria				
MDL - Method Detection Limit					Anion Sum meq/L	meq/L SUM	Acceptable % Difference		
PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL)					0 - 3.0	NA	± 0.2 meq		
					3.0 - 10.0	NA	± 2 %		
					10.0 - 500	13	± 2 - 5 %		
					Anion - Cation Balance =	0.0	%		

Notes:

MDL - Method Detection Limit

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL)

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may stabilize this value (Ca⁺², SO₄⁻² etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(s) = CaCO₃ is at equilibrium.

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20th. Ed. 1992-99
2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
5. Patton, D.C., "Applied Water Technology," 1998 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Date

Kurt R. Buckle, B.S. Vice-President, Laboratory Director

Midway Laboratory, Inc

Laboratory Report
ELAP Cert. 13364
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Producers 1000

Log #: 17179-3
Date in: 10/15/09
Date out: 11/9/09

Rev 10-3-08

Anions	mg/L	mg/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	397.8	6.52	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	326.1	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	104.2	mg/L	SM 2340 B	0.10
Chloride, Cl	67.5	1.90	EPA 300.0	0.01	Salinity, as NaCl	121.9	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (SI) (Davis)	0.13	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	0.21	(Notes)	SM 203	N.A.

Cations	mg/L	mg/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6919	0.10					
Barium, Ba	0.00	0.00	SM3500-Ba B	0.50	Conductivity (Measured)	950.0	µmho's	SM 2510 B	0.100
*Boron, B					Resistivity	10.5263	ohm's	(Calc.)	0.0005
Calcium, Ca	26.3	1.31	SM3500-Ca B	0.50	Specific Gravity (60/60)	0.9998	units	API RP 45	0.0005
Iron, Fe	0.00	0.00	SM3500-Fe B	1.00	Ionic strength	0.010	IS (µ)	(Calc.)	0.001
Magnesium, Mg	9.33	0.77	SM3500-Mg B	0.50	pH	7.98	units	SM 4500 H B	± 0.01
Potassium, K	1.87	0.05	SM3500-K B	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	158	6.87	SM3500-Na B	5.00	Total Diss. Solids (TDS)*	660.8	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Limits
Silica, as SiO ₂	38.7	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	157.5	6.85	API RP-45 2.10	
		Meas EC - Calc EC	1.1	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Carbon and anion summation.

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(e) = CaCO₃ is at equilibrium

* Boron not analyzed

References

1. APHA-AWWA: "Standard Methods for the Examination of Water and Wastewater" 18-20 ed. Ed. 1992-98
2. ASTM: "Water." 1983 American Society for Testing and Material Vol 11.01-02
3. EPA: "Methods for Chemical Analyses of Water and Wastes." 1983 EPA-600/4-79-020
4. API: "Analysis of Oil-Field Waters." 1981 2nd Ed. American Petroleum Institute, API RP 43
5. Patton, G.C.: "Applied Water Technology." 1986 G. C. Patton & Associates, Campbell Petroleum Series

Laboratory Director
Midway Laboratory, Inc.

Date

Laboratory Report
ELAP Cert. 1296A
Geo-Chemical Water Analysis

Rev 12-16-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Frenze, Carla Semprun
Sample Description: Producers 1960

Log #: 17830-7
Date In: 1/14/10
Date Completed: 1/20/10
Date Reported: 1/21/10

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	379.3	6.21	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	310.9	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alc.)	310.9	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	86.3	2.43	SM4500- Cl^{-1}	0.05	Hardness, as CaCO_3 (Calc.)	119.8	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. Na+Cl	491.2	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.0	0.00	SM4500- SO_4^{-2}	1.0	Salinity, from Chlorosily	155.9	mg/L	(Calc.)	NA
Sulfide, S^{-1}	0.0	0.00	SM4500- S^{-1}	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0	0.00	SM4500- SO_3^{-2}	1.0	Stability Index (Langier)	0.41	(Notes)	SM 2330 B	NA
					Stability Index (Stiff-Davis)	0.32	NA	Ref. 4	NA
Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL	
Ammonium, NH_4^{+1}	0.00	0.00	ASTM D 8519	0.10	Conductivity (Measured)	920.0	$\mu\text{mho/s}$	SM 2510 B	1000
Barium, Ba^{+2}	0.00	0.00	EPA 200.7	0.05	Resistivity	10.870	ohm-cm	(Calc.)	NA
Boron, B^{+3}	0.16	0.04	EPA 200.7	0.10	Specific Gravity (60/60)	1.0012	units	API RP 45	± 0.0001
Calcium, Ca^{+2}	33.9	1.69	EPA 200.7	0.05	Ionic strength	0.01	IS (μ)	(Calc.)	NA
Iron, Fe^{+2}	0.23	0.01	EPA 200.7	0.10	pH	8.09	units	SM 4500-H B	± 0.01
Magnesium, Mg^{+2}	8.50	0.70	EPA 200.7	0.05	Temperature	60.0	$^{\circ}\text{F}$	SM 2560 B	± 0.2
Potassium, K^{+1}	2.16	0.06	EPA 200.7	0.50	Total Diss. Solids (TDS)*	637.6	mg/L	(An-Cat Sum)	NA
Sodium, Na^{+1}	127	5.52	EPA 200.7	5.00	Total Diss. Solids @ 180 $^{\circ}\text{C}$	NA	mg/L	Chevron	NA
Strontium, Sr^{+2}	0.00	0.00	EPA 200.7	0.10	QC (Quality Control)				
					Meas EC - Calc EC =	0.9	Note (0.9 - 1.1) EC	>2500	
					TDS - EC Ratio =	0.69	Note (0.55 - 0.70)	>2500	
					Measured EC - Ion Sum =	0.9	Cation (0.9 - 1.1) EC		
						0.9	Anion (0.9 - 1.1) EC		
					Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)		
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)		
					QC - Anion - Cation Balance Criteria				
					Anion Sum meq/L	meq/L SUM	Acceptable % Difference		
					0 - 3.0	NA	± 0.2 meq		
					3.0 - 10.0	NA	± 2 %		
					10.0 - 800	17	$\pm 2 - 5$ %		
					Anion - Cation Balance =	-3.7	%		
Notes:									
MDL - Method Detection Limit									
PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (USEPA 816-G-1)									

Notes:

MDL - Method Detection Limit

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL)

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum

NA - Not applicable to report

Σ = Sum

** Dissociated ions may alter the value (Ca⁺², SO4⁻² etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate

(-) = CaCO_3 will tend to dissolve

(s) = CaCO_3 is at equilibrium

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-010
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45
5. Patton, G.C., "Applied Water Technology," 1986 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date: _____

Laboratory Director Midway Laboratory, Inc

Laboratory Report
ELAP Cert. 198A
Geo-Chemical Water Analysis

Rev 7-10-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze
Sample Description: Producers 1902

Log #: 16812-4
Date In: 6/6/09
Date Completed: 6/10/09
Date Reported: 6/10/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	385.6	6.31	SM2320 B	0.20					
Bromide, Br	0.0 X	0.00	EPA 300.0	0.05	Alkalinity, as CaCO_3 (Total)	316.1	mg/L	SM 3320 B	NA
Carbonate, CO_3^{-1}	0.00 X	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	316.1	mg/L	SM 3320 B	NA
Chloride, Cl^{-1}	70.9	2.00	EPA 300.0	0.05	Hardness, as CaCO_3 (Calc.)	136.2	mg/L	SM 2340 B	NA
Fluoride, F^{-1}	0.00 X	0.00	EPA 300.0	0.20	Refractive Index	NA	NA	NA	NA
Hydroxide, OH^{-1}	0.0 X	0.00	SM2320 B	0.20	Salinity, as NaCl	128.1	mg/L	(Calc.)	1.00
Iodide, I^{-1} (Iodine)	0.0 X	0.00	EPA 300.1	0.05	Calcium Carbonate				
Sulfate, SO_4^{-2}	0.00	0.00	EPA 300.0	0.05	Stability Index (Langier)	0.32	(Notes)	SM 2230 B	NA
Sulfide, S^{-1}	0.0 X	0.00	SM4500-S ⁻¹	1.00	Stability Index (Stiff Davis)	0.24	NA	Rad. 4	NA
Sulfite, SO_3^{-2}	0.0 X	0.00	SM4500-SO ₃ ⁻²	1.00					

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00 X	0.00	ASTM D 6919	0.10	Conductivity (Measured)	734.0	umho's	SM 2610 B 1000
Barium, Ba^{+2}	0.00	0.00	EPA 200.7	0.05	Resistivity	13.624	ohm's	(Calc.) NA
Boron, B^{+3}	0.15	0.04	EPA 200.7	0.10	Specific Gravity (80/80)	1.0008	units	API RP 45 ±0.001
Calcium, Ca^{+2}	41.3	2.06	EPA 200.7	0.05	Ionic strength	0.01	IS (μ)	(Calc.) NA
Iron, Fe^{+3}	0.32	0.02	EPA 200.7	0.10	pH	7.91	units	SM 4500 H B ± 0.01
Magnesium, Mg^{+2}	7.99	0.66	EPA 200.7	0.05	Temperature	60.0	°F	SM 2520 B ± 0.2
Manganese, Mn^{+2}	0.00 X	0.00	EPA 200.7	0.05	Total Diss. Solids (TDS)*	515.1	mg/L	(An-Cat Sum.) NA
Potassium, K^{+1}	2.98	0.08	EPA 200.7	0.50	Total Diss. Solids @ 180 °C	NA	mg/L	Chevron NA
Sodium, Na^{+1}	5.80	0.25	EPA 200.7	5.00				
Strontium, Sr^{+2}	0.00 X	0.00	EPA 200.7	0.10				
Zinc, Zn^{+2}	0.00 X	0.00	EPA 200.7	0.02				

Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Limits
Acetate	0.0 X	0.0	ASTM D 4327	1.00	Meas EC - Calc EC =	1.2	*Note (0.9 - 1.1) EC	>2500
Formate	0.0 X	0.0	ASTM D 4327	1.00	TDS - EC Ratio =	0.70	**Note (0.55 - 0.70)	>2500
Propionate	0.0 X	0.0	ASTM D 4327	1.00	Measured EC - Ion Sum =	1.1	Cation (0.9 - 1.1) EC	
Organic Alkalinity	0 X	0.0	Chevron Pub.	NA		1.1	Anion (0.9 - 1.1) EC	
Lithium, Li	0.0 X	0.0	EPA 200.7	0.02	Calc. Na - Actual Na =	1.00	Me/Na (0.98 - 1.02)	
Silica, as SiO_2	36.1	5.21	EPA 200.7	0.50	NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
Sodium, Na^{+1} (Calc.)	5.8	0.25	API RP 45	NA	QC - Anion - Cation Balance Criteria			
					Anion Sum meq/L	meq/L SUM	Acceptable % Difference	
					0 - 3.0	NA	± 0.2 meq	
					3.0 - 10.0	NA	± 2 %	
					10.0 - 500	17	± 2 - 5 %	
					Anion - Cation Balance =	0.0	%	

Notes:

MDL - Method Detection Limit

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(*) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(=) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastes Water," 18-20 th. Ed. 1992-98
2. ASTM; "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA; "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API; "Analysis of Oil-Field Waters," 1991 2nd. Ed. American Petroleum Institute, API RP 45.
5. Patton, C.C., "Applied Water Technology," 1998 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date: _____

Date: _____

Murt R. Buckle, B.S. Vice-President, Laboratory Director Midway Laboratory, Inc

Laboratory Report
ELAP Cert. 1388A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Producers 1002

Log #: 17023-2
Date in: 9/17/09
Date out: 9/24/09

Rev 10-3-08

Anions	mol/L	meq/L	Method #	PQL(meq/L)	Calculations	Results	Units	Method #	PQL(meq/L)
Bicarbonate, HCO ₃	260.7	4.27	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	213.7	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	105.6	mg/L	SM 2340 B	0.10
Chloride, Cl	129.0	3.64	EPA 300.0	0.01	Salinity, as NaCl	233.0	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.36	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	-0.27	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL (meq/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	16.10	NA	ASTM D 8919	0.500					
Barium, Ba	0.08	0.00	EPA 200.7	0.05	Conductivity (Measured)	793.0	µmho's	SM 2510 B	0.100
Boron, B	0.18	0.05	EPA 200.7	0.10	Resistivity	12.5103	ohm's	(Calc.)	0.0005
Calcium, Ca	30.2	1.51	EPA 200.7	0.05	Specific Gravity (60/60)	0.9981	units	API RP 45	0.0005
Iron, Fe	0.11	0.01	EPA 200.7	0.10	Ionic strength	0.009	IS (µ)	(Calc.)	0.001
Magnesium, Mg	7.31	0.60	EPA 200.7	0.05	pH	7.62	units	SM 4500 H B	± 0.01
Potassium, K	5.39	0.14	EPA 200.7	0.50	Temperature	58.0	°F	SM 2550 B	± 0.1
Sodium, Na	110.0	4.78	EPA 200.7	5.00	Total Diss. Solids (TDS)*	559.1	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	62.4	N.A.	SM 3500-SI B	
Sodium, Na (Calc.)	110.9	4.82	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.55-0.70) >2300 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			1.0	Anion (0.9-1.1) EC

Notes:

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Clean and clean summation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 m. Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol11 D1-D2
3. EPA, "Methods for Chemical Analysis of Water and Wastewater," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP-45.
5. Patton, C.C., "Applied Water Technology," 1988 C. C. Patton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report

CLAP CWT 1388A

Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
 Bakersfield, CA 93311
Attention: Ray Franza, Carla S

Sample Description: Producers 1002

Log #: 17104-3

Date in: 10/1/09

Date out: 10/13/09

Rev 10-3-08

Practical quantification limit

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	223.9	3.67	SM 2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	183.5	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM 2320 B	0.20	Hardness, as CaCO ₃ (Total)	72.3	mg/L	SM 2340 B	0.10
Chloride, Cl	88.4	2.49	EPA 300.0	0.01	Salinity, as NaCl	159.7	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM 2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (SI) (Davis)	-0.18	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.60	0.01	EPA 300.0	0.02	Langelier Saturation Index	-0.07	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 5919	0.10					
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	689.0	µmho's	SM 2510 B	0.100
Boron, B	0.13	0.04	EPA 200.7	0.10	Resistivity	14.5138	ohm's	(Calc.)	0.0005
Calcium, Ca	19.9	0.99	EPA 200.7	0.05	Specific Gravity (60/60)	1.0011	units	API RP 45	0.0005
Iron, Fe	0.07	0.00	EPA 200.7	0.10	Ionic strength	0.007	IS (µ)	(Calc.)	0.001
Magnesium, Mg	5.48	0.45	EPA 200.7	0.05	pH	8.07	units	SM 4500 H B	± 0.01
Potassium, K	3.63	0.09	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	98.7	4.29	EPA 200.7	5.00	Total Diss. Solids (TDS)*	440.8	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	83.2	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	98.0	4.31	API RP-45 2.10	
		Meas EC - Calc EC	1.0	(0.9-1.1) EC
		TDS - EC Ratio	0.64	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantification Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

ND - Not Detected (below PQL)

TDS* - Cation and anion summation.

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(s) = CaCO₃ is at equilibrium.

QC _____ Date _____

References

1. APHA/AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 th Ed. 1992-98
2. ASTM, "Water," 1980 American Society for Testing and Material Vol 11 D1-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 45
5. Patton, C.C. "Applied Water Technology," 1995 C. C. Patton & Associates, Campbell Petroleum Series

Kurt R. Buckle
 Laboratory Director
 Midway Laboratory, Inc.

_____ Date _____

Laboratory Report
SLAP Cert. 1344A
Geo-Chemical Water Analysis

Rev 12-16-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Semprun
Sample Description: Producers 1002

Log #: 17433-7
Date In: 12/3/09
Date Completed: 12/7/09
Date Reported: 12/14/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	230.0	3.77	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	188.5	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (from Org. Alk.)	188.5	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	52.0	1.47	SM4500-Cl ⁻¹	0.05	Hardness, as CaCO_3 (Calc.)	69.8	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.05	Salinity, calc. Na+Cl	306.4	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.6	0.01	SM4500- SO_4^{-2}	1.0	Salinity, from Chlorinity	93.9	mg/L	(Calc.)	NA
Sulfide, S^{-1}	0.0	0.00	SM4500-S ⁻²	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0	0.00	SM4500- SO_3^{-2}	1.0	Stability Index (Langier)	-0.46	(Notes)	SM 2330 B	NA
					Stability Index (Stiff-Davis)	-0.56	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00	0.00	ASTM D 6919	0.10	Conductivity (Measured)	568.0	umho's	SM 2510 B
Barium, Ba^{+2}	0.00	0.00	EPA 200.7	0.05	Resistivity	17.606	ohm's	(Calc.)
Boron, B^{+3}	0.08	0.02	EPA 200.7	0.10	Specific Gravity (80/60)	1.0013	units	API RP 45
Calcium, Ca^{+2}	19.5	0.97	EPA 200.7	0.05	Ionic strength	0.01	(u)	(Calc.)
Iron, Fe^{+3}	1.23	0.07	EPA 200.7	0.10	pH	7.66	units	SM 4500 H B
Magnesium, Mg^{+2}	5.12	0.42	EPA 200.7	0.05	Temperature	60.0	°F	SM 2550 B
Potassium, K^{+1}	2.29	0.08	EPA 200.7	0.50	Total Diss. Solids (TDS)*	395.7	mg/L	(An-Cat Sum)
Sodium, Na^{+1}	84.9	3.69	EPA 200.7	5.00	Total Diss. Solids @ 180 °C	NA	mg/L	Chevron
Strontium, Sr^{+2}	0.00	0.00	EPA 200.7	0.10				

Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Limits
Arsenic, As	0.034	0.00	EPA 200.7	0.002	Meas EC - Calc EC =	0.0	Note (0.0 - 1.1) EC	>2500
Silica, as SiO_2	26.1	3.75	EPA 200.7	0.10	TDS - EC Ratio =	0.70	Note (0.66 - 0.70)	>2500
Sodium, Na^{+1} (Calc.)	84.9	3.69	API RP 45	NA	Measured EC - Ion Sum =	0.0	Cation (0.0 - 1.1) EC	
Chloride, Cl^{-1} (Calc.)	51.7	1.46	API RP 45	NA		0.9	Anion (0.0 - 1.1) EC	
Organic Alkalinity	0.0	0.00	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
					QC - Anion - Cation Balance Criteria			
					Anion Sum meq/L	meq/L, SUM	Acceptable % Difference	
					0 - 3.0	NA	± 0.2 meq	
					3.0 - 10.0	NA	± 2 %	
					10.0 - 800	10	± 2 - 5 %	
					Anion - Cation Balance =	-0.1	%	

Notes:

MDL - Method Detection Limit

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate

this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(±) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98

2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11.01-02

3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020

4. API, "Analysis of Oil-Field Waters," 1961 2nd. Ed. American Petroleum Institute, API RP 45.

5. Patton, C.C., "Applied Water Technology," 1985 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Laboratory Director

Midway Laboratory, Inc.

Date:

Laboratory Report
ELAP Cert. 1394A
Geo-Chemical Water Analysis

Rev 12-18-08

Customer: Chevron Corporation
Address: 8525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Semprun
Sample Description: Producers 1002

Log #: 17630-6
Date In: 1/14/10
Date Completed: 1/20/10
Date Reported: 1/21/10

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	276.4	4.53	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	226.6	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alc.)	226.6	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	82.1	2.32	SM4500- Cl^{-}	0.05	Hardness, as CaCO_3 (Calc.)	78.7	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. Na+Cl	384.3	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.9	0.02	SM4500- SO_4^{-2}	1.0	Salinity, from Chlorosity	148.3	mg/L	(Calc.)	NA
Sulfide, S^{-2}	0.0 X	0.00	SM4500- S^{-2}	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0 X	0.00	SM4500- SO_3^{-2}	1.0	Stability Index (Langlier)	-0.35	(Notes)	SM 2330 B	NA
					Stability Index (SUIT Davis)	-0.44	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00 X	0.00	ASTM D-5816	0.10	Conductivity (Measured)	718.0	umho's	SM 2510 B 1000
Barium, Ba^{+2}	0.00	0.00	EPA 200.7	0.05	Resistivity	13.928	ohm's	(Calc.) NA
Boron, B^{+3}	0.14	0.04	EPA 200.7	0.10	Specific Gravity (80/80)	1.0008	units	API RP 45 ±0.0001
Calcium, Ca^{+2}	22.5	1.12	EPA 200.7	0.05	Ionic strength	0.01	IS (g)	(Calc.) NA
Iron, Fe^{+3}	0.46	0.02	EPA 200.7	0.10	pH	7.64	units	SM 4500 H B ± 0.01
Magnesium, Mg^{+2}	5.46	0.45	EPA 200.7	0.05	Temperature	60.0	°F	SM 2550 B ± 0.2
Potassium, K^{+1}	2.31	0.06	EPA 200.7	0.50	Total Diss. Solids (TDS)*	492.3	mg/L	(An-Cal Sum.) NA
Sodium, Na^{+1}	102	4.44	EPA 200.7	5.00	Total Diss. Solids @ 180 °c	NA	mg/L	Chevron NA
Strontium, Sr^{+2}	0.00 X	0.00	EPA 200.7	0.10				

Other					QC (Quality Control)	Results	Criteria	Limits
Arsenic, As	0.000	0.00	EPA 200.7	0.002	Meas EC - Calc EC =	0.9	*Note (0.9 - 1.1) EC	>2500
Silica, as SiO_2	61.2	8.81	EPA 200.7	0.10	TDS - EC Ratio =	0.89	**Note (0.66 - 0.70) EC	>2500
Sodium, Na^{+1} (Calc.)	102.0	4.44	API RP 45	NA	Measured EC - Ion Sum =	0.9	Cation (0.9 - 1.1) EC	
Chloride, Cl^{-1} (Calc.)	56.2	1.59	API RP 45	NA		1.0	Anion (0.9 - 1.1) EC	
Organic Alkalinity	0.0 X	0.00	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
					QC - Anion - Cation Balance Criteria			
					Anion Sum meq/L	meq/L, GLM	Acceptable % Difference	
					0 - 3.0	NA	± 0.2 meq	
					3.0 - 10.0	NA	± 2 %	
					10.0 - 800	13	± 2 - 5 %	
					Anion - Cation Balance =	-5.8	%	

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

X = Sum

** Dissociated ions may elevate

this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(*) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(±) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 th, Ed. 1992-99
2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11 01-02
3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45
5. Patton, C.C., "Applied Water Technology," 1988 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date _____

Laboratory Director Midway Laboratory, Inc.

Laboratory Report
ELAP Cert. 1388A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Sec. 25 1001

Log #: 18399-1
Date In: 5/7/09
Date out: 5/12/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	156.6	2.57	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	130.4	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	1.24	0.04	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	12.7	mg/L	SM 2340 B	0.10
Chloride, Cl	107.0	3.02	EPA 300.0	0.01	Salinity, as NaCl	193.3	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.54	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	1.60	0.04	EPA 300.0	0.02	Langelier Saturation Index	-0.45	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.000	NA	ASTM D 6818	0.005				
Barium, Ba	0.00	0.00	EPA 200.7	0.01	Conductivity (Measured)	624.0	µmho's	SM 2510 B 0.100
Boron, B	0.86	0.24	EPA 200.7	0.01	Resistivity	16.0256	ohm's	(Calc.) 0.0005
Calcium, Ca	4.62	0.23	EPA 200.7	0.01	Specific Gravity (60/60)	1.0014	units	API RP 45 0.0005
Iron, Fe	0.00	0.00	EPA 200.7	0.01	Ionic strength	0.006	IS (µ)	(Calc.) 0.001
Magnesium, Mg	0.28	0.02	EPA 200.7	0.01	pH	8.47	units	SM 4500 H B ± 0.01
Potassium, K	0.61	0.02	EPA 200.7	0.01	Temperature	68.0	°F	SM 2550 B ± 0.1
Sodium, Na	117.0	5.09	EPA 200.7	0.01	Total Diss. Solids (TDS)*	390.0	mg/L	(Calc.) 0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D 5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	23.3	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	117.1	5.09	API RP-45 2.10	
		Meas EC - Calc EC	1.0	(0.9-1.1) EC
		TDS - EC Ratio	0.63	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

103° - Cation and anion summation

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is in equilibrium

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Materials Vol 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP-45.
5. Pison, C. C., "Applied Water Technology," 1988 C. C. Patton & Associates, Campbell Park, Pennsylvania

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1185A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Sec. 25 1001

Log #: 16584-4
Date in: 6/18/09
Date out: 6/22/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	149.3	2.45	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	130.4	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	4.97	0.17	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	12.8	mg/L	SM 2340 B	0.10
Chloride, Cl	77.9	2.20	EPA 300.0	0.01	Salinity, as NaCl	140.7	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.60	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	-0.51	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.000	NA	ASTM D 6810	0.005				
Barium, Ba	0.00	0.00	EPA 200.7	0.01	Conductivity (Measured)	550.0	µmhos	SM 2510 B 0.100
Boron, B	0.19	0.05	EPA 200.7	0.01	Resistivity	18.1818	ohm's	(Calc.) 0.0005
Calcium, Ca	4.84	0.23	EPA 200.7	0.01	Specific Gravity (60/60)	0.9963	units	API RP 45 0.0005
Iron, Fe	0.00	0.00	EPA 200.7	0.01	Ionic strength	0.005	IS (µ)	(Calc.) 0.001
Magnesium, Mg	0.30	0.02	EPA 200.7	0.01	pH	8.41	units	SM 4500 H B ± 0.01
Potassium, K	0.65	0.02	EPA 200.7	0.01	Temperature	68.0	°F	SM 2550 B ± 0.1
Sodium, Na	118.0	5.13	EPA 200.7	0.01	Total Diss. Solids (TDS)*	355.9	mg/L	(Calc.) 0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D 5.0

Other				QC	Results	Range	Units
Silica, as SiO ₂	22.9	N.A.	SM 3500-SI B		Meas EC - Calc EC	1.0	(0.9-1.1) EC
Sodium, Na (Calc.)	117.4	5.11	API RP-45 2.10		TDS - EC Ratio	0.65	(0.55-0.70) >2500 TDS
					Measured EC - Ion Sum	1.0	Cation (0.9-1.1) EC
						0.9	Anion (0.9-1.1) EC

Notes:

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS - Cation and anion summation

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA/AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-95
2. ASTM, "Water," 1993 American Society for Testing and Material Vol11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-820-R-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45
5. Patton, C.C., "Applied Water Technology," 1985 C. C. Patton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
SLAP Cert. 1394A
Geo-Chemical Water Analysis

Rev 7-10-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze
Sample Description: Sec 25 1001

Log #: 16681-1
Date In: 7/9/09
Date Completed: 7/14/09
Date Reported: 7/15/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO ₃ ⁻¹	166.4	2.73	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total) as CaCO ₃ (Net Org. Alk.)	136.4	mg/l	SM 3320 B	NA
Bromide, Br	0.0 X	0.00	EPA 300.9	0.05		136.4	mg/l	SM 3320 B	NA
Carbonate, CO ₃ ⁻¹	0.0 X	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Calc.)	12.8	mg/l	SM 2340 B	NA
Chloride, Cl ⁻¹	206.0	5.61	EPA 300.9	0.05	Refractive Index	NA	NA	NA	NA
Fluoride, F ⁻¹	0.00 X	0.00	EPA 300.9	0.20	Salinity, as NaCl	372.1	mg/l	(Calc.)	1.00
Hydroxide, OH ⁻¹	0.0 X	0.00	SM2320 B	0.20	Calcium Carbonate				
Iodide, I ⁻¹ (Iodine)	0.0 X	0.00	EPA 300.1	0.05	Stability Index (Langier)	-0.82	(Notes)	SM 2230 B	NA
Sulfate, SO ₄ ⁻²	1.50	0.03	EPA 300.0	0.05	Stability Index (Sat Davis)	-0.91	NA	Ref. 4	NA
Sulfide, S ⁻²	0.0 X	0.00	SM4500-S ⁻²	1.00					
Sulfite, SO ₃ ⁻²	0.0 X	0.00	SM4500-SO ₃ ⁻²	1.00					
Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results		Method #	PQL
Ammonium, NH ₄ ⁺¹	0.00 X	0.00	ASTM D 8819	0.10	Conductivity (Measured)	898.0	µmho's	SM 2510 B	1000
Barium, Ba ⁺²	0.00	0.00	EPA 200.7	0.10	Resistivity	11.138	ohm's	(Calc.)	NA
Boron, B ⁺³	0.12	0.03	EPA 200.7	0.02	Specific Gravity (60/60)	0.9997	Unit/L	API RP 45	±0.0001
Calcium, Ca ⁺²	4.64	0.23	EPA 200.7	0.05	Ionic strength	0.01	IS (µ)	(Calc.)	NA
Iron, Fe ⁺³	0.00	0.00	EPA 200.7	0.05	pH	8.08	units	SM 4500 H B	± 0.01
Magnesium, Mg ⁺²	0.30	0.02	EPA 200.7	0.10	Temperature	60.0	°F	SM 2550 B	± 0.2
Manganese, Mn ⁺²	0.00 X	0.00	EPA 200.7	0.05	Total Diss. Solids (TDS)*	498.8	mg/L	(An-Cat Sum.)	NA
Potassium, K ⁺¹	0.81	0.02	EPA 200.7	0.10	Total Diss. Solids @ 180 °c	NA	mg/L	Chevron	NA
Sodium, Na ⁺¹	119.0	5.18	EPA 200.7	0.10					
Strontium, Sr ⁺²	0.00 X	0.00	EPA 200.7	0.10					
Zinc, Zn ⁺²	0.00 X	0.00	EPA 200.7	0.02					
Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)				
Acetate	0.0 X	0.0	ASTM D 4327	1.00	Mees EC - Calc EC =	0.9	*Note	(0.9 - 1.1)	EC >2500
Formate	0.0 X	0.0	ASTM D 4327	1.00	TDS - EC Ratio =	0.58	**Note	(0.55 - 0.70)	>2500
Propionate	0.0 X	0.0	ASTM D 4327	1.00	Measured EC - Ion Sum =	1.0	Cation	(0.9 - 1.1)	EC
Organic Alkalinity	0 X	0.0	Chevron Pub.	NA		1.0	Anion	(0.9 - 1.1)	EC
Lithium, Li	0.0 X	0.0	EPA 200.7	0.02	Calc. Na - Actual Na =	1.00	Na/Na	(0.98 - 1.02)	
Silica, as SiO ₂	21.4	3.08	EPA 200.7	0.01	NaCl/(NaCl Calc.) =	1.00	Na/Cl	(0.99 - 1.02)	
Sodium, Na ⁺¹ (Calc.)	119.0	5.18	API RP 45	NA	QC - Anion - Cation Balance Criteria				
					Anion Sum meq/L	meq/L SUM	Acceptable % Difference		
					0 - 3.0	NA	± 0.2 meq		
					3.0 - 10.0	NA	± 2 %		
					10.0 - 800	17	± 2 - 5 %		
					Anion - Cation Balance =	0.0	%		

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate this value (Ca⁺², SO₄⁻² etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(x) = CaCO₃ is at equilibrium

References:

1. APHA-AWWA; "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-99
2. ASTM; "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA; "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-010
4. API; "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 48.
5. Patton, C.C.; "Applied Water Technology," 1986 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date _____

Kurt R. Buckle, B.S. Vice-President, Laboratory Director

Midway Laboratory, Inc

Laboratory Report
ELAP Cert. 1338A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Sec. 25 1001

Log #: 16989-1
Date In: 9/10/09
Date out: 9/15/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonates, HCO ₃	144.4	2.37	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	130.4	mg/L	SM 3920 B	0.10
Carbonate, CO ₃	7.46	0.25	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	14.9	mg/L	SM 2340 B	0.10
Chloride, Cl	107.0	3.02	EPA 300.0	0.01	Salinity, as NaCl	193.3	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Silt Davis)	-0.31	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	1.60	0.03	EPA 300.0	0.02	Langlier Saturation Index	-0.22	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6919	0.50					
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	557.0	µmho's	SM 2510 B	0.100
Boron, B	0.18	0.05	EPA 200.7	0.10	Resistivity	17.9533	ohm's	(Calc.)	0.0005
Calcium, Ca	5.47	0.27	EPA 200.7	0.05	Specific Gravity (60/60)	0.9983	units	API RP 45	0.0005
Iron, Fe	0.00	0.00	EPA 200.7	0.10	Ionic strength	0.006	IS (µ)	(Calc.)	0.001
Magnesium, Mg	0.29	0.02	EPA 200.7	0.05	pH	8.63	units	SM 4500 H B	± 0.01
Potassium, K	0.72	0.02	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	120	5.22	EPA 200.7	5.00	Total Diss. Solids (TDS)*	387.1	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Limits
Silica, as SiO ₂	21.8	N.A.	SM 3500-SI B	
Sodium, Na (Calc.)	120.1	5.23	API RP-45 2.10	
		Mass EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.65-0.70) >2500 TDS
		Measured EC - Ion Sum	1.0	(0.9-1.1) EC
			1.0	(0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved without specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(±) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 1993 American Society for Testing and Materials Vol 11.03-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1993 EPA-800-a-79-020
4. API, "Analysis of Oil-Field Waters," 1991 2nd Ed. American Petroleum Institute, API RP 45.
5. Pezon, C.C., "Applied Water Technology," 1988 C. C. Pezon & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1294A
Geo-Chemical Water Analysis

Rev 12-18-08

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Semprun
Sample Description: Sec. 26 1001

Log #: 17433-1
Date In: 12/3/09
Date Completed: 12/7/09
Date Reported: 12/14/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	204.3	3.35	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	167.5	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	2.5	0.08	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	167.5	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	49.0	1.39	SM4500- Cl^{-}	0.05	Hardness, as CaCO_3 (Calc.)	12.7	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. $\text{Na}+\text{Cl}$	282.3	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.8	0.02	SM4500- SO_4^{-2}	1.0	Salinity, from Chlorinity	88.5	mg/L	(Calc.)	NA
Sulfide, S^{-2}	0.0 X	0.00	SM4500- S^{-2}	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0 X	0.00	SM4500- SO_3^{-2}	1.0	Stability Index (Langlier)	-0.43	(Index)	SM 2330 B	NA
					Stability Index (S&B Davis)	-0.52	(Index)	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00 X	0.00	ASTM D-6616	0.10	Conductivity (Measured)	525.0	$\mu\text{mho}/\text{cm}$	SM 2510 B 1000
Barium, Ba^{+2}	0.00 X	0.00	EPA 200.7	0.05	Resistivity	19.048	ohm/cm	(Calc.) NA
Boron, B^{+3}	0.12	0.03	EPA 200.7	0.10	Specific Gravity (60/60)	1.0006	units	API RP 45 ± 0.0001
Calcium, Ca^{+2}	4.65	0.23	EPA 200.7	0.05	Ionic strength	0.01	(μ)	(Calc.) NA
Iron, Fe^{+3}	0.00 X	0.00	EPA 200.7	0.10	pH	8.38	units	SM 4500 H B ± 0.01
Magnesium, Mg^{+2}	0.27	0.02	EPA 200.7	0.05	Temperature	68.0	$^{\circ}\text{F}$	SM 2560 B ± 0.2
Potassium, K^{+1}	0.59	0.02	EPA 200.7	0.50	Total Diss. Solids (TDS)*	366.4	mg/L	(An-Cat Sum.) NA
Sodium, Na^{+1}	104.2	4.53	EPA 200.7	5.00	Total Diss. Solids @ 180 $^{\circ}\text{C}$	NA	mg/L	Chevron NA
Strontium, Sr^{+2}	0.00 X	0.00	EPA 200.7	0.10				

Other	mg/L	meq/L	Method #	PQL
Arsenic, As	0.000	0.00	EPA 200.7	0.002
Silica, as SiO_2	21.8	3.13	EPA 200.7	0.10
Sodium, Na^{+1} (Calc.)	104.2	4.53	API RP 45	NA
Chloride, Cl^{-1} (Calc.)	49.3	1.39	API RP 45	NA
Organic Alkalinity	0.0 X	0.00	Chevron Calc.	NA

QC (Quality Control)	Results	Criteria	Units
Meas EC - Calc EC =	1.1	Note (0.9 - 1.1)	EC >2500
TDS - EC Ratio =	0.70	Note (0.59 - 0.70)	>2500
Measured EC - Ion Sum =	0.9	Cation (0.9 - 1.1)	EC
	0.9	Anion (0.9 - 1.1)	EC
Calc. Na - Actual Na =	1.00	Na:Na	(0.98 - 1.02)
NaCl/(NaCl Calc.) =	1.00	Na:Cl	(0.98 - 1.02)
QC - Anion - Cation Balance Criteria			
Anion Sum meq/L	meq/L SUM	Acceptable % Difference	
0 - 2.0	NA	± 0.2 meq	
3.0 - 10.0	NA	$\pm 2\%$	
10.0 - 800	10	$\pm 2 - 5\%$	
Anion - Cation Balance =	0.1	%	

Notes:

MDL - Method Detection Limit

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum..

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(e) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA; "Standard Methods for the Examination of Water and Wastewater," 19-20 Ed. 1992-99
2. ASTM; "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA; "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API; "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 45.
5. Patton, C.C.; "Applied Water Technology," 1988 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Laboratory Director

Midway Laboratory, Inc.

Date:

Laboratory Report
EPA Part 139A
Geo-Chemical Water Analysis

Rev 12-18-08

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Semprun
Sample Description: Sec. 28 1001

Log #: 17630-8
Date In: 1/14/10
Date Completed: 1/20/10
Date Reported: 1/21/10

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	142.0	2.32	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	116.4	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	3.7	0.12	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	116.4	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	119	3.36	SM4500- Cl^{-1}	0.05	Hardness, as CaCO_3 (Calc.)	14.5	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. $\text{Na}+\text{Cl}$	322.3	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.8	0.02	SM4500- SO_4^{-2}	1.0	Salinity, from Chloroality	215.0	mg/L	(Calc.)	NA
Sulfide, S^{-1}	0.0 X	0.00	SM4500- S^{-1}	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0 X	0.00	SM4500- SO_3^{-2}	1.0	Stability Index (Langelier)	-0.52	(Notes)	SM 2330 B	NA
					Stability Index (Sat Davis)	-0.61	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00 X	0.00	ASTM D 5919	0.10	Conductivity (Measured)	543.0	$\mu\text{mho/s}$	SM 2510 B 1000
Barium, Ba^{+2}	0.00	0.00	EPA 200.7	0.05	Resistivity	18.416	$\text{ohm}\cdot\text{cm}$	(Calc.) NA
Boron, B^{-3}	0.12	0.03	EPA 200.7	0.10	Specific Gravity (80/80)	1.0005	units	API RP 45 ± 0.0001
Calcium, Ca^{+2}	5.30	0.26	EPA 200.7	0.05	Ionic strength	0.01	IS (μ)	(Calc.) NA
Iron, Fe^{+3}	0.00	0.00	EPA 200.7	0.10	pH	8.39	units	SM 4500 H B ± 0.01
Magnesium, Mg^{+2}	0.30	0.02	EPA 200.7	0.05	Temperature	68.0	$^{\circ}\text{F}$	SM 2550 B ± 0.2
Potassium, K^{+1}	0.67	0.02	EPA 200.7	0.50	Total Diss. Solids (TDS)*	379.9	mg/L	(An-Cat Sum.) NA
Sodium, Na^{+1}	108	4.70	EPA 200.7	5.00	Total Diss. Solids @ 180 $^{\circ}\text{C}$	NA	mg/L	Chevron NA
Strontium, Sr^{+2}	0.00 X	0.00	EPA 200.7	0.10				

Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Units
Arsenic, As	0.391	0.02	EPA 200.7	0.002	Meas EC - Calc EC =	1.0	*Note (0.9 - 1.1) EC	>2500
Silica, as SiO_2	21.4	3.08	EPA 200.7	0.10	TDS - EC Ratio =	0.70	**Note (0.55 - 0.70)	>2500
Sodium, Na^{+1} (Calc.)	108.0	4.70	API RP 45	NA	Measured EC - Ion Sum =	0.9	Cation (0.9 - 1.1) EC	
Chloride, Cl^{-1} (Calc.)	91.2	2.57	API RP 45	NA		1.1	Anion (0.9 - 1.1) EC	
Organic Alkalinity	0.0 X	0.00	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
					QC - Anion - Cation Balance Criteria			
					Anion Sum meq/L	meq/L SUM	Acceptable % Difference	
					0 - 3.0	NA	± 0.2 meq	
					3.0 - 10.0	NA	$\pm 2\%$	
					10.0 - 500	11	$\pm 2 - 5\%$	
					Anion - Cation Balance =	-7.2	%	

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

- Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for Calcium Carbonate

Stability Index

(-) = CaCO_3 will tend to precipitate.

(+) = CaCO_3 will tend to dissolve.

(g) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-96

2. ASTM: "Water," 2007 American Society for Testing and Material Vol. 11.01-02

3. EPA: "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020

4. API: "Analysis of Oil-Field Waters," 1991 2nd. Ed. American Petroleum Institute, API RP 45.

5. Patton, C.C., "Applied Water Technology," 1988 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Date:

Laboratory Director Midway Laboratory, Inc

Laboratory Report
SLAP Cat. 1796A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: SJ 1002

Log #: 16958-3
Date in: 9/3/09
Date out: 9/14/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	88.1	1.44	SM 2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	72.2	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM 2320 B	0.20	Hardness, as CaCO ₃ (Total)	13.9	mg/L	SM 2340 B	0.10
Chloride, Cl	40.0	1.13	EPA 300.0	0.01	Salinity, as NaCl	72.3	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM 2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-1.56	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	3.60	0.07	EPA 300.0	0.02	Langelier Saturation Index	-1.48	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.00	NA	ASTM D 6819	0.500				
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	260.0	µmho's	SM 2510 B 0.100
Boron, B	0.17	0.05	EPA 200.7	0.10	Resistivity	38.4615	ohm's	(Calc.) 0.0005
Calcium, Ca	4.84	0.24	EPA 200.7	0.05	Specific Gravity (60/60)	0.9976	units	API RP 45 0.0005
Iron, Fe	0.08	0.00	EPA 200.7	0.10	Ionic strength	0.003	IS (µ)	(Calc.) 0.001
Magnesium, Mg	0.43	0.04	EPA 200.7	0.05	pH	7.68	units	SM 4500 H B ± 0.01
Potassium, K	0.62	0.02	EPA 200.7	0.50	Temperature	88.0	°F	SM 2550 B ± 0.1
Sodium, Na	43.4	1.89	EPA 200.7	5.00	Total Diss. Solids (TDS)*	181.2	mg/L	(Calc.) 0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D 5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	27.0 N.A. SM 3500-Si B	Meas EC - Calc EC	1.0	(0.9-1.1) EC
Sodium, Na (Calc.)	43.8 1.91 API RP-45 2.10	TDS - EC Ratio	0.70	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.8-1.1) EC
			1.0	Anion (0.8-1.1) EC

Notes:

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-600/4-79-020
4. API, "Analysis of Oil Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
5. Porden, C.C. "Applied Water Technology," 1988 C. C. Porden & Associates, Campbell Paracore Series

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cmt. 1315A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S

Log #: 17104-7
Date In: 10/1/09
Date out: 10/13/09

Sample Description: SJ 1002

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	74.8	1.22	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	61.1	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	19.2	mg/L	SM 2340 B	0.10
Chloride, Cl	41.4	1.17	EPA 300.0	0.01	Salinity, as NaCl	74.8	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Siff Davis)	-1.25	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	9.00	0.19	EPA 300.0	0.02	Langelier Saturation Index	-1.17	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.00	NA	ASTM D 8919	0.10				
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	275.0	µmho's	SM 2510 B
Boron, B	0.10	0.03	EPA 200.7	0.10	Resistivity	36.3636	ohm's	(Calc.)
Calcium, Ca	6.57	0.33	EPA 200.7	0.05	Specific Gravity (60/60)	1.0000	units	API RP 45
Iron, Fe	0.13	0.01	EPA 200.7	0.10	Ionic strength	0.003	IS (µ)	(Calc.)
Magnesium, Mg	0.67	0.05	EPA 200.7	0.05	pH	7.93	units	SM 4500 H B
Potassium, K	0.83	0.02	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B
Sodium, Na	45.2	1.97	EPA 200.7	5.00	Total Diss. Solids (TDS)*	178.5	mg/L	(Calc.)
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D

Other	QC	Results	Range	Units
Silica, as SiO ₂	30.2	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	45.4	1.97	API RP-45 2.10	
		Meas EC - Calc EC	1.0	(0.9-1.1) EC
		TDS - EC Ratio	0.65	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

ND - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(0) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Materials Vol11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1961 2nd. Ed. American Petroleum Institute, API RP 45
5. Patton, C.C., "Applied Water Technology," 1986 C. C. Patton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report

ELAP Cert. 13964

Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: SJ 1002

Log #: 17288-6
Date in: 11/5/09
Date out: 11/18/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	77	1.26	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	63.2	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	18.3	mg/L	SM 2340 B	0.10
Chloride, Cl	42	1.19	EPA 300.0	0.01	Salinity, as NaCl	76.1	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-1.31	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	4.30	0.09	EPA 300.0	0.02	Langelier Saturation Index	-1.23	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.000	0.00	ASTM D 6919	0.002					
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	240.0	µmhos	SM 2510 B	0.100
Boron, B	0.11	0.03	EPA 200.7	0.10	Resistivity	41.6667	ohms	(Calc.)	0.0005
Calcium, Ca	8.40	0.32	EPA 200.7	0.05	Specific Gravity (60/60)	1.0001	units	API RP 45	0.0005
Iron, Fe	0.14	0.01	EPA 200.7	0.10	Ionic strength	0.003	IS (u)	(Calc.)	0.001
Magnesium, Mg	0.58	0.05	EPA 200.7	0.05	pH	7.87	units	SM 4500-H B	± 0.01
Potassium, K	0.62	0.02	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	37.4	1.63	EPA 200.7	5.00	Total Diss. Solids (TDS)*	168.7	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	28.9	N.A.	SM 3500-SI B	
Sodium, Na (Calc.)	38	1.65	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			1.1	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report

QC _____ Date _____

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

References

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20th. Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1993 EPA-800/4-79-020
4. API, "Analysis of Oil Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 43.
5. Fister, G.C., "Applied Water Technology," 1986 G. C. Fister & Associates, Campbell Petroleum Series.

Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1386A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S

Log #: 16584-10
Date In: 6/16/09
Date out: 6/22/09

Sample Description: SJ 1003

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculation	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	155.4	2.55	SM 2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	127.4	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM 2320 B	0.20	Hardness, as CaCO ₃ (Total)	92.0	mg/L	SM 2340 B	0.10
Chloride, Cl	106.0	2.99	EPA 300.0	0.01	Salinity, as NaCl	191.5	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM 2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.20	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	-0.12	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.000	NA	ASTM D-6919	0.005					
Barium, Ba	0.08	0.00	EPA 200.7	0.01	Conductivity (Measured)	552.0	µmho's	SM 2510 B	0.100
Boron, B	0.22	0.06	EPA 200.7	0.01	Resistivity	18.1159	ohm's	(Calc.)	0.0005
Calcium, Ca	31.00	1.55	EPA 200.7	0.01	Specific Gravity (60/60)	0.9958	units	API RP 45	0.0005
Iron, Fe	0.35	0.02	EPA 200.7	0.01	Ionic strength	0.006	IS (µ)	(Calc.)	0.001
Magnesium, Mg	3.52	0.29	EPA 200.7	0.01	pH	7.99	units	SM 4500 H B	± 0.01
Potassium, K	2.00	0.05	EPA 200.7	0.01	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	71.9	3.13	EPA 200.7	0.01	Total Diss. Solids (TDS)*	370.4	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	44.9	N.A.	SM 3600-SI B	
Sodium, Na (Calc.)	72.4	3.15	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.8-1.1) EC
		TDS - EC Ratio	0.67	(0.95-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Calc'n (0.9-1.1) EC
			1.0	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation.

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(s) = CaCO₃ is at equilibrium.

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-98
2. ASTM, "Water," 1980 American Society for Testing and Material Vol#1 D1-02
3. EPA, "Methods for Chemical Analysis of Water and Wastewater," 1603 EPA-800-R-79-020
4. API, "Analysis of Oil-Field Waters," 1961 2nd Ed. American Petroleum Institute, API RP 45.
5. Patton, D.C., "Applied Water Technology," 1988 D.C. Patton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1338A
Geo-Chemical Water Analysis

Rev 7-10-08

Customer: Chevron Corporation
Address: 8525 Camino Media
Bakersfield, CA 93311
Analyst: Ray Franze
Sample Description: SJ 1003

Log #: 18981-7
Date In: 7/9/09
Date Completed: 7/14/09
Date Reported: 7/15/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO ₃ ⁻¹	146.9	2.41	SM2320 B	0.20					
Bromide, Br	0.0 X	0.00	EPA 300.0	0.05	Alkalinity, as CaCO ₃ (Total)	120.4	mg/L	SM 3320 B	NA
Carbonate, CO ₃ ⁻¹	0.0 X	0.00	SM2320 B	0.20	as CaCO ₃ (Less Org. Alk.)	120.4	mg/L	SM 3320 B	NA
Chloride, Cl ⁻¹	295.0	8.32	EPA 300.0	0.05	Hardness, as CaCO ₃ (Calc.)	84.7	mg/L	SM 2340 B	NA
Fluoride, F ⁻¹	0.00 X	0.00	EPA 300.0	0.20	Refractive Index	NA	NA	NA	NA
Hydroxide, OH ⁻¹	0.0 X	0.00	SM2320 B	0.20	Salinity, as NaCl	532.9	mg/L	(Calc.)	1.00
Iodide, I ⁻¹ (none)	0.0 X	0.00	EPA 300.1	0.05	Calcium Carbonate				
Sulfate, SO ₄ ⁻²	0.00	0.00	EPA 300.0	0.05	Stability Index (Langier)	-0.27	(None)	SM 2230 B	NA
Sulfide, S ⁻¹	0.0 X	0.00	SM4500-S ²	1.00	Stability Index (Silt Davis)	-0.35	NA	Ref. 4	NA
Sulfite, SO ₃ ⁻²	0.0 X	0.00	SM4500-SO ₃ ²⁻	1.00					
Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL	
Ammonium, NH ₄ ⁺¹	0.00 X	0.00	ASTM D 6919	0.10	Conductivity (Measured)	990.0	umho's	SM 2510 B	1000
Barium, Ba ⁺²	0.05	0.00	EPA 200.7	0.10	Resistivity	10.101	ohm's	(Calc.)	NA
Boron, B ⁺³	0.10	0.03	EPA 200.7	0.02	Specific Gravity (80/80)	1.0003	units	API RP 45	±0.0001
Calcium, Ca ⁺²	28.40	1.42	EPA 200.7	0.05	Ionic strength	0.01	IS (μ)	(Calc.)	NA
Iron, Fe ⁺³	0.23	0.01	EPA 200.7	0.05	pH	7.90	units	SM 4500 H B	± 0.01
Magnesium, Mg ⁺²	3.33	0.27	EPA 200.7	0.10	Temperature	60.0	°F	SM 2550 B	± 0.2
Manganese, Mn ⁺²	0.00 X	0.00	EPA 200.7	0.05	Total Diss. Solids (TDS)*	551.2	mg/L	(An-Cat Sum.)	NA
Potassium, K ⁺¹	2.62	0.07	EPA 200.7	0.10	Total Diss. Solids @ 180 °C	NA	mg/L	Chevron	NA
Sodium, Na ⁺¹	74.6	3.24	EPA 200.7	0.10					
Strontium, Sr ⁺²	0.00 X	0.00	EPA 200.7	0.10					
Zinc, Zn ⁺²	0.00 X	0.00	EPA 200.7	0.02					
Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Limits	
Acetate	0.0 X	0.0	ASTM D 4327	1.00	Meas EC - Calc EC =	0.9	*Note (0.9 - 1.1) EC	>2500	
Formate	0.0 X	0.0	ASTM D 4327	1.00	TDS - EC Ratio =	0.58	**Note (0.55 - 0.70) EC	>2500	
Propionate	0.0 X	0.0	ASTM D 4327	1.00	Measured EC - Ion Sum =	1.1	Cation (0.9 - 1.1) EC		
Organic Alkalinity	0 X	0.0	Chevron Pub.	NA		1.1	Anion (0.9 - 1.1) EC		
Lithium, Li	0.0 X	0.0	EPA 200.7	0.02	Calc. Na - Actual Na =	1.00	Na/Na (0.99 - 1.02)		
Silica, as SiO ₂	39.4	5.67	EPA 200.7	0.01	NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)		
Sodium, Na ⁺¹ (Calc.)	74.6	3.25	API RP 45	NA					
Microbial					QC - Anion - Cation Balance Criteria				
MDL - Method Detection Limit					Anion Sum meq/L meq/L SUM Acceptable % Difference				
PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5x MDL)					0 - 3.0 NA ± 0.2 meq				
					3.0 - 10.0 NA ± 2 %				
					10.0 - 500 21 ± 2 - 5 %				
					Anion - Cation Balance = 0.0 %				

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report

Σ = Sum

** Dissociated ions may elevate this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate

(-) = CaCO_3 will tend to dissolve.

(=) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Waste Water," 18-20 Ed. 1992-98
2. ASTM: "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA: "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API: "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
5. Patton, D.C.: "Applied Water Technology," 1999 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Date

Hurt R. Buckle, B.S. Vice-President, Laboratory Director

Midway Laboratory, Inc.

Laboratory Report
ELAP Cert 13864
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: SJ 1003

Log #: 16958-2
Date In: 9/3/09
Date out: 9/14/09

Rev 10-3-08

Anions	mg/L	mg/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	162.7	2.67	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	133.4	mg/l	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	98.7	mg/l	SM 2340 B	0.10
Chloride, Cl	109.0	3.07	EPA 300.0	0.01	Salinity, as NaCl	196.9	mg/l	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.33	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.80	0.02	EPA 300.0	0.02	Langelier Saturation Index	-0.24	(Notes)	SM 203	N.A.

Cations	mg/L	mg/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 8919	0.500					
Barium, Ba	0.06	0.00	EPA 200.7	0.05	Conductivity (Measured)	548.0	umho/cm	SM 2510 B	0.100
Boron, B	0.20	0.05	EPA 200.7	0.10	Resistivity	18.2482	ohm-cm	(Calc.)	0.0005
Calcium, Ca	33.4	1.67	EPA 200.7	0.05	Specific Gravity (60/60)	0.9976	units	API RP 45	0.0005
Iron, Fe	0.34	0.02	EPA 200.7	0.10	Ionic strength	0.006	IS (u)	(Calc.)	0.001
Magnesium, Mg	3.69	0.30	EPA 200.7	0.05	pH	7.81	units	SM 4500 H B	± 0.01
Potassium, K	2.18	0.08	EPA 200.7	0.50	Temperature	58.0	°F	SM 2560 B	± 0.1
Sodium, Na	73.5	3.20	EPA 200.7	5.00	Total Diss. Solids (TDS)*	385.9	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	43.6	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	74.0	3.22	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.55-0.70) >1500 TDS
		Measured EC - Ion Sum	1.0	Carbon (0.9-1.1) EC
			1.1	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantization Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

ND - Not Detected (below PQL)

TDS* - Caution and anion summation.

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(X) = CaCO₃ is in equilibrium.

QC _____ Date _____

References

1. APHA/AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-98
2. ASTM "Water," 1983 American Society for Testing and Material Vol11 D1-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-600/4-79-020
4. API, "Analysis of Oil-Field Waters," 1961 2nd Ed. American Petroleum Institute, API RP 45.
5. Patton, C.C., "Applied Water Technology," 1996 C. C. Patton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1388A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: SJ 1003

Log #: 17104-6
Date in: 10/1/09
Date out: 10/13/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(meq/L)	Calculations	Results	Units	Method #	PQL(meq/L)
Bicarbonate, HCO ₃	159.0	2.61	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	130.3	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	90.2	mg/L	SM 2340 B	0.10
Chloride, Cl	106.0	2.99	EPA 300.0	0.01	Salinity, as NaCl	191.5	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.12	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.70	0.01	EPA 300.0	0.02	Langelier Saturation Index	-0.03	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(meq/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6819	0.10					
Barium, Ba	0.06	0.00	EPA 200.7	0.05	Conductivity (Measured)	544.0	umho/cm	SM 2510 B	0.100
Boron, B	0.14	0.04	EPA 200.7	0.10	Resistivity	18.3824	ohm's	(Calc.)	0.0005
Calcium, Ca	29.9	1.49	EPA 200.7	0.05	Specific Gravity (80/80)	1.0005	units	API RP 45	0.0005
Iron, Fe	0.40	0.02	EPA 200.7	0.10	Ionic strength	0.006	IS (u)	(Calc.)	0.001
Magnesium, Mg	3.74	0.31	EPA 200.7	0.05	pH	8.08	units	SM 4500 H B	± 0.01
Potassium, K	2.27	0.06	EPA 200.7	0.50	Temperature	58.0	°F	SM 2560 B	± 0.1
Sodium, Na	75.4	3.28	EPA 200.7	5.00	Total Diss. Solids (TDS)*	377.6	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	44.9	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	75.8	3.30	API RP-45 2.10	
		Meas EC - Calc EC	0.9	(0.9-1.1) EC
		TDS - EC Ratio	0.69	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	1.0	Cation (0.9-1.1) EC
			1.0	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation.

N.A. - Not Applicable to report

QC _____ Date _____

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(0) = CaCO₃ is at equilibrium

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-96
2. ASTM, "Water," 1983 American Society for Testing and Materials Vol 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 45
5. Padua, D.C., "Applied Water Technology," 1988 G. C. Patton & Associates, Campbell Petroleum Series

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

_____ Date _____

Laboratory Report
ELAP Cert. 12984
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: SJ 1003

Log #: 17288-5
Date in: 11/5/09
Date out: 11/18/09

Rev 10-3-06

Anions	mg/L	mg/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	166	2.73	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	136.4	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	98.6	mg/L	SM 2340 B	0.10
Chloride, Cl	111	3.13	EPA 300.0	0.01	Salinity, as NaCl	200.5	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.29	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.30	0.01	EPA 300.0	0.02	Langelier Saturation Index	-0.21	(Notes)	SM 203	N.A.

Cations	mg/L	mg/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.007	0.00	ASTM D 6519	0.002				
Barium, Ba	0.06	0.00	EPA 200.7	0.05	Conductivity (Measured)	557.0	umho's	SM 2510 B 0.100
Boron, B	0.15	0.04	EPA 200.7	0.10	Resistivity	17.9533	ohm's	(Calc.) 0.0005
Calcium, Ca	33.1	1.65	EPA 200.7	0.05	Specific Gravity (60/60)	0.9999	units	API RP 45 0.0005
Iron, Fe	0.27	0.01	EPA 200.7	0.10	Ionic strength	0.006	IS (u)	(Calc.) 0.001
Magnesium, Mg	3.84	0.32	EPA 200.7	0.05	pH	7.84	units	SM 4500 H B ± 0.01
Potassium, K	2.19	0.06	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B ± 0.1
Sodium, Na	69.2	3.01	EPA 200.7	5.00	Total Diss. Solids (TDS)*	386.5	mg/L	(Calc.) 0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D 5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	48.8 N.A. SM 3600-SI B	Meas EC - Calc EC	0.9	(0.9-1.1) EC
Sodium, Na (Calc.)	70 3.04 API RP-45 2.10	TDS - EC Ratio	0.69	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			1.1	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Carbon and anion summation.

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(.) = CaCO₃ is in equilibrium.

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 1993 American Society for Testing and Material Vol#1 D1-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1961 2nd. Ed. American Petroleum Institute, API RP 45.
5. Patton, C.C. "Applied Water Technology," 1988 C. C. Patton & Associates, Campbell Petroleum Series.

Laboratory Director
Midway Laboratory, Inc.

_____ Date _____

Laboratory Report
ELAP Cert. 1388A
Geo-Chemical Water Analysis

Rev 12-16-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Frenze, Carla Semprun
Sample Description: SJ 1000

Log #: 17830-10
Date In: 1/14/10
Date Completed: 1/20/10
Date Reported: 1/21/10

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	155.4	2.54	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	127.4	mg/l	SM 2320 B	NA
Carbonate, CO_3^{-2}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	127.4	mg/l	SM 2320 B	NA
Chloride, Cl^{-1}	120	3.38	SM4500-Cl ⁻	0.05	Hardness, as CaCO_3 (Calc.)	103.3	mg/l	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc, Na+Cl	326.7	mg/l	(Calc.)	NA
Sulfate, SO_4^{-2}	0.7	0.01	SM4500-SO ₄ ⁻²	1.0	Salinity, from Chlorosily	216.8	mg/l	(Calc.)	NA
Sulfide, S^{-2}	0.0	0.00	SM4500-S ⁻²	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0	0.00	SM4500-SO ₃ ⁻²	1.0	Stability Index (Langier)	-0.20	(Notes)	SM 2330 B	NA
					Stability Index (Stiff Davis)	-0.29	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00	0.00	ASTM D 8919	0.10	Conductivity (Measured)	551.0	µmhos/cm	SM 2510 B 1000
Barium, Ba^{+2}	0.08	0.00	EPA 200.7	0.05	Resistivity	18.149	ohm-cm	(Calc.) NA
Boron, B^{+3}	0.16	0.04	EPA 200.7	0.10	Specific Gravity (80/60)	1.0006	units	API RP 45 ±0.0001
Calcium, Ca^{+2}	33.7	1.68	EPA 200.7	0.05	Ionic strength	0.01	IS (µ)	(Calc.) NA
Iron, Fe^{+3}	0.31	0.02	EPA 200.7	0.10	pH	7.87	units	SM 4500 H B ± 0.01
Magnesium, Mg^{+2}	4.62	0.38	EPA 200.7	0.05	Temperature	68.0	°F	SM 2550 B ± 0.2
Potassium, K^{+1}	2.28	0.06	EPA 200.7	0.50	Total Diss. Solids (TDS)*	383.1	mg/L	(An-Cat Sum.) NA
Sodium, Na^{+1}	65.8	2.88	EPA 200.7	5.00	Total Diss. Solids @ 180 °c	NA	mg/L	Chevron NA
Strontium, Sr^{+2}	0.00	0.00	EPA 200.7	0.10				

Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Limits
Arsenic, As^{+3}	0.000	0.00	EPA 200.7	0.002	Meas EC - Calc EC =	0.9	**Note (0.9 - 1.1) EC	>2500
Silica, as SiO_2	43.0	6.19	EPA 200.7	0.10	TDS - EC Ratio =	0.70	**Note (0.55 - 0.70)	>2500
Sodium, Na^{+1} (Calc.)	65.8	2.86	API RP 45	NA	Measured EC - Ion Sum =	0.9	Cation (0.9 - 1.1) EC	
Chloride, Cl^{-1} (Calc.)	88.1	2.48	API RP 45	NA		1.1	Anion (0.9 - 1.1) EC	
Organic Alkalinity	0.0	0.00	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
					QC - Anion - Cation Balance Criteria			
					Anion Sum meq/L	meq/L SUM	Acceptable % Difference	
					0 - 3.0	NA	± 0.2 meq	
					3.0 - 10.0	NA	± 2 %	
					10.0 - 800	11	± 2 - 5 %	
					Anion - Cation Balance =	-8.2	%	

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum..

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate

this value (Ca^{+2} , SD^{+2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(±) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA; "Standard Methods for the Examination

of Water and Waste Water," 18-20 th. Ed. 1992-98

2. ASTM; "Water," 2007 American Society for Testing

and Material Vol. 11.04-02.

3. EPA; "Methods for Chemical Analysis of Water and

Waste," 1983 EPA-600/4-73-010

4. API; "Analysis of Oil-Field Waters," 1991 2nd. Ed. American

Petroleum Institute, API RP 45.

5. Palon, C.C.; "Applied Water Technology," 1988 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Date:

Laboratory Director

Midway Laboratory, Inc

Laboratory Report

ELAP Cert. 1386A

Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Tejon 1000

Log #: 16399-2
Date in: 5/7/09
Date out: 5/12/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL (mg/L)	Calculations	Results	Units	Method #	PQL (mg/L)
Bicarbonate, HCO ₃	304.6	4.99	SM 2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	249.7	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM 2320 B	0.20	Hardness, as CaCO ₃ (Total)	83.6	mg/L	SM 2340 B	0.10
Chloride, Cl	61.4	2.30	EPA 300.0	0.01	Salinity, as NaCl	147.1	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM 2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	0.15	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	0.24	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.268	NA	ASTM D 6919	0.005					
Barium, Ba	0.00	0.00	EPA 200.7	0.01	Conductivity (Measured)	780.0	µmho/cm	SM 2510 B	0.100
Boron, B	0.96	0.27	EPA 200.7	0.01	Resistivity	12.8205	ohm·m	(Calc.)	0.0005
Calcium, Ca	25.30	1.28	EPA 200.7	0.01	Specific Gravity (60/60)	1.0009	units	API RP 45	0.0005
Iron, Fe	0.17	0.01	EPA 200.7	0.01	Ionic strength	0.008	IS (µ)	(Calc.)	0.001
Magnesium, Mg	4.93	0.41	EPA 200.7	0.01	pH	8.14	units	SM 4500 H B	± 0.01
Potassium, K	2.31	0.06	EPA 200.7	0.01	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	117.0	5.09	EPA 200.7	0.01	Total Diss. Solids (TDS)*	637.0	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	38.9	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	117.2	5.10	API RP-45 2.10	
		Meas EC - Calc EC	1.0	(0.9-1.1) EC
		TDS - EC Ratio	0.69	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	(0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

ND - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

QC _____ Date _____

References

1. APHA-AWWA: "Standard Methods for the Examination of Water and Wastewater," 18-20 th. Ed. 1992-98
2. ASTM: "Water," 1990 American Society for Testing and Material V0911 01-02
3. EPA: "Methods for Chemical Analysis of Water and Wastes," 1990 EPA-820/4-79-020
4. API: "Analysis of Oil-Field Waters," 1991 2nd Ed. American Petroleum Institute, API RP 45
5. Patton, C.C. "Applied Water Technology," 1996 C. C. Patton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

_____ Date _____

Laboratory Report
ELAP CML 1296A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Tejon 1000

Log #: 18584-5
Date In: 6/18/09
Date out: 6/22/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL (mg/L)	Calculations	Results	Units	Method #	PQL (mg/L)
Bicarbonate, HCO ₃	305.9	5.01	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	250.8	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	91.0	mg/L	SM 2340 B	0.10
Chloride, Cl	112.0	3.16	EPA 300.0	0.01	Salinity, as NaCl	202.3	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	0.22	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	0.30	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL (mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.000	NA	ASTM D 5919	0.005					
Barium, Ba	0.00	0.00	EPA 200.7	0.01	Conductivity (Measured)	810.0	µmho's	SM 2510 B	0.100
Boron, B	0.23	0.08	EPA 200.7	0.01	Resistivity	12.3457	ohm's	(Calc.)	0.0005
Calcium, Ca	27.80	1.39	EPA 200.7	0.01	Specific Gravity (60/60)	0.9967	units	API RP 45	0.0005
Iron, Fe	0.13	0.01	EPA 200.7	0.01	Ionic strength	0.008	IS (µ)	(Calc.)	0.001
Magnesium, Mg	5.23	0.43	EPA 200.7	0.01	pH	8.18	units	SM 4500 H B	± 0.01
Potassium, K	2.46	0.06	EPA 200.7	0.01	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	115.0	5.00	EPA 200.7	0.01	Total Diss. Solids (TDS)*	588.8	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	38.1	N.A.	SM 3500-SI B	
Sodium, Na (Calc.)	116.3	5.06	API RP-45 2.10	
		Meas EC - Calc EC	1.0	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			1.0	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(E) = CaCO₃ is at equilibrium

QC _____ Date _____

References

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-98
2. ASTM, "Water," 1987 American Society for Testing and Material Vol 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1603 EPA-800/a-79-020
4. API, "Analysis of Oil Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 45.
5. Pison, C.C., "Applied Water Technology," 1988 C. C. Patton & Associates, Campbell Petroleum Service.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1286A
Geo-Chemical Water Analysis

Rev 7-10-09

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze
Sample Description: Tejon 1000

Log #: 16812-2
Date In: 8/5/09
Date Completed: 8/10/09
Date Reported: 8/10/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	307.0	5.03	SM2320 B	0.20					
Bromide, Br	0.0 X	0.00	EPA 300.0	0.05	Alkalinity, as CaCO_3 (Total)	251.7	mg/L	SM 3320 B	NA
Carbonate, CO_3^{-1}	0.00 X	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	251.7	mg/L	SM 3320 B	NA
Chloride, Cl^{-1}	75.1	2.12	EPA 300.0	0.05	Hardness, as CaCO_3 (Calc.)	97.9	mg/L	SM 2340 B	NA
Fluoride, F^{-1}	0.00 X	0.00	EPA 300.0	0.20	Refractive Index	NA	NA	NA	NA
Hydroxide, OH^{-1}	0.0 X	0.00	SM2320 B	0.20	Salinity, as NaCl	135.7	mg/L	(Calc.)	1.00
Iodide, I^{-1} (Iodine)	0.0 X	0.00	EPA 300.1	0.05	Calcium Carbonate				
Sulfate, SO_4^{-2}	0.00	0.00	EPA 300.0	0.05	Stability Index (Langier)	0.06	(Notes)	SM 2230 B	NA
Sulfide, S^{-1}	0.0 X	0.00	SM4500-S ²	1.00	Stability Index (Stiff Davis)	-0.02	NA	Ref. 4	NA
Sulfite, SO_3^{-2}	0.0 X	0.00	SM4500-SO ₃ ²⁻	1.00					

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00 X	0.00	ASTM D 6810	0.10	Conductivity (Measured)	630.0	µmho's	SM 2510 B 1000
Barium, Ba^{+2}	0.00	0.00	EPA 200.7	0.05	Resistivity	15.873	ohm's	(Calc.) NA
Boron, B^{+3}	0.15	0.04	EPA 200.7	0.10	Specific Gravity (90/90)	1.0017	Units	API RP 45 ±0.0001
Calcium, Ca^{+2}	29.9	1.49	EPA 200.7	0.05	Ionic strength	0.01	IS (µ)	(Calc.) NA
Iron, Fe^{+2}	0.17	0.01	EPA 200.7	0.10	pH	7.89	units	SM 4500 H B ± 0.01
Magnesium, Mg^{+2}	5.62	0.46	EPA 200.7	0.05	Temperature	60.0	°F	SM 2530 B ± 0.2
Manganese, Mn^{+2}	0.00 X	0.00	EPA 200.7	0.05	Total Diss. Solids (TDS)*	434.6	mg/L	(An-Cat Sum) NA
Potassium, K^{+1}	2.85	0.07	EPA 200.7	0.50	Total Diss. Solids @ 180 °c	NA	mg/L	Chevron NA
Sodium, Na^{+1}	13.8	0.60	EPA 200.7	5.00				
Strontium, Sr^{+2}	0.00 X	0.00	EPA 200.7	0.10				
Zinc, Zn^{+2}	0.00 X	0.00	EPA 200.7	0.02				

Other	mg/L	meq/L	Method #	PQL
Acetate	0.0 X	0.0	ASTM D 4327	1.00
Formate	0.0 X	0.0	ASTM D 4327	1.00
Propionate	0.0 X	0.0	ASTM D 4327	1.00
Organic Alkalinity	0 X	0.0	Chevron Pub	NA
Lithium, Li	0.0 X	0.0	EPA 200.7	0.02
Silica, as SiO_2	31.0	4.47	EPA 200.7	0.50
Sodium, Na^{+1} (Calc.)	13.8	0.60	API RP 45	NA

QC (Quality Control)	Results	Criteria	Limits
Meas EC - Calc EC =	1.1	*Note (0.9 - 1.1) EC	>2500
TDS - EC Ratio =	0.69	**Note (0.55 - 0.70)	>2500
Measured EC - Ion Sum =	1.1	Calc (0.9 - 1.1) EC	
	1.1	Anion (0.9 - 1.1) EC	
Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.99 - 1.02)	
QC - Anion - Cation Balance Criteria			
Anion Sum meq/L	meq/L SUM	Acceptable % Difference	
0 - 3.0	NA	± 0.2 meq	
3.0 - 10.0	NA	± 2 %	
10.0 - 500	14	± 2 - 5 %	
Anion - Cation Balance =	0.0	%	

Notes:

MDL - Method Detection Limit.

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (Below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate

this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index:

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(0) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 16-20 th. Ed. 1992-99
2. ASTM, "Water," 2007 American Society for Testing and Material Vol. 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-010D
4. API, "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 45.
5. Paster, C.C. "Applied Water Technology," 1998 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC _____ Date _____

Date: _____

Kurt R. Buckle, B.S. Vice-President, Laboratory Director Midway Laboratory, Inc.

Laboratory Report
ELAP Cert. 13084
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Tejon Fee 1000

Log #: 16989-3
Date In: 9/10/09
Date out: 9/15/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	319.4	5.23	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	261.8	mg/l	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	92.9	mg/l	SM 2340 B	0.10
Chloride, Cl	75.8	2.14	EPA 300.0	0.01	Salinity, as NaCl	136.9	mg/l	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	0.13	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	0.22	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.00	NA	ASTM D 6919	0.50				
Barium, Ba	0.00	0.00	EPA 200.7	0.05	Conductivity (Measured)	792.0	µmho's	SM 2510 B
Boron, B	0.23	0.06	EPA 200.7	0.10	Resistivity	12.6263	ohm's	(Calc.)
Calcium, Ca	26.20	1.41	EPA 200.7	0.05	Specific Gravity (60/60)	0.9978	units	API RP 45
Iron, Fe	0.20	0.01	EPA 200.7	0.10	Ionic strength	0.008	IS (µ)	(Calc.)
Magnesium, Mg	5.45	0.45	EPA 200.7	0.05	pH	8.05	units	SM 4500 H B
Potassium, K	2.51	0.06	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B
Sodium, Na	128	5.48	EPA 200.7	5.00	Total Diss. Solids (TDS)*	557.8	mg/L	(Calc.)
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D

Other	QC	Results	Range	Units
Silica, as SiO ₂	36.4	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	125.9	5.48	API RP-45 2.10	
		Meas EC - Calc EC	1.0	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.55-0.70) → 2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDE* - Cation and anion summation

N.A. - Not applicable to report

QC _____ Date _____

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(e) = CaCO₃ is at equilibrium

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-98
2. ASTM: "Water," 1983 American Society for Testing and Material Vol 11.01-02
3. EPA: "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-600/4-79-020
4. API: "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP #5
5. Patton, C.C.: "Applied Water Technology," 1988 C. C. Patton & Associates, Campbell Petroleum Series

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP CWT 1388A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Winspear 1000

Log #: 16399-4
Date in: 5/7/09
Date out: 5/12/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	358.2	5.03	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	301.8	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	139.1	mg/L	SM 2340 B	0.10
Chloride, Cl	53.3	1.50	EPA 300.0	0.01	Salinity, as NaCl	95.3	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	0.23	(None)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	0.31	(None)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01	Conductivity (Measured) Resistivity Specific Gravity (60/60) Ionic strength pH Temperature Total Diss. Solids (TDS)* Total Susp. Solids (TSS)	820.0	µmho/c	SM 2510 B	0.100
Arsenic, As	0.000	NA	ASTM D 6519	0.005		12.1951	ohm's	(Calc.)	0.0005
Barium, Ba	0.00	0.00	EPA 200.7	0.01		1.0011	units	API RP 45	0.0005
Boron, B	1.13	0.31	EPA 200.7	0.01		0.009	IS (µ)	(Calc.)	0.001
Calcium, Ca	38.50	1.92	EPA 200.7	0.01		7.95	units	SM 4500 H B	± 0.01
Iron, Fe	1.24	0.07	EPA 200.7	0.01		68.0	°F	SM 2550 B	± 0.1
Magnesium, Mg	10.40	0.88	EPA 200.7	0.01		587.7	mg/L	(Calc.)	0.1
Potassium, K	3.08	0.08	EPA 200.7	0.01		NA	mg/L	SM 2540 D	5.0
Sodium, Na	91.8	3.99	EPA 200.7	0.01					
Strontium, Sr	0.00	0.00	EPA 200.7	0.01					
Other					QC	Results	Range	Limits	
Silica, as SiO2	87.7	N.A.	SM 3500-Si B		Meas EC - Calc EC	1.1	(0.9-1.1) EC		
Sodium, Na (Calc.)	92.1	4.01	API RP-45 2.10		TDS - EC Ratio	0.69	(0.55-0.70)	>2500 TDS	
					Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC		
						0.9	Anion (0.9-1.1) EC		

Notes:

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

ND - Not Detected (below PQL)

TDS* - Cation and anion sum/2000

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(=) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 th. Ed. 1992-98
2. ASTM "Water," 1983 American Society for Testing and Material Vol11 D1-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1961 2nd. Ed. American Petroleum Institute, API 89-45
5. Patton, C.C. "Applied Water Technology," 1986 C.C. Patton & Associates, Campbell Petroleum Series.

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP CML 1316A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Winspear 1000

Log #: 16958-1
Date in: 9/3/09
Date out: 9/14/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	292.5	4.79	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	239.7	mg/L	SM 3320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	89.4	mg/L	SM 2340 B	0.10
Chloride, Cl	66.7	1.68	EPA 300.0	0.01	Salinity, as NaCl	120.5	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.34	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.20	0.00	EPA 300.0	0.02	Langelier Saturation Index	-0.25	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6919	0.500					
Barium, Ba	0.08	0.00	EPA 200.7	0.05	Conductivity (Measured)	758.0	µmho's	SM 2510 B	0.100
Boron, B	0.20	0.06	EPA 200.7	0.10	Resistivity	13.1926	ohm's	(Calc.)	0.0005
Calcium, Ca	24.6	1.23	EPA 200.7	0.05	Specific Gravity (60/60)	0.9976	units	API RP 45	0.0005
Iron, Fe	0.34	0.02	EPA 200.7	0.10	Ionic strength	0.007	IS (µ)	(Calc.)	0.001
Magnesium, Mg	6.78	0.58	EPA 200.7	0.05	pH	7.68	units	SM 4500 H B	± 0.01
Potassium, K	2.68	0.07	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	105	4.57	EPA 200.7	5.00	Total Diss. Solids (TDS)*	499.0	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Limits
Silica, as SiO ₂	85.2	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	105.2	4.58	API RP-45 2.10	
		Meas EC - Calc EC	1.1	(0.9-1.1) EC
		TDS - EC Ratio	0.66	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved with specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation.

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Waste Water," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 1993 American Society for Testing and Materials Vol 11 01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP-45
5. Popho, C. C., "Applied Water Technology," 1998 C. C. Popho & Associates, Campbell Petroleum Series

QC _____ Date _____

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1796A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Winspear 1000

Log #: 17104-4
Date In: 10/11/09
Date out: 10/13/09

Rev 10-3-03

Anions	mg/L	meq/L	Method #	PQL (mg/L)	Calculations	Results	Units	Method #	PQL (mg/L)
Bicarbonate, HCO ₃	348.7	5.71	SM 2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	285.8	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM 2320 B	0.20	Hardness, as CaCO ₃ (Total)	133.2	mg/L	SM 2340 B	0.10
Chloride, Cl	54.1	1.53	EPA 300.0	0.01	Salinity, as NaCl	97.7	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM 2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	0.40	(Notes)	SM 2330 B	N.A.
Sulfate, SO ₄	0.90	0.02	EPA 300.0	0.02	Langelier Saturation Index	0.49	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL (mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.00	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6919	0.10					
Barium, Ba	0.14	0.00	EPA 200.7	0.05	Conductivity (Measured)	770.0	µmho's	SM 2510 B	0.100
Boron, B	0.13	0.03	EPA 200.7	0.10	Resistivity	12.9870	ohm's	(Calc.)	0.0005
Calcium, Ca	36.5	1.82	EPA 200.7	0.05	Specific Gravity (60/60)	1.0002	units	API RP 45	0.0005
Iron, Fe	0.22	0.01	EPA 200.7	0.10	Ionic strength	0.008	IS (µ)	(Calc.)	0.001
Magnesium, Mg	10.2	0.84	EPA 200.7	0.05	pH	8.17	units	SM 4500 H B	± 0.01
Potassium, K	3.16	0.08	EPA 200.7	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	87.3	3.80	EPA 200.7	5.00	Total Diss. Solids (TDS)*	541.3	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	81.7	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	88.0	3.83	API RP-45 2.10	
		Meas EC - Calc EC	1.1	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.65-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(±) = CaCO₃ is at equilibrium

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20 th. Ed. 1992-98
2. ASTM, "Water," 1993 American Society for Testing and Material Vol11 D1-D2
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800-A-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd. Ed. American Petroleum Institute, API RP 43
5. Patton, C.C. "Applied Water Technology," 1985 C. C. Patton & Associates, Campbell Petroleum Series.

QC _____ Date _____

Kurt R. Buckle
Laboratory Director
Midway Laboratory, Inc.

_____, Date _____

Laboratory Report
ELAP Cert. 1386A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S
Sample Description: Winspear 1000

Log #: 17288-3
Date in: 11/5/09
Date out: 11/18/09

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	343	5.61	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	280.8	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	135.2	mg/L	SM 2340 B	0.10
Chloride, Cl	57	1.61	EPA 300.0	0.01	Salinity, as NaCl	102.8	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.04	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.00	0.00	EPA 300.0	0.02	Langelier Saturation Index	0.05	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.000	0.00	ASTM D 6819	0.002				
Barium, Ba	0.13	0.00	EPA 200.7	0.05	Conductivity (Measured)	770.0	µmho's	SM 2510 B 0.100
Boron, B	0.14	0.04	EPA 200.7	0.10	Resistivity	12.9870	ohm's	(Calc.) 0.0005
Calcium, Ca	37.1	1.85	EPA 200.7	0.05	Specific Gravity (60/60)	1.0002	units	API RP 45 0.0005
Iron, Fe	0.27	0.01	EPA 200.7	0.10	Ionic strength	0.008	IS (µ)	(Calc.) 0.001
Magnesium, Mg	10.3	0.85	EPA 200.7	0.05	pH	7.73	units	SM 4500 H B ± 0.01
Potassium, K	2.87	0.07	EPA 200.7	0.50	Temperature	58.0	°F	SM 2550 B ± 0.1
Sodium, Na	87.5	3.81	EPA 200.7	5.00	Total Diss. Solids (TDS)*	537.8	mg/L	(Calc.) 0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D 5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	73.8	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	88.1	3.83	API RP-45 2.10	
		Meas EC - Calc EC	1.1	(0.9-1.1) EC
		TDS - EC Ratio	0.70	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Projected Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Carbon and anion summation

N.A. - Not applicable to report

Calcium Carbonate

Stability Index

(-) = CaCO₃ will tend to precipitate

(+) = CaCO₃ will tend to dissolve

(e) = CaCO₃ is at equilibrium

QC _____ Date _____

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-98
2. ASTM, "Water," 1983 American Society for Testing and Material Vol 11.01-02
3. EPA, "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API, "Analysis of Oil-Field Waters," 1981 2nd Ed. American Petroleum Institute, API RP 45
5. Patton, C.C. "Applied Water Technology," 1998 C. C. Patton & Associates, Campbell Petroleum Series

Laboratory Director
Midway Laboratory, Inc.

_____ Date _____

Laboratory Report
ELAP Cert. 1396A
Geo-Chemical Water Analysis

Rev 12-18-08

Customer: Chevron Corporation
Address: 8525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Semprun
Sample Description: Vinaprep 1000

Log #: 17433-8
Date In: 12/3/09
Date Completed: 12/7/09
Date Reported: 12/14/09

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	348.8	5.71	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	285.9	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alc.)	285.9	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	49.8	1.40	SM4500-Cl ⁻¹	0.05	Hardness, as CaCO_3 (Calc.)	135.0	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. Na+Cl	417.0	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.8	0.02	SM4500-SO ₄ ⁻²	1.0	Salinity, from Chlorosely	90.0	mg/L	(Calc.)	NA
Sulfide, S^{-2}	0.0	X	SM4500-S ⁻²	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0	X	SM4500-SO ₃ ⁻²	1.0	Stability Index (Langier)	0.06	(None)	SM 2330 B	NA
					Stability Index (Stiff-Davis)	-0.03	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00	X	ASTM D 6916	0.10	Conductivity (Measured)	800.0	µmho's	SM 2310 B 1000
Barium, Ba^{+2}	0.14	0.00	EPA 200.7	0.05	Resistivity	12.500	ohm's	(Calc.) NA
Boron, B^{+3}	0.10	0.03	EPA 200.7	0.10	Specific Gravity (80/60)	1.0010	units	API RP 45 40,000
Calcium, Ca^{+2}	38.1	1.90	EPA 200.7	0.05	Ionic strength	0.01	is (µ)	(Calc.) NA
Iron, Fe^{+3}	0.51	0.03	EPA 200.7	0.10	pH	7.72	units	SM 4500 H B ± 0.01
Magnesium, Mg^{+2}	9.65	0.79	EPA 200.7	0.05	Temperature	60.0	°F	SM 2350 B ± 0.2
Potassium, K^{+1}	2.45	0.06	EPA 200.7	0.50	Total Diss. Solids (TDS)*	549.7	mg/L	(An-Cat Sum.) NA
Sodium, Na^{+1}	99.3	4.32	EPA 200.7	5.00	Total Diss. Solids @ 180 °c	NA	mg/L	Chevron NA
Strontium, Sr^{+2}	0.00	X	EPA 200.7	0.10				

Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Limits
Arsenic, As	0.000	0.00	EPA 200.7	0.002	Meas EC - Calc EC =	1.0	*Note (0.9 - 1.1) EC	>2500
Silica, as SiO_2	73.8	10.63	EPA 200.7	0.10	TDS - EC Ratio =	0.66	**Note (0.55 - 0.70) EC	>2500
Sodium, Na^{+1} (Calc.)	99.3	4.32	API RP 45	NA	Measured EC - Ion Sum =	0.9	Cation (0.9 - 1.1) EC	
Chloride, Cl^{-1} (Calc.)	49.8	1.41	API RP 45	NA		0.9	Anion (0.9 - 1.1) EC	
Organic Alkalinity	0.0	X	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na (0.98 - 1.02)	
					NaCl/(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
					QC - Anion - Cation Balance Criteria			
					Anion Sum (meq/L)	meq/L, SUM	Acceptable % Difference	
					0 - 3.5	NA	± 0.2 meq	
					3.5 - 10.0	NA	± 2 %	
					10.0 - 500	14	± 2 - 5 %	
					Anion - Cation Balance =	0.0	%	

Notes:

MDL - Method Detection Limit
PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate

this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(s) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Waste Water," 18-20 Ed, Ed 1992-98
2. ASTM: "Water," 2007 American Society for Testing and Material Vol. 11 01-02
3. EPA: "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
4. API: "Analysis of Oil-Field Waters," 1961 2nd. Ed. American Petroleum Institute, API RP 45.
5. Patton, C.C.: "Applied Water Technology," 1965 Campbell Petroleum Series.

The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Date:

Laboratory Director

Midway Laboratory, Inc.

Laboratory Report
ELAP Cert. 1294A
Geo-Chemical Water Analysis

Rev 12-18-09

Customer: Chevron Corporation
Address: 8525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla Sempton
Sample Description: Winspear 1000

Log #: 17830-5
Date In: 1/14/10
Date Completed: 1/20/10
Date Reported: 1/21/10

Anions	mg/L	meq/L	Method #	PQL	Calculations	Results	Units	Method #	PQL
Bicarbonate, HCO_3^{-1}	357.2	5.85	SM2320 B	0.20	Alkalinity, as CaCO_3 (Total)	292.8	mg/L	SM 2320 B	NA
Carbonate, CO_3^{-1}	0.0	0.00	SM2320 B	0.20	as CaCO_3 (less Org. Alk.)	292.8	mg/L	SM 2320 B	NA
Chloride, Cl^{-1}	61.8	1.74	SM4500-Cl ⁻¹	0.05	Hardness, as CaCO_3 (Calc.)	144.4	mg/L	SM 2340 B	NA
Hydroxide, OH^{-1}	0.0	0.00	SM2320 B	0.20	Salinity, calc. Na+Cl	427.1	mg/L	(Calc.)	NA
Sulfate, SO_4^{-2}	0.0	0.00	SM4500-SO ₄ ⁻²	1.0	Salinity, from Chlorosity	111.6	mg/L	(Calc.)	NA
Sulfide, S^{-1}	0.0 X	0.00	SM4500-S ⁻¹	1.0	Calcium Carbonate				
Sulfite, SO_3^{-2}	0.0 X	0.00	SM4500-SO ₃ ⁻²	1.0	Stability Index (Langier)	0.03	(Notes)	SM 2330 B	NA
					Stability Index (Stiff-Davis)	-0.06	NA	Ref. 4	NA

Cations	mg/L	meq/L	Method #	PQL	Physical Data	Results	Method #	PQL
Ammonium, NH_4^{+1}	0.00 X	0.00	ASTM D 6619	0.10	Conductivity (Measured)	799.0	µmho's	SM 2510 B 1000
Barium, Ba^{+2}	0.15	0.00	EPA 200.7	0.05	Resistivity	12.516	ohm's	(Calc.) NA
Boron, B^{+3}	0.13	0.04	EPA 200.7	0.10	Specific Gravity (60/60)	1.0008	units	API RP 45 ±0.0003
Calcium, Ca^{+2}	40.3	2.01	EPA 200.7	0.05	Ionic strength	0.01	IS (µ)	(Calc.) NA
Iron, Fe^{+3}	0.27	0.01	EPA 200.7	0.10	pH	7.66	units	SM 4500 H B ± 0.01
Magnesium, Mg^{+2}	10.6	0.87	EPA 200.7	0.05	Temperature	60.0	°F	SM 2550 B ± 0.2
Potassium, K^{+1}	3.03	0.08	EPA 200.7	0.50	Total Diss. Solids (TDS)*	562.0	mg/L	(An-Cal Sum.) NA
Sodium, Na^{+1}	88.5	3.85	EPA 200.7	5.00	Total Diss. Solids @ 180 °C	NA	mg/L	Chevron NA
Strontium, Sr^{+2}	0.00 X	0.00	EPA 200.7	0.10				

Other	mg/L	meq/L	Method #	PQL	QC (Quality Control)	Results	Criteria	Limits
Arsenic, As	0.420	0.02	EPA 200.7	0.002	Meas EC - Calc EC =	0.8	Note (0.8 - 1.1) EC	>2500
Silica, as SiO_2	78.5	11.31	EPA 200.7	0.10	TDS - EC Ratio =	0.70	Note (0.55 - 0.70)	>2500
Sodium, Na^{+1} (Calc.)	88.5	3.85	API RP 45	NA	Measured EC - Ion Sum =	0.8	Cation (0.8 - 1.1) EC	
Chloride, Cl^{-1} (Calc.)	35.9	1.01	API RP 46	NA		1.0	Anion (0.8 - 1.1) EC	
Organic Alkalinity	0.0 X	0.00	Chevron Calc.	NA	Calc. Na - Actual Na =	1.00	Na/Na (0.95 - 1.02)	
					NaClW(NaCl Calc.) =	1.00	Na/Cl (0.98 - 1.02)	
					QC - Anion - Cation Balance Criteria			
					Anion Sum meq/L	meq/L SUM	Acceptable % Difference	
					0 - 3.0	NA	± 0.2 meq	
					3.0 - 10.0	NA	± 2 %	
					10.0 - 800	14	± 2 - 5 %	
					Anion - Cation Balance =	-5.0	%	

Notes:

MDL - Method Detection Limit.
PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology (5X MDL).

N.D. - Not Detected (below PQL)

TDS* - Cation and anion sum.

NA - Not applicable to report.

Σ = Sum

** Dissociated ions may elevate

this value (Ca^{+2} , SO_4^{-2} etc.)

X = Not Analyzed for

Calcium Carbonate

Stability Index:

(+) = CaCO_3 will tend to precipitate.

(-) = CaCO_3 will tend to dissolve.

(s) = CaCO_3 is at equilibrium.

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Wastewater," 18-20 th. Ed. 1992-98
 2. ASTM: "Water," 2007 American Society for Testing and Material Vol. 11 01-02
 3. EPA: "Methods for Chemical Analysis of Water and Waste," 1983 EPA-600/4-73-020
 4. API: "Analysis of Oil-Field Waters," 1991 2nd. Ed. American Petroleum Institute, API RP 45,
 5. Patton, C.C., "Applied Water Technology," 1988 Campbell Petroleum Series.
- The Quality of the Analysis is Only as Good as the Quality of the Sample

Comments:

QC

Date

Date:

Laboratory Director Midway Laboratory, Inc.

Laboratory Report
ELAP Cert. 1396A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franze, Carla S

Log #: 17240-1
Date in: 10/28/09
Date out: 11/9/09

Sample Description: Total Interdiction Water (comingled point) 24" pipe

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	334.1	5.47	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	273.8	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	87.6	mg/L	SM 2340 B	0.10
Chloride, Cl	81.4	2.30	EPA 300.0	0.01	Salinity, as NaCl	147.1	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Silt Davis)	-0.18	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.50	0.01	EPA 300.0	0.02	Langelier Saturation Index	-0.09	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL
Ammonia, NH ₂	0.00	0.00	EPA 200.7	0.01				
Arsenic, As	0.00	NA	ASTM D 6919	0.10				
Barium, Ba	0.00	0.00	SM3500-Ba B	0.50	Conductivity (Measured)	850.0	umho's	SM 2510 B
					Resistivity	11.7647	ohm's	(Calc.)
Calcium, Ca	23.6	1.17	SM3500-Ca B	0.50	Specific Gravity (60/60)	1.0005	units	API RP 46
Iron, Fe	0.00	0.00	SM3500-Fe B	1.00	Ionic strength	0.009	IS (u)	(Calc.)
Magnesium, Mg	7.00	0.58	SM3500-Mg B	0.50	pH	7.80	units	SM 4500 H B
Potassium, K	1.80	0.05	SM3500-K B	0.50	Temperature	68.0	°F	SM 2550 B
Sodium, Na	135	5.87	SM3500-Na B	5.00	Total Diss. Solids (TDS)*	583.3	mg/L	(Calc.)
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D

Other	QC	Results	Range	Limit
Silica, as SiO ₂	48.8	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	135.2	5.88	API RP-45 2-10	
		Meas EC - Calc EC	1.0	(0.9-1.1) EC
		TDS - EC Ratio	0.69	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes:

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

N.D. - Not Detected (below PQL)

TDS* - Cation and anion summation

N.A. - Not applicable to report.

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate

(-) = CaCO₃ will tend to dissolve

(s) = CaCO₃ is at equilibrium

References:

1. APHA-AWWA, "Standard Methods for the Examination of Water and Wastewater," 18-20th Ed. 1992-96
2. ASTM, "Water," 1983 American Society for Testing and Material Vol11 D1-D2
3. EPA, "Methods for Chemical Analysis of Water and Wastewater," 1983 EPA-800/4-70-020
4. API, "Analysis of Oil-Field Water," 1981 2nd Ed. American Petroleum Institute, API RP 45
5. Patton, G.C., "Applied Water Technology," 1985 G. C. Patton & Associates, Campbell Petroleum Series

QC _____ Date _____

Laboratory Director
Midway Laboratory, Inc.

Date _____

Laboratory Report
ELAP Cert. 1386A
Geochemical Water Analysis

Customer: Chevron Corporation
Address: 9525 Camino Media
Bakersfield, CA 93311
Attention: Ray Franza, Carla S

Log #: 17240-1
Date In: 10/28/09
Date out: 11/16/09

Sample Description: Total Interdiction Water (comingled point) 24" pipe

Rev 10-3-08

Anions	mg/L	meq/L	Method #	PQL(mg/L)	Calculations	Results	Units	Method #	PQL(mg/L)
Bicarbonate, HCO ₃	334.1	5.47	SM2320 B	0.20	Alkalinity, as CaCO ₃ (Total)	273.8	mg/L	SM 2320 B	0.10
Carbonate, CO ₃	0.00	0.00	SM2320 B	0.20	Hardness, as CaCO ₃ (Total)	87.6	mg/L	SM 2340 B	0.10
Chloride, Cl	81.4	2.30	EPA 300.0	0.01	Salinity, as NaCl	147.1	mg/L	(Calc.)	1.00
Hydroxide, OH	0.00	0.00	SM2320 B	0.20	Calcium Carbonate				
Nitrate, NO ₃	0.00	0.00	EPA 300.0	0.01	Stability Index (Stiff Davis)	-0.18	(Notes)	SM 2230 B	N.A.
Sulfate, SO ₄	0.50	0.01	EPA 300.0	0.02	Langelier Saturation Index	-0.09	(Notes)	SM 203	N.A.

Cations	mg/L	meq/L	Method #	PQL(mg/L)	Physical Data	Results	Method #	PQL	
Ammonia, NH2	0.000	0.00	EPA 200.7	0.01					
Arsenic, As	0.00	NA	ASTM D 6919	0.10					
Barium, Ba	0.00	0.00	SM3500-Ba B	0.50	Conductivity (Measured)	850.0	umho/cm	SM 2510 B	0.100
Boron, B	0.14	0.04	EPA 200.7	0.10	Resistivity	11.7647	ohm-cm	(Calc.)	0.0005
Calcium, Ca	23.5	1.17	SM3500-Ca B	0.50	Specific Gravity (80/60)	1.0005	units	API RP 46	0.0005
Iron, Fe	0.00	0.00	SM3500-Fe B	1.00	Ionic strength	0.009	IS (μ)	(Calc.)	0.001
Magnesium, Mg	7.00	0.58	SM3500-Mg B	0.50	pH	7.80	units	SM 4500 H B	± 0.01
Potassium, K	1.80	0.05	SM3500-K B	0.50	Temperature	68.0	°F	SM 2550 B	± 0.1
Sodium, Na	135	5.87	SM3500-Na B	5.00	Total Diss. Solids (TDS)*	583.4	mg/L	(Calc.)	0.1
Strontium, Sr	0.00	0.00	EPA 200.7	0.01	Total Susp. Solids (TSS)	NA	mg/L	SM 2540 D	5.0

Other	QC	Results	Range	Units
Silica, as SiO ₂	48.8	N.A.	SM 3500-Si B	
Sodium, Na (Calc.)	135.1	5.88	API RP-45 2.10	
		Meas EC - Calc EC	1.0	(0.9-1.1) EC
		TDS - EC Ratio	0.69	(0.55-0.70) >2500 TDS
		Measured EC - Ion Sum	0.9	Cation (0.9-1.1) EC
			0.9	Anion (0.9-1.1) EC

Notes

PQL - Practical Quantitation Limit - The lowest level that can be reliably achieved within specific limits of precision and accuracy of the analytical methodology.

ND - Not Detected (below PQL)

TDS* - Carbon and silicon summation.

N.A. - Not applicable to report.

QC _____ Date _____

Calcium Carbonate

Stability Index

(+) = CaCO₃ will tend to precipitate.

(-) = CaCO₃ will tend to dissolve.

(0) = CaCO₃ is at equilibrium.

* Boron not analyzed

References:

1. APHA-AWWA: "Standard Methods for the Examination of Water and Wastewater," 18-20 ed. Ed. 1992-98
2. ASTM: "Water," 1993 American Society for Testing and Material Vol11 D1-D2
3. EPA: "Methods for Chemical Analysis of Water and Wastes," 1983 EPA-800/4-79-020
4. API: "Analysis of Oil-Field Waters," 1983 2nd Ed. American Petroleum Institute, API 200-45
5. Patton, C. C. "Applied Water Technology," 1986 C. C. Patton & Associates, Campbell Petroleum Series.

Laboratory Director
Midway Laboratory, Inc.

Date _____

Date of Report: 06/16/2014

Dennis Gatson

McMor Chlorination, Inc.

6734 Charity Ave. #8

Bakersfield, CA 93308

Client Project: Chevron

BCL Project: Bacteriological

BCL Work Order: 1412972

Invoice ID:

Enclosed are the results of analyses for samples received by the laboratory on 6/11/2014. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Contact Person: Misty Orton
Client Service Rep



Authorized Signature

Certifications: CA ELAP #1186; NV #CA00014; AK UST101

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 06/16/2014 14:51
Project: Bacteriological
Project Number: Chevron
Project Manager: Dennis Gatson

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1412972-01	COC Number:	---	Receive Date:	06/11/2014 08:10
	Project Number:	---	Sampling Date:	06/11/2014 07:19
	Sampling Location:	---	Sample Depth:	---
	Sampling Point:	Chevron, Monte Cristo Well	Lab Matrix:	Water
	Sampled By:	K. Stanley	Sample Type:	Water
			District ID:	
			System Number:	
			Station Number:	
			Sample Site:	Other
			Residual Chlorine, ppm:	
			Lab Temperature, C:	8.9

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 06/16/2014 14:51
Project: Bacteriological
Project Number: Chevron
Project Manager: Dennis Gatson

1412972-01

Water Analysis (Bacteriological)

COC Number:	---	District ID:	
Project Number:	---	System Number:	
Sampling Location:	---	Station Number:	
Sampling Point:	Chevron, Monte Cristo Well	Sample Site:	Other
Sampled By:	K. Stanley	Residual Chlorine, ppm:	
Receive Date:	06/11/2014 08:10	Temperature, C:	8.9
Sampling Date:	06/11/2014 07:19		
Sample Depth:	---		
Sample Matrix:	Water		

Colilert (10 Tubes)

Constituent	Result	Units	Method	Analyst	Initial Dilution	Date Started	Date Completed	Lab Quals
Total Coliform, Confirmed Test	0	Positive Tubes	SM-9223B	FBV	1	06/11/2014 10:30	06/12/2014	
Total Coliform, Density	< 1.1	MPN/100ml	SM-9223B	FBV	1	06/11/2014 10:30	06/12/2014	
E. Coli, Confirmed Test	0	Positive Tubes	SM-9223B	FBV	1	06/11/2014 10:30	06/12/2014	
E. Coli, Density	< 1.1	MPN/100ml	SM-9223B	FBV	1	06/11/2014 10:30	06/12/2014	

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 06/16/2014 14:51
Project: Bacteriological
Project Number: Chevron
Project Manager: Dennis Gatson

Notes And Definitions

MPN Most Probable Number

Date of Report: 05/20/2014

Dennis Gatson

McMor Chlorination, Inc.

6734 Charity Ave. #8

Bakersfield, CA 93308

Client Project: EH - 563 Chevron Monte Cristo Road

BCL Project: Drinking Water Samples

BCL Work Order: 1410663

Invoice ID:

Enclosed are the results of analyses for samples received by the laboratory on 5/13/2014. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Contact Person: Misty Orton
Client Service Rep



Authorized Signature

Certifications: CA ELAP #1186; NV #CA00014; AK UST101

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RUSH!

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Laboratories, Inc.

Environmental Testing Laboratory Since 1949

Chain of Custody and Cooler Receipt Form for 1410663 Page 2 of 2

BC LABORATORIES INC.		COOLER RECEIPT FORM		Rev. No. 15	07/01/13	Page 1 Of 1					
Submission #: <u>14-10663</u>											
SHIPPING INFORMATION Federal Express <input type="checkbox"/> UPS <input type="checkbox"/> Hand Delivery <input checked="" type="checkbox"/> BC Lab Field Service <input type="checkbox"/> Other <input type="checkbox"/> (Specify) _____				SHIPPING CONTAINER Ice Chest <input checked="" type="checkbox"/> None <input type="checkbox"/> Box <input type="checkbox"/> Other <input type="checkbox"/> (Specify) _____		FREE LIQUID YES <input type="checkbox"/> NO <input type="checkbox"/>					
Refrigerant: Ice <input type="checkbox"/> Blue Ice <input checked="" type="checkbox"/> None <input type="checkbox"/> Other <input type="checkbox"/> Comments: _____											
Custody Seals Ice Chest <input type="checkbox"/> Containers <input type="checkbox"/> None <input checked="" type="checkbox"/> Comments: _____ Intact? Yes <input type="checkbox"/> No <input type="checkbox"/> Intact? Yes <input type="checkbox"/> No <input type="checkbox"/>											
All samples received? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> All samples containers intact? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Description(s) match COC? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>											
COC Received <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		Emissivity: <u>0.95</u> Container: <u>Qrpe</u> Thermometer ID: <u>207</u> Date/Time: <u>5/13/14</u> Temperature: (A) <u>21.8</u> °C (C) <u>21.8</u> °C Analyst Init: <u>Mam 1523</u>									
SAMPLE CONTAINERS		SAMPLE NUMBERS									
		1	2	3	4	5	6	7	8	9	10
QT GENERAL MINERAL/ GENERAL		BC									
PT PE UNPRESERVED											
QT INORGANIC CHEMICAL METALS											
PT INORGANIC CHEMICAL METALS		D									
PT CYANIDE											
PT NITROGEN FORMS											
PT TOTAL SULFIDE											
2oz. NITRATE / NITRITE											
PT TOTAL ORGANIC CARBON											
PT TOX											
PT CHEMICAL OXYGEN DEMAND											
PIA PHENOLICS											
40ml VOA VIAL TRAVEL BLANK											
40ml VOA VIAL		()	()	()	()	()	()	()	()	()	()
QT EPA 413.1, 413.2, 418.1											
PT ODOR											
RADIOLOGICAL											
BACTERIOLOGICAL											
40 ml VOA VIAL- 504		A(3)									
QT EPA 508/608/8080											
QT EPA 515.1/8150											
QT EPA 525											
QT EPA 525 TRAVEL BLANK											
100ml EPA 547											
100ml EPA 531.1											
QT EPA 548											
QT EPA 549											
QT EPA 632											
QT EPA 8015M											
QT AMBER											
8 OZ. JAR											
32 OZ. JAR											
SOIL SLEEVE											
PCB VIAL											
PLASTIC BAG											
FERROUS IRON											
ENCORE											
SMART KIT											
Summa Canister											

Comments:

Sample Numbering Completed By: MV1 Date/Time: 5/13/14 1550

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1410663-01	COC Number:	---	Receive Date:	05/13/2014 15:23
	Project Number:	---	Sampling Date:	05/13/2014 10:54
	Sampling Location:	---	Sample Depth:	---
	Sampling Point:	Well Discharge - KSI Yard - Monte Cristo Rd.		
	Sampled By:	K. Stanley		
			Lab Matrix:	Water
			Sample Type:	Drinking Water

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

EDB/DBCP Analysis (EPA Method 504.1)

BCL Sample ID:	1410663-01	Client Sample Name:	Well Discharge - KSI Yard - Monte Cristo Rd., 5/13/2014 10:54:00AM, K. Stanley					
Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
1,2-Dibromo-3-chloropropane	<0.010	ug/L	0.010		EPA-504.1	ND		1
Ethylene dibromide	<0.010	ug/L	0.010		EPA-504.1	ND		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-504.1	05/15/14	05/16/14 15:19	VH1	GC-4	0.949	BXE1366

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Water Analysis (General Chemistry)

BCL Sample ID: 1410663-01		Client Sample Name: Well Discharge - KSI Yard - Monte Cristo Rd., 5/13/2014 10:54:00AM, K. Stanley						
Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Calcium	83	mg/L	0.10		EPA-6010B	ND		1
Dissolved Magnesium	2.4	mg/L	0.050		EPA-6010B	ND		1
Dissolved Sodium	78	mg/L	0.50		EPA-6010B	ND		1
Dissolved Potassium	3.5	mg/L	1.0		EPA-6010B	ND		1
Bicarbonate	38	mg/L	5.0		EPA-310.1	ND		2
Carbonate	<2.5	mg/L	2.5		EPA-310.1	ND		2
Hydroxide	<1.4	mg/L	1.4		EPA-310.1	ND		2
Chloride	160	mg/L	0.50		EPA-300.0	ND		3
Fluoride	<0.050	mg/L	0.050		EPA-300.0	ND		3
Nitrate as N	<0.10	mg/L	0.10		EPA-300.0	ND		3
Nitrate as NO3	<0.44	mg/L	0.44		Calc	ND		4
Sulfate	150	mg/L	1.0		EPA-300.0	ND		3
Dissolved Total Cations	7.8	meq/L	0.10		Calc	ND		4
Total Anions	8.2	meq/L	0.10		Calc	ND		4
Adjusted Sodium Adsorption Ratio (SAR-adj)	2.9	NA	0.010		Calc	ND		4
Extractable Sodium Percentage (ESP)	2.1	NA	0.010		Calc	ND		4
Gypsum Requirement	<0.010	#100% gyp/hr/10 0 gal	0.010		Calc	ND		4
Dissolved Hardness as CaCO3	220	mg/L	0.50		Calc	ND		4
pHc	8.1	NA	0.010		Calc	ND		4
Sodium Adsorption Ratio (SAR)	2.3	NA	0.10		Calc	ND		4
TDS (by summation)	500	mg/L	10		Calc	ND		4
pH	7.76	pH Units	0.05		EPA-150.1		S05	5
Electrical Conductivity @ 25 C	853	umhos/cm	1.00		EPA-120.1			6

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	05/14/14	05/16/14 16:22	ARD	PE-OP1	1	BXE1092
2	EPA-310.1	05/14/14	05/14/14 12:10	RML	MET-1	1	BXE1212
3	EPA-300.0	05/13/14	05/14/14 01:54	LD1	IC2	1	BXE1198
4	Calc	05/13/14	05/19/14 16:36	TMS	Calc	1	BXE1137
5	EPA-150.1	05/14/14	05/14/14 12:10	RML	MET-1	1	BXE1212
6	EPA-120.1	05/14/14	05/14/14 12:10	RML	MET-1	1	BXE1212

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Metals Analysis

BCL Sample ID:	1410663-01	Client Sample Name:	Well Discharge - KSI Yard - Monte Cristo Rd., 5/13/2014 10:54:00AM, K. Stanley					
Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Boron	0.14	mg/L	0.10		EPA-6010B	ND		1
Total Recoverable Arsenic	<2.0	ug/L	2.0		EPA-200.8	ND		2
Total Recoverable Uranium	<0.67	pCi/L	0.67		EPA-200.8	ND		2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	05/14/14	05/16/14 16:22	ARD	PE-OP1	1	BXE1092
2	EPA-200.8	05/14/14	05/15/14 20:27	EAR	PE-EL2	1	BXE1266

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

EDB/DBCP Analysis (EPA Method 504.1)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXE1366						
1,2-Dibromo-3-chloropropane	BXE1366-BLK1	<0.010	ug/L	0.010		
Ethylene dibromide	BXE1366-BLK1	<0.010	ug/L	0.010		

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

EDB/DBCP Analysis (EPA Method 504.1)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits		Lab
								Percent Recovery	RPD	
QC Batch ID: BXE1366										
1,2-Dibromo-3-chloropropane	BXE1366-BS1	LCS	0.34829	0.35714	ug/L	97.5		50 - 140		
Ethylene dibromide	BXE1366-BS1	LCS	0.37817	0.35714	ug/L	106		60 - 150		

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

EDB/DBCP Analysis (EPA Method 504.1)

Quality Control Report - Precision & Accuracy

									Control Limits		
Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	RPD	Percent Recovery	Lab Quals
QC Batch ID: BXE1366		Used client sample: N									
1,2-Dibromo-3-chloropropane	MS	1407468-70	ND	0.34360	0.35714	ug/L		96.2		30 - 150	
	MSD	1407468-70	ND	0.41269	0.35714	ug/L	18.3	116	30	30 - 150	
Ethylene dibromide	MS	1407468-70	ND	0.39869	0.35714	ug/L		112		40 - 160	
	MSD	1407468-70	ND	0.47463	0.35714	ug/L	17.4	133	30	40 - 160	

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Water Analysis (General Chemistry)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXE1092						
Dissolved Calcium	BXE1092-BLK1	<0.10	mg/L	0.10		
Dissolved Magnesium	BXE1092-BLK1	<0.050	mg/L	0.050		
Dissolved Sodium	BXE1092-BLK1	<0.50	mg/L	0.50		
Dissolved Potassium	BXE1092-BLK1	<1.0	mg/L	1.0		
QC Batch ID: BXE1137						
Nitrate as NO3	BXE1137-BLK1	<0.44	mg/L	0.44		
Dissolved Total Cations	BXE1137-BLK1	<0.10	meq/L	0.10		
Total Anions	BXE1137-BLK1	<0.10	meq/L	0.10		
Adjusted Sodium Adsorption Ratio (SAR-adj)	BXE1137-BLK1	<0.010	NA	0.010		
Extractable Sodium Percentage (ESP)	BXE1137-BLK1	<0.010	NA	0.010		
Gypsum Requirement	BXE1137-BLK1	<0.010	100% gyp/hr/100 g	0.010		
Dissolved Hardness as CaCO3	BXE1137-BLK1	<0.50	mg/L	0.50		
pHc	BXE1137-BLK1	<0.010	NA	0.010		
Sodium Adsorption Ratio (SAR)	BXE1137-BLK1	<0.10	NA	0.10		
TDS (by summation)	BXE1137-BLK1	<10	mg/L	10		
QC Batch ID: BXE1198						
Chloride	BXE1198-BLK1	<0.50	mg/L	0.50		
Fluoride	BXE1198-BLK1	<0.050	mg/L	0.050		
Nitrate as N	BXE1198-BLK1	<0.10	mg/L	0.10		
Sulfate	BXE1198-BLK1	<1.0	mg/L	1.0		
QC Batch ID: BXE1212						
Bicarbonate	BXE1212-BLK1	<5.0	mg/L	5.0		
Carbonate	BXE1212-BLK1	<2.5	mg/L	2.5		
Hydroxide	BXE1212-BLK1	<1.4	mg/L	1.4		

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Water Analysis (General Chemistry)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits		Lab
								Percent Recovery	RPD	
QC Batch ID: BXE1092										
Dissolved Calcium	BXE1092-BS1	LCS	9.8422	10.000	mg/L	98.4		85 - 115		
Dissolved Magnesium	BXE1092-BS1	LCS	10.340	10.000	mg/L	103		85 - 115		
Dissolved Sodium	BXE1092-BS1	LCS	9.8701	10.000	mg/L	98.7		85 - 115		
Dissolved Potassium	BXE1092-BS1	LCS	9.6385	10.000	mg/L	96.4		85 - 115		
QC Batch ID: BXE1198										
Chloride	BXE1198-BS1	LCS	52.254	50.000	mg/L	105		90 - 110		
Fluoride	BXE1198-BS1	LCS	0.93900	1.0000	mg/L	93.9		90 - 110		
Nitrate as N	BXE1198-BS1	LCS	5.2700	5.0000	mg/L	105		90 - 110		
Sulfate	BXE1198-BS1	LCS	105.16	100.00	mg/L	105		90 - 110		
QC Batch ID: BXE1212										
pH	BXE1212-BS2	LCS	7.0300	7.0000	pH Units	100		95 - 105		
Electrical Conductivity @ 25 C	BXE1212-BS1	LCS	306.70	303.00	umhos/cm	101		90 - 110		

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Water Analysis (General Chemistry)

Quality Control Report - Precision & Accuracy

									Control Limits		
Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	RPD	Percent Recovery	Lab Quals
QC Batch ID: BXE1092		Used client sample: Y - Description: Well Discharge - KSI Yard - Monte Cristo Rd., 05/13/2014 10:54									
Dissolved Calcium	DUP	1410663-01	83.041	82.939		mg/L	0.1		20		
	MS	1410663-01	83.041	92.527	10.204	mg/L		93.0		75 - 125	
	MSD	1410663-01	83.041	91.772	10.204	mg/L	0.8	85.6	20	75 - 125	
Dissolved Magnesium	DUP	1410663-01	2.4150	2.4373		mg/L	0.9		20		
	MS	1410663-01	2.4150	12.538	10.204	mg/L		99.2		75 - 125	
	MSD	1410663-01	2.4150	12.621	10.204	mg/L	0.7	100	20	75 - 125	
Dissolved Sodium	DUP	1410663-01	77.602	77.057		mg/L	0.7		20		
	MS	1410663-01	77.602	87.874	10.204	mg/L		101		75 - 125	
	MSD	1410663-01	77.602	86.486	10.204	mg/L	1.6	87.1	20	75 - 125	
Dissolved Potassium	DUP	1410663-01	3.4764	3.4383		mg/L	1.1		20		
	MS	1410663-01	3.4764	13.598	10.204	mg/L		99.2		75 - 125	
	MSD	1410663-01	3.4764	13.391	10.204	mg/L	1.5	97.2	20	75 - 125	
QC Batch ID: BXE1198		Used client sample: N									
Chloride	DUP	1410650-01	67.802	67.699		mg/L	0.2		10		
	MS	1410650-01	67.802	119.40	50.505	mg/L		102		80 - 120	
	MSD	1410650-01	67.802	119.36	50.505	mg/L	0.0	102	10	80 - 120	
Fluoride	DUP	1410650-01	0.29400	0.29700		mg/L	1.0		10		
	MS	1410650-01	0.29400	1.2859	1.0101	mg/L		98.2		80 - 120	
	MSD	1410650-01	0.29400	1.2848	1.0101	mg/L	0.1	98.1	10	80 - 120	
Nitrate as N	DUP	1410650-01	4.1820	4.1290		mg/L	1.3		10		
	MS	1410650-01	4.1820	9.5505	5.0505	mg/L		106		80 - 120	
	MSD	1410650-01	4.1820	9.5505	5.0505	mg/L	0	106	10	80 - 120	
Sulfate	DUP	1410650-01	104.96	104.55		mg/L	0.4		10		
	MS	1410650-01	104.96	212.15	101.01	mg/L		106		80 - 120	
	MSD	1410650-01	104.96	211.97	101.01	mg/L	0.1	106	10	80 - 120	
QC Batch ID: BXE1212		Used client sample: N									
Bicarbonate	DUP	409339-01RE´	387.30	387.87		mg/L	0.1		10		
Carbonate	DUP	409339-01RE´	ND	<2.5		mg/L			10		
Hydroxide	DUP	409339-01RE´	ND	<1.4		mg/L			10		
pH	DUP	409339-01RE´	7.4200	7.4300		pH Units	0.1		20		
Electrical Conductivity @ 25 C	DUP	409339-01RE´	934.80	931.40		umhos/cm	0.4		10		

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Metals Analysis

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXE1092						
Dissolved Boron	BXE1092-BLK1	<0.10	mg/L	0.10		
QC Batch ID: BXE1266						
Total Recoverable Arsenic	BXE1266-BLK1	<2.0	ug/L	2.0		
Total Recoverable Uranium	BXE1266-BLK1	<0.67	pCi/L	0.67		

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6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Metals Analysis

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits		Lab
								Percent Recovery	RPD	
QC Batch ID: BXE1092										
Dissolved Boron	BXE1092-BS1	LCS	0.98407	1.0000	mg/L	98.4		85 - 115		
QC Batch ID: BXE1266										
Total Recoverable Arsenic	BXE1266-BS1	LCS	109.20	100.00	ug/L	109		85 - 115		
Total Recoverable Uranium	BXE1266-BS1	LCS	29.786	26.800	pCi/L	111		85 - 115		

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Metals Analysis

Quality Control Report - Precision & Accuracy

										Control Limits	
Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	RPD	Percent Recovery	Lab Quals
QC Batch ID: BXE1092		Used client sample: Y - Description: Well Discharge - KSI Yard - Monte Cristo Rd., 05/13/2014 10:54									
Dissolved Boron	DUP	1410663-01	0.13614	0.13412		mg/L	1.5		20		
	MS	1410663-01	0.13614	1.1901	1.0204	mg/L		103		75 - 125	
	MSD	1410663-01	0.13614	1.1889	1.0204	mg/L	0.1	103	20	75 - 125	
QC Batch ID: BXE1266		Used client sample: Y - Description: Well Discharge - KSI Yard - Monte Cristo Rd., 05/13/2014 10:54									
Total Recoverable Arsenic	DUP	1410663-01	ND	<2.0		ug/L			20		
	MS	1410663-01	ND	127.92	102.04	ug/L		125		70 - 130	
	MSD	1410663-01	ND	125.41	102.04	ug/L	2.0	123	20	70 - 130	
Total Recoverable Uranium	DUP	1410663-01	ND	<0.67		pCi/L			20		
	MS	1410663-01	ND	30.536	27.347	pCi/L		112		70 - 130	
	MSD	1410663-01	ND	31.962	27.347	pCi/L	4.6	117	20	70 - 130	

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McMor Chlorination, Inc.
6734 Charity Ave. #8
Bakersfield, CA 93308

Reported: 05/20/2014 15:15
Project: Drinking Water Samples
Project Number: EH - 563 Chevron Monte Cristo Road
Project Manager: Dennis Gatson

Notes And Definitions

MDL Method Detection Limit
ND Analyte Not Detected at or above the reporting limit
PQL Practical Quantitation Limit
RPD Relative Percent Difference
S05 The sample holding time was exceeded.

ENVIRONMENTAL HEALTH SERVICES DEPARTMENT

RESERVOIR (Use for all distribution storage, chlorine contact tanks, sand traps, etc.)

- (1) Place and Owner: PM. 9175 (PORTION OF NE 1/4 SW 1/4, SEC. 8, T29S R28E, MDM.)
OWNER - RIVER RANCHES MUTUAL WATER COMPANY, INC.
- (2) Source of Information: ELWOOD CITAMPNESS
- Collected by: FRED PORTER Date: 6-30-99

(3) Number or Name	STORAGE TANKS #1 & #2	PRESSURE VESSEL ^{HORIZ. CIRCULAR}
Date constructed:	N/A	N/A
Purpose (storage, sand trap, etc.):	STORAGE	STORAGE & SURGE PROTECTION
Capacity:	10,000 GAL. EACH	4000 GAL
(4) Location: (specific)	SW COR. PAR 2, PM 9175	SW COR. PAR 2, PM 9175
Neighborhood:	RIVER RANCHES	RIVER RANCHES
Size of lot:	10,000 SQ. FT.	10,000 SQ. FT.
Fencing:	CHAIN LINK, 6' HIGH	CHAIN LINK, 6' HIGH
(5) Construction:		
Material:		
Sides:	12 GA. STEEL	1/4" STEEL WALLS & HEADS
Floor:	12 GA. STEEL	N/A
Cover or roof:	12 GA. STEEL	N/A
Height top of walls above ground:	12'-6"	6'
Surface drainage to reservoir possible?	NO	NO
Ventilation:	OVERFLOW PIPE	NO (CLOSED SYSTEM)
Screening:	YES	NO
(6) Inlet and Outlet Arrangement:		
Inlet:		
Location:	4" @ NEAR BOTTOM	6" @ EAST END
Distance above bottom:	12"	@ BOTTOM
Outlet:		
Distance from inlet:	10'	15' E
Distance above bottom:	12"	@ BOTTOM
Drain to where:	TO STREET	CLOSED SYSTEM, N/A
Overflow to where:	SPLASH PAD & TO STREET	N/A
Sewer or other hazardous connection (if so, make sketch on back)	NONE	NONE
(7) Relation to System:		
Receives from:	WELL #1 & WELL #2	BOOSTER PUMPS
Delivers to:	BOOSTER PUMPS	DISTRIBUTION SYSTEM
(8) Defects and Remarks: (Include statements on cleaning practices, condition of structure—particularly of roof, dimensions and shape of reservoir, leakage, kind and location of access openings, protection against insects, birds and rodents.)	STORAGE TANKS ARE 12' DIA X 12' HIGH WITH AN 18" DIA M.H. @ TOP WITH LOCABLE COVER. THE OVERFLOW IS PROTECTED W/ A SCREEN	PRESSURE VESSEL IS 6' DIA X 21' LONG WITH A BOLTED ACCESS MANHOLE @ ONE END. (CLOSED SYSTEM)

COUNTY OF KERN
ENVIRONMENTAL HEALTH SERVICES DEPARTMENT

SHE1

WELL DATA

PM 9175 (PORTION OF NE 1/4, SW 1/4, SEC 8, T. 29 S., R. 28 E. ADJ.)

(1) Place and Owner RIVER RANCHES MUTUAL WATER COMPANY, INC(2) Source of Information ELWOOD CHAMPNESSCollected by FRED PORTERDate 6-30-99

	WELL #1	WELL #2
(3) Number or Name	UNKNOWN	UNKNOWN
Date drilled	PM 9175	PM 9175
(4) Location: Neighborhood	10,000 SF	10,000 SF
Size of lot	N/A	N/A
Distance to: Sewer	N/A	N/A
Sewage Disposal	N/A	N/A
Abandoned well	UNKNOWN	UNKNOWN
Nearest property line	75'	40'
(5) Housing: Type	NONE	NONE
Condition	N/A	N/A
Pit depth (if any)	N/A	N/A
Floor (material)	N/A	N/A
Drainage	N/A	N/A
(6) Well depth	470'	131'
(7) Casing: Depth	970'	131'
Diameter	12"	12"
Kind	STEEL	STEEL
Height above floor	12"	12"
Distance to highest perforation	497 FT.	80 FT.
Surface sealed (yes or no)	YES	YES
Gravel pack (yes or no)	YES	YES
Second casing depth	N/A	N/A
Second casing diameter	N/A	N/A
Annular seal (depth)	NONE	NONE
(8) Impervious Strata: (Thickness Penetrated (Depth to	UNKNOWN	UNKNOWN
	UNKNOWN	UNKNOWN
(9) Water Levels: (Surface	228 FT	32 FT
Depth to (Static	228 FT	32 FT
(When pumping	UNKNOWN	UNKNOWN
(10) Pump: Make	INTEGRAL PRESS	CARVER
Type	VERT. TURBINE	SUBMERSIBLE
Capacity, g.p.m.	300	100
Lubrication	OIL	WATER
Power	50 HP 230/460V 3PH	10 HP 230/460V 3PH
Auxiliary power	NONE	GENERATOR RECEPTION
Control	LIO. LEVEL	LIO. LEVEL (WARRICK)
Discharge location	55' SOUTH	100' SOUTH
Discharge to	STORAGE TANKS	STORAGE TANKS
(11) Frequency of Use	EVERY DAY	EMERGENCY
(12) Flood Hazard	NONE	NONE
(13) Remarks and Defects		
(14) Attach Well Driller's Report		

(WELL DRILLER'S REPORTS ARE NOT AVAILABLE)

ELWOOD CHAMPNESS / JIMMIE ICARDO
RIVER RANCHES
5279 Fallgatter Street
Bakersfield, CA 93308

May 8 2000

May 8, 2000

Kern County Environmental Health
2700 M Street
Bakersfield, CA 93301

Re: River Ranches Water System

Attn.: Gale Frye

Dear Ms. Frye:

Enclosed are copies of the latest analysis on our water well. Please send copies of the Department approvals to the following addresses:

River Ranches
c/o Elwood Champness
5279 Fallgatter Street
Bakersfield, CA 93308

Porter Robertson Engineering
Fred Porter
1200 East 21st Street
Bakersfield, CA 93301

Thank you for your assistance in this matter.

Sincerely,

Elwood Champness
Elwood Champness

TRUESDAIL LABORATORIES, INC.

INDEPENDENT TESTING, FORENSIC SCIENCE, AND ENVIRONMENTAL ANALYSES



Established 1951

REPORT

14201 FRANKLIN AVENUE
TUSTIN, CALIFORNIA 92780-7001
(714) 730-6239 - FAX (714) 730-6466
www.truesdail.com

CLIENT: BC LABORATOIRES INC
4100 Atlas Court
Bakersfield, CA 93308
ATTENTION: Tina Green

DATE: 4/14/00

RECEIVED: 4/04/00

LABORATORY NO. 421533

SAMPLE: WATER/1

INVESTIGATION: TOTAL URANIUM ANALYSIS PER EPA 908.0

RESULTS

<u>Sample ID</u>	<u>pCi/L</u>	<u>Two Sigma Error</u>
00-03939-1	0.39	+/- 0.46

Analysis complete: 4/13/00

Respectfully submitted,
TRUESDAIL LABORATORIES, INC.

Christine Brown, Project Manager
Water and Waste Laboratory



This report applied only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from these laboratories.

RIVER RANCHES
Attn.: ELWOOD CHAMPNESS 661-327-9588

627 WILLIAMS STREET
BAKERSFIELD, CA 93305

RADIOACTIVITY ANALYSES

Date of Report: 04/14/2000 Lab Sample ID No.: 00-03939-1
Laboratory Signature of
Name: B C Laboratories, Inc. Lab Director
Name of Sampler ELWOOD CHAMPNESS Employed By: RIVER RANCHES
Date/Time Sample Date/Time Sample Date Analysis
Collected: 03/31/00 10:00AM Received @ Lab: 03/31/00 11:00AM Completed: 04/13/2000
=====

System: System
Name: RIVER RANCHES Number:

Name or Number Of Sample Source: PARCEL #9175

User ID: | | | | Station Number: | | | | | | | | | | | | | | | |
Date/Time of Sample: | 0 | 0 | 0 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | Laboratory Code: | 9 | 4 | 6 | 9 |
Y Y M M D D T T T T
Submitted by: Phone #:

MCL	REPORTING UNITS	CONSTITUENT	ENTRY #	ANALYSES RESULTS
15	pCi/L	Total Alpha	01501	
	pCi/L	Total Alpha Counting Error	01502	
50	pCi/L	Total Beta	03501	
	pCi/L	Total Beta Counting Error	03502	
20	pCi/L	Natural Uranium	28012	0.39
	pCi/L	Natural Uranium Counting Error	A-0281	+/-0.46
3	pCi/L	Total Radium 226	09501	
	pCi/L	Total Radium 226 Counting Error	09502	
	pCi/L	Total Radium 228	11501	
	pCi/L	Total Radium 228 Counting Error	11502	
5	pCi/L	Ra 226 + Ra 228	11503	
	pCi/L	Ra 226 + Ra 228 Counting Error	11504	
	pCi/L	Radon 222	82303	
	pCi/L	Radon 222 Counting Error	82302	
20,000	pCi/L	Total Tritium	07000	
	pCi/L	Total Tritium Counting Error	07001	
8	pCi/L	Total Strontium-90	13501	
	pCi/L	Total Strontium-90 Counting Error	13502	

Note: Radiological analyzed by Truesdail Laboratories - Certification #1237

Submission #: 00-03939 Project Code:

T8 Batch #

SHIPPING INFORMATION

Federal Express ☐ UPS ☐ Hand Delivery ☒
BC Lab Field Service ☐ Other ☐ (Specify) _____

SHIPPING CONTAINER

Ice Chest ☐ None ☒
Box ☐ Other ☐ (Specify) _____Refrigerant: Ice ☐ Blue Ice ☐ None ☒ Other ☐ Comments:Custody Seals: Ice Chest ☒ Containers ☒ None ☐ Comments:Intact? Yes ☐ No ☒Intact? Yes ☐ No ☒All samples received? Yes ☒ No ☐All samples containers intact? Yes ☒ No ☐Description(s) match COC? Yes ☒ No ☐Ice Chest ID _____ Date/Time 3/31
Temperature: 27.4 °C 1120
Thermometer ID: 48 Analyst Init JA
Emissivity 90
Container RTPEIce Chest ID _____ Date/Time _____
Temperature: _____ °C
Thermometer ID: _____ Analyst Init _____
Emissivity _____
Container _____

SAMPLE CONTAINERS

SAMPLE NUMBERS

QT GENERAL MINERAL/ GENERAL PHYSICAL

PT PE UNPRESERVED

QT INORGANIC CHEMICAL METALS

PT INORGANIC CHEMICAL METALS

PT CYANIDE

PT NITROGEN FORMS

PT TOTAL SULFIDE

2oz. NITRATE / NITRITE

100ml TOTAL ORGANIC CARBON

QT TOX

PT CHEMICAL OXYGEN DEMAND

100ml PHENOLICS

40ml VOA VIAL TRAVEL BLANK

40ml VOA VIAL

QT EPA 413.1, 413.2, 418.1

PT ODDR

RADIOLOGICAL

BACTERIOLOGICAL

PT EPA 504

QT EPA 506/606/8080

QT EPA 515.1/8150

QT EPA 525

QT EPA 525 TRAVEL BLANK

100ml EPA 547

100ml EPA 531.1

QT EPA 548

QT EPA 549

QT EPA 632

QT EPA 8015M

QT QA/QC

QT AMBER

8 OZ. JAR

32 OZ. JAR

SOIL SLEEVE

PCB VIAL

PLASTIC BAG

October 13, 1999

Comments:

Sample Numbering Completed By: JADate/Time: 3/31 1130

(F:\WPBOLAB_DOCS\FORMS\3AMREC2.WPD)

ELWOOD CHAMPNESS
5279 FALLGATTER ST.
BAKERSFIELD, CA 93308
805-323-4896

Date Reported: 01-19-99
Date Received: 01-13-99
Laboratory No.: 99-00456-1

COLILERT BACTERIOLOGICAL WATER ANALYSIS

Sample Description

WELL #1, PARCEL MAP #9175 - SAMPLED BY ELWOOD CHAMPNESS

System Number: Sample Size:

Temperature: 18.5 C

Date/Time Sample Collected: 01/13/99 @ 08:00AM
Date/Time Sample Received at Lab: 01/13/99 @ 08:30AM
Date/Time Analysis Started: 01/13/99 @ 09:30AM
Date Analysis Completed: 01/14/99

<u>Constituent</u>	<u>Present/ Absent</u>
Total Coliform	Absent
E. Coli	Absent

S C LABORATORIES, INC.

BY *JS*
Department Supervisor

BC
Laboratories, Inc.

Celebrating our 50th Year

February 01, 1999

E. CHAMPNESS
ELWOOD CHAMPNESS
5279 FALLGATTER ST.
BAKERSFIELD, CA 93308

Subject: Laboratory Submission No.: 99-00458
Samples Received: 01/13/99

Dear Mr. Champness:

The sample(s) listed on the Chain of Custody report were received by BC Laboratories, Inc. on 01/13/99.

Enclosed please find the analytical data for the testing requested. If you have any questions regarding this report please contact me at (805) 327-4911, ext. 281.

Any unused sample will be stored on our premises for a minimum of 30 days (excluding bacteriologicals) at which time they will be disposed unless otherwise requested at the time of sample receipt. A disposal fee of \$5 per sample may apply for solid sample matrices.

Please refer to submission number 99-00458 when calling for assistance.

Sincerely,

Michelle Owen

Michelle Owen
Client Services
BC Laboratories, Inc.

[illegible]

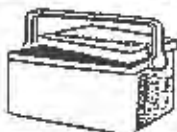
Submission #: 99-458

Project Code:

SHIPPING INFORMATION

Federal Express ☐ UPS ☐ Hand Delivery ☒BC Lab Field Service ☐ Other ☐ (Specify) _____

SHIPPING CONTAINER

Ice Chest ☐None ☒Box ☐Other ☐ (Specify) _____Refrigerant: Ice ☐ Blue Ice ☐ None ☒ Other ☐ Comments:Custody Seals: Ice Chest ☐ Containers ☐ None ☒ Comments:Intact? Yes ☐ No ☐Intact? Yes ☐ No ☐All samples received? Yes ☒ No ☐All samples containers intact? Yes ☒ No ☐Description(s) match COC? Yes ☒ No ☐Ice Chest ID 10011 Date/Time 1/13/99
Temperature: 18.5°C
Thermometer ID: 17 Analyst Init 835
Emissivity 50
Container DEVEIce Chest ID _____ Date/Time _____
Temperature: _____ °C
Thermometer ID: _____ Analyst Init _____
Emissivity _____
Container _____

SAMPLE CONTAINERS

SAMPLE NUMBERS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
QT GENERAL MINERAL/ GENERAL PHYSICAL																						
PT PE UNPRESERVED																						
QT INORGANIC CHEMICAL METALS																						
PT INORGANIC CHEMICAL METALS																						
PT CYANIDE																						
PT NITROGEN FORMS																						
PT TOTAL SULFIDE																						
2oz. NITRATE / NITRITE																						
100ml TOTAL ORGANIC CARBON																						
QT TOX																						
PT CHEMICAL OXYGEN DEMAND																						
100ml PHENOLICS																						
40ml VOA VIAL TRAVEL BLANK																						
40ml VOA VIAL																						
QT EPA 413.1, 413.2, 418.1																						
PT ODOR																						
RADIOLOGICAL																						
BACTERIOLOGICAL																						
PT EPA 504																						
QT EPA 508/508/BORO																						
QT EPA 515.1/5150																						
QT EPA 525																						
QT EPA 525 TRAVEL BLANK																						
100ml EPA 547																						
100ml EPA 531.1																						
QT EPA 548																						
QT EPA 549																						
QT EPA 532																						
QT EPA 8015M																						
QT QA/QC																						
QT AMBER																						
8 OZ. JAR																						
32 OZ. JAR																						
SOIL SLEEVE																						
PCB VIAL																						
PLASTIC BAG																						

Comments:

Sample Numbering Completed By: 112Date/Time: 1/13 9:25

(F:\V\BOL AB DOCS\FORMS\SAMPLE2.VXD)

ELWOOD CHAMPNESS
Attn.: E. CHAMPNESS 805-323-4896

5279 FALLGATTER ST.
BAKERSFIELD, CA 93308

GENERAL MINERAL, PHYSICAL & INORGANIC CHEMICAL ANALYSES

Date of Report: 01/28/99 Lab Sample ID No.: 99-00458-1
Laboratory Signature of
Name: B C Laboratories, Inc. Lab Director: *[Signature]*
Name of Sampler ELWOOD CHAMPNESS Employed By: ELWOOD CHAMPNESS
Date/Time Sample Date/Time Sample Date Analysis
Collected: 01/13/99 08:00AM Received @ Lab: 01/13/99 08:35AM Completed: 01/22/99

System: System
Name: Number:

Name or Number Of Sample Source: WELL #1 PAROUL MAP 9/75

User ID: Station Number:
Date/Time of Sample: 9/9/01 13/08/00 Laboratory Code: 5806
Y Y M M D D T T T T
Submitted by: Phone #:

MCL	REPORTING UNITS	CONSTITUENT	ENTRY #	ANALYSES RESULTS	DLR
	mg/L	Total Hardness (as CaCO ₃)	00900	77.	
	mg/L	Calcium (Ca)	00916	25.	
	mg/L	Magnesium (Mg)	00927	3.5	
	mg/L	Sodium (Na)	00929	30.	
	mg/L	Potassium (K)	00937	1.7	
	Total Cations meq/L Value: 2.88				
	mg/L	Total Alkalinity (as CaCO ₃)	00410	107.	
	mg/L	Hydroxide (OH)	71830	< 0.8	
	mg/L	Carbonate (CO ₃)	00445	< 2.6	
	mg/L	Bicarbonate (HCO ₃)	00440	130.	
	mg/L	Sulfate (SO ₄)	00945	13.	0.5
	mg/L	Chloride (Cl)	00940	13.	
	mg/L	Nitrate (NO ₃)	71850	< 0.4	2.
	mg/L	Fluoride (F) Temp. Depend.	00951	0.24	0.1
	Total Anions meq/L Value: 2.78				
	Std Units +	pH (Laboratory)	00403	7.45	
**	umho/cm +	Specific Conductance (E.C.)	00095	292.	
***	mg/L +	Total Filterable Residue at 180 C (TDS)	70300	187.	
15.	UNITS	Apparent Color (Unfiltered)	00081	2.	
3.	TON	Odor Threshold at 60 C	00086	8.	
5.	NTU	Lab Turbidity	82079	0.79	
0.5	mg/L +	MBAS	38260	< 0.05	

* 250-500-600

** 900-1600-2200

*** 500-1000-1500

Recommended - Upper - Short Term

ELWOOD CHAMPNESS
Attn.: E. CHAMPNESS

805-323-4896

5279 FALLGATTER ST.
BAKERSFIELD, CA 93308

Lab. #99-00458-1

INORGANIC CHEMICALS

Page 2 of 2

MCL	REPORTING UNITS	CONSTITUENT	ENTRY #	ANALYSES RESULTS	DLR µg/L
1000	µg/L	Aluminum (Al)	01105	< 50.	50.
6	µg/L	Antimony	01097	< 1.	6.
50	µg/L	Arsenic (As)	01002	< 2.	2.
1000	µg/L	Barium (Ba)	01067	< 100.	100.
4	µg/L	Beryllium	01012	< 0.2	1.
5	µg/L	Cadmium (Cd)	01027	< 1.	1.
50	µg/L	Chromium (Total Cr)	01034	< 10.	10.
1000	µg/L +	Copper (Cu)	01042	< 10.	50.
300	µg/L +	Iron (Fe)	01045	63.	100.
	µg/L	Lead (Pb)	01051	< 5.	5.
50	µg/L +	Manganese (Mn)	01055	102.	30.
2	µg/L	Mercury (Hg)	71900	< 0.2	1.
100	µg/L	Nickel	01067	< 5.	10.
50	µg/L	Selenium (Se)	01147	< 2.	5.
100	µg/L +	Silver (Ag)	01077	< 10.	10.
2	µg/L	Thallium	01059	< 1.	1.
5000	µg/L	Zinc (Zn)	01092	< 50.	50.

ADDITIONAL ANALYSES

NTU	Field Turbidity	82078		
C	Source Temperature	00010		
	Langelier Index Source Temp.	71814		
	Langelier Index at 60 C	71813		
Std Units	Field pH	00400		
	Aggressiveness Index	82383		
mg/L	Silica	00955		
mg/L	Phosphate	00650		
mg/L	Iodide	71865		
	Sodium Absorption Ratio	00931		
7 MFL	Asbestos (*)	81855		0.2
mg/L	Boron	01020		
10000 µg/L	Nitrate + Nitrite as N	A-029		400.
1000 µg/L	Nitrite as N (Nitrogen)	00620	< 20.	400.
200 µg/L	Cyanide	01291	< 20.	100.
mg/L	Ammonia as N	00612		
mg/L	Lithium	01332		
mg/L	Bromide	82298		
mg/L	Bromate	A-027		

DLR = Detection Limit for Reporting purposes

+ = Indicates Secondary Drinking Water Standards

(*) MFL = Million Fibers Per Liter

ELWOOD CHAMPNESS
Attn.: E.CHAMPNESS 805-323-4896

5279 FALLGATTER ST.
BAKERSFIELD, CA 93308

ORGANIC CHEMICAL ANALYSIS

Date of Report: 01/20/99 Lab Sample ID No.: 99-00458-1
Laboratory Signature of
Name: B C Laboratories, Inc. Lab Director
Name of Sampler ELWOOD CHAMPNESS Employed By: ELWOOD CHAMPNESS
Date/Time Sample Date/Time Sample Date Analysis
Collected: 01/13/99 08:00AM Received @ Lab: 01/13/99 08:35AM Completed: 01/18/99

System: System
Name: Number:

Name or Number Of Sample Source: WELL #1 PAROUL MAP 9/75

User ID: Station Number:
Date/Time of Sample: 9/9/01/13/08/00 Laboratory Code: 5/8/0/6/
Y Y M M D D T T T T
Submitted by: Phone #:

REGULATED ORGANIC CHEMICALS

TEST METHOD	CONSTITUENT ALL CONSTITUENTS REPORTED µg/L	ENTRY #	ANALYSIS RESULTS	MCL µg/L	DLR µg/L
	Bromodichloromethane	32101			0.5
	Bromoform	32104			0.5
	Chloroform (Trichloromethane)	32106			0.5
	Dibromochloromethane	32105			0.5
	Total Trihalomethanes (THM's/TTHM)	82080		100	0.5
	Benzene	34030		1	0.5
	Carbon tetrachloride	32102		0.5	0.5
	1,2-Dichlorobenzene (o-DCB)	34536		600	0.5
	1,4-Dichlorobenzene (p-DCB)	34571		5	0.5
	1,1-Dichloroethane (1,1-DCA)	34496		5	0.5
	1,2-Dichloroethane (1,2-DCA)	34531		0.5	0.5
	1,1-Dichloroethylene (1,1-DCE)	34501		6	0.5
	cis-1,2-Dichloroethylene	77093		6	0.5
	trans-1,2-Dichloroethylene	34546		10	0.5
	Dibromomethane (Methylene Chloride)	34423		5	0.5
	1,2-Dichloropropane	34541		5	0.5
	Total 1,3-Dichloropropene	34561		0.5	0.5
	Ethyl benzene	34371		700	0.5
	Monochlorobenzene (Chlorobenzene)	34301		70	0.5
	Styrene	77128		100	0.5
	1,1,2,2-Tetrachloroethane	34516		1	0.5
	Tetrachloroethylene (PCE)	34475		5	0.5
	Toluene	34010		150	0.5
	1,2,4-Trichlorobenzene	34551		70	0.5
	1,1,1-Trichloroethane (1,1,1-TCA)	34506		200	0.5
	1,1,2-Trichloroethane (1,1,2-TCA)	34511		5	0.5
	Trichloroethylene (TCE)	39180		5	0.5

ELWOOD CHAMPNESS
Attn.: E.CHAMPNESS 805-323-4896

5279 FALLGATTER ST.
BAKERSFIELD, CA 93308

Lab. #99-00458-1

REGULATED ORGANIC CHEMICALS (CONTINUED)

Page 2 of 3

TEST METHOD	CONSTITUENT ALL CONSTITUENTS REPORTED $\mu\text{g/L}$	ENTRY #	ANALYSIS RESULTS	MCL $\mu\text{g/L}$	DLR $\mu\text{g/L}$
	Trichlorofluoromethane (Freon 11)	34488		150	5.
	Trichlorotrifluoroethane (Freon 113)	81611		1200	10.
	Vinyl Chloride (VC)	39175		0.5	0.5
	m,p-Xylene	A-014			0.5
	o-Xylene	77135			0.5
	Total Xylenes (m,p, & o)	81551		*1750	*0.5
504.1	Dibromochloropropane (DBCP)	38761	< 0.01	0.2	0.01
504.1	Ethylene Dibromide (EDB)	77651	< 0.01	0.05	0.02
	Endrin	39390		2.	0.1
	Lindane (gamma-BHC)	39340		0.2	0.2
	Methoxychlor	39480		40	10.
	Toxaphene	39400		3	1.
	Chlordane	39350		0.1	0.1
	Diethylhexylphthalate (DEHP)	39100		4.	3.
	Heptachlor	39410		0.01	0.01
	Heptachlor epoxide	39420		0.01	0.01
	Atrazine (AAtrex)	39033		3	1.
	Molinate (Ordram)	82199		20	2.
	Simazine (Princep)	39055		4	1.
	Thiobencarb (Bolero)	A-001		+ 70	1.
	Alachlor (Alanex)	77825		2	1.
	Bentazon (Basagran)	38710		18	2.
	Benzo (a) pyrene	34247		0.2	0.1
	2,3,7,8-TCDD (Dioxin)	34676		3 e-5	5 e-6
	2,4-D	39730		70	10.
	2,4,5-TP (Silvex)	39045		50	1.
	Carbofuran (Furadan)	81405		18	5.
	Dalapon	38432		200	10.
	Dinoseb (DNBP)	81287		7	2.
	Diquat	78885		20	4.
	Di (2-ethylhexyl) adipate	A-026		400	5.
	Endothall	38926		100	45.
	Glyphosate	79743		700	25.
	Hexachlorobenzene	39700		1	0.5
	Hexachlorocyclopentadiene	34386		50	1.
	Oxamyl (Vydate)	38865		200	20.
	Pentachlorophenol (PCP)	39032		1	0.2
	Picloram	39720		500	1.
	Polychlorinated Biphenyls (Total PCB's)	39516		0.5	0.5

* MCL is for either single isomer or the sum of the isomers

+ Indicates Secondary Drinking Water Standards

ELWOOD CHAMPNESS
Attn.: E. CHAMPNESS 805-323-4896

5279 FALLGATTER ST.
BAKERSFIELD, CA 93308

Lab. #99-00458-1

UNREGULATED ORGANIC CHEMICALS

Page 3 of 3

TEST METHOD	CONSTITUENT ALL CONSTITUENTS REPORTED $\mu\text{g/L}$	ENTRY #	ANALYSIS RESULTS	MCL $\mu\text{g/L}$	DLR * $\mu\text{g/L}$
	Bromobenzene	81555			0.5
	Bromochloromethane	A-012			0.5
	Bromomethane (Methyl Bromide)	34413			0.5
	n-Butylbenzene	A-010			0.5
	sec-Butylbenzene	77350			0.5
	tert-Butylbenzene	77353			0.5
	Chloroethane	34311			0.5
	2-Chloroethylvinyl ether	34576			1.0
	Chloromethane (Methyl Chloride)	34418			0.5
	2-Chlorotoluene	A-008			0.5
	4-Chlorotoluene	A-009			0.5
	Dibromomethane	77596			0.5
	1,3-Dichlorobenzene (m-DCB)	34566			0.5
	Dichlorodifluoromethane	34668			1.0
	1,3-Dichloropropane	77173			0.5
	2,2-Dichloropropane	77170			0.5
	1,1-Dichloropropene	77168			0.5
	Hexachlorobutadiene	34391			0.5
	Isopropylbenzene (Cumene)	77223			0.5
	p-Isopropyltoluene	A-011			0.5
	Naphthalene	34696			0.5
	n-Propylbenzene	77224			0.5
	1,1,1,2-Tetrachloroethane	77562			0.5
	1,2,3-Trichlorobenzene	77613			0.5
	1,2,3-Trichloropropane	77443			0.5
	1,2,4-Trimethylbenzene	77222			0.5
	1,3,5-Trimethylbenzene	77226			0.5
	Methyl Ethyl Ketone (MEK, Butanone)	81595			5.0
	Methyl Isobutyl Ketone (MIBK)	81596			5.0
	bis (2-Chloroethyl) Ether	34273			5.0
	Aldicarb (Temik)	39053			3.0
	Aldicarb sulfone	A-020			4.
	Aldicarb sulfoxide	A-019			3.
	Aldrin	39330			0.075
	Bromacil (Hyvar)	82198			10.
	Butachlor	77860			0.38
	Carbaryl (Sevin)	77700			5.
	Chlorothalonil (Daconil, Bravo)	70314			5.0
	Diazinon	39570			0.25
	Dicamba (Banvel)	82052			0.081
	Dieldrin	39380			0.02
	Dimethoate (Cygon)	38458			10.
	Diuron	39650			1.
	3-Hydroxycarbofuran	A-021			3.
	Methomyl	39051			2.
	Metolachlor	39356			1.
	Metribuzin	81408			1.
	Prometryn (Caparol)	39057			2.0
	Propachlor	38533			0.5
	Methyl-tetra-butyl Ether (MTBE)				5.

California D.O.H.S. Cert. #1186

Laboratory comments and description of any additional compounds found:



California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

January 16, 2015

Work Order #: AL19034

Anthony Toto
RWQCB - Fresno
1685 E Street
Fresno, CA 93706-2007

RE: 13-014-150

Enclosed are the analytical results for samples received by our laboratory on 12/19/14 . For your reference, these analyses have been assigned laboratory work order number AL19034 .

All analyses have been performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, Moore Twining Associates, Inc. (MTA) is not responsible for use of less than complete reports. Results apply only to samples analyzed.

If you have any questions, please feel free to contact us at the number listed above.

Sincerely,

Moore Twining Associates, Inc.

A handwritten signature in black ink, appearing to read 'Julio Morales', is written over a horizontal line.

Julio Morales
Client Services Supervisor



2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

California ELAP Certificate #1371

RWQCB - Fresno

Project: 13-014-150

1685 E Street

Project Number: River Ranch HOA Deep Well

Fresno CA, 93706-2007

Project Manager: Anthony Toto

Reported:

1/16/2015

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
DLW-121914-1	AL19034-01	Drinking Water - Public/Routine	12/19/14 10:54	12/19/14 15:45

AMENDED REPORT:

Nitrate is now included.



2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

California ELAP Certificate #1371

RWQCB - Fresno
1685 E Street
Fresno CA, 93706-2007

Project: 13-014-150
Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

DLW-121914-1

AL19034-01 (Drinking Water - Public/Routine)

Sampled:12/19/14 10:54

Analyte	Flag	Result	Reporting Limit	MDL	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Method
Inorganics											
Total Alkalinity as CaCO ₃		82	1.0	0.23	mg/L	1	U4L1926	CMG	12/19/14 17:11	12/19/14 21:38	SM2320B
Bicarbonate Alkalinity as HCO ₃		100	1.3	0.23	mg/L	1	U4L1926	CMG	12/19/14 17:11	12/19/14 21:38	SM2320B
Carbonate Alkalinity as CO ₃		ND	1.0	0.23	mg/L	1	U4L1926	CMG	12/19/14 17:11	12/19/14 21:38	SM2320B
Hydroxide Alkalinity as OH		ND	1.0	0.23	mg/L	1	U4L1926	CMG	12/19/14 17:11	12/19/14 21:38	SM2320B
Cation/Anion Balance (% Difference)		1.0			%	1	U5A0717	JAA	1/7/15 14:28	1/7/15 14:36	CALC
Chloride		12	2.0	0.018	mg/L	1	U4L1925	ETH	12/19/14 16:35	12/20/14 13:58	EPA 300.0
Specific Conductance (EC)		270	1.0	0.26	µS/cm	1	U4L1926	CMG	12/19/14 17:11	12/19/14 21:38	SM2510B
Nitrate as Nitrogen		1.2	0.45	0.0040	mg/L	1	[CALC]	MCM	12/20/14 13:58	12/20/14 13:58	EPA 300.0
Nitrate as NO ₃		5.5	2.0	0.018	mg/L	1	U4L1925	MCM	12/19/14 16:35	12/20/14 13:58	EPA 300.0
Orthophosphate as P		ND	0.25	0.0028	mg/L	1	U4L1925	ETH	12/19/14 16:35	12/20/14 13:58	EPA 300.0
Sulfate as SO ₄		20	2.0	0.0094	mg/L	1	U4L1925	ETH	12/19/14 16:35	12/20/14 13:58	EPA 300.0
Total Dissolved Solids		170	10	8.1	mg/L	1	U4L2213	MVY	12/22/14 14:45	12/23/14 15:10	SM 2540C
Metals - Dissolved											
Antimony	J	0.44	1.0	0.068	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Arsenic	J	0.76	1.0	0.15	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Barium		38	1.0	0.042	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Beryllium		ND	1.0	0.20	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Boron		150	20	7.8	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Cadmium		ND	0.20	0.079	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Calcium		19	0.10	0.0076	mg/L	1	U5A0602	DAR	1/6/15 8:33	1/6/15 11:33	EPA 200.7
Chromium	J	0.93	1.0	0.17	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Cobalt	J	0.18	1.0	0.024	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Copper	J	0.71	2.0	0.060	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Hardness		60	0.66	0.056	mg equiv. CaCO ₃ /L	1	[CALC]	DAR	1/6/15 11:33	1/6/15 11:33	[CALC]
Iron		65	20	5.9	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Lead	J	0.060	1.0	0.029	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Magnesium		3.0	0.10	0.0091	mg/L	1	U5A0602	DAR	1/6/15 8:33	1/6/15 11:33	EPA 200.7
Manganese		58	1.0	0.051	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Mercury		ND	0.20	0.062	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 245.1
Molybdenum		9.7	1.0	0.025	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Nickel	J	0.52	1.0	0.027	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Potassium		1.7	1.0	0.077	mg/L	1	U5A0602	DAR	1/6/15 8:33	1/6/15 11:33	EPA 200.7
Selenium	J	0.21	1.0	0.17	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8

Moore Twining Associates, Inc.

Juliane Adams, Director of Analytical Chemistry

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

California ELAP Certificate #1371

RWQCB - Fresno
1685 E Street
Fresno CA, 93706-2007

Project: 13-014-150
Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

DLW-121914-1

AL19034-01 (Drinking Water - Public/Routine)

Sampled:12/19/14 10:54

Analyte	Flag	Result	Reporting Limit	MDL	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Method
---------	------	--------	-----------------	-----	-------	----------	-------	---------	----------	----------	--------

Metals - Dissolved

Silver		ND	1.0	0.15	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Sodium		30	1.0	0.26	mg/L	1	U5A0602	DAR	1/6/15 8:33	1/6/15 11:33	EPA 200.7
Thallium		ND	1.0	0.064	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Vanadium		2.3	1.0	0.21	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8
Zinc	J	4.4	5.0	0.060	µg/L	1	U4L2309	JTN	12/24/14 9:15	12/24/14 13:34	EPA 200.8

Semi-Volatile Organics

N-Nitrosodimethylamine	ND	5.0	1.4	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Phenol	ND	5.0	0.63	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Bis(2-chloroethyl)ether	ND	5.0	0.51	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2-Chlorophenol	ND	5.0	0.69	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
1,3-Dichlorobenzene	ND	5.0	0.29	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
1,4-Dichlorobenzene	ND	5.0	0.59	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
1,2-Dichlorobenzene	ND	5.0	0.32	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Bis(2-chloroisopropyl)ether	ND	5.0	0.46	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2-Methylphenol	ND	5.0	0.93	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Hexachloroethane	ND	5.0	0.98	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
3-Methylphenol	ND	5.0	0.96	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
4-Methylphenol	ND	5.0	1.1	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
N-Nitrosodi-n-propylamine	ND	5.0	0.36	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Nitrobenzene	ND	5.0	0.66	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Isophorone	ND	5.0	0.42	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2-Nitrophenol	ND	5.0	1.3	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2,4-Dimethylphenol	ND	5.0	1.2	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Bis(2-chloroethoxy)methane	ND	5.0	0.28	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2,4-Dichlorophenol	ND	5.0	0.79	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
1,2,4-Trichlorobenzene	ND	5.0	0.22	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Naphthalene	ND	5.0	0.29	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
4-Chloroaniline	ND	5.0	0.78	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Hexachlorobutadiene	ND	5.0	0.62	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
4-Chloro-3-methylphenol	ND	5.0	0.57	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2-Methylnaphthalene	ND	5.0	0.35	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Hexachlorocyclopentadiene	ND	5.0	0.83	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2,4,5-Trichlorophenol	ND	5.0	2.3	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C

Moore Twining Associates, Inc.

Juliane Adams, Director of Analytical Chemistry

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2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

California ELAP Certificate #1371

RWQCB - Fresno
1685 E Street
Fresno CA, 93706-2007

Project: 13-014-150

Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

DLW-121914-1

AL19034-01 (Drinking Water - Public/Routine)

Sampled: 12/19/14 10:54

Analyte	Flag	Result	Reporting Limit	MDL	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Method
Semi-Volatile Organics											
2,4,6-Trichlorophenol		ND	5.0	2.5	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2-Chloronaphthalene		ND	5.0	0.29	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2-Nitroaniline		ND	5.0	0.88	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Dimethyl phthalate		ND	5.0	0.27	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Acenaphthylene		ND	5.0	0.27	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2,6-Dinitrotoluene		ND	5.0	1.0	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
3-Nitroaniline		ND	5.0	0.98	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Acenaphthene		ND	5.0	0.59	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2,4-Dinitrophenol		ND	5.0	1.9	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Dibenzofuran		ND	5.0	0.21	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
4-Nitrophenol		ND	5.0	1.6	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
2,4-Dinitrotoluene		ND	5.0	0.70	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Fluorene		ND	5.0	0.50	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Diethyl phthalate		ND	5.0	0.32	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
4-Chlorophenyl phenyl ether		ND	5.0	0.45	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
4-Nitroaniline		ND	5.0	1.6	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Diphenylamine		ND	5.0	0.48	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
1,2-Diphenylhydrazine		ND	5.0	0.49	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Benzidine		ND	5.0	1.2	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
N-Nitrosodiphenylamine		ND	5.0	0.58	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
4,6-Dinitro-2-methylphenol		ND	5.0	0.51	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
4-Bromophenyl phenyl ether		ND	5.0	0.52	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Hexachlorobenzene		ND	5.0	0.42	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Pentachlorophenol		ND	5.0	1.3	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Phenanthrene		ND	5.0	0.26	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Anthracene		ND	5.0	0.31	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Di-n-butyl phthalate		ND	5.0	0.65	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Fluoranthene		ND	5.0	0.34	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Pyrene		ND	5.0	0.26	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Butyl benzyl phthalate		ND	5.0	0.76	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Benzo (a) anthracene		ND	5.0	0.56	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Chrysene		ND	5.0	0.25	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Bis(2-ethylhexyl) phthalate		ND	5.0	0.58	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Di-n-octyl phthalate		ND	5.0	0.36	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C

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California ELAP Certificate #1371

RWQCB - Fresno
1685 E Street
Fresno CA, 93706-2007

Project: 13-014-150
Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

DLW-121914-1

AL19034-01 (Drinking Water - Public/Routine)

Sampled: 12/19/14 10:54

Analyte	Flag	Result	Reporting Limit	MDL	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Method
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Semi-Volatile Organics

Benzo (b) fluoranthene		ND	5.0	0.67	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Benzo (k) fluoranthene		ND	5.0	0.70	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Benzo (a) pyrene		ND	5.0	0.46	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
3,3'-Dichlorobenzidine		ND	5.0	1.1	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Indeno(1,2,3-cd)pyrene		ND	5.0	0.58	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Dibenzo(a,h)anthracene		ND	5.0	0.39	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Benzo(ghi)perylene		ND	5.0	0.36	µg/L	1	U4L2307	FFP	12/23/14 12:57	12/30/14 0:13	EPA 8270C
Surrogate: 2-Fluorophenol		44.0 %	22-92				U4L2307		12/23/14 12:57	12/30/14 0:13	EPA 8270C
Surrogate: Phenol-d5		27.8 %	10-94				U4L2307		12/23/14 12:57	12/30/14 0:13	EPA 8270C
Surrogate: Nitrobenzene-d5		66.7 %	41-110				U4L2307		12/23/14 12:57	12/30/14 0:13	EPA 8270C
Surrogate: 2-Fluorobiphenyl		65.1 %	40-92				U4L2307		12/23/14 12:57	12/30/14 0:13	EPA 8270C
Surrogate: 2,4,6-Tribromophenol		72.3 %	49-138				U4L2307		12/23/14 12:57	12/30/14 0:13	EPA 8270C
Surrogate: d14-Terphenyl		105 %	44-131				U4L2307		12/23/14 12:57	12/30/14 0:13	EPA 8270C
Diesel	J	27	50	25	µg/L	1	U5A0205	RND	1/2/15 8:41	1/6/15 1:35	EPA 8015B
Surrogate: o-Terphenyl		76.7 %	34-150				U5A0205		1/2/15 8:41	1/6/15 1:35	EPA 8015B
Motor Oil		ND	100	25	µg/L	1	U5A0204	RND	1/2/15 8:39	1/6/15 1:35	EPA 8015B

Volatile Organics

Dichlorodifluoromethane (CFC-12)		ND	0.50	0.19	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Chloromethane		ND	0.50	0.16	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Vinyl chloride		ND	0.50	0.16	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Bromomethane		ND	1.0	0.32	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Chloroethane		ND	0.50	0.16	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,1-Dichloroethene		ND	0.50	0.14	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Carbon disulfide		ND	0.50	0.14	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Acrolein		ND	10	1.5	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Methylene chloride		ND	1.0	0.20	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
trans-1,2-Dichloroethene		ND	0.50	0.11	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Methyl tert-Butyl Ether (MTBE)		ND	1.0	0.36	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,1-Dichloroethane		ND	0.50	0.12	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Acrylonitrile		ND	5.0	2.9	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
cis-1,2-Dichloroethene		ND	0.50	0.15	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
2,2-Dichloropropane		ND	1.0	0.24	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Bromochloromethane		ND	0.50	0.20	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B

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California ELAP Certificate #1371

RWQCB - Fresno

Project: 13-014-150

1685 E Street

Project Number: River Ranch HOA Deep Well

Fresno CA, 93706-2007

Project Manager: Anthony Toto

Reported:

1/16/2015

DLW-121914-1

AL19034-01 (Drinking Water - Public/Routine)

Sampled:12/19/14 10:54

Analyte	Flag	Result	Reporting Limit	MDL	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Method
Volatile Organics											
Chloroform		ND	0.50	0.14	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Carbon tetrachloride		ND	0.50	0.16	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,1,1-Trichloroethane (TCA)		ND	0.50	0.16	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,1-Dichloropropene		ND	0.50	0.12	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Benzene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2-Dichloroethane (1,2-DCA)		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Trichloroethene (TCE)		ND	0.50	0.17	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Dibromomethane		ND	0.50	0.14	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2-Dichloropropane		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Bromodichloromethane		ND	0.50	0.13	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
cis-1,3-Dichloropropene		ND	0.50	0.11	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Toluene		ND	0.50	0.27	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
trans-1,3-Dichloropropene		ND	0.50	0.14	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Tetrachloroethene (PCE)		ND	0.50	0.12	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Dibromochloromethane		ND	0.50	0.11	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,3-Dichloropropane		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2-Dibromoethane (EDB)		ND	0.50	0.22	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Ethylbenzene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Chlorobenzene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,1,1,2-Tetrachloroethane		ND	0.50	0.12	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
m,p-Xylene		ND	1.0	0.20	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
o-Xylene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Bromoform		ND	1.0	0.12	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Isopropylbenzene		ND	1.0	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Bromobenzene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
n-Propylbenzene		ND	1.0	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,3,5-Trimethylbenzene		ND	0.50	0.11	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
2-Chlorotoluene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2,3-Trichloropropane (123TCP)		ND	0.50	0.29	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
4-Chlorotoluene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
tert-Butylbenzene		ND	1.0	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2,4-Trimethylbenzene		ND	1.0	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
sec-Butylbenzene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
p-Isopropyltoluene		ND	1.0	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B

Moore Twining Associates, Inc.

Juliane Adams, Director of Analytical Chemistry

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

California ELAP Certificate #1371

RWQCB - Fresno
1685 E Street
Fresno CA, 93706-2007

Project: 13-014-150
Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

DLW-121914-1

AL19034-01 (Drinking Water - Public/Routine)

Sampled: 12/19/14 10:54

Analyte	Flag	Result	Reporting Limit	MDL	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Method
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Volatile Organics

1,3-Dichlorobenzene		ND	0.50	0.040	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,4-Dichlorobenzene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
n-Butylbenzene		ND	0.50	0.13	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2-Dichlorobenzene		ND	0.50	0.12	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2-Dibromo-3-chloropropane (DBCP)		ND	5.0	0.39	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2,4-Trichlorobenzene		ND	1.0	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Hexachlorobutadiene		ND	1.0	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Naphthalene		ND	0.50	0.15	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
1,2,3-Trichlorobenzene		ND	0.50	0.10	µg/L	1	U4L2908	DTH	12/29/14 11:00	12/30/14 10:21	EPA 8260B
Surrogate: 4-Bromofluorobenzene	96.6 %		70-130				U4L2908		12/29/14 11:00	12/30/14 10:21	EPA 8260B
Surrogate: Dibromofluoromethane	109 %		70-130				U4L2908		12/29/14 11:00	12/30/14 10:21	EPA 8260B
Surrogate: Toluene-d8	104 %		70-130				U4L2908		12/29/14 11:00	12/30/14 10:21	EPA 8260B

Notes and Definitions

RPD	The RPD result exceeded the QC control limits. However, both percent recoveries were acceptable.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag). Same as DNQ - Detected, but Not Quantified.
BS2	Recovery for this analyte was biased low. Results were accepted based on duplicate results.
BS1	Recovery for this analyte was biased high. Results were accepted based on duplicate results.
*	The BS was inadvertently double spiked with motor oil and surrogate.
ug/L	micrograms per liter (parts per billion concentration units)
mg/kg	milligrams per kilogram (parts per million concentration units)
mg/L	milligrams per Liter (parts per million concentration units)
ND	Analyte NOT DETECTED at or above the Minimum Detection Limit (MDL)
RPD	Relative Percent Difference

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 Project: 13-014-150
 Project Number: River Ranch HOA Deep Well
 Project Manager: Anthony Toto

 Reported:
 1/16/2015

Inorganics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch U4L1925 - EPA 300.0										
Blank (U4L1925-BLK1) Prepared & Analyzed: 12/19/14										
Chloride	ND	2.0	mg/L							
Orthophosphate as P	ND	0.25	mg/L							
Nitrate as NO3	ND	2.0	mg/L							
Sulfate as SO4	ND	2.0	mg/L							
LCS (U4L1925-BS1) Prepared & Analyzed: 12/19/14										
Orthophosphate as P	4.78	0.25	mg/L	5.00		95.5	90-110		20	
Chloride	49.7	2.0	mg/L	50.0		99.4	90-110		20	
Nitrate as NO3	48.6	2.0	mg/L	50.0		97.3	90-110		20	
Sulfate as SO4	49.1	2.0	mg/L	50.0		98.3	90-110		20	
LCS Dup (U4L1925-BSD1) Prepared & Analyzed: 12/19/14										
Orthophosphate as P	4.82	0.25	mg/L	5.00		96.3	90-110	0.826	20	
Chloride	49.6	2.0	mg/L	50.0		99.2	90-110	0.153	20	
Nitrate as NO3	49.0	2.0	mg/L	50.0		98.0	90-110	0.738	20	
Sulfate as SO4	49.0	2.0	mg/L	50.0		98.0	90-110	0.290	20	
Matrix Spike (U4L1925-MS1) Source: AL19006-01 Prepared & Analyzed: 12/19/14										
Chloride	116	4.0	mg/L	100	16.5	99.1	48-147		15	
Orthophosphate as P	8.96	0.50	mg/L	10.0	ND	89.6	80-120		20	
Nitrate as NO3	109	4.0	mg/L	100	11.6	97.0	70-130		20	
Sulfate as SO4	101	4.0	mg/L	100	2.81	98.5	70-130		20	
Matrix Spike (U4L1925-MS2) Source: AL19031-01 Prepared: 12/19/14 Analyzed: 12/20/14										
Chloride	100	4.0	mg/L	100	7.24	93.0	48-147		15	
Orthophosphate as P	8.90	0.50	mg/L	10.0	ND	89.0	80-120		20	
Nitrate as NO3	99.8	4.0	mg/L	100	9.29	90.5	70-130		20	
Sulfate as SO4	105	4.0	mg/L	100	13.3	91.9	70-130		20	
Matrix Spike Dup (U4L1925-MSD1) Source: AL19006-01 Prepared & Analyzed: 12/19/14										
Orthophosphate as P	8.60	0.50	mg/L	10.0	ND	86.0	80-120	4.14	20	
Chloride	110	4.0	mg/L	100	16.5	93.6	48-147	4.89	15	
Nitrate as NO3	103	4.0	mg/L	100	11.6	91.1	70-130	5.57	20	
Sulfate as SO4	96.4	4.0	mg/L	100	2.81	93.6	70-130	4.94	20	
Matrix Spike Dup (U4L1925-MSD2) Source: AL19031-01 Prepared: 12/19/14 Analyzed: 12/20/14										
Chloride	102	4.0	mg/L	100	7.24	94.6	48-147	1.61	15	
Orthophosphate as P	9.23	0.50	mg/L	10.0	ND	92.3	80-120	3.69	20	
Nitrate as NO3	103	4.0	mg/L	100	9.29	93.4	70-130	2.83	20	



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Project: 13-014-150
Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

Inorganics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch U4L1925 - EPA 300.0

Matrix Spike Dup (U4L1925-MSD2)

Source: AL19031-01

Prepared: 12/19/14 Analyzed: 12/20/14

Sulfate as SO4	107	4.0	mg/L	100	13.3	93.5	70-130	1.52	20	
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Batch U4L1926 - SM2510B

Blank (U4L1926-BLK1)

Prepared & Analyzed: 12/19/14

Specific Conductance (EC)	ND	1.0	µS/cm							
Total Alkalinity as CaCO3	0.340	1.0	mg/L							J
Bicarbonate Alkalinity as HCO3	0.420	1.3	mg/L							J
Carbonate Alkalinity as CO3	ND	1.0	mg/L							
Hydroxide Alkalinity as OH	ND	1.0	mg/L							

LCS (U4L1926-BS1)

Prepared & Analyzed: 12/19/14

Specific Conductance (EC)	525	1.0	µS/cm	500		105	80-120		20	
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LCS (U4L1926-BS3)

Prepared & Analyzed: 12/19/14

Total Alkalinity as CaCO3	208	1.0	mg/L	250		83.1	80-120		20	
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LCS Dup (U4L1926-BSD1)

Prepared & Analyzed: 12/19/14

Specific Conductance (EC)	524	1.0	µS/cm	500		105	80-120	0.193	20	
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LCS Dup (U4L1926-BSD3)

Prepared & Analyzed: 12/19/14

Total Alkalinity as CaCO3	203	1.0	mg/L	250		81.2	80-120	2.37	20	
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Duplicate (U4L1926-DUP1)

Source: AL17043-01

Prepared & Analyzed: 12/19/14

Total Alkalinity as CaCO3	123	1.0	mg/L		127			3.51	20	
Specific Conductance (EC)	755	1.0	µS/cm		755			0.00	20	
Bicarbonate Alkalinity as HCO3	150	1.3	mg/L		155			3.50	20	
Carbonate Alkalinity as CO3	ND	1.0	mg/L		ND				20	
Hydroxide Alkalinity as OH	ND	1.0	mg/L		ND				20	

Duplicate (U4L1926-DUP2)

Source: AL19025-03

Prepared & Analyzed: 12/19/14

Total Alkalinity as CaCO3	311	1.0	mg/L		299			3.71	20	
Specific Conductance (EC)	934	1.0	µS/cm		933			0.108	20	
Bicarbonate Alkalinity as HCO3	379	1.3	mg/L		365			3.70	20	
Carbonate Alkalinity as CO3	ND	1.0	mg/L		ND				20	
Hydroxide Alkalinity as OH	ND	1.0	mg/L		ND				20	

Batch U4L2213 - SM 2540C

Blank (U4L2213-BLK1)

Prepared: 12/22/14 Analyzed: 12/23/14

Total Dissolved Solids	ND	10	mg/L							
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Project Manager: Anthony Toto

Reported:
1/16/2015

Inorganics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch U4L2213 - SM 2540C

LCS (U4L2213-BS1)

Prepared: 12/22/14 Analyzed: 12/23/14

Total Dissolved Solids	240	10	mg/L	240		100	80-120		20	
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LCS Dup (U4L2213-BSD1)

Prepared: 12/22/14 Analyzed: 12/23/14

Total Dissolved Solids	247	10	mg/L	240		103	80-120	2.87	20	
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Duplicate (U4L2213-DUP1)

Source: AL16045-01

Prepared: 12/22/14 Analyzed: 12/23/14

Total Dissolved Solids	628	10	mg/L		654			4.06	20	
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Duplicate (U4L2213-DUP2)

Source: AL18033-01

Prepared: 12/22/14 Analyzed: 12/23/14

Total Dissolved Solids	278	10	mg/L		279			0.359	20	
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Project Manager: Anthony Toto

Reported:
1/16/2015

Metals - Dissolved - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch U4L2309 - EPA 200.8

Blank (U4L2309-BLK1)

Prepared & Analyzed: 12/24/14

Iron	ND	20	µg/L							
Molybdenum	0.0276	1.0	µg/L							J
Nickel	ND	1.0	µg/L							
Vanadium	ND	1.0	µg/L							
Thallium	ND	1.0	µg/L							
Arsenic	ND	1.0	µg/L							
Beryllium	ND	1.0	µg/L							
Barium	ND	1.0	µg/L							
Selenium	ND	1.0	µg/L							
Silver	0.315	1.0	µg/L							J
Boron	ND	20	µg/L							
Mercury	ND	0.20	µg/L							
Cobalt	ND	1.0	µg/L							
Manganese	0.133	1.0	µg/L							J
Lead	ND	1.0	µg/L							
Copper	0.102	2.0	µg/L							J
Chromium	ND	1.0	µg/L							
Zinc	0.226	5.0	µg/L							J
Antimony	0.165	1.0	µg/L							J
Cadmium	ND	0.20	µg/L							

LCS (U4L2309-BS1)

Prepared & Analyzed: 12/24/14

Arsenic	51.0	1.0	µg/L	50.0		102	85-115		20	
Antimony	49.2	1.0	µg/L	50.0		98.3	85-115		20	
Barium	50.4	1.0	µg/L	50.0		101	85-115		20	
Iron	2550	20	µg/L	2500		102	85-115		20	
Boron	257	20	µg/L	250		103	85-115		20	
Molybdenum	50.0	1.0	µg/L	50.0		100	85-115		20	
Cobalt	49.9	1.0	µg/L	50.0		99.7	85-115		20	
Copper	50.8	2.0	µg/L	50.0		102	85-115		20	
Nickel	50.9	1.0	µg/L	50.0		102	85-115		20	
Thallium	50	1.0	µg/L	50.0		101	85-115		20	
Beryllium	50.2	1.0	µg/L	50.0		100	85-115		20	
Manganese	49.2	1.0	µg/L	50.0		98.4	85-115		20	
Cadmium	49.8	0.20	µg/L	50.0		99.7	85-115		20	

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Reported:
1/16/2015

Metals - Dissolved - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch U4L2309 - EPA 200.8

LCS (U4L2309-BS1)

Prepared & Analyzed: 12/24/14

Silver	49.8	1.0	µg/L	50.0		99.6	85-115		20	
Chromium	49.7	1.0	µg/L	50.0		99.5	85-115		20	
Selenium	50.5	1.0	µg/L	50.0		101	85-115		20	
Zinc	50.7	5.0	µg/L	50.0		101	85-115		20	
Lead	50	1.0	µg/L	50.0		99.8	85-115		20	
Mercury	0.997	0.20	µg/L	1.00		99.7	80-115		20	
Vanadium	49.4	1.0	µg/L	50.0		98.9	85-115		20	

LCS Dup (U4L2309-BSD1)

Prepared & Analyzed: 12/24/14

Iron	2220	20	µg/L	2500		89.0	85-115	13.7	20	
Vanadium	41.0	1.0	µg/L	50.0		81.9	85-115	18.7	20	BS2
Chromium	57.1	1.0	µg/L	50.0		114	85-115	13.7	20	
Copper	42.5	2.0	µg/L	50.0		85.0	85-115	17.8	20	
Lead	62	1.0	µg/L	50.0		124	85-115	21.8	20	BS1
Nickel	43.0	1.0	µg/L	50.0		86.1	85-115	16.7	20	
Manganese	43.0	1.0	µg/L	50.0		86.0	85-115	13.5	20	
Molybdenum	41.9	1.0	µg/L	50.0		83.8	85-115	17.8	20	BS2
Boron	217	20	µg/L	250		86.9	85-115	16.9	20	
Beryllium	42.0	1.0	µg/L	50.0		83.9	85-115	17.9	20	BS2
Mercury	1.24	0.20	µg/L	1.00		124	80-115	21.5	20	BS1
Selenium	43.0	1.0	µg/L	50.0		86.0	85-115	15.9	20	
Barium	62.6	1.0	µg/L	50.0		125	85-115	21.6	20	BS1
Arsenic	42.3	1.0	µg/L	50.0		84.6	85-115	18.7	20	BS2
Silver	41.8	1.0	µg/L	50.0		83.5	85-115	17.5	20	BS2
Antimony	41.3	1.0	µg/L	50.0		82.5	85-115	17.5	20	BS2
Cobalt	41.2	1.0	µg/L	50.0		82.4	85-115	19.0	20	BS2
Thallium	62	1.0	µg/L	50.0		124	85-115	20.4	20	BS1
Cadmium	41.9	0.20	µg/L	50.0		83.8	85-115	17.3	20	BS2
Zinc	42.8	5.0	µg/L	50.0		85.5	85-115	16.9	20	

Batch U5A0602 - EPA 200.7

Blank (U5A0602-BLK1)

Prepared & Analyzed: 01/06/15

Magnesium	ND	0.10	mg/L							
Sodium	ND	1.0	mg/L							
Potassium	ND	1.0	mg/L							

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Metals - Dissolved - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch U5A0602 - EPA 200.7										
Blank (U5A0602-BLK1)					Prepared & Analyzed: 01/06/15					
Calcium	ND	0.10	mg/L							
LCS (U5A0602-BS1)					Prepared & Analyzed: 01/06/15					
Sodium	2.27	1.0	mg/L	2.00		114	85-115		20	
Potassium	1.89	1.0	mg/L	2.00		94.4	85-115		20	
Magnesium	1.95	0.10	mg/L	2.00		97.3	85-115		20	
Calcium	1.00	0.10	mg/L	1.00		100	85-115		20	
LCS Dup (U5A0602-BSD1)					Prepared & Analyzed: 01/06/15					
Magnesium	1.95	0.10	mg/L	2.00		97.7	85-115	0.428	20	
Calcium	1.00	0.10	mg/L	1.00		100	85-115	0.0546	20	
Potassium	1.92	1.0	mg/L	2.00		95.9	85-115	1.57	20	
Sodium	2.23	1.0	mg/L	2.00		112	85-115	1.92	20	

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RWQCB - Fresno

Project: 13-014-150

1685 E Street

Project Number: River Ranch HOA Deep Well

Fresno CA, 93706-2007

Project Manager: Anthony Toto

Reported:

1/16/2015

Semi-Volatile Organics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch U4L2307 - EPA 8270C

Blank (U4L2307-BLK1)

Prepared: 12/23/14 Analyzed: 12/29/14

Surrogate: 2-Fluorophenol	44.7		µg/L	100		44.7	22-92			
Surrogate: Phenol-d5	29.5		µg/L	100		29.5	10-94			
Surrogate: Nitrobenzene-d5	34.8		µg/L	50.0		69.7	41-110			
Surrogate: 2-Fluorobiphenyl	34.7		µg/L	50.0		69.4	40-92			
Surrogate: 2,4,6-Tribromophenol	77.4		µg/L	100		77.4	49-138			
Surrogate: d14-Terphenyl	66.4		µg/L	50.0		133	44-131			
N-Nitrosodimethylamine	ND	5.0	µg/L							
Phenol	ND	5.0	µg/L							
Bis(2-chloroethyl)ether	ND	5.0	µg/L							
2-Chlorophenol	ND	5.0	µg/L							
1,3-Dichlorobenzene	ND	5.0	µg/L							
1,4-Dichlorobenzene	ND	5.0	µg/L							
1,2-Dichlorobenzene	ND	5.0	µg/L							
Bis(2-chloroisopropyl)ether	ND	5.0	µg/L							
2-Methylphenol	ND	5.0	µg/L							
Hexachloroethane	ND	5.0	µg/L							
3-Methylphenol	ND	5.0	µg/L							
4-Methylphenol	ND	5.0	µg/L							
N-Nitrosodi-n-propylamine	ND	5.0	µg/L							
Nitrobenzene	ND	5.0	µg/L							
Isophorone	ND	5.0	µg/L							
2-Nitrophenol	ND	5.0	µg/L							
2,4-Dimethylphenol	ND	5.0	µg/L							
Bis(2-chloroethoxy)methane	ND	5.0	µg/L							
2,4-Dichlorophenol	ND	5.0	µg/L							
1,2,4-Trichlorobenzene	ND	5.0	µg/L							
Naphthalene	ND	5.0	µg/L							
4-Chloroaniline	ND	5.0	µg/L							
Hexachlorobutadiene	ND	5.0	µg/L							
4-Chloro-3-methylphenol	ND	5.0	µg/L							
2-Methylnaphthalene	ND	5.0	µg/L							
Hexachlorocyclopentadiene	ND	5.0	µg/L							
2,4,5-Trichlorophenol	ND	5.0	µg/L							
2,4,6-Trichlorophenol	ND	5.0	µg/L							



2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

California ELAP Certificate #1371

RWQCB - Fresno

Project: 13-014-150

1685 E Street

Project Number: River Ranch HOA Deep Well

Fresno CA, 93706-2007

Project Manager: Anthony Toto

Reported:

1/16/2015

Semi-Volatile Organics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch U4L2307 - EPA 8270C

Blank (U4L2307-BLK1)

Prepared: 12/23/14 Analyzed: 12/29/14

2-Chloronaphthalene	ND	5.0	µg/L
2-Nitroaniline	ND	5.0	µg/L
Dimethyl phthalate	ND	5.0	µg/L
Acenaphthylene	ND	5.0	µg/L
2,6-Dinitrotoluene	ND	5.0	µg/L
3-Nitroaniline	ND	5.0	µg/L
Acenaphthene	ND	5.0	µg/L
2,4-Dinitrophenol	ND	5.0	µg/L
Dibenzofuran	ND	5.0	µg/L
4-Nitrophenol	ND	5.0	µg/L
2,4-Dinitrotoluene	ND	5.0	µg/L
Fluorene	ND	5.0	µg/L
Diethyl phthalate	ND	5.0	µg/L
4-Chlorophenyl phenyl ether	ND	5.0	µg/L
4-Nitroaniline	ND	5.0	µg/L
Diphenylamine	ND	5.0	µg/L
1,2-Diphenylhydrazine	ND	5.0	µg/L
Benzidine	ND	5.0	µg/L
N-Nitrosodiphenylamine	ND	5.0	µg/L
4,6-Dinitro-2-methylphenol	ND	5.0	µg/L
4-Bromophenyl phenyl ether	ND	5.0	µg/L
Hexachlorobenzene	ND	5.0	µg/L
Pentachlorophenol	ND	5.0	µg/L
Phenanthrene	ND	5.0	µg/L
Anthracene	ND	5.0	µg/L
Di-n-butyl phthalate	ND	5.0	µg/L
Fluoranthene	ND	5.0	µg/L
Pyrene	ND	5.0	µg/L
Butyl benzyl phthalate	ND	5.0	µg/L
Benzo (a) anthracene	ND	5.0	µg/L
Chrysene	ND	5.0	µg/L
Bis(2-ethylhexyl) phthalate	ND	5.0	µg/L
Di-n-octyl phthalate	ND	5.0	µg/L
Benzo (b) fluoranthene	ND	5.0	µg/L

Moore Twining Associates, Inc.

Juliane Adams, Director of Analytical Chemistry

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California ELAP Certificate #1371

RWQCB - Fresno

Project: 13-014-150

1685 E Street

Project Number: River Ranch HOA Deep Well

Fresno CA, 93706-2007

Project Manager: Anthony Toto

Reported:
1/16/2015

Semi-Volatile Organics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch U4L2307 - EPA 8270C

Blank (U4L2307-BLK1)

Prepared: 12/23/14 Analyzed: 12/29/14

Benzo (k) fluoranthene	ND	5.0	µg/L							
Benzo (a) pyrene	ND	5.0	µg/L							
3,3'-Dichlorobenzidine	ND	5.0	µg/L							
Indeno(1,2,3-cd)pyrene	ND	5.0	µg/L							
Dibenzo(a,h)anthracene	ND	5.0	µg/L							
Benzo(ghi)perylene	ND	5.0	µg/L							

LCS (U4L2307-BS1)

Prepared: 12/23/14 Analyzed: 12/29/14

Surrogate: 2-Fluorophenol	48.7		µg/L	100		48.7	22-92			
Surrogate: Phenol-d5	30.9		µg/L	100		30.9	10-94			
Surrogate: Nitrobenzene-d5	36.2		µg/L	50.0		72.4	41-110			
Surrogate: 2-Fluorobiphenyl	35.7		µg/L	50.0		71.4	40-92			
Surrogate: 2,4,6-Tribromophenol	83.6		µg/L	100		83.6	49-138			
Surrogate: d14-Terphenyl	63.4		µg/L	50.0		127	44-131			
Phenol	15.4	5.0	µg/L	50.0		30.9	5-112		20	
2-Chlorophenol	34.6	5.0	µg/L	50.0		69.3	23-134		20	
1,4-Dichlorobenzene	12.6	5.0	µg/L	25.0		50.6	20-124		20	
N-Nitrosodi-n-propylamine	17.3	5.0	µg/L	25.0		69.3	5-230		20	
1,2,4-Trichlorobenzene	14.7	5.0	µg/L	25.0		58.9	44-142		20	
4-Chloro-3-methylphenol	38.5	5.0	µg/L	50.0		76.9	22-147		20	
Acenaphthene	18.3	5.0	µg/L	25.0		73.1	47-145		20	
2,4-Dinitrotoluene	17.0	5.0	µg/L	25.0		68.0	39-139		20	
Pyrene	25.0	5.0	µg/L	25.0		100	52-115		20	

LCS Dup (U4L2307-BSD1)

Prepared: 12/23/14 Analyzed: 12/29/14

Surrogate: 2-Fluorophenol	50.1		µg/L	100		50.1	22-92			
Surrogate: Phenol-d5	34.7		µg/L	100		34.7	10-94			
Surrogate: Nitrobenzene-d5	42.0		µg/L	50.0		84.0	41-110			
Surrogate: 2-Fluorobiphenyl	43.6		µg/L	50.0		87.2	40-92			
Surrogate: 2,4,6-Tribromophenol	90.3		µg/L	100		90.3	49-138			
Surrogate: d14-Terphenyl	61.0		µg/L	50.0		122	44-131			
Phenol	17.2	5.0	µg/L	50.0		34.4	5-112	10.9	20	
2-Chlorophenol	38.1	5.0	µg/L	50.0		76.2	23-134	9.48	20	
1,4-Dichlorobenzene	16.0	5.0	µg/L	25.0		64.1	20-124	23.7	20	RPD
N-Nitrosodi-n-propylamine	18.5	5.0	µg/L	25.0		73.9	5-230	6.51	20	
1,2,4-Trichlorobenzene	18.1	5.0	µg/L	25.0		72.5	44-142	20.7	20	RPD

Moore Twining Associates, Inc.

Juliane Adams, Director of Analytical Chemistry

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Fresno, CA 93721
(559) 268-7021 Phone
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California ELAP Certificate #1371

RWQCB - Fresno
1685 E Street
Fresno CA, 93706-2007

Project: 13-014-150
Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

Semi-Volatile Organics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch U4L2307 - EPA 8270C

LCS Dup (U4L2307-BSD1)

Prepared: 12/23/14 Analyzed: 12/29/14

4-Chloro-3-methylphenol	38.2	5.0	µg/L	50.0		76.4	22-147	0.710	20	
Acenaphthene	21.2	5.0	µg/L	25.0		84.9	47-145	14.9	20	
2,4-Dinitrotoluene	18.9	5.0	µg/L	25.0		75.6	39-139	10.6	20	
Pyrene	24.7	5.0	µg/L	25.0		98.7	52-115	1.45	20	

Batch U5A0204 - EPA 8015B

Blank (U5A0204-BLK1)

Prepared: 01/02/15 Analyzed: 01/05/15

Surrogate: o-Terphenyl	40.8		µg/L	40.0		102	0-200			
Motor Oil	ND	100	µg/L							

LCS (U5A0204-BS1)

Prepared: 01/02/15 Analyzed: 01/05/15

Surrogate: o-Terphenyl	105		µg/L	40.0		262	62-132			*
Motor Oil	1050	100	µg/L	1000		105	62-132		20	*

LCS Dup (U5A0204-BSD1)

Prepared: 01/02/15 Analyzed: 01/05/15

Surrogate: o-Terphenyl	39.0		µg/L	40.0		97.4	62-132			
Motor Oil	536	100	µg/L	500		107	62-132	64.5	20	

Batch U5A0205 - EPA 8015B

Blank (U5A0205-BLK1)

Prepared: 01/02/15 Analyzed: 01/05/15

Surrogate: o-Terphenyl	32.5		µg/L	40.0		81.2	34-150			
Diesel	32.5	50	µg/L							J

LCS (U5A0205-BS1)

Prepared: 01/02/15 Analyzed: 01/05/15

Surrogate: o-Terphenyl	45.6		µg/L	40.0		114	34-150			
Diesel	454	50	µg/L	500		90.9	70-130		20	

LCS Dup (U5A0205-BSD1)

Prepared: 01/02/15 Analyzed: 01/05/15

Surrogate: o-Terphenyl	41.3		µg/L	40.0		103	34-150			
Diesel	514	50	µg/L	500		103	70-130	12.2	20	

Moore Twining Associates, Inc.
Juliane Adams, Director of Analytical Chemistry

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California ELAP Certificate #1371

RWQCB - Fresno
1685 E Street
Fresno CA, 93706-2007

Project: 13-014-150
Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

Volatile Organics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch U4L2908 - EPA 8260B

Blank (U4L2908-BLK1)

Prepared & Analyzed: 12/29/14

Surrogate: 4-Bromofluorobenzene	24.3		µg/L	25.0		97.2	70-130			
Surrogate: Dibromofluoromethane	26.4		µg/L	25.0		106	70-130			
Surrogate: Toluene-d8	25.6		µg/L	25.0		102	70-130			
Dichlorodifluoromethane (CFC-12)	ND	0.50	µg/L							
Chloromethane	ND	0.50	µg/L							
Vinyl chloride	ND	0.50	µg/L							
Bromomethane	ND	1.0	µg/L							
Chloroethane	ND	0.50	µg/L							
1,1-Dichloroethene	ND	0.50	µg/L							
Carbon disulfide	ND	0.50	µg/L							
Acrolein	ND	10	µg/L							
Methylene chloride	ND	1.0	µg/L							
trans-1,2-Dichloroethene	ND	0.50	µg/L							
Methyl tert-Butyl Ether (MTBE)	ND	1.0	µg/L							
1,1-Dichloroethane	ND	0.50	µg/L							
Acrylonitrile	ND	5.0	µg/L							
cis-1,2-Dichloroethene	ND	0.50	µg/L							
2,2-Dichloropropane	ND	1.0	µg/L							
Bromochloromethane	ND	0.50	µg/L							
Chloroform	ND	0.50	µg/L							
Carbon tetrachloride	ND	0.50	µg/L							
1,1,1-Trichloroethane (TCA)	ND	0.50	µg/L							
1,1-Dichloropropene	ND	0.50	µg/L							
Benzene	ND	0.50	µg/L							
1,2-Dichloroethane (1,2-DCA)	ND	0.50	µg/L							
Trichloroethene (TCE)	ND	0.50	µg/L							
Dibromomethane	ND	0.50	µg/L							
1,2-Dichloropropane	ND	0.50	µg/L							
Bromodichloromethane	ND	0.50	µg/L							
cis-1,3-Dichloropropene	ND	0.50	µg/L							
Toluene	ND	0.50	µg/L							
trans-1,3-Dichloropropene	ND	0.50	µg/L							
Tetrachloroethene (PCE)	ND	0.50	µg/L							
Dibromochloromethane	ND	0.50	µg/L							

Moore Twining Associates, Inc.

Juliane Adams, Director of Analytical Chemistry

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Project: 13-014-150

1685 E Street

Project Number: River Ranch HOA Deep Well

Fresno CA, 93706-2007

Project Manager: Anthony Toto

Reported:
1/16/2015

Volatile Organics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch U4L2908 - EPA 8260B

Blank (U4L2908-BLK1)

Prepared & Analyzed: 12/29/14

1,3-Dichloropropane	ND	0.50	µg/L
1,2-Dibromoethane (EDB)	ND	0.50	µg/L
Ethylbenzene	ND	0.50	µg/L
Chlorobenzene	ND	0.50	µg/L
1,1,1,2-Tetrachloroethane	ND	0.50	µg/L
m,p-Xylene	ND	1.0	µg/L
o-Xylene	ND	0.50	µg/L
Bromoform	ND	1.0	µg/L
Isopropylbenzene	ND	1.0	µg/L
Bromobenzene	ND	0.50	µg/L
n-Propylbenzene	ND	1.0	µg/L
1,3,5-Trimethylbenzene	ND	0.50	µg/L
2-Chlorotoluene	ND	0.50	µg/L
1,2,3-Trichloropropane (123TCP)	ND	0.50	µg/L
4-Chlorotoluene	ND	0.50	µg/L
tert-Butylbenzene	ND	1.0	µg/L
1,2,4-Trimethylbenzene	ND	1.0	µg/L
sec-Butylbenzene	ND	0.50	µg/L
p-Isopropyltoluene	ND	1.0	µg/L
1,3-Dichlorobenzene	ND	0.50	µg/L
1,4-Dichlorobenzene	ND	0.50	µg/L
n-Butylbenzene	ND	0.50	µg/L
1,2-Dichlorobenzene	ND	0.50	µg/L
1,2-Dibromo-3-chloropropane (DBCP)	ND	5.0	µg/L
1,2,4-Trichlorobenzene	ND	1.0	µg/L
Hexachlorobutadiene	ND	1.0	µg/L
Naphthalene	ND	0.50	µg/L
1,2,3-Trichlorobenzene	ND	0.50	µg/L

LCS (U4L2908-BS1)

Prepared & Analyzed: 12/29/14

Surrogate: 4-Bromofluorobenzene	24.9		µg/L	25.0	99.6	70-130	
Surrogate: Dibromofluoromethane	26.6		µg/L	25.0	106	70-130	
Surrogate: Toluene-d8	25.7		µg/L	25.0	103	70-130	
1,1-Dichloroethene	21.3	0.50	µg/L	19.8	107	70-130	20
Benzene	20.1	0.50	µg/L	20.0	100	70-130	20

Moore Twining Associates, Inc.

Juliane Adams, Director of Analytical Chemistry

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Project Number: River Ranch HOA Deep Well
Project Manager: Anthony Toto

Reported:
1/16/2015

Volatile Organics - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch U4L2908 - EPA 8260B

LCS (U4L2908-BS1)

Prepared & Analyzed: 12/29/14

Trichloroethene (TCE)	17.9	0.50	µg/L	20.0		89.7	70-130		20	
Toluene	19.0	0.50	µg/L	19.9		95.5	70-130		20	
Chlorobenzene	18.8	0.50	µg/L	20.0		94.2	70-130		20	

LCS Dup (U4L2908-BSD1)

Prepared & Analyzed: 12/29/14

Surrogate: 4-Bromofluorobenzene	24.3		µg/L	25.0		97.1	70-130			
Surrogate: Dibromofluoromethane	26.9		µg/L	25.0		108	70-130			
Surrogate: Toluene-d8	25.9		µg/L	25.0		104	70-130			
1,1-Dichloroethene	20.3	0.50	µg/L	19.8		103	70-130	4.62	20	
Benzene	19.1	0.50	µg/L	20.0		95.6	70-130	4.95	20	
Trichloroethene (TCE)	17.0	0.50	µg/L	20.0		85.1	70-130	5.26	20	
Toluene	18.1	0.50	µg/L	19.9		90.9	70-130	4.96	20	
Chlorobenzene	17.9	0.50	µg/L	20.0		89.7	70-130	4.95	20	

Date of Report: 01/13/2015

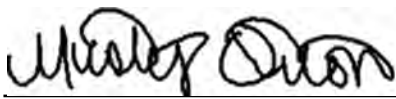
Julio Morales

Moore-Twining Associates
2527 Fresno Street
Fresno, CA 93720

Client Project: AL19034
BCL Project: Water Samples
BCL Work Order: 1430788
Invoice ID: B193225

Enclosed are the results of analyses for samples received by the laboratory on 12/24/2014. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Contact Person: Misty Orton
Client Service Rep



Authorized Signature

Certifications: CA ELAP #1186; NV #CA00014; OR ELAP #4032-001; AK UST101

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1430788-01 - DLW-121914-1 AL19034-01

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Quality Control Reports

Metals Analysis

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SUBCONTRACT ORDER - Purchase Order # 22571

California ELAP Certification # 1371

MTA Project # AL19034

Please reference these numbers on all reports and invoices:

We also request QC data be provided with final report.

SENDING LABORATORY:

Moore Twining Associates, Inc.
2527 Fresno Street
Fresno, CA 93721
Phone: (559) 268-7021
Fax: (559) 268-0740
Project Manager: Julio Morales

RECEIVING LABORATORY:

BC Laboratories, Inc.
4100 Atlas Court
Bakersfield, CA 93308
Phone : (800) 878-4911
Fax: (661) 327-1918

Sample Comments

Client Sample ID#: DLW-121914-1

MTA Sample ID: AL19034-01 Matrix: Water

Sampled: 12/19/14 10:54

Report Due to Client: 01/06/15

Requested Analysis: Chromium, Hexavalent

Holding time expires: 01/16/15 10:54

Containers Supplied:

125mL Plastic w/borate
carbonate buffer (J)

SHORT HOLDING TIME					
Cr ⁺⁶	NO ₂	NO ₃	OP	SS	
DO	Cl ₂	BOD	MBAS	COT	

CHK BY	DISTRIBUTION
 <input type="checkbox"/>	 <input type="checkbox"/>
SUB-OUT <input type="checkbox"/>	

 Released By	12/23/14 Date	 Received By	12/24/14 1025 Date
-----------------	------------------	-----------------	-----------------------

Released By	Date	Received By	Date
-------------	------	-------------	------

Please fax copy of receipt with your assigned sample ID number to (559) 268-0740 Page 1 of 1



Laboratories, Inc.

Environmental Testing Laboratory Since 1949

Chain of Custody and Cooler Receipt Form for 1430788 Page 2 of 2

BC LABORATORIES INC.		COOLER RECEIPT FORM		Rev. No. 18	09/04/14	Page 1 Of 1					
Submission #: <u>1430788</u>											
SHIPPING INFORMATION Federal Express <input type="checkbox"/> UPS <input type="checkbox"/> Hand Delivery <input type="checkbox"/> BC Lab Field Service <input type="checkbox"/> Other <input type="checkbox"/> (Specify) <u>Golden</u>		SHIPPING CONTAINER Ice Chest <input checked="" type="checkbox"/> None <input type="checkbox"/> Box <input type="checkbox"/> Other <input type="checkbox"/> (Specify) _____		FREE LIQUID YES <input type="checkbox"/> NO <input type="checkbox"/>							
Refrigerant: Ice <input type="checkbox"/> Blue Ice <input checked="" type="checkbox"/> None <input type="checkbox"/> Other <input type="checkbox"/> Comments: _____											
Custody Seals: Ice Chest <input type="checkbox"/> Containers <input type="checkbox"/> None <input checked="" type="checkbox"/> Comments: _____ Intact? Yes <input type="checkbox"/> No <input type="checkbox"/> Intact? Yes <input type="checkbox"/> No <input type="checkbox"/>											
All samples received? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> All samples containers intact? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Description(s) match COC? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>											
COC Received <input type="checkbox"/> YES <input type="checkbox"/> NO		Emissivity: <u>0.98</u> Container: <u>PE</u> Thermometer ID: <u>208</u> Temperature: (A) <u>2.7</u> °C (C) <u>2.3</u> °C		Date/Time: <u>12/24/14</u> Analyst Init: <u>WMS/025</u>							
SAMPLE CONTAINERS		SAMPLE NUMBERS									
		1	2	3	4	5	6	7	8	9	10
QT GENERAL MINERAL/ GENERAL											
PT PE UNPRESERVED											
QT INORGANIC CHEMICAL METALS											
PT INORGANIC CHEMICAL METALS											
PT CYANIDE											
PT NITROGEN FORMS											
PT TOTAL SULFIDE											
2oz. NITRATE/NITRITE <u>CRB</u>		<u>A</u>									
PT TOTAL ORGANIC CARBON											
PT TOX											
PT CHEMICAL OXYGEN DEMAND											
PA PHENOLICS											
40ml VOA VIAL TRAVEL BLANK											
40ml VOA VIAL											
QT EPA 413.1, 413.2, 418.1											
PT ODOR											
RADIOLOGICAL											
BACTERIOLOGICAL											
40 ml VOA VIAL- 504											
QT EPA 508/608/8080											
QT EPA 515.1/8150											
QT EPA 525											
QT EPA 525 TRAVEL BLANK											
40ml EPA 547											
40ml EPA 531.1											
8oz Amber EPA 548											
QT EPA 549											
QT EPA 632											
QT EPA 8015M											
QT AMBER											
8 OZ. JAR											
32 OZ. JAR											
SOIL SLEEVE											
PCB VIAL											
PLASTIC BAG											
FERROUS IRON											
ENCORE											
SMART KIT											
Summa Canister											

Comments:

Sample Numbering Completed By: _____

A = Actual / C = Corrected

Date/Time: 12-24-14

1208 [S:\WPDoc\WordPerfect\LAB_DOCS\FORMS\SAMREC]

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Moore-Twining Associates
2527 Fresno Street
Fresno, CA 93720

Reported: 01/13/2015 12:40
Project: Water Samples
Project Number: AL19034
Project Manager: Julio Morales

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1430788-01	COC Number:	---	Receive Date:	12/24/2014 10:25
	Project Number:	---	Sampling Date:	12/19/2014 10:54
	Sampling Location:	---	Sample Depth:	---
	Sampling Point:	DLW-121914-1 AL19034-01	Lab Matrix:	Water
	Sampled By:	---	Sample Type:	Water

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Moore-Twining Associates
2527 Fresno Street
Fresno, CA 93720

Reported: 01/13/2015 12:40
Project: Water Samples
Project Number: AL19034
Project Manager: Julio Morales

Metals Analysis

BCL Sample ID:	1430788-01	Client Sample Name:	DLW-121914-1 AL19034-01, 12/19/2014 10:54:00AM					
Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Hexavalent Chromium	ND	ug/L	0.20	0.055	EPA-218.6	0.067		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-218.6	12/26/14	12/26/14 19:57	OLH	IC-4	1	BXL2699

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Moore-Twining Associates
2527 Fresno Street
Fresno, CA 93720

Reported: 01/13/2015 12:40
Project: Water Samples
Project Number: AL19034
Project Manager: Julio Morales

Metals Analysis

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXL2699						
Hexavalent Chromium	BXL2699-BLK1	0.067000	ug/L	0.20	0.055	J

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Moore-Twining Associates
2527 Fresno Street
Fresno, CA 93720

Reported: 01/13/2015 12:40
Project: Water Samples
Project Number: AL19034
Project Manager: Julio Morales

Metals Analysis

Quality Control Report - Laboratory Control Sample

								<u>Control Limits</u>		
Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Percent Recovery	RPD	Lab
Quals										
QC Batch ID: BXL2699										
	Hexavalent Chromium	BXL2699-BS1	LCS	21.005	20.000	ug/L	105	90 - 110		

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Moore-Twining Associates
2527 Fresno Street
Fresno, CA 93720

Reported: 01/13/2015 12:40
Project: Water Samples
Project Number: AL19034
Project Manager: Julio Morales

Metals Analysis

Quality Control Report - Precision & Accuracy

									Control Limits		
Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	RPD	Percent Recovery	Lab Quals
QC Batch ID: BXL2699		Used client sample: Y - Description: Conference Room AL19028-01, 12/19/2014 11:28									
Hexavalent Chromium	DUP	1430785-01	0.59000	0.57400		ug/L	2.7		10		
	MS	1430785-01	0.59000	21.674	20.202	ug/L		104		90 - 110	
	MSD	1430785-01	0.59000	21.667	20.202	ug/L	0.0	104	10	90 - 110	

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Moore-Twining Associates
2527 Fresno Street
Fresno, CA 93720

Reported: 01/13/2015 12:40
Project: Water Samples
Project Number: AL19034
Project Manager: Julio Morales

Notes And Definitions

J	Estimated Value (CLP Flag)
MDL	Method Detection Limit
ND	Analyte Not Detected at or above the reporting limit
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference

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2527 FRESNO STREET • FRESNO, CA 93721 • PHONE (559) 268-7021 • FAX: (559) 268-0740

PAGE 1 OF 3

AL19034

REPORTING:

[illegible]

COMMENTS/ADDITIONAL INSTRUCTIONS:

All samples NOT field filtered

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY
Douglas Wachtel	RB5F	12/19	1545	LB	11/19/19

Sample Integrity

Page

of

WO#

Date Received:

23

AL19034

12/19/14

Section 1-Sampled Same Day

Sample Transport:

Walk In

MTA Courier

Transported In:

Ice Chest

Box

Hand

Has Chilling Begun?

Yes

No

Section 2-Sampled Previously

Sample Transport:

Walk-in

UPS

GSO

Fed Ex

MTA Courier

Other:

No. Coolers/Ice Chests:

Temperature(s):

Was Temperature In Range: Y or N

Received On Ice:

Wet

Blue

Describe type of packing materials: Bubble Wrap

Foam

Packing Peanuts

Paper

Other:

Were ice chest custody seals present? Y or N

Intact? Y or N

Section 3-COC Info.

	Completed				Completed	
	Yes	No			Yes	No
Was COC Received	/	/	Analysis Requested		/	/
Date Sampled	/	/	Any hold times less than 72hr		/	/
Time Sampled	/	/	Client Name		/	/
Sample ID	/	/	Address		/	/
Special Storage/Handling Ins.	/	/	Telephone #		/	/

Section 4-Bottles/Analysis

	Yes	No	N/A	Comment
Did all bottles arrive unbroken and intact?	/	/	/	
Were bottle custody seals present?	/	/	/	
Were bottle custody seals intact?	/	/	/	
Did all bottle labels agree with COC?	/	/	/	
Were correct containers used for the tests requested?	/	/	/	
Was sufficient amount of sample sent for tests indicated?	/	/	/	
Were bubbles present in VOA Vials? (Volatiles Methods Only)	/	/	/	
Were Ascorbic Acid Bottles Received with VOAs?	/	/	/	

Section 5-Comment/Discrepancies

Sample(s) Split/Preserve: Yes or No Container: Preservation: Initials:

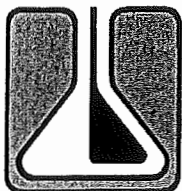
Filtered: Yes No Container: Preservation: Initials:

Was Client Service Supervisor notified of discrepancies: Yes or No N/A Notified by:

Explanations/Comments:

Labeled by: Checked by:

FL-SC



ZALCO LABORATORIES, INC.

Analytical & Consulting Services

4309-Armour Avenue
Bakersfield, California 93308

(661) 395-0539
FAX (661) 395-3069

November 12, 2013

Janelle Dockham
River Ranch HOA
2131 G Street
Bakersfield, CA 93301

TEL: (661) 327-0440
FAX: -

RE: 1310303

Dear Janelle Dockham:

Zalco Laboratories, Inc. received 1 samples on 10/28/2013 for the analyses presented in the following report.

We appreciate your business and look forward to serving you in the future. Please feel free to call our office if you have any questions regarding these test results.

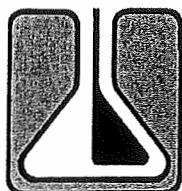
Sincerely,

Juan Magana
Project Manager
CC: Colleen Bellue

+ 250-500-600 ++ 0.6-1.7 +++ 900-1600-2200 + 500-1000-1500 P:Primary Standard S: Secondary Standard

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NSS: non-sufficient sample; MCL: maximum contaminant level; RL: reporting limit; #: above MCL

Note: Samples analyzed for regulatory purposes should be put on ice immediately after sampling and received by the laboratory at temperatures between 0-6°C. Microbiological analysis requires samples to be at least 4-10°C when received at the laboratory. For additional information regarding the limitations of the method(s) referred to, please call us at 661-395-0539.



ZALCO LABORATORIES, INC.

Analytical & Consulting Services

4309 Armour Avenue
Bakersfield, California 93308

(661) 395-0539
FAX (661) 395-3069

River Ranch HOA	Project: Master	Work Order No.: 1310303
2131 G Street	Project Number:	Reported: 11/12/2013
Bakersfield, CA 93301	Attention: Janelle Dockham	

Lab ID: 1310303-01

Client ID: Well-River Ranch HOA

Field Conditions:

Temp. Received, Celsius: 21.00

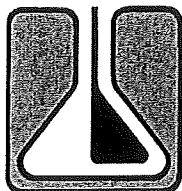
Date/Time	Collected By	Sampler's Employer	Fld. Res. Cl.	Fld. pH	Fld. Temp. C	User ID:	PS Code	Lab #
10/28/2013 11:15:00AM	Colleen Bellue							7625

MCL	Analyte	Results	RL	Units	Flag	Method	Prepared	Analyzed	Int.
Alkalinity									
	Total Alkalinity	77	10	mg/L		SM 2320B	10/28/13	10/28/13	MSS
	Bicarbonate (HCO ₃)	77	10	mg/L		SM 2320B	10/28/13	10/28/13	MSS
	Carbonate (CO ₃)	<10	10	mg/L		SM 2320B	10/28/13	10/28/13	MSS
	Hydroxide (OH)	<10	10	mg/L		SM 2320B	10/28/13	10/28/13	MSS
General Chemistry									
S	15 Color	<3.0	3.0	Color Units		SM 2120B	10/28/13	10/28/13	MSS
P	2 Fluoride	0.37	0.10	mg/L		EPA 300.0	10/28/13	10/28/13	LME
P	45 Nitrate as NO ₃	6.1	2.0	mg/L		EPA 300.0	10/28/13	10/28/13	LME
S	3 Threshold Odor Number	<1.0	1.0	T.O.N.		SM 2150B	10/28/13	10/28/13	MSS
S	5 Turbidity	<0.10	0.10	NTU		SM 2130 B	10/28/13	10/28/13	MSS
P	150 Cyanide	<100	100	ug/L		SM 4500-CN-CE	10/29/13	10/29/13	RAM
P	10000 Nitrate + Nitrite (as N)	1400	400	ug/L		EPA 300.0	10/28/13	10/28/13	LME
	Nitrite as NO ₂	<1.0	1.0	mg/L		EPA 353.2	10/28/13	10/28/13	LME
p	Nitrite as Nitrogen (N)	<400	400	ug/L		EPA 300.0	10/28/13	10/28/13	LME
	600 Chloride	17	2.0	mg/L		EPA 300.0	10/28/13	10/28/13	LME
S	0.5 MBAS (calculated as LAS, mol wt__)	<0.050	0.050	mg/L		SM 5540C	10/29/13	10/29/13	CMM
S	pH	7.46		pH Units		EPA 150.1	10/28/13	10/28/13	MSS
S	+++ Specific Conductance	270	10	umhos/cm		SM 2510B	10/28/13	10/28/13	MSS
S	+ Sulfate as SO ₄	20	0.50	mg/L		EPA 300.0	10/28/13	10/28/13	LME
S	++++ Total Dissolved Solids	170	10	mg/L		SM 2540C	10/29/13	10/29/13	MSS
Hardness									
S	Hardness (as CaCO ₃)	64	2.0	mg/L		SM 2340B	10/30/13	10/31/13	SS
Inorganic Chemical									
P	1000 Aluminum	<50	50	ug/L		EPA 200.7	10/30/13	10/31/13	SS
P	6 Antimony	<2.0	2.0	ug/L		EPA 200.8	10/29/13	10/29/13	MSS
P	1000 Barium	<100	100	ug/L		EPA 200.7	10/30/13	10/31/13	SS
P	4 Beryllium	<1.0	1.0	ug/L		EPA 200.8	10/29/13	10/29/13	MSS
P	5 Cadmium	<1.0	1.0	ug/L		EPA 200.8	10/29/13	10/29/13	MSS
P	50 Chromium	<10	10	ug/L		EPA 200.7	10/30/13	10/31/13	SS
S	1000 Copper	<50	50	ug/L		EPA 200.7	10/30/13	10/31/13	SS
S	300 Iron	<100	100	ug/L		EPA 200.7	10/30/13	10/31/13	SS
P	15 Lead	<2.0	2.0	ug/L		EPA 200.8	10/29/13	10/29/13	MSS
S	50 Manganese	<20	20	ug/L		EPA 200.7	10/30/13	10/31/13	SS
P	2 Mercury	<0.20	0.20	ug/L		EPA 245.1	10/30/13	10/31/13	LME
P	100 Nickel	<10	10	ug/L		EPA 200.7	10/30/13	10/31/13	SS
P	50 Selenium	<2.0	2.0	ug/L		EPA 200.8	10/29/13	10/29/13	MSS

+ 250-500-600 ++ 0.6-1.7 +++ 900-1600-2200 +++ 500-1000-1500 P:Primary Standard S: Secondary Standard

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Analytical & Consulting Services

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Bakersfield, California 93308

(661) 395-0539
FAX (661) 395-3069

River Ranch HOA
2131 G Street
Bakersfield, CA 93301

Project: Master
Project Number:
Attention: Janelle Dockham

Work Order No.: 1310303
Reported: 11/12/2013

Lab ID: 1310303-01

Client ID: Well-River Ranch HOA

Field Conditions:

Temp. Received, Celsius: 21.00

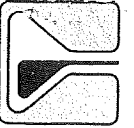
Date/Time	Collected By	Sampler's Employer	Fld. Res. Cl.	Fld. pH	Fld. Temp. C	User ID:	PS Code	Lab #
10/28/2013 11:15:00AM	Colleen Bellue							7625

MCL	Analyte	Results	RL	Units	Flag	Method	Prepared	Analyzed	Int.
Inorganic Chemical									
S	100 Silver	<10	10	ug/L		EPA 200.7	10/30/13	10/31/13	SS
P	2 Thallium	<1.0	1.0	ug/L		EPA 200.8	10/29/13	10/29/13	MSS
S	5000 Zinc	57	50	ug/L		EPA 200.7	10/30/13	10/31/13	SS
P	10 Arsenic	<2.0	2.0	ug/L		EPA 200.8	10/29/13	10/29/13	MSS
Metals									
	Calcium	20	0.050	mg/L		EPA 200.7	10/30/13	10/31/13	SS
	Magnesium	3.4	0.050	mg/L		EPA 200.7	10/30/13	10/31/13	SS
	Potassium	1.5	0.50	mg/L		EPA 200.7	10/30/13	10/31/13	SS
	Sodium	29	7.0	mg/L		EPA 200.7	10/30/13	11/12/13	SS

+ 250-500-600 ++ 0.6-1.7 +++ 900-1600-2200 ++++ 500-1000-1500 P: Primary Standard S: Secondary Standard

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ZALCO LABORATORIES, INC. **CHAIN OF CUSTODY, ID#** **1310303**
4309 Armour Avenue, Bakersfield, CA 93308 (661) 395-0539 FAX (661) 395-3069 www.zalcolabs.com
2186 Eastman Avenue, Suite 103, Ventura, CA 93003 (805) 477-0114 Fax (805) 477-0125

REPORT INFO

INVOICE INFO

ANALYSIS

Client: EVER RANCH HDA Invoice To: Same as Client ☐
Address: 231 S. ST. Address:
City, State, Zip: BKRD, CA 93301 City, State, Zip:
Attention: JANELL Attention:
Phone: 661-616-8267 Phone:
Results ☐ Fax: ☐
Email: bellue@skalab.net Email:
Results ☐

SAMPLED BY: J

EMPLOYED BY:

Sample No. * Sample Description Date Sample Time Type *
1 Well - Ever Ranch HDA 10/28/13 11:15 AM DW 14

10/28/13 11:15 AM DW 14

10/28/13 11:30 AM DW 14

21°C

County

NOTE: Samples are discarded 30 days after results unless other arrangements are made. Hazardous samples will be returned to client or disposed of at the client's expense.

*Sample Type Key: AQ-Aqueous; BS-Biosolid; DW-Drinking Water; G-Ground Water; L-PG-Liquid Petroleum Gas; OL-Oil; O-Other; P-Petroleum; S-Soil/Solid; ST-Storm Water; WW-Wastewater

*Sample No.: FOR OFFICE USE ONLY

RECEIVED BY: Signature

DATE

TIME

PRINT

RECEIVED BY: Signature

DATE

TIME

PRINT

RECEIVED BY: Signature

DATE

TIME

PRINT

RECEIVED BY: Signature

DATE

TIME

Appendix E

Enhanced Oil Recovery Injection Information

E-1 Kern River Formation Active Steam Injection Well Summary

E-2 Station 36 Produced Water/Injectate Water Quality

Steam injection well locations are illustrated on Report Figure 56.

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403056342	19_0529R	19	S28	E28	SECTION 19	1699132.22	722000.22	941.9	YES	1681	-291.99	-301.98
0402957112	19_0555	19	S28	E28	SECTION 19	1700452	720544	918	NO	1295	158	-327
0403023606	19_0572R	19	S28	E28	SECTION 19	1700865.43	720269.36	995	YES	1509	165.02	-324.96
0403031925	19_0588	19	S28	E28	SECTION 19	1699134.12	720894.56	963	YES	1480	97.01	-342.99
0403050610	19_0597	19	S28	E28	SECTION 19	1701022.68	720478.79	1001.1	YES	1589	-301.97	-311.97
0403056343	19_0598	19	S28	E28	SECTION 19	1699312.77	721644.85	944.2	YES	1746	-185.16	-315.16
0402963562	25_0509	25	S28	E27	SECTION 25	1695927	715768	789	NO	1330	-256	-463
0402963563	25_0510	25	S28	E27	SECTION 25	1696263	715752	809	NO	1351	-236	-467
0402963567	25_0514	25	S28	E27	SECTION 25	1696264	715377	806	NO	1353	-257	-474
0402963570	25_0517	25	S28	E27	SECTION 25	1695922	715052	822	NO	1368	-296	-468
0402963571	25_0518	25	S28	E27	SECTION 25	1696302	715021	864	NO	1410	-276	-481
0402963572	25_0519	25	S28	E27	SECTION 25	1696643	715015	885	NO	1426	-245	-439
0403046948	25_0549	25	S28	E27	SECTION 25	1697240.4	713550.02	773.1	YES	1849	-382.08	-452.08
0403047809	25_0550	25	S28	E27	SECTION 25	1696888.8	713657.5	796.6	YES	1845	-401.36	-468.36
0403047810	25_0551	25	S28	E27	SECTION 25	1697470.78	713601.75	790.2	YES	1928	-367.67	-447.66
0403049017	25_0552	25	S28	E27	SECTION 25	1695831.91	715478.78	800.9	YES	1907	-282.08	-369.03
0403049018	25_0553	25	S28	E27	SECTION 25	1695922.35	714909.98	821.8	YES	1906	-307.86	-382.9
0403049019	25_0554	25	S28	E27	SECTION 25	1696060.01	714469.61	831	YES	1925	-299.87	-376.97
0403049630	25_0555	25	S28	E27	SECTION 25	1697498.47	714443.61	831.1	YES	1921	-398.01	-412.9
0403049860	25_0556	25	S28	E27	SECTION 25	1697423.8	713956.41	798.8	YES	1890	-396.66	-416.59
0403050272	25_0557	25	S28	E27	SECTION 25	1696571.24	714267.73	859.4	YES	1979	-394.68	-413.67
0403050306	25_0558	25	S28	E27	SECTION 25	1696519.86	714074.02	859.2	YES	1944	-414.17	-429.13
0403053426	25_0561	25	S28	E27	SECTION 25	1696989.78	713984.63	792.3	YES	1879	-392.34	-412.33
0403053427	25_0562	25	S28	E27	SECTION 25	1696905.33	714257.77	818	YES	1842	-281.24	-430.96
0403049205	25_0578	25	S28	E27	SECTION 25	1696860.4	718471.54	838.1	YES	1680	-306.04	-461.62
0403053851	3990214-9R	9	S29	E28	KCL-39	1710991.47	701675.8	453.8	YES	1028	149.4	-317.78
0402950828	3990215	9	S29	E28	KCL-39	1711141	701744	443	NO	832	166	-244
0402956426	3990216	9	S29	E28	KCL-39	1711436	701761	446	NO	777	271	-310
0402971726	3990219A	9	S29	E28	KCL-39	1710170	701423	444	NO	775	94	-396
0402950832	3990220	9	S29	E28	KCL-39	1710507	701444	442	NO	855	104	-351
0402950833	3990221	9	S29	E28	KCL-39	1710835	701444	444	NO	827	131	-316
0402950834	3990222	9	S29	E28	KCL-39	1711156	701425	444	NO	804	146	-273
0402956427	3990223	9	S29	E28	KCL-39	1711448	701467	447.7	NO	808	253.7	-282.3
0402950875	3990227	9	S29	E28	KCL-39	1710176	701114	442	NO	891	78	-392
0402950876	3990228	9	S29	E28	KCL-39	1710531	701103	443	NO	871	103	-367
0402950877	3990229	9	S29	E28	KCL-39	1710897	701082	445	NO	811	121	-318
0403053852	3990230-9R	9	S29	E28	KCL-39	1711208.76	701136.24	460.7	YES	1025	-166.21	-176.21
0402956428	3990231	9	S29	E28	KCL-39	1711485	701136	456	NO	823	139	-171
0402950882	3990234	9	S29	E28	KCL-39	1709889	700754	441	NO	902	43	-423
0403053853	3990235-9R	9	S29	E28	KCL-39	1710249.74	700778.29	453.8	YES	1050	50.14	-425.95

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0402950885	3990237	9	S29	E28	KCL-39	1710952	700723	459	NO	842	38	-364
0402950886	3990238	9	S29	E28	KCL-39	1711285	700738	452	NO	820	42	-348
0402950887	3990239	9	S29	E28	KCL-39	1711677	700747	454	YES	819	122.35	-287.88
0403028734	3990500	9	S29	E28	KCL-39	1708062.43	701222.89	469	YES	1277	-38.98	-438.96
0403028735	3990501	9	S29	E28	KCL-39	1708038.44	700869.72	463	YES	1306	-51	-460.98
0403028736	3990502	9	S29	E28	KCL-39	1708025.39	700533.27	461	YES	1301	-79	-468.98
0403028737	3990503	9	S29	E28	KCL-39	1708325.67	700510.02	461	YES	1310	-65	-204
0403028738	3990504	9	S29	E28	KCL-39	1708619.67	700519.94	454	YES	1267	-41.92	-193.93
0403028739	3990505	9	S29	E28	KCL-39	1708015.7	700264.49	461	YES	1340	-96.99	-323.98
0403028740	3990506	9	S29	E28	KCL-39	1708443.22	700309.81	452	YES	1349	-77.78	-238.52
0403028741	3990507	9	S29	E28	KCL-39	1708724.33	700279.03	455	YES	1314	-64.99	-217.98
0403036407	3990514	9	S29	E28	KCL-39	1708453	701239	462	NO	1000	-14	-410
0403036408	3990515	9	S29	E28	KCL-39	1708411.2	701055.2	460	NO	1000	-96	-428
0403036409	3990516	9	S29	E28	KCL-39	1708485.8	700849.4	459	NO	1000	-111	-439
0403050307	3990518	9	S29	E28	KCL-39	1710824.16	700856.9	461.1	YES	1582	-91.88	-398.15
0402980579	AL_0030	4	S29	E28	ALMA	1709883	704633	548	NO	961	393	-352
0402953729	AL_0503	4	S29	E28	ALMA	1709715	705331	587	NO	974	232	-323
0402940703	ALJ0501	4	S29	E28	ALMA JR	1710399	704608	547	NO	886	317	-333
0402953761	ALJ0502	4	S29	E28	ALMA JR	1710689	704635	512	NO	870	307	-298
0402962728	ALJ0507	4	S29	E28	ALMA JR	1710632	704007	482	NO	879	352	-303
0402951611	AMA0510	30	S28	E28	AMAZON	1701963	713629	808	NO	1488	83	-577
0403055241	AMA0514	30	S28	E28	AMAZON	1702271.6	713637.47	784.2	YES	1564	-495.86	-557.86
0403037420	ANG0505	13	S28	E27	ANGUS	1696851.26	724907.16	974	YES	1720	-196.91	-279.91
0403042536	ANG0507	13	S28	E27	ANGUS	1697279.37	724966.4	992.3	YES	1695	-156.01	-273.99
0403042538	ANG0509	13	S28	E27	ANGUS	1697234.31	724541.62	973	YES	1664	-183.61	-291.59
0403042539	ANG0510	13	S28	E27	ANGUS	1697532.16	724513.83	970.2	YES	1674	-165.85	-297.84
0403042540	ANG0511	13	S28	E27	ANGUS	1697566.56	724334.6	968.9	YES	1677	-190.07	-308.06
0403042541	ANG0512	13	S28	E27	ANGUS	1697501.7	723960.98	979.3	YES	1714	-197.83	-326.83
0403042542	ANG0513	13	S28	E27	ANGUS	1697803.15	723957.77	971.4	YES	1672	-177.33	-300.33
0403042543	ANG0514	13	S28	E27	ANGUS	1698132.02	723946.48	977.1	YES	1678	-159.39	-285.38
0402968795	ANG0807	13	S28	E27	ANGUS	1698855	725771	1052	NO	1289	-59	-199
0402968796	ANG0808	13	S28	E27	ANGUS	1698840	726131	1046	NO	1274	-53	-190
0402975059	ANG0816	13	S28	E27	ANGUS	1698553	725778	1046	NO	1334	-83	-209
0402975060	ANG0817	13	S28	E27	ANGUS	1698535	726169	1045	NO	1310	-75	-210
0402975061	ANG0818	13	S28	E27	ANGUS	1698202	726178	1054	NO	1345	-93	-216
0402975062	ANG0819	13	S28	E27	ANGUS	1698193	725792	1011	NO	1296	-97	-239
0402975066	ANG0823	13	S28	E27	ANGUS	1697818	724253	989	NO	1350	-98	-282
0402975068	ANG0825	13	S28	E27	ANGUS	1697832	725010	1026	NO	1359	-84	-271
0402948289	ANO0002-6B	31	S28	E28	AMERICAN NAPHTHA	1701947	709605	685	NO	1366	73	-615
0402949438	ANO0008-12B	31	S28	E28	AMERICAN NAPHTHA	1703305	708223	635	NO	1336	95	-605

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0402949440	ANO0008-9B	31	S28	E28	AMERICAN NAPHTHA	1703298	708919	657	NO	1332	187	-578
0403050105	ANO0010-11BR	31	S28	E28	AMERICAN NAPHTHA	1703534.66	708381.12	682.1	YES	1568	-458.48	-558.15
0403050104	ANO0010-8	31	S28	E28	AMERICAN NAPHTHA	1703494.18	709001.67	678.1	YES	1544	-434.46	-524.46
0402983427	ANO0303	31	S28	E28	AMERICAN NAPHTHA	1701904	709964	707	NO	1386	71	-572
0402983429	ANO0305	31	S28	E28	AMERICAN NAPHTHA	1701915	709275	684	NO	1385	23	-626
0402983434	ANO0313	31	S28	E28	AMERICAN NAPHTHA	1702209	709976	680.72	YES	1350	-469.63	-490.62
0402972797	ANO0315	31	S28	E28	AMERICAN NAPHTHA	1702252	709202	650	YES	1439	-61.28	-595.72
0402972802	ANO0335	31	S28	E28	AMERICAN NAPHTHA	1702997	709210	700	YES	1480	101.88	-562.95
0402970780	ANO0347	31	S28	E28	AMERICAN NAPHTHA	1703269	708569	661	NO	1354	80	-577
0402984357	ANO0352	31	S28	E28	AMERICAN NAPHTHA	1703587	710310	724	NO	1385	48	-545
0402972805	ANO0353	31	S28	E28	AMERICAN NAPHTHA	1703559	709934	717	NO	1390	207	-583
0403050106	ANO0358A	31	S28	E28	AMERICAN NAPHTHA	1703731.41	708186.97	687.5	YES	1584	-461.03	-574.02
0403001166	ANO0363	31	S28	E28	AMERICAN NAPHTHA	1703942	709943	731	YES	1420	-392.98	-532.98
0402984360	ANO0366	31	S28	E28	AMERICAN NAPHTHA	1704032	708974	709.46	YES	1423	221.18	-517.56
0402984361	ANO0367	31	S28	E28	AMERICAN NAPHTHA	1703984	708585	662	NO	1358	184	-546
0403042935	ANO0501	31	S28	E28	AMERICAN NAPHTHA	1703575.14	710533.01	740.4	YES	1544	-508.79	-574.45
0403043956	ANO0503	31	S28	E28	AMERICAN NAPHTHA	1704057.84	710501.67	750.1	YES	1519	-483.01	-532.05
0403046374	ANO0505	31	S28	E28	AMERICAN NAPHTHA	1702627.23	709634.96	666.7	YES	1531	-457.5	-565.43
0403046375	ANO0506	31	S28	E28	AMERICAN NAPHTHA	1702742.26	709135.31	697.6	YES	1579	-484.64	-594.63
0403045303	ANO0507	31	S28	E28	AMERICAN NAPHTHA	1701735.87	709966.73	714.9	YES	1662	-424.68	-623.67
0403045304	ANO0508	31	S28	E28	AMERICAN NAPHTHA	1701740.59	709524.52	674.3	YES	1623	-435.87	-630.83
0403046376	ANO0510	31	S28	E28	AMERICAN NAPHTHA	1701740.88	709421.23	673.5	YES	1615	-446.35	-649.32
0403050321	ANO0511	31	S28	E28	AMERICAN NAPHTHA	1702876.29	709197.35	706.7	YES	1589	-478.26	-582.24
0403050973	ANO0512	31	S28	E28	AMERICAN NAPHTHA	1704132.15	708158.45	646	YES	1560	-452.72	-560.71
0403050107	ANO3683	31	S28	E28	AMERICAN NAPHTHA	1703951.4	708207.81	659.9	YES	1584	-459.85	-539.85
0403032424	AZ_0505R	4	S29	E28	AZTEC	1706929.76	707625.43	625	YES	1290	-404.86	-456.83
0402951588	AZ_0506	4	S29	E28	AZTEC	1707326	707538	621	NO	1140	351	-477
0403044321	AZ_0514	4	S29	E28	AZTEC	1706890.63	707559.41	622.4	YES	1495	-403.84	-468.35
0402969639	BF_0506	31	S28	E28	BEAR FLAG	1699841	710989	706	NO	1420	48	-623
0403034580	BF_0507	31	S28	E28	BEAR FLAG	1699808.31	711279.27	724	YES	1598	-498.73	-614.72
0403052395	BF_0509	31	S28	E28	BEAR FLAG	1700124.19	710882.13	691.7	YES	1619	-469.89	-603.87
0402967278	CAU0503	36	S28	E27	CAULEY	1696548	711373	723	NO	1321	-351	-492
0402967283	CAU0508	36	S28	E27	CAULEY	1696888	711046	693	NO	1282	-345	-438
0402957888	CEN0500	25	S28	E27	20TH CENTURY	1698362	717909	930	NO	1468	-22	-423
0402959969	CEN0505	25	S28	E27	20TH CENTURY	1698056	717581	885	NO	1398	-34	-455
0402959970	CEN0506	25	S28	E27	20TH CENTURY	1698371	717609	902	NO	1435	5	-472
0402959972	CEN0508	25	S28	E27	20TH CENTURY	1698698	717267	888	NO	1416	21	-452
0403056344	CH_0500R	24	S28	E27	CHANSLOR	1698814.68	722021.5	937.1	YES	1726	-316.43	-326.43
0403056107	CH_0501R	24	S28	E27	CHANSLOR	1698500.57	721599.32	909.3	YES	1650	-209.53	-359.31
0403052156	CH_0507R	24	S28	E27	CHANSLOR	1698129.2	722745.61	910.5	YES	1442	-208.77	-309.76

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403056345	CH_0510R	24	S28	E27	CHANS LOR	1698091.56	722362.07	909.4	YES	1656	-225.32	-370.24
0402962101	CH_0511	24	S28	E27	CHANS LOR	1698414	722316	889	NO	1305	111	-359
0403034713	CH_0512R	24	S28	E27	CHANS LOR	1698791.36	722260.64	917	YES	1416	97.03	-327.96
0403056572	CH_0513R	24	S28	E27	CHANS LOR	1698127.03	722046.47	896	YES	1651	-316.9	-371.74
0403056571	CH_0515R	24	S28	E27	CHANS LOR	1698183.86	721594.89	902.77	YES	1653	-231.34	-382.23
0403056108	CH_0517R	24	S28	E27	CHANS LOR	1697708.88	722370.47	914	YES	1746	-238.2	-376.19
0402964071	CH_0519	24	S28	E27	CHANS LOR	1697759	721587	870	NO	1342	62	-404
0403052040	CH_0527	24	S28	E27	CHANS LOR	1697488.39	723529.66	939.6	YES	1478	-214.38	-324.38
0403052041	CH_0528	24	S28	E27	CHANS LOR	1697766.53	723531.96	937.9	YES	1473	-198.07	-307.06
0403052042	CH_0529	24	S28	E27	CHANS LOR	1698080.64	723564.99	949	YES	1467	-176.99	-291.99
0403052043	CH_0530	24	S28	E27	CHANS LOR	1697446.71	723105.65	953.2	YES	1500	-208.71	-338.71
0403052044	CH_0531	24	S28	E27	CHANS LOR	1697783.25	723111.93	924.1	YES	1490	-203.85	-320.85
0403052045	CH_0532	24	S28	E27	CHANS LOR	1698019.84	723132.19	926.5	YES	1490	-190.25	-301.25
0403052046	CH_0533	24	S28	E27	CHANS LOR	1697447	722737.8	925.6	YES	1522	-232.37	-352.36
0403052047	CH_0534	24	S28	E27	CHANS LOR	1697776.43	722696.56	906.4	YES	1512	-206.52	-331.5
0403051897	CH_0535H	24	S28	E27	CHANS LOR	1696923.65	721746.5	893.7	YES	2935	-370.85	-352.66
0403051898	CH_0536H	24	S28	E27	CHANS LOR	1696972.89	721745.94	893.6	YES	2915	-359.08	-318.94
0403056346	CH_0537	24	S28	E27	CHANS LOR	1698421.69	722763.21	926.1	YES	1641	-192.49	-289.41
0403056347	CH_0538	24	S28	E27	CHANS LOR	1698840.1	722776.09	913.8	YES	1622	-172.13	-257.1
0403056348	CH_0540	24	S28	E27	CHANS LOR	1697750.39	722017.8	897	YES	1659	-237.43	-387.33
0403056350	CH_0541	24	S28	E27	CHANS LOR	1698296.71	722005.26	900.8	YES	1790	-297.09	-376.09
0403056349	CH_0543	24	S28	E27	CHANS LOR	1698867.93	721509.46	912.6	YES	1739	-192.37	-332.37
0403033995	CLA0512	31	S28	E28	CLARENCE	1699550.63	712288.56	787	YES	1653	-482.76	-662.76
0403034582	CLA0513	31	S28	E28	CLARENCE	1699803.11	712013.95	798	NO	1694	-477	-621
0402953645	CLP0517	4	S29	E28	CLAMPITT	1710700	705318	549	NO	928	372	-326
0402953475	CLP0518	4	S29	E28	CLAMPITT	1710047	704984	556	NO	944	301	-334
0402953476	CLP0519	4	S29	E28	CLAMPITT	1710375	704973	560	NO	937	308	-315
0402956414	CTZ0036	5	S29	E28	CORTEZ	1702789	704175	523	NO	1442	-55	-225
0402956262	CTZ0504	5	S29	E28	CORTEZ	1703321	704648	556	NO	1386	7	-542
0402956264	CTZ0506	5	S29	E28	CORTEZ	1703956	704563	555	NO	1342	75	-511
0402956272	CTZ0514	5	S29	E28	CORTEZ	1703915	704265	552	NO	1373	6	-528
0403018451	CTZ0517	5	S29	E28	CORTEZ	1703659.63	704266.49	543	NO	1473	-23	-727
0403048358	CTZ0519	5	S29	E28	CORTEZ	1703316.22	704355.68	534.5	YES	1603	-483.78	-538.77
0403048359	CTZ0520	5	S29	E28	CORTEZ	1703592.96	704552.65	553	YES	1609	-451.52	-525.5
0403048361	CTZ0522	5	S29	E28	CORTEZ	1703674.9	704066.11	525.2	YES	1627	-487.79	-528.79
0402957116	DDA0500	19	S28	E28	D & D A	1700411	719866	925	NO	1343	138	-339
0402957122	DDA0506	19	S28	E28	D & D A	1700827	719215	887	NO	1310	147	-333
0402957124	DDA0508	19	S28	E28	D & D A	1700421	718896	865	NO	1318	170	-263
0403050310	DDA0512	19	S28	E28	D & D A	1700845.17	719464.78	908.4	YES	1606	-285.35	-322.35
0403050311	DDA0514	19	S28	E28	D & D A	1700957.18	719180.56	884.3	YES	1670	-350.17	-360.17

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403050611	DDA0515	19	S28	E28	D & D A	1700930.26	719769.11	932.1	YES	1467	-297.15	-307.15
0403050309	DDB0504	19	S28	E28	D & D B	1700311.53	720128.56	946.4	YES	1637	-314.63	-324.63
0403022836	DF_0501	8	S29	E28	DAVIS FEE	1703609.53	702635.24	502	YES	1565	-273.68	-609.59
0403022837	DF_0502	8	S29	E28	DAVIS FEE	1703685.31	702384.13	492	YES	1551	-298.85	-635.76
0403022838	DF_0503	8	S29	E28	DAVIS FEE	1703637.13	702029.32	493	YES	1582	-306.96	-470.94
0403022840	DF_0505	8	S29	E28	DAVIS FEE	1703925.14	702633.33	505.51	YES	1551	-253.16	-516.13
0403022841	DF_0506	8	S29	E28	DAVIS FEE	1703974.9	702385.64	498	YES	1551	-251.97	-601.94
0403022844	DF_0509	8	S29	E28	DAVIS FEE	1704277.5	702382.38	499	YES	1556	-68.99	-605.97
0403051410	DIC0574	34	S28	E28	DICK	1716314.34	709829.56	680.7	YES	727	292.7	196.7
0403057135	DIC0593R	34	S28	E28	DICK	1715841.78	709105.39	779.6	YES	917	424.6	404.6
0402978843	DIC0594I	34	S28	E28	DICK	1716343	709162	695	NO	688	460	153
0403057136	DIC0603R	34	S28	E28	DICK	1715834.88	708793.71	777.9	YES	916	417.91	147.91
0402978759	DIC0604	34	S28	E28	DICK	1716289	708785	713	NO	711	425	95
0402978760	DIC0613	34	S28	E28	DICK	1715906	708441	731	NO	784	314	38
0402978761	DIC0614	34	S28	E28	DICK	1716270	708479	743	NO	805	343	55
0402956282	DR_0510	5	S29	E28	DEL REY	1703358	704930	562	NO	1384	72	-523
0402956283	DR_0511	5	S29	E28	DEL REY	1703684	704899	563	NO	1363	83	-493
0403048362	DR_0516	5	S29	E28	DEL REY	1703498	705197.5	580.8	YES	1611	-425.59	-497.59
0403048363	DR_0520	5	S29	E28	DEL REY	1703215.24	705144.14	576.1	YES	1596	-446.61	-522.59
0403051488	DR_0521	5	S29	E28	DEL REY	1703102.26	705045.28	569.1	YES	1661	-494.37	-619.34
0403051489	DR_0522	5	S29	E28	DEL REY FEE	1703817.2	705217.57	582	YES	1587	-399.1	-546.05
0402956372	DRW0500	5	S29	E28	DEL REY WEST	1701937	705370	563	NO	1472	-107	-572
0402956379	DRW0507	5	S29	E28	DEL REY WEST	1701625	704697	540	NO	1459	-301	-440
0403018452	DRW0508	5	S29	E28	DEL REY WEST	1702222	705120	542	NO	1513	-134	-763
0403054903	DRW0510	5	S29	E28	DEL REY WEST	1701525.77	705275.44	554	YES	1654	-463.13	-541.13
0403054904	DRW0513	5	S29	E28	DEL REY WEST	1701576.92	705203.76	553.7	YES	1654	-480.86	-552.86
0403054905	DRW0514	5	S29	E28	DEL REY WEST	1701909.86	705105.54	561.6	YES	1645	-476.31	-522.31
0403054906	DRW0515	5	S29	E28	DEL REY WEST	1702423.93	705103.58	548.8	YES	1654	-433.62	-507.61
0403022619	DVS0502R	8	S29	E28	DAVIS	1706302	701983	475.01	YES	1286	48.2	-581.6
0402956383	DVS0503	8	S29	E28	DAVIS	1706306	701704	468	NO	1271	-89	-603
0403055190	ELW0500	3	S29	E28	ELWOOD	1714978.77	703702.13	518.9	YES	805	-92.46	-102.07
0403055130	ELW0502	3	S29	E28	ELWOOD	1715392.05	703465.07	508.3	YES	792	-75.46	-84.95
0403007000	ELW0910	3	S29	E28	ELWOOD	1715024	703824	522.8	NO	700	421.8	-97.2
0403007006	ELW0930	3	S29	E28	ELWOOD	1714986	703307	489	YES	640	399.14	-91.52
0402972788	FEA0154	25	S28	E27	FEE A	1698473	716701	884	YES	1415	-5	-482.14
0402974589	FEA0163	25	S28	E27	FEE A	1698641	715235	787	YES	1302	-76.96	-456.7
0403040776	FEA0503	25	S28	E27	FEE A	1698716.75	716742.51	880.7	YES	1716	-423.7	-475.65
0403040777	FEA0504	25	S28	E27	FEE A	1698906.77	716128.83	830	YES	1655	-416.04	-452.51
0403058115	FEA0505	25	S28	E27	FEE A	1698613.2	716123.32	828.3	YES	1693	-425.19	-461.19
0403059129	FEA0509	25	S28	E27	FEE A	1698653.44	716040.32	828.3	YES	1634	-426.96	-485.95

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0402965911	FEB0076	6	S29	E28	FEE B	1700585	707799	595	NO	1390	-187	-305
0402974721	FEB0370	6	S29	E28	FEE B	1700270	707803	604	NO	1240	-212	-428
0403049021	FEB0503	6	S29	E28	FEE B	1700606.93	707478.68	598.8	YES	1596	-206.09	-307.08
0402957393	FR_0500	8	S29	E28	FRANK	1704958	701011	464	NO	1441	-287	-498
0402942714	GW_0502	31	S28	E28	GREEN & WHITTIER	1699441	709308	672	NO	1163	-202	-431
0402944802	GW_0515	31	S28	E28	GREEN & WHITTIER	1700484	710329	666	NO	1448	-374	-609
0402944762	GW_0523	31	S28	E28	GREEN & WHITTIER	1700880	709719	659	NO	1460	21	-601
0402956237	GW_0531	31	S28	E28	GREEN & WHITTIER	1699457	708977	651	NO	1490	-79	-454
0402973301	GW_0553	31	S28	E28	GREEN & WHITTIER	1701236	709335	675	NO	1458	25	-585
0402973302	GW_0554	31	S28	E28	GREEN & WHITTIER	1700846	710326	703	NO	1434	-349	-590
0402973304	GW_0556	31	S28	E28	GREEN & WHITTIER	1700105	710260	690	NO	1462	-7	-525
0402973305	GW_0557	31	S28	E28	GREEN & WHITTIER	1700190	710614	686	NO	1427	-409	-624
0402973321	GW_0558	31	S28	E28	GREEN & WHITTIER	1699394	710338	677	NO	1491	-140	-523
0402973773	GW_0560	31	S28	E28	GREEN & WHITTIER	1699737	710641	690	NO	1450	-134	-635
0403038085	GW_0562	31	S28	E28	GREEN & WHITTIER	1699213.1	710488.17	678.7	YES	1611	-358.93	-547.85
0403038086	GW_0563	31	S28	E28	GREEN & WHITTIER	1699100.15	710269.56	684.8	YES	1579	-357.14	-588.13
0403038087	GW_0564	31	S28	E28	GREEN & WHITTIER	1699077.45	709968.46	675.8	YES	1549	-376.15	-579.14
0403038088	GW_0565	31	S28	E28	GREEN & WHITTIER	1699085.69	709642.82	673	YES	1583	-386.92	-570.91
0403038089	GW_0566	31	S28	E28	GREEN & WHITTIER	1699037.92	709319.9	669.3	YES	1576	-411.66	-456.66
0403038090	GW_0567	31	S28	E28	GREEN & WHITTIER	1698977.57	710361.93	679.5	YES	1660	-363.64	-432.48
0403040248	GW_0569	31	S28	E28	GREEN & WHITTIER	1699609.65	709640.71	657.9	YES	1658	-182.92	-557.88
0403046377	GW_0571	31	S28	E28	GREEN & WHITTIER	1701345.09	710020.61	665.7	YES	1635	-439.2	-634.19
0403046378	GW_0572	31	S28	E28	GREEN & WHITTIER	1701392.04	709772.78	688.2	YES	1675	-443.05	-653.05
0403052048	GW_0574	31	S28	E28	GREEN & WHITTIER	1700452.84	710081.66	662.5	YES	1645	-437.5	-592.5
0403052049	GW_0575	31	S28	E28	GREEN & WHITTIER	1700822.11	709940.66	682.1	YES	1645	-443.03	-575.02
0403052050	GW_0576	31	S28	E28	GREEN & WHITTIER	1700787.03	709366.01	642.3	YES	1630	-472.82	-594.81
0403053611	GW_0578	31	S28	E28	GREEN & WHITTIER	1699631.59	709567.27	658.2	YES	1665	-451.13	-540.12
0403053612	GW_0579	31	S28	E28	GREEN & WHITTIER	1699656.05	709590.49	658.7	YES	1725	-427.53	-529.52
0403053613	GW_0580	31	S28	E28	GREEN & WHITTIER	1700254.23	709870.06	658.7	YES	1641	-420.2	-529.19
0403053646	GW_0581	31	S28	E28	GREEN & WHITTIER	1700149.16	709622.01	642.8	YES	1609	-426.1	-528.08
0403053614	GW_0582	31	S28	E28	GREEN & WHITTIER	1700443.22	709713.95	664	YES	1630	-399.93	-511.92
0403053616	GW_0584	31	S28	E28	GREEN & WHITTIER	1699427.94	710546.95	679.6	YES	1621	-451.13	-528.12
0402946178	GWA0516	30	S28	E28	GREEN & WHITTIER A	1699957	715327	769	NO	1358	12	-72
0403028606	GWA0533R	30	S28	E28	GREEN & WHITTIER A	1699563.67	714006.23	755	YES	1574	-84.53	-504.44
0402951626	GWA0552	30	S28	E28	GREEN & WHITTIER A	1701640	713635	812	NO	1482	142	-580
0403037018	GWA0567	30	S28	E28	GREEN & WHITTIER A	1699944.5	714311.95	743	YES	1529	-454.99	-586.99
0402988866	GWA0570	30	S28	E28	GREEN & WHITTIER A	1699967	713993	729	NO	1435	-29	-593
0402988867	GWA0571	30	S28	E28	GREEN & WHITTIER A	1699888	713654	724	NO	1476	-47	-616
0402989572	GWA0573	30	S28	E28	GREEN & WHITTIER A	1700011	714561	760	NO	1434	-10	-559
0403033993	GWA0579	30	S28	E28	GREEN & WHITTIER A	1699412.54	713430.44	722	YES	1590	-489.35	-644.33

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403035128	GWA0580	30	S28	E28	GREEN & WHITTIER A	1699542.88	715331.02	774	YES	1559	-450.32	-475.32
0403035129	GWA0581	30	S28	E28	GREEN & WHITTIER A	1699621.3	715066.43	776	YES	1579	-462.19	-487.18
0403034990	GWA0582	30	S28	E28	GREEN & WHITTIER A	1699662.17	714338.63	751	YES	1591	-433.42	-512.41
0403035130	GWA0583	30	S28	E28	GREEN & WHITTIER A	1699304.66	715077.69	791	YES	1591	-432.27	-492.26
0403035131	GWA0584	30	S28	E28	GREEN & WHITTIER A	1699319.01	714753.6	773	YES	1587	-444.48	-496.47
0403035132	GWA0585	30	S28	E28	GREEN & WHITTIER A	1699579.8	714662.45	772	YES	1603	-442.38	-510.38
0403035133	GWA0587	30	S28	E28	GREEN & WHITTIER A	1699456.1	713696.1	731	YES	1565	-449.41	-516.41
0403055242	GWA0588	30	S28	E28	GREEN & WHITTIER A	1701411.66	713336.61	807.1	YES	1667	-554.54	-594.54
0402969741	HF_0510	31	S28	E28	HANFORD & FRESNO	1699575	712673	714	NO	1401	-78	-636
0403015226	HF_0514	31	S28	E28	HANFORD & FRESNO	1699509	713023	709	YES	1536	-449.28	-653.28
0403033996	HF_0515	31	S28	E28	HANFORD & FRESNO	1699854.33	712714.4	741	YES	1592	-623.83	-668.83
0402961586	HF80003-1B	8	S29	E28	H H & F SEC 8	1705014	702624	499	YES	1366	1.96	-634
0402961587	HF80003-2B	8	S29	E28	H H & F SEC 8	1704844	702382	495	YES	1384	-22.37	-537.62
0402961590	HF80005-2B	8	S29	E28	H H & F SEC 8	1705283	702360	488	YES	1355	0	-625.98
0403041156	HOT0500	10	S29	E28	HOTCHKISS	1712200.01	701119.85	452.9	YES	1183	-55.73	-231.31
0403037343	JUN0050R	9	S29	E28	JUNCTION	1707418.69	701230.83	460	YES	1310	24.14	-581.48
0402956353	JUN0512	9	S29	E28	JUNCTION	1707011	701439	465	NO	1243	-72	-589
0402956355	JUN0514	9	S29	E28	JUNCTION	1707629	701562	470	NO	1208	-30	-80
0402956405	JUN0515	9	S29	E28	JUNCTION	1707006	701139	459	NO	1245	-103	-504
0402956362	JUN0522	9	S29	E28	JUNCTION	1706705	701498	465	NO	1263	-85	-408
0402956363	JUN0523	9	S29	E28	JUNCTION	1706704	701138	457	NO	1254	-59	-591
0403028805	JUN0527	9	S29	E28	JUNCTION	1706779.01	700871.96	455	YES	1390	-138.51	-523.32
0403028806	JUN0528	9	S29	E28	JUNCTION	1707068.14	700808.31	442	YES	1354	-122.99	-508.98
0403028807	JUN0529	9	S29	E28	JUNCTION	1707340.38	700808.06	443	YES	1333	-83.91	-502.12
0403028808	JUN0530	9	S29	E28	JUNCTION	1707580.06	700882.47	447	YES	1386	-73.58	-509.7
0403028809	JUN0531	9	S29	E28	JUNCTION	1706717.88	700584.62	451	YES	1401	-127.99	-368.98
0403028810	JUN0532	9	S29	E28	JUNCTION	1707000.21	700554.2	443	YES	1392	-126.99	-531.98
0403028811	JUN0533	9	S29	E28	JUNCTION	1707333.82	700576.16	442	YES	1345	-101.99	-508.98
0403028812	JUN0534	9	S29	E28	JUNCTION	1707614.22	700535.88	443	YES	1343	-91.71	-505.13
0403028813	JUN0535	9	S29	E28	JUNCTION	1706714.46	700340.24	448	YES	1445	-149.41	-397.09
0403028814	JUN0536	9	S29	E28	JUNCTION	1707010.36	700290.03	445	YES	1390	-149.98	-384.96
0403028815	JUN0537	9	S29	E28	JUNCTION	1707368.17	700287.18	442	YES	1354	-131	-539.98
0403028816	JUN0538	9	S29	E28	JUNCTION	1707610.54	700287.5	440	YES	1353	-113.5	-522.27
0403058329	JUN0545	9	S29	E28	JUNCTION	1707005.76	701085.68	471.5	YES	1454	-385.74	-495.73
0403014180	K100077	10	S29	E28	KCL-10	1713150	701465	454.81	NO	802	180.81	-179.19
0403041157	K100500	10	S29	E28	KCL-10	1712320.05	701748.95	455.8	YES	1147	-19.32	-212.13
0403041158	K100501	10	S29	E28	KCL-10	1712860.02	701707.27	448.2	YES	911	4.39	-185.33
0403041159	K100502	10	S29	E28	KCL-10	1713269.83	701684.44	448.2	YES	920	24.46	-156.11
0403041160	K100503	10	S29	E28	KCL-10	1712260.83	701508.23	453.3	YES	1146	-51.69	-246.68
0403041161	K100504	10	S29	E28	KCL-10	1712634.75	701499.2	455.8	YES	1112	-15.25	-206.31

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403041228	K100505	10	S29	E28	KCL-10	1713390.42	701646.3	447.6	YES	925	38.36	-169.4
0403014819	K100603	10	S29	E28	KCL-10	1712776	702184	445	NO	897	237	-415
0403021444	K100605	10	S29	E28	KCL-10	1713146	702110	446	YES	815	52.96	-180.3
0403015443	K100606	10	S29	E28	KCL-10	1712278	702309	443	YES	976	255.19	-204.55
0403015427	K100615	10	S29	E28	KCL-10	1713520	701551	448	NO	883	238	-196
0403015428	K100617	10	S29	E28	KCL-10	1713846	701511	448	NO	838	244	-170
0402987832	KC20211	2	S29	E28	KCL-2	1718111	704147	468	NO	466	298	178
0402987833	KC20213	2	S29	E28	KCL-2	1718112	703872	474	NO	451	292	165
0402962360	KC20215	2	S29	E28	KCL-2	1717492	703522	469	NO	400	336	162
0402987834	KC20217	2	S29	E28	KCL-2	1718158	703516	488	NO	432	300	169
0403050085	KC20219R	2	S29	E28	KCL-2	1717519.97	703161.27	475.5	YES	510	305.5	89.5
0402987836	KC20223	2	S29	E28	KCL-2	1718142	703182	498	NO	465	282	166
0402958665	KC30601	3	S29	E28	KCL-3	1712273	703664	462	NO	745	316	-174
0402958275	KC30612	3	S29	E28	KCL-3	1712609	703325	456	NO	730	335	-179
0403007012	KC30618	3	S29	E28	KCL-3	1714610	703326	472.04	NO	625	382.04	-77.96
0402958561	KC30622	3	S29	E28	KCL-3	1712619	703021	451	NO	705	319	-196
0402958354	KC30624	3	S29	E28	KCL-3	1713279	702997	454	NO	650	301	-156
0403007013	KC30628	3	S29	E28	KCL-3	1714603	703053	461.41	NO	615	371.41	-101.59
0403027982	KC30637R	3	S29	E28	KCL-3	1714427.5	702739.81	460	YES	818	247.65	-118.74
0403055131	KC30639	3	S29	E28	KCL-3	1714399.98	702962.96	475.8	YES	735	-57.13	-107.01
0402928488	KER0116	32	S28	E28	KERN	1705331	709331	638	NO	1210	298	-472
0403031223	KER0140R	32	S28	E28	KERN	1706750.88	708353.54	663	YES	1243	-452.93	-492.93
0403037556	KER0504R	32	S28	E28	KERN	1704592.75	710308.11	694	YES	1435	-489.47	-515.37
0402952490	KER0516	32	S28	E28	KERN	1705622	708481	637	NO	1216	294	-473
0403032425	KER0530	32	S28	E28	KERN	1705024.05	708334.9	628	YES	1390	-406.78	-453.62
0403036797	KER0539	32	S28	E28	KERN	1704596.68	709827.99	689	YES	1438	-471.97	-517.87
0403036742	KER0540	32	S28	E28	KERN	1704975.46	709696.42	660	YES	1412	-471.25	-510.67
0403043957	KER0542	32	S28	E28	KERN	1705469.12	708835.25	645.7	YES	1425	-422.98	-479.9
0403046367	KER0543	32	S28	E28	KERN	1705530.11	708356.97	632.5	YES	1539	-439.61	-480.54
0403051406	KNV0504	34	S28	E28	KERNVIEW	1716717.99	709883.27	643.2	YES	681	350.21	213.21
0403051407	KNV0505	34	S28	E28	KERNVIEW	1717100.52	709884.62	625.8	YES	645	372.8	249.81
0403051408	KNV0506	34	S28	E28	KERNVIEW	1716694.58	709559.54	641.3	YES	681	345.3	215.3
0403051409	KNV0507	34	S28	E28	KERNVIEW	1717114	709489.82	598.7	YES	641	365.7	238.71
0403014352	KRD0101	36	S28	E27	KERN RIVER DRILLERS	1697440	713191	792.92	NO	1761	-267.08	-491.08
0403046949	KRD0528	36	S28	E27	KERN RIVER DRILLERS	1697050.71	713045.34	754.8	YES	1940	-405.49	-467.47
0403047811	KRD0529	36	S28	E27	KERN RIVER DRILLERS	1697126.74	713214.9	759.6	YES	1733	-296.4	-476.4
0403047812	KRD0530	36	S28	E27	KERN RIVER DRILLERS	1697267.27	712933.52	773.6	YES	1768	-389.27	-473.26
0403047813	KRD0531	36	S28	E27	KERN RIVER DRILLERS	1697123.27	712551.33	733.8	YES	1748	-329.33	-464.26
0403051404	KRN0503	34	S28	E28	KERN	1716702.62	708069.01	627.4	YES	760	287.4	147.4
0403051405	KRN0504	34	S28	E28	KERN	1717100.53	708078.55	598	YES	688	322	193.01

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403051415	KRN0505	34	S28	E28	KERN	1716701.15	708416.33	654.5	YES	732	303.51	154.51
0403055276	LH_0505	30	S28	E28	LAWTON & HANNAMAN	1701981.31	713449.23	808.8	YES	1631	-524.89	-567.86
0403055245	LH_0506	30	S28	E28	LAWTON & HANNAMAN	1702751.38	713330.54	747.6	YES	1553	-481.97	-546.97
0403055246	LH_0507	30	S28	E28	LAWTON & HANNAMAN	1702327.45	713353.57	768	YES	1563	-499.28	-558.27
0402957396	MAY0502	8	S29	E28	MAY	1705950	700986	460	NO	1357	-160	-510
0402957441	MAY0505	8	S29	E28	MAY	1705633	701360	468	NO	1360	-152	-372
0402969463	MAY0508	8	S29	E28	MAY	1706346	700861	454	NO	1321	-142	-496
0403030659	MC10002-2BR	5	S29	E28	MONTE CRISTO 1	1701659.23	707784.79	620	YES	1583	-396.91	-484.9
0403030660	MC10002-4BR	5	S29	E28	MONTE CRISTO 1	1701579.46	707233.97	611	YES	1580	-414.86	-492.85
0403030661	MC10002-6BR	5	S29	E28	MONTE CRISTO 1	1701620.15	706943.49	598	YES	1590	-425.99	-491.99
0402951162	MC10004-14B	5	S29	E28	MONTE CRISTO 1	1701986	705685	568	NO	1212	-129	-558
0403030662	MC10004-4BR	5	S29	E28	MONTE CRISTO 1	1701941.75	707247.57	599	YES	1554	-391.03	-447.02
0403030663	MC10004-6BR	5	S29	E28	MONTE CRISTO 1	1702002.09	706999.98	592	YES	1547	-403.93	-473.93
0403030664	MC10004-8BR	5	S29	E28	MONTE CRISTO 1	1702057.23	706769.48	589	YES	1540	-405.99	-478.99
0402951168	MC10006-12B	5	S29	E28	MONTE CRISTO 1	1702430	705976	556	NO	1161	-102	-547
0402951174	MC10008-10B	5	S29	E28	MONTE CRISTO 1	1702534	706282	565	YES	1158	-34	-540.85
0402951173	MC10008-8B	5	S29	E28	MONTE CRISTO 1	1702534	706578	572	NO	1177	92	-510
0402951178	MC10010-10B	5	S29	E28	MONTE CRISTO 1	1702877	706170	571	NO	1178	59	-528
0402955911	MC10010-16B	5	S29	E28	MONTE CRISTO 1	1702909	705376	561	NO	1138	64	-557
0402951177	MC10010-8B	5	S29	E28	MONTE CRISTO 1	1702902	706548	584	YES	1143	84	-476.39
0402951185	MC10012-10B	5	S29	E28	MONTE CRISTO 1	1703297	706173	590	NO	1180	84	-514
0402951186	MC10012-12B	5	S29	E28	MONTE CRISTO 1	1703341	705834	572	NO	1182	103	-505
0402952120	MC10012-1B	5	S29	E28	MONTE CRISTO 1	1703348	707909	622	YES	1306	86.73	-586.23
0402951184	MC10012-8B	5	S29	E28	MONTE CRISTO 1	1703292	706524	599	NO	1174	99	-498
0402951192	MC10014-10B	5	S29	E28	MONTE CRISTO 1	1703709	706197	599	NO	1160	121	-518
0402951193	MC10014-12B	5	S29	E28	MONTE CRISTO 1	1703717	705869	579	NO	1171	69	-545
0402951189	MC10014-4B	5	S29	E28	MONTE CRISTO 1	1703714	707274	627	NO	1107	141	-454
0402951190	MC10014-6B	5	S29	E28	MONTE CRISTO 1	1703702	706927	613	NO	1139	131	-481
0402955915	MC10016-10B	5	S29	E28	MONTE CRISTO 1	1704003	706238	600	NO	1171	124	-498
0402955916	MC10016-14B	5	S29	E28	MONTE CRISTO 1	1703991	705597	597	NO	1162	77	-509
0403030665	MC10176R	5	S29	E28	MONTE CRISTO 1	1701605.55	706704.65	586	YES	1582	-439.89	-504.89
0402970625	MC10344	5	S29	E28	MONTE CRISTO 1	1702915	706915	583	NO	1240	-190	-567
0402970628	MC10353	5	S29	E28	MONTE CRISTO 1	1703285	707298	597	NO	1216	119	-523
0403043949	MC10501	5	S29	E28	MONTE CRISTO 1	1703624.82	706479.97	612.9	YES	1547	-372.48	-516.45
0403043950	MC10502	5	S29	E28	MONTE CRISTO 1	1703257.81	707125.05	607	YES	1572	-427.25	-516.24
0403043951	MC10503	5	S29	E28	MONTE CRISTO 1	1703878.45	707240.49	639.7	YES	1551	-418.47	-468.47
0403043952	MC10504	5	S29	E28	MONTE CRISTO 1	1703660.89	707420.81	620.4	YES	1549	-367.82	-471.79
0403051490	MC10505	5	S29	E28	MONTE CRISTO 1	1702733.03	705923.77	571.2	YES	1597	-467.33	-572.33
0403051491	MC10507	5	S29	E28	MONTE CRISTO 1	1703520.42	705569.92	578.7	YES	1554	-447.26	-567.25
0403051492	MC10508	5	S29	E28	MONTE CRISTO 1	1703459.9	705502.12	577.8	YES	1603	-418.28	-578.15

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403043953	MC10509	5	S29	E28	MONTE CRISTO 1	1703891.96	707418.63	632.8	YES	1550	-463.78	-487.78
0403051493	MC10510	5	S29	E28	MONTE CRISTO 1	1703267.18	705493.56	576	YES	1594	-440.91	-567.87
0403051494	MC10511	5	S29	E28	MONTE CRISTO 1	1703252.62	705563.49	577.3	YES	1595	-425.59	-580.59
0403051495	MC10512	5	S29	E28	MONTE CRISTO 1	1703087.08	705599.74	578	YES	1601	-438.33	-567.32
0403051496	MC10513	5	S29	E28	MONTE CRISTO 1	1702593.57	705694.75	566.2	YES	1588	-455.5	-582.5
0403050974	MC10514	5	S29	E28	MONTE CRISTO 1	1703522.81	707703.21	616.4	YES	1550	-472.73	-551.73
0403054833	MC10515	5	S29	E28	MONTE CRISTO 1	1701612.71	706318.59	580.7	YES	1627	-444.49	-544.48
0403054899	MC10516	5	S29	E28	MONTE CRISTO 1	1702052.81	706291.46	589.3	YES	1660	-431.12	-522.08
0403054900	MC10517	5	S29	E28	MONTE CRISTO 1	1702374.85	706190.1	571	YES	1596	-402.56	-505.55
0403054901	MC10518	5	S29	E28	MONTE CRISTO 1	1701622.33	705986.68	574.4	YES	1630	-453.55	-564.55
0403054834	MC10519	5	S29	E28	MONTE CRISTO 1	1702000.68	705857.41	579.9	YES	1629	-445.05	-515.04
0403054902	MC10520	5	S29	E28	MONTE CRISTO 1	1701628.32	705537.4	559.5	YES	1667	-454.02	-518.01
0403054835	MC10521	5	S29	E28	MONTE CRISTO 1	1702358.54	705659.9	562.9	YES	1596	-436.03	-509.02
0403054836	MC10522	5	S29	E28	MONTE CRISTO 1	1702372.92	706984.99	594.5	YES	1627	-439.53	-478.02
0403054837	MC10523	5	S29	E28	MONTE CRISTO 1	1702252.92	705441.88	562.1	YES	1636	-455	-510
0403054838	MC10524	5	S29	E28	MONTE CRISTO 1	1702506.86	705416.61	556.2	YES	1604	-432.84	-502.84
0402973165	MIT0024	18	S28	E28	MITCHELL	1700367	725235	1008	NO	1244	-2	-132
0403011110	MIT0501	18	S28	E28	MITCHELL	1700325	725657	1023	NO	1282	-67	-107
0403011111	MIT0502	18	S28	E28	MITCHELL	1700337	724886	989	NO	1272	-12	-133
0403011113	MIT0504	18	S28	E28	MITCHELL	1700320	724153	944	NO	1243	-31	-155
0403011114	MIT0505	18	S28	E28	MITCHELL	1700796	726088	1038	NO	1262	-40	-55
0403011115	MIT0506	18	S28	E28	MITCHELL	1700849	725817	1044	YES	1263	-49.45	-69.44
0403011116	MIT0507	18	S28	E28	MITCHELL	1700791	724146	980	NO	1277	3	-129
0403011119	MIT0510	18	S28	E28	MITCHELL	1701328	724838	966	NO	1207	48	-69
0403037912	MIT0516	18	S28	E28	MITCHELL	1700834.35	724962.33	984	YES	1506	13.22	-114.77
0403015665	MTD0023	30	S28	E28	MT DIABLO	1699011	714837	766	YES	1620	-60.23	-578.12
0402946794	OAK0047	24	S28	E27	OAKLAND	1698050	718911	889	NO	1320	4	-421
0403010555	OAK0501	24	S28	E27	OAKLAND	1697689	719245	868	YES	1506	-4.13	-449.12
0403010557	OAK0503	24	S28	E27	OAKLAND	1698056	718633	889	NO	1536	9	-443
0403010560	OAK0506	24	S28	E27	OAKLAND	1698786	719257	903	NO	1452	93	-402
0403038446	OAK0513	24	S28	E27	OAKLAND	1698111.2	719587.15	888	YES	1489	20.03	-443.96
0402957400	PIE0502	8	S29	E28	PIERCE	1705296	702016	483	NO	1365	-12	-555
0402957407	PIE0509	8	S29	E28	PIERCE	1705952	702031	476	NO	1309	28	-603
0403047221	PIE0511	8	S29	E28	PIERCE	1705640.41	702439.13	479.8	YES	1513	-528.57	-643.57
0403047367	PIE0512	8	S29	E28	PIERCE	1705534.39	701812.98	474.8	YES	1533	-533.83	-622.8
0402966655	QE_0511	31	S28	E28	QUEEN ESTHER	1699149	711269	725	NO	1487	-141	-484
0402969199	QE_0513	31	S28	E28	QUEEN ESTHER	1699475	711930	786	NO	1538	-87	-669
0402969585	QE_0515	31	S28	E28	QUEEN ESTHER	1699453	711298	752	NO	1493	1	-538
0403033997	QE_0519	31	S28	E28	QUEEN ESTHER	1699531.3	711545.92	732	YES	1623	-511.92	-679.92
0403049697	QE_0520	31	S28	E28	QUEEN ESTHER	1699294.81	711641.68	755	YES	1703	-418.96	-466.95

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403050087	QE_0522	31	S28	E28	QUEEN ESTHER	1698918.64	711283.64	724.4	YES	1680	-456.78	-501.78
0403053617	QE_0524	31	S28	E28	QUEEN ESTHER	1699362.33	710900.82	693.8	YES	1654	-453.7	-547.69
0402958409	RAS0227	4	S29	E28	RASMUSSEN	1711784	703445	461	NO	790	290	-211
0402958684	RAS0503	4	S29	E28	RASMUSSEN	1710312	703690	483	NO	870	318	-331
0402960654	RAS0512	4	S29	E28	RASMUSSEN	1709952	703331	469	NO	950	281	-384
0402958693	RAS0518	4	S29	E28	RASMUSSEN	1711952	703336	454	NO	775	312	-212
0402958558	RAS0522	4	S29	E28	RASMUSSEN	1709947	702967	468	NO	930	258	-407
0402958433	RAS0523	4	S29	E28	RASMUSSEN	1710286	702959	458	NO	905	282	-382
0402958690	RAS0524	4	S29	E28	RASMUSSEN	1710611	703070	457	NO	890	197	-365
0402940384	RAS0525	4	S29	E28	RASMUSSEN	1710920	703069	454	NO	825	214	-338
0402940386	RAS0527	4	S29	E28	RASMUSSEN	1711616	703046	452	NO	785	264	-234
0403052052	RAS0535	4	S29	E28	RASMUSSEN	1710755.13	703687.09	467.8	YES	1115	-290.87	-300.7
0403052051	RAS0536	4	S29	E28	RASMUSSEN	1710369.09	703380.27	474.8	YES	1118	-333.58	-353.51
0403052053	RAS0537	4	S29	E28	RASMUSSEN	1710607.33	703370.82	462.3	YES	1127	-267.68	-337.68
0402962066	RAS0703	4	S29	E28	RASMUSSEN	1710288	704000	494	NO	940	370	-317
0402966589	RAS0708	4	S29	E28	RASMUSSEN	1711931	703985	477	YES	835	327	-201.47
0403017545	REA0504	25	S28	E27	REARDON	1698273	716961	904	YES	1686	-10.77	-485.75
0402957225	RED0507	4	S29	E28	RED BANK	1711021	704640	534	NO	872	340	-209
0402953670	REV0506	4	S29	E28	REVENUE	1711363	705622	544	NO	902	382	-266
0402953101	S3_0002-19	3	S29	E28	SECTION 3	1712310	704555	497	NO	795	345	320
0402953102	S3_0002-20	3	S29	E28	SECTION 3	1712266	704294	491.63	YES	804	340.62	317.62
0402940742	S3_0005-6	3	S29	E28	SECTION 3	1713015	706824	583	NO	800	383	251
0403055129	S3_0017-21	3	S29	E28	SECTION 3	1715276.39	704000.37	546.2	YES	848	-74.38	-83.23
0402944880	SEN0501	31	S28	E28	SENATOR	1701350	711945	738	NO	1449	-3	-607
0403052054	SEN0523	31	S28	E28	SENATOR	1700476.15	710807.68	684	YES	1628	-447.33	-602.3
0403052055	SEN0524	31	S28	E28	SENATOR	1700489.4	710846.53	684.6	YES	1589	-460.23	-579.22
0403041229	SFK0506	10	S29	E28	SANTA FE ENERGY KCL-10	1713769.91	702111.59	450.3	YES	886	1.72	-138.87
0402944241	SJ_0545	5	S29	E28	SAN JOAQUIN	1704621	704141	538	NO	1139	96	-587
0402944255	SJ_0546	5	S29	E28	SAN JOAQUIN	1705007	704106	530	NO	1129	130	-561
0402952049	SJ_0557	5	S29	E28	SAN JOAQUIN	1706155	707875	632	NO	1191	304	-473
0402952077	SJ_0565	5	S29	E28	SAN JOAQUIN	1705751	707551	619	YES	1219	286.83	-505.92
0402956371	SJ_0586	5	S29	E28	SAN JOAQUIN	1704009	705981	586	NO	1272	134	-479
0402956295	SJ_0593	5	S29	E28	SAN JOAQUIN	1704270	704164	543	NO	1353	70	-563
0403048360	SJ_0597R	5	S29	E28	SAN JOAQUIN	1703405.21	704042.48	521.2	YES	1580	-439.14	-555.11
0402956301	SJ_0599	5	S29	E28	SAN JOAQUIN	1703876	703991	530	NO	1389	-5	-542
0402956302	SJ_0600	5	S29	E28	SAN JOAQUIN	1704187	703971	531	NO	1362	26	-537
0402956303	SJ_0601	5	S29	E28	SAN JOAQUIN	1704533	703930	535	NO	1354	248	-543
0402956311	SJ_0609	5	S29	E28	SAN JOAQUIN	1703880	703626	531	NO	1400	-10	-525
0402956320	SJ_0618	5	S29	E28	SAN JOAQUIN	1702283	703391	498	NO	1457	-318	-471
0402956321	SJ_0619	5	S29	E28	SAN JOAQUIN	1702592	703398	511	NO	1470	-292	-453

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0402956324	SJ_0622	5	S29	E28	SAN JOAQUIN	1703564	703356	514	NO	1393	-46	-597
0403030935	SJ_0623R	5	S29	E28	SAN JOAQUIN	1703861.87	703326.58	516	YES	1495	-500.94	-515.94
0402956329	SJ_0627	5	S29	E28	SAN JOAQUIN	1705353	703233	517	NO	1302	25	-582
0402956330	SJ_0628	5	S29	E28	SAN JOAQUIN	1705715	703322	536	NO	1295	68	-600
0402956333	SJ_0631	5	S29	E28	SAN JOAQUIN	1702266	703067	494	NO	1463	-356	-491
0402956334	SJ_0632	5	S29	E28	SAN JOAQUIN	1702630	703035	498	NO	1462	-333	-477
0402956335	SJ_0633	5	S29	E28	SAN JOAQUIN	1702962	703054	498	NO	1447	-296	-462
0402956336	SJ_0634	5	S29	E28	SAN JOAQUIN	1703261	703061	492	NO	1421	-82	-637
0402956337	SJ_0635	5	S29	E28	SAN JOAQUIN	1703566	703041	502	NO	1401	-60	-618
0402956338	SJ_0636	5	S29	E28	SAN JOAQUIN	1703918	703006	507	NO	1387	-30	-569
0403030937	SJ_0637R	5	S29	E28	SAN JOAQUIN	1704312.93	703018.61	507	YES	1527	-456.99	-506.99
0403030939	SJ_0639R	5	S29	E28	SAN JOAQUIN	1705009.13	703065.37	511	YES	1435	-486.98	-595.98
0402956342	SJ_0640	5	S29	E28	SAN JOAQUIN	1705301	703003	520	NO	1329	35	-632
0402956343	SJ_0641	5	S29	E28	SAN JOAQUIN	1705666	702979	525	NO	1294	87	-575
0402961749	SJ_0646	5	S29	E28	SAN JOAQUIN	1705266	702802	507	YES	1354	19.78	-611.16
0402969948	SJ_0651	5	S29	E28	SAN JOAQUIN	1705255	703607	526.72	NO	1286	92.72	-553.28
0403017576	SJ_0657	5	S29	E28	SAN JOAQUIN	1702224	703994	512	YES	1517	-297.98	-441.98
0403018631	SJ_0658	5	S29	E28	SAN JOAQUIN	1702915	704003	526.33	NO	1524	-63.67	-389.67
0403041672	SJ_0662	5	S29	E28	SAN JOAQUIN	1703334.18	703976.89	519.7	YES	1822	-46.54	-212.81
0403041673	SJ_0663	5	S29	E28	SAN JOAQUIN	1703078.91	703651.93	506.1	YES	1647	-140.23	-240.44
0403043954	SJ_0664	5	S29	E28	SAN JOAQUIN	1704356.47	705467.51	579.6	YES	1573	-440.49	-512.47
0403043955	SJ_0665	5	S29	E28	SAN JOAQUIN	1704319.24	705210.04	581.3	YES	1541	-412.18	-515.17
0403044323	SJ_0667	5	S29	E28	SAN JOAQUIN	1706346.07	707692.45	630.6	YES	1459	-442.79	-495.37
0403048364	SJ_0668	5	S29	E28	SAN JOAQUIN	1704088.66	704906.2	556.6	YES	1574	-448.64	-486.62
0403049070	SJ_0670	5	S29	E28	SAN JOAQUIN	1702904.53	703043.89	497.5	YES	1624	-433.21	-644.18
0403049071	SJ_0671	5	S29	E28	SAN JOAQUIN	1702870.81	703437.62	512.7	YES	1665	-511.57	-640.56
0403049324	SJ_0673	5	S29	E28	SAN JOAQUIN	1702656.44	703710.64	516.9	YES	1662	-522.4	-635.39
0403042937	SOV0505	31	S28	E28	SOVEREIGN	1704257.57	711072.54	718.3	YES	1506	-449.96	-513.52
0403042939	SOV0507	31	S28	E28	SOVEREIGN	1704032.54	711036.39	724.1	YES	1505	-466.64	-555.57
0403042940	SOV0508	31	S28	E28	SOVEREIGN	1703712.71	710927.53	732.3	YES	1548	-487.69	-608.34
0402942593	ST_0505	31	S28	E28	STERLING	1703576	711312	761	NO	1362	213	-549
0402944834	ST_0508	31	S28	E28	STERLING	1703319	712980	761	NO	1362	213	-517
0402944836	ST_0514	31	S28	E28	STERLING	1703288	712239	779	NO	1391	192	-503
0402944808	ST_0517	31	S28	E28	STERLING	1701658	711945	750	NO	1431	14	-590
0402944823	ST_0519	31	S28	E28	STERLING	1702372	711913	754	NO	1416	168	-566
0402944813	ST_0526	31	S28	E28	STERLING	1701978	711297	720	NO	1442	145	-586
0403000413	ST_0544	31	S28	E28	STERLING	1702299	711292	746	NO	1445	168	-609
0403054839	ST_0551	31	S28	E28	STERLING	1702520.01	711671.01	733.8	YES	1659	-537.46	-572.46
0403054840	ST_0552	31	S28	E28	STERLING	1702538.94	711647.52	733.7	YES	1604	-517.71	-587.7
0403054841	ST_0553	31	S28	E28	STERLING	1701975.79	711694.7	756.7	YES	1646	-551.1	-591.1

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perforation (TVDSS) ⁴	Bottom of Perforation (TVDSS)
						X	Y					
0403054842	ST_0554	31	S28	E28	STERLING	1702448.44	711262.35	751.1	YES	1651	-527.21	-597.2
0403054843	ST_0555	31	S28	E28	STERLING	1701738.45	711565.95	753.8	YES	1676	-574.31	-594.31
0403054844	ST_0556	31	S28	E28	STERLING	1701999.31	711933.25	802.8	YES	1659	-532.17	-592.17
0403051411	STP0502	34	S28	E28	STEPHENS	1716700.57	709135.08	659.4	YES	689	339.4	201.4
0403051412	STP0503	34	S28	E28	STEPHENS	1716994.04	709113.87	659.5	YES	714	360.51	227.51
0403051413	STP0504	34	S28	E28	STEPHENS	1716693.93	708784.13	656.8	YES	727	346.8	190.8
0403051414	STP0505	34	S28	E28	STEPHENS	1717063.97	708779.58	657.7	YES	719	367.7	37.72
0403051416	STP0507	34	S28	E28	STEPHENS	1717098.5	708420.13	625.8	YES	722	315.8	183.8
0402944903	SYC0511	31	S28	E28	SYCAMORE	1701342	712299	776	NO	1496	-8	-604
0402968030	SYC0516	31	S28	E28	SYCAMORE	1701008	712361	774	NO	1463	42	-610
0403055243	SYC0524	31	S28	E28	SYCAMORE	1701393.67	712495.12	788.4	YES	1632	-565.03	-614
0403055244	SYC0525	31	S28	E28	SYCAMORE	1701341.47	712569.83	789.3	YES	1732	-552.1	-604.03
0403055338	SYC0526	31	S28	E28	SYCAMORE	1701236.65	712598.03	788.7	YES	1675	-583.7	-598.7
0402967286	TEJ0510	36	S28	E27	TEJON	1697569	711039	696	NO	1544	-287	-464
0403028605	TEJ0518R	36	S28	E27	TEJON	1698236.88	713023.2	716	YES	1663	-251.99	-480.97
0403003055	TEJ0522	36	S28	E27	TEJON	1698124	712524	777	YES	1626	-154.45	-467.2
0403003058	TEJ0525	36	S28	E27	TEJON	1697922	712319	769	NO	1677	-154	-487
0403033212	TEJ0534	36	S28	E27	TEJON	1697886.86	713045.79	751	YES	1592	-471.95	-496.95
0403033213	TEJ0535	36	S28	E27	TEJON	1697989.96	712580.53	775	YES	1602	-447.56	-496.54
0403034102	TEJ0537	36	S28	E27	TEJON	1698340.81	712337.73	730	YES	1592	-172.86	-513.38
0403038182	TEJ0538	36	S28	E27	TEJON	1698374.33	710783.06	670.9	YES	1612	-401.44	-481.43
0403049694	TEJ0540	36	S28	E27	TEJON	1698732.74	712034.53	690	YES	1645	-437.09	-481.07
0403049695	TEJ0541	36	S28	E27	TEJON	1698758.69	711721.69	690.3	YES	1645	-439.55	-493.53
0403049696	TEJ0543	36	S28	E27	TEJON	1698757.76	711025.35	702.5	YES	1690	-476.69	-514.69
0402957408	TM_0500	8	S29	E28	TARR & MCCOMB	1704618	702387	494	NO	1407	-36	-591
0402957411	TM_0503	8	S29	E28	TARR & MCCOMB	1704353	701691	480	NO	1453	-289	-438
0402957413	TM_0505	8	S29	E28	TARR & MCCOMB	1704324	701310	471	NO	1465	-309	-458
0403011217	USA0500	18	S28	E28	USA	1701777	724489	1083	YES	1339	-47.67	-61.67
0403011218	USA0501	18	S28	E28	USA	1701713	724162	1062	NO	1319	-51	-74
0403011219	USA0502	18	S28	E28	USA	1702059	724509	1071	NO	1322	-26	-46
0403011220	USA0503	18	S28	E28	USA	1702172	724292	1038	YES	1289	-32.35	-49.31
0403011221	USA0504	18	S28	E28	USA	1702156	723857	1012	NO	1262	-43	-56
0403011222	USA0505	18	S28	E28	USA	1702538	724477	1037	NO	1250	141	-51
0403011223	USA0506	18	S28	E28	USA	1702536	724132	1063	NO	1262	134	-123
0403011224	USA0507	18	S28	E28	USA	1701758	723870	1032	NO	1290	-62	-81
0403039543	USA0508	18	S28	E28	USA	1702936.37	724831.81	1062.5	YES	1437	129.57	32.58
0403039544	USA0509	18	S28	E28	USA	1702927.41	724113.15	1084.8	YES	1517	116.86	-12.13
0403043859	USA0510	18	S28	E28	USA	1701762.86	724890.17	1031.8	YES	1510	-34.6	-51.58
0403043860	USA0511	18	S28	E28	USA	1702052.75	724740.09	1060.6	YES	1510	-17.19	-31.19
0403043861	USA0512	18	S28	E28	USA	1702536.03	724838.31	1062.2	YES	1469	112.24	-17.76

Exhibit E-1: Kern River Formation Active Steam Injection Well Summary

API No.	Well ID	Section	Township	Range	Lease Name	Surface Coordinates ¹		Elevation (feet, amsl) ²	Directional Drilled	Well Depth ³ (feet)	Top of Perferation (TVDSS) ⁴	Bottom of Perferation (TVDSS)
						X	Y					
0403043862	USA0513	18	S28	E28	USA	1702963.64	724430.44	1098.9	YES	1511	123.46	18.53
0403041676	USL0510R	24	S28	E27	USL	1698658.8	720411.28	930.5	YES	1722	-277.71	-406.71
0403040484	USL0528	24	S28	E27	USL	1698711.45	720346.8	930	YES	1533	-251.71	-388.71
0402944838	VES0502	31	S28	E28	VESTA	1702273	712970	782	NO	1414	179	-533
0402900198	VES0503	31	S28	E28	VESTA	1702609	712947	743	NO	1443	183	-556
0402944745	VES0505	31	S28	E28	VESTA	1701953	712623	779	NO	1509	156	-595
0402946041	VES0506	31	S28	E28	VESTA	1702312	712630	816	NO	1477	183	-539
0402944905	VES0507	31	S28	E28	VESTA	1702651	712620	734	NO	1365	174	-538
0402940532	VES0508	31	S28	E28	VESTA	1702938	712613	727	NO	1308	227	-531
0402944839	VES0509	31	S28	E28	VESTA	1701672	712284	767	NO	1487	113	-597
0402944840	VES0510	31	S28	E28	VESTA	1702022	712260	818	NO	1509	136	-567
0402956610	VES0514	31	S28	E28	VESTA	1702661	712228	722	NO	1357	188	-553
0402979786	VES0515	31	S28	E28	VESTA	1701989	712750	771	YES	1490	45.6	-574.46
0403054845	VES0516	31	S28	E28	VESTA	1702073.37	712152.31	818.4	YES	1720	-529.31	-574.31
0403055247	VES0517	31	S28	E28	VESTA	1702818.93	712908.55	739.5	YES	1551	-481.22	-538.21
0403058330	WES0334R	24	S28	E27	WESTATES	1697399.54	718837.83	868.4	YES	1712	-256.99	-445.99
0403010551	WES0500	24	S28	E27	WESTATES	1697372	718626	881	NO	1441	-9	-449
0403010553	WES0502	24	S28	E27	WESTATES	1697702	718632	876	YES	1501	0.72	-354.04
0403049208	WES0503	24	S28	E27	WESTATES	1697001.1	719375.7	865.2	YES	1676	-290.87	-453.86
0403055132	WES0504	24	S28	E27	WESTATES	1697037.25	718936.93	847.7	YES	1628	-290.45	-456.44
0403055133	WES0505	24	S28	E27	WESTATES	1697116.02	719731.84	871.6	YES	1627	-238.03	-454.01
0403055134	WES0506	24	S28	E27	WESTATES	1697392.22	719329.53	880.9	YES	1621	-268.12	-450.11
0403055248	WES0507	24	S28	E27	WESTATES	1697438.61	719596.11	893.3	YES	1602	-270.68	-454.68
0402986928	WLM0804	20	S28	E28	WILMAR	1705905	721441	985	NO	1010	239	97

Notes

¹ North American Datum, 1927
² above mean sea level
³ Depth measured along the casing length.
⁴ True vertical depth relative to mean sea level

Exhibit E-2: Station 36 Produced Water/Injectate Water Quality

Constituent	Units	Influent Result	Effluent Result
Sodium	mg/l ^(a)	125	113
Potassium	mg/l	5.5	5.8
Magnesium	mg/l	5.3	5.6
Calcium	mg/l	30.8	27.4
Strontium	mg/l	0.5	0.3
Barium	mg/l	0.1	0.1
Iron	mg/l	3.9	3.5
Manganese	mg/l	0.1	0.1
Lead	mg/l	ND ^(b)	NA ^(c)
Zinc	mg/l	ND	NA
Chloride	mg/l	123.8	112
Sulfate	mg/l	34.1	1.7
Borate	mg/l	ND	NA
Fluoride	mg/l	ND	NA
Bromide	mg/l	ND	NA
Nitrite(NO ₂)	mg/l	ND	NA
Nitrate(NO ₃)	mg/l	ND	NA
Phosphate	mg/l	0.2	NA
Silica	mg/l	89.2	68.2
Bicarbonate (HCO ₃)	mg/l	254	NA
Carbonate (CO ₃)	mg/l	ND	NA
Hydroxide (OH)	mg/l	ND	NA
pH	pH Units	6.7	6.7
EC ^(d)	µmhos/cm ^(e)	1,100	7,181
TDS ^(f)	mg/l	583	614
Initial Temperature	F ^(g)	250	80
Final Temperature	F	136	NA

Notes:

- (a) mg/l - milligrams per liter.
- (b) ND - not detected.
- (c) NA - not analyzed.
- (d) EC - electrical conductivity.
- (e) µmhos/cm - micromhos per centimeter.
- (f) TDS - total dissolved solids.
- (g) F - degrees Fahrenheit.

Appendix F

CalGEM Memorandum, Water Well Capture Radius Analysis Update, Kern
River Aquifer Exemption, 22 March 2019



MEMORANDUM

DATE: March 22, 2019

To: Cameron Campbell
Inland District Deputy,
Division of Oil, Gas, and Geothermal Resources (DOGGR)

FROM: Jimmy Schloss, P.G. (No. 9464) William Long
Assoc. Oil & Gas Engineer, DOGGR Supervising Oil & Gas Engineer, DOGGR
Matthew Van Grinsven
Assoc. Oil & Gas Engineer, DOGGR

SUBJECT: Water Well Capture Radius Analysis Update, Kern River Aquifer Exemption

Objective

The objective of this memorandum is to provide an update to previous capture radius calculations and to perform capture radius calculations for wells not previously identified in the January 2017 Kern River aquifer exemption application. This memorandum serves an update to the original dated 12/18/2018.

Conclusions

The following are conclusions from this evaluation:

1. Thirty-year (30) fixed capture 2D radius calculations were made for sixty-seven (67) water wells in or near the Kern River Aquifer Exemption Area. Capture radius intrusion into the proposed Aquifer Exemption is observed in two (2) water wells.
2. Application of fixed capture 2D radius calculations to vertically separated geological zones significantly increases the certainty of hydraulic isolation.



Recommendations

The following recommendations are given for this evaluation:

1. Reduce the proposed Aquifer Exemption area to a three-hundred (300) feet offset from the 30-year capture rate boundary in water wells which have capture potential and honoring primacy area. These water wells include Z, 11, AA, Y, 9, 15, and X (Figures 1, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3). The 30-year calculated capture radius should be used in water well 23 (Figures 4.3, 5.3).
2. Do not make additional analytical calculations with fixed capture rate equations for hydraulic isolation determination.

Discussion

Capture radius calculations have been performed multiple times for the Kern River aquifer exemption (KRAE), but each iteration lacked coverage for all water wells identified in the study area and/or did not have alignment on the correct input variables of the model. Examples of this includes the capture radius analysis and supporting documentation from the January 2017 aquifer exemption application, and numerous discussions between DOGGR and the State Water Board (SWB) and Regional Water Quality Board (RWQB) for the past two years.

Water Wells and Completion Information

The most up to date water well search is shown in Figure 1 and Table 1. The water well search was performed using a combination of Division of Water Resource (DWR) water well completion reports, Kern County Environmental Health (KCEH) water well completion reports, GeoTracker GAMA, and field reconnaissance. The water well search has been iterative over the past two years between DOGGR, the SWB, and RWQB such that some water wells have been removed once they have been determined to be inactive and or destroyed.



The 67 wells of the Kern River Water Well Survey can be divided into the following categories. Figure 2 conceptually illustrates the water well categories.

- A. *Wells penetrating or with high probability for hydraulic connection to the proposed aquifer exemption interval.* Three wells are noted in orange on Figure 1. Limited water well construction data and a close three-dimensional proximity to the expansion interval create uncertainty for the hydraulic connectivity for these wells with the oil bearing interval. Steam is injected into this formation and isolation is empirically proven by the lack of steam production from the water wells.
- B. *Wells in the shallower, A and/or B Kern River Interval.* Thirty wells are noted in blue on Figure 1. These water wells are completed in the shallowest portions of the Kern River Formation which is not currently considered for exemption expansion. These wells are stratigraphically isolated from the exemption expansion interval with an average vertical separation of 1,484 feet which includes packages of low permeability geological materials such as silts and clays. These water wells are hydraulically isolated from the hydrocarbon bearing portion and producing interval of the Kern River formation. Steam is injected into this formation and isolation is empirically proven by the lack of steam production from the water wells.
- C. *Wells in shallow perched aquifer laterally separated from the exemption interval.* Twenty-one water wells are noted in yellow on Figure 1. These wells are in shallow perched aquifers laterally separated from the exemption expansion interval and can be stratigraphically equivalent or deeper than the oil-bearing exemption expansion interval.
- D. *Wells in shallow perched aquifer vertically above the current exemption interval.* Thirteen wells are noted in purple on Figure 1. Though some of these water wells are completed within the currently exempt interval of the Kern River Formation, they are hydraulically isolated from the oil bearing and producing interval into which steam is injected.



These four categories are further discussed in the draft water well write up shared with the SWB and RWQCB on October 3, 2018.

Method

The equation used in this analysis is the same as that of previous analysis provided in the January 2017 aquifer exemption application. The calculated fixed radius equation by the United States Environmental Protection Agency (US EPA) was again used and is outlined as follows:

$$r_t = \left(\frac{Qt}{\pi\phi h} \right)^{1/2}$$

where r_t = capture radius, Q = pumping rate, t = time of travel threshold, ϕ = effective porosity, h = open interval or length of well screen (Equation 4.2: US EPA, 1994).

Analysis

Effective Porosity

The effective porosity in this analysis remains at 22% and has not changed from the original capture analysis. Please refer to the Kern River aquifer exemption from January 2017 for this documentation and other data.

Interval Length

Previous capture analysis assumed interval length (h) was equivalent to the length of the water well screens. The minimum screen length of forty (40) feet is assumed in wellbores without documentation. However, these assumptions may not fully reflect the capture potential from a water well since the saturated thickness of the aquifer and other well construction details such as gravel pack could also influence the capture potential. In addition, per the 11/29/2018 meeting discussion, the interval (h) was interpreted to assume that a water well was fully penetrating the aquifer it was



completed in or that the screen length would fully penetrate the aquifer. In order to properly address these concerns, DOGGR re-evaluated the open interval in the water wells with the following considerations.

1. All water wells in the study area are completed in the upper portions of the Kern River formation / Kern River aquifer.
2. All of the gravel pack is completed above the static water levels. This is important because the gravel pack allows for the well to be hydraulically connected everywhere it is present and not just across the screened interval.
3. The open interval (h) was determined through from the static water level to base of screened interval.

Static water levels were obtained from the Spring 2017 Kern River aquifer water table/potentiometric surface map published by the Kern County Water Agency Map (KCWA 2018, pg 70). The water level elevations overlie most of water wells and the study area. Water level elevations were interpolated by georeferencing the KCWA map in ArcMap and inferring the water levels. Water level elevations where the map did not extend were inferred by extending the contour lines. Figure 3 and Table 1 show a summary of the Spring 2017 water level elevations in each of the water wells.

Time of Travel

Calculations use both 10 years and 30 years for the capture radius calculations. However, the 10-year travel time is likely the most appropriate for use. The California Department of Health Services (DHS) has specified recommendations for the evaluation of groundwater protection such as the Drinking Water Source Assessment and Protection Program (DWSAP) which defines ground water zones based on time of travel. The DWSAP document has adapted the usage of the US EPA's fixed calculated radius method, among other methods, for the appropriate analysis for groundwater protection. DHS defines the zone of capture (ZOC) essentially as the potential for well capture in a specified time of travel criterion. A maximum ZOC of 10 years has been applied to this analysis. This assumption of 10 years assumes that a well is pumped



continuously for the given 10-year period, which is itself a conservative assumption. More commonly, pumps are used infrequently and on demand for domestic water needs.

Pumping Rates

The pumping rate for each water well was re-visited in this capture analysis and updated for municipal wells based on measured water demand provided by the State Water Board. Pumping rates were determined using the information available to DOGGR that is based on measured water demand volumes. Pumping rates were maintained from the previous capture analysis where new information was not available.

Pumping rates for wells in the previous analysis were cited based on a combination of values taken from water well completion reports and numbers cited by owners. These pumping rates do not appear to reflect the actual water demand and actual pumping rates.

The Oildale Mutual Water Company (OMWC) is the primary water supplier in the study area and public documents were used to determine water demand. The OMWC has two primary customer populations located in the communities of Oildale and Shafter (OMWC 2010). The water demand in this investigation focused on the water provided to the "Oildale Service Area" which serves a population of approximately 32,374 as of 2009 (OMWC 2010). The OMWC cites that its 2010 water use in the "Oildale Service Area" was 0.88 acre-feet per connection (OMWC 2010, pg. 7).

It should be noted that the OMWC does not rely on groundwater as a primary resource for the "Oildale Service Area". The OMWC did rely on groundwater from wells in the "Oildale Service Area" in the past up until 1977 (OMWC 2010). However, "reliance on groundwater as a primary resource contributed to progressive decline in the regional water table (OMWC 2010, pg. 17)". The OMWC relies on imported water from the State Water Project and the North of the River Municipal Water District to supply over 95% of



its total system requirements (OMWC 2010). Groundwater reliance is so minimal that the OMWC did not even pump groundwater for the Oildale Sub Basin in 2015 (OMWC 2015).

The OMWC uses a small volume of groundwater and the pumping rate in this assessment is based on projected groundwater demand for the “Oildale Service Area”. Table 19 (OMWC 2010, pg. 21) highlights the projected groundwater demand from the Oildale Sub Basin from 2015 to 2030 and averages 585 acre-feet per year which is equivalent to 362 gallons per minute (gpm).

The pumping rate for domestic water wells was determined through the following assumptions. As previously stated, water use in the “Oildale Service Area” was 0.88 acre-feet per connection (OMWC 2010, pg. 7). This is equivalent to a pumping rate of 0.55 gpm. This water demand services an urban population that may not reflect the water demand for homeowners who own private domestic water wells in the study area.

The California Water Well Standards cites typical domestic water well pumping rates based on demand where “[...] a well supplying one to three gallons per minute is a reasonable amount for a single-family dwelling (DWR, 1981, 1990). In order to reflect these cited water demands, 2 gpm was assumed to be the pumping rate for all domestic water wells in the study area.

It should be noted that the original capture analysis used a pumping rate of 10 gpm. This original pumping rate was used as a conservative measure and does not reflect the water cited water demands in this area from OMWC (OMWC 2010) and those in the California Water Well Standards (DWR, 1981, 1990). A total of twelve (12) active wells owned and operated by Oildale Mutual Water Company (OMWC) were identified in the water well study area.

The OMWC pumping rates were revised in this capture radius analysis. A pumping rate of 30 gpm per OMWC municipal water well was used in the 12/21/18 capture radius



calculations. However, new measured water demand from active water wells was used in this analysis using data from 2013 to 2017. This data showed that the OMWC had up to 5 active water wells with an average annual water demand of 175.6 Acre-feet between 2013 to 2017. The 175.6 Acre-feet water demand was divided evenly among the 5 active water wells for a pumping rate of 109 gpm. The OMWC measured water demand and pumping rates are summarized in Table 3.

The estimates for OMWC may be over-conservative. Only 5 OMWC water wells were active whereas a total of 13 OMWC water wells exist in the study area. At least 7 of the wells identified in this study were unused since 2013. As a conservative measure, a pumping rate of 109 gpm was assumed and used in the revised capture radius calculations for all OMWC wells. Caution must be exercised because it is unknown which wells were active.

Pumping rates for other municipal wells in the study area were also updated using information provided from the State Water Board. The 12/21/2018 had previously assumed a representative 2 gpm multiplied by the cited number of service connections in the Safe Drinking Water Information System (SDWIS). Table 3 was updated to reflect the revised pumping rates for municipal water wells and summarizes the pumping rates which were used in the updated capture radius calculations. Updates include pumping rates for Meadows of Kern Mutual Water Company, Uplands of the Kern Mutual Water Company, and Ranchos Del Rio Mutual Water Company. Note that the most recent water demand data from 2013 to 2017 shows that Ranchos Rio Equestrian Center was inactive. However, a pumping of 73 gpm was selected for this water well based on the equivalent water demand of the Ranchos Del Rio Mutual Water Company.

Combined Pumping Effects

January 2019 correspondence between DOGGR and the State Water Board identify three groups of wells which may benefit from further analysis on the cumulative impacts of well pumping and capture analysis. These wells are wells 2 & 3, 16 & 17, and J & H.



Wells 2 & 3 cover a small area, have minimal overlap, and are completely within the current exemption area where there is no proposed expansion. Because of this, analysis of the cumulative impact is not necessary. For Wells 16 & 17, the capture area is small, and already has a 300-foot buffer applied. Furthermore Wells 15 and 9 are closer to the proposed exemption area and we have recommended to decrease the proposed expansion areas near these wells. For these reasons, an analysis of the cumulative impact is not necessary. Wells J & H are far from the exemption area and separated from the exemption area by the Kern River and well Y's capture area setback.

For discussion purposes, the combined pumping effects for two water wells were evaluated in this revised capture analysis. Water wells H and J are in relatively close proximity to one another and are classified as being completed in the shallow, perched aquifer but laterally separated from the proposed exemption (Classification C in the Water Well Completion Information Section above). A simplistic approach was taken to consider the combined pumping effects from these water wells which took combines the individual 10 and 30-year travel times in the capture radii at a common mid-point location between the water wells. This is discussed in further detail in the next section.

Capture Radius Summary

Individual Capture Radius

The calculated capture radius for all water wells in the study area are summarized in Tables 1 and 2. The capture radii are also shown visually in Figures 4.1, 4.2, 4.3, and 4.4 where 10-year travel times radii are shown in black and 30-year travel times are shown in red.

Overall, the capture radii are minimal whether the travel time is 10 years or 30 years. There are a few wells with capture radii that intersect the lateral extent of the proposed KRAE boundary (Figures 3.1, 3.2 and Tables 1, 2. It is recommended that the Aquifer Exemption boundary near water well Z be modified to provide for a buffer distance not



less than two-hundred feet from the capture radii. Water wells 9 and 11 are not as likely completed in the proposed KRAE but the same buffer distance is recommended.

Other areas where capture radii intersect the KRAE occur in Sections 17 and 18 (T29S, R28E); however, these capture radii intersect the 1973 hydrocarbon exempt area which has been exempted for the past 45 years.

There is some apparent overlap of capture analysis areas for water wells completed in the A & B zones that are vertically above the proposed KRAE (Figure 4.3 and Tables 1, 2). It should be noted that the capture radii for these water wells only appears to cut into the proposed aquifer exemption boundary. The A & B zones have a high degree of vertical separation from the deeper oil-bearing portion of the Kern River aquifer exemption and are hydraulically isolated from any oil-bearing portions of the Kern River formation with packages of low permeability siltstones and shales. This is discussed in more detail in the writeup shared with the SWB and CVRWQCB on October 3, 2018.

Although the capture analysis for these wells appear to overlap, it is hard to justify the need for further analysis such as transient state equations, numerical modeling, etc. because these water wells are hydraulically isolated from the proposed exemption area and will not be impacted (see draft water well write up shared with the SWB and CVRWQCB on October 3, 2018).

Combined Pumping Effects

The combined pumping effects for water wells H and J can be found in Tables 1, 2 and Figures 4.2, 5.2. The 10 and 30-year travel time combined capture radius is equal to 271 feet and 469 feet, respectively. The combined capture radius for water wells H and J does not encroach upon the proposed exemption area.



Cutout Areas

The revised capture radius calculations resulted in a larger capture radius for water well Y (Tables 1, 2 and Figure 4.3). To ensure protection for water well Y, the proposed exemption area should be cutout to an area equal to the capture radius.

In addition, despite the outlined calculated capture radii for the water wells (Tables 1, 2 and Figures 4.1 – 4.4), DOGGR nevertheless recommends cutting out portions of the proposed aquifer exemption boundary in order to ensure safety for certain water wells including Z, 11, 9, 15, and X (Table 2). The following rationale explains the recommended exemption cut out for these water wells.

Underground injection control (UIC) projects for steam flood currently use the Neuman equation for zone of endangering influence (ZEI) calculations to evaluate how far steam can migrate in the oil-bearing portions of the Kern River formation. Several Kern River field UIC steam flood projects use ZEIs of approximately three hundred (300) feet.

In order to provide the maximum safety to the water wells of concern, the largest possible value was selected between the calculated capture radius and the 300-foot buffer distance. The 300-foot buffer distance value was greater than all the 30-year capture radii for water wells Z, 11, 9, 15, and X (Table 2). The 30-year calculated capture radius was the largest for water well 23 (Table 2). Using these values, cutout recommendations were applied to the proposed exemption area. The proposed aquifer exemption cutout areas are shown in Figures 5.1, 5.2, and 5.3.



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<https://nepis.epa.gov/Exe/ZyPDF.cgi/30004NCA.PDF?Dockey=30004NCA.PDF>

Table 1, KRAE Water Wells Capture Radii, 10 Year Travel Time - Revised

Map ID	T	R	Sec	LAT_Y	LON_X	Water Well Type	Compl. Depth (ft)	Compl. Depth EL (ft)	Top Perf. (ft)	Bottom Perf. (ft)	Screen Length (ft)	Ground EL (ft)	Spring '17 Water Level EL (ft)	Sat. Thickness, b (ft)	Over HC Zone?	Q (gpm)	φe (%)	t (years)	r _t (feet)	Oil Zone Comment	Water Well Owner
1	29S	28E	6	35.440698	-119.013290	Domestic	750	-158	600	750	150	592	302	460	No	2	22%	10	66	TD Above Oil Zone	Dexzel Inc.
2	29S	28E	2	35.436807	-118.942442	Domestic	273	211	173	273	100	484	422	211	Yes	2	22%	10	98	Inside 73-74 AE and screened interval	John Wilson
3	29S	28E	2	35.435682	-118.942218	Domestic	170	323	70	170	100	493	421	98	No	2	22%	10	144	Inside 73-74 AE, TD Above Oil Zone	Roger Hatch
4	29S	28E	2	35.430761	-118.943210	Domestic	220	241	140	220	80	461	425	184	No	2	22%	10	105	Inside 73-74 AE, TD Above Oil Zone	Terry DeLaMater
5	29S	28E	2	35.432954	-118.943032	Domestic	175	290	100	175	75	465	420	130	Yes	2	22%	10	125	Inside 73-74 AE and partially within Oil	Dwight Bowers
6	29S	28E	8	35.422739	-118.996271	Domestic	520	-52			40	468	322	374	No	2	22%	10	74	TD Above Oil Zone	Alon Asphalt Bakersfield Inc.
7	29S	28E	8	35.423164	-118.994763	Domestic	520	-46			40	474	325	371	No	2	22%	10	74	TD Above Oil Zone	Alon Asphalt Bakersfield Inc.
8	29S	28E	8	35.417322	-118.997985	Municipal	970	-525			40	445	320	845	No	30	22%	10	190	TD Above Oil Zone	River Ranch HOA
9	29S	28E	10	35.419752	-118.954278	Domestic	310	193	115	310	195	503	408	215	No	2	22%	10	97	TD Above Oil Zone	Ace Stables
10	28S	28E	7	35.507857	-118.988423	Unknown	1135	-18			0	1117	350	368	Yes	2	22%	10	74	The Top of the interpolated oil zone is s	
11	28S	27E	24	35.479372	-119.020860	Domestic	800	124	500	800	300	924	315	191	No	2	22%	10	103	TD Above Oil Zone	Dwight Grimmes
12	28S	27E	36	35.441567	-119.029430	Municipal	970	-362	502	970	468	608	278	640	No	109	22%	10	416	TD Above Oil Zone	Oildale Mutual Water Company
13	29S	28E	2	35.434215	-118.939435	Domestic	200	282	60	200	140	482	430	148	No	2	22%	10	117	Interpreted east of oil zone pinchout	Francis B. Perry
14	29S	28E	10	35.418958	-118.965281	Domestic	460	14	380	460	80	474	370	356	No	2	22%	10	76	TD Above Oil Zone	Derrel's Mini Storage
15	29S	28E	10	35.419418	-118.960299	Domestic	420	63	100	420	320	483	395	332	No	2	22%	10	78	TD Above Oil Zone	Rep. Kevin Flem (420 Club)
16	29S	28E	10	35.418923	-118.956228	Domestic	248	257	100	248	148	505	405	148	No	2	22%	10	117	TD Above Oil Zone	Terry J. Easton
17	29S	28E	10	35.418839	-118.956949	Domestic	300	213	175	255	80	513	405	192	No	2	22%	10	103	TD Above Oil Zone	Tom & Donna Chisum
18	29S	28E	7	35.412678	-119.011317	Domestic	250	174	190	250	40	424	407	233	No	2	22%	10	93	TD Above Oil Zone	Val Butler
19	29S	28E	18	35.410600	-119.011185	Irrigation	415	4			40	419	295	291	No	100	22%	10	591	TD Above Oil Zone	Irma Roberston
20	29S	28E	18	35.410655	-119.011187	Domestic	300	119	200	300	100	419	295	176	No	2	22%	10	107	TD Above Oil Zone	Wm Robertson
21	29S	28E	18	35.410958	-119.006979	Domestic	300	123	220	300	80	423	305	182	No	2	22%	10	106	TD Above Oil Zone	Priscilla Mueller
22	29S	28E	18	35.411481	-119.005561	Domestic	50	372			40	422	307	40	No	2	22%	10	225	TD Above Oil Zone	Rancho Not So Grande
23	29S	28E	17	35.409636	-119.006232	Unknown	-	-			40	645	305	40	No	73	22%	10	1,358	TD Above Oil Zone	Ranchos Rio Equestrian Center
24	29S	28E	18	35.407006	-119.006600	Domestic	250	169			40	419	310	141	No	2	22%	10	120	TD Above Oil Zone	Bill Norman
25	29S	28E	17	35.405797	-118.999507	Municipal	382	51	215	380	135	433	290	239	No	73	22%	10	556	TD Above Oil Zone	Ranchos Del Rio Mutual Water Company
26	29S	28E	18	35.405848	-118.999507	Municipal	420	15	215	380	165	435	290	275	No	73	22%	10	518	TD Above Oil Zone	Ranchos Del Rio Mutual Water Company
27	29S	28E	17	35.406698	-118.986445	Irrigation	390	226			40	616	290	64	No	100	22%	10	1,260	TD Above Oil Zone	GreenLawn Memorial Park
A	28S	28E	8	35.513366	-118.979901	Domestic	800	94	400	800	400	894	380	286	No	2	22%	10	84	Interpreted east of oil zone pinchout	Wendell Weller
B	28S	28E	7	35.511329	-118.996894	Domestic	800	182	500	800	300	982	350	168	No	2	22%	10	110	Interpreted east of oil zone pinchout	Mike Combs
C	28S	28E	8	35.507854	-118.986059	Domestic	975	59	715	975	260	1034	360	301	No	2	22%	10	82	Interpreted east of oil zone pinchout	John Tart
D	28S	28E	8	35.512732	-118.988606	Domestic	813	166	540	813	273	979	360	194	No	2	22%	10	102	Interpreted east of oil zone pinchout	Mike Hood
E	28S	28E	8	35.511516	-118.984895	Domestic	800	158	400	800	400	958	370	212	No	2	22%	10	98	Interpreted east of oil zone pinchout	Susan Abarros-Deltoro
F	28S	28E	17	35.496949	-118.986021	Domestic	800	315	400	800	400	1115	370	55	No	2	22%	10	192	Interpreted east of oil zone pinchout	Tom Wilson
G	28S	28E	17	35.497446	-118.991226	Domestic	1200	-112	880	1200	320	1088	360	472	No	2	22%	10	66	Well is Interpreted to penetrate oil zone	Thomas Gafford
H	28S	28E	35	35.447766	-118.938986	Domestic	263	207	163	263	100	470	460	253	No	2	22%	10	90	Interpreted east of oil zone pinchout	Tenneco West, Inc.
I	28S	28E	35	35.441589	-118.937504	Domestic	320	145	140	320	180	465	460	315	No	10	22%	10	181	Interpreted east of oil zone pinchout	Meadows of the Kern Mutual Water Co.
J	28S	28E	35	35.447348	-118.937762	Municipal	320	148	120	320	200	468	460	312	No	10	22%	10	181	Interpreted east of oil zone pinchout	Meadows of the Kern Mutual Water Co.
K	29S	27E	12	35.425828	-119.037008	Domestic	730	-235	507	730	223	495	248	483	No	109	22%	10	479	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
L	29S	27E	12	35.419184	-119.034220	municipal	892	-431	597	892	295	461		431	No	109	22%	10	507	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
M	29S	27E	12	35.425707	-119.036844	municipal	425	69			0	494	248	179	No	109	22%	10	787	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
N	29S	27E	12	35.422438	-119.035698	Municipal	722	-245	290	697	407	477	248	493	No	109	22%	10	474	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
O	29S	27E	12	35.412747	-119.029672	Municipal	620	-184	192	620	428	436	255	439	No	109	22%	10	502	Well TD is above TKRAE (Interpreted a	Oildale Mutual Water Company
P	29S	27E	12	35.419238	-119.025492	Domestic	700	-231	292	700	408	469	258	489	No	109	22%	10	476	Well TD is above TKRAE (Interpreted a	Oildale Mutual Water Company
Q	29S	27E	12	35.419254	-119.034000	Municipal	670	-208	300	600	300	462	248	456	No	109	22%	10	493	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
R	29S	27E	13	35.401802	-119.034643	Municipal	610	-201	299	600	301	409	260	461	No	109	22%	10	490	Interpreted west of oil zone pinchout	North of the River MWD
S	29S	27E	13	35.403256	-119.029590	Domestic	577	-167	264	577	313	410	240	407	No	109	22%	10	522	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
T	29S	27E	13	35.410865	-119.033957	Municipal	600	-167	330	600	270	433	248	415	No	109	22%	10	517	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
U	29S	27E	13	35.410767	-119.033798	domestic	954	-521.4			0	432.6	248	769.4	No	109	22%	10	379	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
V	29S	27E	13	35.405173	-119.038597	Domestic	400	18			0	418	240	222	No	2	22%	10	96	Interpreted west of oil zone pinchout	Janco Pump Co.
W	29S	27E	13	35.410978	-119.038633	Municipal	643	-203	307	643	336	440	243	446	No	109	22%	10	498	Interpreted west of oil zone pinchout	Oildale Mutual Water Company
X	29S	28E	7	35.415216	-119.013781	Domestic	435	1			0	436	290	289	No	2	22%	10	84	Well TD is above TKRAE (Interpreted a	Dr. A.E. Angell
Y	28S	28E	34	35.445095	-118.942250	Municipal	266	209	146	266	120	475	440	231	No	170	22%	10	864	Interpreted east of oil zone pinchout	UPLANDS OF THE KERN MUTUAL WATER COMPANY
AA	28S	28E	34	35.446759	-118.944501	Domestic	266	-266	146	266	120	0	440	706	Yes	2	22%	10	54	Interpreted right at the oil zone pinch ou	UNK
Z	28S	27E	12	35.513286	-119.020807	Domestic	1200	-183	450	1200	750	1017	440	623	Yes	2	22%	10	57	Interpreted within thinning portion of oil	UNK
AD	28S	28E	34	35.445320	-118.942874	Domestic	266	215	146	266	120	481	440	225	Yes	2	22%	10	95	Interpreted right within the oil zone pinc	UNK

Map ID	T	R	Sec	LAT_Y	LON_X	Water Well Type	Compl. Depth (ft)	Compl. Depth EL (ft)	Top Perf. (ft)	Bottom Perf. (ft)	Screen Length (ft)	Ground EL (ft)	Spring '17 Water Level EL (ft)	Sat. Thickness, b (ft)	Over HC Zone?	Q (gpm)	ϕ_e (%)	t (years)	r _t (feet)	Oil Zone Comment	Water Well Owner
AB	29S	27E	13	35.401537	-119.033400	domestic	400	9	340	400	60	409	240	231	No	2	22%	10	94	Interpreted west of oil zone pinchout.	M. E. beachlor
AC	29S	27E	13	35.403013	-119.025210	domestic	200	211	140	200	60	411	277	66	No	2	22%	10	176	Well TD is above TKRAE (Interpreted as	Jim Pair
AF	29S	27E	AC	35.401860	119.030718	domestic	60	-60	36	60	24	0	365	425		2	22%	10	69		Mrs. Mary C. Gray
AG	29S	27E	13	35.401800	119.031383	domestic	100	-100	50	100	50	0	370	470		2	22%	10	66		Willie Wile
AN	28S	28E	8	35.507857	-118.988423	domestic	1135	-44			0	1091	380	424	No	2	22%	10	69	Interpreted east of oil zone pinchout. As	
AF	28S	28E	8	35.507857	-118.988423	domestic	1135	-91		1135	0	1044	370	461	No	2	22%	10	66	Interpreted east of oil zone pinchout.	
AG	28S	28E	8	35.508180	-118.985680	domestic	1135	-213			0	922	370	583	No	2	22%	10	59	Interpreted east of oil zone pinchout. As	
AH	28S	28E	8	35.513082	-118.983907	domestic	1135	-78			0	1057	370	448	No	2	22%	10	67	Interpreted east of oil zone pinchout. As	
AI	28S	28E	8	35.508068	-118.993782	domestic	1135	-75			0	1060	360	435	No	2	22%	10	68	Interpreted east of oil zone pinchout. As	
AJ	28S	28E	8	35.503603	-118.992526	domestic	1135	-119			0	1016	360	479	No	2	22%	10	65	Interpreted east of oil zone pinchout. As	
AK	28S	28E	8	35.503928	-118.982596	domestic	1135	-115			0	1020	370	485	No	2	22%	10	65	Interpreted east of oil zone pinchout. As	
AL	28S	28E	8	35.508423	-118.977910	domestic	1135	-78			0	1057	380	458	No	2	22%	10	67	Interpreted east of oil zone pinchout. As	
AM	28S	28E	8	35.501309	-118.986317	domestic	1135	-79			0	1056	360	439	No	2	22%	10	68	Interpreted east of oil zone pinchout. As	

Table 2, KRAE Water Wells Capture Radii, 30 Year Travel Time - Revised

Map ID	T	R	Sec	LAT_Y	LON_X	Water Well Type	Compl. Depth (ft)	Compl. Depth EL (ft)	Top Perf. (ft)	Bottom Perf. (ft)	Screen Length (ft)	Ground EL (ft)	Spring '17 Water Level EL (ft)	Sat. Thickness, b (ft)	Over HC Zone?	Q (gpm)	ϕe (%)	t (years)	r _t (feet)	Oil Zone Comment	Water Well Owner
1	29S	28E	6	35.4407	-119.013	Domestic	750	-158	600	750	150	592	302	460	No	2	22%	30	115	TD Above Oil Zone	Dexzel Inc.
2	29S	28E	2	35.43681	-118.942	Domestic	273	211	173	273	100	484	422	211	Yes	2	22%	30	170	Inside 73-74 AE and screened in	John Wilson
3	29S	28E	2	35.43568	-118.942	Domestic	170	323	70	170	100	493	421	98	No	2	22%	30	249	Inside 73-74 AE, TD Above Oil Zone	Roger Hatch
4	29S	28E	2	35.43076	-118.943	Domestic	220	241	140	220	80	461	425	184	No	2	22%	30	182	Inside 73-74 AE, TD Above Oil Zone	Terry DeLaMater
5	29S	28E	2	35.43295	-118.943	Domestic	175	290	100	175	75	465	420	130	Yes	2	22%	30	217	Inside 73-74 AE and partially within	Dwight Bowers
6	29S	28E	8	35.42274	-118.996	Domestic	520	-52			40	468	322	374	No	2	22%	30	128	TD Above Oil Zone	Alon Asphalt Bakersfield Inc.
7	29S	28E	8	35.42316	-118.995	Domestic	520	-46			40	474	325	371	No	2	22%	30	128	TD Above Oil Zone	Alon Asphalt Bakersfield Inc.
8	29S	28E	8	35.41732	-118.998	Municipal	970	-525			40	445	320	845	No	30	22%	30	329	TD Above Oil Zone	River Ranch HOA
9	29S	28E	10	35.41975	-118.954	Domestic	310	193	115	310	195	503	408	215	No	2	22%	30	168	TD Above Oil Zone	Ace Stables
10	28S	28E	7	35.50786	-118.988	Unknown	1135	-18			0	1117	350	368	Yes	2	22%	30	129	The Top of the interpolated oil zone	
11	28S	27E	24	35.47937	-119.021	Domestic	800	124	500	800	300	924	315	191	No	2	22%	30	179	TD Above Oil Zone	Dwight Grimmes
12	28S	27E	36	35.44157	-119.029	Municipal	970	-362	502	970	468	608	278	640	No	109	22%	30	721	TD Above Oil Zone	Oildale Mutual Water Company
13	29S	28E	2	35.43422	-118.939	Domestic	200	282	60	200	140	482	430	148	No	2	22%	30	203	Interpreted east of oil zone pinch	Francis B. Perry
14	29S	28E	10	35.41896	-118.965	Domestic	460	14	380	460	80	474	370	356	No	2	22%	30	131	TD Above Oil Zone	Derrel's Mini Storage
15	29S	28E	10	35.41942	-118.96	Domestic	420	63	100	420	320	483	395	332	No	2	22%	30	136	TD Above Oil Zone	Rep. Kevin Flem (420 Club)
16	29S	28E	10	35.41892	-118.956	Domestic	248	257	100	248	148	505	405	148	No	2	22%	30	203	TD Above Oil Zone	Terry J. Easton
17	29S	28E	10	35.41884	-118.957	Domestic	300	213	175	255	80	513	405	192	No	2	22%	30	178	TD Above Oil Zone	Tom & Donna Chisum
18	29S	28E	7	35.41268	-119.011	Domestic	250	174	190	250	40	424	407	233	No	2	22%	30	162	TD Above Oil Zone	Val Butler
19	29S	28E	18	35.4106	-119.011	Irrigation	415	4			40	419	295	291	No	100	22%	30	1024	TD Above Oil Zone	Irma Roberston
20	29S	28E	18	35.41066	-119.011	Domestic	300	119	200	300	100	419	295	176	No	2	22%	30	186	TD Above Oil Zone	Wm Robertson
21	29S	28E	18	35.41096	-119.007	Domestic	300	123	220	300	80	423	305	182	No	2	22%	30	183	TD Above Oil Zone	Priscilla Mueller
22	29S	28E	18	35.41148	-119.006	Domestic	50	372			40	422	307	40	No	2	22%	30	390	TD Above Oil Zone	Rancho Not So Grande
23	29S	28E	17	35.40964	-119.006	Unknown	-	-			40	645	305	40	No	73	22%	30	2353	TD Above Oil Zone	Ranchos Rio Equestrian Center
24	29S	28E	18	35.40701	-119.007	Domestic	250	169			40	419	310	141	No	2	22%	30	208	TD Above Oil Zone	Bill Norman
25	29S	28E	17	35.4058	-119	Municipal	382	51	215	380	135	433	290	239	No	73	22%	30	963	TD Above Oil Zone	Ranchos Del Rio Mutual Water Company
26	29S	28E	18	35.40585	-119	Municipal	420	15	215	380	165	435	290	275	No	73	22%	30	897	TD Above Oil Zone	Ranchos Del Rio Mutual Water Company
27	29S	28E	17	35.4067	-118.986	Irrigation	390	226			40	616	290	64	No	100	22%	30	2183	TD Above Oil Zone	GreenLawn Memorial Park
A	28S	28E	8	35.51337	-118.98	Domestic	800	94	400	800	400	894	380	286	No	2	22%	30	146	Interpreted east of oil zone pinch	Wendell Weller
B	28S	28E	7	35.51133	-118.997	Domestic	800	182	500	800	300	982	350	168	No	2	22%	30	191	Interpreted east of oil zone pinch	Mike Combs
C	28S	28E	8	35.50785	-118.986	Domestic	975	59	715	975	260	1034	360	301	No	2	22%	30	142	Interpreted east of oil zone pinch	John Tart
D	28S	28E	8	35.51273	-118.989	Domestic	813	166	540	813	273	979	360	194	No	2	22%	30	177	Interpreted east of oil zone pinch	Mike Hood
E	28S	28E	8	35.51152	-118.985	Domestic	800	158	400	800	400	958	370	212	No	2	22%	30	170	Interpreted east of oil zone pinch	Susan Abarros-Deltoro
F	28S	28E	17	35.49695	-118.986	Domestic	800	315	400	800	400	1115	370	55	No	2	22%	30	333	Interpreted east of oil zone pinch	Tom Wilson
G	28S	28E	17	35.49745	-118.991	Domestic	1200	-112	880	1200	320	1088	360	472	No	2	22%	30	114	Well is Interpreted to penetrate oil zone	Thomas Gafford
H	28S	28E	35	35.44777	-118.939	Domestic	263	207	163	263	100	470	460	253	No	2	22%	30	155	Interpreted east of oil zone pinch	Tenneco West, Inc.
I	28S	28E	35	35.44159	-118.938	Domestic	320	145	140	320	180	465	460	315	No	10	22%	30	313	Interpreted east of oil zone pinch	Meadows of the Kern Mutual Water Co.
J	28S	28E	35	35.44735	-118.938	Municipal	320	148	120	320	200	468	460	312	No	10	22%	30	314	Interpreted east of oil zone pinch	Meadows of the Kern Mutual Water Co.
K	29S	27E	12	35.42583	-119.037	Domestic	730	-235	507	730	223	495	248	483	No	109	22%	30	830	Interpreted west of oil zone pinch	Oildale Mutual Water Company
L	29S	27E	12	35.41918	-119.034	municipal	892	-431	597	892	295	461		431	No	109	22%	30	878	Interpreted west of oil zone pinch	Oildale Mutual Water Company
M	29S	27E	12	35.42571	-119.037	municipal	425	69			0	494	248	179	No	109	22%	30	1363	Interpreted west of oil zone pinch	Oildale Mutual Water Company
N	29S	27E	12	35.42244	-119.036	Municipal	722	-245	290	697	407	477	248	493	No	109	22%	30	821	Interpreted west of oil zone pinch	Oildale Mutual Water Company
O	29S	27E	12	35.41275	-119.03	Municipal	620	-184	192	620	428	436	255	439	No	109	22%	30	870	Well TD is above TKRAE (Interp	Oildale Mutual Water Company
P	29S	27E	12	35.41924	-119.025	Domestic	700	-231	292	700	408	469	258	489	No	109	22%	30	825	Well TD is above TKRAE (Interp	Oildale Mutual Water Company
Q	29S	27E	12	35.41925	-119.034	Municipal	670	-208	300	600	300	462	248	456	No	109	22%	30	854	Interpreted west of oil zone pinch	Oildale Mutual Water Company
R	29S	27E	13	35.4018	-119.035	Municipal	610	-201	299	600	301	409	260	461	No	109	22%	30	849	Interpreted west of oil zone pinch	North of the River MWD
S	29S	27E	13	35.40326	-119.03	Domestic	577	-167	264	577	313	410	240	407	No	109	22%	30	904	Interpreted west of oil zone pinch	Oildale Mutual Water Company
T	29S	27E	13	35.41087	-119.034	Municipal	600	-167	330	600	270	433	248	415	No	109	22%	30	895	Interpreted west of oil zone pinch	Oildale Mutual Water Company
U	29S	27E	13	35.41077	-119.034	domestic	954	-521.4			0	432.6	248	769.4	No	109	22%	30	657	Interpreted west of oil zone pinch	Oildale Mutual Water Company
V	29S	27E	13	35.40517	-119.039	Domestic	400	18			0	418	240	222	No	2	22%	30	166	Interpreted west of oil zone pinch	Janco Pump Co.
W	29S	27E	13	35.41098	-119.039	Municipal	643	-203	307	643	336	440	243	446	No	109	22%	30	863	Interpreted west of oil zone pinch	Oildale Mutual Water Company
X	29S	28E	7	35.41522	-119.014	Domestic	435	1			0	436	290	289	No	2	22%	30	145	Well TD is above TKRAE (Interp	Dr. A.E. Angell
Y	28S	28E	34	35.4451	-118.942	Municipal	266	209	146	266	120	475	440	231	No	170	22%	30	1496	Interpreted east of oil zone pinch	UPLANDS OF THE KERN MUTUAL WATER COMPANY
AA	28S	28E	34	35.44676	-118.945	Domestic	266	-266	146	266	120	0	440	706	Yes	2	22%	30	93	Interpreted right at the oil zone pinch	UNK
Z	28S	27E	12	35.51329	-119.021	Domestic	1200	-183	450	1200	750	1017	440	623	Yes	2	22%	30	99	Interpreted within thinning portion	UNK
AD	28S	28E	34	35.44532	-118.943	Domestic	266	215	146	266	120	481	440	225	Yes	2	22%	30	165	Interpreted right within the oil zone	UNK

Map ID	T	R	Sec	LAT_Y	LON_X	Water Well Type	Compl. Depth (ft)	Compl. Depth EL (ft)	Top Perf. (ft)	Bottom Perf. (ft)	Screen Length (ft)	Ground EL (ft)	Spring '17 Water Level EL (ft)	Sat. Thickness, b (ft)	Over HC Zone?	Q (gpm)	ϕe (%)	t (years)	r _t (feet)	Oil Zone Comment	Water Well Owner
AB	29S	27E	13	35.40154	-119.033	domestic	400	9	340	400	60	409	240	231	No	2	22%	30	162	Interpreted west of oil zone pinch	M. E. beachlor
AC	29S	27E	13	35.40301	-119.025	domestic	200	211	140	200	60	411	277	66	No	2	22%	30	304	Well TD is above TKRAE (Interp	Jim Pair
AF	29S	27E	13	35.40186	-119.031	domestic	60	-60	36	60	24	0	365	425		2	22%	30	120		Mrs. Mary C. Gray
AE	29S	27E	13	35.4018	-119.031	domestic	100	-100	50	100	50	0	370	470		2	22%	30	114		Willie Wile
AN	28S	28E	8	35.50786	-118.988	domestic	1135	-44			0	1091	380	424	No	2	22%	30	120	Interpreted east of oil zone pinch	
AF	28S	28E	8	35.50786	-118.988	domestic	1135	-91		1135	0	1044	370	461	No	2	22%	30	115	Interpreted east of oil zone pinch	
AG	28S	28E	8	35.50818	-118.986	domestic	1135	-213			0	922	370	583	No	2	22%	30	102	Interpreted east of oil zone pinch	
AH	28S	28E	8	35.51308	-118.984	domestic	1135	-78			0	1057	370	448	No	2	22%	30	117	Interpreted east of oil zone pinch	
AI	28S	28E	8	35.50807	-118.994	domestic	1135	-75			0	1060	360	435	No	2	22%	30	118	Interpreted east of oil zone pinch	
AJ	28S	28E	8	35.5036	-118.993	domestic	1135	-119			0	1016	360	479	No	2	22%	30	113	Interpreted east of oil zone pinch	
AK	28S	28E	8	35.50393	-118.983	domestic	1135	-115			0	1020	370	485	No	2	22%	30	112	Interpreted east of oil zone pinch	
AL	28S	28E	8	35.50842	-118.978	domestic	1135	-78			0	1057	380	458	No	2	22%	30	115	Interpreted east of oil zone pinch	
AM	28S	28E	8	35.50131	-118.986	domestic	1135	-79			0	1056	360	439	No	2	22%	30	118	Interpreted east of oil zone pinch	

Table 3, Revised Municipal Water Well Information & Pumping Rates**Oildale Mutual Water Company**

Service Details	Year					Avg. Annual Pumping Volume / Well (2013 - 2017)		
	2013	2014	2015	2016	2017	Acre-ft	Gallons	Pumping Rate Equivalent (gpm)
Population	26,000	32,684	34,133	34,133	34,133			
# of Service Connections	8,126	8,120	8,120	8,120	9,863			
# of Wells	4	4	4	5	5			
Groundwater use (Acre-ft)	492	2,626	0	124	622	176	57,232,914	109

Meadows of the Kern

Service Details	Year					Avg. Annual Pumping Volume / Well (2013 - 2017)		
	2013	2014	2015	2016	2017	Acre-ft	Gallons	Equivalent Pumping Rate (gpm)
Population	32	32	32	32	32			
# of Service Connections	16	16	16	16	16			
# of Wells	4	4	4	4	4			
Groundwater use (Acre-ft)	0	1	85	111	129	16	5,327,780	10

Ranchos Del Rio

Service Details	Year					Avg. Annual Pumping Volume / Well (2013 - 2017)		
	2013	2014	2015	2016	2017	Acre-ft	Gallons	Equivalent Pumping Rate (gpm)
Population	62	62	62	62	62			
# of Service Connections	24	24	24	24	24			
# of Wells	4	4	4	4	4			
Groundwater use (Acre-ft)	0	0	113	2028	202	117	38,167,905	73

Ranchos Rio Equestrian Center

Service Details	Year					Avg. Annual Pumping Volume / Well (2013 - 2017)		
	2013	2014	2015	2016	2017	Acre-ft	Gallons	Equivalent Pumping Rate (gpm)
Population	25*	25*	25*	25*	25*			
# of Service Connections	4	4	4	4	4			
# of Wells	1	1	1	1	1			
Groundwater use (Acre-ft)	0	0	0	0	0	-	-	-

* Listed as transient connections.

Uplands of the Kern

Service Details	Year					Avg. Annual Pumping Volume / Well (2013 - 2017)		
	2013	2014	2015	2016	2017	Acre-ft	Gallons	Equivalent Pumping Rate (gpm)
Population	80	80	80	80	80			
# of Service Connections	20	20	20	20	20			
# of Wells	1	1	1	1	1			
Groundwater use (Acre-ft)	0	0	1,002	160	207	274	89,204,781	170

Figure 1, Water Wells: Kern River Aquifer Exemption

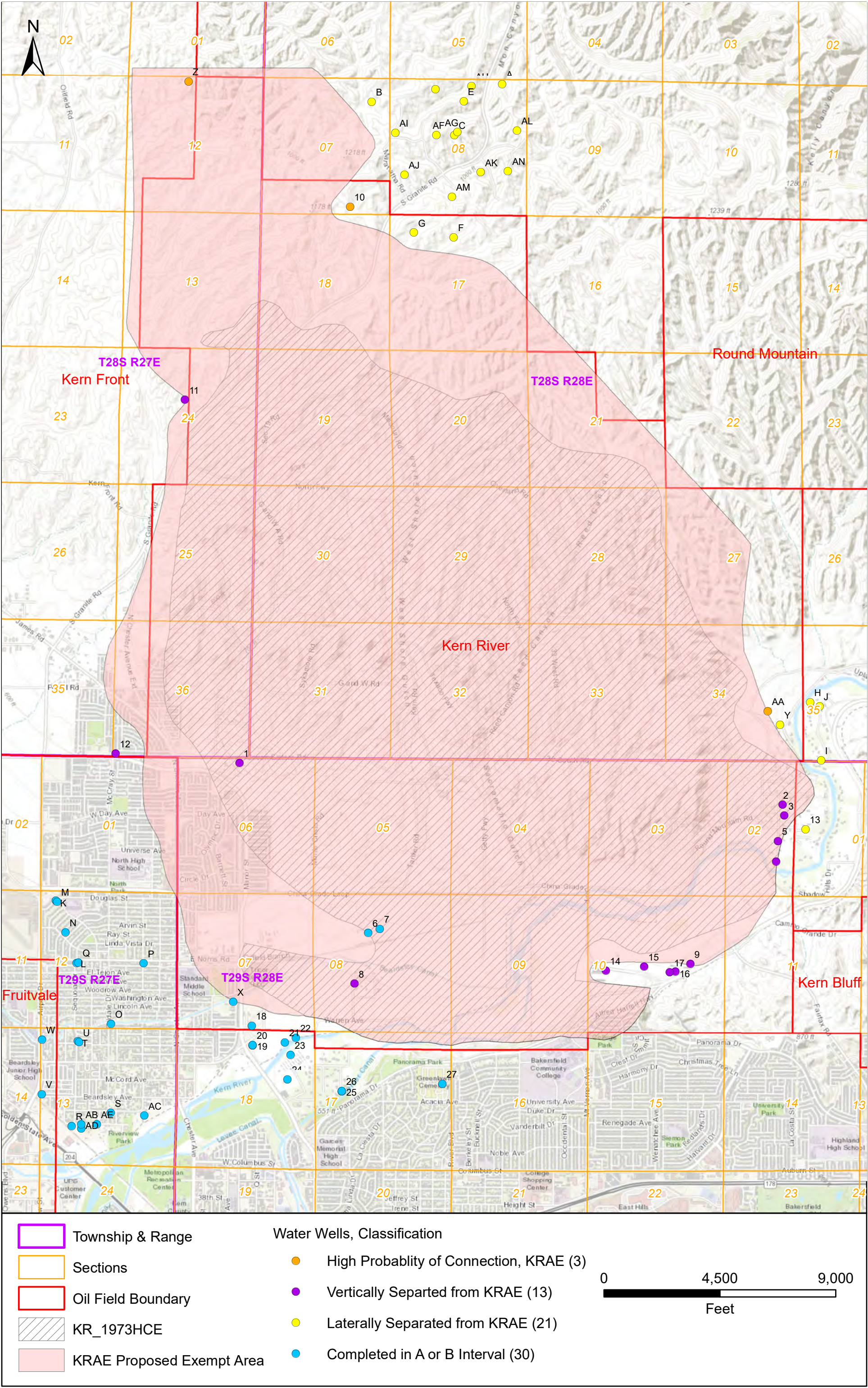
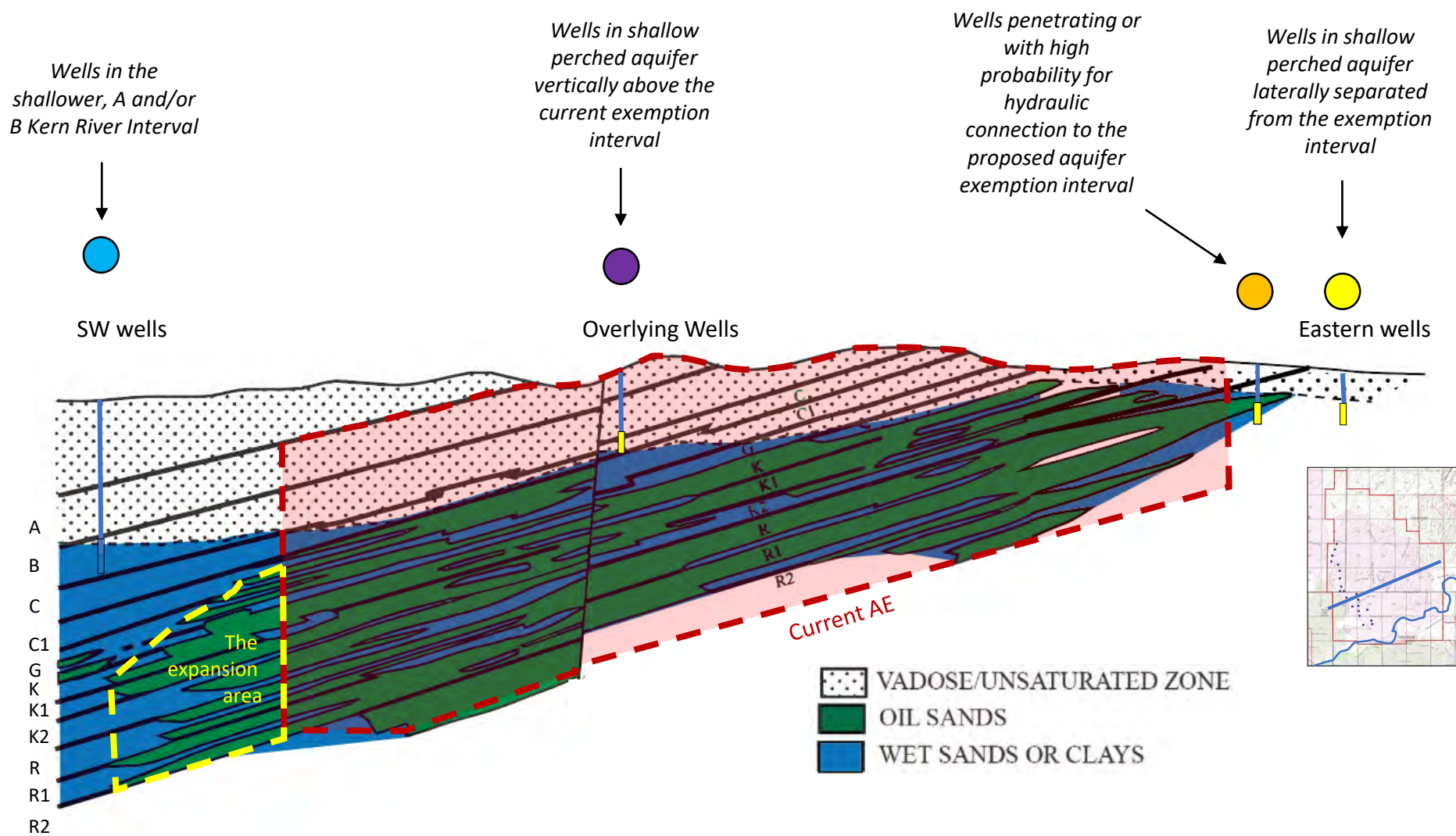


Figure 2, Categories of Water Wells and Completion Information



Adapted from Coburn and Gillespie 2006

[illegible]

Figure 4.1, Capture Analysis: North

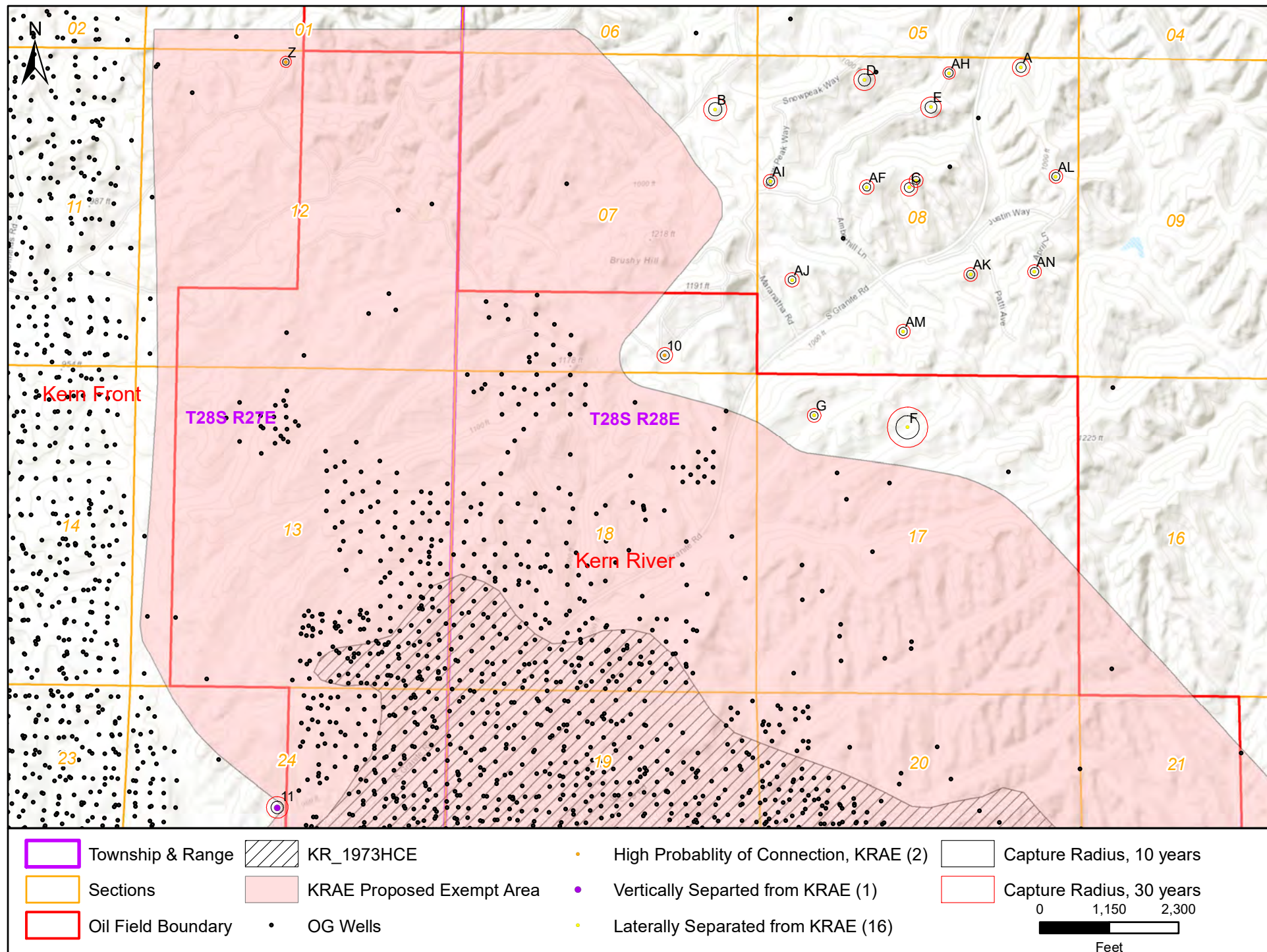


Figure 4.2, Capture Analysis: Southeast

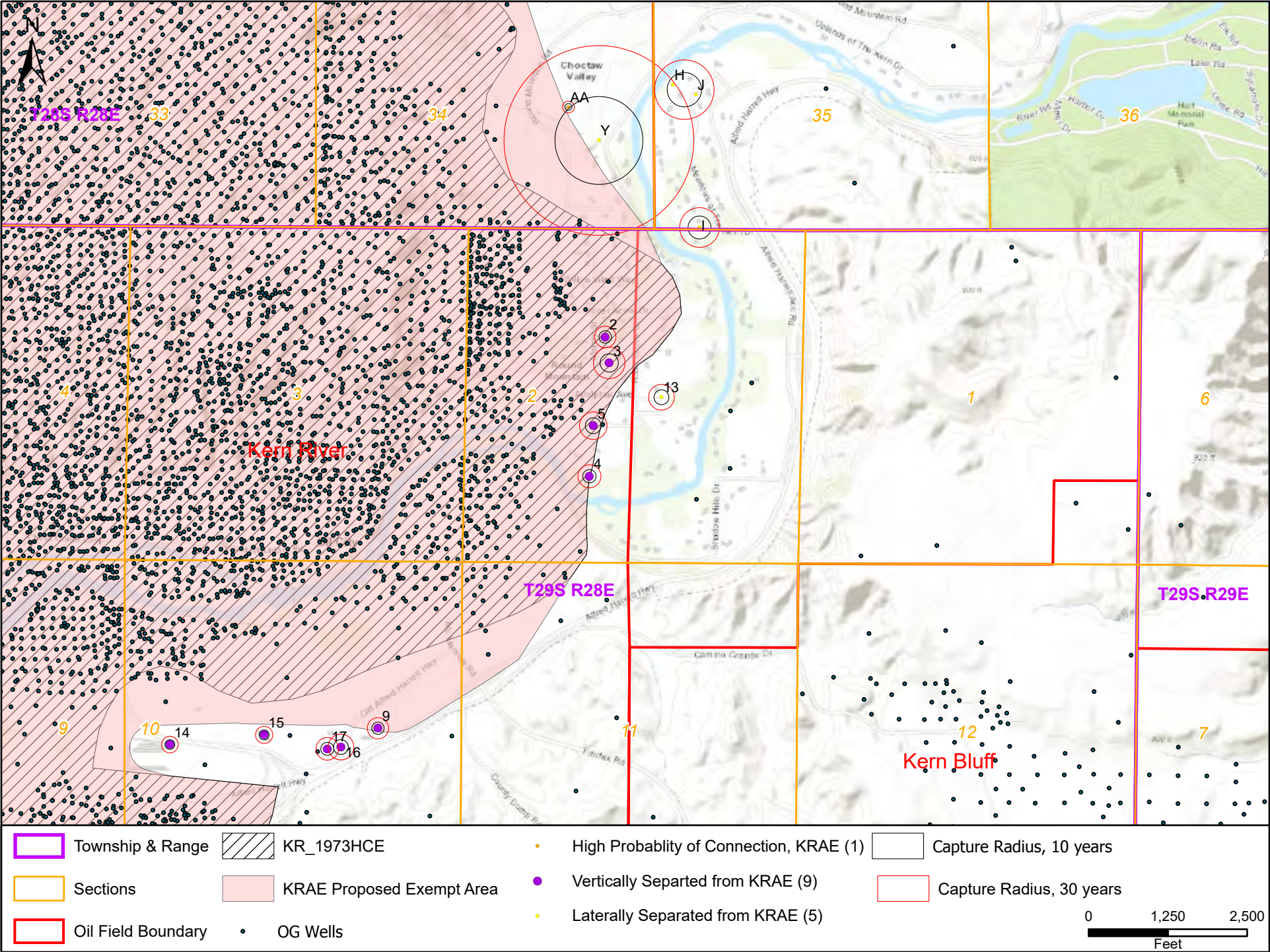
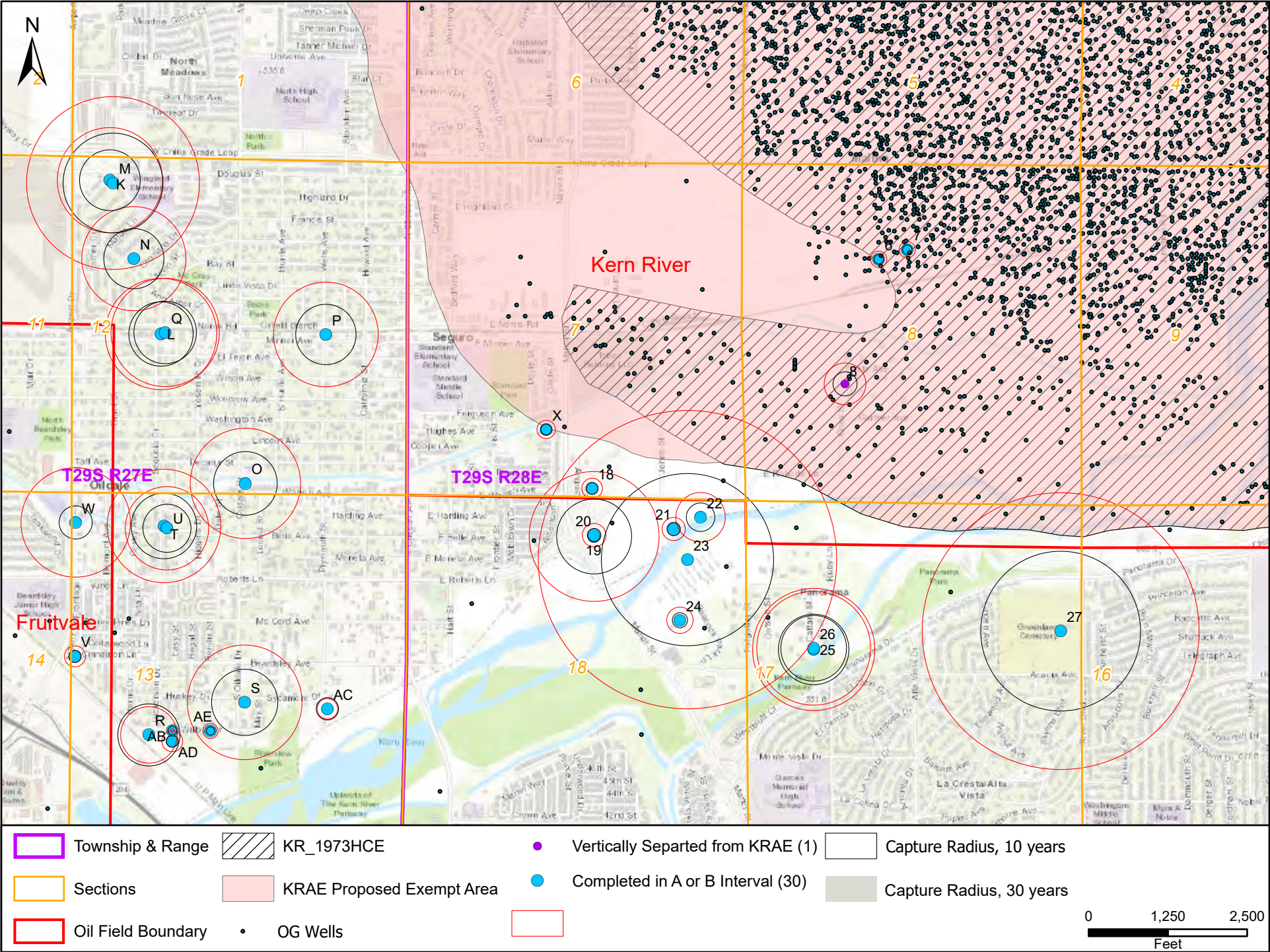


Figure 4.3, Capture Analysis: Southwest



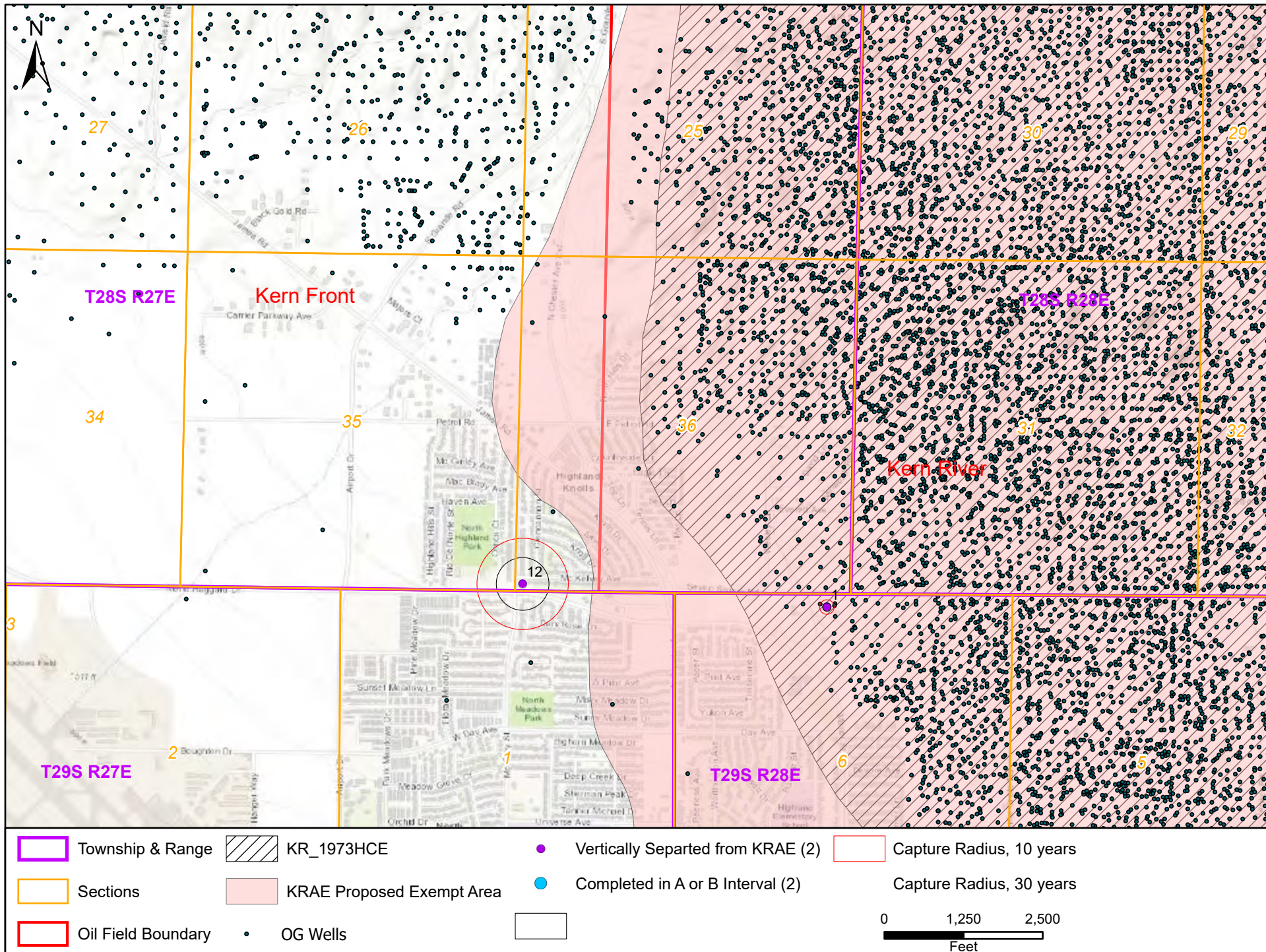
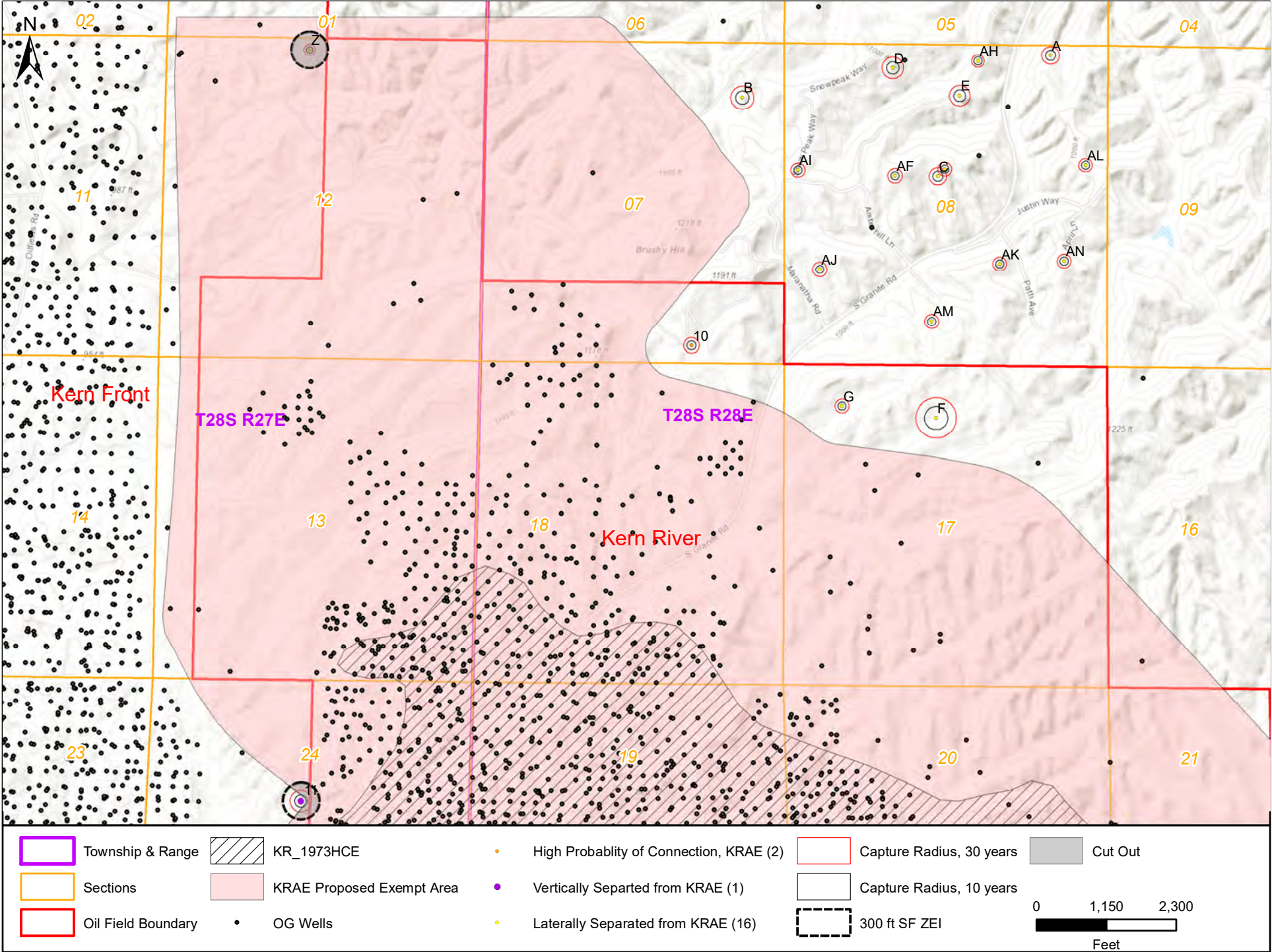


Figure 5.1, Capture Analysis & Cutout: North



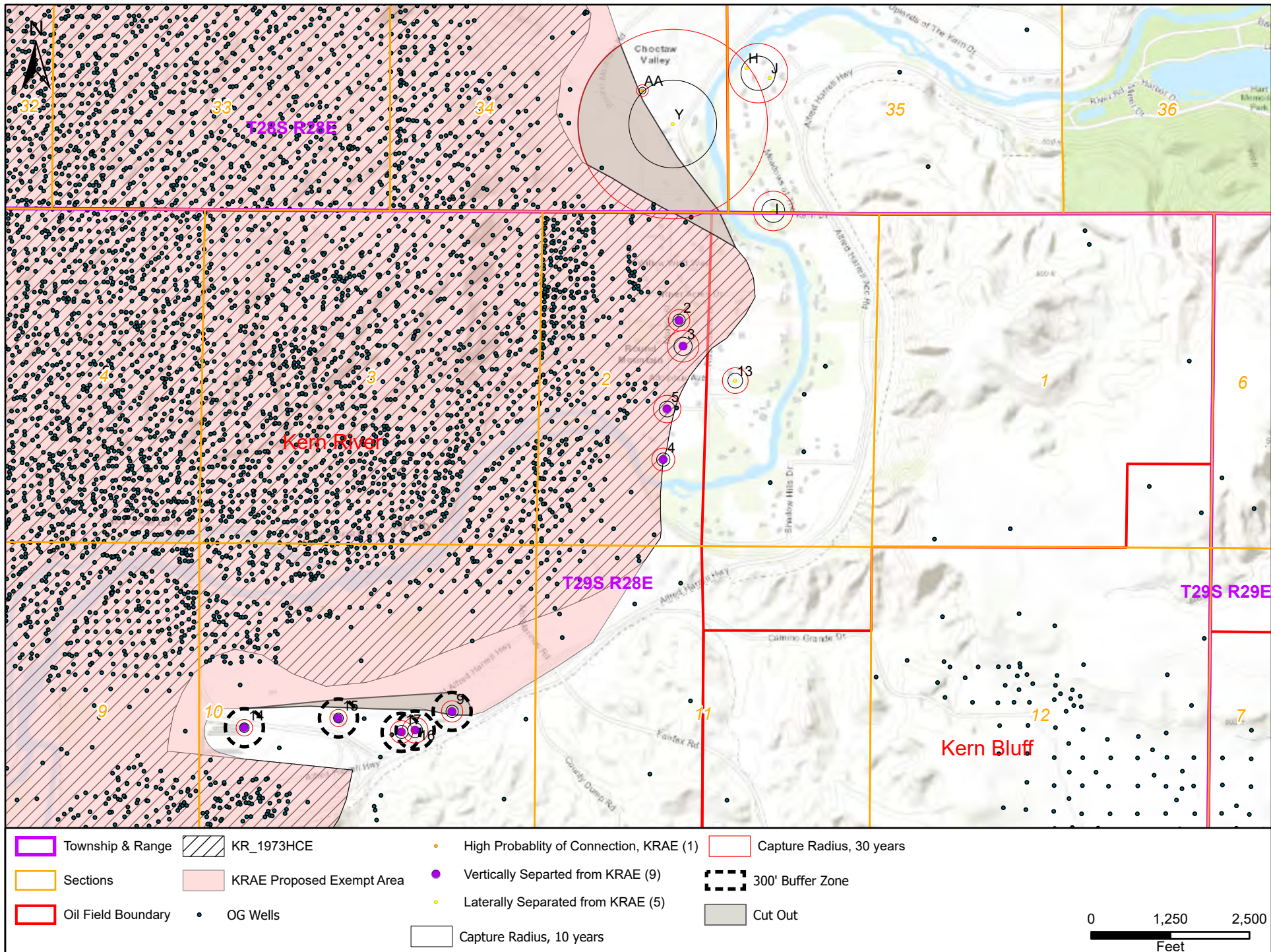
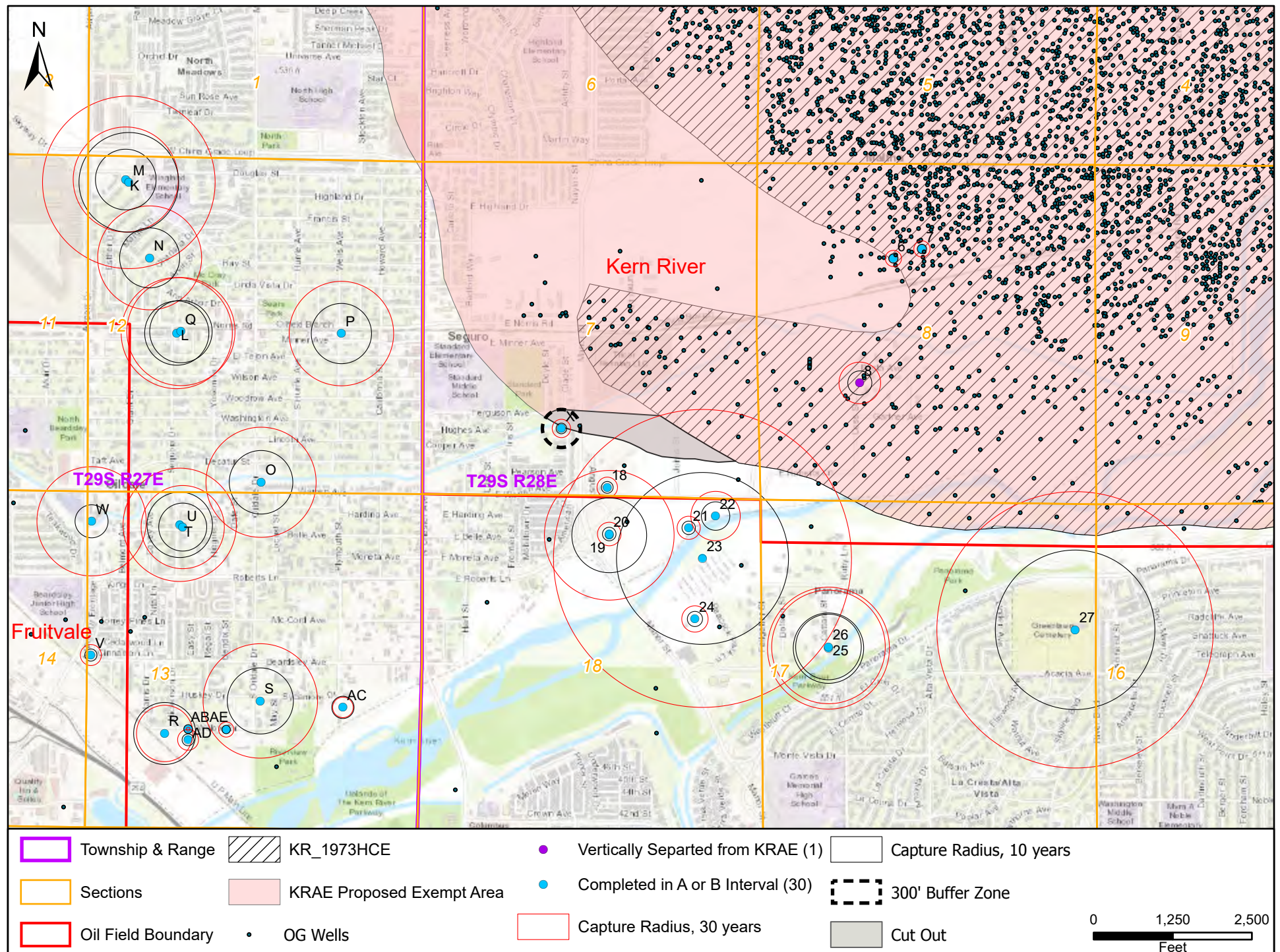


Figure 5.3, Capture Analysis & Cutout: Southwest



Appendix G

Revised Potential Conduit Well Assessment, 26 March 2025

**Revised Potential Conduit
Well Assessment
Kern River Reservoir
Aquifer Exemption
Boundary Expansion
Application
Kern River Oil Field
Kern County, California**

26 March 2025

Prepared for

**Chevron North America
Exploration and Production**

San Joaquin Valley Business Unit
9525 Camino Media
Bakersfield, CA 93311

KJ Project No. 2565005*00

26 March 2025

Ryan Jones
CalGEM Agent
Chevron North America Exploration and Production
San Joaquin Valley Business Unit
9525 Camino Media
Bakersfield, California 93311


Subject: Revised Potential Conduit Well Assessment
Kern River Aquifer Exemption Boundary Expansion
KJ Project No. 2565004.00


Dear Mr. Jones,

The attached *Revised Potential Conduit Well Assessment For The Kern River Reservoir Aquifer Exemption Boundary Expansion Application, Kern River Oil Field, Kern County, California* has been prepared for submittal to the California Geologic Energy Management (CalGEM) Division by Kennedy/Jenks Consultants, Inc, in association with Chevron North America Exploration and Production Company (Chevron). The interpretations, calculations, recommendations, and professional opinions presented herein were prepared in accordance with generally accepted professional geologic and engineering practices and within the scope of the project; and, to the best of our knowledge and belief, are true, accurate, and complete.

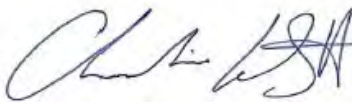
Respectfully,

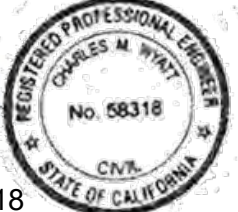
Kennedy/Jenks Consultants, Inc.


Todd Miller, PG, CHG No. 695



Lynn Endeavors, Inc.


Charlie Wyatt, PE No. 58318



Enclosure

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- 1 Map Showing Amended Proposed Aquifer Exemption Boundary and Potential Conduit Wells

List of Appendices

- A Wellbore Diagrams

Section 1: Introduction

Kennedy/Jenks Consultants, Inc. (Kennedy Jenks) submits this Revised Potential Conduit Well Assessment in support of the Kern River Reservoir Aquifer Exemption Boundary Expansion Application for the Kern River Oil Field, located in Kern County, California. The information presented in this report was prepared in general accordance with the Remediation and Monitoring of Potential Conduit Wells for Proposed Aquifer Exemptions (CalGEM 2024). This report has been updated based on additional information requested by CalGEM in a meeting with Chevron on 22 October 2024 and further comments from CalGEM via email to Chevron on 13 March 2025.

1.1 Background

Chevron North America Exploration and Production (Chevron) provided the California Department of Conservation Geologic Energy Management Division (CalGEM) with a Potential Conduit Well (PCW) Analysis on 10 February 2022 (Chevron 2022a) in support of their aquifer exemption boundary expansion application for the Kern River Oil Field (Kennedy Jenks 2020). The 2022 PCW Analysis identified 24 idle and abandoned wells where completion, plugging, or abandonment information indicated that fluids injected into the exempted aquifer could potentially impact the quality of beneficial use waters above or below the existing exempted aquifer if those fluids were to encounter the well. Chevron submitted a Mitigation Strategy Addendum to CalGEM on 18 July 2022 (Chevron 2022b) and in an email dated 22 July 2022, CalGEM responded to Chevron's PCW Analysis, requesting additional information. Chevron provided the additional information in an email dated 30 July 2022.

In an email dated 25 January 2024, CalGEM returned the PCW Analysis to Chevron and requested that it be revised to meet the framework outlined in Remediation and Monitoring of Potential Conduit Wells for Proposed Aquifer Exemptions (CalGEM 2024). In 2024 Chevron elected to revise the Aquifer Exemption boundaries such that only seven PCWs remain. This revised PCW Analysis presents plugging and abandonment information for the seven remaining wells that are within the revised Aquifer Exemption boundaries.

Section 2: Potential Conduit Well Assessment and Mitigation

The conduit analysis study area is defined by the spatially overlapping regions of the proposed aquifer exemption zone and any overlying or underlying aquifers containing water of beneficial use (CalGEM 2024). PCWs inside an Underground Injection Control (UIC) Area of Review (AOR) are to be addressed per the requirements in Title 14 California Code of Regulation (14 CCR) Section 1724.8 (§1724.8). PCWs within an aquifer exemption area should be addressed through remediation, monitoring or an alternative demonstration (CalGEM 2024).

Kennedy Jenks and Chevron reviewed wellbore diagrams and cement calculations for wells considered under this Conduit Analysis. Based on the review, discussions with CalGEM and the Water Board, and revisions to the Aquifer Exemption boundaries, seven wells were identified as PCWs needing further assessment and possibly remediation. The seven wells are listed in Table 1 and the well locations are shown on Figure 1.

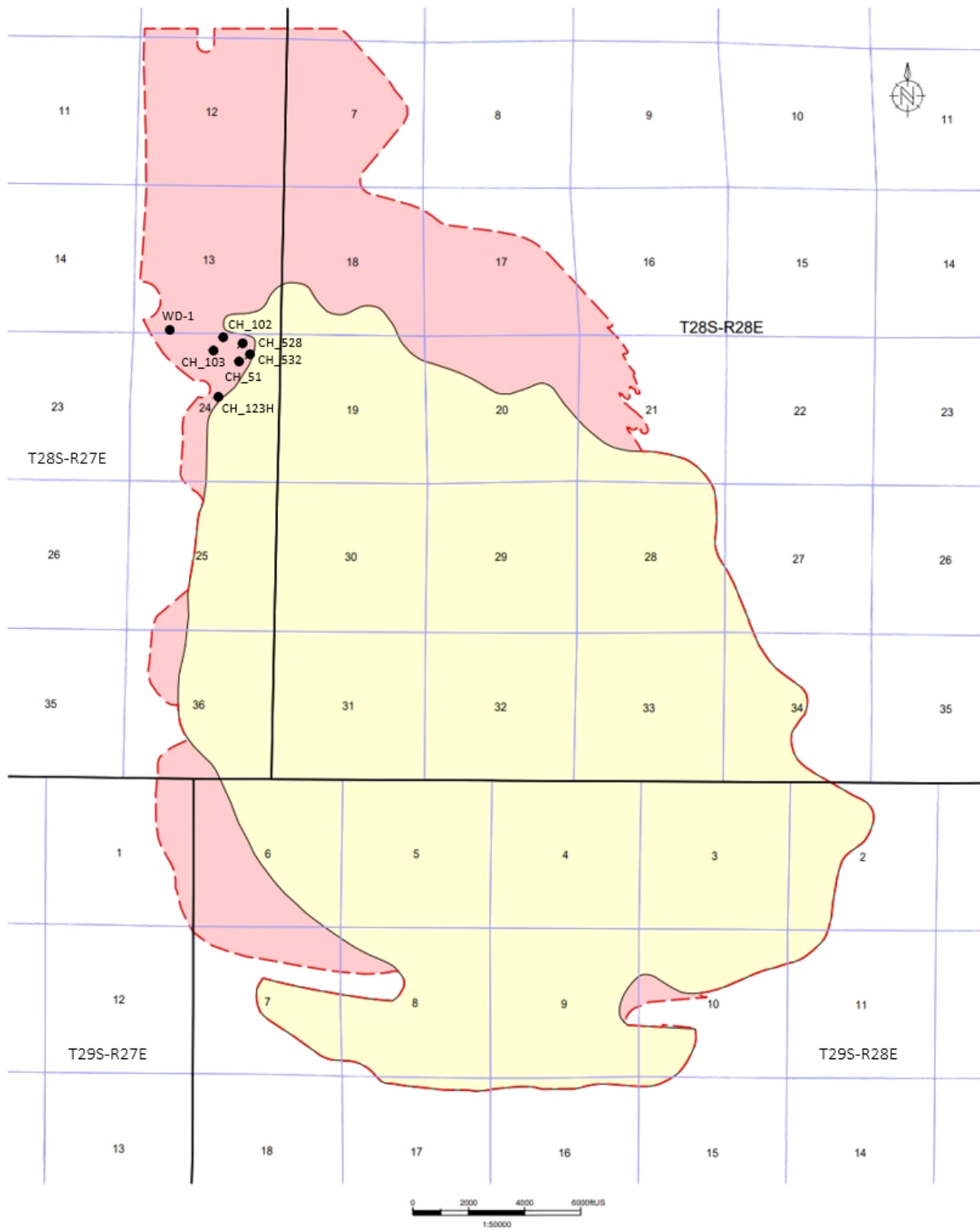
The seven PCWs were plugged and abandoned in 2022 and 2023. Appendix A contains wellbore diagrams documenting plugging and abandonment for the seven wells.

References

- California Department of Conservation Geologic Energy Management Division and State Water Resources Control Board, 2024, Remediation and Monitoring of Potential Conduit Wells for Proposed Aquifer Exemptions, January
- Chevron North America Exploration and Production Company, 2022a, Conduit Analysis, 10 February 2022.
- Chevron North America Exploration and Production Company, 2022b, Kern River Aquifer Exemption Conduit Analysis, Kern River Field, Kern River Reservoir, Mitigation Strategy Addendum A, July
- Kennedy/Jenks Consultants, Inc., 2020, Data In Support of The Aquifer Exemption Boundary Expansion Application For The Kern River Reservoir Including the Kern River Formation and Upper Chanac Formation, Kern River Field, Kern County, California, September.

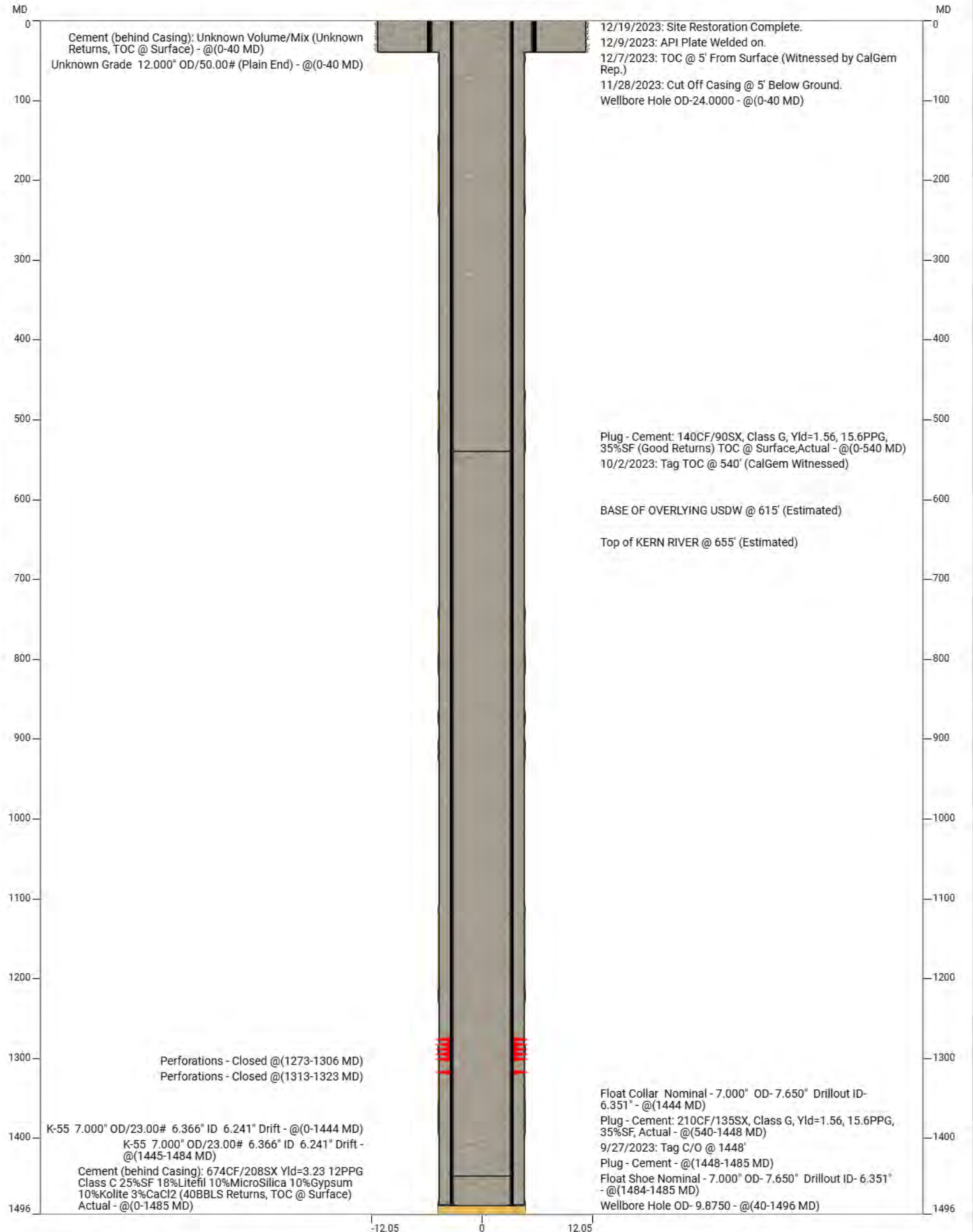
Table 1. Potential Conduit Well Summary

Well Count	API 10	Extension	Well Name	Operator	Remediation Completed
1	0403051465	00	Chanslor 102	Chevron	P&A 2023
2	0403051466	00	Chanslor 103	Chevron	P&A 2023
3	0403052041	00	Chanslor 528	Chevron	P&A 2023
4	0403052045	00	Chanslor 532	Chevron	P&A 2023
5	0403063442	00	Chanslor 123H	Chevron	P&A 2023
6	0403010190	00, 01	Chanslor 51	Chevron	P&A 2023
7	0403010794	00	Unspecified WD-1	CRC	P&A 2023



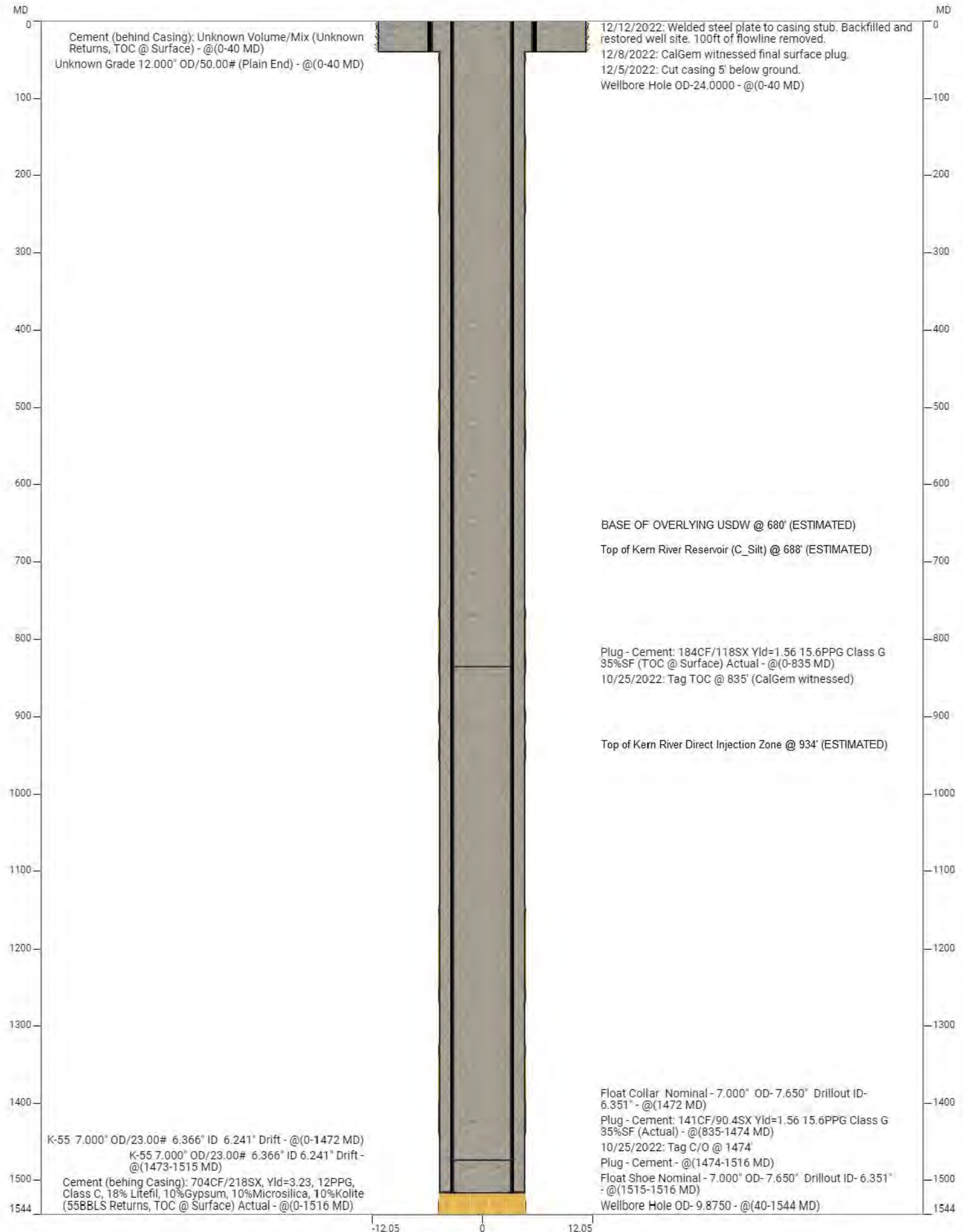
Appendix A: Wellbore Diagrams

Operator Name:	Chevron U.S.A. Inc.	Field:	Kern River	Well Name:	ZCH 102		
Fee/Lease:	Chanslor			Well Number:	102		
County:	Kern (2)	St:	California	API:	0403051465	API12:	040305146500
Section:	24	Township:	28S	Range:	27E	Base Meridian:	MD
Well Profile:	Vertical						



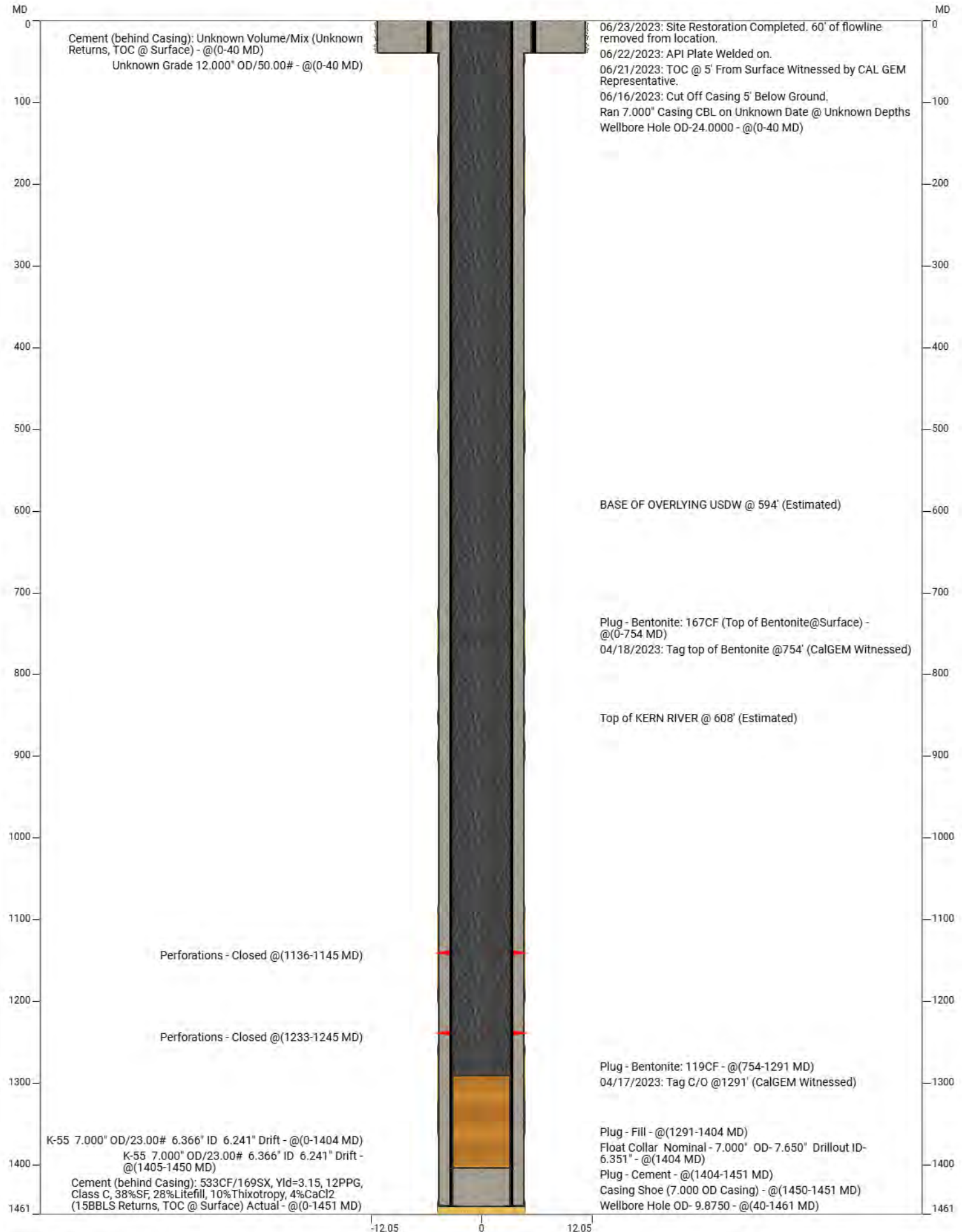
Ground Elevation (MSL):	947.70 ft	Spud Date:	10/17/2013	Compl. Date:	12/10/2013
Well Depth Datum:	Ground Level	Elevation (MSL):	947.70 ft	Correction Factor:	0.00 ft

Field:	Kern River	Well Name:	ZCH 103	CalGEM Well Number:	103		
Lease Name:	Chanslor	CalGEM Lease Name:	Chanslor	API:	0403051466	API12:	040305146600
County:	Kern (2)	St:	California	Range:	27E	Base Meridian:	MD
Section:	24	Township:	28S				
Well Profile:	Vertical						



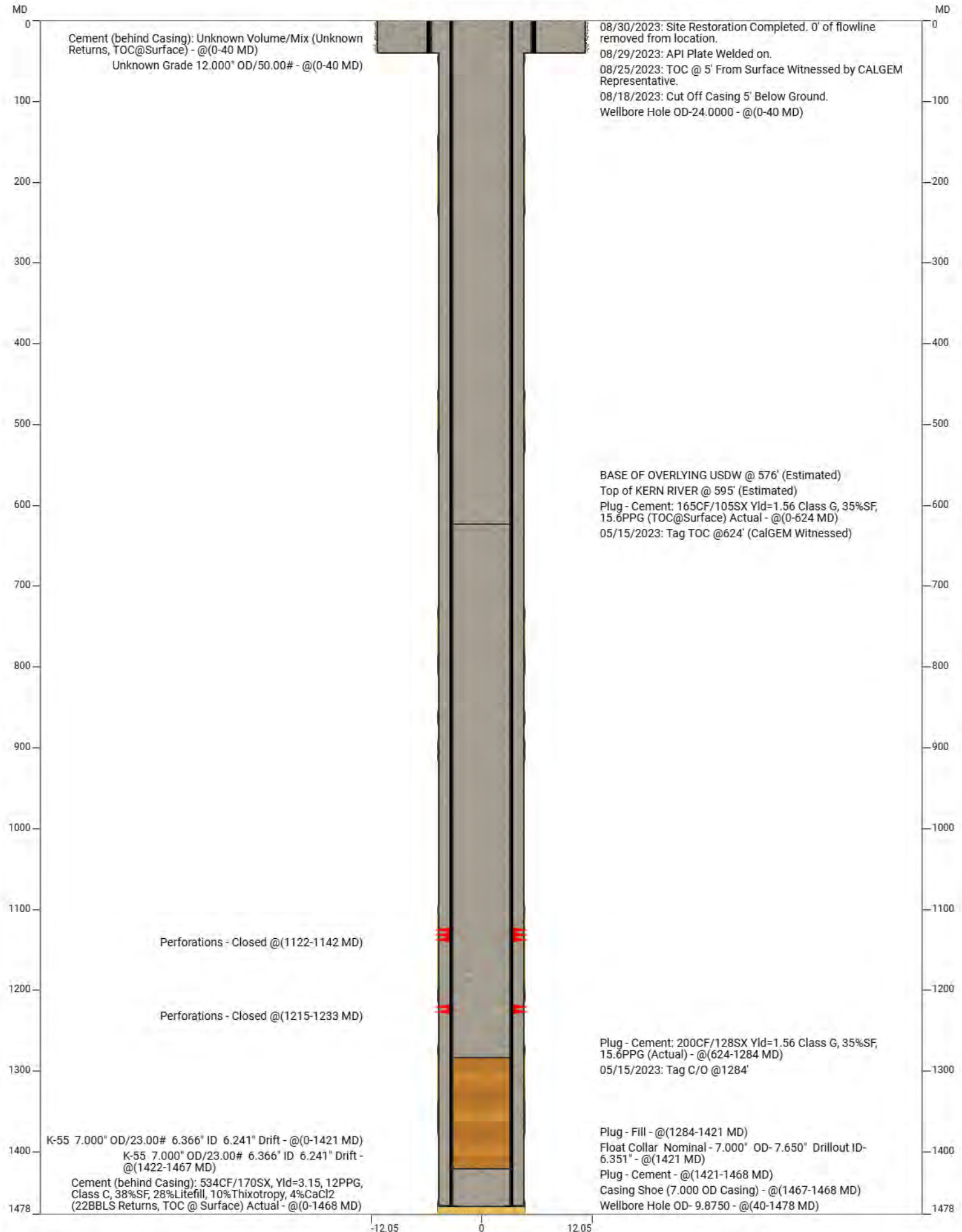
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Well Depth Datum:	Ground Level	Elevation (MSL):	954.60 ft	Correction Factor:	0.00 ft

Operator Name:	Chevron U.S.A. Inc.	Field:	Kern River	Well Name:	ZCH 528		
Fee/Lease:	Chanslor			Well Number:	528		
County:	Kern (2)	St:	California	API:	0403052041	API12:	040305204100
Section:	24	Township:	28S	Range:	27E	Base Meridian:	MD
Well Profile:	Vertical						



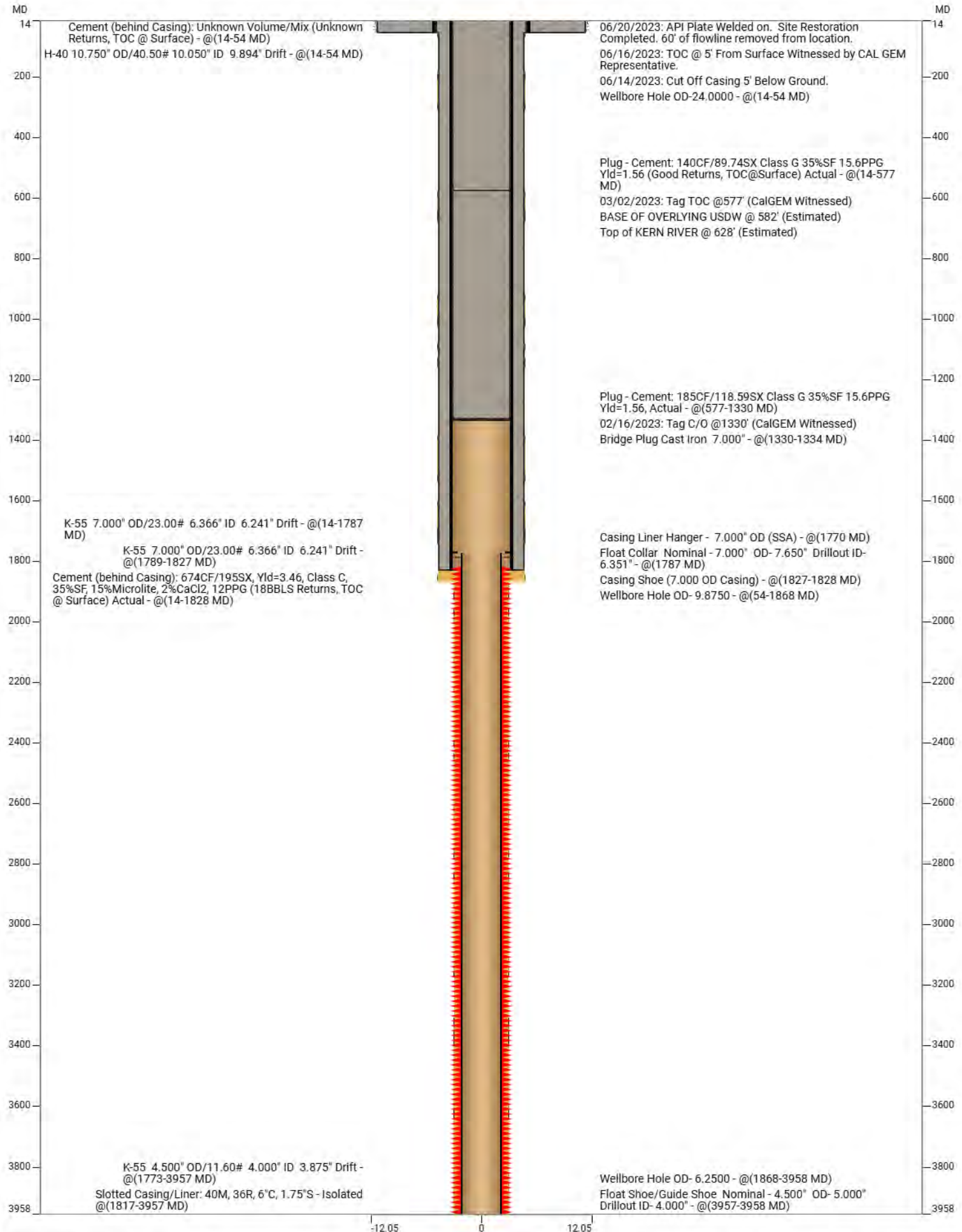
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Well Depth Datum:	Ground Level	Elevation (MSL):	937.90 ft	Correction Factor:	0.00 ft

Operator Name:	Chevron U.S.A. Inc.	Field:	Kern River	Well Name:	ZCH 532		
Fee/Lease:	Chanslor			Well Number:	532		
County:	Kern (2)	St:	California	API:	0403052045	API12:	040305204500
Section:	24	Township:	28S	Range:	27E	Base Meridian:	MD
Well Profile:	Directional						



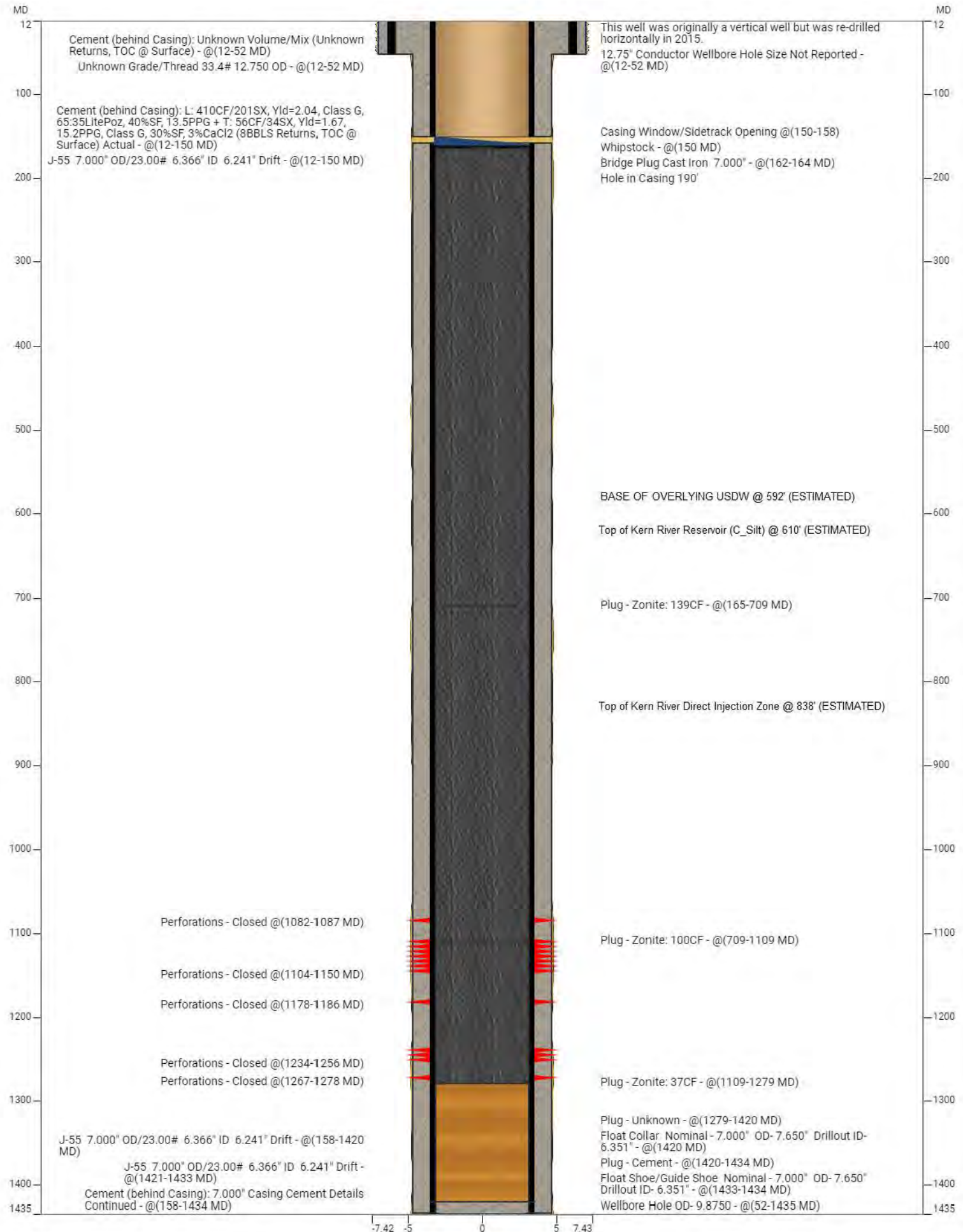
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Well Depth Datum:	Ground Level	Elevation (MSL):	926.50 ft	Correction Factor:	0.00 ft

Operator Name:	Chevron U.S.A. Inc.	Field:	Kern River	Well Name:	ZCH 123H		
Fee/Lease:	Chanslor			Well Number:	123H		
County:	Kern (2)	St:	California	API:	0403063442	API12:	040306344200
Section:	24	Township:	28S	Range:	27E	Base Meridian:	MD
Well Profile:	Horizontal						



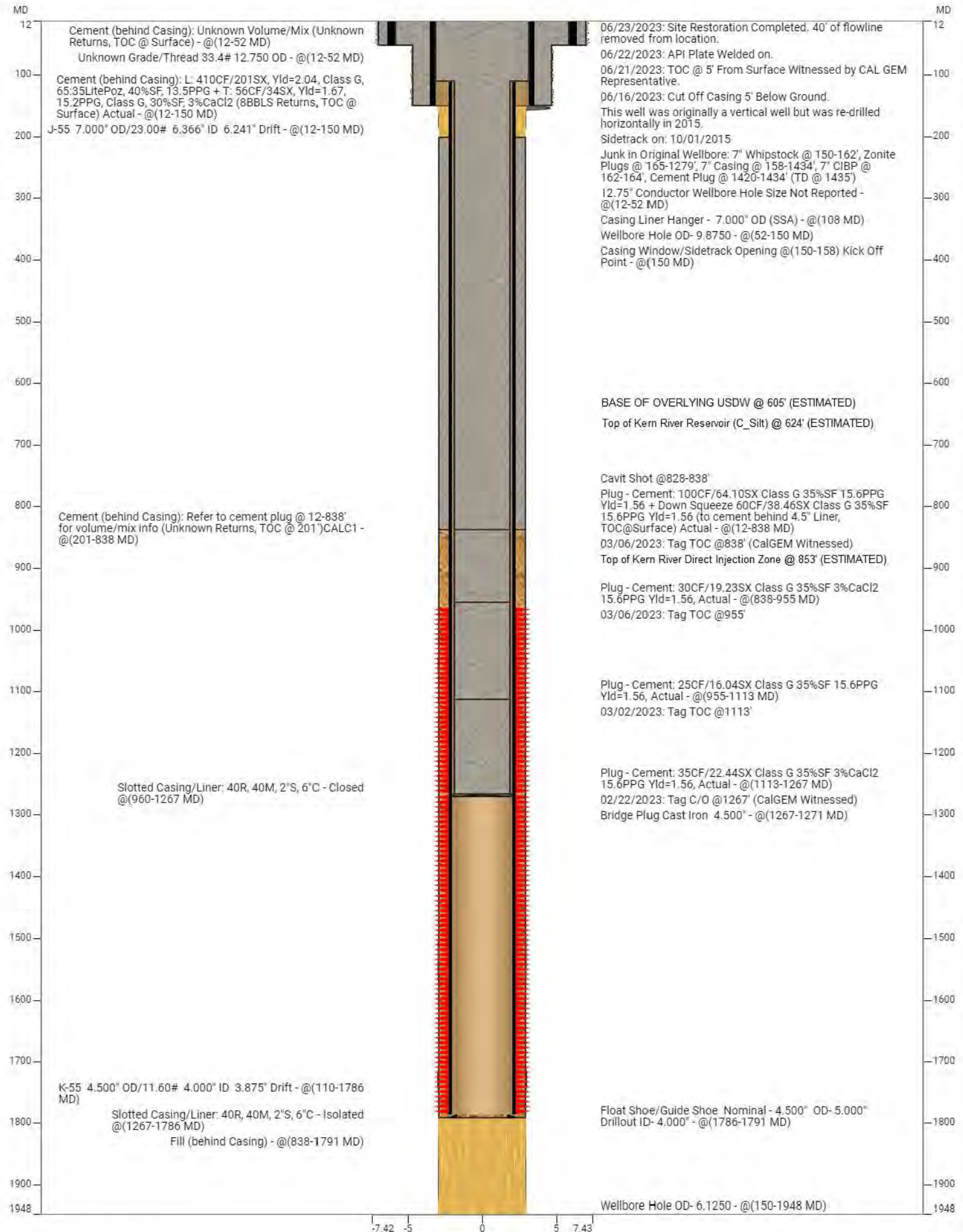
Ground Elevation (MSL):	870.20 ft	Spud Date:	3/13/2018	Compl. Date:	4/3/2018
Well Depth Datum:	Kelly Bushing	Elevation (MSL):	884.20 ft	Correction Factor:	14.00 ft

Field:	Kern River	Well Name:	ZCH 51	CalGEM Well Number:	51		
Lease Name:	Chanslor	CalGEM Lease Name:	Chanslor	API:	0403010190	API12:	040301019000
County:	Kern (2)	St:	California	API:	0403010190	API12:	040301019000
Section:	24	Township:	28S	Range:	27E	Base Meridian:	MD
Well Profile:	Horizontal						



Ground Elevation (MSL):	930.00 ft	Spud Date:	1/11/1998	Compl. Date:	1/22/1998
Well Depth Datum:	Kelly Bushing	Elevation (MSL):	942.00 ft	Correction Factor:	12.00 ft

Field:	Kern River	Well Name:	ZCH 51	CalGEM Well Number:	51		
Lease Name:	Chanslor	CalGEM Lease Name:	Chanslor	API:	0403010190	API12:	040301019001
County:	Kern (2)	St:	California	Range:	27E	Base Meridian:	MD
Section:	24	Township:	28S				
Well Profile:	Horizontal						



Ground Elevation (MSL):	930.00 ft	Spud Date:	1/11/1998	Compl. Date:	1/22/1998
Well Depth Datum:	Kelly Bushing	Elevation (MSL):	942.00 ft	Correction Factor:	12.00 ft

Field:

Kern River

Well Name:

WD - 1

Lease Name:

Lease by California Resources

CalGEM Lease Name:

Lease by California Resources

CalGEM Well Number:

1

County:

St:

API:

0403010794

API12:

040301079400

Section:

13

Township:

28S

Range:

27E

Base Meridian:

*

Well Profile:

Vertical

