



Statement of Basis for the Proposed Expansion of the Aquifer Exemption for the Kern River and upper Chanac Formations, Kern River Oil Field

Field:	Kern River Oil Field
County:	Kern County, California
Class and Well Type:	Class II, Enhanced Oil Recovery
Geologic Formations:	Kern River and upper Chanac Formations
Federal Exemption Criteria:	40 CFR §§ 146.4(a) and 146.4(b)(1)

The California Department of Conservation, Geologic Energy Management Division (CalGEM), in consultation with staff of the State Water Resources Control Board (State Water Board) and the Central Valley Regional Water Quality Control Board (collectively, the Water Boards), is considering recommending that the United States Environmental Protection Agency (US EPA) expand the existing aquifer exemption in the Kern River Oil Field under the Safe Drinking Water Act for purposes of receiving fluids from Class II injection wells.

The current exempted interval, which remains unchanged, is referred to in this document as the Kern River Reservoir. For purposes of this proposal, the Kern River Reservoir includes the hydrocarbon-bearing portions of the Kern River Formation below the "C" silt and the upper Chanac Formation within and immediately surrounding the Kern River Oil Field.

This proposal would expand the lateral boundaries of the existing aquifer exemption area to include additional portions of the Kern River Reservoir. This document summarizes the basis for CalGEM's potential recommendation to the US EPA.

SYNOPSIS

In 1983, subject to ongoing US EPA supervision, the US EPA granted CalGEM primary authority to regulate Class II injection in California for purposes of achieving the objectives of the Safe Drinking Water Act. These objectives include regulating Class II injection to ensure that current or anticipated sources of drinking water are not endangered. Federal regulations broadly define underground sources of drinking water as any geologic

formation that contains water with a total dissolved solids composition of less than 10,000 milligrams per liter in a sufficient quantity to supply a public water system. Class II injection encompasses injection for enhanced oil recovery (e.g., injection of water or steam to increase oil production) and for disposal of produced fluids associated with oil and gas production.

As part of its ongoing supervision of Safe Drinking Water Act implementation, the US EPA retains authority to designate specific water-containing geologic formations (i.e., aquifers) “exempt” from presumptive classification as a source of drinking water. This aquifer exemption process involves a careful case-by-case evaluation of characteristics affecting the aquifer's potential for use as a source of drinking water based on specific criteria set by federal law. CalGEM, with concurrence from the State Water Board, may submit a proposal to the US EPA recommending that an aquifer be designated “exempt” for the purpose of receiving fluids from Class II injection wells. Although the decision to designate an aquifer exempt ultimately rests exclusively with the US EPA, California state law adds additional criteria that CalGEM and the Water Boards must evaluate before proposing an aquifer exemption to the US EPA. These state law criteria are intended to help ensure that injection activity will not negatively affect waters of potential beneficial use. The federal and state components of the aquifer exemption process are important mechanisms for regulating the safe operation of Class II injection in California.

Concurrent with its grant of primary authority to CalGEM in 1983, the US EPA designated an aquifer exemption for portions of the Kern River Formation within the Kern River Oil Field. The boundaries of this aquifer exemption were based on 1973-74 CalGEM maps of the oil/water contact for the Kern River Oil Field. In 2017, Chevron U.S.A. Inc. along with the other Kern River Field operators, requested that CalGEM propose to the US EPA an expansion of the existing aquifer exemption for the Kern River Reservoir, utilizing newer and more detailed information. Based on a rigorous review of the supporting information, and with preliminary concurrence from the State Water Board, CalGEM has determined that the hydrocarbon bearing portion of the Kern River Reservoir, which for this proposal is considered to consist of both the Kern River Formation below the ‘C’ silt and the upper Chanac Formation within and immediately surrounding the Kern River Oil Field identified as the Proposal Area, appears to meet the criteria for proposal of an aquifer exemption recommendation to the US EPA.

In accordance with section 146.4 of title 40 of the Code of Federal Regulations (40 CFR), the information presented in the proposal materials supports a conclusion that the Proposal Area does not currently serve as a source of drinking water, and that the Proposal Area cannot now and will not in the future serve as a source of drinking water, because it is hydrocarbon producing or contains hydrocarbons that are expected to be commercially producible. In accordance with California Public Resources Code (PRC) section 3131, information presented in the proposal materials also supports a conclusion that injection of fluids into the Proposal Area will not affect the quality of water that is, or may reasonably be, used for any beneficial use, and that injected fluids will remain confined in the Proposal Area.

If approved by the US EPA, this aquifer exemption proposal would clarify that the Proposal

Area may be a suitable location for Class II injection to occur. However, approval of the proposed aquifer exemption would not, by itself, authorize any new injection activity. Approval to operate a Class II injection project involves a regulatory process separate from aquifer exemption. The approval process for operation of a Class II injection project includes evaluation of well construction, pressure limits, and many other project-specific details not considered in the context of an aquifer exemption proposal.

Additional information about this aquifer exemption proposal may be found in the supporting proposal materials.

LOCATION

The Proposal Area is located in the north central portion of Kern County (southern San Joaquin Valley), approximately two miles northeast of Bakersfield, California within Township 28 South / Range 27 East (T28S/R27E), T28S/R28E, and T29S/R28E, Mount Diablo Basin and Meridian (M.D. B.&M.).

A map depicting the boundaries of the Proposal Area appears at the end of this document.

AQUIFER EXEMPTION CRITERIA

Federal Exemption Criteria:

Section 146.4 of Title 40 of the Code of Federal Regulations. (40 CFR § 146.4)

An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in 40 CFR section 146.3 may be determined under 40 CFR section 144.7 to be an "exempted aquifer" if it meets the following criteria:

- (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:
 - (1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.
 - (2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;
 - (3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or
 - (4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or
- (c) The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

California State Criteria for Aquifer Exemption Proposals:

California Public Resources Code section 3131, subdivision (a). (PRC § 3131(a))

To ensure the appropriateness of a proposal by the state for an exempted aquifer determination subject to any conditions on the subsequent injection of fluids, and prior to proposing to the US EPA that it exempt an aquifer or portion of an aquifer pursuant to 40 CFR section 144.7, CalGEM shall consult with the appropriate regional water quality control board and the State Water Board concerning the conformity of the proposal with all of the following:

- (1) The criteria set forth in 40 CFR section 146.4.
- (2) The injection of fluids will not affect the quality of water that is, or may reasonably be, used for any beneficial use.
- (3) The injected fluid will remain in the aquifer or portion of the aquifer that would be exempted.

BASIS FOR EXEMPTION

The Proposal Area meets the federal criteria for aquifer exemption, as described in 40 CFR sections 146.4(a) and 146.4(b)(1).

The Proposal Area also meets the California criteria for proposal of an aquifer exemption to the US EPA, as described in PRC section 3131(a).

Proposal Area Meets Federal Exemption Criteria

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

Pursuant to 40 CFR 146.4(a), the groundwater in the proposed expansion area does not currently serve as a source of drinking water. A search for water supply wells was conducted within and around the proposal area. The water well search entailed obtaining data files from the Department of Water Resources water well completion reports, Kern County Environmental Health water well completion reports, the Groundwater Ambient Monitoring and Assessment (GAMA) Groundwater Information System and identifying existing wells through field reconnaissance. There are no known private or municipal drinking water supply wells completed within the Kern River Reservoir within the proposed expansion area. 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 strong hydraulic gradient towards the center of the field created by production operations. Additionally, in 2019 CalGEM performed a capture radius analysis for each of these twenty wells based on well specific information. The capture analysis confirmed that the origin of the water potentially extracted from these wells is outside the proposed expanded aquifer exemption boundary.

It cannot now and will not in the future serve as a source of drinking water because it is hydrocarbon producing or contains hydrocarbons that are expected to be commercially producible. (40 CFR § 146.4(b)(1))

The total dissolved solids (TDS) content of the Kern River Reservoir water is less than 10,000 milligrams per liter (mg/L), ranging from 120 to 1,700 mg/L with an average of 691 mg/L. This is based on historical water quality data collected from a period of 1955 to 2015 for water wells within a quarter mile of the proposed exemption boundary. Although the water quality TDS is generally low, the groundwater within the Kern River Reservoir cannot now and will not in the future serve as a source of drinking water because it is hydrocarbon producing in commercially producible quantities.

Proposal Area Meets California State Criteria for Aquifer Exemption Proposals

The Proposal Area meets US EPA exemption criteria. (PRC § 3131(a)(1))

As discussed above, the Proposal Area meets the federal criteria for aquifer exemption — specifically, 40 CFR sections 146.4(a) and 146.4(b)(1).

The injection of fluids into the Proposal Area will not affect the quality of water that is, or may reasonably be, used for any beneficial use. (PRC § 3131(a)(2))

As per PRC section 3131(a)(2), injection fluids are not expected to affect the quality of water that is, or may reasonably be used for any beneficial use because (1) groundwater contained in the Proposed Area contains petroleum hydrocarbons and (2) injected fluids will be of similar or better quality than the existing groundwater in the Proposed Area.

The injected fluid will remain in the aquifer or portion of the aquifer that would be exempted. (PRC §3131(a)(3))

Consistent with PRC section 3131(a)(3), a conduit analysis review was conducted to evaluate the potential for fluid migration outside the Proposed Area into overlying beneficial use aquifers. The review evaluated all idle and plugged and abandoned wells within the Proposed Area to ensure that injected fluid will remain in the portion of the aquifer that would be exempted. In 2021, the Operator submitted wellbore diagrams and well integrity information to CalGEM and Water Boards staff for all idle and abandoned wells located in the Proposed Area. Water Board and CalGEM staff identified 24 potential conduit wells. The Operator submitted mitigation strategies in 2022 and 2024 and after revisions to the Proposed Area boundary, seven potential conduit wells remained within the boundary. All seven potential conduit wells were plugged and abandoned in 2023 and verified by wellbore diagrams. No monitoring plan is required.

The requirement of PRC section 3131(a)(3) is further satisfied as the injected fluids are expected to remain in the Proposed Area due to a combination of geologic conditions and operational controls. Vertical containment for the top of the Kern River Formation is provided by the overlying low permeability C-Silt interval. Vertical containment in the downward direction is controlled by a silt unit within the Chanac Formation that provides

vertical hydraulic separation between the overlying Kern River Reservoir and the deeper non-oil-bearing portions of the Chanac Formation. Lateral containment in the proposed exempted area is primarily provided by a production-induced inward hydraulic gradient. A low-pressure zone in the center of the oil field has formed due to years of fluid extraction activities. This low-pressure zone creates an inward hydraulic gradient, which establishes an overall hydraulic control within the oil field boundaries and provides isolation of injection fluids. Geologic features such as sealing faults, geologic structure, and tar seals also provide redundant measures of lateral containment.

The geologic features that represent the lateral containment boundaries include the Kern Front Fault along the western boundary, the Poso Creek Fault along the northern boundary, and multiple unnamed faults along the northeastern boundary. At the eastern extent, the Kern River Formation outcrops, creating a natural stratigraphic barrier. It is important to note that in areas 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 the ground surface. In the south and southeast, containment is controlled by tar seals that exist within the Kern River Reservoir outside the limits of production. In the southwest, the proposed aquifer exemption boundary is limited to the lowest known oil, with containment being provided by the strong inward hydraulic gradient resulting from production operations.

Project-Level Limitations and Conditions

To ensure that injected fluids do not affect the quality of reservoir water, the following limitation would be incorporated in all current and future Class II Underground Injection Control (UIC) project approvals:

- *Injection fluids must be of similar or better quality than the existing groundwater in the proposed exempted area as determined by Water Boards staff, using methods such as chemical analyses of injectate samples and groundwater samples from the exempted area.*

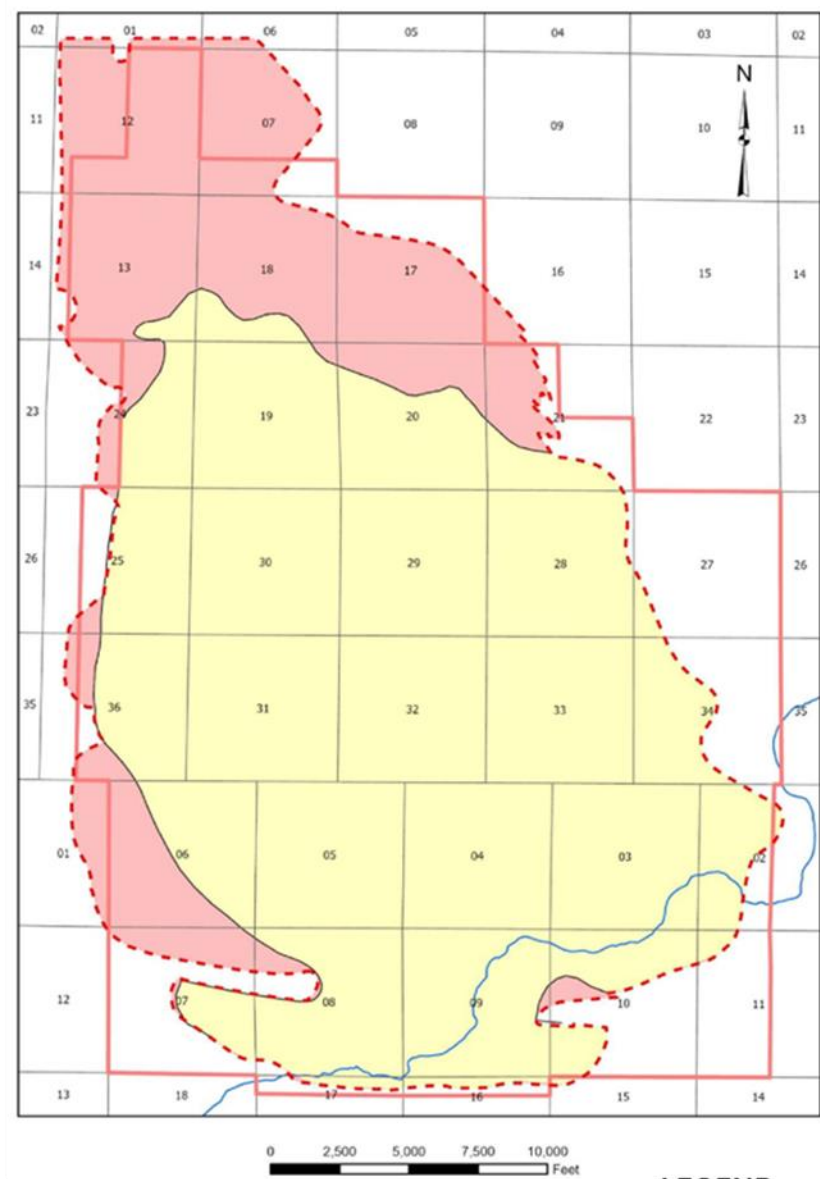
Approval of Class II UIC projects involve a joint review by CalGEM and the Water Boards staff. CalGEM and the Water Boards staff will consider incorporating conditions into approvals of Class II injection projects. Potential conditions may include, but are not limited to, requiring monitoring to validate that injected fluids remain in the exempted area. In addition, for any injection project within one-quarter mile of a water supply well, Water Boards staff may seek the inclusion of a requirement to monitor for all chemical compounds and elements that constitute the chemicals and additives used in petroleum exploration, production, treatment, and injection using Environmental Laboratory Accreditation Program (ELAP)-approved analyses. If a monitoring requirement is incorporated in a UIC project approval, the operator must submit a work plan to the Central Valley Regional Water Quality Control Board for approval.

CONCLUSION

Information presented in the proposal materials supports the following conclusions regarding the Proposal Area:

- 1) The Proposal Area does not currently serve as a source of drinking water;
- 2) The Proposal Area cannot now and will not in the future serve as a source of drinking water because it is hydrocarbon producing or contains hydrocarbons that are expected to be commercially producible;
- 3) The injection of fluids into the Proposal Area will not affect the quality of water that is, or may reasonably be, used for any beneficial use; and
- 4) The injected fluids will remain in the aquifer or portion of the aquifer that would be exempted.

Based on these factors, as further discussed in the supporting proposal materials, and pending review of all timely and relevant comments from the public, with the concurrence of the State Water Board, CalGEM intends to recommend that the US EPA designate the Proposal Area an exempted aquifer for purposes of receiving fluids from Class II injection wells.

**LEGEND**

-  Proposed Aquifer Exemption Boundary
-  Current Aquifer Exemption Boundary
-  Kern River Oil Field Administrative Boundary
-  Kern River

