The State of California
Division of Oil, Gas, and Geothermal Resources
and the
State Water Resources Control Board
Aquifer Exemption Process
Guidance Document

This Aquifer Exemption Guidance Document (Guidance Document) provides a brief history of the aquifer exemption process, the role the state plays with enforcing the Safe Drinking Water Act (42 U.S.C. 300f et seq.), and the general process of aquifer exemption application submittals review. This Guidance Document is a supplement to the information presented at the Division of Oil, Gas, and Geothermal Resources (Division), State Water Resources Control Board (State Water Board), and the U.S. Environmental Protection Agency (US EPA) joint agency workshops given in Bakersfield and the Los Angeles area, in February and March, 2015, respectively.

This Guidance Document includes a general description of existing federal and state statutes and regulations. This Guidance Document is not intended to implement, interpret, or make specific any of these statutes or regulations, or to create any new substantive or procedural requirements. Rather, this Guidance Document is intended to provide the regulated community and the public with a general understanding of existing statutes and regulations. In the case of any conflict, the actual statute or regulation governs. All decisions by the Division and the State Water Board regarding aquifer exemptions will be made on a case-by-case basis, and will not be based on this Guidance Document.

History

The Safe Drinking Water Act was passed in 1974 and required the US EPA to develop regulation to protect underground sources of drinking water (USDW) from contamination or damage associated with injection activity. The threshold of water to be protected is mandated to include water with less than 10,000 milligrams per liter of Total Dissolved Solids ("TDS" means milligrams per liter of total dissolved solids content). The regulations define six classes of injection wells. This document will focus on Class II injection wells. A Class II injection well is defined in the federal regulation quoted below.
40 C.F.R. section 146.5, subdivision (b):

Class II. Wells which inject fluids:
(1) Which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.
(2) For enhanced recovery of oil or natural gas; and
(3) For storage of hydrocarbons which are liquid at standard temperature and pressure.

The federal government recognized the desires of the states to regulate injection wells, and allowed a process that by which the states could apply for authority to regulate the injection wells. This process is referred to as "Primacy." Because of the variances with the way states regulated injection, the federal government allowed states to apply under one of two separate criteria. California applied for Primacy under Section 1425, this refers to an application whereby a state applies stating that their program is equivalent or more stringent than the US EPA's program.

In April of 1981, the Division (known at that time as the Division of Oil and Gas) submitted an application to the US EPA and provided supporting data over the next year and a half. On September 28th and 29th of 1982, a Memorandum of Agreement (MOA) was signed by both the State and the federal government. This was ratified and placed in the federal register in March of 1983. The application for Primacy describes the State's program and can be found at the following link:
http://www.conservation.ca.gov/dog/general_information/Documents/Application%20for%20Primacy.pdf

In addition to the Primacy application document, the Division provided two supplemental technical documents that were used to show the locations of existing oil and gas areas, including those that were considered hydrocarbon producing. This is an important piece of information in order to determine what was applied for to the US EPA, and what was approved. These two technical documents can be found at:

ftp://ftp.consrv.ca.gov/pub/oil/UIC%20Files/Volume%201%20193MB.pdf

ftp://ftp.consrv.ca.gov/pub/oil/UIC%20Files/Volume%202%20116MB.pdf

The two technical documents were generated nearly ten years before Primacy was granted, yet they are the foundation of much of the State's application. These documents include geologic maps and cross sections delineating the areal extent of the productive limits of the oil and gas fields, as well as a data sheet that lists the different producing zones, including some details regarding the depth and thickness of the producing formations. An example of such a data sheet and map can be found in Exhibit A. Although there are maps and cross sections for most oil and gas fields, the documents also describe the productive area as follows:

1) *By inference from well symbols placed on the contour map.*

2) *By shading (see legend) on contour map and/or cross sections.*

These maps and cross sections have limited value since the shaded areas shown on the contour maps represent the *maximum* productive limits of the oil or gas field. Oil and gas fields may have multiple hydrocarbon producing zones (vertically and horizontally), which may or may not overlap with the zones above or below. This is illustrated in the map and 3-D image of Exhibit B. Therefore, the maximum productive limits do not necessarily outline the productive limits of all the hydrocarbon producing horizons at a given oil or gas field.

US EPA Aquifer Exemption Criteria

An aquifer, or a portion thereof, may be determined to be an exempted aquifer for Class II injection wells if it meets the criteria in the federal regulations listed below.

40 CFR section 146.4:

The aquifer:

(a)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 Class III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible; **or**

(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; **or**

(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) TDS is more than 3,000 and less than 10,000 and it is not reasonably expected to supply a public water system.

Aquifer Exemption Process

If an operator, or operators, wish to inject Class II fluid into a zone where the water quality is less than 10,000 TDS, and the zone has not been previously exempted, the Division will request data from the operator(s) to help provide additional supporting documentation necessary to assess if the aquifer exemption request meets the criteria as specified in 40 CFR 146.4.

The State's evaluation of the supporting documentation provided by the operator(s) must verify:

A) The aquifer does not currently serve as a source of drinking water. (Additional information and guidance can be found in the US EPA's Guidance #34 that is included with this document.)

State Water Board staff will evaluate the information contained in the Aquifer Exemption Application as to whether or not the proposed injection will likely affect current or potential future beneficial uses of water. If, for example, there is an aquifer that is currently being used, or could be used for beneficial purposes in the area where there may be a hydrologic connection to the injection zone, and the injection could have an impact on this or other beneficial uses, the State will not pursue an aquifer exemption. Demonstration of a lack of hydrologic connection is critical to pursue an aquifer exemption.

If data suggests that the aquifer does not currently serve as a source of drinking water, one of the following must also be proven:

B) The aquifer cannot now, and will not in the future, serve as a source of drinking water because:

1) **The aquifer is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.**

Supporting documentation for the State's application must include such data as: production data and/or maps generated using geophysical logs and other pertinent data to indicate the vertical and lateral extent of the oil/water contact of historic and/or current hydrocarbon production. If the proposed area to be exempted is to extend the area beyond the current hydrocarbon production limits, the supporting documentation must include definitive vertical and lateral extent data of potential future hydrocarbon production. Therefore, the supporting documentation must indicate not only the areal extent of the proposed exemption, but also must show a clear delineation of the depth/thickness of the proposed exempted area/aquifer.

Or

2) **The aquifer is situated at a depth or location that makes recovery of water for drinking water purposes economically or technologically impractical.**

Data must be provided in the State's application that clearly indicates the depth of all impacted water that has the potential to be used for drinking water purposes. Based on current data, water supply wells are being drilled deeper and deeper because of the drought, any many water supply wells are being drilled below 4,000 feet. Because some water supply wells are being drilled increasingly deeper, supporting data must be current and accurate.

Or

3) **The aquifer is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption.**

The drought has forced people of the State to use water of lesser quality to meet their needs. Data provided to support the claim that the water is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption, must be current and accurate. Although the initial supporting data will be complied and evaluated by the Division, the State Water Board must concur with the final analysis and determination.

Or

C) The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 TDS and other water quality constituents render the water to be of a certain quality that it is not reasonably expected to supply a public water system.

The State will use data submitted by the aquifer exemption applicant to determine whether an aquifer exemption is justified. In cases where the State has limited data, the State may request additional supporting data from the applicant, or from operators that may be impacted by a proposed injection project. Please note that the supporting data should be clear and concise, while still providing the necessary empirical data. Past practices, including injection and/or approvals are not necessary in the supporting documentation and will not be considered. The data supporting the location and potential economic viability of production of hydrocarbons in the zone, or the quality and extent of water verifying that it is not fit for beneficial use, is of paramount importance.

During the process of evaluating the supporting documentation, the Division will confer with the State Water Resources Control Board, the Region Water Quality Control Board, and the operators as necessary, to ensure the supporting data is accurate, up-to-date, and complete.

Once the Division has prepared its analysis and reviewed the supporting documentation, all supporting documentation, the proposed application, and a draft

letter to the US EPA requesting an aquifer exemption will be forwarded to the State Water Board for concurrence. If necessary, the Division, the State Water Board, and the Regional Water Quality Control Board will meet and review the supporting documentation. Where appropriate, the operators affected by the proposed aquifer exemption may be included in meetings to clarify or to provide additional supporting documentation. If both the Division and the State Water Board are in agreement, and if appropriate, the State Water Board will provide a written concurrence to the application.

Water Board Evaluation of the Aquifer Exemption Application

The quality of all the waters of the State shall be protected for use and enjoyment by the people of the State (Water Code Section 13000); therefore, State Water Board staff will evaluate the information contained in the Aquifer Exemption Application as to whether or not the proposed injection will likely affect current or potential future beneficial uses of water. State Water Board staff will review the information in accordance with the following criteria:

1. Identification of underground sources of drinking water and exempted aquifers (Code of Federal Regulations, Title 40, Section 144.7).
2. US EPA Aquifer Exemption Checklist.
3. EPA Guidance for Reviewing Aquifer Exemption Requests.
4. A review and evaluation of current and potential future beneficial uses of water (e.g. domestic, municipal, irrigation, and industrial).

   This evaluation should include a survey of any and all water supply, injection, production, or monitoring wells that could have a hydrologic connection with the proposed exempted aquifer. This survey should include all active, inactive, idle, or plugged and abandoned wells within the study area.
5. A review of the pertinent Regional Water Quality Control Board's Water Quality Control Plan (Basin Plan) and any amendments thereto.
6. A review of the technical demonstration provided by the operator that the injectate will remain within the exempted portion of the aquifer.

   This technical demonstration must include a detailed site conceptual model with geologic maps and cross-sections that clearly describe the *injection zone*s and any confining layers within the study area. Technical information should clearly demonstrate that the injectate will not affect current or potential future beneficial uses of water.

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Definitions

"Beneficial uses" of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. (Water Code Section 13050 (f))

Confining bed means a body of relatively impermeable or distinctly less permeable material stratigraphically adjacent to an aquifer.

Injection zone or zones of injection means a geological formation, group of formations, or part of a formation receiving fluids through a well. This includes any saturated or unsaturated geologic strata that are hydrologically connected to the injection wells.

Study area is determined based on the location of current or potential future beneficial uses of water surrounding the proposed exempted aquifer boundary.

A. Study Area Maps

i. Contour maps of any confining beds used to demonstrate containment of the injectate within the proposed exempted area.

ii. An isopach map of the injection zone with anticipated direction(s) of injectate flow along the map boundary.

iii. Maps showing the locations of any and all water supply, injection, production, or monitoring wells that could have a hydrologic connection with the proposed exempted aquifer. This survey should include all active, inactive, idle, or plugged and abandoned wells within the study area, including any known faults and formation contacts.

The boundary of the study area should:

iv. Extend a minimum of ¼ mile beyond the proposed aquifer exemption boundary, if the operator can clearly demonstrate containment within the proposed exempted aquifer.

v. Extend up to 5 miles beyond the proposed aquifer exemption boundary, if the injectate may affect current or potential future beneficial uses of water.

B. Study Area Geologic Cross-Sections

Geologic cross-sections should be oriented in the down- and cross-gradient directions of groundwater flow. If no groundwater is present in the proposed exempted area, the geologic cross-sections should be oriented according to the

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strike and dip of the lower confining bed. The cross-sections should cover the entire study area and should include:

i. The proposed exempted area, including all permeable zones and confining beds.

ii. The locations of any and all water supply, injection, production, or monitoring wells that could have a hydrologic connection with the proposed exempted aquifer. This should include all active, inactive, idle, or plugged and abandoned wells.

iii. Formation/member names

iv. Geologic structures

v. The depth to groundwater in proposed aquifer exemption formation (potentiometric surface) and in the overlying unconfined zone(s), if present.

C. Additional Information

i. The thickness, effective porosity and permeability of the confining layers and the formation/member(s) located within the proposed aquifer exemption.

ii. Anticipated total volume of waste to be injected into the injection zone

iii. Anticipated total duration of the injection project.

Public Comment

Once the Division and the State Water Board have reached an agreement to forward an aquifer exemption application to the US EPA, the Division will proceed with providing the appropriate public notification and solicit comments on the proposed aquifer exemption. Upon conclusion of the public comment period, and once comments have been appropriately addressed, the Division will forward the application to US EPA – Region 9.

Interim Period

Within the next 24 months, no later than February 15, 2017, all injection into non-exempt USDWs will be addressed, and beyond that date no injection will be permitted into a non-exempt USDW. Injection into non-hydrocarbon aquifers with a total dissolved

solids of less than 3,000 TDS must be addressed and an aquifer exemption approved by October 15, 2015.

The Interim Process

For each UIC well application, the review of supporting documentation and the approval process will be based on each UIC well permit's ability to demonstrate how it individually meets the requirements established for aquifer exemptions, with clear recognition that a well-defined zone within an aquifer might meet the requirements for exemption but the remaining portion of the aquifer might require protection. A showing that the aquifer likely meets the criteria for exemption will be necessary, but not always sufficient.

Treatment of individual UIC well applications will depend on the nature of the project and characteristics of the target zone:

1) Water disposal wells into sub-3,000 TDS. **These well applications will be permitted only if an aquifer exemption is in place.** This will be the case whether or not there is a project approval letter on file with the Division.

Any existing water disposal wells into a non-hydrocarbon producing aquifer with a water quality of less than 3,000 TDS will be required to cease injection by October 15, 2015, unless an aquifer exemption is approved. Aquifer exemptions for this class of aquifer requires approval after public comment periods from US EPA headquarters in Washington DC. One attribute that will be necessary is a demonstration that the zone is or has strong potential to be hydrocarbon producing within the zone of interest, and the water chemistry is such that no beneficial use can be contemplated (e.g., it contains excessive boron or arsenic). Otherwise, owing to the quality of the water, the State Water Resources Control Board will not allow an aquifer exemption to proceed.

2) Water disposal wells into 3,000-10,000 TDS aquifers. **These UIC well applications will be permitted only if an aquifer exemption is in place.**

3) Enhanced oil recovery into hydrocarbon-bearing, sub-3,000 TDS aquifers. Where a non-exempt aquifer is hydrocarbon producing, new wells that are part of a previously approved project may be permitted if groundwater in the vicinity of the hydrocarbon-bearing zone does not currently have any beneficial use. Such approvals will include the express condition that the permit expires on February 15, 2017, unless US EPA approves an aquifer exemption before then.

4) Enhanced oil recovery into 3,000-10,000 TDS aquifers. Where a non-exempt aquifer is hydrocarbon producing, new wells that are part of a previously approved project may be permitted if groundwater in the vicinity of the hydrocarbon-bearing zone does not currently have any beneficial use. Such approvals will include the express condition

that the permit expires on February 15, 2017, unless US EPA approves an aquifer exemption before then.

The 11 Aquifers Historically Treated as Exempt

With respect to the 11 aquifers historically treated as exempt, the State Water Board and the Division will work with US EPA to evaluate these 11 aquifers. If any portion of these aquifers meets the criteria for exemption and the State Water Board determines that injection into the aquifers will not adversely affect existing or potential beneficial uses of groundwater, the Division will prepare and submit an exemption application to US EPA. The evaluation, application, and subsequent decision for these 11 aquifers will be completed by February 15, 2017.

11 aquifers historically treated as exempt

- The **Pico** formation within the boundaries of the **South Tapo Canyon** field;
- The **Tumey** formation within the boundaries of the **Blackwell's Corner** field;
- The **Kern River** formation within the boundaries of the **Kern Bluff** field;
- The **Santa Margarita** formation within the boundaries of the **Kern Front** field;
- The **Chanac** formation within the boundaries of the **Kern River** field;
- The **Santa Margarita** formation within the boundaries of the **Kern River** field;
- The **Walker** formation within the boundaries of the **Mount Poso** field;
- The **Olcese** formation within the boundaries of the **Round Mountain** field;
- The **Walker** formation within the boundaries of the **Round Mountain** field;
- **All aquifers** within the **Bunker Gas** field that are not in a hydrocarbon producing zone and that have groundwater that has less than 10,000 TDS; and
- **All aquifers** within the **Wild Goose** field that are not in a hydrocarbon producing zone and that have groundwater that has less than 10,000 TDS.

In Summary

The Division, the State Water Board, and US EPA are working closely together to address potential impacts to water of beneficial use and to work collaboratively with stakeholders to meet the State's natural resource needs.

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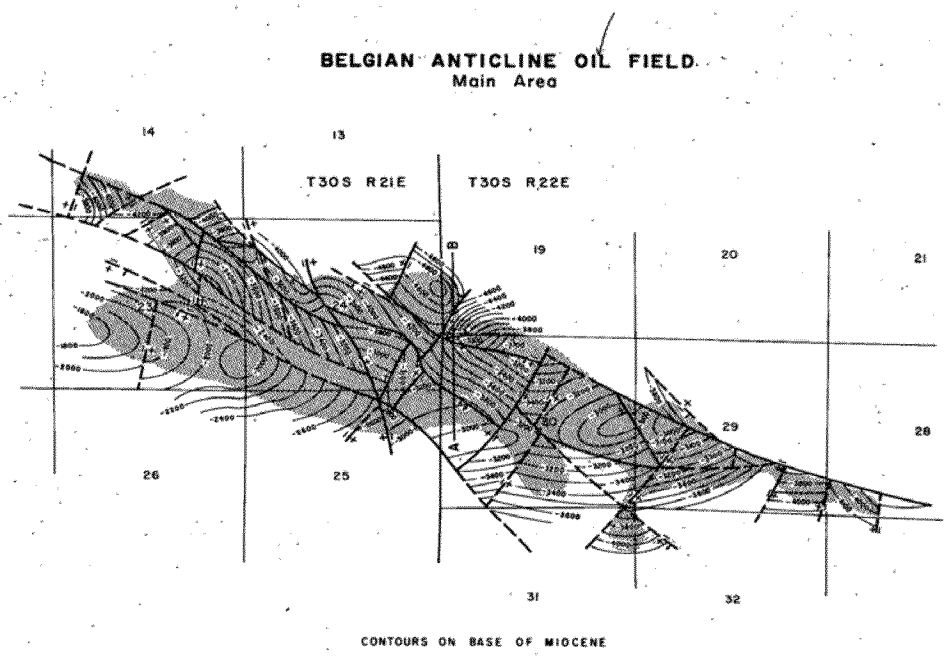
Exhibit A – Part 1



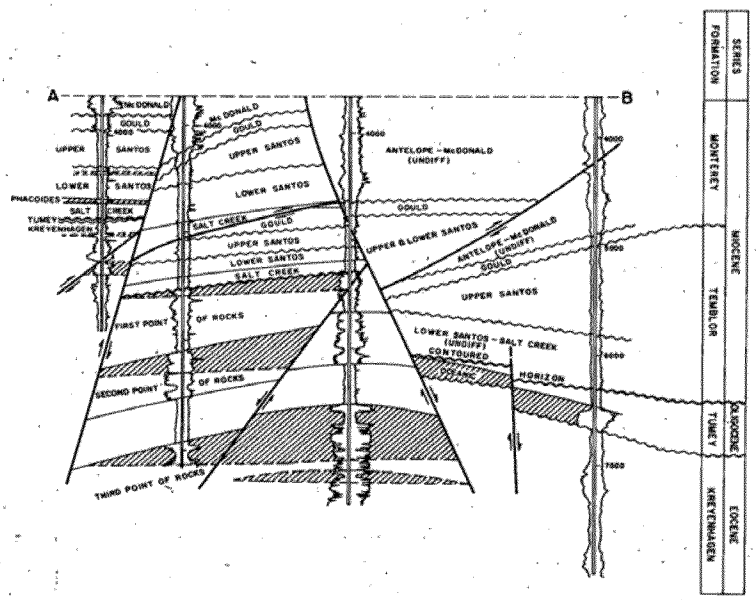


Exhibit A – Part 2

CALIFORNIA DIVISION OF OIL AND GAS

BELGIAN ANTICLINE OIL FIELD

MAIN AREA

Kern County

LOCATION: See index map of Belgian Anticline Oil Field

TYPE OF TRAP: Anticline with complex faulting

ELEVATION: 1,400 - 1,800

DISCOVERY DATA

Zone	Present operator and well name	Original operator and well name	Sec. T. & R.	B & M	Initial daily production Oil (bbl)	Initial daily production Gas (Mcf)	Date of completion
Phacoides	Texaco Inc. "Westpet Unit One" 26-29	The Texas Co. "Westpet Unit One" 26-29	29 30S 22E	MD	214	130	Sep 1947
Oceanic	Texaco Inc. "Westpet NCT One" 77-29	The Texas Co. "Westpet" 1	29 30S 22E	MD	140	2,230	Oct 1946
Point of Rocks	Texaco Inc. "Tulare NCT One" 28-28	The Texas Co. "Tulare NCT One" 28-28	28 30S 22E	MD	38	480	May 1947

Remarks:

DEEPEST WELL DATA

Present operator and well name	Original operator and well name	Date started	Sec. T. & R.	B & M	Depth (feet)	At total depth: Strata	At total depth: Age
Getty Oil Co. "Midway-McKittrick A" 22-30	Pacific Western Oil Corp. "Midway-McKittrick A" 22-30	Feb 1953	30 30S 22E	MD	10,867	Canoas	late Eo

PRODUCING ZONES

Zone	Average depth (feet)	Average net thickness (feet)	Geologic: Age	Geologic: Formation	Oil gravity (°API) or Gas (btu)	Salinity of zone water gr/gal	Class BOPE required
Phacoides	4,600	15	early Miocene	Temblor	37	775	IV
Oceanic	5,300	0 - 150	Oligocene	Tumey	35	680	IV
First Point of Rocks	5,400	300	late Eocene	Kreyenhagen	34	100 - 1,050	IV
Second Point of Rocks	6,100	400	late Eocene	Kreyenhagen	60	100 - 1,050	IV
Third Point of Rocks	6,700	300	late Eocene	Kreyenhagen	33	100 - 1,050	IV

PRODUCTION DATA (Jan. 1, 1973)

1972 Production: Oil (bbl)	1972 Production: Net gas (Mcf)	1972 Production: Water (bbl)	1972 Proved acreage	1972 Average number producing wells	Cumulative production: Oil (bbl)	Cumulative production: Gas (Mcf)	Peak oil production: Barrels	Peak oil production: Year	Total number of wells: Drilled	Total number of wells: Completed	Maximum proved acreage
422,100	1,449,259	506,879	1,020	70	26,487,395	106,734,721	3,336,160	1953	188	137	1,200

STIMULATION DATA (Jan. 1, 1973)

Type of project	Date started	Cumulative injection - Water, bbl; Gas, Mcf; Steam, bbl (water equivalent)	Maximum number of wells used for injection
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SPACING ACT: Applies

BASE OF FRESH WATER: Present only at extreme western end at about 1,200' in fractured shale.

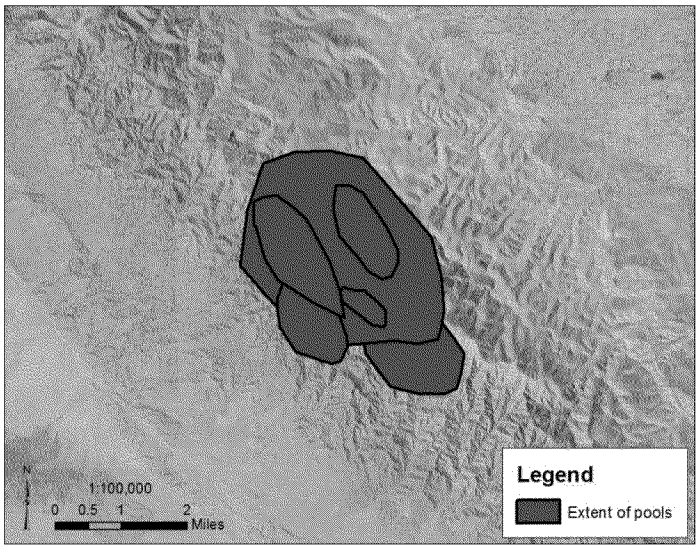
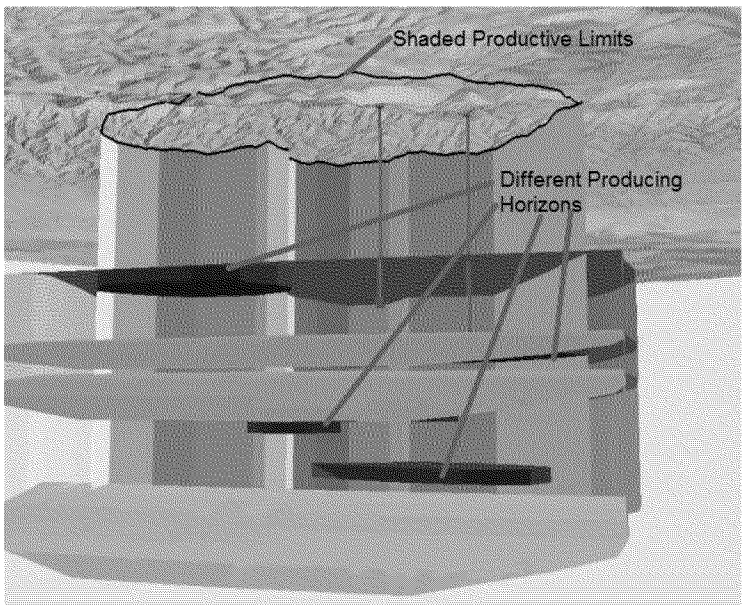
CURRENT CASING PROGRAM: 11 3/4" cem. 500; 7" or 5 1/2" cem. through zone and across base of fresh waters.

METHOD OF WASTE DISPOSAL: Unlined sumps.

REMARKS: A pilot water flood was started in 1965 and discontinued in 1967 after injecting 1,084,823 barrels of water into the Second Point of Rocks sand.

REFERENCES: Dunwoody, J.A., Belgian Anticline Oil Field, Southeast Portion: Pacific Sections AAPG-SEG-SEPM 1968 Guidebook, Geology and Oil Fields Westside Southern San Joaquin Valley, p. 80-81.
Hewitt, R.L., and C.W. Porter, Belgian Anticline Field: AAPG-SEPM-SEG Guidebook Joint Ann. Mtg., Los Angeles, 1952, p. 239-240.
Park, W.H., P.E. Land, and D.D. Bruce, Belgian Anticline Oil Field: Calif. Div. of Oil and Gas, Summary of Operations--Calif. Oil Fields, Vol. 43, No. 1 (1957).

Exhibit B



Side View