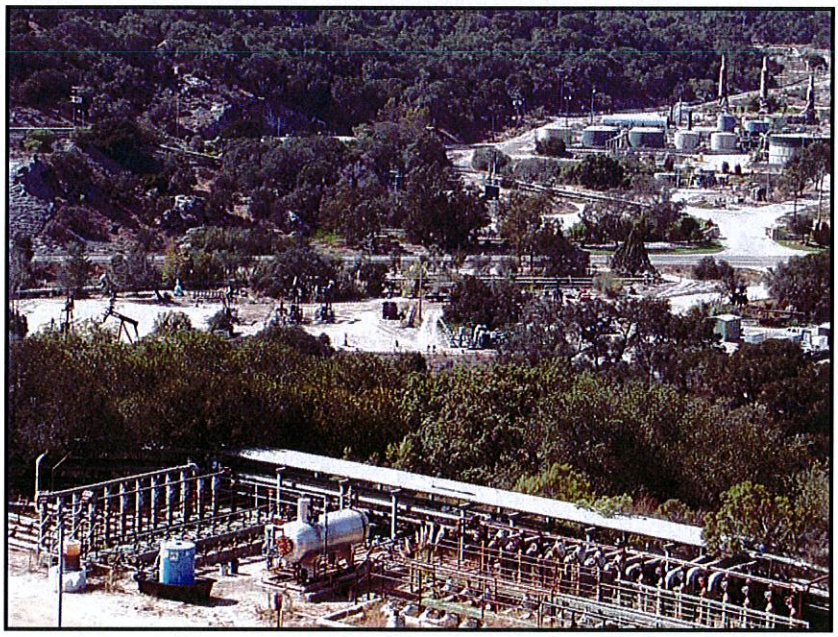
PLAINS EXPLORATION AND PRODUCTION
CONDITIONAL USE PERMIT D010386D
(PHASE IV DEVELOPMENT PLAN)

ADDENDUM TO FINAL ENVIRONMENTAL IMPACT REPORT



Prepared for:
County of San Luis Obispo
Department of Planning and Building

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JUNE 2005

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1.0 SUMMARY

On September 23, 2004, the County of San Luis Obispo Planning Commission approved the Final Environmental Impact Report (FEIR) for the proposed Plains Exploration and Production (PXP) Conditional Use Permit (D010386D) for the Phase IV Expansion. Subsequently, the County of San Luis Obispo received an appeal from Ms. Helen Hale appeal concerning:

- Potential groundwater contamination and resulting human health effects from use as drinking water.

Following the County of San Luis Obispo's receipt of the appeal, the County of San Luis Obispo Board of Supervisors received the following:

- A letter dated April 15, 2005 from Ms. Hale's attorney, which included additional letters from Mr. Timothy Cleath, a local hydrogeologist, and Charles Champion, an oil and gas production engineer;
- A letter dated April 6th, 2005 from Rachel Kovesdi of King Ventures, which included two additional letters from Mr. Cleath; and,

In response to these letters, PXP submitted the following letters to the County of San Luis Obispo:

- Letter dated May 17, 2005 from Hollister & Brace to Mr. Steve McMasters of the County of San Luis Obispo;
- Letters dated May 4, 2005 and May 12, 2005 from Mr. Dan Tormey of Entrix to Mr. Steve Rusch of PXP; and,
- Letter dated May 13, 2005 from Mr. John Pierson of MRS.

During review of the letters listed above, County staff met with representatives of DOGGR to discuss PXP's Arroyo Grande Oil Field operations and DOGGR's jurisdiction of the proposed project. Subsequently, DOGGR submitted the following:

- A letter to County Staff dated May 25, 2005 from California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR).

These letters raise a number of issues:

- Potential impacts to groundwater and surface water from increased steam injection operations;
- Potential impacts to the water rights of other property owners and users in the area of the Project;
- Comments on the nature of some of the proposed mitigation measures and conditions for the Project;
- Identification of an existing discrepancy in the Project Description regarding the potential use of fresh water for steam injection "makeup" water and lack of discussion of the quantity of makeup water that may be used as part of the Project;
- PXP's water disposal capability in the project area; and,

- DOGGR's primary responsibility for regulating underground injection projects of Environmental Protection Agency (EPA) Class II fluids in California.

1.1 Statutory Background

Under the California Environmental Quality Act (CEQA), an Addendum to a certified EIR or Negative Declaration is needed if minor technical changes or modifications to a proposed project occur (CEQA Guidelines § 15164). An addendum is appropriate only if these minor technical changes or modifications do not result in any new significant impacts or a substantial increase in the severity of previously identified significant impacts. The Addendum need not be circulated for public review (CEQA Guidelines § 15164[c]); however, an addendum is to be considered along with the full text of the Final EIR by the decision making body prior to making a decision on the project (CEQA Guidelines § 15164[d]).

None of the circumstances that require a Subsequent or Supplemental EIR, such as new significant impacts or significant impacts of a substantially more sever nature, are present. Thus, an Addendum is the appropriate level of CEQA analysis ad the appropriate method of updating the analysis in the Final EIR.

1.2 Addendum Summary

Section 2.0 provides an overview of PXP's operations at the Arroyo Grande Oil Field, including a discussion of steam injection, oil production, and produced water management. It also includes a clarification that *no water pumped from existing water wells will be used to augment the water supplied to the generators ("make-up water")*. This is in direct contrast to Section 3.4.2.4 of the Final EIR, which states that "If necessary, water pumped from existing water wells can be used to augment the water supplied to the generators."

Section 3.0 discusses issues of hydrogeologic connectivity. PXP's Arroyo Grande Oil Field operation includes the production of heavy oil from the first permeable zone, which is known as the Dollie Sand Unit (production zone). Steam injection and oil production occurs within the Dollie Sand Unit/production zone at depths of approximately 300 to 1,300 feet below ground surface (Sande 2005, pers. comm.). The production zone is the zone of oil production, steam injection, and produced water disposal.

Based on the lateral distance between the well and the oil production activities and the vertical separation between oil production and groundwater production zones, it is unlikely that the oil production activities proposed by PXP will adversely impact the quality of groundwater produced at the domestic water well of concern (King Water Well) or other water supply wells. Nevertheless, PXP's oil production activities could possibly impact the quality of groundwater produced at the well in question. It is possible that oil field operations could affect groundwater in the field. This would depend on the geology and proximity of domestically-produced groundwater wells. The probability would be higher in areas where oil is naturally occurring at the surface (seeps), thereby indicating a close proximity or connection between the oil bearing layers and shallow aquifers. In this respect, there may be naturally occurring contamination of groundwater due to the same reasons.

Section 4.0 provides a groundwater monitoring program, which would be implemented by PXP through oversight by the County of San Luis Obispo[1]. A Sentry Groundwater Monitoring Well Program is proposed involving construction of three Sentry Wells with similar construction details as the well of concern, and monitoring and reporting on a semi-annual basis.

Section 5.0 summarizes the roles and responsibilities of the California State Water Resources Control Board (SWRCB)/California Regional Water Quality Control Board (RWQCB) and DOGGR regarding the construction and operations of oil fields in California. DOGGR is mandated by Division 3 of the Public Resources Code to supervise the drilling, operation, maintenance, and plugging and abandonment of oil, gas, and geothermal wells; and the operation, maintenance, and removal of tanks and facilities. In California, all Class II injection wells are regulated by DOGGR, under provisions of the state Public Resources Code and the federal Safe Drinking Water Act. The SWRCB and RWQCB are responsible for maintaining water quality in the State of California under the authority of the federal Clean Water Act, and the State Porter-Cologne Water Quality Control Act (PCWQCA). Pursuant to § 13260 of the California Water Code, persons discharging or proposing to discharge waste that could affect the quality of the waters of the State, such as California's surface, coastal, or groundwater, other than into a community sewer system, are required to file a Report of Waste Discharge (ROWD) and obtain Waste Discharge Requirements (WDRs). Copies of the monitoring reports for the monitoring program would be made available to DOGGR and the RWQCB.

Section 6.0 includes copies of the aforementioned comment letters and responses to these letters.

[1] Preparation and implementation of a groundwater monitoring program was included as a Mitigation Measure in the EIR.

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2.0 OIL FIELD OPERATIONS

2.1 Plains Exploration and Production Arroyo Grande Oil Field Production

PXP currently produces approximately 1,800-1,900 barrels of oil per day[2] (BOPD) from about 125 producing wells in the 320-acre Arroyo Grande Oil Field, whose boundary is defined by the DOGGR. The project area is shown in Figure 1. Many of the existing wells on the property are co-located with steam injection wells, which provide steam for enhanced oil recovery. Other existing production facilities include above-ground pipelines, six (6) steam generators (4 west of Price Canyon Road; 2 east of the road), "steam headers" (which distribute steam to the steam injection wells), a dehydration facility for the entire field, and a gas plant.

The dehydration and gas plants are located on the west side of Price Canyon Road. The dehydration plant has several associated facilities, including heater treaters, oil storage tanks, vapor recovery compression, water softening equipment, and sand filters. The gas plant processes about 1.5 million standard cubic feet per day (MMSCFD) of associated gas ("casing gas") that contains carbon dioxide and hydrogen sulfide, which is removed using a patented absorption process. The resulting waste steam is reinjected into designated injection wells. All hydrocarbon pipelines crossing underneath Price Canyon Road and Pismo Creek are contained within "conductor pipelines," which are intended to contain any oil releases that could occur from these pipelines. Figure 2 shows a fluid schematic diagram of the oil field.

2.2 Steam Injection

Steam injection (through either steamflooding or cyclic stimulation) is an enhanced oil recovery technique to lower the viscosity of heavy crude so it will flow. Steamflooding is carried out by injecting steam into a reservoir through injection wells (see Section 1.3) and producing the oil from nearby production wells. Steamflooding is designed to heat the entire formation between wells to produce larger volumes of oil than could be produced with cyclic injection. The injected water increases or maintains the reservoir pressure, pushing the oil through the reservoir to the producing wells in a manner similar to natural water drive. Figure 3 generally illustrates how the steamflooding process works. Once produced, the steam and oil are separated and the water is usually recycled to make additional steam.

Cyclic steam is used initially on the production wells to help establish or improve fluid communication between injection and production wells. After this initial heating, steamflooding is begun. Cyclic steaming is carried out by injecting a predetermined amount of steam into a producing well for a short period every few months. After injection, the well is shut in for a brief period to allow the steam to condense and the heat to penetrate the surrounding formation, thereby lowering the viscosity of the surrounding oil. When the steam-soak period is completed, the well is returned to production for a number of months.

2.3 PXP Steam Injection Process

The primary method of steam injection utilized at the Arroyo Grande Oil Field is steam flooding (with some associated cyclic steaming). Steam is injected into "injection" wells where it raises the temperature of the oil reservoir, decreases the oil viscosity, and floods or pushes the oil to "producing" wells which surround each injector. Periodically production wells are selected

[2] One barrel equals 42 gallons

to be cyclic steamed, wherein a relatively "small" volume (relative to injectors) is injected into the well and produced back to enhance its productivity.

The steam injection process at the oil field increases the temperature of the oil to reduce the characteristically high viscosity of approximately 3,500 centipoises (cp) at 90° F. At lower viscosity, the oil flows more easily. Steam is injected at pressures of 500 to 800 pounds per square inch gauge (psig). The oil and water is pumped to the surface from the well to the tank battery facility for separation. The reservoir temperature is approximately 90° F, and the corresponding viscosity is 3,500 cp.

The Arroyo Grande Oil Field currently includes 50 steam injection wells (injectors), and the proposed expansion of the oil field will include the addition of 30 more steam injectors. PXP's Arroyo Grande Oil Field operation includes the production of heavy oil from the first permeable zone capable of producing oil, which is known as the Dollie Sand Unit (production zone). Steam injection and oil production occurs within the Dollie Sand Unit/production zone at depths of approximately 300 to 1,300 feet below ground surface (Sande 2005, personal communication). The production zone is the zone of oil production, steam injection, and produced water disposal. Figure 4 presents in plan view, the approximate boundaries of the Phase IV Development Plan and the line of section C-D. Cross Section C-D is shown as a cross section in Figure 5.

2.4 Injection Wells

About 25,000 injection wells are used for waterflood, steamflood, cyclic steam, and water disposal in California (DOGGR 2005). These wells are referred to as Class II injection wells under the Underground Injection Control (UIC) program. Class II injection wells are used to safely dispose of the salt and fresh water produced with oil and gas, as well as to inject steam. Injection is often accomplished in a manner that will increase oil and gas production. Approximately 6 times more water than oil is produced from California's oil and gas fields (DOGGR 2005).

In about 90 percent of the Class II injection wells, water is injected into petroleum reservoirs to increase oil production. Approximately 60 percent of California's oil production is a result of Class II injection wells.

After a well is drilled, often to depths typically of over 5,000 feet throughout California, steel pipe called casing is cemented in the drill hole. The casing and cement prevent fluids in different zones from mixing with each other or with injected fluids. The casing and cement are perforated opposite the injection zone. To provide additional protection, tubing is placed in the well to a point just above the perforations and a packer is used near the bottom of the tubing to seal it against the casing. The packer prevents water from entering the space between the tubing and casing when water is injected down the tubing. Several tests witnessed and approved by DOGGR staff are completed to make sure the well is operating properly and the injected fluids are confined to the intended injection zone.

An injection zone is usually sandstone, a rock porous and permeable enough to accept injected fluids. Rock beds chosen for injection zones are confined by impermeable beds, like shale, which act as cap rocks, confining injected liquids in the porous beds.

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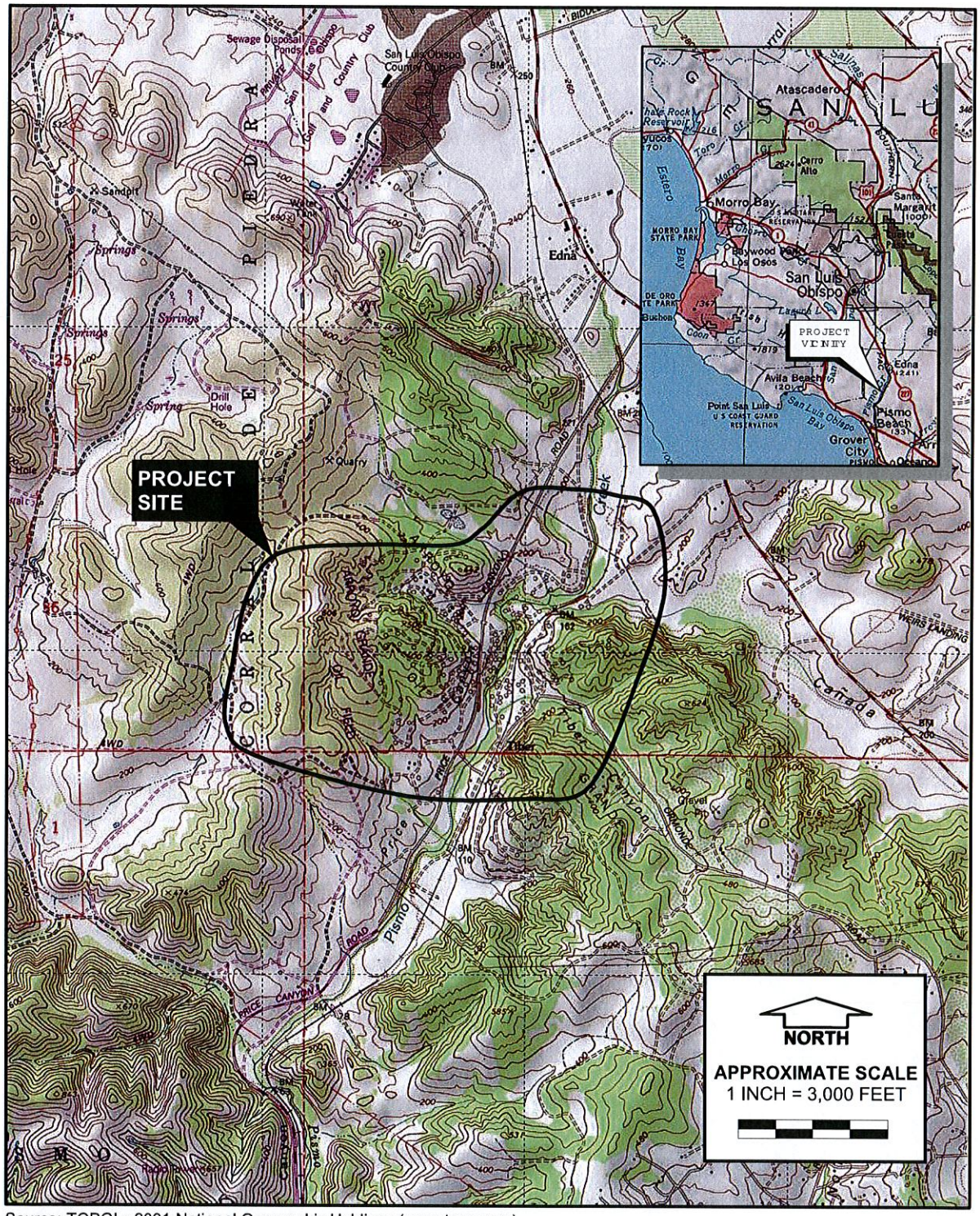

Source: TOPO! c 2001 National Geographic Holdings (www.topo.com)

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PROJECT SITE

FIGURE 1

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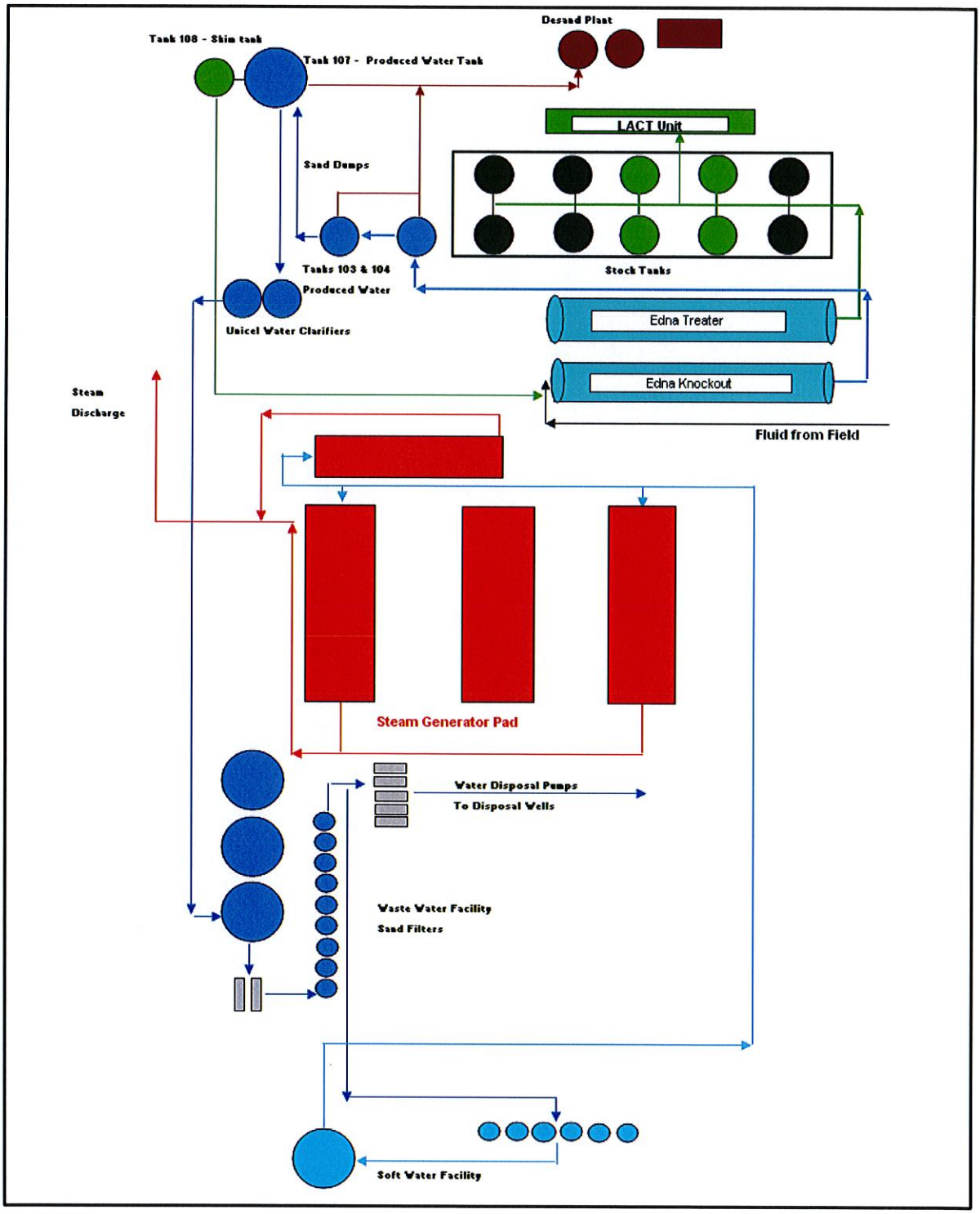

Source: PXP

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ARROYO GRANDE OIL FIELD FLUID SCHEMATIC

FIGURE 2

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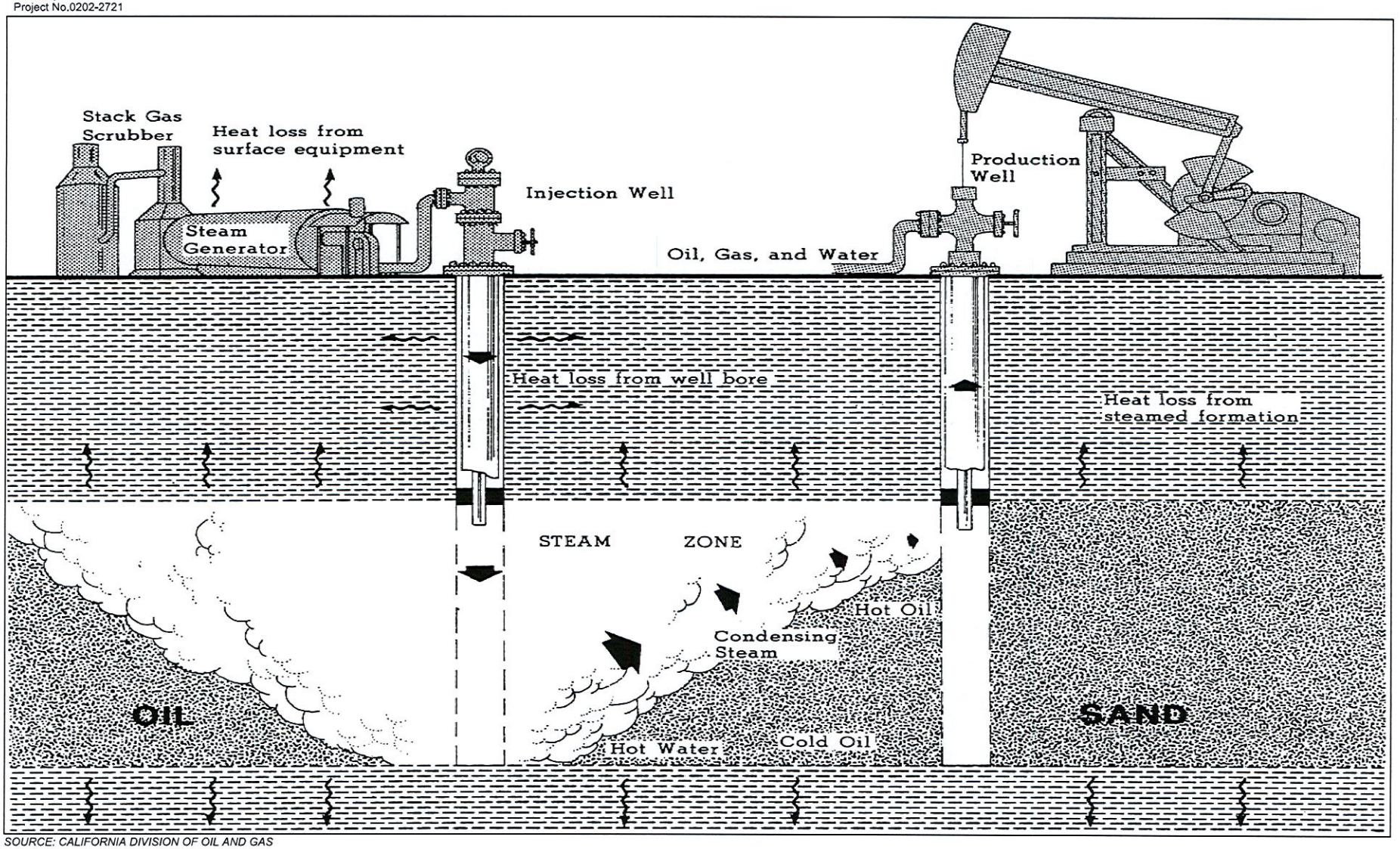

SOURCE: CALIFORNIA DIVISION OF OIL AND GAS

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MECHANISMS OF THE STEAMFLOOD PROCESS

FIGURE 3

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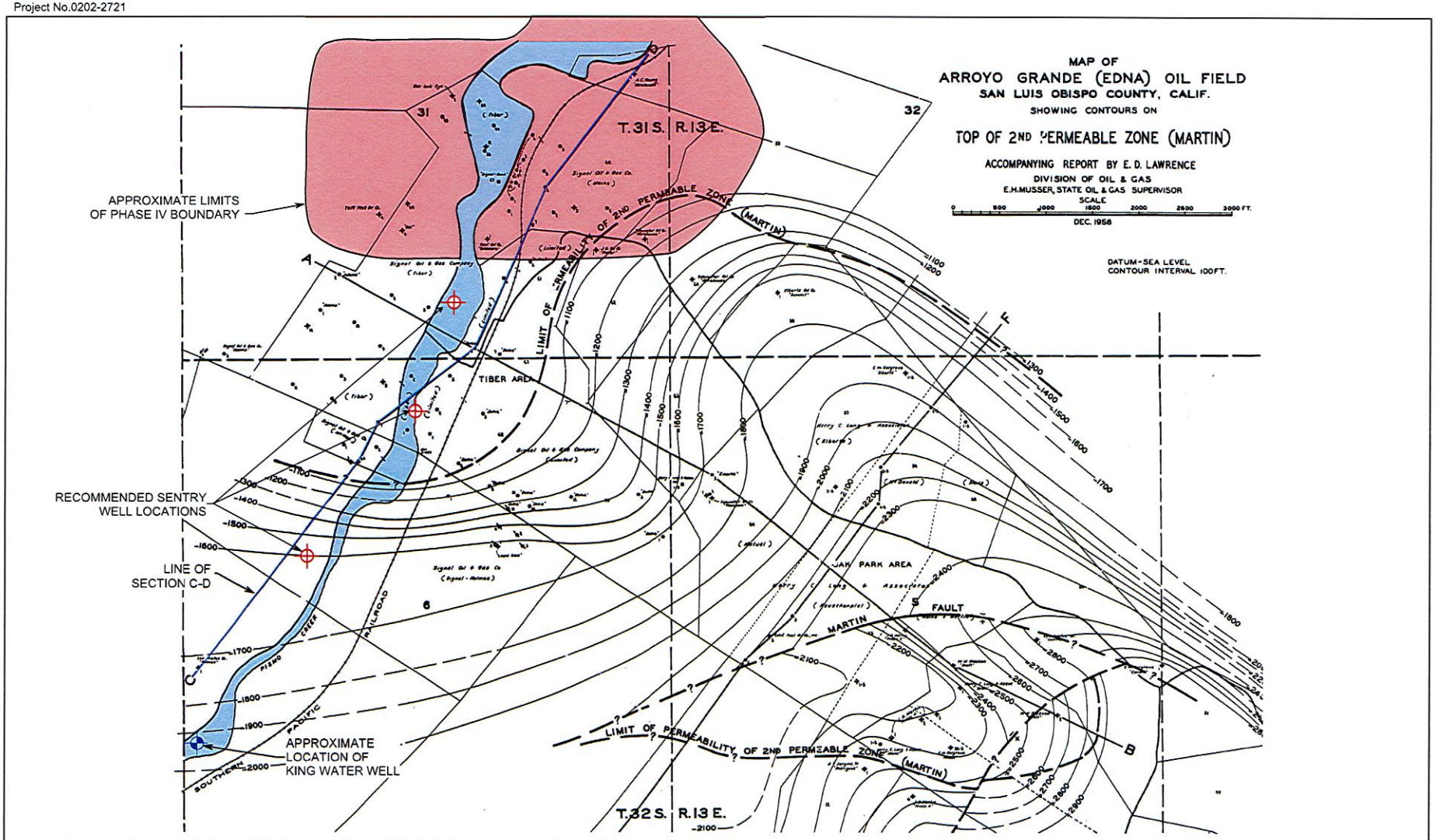

Source: Summary of Operations, California Oil Fields - Arroyo Grande Oil Field, California Department of Natural Resources, Division of Oil and Gas, 1958, Plains Exploration and Production, Inc.

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ARROYO GRANDE (EDNA) OIL FIELD
PXP DEVELOPMENT PHASE IV, SITE PLAN

FIGURE 4

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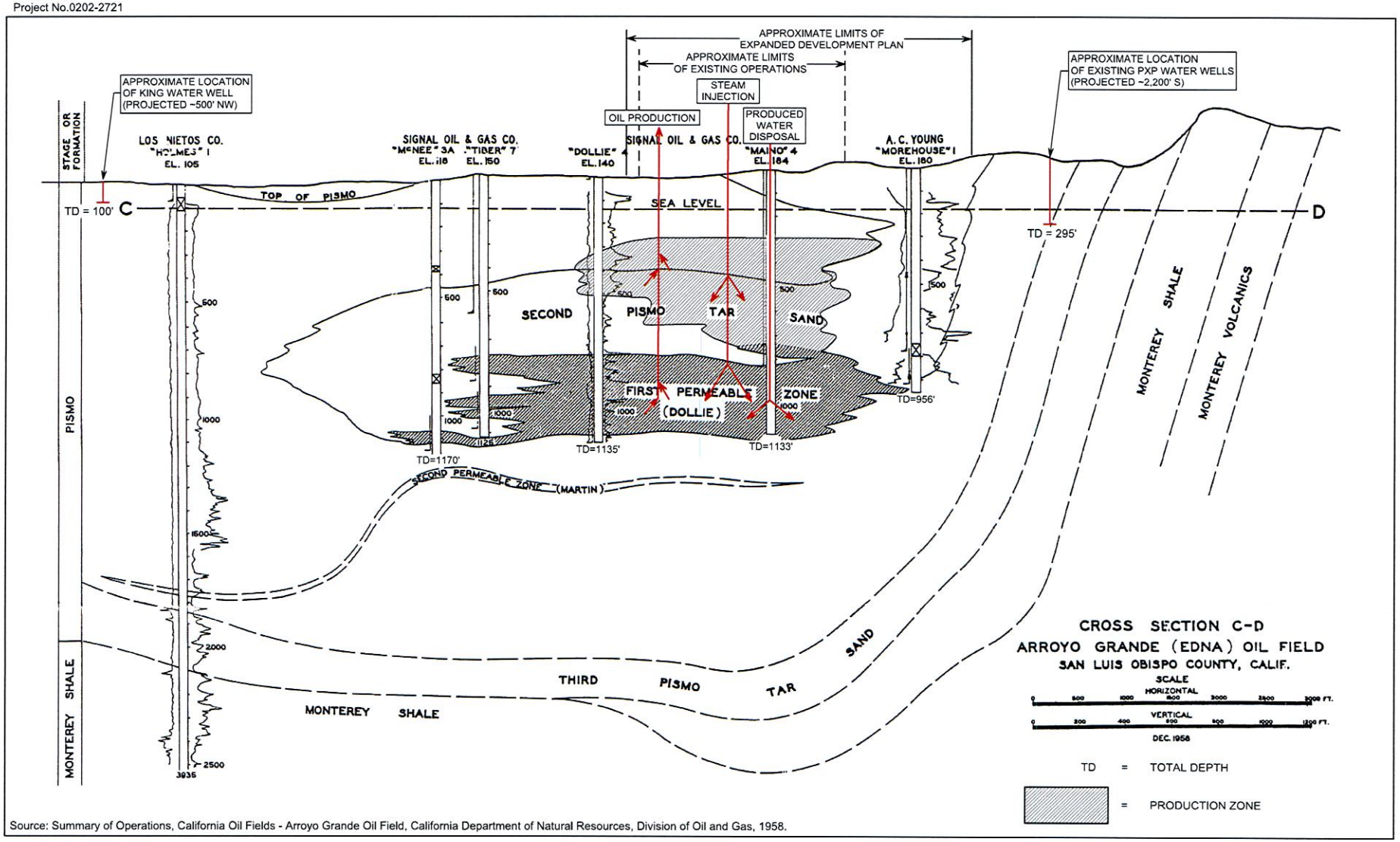

Source: Summary of Operations, California Oil Fields - Arroyo Grande Oil Field, California Department of Natural Resources, Division of Oil and Gas, 1958.

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CROSS-SECTION C-D
FIGURE 5

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Current state and federal regulations allow nonhazardous fluids produced from oil or gas wells and several other nonhazardous fluids associated with the production process to be injected into a Class II well. These other fluids include diatomaceous earth-filter backwash, thermally enhanced oil recovery cogeneration plant fluid, water-softener regeneration brine, air scrubber waste, drilling mud filtrate, naturally occurring radioactive materials (NORM), and tank bottoms.

2.5 PXP's Produced Water Management

Producing wells pump water (in emulsion with oil) at a ratio of approximately 8 barrels of water to 1 barrel of oil (water output to oil output). As such, the water recovered per barrel is actually a combination of the condensed steam pumped into the ground and water located naturally in the reservoir rock with the oil. This recovered water is called "produced water" and when separated from the oil, the produced water is used in the steam generators to produce steam for thermal injection or disposal via water injection wells.

PXP currently has adequate capacity to dispose produced water via water injection wells into the Arroyo Grande oil field as part of its existing operations. Furthermore, PXP will have sufficient capacity to dispose of the additional wastewater generated by the proposed project (DOGGR 2005).

2.5.1 Freshwater Use

In Section 3.4.2.4 of the Final EIR, it states that "if necessary, water pumped from existing water wells can be used to augment the water supplied to the generators." However, in Section 3.4.3.3 it states that "the three fresh groundwater wells currently provide water only for landscaping and plumbing; this practice would not change with the proposed project." To clarify, water historically has been pumped from the three existing water wells to augment the water supplied to the steam generators. However, PXP currently does not pump fresh water from the wells for this use and does not proposed to as part of the proposed project. No freshwater will be utilized to augment the water supplied to the steam generators ("make-up water").

The produced water and groundwater are required to undergo filtration and processing prior to use in the generators. The system includes a water holding tank, flotation cells, sand filters, and water softening units. Water entering the treatment system comes principally from the free water knockout vessels and the heater treaters; however, small volumes of water may enter from other process sources. The water first passes through the wash tanks and then enters a flotation cell where entrained oil is removed from the produced water. The oil is then returned to the tank battery system and then sent to storage. The water passes through a series of sand filter vessels to remove particulate matter. After the sand filtering, the water passes through a sodium zeolite water softening unit and then is pumped to the steam generators.

The produced water not used for steam generators is sent to the flotation cell and sand filters to remove entrained oil and then reinjected through waste water injection wells to approved subsurface disposal zones as per DOGGR requirements. This water is not suitable for irrigation or potable use. The subsurface disposal zones are located at the same depth of PXP's Arroyo Grande Dollie Sand steam injection and oil production zone (300 to 1,300 feet).

See Figure 5. Water pumped from groundwater wells is stored in a 30,000-barrel reservoir lined with a bentonic clay liner. This water is used for irrigation.

3.0 HYDROGEOLOGIC COMMUNICATION

3.1 Introduction

Groundwater hydrology, or hydrogeology, is the subdivision of the science of hydrology pertaining to the occurrence, movement, and quality of water beneath the surface of the Earth. Because groundwater hydrology deals with the occurrence and movement of water in an almost infinitely complex subsurface environment, it is, in its most advanced state, one of the most complex of the sciences. However, many of its basic principles and methods can be readily understood by non-hydrogeologists and used in the solution of groundwater problems.

Groundwater occurs in two different zones. One zone, which occurs immediately below the land surface in most areas, contains both water and air and is referred to as the unsaturated zone. The unsaturated zone is almost invariably underlain by a zone in which all interconnected openings or pore spaces are full of water, which is referred to as the saturated zone. Water within the saturated zone is the only groundwater that is available to supply water wells and/or springs. The lowest portion of the unsaturated zone is occupied by the capillary fringe, the subzone between the unsaturated and saturated zones. The capillary fringe results from the attraction between water and rocks.

From the standpoint of groundwater occurrence, most rock layers that underlie the Earth's surface can be classified either as aquifers or as confining units. An aquifer is a rock unit that will yield water in a usable quantity to a well or spring. A confining unit is a rock unit having very low hydraulic conductivity that restricts the movement of groundwater either into or out of adjacent water bearing units (aquifers).

Hydrogeologic communication is the communication, or mixing, of groundwater in two separate aquifers.

3.2 Hydrogeologic Study Area

The Arroyo Grande Oil Field is located within the Central Coastal Hydrogeologic Study Area (HSA), as defined by the State of California, Department of Water Resources (DWR) in Bulletin No. 118 titled *California's Ground Water*, dated September 1975, reprinted January 1994. The HSA comprises the coastal drainage basins between the western end of Ventura County on the south and the southern end of San Mateo County on the north. See Figure 6. Additionally, the Arroyo Grande Oil Field is defined by the California Regional Water Quality Control Board – Central Coast Region to be located within the Estero Bay Hydrologic Unit (RWQCB-CCR Water Quality Control Plan, September 1994), which includes the coastal drainage basins located within San Luis Obispo County.

The Arroyo Grande Oil Field is specifically located within the Pismo Creek Valley Groundwater Basin. This basin is defined by DWR as a 10-square mile coastal basin drained by Pismo Creek, including portions of the Edna Valley. Refer to Figure 7. The groundwater-bearing unit of the Pismo Creek Valley Groundwater Basin is defined by DWR as younger alluvium deposits from depths of the surface to approximately 110 feet. According to the referenced DWR document titled *California's Ground Water*, well yields within the Pismo Creek Valley Groundwater Basin average approximately 350 gallons per minute, with maximum yields of approximately 500 gallons per minute, and the groundwater production zones within the Pismo Creek Valley Groundwater Basin extend from depths of approximately 10 to 110 feet below ground surface. The water quality for the Pismo Creek Valley Groundwater Basin is

characterized by DWR as having elevated total dissolved solids (TDS), chloride, nitrate, and sulfate concentrations.

3.2.1 Local Geology

As mapped by Hall (1973), the surface outcrops within the region are composed of hard sandstones, pebbly sands and conglomerates of the Edna Member and the brown clays and silts of the Meguiliuto Member of the Pismo formation. Refer to Figure 8. The depositional environment is described as an inner neritic (shallow marine) shelf (Stanley, K.O. am Surdam, R.C., 1984). This interpretation is based on mega and trace fossils and sedimentary structures.

The local structure is formed by a northwest-southwest trending syncline that is paralleled to the north by a related anticline. Refer to Map 2, Map 3, and Cross Sections A-A and B-B of Appendix A. As shown in Cross Section A-A of Appendix A, the oil-bearing sands of the Edna Member dip below the alluvial valley to the southwest of the project area.

3.3 Hydrogeologic Communication

3.3.1 Fresh Water Aquifer

According to information provided by Pacific Geotechnical Associates, Inc. (PGA), the fresh water aquifer that could potentially be impacted by operations in the Arroyo Grande Oil Field is limited to a narrow veneer of alluvium located along Pismo Creek. Refer to Map 3 of Appendix A. PGA states that wells drilled outside of the alluvial fill encounter marine rocks from the surface, and because of the natural salinity of the marine sediments, there is little chance of encountering fresh water aquifers. PGA's analysis of the SP log in oil well "Titan" 68, which is just outside of the alluvial fill, indicates TDS values of 3,000 ppm from the shallowest readings, which are about 60 feet below the surface. Refer to Log Illustration 1 and Appendix 2 of Appendix A. Water wells located within the alluvial valley are located along Price Canyon Road. Refer to Map 3 of Appendix A. Elevated levels of TDS in the aquifer may be due to contact with naturally saline marine sediments.

3.3.2 King Water Well

The King Water Well (KWW) is a domestic water well located within the alluvial valley constructed to service a single family residence located approximately 6,500 feet from the southern boundary of the PXP Phase IV Development Area (refer to Figure 4). Although a well construction log for KWW has not been made available to Padre, based on information provided to PXP from Farm Supply, Inc. the total depth of the KWW is 100 feet, and produces from alluvial deposits. Additionally, Padre has assumed that the well produces between 20 to 100 gallons per minute, and that the groundwater production zone of the KWW is the alluvial aquifer underlying Pismo Creek. Therefore, Padre assumes that the KWW is producing groundwater from a zone potentially extending from depths of 10 to 100 feet below ground surface.

3.3.3 PXP's Zone of Production, Steam Injection, and Produced Water Disposal

Based on information provided to Padre by PXP and DOGGR, it is our understanding that PXP's oil production activities are targeted and conducted within the Dollie Sand Unit, which is characterized by DOGGR as the first permeable zone that will produce oil (refer to Figure 5). The Dollie Sand Unit that is subject to PXP's Phase IV Development Plan is located at depths of approximately 300 to 1,300 feet, and is overlain by the Second Pismo Tar Sand (refer to Figure 5).

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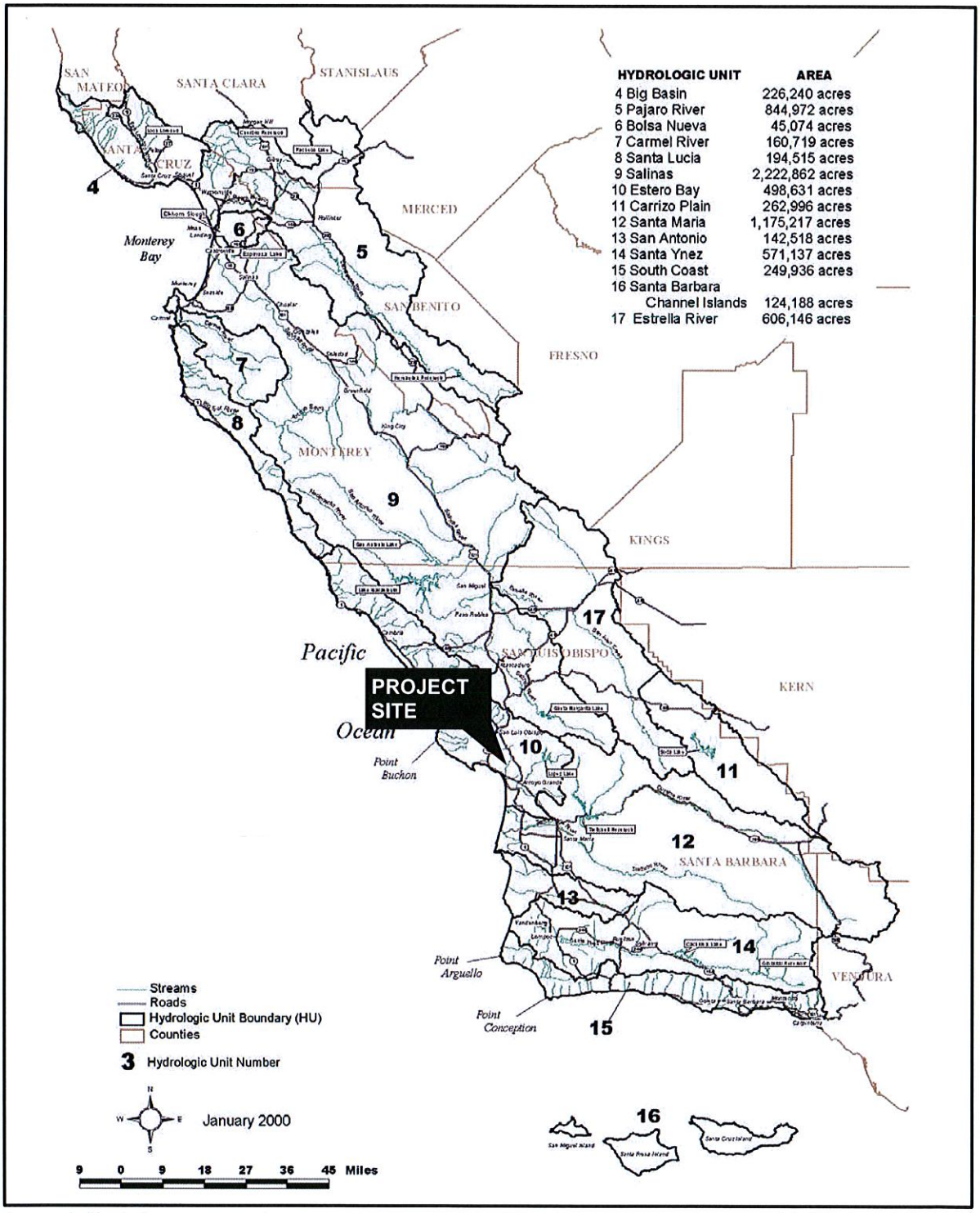

Source: California Regional Water Quality Control Board

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CENTRAL COAST HYDROLOGIC BASIN PLANNING AREA

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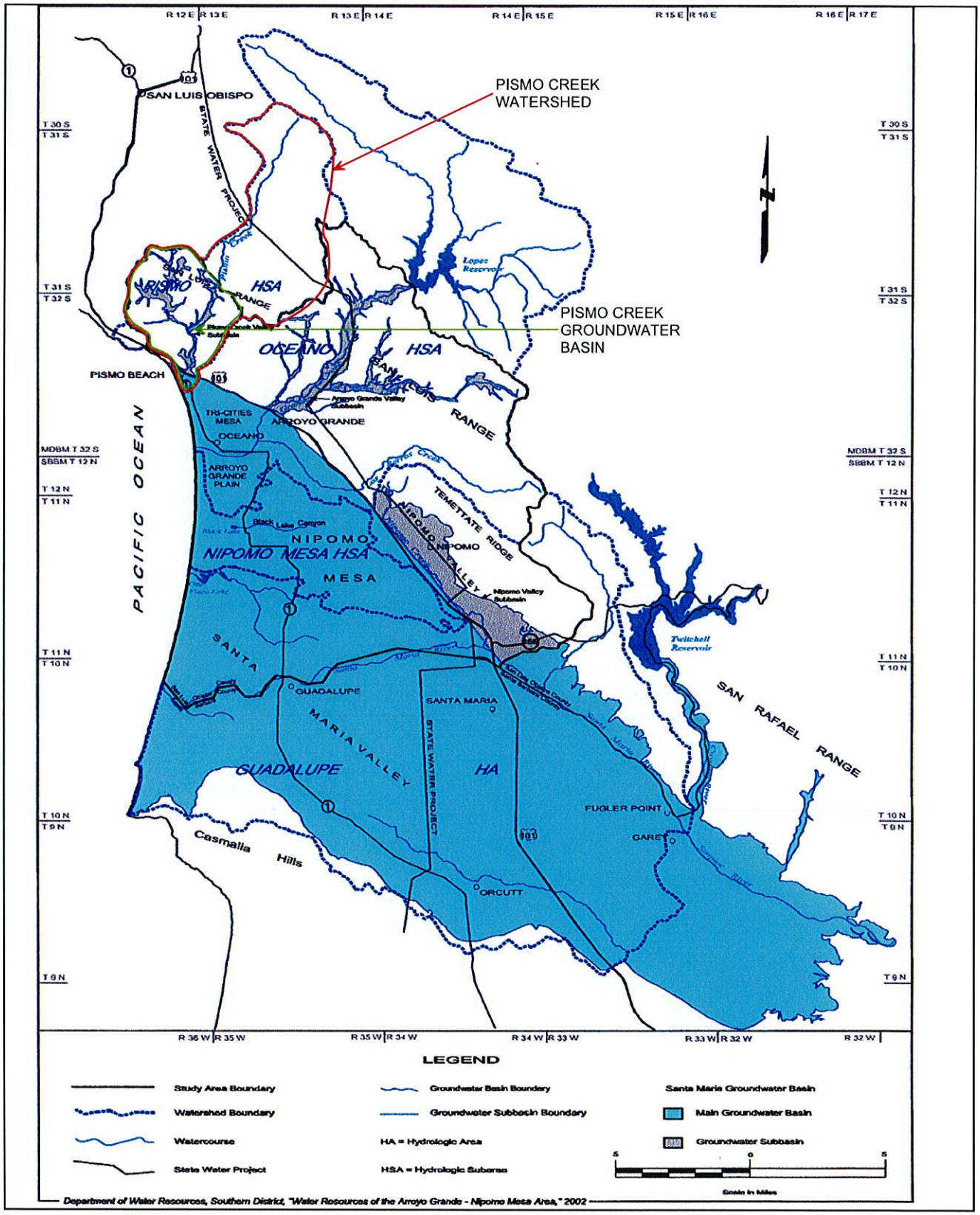

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PISMO CREEK VALLEY GROUNDWATER BASIN

FIGURE 7

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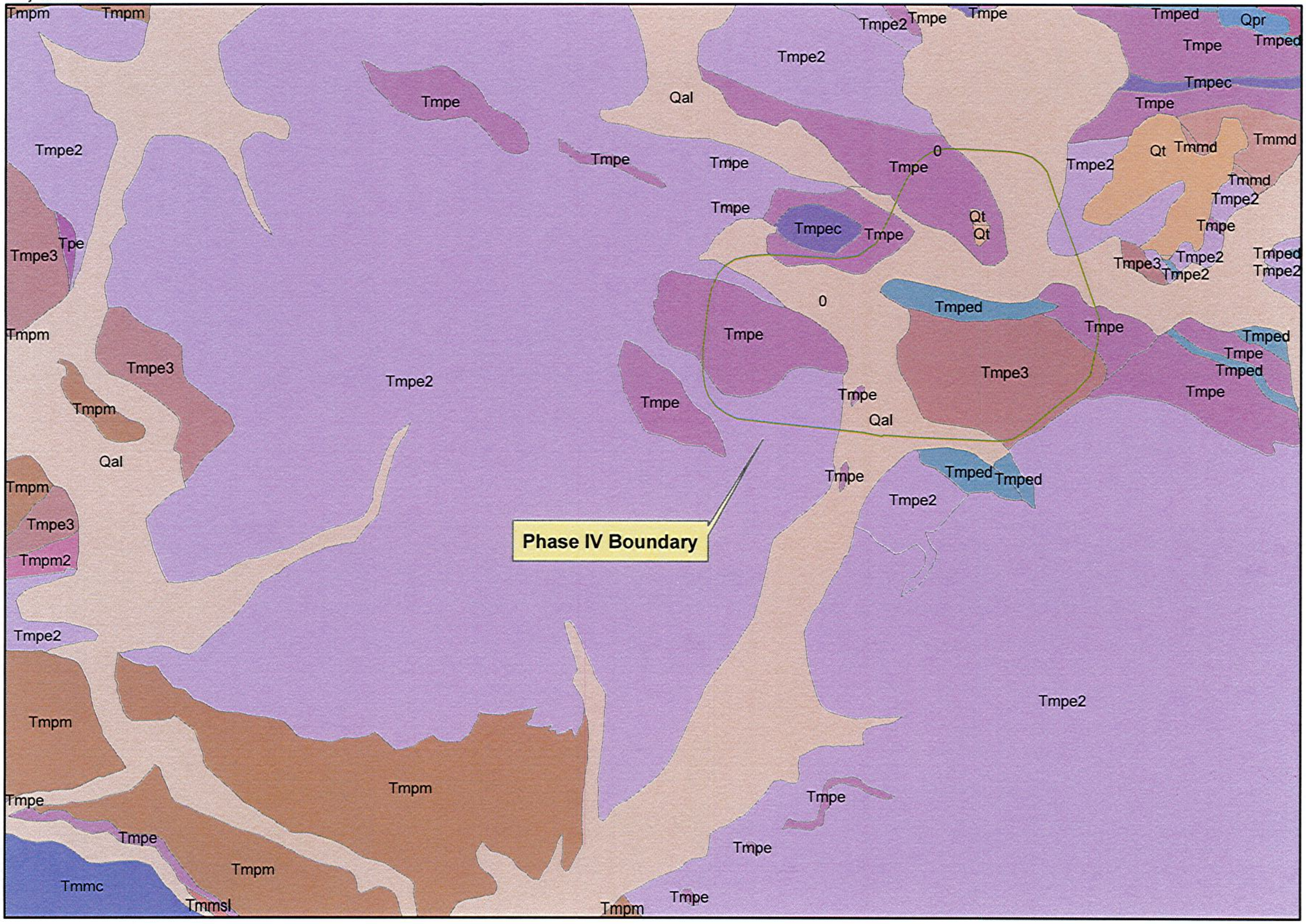

Source: County of San Luis Obispo

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SOILS

FIGURE 8

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However, due to the lateral discontinuity of the upper portion of the Dollie Sand Unit, PXP reports that oil production, steam injection, and produced water injection activities planned at the closest point to the KWW will occur within the deeper Dollie Sand Unit at depths of not less than 800 feet (see Figure 4).

3.3.4 Local Stratigraphy

A review of the available stratigraphic data for the Arroyo Grande Oil Field indicates that the alluvial deposits in which the KWW and other water wells located within the alluvial valley is underlain by a thick sequence of low permeability material to depths of approximately 500 feet. The electric log for the Los Nietos Company "Holmes" Well No. 1, located approximately 800 feet north of the KWW, indicates the presence of a member of the Pismo Formation comprised of low permeability earth materials (clays and silts), which extends from depths of approximately 200 to 500 feet.

The presence of this thick sequence of low permeability earth materials generally creates a vertical discontinuity between the KWW production zone (alluvial deposits) as well as other water wells, and the zone of PXP's oil production activities (Dollie Sand Unit) at a depth of approximately 800 feet. Additionally, it is important to note that based on the stratigraphic data available from both PXP and DOGGR, both the upper and lower portions of the Dollie Sand Unit pinch out, and are not laterally continuous in the subsurface in the area of the KWW and other water wells. As stated above, PXP's zone of seam injection and oil production occurs within the Dollie Sand Unit/production zone at depths of approximately 300 to 1,300 feet below ground surface due to the lateral discontinuity of the zone of the upper portion of the Dollie Sand Unit. Therefore, PXP's production/injection activities at the closest point to the KWW and other wells will occur within the deeper Dollie Sand Unit at depths of not less than 800 feet. See Figure 5.

The upper portion of the Dollie Sand Unit pinches out near the southern boundary of PXP's Phase IV Development Plan, generally at the location of "Dollie" Well No. 4. The lower portion of the Dollie Sand Unit pinches out approximately 2,500 feet south of the southern boundary of PXP's Phase IV Development Plan, generally at the locations of Signal Oil & Gas Company "McNee" Well No. 3A and Signal Oil & Gas Company "Tiber" Well No. 7. Therefore, PXP's targeted zone of oil production activities does not extend to the area of the KWW and water supply wells, and reportedly pinches out more than 3,000 feet north of the KWW.

The oil-bearing rocks of the Pismo Formation are projected to be seven to eight hundred feet below the ground surface in the area of the other water wells in Section 6. According to PGA, driller's logs and cores of wells in the northern half of Section 6 describe many tens to hundreds of feet of shale, silt and shell (low permeable rock) above the oil-bearing sands. PGA contends that any naturally migrating oil within the area would migrate through the sands toward the top of the structure to the north on Section 31. PGA contends that it is unlikely that oil would migrate vertically from the oil-bearing rock to the aquifer near the surface. However, PGA notes that cap rock near the top of the structure has been breached at shallow depths as shown by the natural surface oil seeps in Section 31. Therefore, it is possible that oil from these natural seeps *could enter the stream and find their way into the aquifer.*

Conclusion. Based on the following, PXP's oil production activity would not likely affect the quality of groundwater produced at the KWW or other shallow groundwater supply wells:

- The KWW and other wells are most likely producing groundwater from a zone potentially extending from depths of 10 to 100 feet;
- Oil production, steam injection, and produced water injection activities planned at the closest point to the KWW and other wells will occur within the deeper Dollie Sand Unit at depths of not less than 800 feet;
- The alluvial deposits in which the KWW and other water wells are constructed and produce from is underlain by a thick sequence of low permeability material to depths of approximately 500 feet;
- The presence of this thick sequence of low permeability earth materials generally creates a vertical discontinuity between the KWW and other water wells production zone (alluvial deposits) at depths of 100 feet or less and the zone of PXP's oil production activities (Dollie Sand Unit) at a depth of approximately 800 feet;
- The KWW and other water wells are located greater than one mile south of the southern boundary of the PXP Phase IV Development Plan area;
- Targeted production zone of the KWW and other water wells and PXP's targeted production/injection zone are separated vertically by a minimum of approximately 700 feet; and,
- PXP's targeted zone of oil production activities does not extend to the area of the KWW and other water wells, and is documented to pinch out laterally more than 3,000 feet north of the KWW and other water wells.

As depicted on Figures 4 and 5, the KWW (closest water wells) is located greater than one mile south of the southern boundary of the PXP Phase IV Development Plan area, and the targeted production / injection zones of the KWW and other water wells and PXP's oil production activities are separated vertically by a minimum of approximately 700 feet. Based on the lateral distance between the KWW and other water wells and PXP's oil production activities, as well as the vertical separation between the targeted, separate production zones, it is unlikely that the oil production activities proposed by PXP will adversely impact the quality of the groundwater contained within the alluvial aquifer that is produced at the KWW and other water wells.

Padre believes that PXP's oil production activities are not likely to affect the quality of groundwater produced at the KWW and other water wells. However, due to the complexity of hydrogeology, Padre recommends that a Sentry Groundwater Monitoring Well be constructed as an added assurance measure at a location between the KWW and the southern boundary of the PXP Phase IV Development Plan. Two additional Sentry Wells should be located between the aforementioned Sentry Well and the western and eastern boundaries of the project site as well. The recommended locations of the Sentry Wells are presented on Figures 4 and 9. The Sentry Wells should be constructed with similar construction details as the KWW and other wells (i.e. similar perforated zone, total depth), and should be incorporated into a groundwater monitoring program. Padre recommends that the Sentry Wells be monitored as part of the required groundwater monitoring program on a semi-annual basis for the presence of total petroleum hydrocarbons (TPH), carbon chain breakdown, as well as for the presence of Title 22 metals, total dissolved solids (TDS), pH, temperature, and conductivity.

4.0 GROUNDWATER MONITORING AND REPORTING PROGRAM

As an added protection measure, a Sentry Groundwater Monitoring Well Program will be incorporated into a groundwater monitoring program for the proposed project. This monitoring and reporting program will evaluate constituents in the groundwater aquifer associated with the Pismo Creek alluvial valley.

4.1 Sentry Well Program

Three Sentry Wells will be constructed with similar construction details as the KWW (i.e. similar perforated zone, total depth). The three Sentry Wells would be located at different locations along the Pismo Creek basin to monitor direction of flow. These locations would be on either PXP's property or adjacent properties with the property owner's consent. The recommend locations of the Sentry Wells are presented on Figures 4 and 9. The furthest Sentry Well from the project area would be approximately 2,200 feet northwest from the KWW. These wells would be constructed according to California Well Standards. The advantage of three Sentry Wells is that it would afford flexibility in the monitoring program, such that certain one or more of the wells could be monitored on a more frequent or less frequent basis based on the test results.

4.2 Groundwater Sample Collection

Groundwater samples will be collected from each well on semi-annual basis. Prior to collection of the groundwater sample, groundwater elevations will be measured with an electronic water level indicator. The Sentry Wells will be purged of a minimum of three casing volumes and until water quality parameters (i.e., temperature, pH, TPH) stabilize, or until the well is pumped dry. Following purging procedures and once the Sentry Well has recharged to a minimum of 80% of their pre-sampling elevation, the groundwater samples will be collected using a disposable bailer, and transferred into the appropriate sample containers, sealed, labeled, and preserved in the field. Chain-of-custody forms will be utilized to document sample management procedures and protocols.

All purging and sampling equipment will be decontaminated prior to use. The equipment will be cleaned with a detergent wash followed by tap water and de-ionized water rinses.

4.3 Laboratory Analytical Program

The samples will be chemically analyzed for the presence of total petroleum hydrocarbons (TPH), carbon chain breakdown, Title 22 Metals, total dissolved solids (TDS), pH, temperature, and conductivity. The analytical program will be completed by a State of California Department of Health Services-certified laboratory.

4.4 Groundwater Screening and Analysis

The results of the Sentry Well Program testing will be summarized and incorporated into a table and compared to previous sampling events (when completed) and applicable regulatory groundwater quality standards, including State of California Maximum Contaminant Limits (MCL) as shown in Table 1.

4.5 Comparison of Current Results with Previous Results

To evaluate variability in groundwater quality with respect to time and season, time series plots will be generated for the analytes detected during the program. Statistical tests

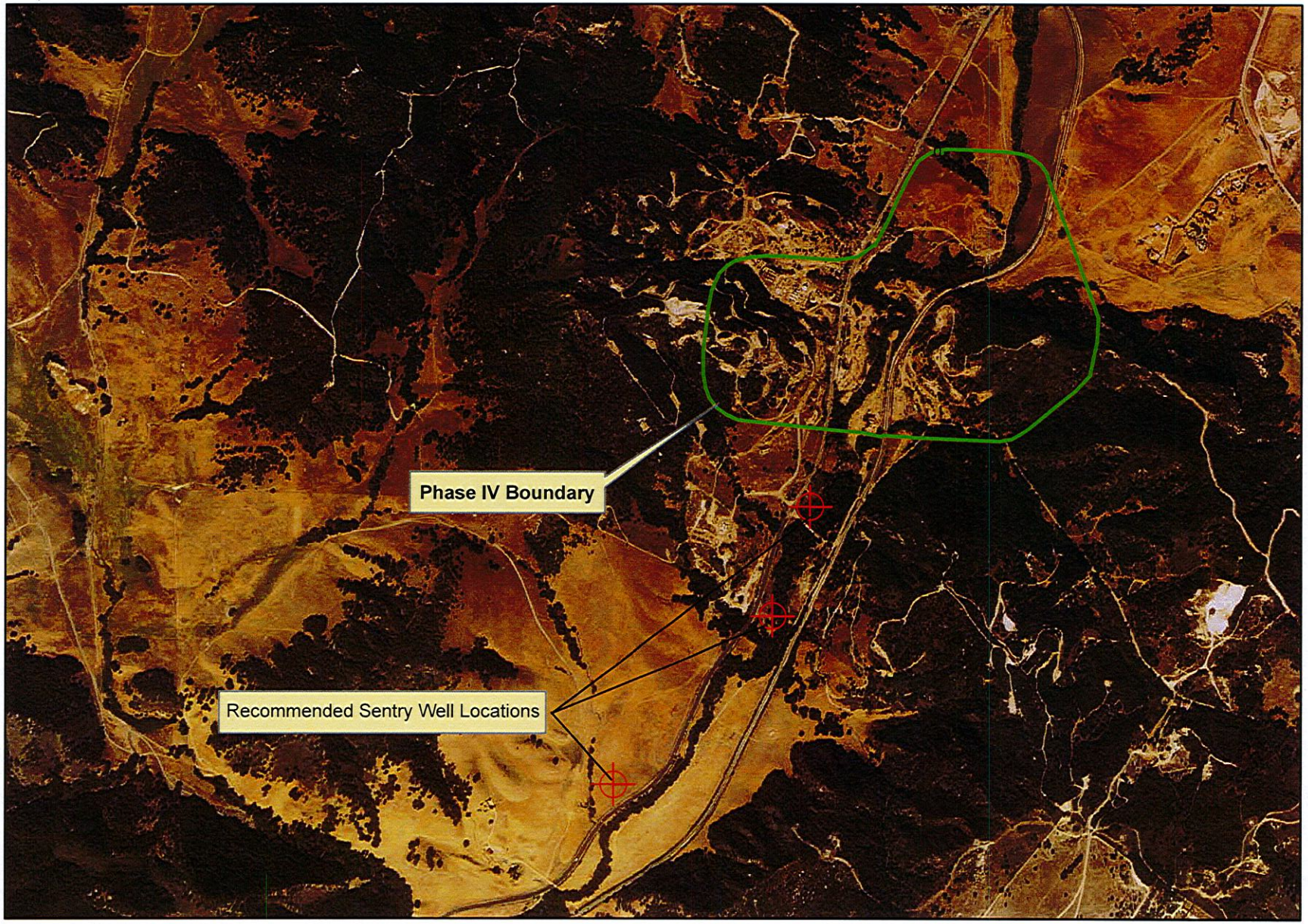
(one or two-tailed T-Test with 95% confidence interval) will be performed to evaluate statistically significant trends in the most recent data present with respect to time or season. Time series plots will also be evaluated for seasonality and "outliers" (defined as data that appears to be incongruent with respect to historical results). A statistical analysis will be performed for all detected constituents that are observed at concentrations above the MCLs or other standards.

Table 1. Sentry Well Testing Results

Test Parameter (mg/L)		Summer 2005	Winter 2006	Summer 2006	MCLs (mg/L)
TPH					1*
Title 22 Metals	Antimony				0.006
	Arsenic				0.05
	Barium				1.0
	Beryllium				0.004
	Cadmium				0.005
	Chromium				0.05
	Copper				1.0
	Lead				0.015
	Mercury				0.002
	Nickel				0.1
	Silver				0.1
	Thallium				0.002
	Zinc				5.0
TDS					500-1000
pH					6.5-8.5
Temperature					
Conductivity					0.90-1.6

*Taste and Order Threshold

June 2005
Project No. 0202-2721



Source: County of San Luis Obispo

padre associates, inc.
ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

RECOMMENDED SENTRY WELL LOCATIONS

FIGURE 9

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4.6 Reporting

Within 30 days of collecting the sample, testing results and evaluation will be submitted to the County of San Luis Obispo Planning and Building Department. The County will make copies of the semi-annual monitoring reports available to other agencies, including the RWQCB and DOGGR. If no detected constituents are observed at concentrations above the U.S. EPA's MCLs or other standards, and no statistically significant trends in the data are present with respect to time or season, then the monitoring and reporting program will continue with no additional action. However, if detected constituents are observed at concentrations above the MCLs or other standards, and/or there are statistically significant trends in the data, then the following will occur:

- The County of San Luis Obispo Planning and Building Department will coordinate with DOGGR, RWQCB, and County Environmental Health to implement a more intensive testing/analysis. Based on these results, operations at the oilfield could be modified.

Because DOGGR has primary authority over the construction and operation of Class II wells, DOGGR may initiate review of the monitoring program at its own discretion, and undertake additional analyses or enforcement actions pursuant to its regulatory authority.

4.7 Program Duration

The Sentry Well Groundwater Monitoring and Reporting Program will continue throughout the operational life of the Arroyo Grande Oil Field.

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5.0 AGENCY JURISDICTION

5.1 The Division of Oil, Gas, and Geothermal Resources (DOGGR)

The California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) is mandated by Division 3 of the Public Resources Code to supervise the drilling, operation, maintenance, and plugging and abandonment of oil, gas, and geothermal wells; and the operation, maintenance, and removal of tanks and facilities, including certain pipelines located in oil and gas fields to:

- Prevent, as far as possible, damage to life, health, property, and natural resources;
- Prevent damage and waste of underground oil, gas, and geothermal deposits;
- Prevent loss of oil, gas, and geothermal reservoir energy;
- Prevent damage to underground and surface waters suitable for irrigation or domestic use;
- Prevent other surface environmental damage, including subsidence;
- Prevent conditions that may be hazardous to life; and,
- Encourage the wise development of oil, gas, and geothermal resources through good conservation and engineering practices.

DOGGR has had requirements concerning oil and gas well drilling since its inception in 1915 (Public Resources Code 1985). Over the years, these requirements have been supplemented and refined to ensure not only protection for the oil and gas zones, but for the freshwater aquifers.

In California, all Class II injection wells are regulated by DOGGR, under provisions of the state Public Resources Code and the federal Safe Drinking Water Act. Class II injection wells fall under the Division's Underground Injection Control (UIC) program, which is monitored and audited by the U.S. Environmental Protection Agency (U.S. EPA). In 1983, the Division received U.S. EPA primary authority, *primacy*, to regulate Class II wells. The main features of the UIC program include permitting, inspection, enforcement, mechanical integrity testing, plugging and abandonment oversight, data management, and public outreach.

All proposed subsurface injection projects must undergo a comprehensive review by DOGGR. The review includes, in part, a study of the geologic conditions, the quality and compatibility of the formation fluid with the injected fluid, and the mechanical condition of all wells within the area affected by the project. A project may be rejected if any possibility exists for the injected fluid to migrate from the permitted zone.

Every project must be reviewed annually. The operator must demonstrate, through the use of tracer, spinner, and temperature surveys, that injection is confined to the intended zone and that mechanical integrity for the well has been maintained. Field inspections performed by DOGGR personnel are conducted to check for surface leakage and abnormal conditions, such as excessive injection pressures that could cause adverse subsurface fractures.

When any oil field-related well is drilled, conditions must be met to protect not only the productive oil zone, but also all overlying Underground Sources of Drinking Water (USDW). Such protection usually consists of a solid string of metal well casing cemented across and above oil and gas zones and freshwater-saltwater interfaces. The cement seal acts as a replacement for any natural barrier that was removed during the well drilling process. Also,

plugging the open well bore with cement and drilling mud prevents fluid movement in the open spaces.

DOGGR regulations require that cement be placed in all casing/well-bore annuli to at least 500 feet above producing intervals and injection zones. The freshwater-saltwater interface must be covered with at least 100 lineal feet of cement. Any well not meeting these requirements must be modified to meet them.

In all injection wells, DOGGR requires annual mechanical integrity tests to ensure the injected fluid is confined to the permitted zone. If mechanical integrity does not exist, or fluid migration it another zone is detected, DOGGR will order an operator to cease injection until the problem is corrected. To reduce the change of lateral and vertical migration, every proposed injection project is reviewed by DOGGR engineers. They review the well histories and cementing records of all wells within the proposed project area at least ¼-mile away from proposed injector(s). If the review reveals that a well is not adequately cemented, the proposal is either denied or remedial action is required before DOGGR approval is issued.

Additionally, DOGGR has an on-going program that requires operators to demonstrate casing integrity on all idle injection and production wells. The program enables DOGGR to locate deteriorating wells and order their repair or abandonment before harmful consequences occur. Under DOGGR's Underground Injection Control Program, the unused but potentially-usable deep aquifers receive the same scrutiny and consideration as the shallow aquifers.

5.2 State Water Resources Control Board (SWRCB) and Regional Water Quality Control Board (RWQCB)

The SWRCB and RWQCB have responsibility for maintaining water quality in the State of California under the authority of the federal Clean Water Act, and the State Porter-Cologne Water Quality Control Act (PCWQCA). The Boards exercise this authority through regulations contained in Title 23 and 27 of the California Code of Regulations (CCR). SWRCB provides statewide policy direction and administrative functions, while the nine RWQCBs have principal authority for permitting and enforcing requirements to control any discharge to surface waters, groundwater, or wetlands. The RWQCBs also direct, oversee, inspect, and enforce tasks associated with the assessment, remedial monitoring, and closure of sites with discharges that have impacted or could impact the waters of the State.

Under the PCWQCA, each RWQCB may impose more stringent requirements on discharges of waste than any statewide requirements as needed to protect water quality based on identified beneficial uses.

Water quality goals and cleanup levels at a site are determined by a variety of site-specific factors. As a broad goal, the SWRCB and RWQCBs attempt to restore all contaminated sites to background levels according to State Board's Resolution No. 68-16 "State of Policy With Respect to Maintaining High Quality Waters in California (often referred to as the State's Antidegradation Policy"). Resolution 68-16 states that "whenever the existing quality of water is better than the quality established in policies...such existing high quality will be maintained." The Resolution further states that degradation will only be allowed if it is in the best interest of the State, and will not impair present and future beneficial uses. SWRCB Resolution 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code § 13304" empowers the RWQCBs to pursue the "complete

cleanup of waste discharged and restoration of affected water to background conditions (i.e., the water quality that existed before the discharge)".

Federal and State water quality criteria and standards designed to protect human health and welfare, agricultural use, and aesthetics have been established in a wide range of references. Of all water quality criteria, only the United States Environmental Protection Agency's (U.S. EPA) and California Environmental Protection Agency's (Cal/EPA) primary Maximum Contaminant Levels (MCLs) set mandatory water quality criteria for drinking water. RWQCBs have established MCLs as minimum cleanup standards. However, MCLs have not been developed for all chemical constituents. In such cases, the following water quality goals generally are used:

- California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)
- Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) Public Health Goals (PHGs)
- U.S. EPA Suggested No Adverse Response Level (SNARL)

5.2.1 Injection Wells/Waste Discharge Requirements

Pursuant to § 13260 of the California Water Code, persons discharging or proposing to discharge waste that could affect the quality of the waters of the State, such as California's surface, coastal, or groundwater, other than into a community sewer system, are required to file a Report of Waste Discharge (ROWD) to obtain Waste Discharge Requirements (WDRs).

Discharges of wastes (including spills, and leaks), where they may impact the waters of the State, are prohibited under the PCWQCA, including the discharge of hazardous wastes and petroleum products. The assessment and remediation of these wastes in San Luis Obispo County are regulated by the Central Coast RWQCB (RWQCB-CCR). The RWQCB-CCR regulates discharges of waste to land through the waste discharge requirement process, including oil wastes in sumps or pits. Also, the RWQCB-CCR regulates on-site treatment of petroleum contaminated soils, tank bottom materials, and abrasive grits under Title 27 of the California Code of Regulations.

Under § 13051 of the PCWQCA, "injection well" means any bored, drilled, or driven shaft, dug pit, or hole in the ground into which waste or fluid is discharged, and any associated subsurface appurtenances, and the depth of which is greater than the circumference of the shaft, pit, or hole. PXP's injection wells would be regulated by the RWQCB-CCR through Waste Discharge Requirements pursuant to the PCWQCA (Cal Water Code, Division 7) if the quality of the waters of the State (i.e., Pismo Creek) are affected by the use of PXP's injection wells. If regulated, the RWQCB-CCR could impose various WDRs, including specific conditions, such as effluent limitations, and general monitoring and reporting requirements. Monitoring and reporting would need to be consistent with 40 CFR Parts 136 and 141 - Guidelines Establishing Test Procedures for Analysis of Pollutants and National Primary Drinking Water Regulations.

5.2.2 Industrial Storm Water General Permit

PXP may need to obtain an Industrial Storm Water General Permit issued by the SWRCB (Permit Order 97-03-DWQ) for the Phase IV Development Plan. To comply with the general permit, PXP would be required to prepare and implement a Storm Water Pollution prevention Plan (SWPPP). The SWPPP is required to include the following elements: 1)

identify the potential sources of storm water pollution at the Project Site; 2) identify, select, and implement BMPs to reduce the potential for storm water pollution; 3) train employees in storm water pollution prevention BMPs; and 4) regularly monitor the effectiveness of the selected BMPs through plan evaluation and annual storm water quality testing.

5.3 Agency Reporting

As stated previously, the County will make copies of the semi-annual monitoring reports available to the RWQCB and DOGGR.

6.0 RESPONSE TO COMMENTS

The County received comments from the following individuals listed below following approval of the Final EIR on September 23, 2004 by the San Luis Obispo Planning Commission. Copies of the letters with individual numbered comments are included along with responses to these comments following each letter.

1. Ms. Helen Hale
2. Mr. John J. Harris of Richards, Watson, Gershon, which contained reports and letters from:
    a. Mr. Timothy S. Cleath of Cleath & Associates;
    b. Mr. Charles A. Champion, P.E., of Tower Petroleum Corporation;
    c. Ms. Rachel Kovesdi of King Ventures;
3. Mr. William E. Brannon, DOGGR
4. Mr. Steven Evans Kirby of Hollister & Brace
5. Mr. Dan Tormey of Entrix via Mr. Steve Rusch of PXP.
6. Mr. John Pierson of MRS via Mr. Steve Rusch of PXP.

Letter dated April 15, 200 from Richards, Watson, Gershon, Attorneys at Law	
Comment #	**Response**
1	a) The EIR (with addendum) adequately assess and discusses the potential impact the proposed expanded steam injection operations may have on both groundwater and surface water. Section 5.7.2 discusses impacts to both groundwater and surface water. To minimize impacts to surface waters, including Pismo Creek, Mitigation Measure GEO-2 is included requiring PXP to prepare a Sediment and Erosion Control Plan (SECP), a grading plan, and complying with the requirements under a general stormwater construction permit, which may be required by the RWQCB for the project. Mitigation Measure GEO-3 requires PXP to remove petroleum products from wastewater generated in the oil recovery process prior to reinjection. It also requires monitoring of the water quality of the shallow aquifer zone beneath and downgradient from the site. b) No impacts to water users in the area of the Project were identified. PXP conducted groundwater sample collection and chemical analyses at the Project Site in June 2004. Groundwater samples were collected from two water supply wells located within the Project Site and operated by PXP. The groundwater samples were taken to Oilfield Environmental and Compliance, Inc., a state-certified analytical laboratory, for testing for the following parameters: • pH values; • Electrical conductivity; • Total dissolved solids (TDS); • Heavy metals; and, • Total petroleum hydrocarbons (TPH). A review of the analytical results shows that there has been no significant increase in metals or TDS concentrations. TPH was not indicated above reporting limits in samples collected from the two wells. Electrical conductivity and pH values have increased slightly in each well but do not exceed state drinking water standards, known as Maximum Contaminant Levels (MCLs). Comparison of this data with historical data does not indicate a significant impact to groundwater from steam or wastewater injection activities at the oilfield. Furthermore, the testing for TPH performed on the King Water Well (KWW) on November 17th reported less-than-detectable concentrations of TPH.
2	All of the proposed mitigation measures for the Project are mandatory, except for: Mitigation GEO-2 (C). The proposed Project may not be subject to the requirements under a general storm water construction permit. Currently oil and gas construction activities are only required to obtain a stormwater construction permit if the total area of disturbance is more than 5 acres. Although the Project will involve a total area of disturbance greater than 7 acres, as described in Section 3.5.1 of the Final EIR, construction would begin upon approval by the County and would occur periodically for 36 or more months. At no single time would 5 or more acres by disturbed. Therefore, PXP may not need to prepare a Stormwater Pollution Prevention Plan (SWPPP) and may not need to obtain a stormwater construction permit.
3	The Project does not include discharges to surface waters and has been conditioned to prevent discharges to surface waters. The Project will involve steam injection and reinjection of produced water into the oil production zone. Based on previous analytical testing of wells and the 2004 testing, there is no evidence that the project will affect State waters. Therefore, the Project does not require Waste Discharge Requirements. The RWQCB is designated as a responsible agency for this project and will ensure that appropriate permits under its jurisdiction have been obtained by PXP prior to initiation of project activities.
4	The findings in support of the approval of the CUP and the certification of the EIR are clearly supported by evidence in the record. All potential impacts have been clearly identified and all feasible mitigation measures have been prescribed.
5	Fresh water has not been used for steam generation since PXP has operated the field. Page 3-19 is accurate (Grace Petroleum used fresh water for make-up). Currently the 3 wells are used for landscaping and plumbing only, but they have been used in the past for irrigation and generator "make-up" water. As clarified in this addendum to the Final EIR, PXP will not utilize any fresh water for steam injection purposes.
6	See response to comment #5.

7	The water supply requirements of SB 610 (Water Code § 10910, et seq.) do not apply to this project.
8	See response to comment #5.
9	As discussed in the addendum, the location of the aquifer within the Arroyo Grande Oil Field is confined to an alluvial valley. The water wells are located within the alluvial valley south of the project site, a minimum distance of 6,000 feet. There is no evidence that either injected steam or the oil and associated water in the oil bearing formation has, upon being re-pressurized, to migrate through either formation factures or along the annulus of a well into fresh water aquifers. Altough there has been no evidence of this occurring; a Sentry Well Monitoring Program will be implemented to monitor potential ground water impacts within the oil field.
10	PXP has sufficient capacity to dispose all waste water associated with existing operations and the proposed expansion project into the production zone or by injection into waste water disposal wells. The project does not involve disposal of wastewater into either a surface water or groundwater. See letter dated May 25, 2005 from DOGGR to Steve McMasters of the County of San Luis Obispo, Department of Planning and Building.
11	There is no evidence to suggest that State waters would be affected by the proposed project. Therefore, a mandatory mitigation measure required PXP to obtain WDRs from the RWQCB before operations commence is not warranted.
12	The Project would have a significant impact on the environment. However, mitigation measures have been developed to mitigate all significance impacts to a level of less than significant. In addition, there is no evidence that the Project would have a potential impact on the water rights of property owners near the Project. Therefore, there is no need to: • Grant Mrs. Hale's appeal; • Defer action on the CUP and EIR; • Require further study and revisions to the CUP and EIR; • Direct that a revised and adequate EIR be re-circulated for further public and public agency comment before Board takes any further action on this Project and approves the CUP; and, • Develop and impose additional mitigation measures.
13	Oilfield Environmental and Compliance performed the testing of PXP's water wells in 2004. The testing of the KWW on November 17, 2004, was performed by Zymax, which is the firm owned by the Planning Commissioner in question; however, all sampling and testing procedures were done thoroughly and accurately and the sampling and testing occurred approximately two months after the Planning Commission action.
14	The project, as conditioned, will have less than significant impacts on the environment. The project site has been an active oil field for approximately 100 years. The proposed project would occur within the Phase III boundary that was approved in 1994. All feasible and appropriate mitigation measures have been developed. Furthermore, the project area lies within the County's Energy or Extractive Uses Combining Designation, which is designed for the following purpose: 1. To identify areas where mineral or petroleum extraction occurs, is proposed to occur, or where petroleum or mineral reserves of statewide significance exist, as defined by the State Geologist; 2. To protect existing extraction areas so that land uses incompatible with continuing extraction activities will not be developed on adjacent properties; 3. To protect existing energy production areas and regional production facilities so that incompatible uses will not be developed on adjacent properties such that the energy production facilities become dangerous or detrimental to public health and safety; and, 4. To protect energy production areas from encroaching urban development or other incompatible land uses that may hinder their continued operation.
15	Comment noted.
16	Comment noted.
17	Potential water quality impacts have been fully and fairly addressed. To date, there is no evidence that PXP's existing operations have affected freshwater supplies. Furthermore, a Sentry Well Groundwater Monitoring Program is proposed to monitor trends in groundwater in the

	project area.
18	To date, there has been no evidence of impacts to groundwater from existing operations. As such, an extensive hydrogeologic study is not warranted. However, a Sentry Well Groundwater Monitoring Program will be implemented to monitor groundwater quality trends. If the results of the program suggest changing quality, then more extensive analyses may be appropriate. This additional analysis could be required by the County, but would also fall within existing jurisdiction of DOGGR.
19	See response to comment #18.
20	The mitigation measures contained in the EIR and conditions of approval have been developed to minimize all impacts to a level of less than significant. See response to comment #18.
21	There is one single discrepancy in the EIR in that it states in Section 3.4.3.3 that "the three fresh groundwater wells currently provide water only for landscaping and plumbing; this practice would not change with the proposed Project' while in Section 3.4.2.4 it states that "water pumped from existing water wells can be used to augment the water supplied to the generators." This water would be used as "make-up" water. This addendum serves to clarify this issue by stating that no fresh water will be used to augment the water supplied to the steam generators.
22	Section 1.7 of the EIR adequately identifies the federal, state, and local responsible agencies for the Project. The EIR does not need to identify every possible discretionary approval that PXP will need to obtain nor does it need to discuss the environmental review requirements that each of these agencies will need to meet before they can issue permits, franchises, and other entitlements.
23	The County of San Luis Obispo Board of Supervisors' CEQA review does not bind these other responsible agencies nor would PXP contend this. Other responsible agencies may have the authority to impose additional conditions on the project consistent with their authority, relevant to the potential impact and in proportion to the potential impact in which the condition is being applied.
24	See response to comment #18.
25	See response to comment #18.
26	See response to comment #21.
27	See response comment #18.
28	The proposed Sentry Well Groundwater Monitoring Program includes construction and monitoring of three Sentry Wells to monitor groundwater quality.
29	See response to comment #3. Copies of the monitoring reports will be made available to both DOGGR and the RWQCB. Furthermore, as the CEQA Lead Agency, the County of San Luis Obispo will have responsibility for oversight of the monitoring program. Furthermore, the Sentry Wells fall under the authority of County Environmental Health Department. PXP will have to obtain permits from DOGGR prior to constructing the Sentry Wells.
30	The EIR discusses PXP's three fresh water wells in the oil field and the addendum discusses other water wells within the oil field as well. See response to comment #18.
31	The March 2005 Report states that "although a well construction log for KWW has not been made available to Padre, based on information provided to PXP from Farm Supply, Inc. the total depth of the KWW is 100 feet, and produces from alluvial deposits." Because a well construction log for the KWW was not made available to Padre, it was assumed that the well is producing from a zone potentially extending from depths of 10 to 100 feet. The March 2005 Report was prepared in response to the appeal filed by Ms. Hale. As such, the analysis was directed toward impacts to such well from the proposed Project. Additional data is provided in the EIR on PXP's three fresh water wells. See response to comment #18.
32	As stated in the March 2005 Report, due to the lateral discontinuity of the upper portion of the Dollie Sand Unit, PXP reports that oil production, steam injection, and produced water injection activities planned at the closest point to the KWW will occur within the deeper Dollie Sand Unit at depths of not less than 800 feet. As depicted on Figures 4 and 5 the March 2005 Report, the KWW is located greater than one mile south of the southern boundary of the PXP Phase IV Development Plan area, and the targeted production / injection zones of the KWW and PXP's oil production activities are

	separated vertically by a minimum of approximately 700 feet.
33	Each of the 30 steam injection wells will require a permit from DOGGR. As part of the Class II Injection Well permitting process, DOGGR will require testing for injection wells, including: 1. Well sonic logs (cement bond longs) and induction logs; 2. Radioactive tracer surveys; 3. Downhole pressure surveys ; 4. Pressure "fall-off" surveys; and, 5. Casing integrity tests. DOGGR will deliver copies of these reports to the Central Coast RWQCB.
34	See response to comment #30 and #18.
35	See response to comments #18, #30, and #33. Copies of the monitoring reports will be made available to both DOGGR and the RWQCB.
36	The Class II injection wells will be constructed and operated according to DOGGR Requirements. See response to comments #18 and #30. The proposed Sentry Well Groundwater Monitoring Program is adequate. Copies of the monitoring reports will be made available to both DOGGR and the RWQCB. DOGGR has primary authority, *primacy*, to regulate Class II wells. The main features of the UIC program include permitting, inspection, enforcement, mechanical integrity testing, plugging and abandonment oversight, data management, and public outreach. Any report prepared by DOGGR for PXP's proposed injection wells will be provided to the Central Coast RWQCB. As CEQA Lead Agency, the County will oversee the Sentry Well Groundwater Monitoring Program. PXP does not need to obtain the advanced approval of the RWQCB of the monitoring program.
37	See response to comment #21.
38	PXP has adequate capacity to dispose all wastewater through reinjection. The proposed Project does not involve the discharge of wastewater to surface water or fresh water aquifers. Copies of the groundwater monitoring reports will be made available to the RWQCB, pursuant to Section 22.10.180.1.B. of the Land Use Ordinance.
39	Condition #29 has been modified so that the terms "should" have been replaced with "shall."
40	See response to comment #3.
41	There is no evidence to show that impacts to State waters will occur. Neither the 2004 testing of PXP's wells or the KWW showed any level of contamination. See response to comment #36. DOGGR will provide copies of its reports on the proposed Class II injection wells to the Central Coast RWQCB as outlined in the May 25, 2005 letter from DOGGR to Mr. Steve McMasters of the County of San Luis Obispo.
42	See responses to comments #10 and #38
43	A mitigation monitoring and reporting program has been developed for the Project to ensure that measures are actually implemented and maintained. Mitigation will be required as conditions of approval. These conditions of approval are legally enforceable and are the vehicle to implement the mitigation and track compliance. Furthermore, the monitoring program provides appropriate oversight from the RWQCB and DOGGR.
44	See response to comment #4

Letter dated April 7, 2005 from Cleath & Associates	
Comment #	**Response**
1	To date, there has been no evidence of impacts to groundwater from existing operations. As such, an extensive hydrogeologic study is not warranted. However, a Sentry Well Groundwater Monitoring Program will be implemented to monitor groundwater quality trends. If the results of the program suggest changing quality, then more extensive analyses may be appropriate. This additional analysis could be required by the County, but would also fall within existing jurisdiction of DOGGR.
2	The Phase IV Development Plan Boundary depicted on Figures 1 and 4 are an approximation.
3	See response to comment #1
4	Two additional Sentry Wells are included in the Sentry Well Groundwater Monitoring Program.
5	DOGGR will require pressure testing of all proposed Class II injection wells as outlined in the May 25, 2005 letter from DOGGR to Mr. Steve McMasters of the County of San Luis Obispo, Department of Planning and Building.
6	Steam injection and produced water re-injection will occur within the production zone. See response to comment #1.
7	Fresh water has not been used for steam generation since PXP has operated the field. Page 3-19 is accurate (Grace Petroleum used fresh water for make-up). Currently the 3 wells are used for landscaping and plumbing only, but they have been used in the past for irrigation and generator "make-up" water. As clarified in this addendum to the Final EIR, PXP will not utilize any fresh water for steam injection purposes.
8	The proposed Project does not include the disposal of treated effluent to Arroyo Grande Creek Valley. PXP has sufficient capacity to dispose all waste water associated with existing operations and the proposed expansion project into the production zone or by injection into waste water disposal wells. The project does not involve disposal of waste water into either a surface water or groundwater.

Report dated April 15, 2005 from Charles A. Champion, Tower Petroleum Corporation	
Comment #	**Response**
1	As stated in the March 2005 Report, due to the lateral discontinuity of the upper portion of the Dollie Sand Unit, PXP reports that oil production, steam injection, and produced water injection activities planned at the closest point to the KWW will occur within the deeper Dollie Sand Unit at depths of not less than 800 feet. As depicted on Figures 4 and 5 the March 2005 Report, the KWW is located greater than one mile south of the southern boundary of the PXP Phase IV Development Plan area, and the targeted production / injection zones of the KWW and PXP's oil production activities are separated vertically by a minimum of approximately 700 feet.
2	Fresh water has not been used for steam generation since PXP has operated the field. Page 3-19 is accurate (Grace Petroleum used fresh water for make-up). Currently the 3 wells are used for landscaping and plumbing only, but they have been used in the past for irrigation and generator "make-up" water. As clarified in this addendum to the Final EIR, PXP will not utilize any fresh water for steam injection purposes. Each of the 30 steam injection wells will require a permit from DOGGR. As part of the Class II Injection Well permitting process, DOGGR will require testing for injection wells, including: 1. Well sonic logs (cement bond longs) and induction logs; 2. Radioactive tracer surveys; 3. Downhole pressure surveys ; 4. Pressure "fall-off" surveys; and, 5. Casing integrity tests. DOGGR will deliver copies of these reports to the Central Coast RWQCB.
3	See response to comment #2.
4	See response to comment #2.
5	See response to comment #2.
6	See response to comment #2.
7	PXP has sufficient capacity to dispose all waste water associated with existing operations and the proposed expansion project into the production zone or by injection into waste water disposal wells. The project does not involve disposal of waste water into either a surface water or groundwater.

Letter dated April 6, 200 from King Ventures	
Comment #	**Response**
1	To date, there has been no evidence of impacts to groundwater from existing operations. As such, an extensive hydrogeologic study is not warranted. However, a Sentry Well Groundwater Monitoring Program will be implemented to monitor groundwater quality trends. If the results of the program suggest changing quality, then more extensive analyses may be appropriate. This additional analysis could be required by the County, but would also fall within existing jurisdiction of DOGGR.
2	See response to comment #1.
3	Steam injection and produced water re-injection will occur within the production zone. See response to comment #1.
4	As stated in the March 2005 Report, due to the lateral discontinuity of the upper portion of the Dollie Sand Unit, PXP reports that oil production, steam injection, and produced water injection activities planned at the closest point to the KWW will occur within the deeper Dollie Sand Unit at depths of not less than 800 feet. As depicted on Figures 4 and 5 the March 2005 Report, the KWW is located greater than one mile south of the southern boundary of the PXP Phase IV Development Plan area, and the targeted production / injection zones of the KWW and PXP's oil production activities are separated vertically by a minimum of approximately 700 feet.
5	The Class II injection wells will be constructed and operated according to DOGGR Requirements. The EIR discusses PXP's three fresh water wells in the oil field and the addendum discusses other water wells within the oil field as well. See response to comments #1. The proposed Sentry Well Groundwater Monitoring Program is adequate. Copies of the monitoring reports will be made available to both DOGGR and the RWQCB. DOGGR has primary authority, *primacy*, to regulate Class II wells. The main features of the UIC program include permitting, inspection, enforcement, mechanical integrity testing, plugging and abandonment oversight, data management, and public outreach. Any report prepared by DOGGR for PXP's proposed injection wells will be provided to the Central Coast RWQCB. As CEQA Lead Agency, the County will oversee the Sentry Well Groundwater Monitoring Program. PXP does not need to obtain the advanced approval of the RWQCB of the monitoring program.
6	PXP has sufficient capacity to dispose all waste water associated with existing operations and the proposed expansion project into the production zone or by injection into waste water disposal wells. The project does not involve disposal of waste water into either a surface water or groundwater.
7	Fresh water has not been used for steam generation since PXP has operated the field. Page 3-19 is accurate (Grace Petroleum used fresh water for make-up). Currently the 3 wells are used for landscaping and plumbing only, but they have been used in the past for irrigation and generator "make-up" water. As clarified in this addendum to the Final EIR, PXP will not utilize any fresh water for steam injection purposes. The water supply requirements of SB 610 (Water Code § 10910, et seq.) do not apply to this project.

Letter dated February 16, 2005 from Cleath & Associates	
Comment #	**Response**
1	Neither diluent nor other additives are used at the oilfield for enhancing the yield from the flooding operation.
2	To date, there has been no evidence of impacts to groundwater from existing operations. As such, an extensive hydrogeologic study is not warranted. However, a Sentry Well Groundwater Monitoring Program will be implemented to monitor groundwater quality trends. If the results of the program suggest changing quality, then more extensive analyses may be appropriate. This additional analysis could be required by the County, but would also fall within existing jurisdiction of DOGGR.
3	Well #1 (i.e., KWW) was tested for TPH. The results were "non-detect." Therefore, there is no evidence that the higher salinity is due to ground water contamination from the oil field activities. It is possible that the higher salinity is due to the presence of the naturally saline sediments adjacent to the alluvial valley.
4	The three PXP wells and the KWW were tested for TPH. The results for all four wells were "non-detect".
5	See response to comment #2.
6	See response to comment #2.
7	Fresh water has not been used for steam generation since PXP has operated the field. Page 3-19 is accurate (Grace Petroleum used fresh water for make-up). Currently the 3 wells are used for landscaping and plumbing only, but they have been used in the past for irrigation and generator "make-up" water. As clarified in this addendum to the Final EIR, PXP will not utilize any fresh water for steam injection purposes. The water supply requirements of SB 610 (Water Code § 10910, et seq.) do not apply to this project.

Letter dated March 4, 2005 from Cleath & Associates	
Comment #	**Response**
1	To date, there has been no evidence of impacts to groundwater from existing operations. As such, an extensive hydrogeologic study is not warranted. However, a Sentry Well Groundwater Monitoring Program will be implemented to monitor groundwater quality trends. If the results of the program suggest changing quality, then more extensive analyses may be appropriate. This additional analysis could be required by the County, but would also fall within existing jurisdiction of DOGGR.
2	Fresh water has not been used for steam generation since PXP has operated the field. Page 3-19 is accurate (Grace Petroleum used fresh water for make-up). Currently the 3 wells are used for landscaping and plumbing only, but they have been used in the past for irrigation and generator "make-up" water. As clarified in this addendum to the Final EIR, PXP will not utilize any fresh water for steam injection purposes. The water supply requirements of SB 610 (Water Code § 10910, et seq.) do not apply to this project See response to comment #1
3	Well #1 (i.e., KWW) was tested for TPH. The results were "non-detect." Therefore, there is no evidence that the higher salinity is due to ground water contamination from the oil field activities. It is possible that the higher salinity is due to the presence of the naturally saline sediments adjacent to the alluvial valley.
4	A Sentry Well Groundwater Monitoring Program will be implemented by PXP with oversight from the County. During the course of the program, if detected constituents are observed at concentrations above the U.S. EPA's MCLs or other standards, and/or there are statistically significant trends in the data, then the following will occur: At the discretion of the Planning Director, additional measures may be implemented, including: • Conducting additional tests; • Reducing operations; or • Implementing other measures in coordination with DOGGR, SWRCB/RWQCB, and the County Environmental Health Department. Because DOGGR has primary authority over the construction and operation of Class II wells, DOGGR may initiate review of the monitoring program at its own discretion, and undertake additional analyses pursuant to its regulatory authority.

Letter dated May 25, 2005 from California Department of Conservation, Division of Oil, Gas, and Geothermal Resources	
Comment #	**Response**
1	Comment noted.
2	Comment noted.

Letter dated May 17, 2005 from Hollister & Brace	
Comment #	**Response**
1	Fresh water has not been used for steam generation since PXP has operated the field. Page 3-19 is accurate (Grace Petroleum used fresh water for make-up). Currently the 3 wells are used for landscaping and plumbing only, but they have been used in the past for irrigation and generator "make-up" water. As clarified in this addendum to the Final EIR, PXP will not utilize any fresh water for steam injection purposes.
2	Comment noted.
3	Comment noted.
4	Comment noted.
5	Comment noted.
6	Comment noted.

Letter dated May 4, 2005 from Mr. Dan Tormey of Entrix	
Comment #	**Response**
1	Impacts to surface water quality may occur from short-term increases in erosion and sedimentation resulting from earth-moving operations and exposed soils. Mitigation measure GEO-2 has been proposed requiring PXP to prepare prior to construction and implement during construction a Sediment Erosion Control Plan (SECP) for the project. The SECP will include slope surface stabilization measures, erosion and sedimentation control devices, and other measures to minimize erosion. GEO-2 also requires PXP to prepare a grading plan for the project and comply with the requirements under a general stormwater construction permit.
2	Each of the 30 steam injection wells will require a permit from DOGGR. As part of the Class II Injection Well permitting process, DOGGR will require testing for injection wells, including: 6. Well sonic logs (cement bond longs) and induction logs; 7. Radioactive tracer surveys; 8. Downhole pressure surveys ; 9. Pressure "fall-off" surveys; and, 10. Casing integrity tests. DOGGR will deliver copies of these reports to the Central Coast RWQCB. The Class II injection wells will be constructed and operated according to DOGGR Requirements. See response to comments #18 and #30. The proposed Sentry Well Groundwater Monitoring Program is adequate. Copies of the monitoring reports will be made available to both DOGGR and the RWQCB. DOGGR has primary authority, *primacy*, to regulate Class II wells. The main features of the UIC program include permitting, inspection, enforcement, mechanical integrity testing, plugging and abandonment oversight, data management, and public outreach. Any report prepared by DOGGR for PXP's proposed injection wells will be provided to the Central Coast RWQCB. As CEQA Lead Agency, the County will oversee the Sentry Well Groundwater Monitoring Program. PXP does not need to obtain the advanced approval of the RWQCB of the monitoring program.
3	See response to comment #2.
4	The Final EIR identified a Class II – Significant but Mitigable impact to groundwater quality. As stated on page 3-9 of the Addendum, Padre believes that PXP's oil production activities are not likely to affect the quality of groundwater produced at the KWW and other water wells. However, due to the complexity of hydrogeology, Padre recommends that a Sentry Groundwater Monitoring Well be constructed as an added assurance measure at a location between the KWW and the southern boundary of the PXP Phase IV Development Plan. Two additional Sentry Wells should be located between the aforementioned Sentry Well and the western and eastern boundaries of the project site as well. Results of the monitoring program will be made available to DOGGR. If results of the monitoring program show elevated levels of TPH or other constituents, DOGGR may require additional tests to determine the source of the contamination according to their regulatory authority.
5	The Final EIR recognizes (see page 5.7-6) that groundwater at the Arroyo Grande oilfield overlies naturally occurring oil and that such oil regularly migrates upward from lower elevations toward the surface, frequently coming into contact with the groundwater. The groundwater monitoring program recognizes that these naturally-occurring seeps can lead to chemical signals in water that are difficult to distinguish from the oil in the production zone. See response to comment #4.
6	Comment noted.

Letter dated May 19, 2005 from Mr. Dan Tormey of Entrix	
Comment #	**Response**
1	Comment noted.
2	Comment noted.

Letter dated May 13, 2005 from Mr. John Pierson of MRS	
Comment #	**Response**
1	Comment noted.
2	Comment noted.
3	Fresh water has not been used for steam generation since PXP has operated the field. Page 3-19 is accurate (Grace Petroleum used fresh water for make-up). Currently the 3 wells are used for landscaping and plumbing only, but they have been used in the past for irrigation and generator "make-up" water. As clarified in this addendum to the Final EIR, PXP will not utilize any fresh water for steam injection purposes.
4	Comment noted.

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FACSIMILE TRANSMISSION

April 15, 2005

TO:	FAX NO:	PHONE NO:
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FROM:	FILE NO:	USER NO:
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REMARKS:

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April 15, 2005

HAND DELIVERED
Board of Supervisors
County of San Luis Obispo
County Government Center
1050 Monterey St.
San Luis Obispo, CA 93408

Re: **Helen Hale Appeal of Planning Commission Approval of Conditional Use Permit D010386D- Plains Exploration & Production Company Project- Arroyo Grande Oil Field**

Honorable Supervisors:

This firm represents Helen Hale, a San Luis Obispo County resident who lives near the Plains Exploration & Production Company ("PXP") oil production facilities in Arroyo Grande Oil Field at which PXP has proposed to expand its steam injection operations (the "Project"). Mrs. Hale has appealed to this Board the County Planning Commission's approval of Conditional Use Permit D010386D (the "CUP"), which PXP applied for to expand its steam injection operations in the Arroyo Grande Field, and the proposed certification by this Board of the Environmental Impact Report for the Project and the CUP. We also represent King Ventures which has previously commented on the CUP and which shares Mrs. Hale's concerns regarding this Project.

As discussed in further detail below, and in the comments submitted on her behalf by Timothy Cleath, a local geologist, and Charles Champion, an oil & gas production engineer, Mrs. Hale has appealed the Planning Commission's approval of the CUP for the following reasons:

1. **The proposed Environmental Impact Report does not adequately assess or discuss (a) the potential impact which the proposed expanded steam injection operations may have on both groundwater and surface water; or (b) the potential impact of the Project on the water rights of other property owners and water users in the area of the Project.** (1)

2. The proposed mitigation measures and conditions for the Project (a) are stated in directory, rather than mandatory language; and (b) in any event, are clearly insufficient and inadequate to either assess or properly protect groundwater and surface water from the potential environmental impacts of PXP's proposed expansion of its steam injection operations in the Arroyo Grande Field.

3. Although the Project contemplates discharges to surface and ground water, the CUP is not conditioned upon obtaining Waste Discharge Requirements and other appropriate approvals and permits from the Regional Water Quality Control Board.

4. The proposed findings in support of the approval of the CUP and the certification of the EIR are not supported by evidence in the record.

In submitting these comments, we have reviewed:

(1) the "Final Plains Exploration & Production Phase IV Development Plan Environmental Impact Report" (the "EIR"), dated September 2004, prepared on behalf of PXP by Padre Associates, Inc. ("Padre");

(2) The September 23, 2004 Staff Report to the Planning Commission (the "2004 Staff Report") regarding proposed EIR;

(3) Padre's "Groundwater/ Arroyo Grande Oil Field Operations Discussion" for the Project, dated March 2005 (the "Padre March 2005 Report");

(4) The April 19, 2005 memorandum from Ellen Carroll of the County Department of Planning and Building, with its attachments (the "Carroll Memo");

(5) The proposed "Resolution Affirming and Modifying the Decision of the Planning Commission and Conditionally Approving the Application of Plains Exploration & Production for Conditional Use Permit D010386D" ("Proposed Resolution") submitted with the Carroll memo, proposing to deny of Mrs. Hale's appeal and to certify the EIR as "complete and adequate and conditionally approving the CUP";

(6) Exhibit A to the Proposed Resolution, entitled "Findings Plains Exploration & Production Conditional Use Permit D010386D" (the "Proposed Findings");

(7) Exhibit B to the Proposed Resolution, entitled "Conditions of Approval- Plains Exploration & Production Conditional Use Permit D010386D" (the "Proposed Conditions"); and

(8) Exhibit C to the Proposed Resolution, entitled "Required CEQA Findings- Plains Exploration & Production Conditional Use Permit D010386D" (the "Proposed CEQA Findings").

The purpose of this letter is summarize the factual bases for Mrs. Hale's appeal to this Board and to identify some of the more obvious errors and inadequacies in the EIR, 2004 Staff Report, the Carroll Memo, the Proposed Findings, the Proposed Conditions, and the CEQA Proposed Findings. Our comments are not all-inclusive. In submitting this letter, we do not waive the right to identify other inadequacies in the EIR or those described in the responses to the various comments made by interested persons and public agencies, and which are part of the administrative record. We incorporate those other comments by reference.

As discussed in further detail below, the EIR, the March 2005 Padre Report, the 2004 Staff Report and the Carroll Memo did not fully or adequately consider obvious and significant environmental impacts of the Project, and fail to address any of the potential operational impacts of the Project. Accordingly, the Proposed

Resolution, the Proposed Conditions and the CEQA Proposed Findings, which are each based on those documents, cannot withstand legal or factual scrutiny.

From a water quality perspective, this Project presents, at least, three overarching and unresolved issues:

First, what capacity demands on fresh water aquifers will the Project present?

(5) The EIR assumes, but does not provide supporting evidence to confirm that the source of the water which will be utilized for steam generation and injection will be *solely* produced water. In the event that waste water in association with oil production is not produced in sufficient volumes or cannot be cleaned to a sufficient quality that it could be used for steam injection purposes, PXP will utilize fresh water wells, thereby drawing down on limited local ground water supplies. That action necessarily would affect the water rights of other property owners in the area who depend on the limited ground water supplies in this part of the County.

(6) Accordingly, the question is whether produced water produced in association with oil could be sufficient to supply steam for the generators without any drawdown of groundwater supplies. On one hand, the EIR implies that fresh water aquifers will *not* be utilized as a source for water to generate steam. However, the EIR and the Padre March 2005 Report also indicate that groundwater from fresh water aquifers *will* be utilized.

(7) The water supply requirements of SB 610 (Water Code § 10910, et seq.) would potentially apply to the Project, if the source of the water for steam was groundwater and the quantities utilized created a "...demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project." (See, Water Code § 10912(a)(7).) The EIR does not provide sufficient data to confirm the potential demand from fresh water sources.

(8) At the very least, a mandatory mitigation measure should be imposed limiting the source of the water used for steam generation to water produced in association with oil and to confirm that fresh water aquifers will not be utilized as a source water for steam generation.

(9) Second, what impact will the proposed increased steam injection potentially have on fresh water aquifers in the area of the Project, and, in particular, what are the mechanics of the steam injection operation, the location of all of the aquifers beneath and above the injection zone, and the location of producing water wells, and what is the potential that either the injected steam or the oil and associated water in the oil bearing formation will, upon being re-pressurized, migrate through either formation fractures or along the annulus of a well into fresh water aquifers?

The EIR does not provide confirming evidence that the oil bearing formation is, in fact, a sealed formation such that there is no risk that the oil in addition to being pushed toward oil production wells, as intended, will also migrate into fresh water aquifers. In other words, there is a risk, which is not mitigated by the conditions for approval of this Project, that the expanded steam injection operations will contaminate fresh water aquifers.

The EIR simply fails to provide sufficient information and data to properly assess this risk and no mitigation measures or conditions have been proposed to ensure that this adverse environmental impact will be avoided.

(10) Third, what is the potential quantity and quality of waste water that would have to be disposed as a result of the expansion of PXP's steam injection operations?

The EIR appears to assume that *all* waste water will be disposed by either reinjection as steam into the oil producing zone or by injection into waste water disposal wells. However, the EIR fails to provide sufficient data to confirm that there will be no offsite disposal of waste water into a either surface water or ground water. The Padre March 2005 Report confirms that the produced water"... is not suitable for irrigation or potable use." (Section 2.5 at p. 2-13.)

(11) If there are any contemplated discharges to surface water or groundwater, then PXP would first have to obtain waste discharge requirements from the Central Coast Regional Water Quality Control Board ("RWQCB"). Accordingly, at the least, a mandatory mitigation measure should be imposed requiring PXP to obtain waste discharge requirements from the RWQCB *before* operations commence.

(12) If is undisputed that the proposed Project will have a significant impact on the environment. We hope the Board will agree that, given the gravity of the Project and its significant potential for serious adverse environmental impacts and harm and the potential impact on the water rights of property owners in the vicinity of the Project, the Board should:

(1) Grant Mrs. Hale's appeal;

(2) Defer action on the CUP and EIR;

(3) Require further study and revisions to the CUP and EIR;

(4) Direct that a revised and adequate EIR be re-circulated for further public and public agency comment before Board takes any further action on this Project and approves the CUP; and

(5) Develop and impose appropriate mitigation measures that fully and adequately protect the environment, water quality and the rights of property owners in the vicinity of the Project.

I. Legal and Procedural Background

On September 23, 2004, the Planning Commission approved the PXP CUP. (See, Resolution No. 2004-077, C-3, p. 71) [1]

(13) In approving the CUP, an apparent conflict of interest at the Planning Commission level was not addressed, that is, as we understand, the Commissioner who moved to approve the project owns the firm that does water quality testing for PXP. That undisclosed conflict of interest, which necessarily denied Mrs. Hale a fair and unbiased hearing of itself is a sufficient basis to send this matter back to the Planning Commission for action based on an expanded and properly noticed new EIR.

[1] The page references herein are to the pages numbers set forth in "Agenda Item Transmittal " for this Appeal.

Mrs. Hale filed a timely appeal of the Planning Decision's decision to this Board pursuant to the applicable provisions of Title 22 of the County Code. (C-3, pp. 5-6.)

Finding No. 3 of this Board's Proposed Findings, states: "As conditioned, the proposed project or use satisfies all applicable provisions of Title 22 of the County Code." We do not believe that this proposed finding is supported by sufficient evidence in the record before the Board, since, as discussed below, the Project, in fact, fails to comply with Title 22 in a number of significant respects.

(14) The County of San Luis Obispo's "Policies for the Implementation of the California Environmental Quality Act", state that, among other things, that it is this County's policy to:

"Maintain a high quality and healthy environment for the people of San Luis Obispo County now and in the future;

"Take actions necessary to protect, rehabilitate, and enhance the environmental quality of San Luis Obispo County;

"Take actions that will provide the people of San Luis Obispo County with clean air and water, enjoyment of aesthetic, natural, scenic, and historic environmental qualities, and freedom from excessive noise; ...

"Not approve projects as proposed if there are feasible mitigation measures or feasible alternatives available that would avoid or lessen the significant adverse environmental effects of such projects."

"Prefer avoidance of adverse impacts over mitigation. However, if mitigation is necessary, on-site or off-site mitigation should be fully implemented;"

"Give major consideration to preventing negative environmental effects while providing a decent home and satisfying living environment for every San Luis Obispo County resident'.

(15) County staff has already determined that "... after completion of the initial study that *there is evidence that the project may have a significant effect on the environment*,..." (Emphasis added.) The EIR was prepared for that reason. (See, "Staff Report for September 23, 2004 Planning Commission Meeting [C-3, p.58]; see also, Section 303 00(d), 507.00(b) and 600.00 of the County's "Environmental Quality Act Guidelines" ["County CEQA Guidelines"])

(16) The importance of full consideration of a project's impact on water quality is underscored in Section 22.34.010 of the County Land Use Ordinance, which specifically provides:

> "This chapter provides reasonable regulations for the extraction and development of onshore petroleum and other subterranean resources in San Luis Obispo County, including but not limited to exploration, production, storage, processing, transportation, and the disposal of petroleum and other hydrocarbons and of any operations accessory thereto. *This chapter is intended to supplement regulations administered by the California State division of oil and gas, to address particular problems in the county that do not apply generally throughout the state. These problems include a limited water supply for agricultural and domestic uses in a county that depends heavily on agriculture and tourism for its economic welfare. The fresh water supply must be fully protected from pollution by petroleum operations.* (Ord. 2892 § 1 (part), 2002)" (Emphasis added.)

(17) Therefore, it is absolutely essential that water quality impacts are fully and fairly assessed. Those impacts have not yet been adequately assessed in the EIR. For that reason, we believe that the Board can and should find that the EIR and the proposed mitigation measures fail to comply with Section 22.34.010 in that the Project does not ensure that the fresh water supply is "...fully protected from pollution by petroleum operations."

II. Inadequacies Of The Project Description

The Project Description is perhaps the most inadequate aspect of the EIR. As discussed in greater detail below, these discrepancies are indicative of the lack

of careful examination in the EIR of the significant environmental impacts of this Project.

(18) One of the more glaring shortcomings of the EIR (and the March 2005 Padre Report) is the lack of a detailed discussion of the potential impact that the proposed increased steam injection may have on groundwater and, in particular, the mechanics of the operation, the location of the injection zones, and the location of all of the aquifers beneath and above the injection zone and the location of producing water wells.

The Padre March 2005 Report describes PXP's proposed steam injection operations in the following terms in Section 2.3 at pages 2-1 and 2-2:

> "The primary method of steam injection utilized at the Arroyo Grande Oil Field is steam flooding (with some associated cyclic steaming). Steam is injected into "injection" wells where it raises the temperature of the oil reservoir, decreases the oil viscosity, and floods or pushes the oil to "producing" wells which surround each injector. Periodically production wells are selected to be cyclic steamed, wherein a relatively "small" volume (relative to injectors) is injected into the well and produced back to enhance its productivity.
>
> The steam injection process at the oil field increases the temperature of the oil to reduce the characteristically high viscosity of approximately 3,500 centipoises (cp) at 90°F. At lower viscosity, the oil flows more easily. Steam is injected at pressures of 500 to 800 pounds per square inch gauge (psig). The oil and water is pumped to the surface from the well to the tank battery facility for separation. The reservoir temperature is approximately 90° F, and the corresponding viscosity is 3,500 cp. ...
>
> Steam injection and oil production occurs within the Dollie Sand Unit/production zone at depths of approximately 800 to 1,300 feet below ground surface (Sande 2005, personal communication). The production zone is the zone of oil production, steam injection, and produced water disposal."

The Padre March 2005 Report describes proposed steam injection zones in Section 2.4 at pages 2-2:

> "An injection zone is usually sandstone, a rock porous and permeable enough to accept injected fluids. ***Rock beds chosen for injection zones are confined by impermeable beds, like shale, which act as cap rocks, confining injected liquids in the porous beds.***" (Emphasis added.)

(19) However, as discussed in the Cleath Report, neither the Padre March 2005 Report nor the EIR provide any data, such as well logs or geologic reports that the "Dollie Sand Unit/production zone" is, in fact, confined by an impermeable bed, such as shale, which would act as a cap rock in this case, and ensure that injected liquids are confined to the oil production zone.

(20) Furthermore, the proposed mitigation measures and monitoring plan provide no assurance that injected liquids will be appropriately monitored to ensure that the flow of injected liquids will be confined to the production zone.

Section 3.4.3.3 of the EIR at p. 3-19, entitled "Produced Water Management", identified the source of the water for steam injection:

> "Water for the proposed Project would come from existing sources: three ground water wells on the Property, ***and water recovered during the production of the oil (produced water)***... The three fresh groundwater wells currently provide water only for landscaping and plumbing; this practice would not change with the proposed Project."

Section 3.4.2.4 of the EIR at p. 3-11, also entitled "Produced Water Management", states in part:

> "This recovered water is called "produced water" and when separated from the oil, the produced water is used in the steam generators to produce steam for thermal injection or disposal via water injection wells. ***If necessary, water pumped from existing water wells can be used to augment the water supplied to the generators.***" (Emphasis added.)

Section 607.00 of the County CEQA Guidelines provides in pertinent part:

> "The Environmental Coordinator shall not endorse any information prepared by or under contract to the applicant without first conducting sufficient analysis to determine that the information is complete, accurate, and can be presented to the public without question as to any actual or perceived conflict of interest on the part of the preparer of the information."

(21) The Staff report does not indicate compliance with Section 607.00, that is, a confirmation that the information in the EIR" is complete, accurate, and can be presented to the public without question as to any actual or perceived conflict of interest on the part of the preparer of the information."

(22) Section 1.7 of the EIR identifies a variety of state, local and federal agencies as responsible agencies, with Board designated as the lead agency for CEQA purposes. However, the EIR and the Proposed Conditions fail to identify all of the specific discretionary approvals that PXP will need to obtain from any of these agencies and when they will be obtained. The EIR fails to discuss the environmental review requirements that each of these agencies will need to be met before they can issue permits, franchises, and other entitlements.

(23) Since PXP will undoubtedly contend that Board's CEQA review binds these other responsible agencies, it is important to know exactly what permits and other entitlements PXP will need to obtain and the status of each of its applications.

III. <u>Inadequate Consideration and Analysis Of Potential Environmental Impacts of the Project.</u>

(24) Among the more obvious shortcomings of both the EIR and the Padre March 2005 Report is the lack of a detailed discussion of the potential impact that the proposed increased steam injection on groundwater and, in particular, the mechanics of the operation, the location of the injection zones, and the location of all of the aquifers beneath and above the injection zone, and the location of producing water wells.

The 2004 Planning Commission Staff Report states at C-3, p.62:

> "*Major issues with this project involve assessing the Project's impact to ground water, air quality, and biological resources. The geology of the area includes oil-bearing strata exposed at the ground surface as well as in contact with the ground water.* Because oil naturally contacts ground water in this region it is difficult to determine the Project impacts on water quality. A water quality analysis was performed as part of the EIR preparation and the results compared to the previous sampling of the same wells. No significant changes had occurred. In addition, the level of TRPH (total recoverable petroleum hydrocarbons) was non-detectable. (See FIBR Appendix 1.) The conditions of approval require the applicant to periodically test water quality and report the results to appropriate agencies." (Emphases added.)

(25) Although the 2004 Staff Report acknowledges the contact for oil-bearing strata with groundwater, the Report does not explain how the water quality analysis, standing alone, is an appropriate assessment of the potential impact of the Project on the groundwater.

(26) Section 3.4.2.3 of the EIR states that: "PXP currently has six steam generators in the Arroyo Grande Field...." and that, "Site-produced water is used at the rate of 6,000 barrels per day..." or 264,000 gallons of water per day. This reference, standing alone, does not identify the source of the water which will be utilized for steam generation and injection.

A. Water Quality Issues

(27) A number of the individuals who testified at the September 23, 2004 Planning Commission hearing expressed their concerns regarding ground water contamination caused by oil operations. PXP acknowledged that there have been instances in the past of such intrusion. (See, "Minutes of San Luis Obispo Planning Commission-September 23, 2004 "["Commission Minutes"], pages 14-15, C-3,pp. 67-68.) Although the EIR contains some discussion of the fresh water bodies, as discussed in greater and in technical detail in the comments submitted on Mrs. Hale's behalf

by Timothy Cleath, there is no discussion of the potential impact that steam injection operations may have on the water quality of either tributaries or ground water and the proposed mitigation measures are inadequate.

The Carroll Memo discusses the water quality issues relating to this project in the following general terms:

> "After receiving the appeal, the landowner [Mrs. Hale] allowed the applicant [PXP] to test the water quality of the well in question. Tests were performed on November 21, 2004. No hydrocarbons were detected. Since the appeal letter included minimal information, staff, the EIR consultant (Padre Associates), and the appellant's representatives met to discuss the concerns on December 15, 2004. At that meeting the appellant's representatives clarified and expanded upon their concerns regarding water quality. Subsequently, as a way to clarify and expand the discussion regarding this technical subject, staff directed the EIR consultants to prepare the following:
>
> 1. A discussion of the "steamflood" process.
>
> 2. Hydrogeologic cross-sections of the oilfield and surrounding region.
>
> 3. A water quality monitoring program.
>
> 4. A discussion of the regulatory environment as it pertains to oilfield operations.
>
> "At that meeting the appellant's representatives clarified and expanded upon their concerns regarding water quality. This information was prepared and included in the document "Groundwater/Arroyo Grande Oil Field Operations Discussion" (see attached). Tasks 1 and 2 were performed so that the consultant could clarify the relationship between oilfield operations and local groundwater conditions. Those conclusions were used to develop #3, the water quality monitoring program. Item #4 is included for informational purposes.

In summary, the report concluded that oilfield operations are not likely to impact groundwater at the appellant's water well. This is due to the:

1. horizontal distance between oilfield operations and the water well (minimum of 3000 feet),
2. vertical separation between the injection zone and the groundwater extraction zone, and (minimum of 700 feet at closest point),
3. change in geology between the oil production and injection zone and the groundwater extraction zone (a layer of low permeability clays and silts exists from depths of approximately 200 to 500 feet)

However, the consultant and staff recognize that hydrogeology is a complex science and therefore recommends that a "sentry" well be constructed to provide a consistent method to monitor groundwater in the area. The specific recommendation shall replace existing Condition #29 found in the Planning Commission staff report. These parameters will also be required of the two other wells on the applicant's property that were tested in 1993 and 2004.

Amended Condition #29: To minimize any impact to groundwater downgradient from the site, petroleum products ***should be removed*** from wastewater generated in the oil recovery process prior to reinjection. In addition, the water quality of the shallow aquifer zone beneath and downgradient from the site ***should be monitored*** as described in Section 4 of the report titled "Groundwater/Arroyo Grande Oil Field Operations Discussion" completed in March 2005. This monitoring program shall apply to both the proposed sentry well and the two existing wells previously monitored in 1993 and 2004 (Signal Extension Wells #1 and #2).

....The SWRCB and RWQCB are responsible for maintaining water quality in the State of California under the authority of the federal Clean Water Act, and the State Porter-Cologne Water Quality Control Act (PCWQCA). Pursuant to § 13260 of the California Water Code, persons discharging or

proposing to discharge waste that could affect the quality of the waters of the State, such as California's surface, coastal, or groundwater, other than into a community sewer system, are required to file a Report of Waste Discharge (ROWD) to obtain Waste Discharge Requirements (WDRs) ***Copies of the monitoring reports for the monitoring program would be made available to DOGGR and the RWQCB.*** (Emphases added.)

28 Neither the Carroll Memo nor the EIR contain any explanation as to why water quality of the aquifer beneath and downgradient from the site should be the only aquifer monitored or why a *single* monitoring well is sufficient.

29 Moreover, after discussing the need for Waste Discharge Requirements, PXP does *not* propose to obtain such requirements or any other permit from the RWQCB, but instead only proposes to make copies of the semi-annual monitoring reports for the monitoring program *available* to DOGGR and the RWQCB. How can the proposed monitoring proposal genuinely be considered a "monitoring program" when no regulatory agency is provided with the monitoring reports on a regular basis for its review and oversight? The proposed mitigation measure is clearly inadequate.

30 Furthermore, other fresh water production wells, besides Mrs. Hale's well, are *not* identified in either the EIR or the Padre March 2005 Report and other wells could potentially be affected by the steam injection operations contemplated by this Project. Other aquifers may very well be impacted by the steam injection operations.

31 The Padre March 2005 Report is based solely on assumptions regarding the location of fresh water wells. For example, the report states in Section 3.3 at page 3-2: "Padre *assumes* that the KWW is producing groundwater from a zone potentially extending from depths of 10 to 100 feet." (Emphasis added.) Although the report further states at page 3-2: "The presence of this thick sequence of low permeability earth materials generally creates a vertical discontinuity between the KWW production zone (alluvial deposits) and the zone of PXP's oil production activities (Vaqueros Sand Unit) at a depth of approximately 800 feet," the permeability data is *not* provided in the EIR or the report. No other data is provided regarding other water wells in the area nor is the potential for contamination assessed.

(32) However, the statement that there is "vertical separation between the injection zone and the groundwater extraction zone, (minimum of 700 feet...)" directly contradicts the project description contained in the Summary section of the Padre March 2005 Report at page 1-1 which describes the production zone "at depths of approximately 300 to 1,300 feet below ground surface".

(33) Furthermore, neither the EIR nor the Padre March 2005 Report assess the potential impact that repressurizing Dollie Sand may have on the allegedly "low permeability earth materials" which it asserts creates "a vertical discontinuity". As discussed in detail in the comments of a petroleum engineer, Charles Champion, PXP's proposed steam injections operations will be conducted at high pressure and create the risk that the "cap rock" may fracture. Such fracturing could potentially cause communication with fresh water aquifers.

(34) As discussed above and in the Cleath Report, neither the Padre March 2005 Report nor the EIR contain well logs or geologic reports confirming that the "Dollie Sand Unit/production zone" is, in fact, confined by an impermeable barrier. The proposed mitigation measures and monitoring plan provide no assurance that injected liquids will be appropriately monitored to ensure that the flow of injected liquids will be confined to the production zone.

(35) Neither the EIR nor the Padre March 2005 Report identify the location of existing ground water wells within the area (other than the "King Water Well"). The May 17, 2004 comment letter from the DOGGR included in the EIR notes: "Areas of natural seepage and the "Clampett well" should be subjected to particular scrutiny as a part of the proposed surface monitoring." However, PXP's proposed monitoring program does not address this valid concern raised by the DOGGR.

Most significantly, the RWQCB's March 26, 2004 letter included in the EIR states:

> " The Report has appropriately raised the issues of surface and groundwater contamination. ***Plains Exploration and Production must submit a plan for surface and groundwater monitoring of the facility to the Regional Water Quality Control Board pursuant to Water Code section 13267 prior to the installation of the proposed new wells.*** " (Emphasis added.)

Despite this comment, the Mitigation Measures do not require that the monitoring plan be submitted to the RWQCB for prior approval.

Injected steam can, of course, have a corrosive impact on well casings and could potentially cause loss of water wells and communication between aquifers and oil producing formations.

In this regard, the Padre March 2005 Report states at p. 1-1:

> "Based on the lateral distance of the well and the oil production activities and the vertical separation between the targeted, separate production zones, it is unlikely that the oil production activities proposed by PXP will adversely impact the quality of groundwater produced at the domestic water well of concern (King Water Well). ***Nevertheless, PXP's oil production activities could possibly impact the quality of groundwater produced at the well in question.***
>
> Therefore, a Sentry Groundwater Monitoring Well Program is proposed involving construction of a Sentry Well with similar construction details as the well of concern, and monitoring and reporting on a semi-annual basis." (Emphasis added.)

(36)

Neither the EIR nor the Padre March 2005 Report adequately discuss or assess the risk that water production wells potentially could be affected by the Project. The only mitigation measure proposed by the applicant is the installation of a *single* monitoring well with no mandatory regulatory oversight.

The Padre March 2005 Report discusses the monitoring program in the following terms in Section 4.6 at page 4-2:

> "Within 30 days of collecting the sample, testing results and evaluation will be submitted to the County of San Luis Obispo Planning and Building Department. ***The County will make copies of the semi-annual monitoring reports available to other agencies, including the RWQCB and DOGGR, as necessary.***" (Emphasis added.)

The proposed mitigation measure is clearly inadequate. The primary agency responsible for the protection of groundwater, the RWQCB, will only receive *semi-annual* monitoring reports "***as necessary***".

(36) The "program" also assumes the County Planning Department has the resources available to review, and analyze the monitoring reports and to make the scientific determinations necessary to ensure protection of water quality.

A mitigation measure should be imposed requiring PXP to prepare and obtain the advance approval of the RWQCB of a monitoring program which genuinely assesses the potential impact of its operations on water quality and requires regular reporting, as dictated by the RWQCB.

B. Water Capacity Demands

Neither EIR nor the Padre March 2005 Report discuss the Project's potential impact of PXP's use on groundwater for its operations. Although the EIR assumes that the source of water used for the injection operations will be water produced in association with oil, the Padre March 2005 contains contrary information, stating in Section 2.5 at p. 2-13:

> "***Water pumped from groundwater wells*** is stored in a 30,000-barrel reservoir lined with a bentonic clay liner. ***This water is used for steam generator make-up water and irrigation***." (Emphasis added.)

(37) If water is pumped from groundwater wells, that operation necessarily, draws down upon water available for other uses in the area. However, neither the EIR nor the Padre March 2005 Report discuss the volumes of groundwater that will be pumped from *fresh water aquifers* to be utilized in steam injection operations. Furthermore, neither the EIR nor the Padre March 2005 Report, nor any of the County staff analyses consider or address the impact on the water rights of other property owners.

C. Waste Water Disposal Concerns.

Although the EIR contemplates that waste water will generally be recycled for steam generation purposes and that excess waste water will be disposed in onsite disposal wells, the EIR indicates that the steam injection operations may generate waste water that might have to be disposed offsite. However, the EIR does not state where that water will be disposed. The May 17, 2004 second comment letter from the DOGGR notes:

> "However, our chief concern with the expanded injection operations as [sic] Arroyo Grande Field is ***the limited availability of wastewater disposal injection. PXP has recently tried, at considerable expense, to increase wastewater injection capacity with, as yet, limited success.*** PXP should be developing contingency plans for proper wastewater handling in the event that adequate wastewater injection capacity cannot be developed."

(38) Despite DOGGR's concerns, neither the EIR nor the Padre March 2005 Report discuss any such "contingency plan" or discuss how wastewater that cannot be injected will be disposed.

To the extent any waste water is disposed by discharge to surface water or groundwater, then PXP would *first* have to obtain waste discharge requirements from the Central Coast Regional Water Quality Control Board ("RWQCB"). Accordingly, at the least, a mandatory mitigation measure requiring PXP to obtain waste discharge requirements from the RWQCB *before* operations commence.

Section 22.10.180 of the Land Use Ordinance entitled "Water Quality", provides:

> "1. This section establishes a procedure for the notification of the California Central Coast Regional Water Quality Control Board (RWQCB) when a new land use or modification to an existing use may affect groundwater quality because of proposed methods of disposal, or large volumes of wastewater, or because of the disturbance of natural soil contours."

Section 22.10.180.1.B. provides:

> "B. Review Procedure. A copy of all applications as described above shall be forwarded to the regional water quality control board for review upon receipt by the department. This transmittal is intended to enable the RWQCB to:
>
> 1. Determine if the proposed use or activity is required to have discharge requirements, or is subject to other regulations of the RWQCB.
>
> 2. Contact and advise the applicant on applicable requirements, and to advise the department of any RWQCB permit requirements."

The Carroll Memo and its attachments fail to indicate compliance with this provision of the Land Use Ordinance

(39)

C. Inadequate Mitigation Measures.

Perhaps the most obvious problem with the proposed mitigation measures is their use of the term "*should*" rather than "*shall*". For example, proposed Amended Condition No. 29 (C-3, p.3) states:

> "**Amended Condition #29:** To minimize any impact to groundwater downgradient from the site, petroleum products ***should be removed*** from wastewater generated in the oil recovery process prior to reinjection. In addition, the water quality of the shallow aquifer zone beneath and downgradient from the site ***should be monitored*** as described in Section 4 of the report titled "Groundwater/Arroyo Grande Oil Field Operations Discussion" completed in March 2005. This monitoring program shall apply to both the proposed sentry well and the two existing wells previously monitored in 1993 and 2004 (Signal Extension Wells #1 and #2)." (Emphasis added, see, also, Mitigation Measure GEO-3 in the Proposed CEQA Findings, C-3, p. 52.)

Section 22.02.020 of the County Land Use Ordinance sets forth the County's Rules of interpretation. Section 22.02.020.C.1 states in pertinent part: " When used in this Title, the words "shall," "will," and "is to" are always mandatory and not discretionary. ***The words "should" or "may" are permissive.***" (Emphasis added.) Accordingly, the mitigation measures provide no assurance that the applicant, PXP will ever actually implement this very important mitigation measure.

Other Mitigation Measures are similarly deficient. For example, Mitigation Measure No. 5 (C-3, p. 12) states:

(39)

> "Prior to issuance of the first Notice to Proceed or grading permit, the applicant shall submit a copy of all permits/authorizations required by other agencies, including, but not limited to the Air Pollution Control District, the Regional Water Quality Control Board, the Department of Conservation, and the Department of Fish and Game."

However, the Proposed Mitigation Measure does not identify which specific permits, such Waste Discharge Requirements or applicable NPDES Permits from the Regional Water Quality Control Board ("RWQCB") must be obtained prior to issuance of the first Notice to Proceed or grading permit.

Mitigation Measure No. 6 (C-3, p. 13) provides:

> "Prior to issuance of the first Notice to Proceed or grading permit, ***the applicant shall retain a mitigation monitor*** approved by the county to monitor compliance with all conditions of approval." (Emphasis added.)

This measure is inadequate since the scope of the mitigation monitor's reporting obligations to the County are undefined and it is unclear whether the County can delegate this governmental function and duty to a third party. At least, the monitor should be retained by the County with the applicant, PXP, reimbursing the County for the expense.

Mitigation Measure No. 28 (C-3, p. 24) states:

> "Prior to issuance of the first Notice to Proceed or Grading permit, the applicant will comply with the requirements under a general storm water construction permit, which may be required by the RWQCB for the project. Such requirements *may* include preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP would include provisions for the installation and maintenance of Best Management Practices to reduce the potential for erosion of disturbed soils at the Project site." (Emphasis added; see also, Proposed CEQA Finding No. G.C, C-3, p. 59.)

(40)

Mitigation Measure No. 28 should require PXP to file a Notice of Intent to be covered under the General Construction Permit (and, to the extent applicable, the General Industrial Permit) and to have a SWPPP approved by the RWQCB *before* issuance of the first Notice to Proceed or Grading permit. PXP should also be required to obtain RWQCB's approval of its monitoring program.

Mitigation Measure No. 34 (C-3, p. 26) states:

> "The applicant shall submit a Notice of Intent and obtain written approval from the State Oil and Gas Supervisor prior to drilling, reworking, injecting into, plugging, or abandoning any well. ***The Notice of Intent will be reviewed by DOGGR on an engineering and geological basis. PXP will be required to submit detailed geological and engineering information to support the project.*** Approval will be subject to protection of the public and the environment by using adequate blowout prevention equipment. DOGGR will monitor potential risks from critical wells (wells located in close proximity to Price Canyon Road and the UPRR railroad) as part of their well application review process."

(41)

This measure is inadequate because it completely delegates to the DOGGR the responsibility for determining whether any of the injection wells may have any impact on groundwater and fails to provide for any review by the County or the RWQCB.

Mitigation Measure No. 35 (C-3, p. 26) states:

> "Prior to issuance of the first Notice to Proceed or Grading permit, PXP shall develop a contingency plan for proper wastewater handling in the event that adequate wastewater injection capacity cannot be developed."

(42)

A critical aspect of this Board's review and approval of this Project is the potential impact on surface and ground water. If adequate wastewater injection capacity cannot be developed on site, PXP will have to dispose the waste water generated by its operations somewhere. The impact of those disposal operations should be considered *prior* to approval. The contingency plan should be developed and reviewed prior to approval of this Project.

D. No Adequate Mitigation Monitoring Plan.

Section 900.00 of the County CEQA Guidelines provides: "The Environmental Coordinator shall conduct mitigation monitoring and reporting pursuant to CEQA and the State CEQA Guidelines. " Section 901.00 provides: "Costs incurred by Environmental Coordinator for mitigation monitoring shall be included in the fees required of the applicant, the amount of which shall be set by ordinance of the Board of Supervisors. Additional fees beyond the original amount shall be required if additional monitoring is determined to be necessary by the Environmental Coordinator."

(43)

Although the EIR sets forth a number of mitigation measures, it does not set forth a specific mitigation monitoring plan or any other mechanism for ensuring that the measures are actually implemented and maintained. Furthermore, as discussed, the Monitoring Plan does not provide for adequate oversight by the RWQCB or the DOGGR.

V. Unsupported Findings

(44)

Many of the mandatory findings that the Board has to make to approve the CUP and certify the EIR are either missing or are inadequate. As discussed above, Finding No. 3 of the Proposed Findings, regarding compliance with all applicable provisions

of Title 22 of the County Code, is not supportable, factually or legally. We do not believe that many of the other proposed findings are supported by sufficient evidence in the record before this Board.

Conclusion

This Project will undoubtedly have a significant impact on the environment, which will not be adequately mitigated by the measures proposed in the EIR. The procedural and substantive inadequacies of the EIR, as discussed above, should, at the very least, cause the Board to defer action on the EIR, direct that further assessment and revisions of the EIR be made and then re-circulate it for further public and public agency comment before this Project proceeds any further.

Once an adequate EIR is prepared, then appropriate mitigation measures can be developed and required for the Project to ensure that unnecessary and avoidable adverse impacts on the environment caused by this Project will be addressed and mitigated.

Therefore, we respectfully request that the Board:

1. Grant Mrs. Hale's appeal;
2. Deny or defer action on the CUP;
3. Require further study and revisions to the CUP and EIR;
4. Direct that a revised and adequate EIR be re-circulated for further public and public agency comment before Board takes any further action on this Project or the CUP; and
5. Develop and impose appropriate mitigation measures that fully and adequately protect the environment and the rights of property owners in the vicinity of the Project.

Please do not hesitate to contact us if you have any questions regarding the foregoing.

Very truly yours,

John J. Harris

Enclosure

cc: Ellen Carroll, County Department of Planning and Building (via facsimile)
Helen Hale
King Ventures
Plains Exploration & Production Company (via facsimile)
Interested Parties

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San Luis Obispo
California 93405

April 7, 2005

Rachel Kovesdi
King Ventures
285 Bridge Street
San Luis Obispo, CA 93401

Subject: PXP Development Plan Environmental Impacts Comments

Dear Ms. Kovesdi:

Per your request, I have reviewed the information provided on the PXP Phase IV Development Plan with a focus on the impacts related to water resources. The main concern I have is with the potential for contamination of the fresh water aquifers from the water/wastewater injection and steam flooding operations and the reduction in available water to adjacent water wells and Pismo Creek stream flow.

There are water wells located all around the existing oil field within the shallow alluvial aquifers and within aquifers in the Pismo Formation. The oil field produces from relatively shallow wells completed permeable zones within the Pismo Formation. The information I have reviewed included the Padre Associates, Inc. report "Groundwater/Arroyo Grande Oil Field Operations Discussion", dated March 2005 and the original Environmental Impact Report. My comments on the adequacy of these documents are presented below.

Impact on Fresh Water Aquifers

(1) The Padre Associates report is very cursory with respect to the planned operations and the extent of the migration of the fluids. While they say that the subsurface environment is "almost infinitely complex" there does appear to be adequate information to determine how to operate the oil field with steam flooding and water injection. This same information on the geologic stratigraphy and structure and movement of fluids should be applied to this analysis on impacts to the fresh water aquifers.

(2) The Padre report maps and cross sections are not consistent with respect to the area of the operation and do not show the entire area. Figure 4 cuts off the northern portion of the Phase IV development. The Cross-Section shows the development area extending 600 feet further south than the map on Figure 4. Figure 1 shows the development area extending 2000 feet further west than what is shown on Figure 4.

(3) In determining the potential for impact on the fresh water aquifers, it is critical to show the base of the fresh water map for the development area and maps showing the structural

(3) elevation contours of the top and bottom of the steam injected zones. A subcrop map showing the base of the alluvium within the development plan area and the underlying Pismo Formation permeable zones that are being developed would be important in establishing the separation of the developed zones from the alluvial aquifer. These types of maps would need to be specially constructed for this project. Using the 1958 map (Figure 4) and cross section (Figure 5) are inadequate to address the specific issues related to this project. In addition, it is important to have a map showing the existing water wells in the general vicinity of the project water wells and oil field.

(4) The Padre report states that the operation will inject into the Dollie sand between 300 and 1300 feet depth but later states that there is a vertical separation of 700 feet between the "King Water Well" and the depth of the oil bearing zones that are being injected. The water well under discussion in this report is the well used by Ms. Hale. Other domestic wells operating in the area may also be adversely affected by the increased steam flooding and water injection. Additional "sentry wells" may need to be located to address potential impacts to these other wells.

(5) In order to show that there is a good seal precluding leaks within the wells used for production and injection, there should be pressure testing of all wells used to demonstrate that they would not contaminate the fresh water aquifers via the well bore.

(6) There is an absence of information on water quality of the water to be used for injection, the water used for steam injection, the water used for water flooding operations, the wastewater disposed of to the oil field zones, and the quality of the wastewater generated as brine from the treatment trains. These sources need to be tested to document if there are any hazardous contaminants or constituents exceeding the drinking water standards. Without this information, it is not possible to evaluate the seriousness of any spills or leaks. For further discussions on a review of the water quality data that was provided, please see my letter of February 16, 2005.

Impacts of Increased Water Production from Oil Field wells

(7) There has been no analysis of ground water impacts resulting from the increased production from the water wells serving the oil field. The increase in water production is significant and will result in lowering of water levels in the proximity to those wells. This could also have an impact on stream flow if there is a connection between the aquifers. Therefore, a pumping test of the wells and an operations plan for the water supply wells should be presented and the impact of production from these wells on water levels and stream flow should be analyzed.

Impacts of Exporting Water to Arroyo Grande Creek Valley

(8) The proposed development includes the disposal of treated (desalinated) effluent to Arroyo Grande Creek valley. This could have an impact on available ground water or surface water flows because otherwise, this water would be available to local habitat and Price Canyon/Pismo Creek Valley water uses.

If you would like to discuss these issues further, please call.

Very truly yours,

Timothy S. Cleath
Certified Hydrogeologist #81
Certified Engineering Geologist #1102
Registered Geologist #3675

Report

Helen Hale Appeal of Planning Commission Approval
of Conditional Use Permit D010386D-
Plains Exploration & Production Company Project- Arroyo Grande Oil Field

Prepared by Charles A. Champion

April 15, 2005

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REPORT OF CHARLES A. CHAMPION

This report sets forth my comments regarding certain petroleum engineering issues relating to Helen Hale's Appeal of the County of San Luis Obispo Planning Commission Approval of the Conditional Use Permit D010386D (the "CUP"), which Plains Exploration & Production Company ("PXP") has applied for to expand its steam injection operations in the Arroyo Grande Field, and the proposed certification of the Environmental Impact Report ("EIR") for the Project and the CUP by the County Board of Supervisors.

In submitting these comments, I have reviewed the information contained in the following documents:

(1) the "Final Plains Exploration & Production Phase IV Development Plan Environmental Impact Report" (the "EIR"), dated September 2004, prepared on behalf of PXP by Padre Associates, Inc. ("Padre");

(2) The September 23, 2004 Staff Report to the Planning Commission (the "2004 Staff Report") regarding proposed EIR;

(3) Padre's "Groundwater/ Arroyo Grande Oil Field Operations Discussion" for the Project, dated March 2005 (the "Padre March 2005 Report");

(4) The April 19, 2005 memorandum from Ellen Carroll of the County Department of Planning and Building, with its attachments (the "Carroll Memo"), together with its various attachments.

A. Steam Injection Concerns

The Padre March 2005 Report describes PXP's proposed steam injection operations in the following terms in Section 2.3 at pages 2-1 and 2-2:

> "The primary method of steam injection utilized at the Arroyo Grande Oil Field is steam flooding (with some associated cyclic steaming). Steam is injected into "injection" wells where it raises the temperature of the oil reservoir, decreases the oil viscosity, and boosts the oil to "producing" wells which surround each injector. Periodically producing wells are selected to be cyclic steamed, wherein a relatively "small" volume (relative to injectors) is injected into the well allowed to soak and condense and produced back to enhance its productivity.
>
> The steam injection process at the oil field increases the temperature of the oil to reduce the characteristically high viscosity of approximately 3,500 centipoises (cp) at 90° F. At lower viscosity, the oil flows more easily. Steam is injected at pressures of 500 to 800 pounds per square inch gauge (psig). The oil and water is pumped to the surface from the well to the tank battery for separation.
>
> Steam injection and oil production occurs within the Dollie Sand Unit/production zone at depths of approximately 800 to 1,300 feet below ground surface (Sande 2005, personal communication to Padre). The production zone is the zone of oil production, steam injection, and produced water disposal."

The Padre March 2005 Report describes proposed steam injection zones in Section 2.4 at pages 2-2:

> "An injection zone is usually sandstone, a rock porous and permeable enough to accept injected fluids. Rock beds chosen for injection zones are confined by impermeable beds, like shale, which act as cap rocks, confining injected liquids in the porous beds." (Emphasis added.)

The Padre March 2005 Report is based on certain assumptions regarding the location of fresh water wells. For example, the report states in Section 3.3 at page 3-2: "Padre assumes that the KWW is producing groundwater from a zone potentially extending from depths of 10 to 100 feet." Although the report further states at page 3-2: "The presence of this thick sequence of low permeability earth materials generally creates a vertical discontinuity between the KWW production zone (alluvial deposits) and the zone of PXP's oil production activities (Dollie Sand Unit) at a depth of approximately 800 feet," the permeability data is not provided in the report.

(1) However, the statement that there is "vertical separation between the injection zone and the groundwater extraction zone, (minimum of 700 feet...)" directly contradicts the project description contained in the Summary section of the Padre March 2005 Report at page 1-1 which describes the production zone "at depths of approximately 300 to 1,300 feet below ground surface".

(2) Neither the EIR nor the Padre March 2005 Report assess the potential impact that repressurizing Dollie Sand may have on the allegedly "low permeability earth materials" which it asserts creates "a vertical discontinuity".

Steam Injection Pressures

(3) PXP's proposed steam injections operations will be conducted at relatively high pressure, that is, 500 to 800 psig. Those high pressures create the potential risk that the "cap rock" may fracture. Such fracturing could possibly cause communication with fresh water aquifers. However, this can be mitigated by regulating surface injection pressures.

(4) It has been stated in the EIR that steam injection pressures at the surface are between 500 psig and 800 psig. At the higher pressures, the pressure gradient is likely to be approaching the maximum limit of 0.8 psi/ft. Exceeding this can cause fracturing of the injection zone and possible migration of injection fluids into shallower intervals.

Initially establishing maximum allowable surface pressure for each injection well and continuous monitoring could address potential problems.

(5) Neither the Padre March 2005 Report nor the EIR contain well logs or geologic reports confirming that the "Dollie Sand Unit/production zone" is, in fact, confined by an impermeable barrier. The proposed mitigation measures and monitoring plan provide no assurance that injected liquids will be appropriately monitored to ensure that the flow of injected liquids will be confined to the production zone.

(6) Recommended Approach

- Analyze data both surface and subsurface to assure no injection fluid migration into shallower fresh water intervals.
- Review "Notices of Intent" to DOGGR to drill new wells, alter casing, abandon wells, etc.
- Review DOGGR approvals and conditions.
- Review and monitor DOGGR required well testing for injection wells
  - Well sonic logs (cement bond logs) and induction logs
  - Radioactive tracer surveys
  - Downhole pressure surveys - Analyses
  - Pressure "fall-off" surveys - Analyses
  - Casing integrity tests
- Review other surveys as required and monitor reports to DOGGR (form 110's, etc.)
- Water monitoring wells(s)
  - Analytical parameters
  - Fluid levels
- Prepare brief reports as necessary

B. Waste Water Disposal.

(7) Although the EIR contemplates that waste water will generally be recycled for steam generation purposes and that excess waste water will be disposed in onsite disposal wells, the EIR indicates that the steam injection operations may generate waste water that might have to be

(7) disposed offsite. However, the EIR does not state where that water will be disposed. The May 17, 2004 second comment letter from the DOGGR notes:

> "However, our chief concern with the expanded injection operations as [sic] Arroyo Grande Field is the limited availability of wastewater disposal injection. PXP has recently tried, at considerable expense, to increase wastewater injection capacity with, as yet, limited success. PXP should be developing contingency plans for proper wastewater handling in the event that adequate wastewater injection capacity cannot be developed."

Despite DOGGR's concerns, neither the EIR nor the Padre March 2005 Report discuss any such "contingency plan" or discuss how wastewater that cannot be injected will be disposed.

C. Qualifications

I am a registered Petroleum Engineer in California and President of Tower Petroleum Corporation. My business address is 10101 Slater Avenue, Fountain Valley, CA 92708. I have a Geological Engineering degree from the Colorado School of Mines (1952) and a Masters of Science degree in petroleum engineering from the University of Southern California (1962).

I have been engaged in many different areas within the oil industry since 1954 when I began work with Richfield Oil Corporation. Since that time, I have worked for Mobil Oil Corporation, Hamilton Brothers Oil Company and the State of Alaska as pipeline coordinator for the Trans-Alaska pipeline.

Beginning in 1977, I was managing partner and founder of Northern Technical Services. In that company I was responsible for all petroleum services in California and Alaska. Presently, I am President and Chief Executive Officer of Tower Petroleum Corporation. In that capacity, I am an independent oil and gas producer and operator. I provide engineering and management of oil production, lease cleanup, well abandonment and soil remediation of oil fields in California. I also served as a Board Member and Chairman of Fortune Petroleum Corporation.

In many of the companies for which I have worked, I have been involved in disposal of oil field waste and have become knowledgeable of good oil field practices with respect to such disposal.

Charles A. Champion, P.E.

KING VENTURES

MEMORANDUM

DATE April 6, 2005
TO Supervisors Bianchi, Achadjian, Lenthall, Ovitt and Patterson
CC John King, Dave Watson
FROM Rachel Kovesdi – King Ventures

RE: PXP Phase IV Development Plan Appeal

Dear Chairperson Bianchi, Members of the Board:

We are coordinating an appeal of the Planning Commission's September 23, 2004 approval of the Plains Exploration and Production (PXP) Phase IV Development Plan on behalf of Helen Hale, the tenant on our neighboring property. The concerns which generated this appeal can be described in terms of two issue areas: water quality and water rights.

(1) 1. Water Quality: The PXP EIR states that Phase IV "common drilling depths will range from 500 to 1,500 feet". The March 2005 supplemental document prepared by Padre Associates ("Groundwater/Arroyo Grande Oil Field Operations Discussion") indicates that both steam injection and oil production at the Arroyo Grande field occurs "at depths of approximately 300 to 1,300 feet below ground surface". This depth also serves as the disposal zone for produced water. These depths are well within the range of the local aquifer serving domestic water wells surrounding the oil field. We question the adequacy of the EIR's treatment of water quality impacts to the local groundwater aquifer and the possibility of communication between zones.

(2) The water quality analysis is very cursory with respect to the planned operations and the extent of the migration of the fluids. While the consultant says that the subsurface environment is "almost infinitely complex" there does not appear to be adequate information to regarding steam flooding and water injection operations, the underlying geologic structure and movement of fluids, or potential impacts to the fresh water aquifers.

(3) There is also an absence of information on water quality of the water to be used for steam injection, the water used for water flooding operations, or the wastewater disposed of to the "produced water disposal" zones. These sources need to be tested to document if there are any hazardous contaminants or constituents exceeding the drinking water standards.

(4) The Padre analysis draws the conclusion that there is a vertical and horizontal "discontinuity" between the King Water Well (KWW) in question and the PXP production zone. The DOGGR spill reports of 2002 and 2003, as well as the mature oaks on the Tract 2388 site which fell and emitted an oily substance from their root zone in 2002 seem to contradict this assertion.

(5) The Regional Water Quality Control Board (RWQCB) should review all sentry well testing reports to determine whether thresholds have been exceeded or statistically significant data trends are present. That agency should also have jurisdiction over any remedial actions. There is no indication that PXP has ever submitted to any RWQCB oversight processes, including Reports of Waste Discharge (ROWD's),

Industrial Storm Water General Permits or Storm Water Pollution Prevention Plans (SWPPP). The Regional Board may also take jurisdiction over off-site discharges associated with the proposed Flood Control District exportation of treated produced to Lopez Lake (see discussion below)

(6) 2. Water Rights: The EIR and supplemental document should include a full analysis of the impact of the increased steam production associated with the Phase IV Development Plan, as well as the proposed exportation of produced water to Lopez Lake, as these activities relate to recharge. The proposed development includes the disposal of treated (desalinated) effluent to Arroyo Grande Creek valley. This could have an impact on available ground water or surface water flows because otherwise, this water would be available to local habitat and Price Canyon/Pismo Creek Valley water uses.

(7) Applicability of SB 610 (Section 10912 of the CA State Water Code) to this project should also be considered. Preliminary calculations based on the PXP Phase IV project description as stated in Section 3 of the EIR indicate an increase in production of 10,600 barrels of steam per day. At 44 gallons per barrel, that translates into 522.4 acre feet per year in addition to their current water use of 295.7 afy. Therefore, using the most conservative figures allowed for by the Water Code, the water demand associated with this proposal is the equivalent of 1,045 single family residential units. Based on these calculations, it's apparent that the County is required to prepare an SB 610 assessment for inclusion in this EIR.

In closing, we believe that the certification of this EIR by your Board would expose the County to significant liability. We urge you to direct staff to require a more comprehensive analysis of water issues by the EIR consultant. Thank you for you attention.

Sincerely,

Rachel K. Kovesdi

Rachel K. Kovesdi
Project Planner

King Ventures 285 Bridge Street San Luis Obispo, CA 93401 (805) 544-4444 (805) 544-5637 FAX

Cleath & Associates
Engineering Geologists
Ground Water
(805) 543-1413
1390 Oceanaire Drive
San Luis Obispo
California 93405

February 16, 2005

Rachel Kovesdi
King Ventures
285 Bridge Street
San Luis Obispo, CA 93401

Subject: Impacts of proposed Arroyo Grande Oil Field Activities on Ground Water

Dear Ms. Kovesdi:

The proposed Arroyo Grande Oil Field Expansion Project includes the use of steam and water flooding and the drilling of additional wells to produce oil, inject steam and water and to inject wastewater from the operation. The environmental documents addressing the impact of such activities on the ground water are very limited in their analysis and do not provide an adequate assessment of this potential impact. This letter explains why the assessment is not adequate.

(1) The Arroyo Grande Oil Field produces oil and water from permeable zones that are both shallow and tectonically deformed. As a result, pumping from these wells or injection into these wells will have a tendency to migrate into shallow water bearing zones. The proposed project enhancing oil production by increasing the pressures in the wells and by forcing oil to migrate using heat (steam) and water pressure. Based on other oil fields in the area, diluent may also be used to thin the oil viscosity. Other additives used for enhancing the yield from the flooding operation should be clearly stated in the project description.

(2) Unless the pressure and migration of fluids is modeled and a detailed understanding of the geology is provided, we cannot know what the impact will be. Recent spills have occurred from these operations and others can be expected to occur. Just saying that the oil company has means to clean it up after it occurs is not enough.

(3) King Ventures has several wells along the Pismo Creek Valley and water quality tests have been performed on these wells. The well closest to the oil field (Well #1 on Figure 1) has a much higher total dissolved solids concentration than any of the other wells.(1400 mg/l as compared to between 510 and 730 mg/l in all of the other wells tested on the property). This higher salinity is very likely due to ground water contamination from the oil field activities.

(4) Other water quality constituents that are notable in the analyses reported in the environmental documents include the very low pH in some of the oil company wells and increasing concentrations of arsenic and total dissolved solids (Shell #2). The water temperatures in some of the test results are slightly elevated as compared to normal ground water temperatures in the area suggesting that heat may be migrating into the fresh water aquifer from steam operations. Thallium was noted as exceeding the maximum contaminant level in one well in the water quality tests but not in the text. The text also stated that "groundwater samples were collected from two water supply wells located within the Project Site and operated by PXP"..... and "there has been no significant increase in metals or TDS concentrations" (p. 5.7-6) but it is evident from the data

that arsenic and total dissolved solids have **increased more than 300 percent** in their Well #2 (see table titled "PXP Arroyo Grande Field Water Well Testing" in Appendix I).

(5) As the well field operations alter the physical and chemical environment in the subsurface, some constituents may be mobilized from within the oil-bearing sediments and travel toward areas where ground water is tapped for potable purposes. Selenium, arsenic, boron and other salts are known to be present in some of these sedimentary beds. These salts become increasingly soluble in higher temperature water and with lower pH conditions.

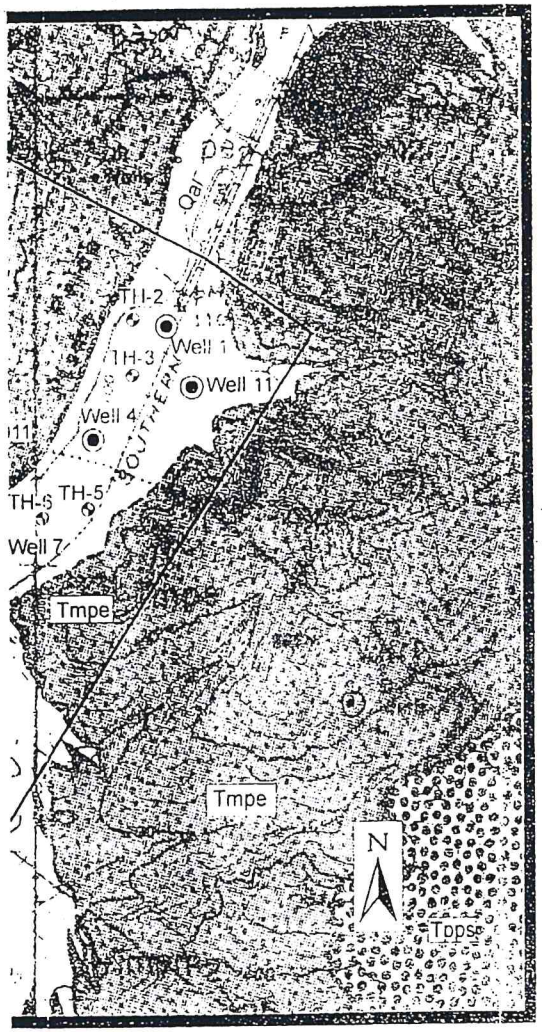
(6) Health complaints by the resident on the King property have been attributed by the resident to the water and possibly to oil field contaminants. The water test for oil in the water is insufficient to determine whether or not it is due to oil field contaminants for some of the reasons presented above. The dermatitis may have been caused by any number of factors and we suggest that a more extensive laboratory analysis of the water should be run, including general mineral constituents, trace inorganic constituents, physical parameters, and boron and hydrogen sulfide and MBAS (a test to indicate soap compounds).

(7) In summary, the EIR document does not provide a sufficiently thorough assessment of the potential impacts to the ground water of this project that involves primarily subsurface water processes in an area of shallow contact between oil and fresh water resources. The data presented does not support their conclusions. The data used is not complete enough to evaluate the potential impacts. The project description does not provide sufficient detail regarding the quality of the steam and water flood waters and the wastewater that is to be re-injected, nor does it provide enough detail as to where the work is to occur and what the geologic conditions are that would confine the impacts. As experienced previously, contamination may also occur where old wells or test holes have not been properly abandoned. A review of this possibility was not discussed.

If you would like to discuss these issues further with me, please call and we can meet to address any other concerns.

Very truly yours,

Timothy S. Cleath
Registered Geologist #3675/ Certified Engineering Geologist #1102/ Certified Hydrogeologist #81



Map Geology: Hall, 1973, Geology of the Arroyo Grande Quadrangle, CDMG Map Sheet 24

Map Scale: 1 inch = 1,000 feet

Legend:

- 1J1 — Older water well
- Well 9 — New water well
- TH-8 — Test hole

Qal - Younger alluvium
Pismo Formation:
- Tpps - Squire Member
- Tppb - Belleview Member
- Tppg - Gragg Member
- Tmpm - Miguelito Member
- Tmpe - Edna Member

Monterey Formation:
- Tmmb, Tmmc, Tmmsl

Figure 1

Well/Test Hole Locations
Avila Ranch, Price Canyon
King Ventures

Cleath & Associates

Cleath & Associates
Engineering Geologists
Ground Water
(805) 543-1413
1390 Oceanaire Drive
San Luis Obispo
California 93405

Date: March 4, 2005
To: Rachel Kovesdi, King Ventures
Fax. 805-544-5637
From Tim Cleath
Cleath & Associates

Regarding: PXP Phase IV Development Plan Discussion memo

1. Note that water quality parameters tend to increase in concentration when higher temperatures are present such as in a steam injection program.
2. Additional analysis should include

   a subsurface flow simulation of the steam injection and pumping with a presentation of the geologic stratigraphy and structure that may influence the migration of the oil with respect to the alluvial aquifer and any known fresh water bearing zones within the oil field.

   A characterization of the water quality of the water in the injected zones and the source water to be injected. This should lead to an analysis of the potential for contributing salts as well as hydrocarbons to fresh water aquifers and Pismo Creek.

   An impact analysis related to the increased production from the oil field water wells and the ground water resources of the area. This impact should include an estimation of water level changes within the ground water bearing sedimentary beds due to oil field fresh water production during drought year conditions.

   Address the potential subsidence issues related to oil removal.

3. Mitigation measures may include:
   Salt removal from ground water where increased salinity is noted, and appropriate disposal

   Not injecting into sedimentary beds that may be connected to fresh water aqufers.

   Minimizing the production from the oil field water wells and instead reuse the steam water produced at the oil wells.

   Not disposing of the desalinated excess water to Arroyo Grande Creek valley.

4. Monitoring program improvements would involve more extensive ground water quality testing, the installation of monitoring wells in the aquifers that may be impacted by the increased oil field development. Also measurement of water levels should be a part of the monitoring and the frequency of the monitoring should be determined as at least twice per year. Stream flow monitoring may also be helpful should any impact to the stream be anticipated.

41/41

Cleath & Associates
Engineering Geologists
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(805) 543-1413
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San Luis Obispo
California 93405

Date: March 4, 2005
To: Rachel Kovesdi, King Ventures
Fax: 805-544-5637
From: Tim Cleath
Cleath & Associates

Regarding: PXP Phase IV Development Plan Discussion memo

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41/111

STATE OF CALIFORNIA, RESOURCES AGENCY
ARNOLD SCHWARZENEGGER, GOVERNOR

DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES
5075 South Bradley Road • Suite 221 • SANTA MARIA, CALIFORNIA 93455
PHONE 805 / 937-7246 • FAX 805 / 937-0673 • WEB SITE conservation.ca.gov

May 25, 2005

Steven McMasters, Environmental Specialist
County of San Luis Obispo
Dept. of Planning & Building
County Government Center
San Luis Obispo, CA 93408

Re: Plains Exploration & Production Expansion Project

Dear Mr. McMasters,

Thank you for meeting with us to discuss the PXP production and steamflood expansion in the Arroyo Grande oil field. During the meeting you asked us to clarify a couple of issues. I hope the following helps you during your deliberations.

In our letter dated May 17, 2004 we commented, "PXP has recently tried to, at considerable expense, increase water injection capacity, with as yet little success..." We would like to clarify that PXP was trying to find additional water injection capacity outside of the producing intervals so as to enhance the steam injection process. Due to the fact that oil is continuously being removed from the reservoir and only the produced water returned, a net loss of fluid volume continues to be created. Consequently, PXP maintains sufficient water disposal capability in the project area.

The Department of Conservation, Division of Oil, Gas and Geothermal Resources (Division) has primary responsibility for regulating underground injection projects of Environmental Protection Agency (EPA) Class II fluids in California. During the permitting process for a new or expanded underground injection project the Division sends pertinent information concerning the project to the local Regional Water Quality Control Board for their comments. This procedure is a requirement of the State permitting process. The RWQCB comments are addressed in the final project approval letter.

In 1983, the Division was granted primacy to regulate Class II underground injection projects in California by the EPA. To receive primacy, the state had to agree to follow certain processes when evaluating and permitting underground injection projects. All new or expanded Class II underground injection projects in California follow the required process. Because the project in Arroyo Grande is a substantial expansion of the current injection project, it is the Division's intention to follow these

procedures. Section 1724.6 through Section 1724.10 of the California Code of Regulations (CCR) specifies project data that must be submitted for review prior to project approval and various notifications and periodic data submissions and tests that are required during the life of the project. After required data is submitted and evaluated, the RWQCB is notified and asked to comment on the project. Then after 15 days a notice is put into a local newspaper of general circulation notifying the public of the project and asking for comments. After 14 days, if no comments are received or the comments concerns are addressed the project is approved and a project approval letter is sent outlining all of the general requirements for the underground injection project.

After the underground injection project is approved then individual injection wells can be permitted. No injection is permitted without a project approval. Therefore, at first there may not be any injection wells in the approved injection project. Each injection well is individually evaluated for compliance with the conditions of the project approval and various mechanical integrity requirements. On the individual well permits specific requirements are outlined, such as well mechanical integrity test (MIT) schedules and maximum surface injection pressure limitations. Typically a pressure test is conducted on an injection well before injection commences, a MIT is performed soon after the beginning of injection and then as required thereafter. Our inspectors periodically inspect the oil field leases and one of their duties is to check the surface pressure and conditions of the well. By law, injection volumes and pressures are reported to the Division on a monthly basis. A project review meeting is conducted with the project engineer every year or so to review the project performance and discuss any regulatory concerns that come up.

Thank you for the opportunity to clarify some of the issues been raised. Please feel free to contact me for additional information at any time.

Sincerely,

William E Brannon

William E. Brannon
Deputy Supervisor

cc: Kris A. Vardas

HOLLISTER & BRACE
A PROFESSIONAL CORPORATION

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RETIRED FOUNDERS
WILLIAM A. BRACE
J. JAMES HOLLISTER III

May 17, 2005

Steve McMasters
EIR Project Manager
Department of Planning and Building
San Luis Obispo County
County Government Center, Room 310
San Luis Obispo, CA 93408-2040

Re: Groundwater Supply Issues
Arroyo Grande Oil Field
Plains Exploration and Production
Phase IV Development Plan (CUP D010386D)

Dear Mr. McMasters:

This office represents Plains Exploration and Production Company (PXP). The purpose of this letter is to clarify a potentially misleading statement in the final EIR for the referenced project. The statement can be read as implying that the project may need to rely on fresh water pumped from groundwater wells for steam generation purposes. According to our client, this is not the case.

Section 3.4.2.4 of the EIR (entitled "Produced Water Management") states that "[i]f necessary, water pumped from existing groundwater wells can be used to augment the water supplied to the [steam] generators." While this statement may be literally correct, it misleadingly implies that fresh water may be needed to generate steam for thermal injection. In fact, PXP does not envision any need to use fresh water for this purpose. PXP's operating experience in the field is that produced water volumes greatly exceed the volumes of water required for the steam generators (i.e. by a ratio of approx. 3:1). Thus, PXP does not intend to use any water pumped from water wells for the production of steam for thermal injection. PXP will instead rely exclusively on produced water for these operations.

(1)

(1) The groundwater that is pumped from the three existing groundwater wells is used primarily for watering the landscaping at the site and for on-site bathrooms. Every one to two months, depending on the weather, water is also used to stock the fresh water pond on the site. In addition, small amounts of water are used during well work for cleaning and mud and cement mixing. None of the groundwater from the wells has been used to produce steam for enhanced oil recovery operations. This practice will not change with the proposed project, and fresh water usage is expected to remain within the historical range or "baseline."

(3) King Ventures and its attorneys erroneously assume that groundwater will be used for purposes of steam generation. Relying on this assumption, they contend that the draft EIR is inadequate, among other reasons because the environmental document lacks information regarding the increased demand that the proposed project will place on fresh water aquifers. King erroneously calculates that the proposed project will require 522.4 acre feet per year of fresh water over and above PXP's current water use. As stated above, the proposed project will rely exclusively on produced water for its thermal injection needs. The project's fresh water requirements are expected to fall within the range of historical use.

(4) King and its attorneys further assert that SB 610 (Water Code § 10912) applies to the project, and that the County is required to undertake a comprehensive analysis of water supply issues. This too is incorrect. SB 610 imposes requirements on lead agencies when evaluating the impacts of very large projects on public water systems. (Public Resources Code § 21151.9; Water Code § 10910; CEQA Guidelines § 15083.5.) For example, whenever a lead agency prepares an EIR for a project with a water demand equal to or greater than the amount of water required by a 500 unit residential project, the agency must conduct a comprehensive water supply assessment. As a general rule of thumb, one acre foot of water per year will serve two residential households. Thus, before the requirements of SB 610 are triggered by Water Code § 10912(a)(7), a project must be determined to have a water demand equal to or greater than 250 acre feet per year. As explained above, PXP's proposed project will not place any additional significant demand on local groundwater supplies and, as such, it is not subject to SB 610's requirement for a water supply assessment.

(5) King and its attorneys also assert that the alleged demand that the project will place on local groundwater supplies will cause injury to the water rights of other property owners in the area who depend upon these supplies. In making this assertion, King suggests that the County is obligated to analyze water right impacts under CEQA. Aside from the fact that this project will not significantly impact groundwater supplies, any alleged potential for injury to water rights is not a proper subject for CEQA review.

(5) The statutory scheme under CEQA requires an analysis of significant impacts to the physical environment, not impacts that might be felt by individual users of a common resource. Public Resources Code §§ 21000, et seq. Competing claims between different stakeholders in a common resource is not a proper subject for an environmental document prepared pursuant to CEQA. CEQA Guidelines § 15131.

(6) Finally, clarification that the proposed project will rely exclusively on produced water for its thermal injection needs and will not significantly impact groundwater supplies does not require re-circulation of the EIR for public comment. The legal standard for re-circulation is as follows: Public Resources Code § 21092.1 requires re-circulation whenever "significant new information" is added to an EIR following the close of public comment, but before final certification. In *Laurel Heights II* (6 Cal. 4th 1112), the California Supreme Court provided guidance on what constitutes "significant new information" so as to trigger the need for recirculation of an EIR. The Court stated that "the addition of new information to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a *substantial* adverse environmental effect . . . ." The Court stated that recirculation is not required where the new information added to the EIR "merely clarifies or amplifies . . . or makes insignificant modifications in . . . an adequate EIR." Id. at 1129-1130 (Emphasis in original). See also CEQA Guidelines § 15088.5. Clarification that PXP's proposed project will rely exclusively on produced water for its thermal injection needs and will not place any significant additional demands on groundwater resources is therefore not "significant new information" within the meaning of Section 21092.1. The absence of recirculation will not deprive the public of a meaningful opportunity to comment upon a substantial adverse environmental effect, since there is none.

Very truly yours,

HOLLISTER & BRACE
A Professional Corporation
Steven Evans Kirby
Peter L. Candy

By _____
Steven Evans Kirby

SEK/sgt

ENTRIX

Excellence in Environmental Consulting Since 1984

2140 Eastman Avenue,
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(Fax) 658-0612

Memorandum

Date: May 4, 2005
To: Steve Rusch
From: Dan Tormey
Regarding: Arroyo Grande Water Quality Comments

(1) **The are less than significant impacts to surface water quality from the Phase IV Development Plan.** The County's EIR contractor evaluated subsurface geology and stratigraphy and other geologic and hydrogeologic data in detail in both the EIR and the March 2004 report *Groundwater/Arroyo Grande Oil Field Operations Discussion*. The findings were clear: owing to the vertical separation of the producing zones from the freshwater aquifer, and to the horizontal separation between the steam injection zone and supply wells, there would not be a significant effect on surface water quality as a result of the development plan. As stated in the March 2005 Report, the lateral discontinuity of the upper portion of the Dollie Sand Unit leads to the oil production activitites at the closest point to the King Well occuring at depths of not less than 800 feet. Also, Figures 4 and 5 the March 2005 Report demonstrate that the King Well is located greater than one mile south of the southern boundary of the PXP Phase IV Development Plan area. The County's finding also corresponds to more than 25 years of steam drive operations at the field without impacts to the freshwater aquifer.

(2) The California Department of Conservations, Divison of Oil, Gas, and Geothermal Resources (DOGGR) is the statewide agency responsible for overseeing oilfield operations, and establishing regulations and standards to prevent damages to freshwater aquifers. The regulations and standards address injection pressure, injected water quality, and zones of injections. The project will operate in full compliance with these regulations and standards.

(3) No permits or approvals are required from the California Regional Water Quality Control Board, because there will be no discharges to surfacewater or the freshwater aquifer as a result of the steam drive. The water is being injected back in the formation from which it was drawn. In fact, as a result of water treatment at the surface, the injected water will be of better quality.

Taken together, these facts lead to the conclusion that the Phase IV Development Plan will have less than significant impacts to water quality.

(4) **No mitigation is required for less than significant impacts, and therefore the County should not expand the groundwater monitoring program.** Despite the finding of less than significant impacts to water quality, the County is proposing a groundwater monitoring program of sentry wells placed between the steam injection zone and the water supply wells. This provision should be removed from the mitigation conditions, since no mitigation is required. As demonstrated in the following comment, the monitoring plan is flawed, because there are naturally-occurring sources of oil to the freshwater aquifer and surface waters. Therefore the monitoring will be unable to distinguish natural sources of oil from those caused by the development plan.

(5) **The naturally-occurring oil seeps will confound interpretation of monitoring results.** Price Canyon has been an area of naturally-occuring oil seeps since before the first Spanish explorers came through the area. Records of that time indicate that the seeps enter what is now called Pismo Creek, and affect the quality of the water. The seeps are well-documented, and are known to cause total petroleum hydrocarbons (TPH) in groundwater of approximately one part per million (1 mg/l). The seeps can be more active after heavy precipitation, and therefore have an episodic affect on surface water or groundwater quality.

These naturally-occurring sources of oil are currently in contact with the freshwater aquifer and surface water in Pismo Creek. Even absent any oil development in Price Canyon, there would still be a likelihood of encountering oil in a production well or in Pismo Creek.

Any groundwater or surface water monitoring program must recognize that these naturally-occurring seeps can lead to chemical signals in water that are difficult to distinguish from the oil in the production zone. Without this recognition, any detection of TPH in a well may be attributed to the oilfield, and lead to a temporary reduction in oil production or other unwarrented response. It will likely be up to PXP to prove that the detection is naturally-occurring, and as such they will suffer economic loss. At a minimum, the monitoring plan should assume that a TPH detection in groundwater is most likely due to the natural source; that is, PXP should first be presumed innocent. Oil production should be allowed to continue until it can be shown the detection is not naturally-occurring.

(6) **The oilfield is a conforming land use that has existing water rights; future use is within these rights.** The comments suggesting that the Phase IV development project cannot use groundwater fail to recongize that the oilfield has current water rights,

including current provisions to use groundwater as makeup water for the steam drive system. The anticipated water needs are within these current allocations. Rather than limiting the oilfield's water rights, it must be recognized that future water use by others cannot impair the right of the field to its water.

ENTRIX

Excellence in Environmental Consulting Since 1984

2140 Eastman Avenue,
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Ventura, CA 93003
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(Fax) 658-0612

Memorandum

Date: May 12, 2005
To: Steve Rusch
From: Dan Tormey
Regarding: Additional Arroyo Grande Water Quality Response

The are no measured impacts to surface water quality from oilfield practices at the Arroyo Grande oilfield. The February 16, 2005 letter from Cleath and Associates to Trachel Kovesdi, submitted as part of the King appeal, hypothesizes that detections of arsenic and total dissolved solids in water supply wells are the result of oilfield activities. The letter also suggests that thalium and pH may also be due to steam injection and oil extraction. This rather creative suggestion ignores certain facts of subsurface hydrogeology and geochemistry.

(1)

First, the subsurface geology and stratigraphy and other geologic and hydrogeologic data demonstrate a vertical separation of the oil producing zones from the freshwater aquifer of not less than 800 feet, and a horizontal separation between the steam injection zone and the supply wells of not less than one mile. The Dollie Sand Unit from which oil is produced is entirely separated from the alluvial deposits of Pismo Creek from which the water supply wells pump. Taken together, the hydrogeology of the site demonstrates that the quality of the freshwater aquifer is determined by shallow conditions, not the conditions in the deeper production zones.

Second, the water quality features described in the letter are not consistent with an oilfield source. The letter notes "that arsenic and total dissolved solids have increased more than 300 percent in their Well #2". The changes noted are an increase in arsenic from 0.012 to 0.0339 mg/l, and in total dissolved solids from 200 to 640 mg/l. All of these values are below drinking water standards, and as such to not violate any water quality standards. These consituents, as well as thalium and pH, are not indicators of oilfield activity. For example, the most basic indicator of oil, total petroleum hydrocarbons, was not detected in any water quality samples. Although temperatures in excess of 200 degrees and elevated pressure can lead to higher solubility of dissolved solids, the samples were only 70 to 75 degrees. The letter notes that this temperature "is slightly elevated compared to normal ground water temperatures in the area", but offers no data whatsoever to validate this contention.

The evidence is actually very clear: no compounds indicative of oil were detected, and compounds indicative of rock types or surface land uses were detected. Therefore, the increase is in arsenic and total dissolved solids, while not significant, are more readily explained by surface conditions. That is, either the rock types in the shallow alluvial freshwater aquifer causes the arsenic and total dissolved concentrations, or surface activities such as grazing, herbicide use, or other uses lead to the concentrations. It strains credulity to suggest these increases are due to steam injection.

(2)

Furthermore, Price Canyon has been an area of naturally-occuring oil seeps since before the first Spanish explorers came through the area. The seeps are well-documented, and are known to cause total petroleum hydrocarbons (TPH) in groundwater of approximately one part per million (1 mg/l). The seeps can be more active after heavy precipitation, and therefore have an episodic affect on surface water or groundwater quality. These naturally-occurring sources of oil are currently in contact with the freshwater aquifer and surface water in Pismo Creek. Therefore, even if petroleum is detected in a freshwater well, it will be due to the surface petroleum.

The Feburary 16, 2005 letter further attempts to link total dissolved solids in King Ventures wells to the oilfield. For the same reasons described above, this connection simply does not make sense. No total petroleum hydrocarbons were detected in these wells, and elevated levels of dissolved solids would not be an expected outcome of oil development. This data is not presented in the letter, and there is no way to assess the accuracy of the statement or the data.

mrs

3140 Telegraph Road, Suite A
Ventura, Ca 93003-3238
phone 805.289.3920
fax 805.2893935

May 13, 2005

Mr. Steve Rusch
Plains Exploration & Production, Inc.
5640 South Fairfax Avenue
Los Angeles, CA 90056

Re: Arroyo Grande Phase IV Development Plan Environmental Impact Report

Dear Steve:

(1)

MRS has reviewed the September 2004 Environmental Impact Report (EIR) prepared by San Luis Obispo County for the Plains Exploration and Production, Inc. (PXP) proposed Phase IV Development Plan at the Arroyo Grande Oil Field. In general, we have found that the EIR meets all of the requirements of the California Environmental Quality Act (CEQA), and has adequately addressed the impacts associated with the proposed project.

A. Background

PXP has applied to San Luis Obispo County to expand their existing operations at the Arroyo Grande Oil Field. PXP is proposing to install 95 new production wells and 30 new steam injection wells. PXP is also proposing to install an additional three steam generations, which will be used to generate steam for enhanced oil recovery operations.

(2)

San Luis Obispo County prepared an EIR for the proposed project and on September 23, 2004 the San Luis Obispo County Planning Commission certified the EIR and approved the Conditional Use Permit. The Planning Commission decision was appealed to the Board of Supervisors. All of the appeal issues associated with the project are related to water resource issues including, groundwater and surface water impacts associated with the Arroyo Grande operations.

In response to the appeal from Ms. Helen Hale, San Luis Obispo staff prepared a Groundwater/Arroyo Grande Oil Field Operations Discussion document (March 2005) that addressed the issue of groundwater contamination associated with the oil field operations.

On April 15, 2005, San Luis Obispo County received a letter from King Ventures that raised a number of water resource issues associated with the project. The issues included in the letter focused on potential impacts to surface and groundwater.

(2) As a result of these letters, PXP asked MRS to review the EIR and associated documents to assess their adequacy in meeting the requirements of CEQA.

B. Comments on the EIR

This section of the letter provides specific comments on the EIR that San Luis Obispo may want to consider addressing prior to the Board of Supervisor hearing. The main issue with the EIR is that the document is inconsistent with how it discusses the use of groundwater for use as make-up water for the steam generators. It is our understanding from PXP that groundwater from the onsite wells has not been used for make-up water for the steam generators and that this practice will not change with the proposed project.

Since the proposed project will not use groundwater for the steam generators, then the project would not have any impacts on groundwater use. As such, the EIR does not have to address the issue of impacts to groundwater use from the proposed project.

(3) The inconsistencies identified in the EIR with regard to groundwater use for steam generation are identified below with suggested changes.

Section 3.4.2 Existing Operations – This section should provide a clear description of the current uses for fresh water at the project site. This fresh water is pumped from existing wells at the site and is an issue that has been raised by King Ventures.

The groundwater that is pumped from the wells is used for watering the landscaping at the site and for the bathrooms at the site. Every 1 – 2 months depending on the weather, water is used to stalk the fresh water pond on the site. In addition, small amount of water are used during well work for cleaning and mud and cement mixing. Historically none of the groundwater from the wells has been used to produce steam for enhanced oil recovery operations.

Section 3.4.2.4 Produced Water Management – The last sentence on page 3-11 should be deleted since water pumped from the existing wells is not used to augment the water supplied to the steam generators.

Section 3.4.3.3 Produced Water Management – A sentence should be added to this section that states that no water from the three groundwater wells on the property will be used to augment water that is supplied to the steam generators.

(3) ***Section 2.5 PXP's Produced Water Management (Groundwater/Arroyo Grande Oil Field Operations Discussion document (March 2005)*** – The last sentence on page 2-13 should be changed to state that water pumped from the groundwater wells is used for irrigation and pluming only. None of the pumped groundwater would be used for steam generator make-up water.

C. EIR Organization

Given that the Planning Commission's certification of the EIR has been appealed to the Board of Supervisors, the Final EIR can still be modified. As such, San Luis Obispo County may want to consider the following organizational modifications to the Final EIR.

(4)

1. Incorporate the letter received on the EIR since the Planning Commission Hearing into Section 9 – Response to Comments of the EIR. Each of the comments in these letters would have to be numbered and responses would have to be developed.

2. Including any updated Groundwater/Arroyo Grande Oil Field Operations Discussion Document as an appendix in the EIR. This could be included with the existing Appendix 1 – Results of Groundwater Analysis.

Should you have any further questions or need additional information give me a call.

Best Regards,

John F. Peirson, Jr.
Principal

7.0 REFERENCES

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Title 23 Chapter 15 of the CCR and Division 7 Chapter 3 of the Water Quality Code.

APPENDIX A

ANALYSIS OF GEOLOGICAL SEPARATION OF PRICE CANYON OIL DEVELOPMENT FROM THE FRESH WATER AQUIFER, PRICE CANYON, ARROYO GRANDE, SAN LUIS OBISPO COUNTY

For

Mr. Steve Rusch
Plains Exploration & Production Company

Prepared by
Pacific Geotechnical Associates, Inc.
4800 Easton Drive, Suite 101
Bakersfield, Californai, 93309

June 2, 2005

ANALYSIS OF GEOLOGICAL SEPARATION OF PRICE CANYON OIL DEVELOPMENT FROM THE FRESH WATER AQUIFER, PRICE CANYON, ARROYO GRANDE, SAN LUIS OBISPO COUNTY

SUMMARY

The objective of this study was to analyze the geologic relationships of the Price Canyon oil field and the local fresh water aquifer. The fresh water aquifer in Price Canyon is limited to a narrow veneer of alluvium along Pismo Creek.

It is highly unlikely that the oil would migrate vertically from the oil-bearing rock to the aquifer near the surface due to depth and intervening low permeability strata. The cap rock near the top of the structure has been breached at shallow depths as is evidenced by the natural surface oil seeps on Section 31. While it is possible that oil from the natural seeps could, and probably have entered the stream, the author has seen no evidence to suggest it has migrated into the aquifer based on the lack of hydrocarbons detected in water well sample tests.

The tar sands that form the seal on the reservoir are self-healing and historically have not shown evidence of fracturing. Well construction practices in the past have been effective in stopping oil form migrating up a well annulus. Future completions will also adhere to the effective construction requirements the Division of Oil Gas and Geothermal Resources.

The steam injection operations will most likely result in the formation of a steam chest or desaturated zone at the top of the reservoir. Oil movement will predominantly be horizontal or downward as it moves toward lower pressure around producing wells and is drawn downward by gravity. Historically much more fluid has been removed from the reservoir than has been injected, and future operations do not include over injecting to reverse that condition.

As a result of the analysis of the geology, the physics of the operation and historic evidence and experience, there is no evidence to suggest that PXP proposed development plan and steaming operations would have any affect on the fresh water aquifer.

INTRODUCTION

The objective of this study was to analyze the geologic relationships of the Price Canyon oil field and the local fresh water aquifer. The study reviews the stratigraphic and areal relationship between the local aquifer and the planned operations in the Arroyo Grande

oil field. It also reviews the possible upward migration routes of oil through fractures or up the annulus of well bores.

This report also reviews the potential for steam injection operations to affect fresh water aquifers, looking at steam injection mechanics and the potential for oil to be pushed to the surface.

This brief report is intended to address the potential effects and to show evidence that supports its conclusions that the planned operations will not affect aquifer in Price Canyon. This report begins with a discussion of the general geology and the groundwater aquifer in the area. It is critical to identify all fresh water aquifers before any potential impact can be assessed.

The data used in preparation of this report includes data supplied by the Client, data already in the possession of Pacific Geotechnical Associates, Inc., data obtained from government agencies and personal communications with the Client's employees and others.

For the purpose of this report reference to the "Project area" refers to the Phase IV development outline labeled "Approximate Project Area" on Map 1.

DISCUSSION

Local Geology

As mapped by Hall (1973) the surface outcrops in the region are composed of hard sandstones, pebbly sands and conglomerates of the Edna Member and the brown clays and silts of the Meguelito Member of the Pismo formation (Map 2). The environment of deposition is described as an inner neritic (shallow marine) shelf (Stanley, K.O. and Surdam, R.C., 1984). This interpretation is based on mega and trace fossils and sedimentary structures.

The local structure is formed by a northwest-southeast trending syncline which is paralleled to the north by a related anticline (see Map 2 and Cross Section A-A'). The oil-bearing sands of the Edna Member dip below the alluvial valley to the southwest of the project area.

Fresh Water Aquifer

The area of investigation is located in the Pismo Creek Valley Subbasin of the Pismo Hydrologic Subarea. Groundwater in the subbasin is restricted to surface alluvium and has been deemed by California Department of Water Resources (2002) to be of poor quality due "faults and mineralized zones, residual saline deposits, and local sea water intrusion." See Appendix 1 for a discussion of groundwater in the area.

The fresh water aquifer that could potentially be impacted by operations in the Arroyo Grande oil field is limited to a narrow veneer of alluvium along Pismo Creek (see Map

3). Wells drilled outside of the alluvial fill encounter marine rocks from the surface and because of the natural salinity of the marine sediments have little chance of encountering fresh water aquifers. Analysis of the SP log in "Titan" 68 just outside of the alluvial fill indicates total dissolved solids (TDS) of 3,000 ppm from the shallowest readings which are about 60 feet below the surface. (see Log Illustration 1 and Appendix 2).

Water wells within the alluvial valley are located along Price Canyon Road (see Map 3). The nearest active well, Well 10 is more than 6,000 feet from southern limit of the Project area. Analysis of water samples taken from this well report that no petroleum hydrocarbons were detected (TPH) in this well in November, 2004.

The nearest inactive water well, Well 1, is more than one-half mile from the southern limit of the Project area. The well is reported to be less than 100 feet deep and is developed in the alluvium. The well has tested poor quality water (high total dissolved solids), but the sample was not tested for petroleum hydrocarbons (Tim Cleath, 2005, per. comm.).

POTENTIAL IMPACT ON FRESH WATER AQUIFERS

Location of Water Wells and Stratigraphy

The oil-bearing rocks of the Pismo formation are projected to be seven to eight hundred feet below the surface in the area of the water wells on Section 6. Driller's logs and cores in wells in the northern half of Section 6 describe many tens to hundreds of feet of shale, silt and shell (low permeable rock) above the oil-bearing sands. Any naturally migrating oil in the area would migrate through the sands toward the top of the structure to the north on Section 31. It is unlikely that the oil would migrate vertically from the oil-bearing rock to the aquifer near the surface.

The cap rock near the top of the structure has been breached at shallow depths as is evidenced by the natural surface oil seeps on Section 31. It is possible that oil from these natural seeps could enter the stream and find their way into the aquifer.

Possible Migration Paths – Fractures, Well Annulus

Tar sands form the seal that trap the oil accumulation in the underlying sands. Tar sands are pliable and are self-healing when disturbed by structural deformation and are not likely to fracture. The tar in the pore space forms a sealing surface even if the sedimentary units are offset. Examples of analogous oil fields that have similar geologic conditions and tar seal traps and which are also being steam injected are Kern River and Cymric oil fields located in the San Joaquin Valley, California.

Standard industry and California Division of Oil Gas and Geothermal Resources approved practices for well design, tubular goods, and cementing the casing serve to prevent the upward escape of down-hole fluids. Injection pressures are closely monitored to keep them well below the fracture gradient of the rock. Thirty years of successful

steam injection and producing operations in the Arroyo Grande oil field demonstrate the integrity and safety of the engineering practices and ongoing operations (Graph 1).

To the authors knowledge there have been no reported new seeps or increased seep activity in the thirty years of thermal operations in the field.

POTENTIAL FOR STEAM INJECTION IMPACT

Mechanics of Steam Operations

Steam supplies heat which lowers the viscosity of oil allowing it to flow more readily toward the well bore. In a mature reservoir such as the oil-bearing rocks of the Pismo formation (locally known as the Dollie Sand) more steam is required to maintain heat in the reservoir and to reach parts of the reservoir that have not been heated before.

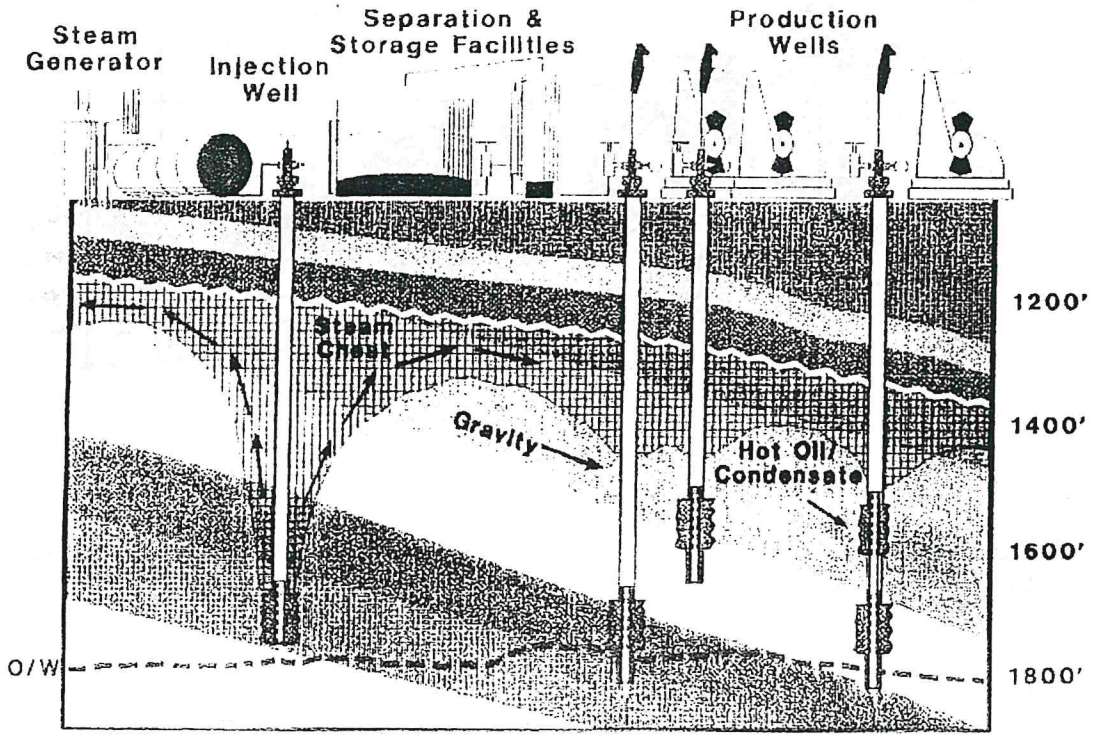


Figure 1. Diagramatic illustration of steaming operation. Steam from injectors and cyclic steamed producers finds its way upward in the reservoir toward the steam chest (gas rises over fluid). Water vapor condenses as the steam cools and heat from the steam lowers the viscosity of the oil. Gravity and lower pressure around the well bore motives the oil toward the producing wells. Picture from "Fieldtrip Guide: from the Sierras to the Sea." April 1992. Bob Timmer and Mike Wracher, editors.

As steam is injected a "steam chest" forms (see Figure 1). This is a part of the reservoir that has been drained of most of its fluid. Initially these pockets are thin and localized. As the oil flows downward toward producing wells the steam chest grows at the top of the sand.

Eventually the steam chest will expand to engulf the entire reservoir, usually from the top down. Evidence of local desaturation is found in wireline logs in the main part of the field in the center of Section 31. (see Cross Section B-B').

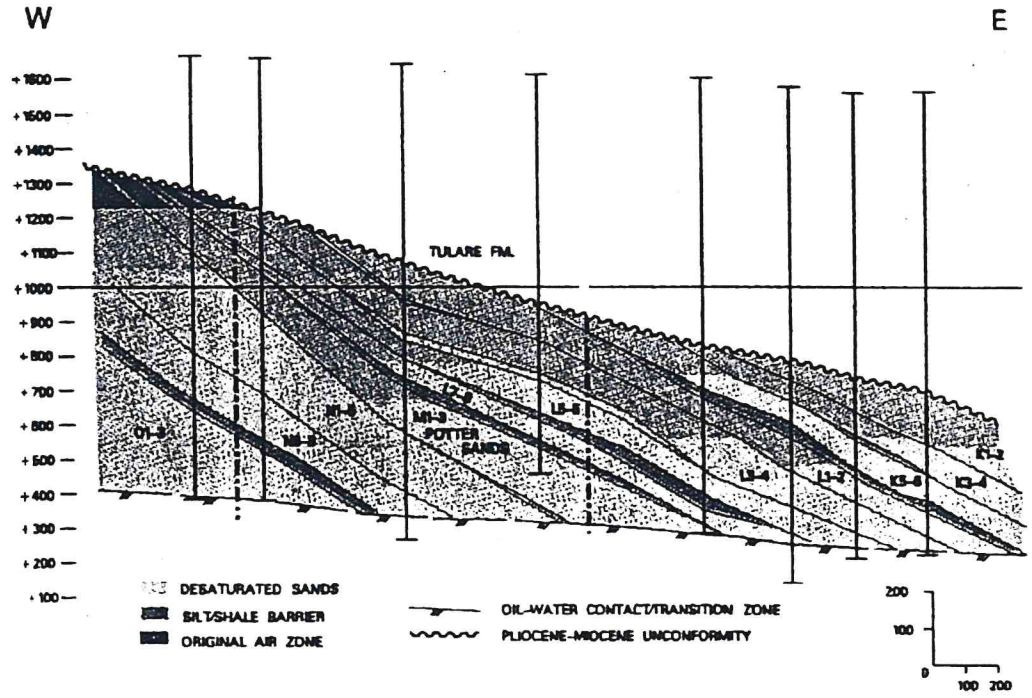


Figure 2. Example of a mature oil reservoir with multiple steam chests (pink areas) at the top of the oil reservoir. Green indicates areas of remaining oil saturation.

Potential for Oil to Be Pushed Toward the Surface

With the formation of a steam chest it is unlikely that any oil will travel upward toward the aquifer. Producing wells are constantly drawing down the pressure in the reservoir, and historically much more fluid has been taken out than has been put in. Graph 2 illustrates the amount of fluid that has been taken out versus the amount that has been injected, and it shows that the planned operations do not include reversing that condition.

Conclusion

After a review of the planned project, historical experience of the operator in the field, the producing mechanism of the reservoir and the spatial relations of the aquifer and producing zones, no evidence has been found that suggests the proposed operations will have any affect on the groundwater aquifer.

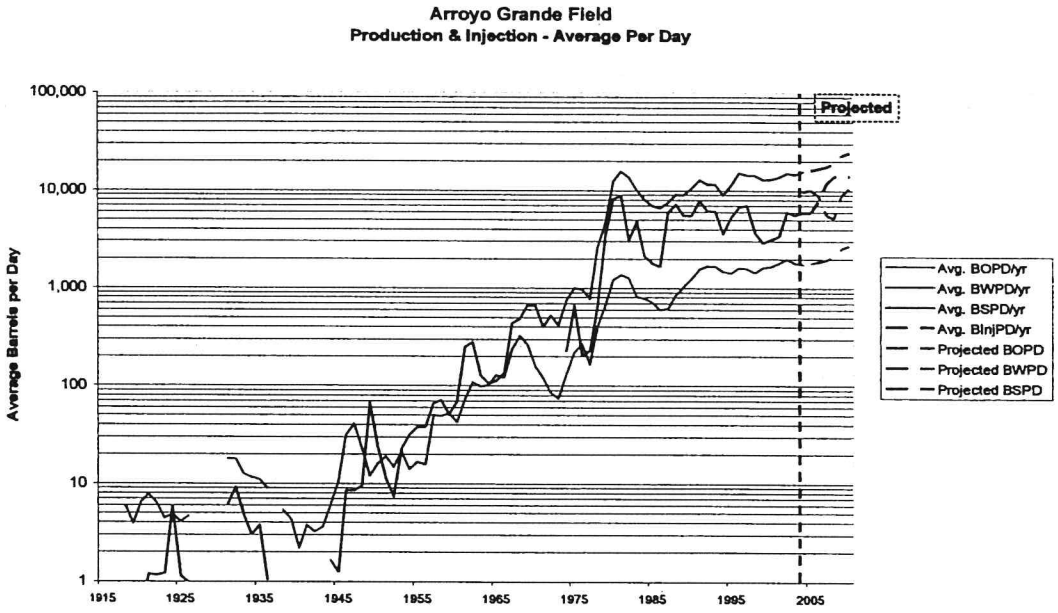
Randall T. Metz, R.G.
President

REGISTERED GEOLOGIST
RANDALL T. METZ
6/3/07
No. 3995
STATE OF CALIFORNIA

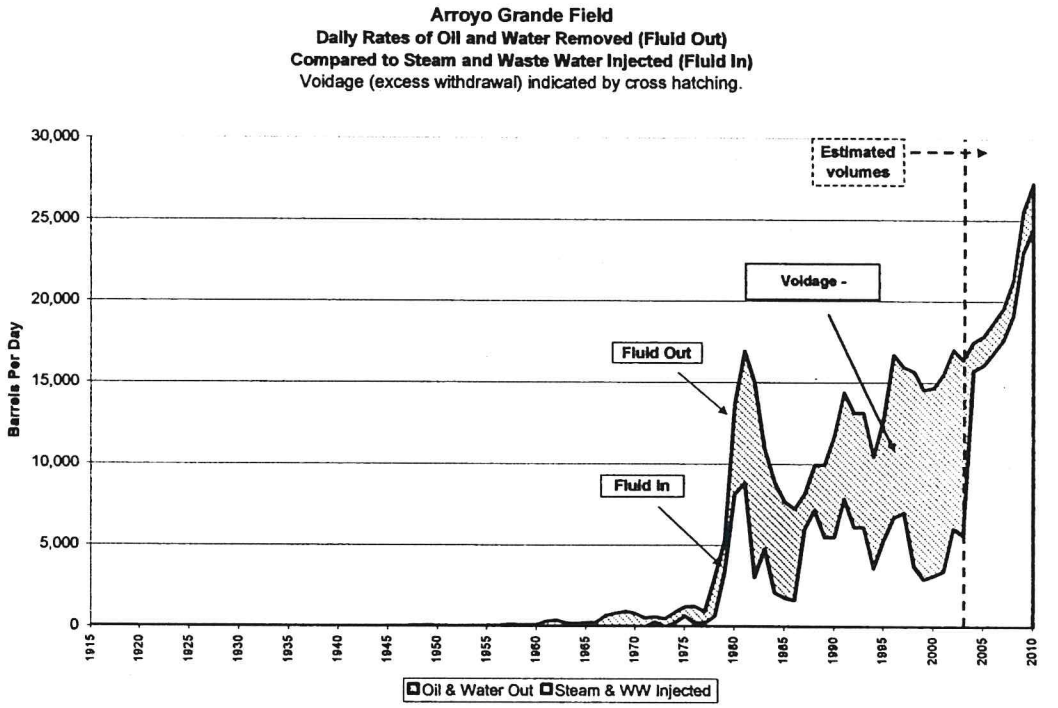
Warrantee

The findings and recommendations listed above are based on a brief review of data obtained from sources named above and PGA's experience in the Arroyo Grande area. It is by no means a comprehensive study and the facts and conclusions are subject to revision as more data are analyzed. The preparer does not warrant the accuracy of the results or predictions contained herein.

This report is proprietary and confidential, to be delivered to, and intended for the exclusive use of, the above named client only. The preparer assumes no responsibility or liability for the reliance herein or use hereof by anyone other than the above named client.



Graph 1. Historical oil and water production and steam injection (solid lines) and projected volumes (broken lines).



Graph 2. Historical fluid withdrawal and fluid injection along with projected volumes (right of the vertical dashed line).

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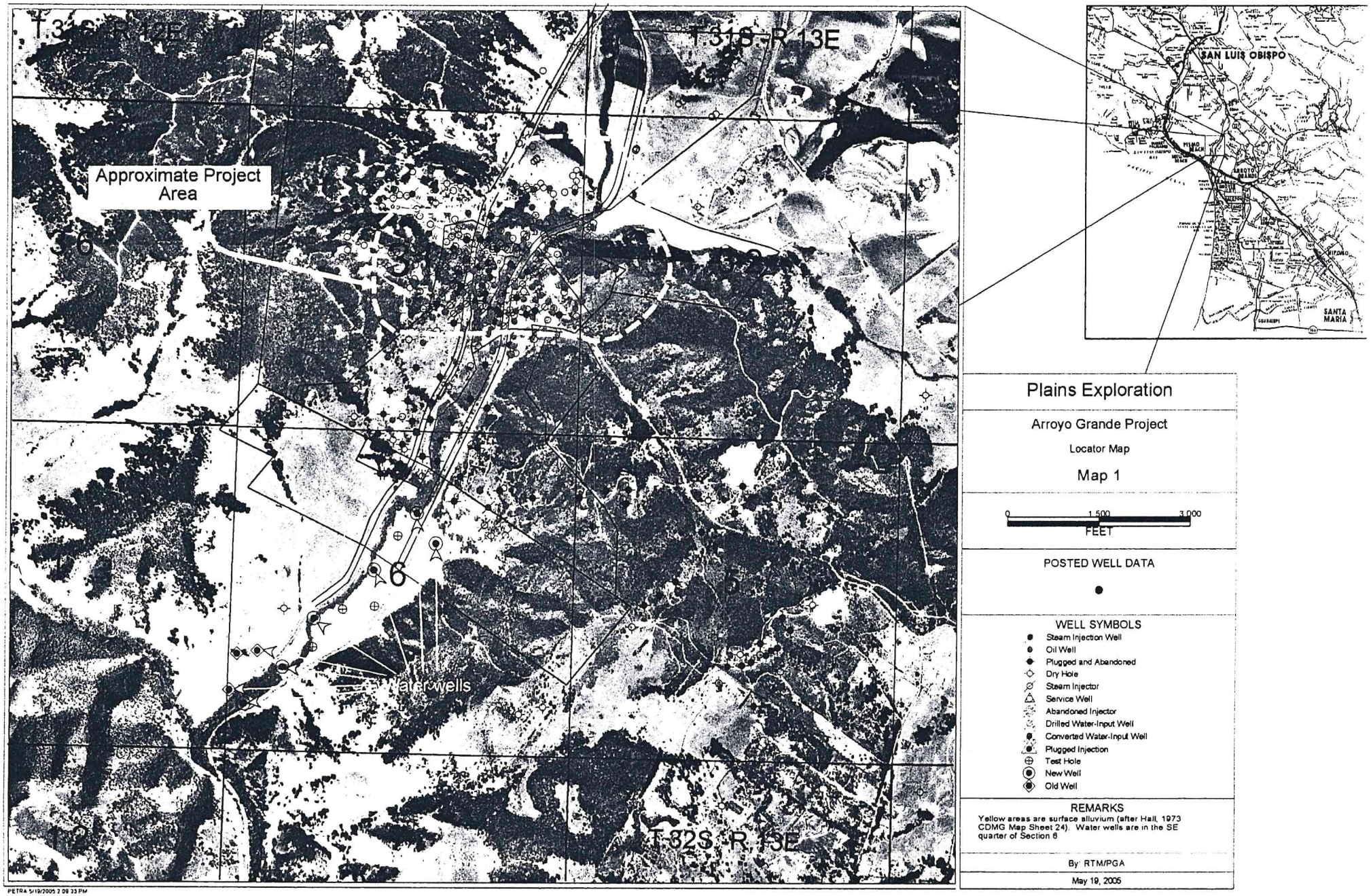
Stanley, K.O. and Surdam, R.C., 1984, The Role of Wrench Fault Techtonics and Relative Changes of Sea Level on Deposition of Upper Miocene – Pliocene Pismo Formation, Pismo Syncline, California *in* A Guidebook to the Stratigraphic Tectonic, Thermal, and Diagenetic Histories of the Monterey Formation, Pismo and Huasna Basin, California: SEPM Guidebook No. 2, p.21-37.



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Plains Exploration

Arroyo Grande Project

Locator Map

Map 1

0 1,500 3,000
FEET

POSTED WELL DATA

WELL SYMBOLS

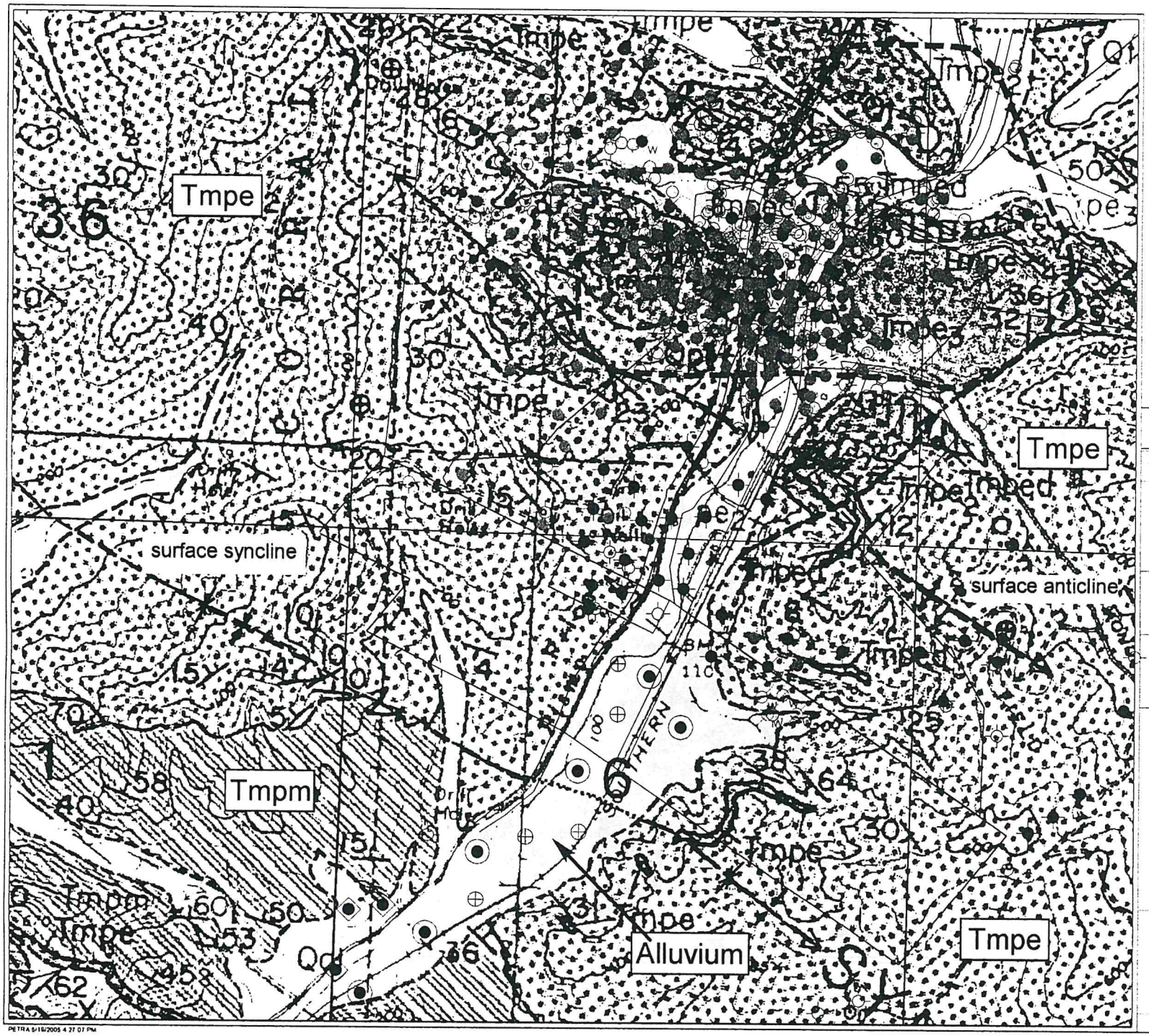
- Steam Injection Well
- Oil Well
- Plugged and Abandoned
- Dry Hole
- Steam Injector
- Service Well
- Abandoned Injector
- Drilled Water-Input Well
- Converted Water-Input Well
- Plugged Injection
- Test Hole
- New Well
- Old Well

REMARKS

Yellow areas are surface alluvium (after Hall, 1973 CDMG Map Sheet 24). Water wells are in the SE quarter of Section 6

By: RTM/PGA

May 19, 2005



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Plains Exploration

Arroyo Grande Project

Map 2

Surface Geology

Hall, 1973 CDMG Map Sheet 24

0 1,000 2,000
FEET

POSTED WELL DATA

WELL SYMBOLS

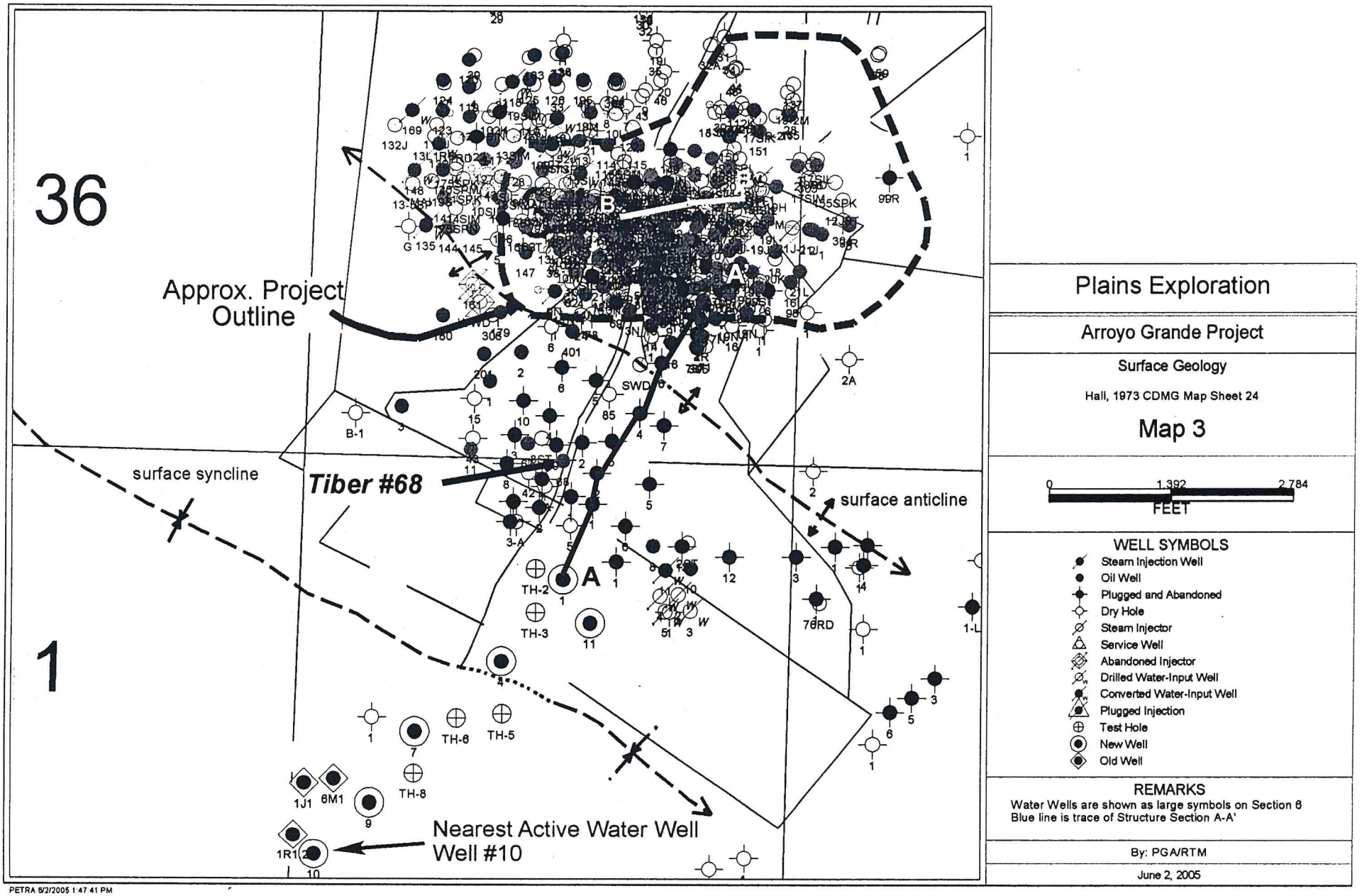
- Steam Injection Well
- Oil Well
- Plugged and Abandoned
- Dry Hole
- Steam Injector
- Service Well
- Abandoned Injector
- Drilled Water-Input Well
- Converted Water-Input Well
- Plugged Injection
- Test Hole
- New Well
- Old Well

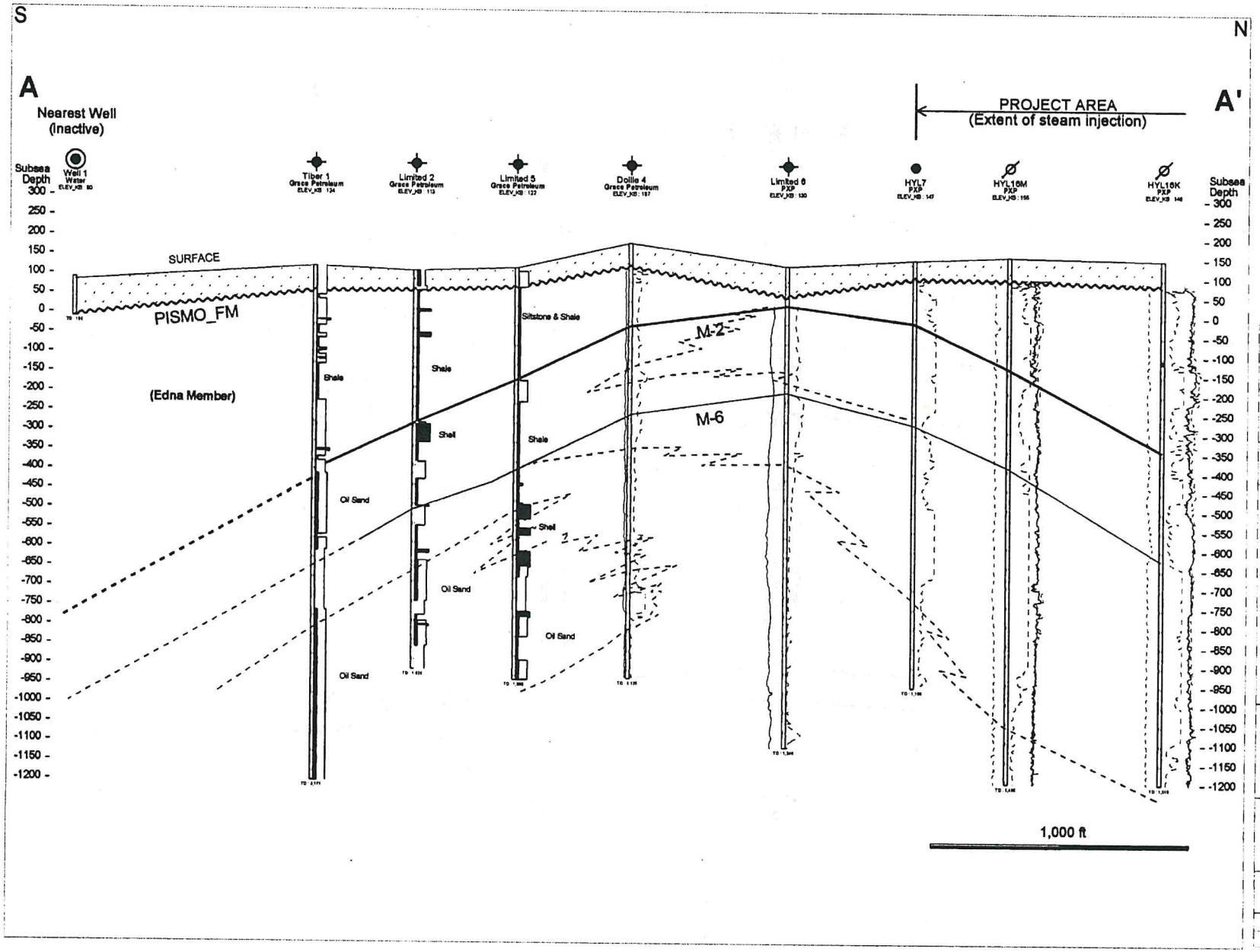
REMARKS

Stippled and hatchured areas depict Pismo Fm outcrop
Yellow areas are surface alluvium
Tmpm = Miguelito Member
Tmpe = Edna Member

By PGA/RTM

May 19, 2005


36
1
Approx. Project Outline
surface syncline
Tiber #68
surface anticline
Nearest Active Water Well
Well #10
A
A'
B
B'
SWD
TH-2
TH-3
TH-5
TH-6
TH-8
B-1
2A
3-A
76RD
99R
1J1
6M1
1R1
10
Plains Exploration
Arroyo Grande Project
Surface Geology
Hall, 1973 CDMG Map Sheet 24
Map 3
0
1,392
2,784
FEET
WELL SYMBOLS
Steam Injection Well
Oil Well
Plugged and Abandoned
Dry Hole
Steam Injector
Service Well
Abandoned Injector
Drilled Water-Input Well
Converted Water-Input Well
Plugged Injection
Test Hole
New Well
Old Well
REMARKS
Water Wells are shown as large symbols on Section 6
Blue line is trace of Structure Section A-A'
By: PGA/RTM
June 2, 2005
PETRA 6/2/2005 1:47:41 PM



Plains Exploration & Production Co

Arroyo Grande Project

Structure Cross Section

A - A'

Horizontal Scale = 76.8
Vertical Scale = 50.0
Vertical Exaggeration = 1.5x

LOG CURVES

- 0 — 100 SP (MV) Spontaneous Potential CUTOFF = -50.00
- 0 — 150 GR (GAPI) Calibrated Gamma-Ray SC
- 0 — 100 SRES (OHMM) Shallow Resistivity
- 0 — 100 DRES (OHMM) Deep Resistivity
- 0 — 10 LITHOLOGY Lithology from Drillers Logs
- 0 — 7 LITHOILFLAG (UNITLESS) YES = 1.0 NO = NULL CUTOFF = 0.00
- 1.65 — 2.65 RHOB (GM/CC) RHOB
- 0.6 — 0 NPHI (ft3/ 31 Thermal Neutron Porosity (Ratio M

TOPS AND MARKERS

- SURFACE
- PISMO_FM
- M-1 DEFAULT
- M-2
- M-6

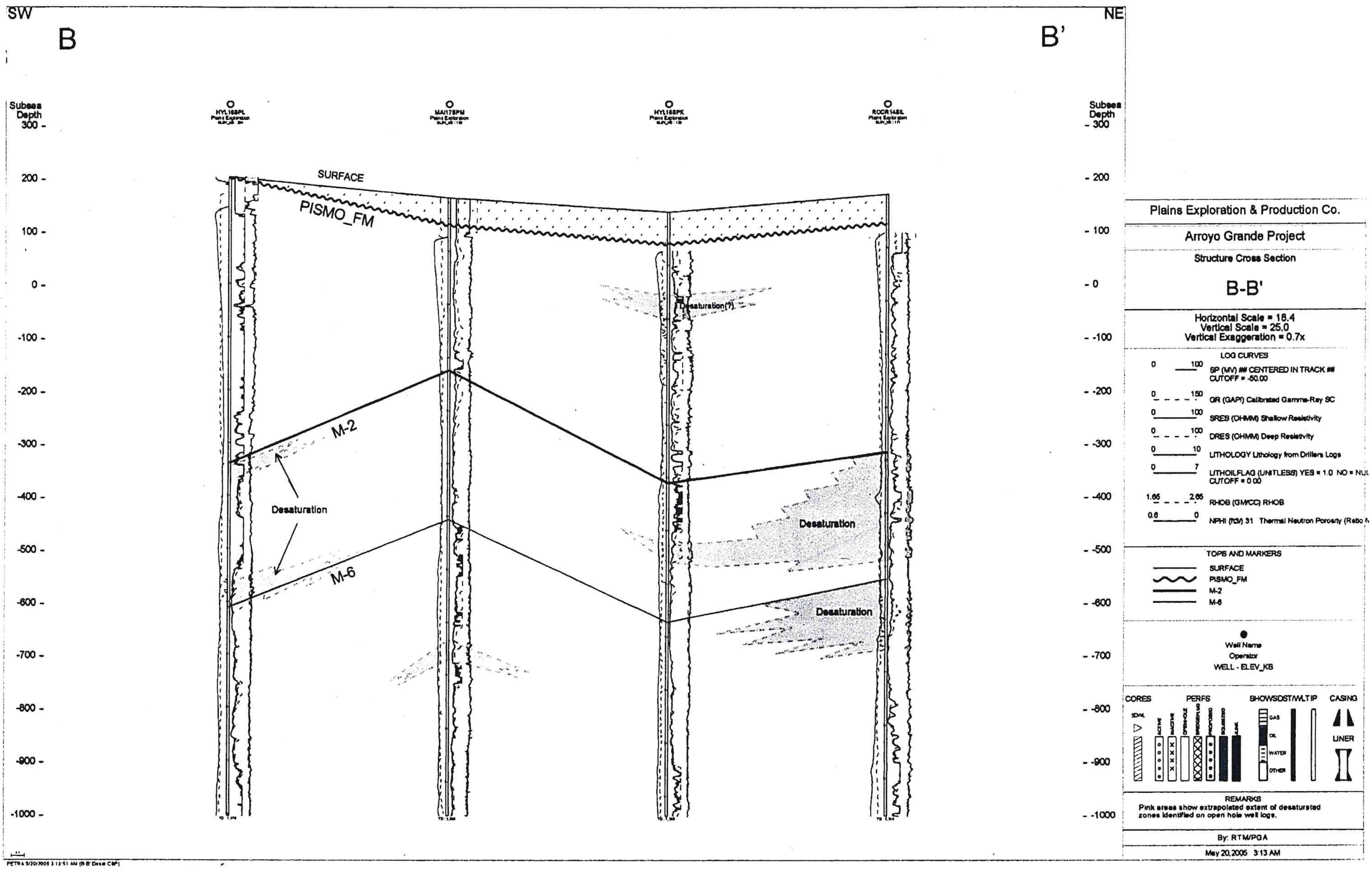
Well Name
Operator
WELL - ELEV_KB

REMARKS

North - South structure cross section down Pismo Creek Valley.

By: RTM/PGA

May 20,2005 3:24 AM


SW
B
NE
B'
Subsea Depth
SURFACE
PISMO_FM
M-2
M-6
Desaturation
Desaturation(?)
Plains Exploration & Production Co.
Arroyo Grande Project
Structure Cross Section
B-B'
Horizontal Scale = 18.4
Vertical Scale = 25.0
Vertical Exaggeration = 0.7x
LOG CURVES
SP (MV) ## CENTERED IN TRACK ## CUTOFF = -50.00
GR (GAPI) Calibrated Gamma-Ray SC
SRES (OHMM) Shallow Resistivity
DRES (OHMM) Deep Resistivity
LITHOLOGY Lithology from Drillers Logs
LITHOILFLAG (UNITLESS) YES = 1.0 NO = NUL CUTOFF = 0.00
RHOB (GM/CC) RHOB
NPHI (ft3/) 31 Thermal Neutron Porosity
TOPS AND MARKERS
SURFACE
PISMO_FM
M-2
M-6
Well Name
Operator
WELL - ELEV_KB
CORES
PERFS
SHOWS/DST/WLTIP
CASING
LINER
REMARKS
Pink areas show extrapolated extent of desaturated zones identified on open hole well logs.
By: RTM/PGA
May 20,2005 3:13 AM

APPENDIX 1

Groundwater in the Pismo Creek Valley Subbasin

The following are agencies with jurisdiction in the Project area. Included are conclusions regarding the region from the respective agencies.

CRWQCB
The Arroyo Grande oil field lies with the Pismo Creek Valley Subbasin of the Estero Bay hydrologic unit within the Central Coast Region of the California Regional Water Quality Control Board (Figure Appendix-1).

CDWR
The California Department of Water Resources authored a report describing basins and watershed in 2002 in a document titled "Water Resources of the Arroyo Grande – Nipomo Area." The areal extent is shown in Figure Appendix-2 from the map presented as Plate I. The aquifer descriptions from this report are cursory and brief.

> "Groundwater flows southwesterly in Arroyo Grande Valley and Nipomo Valley Subbasins."[9]
> [9] Groundwater levels in wells in the Pismo Creek Valley Subbasin are not monitored by the county; therefore, no data were available to determine groundwater elevations. (Executive Summary, p. 7)

> "Pismo Creek Valley Subbasins. Groundwater occurs in the alluvium. Thickness of the alluvium ranges from negligible to about 60 feet near the southern boundary. Groundwater is unconfined. In some parts of the subbasins, the alluvium may be saturated only during rainfall." (Chapter V, Hydrogeology, p. 55)

> "No recent groundwater quality data were available for Pismo Creek Valley Subbasin. The historical data consist of analyses from seven wells sampled in the 1950s and 1960s. Given the data limitations, no trend analysis or box plots were developed for this part of the basin. The data indicate that groundwater quality in Pismo Creek Valley Subbasin generally did not meet Drinking Water Standards for sulfate, chloride, and TDS. Concentrations of sulfate ranged from 740 to 1 mg/L; chloride, from 766 to 49 mg/L; and TDS, from 2,390 to 790 mg/L. Nitrate concentrations in two wells exceeded the MCL. The dominant ions were sodium and chloride-bicarbonate or sulfate-chloride. A study by the Department in 1965 concluded that the poor quality of groundwater in lower Pismo Creek resulted from the presence of faults and mineralized zones, residual saline deposits, and local sea water intrusion. Sampled well depths ranged from 30 to 102 feet." (Chapter VI, Water Quality, p. 122)

The California Department of Water Resources maintains a website (http://well.water.ca.gov/) that shows water elevations for one well in section 19, T31S, R13E (H001), approximately two miles north of the Arroyo Grand oil field and one well four miles to the south in 19, T32S, R13E (Q002). Both of these wells are too far removed from the project area to provide useful data for constructing a local water elevation and aquifer model.

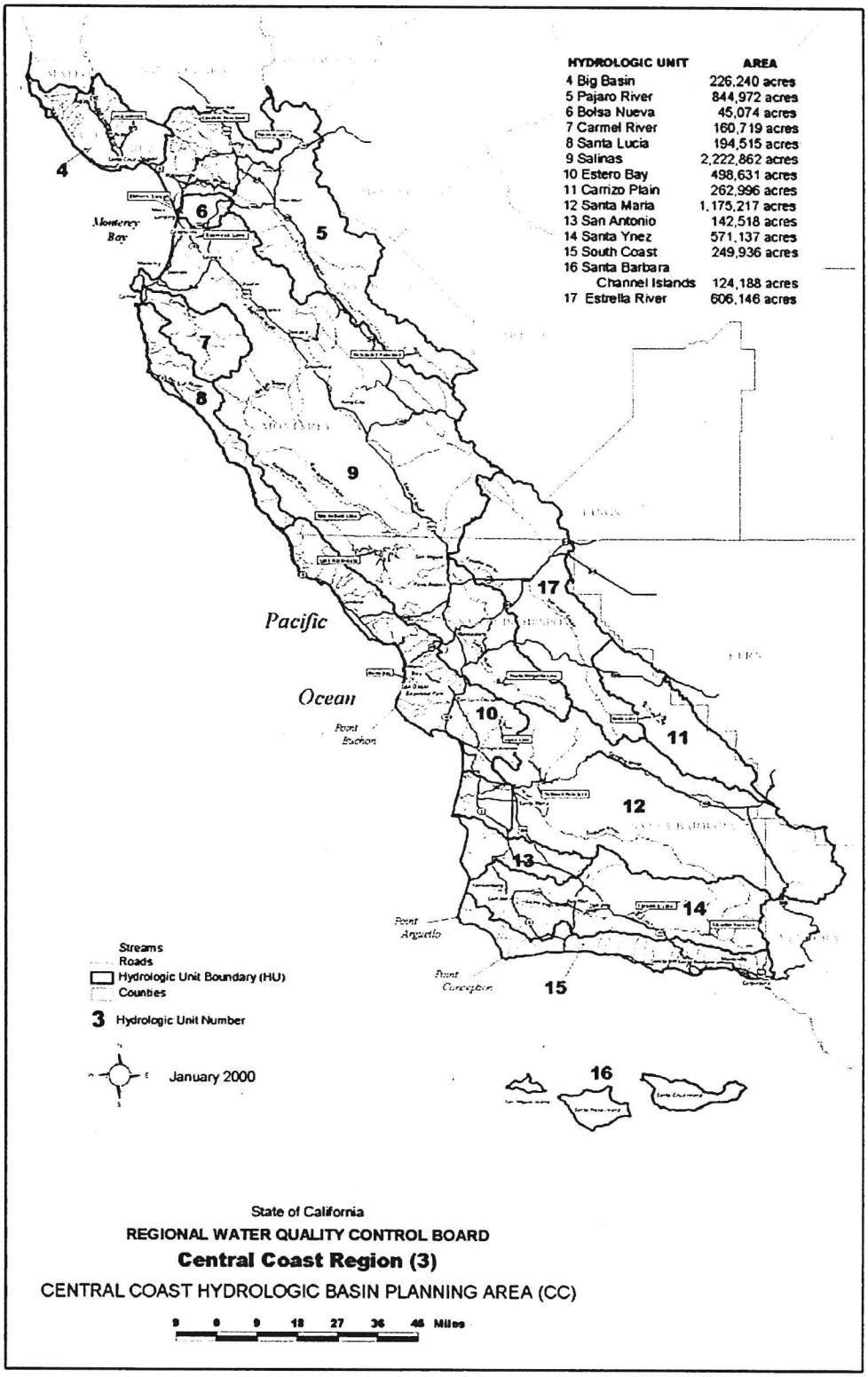
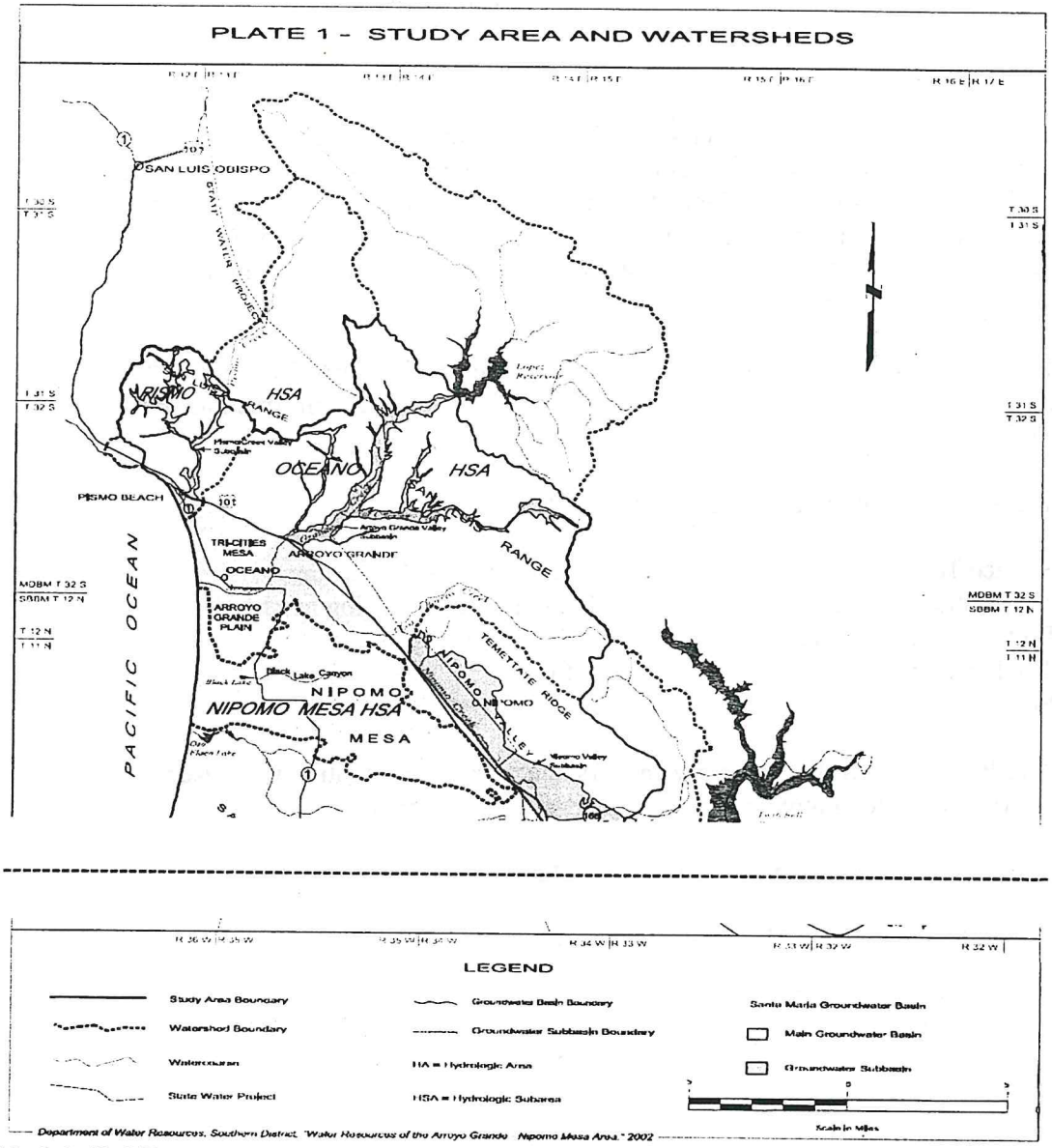


Figure Appendix 1-1



North half of Plate I, "Water Resources of the Arroyo Grande – Nipomo Area", 2002 by the Department of Water Resources, Southern District.

Figure Appendix 1-2

APPENDIX 2

Determination of Ground Water Salinity from SP Log

Groundwater salinity in Plains Exploration *Tiber* # 86, Section 6, T.32S.-R.13E, was determined from the Spontaneous Potential (SP) log and mud filtrate as recorded on the log header. Track 6 of the attached illustration shows a calculated Total Dissolved Solids (TDS) or 3,000 Part Per Million (ppm) or greater from approximately 75 from surface to a depth of 1100 feet below grade. Salinities of almost 8,000 ppm are indicated for the oil bearing sands at about 800 feet.

The equations used to calculate salinities are in WELENCO, 1995, "Water and Environmental Geophysical Well Logs" Vol I., Technical Information and Data, 7th edition, p. 12.

The variables used in this calculation include:

Surface Temperature:	65 °F, log header, log header
Mud Filtrate Resistivity:	2.43 ohm-m @ 65 °F, log header
Bottom Hole Temperature:	125 °F, log header
Total Depth:	2478 ft.
SP:	Log

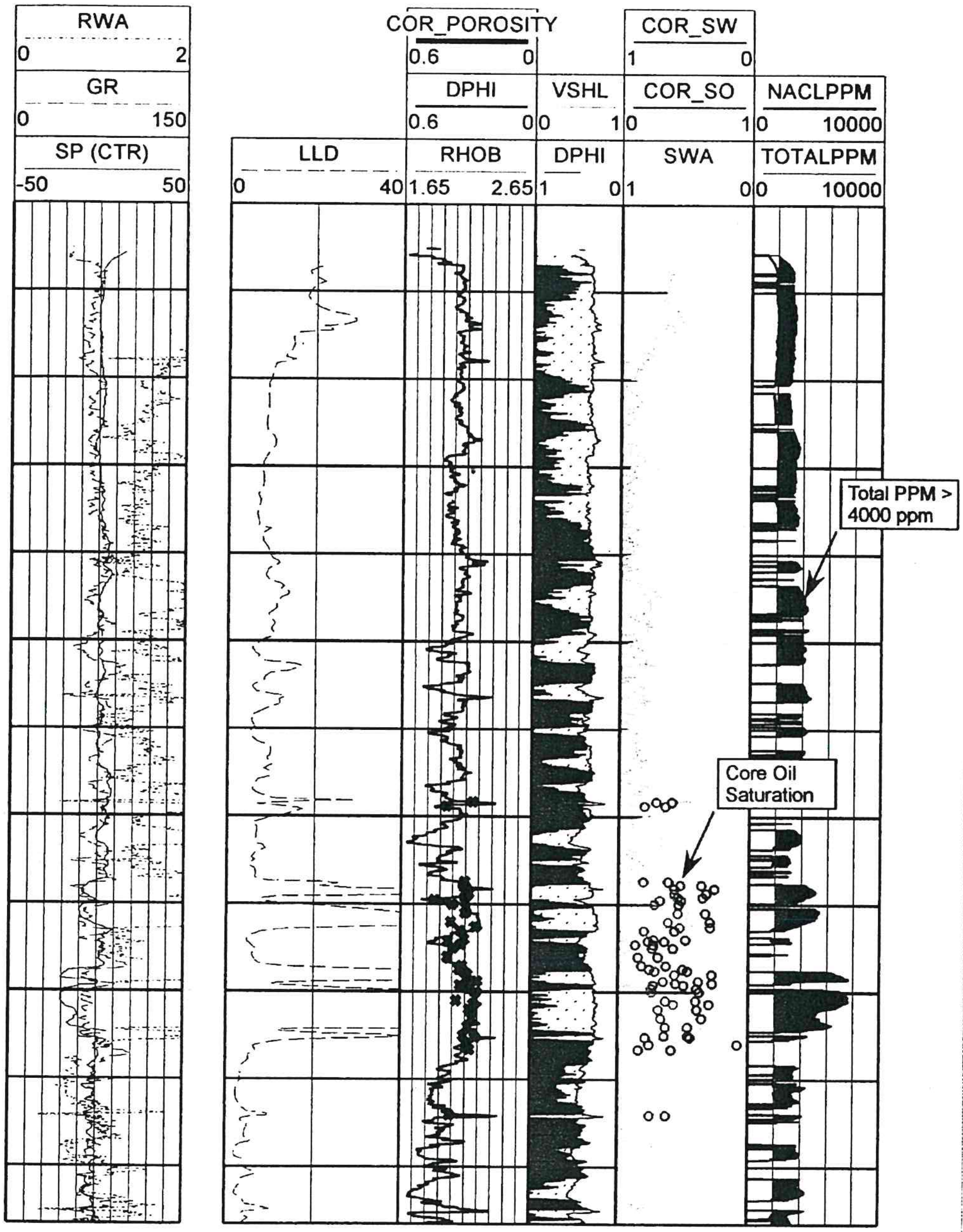
An SP Baseline (SSP_B) and a VShale (shale volume) calculation were used as discriminators to eliminate non-sand intervals.

These formulae are used to obtain water salinity:

1. $R_{mf}^{corr} = [R_{mf}^{@meas\ tem}(Temp + 6.77)/81.770]$
2. $R_{we} = R_{mf}^{corr}/10^{(sp/-70.7)}$
3. $Rw^{NaCl} = (R_{we}^{1.227})0.825$
4. NaCl ppm = $5300/Rw^{NaCl}$
5. TDS ppm = 1.65 NaCl ppm

Log Illustration 1. Plains Exploration *Tiber* # 86, Section 6, T.32S.-R.13E

Tiber 68
Plains Exploration
ELEV_KB : 165



TD : 2,490

Plains Exploration & Production Co.

Arroyo Grande Project

Computed Log TDS

Log Illustration 1

Horizontal Scale = 1.0
Vertical Scale = 100.0
Vertical Exaggeration = 0.0x

LOG CURVES

BS (in) 33 Bit Size
SP (MV) ## CENTERED IN TRACK ##
GR (GAPI) Calibrated Gamma-Ray SC
RWA (OHMM) Apparent Water Res.
DRES (OHMM) Deep Resistivity
SRES (OHMM) Shallow Resistivity
RHOB (GM/CC) RHOB
NPHI (ED) 31 Thermal Neutron Porosity (Ratio Met
DPHI (UNKNOWN) DPHI
COR_POROSITY (DEC) Core Porosity
DPHI (UNKNOWN) DPHI CUTOFF = 1.00
VSHL (FRACTION) SHALE VOLUME FOR LITH COLUMN CUTOFF = 0.80
SWA (FRACTION) ARCHIE WATER SATURATION CUTOFF = 0.00
COR_SO (DEC) Core Oil Saturation
COR_SW (DEC) Core Water Saturation
TOTALPPM (PPM) TOTAL FORMATION WATER SALINITY CUTOFF = 2000.00
NACLPPM (PPM) FORMATION NACL WATER CONCENTRATION

Well Name
Operator
WELL - ELEV_KB

REMARKS
Red line in Track 6 shows Total Dissolved Solids (TDS) as calculated from the SP curve. Red shading indicates TDS greater than 2000 ppm. The black line records TDS NaCl.

By: RTM/PGA
May 20,2005 2:24 AM