

**STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

STAFF REPORT FOR REGULAR MEETING OF MARCH 17-18, 2016

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ITEM NUMBER: 10

SUBJECT: Active Oil Field Regulatory Program: A Historical Retrospective and New Paradigm

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SUMMARY

In recent years, oil and gas production practices in California have become increasingly scrutinized by the public, State Legislature, United States Environmental Protection Agency (US EPA, or EPA), and various local and state agencies as a result of heightened awareness and concerns about hydraulic fracturing and deficiencies in the state's implementation of the Underground Injection and Control program for oil field injection wells. One of the primary issues of concern is the impact of oil and gas production and water disposal practices on groundwater quality. Consequently, the State Legislature recently adopted new regulations for the oversight of oil and gas production with an emphasis on protecting groundwater, particularly with respect to drinking water beneficial uses, and public transparency and accountability. There are four primary operational issues of concern:

1. Underground injection of produced water for the purposes of disposal or enhanced oil recovery,
2. Aquifer exemptions (as needed prior to the approval of injection projects), and
3. Surface disposal of oil extraction-related waste water via produced water ponds or sumps.
4. Hydraulic fracturing and other well stimulation treatments to enhance oil recovery,

These operational issues are often interrelated and complex, requiring the coordinated oversight and authorities of multiple agencies including the US EPA, Division of Oil, Gas, and Geothermal Resources (DOGGR; a Division of the CA Department of Conservation), the State and Regional Water Boards, and local/county land use permitting and public health agencies. This staff report discusses the above noted operational issues in more detail along with an overview of some of the historical deficiencies in regulatory oversight and resulting challenges, the governing regulatory requirements with an emphasis on recent legislation, the associated roles and responsibilities of the various oversight agencies, and current and pending actions, with an emphasis on DOGGR and the Water Boards.

DISCUSSION

Background

Oil production/extraction operations in California date back to the drilling of the first recorded successful oil production well in 1865. Until recently – when it was beaten by North Dakota in 2012 - California had been the second largest producer of crude oil in the United States. California now ranks third, with Texas continually being the largest producer. Oil and gas production activities in California are concentrated primarily in Kern County and to a lesser extent, Kings, Tulare and Fresno County areas of the San Joaquin Valley (Region 5 – Central Valley), Ventura and Los Angeles County areas of the Los Angeles basin (Region 4 – Los Angeles, and to a lesser extent, Region 8 – Santa Ana), and areas of Santa Barbara, San Luis Obispo, Monterey and San Benito Counties in the Central Coast Region as depicted in Attachment 1. The regulatory oversight of offshore oil production is provided almost entirely by the EPA, with only one platform, Platform Holly in the Santa Barbara channel that is within State waters. Currently, there are 204 active oil fields and 91 active natural gas fields in California. Forty-seven oil fields are located in the Central Coast Region, thirty of which are listed by DOGGR as active. In addition to these listed oil fields, numerous non-designated oil production sites are situated throughout the region. Non-designated sites are those where one or more wells are located outside of designated oil field boundaries. The majority of wells located in non-designated sites are plugged and abandoned.

Oil and gas production is a multi-stepped process requiring a substantial amount of planning, coordination and ongoing oversight. Despite the complexity, hydrocarbon extraction can be summed up by two primary activities: drilling and pumping. A simple, shallow oil well is similar in construction to a water well. A vertical bore hole is drilled, a casing/liner is installed and cemented inside the bore, and a pump is attached to the wellhead. However, well construction can quickly become complex depending on the depth of the well and the surrounding geology. Wells may be drilled thousands of feet at an angle or horizontally; double well bores can be drilled from one wellhead; and multiple casings may be installed with multiple perforation zones separated by hundreds of feet of casing or more. As technology has progressed, oil extraction often involves more than simply pumping the oil from the ground. In addition to hydraulic fracturing, a number of enhanced oil recovery (EOR) or well stimulation treatment techniques using injection or production wells may be used such as steam flood, cyclic steam, water flood, CO₂ injection, or various chemical treatments. Many of the oil and gas fields in the State require EOR or well stimulation treatment techniques because of their age and waning productivity. Consequently, about 75 percent of California's oil production is the result of EOR techniques.

One of the oldest and most significant problems associated with oil and gas production is how to manage produced water. Produced water is the term used for formation water that is pumped up with the petroleum during oil and gas extraction. Once it is separated from the extracted oil/water mixture, and depending on its source and level of treatment, produced water can contain significant concentrations of minerals (e.g., total dissolved solids, metals, etc.) and petroleum hydrocarbons. The amount of water produced per well varies. In California, the average is for every 1 barrel (42 gallons) of oil that is produced, 8-10 barrels of water are produced and this ratio is referred to as the water cut. Produced water has historically been disposed of by injecting it back into the oil bearing formation for disposal or to enhanced oil recovery, discharging it to produced water ponds or sumps, or by discharging it to surface water or recycling it for other beneficial uses. At the turn of the 20th century produced water was primarily put into sumps, or produced water ponds for the purposes of disposal via evaporation or by percolation. Beginning in the 1930s, underground injection wells became more commonly

used and are now the preferred method; either explicitly for disposal or by using produced water for EOR techniques such as steam or water flooding.

The use of injection wells for disposal and EOR has steadily increased since the 1930's. This increase creates additional water quality and related health and safety risks, particularly with respect to nearby water supply wells. There are approximately 90,000 active or idle production and injection wells in the State, of which over 50,000 are active injection wells used to increase oil recovery or dispose of fluids produced during oil and gas extraction. Close to 1,500 of these injection wells are produced water disposal wells.

According to DOGGR's database, there are currently about 12,600 oil and gas production related wells in the Central Coast Region; most of these wells are listed as plugged and abandoned, idle, or buried. Approximately 2,700 of these wells are listed as active. Roughly half of active wells are permitted as oil and gas producers, 200 are permitted to inject water, and 800 for steam injection.

Historical DOGGR and Water Board Oversight

The US EPA, DOGGR, and the State and Regional Water Boards are all actively involved in the regulation of various oil field-related activities, as well as local county land use permitting and public health agencies to a lesser extent. The regulatory oversight of oil and gas production activities is primarily implemented by DOGGR with respect to the installation and operation of oil exploration and extraction wells, and injection wells used for the disposal of produced water or enhanced oil recovery. Wells that inject fluids associated with oil and natural gas production operations (Class II injection wells) are subject to US EPA's Underground Injection Control (UIC) program, as promulgated under the federal Safe Drinking Water Act (SDWA). The UIC program and associated aquifer exemption process are intended to protect underground sources of drinking water (USDW).¹ In California, DOGGR is the lead, or primacy, agency for implementation the UIC program for Class II injection wells pursuant to a 1982 Memorandum of Agreement (MOA) between the US EPA and DOGGR. Prior to the approval of UIC-related projects, an aquifer exemption proposal request from DOGGR for the targeted injection zone must be approved by the US EPA. The 1982 MOA contained a list of and references to exempted aquifers. These exempted aquifers primarily include hydrocarbon producing aquifers that were in active production when the federal SDWA was adopted 1974, and are often referred to as pre-1973 exempted aquifers.

State and Regional Water Boards are the lead oversight agency for oil field related surface discharges such as the use of produced water disposal ponds or sumps, surface water discharges, and the reuse of produced water for beneficial purposes such as irrigation, etc. via its waste discharge permitting and NPDES programs. The Central Coast Water Board also regulates the beneficial reuse of non-hazardous crude oil impacted soils for road pavement and other uses on active oil field leases via a conditional waiver (Order No. R3-2010-0037). A 1988 MOA between the State Water Board and DOGGR outlines the various roles and responsibilities of the two agencies with respect to implementing and coordinating the permitting of surface discharges and UIC projects, including the Water Board's technical advisory role in reviewing UIC projects, to protect groundwater quality and its beneficial uses. The 1988 MOA

¹ 40 CFR 144.3 defines an Underground source of drinking water (USDW) as an aquifer or its portion: (a)(1) which supplies any public water system; or (2) which contains a sufficient quantity of ground water to supply a public water system; and (i) currently supplies drinking water for human consumption; or (ii) contains fewer than 10,000 mg/l total dissolved solids; and (b) which is not an exempted aquifer.

was intended to provide a coordinated singular approach for permitting oil field-related injection wells and surface discharges to satisfy the statutory obligations of both agencies with an emphasis on protecting water quality and beneficial uses. This MOA is currently under revision to reflect the changing roles and expectations between DOGGR and the State Water Board.

Until recently and as a general rule, the State and Regional Water Boards have had limited involvement and coordination with DOGGR for the oversight of UIC projects and produced water ponds/sumps. Consequently, a large number of active or inactive oil field produced water ponds/sumps have not been permitted by the Water Boards, and a large number of UIC-related projects have been approved by DOGGR that are not in strict compliance with the federal SDWA (i.e., are not within US EPA approved exempted aquifers) or applicable California water quality statutes and policies. These deficiencies were recently brought to light as a result of US EPA's audit of DOGGR's UIC program and review of exempted aquifers with respect to the UIC program, the 1982 MOA, and permitted UIC projects.

In 2011, the US EPA audited DOGGR's Class II UIC program and identified substantial implementation deficiencies. In 2012 the US EPA also conducted a review of aquifer exemption-related documentation and discovered two different versions of the 1982 MOA with conflicting lists of exempted aquifers. The US EPA audit and review identified a significant number of approved UIC projects in aquifer zones without approved exemptions, and 11 non-exempted aquifers that were historically treated as exempt with respect to approving UIC projects. Consequently, the legal and technical basis for a large number of UIC projects and aquifer exemptions are now in question. Statewide estimates by DOGGR in 2015, identified 532 produced water disposal wells and 2,021 EOR wells associated with approved UIC projects injecting into non-exempt aquifers, and 3,604 production wells with reported cyclic steam injection (EOR) treatments that were not associated with an approved UIC project.

In 2014 the US EPA sent both DOGGR and the State Water Board letters of concern over DOGGR's implementation of the UIC program and the aquifer exemption inconsistencies between the two 1982 MOAs. The letter provided direction on how to correct the areas of concern.

Renewed DOGGR and Water Board Coordinated Oversight

In response to US EPA's directive to remedy deficiencies in DOGGR's implementation of the UIC program and address discrepancies associated with approved UIC projects in non-exempted aquifers, the Governor's Office directed the State Water Board to assist DOGGR in the review of the UIC projects and aquifer exemptions, and other issues related to oil and gas wastewater disposal activities. Subsequently, in a joint [February 6, 2015 letter to US EPA](#), DOGGR and the State Water Board proposed a comprehensive, coordinated plan to bring the UIC program back in to compliance with the SDWA, to review and address, as appropriate, the UIC project wells that may be injecting into non-exempt aquifers, and to jointly review proposed UIC projects and aquifer exemptions. On [March 9, 2015, US EPA forwarded a letter](#) to DOGGR and State Water Board outlining agreed upon deadlines and milestones for implementing the February 6, 2015 DOGGR and State Water Board plan. As part of this renewed coordination, DOGGR and the State Water Board are in the process of revising and updating the 1988 MOA.

In response to concerns over potential impacts of well stimulation activities, particularly hydraulic fracturing, on water resources, and the US EPA's daylighting of the UIC program and aquifer exemption problems, the State Legislature and Governor's Office passed two senate bills, SB 4 and SB 83, containing additional and related oil field regulatory requirements. The

relevant water quality requirements of these two bills are discussed below as part of the more focused discussions about the Active Oil Field Regulatory Program roles and responsibilities associated with the coordinated review of UIC project proposals and aquifer exemptions, the identification and permitting of produced water ponds/sumps, and groundwater monitoring in areas oil and gas well stimulation.

SB 83 - Underground Injection Control and Aquifer Exemptions: The federal Safe Drinking Water Act (SDWA) requires the US EPA to regulate injection wells used to dispose fluid waste. The US EPA regulates injection wells with the Underground Injection Control (UIC) program. There are six classes of waste injection wells. Class II injection wells are used only to inject fluids associated with oil and natural gas production. These fluids are primarily the brine water - or treated brine water - brought to surface during oil and gas production. Class II wells are divided into three categories: disposal wells, enhanced oil recovery wells, and hydrocarbon storage wells. The US EPA has delegated its authority for implementation of the Class II UIC program in California to DOGGR. As such, DOGGR issues permits to operate Class II injection wells.

Under the SDWA, injection of fluids into an underground source of drinking water (USDW) that may harm human health, or cause a violation of a primary drinking water regulation is prohibited. An aquifer exemption exempts an aquifer from this protection to allow injection that would otherwise be prohibited. According to 40 CFR 146.4, for an aquifer to be considered for exemption, it must meet the following criteria:

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

The Governor's Office and more recently the State Legislature have directed the State Water Board to assist DOGGR in the review of aquifer exemptions, Class II injection wells, and to coordinate oversight of oil and gas wastewater disposal activities. This is in addition to, and supplements, the Water Board's historical role in providing coordinated review and oversight of UIC projects and produced water ponds/sumps.

On June 24, 2015, the Governor signed Senate Bill No. 83 (Committee on Budget and Fiscal Review, 2015), "Public Resources," commonly referred to as the Resources Budget Trailer Bill, or SB 83. This bill requires DOGGR to consult with the State and Regional Water Boards for the review of proposed aquifer exemptions to ensure they comply with various State and Federal water quality related policies and statutes, and requires both agencies to provide a public comment period and to jointly conduct a public hearing prior to making a joint

recommendation to US EPA to approve the aquifer exemption. The bill also requires the following:

- DOGGR, until March 1, 2019, to notify the relevant policy committees of the Legislature before submitting aquifer exemption proposals to US EPA,
- Secretary for Environmental Protection and the Secretary of the Natural Resources Agency to appoint an independent review panel to evaluate the Underground Injection Control Program and to make recommendations on how to improve the effectiveness of the program, and
- Department of Conservation and the State Water Resources Control Board, by January 30, 2016, and every 6 months thereafter, until March 1, 2019, to provide to the fiscal and relevant policy committees of the Legislature certain reports regarding the implementation of the Underground Injection Control Program.

The Water Board's technical advisory role in reviewing and recommending approval of aquifer exemptions is new and requires the coordination of State and Regional Water Board staff. State and Regional Water Boards will act in a technical advisory capacity in coordination with DOGGR to review and reach consensus on the recommended approval of aquifer exemptions using the evaluation criteria outlined below:

- April 10, 2015, DOGGR and State Water Board "Aquifer Exemption Guidance Document"
- Review of current and future beneficial sources of water (e.g. domestic, municipal, irrigation, industrial)
- Pertinent elements of Regional Water Board Basin Plan(s)
- Technical demonstration by operator that the waste will remain in the exempted portion of the aquifer(s)
- Identification of underground sources of drinking water and exempted aquifers (Code of Federal Regulations, Title 40, Section 144.7)
- US EPA Guidance for Review and Approval of State Underground Injection Control (UIC) Programs and Revisions to Approved State Programs
- US EPA Aquifer Exemption Checklist

In the February 6, 2015 letter to US EPA, DOGGR and State Water Board identified an approach to work together for more integrated oversight of the UIC program. The approach is intended to:

- Ensure that aquifers to be used for injection are not underground sources of drinking water,
- Review proposed UIC project proposals submitted by well operators to ensure the protection of groundwater beneficial uses, and
- Review existing UIC injection wells that may be injecting into aquifers that may not have been properly exempted.

To address potential discrepancies between approved UIC projects and exempted aquifers as noted previously, the February 6, 2015 letter to US EPA outlined a three tiered, phased approach to evaluate existing UIC permits for SDWA compliance. This tiered approach is based on the sequential evaluation of the following categories of UIC wells:

- Category 1 Wells: Class II water disposal wells injecting into non-exempt, non-hydrocarbon-bearing aquifers or the 11 aquifers historically treated as exempt
- Category 2 Wells: Class II enhanced oil recovery (EOR) wells injecting into non-exempt, hydrocarbon-bearing aquifers
- Category 3 Wells: Class II water disposal and EOR wells that are inside the surface boundaries of exempted aquifers, but that may nevertheless be injecting into a zone not exempted in the primacy agreement

To facilitate review of the questionable UIC permits, the State and Regional Water Boards have issued and are continuing to issue 13267 Orders to oil and gas operators with UIC wells consistent with the three categories, starting with Category 1 and 2 wells first. Working from DOGGR data, on November 20, 2015, Central Coast Water Board staff issued twelve Water Code section 13267 letters/orders (i.e., requests for technical reports) drafted by the State Water Board to oil operators in the region with DOGGR-permitted Class II UIC wells meeting the first two well categories. This represents approximately 47 UIC wells in the Central Coast Region that may have been inappropriately permitted (Note: some of the 47 identified wells may not be UIC wells or may be appropriately permitted as such, and; additional assessment is ongoing to identify Category 3 Wells, as well as other Category 1 and 2 Wells.). The 13267 letters/orders require the operators to submit work plans and subsequent technical reports: to provide technical information about the UIC wells, fluids injected, groundwater quality, surrounding water supply wells, etc. Acknowledging the data source identifying these UIC wells is incomplete/imperfect, the 13267 letters/orders also allow operators to provide justification to the Central Coast Water Board documenting why the identified wells are not UIC wells (these wells could be oil production wells, for example) or are in compliance with the UIC program (e.g., they are not used for injection, are within an exempted aquifer, or the injection zone is not an underground source of drinking water). The requested technical information will be used to evaluate whether the UIC wells are injecting into groundwater with beneficial uses, with an emphasis on drinking water, and to evaluate potential water quality impairment. Central Coast Water Board staff has received seven responses and is in the process of reviewing three responses, consisting of one work plan and two technical reports. Two responses were marked 'Return to Sender' and two respondents claim the identified wells are either not UIC wells or that they are in compliance.

Arroyo Grande Aquifer Exemption: State and Central Coast Water Board staff has recently reviewed and recommended conditional approval of an aquifer exemption in coordination with DOGGR for the Dollie sands of the Pismo formation in the Arroyo Grande oil field in San Luis Obispo County. This was the first coordinated aquifer exemption review in the State per the new regulatory paradigm discussed above. US EPA approval of the proposed aquifer exemption was still pending as of the preparation date of this staff report. The proposed aquifer exemption meets the criteria under the federal SDWA because: 1) the geologic formation does not currently serve as a source of drinking water and will not in the future since it contains hydrocarbons; 2) the injection of fluids will not affect the quality of water that is, or may reasonably be, used for any beneficial use (due to geologic, structural, and stratigraphic features); and 3) the injected fluid will remain in the exempted aquifer (due to geologic features and an inward hydraulic gradient). Central Coast Water staff recommended a condition requiring the use of sentry monitoring wells as an additional protection to ensure injected fluids associated with existing and future UIC projects remain within the exempted portion of the aquifer. Subject to approval by the US EPA, the proposed aquifer exemption would allow for Class II injection into the proposed exempted area, either for enhanced oil recovery or for the disposal of fluids associated with oil production at the field.

SB 83 – Produced Water Ponds/Sumps: The historical practice and ongoing use of produced water ponds or sumps to hold or dispose of water and other fluids associated with oil extraction is currently being re-evaluated statewide due to recent concerns over deficiencies in the regulation of oil and gas production related activities. In California, produced water ponds or sumps are predominantly unlined and used to dispose of produced water through evaporation and/or percolation. The potential groundwater impact of historical and existing produced water ponds/sumps is not fully understood, although the risk to groundwater is potentially very high. The identification and evaluation of produced water ponds/sumps, particularly historical ones is a difficult task because their locations are generally undocumented and obscured by subsequent ground surface modification (i.e., grading). In an effort to identify the location of historical and existing ponds/sumps, Central Coast Water Board staff has reviewed available reports - primarily from the 1960's - discussing oil field waste water practices, DOGGR records, and remote sensing data (e.g. Google Earth, ArcGIS), in addition to conducting field inspections. Unfortunately, very few written records exist, making it difficult to identify the location of potentially numerous oil field ponds/sumps that were back filled years ago.

To address unpermitted sumps and the associated potential water quality impacts, SB 83 requires the State Water Board to post on its website a status report on the regulation of oil field produced water ponds/sumps within each region by January 30, 2016, and every six months thereafter, until March 1, 2019. The table below summarizes the status of the State Water Board's review of produced water pond inventory as of December 1, 2015. This table includes the total number of ponds currently identified and/or being investigated in both the Central Coast and Central Valley regions, the number of permitted and unpermitted ponds, enforcement actions, and the status of permitting the unpermitted ponds. Note that the Los Angeles Region did not identify any disposal ponds in their oil fields.

Region	Active Ponds (unpermitted)	Inactive Ponds (unpermitted)	Total Ponds (unpermitted)	Current Enforcement Actions
Central Coast Region	38 (35)	8 (8)	46 (43)	15
Central Valley Region	623 (162)	370 (269)	993 (431)	280
Total	667 (203)	783 (682)	1450 (885)	332

Note: the numbers for the Central Coast were revised as of February 24, 2016, for the purposes of this staff report based on operator submitted technical information and other available information.

Central Coast Water Board staff created this pond inventory using technical information through satellite imagery reconnaissance and site inspections, and through information provided by DOGGR as well as by oil field operators in compliance with 13267 letters/orders. The 13267 letters/orders required operators to provide technical information about the location, operation and current status of historical and existing produced water ponds/sumps. Central Coast Water Board staff issued 15 13267 letters/orders to operators in the region in October 2015. So far, excluding the Guadalupe/Union Oil oil field, 46 sumps have been identified in the Central Coast Region. More are anticipated as Central Coast Water Board staff become more familiar with the oil fields in our region and as our efforts to identify disposal ponds continue. Central Coast Water Board staff is currently prioritizing review of the submitted pond/sump technical information and will cross-check it with other available information as well as via additional follow-up site inspections, as appropriate. As part of our review we'll be prioritizing our responses and follow-up actions based on relative threat to water quality. Going forward, pond

operators will have two primary regulatory options to achieve compliance: 1) clean-close/remove ponds and remediate soil and groundwater as necessary or, 2) retrofit ponds to meet Title 27 requirements if they currently don't, and permit them accordingly via waste discharge requirements. There may be other options, or hybrids of the two basic options, based on our review of individual cases. The date for completion of closing or retrofitting and permitting all ponds in the region will be determined based on our thorough review of responses and in coordination with the various operators and other stakeholders. Produced water ponds will only be permitted if it is determined that their use will not adversely impact current or potential future beneficial uses of groundwater or surface water.

SB 4 – Hydraulic Fracturing or “Fracking” and Groundwater Monitoring: Hydraulic fracturing or “fracking” is a well stimulation treatment technique (WST) where fluids are injected under high pressures into a low-permeability oil or gas bearing formation to create fractures, or expand the size and/or amount of flow paths, through which oil, gas, or water can be more easily extracted. Usually sand or other synthetic material(s) is added to the fracturing fluid as a “proppant” to prop open the fractures and prevent them from closing. On average fracturing fluid is composed of 98-99% water and 1-2% other chemicals. Some of these chemicals may include: hydrochloric acid, biocides, sodium or potassium carbonate, methanol, and various salts. Though by no means a new practice, hydraulic fracturing has become more widely used in the last decade as a result of technological advances in fracturing techniques and increased oil and gas prices, supporting more expensive WST/EOR strategies. Oil shales and other less permeable rock formations containing oil and gas once considered too costly to extract oil and gas from have now become economically viable sources of hydrocarbons because of hydraulic fracturing techniques. California petroleum reserves tend to be contained in formations where hydraulic fracturing - especially the type of fracturing done east in the Bakken Shale – is not necessary or practical. Available information is conflicting regarding the number and location of hydraulic fracturing wells in the Central Coast. Although DOGGR records indicate that no wells have been hydraulically fractured in the Central Coast since 2014 when operators began reporting, the FracFocus.org and State Water Board GAMA GeoTracker information system indicate there are three such wells in the Central Coast. Central Coast Water Board staff is coordinating with State Board and DOGGR staff to clarify and rectify this discrepancy. The very limited application, or lack thereof, of fracturing in the Central Coast Region is due to the regional geology and the viability of more standard enhanced oil extraction and well stimulation treatment techniques. For the purposes of SB 4, well stimulation treatments do not include steam flooding, water flooding, or cyclic steaming and do not include routine well maintenance.

On September 20, 2013, the Governor signed Senate Bill No. 4 (Pavley, 2013), “Oil and gas: well stimulation,” commonly referred to as the Fracking Bill or SB 4. Although, SB 4 acknowledged that hydraulic fracturing and other well stimulation treatments are critical to the ongoing oil and gas production in California, it also acknowledged that there is a lack of scientific information to fully assess the potential environmental, occupational, and public health hazards and risks of hydraulic fracturing and other well stimulation treatments. The bill also identified the need for transparency and accountability to the public regarding well stimulation treatments and related chemicals and waste products. Subsequently, SB 4 among other things required the Natural Resources Agency to conduct an independent scientific study on well stimulation treatments, and required DOGGR to adopt new rules and regulations for the construction, operation, testing, permitting and inspection of well stimulation-related activities with reporting to a publicly accessible Internet based database, including full public disclosure of the chemical composition and disposition of well stimulation fluids. As part of this effort, SB 4 required DOGGR to consult with various state and local agencies, including the State and Regional Water Boards, to identify and delineate statutory authority and regulatory

responsibility, and to enter into agreements as appropriate to coordinate oversight. In December 2014, the State and Regional Water Boards entered into an MOA with DOGGR regarding “Well Stimulation Treatments and Well Stimulation Treatment-Related Activities.” The MOA delineates the agencies’ respective authority, responsibilities, and notification and reporting requirements associated with well stimulation treatments and other water quality-related activities (e.g., surface discharges of produced waste via produced water ponds/sumps, discharges to surface water, reuse, etc.), including water quality monitoring as discussed in more detail below. In particular, DOGGR is required to notify the State Water Board and applicable Regional Water Board of and provide them with WST application-related documents for their review and comment as necessary to determine if the application is complete for the purposes of regulating water quality. The Water Boards have 14 days to provide comments to DOGGR once the WST application is deemed complete. Additional time may be requested in writing, but should not exceed 45 days. Well Stimulation Treatment permits are to include a condition prohibiting the commencement of WST prior to Water Board approval of the operator-submitted groundwater monitoring plan or issuance of a letter of written concurrence that groundwater monitoring is not required (this is discussed in more detail below). The MOA also requires the Water Board to inform DOGGR about and provide them with copies of report of waste discharge (ROWD) and waste discharge requirement (WDR) related documents, and provide them 14 days to review and comment on the ROWD application and 30 days to provide comment on the draft WDRs for the addition of provisions (e.g., mitigation measures). The MOA also outlines relative authorities and responsibilities associated with enforcement coordination, water quality planning coordination and information sharing.

The other primary provision of SB 4 required the State Water Board to develop and begin implementing a strategic, scientifically-based groundwater monitoring program for the State’s oil and gas production areas by July 1, 2015. The resulting program known as the “Model Criteria for Groundwater Monitoring in areas of Oil and Gas Well Stimulation” (Model Criteria) is intended to protect all waters designated for any beneficial use, while prioritizing the monitoring of groundwater that is or has the potential to be a source of drinking water. Factors considered for the Model Criteria include well stimulation treatments, among other events or activities that have the potential to contaminate groundwater, such as oil and gas well casing failure or breach, fluids produced or introduced in the well stimulation process including, but not limited to, produced water ponds and UIC wells.

The Model Criteria has three main components:

1. Area-Specific required groundwater monitoring near stimulation wells by operators
2. Requirements for Designated Contractor Sampling and Testing (for property owners)
3. Regional scale groundwater monitoring to be implemented by the State Water Board

The State Water Board’s Groundwater Monitoring and Assessment Section of the Division of Water Quality is implementing the Model Criteria in coordination with the Regional Boards as applicable. All groundwater monitoring data collected in accordance with the Model Criteria will be uploaded to and publicly available on the Water Board’s online GeoTracker groundwater information system. The three Model Criteria components are briefly described below. More detailed information about the Model Criteria is available on the following State Water Board website: http://www.waterboards.ca.gov/water_issues/programs/groundwater/sb4/index.shtml

Area-Specific Groundwater Monitoring: The Model Criteria specifies area-specific groundwater monitoring requirements for operators to implement as part of DOGGR’s oil field permitting requirements for oil and gas well stimulation treatments (i.e., hydraulic fracturing). The requirements are designed to characterize baseline water quality conditions and detect potential

impacts to beneficial use waters from well stimulation treatments. These requirements do not apply to groundwater monitoring plans that were approved in connection with permits issued by DOGGR for well stimulation prior to the adoption of the Model Criteria in July 2015.

In order to assess the state's groundwater resources in a systematic way, the requirement for an operator to develop and implement an area-specific groundwater monitoring plan as part of a well stimulation treatment (WST) permit is currently limited to areas where "protected water" is present (Water Code section 10783, subdivisions (g)(2) and (j).) "Protected water" is defined as:

- Water with less than 10,000 milligrams per liter (mg/L) of total dissolved solids (TDS), and
- Outside an exempt aquifer (meeting the criteria of Code of Federal Regulations, title 40, part 146.4).

As outlined in the 2014 MOA between DOGGR and the State and Regional Water Boards, the State and/or Regional Water Board will review, and approve as appropriate, the operator-submitted groundwater monitoring plan or exclusion from groundwater monitoring as part of its coordinated review of the WST permit application. To date, no SB 4-related WST permits or operator submitted area-specific groundwater monitoring plans have been submitted in the Central Coast Region and none are anticipated in the near future.

Requirements for Designated Contractors: In addition to requiring notification of nearby property owners and tenants of WST permits, SB 4 also required the State Water Board to provide information about available water sampling and testing and to designate one or more qualified independent third-party contractors (designated sampler) to perform property owner requested water quality sampling and testing. The well owner or operator shall pay for the sampling and testing, and the sampling and testing performed shall be subject to audit and review by the State Water Board or applicable Regional Water Board, as appropriate. To facilitate uniform and representative testing of water wells as requested by property owners in the vicinity of oil and gas production areas, the Model Criteria includes requirements describing how to become a designated contractor for requested sampling and the associated water quality testing standards, protocols, and data submittal requirements. To date, no WST permit related well sampling has been requested by private property owners in the Central Coast Region because no operators have requested WST permits in the region. Statewide, only one property owner in Ventura County, near the Hopper Canyon Oil Field in Region 4, has requested sampling.

Regional Groundwater Monitoring: The State Water Board has developed and begun implementing the Regional Monitoring Program in consultation with technical experts (i.e., Lawrence Livermore National Laboratory and United States Geological Survey), public stakeholder groups, and the Regional Water Boards. The program is intended to systematically and comprehensively collect and assess water quality data and information associated with well stimulation and other related oil field activities to establish baseline water quality conditions and identify groundwater vulnerability and risk in areas of oil and gas production to inform the management and protection of waters designated for any beneficial use. Some of the factors to be considered include well stimulation treatments, the injection of produced water for EOR or disposal, and produced water ponds/sumps among other events or activities that have the potential to contaminate groundwater, such as an oil and gas well failure or breach.

The three main components of the Regional Monitoring program, and primary activities, are:

- Characterizing and monitoring groundwater risk zones by:
 - mapping the extent, in three dimensions, of beneficial use water resources near oil and gas fields, and performing assessments to determine if fluids related to well stimulation, or other events or activities that have the potential to contaminate groundwater (e.g., well failure or breach), have migrated into these groundwater resources, and
 - establishing monitoring networks to provide early warning in higher risk zones.
- The assessment of surface activity effects by:
 - characterizing the effect of legacy and currently regulated surface activities, including sumps and spills, and
 - characterizing risks to shallow water users from chemical constituents associated with well stimulation activities.
- The assessment of potential “well integrity” risks to water quality from poorly constructed or damaged wells and improperly abandoned wells that could lead to a well failure or breach, and groundwater quality degradation.

The Regional Monitoring Program component of the Model Criteria will be conducted in a phased approach, with the first phase anticipated to take approximately five years to implement. The first phase of the Regional Monitoring Program will focus on characterizing and monitoring groundwater risk zones and identifying where vulnerable beneficial use water resources are located.

The State Water Board will periodically review data associated with well stimulation and groundwater monitoring to assure quality results and assessments. Data, information and status reports will be made publicly available on a regular basis. Formal reports on the status and findings of the Regional Monitoring Program are anticipated to be prepared on a biennial basis starting January 2018.

Central Coast Water Board Active Oil Field Regulation Staff Resources – Allocation and Identified Projects

The Central Coast Water Board has four positions dedicated to the Active Oil Field Regulation program, three engineering geologists and a senior water resources control engineer. SB 83 provided funding for three of these positions in this fiscal year's budget (2015-2016) and the remaining position was funded in FY 2014-2015 by SB 4. Two of the engineering geologist positions were very recently filled, with the new staff starting on March 2nd and 7th, respectively. Central Coast Water Board staff will be reviewing, and responding to as appropriate, oil field operator responses to the UIC and sump 13267 letters/orders in coordination with State Water Board staff as needed to provide technical and resource assistance, and to generate reports for the Legislature. Central Coast Water Board staff will also be conducting field inspections and coordinating with DOGGR staff as needed to evaluate and respond to the UIC and sump related technical submittals. Although the level of effort is currently uncertain depending on the timing, number and technical complexity of future projects, Central Coast Water Board staff will also coordinate very closely with State Water Board and DOGGR staff for the review of aquifer exemptions, and UIC and WST project proposals, and to develop recommendations as appropriate to either approve or deny them based on compliance with applicable state and federal requirements with an emphasis on protecting groundwater beneficial uses. Central Coast Water Board staff is also coordinating with State Board staff on enforcement related actions to address injection well failures or breaches as they are reported to us by DOGGR. One such action is currently in the works. As with the ongoing UIC and sump evaluations, the

injection well failure or breach related enforcement primarily consists of a request for technical information pursuant to Water Code section 13267 to determine if beneficial uses of groundwater have been impaired.

Central Coast Water Board Active Oil Field Regulatory program staff is currently developing a strategic plan for the effective implementation of the above noted activities. As has been the case to date, it is anticipated that the State Water Board will continue to provide supporting staff resources as needed to implement various program related activities. In an effort to be more knowledgeable about oil and gas production related activities in the Central Coast Region, staff is organizing a forthcoming field visit to the San Ardo oil field for State and Regional Water Board staff and board members.

CONCLUSIONS

Central Coast Water Board staff are implementing recent directives and mandates to develop and systematically implement actions coordinated with the State Water Board and DOGGR to address the conditions resulting from the historical deficiencies in regulatory oversight, and to provide diligent and transparent regulation for ongoing and future oil and gas production with clearly defined processes and technical criteria. The State and Regional Water Boards and DOGGR are committed to providing regulatory oversight as required to comply with state and federal mandates with an emphasis on protecting the state's water resources. The primary focus for Central Coast Water Board staff in this program is more robust and transparent implementation of the UIC program in coordination with DOGGR and the State Water Board, permitting and closure of produced water ponds/sumps, and the implementation of water quality monitoring to ensure the protection of our water resources and inform our ongoing regulatory efforts.

ATTACHMENTS

1. Central Coast Region Oil Field and Active Oil Well Maps, and Injection/Extraction Well Diagram