Narrative Description of Hydraulic Fracturing Draft Regulations

The Department of Conservation has released a discussion draft of hydraulic fracturing (HF) regulations. This narrative attempts to describe, in lay terms, the backdrop of existing regulations on top of which the HF regulations rest and then describe the effect of the discussion draft of the proposed regulations, as if they were adopted.

Background

All oil and gas wells in California are constructed to meet a high standard. The Department reviews well designs before drilling to ensure the construction plans meet stringent well construction standards. Some states have lower standards for "typical" oil and natural gas wells and then raise their standards for wells through which a production stimulation practice like HF will occur. California maintains a high, or higher, construction standard for ALL wells.

Well construction standards have a fundamental purpose – to ensure "zonal isolation." Zonal isolation means that oil and gas coming up a well from the productive, underground geologic zone will not escape the well and migrate into other geologic zones, including zones that might contain fresh water. Zonal isolation also means that the fluids and oil and gas operator puts down a well for any purpose will stay in that zone and not migrate to another zone. To achieve zonal isolation, current rules require that a cement barrier be placed between the well and the surrounding geologic strata or stratum. The cement bonds to the surrounding rock and forms a barrier against fluid migration. Cement barriers must meet certain standards for strength and integrity. If they do not meet the standards, they must be fixed or replaced. Metal casings – sometimes several layers of metal, depending upon the well depth – also separate the fluids going up and down a well bore from the surrounding geology. If the integrity of a well is compromised by ground movement or other mechanisms, the operators must fix the well.

Once well operators drill into oil- and gas-bearing geologic formations, if there is recoverable oil or gas, they begin extraction of the resource. In some cases, the oil or natural gas will not flow freely to the well and must be stimulated. There are a variety of stimulation techniques, including HF, intended to improve the flow of oil or natural gas from the geologic strata to the well so resources can be produced.

The practice of HF involves the temporary application of high pressure to the oil and gas producing strata with the aim of creating new fissures through which oil or gas can flow back to the well and be produced. Without these fissures, the geologic zone would not as easily release the oil or gas and the well would not flow. The pressures applied must be high enough to break the geologic formation (i.e., higher than the strata's "fracture pressure"). In HF, a fluid with

chemicals and additives intended to achieve certain ends is injected into the formation under pressure. A "proppant" (typically sand, or small resin or ceramic beads) is added so that the fractures created by the pressure do not collapse back on themselves under the weight of thousands of feet of overlying rock. If the fractures closed, no additional flow of oil or gas would occur. Some chemicals and additives in the fracturing fluid help make sure the proppant remains in a gel-like solution (instead of settling to the bottom of the fluid) for circulation into the fissures. Other additives dissolve the gel after the fractures are created to allow the "fracturing fluid" to come back to the surface and leave the proppants behind in the fissures. Still others are inserted to ensure that bacteria from the surface are not accidentally injected into the geologic strata, where they might form biofilms or cultures that could clog the flow of the well. Some of the chemicals used in fracturing fluids are non-toxic, but others have potential health hazard properties in certain concentrations. Once the fluids are injected, most of them are produced back to the surface through the well down which they were applied to the geologic formation.

California oil and natural gas is almost always associated with "produced water" – that is, brackish water that already exists in the oil and gas formation. Generally, there is far more water in a reservoir formation than there is oil or natural gas; 80-90% water is not uncommon in California oil and gas fields. This means that, on average for all wells in the state, for every 100 barrels of fluid produced, more than 80 of the barrels of fluid are brackish water. One of three things can happen to this water: It can be used for enhanced oil operations; it can be re-injected into wastewater disposal wells; or it can be treated. When HF occurs, most of the fracturing fluid is pumped to the surface along with the formation water, making separation of the fracturing fluids from the produced water impossible. The fracturing fluid is then co-disposed with the produced water. Current regulations specify the disposal requirements for these fluids – for instance, existing regulations govern how fluids are disposed of in disposal wells, how they are used to increase oil production from existing reservoirs, or how they are treated.

Current Well Approval Process

Operators apply to the Department before drilling an oil and gas well. If their well construction proposal meets existing standards, the Department's Division of Oil, Gas, and Geothermal Resources approves the proposal. Once the well is authorized, the operator is allowed to construct the well to the standards and operate it in accordance with existing rules. If the well loses integrity – for example, damage to the well results in an inability to provide zonal isolation – the operator must remedy the situation. Also, if the well operator wants to the change the well's depth or change the well from a "producing well" to an "injection well" or a "disposal well," the Department/Division must review the proposed change. The Department's existing

regulations protect groundwater, public health and safety, and the environment through adherence to high construction standards and maintenance of the well's integrity. These protections must remain intact, regardless of the production stimulation techniques applied to the geologic formation through the well.

What These Regulations Require

1. **Pre-Fracturing Testing**. Before HF occurs, operators will have to make sure the well through which the HF will occur is competent to withstand the HF forces. The proposed regulations require that the operator test well integrity at various points in the well's construction to ensure the pressures/forces of HF will not break the well. If the well has weaknesses that pressure tests reveal, the well could not be used for HF before the well is fixed or strengthened. The operator will also be required to test the thickness and integrity of existing cement bonds to ensure that the well will not break into or out of isolated zones under HF pressures. Operators will also have to test the integrity of wells near the HF to ensure that they cannot, after the HF is complete, create a conduit out of the intended zone and into other geologic strata. Operators model where and how far fractures will propagate during HF; the Department's proposed regulations would require the assessment of features and possible sources of migration to other zones twice this distance considered in the model. For example, if an operator models HF resulting in a 100-foot fracture, the proposed regulations require evaluation of the integrity of any well within 200 feet of the HF operation.

2. **Pre-notice**. Operators will be required to report to the Department on a specified form the results of these tests at least 10 days prior to the actual HF operation. Operators will also provide specified information about well location, depth, and other details. The proposed regulations require that the Department/Division be given 24 hours advance notice of the actual HF operations to allow Division engineers/inspectors to witness operation. This timeframe is consistent with other pre-notice requirements, such as the notice required for blow-out preventer tests. The Department will post on its website for public access copies of the form – "HF1" – as soon as possible after receipt, but no less than 7 days after receipt of the HF1.

3. **Monitoring During Fracturing Operations**. During the HF operation, operators will be required to constantly monitor their wells. If they notice unexpected changes, they will be required to stop operations, investigate the change, and remediate the problem before resuming the HF operation. For instance, a sudden pressure spike in a part of the well that is supposed to be protected would indicate possible failure of a well component. Similarly, sudden pressure drops could indicate failure of containment of

the pressure. In either case, the operator will be required to stop operations immediately and investigate, report, and remediate before resuming fracture operations.

4. **Monitoring After Fracturing Operations**. To ensure that the actual fracturing operations did not damage the well, operators will be required to monitor specified pressures, conditions and production rates daily for the first 30 days after fracturing and monthly for 5 years after the fracturing operation. Under the proposed regulations, operators must retain data about the fracturing operation – including the fluids used -- allowing long-term monitoring in the event of future questions about potential harm from the present day practice.

5. **Disclosure**. After the fracturing operation, operators will be required to post information about the operations to a "chemical disclosure registry." The proposed regulations specify FracFocus.org, but should it become unusable for this purpose, the Department/Division will specify another means of reporting certain information. This will include such things as the operator's name, the well and location, depth of well, name of the geologic formation fractured, the list of chemicals used in the fracturing process, total volume of fluid used and the disposition of the fluid used for fracturing.

6. **Trade Secrets**. Some operators and contractors for operators claim that the chemical composition of the fracturing fluids they use are subject to trade secret protections. Trade secret protections are specified primarily in the California Civil Code. To invoke them in the context of the proposed regulations, the owner of the trade secret will be required to demonstrate that the secret gives its owner a significant economic advantage, that disclosure of the secret would compromise that advantage, that the information has not been disclosed elsewhere, and that the fluid or substance cannot be reverse engineered to discover its composition. The proposed regulations will require that the holder of information deemed a trade secret declare under penalty of perjury that the information withheld meets these trade secret requirements. The proposed regulations also require that, should the Department or other agency determine as a result of spill or accidental release of fracturing fluid that the Department or other agency needs to know the specific composition of the fracturing fluid for investigatory or emergency response purposes, that it shall immediately be made available to the Department or other agency. The proposed regulations require disclosure to a doctor, nurse or other specified medical professional treating a patient suspected of exposure to fracturing fluid the specific chemical composition of that fluid. The Division will

support legislation, with appropriate safeguards, that will allow the public to directly challenge an assertion of trade secrecy.

7. **Storage and Handling of Hydraulic Fracturing Fluids**. Current law and regulations administered by the Department/Division contains provisions governing notification, response and clean-up of spills in the oil field environment. The proposed regulations clarify that fracturing fluids are subject to those reporting, response, and clean-up requirements. Concentrated fracturing fluids stored on-site prior to mixing, mixed fracturing fluids, and produced fluids, including the fracturing fluid flowback, will all be subject to those requirements. In addition, the proposed regulations specify that hydraulic fracturing fluids could not be stored at any time in unlined sumps or pits. Further, in the event of a release or spill, operators will be required to provide a report to the Department/Division detailing activities leading up to the release, types and volumes released, cause of release, actions taken to stop, control, and report the release, and steps taken to prevent future releases.