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Ms. Adele Lagomarsino
Department of Conservation
Division of Oil, Gas and Geothermal Resources
801 K Street, MS 18-00
Sacramento, CA 95814
Email: SB4EIR@conservation.ca.gov
Via Electronic and U.S. Mail

RE: **The Department of Conservation's Draft Environmental Impact Report (DEIR) for Well Stimulation in California**

To Ms. Adele Lagomarsino and staff,

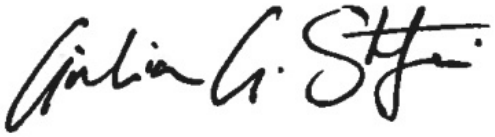
On behalf of the Natural Resources Defense Council (NRDC), Center for Biological Diversity (CBD), Sierra Club, Los Angeles Waterkeeper, and our millions of members and activists, we submit the following comments on the Department of Conservation's, through its Division of Oil, Gas and Geothermal Resources (DOGGR), Draft Environmental Impact Report (DEIR) for Well Stimulation in California (the Project) prepared pursuant to the California Environmental Quality Act (CEQA).

Our evaluation of the Project, as well as that of two independent experts retained by NRDC, concludes that well stimulation will result in significant environmental impacts that have not been disclosed or mitigated in the DEIR.

Well stimulation puts California communities at risk of surface and groundwater contamination, fresh water depletion, air pollution, greenhouse gas emissions, induced seismicity, land degradation, wildlife habitat fragmentation, and a host of other harmful consequences. We urge the Department and its Division to adhere to its mandate under the California Public Resources Code "to prevent, as far as possible, damage to life, health, property. . . natural resources" and "damage to underground and surface waters"[1] and to, for that reason, impose an immediate moratorium on hydraulic fracturing, acidizing, and other forms of well stimulation in California.

[1] Cal. Pub. Res. Code § 3106(a)

Respectfully submitted,



Giulia C.S. Good Stefani
Attorney
Natural Resources Defense Council (NRDC)

Briana Mordick
Staff Scientist
Natural Resources Defense Council (NRDC)

Hollin Kretzmann
Staff Attorney
Center for Biological Diversity (CBD)

Nathan Matthews
Staff Attorney
Sierra Club Environmental Law Program

Tatiana Gaur
Staff Attorney
Los Angeles Waterkeeper

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1 INTRODUCTION

The heart of CEQA is the EIR. But a mountain of pages alone won't protect California's residents, land, wildlife, air, and water from the serious risks of well stimulation. "CEQA requires more than merely preparing environmental documents."[2] In adopting CEQA, the California legislature found that it is the policy of California to "take all action necessary to *protect, rehabilitate, and enhance* the environmental quality of the State."[3] And, to "[t]ake all action necessary to provide the people of this state with clean air and water, enjoyment of aesthetic, natural, scenic, and historic environmental qualities, and freedom from excessive noise."[4] DOGGR's environmental review process must go beyond a lackluster attempt to mitigate impacts and should be an opportunity to provide us all with a higher, not lower, level of protection and health. Even in the absence of a moratorium, which is the only alternative that will eliminate the risks from well stimulation, the DEIR still falls short of meeting CEQA's requirements in several ways.

Here, DOGGR relies on regulations to characterize the Project and baseline that were being revised while DOGGR was writing the DEIR and that won't go into effect until July. DOGGR also characterizes this DEIR as the sole CEQA document necessary for some projects, but this is highly problematic because (1) DOGGR won't be the Lead Agency for all well stimulation projects, and therefore cannot mandate or ensure employment of any mitigation suggested here and (2) the high level of generality of the DEIR, which is vague and inexplicit about future well sites and mitigation requirements, and defers important mitigation to an unspecified later date.

In addition, the DEIR discounts impacts and assumes mitigation without foundation. Specifically, the DEIR fails to adequately evaluate significant air quality, human health, biological resources, seismic, transportation, hazardous materials, environmental justice, and surface and groundwater impacts of the Project. The DEIR also fails to identify and analyze mitigation measures that would reduce the Project's impacts, incorrectly claiming that no mitigation measures are available or deferring mitigation to some later date, process, or actor. In fact, there are numerous mitigation measures and alternatives that would reduce the impacts of the Project. These measures must be analyzed in the DEIR, so that the full range of options are publicly disclosed and considered by decision-makers. The EIR must be "meaningful and useful to decision makers and to the public."[5]

The DEIR's treatment of hazardous materials is an illustrative example. The state's own records show that fracking results in a slew of extremely toxic chemicals (e.g. benzene and lead). These and other chemicals are often mixed in large volumes, transported around the state, injected in the earth, and/or disposed of in open pits or back in our aquifers. Yet, shockingly, DOGGR identifies <u>only one</u> mitigation measure to protect our water, air, land, and health from hazardous materials, namely to "provide a physical barrier on the ground surface at the site pad."[6] Is the State of California's plan, then, to protect

[2] Cal. Code Regs. tit. 14, § 15002(h)
[3] DEIR 4-3 citing Cal. Pub. Res. Code Division 13, § 21000(a)-(g) (emphasis added)
[4] DEIR 4-3 citing Cal. Pub. Res. Code Division 13, § 21000(a)-(g)
[5] Cal. Pub. Res. Code § 21003(b)
[6] DEIR 10.13-30

us from fracking's hazardous materials, e.g. methanol (fatal in high doses), diesel (a known carcinogen), lead (dangerous to the neurological development of children), and hydrogen fluoride (highly irritating and poisonous fumes) to put a sheet of plastic on the ground? DOGGR must—and can—do more.

For example, DOGGR must conduct a health risk assessment of the impacts on people and the environment of the use of the specific chemicals used in well stimulation. DOGGR should require industry drilling operators to help protect human health and select the lowest toxicity chemicals for use in fracture treatment additives. Detailed collection, testing, transportation, treatment, and disposal methods for each type of drilling and production waste and equipment containing hazardous materials should be included as a mitigation measure and codified in the proposed regulations. DOGGR should consider reclassifying oil and gas wastewater as hazardous waste and evaluating the impacts of requiring disposal in Class I underground injection wells or treatment at hazardous waste facilities when produced water and flowback exhibit hazardous properties. DOGGR must propose mitigation that would ensure proper oversight of the disposal of potentially toxic well stimulation wastewater. The DEIR should be revised to address secondary containment for transport, mixing, and pumping equipment in order to minimize potential soil and water resource impacts from chemical spills. DOGGR should create limits as to how much of a given hazardous material may be stored or present at a given site, as well as potential aggregate or temporal limits for storage. DOGGR should include measures to ensure the integrity of any physical barriers over time. DOGGR should require monitoring and detection for NORM. DOGGR should also make mandatory the mitigation it mentions in the DEIR but currently does not require, including employing best management practices for handling hazardous waste. In sum, without dramatically increased mitigation, the risk from hazards and hazardous materials cannot be less than a class 1 significant and unavoidable impact.

In its alternatives analysis, DOGGR misleadingly cherry picks how it considers impacts from in-state production in a way that significantly downplays the environmental impact of increased California production. As the TGG Report explains, DOGGR's analysis (1) overstates the short-term impact of a reduction in well stimulation on statewide oil production, (2) downplays the in-state air quality impacts associated with well stimulation production, and (3) exaggerates the total air impacts of imported oil.[7] Furthermore, the alternatives analysis relies on an overblown figure for in-state oil production from well-stimulation that comes from a personal communication with Halliburton, a corporation with a strong financial interest in promoting fracking.[8] These mistakes and exaggerations result in the unwarranted dismissal of No Future Well Stimulation Treatments Alternative (Alternative 1) and the No Future Well Stimulation Treatments Outside of Existing Oil and Gas Field Boundaries (Alternative 2).[9]

The people of California will be protected from the harms of well stimulation only if DOGGR adopts Alternative 1 to the Project. And, in light of the Project's significant, unmitigated impacts, DOGGR should not finalize this EIR until the statewide scientific studies have been made available for public comment and are completed. The extremely short time period during which the public was expected to

[7] See TGG Report § 3.3 (Attachment 1)
[8] Attachment 1 § 2.3
[9] Attachment 1 § 2.3

submit comments on the DEIR was also problematic. DOGGR should allow more time for public comments to permit the public to submit comprehensive comments to aid its decision-making, especially considering the length of the DEIR. In addition, for the reasons discussed throughout, DOGGR should not permit this DEIR to stand alone as the sole CEQA analysis for *any* future well stimulation project. Finally, DOGGR should revisit its alternatives analysis, in particular, the No Future Well Stimulation Treatments Alternative (Alternative 1) was inappropriately dismissed.

As DOGGR updates the DEIR, we urge the agency to work with Governor Jerry Brown to put an immediate moratorium on fracking in California.

2 PROJECT DEFINITION: The Project's definition and objectives are misleading and inaccurate.

The primary goal of CEQA is to "[e]nsure that the long-term protection of the environment shall be the guiding criterion in public decisions."[10] To this end, CEQA requires that the EIR include an accurate project description, and that the nature and objective of a project be fully disclosed and fairly evaluated in the EIR.

The DEIR's project description is inaccurate, obscure, and misleading. The Project definition in the DEIR states that it will include "all activities associated with a stimulation treatment that could occur either at an existing oil and gas well, or at an oil and gas well that is drilled in the future expressly for the purposes of a stimulation treatment."[11] That definition is problematic because it (1) rests on unfounded and unenforceable assumptions, (2) defers the identification of mitigation to some later date, (3) obscures the fact that the Project is geographically limited, (4) depends on draft proposed regulations, and (5) lacks certain key analyses of indirect effects, such as a lifecycle analysis of the chemicals used and crude produced by stimulated wells.

2.1 DOGGR relies on unenforceable assumptions concerning its ability to assure full consideration of and require mitigation of the Project's impacts.

DOGGR makes some key assumptions in defining the project. First, DOGGR seems to assume that well stimulation will satisfy specific standards for resource protection, including standards for water recycling, habitat protection, surface water protection and groundwater protection—without specifying in the DEIR what those are, deferring any mitigation that would bring the project within those standards, and not making the standards mandatory. For example, the DEIR states the DOGGR merely "intends" to impose and enforce a vague "Habitat Protection Standard" to minimize impacts to biological resources. But the standard is ill-defined and completely unenforceable. The DEIR cannot rely on such unconfirmed assumptions in describing the impact of the project. Second, DOGGR often seems to assume implementation of the (often vague and inadequate) mitigation measures recommended in the DEIR. But as DOGGR concedes in every section, it may not act as the Lead Agency for a particular well—and thus may not be in a position to analyze site-specific impacts and to mandate application of either the

[10] Cal. Pub. Res. Code § 21001(d)
[11] DEIR ES-2.

vague mitigation measures referenced in the EIR or other mitigation. For a more detailed discussion of this problem, see *below* Part 8.1.

2.2 DOGGR impermissibly defers mitigation.

A large portion of the "mitigation" in the DEIR is not merely potentially unenforceable by DOGGR, but also inadequately identified in the DEIR. In particular, throughout the DEIR, the impact findings rest on an "act now, study later" course of action with yet-to-be-completed studies and plans set forth to serve as mitigation. This is unacceptable: to the extent that DOGGR or other prospective Lead Agencies may rely on this EIR to characterize the potential environmental effects of any well stimulation project in California, DOGGR cannot wait to identify and discuss, in detail, available and feasible means of mitigating those effects. The DEIR does not adequately discuss and mandate mitigation measures that are likely to be workable and important measures for reducing the impacts of well-stimulation at a large number of sites, and that can and should be mandated as part of this programmatic review (even though the programmatic review cannot fully analyze the mitigation that may be required at each individual site). Further, the DEIR provides insufficient information regarding the impacts of well stimulation after mitigation measures are implemented. For a more detailed discussion of this problem, see *below* Part 8.2.

2.3 The Project's geographical limits are inappropriate and unsupported.

Despite a mandate in SB 4 to consider and "provide the public with detailed information regarding *any potential* environmental impacts of well stimulation *in the state*,"[12] the DEIR excludes 27 California counties (out of 58 counties total). For a more detailed discussion of this problem, see *below* Part 5.

2.4 The DEIR relies on proposed and final regulations that have not yet taken effect.

The Project definition impermissibly relies on proposed regulations that were undergoing active review during the DEIR analysis process and that have yet to go into effect to characterize the environmental setting and baseline. For a more discussion of this problem, see *below* Parts 3 and 7.

2.5 The DEIR lacks critical information on the lifecycle effects of well stimulation activities.

The DEIR should be clear that the Project's impacts reach beyond the well itself. Project-specific effect means "all the direct or indirect environmental effects of a project."[13] The DEIR's analysis should reflect this scope of impact and include, among others, a lifecycle analysis of the well stimulation chemicals and a lifecycle analysis of any increased in-state crude production, including of phases of oil and gas development that always accompany well stimulation. These analyses are necessary to appreciate the true reach of the Project and its total impacts on, e.g. greenhouse gas emissions, groundwater, and public health.

[12] Cal. Pub. Res. Code § 3161(b)(3)(A) (emphasis added)
[13] Cal. Pub. Res. Code § 21065.3

2.6 The Project's objectives are overly narrow.

The DEIR characterizes the Project's objectives as focused on the recovery and production of hydrocarbons.[14] The Project, however, is a direct outgrowth of Senate Bill 4, the first legislation in California to directly address hydraulic fracturing and the legislation that mandated this very environmental review process. Senate Bill 4 was not so cramped in its focus. Rather, Senate Bill 4 found that regulatory action was needed because: (1) there was insufficient information to assess the environmental, occupational and public health hazards and risks from well stimulation, (2) providing transparency and accountability to the public regarding well stimulation treatments, associated emissions to the environment, and the handling, processing, and disposal of well stimulation and related wastes, including from fracking, was of "paramount concern," (3) public disclosure of chemicals was required, and (4) the Legislature encouraged the use and reuse of treated and untreated and produced water for well stimulation.[15] To these ends, DOGGR should include in its Project definition the following four objectives:

1. the need to understand and prevent environmental, occupational, and public health risks;
2. the need for transparency around emissions and waste disposal;
3. the disclosure of chemicals;
4. and the reuse of water.

As explained in CEQA Guidelines Section 15124, an agency preparing an EIR must set out a clearly written statement of objectives in order to help the lead agency develop a reasonable range of alternatives to evaluate in the EIR. These four objectives, taken from Senate Bill 4 and the California Legislature itself, should inform the analysis of impacts, alternatives, and mitigation measures in this EIR.

One of the current stated objectives is to minimize the number of new wells required. However, this should be an objective only if fewer wells lessens environmental impact of the project.

The objectives also include a goal of reducing California's reliance on foreign oil and gas. However, the DEIR never considers that there are alternative ways to reduce the State's reliance on foreign oil and gas. For example, the DEIR dismisses without analysis the alternative technologies alternative to the Project. Critically, the DEIR also fails to consider California's greenhouse reduction goals, which include (1) increasing from one-third to 50 percent the state's electricity derived from renewable sources and (2) reducing today's petroleum use in cars and trucks by up to 50 percent by 2030.[16] With the state working towards these reductions, the need for petroleum imports is less likely.

3 PROJECT SETTING: The DEIR impermissibly relies on a poorly defined and shifting definition of the project setting.

[14] DEIR 7-2
[15] Senate Bill 4, Section 1
[16] Edmund G. Brown Jr., Inaugural Address Remarks as Prepared, (January 5, 2015) http://gov.ca.gov/news.php?id=18828 (last visited March 4, 2015). (Attachment 3)

The DEIR analysis addresses the effects of "oil and gas well stimulation treatments in California with implementation of DOGGR's *proposed* permanent regulations that would amend California Code of Regulations Title 14, Division 2, Chapter 4, Subchapter 2."[17] The proposed regulations were approved and finalized by the Office of Administrative Law on December 30, 2014, just 15 days before the Department of Conservation, through DOGGR, published the DEIR. The regulations are scheduled to go into effect on July 1, 2015; they address, among other key and related issues, baseline water testing, monitoring, public notice, and permitting of well stimulation treatments.

The proposed regulations have undergone several rounds of revision, and DOGGR is not transparent about which version (or versions) of the proposed regulations it relied on in preparing the DEIR. The final regulations were developed over a twelve-month period and are, by DOGGR's own admission, the result of consideration of extensive public input and consultation with other state regulatory agencies and underwent three rounds of revision. The final round of public input was completed on October 24, 2014, or about two and a half months before publication of the DEIR.

The DEIR's reliance on non-final regulations is problematic. DOGGR should have incorporated the development of regulations into the "project" under consideration and thus the EIR process. In this way, because regulations would be adopted as part of the action chosen, the EIR's analysis could rely upon measures required by the regulations. Here, however, DOGGR relied upon proposed regulations developed in a separate, parallel process, without accounting for the fact that the substance of the regulations could change. Indeed, the regulations the DEIR references here did in fact change during the time DOGGR was working on the DEIR. It is improper for any review, and especially one of this scope, magnitude and importance, to be based on contingencies. Other aspects of well stimulation regulations remain incomplete such as groundwater monitoring standards and memoranda of agreement among agencies delineating the responsibilities and coordination plans for each. This problem infects the very heart of the EIR analysis, because the environmental context against which the EIR purports to analyze impacts, alternatives, and mitigation is unclear, may have shifted during the review, and cannot be fully characterized until after the regulations DOGGR adopted late last year actually take effect this summer. It violates CEQA's requirements that EIRs incorporate and build on a stable, internally consistent project description.[18]

For much the same reasons, DOGGR's approach also violates CEQA's requirements to articulate a clear baseline, an issue we return to at Part VII, *below*. And it violates CEQA's requirements that the DEIR clearly and specifically describe its conclusions concerning the appropriate scope of mitigation measures and alternatives to include in this DEIR, issues we return to at Parts VIII and X, *below*. For example, DOGGR says that the mitigation measures it has suggested are limited to those "instances where the proposed permanent regulations have been found to not minimize potentially significant environmental effects," but that analysis is impossible at this stage.[19] The alternatives analysis, similarly, assumes the final regulations are already in place.

[17] DEIR 2-23
[18] *See, e.g.*, *County of Inyo v City of Los Angeles* (1977) 71 Cal. App. 3d 185, 197
[19] DEIR 4-1

4 LACK OF SCIENCE: The DEIR was written in the scientific dark and lacks the insights of the state's scientific study of the impacts of well stimulation.

In conducting this EIR, the Department and the Division have put the cart in front of the horse. The state is currently undergoing a scientific study mandated by Senate Bill 4 of the effects of well stimulation. Volume II of that study, concerning the impacts of well stimulation in California, is not due to be completed until July 2015 and is not yet available for public review. The study is being conducted precisely because this is an area of limited knowledge and a relatively new technology with only recent monitoring in California. To purport to conduct a statewide environmental review of an industry and process that is currently the subject of a separate impacts study, whose conclusions are not yet available to the public, simply does not make sense. Proceeding in this way will mean that the DEIR won't—and, indeed, cannot—have the benefit of or incorporate what is learned in the statewide study. Given what we already know about the dangers of well stimulation, it is irresponsible to proceed without a full assessment of the risks specific to California. Regulating in the scientific dark unnecessarily increases the risks to human health and the environment.

As the DEIR recognizes in its objectives, the requirements of Senate Bill 4 "are all inter-related in the sense that they all serve the overall objective of SB 4 to rigorously evaluate well stimulation treatments and determine whether they can be conducted safely and with minimal impacts to the environment."[20] To meet the very requirements of Senate Bill 4, the scientific study should logically inform the EIR process, and without this important information, the EIR's analysis of the environmental impacts of well stimulation in California is knowingly handicapped and limited.

Specifically, Senate Bill 4 requires conducting a scientific study that addresses the following:

> Identify areas with existing and potential conventional and unconventional oil and gas reserves where well stimulation treatments are likely to spur or enable oil and gas exploration and production.
>
> Evaluate all aspects and effects of well stimulation treatments, including, but not limited to, the well stimulation treatment, additive and water transportation to and from the well site, mixing and handling of the well stimulation treatment fluids and additives onsite, the use and potential for use of nontoxic additives and the use or reuse of treated or produced water in well stimulation treatment fluids, flowback fluids and handling, treatment, and disposal of flowback fluids and other materials, if any, generated by the treatment. Specifically, the potential for the use of recycled water in well stimulation treatments, including appropriate water quality requirements and available treatment technologies, shall be evaluated. Well stimulation treatments include, but are not limited to, hydraulic fracturing and acid well stimulation treatments.

[20] DEIR ES-3

> Review and evaluate acid matrix stimulation treatments, including the range of acid volumes applied per treated foot and total acid volumes used in treatments, types of acids, acid concentration, and other chemicals used in the treatments.
>
> Consider, at a minimum, atmospheric emissions, including potential greenhouse gas emissions, the potential degradation of air quality, potential impacts on wildlife, native plants, and habitat, including habitat fragmentation, potential water and surface contamination, potential noise pollution, induced seismicity, and the ultimate disposition, transport, transformation, and toxicology of well stimulation treatments, including acid well stimulation fluids, hydraulic fracturing fluids, and waste hydraulic fracturing fluids and acid well stimulation in the environment.
>
> Identify and evaluate the geologic features present in the vicinity of a well, including the well bore, that should be taken into consideration in the design of a proposed well stimulation treatment.
>
> Include a hazard assessment and risk analysis addressing occupational and environmental exposures to well stimulation treatments, including hydraulic fracturing treatments, hydraulic fracturing treatment-related processes, acid well stimulation treatments, acid well stimulation treatment-related processes, and the corresponding impacts on public health and safety with the participation of the Office of Environmental Health Hazard Assessment.

Each of the subject areas specified for the scientific study in Senate Bill 4 should be analyzed in the EIR.

Senate Bill 4, as originally drafted, did not contemplate concurrent release of the EIR and scientific study – rather, it provided for the study to come out on January 1, 2015 and for the EIR to be finalized July 1, 2015. This original order of events makes sense.

On January 14, 2015, California Council on Science and Technology (CCST) released Volume I of the assessment to the public. Volume I, which is titled "An Independent Scientific Assessment of Well Stimulation Technologies in California: Well Stimulation Technologies and their Past, Present, and Potential Future Use in California", provides the factual basis describing what well stimulation treatments are, how they are conducted in general and practiced in California, and where they have been and are being used for oil and gas production in the state. The remainder of the full independent scientific assessment will be released in July 2015. Volume II will assess the potential impacts of well stimulation with respect to water, air quality, and greenhouse gas emissions, as well as induced seismicity, ecology, traffic and noise. And Volume III will present case studies to assess environmental issues and qualitative hazards for specific geographic regions. All three volumes should inform the EIR process, and DOGGR should not complete its EIR until DOGGR and the public have had the opportunity to review and comment on all three volumes.

5 GEOGRAPHIC SCOPE & KERN COUNTY: The DEIR improperly defines and limits the geographic scope of the Project area and fails to adequately consider impacts of Kern County well stimulation.

5.1 The DEIR study regions are not based on any logical organizing principle and impermissibly exclude part of the State.

For purposes of the DEIR, DOGGR partitioned the State into six study regions. These study regions follow the boundaries of DOGGR's six administrative Districts. The stated purpose of subdividing the State was to grapple with California's "diversity of environmental attributes," but the boundaries of the study regions are set by political, not environmental, parameters. Instead of permitting an analysis that considers similar ecosystems or is done by impacted watersheds, for example, the study regions serve to splice and downplay impacts. This improper piecemealing masks impacts and impairs review.

Furthermore, Senate Bill 4 and Public Resources Code Section 3161(b)(3) require this EIR to evaluate well stimulation treatments throughout the State of California. This EIR, however, fails to do that. Instead it excludes "portions of California that have not been developed for oil and gas production historically," and areas "not reasonably projected to be developed for oil and gas production in the future because they do not contain hydrocarbon reserves that could be economically produced."[21] In total, it excludes 27 of California's 58 counties or approximately 43 percent of California's total land mass.

This is impermissible for at least three reasons. First, SB 4 mandated a review of the impacts of well stimulation throughout the state. This makes good sense. The indirect and potential impacts of well stimulation are not reasonably limited to the physical location of the Monterey Shale. The water, wastewater, chemicals, and crude involved in well stimulation may travel as far as 300 miles one-way from a production field[22], and those trips (and their impacts on, e.g., traffic, hazardous materials, and air) are nowhere legally confined to the boundaries of the Monterey Shale. Second, the reason that SB 4 was passed and this EIR was undertaken is precisely because of a sudden increase in estimates of California's oil reserves and advancements in drilling methods and technology that make extraction possible in places and of reserves that it has historically not been economical or possible to extract. Third, when speaking on panels, the Department of Conservation's own Director Mark Nechodom frequently puts up various, differing maps of the Monterey Shale and makes the point that we do not know with any certainty where this reserve is and where it isn't. For example, compare the BLM/CA Department of Conservation map of the Monterey Shale (provided below) with the one in Figure 5-9 in the DEIR. The discrepancies are numerous. For example, one map shows the shale formation reaching up through San Mateo and Santa Cruz counties, the other does not. The one map shows the formation reaching through the middle of Monterey County; the other shows the formation off the coast of Monterey. The one map shows the formation off the coast of San Diego County; the other does not.

[21] DEIR 4-6
[22] DEIR 10.3-31

Even using DOGGR's own test of areas reasonably projected to be developed for oil and gas production in the future because they contain hydrocarbon reserves that could be economically produced, the DEIR impermissibly excludes counties. For example, San Diego County is excluded although, even by the DEIR's *own map*, it has the Monterey Shale in its northwestern boundary, just off its coast, and is a major port. The DEIR also excludes Mariposa and Tuolumne counties, even though by the DEIR's *own map*[23], those counties' western borders include the Monterey Shale. Finally, the DEIR excludes a host of Northern California counties that don't appear to overlap the Monterey Shale but are directly adjacent to numerous oil or gas fields in the Sacramento Valley.

The final EIR must consider the possibility that well stimulation would occur throughout the state, or put actual, enforceable limits on permissible activity. Failure to include San Diego, Mariposa, and Tuolumne counties is perhaps the most outrageous because those counties—according to DOGGR's own map included in the DEIR itself[24]—include the Monterey Shale in their boundaries or in their coastal waters.[25]

5.2 DOGGR failed to do in-depth study of any Kern oil field.

The DEIR engages in a "spotlight" analysis of three specific oil and gas fields, namely, the Wilmington, Inglewood, and Sespe oil and gas fields. The selection of these three "example" oil fields is problematic for multiple reasons. First, these fields are all located in Region 1 and 2 and are, therefore, not necessarily representative of an activity that will be conducted throughout the state and the six study regions in the DEIR. The conditions and concerns experienced in these Southern California existing oil fields are likely to vary greatly from those of, e.g., a well stimulation project in the north end of Monterey County, which historically has had very little to no fracking and has an entirely different set of ecological and human considerations.

[23] DEIR Figure 5-9
[24] *Id.*
[25] See also, Richard Behl, The Monterey Formation of California: New Research Directions: AAPG 2012 showing Monterey formation extending well into northern California. (Attachment 4)

Second, the selection of these three specific oil fields misses the fracking elephant in the State: Kern County. According to DOGGR, Kern County is the site of the vast majority of California's current well stimulation projects and permits. Indeed, Kern County is projected by DOGGR itself to be the site of 95 percent of future well stimulation in California. The DEIR notes that Kern is undergoing its own EIR process and seems to, on that basis, abnegate its duty and mandate to conduct a true statewide study of the environmental impacts of fracking. Instead, it punts the question of environmental impacts in Kern to a hypothetical future EIR by the county. The Project and EIR must address Kern County and should conduct a higher, not lower, level of review of the potential impacts of continued well stimulation activity in Kern County.[26] This is troubling not only because Kern County is such a locus of well-simulation activity already, but also because it is home to poor communities and communities of color that Cal EPA has identified as particularly burdened by and vulnerable to pollution.[27]

6 INTENT OF EIR: The DEIR is a programmatic level analysis of the Project that cannot serve as the final CEQA document.

The stated intent of the DEIR is "to function as a programmatic environmental review document under CEQA."[28] However, the document also asserts that for some unlimited number of wells this document is also intended to be able to serve as the sole CEQA review.[29] To that end, the DEIR sets out a process where the State Oil and Gas Supervisor, or his appointee, will use a checklist to "determin[e] the extent, if any, to which a particular proposed permit or group of proposed permits requires additional, site-specific or project-specific analysis . . . ."[30] This EIR, which is by its very design hindered in its ability to consider location-specific environmental impacts and mitigation, should not and cannot serve as the final CEQA review for any future wells.

Programmatic-level EIRs are a first-tier document under which subsequent, site-specific proposed activities must also be evaluated under CEQA. The reason for that is twofold. As an initial matter, the environmental effects of any identified well stimulation activity are not in the scope of this DEIR's programmatic level analysis because the analysis here has been abstracted in order to consider impacts statewide. Well-by-well and site-specific CEQA analysis is required because each location and each oil well in California has its own set of highly particular concerns and environmental considerations including, but not limited to: local water supply and hydrology, geology, faults and seismology, community and environmental justice concerns, neighboring wells (i.e. offset wells), and critical habitat and threatened or endangered species impacts. In all future cases, "the later activity would have effects that were not examined in the program EIR" and a new initial study would need to be prepared.[31] A program EIR is limited in its utility for dealing with subsequent activities by the specificity and

[26] See Attachment 1 § 4.2; Attachment 2 §§ 2.2.2, 3.3
[27] Attachment 2 § 3.3
[28] DEIR 4-2
[29] DEIR 4-2
[30] DEIR 4-2
[31] CEQA Guidelines 15168(c)(1)

comprehensibility with which it considers and anticipates future activities under the program.[32] The present draft programmatic EIR lacks the detail necessary to act as the final decision document for any future site specific project.

Second, because this DEIR depends on regulations that were not finalized until very late in its preparation and that are not yet in effect, comes in advance of a statewide scientific impacts study that is not publicly available or complete, and has, across issue areas, deferred mitigation to analyses that were not undertaken in the short time in which this DEIR was drafted, no future site can be deemed to have been sufficiently studied for impacts or have those significant impacts mitigated by this document. Those regulations themselves were not evaluated pursuant to CEQA, so there is no credible way to assess the impact of their implementation. New information that was not known at the time of the previous EIR, in particular, "[m]itigation measures or alternatives previously found not to be feasible" and "[m]itigation measures or alternatives which are considerably different from those analyzed in the previous EIR" and would reduce one or more significant effects on the environment" are grounds for a new EIR.[33] Here, the mitigation measures are not known and have been deferred to some future study and plan. Accordingly, once those plans and studies are completed, any future project would necessarily have the benefit of that information and only then could it begin to mitigate the impacts, as required by CEQA.

In order to ensure the full disclosure of a particular project's environmental impacts and to best adopt feasible measures to mitigate those local and regional impacts, full site-specific CEQA review at the well level is required in addition to the statewide EIR. Any single project authorization should be carefully justified and must be strictly limited to a maximum number of wells in the same field and pool/zone.

7 BASELINE: The Project's environmental baselines are inadequately defined and contingent on future developments whose impacts cannot be characterized now.

To evaluate the environmental impacts of a proposed project, a lead agency must first determine the environmental setting, or baseline.[34] Under CEQA, the baseline consists of "the physical environmental conditions in the vicinity of the project, as they exist at the time . . . environmental analysis is commenced."[35] In other words, the baseline is the actual physical conditions that exist at the site—not hypothetical conditions.[36] As discussed at Part III, *above*, this DEIR purports to use conditions following the implementation of regulations that will not go into effect until this summer, and that were being revised while the EIR was written, as the setting for this analysis. The DEIR thus explicitly relies on future, hypothetical conditions—and not the conditions at the time its analysis commenced—as the baseline. This not only violates CEQA's baseline requirements, but also makes it impossible for the public to tell what effects baseline DOGGR assumed for any part of the analysis; to be sure the baseline was

[32] CEQA Guidelines 15168(c)(5)
[33] CEQA Guidelines 15162(3)(c),(d)
[34] 14 Cal. Code Regs. ("Guidelines") § 15125(a)
[35] Guidelines § 15125(a)
[36] *Communities for a Better Env't v. S. Coast Air Quality Mgmt. Dist*., 48 Cal. 4th 310, 315(2010)

consistent from part to part, or (because the baseline is tacked to well stimulation activities under regulations that are not in effect yet) whether the baseline appropriately captures the conditions that may exist after the regulations actually go into effect this summer.

8 UNENFORCEABLE AND DEFERRED MITIGATION: The DEIR Relies on Speculative and Unenforceable Mitigation Measures.

8.1 DOGGR cannot rely on the DEIR's mitigation analysis to minimize or avoid discussing significant impacts, because the mitigation is not sufficiently enforceable.

As an initial matter, all of the mitigation in this DEIR is speculative and unenforceable. DOGGR cannot, therefore, rely on it to avoid characterizing any of the impacts of well stimulation as significant for CEQA purposes, or to avoid fully analyzing impacts it does concede are significant.

A fundamental problem with DOGGR's approach to mitigation measures is that, as discussed at Part II.2, *above*, DOGGR may not serve as the Lead Agency for all (or even the lion's share of) well stimulation projects in California that this DEIR purports to analyze. Because DOGGR has limited authority to require any of the mitigation identified in the DEIR in instances where it is not the Lead Agency, it cannot assume in defining and analyzing the impacts of this Project that the standards for resource protection and mitigation in this DEIR *will* be implemented for all well stimulation projects in California.[37]

Another problem is that, as discussed at Parts 3 and 7, *above*, the environmental setting and baseline for the project, which determine its impacts and affect the appropriate scope of mitigation measures, are hypothetical and impossible to characterize fully at this time.

A third problem is that much of the mitigation in the DEIR is described in vague terms that make it impossible to understand what mitigation DOGGR understands to be feasible or envisions would be required at any particular well stimulation site. Agencies may not incorporate proposed mitigation measures into the description of the project to skirt CEQA's requirement to disclose significant impacts.[38] If an agency relies on such measures to reduce the significance of the project, it must ensure that they are enforceable.[39] DOGGR cannot assure that the limited set of mitigation measures it mentions will be enforceable, even at sites where it will serve as Lead Agency, because it has not clearly specified which measures it intends to enforce.

DOGGR's preparation of this EIR cannot substitute for or excuse local lead agencies from conducting their own CEQA review for well-stimulation projects they approve. The Legislature expressly anticipated

[37] (See, e.g. 10.3-42 explaining that to avoid objectionable air odors affecting substantial numbers of people will require counties and cities to use their police power and statutory authority). *See, e.g.*, Cal. Pub. Res. Code § 21165(a) (making Lead Agencies responsible for preparing environmental impact reports for, and determining the environmental significance of impacts from, projects they carry out or approve).
[38] *Lotus v. Dep't of Transp.*, 223 Cal. App. 4th 645, 655-56 (2014)
[39] *Id*. at 652

that agencies other than DOGGR would serve as Lead Agency for some well-stimulation projects.[40] Indeed, there is reason to believe that local agencies, rather than DOGGR, will generally serve as the Lead Agency under CEQA.[41]

DOGGR must revise the DEIR to make clear that this document alone does not satisfy CEQA requirements for individual well-stimulation projects, and that all Lead Agencies remain responsible for preparing supplemental CEQA documents that fully analyze the site-specific impacts of, and identify and prescribe appropriate mitigation measures for, well stimulation projects they approve.

8.2 DOGGR has impermissibly deferred mitigation in an "act now, study later" approach.

The DEIR acknowledges that the Project will have significant adverse environmental impacts. DOGGR then goes on to assert that as part of its mitigation it will conduct various plans, reports, and studies. The problem with this approach, however, is that the true environmental consequences of the proposed action are required to be considered *before* actions are taken—not after. To study the effects and mitigate after the project has commenced is backwards. DOGGR has proposed to increase the risk of harm to the environment and then to study that risk, but the entire purpose of the EIR process is that before one brings about a potentially significant and irreversible change to the environment, the agency sufficiently explore the intensity of the environmental effects and mitigate those impacts. A description of the Project that depends on future mitigation studies is misleading: there is no enforceable requirement related to these future plans or studies.

The question every EIR must answer is whether the planned activity will have "significant effects on the environment" so that it can "identify alternatives to the project, and [] indicate the manner in which those significant effects can be mitigated or avoided."[42] In violation of CEQA, DOGGR has left that question unanswered. As a result, DOGGR failed to fulfill the purpose of the DEIR that it "mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so."[43]

While DOGGR promises that the necessary studies and reports will be performed after the EIR is completed, that is too late. Without ascertaining, for example, the health impacts created by the Project before completion of the EIR, the EIR cannot be, as it is required to be, a "meaningful and useful to decision makers and to the public."[44] CEQA rejects DOGGR's "act first, study later" approach. And, the fact that DOGGR might have to work harder to determine if significant impacts can result from this Project in comparison to other projects cannot be an excuse for deferred study. The Project's size and complexity calls for greater consideration and study, not less.

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[40] See SB 4, Cal. Pub. Res. Code § 3161(b)(4)(C) ("Nothing in this section prohibits a local lead agency from conducting its own EIR.")

[41] See CEQA Guidelines § 15051(b)(the lead agency for projects carried out by nongovernmental entities "will normally be the agency with general governmental powers, such as a city or county, rather than an agency with a single or limited purpose [such as DOGGR]")

[42] Cal. Pub. Res. Code § 21002.1(a)

[43] Cal. Pub. Res. Code § 21002.1(b)

[44] Cal. Pub. Res. Code § 21003(b)

8.3 DOGGR must complete the Health Risk Assessment (HRA) before finalizing the EIR

Numerous health concerns have been associated with well stimulation, and while the DEIR addresses some aspects of a subset of these health issues, it fails to address other important health risks. In particular, the DEIR doesn't consider health issues as a group in a formal Health Risk Assessment (HRA), including interactive effects on the health of local residents and communities. A full HRA as part of the DEIR is a necessary component, as there are already numerous reports of health complaints including dizziness, sinus disorders, depression, anxiety, difficulty concentrating, and many others, among people who live near well stimulation operations in other states. Without a full assessment and mitigation of the impacts of the risks, the health of California residents and communities is likely to suffer.

In adopting CEQA, the California legislature found that "[t]he capacity of the environment is limited, and it is the intent of the Legislature that the government of the State take immediate steps to identify any critical thresholds for the health and safety of the people of the State and take all coordinated actions necessary to prevent such thresholds being reached."[45] The legislature went on to find that there is "a need to understand the relationship between the maintenance of high-quality ecological systems and the general welfare of the people of the State . . . ."[46] To these ends, DOGGR must complete its Health Risk Assessment of the Project before finalizing the EIR.

8.4 DOGGR can and must do more to describe and mandate mitigation measures that are appropriately required at a programmatic level, as a floor and complement to further mitigation measures that may be identified through site-specific review.

As noted throughout the detailed review comments, the DEIR includes numerous mitigation commitments that are not enforceable because they are not included in the proposed regulations or any supplemental permit conditions. Although it is impossible for this programmatic review to fully identify and analyze all mitigation measures that may be needed at individual well-stimulation sites, DOGGR can and must do more to describe and mandate various categories of mitigation that existing studies demonstrate are likely to be important and feasible methods of reducing impacts at many sites across California. These mitigation measures should set a floor for future mitigation that DOGGR or other Lead Agencies identify in further, site-specific CEQA review. For example, as we discuss at Part XIII, *below*, DOGGR can and must do more to describe and mandate mitigation for the air-quality, groundwater, surface water, noise and vibration, hazards and hazardous materials, terrestrial biological resources, marine biological resources, seismic, and environmental justice impacts of well stimulation.

Mitigation measures that are suggested in the DEIR itself that are unenforceable (i.e., not codified through regulatory or other mechanisms) should be acknowledged as such and reduced efficacy of mitigation due to the lack of enforcement should be analyzed and disclosed.

[45] DEIR 4-2 (citing PRC Division 13, Section 21000(a) through (g))
[46] *Id.*

9 ALTERNATIVES: The alternatives analysis impermissibly rejects feasible alternatives.

The alternatives analysis is central to an EIR. As the California Supreme Court has written, "The EIR is the heart of CEQA, and the mitigation and alternatives discussion forms the core of the EIR."[47] A major goal of any EIR is to "ensure that all reasonable alternatives to proposed projects are thoroughly assessed by the responsible official."[48]

Given the central importance of the alternatives analysis to the integrity of its EIR, DOGGR must do far more than merely go through motions of analyzing and summarily dismissing alternatives before selecting its preferred alternative. Rather, DOGGR must identify and "consider a reasonable range of potentially feasible alternatives that will foster informed decisionmaking and public participation."[49] This range must include alternatives that "feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project."[50]

"[A]n agency may not approve a proposed project if feasible alternatives exist that would substantially lessen its significant environmental effects."[51] An agency's finding that an alternative is infeasible "must be supported by substantial evidence in the record."[52]

Of particular importance here, the CEQA Guidelines provide that:

> An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain *most* of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives.[53]

That an alternative may be inconsistent with some project objectives, therefore, may not justify its elimination from review.[54]

> The Guidelines also provide state that:
>
> Because an EIR must identify ways to mitigate or avoid the significant effects that a project may have on the environment (Public Resources Code Section 21002.1), the discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project,

[47] *In re Bay-Delta Programmatic Envtl. Impact Report Coordinated Proceedings*, 43 Cal. 4th 1143, 1162 (2008)
[48] *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 735; *see also* Cal. Pub. Res. Code § 21002.1(a)
[49] CEQA Guidelines, § 15126.6(a)
[50] *Id.*
[51] *Save Panoche Valley v. San Benito Cnty.*, 217 Cal. App. 4th 503, 521 (2013) (citations omitted); *see also* Cal. Pub. Res. Code § 21081 (a); CEQA Guidelines, § 15091 (a)(3); *California Native Plant Soc. v. City of Santa Cruz*, 177 Cal. App. 4th 957, 1002 (2009)
[52] *Id*.; Pub. Resources Code § 21081.5; Pub. Resources Code § 21081(a)(3)
[53] 14 Cal. Code. Regs § 1526.6(a) (emphasis added)
[54] See also *id*. §§(c), (f)

even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly.[55]

In the DEIR, DOGGR purported to evaluate six alternatives, including a no project alternative.[56] The DEIR's evaluation of these alternatives was deeply flawed. The DEIR does not support DOGGR's conclusion that the preferred alternative is "environmentally superior" to the other enumerated alternatives or logical extensions thereof.[57] More fundamentally, DOGGR impermissibly refused to analyze several additional important alternatives. The DEIR's discussion of alternatives mischaracterized the project's true purpose and objectives, applicable law, and the available facts on relative impacts.

9.1 DOGGR Impermissibly Rejected various alternatives that it must re-analyze in the Final EIR.

DOGGR impermissibly dismisses, based on misreadings of law and unsubstantiated factual claims, a number of alternatives that (if appropriately analyzed and characterized) could further reduce the impacts of well stimulation. These alternatives also provide important context for DOGGR's review of other alternatives, by helping the public to better understand the relative environmental, social, and economic costs of different approaches to meeting California's energy needs.

9.1.1 No future well stimulation alternative (Alternative 1) and No future well stimulation outside of existing oil and gas field boundaries alternatives (Alternative 2)

As the TGG Report explains, DOGGR's conclusion that the Project is the environmentally preferable alternative is largely unfounded. In particular, two alternatives have not been given adequate consideration: No future well stimulation (Alternative 1) and No future well stimulation outside of existing oil and gas field boundaries alternatives (Alternative 2). These alternatives must be reconsidered.

In its rejection of Alternative 1 and 2, DOGGR makes three key assumptions. First, that there would be less California crude production under either alternative and 25 percent less under Alternative 1. Second, that this foregone production would be offset by additional oil produced outside of the State and delivered to California. Third, that there would be indirect environmental impacts associated with exploration and production activities in the areas where the oil would be produced and impacts associated with transportation of the oil into California, primarily by tanker and rail.[58]

With respect to the first assumption, the TGG Report explains that the 25 percent figure is overstated, contradicted within the DEIR itself, at odds with the recent CCST SB4 Well Stimulation Study figures[59], and from a personal communication with Halliburton, an unreviewable and obviously biased source.[60]

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[55] *Id*. §§ 15126(b)
[56] *See, e.g.,* DEIR ES-5
[57] DEIR ES-46 – ES-47
[58] DEIR, p. 8-7-8-8
[59] CCST (California Council on Science and Technology), An Independent Scientific Assessment of Well Stimulation in California, Volume 1: Well Stimulation Technologies and their Past, Present, and Potential Future Use in

DOGGR's three assumptions are also based on historical information that may not be representative of future conditions. The information in the DEIR "predates, and thus does not take into account, the major changes since mid-2014 in terms of dramatically lower crude prices."[61] This shortcoming in the analysis has implications for DOGGR's future predictions and alternatives analysis. Specifically, as the TGG Report explains, "[i]n California, well stimulation, in combination with high crude prices, has not enabled large amounts of crude production from shale/tight oil plays. Thus, in California, restrictions on well stimulation might have only a short-term impact on crude production, even in a context of high crude prices."[62] "Put more simply, if crude prices are low and there is much less drilling in California (compared with recent years when crude prices were high and there was substantial drilling activity in California), then restrictions on well stimulation may not have a big impact on production" over the short-term.[63]

In sum, less than 25 percent of oil in California is currently a product of well stimulation. And, lower crude prices means that there will likely be even less stimulation activity going forward, so that any restriction will have a lower impact than DOGGR predicts over the short-term. "So instead of the immediate 25% drop in production claimed by the DEIR for Alternative 1, any impact on crude production from Alternative 1 may be very small at first and will (at most) grow only slowly over a long period."[64]

The following summary is from the TGG Report, Section 2.5:

> The DEIR analysis assumes that well stimulation enables 25% of California crude production, and that Alternative 1 (No Future Well Stimulation) would result in an immediate 25% drop in production. But **for multiple reasons, restrictions on well stimulation may have only a much smaller impact on California crude production and supply,** especially in the near term**.**
>
> First, the DEIR assumes that restrictions on well stimulation would immediately have their full impact on production; however, this is not a realistic reflection of the time pattern for drilling and production. Wells typically produce crude over a number of years, albeit at declining rates. So production in a given year is affected not just by drilling in that year, but also by ongoing production from wells drilled in previous years. Thus, any change in drilling practices (such as restrictions on well stimulation) will have only a limited impact on production in the near term. It will likely take several years, or even longer, for a change in drilling practices to affect large numbers of wells and reach its maximum effect on overall crude production.

California. Prepared by Long, Jane, et al (CCST, Lawrence Berkeley National Laboratory, Pacific Institute, and Dr. Donald Gautier, LLC), January 2015 http://ccst.us/projects/hydraulic_fracturing_public/SB4.php (Attachment 5)

[60] Attachment 1 § 2.3

[61] Attachment 1 § 2.4

[62] *Id.*

[63] *Id.*

[64] *Id.*

Second, the DEIR assumes that well stimulation enables 25% of California crude production, but this 25% figure is high relative to historical experience and other available information. Moreover, this 25% figure is based on a personal communication that is unreviewable, as well as potentially prone to bias.

Third, the 25% figure assumed by the DEIR does not take into account the major changes since mid-2014 in terms of dramatically lower crude prices. Lower crude prices (vs. higher crude prices) will result in lower California crude production and lower usage of well stimulation. In California, new drilling and crude production in January 2015 have decreased by about 90% compared with May-November 2014. Lower crude prices are also likely to delay (and quite possibly forestall) extensive development of new oil fields and Monterey shale resources

Thus, restrictions on well stimulation may not have a big impact on production. So instead of the immediate 25% drop in production claimed by the DEIR for Alternative 1, **any impact on crude production from Alternative 1 may be very small at first and will (at most) grow only slowly over a long period**.

Meanwhile, **Alternative 2 may not (in practice) have a sizable impact on crude production**, especially in the near-term. Alternative 2 would only prohibit well stimulation in locations (outside of existing fields and their buffer areas) where there might be little or no well stimulation in a context of lower crude prices.

Second, even if Alternatives 1 and 2, or any other alternative, would decrease in-state oil production, DOGGR's analysis rests on a flawed and utterly unsupported assumption that any decrease in production will be met with a corresponding increase in imports. The DEIR's discussion of this effect is based solely on the (mistaken) contentions that 25 percent of *current* in state production uses well stimulation and that roughly half of the oil used in state is *currently* imported.[65] DOGGR contends that any decrease in production below current levels would need to be replaced, on a barrel for barrel basis, by increased imports. This analysis entirely fails to consider California's projections and commitments regarding curtailment of in state oil demand. California law already requires measures to significantly reduce in state oil use pursuant to the Global Warming Solutions Act, AB 32.[66] Implementation of AB 32 is expected to significantly reduce total California gasoline and diesel use relative to present levels.[67] Recently, Governor Brown has announced even more ambitious targets, setting the goal to ""within the next 15 years, . . . [r]educe today's petroleum use in cars and trucks by up to 50 percent."[68] Because the reduction in future California oil demand is likely to be far greater than any reduction in oil production caused by a ban or other limit on well stimulation, there is no basis for assuming that any decrease in production will be replaced on a one-for-one basis with increased imports.

[65] DEIR 12.2-66
[66] *See* California Air Resources Board, First Update to the Climate Change Scoping Plan, 46-56 (May 2014)
[67] *See, e.g.,* Simon Mui, Natural Resources Defense Council, *California is Already Cutting Carbon Pollution and Reducing Vehicle Fuel Expenditures* May 8, 2014)
http://switchboard.nrdc.org/blogs/smui/new_analysis_california_is_alr.html
[68] Attachment 3.

Third and finally, DOGGR's assumptions regarding emissions for imports are unsupported. In particular, DOGGR's analysis of emissions is focused on marine deliveries via tankers. The numbers DOGGR uses, however, include emissions from tankers transporting other liquid bulk commodities, and "will tend to overstate emissions for the subset of tankers transporting California crude oil into California."[69]

Based on its analysis, the TGG Report concludes that DOGGR's comparison of alternatives, which ranks the Project environmentally superior to Alternative 1 "is not consistent with the DEIR air quality analysis."[70] "The DEIR understates adverse air quality impacts for the Project and overstates adverse impacts for Alternative 1 (and 2). Thus, the DEIR consideration of air quality impacts is incomplete and unbalanced."[71]

A proper consideration of air quality impacts would likely result in a comparison of alternatives that differs very substantially from that provided in the DEIR. Given the size and importance of these air quality impacts, it is essential that a proper consideration of these impacts be undertaken. The DEIR has not provided a sound basis for decision-making in regard to air quality, and more broadly in terms of the Project and any comparison to the alternatives.

DOGGR must revise the DEIR to include fuller review of the No Future Well Stimulation Alternative (Alternative 1) and the corollary that assumes that future well stimulation will be limited to the boundaries of existing California oil and gas fields (Alternative 2). These alternatives—in addition to providing attractive alternatives that could potentially have significantly reduced environmental and public health impacts—provide critical context for government decision-makers and the public. DOGGR's reasons for eliminating them are based on erroneous readings of law and unsupported by substantial evidence.

9.1.1.1 Alternatives 1 and 2 are feasible

DOGGR is wrong to presume that "[t]o be implemented, [the No Future Well Stimulation Alternative] would require new legislation to amend or repeal [California Public Resources Code] Section 3106(b), which currently authorizes well stimulation treatments, and 3160(b), which was enacted as part of Senate Bill 4."[72] On the contrary: DOGGR has an affirmative duty to prohibit well stimulation unless DOGGR determines that it can be done safely while preventing, as far as possible, damage to life, health, property, and natural resources, and reflects the best policy for California.

Section 3106(b) directs DOGGR to permit only those "methods and practices . . . for the purpose of increasing the ultimate recovery of underground hydrocarbons . . . which, in the opinion of the supervisor, *are suitable for this purpose*."[73] As DOGGR recognizes, "SB 4's requirements . . . are all inter-related [and] . . . all serve the overall objective . . . of requiring the State to rigorously evaluate well

[69] Attachment 1 S. 4.3
[70] Attachment 1 S. 4.4
[71] *Id.*
[72] DEIR 12.1-2.
[73] Ca. Pub. Res. Code § 3106(b) (emphasis added)

stimulation treatments and *determine whether they can be conducted safely*."[74] More broadly, the findings in the final version of this EIR and other legally mandated reviews may demonstrate that that the putative benefits of well stimulation simply do not outweigh the associated damage and threats to the environment and public health. Plainly, the fundamental purpose of this EIR and the other reviews the Legislature has mandated is to whether well stimulation is "suitable" for California. If the DEIR and other reviews demonstrate that it is not, DOGGR has both the authority and obligation to prohibit its use.

Consistent with this mandate, neither section 3016(b) nor section 3160(b) set a floor on the level of well stimulation that must lawfully occur, or purports to prevent California regulators from exercising their discretion to ban future well stimulation. Section 3160(b) simply requires the adoption by January 1 of this year of regulations specific to well stimulation, and the collection and submission of other information about well stimulation.[75] Section 3106(b) likewise does not mandate any particular level of well stimulation,[76] but instead contemplates that some methods and practices are not "suitable" and therefore must not be allowed. Section 3106(b) must also be read in the context of section 3016(d), which provides that DOGGR "shall administer" California's oil and gas law "so as to encourage the wise development of oil and gas resources."[77] Their EIR and the other actions required by SB 4 must determine whether, rather than assume that, it is "wise" for DOGGR and fellow regulators to allow any well stimulation in California, as well as determining whether and how to limit any stimulation that is allowed.

Furthermore, nothing in Senate Bill 4 changed DOGGR's existing duty under the Public Resources Code to "prevent, as far as possible, damage to life, health, property, and natural resources . . . ." § 3106(a). Thus, implementing Alternative 1 is clearly within DOGGR's authority, and no changes to the law would be needed.

DOGGR is also wrong to suggest that it may dismiss otherwise reasonable alternatives from its CEQA review simply because they *may* require some "independent legislative action."[78] As explained in the introduction to the Alternatives section, EIRs generally should foster public understanding about the probable environmental and public-health consequences of different courses of action. In considering what alternatives are reasonable and feasible here, DOGGR must also keep in mind that this EIR is being prepared in response to a law that recognized that the public lacks sufficient information about the environmental and other hazards of well stimulation, and that called for more transparency and accountability in educating the public about these hazards. *See above* Part II.6.

If, for example, DOGGR were to conclude following full and fair consideration of Alternatives 1 and 2 that these alternatives are viable options for minimizing the damage and threats to the environment

[74] DEIR 7-2.
[75] *See* Cal. Pub. Res. Code § 3106(b)
[76] *See id*. § 3106(b)
[77] *Id*. § 3106(d) (emphasis added)
[78] DEIR 12.1-2

and public health associated with well stimulation, DOGGR is obligated to stop well stimulation in order to prevent damage to life, health, property, and natural resources. It may also help to inform future legislation, as well as DOGGR's own determination of whether well stimulation was "suitable" and "wise."[79] Full consideration of Alternative 2 and related alternatives that would more tightly regulate well stimulation would also provide important context for DOGGR's own regulatory work and oversight of well-stimulation projects, even assuming that no new legislation passes. As DOGGR concedes elsewhere, it and other California agencies retain the discretion to adopt more stringent well-stimulation regulations than have been adopted recently in response to SB4. *See also below* Pt II.6 (discussing SB4), Pt. X.1 (discussing DOGGR's impermissible rejection of a "Most Stringent" Alternative).

9.1.2 DOGGR's claims about the air-quality impacts of Alternatives 1 and 2 are exaggerated, arbitrary and unsupported by substantial evidence.

DOGGR claims that the no well stimulation alternative in California would be worse for air quality than allowing future well stimulation. This claim is based on a flawed analysis that exaggerates the comparative impacts DOGGR identifies. It is also arbitrary.

As an initial matter, in the DEIR, DOGGR's estimates of emissions for criteria and precursor air pollutant emissions include new drilling, but the Greenhouse Gas (GHG) emissions from well stimulation fail to include emissions from new well drilling.[80] DOGGR also "substantially underestimates GHG emissions for the supply from California production enabled by well stimulation, while overstating emissions for alternative crude supply production outside California."[81] More specifically, the crude produced in California has a relatively high average carbon intensity. Indeed, even using DOGGR's own numbers, the GHG emissions from the California crude production enabled by well stimulation would be a very significant component of overall statewide emissions.[82]

> But the DEIR analysis substantially understates GHG emissions for the supply from California production enabled by well stimulation. . . . California production enabled by well stimulation has a substantially higher carbon intensity, relative to other California crude production and relative to replacement supply from imports.[83]

As the TGG Report explains, there is variation in the carbon intensity of different California oil fields. Some of the highest intensity fields are in Kern County and the San Joaquin Valley. It is these fields that are expected by DOGGR itself to be the locus of future well stimulation activity, and, therefore, the crude produced from well stimulation is higher intensity crude than the California average. For this reason, it is inappropriate—and results in a lower GHG emissions impact than actual—to use the California average GHG numbers for crude. The TGG's analysis found that "the carbon intensity of

[79] Ca. Pub. Res. Code § 3106(b), (d)
[80] Attachment 1 § 3.1
[81] Attachment 1 § 3.2.1
[82] *Id.*
[83] Attachment 1 § 3.2.1

California crude production enabled by well stimulation is 22-50% higher than the average for all California production (13.06 g CO2e/MJ for 2012 crude supply)."[84]

While DOGGR understates the impact of increased California crude production it overstates the carbon intensity of imported oil.[85] "Average carbon intensity for all foreign imports (from production outside the US) is 9.8 g CO2e/MJ in 2012. Thus, while the DEIR assumes that replacement supply from imports could have a carbon intensity of about 11.4 g CO2e/MJ (based on the carbon intensity for average crude supply to California), replacement supply might have a substantially lower carbon intensity, notably about 9.8 g CO2e/MJ (based on the carbon intensity for foreign imports to California)."[86]

The TGG analysis concludes that "California crude production has a carbon intensity that is 62-100% greater than the carbon intensity of replacement supply. Put another way, California crude production enabled by well stimulation could be up to twice as carbon intensive as replacement crude supply from imports."[87]

In sum, DOGGR "substantially understates GHG emissions for the supply from California production enabled by well stimulation, while overstating emissions for alternative crude supply from production outside California."[88]

DOGGR selects the Project as the Environmentally Superior Alternative, and bases this selection at least in part on its analysis of Alternative 1 and Alternative 2 and their estimated GHG emissions. Without a proper evaluation of crude supply and associated emissions from California production, DOGGR does not provide decision-makers and the public a proper comparison of alternatives.

9.1.3 Alternatives 3 – 5

Alternatives 3, 4, and 5 concern, respectively, consolidating well pads, limiting stimulation in urban areas, and limiting stimulation in areas of active fault zones. The DEIR recognizes that each of these alternatives presents environmental benefits.[89]

Despite identifying clear benefits of these policies, the DEIR determines that these alternatives are not environmentally superior on the basis of an entirely artificial construction: DOGGR has chosen to include mitigation measures in its preferred alternative but not alternatives 3 - 5, and the DEIR concludes that the preferred alternative is superior because it is the only one that includes these mitigation measures. There is no reason, however, to confine mitigation measures to the preferred alternative. Nothing indicates that the mitigation measures would in any way be incompatible with

[84] Attachment 1 § 3.2.2; see also Gordon, D., et al., Know Your Oil: Creating a Global Oil-Climate Index, *Carnegie Endowment for International Peace*, Mar. 2015. Available at http://carnegieendowment.org/2015/03/11/know-your-oil-creating-global-oil-climate-index/i3oy (Attachment 6)
[85] Attachment 1 § 3.2.3
[86] *Id.*
[87] Attachment 1 § 3.3 (emphasis added)
[88] Attachment 1 § 3.3
[89] DEIR 14-6 to 14-8

alternatives 3 - 5. Alternatives that would combine the benefits of these policies with the mitigation measures are reasonable—indeed obvious—alternatives that must be considered.

In addition, DOGGR must consider an alternative combining the policies underlying Alternatives 3, 4, and 5. There is no reason why Californians should have to choose only one. Thus, an additional alternative combining alternatives 3, 4, 5, and the mitigation measures from the preferred alternative must be considered.

9.1.4 No project alternative

An overarching reason for DOGGR to consider the alternatives discussed in this section is that they provide important context for the public and for DOGGR and other agencies who may rely on the EIR about DOGGR's policy choices and the environmental consequences of those choices. The objectives of the California Legislature in passing Senate Bill 4 were, as discussed above, broader than the objectives of DOGGR in this DEIR. To fulfill those objectives of increasing our understanding of the human and environmental impacts of well stimulation, a full analysis of the no project alternative is required.

9.2 DOGGR impermissibly refused to analyze various alternatives that it must analyze in the Final EIR.

9.2.1 A "use of alternative energy alternative"

This alternative was rejected "because it would not meet the objectives of the project and immediate implementation would be technologically infeasible."[90] As a threshold matter, as we explain at Part II.6, *above*, DOGGR has defined the project's objectives too narrowly. Even if this were not the case, however, DOGGR would be required to analyze this alternative, which, obviously furthers the Project's stated objectives of (1) minimizing the number of new wells required for the recovery of hydrocarbons, (2) the safety and protection of the California environment and natural resources, and (3) reducing dependence on foreign oil and gas. The only analysis in the DEIR under this alternative outlines California's measures to reduce greenhouse gas emissions. This list is essentially irrelevant to dismissing this alternative because it does not tie back to the feasibility of using alternative energy instead of well stimulation. The only sentence in this section that addresses the actual issue of feasibility states that technologies do not currently exist to replace all petroleum-derived products within a reasonably foreseeable time frame. That is not the issue at hand: the current DEIR Project addresses only well stimulation in California, not all oil in California overall. (The majority of oil is currently, even with well stimulation, imported.) There is no data or explanation in this section on how much energy the state would require, how much energy alternatives could offer, or what technologies are currently unavailable, each of which is required to assess the feasibility of this alternative. Dismissal of this alternative from further consideration was unsupported.

9.2.2 A "Most Stringent Alternative"

[90] DEIR 8-5

DOGGR's reasons for refusing to analyze this alternative, which it says would have "integrated all the most stringent potential regulations [for well stimulation]"[91] are arbitrary and unacceptable. DOGGR must analyze this alternative.

DOGGR's first reason is that "the proposed permanent regulations process is underway and independent of the EIR."[92] But DOGGR now has the final text of the regulations that will apply both through and after July 1, 2015.[93] And, as DOGGR goes on to acknowledge in the DEIR, DOGGR and other California regulators "retain the ability to enact more stringent regulations dealing with [the] impacts" of well stimulation notwithstanding these regulations.[94]

DOGGR's second reason for refusal to analyze a "More Stringent" Alternative is that it can always adopt regulations "on an impact-by-impact basis rather than as a package of actions artificially bundled together."[95] While this may be true, it does nothing to excuse DOGGR from describing and analyzing, as a package, the well-stimulation regulations it believes are the most stringent feasible, in furtherance of its general duty to analyze a reasonable range of alternatives that would satisfy most project objectives while minimizing impacts.

The "Most Stringent" Alternative also provides important context for regulators and the public. If DOGGR never clearly identifies what set of regulations it thinks would be the most stringent feasible, it will be much harder for regulators and the public to understand what those regulations look like (and much harder for the public to know whether DOGGR has even identified that set of regulations). DOGGR must include it in the final EIR.

9.2.3 The use of waterless hydraulic fracturing techniques

This alternative was rejected as infeasible on economic grounds. However, there is no evidence in the DEIR to support these claims, as there is no economic analysis for fracking with or without water. Second, the DEIR acknowledges that merely increased cost is not a sufficient ground for finding economic infeasibility. Third, what little analysis is here indicates that this technology is already being used in water-stressed areas or near vulnerable reservoirs. In light of the historic drought we are currently experiencing in California, this alternative warrants further review and was prematurely rejected without findings.

9.2.4 Alternative Technologies Alternative

This alternative would require the use of "green" or non-chemical technologies, and was "considered but not carried forward" as infeasible for three reasons. "First and foremost, the concept of 'green' technologies for well stimulation activities is not adequately defined such that a comparison with other well stimulation technologies might be made. It is unknown at this time which well stimulation

[91] DEIR 8-6
[92] *Id*.
[93] *See generally* 14 Cal. Code Regs. §§ 1780-89
[94] *Id*.
[95] *Id*.

technologies are considered 'green,' and which are not."[96] The second reason alleged that the proprietary nature of newer technologies prohibits meaningful analysis. Further, "Some industry representatives have stated that they are not willing to use their newest well stimulation technologies in California, as their use would require disclosure (under SB 4) of information considered proprietary and subject to trade-secrets," and California does not have the authority to disclose trade secrets to the public. Third, based on current reporting and responses to requests for information, "the frequency of 'green' technologies is currently uncertain, at best."[97] All three of these rationales erode under scrutiny.

9.2.5 Resource Protection Alternatives

This alternative would limit certain areas from future well stimulation to protect sensitive areas. Like the Alternative Technologies. DOGGR explains that "[d]uring development of the EIR, it was determined that key features of these potential alternatives should be integrated into the project description as standards to avoid and minimize impacts to sensitive resources."[98] Therefore, this alternative was eliminated on account of redundancy. However, there is no related limitation on well stimulation in the Project; therefore this explination is misleading and the alternative was dismissed impermissibly.

10 AIR QUALITY: The DEIR Fails to Properly Disclose, Analyze, and Mitigate the Project's Significant Air Quality Impacts.

10.1 The DEIR fails to identify several of the Project's significant air quality impacts.

Air pollution from the oil and natural gas sector is a serious problem that currently threatens the health of communities across the state. Flaring, venting, leaking, combustion, and release of contaminants throughout the production, processing, transmission, and distribution systems are significant sources of air pollution from the oil and gas sector.[99] Pollutants identified by the EPA as being related to the process of hydraulic fracturing and capturing hydrocarbons include but are not limited to alkanes, benzene, toluene, ethylbenzene, xylenes, and methanol. These toxic air contaminants and smog-forming volatile organic compounds (VOCs and NOx) threaten local communities and regional air quality.

This Project has identified significant, unmitigated air quality impacts. The air impacts, however, are not fully analyzed. Specifically, DOGGR "does consider air quality impacts from well drilling and stimulation, but it only selectively and inaccurately considers air quality impacts from crude production and transport."[100] "The DEIR understates adverse air quality impacts for the Project and overstates adverse impacts for Alternative 1 (and 2). The consideration of air quality impacts in the DEIR is thus incomplete and unbalanced."[101]

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[96] DEIR 8-6
[97] DEIR 8-5-6.
[98] DEIR 8-7
[99] See Attachment 2 S. 2
[100] Attachment 1 S. 4.1
[101] *Id.*

> The DEIR estimates for emissions from crude production are incomplete and potentially misleading. California crude production results in substantial emissions from both combustion and non-combustion sources. Only a portion of these emissions (notably those from non-combustion sources) are explicitly considered by the DEIR. By failing to consider combustion sources, the DEIR fails to account for a sizable portion of the overall emissions associated with California crude production. In particular, the DEIR fails to account for virtually all of the emissions for criteria and precursor pollutants other than ROG (reactive organic gases).[102]

This failure of analysis is particularly troubling for the air quality analysis of Kern County, where combustion sources are predicted to be particularly high relative to other places and where DOGGR estimates the majority of future new well stimulation activities will occur.[103] These unaccounted for emissions would be occurring in a non-attainment region at levels that could violate an air quality standard. Without full consideration of the emissions from crude production enabled by well stimulation in Kern County and throughout California, DOGGR has underrepresented the air quality impacts and deprived decision-makers and the public of a sound basis for evaluating the Project compared to the alternatives in regard to air quality. (*Id.*)

Several mitigation measures are unenforceable and contingent on outside, independent actors. For example, mitigation related to exposing sensitive receptors (e.g. residences, schools, children's day care centers, hospitals, and nursing and convalescent homes) to substantial pollutant concentrations and objectionable odors both depend on a city or county to use its police and land use powers.

DOGGR must, however, go beyond the mitigation and impacts analysis in the DEIR. In addition to the analysis in the DEIR, a complete air emission analysis must also address the following:

- The air emissions impacts of well stimulation on all of California's air basins.
- The significant air quality impacts of continued and/or increased well stimulation activity to the San Joaquin Valley.
- The variation in emissions that might arise from project to project.
- The air emissions of individual known chemicals used for well stimulation. And, the aggregate impacts of chemicals known to be found in hydraulic fracturing fluids, including an analysis of impacts over time that considers how these chemicals degrade or interact with chemicals that are native to the subsurface
- The air emissions of proppants. The proppants that are pumped into the subsurface help keep fissures open so that oil and gas can be extracted more easily. Silica, which is used as a proppant, can enter the atmosphere as respirable dust during transport and mixing.
- The specific VOCs, TACs, or HAPs that are emitted from well stimulation processes.
- A quantified evaluation of the magnitude of criteria emissions that includes not only emissions from combustion of vehicles and equipment, but also (1) criteria emissions from venting and fugitive emissions of volatiles, and (2) emissions from road dust. If estimates of these emissions

[102] Attachment 1 S. 4.2

[103] *Id.*

are not quantifiable, at the very least, DOGGR should address the data that would be needed to estimate those emissions, or the magnitude of air quality impacts that has been observed from these emissions sources for well stimulation activities in other places or in the past.

- An analysis of the air pollution that accompanies all phases of oil and gas production process that accompany well stimulation.

The Project only addresses impacts to the eight air basins that currently include DOGGR oil and gas fields, which amount to only about half of California's total air basins. Air does not respect political boundaries. It does not make sense, as argued above with regard to the DEIR as a whole, to geographically limit review of the air impact analysis to these eight basins.

As the SSR Report explains, several California airsheds are in nonattainment at the state and federal level for PM10, PM2.5, and ozone (formed when NO_X and VOCs react in the presence of sunlight).[104] Particularly for areas in nonattainment, any additional emissions matter. Oil and gas operations produce PM, NOx, and VOC emissions and may impact regional PM, VOCs, NO_X, and ozone levels. The San Joaquin Valley is of particular concern because it is already in non-attainment for both ozone and PM and has a long history of difficulty meeting regional air quality standards.[105] The San Joaquin Valley is NO_X-limited, which makes controlling additional NO_X emissions critical. At the same time, higher VOC levels may contribute to ozone formation in some urban areas in the SJV depending on wind conditions.

In particular, impacts to Kern County communities must be considered. The majority of California well stimulation activities occur in Kern County. According to the 2010 US Census, Kern County is 50.9 % Hispanic (compared to 38.4% for the state), with 22.9% of residents living below poverty (versus 15.9% for the state). Additionally, CalEPA has identified large swaths of Kern County as environmental justice communities based on their disproportionate pollution burdens and socioeconomic vulnerabilities. To the extent that new well stimulation projects have emissions and health impacts, they will add to the already substantial health and economic burdens of these communities.[106]

DOGGR must also address the wide variation in emissions from well stimulation activities across regions and wells.[107] This variation is a product of several complex factors, including variation in the scale of operations across time and space. As the SSR Report explains, "[t]he accumulation of emissions from many well sites across a region can also be substantial even when individual well sites have modest emissions. Furthermore, drilling activities can occur for decades, and the timing of emissions can vary. For example, well completion occurs initially, and refracturing and liquids unloading can occur later in a well's lifetime; each of these processes can have elevated emissions."[108] DOGGR must consider the special and temporal variation of omissions and the potential for higher cumulative impacts as a result.

The high level of site-specific variation is an additional reason why this DEIR cannot serve as the final CEQA document for any project-level approval. For example, as the SSR Report explains, different well

[104] Attachment 2 S. 2.2.2
[105] *Id.*
[106] Attachment 2 S. 3.3
[107] Attachment 2 S 2.3
[108] Attachment 2 S. 2.3

sites will use different equipment, which will manifest in a variation in emissions.[109] There is also "wide variation in emissions during completion depending on the nature of the separation and storage of flowback water," and the "use of trucks versus pipelines to transport flowback and/or produced waters also affects emissions from vehicle engine combustion."[110] As a further example, the variability of the geologic formation being developed also adds uncertainty. The depth of the target formation can result in a longer or shorter well that will, in turn, affect how much fluid is injected and recovered in flowback. These amounts have air impacts that ripple down the chain of production: the total amount of flowback will affect the emissions from the fluids as well as from the vehicles transporting the recovered fluids.[111]

As the SSR Report concludes, this variation in air emissions "indicates that air quality impacts are project specific and should be evaluated on a case-by-case basis."[112]

One potentially large source of emissions during the production phase that requires further analysis occurs during the flowback period after well stimulation. Flowback water can contain water, hydraulic fracturing chemicals, natural gas, oil, other chemicals that occur naturally in the subsurface, and chemicals formed due to reactions between these constituents.[113] Drilling muds is another source of emissions that also contains chemicals that are toxic to the skin, respiratory system, and brain, and tanks used to store drilling muds may emit volatile organic compounds (VOCs).[114] These emissions can include criteria and toxic air contaminants as well as methane, a greenhouse gas with a global warming potential at least 84 times greater than carbon dioxide over a 20-year horizon. Consideration should be given to the specific chemicals known to be used in well stimulation projects and their particular impacts.

Consideration of these flowback, proppant, and drilling mud toxin emissions are particularly important for protecting oil field workers. As the SSR Report explains, "[w]ell stimulation workers are likely most at risk for suffering health impacts from emissions. Worker exposure to benzene has been found to exceed NIOSH standards, particularly for workers gauging flowback levels in tanks or performing maintenance on equipment used in the flowback process. There have even been reports of worker fatalities during flowback, likely due to acute exposure to volatile hydrocarbons. Worker exposure to silica dust has also been found to exceed NIOSH and OSHA standards."[115]

The Project defers a Health Risk Assessment (HRA) for the Project and, therefore, fails to include key information necessary to evaluate the increased health risks that could result from air emissions from the Project. As such, there is no basis to conclude that the Project would not result in significant health impacts; in fact the Project raises serious potential health impacts. DOGGR fails to properly disclose and analyze the air quality and health impacts of well stimulation that is reasonably foreseeable that would be included with the Project.

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[109] *Id.*
[110] *Id.*
[111] *Id.*
[112] Attachment 2 S. 2.3
[113] Attachment 2 § 2.1.2
[114] Attachment 2 § 2.1.1
[115] Attachment 2 S. 3.2

In addition, the DEIR should analyze the effects of increased well stimulation on California's ability to meet its AB32 targets and clean energy and efficiency goals. Because increased well stimulation is expected to produce significant additional emissions of criteria pollutants and hazardous air pollutants, these must be analyzed and mitigation measures must be proposed and implemented to ameliorate and guard against their negative effects.

The DEIR should also analyze the climate and air quality effects of the combustion of any hydrocarbons extracted as a result of well stimulation treatments. This analysis should include a comparison to existing and other new sources of oil or gas. The EIR must analyze the climate impacts of not extracting the hydrocarbon reserves that may become accessible due to well stimulation. The EIR should also evaluate the impacts of increased oil production from well stimulation on California's clean energy economy, efficiency goals, and transition to renewables. Again, more hydrocarbon production is made possible by the use of well stimulation. In the absence of these techniques, many hydrocarbons would be left in the ground.

10.2 The DEIR fails to employ feasible mitigation that would help ameliorate the Project's significant air quality impacts.

As described in more detail in the accompanying report by Sustainable Systems Research, LLC[116], the DEIR mitigation analysis suffers from several shortcomings and should be revised.

First, the DEIR relies on a setback distance that is scientifically unsupported. The DEIR relies on an arbitrary distance (1,500 ft) to trigger health risk assessment and emissions controls[117], and that figure should be reconsidered in light of the studies that indicate that pollution impacts from well stimulation occur at greater distances. The 1,500 ft trigger distance must be revised to ensure maximum protection.

Second, the DEIR is vague and DOGGR should clarify how land use compatibility will be ensured and assessed.[118] There seems to be an implicit assumption built into the language of the DEIR that well stimulation will not be analyzed as a regional source because the contribution of each individual well stimulation is likely to be small. This must be clarified.

The DEIR currently makes an unjustified exception, allowing property owners to refuse emissions sensors.[119] DOGGR should revise this exception. To avoid improper refusal and dangerous impacts, DOGGR should require sensors regardless of the property owner.

The DEIR should clearly define what "cumulatively considerable" levels are.[120]

Further, the DEIR impermissibly relies on "recommending to local air district that they update their planning inventories, and, if necessary, establish in future air quality plans additional control strategies

[116] Attachment 2
[117] MM AQ-3a
[118] MM AQ-3b and MM AQ-4b
[119] MM GHG-1c
[120] MM GHG-2a

for sources related to petroleum production to ensure that emissions with potential growth are not in excess of those anticipated within the planning inventories for the oil and gas production subcategory." (10.3-29). This mitigation measure cannot be enforced by DOGGR itself.

In addition, DOGGR should require additional emissions reducing technologies such as, e.g., plunger lift systems, no or low bleed pneumatic controllers, cleaner engines, use of non-silica proppants, and reduced emissions from dehydrators.[121] As explained more fully in the SSR Report, plunger lift systems reduce emissions during liquid unloading by placing a plunger in the well and allowing the well pressure to push it to the surface (along with the liquids that need to be cleared), which reduces venting of gas from the well during the liquid unloading process. No or low bleed pneumatic controllers reduce deliberate releases of natural gas from the operation of pneumatic devices. Cleaner engines can reduce emissions from equipment and vehicle engine combustion. Specifically, electric motors should be used instead of internal combustion engines for activities occurring near sensitive receptors, EPA Tier 4 engines for nonroad diesel equipment such as pumps should be used, and trucks that meet 2010 standards should be required to be used instead of dirtier vehicles. Non-silica proppants could be used to reduce emissions of respirable silica. Although MM AQ-2c discusses road dust abatement, it does not address silica dust. DOGGR should also include in its mitigation a requirement to reduce emissions from dehydrators by improving glycol flow and using flash tank separators to reduce venting. Although the DEIR mentions dehydrators, this strategy to reduce emissions is not specifically mentioned in the DEIR mitigations.

DOGGR should also, in its mitigation, require industry to reduce the toxicity of its well stimulation fluids. Reducing the toxicity of well stimulation fluids will have positive impacts for health and the environment throughout the well stimulation process. It would not only reduce air emissions from harmful toxins, but it would reduce the danger of hazardous materials during transportation and waste disposal.

In addition to technological mitigations, DOGGR should include in its mitigation the implementation of programs to modify practices that reduce emissions. These mitigation measures are particularly ripe for consideration at this programmatic stage of analysis. This list of mitigation measures is copied from the SSR Report Section 5.2:

Silica exposure reduction strategies such as modifying how silica is handled, implementing dust suppression and control, providing personal protective equipment for workers, and setting worker exposure limits can reduce the impacts of respirable silica. Although MM AQ-2c discusses road dust abatement, it does not address silica dust. Silica dust is not mentioned in Chapter 10.3 of the DEIR.

Educate workers about risks and provide personal protective equipment, including respirators when appropriate. Worker training and protection are particularly important for flowback activities and proper handling of silica. This strategy is not specifically mentioned in the DEIR mitigations in Chapters 10.3 and 10.12.

[121] Attachment 2 SS 5, 5.2

Change tank gauging procedures. Workers should avoid opening tanks to gauge levels to avoid excessive exposure to volatilized chemicals; alternative methods to gauge tanks are needed. This strategy is not specifically mentioned in the DEIR mitigations in Chapters 10.3 and 10.12.

Leak detection and repair programs can reduce releases of methane and other VOCs. Belowred cameras are one method of identifying leaks. This strategy is included (with reference to methane and carbon dioxide but not other VOCs) in MM GHG-1c.

Ensure proper well design, construction, and maintenance. This may include well design and construction standards, casing pressure tests, inspections, reporting, best management practices for these activities, etc. This strategy is not specifically mentioned in the DEIR mitigations in Chapters 10.3 and 10.12.

Emergency planning can decrease health and environmental risks of unexpected releases. This strategy is not specifically mentioned in the DEIR mitigations in Chapters 10.3 and 10.12.

Waste planning can reduce releases and could be part of project approvals. This strategy is not specifically mentioned in the DEIR mitigations in Chapters 10.3 and 10.12.

In addition to the above mitigation measures, the SSR Report identified a few policy measures that would help reduce air emission impacts and should be considered by DOGGR in the EIR process.[122] This analysis is exactly the sort of precautionary approach mandated by Senate Bill 4. Specifically, Senate Bill 4 recognized that "[i]nsufficient information is available to fully assess the . . . environmental, occupational, and public health hazards and risks [of well stimulation," and what was required was increased "transparency and accountability to the public regarding well stimulation treatments."[123] A subset of the measures identified in the SSR Report is reproduced here:

Improve monitoring and modeling of emissions composition and quantities and of the subsequent health risks and impacts. Monitoring of air quality should occur at the regional level and adjacent to well stimulation activities, and both baseline (pre-stimulation) and post-stimulation data are needed. This data can be used to create inventories of emissions from well stimulation that can be used to track emissions over time and to attribute emissions to various sources. Epidemiological monitoring of nearby residents and natural gas extraction workers should occur at the state level and should include long and short term impacts in order to provide an early indication of potential impacts. Additionally, toxicological testing of hydraulic fracturing fluids can increase our understanding of their combined health impacts.

Project-specific environmental impact evaluations are crucial for understanding and mitigating impacts. As described above, there is a high degree of variation in emissions. Additionally, processes used and available technologies for mitigation will continue to evolve. Project-by-project consideration is needed to address variability and shifting emissions and mitigation realities. This could be spelled out explicitly in the DEIR. Where there is concern over health impacts to workers or adjacent communities, a health

[122] Attachment 2 S. 5.3
[123] SB 4 section 1

impact assessment is warranted. MM AQ-3a discusses the use of Health Risk Assessment but only points to a need for projects with emissions located within 1,500 feet of receptors.

Building in adaptability to changes in well stimulation processes and technologies and available mitigations by defining best available technologies on an ongoing basis and providing a mechanism to require and oversee their use can help mitigate impacts. MM AQ-3a mentions Toxic Best Available Control Technologies but does not provide detail and does not more generally address how mitigations will adapt with changing extraction and mitigation technologies.

11 BIOLOGICAL RESOURCES: TERRESTRIAL ENVIRONMENT

11.1 The Proposed Habitat Protection Standard Fails to Provide Effective and Enforceable Mitigation for Biological Resources

The DEIR's Project Description proposes four Project Standards for Resource Protection, including a Habitat Protection Standard, that "represent general approaches" that "would be implemented as part of the project to avoid and minimize impacts to sensitive resources."[124] The DEIR states that "DOGGR *intends* to impose and enforce these standards in the future both when acting as a Lead Agency in conducting site-specific environmental analyses for proposed well stimulation treatments and when acting as a Responsible Agency in communicating with other agencies."[125] The DEIR further states that the environmental impact analysis presented in Chapter 10 "*assumes* that the standards outlined in EIR Section 7.5 (Project Standards for Resource Protection) would be applied to avoid and minimize certain categories of environmental effects."[126]

Although the DEIR claims that the Habitat Protection Standard will avoid and minimize impacts to biological resources, this assumption is misplaced and improper. First, although DOGGR "intends" to impose and enforce this Standard, there is no requirement for DOGGR to do so. The Habitat Protection Standard is not identified as a mitigation measure in the DEIR and does not adhere to CEQA's requirements for mitigation measures.[127] DOGGR provides no evidence that this Standard would lessen the impacts on biological resources. Instead this Standard relies on vague, deferred, and non-binding actions. The Standard requires two steps to determine if any mitigation is needed: (1) each well owner/operator/ service provider who proposes a new well would need to determine if the proposed location occurs within a sensitive habitat type, and (2) DOGGR reviews the information submitted to determine whether a proposed well stimulation treatment could adversely affect sensitive habitat types, and "what sort of mitigation, if any, is necessary or appropriate."[128] However, the DEIR never specifies the mitigation measures that would be required as a condition of the permit. Moreover, when an agency other than DOGGR conducts the environmental review, the best DOGGR can offer is to

[124] DEIR 7-48.
[125] DEIR 7-48.
[126] DEIR 10.0-1.
[127] CEQA Guidelines § 15126.4.
[128] DEIR 7-51-52.

"encourage" the agency to follow the Standard.[129] For this Standard to be considered as mitigation of harm, the EIR cannot rely on abstract, unenforceable, and deferred future actions by DOGGR or another lead agency.

In effect, the Standard would allow many significant impacts to proceed in sensitive habitats. First, the Standard appears to apply only to the well stimulation treatment itself, opening the door for significant impacts to occur during other phases of the project. The Standard also excludes existing wells in existing fields (i.e., "the Habitat Protection Standard would apply outside of existing oil and gas fields and for new wells within existing fields"[130]), meaning that well stimulation treatments at existing wells would inexplicably be exempted although they could lead to significant habitat impacts. The Standard states that avoidance of habitat impacts will principally occur in California Marine Protection Areas and not in other sensitive habitats. In other habitats, significant adverse effects can proceed as long as DOGGR or other lead agency determines that a proposed mitigation strategy would "avoid any *net* adverse effects on the function and values of such habitat." Based on the extensive scientific literature on the significant and often permanent impacts of well-stimulation-related activities on habitat, it is difficult to conceive of a situation where net adverse effects would not occur, even given mitigation. As such, the Standard should require actions to "avoid effects on the habitats entirely" in all sensitive habitats, for example, by siting projects outside of sensitive habitats and appropriate buffer zones. Finally, while the DEIR properly includes several habitat categories in its definition of "sensitive habitat types" (i.e., critical habitat, recovery areas, federal and California protected areas and California conservation easements, California Marine Protection Areas, and Areas of Special Biological Significance), it excludes other important habitat types that should also be defined as "sensitive," including riparian areas, wetlands, floodplains, perennial and intermittent watercourses, and wildlife movement corridors.

11.2 The DEIR Must Evaluate the Full Range of Direct and Indirect Environmental Impacts of Well Stimulation on Biological Resources

Under both CEQA and SB 4, DOGGR is required by law evaluate direct and indirect effects of well stimulation. Under CEQA guidelines, direct impacts are those that result from the project and occur at the same time and place, while indirect impacts are those that are "caused by a project, but can occur later in time or farther removed in distance and are still reasonably foreseeable and related to the operation of the project."[131] In Section 10.4, the DEIR states that it "evaluates the potential direct and indirect effects to biological resources of past, current, and future oil and gas well stimulation treatments."[132] However, as detailed in these comments, the DEIR is woefully inadequate in disclosing, evaluating, and mitigating the full range of direct and indirect impacts of well stimulation by excluding impacts associated with the full lifecycle of the well undergoing well stimulation—i.e., impacts related to pre-drilling, site preparation, drilling operations, well completion operations, testing and production, well plugging and abandonment, and transport of oil and gas to refineries. The DEIR also fails to

[129] DEIR 7-52.
[130] DEIR 7-50.
[131] DEIR 10.4-42.
[132] DEIR 10.4-42.

acknowledge that well stimulation increases the scope of direct and indirect impacts by prolonging the lifespan of the well.

11.3 The DEIR Fails to Correctly Classify Many Impacts to Biological Resources as Significant

CEQA Guidelines define a "significant risk" as "a substantial, or potentially substantial, adverse change in any of the physical condition within the area affected by the project."[133] In relation to biological resources, the project may result in significant impacts based on nine significance criteria related to the project's effects on habitat reduction, adverse effects on sensitive species, sensitive natural communities, protected wetlands, and wildlife movements, and conflicts with protective measures.[134] The DEIR asserts that the majority of potential impacts on biological resources would be adverse but less than significant or reduced to a less than significant level.[135] This assertion and similar statements throughout this subsection are based on conclusory assertions instead of substantial evidence and analysis as required by CEQA. In contrast, as detailed below, a large body of scientific research demonstrates that many harms to species and habitats from well stimulation activities are permanent and significant—including impacts from habitat loss, habitat fragmentation, degradation of water quantity and quality, oil and chemical spills, and air pollution—and cannot be reduced to a less-than-significant level even with feasible mitigation.

11.4 The DEIR Cannot Assume that the Final Proposed Regulations for Well Stimulation Will Adequately Mitigate Harms

The DEIR assumes the "application of DOGGR's proposed regulations for well stimulation" in evaluating the direct and indirect impacts of well stimulation treatments on biological resources,[136] and assumes that the yet-to-be-implemented well stimulation regulations will mitigate impacts. However, anything less than full implementation and enforcement of these proposed regulations by DOGGR and anything less than 100% industry compliance can result in significant impacts to biological resources. Based on the past track record of failed agency enforcement and industry compliance, significant impacts of well stimulation activities on biological resources are reasonably foreseeable under these regulations.

11.5 The Cumulative Impacts Analysis for Biological Resources is Flawed

The DEIR's cumulative impacts analysis concludes that eight of ten impacts on biological resources would have significant cumulative effects.[137] For example, the DEIR states that "the project's contribution to cumulative loss and degradation of habitat for fish and wildlife would be considerable (Class I)."[138] In these cases the DEIR acknowledges that "additional mitigation to reduce the project's contribution to significant cumulative effects could be developed and implemented at a regional or

[133] CEQA Guidelines § 15382.
[134] DEIR 10.4-42.
[135] DEIR 10.4-43.
[136] DEIR 10.4-43.
[137] DEIR at Table 13.6-1.
[138] DEIR at 13-26.

program level as the future locations and habitat effects of project-specific well stimulation authorizations become known."[139] However, the DEIR fails to put in place any requirements that these analyses and additional mitigation measures for cumulative impacts are actually implemented. Similarly, Section 10.4 fails to require any analysis of the cumulative impacts of well stimulation activities on biological resources or mitigation of significant cumulative impacts.

11.6 The DEIR Fails to Adequately Disclose, Evaluate, and Mitigate Direct and Indirect Impacts from the Project on Biological Resources

The DEIR fails to adequately disclose and evaluate "the potential direct and indirect effects to biological resources of past, current, and future oil and gas well stimulation treatments"[140] and fails to adequately mitigate these harms. These deficiencies are detailed under each impact criterion below.

11.6.1 Impact BIOT-1: Substantially reduce the wildlife habitat of a fish or wildlife species

The DEIR fails to disclose and evaluate the full scope of direct and indirect impacts of well stimulation on habitat reduction. The DEIR only briefly states that "site preparation or other activities may include removing native vegetation and habitat for well pads, drilling equipment, staging areas for supplies and materials, vehicle parking areas, road access, and administrative functions. In addition, direct and indirect effects of well stimulation activities could cause degradation of native habitat surrounding the work areas."[141] The DEIR then very briefly lists four potential indirect impacts: invasive species introduction and spread, dust, altered local surface hydrology, and reduced surface or groundwater availability.[142] The DEIR must disclose, evaluate, and mitigate the full range of habitat reduction impacts stemming from well stimulation activities including but not limited to: (1) habitat removal from well stimulation-related infrastructure, (2) habitat fragmentation, edge effects, and density effects; (3) human disturbance; (4) noise pollution; (5) reduced water quantity; and (6) reduced water quality.

Well stimulation-related infrastructure: The DEIR fails to disclose and evaluate the habitat impacts of the full range of well stimulation-related infrastructure, including impacts from pipelines, compressor stations, transmission lines, production facilities, and seismic lines. The DEIR should acknowledge that well pads result in significant and permanent habitat loss as they become fully industrialized sites. As described in the Project Description, well pads are typically cleared of vegetation, graded, compacted, and sometimes covered in gravel. Drilling equipment and materials include the drilling rig of 100 to 150 feet in height; storage tanks for industrial chemicals, oil, diesel, drilling muds, and water; on-site electrical generators; diesel-powered mud pumps; trailers for workers; and storage racks for drill pipe and casing.[143] Well pad footprints are substantial. Well pads in California typically range from one to three acres in size outside urban areas, while total well pad size can reach five acres with access roads

[139] DEIR at 13-26.
[140] DEIR at 10.4-42.
[141] DEIR at 10.4-44.
[142] DEIR at 10.4-45.
[143] DEIR 7-12.

and staging areas.[144] Well pads built for future drilling in the Monterey Formation would be even larger, estimated at approximately four acres with three to 10 wells per pad, with the potential for five to 10 wells within a one-square-mile area.[145] Beyond the well pad itself, the footprint of access roads, pipelines, transmission lines, seismic lines, compressor stations, and production facilities can substantially reduce habitat (e.g., production facilities alone are estimated to occupy 20 acres[146]), but the DEIR fails to conduct any analyses of these habitat reduction impacts.

The DEIR also erroneously includes agricultural lands as sites with little native habitat value where "well stimulation treatment activities (and associated disturbance)…would not have significant impacts to fish and wildlife habitat,"[147] and incorrectly de-values the well-known conservation benefits of many agricultural lands for wildlife. There are numerous examples where native species have become dependent on agricultural lands due to the severe loss of natural habitats through conversion of natural grassland, wetland, or other habitat to agricultural lands. Species that rely on agricultural lands in California include the tri-colored blackbird which received emergency protections under the California Endangered Species Act in 2014,[148] millions of wintering and migratory waterbirds, and more than 200 bird species that depend on agricultural habitats for at least part of their annual life cycle.[149]

Habitat fragmentation, edge effects, and density effects: Although the DEIR addresses habitat fragmentation in the context of impeding wildlife movements, the DEIR fails to disclose and evaluate the impacts that fragmentation, associated edge effects, and increasing infrastructure densities have on habitat reduction. Numerous scientific studies demonstrate that habitat fragmentation from the construction of well pads, roads, seismic lines, pipelines and other linear corridors negatively affects species by reducing home range size, reducing patch size below what is needed for foraging and life history activities, increasing habitat isolation, altering physical characteristics such as light, moisture, and temperature, facilitating the spread of invasive species, and altering species dynamics, including movement patterns, interactions, and abundance.[150] Fragmentation also increases the proportion of disturbed edge habitat to undisturbed interior habitat which can increase the likelihood of predation, parasitism, and human disturbance. For example, in the Marcellus shale, while each drilling pad and associated infrastructure results in the clearing of 8.8 acres of forest, each drilling pad affects 30 acres of forest after accounting for ecological edge effects.[151] Similarly, in the Big Piney-LaBarge field in

[144] DEIR 7-8.
[145] DEIR 7-29.
[146] DEIR 7-20.
[147] DEIR 10.4-44.
[148] http://www.biologicaldiversity.org/news/press_releases/2014/tricolored-blackbird-12-03-2014.html (Attachment 7)
[149] http://ca.audubon.org/working-lands (Attachment 8)
[150] Brittingham, M.C., K.O. Maloney, A.M. Farag, D.D. Harper, and Z.H. Bowen. (2014) Ecological risks of shale oil and gas development to wildlife, aquatic resources and their habitats. Environmental Science and Technology 48: 11034-11047. (Attachment 9)
[151] Johnson, N. (2010). "Pennsylvania energy impacts assessment: Report 1: Marcellus shale natural gas and wind," Nature Conservancy – Pennsylvania Chapter, http://www.tcgasmap.org/media/PA%20Assessment%20of%20Gas%20Impacts%20TNC.pdf, (accessed June 26, 2012) (Attachment 10)

Wyoming, a study found that while the overall area of oil and gas infrastructure, including roads, pipelines, pads, and wastepits covered 4% of the total area, 97% of the total area fell within one-quarter mile of oil and gas infrastructure.[152] As a result, oil and gas infrastructure impacted all the habitat of the greater sage-grouse in the area and road densities adversely affected elk. Numerous studies have also documented that wildlife species decrease use of preferable habitat areas or avoid habitat areas altogether in areas with increasing densities of oil and gas development, leading to indirect habitat loss.[153] For example, several studies have found that mule deer are significantly less likely to occupy areas in proximity to well pads than those farther away.[154] One study found that mule deer have a significantly lower likelihood of using habitat within 2.7 to 3.7 kilometers of well pads, concluding that "indirect habitat losses may be substantially larger than direct habitat losses."[155] In addition, changes in habitat selection appeared to be immediate with no evidence of well-pad acclimation, leading to increasing use of non-preferred habitats.

Human disturbance from infrastructure construction and operation: The DEIR fails to disclose and evaluate the impacts of chronic and episodic human disturbance on reducing habitat quality and quantity. Well stimulation activities result in long-term human disturbance to surrounding habitat areas. For example, drilling operations at the well pad including site preparation, drilling, well stimulation, and testing can take as much as six months to complete.[156] Drilling occurs continuously until the target depth is reached, and the transport of workers and material occurs on a 24-hour basis.[157] Once production starts, production operations are ongoing 24 hours per day year-round.[158] Truck traffic is heavy when water is being trucked in for fracking and produced water is being trucked out. For example, the DEIR estimates that 1,000 to 2,000 round-trip truck trips are needed to deliver water to the well site for

[152] Weller, C., J. Thomson, and G.Aplet. (2002). Fragmenting Our Lands: The Ecological Footprint from Oil and Gas Development. The Wilderness Society 80221(303):1-30. (Attachment 11)

[153] Beckmann, J.P., K. Murray, R.G. Seidler, and J. Berger. (2012). Human-mediated shifts in animal habitat use: Sequential changes in pronghorn use of a natural gas field in Greater Yellowstone. Biological Conservation 147(1): 222-3 (Attachment 12); Dzialak M.R., S.M. Jarju, R.G. Osborn, J.J. Wondzell, L.D. Hayeden-Wing, J.B. Winstead, et al. (2011). Prioritizing conservation of ungulate calving resources in multiple-use landscapes. Plos One 6(1): e14597. doi:10.1371/journal.pone.0014597 (Attachment 13); Doherty, K.E., D.E. Naugle, B.L. Walker, and J.M. Graham. (2008). Greater sage-grouse winter habitat selection and energy development. Journal of Wildlife Management 72: 187-195 (Attachment 14); Thomson J.L, T.S. Schaub, N.W. Culver, and P. Aengst. (2006). Wildlife at a Crossroads: Energy Development in Western Wyoming. 8th Biennial Scientific Conference on the Greater Yellowstone Ecosystem. 206-7 ("Thomson 2006") (Attachment 15); Wyoming Game and Fish Department (2010). Recommendations for development of oil and gas resources within important wildlife habitats: Wyoming Game and Fish Department.10 (Attachment 16)

[154] Sawyer, H., R.M. Nielson, F. Lindzey, and L.L. McDonald. (2006). Winter Habitat Selection of Mule Deer Before and During Development of a Natural Gas Field. Journal of Wildlife Management 70(2): 396–403 (Attachment 17); Sawyer, H., M.J. Kauffman, and R.M. Nielson. (2010). Influence of well pad activity on winter habitat selection patterns of mule deer. Journal of Wildlife Management 73: 1052-1061, page 1058 (*citing* Bureau of Land Management. 2006. Supplemental environmental impact statement for the Pinedale Anticline Oil and Gas Exploration and Development Project. Wyoming State Office, Cheyenne, USA.) (Attachment 18)

[155] Attachment 17.

[156] DEIR 7-13.

[157] DEIR 7-13.

[158] DEIR 7-19.

drilling and stimulation,[159] while eight to 20 round-trip truck trips are required to deliver proppant for well stimulation.[160]

Noise pollution: The DEIR fails to disclose and evaluate the impacts of noise pollution leading to habitat loss. Well-stimulation-related activities cause significant intermittent and chronic noise pollution during the lifetime of the well due to construction, drilling, fracking, truck transport, compressors, human activity, and other noise sources. Noise pollution from well stimulation is particularly significant. Noise from pumping during a frack job is estimated at 107 decibels[161] while noise from pumping during acid matrix stimulation can range between 75 to 100 decibels.[162] Numerous studies demonstrate that noise pollution from oil and gas-related activities can cause wildlife to alter their spatial distributions and temporarily or permanently abandon habitat areas.[163] For example, in areas where sage grouse were exposed to intermittent anthropogenic sounds associated with natural gas drilling and roads, male attendance at leks decreased up to 73%.[164]

Reduced water quantity: The DEIR fails to adequately disclose and evaluate the impacts of well stimulation on water availability for biological resources. The DEIR briefly states that well stimulation activities could have indirect effects on water quantity due to pumping: "reduced surface or ground water availability, caused by pumping from a surface source such as a lake, stream, spring, or a groundwater source, reducing surface or soil water availability at a wildlife drinking water source, or wetlands, riparian, or aquatic habitat."[165] It fails to evaluate the significant local and regional impacts of past, current, and future surface and ground water withdrawal for well stimulation activities on fish and wildlife, particularly in areas where wells are concentrated and well owners/operators permanently remove millions of gallons of water from fresh surface and sub-surface supplies (i.e., groundwater wells and municipal water sources).[166] The DEIR also fails to examine these impacts in the context of limited water availability due to drought conditions and competing agricultural, industrial, and municipal waters needs.

Reduced water quality: The DEIR fails to adequately disclose and evaluate the impacts of well stimulation on water quality. The DEIR only briefly acknowledges the impacts on water quality through disruption of local surface hydrology: "altered local surface hydrology, causing short-term or long term

[159] DEIR 7-43.
[160] DEIR 7-37.
[161] DEIR 7-30.
[162] DEIR 7-37.
[163] Bayne E.M., L. Habib, and S. Boutin. (2008). Impacts of chronic anthropogenic noise from energy-sector activity on the abundance of songbirds in the boreal forest. Conservation Biology 22(5): 1186-93 (Attachment 19); Francis, C.D. and J.R. Barber. (2013). A framework for understanding noise impacts on wildlife: an urgent conservation priority. Frontiers in Ecology and the Environment 11: 305-313. (Attachment 20)
[164] Blickley, J.L. et al. (2012). Experimental evidence for the effects of chronic anthropogenic noise on abundance of greater sage-grouse at leks. Conserv Biol 26: 461-471. (Attachment 21)
[165] DEIR 10.4-44.
[166] DEIR 7-36.

habitat inundation behind berms, or interruption of downstream flow and sediment delivery."[167] Other impacts on surface water hydrology that are not adequately disclosed include (1) clearing and grading of well pads that increase sediment runoff; (2) construction, maintenance, and/or use of access roads that elevate runoff rates, increase sedimentation and turbidity in receiving water bodies, and alter timing and volume of stream flow, water chemistry, and stream channel morphology; and (3) construction, maintenance, and/or use of culverts, pipelines, and other structures that alter water flow.[168] In addition, the DEIR fails to acknowledge that spills of fracking chemicals, produced water, oil, and other toxins associated with well stimulation should be included among the water quality impacts that can result in temporary and permanent habitat reduction.[169]

Mitigation measures addressing habitat reduction are completely inadequate

The DEIR incorrectly asserts that mitigation measures BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, SWR-1a and SWR-2a will effectively mitigate adverse impacts on habitat to a less than significant level for most well stimulation projects.[170] As detailed below, these incomplete and often vague, unenforceable, unproven, and deferred mitigation measures simply do not meet CEQA's mitigation requirements.

(1) The EIR should include a feasible mitigation measure requiring applicants to site well stimulation activities outside sensitive habitat areas. Many significant impacts to habitats could be avoided altogether or substantially lessened by requiring well stimulation activities, including the construction and operation of well pads, access roads, pipelines, transmission lines, and other infrastructure, outside of the boundaries of identified sensitive habitats, as well as outside of a scientifically defensible buffer zone surrounding sensitive habitat areas that accounts for the sensitivities of affected species. To support this mitigation measure, the EIR should require a comprehensive state-wide identification and mapping of sensitive habitat areas, where sensitive habitats include all categories proposed to be included in the Vegetation and Habitat Map[171] and Habitat Protection Standard.[172] The EIR should require applicants to avoid siting well stimulation activities within any of these sensitive habitat areas as well as an appropriate buffer zone surrounding these areas.

(2) MM BIOT-1a inappropriately limits the scope of habitat evaluation and mitigation to areas affected by fencing, grading, and site preparation activities, even though impacts can occur in other areas and in other phases of well stimulation-related activities. Although the DEIR states in one section that the evaluation should occur in all "direct and indirect project-related disturbance areas," it subsequently limits the scope of the measure to areas of fencing, grading, and site preparation through the requirements of the Grading, Fencing, and Site Preparation Plan and the Vegetation and Habitat Map. It allows the applicant to avoid habitat mitigation measures altogether if it affirms that "no grading,

[167] DEIR 10.4-46.
[168] Attachment 9
[169] *Ibid.*
[170] DEIR 10.4-45.
[171] DEIR 10.4-47.
[172] DEIR 7-50-51.

fencing, or other site preparation will be included in the work."[173] The measure also specifies that the Vegetation and Habitat Map only pertains to the proposed limits of grading or site preparation including a 300-foot buffer. The DEIR also inappropriately exempts well stimulation activities at existing wells from this measure if those existing wells do not require site preparation, even though well stimulation activities at existing wells can result in habitat reducing impacts (e.g., ground and noise disturbance from heavy equipment and trucks, and oil and chemical spills).

(3) MM BIOT-1a fails to require an analysis of the total footprint of habitat reduction resulting from the direct and indirect impacts of well stimulation activities, which is necessary for ensuring adequate mitigation for habitat loss. This spatial analysis should include habitat reduction resulting from all infrastructure (i.e., well pads, roads, pipelines, transmission lines, seismic lines, production facilities, water wells), habitat fragmentation, edge and density effects, human disturbance, noise pollution, and reductions in water quantity and quality. The analysis should also determine the radius or zone of habitat impact resulting from each disturbance source, taking into account the differential sensitivities of affected species. For example, studies have determined that well pads create an impact zone for mule deer extending up to 3.7 kilometers from the pad.[174] This spatial analysis must not only factor in the habitat impacts from individual well projects, but must also analyze the cumulative impacts from surrounding projects on a local and regional scale.

(4) MM BIOT-1b does not adequately minimize impacts on native vegetation and habitat. The primary substance of this measure titled "Impact Minimization" consists of one sentence that relies on vague, non-enforceable, and deferred mitigation: "For projects that may directly or indirectly affect native vegetation or habitat, DOGGR shall review the project footprint design to ensure that it minimizes these effects (e.g., by consolidating well pads, or revising the site plan to relocate disturbance areas, if such revisions would allow for safe project implementation and would not cause new adverse effects to other resources)."[175] The EIR must include specific requirements and performance standards for impact minimization as conditions of the permit. First and foremost, this mitigation measure should require that applicants avoid siting well stimulation activities inside or near sensitive habitat areas. Where well stimulation infrastructure is built, specific mitigation measures should require that infrastructure should be consolidated and co-located to reduce disturbance; roads should be prohibited from crossing wetlands, riparian areas, and perennial or seasonal watercourses; and vegetation clearing should be done by hand, in addition to the full range of other feasible mitigation.

(5) MM BIOT-1c, which proposes on-site restoration for "temporary" impacts and compensation for "permanent" impacts, is inadequate to offset or compensate for the destruction of native vegetation and habitat. At the most basic level, the DEIR presents no evidence that these restoration and compensation techniques can effectively replace the value, structure, and function of native habitats that are destroyed. This measure does not mitigate the adverse impacts from habitat fragmentation,

[173] DEIR 10.4-47.
[174] Attachment 17.
[175] DEIR 10.4-48.

edge effects, and density effects resulting from the network of well pads, roads, pipelines, transmission lines, and other infrastructure crossing sensitive habitats. In addition, the DEIR states that on-site restoration for "temporary" impacts need not be implemented for up to five years after the initial disturbance, leaving a long time lag before impacts begin to be remediated; requires no timeline for completion of restoration; and provides no assurances for success (i.e., there is vague language referring to "contingency measures" for remediation if the restoration is not successful). For compensation, the DEIR specifies no timeline for completion, includes no requirements specifying how the Lead Agency will evaluate whether the "habitat value" of the compensation land is "equivalent or greater than habitat removed for the project," and includes no requirement that these compensation lands successfully replace lost habitat over time.

(6) MM BIOT-1a, 1b, and 1c do not mitigate the effects from noise pollution. MM BIOT-2a has one requirement addressing noise pollution: "To the extent feasible, project activities exceeding 70 decibels at the project site boundary (e.g., high-pressure pumping of hydraulic fracturing fluids) shall be scheduled outside the peak avian (bird) breeding season, to minimize effects to such birds." However, this measure applies only to birds and ignores other affected wildlife, is not mandatory (i.e., "to the extent feasible"), does not provide justification for why the threshold of 70 decibels is sufficiently protective, does not provide justification for why mitigation only during the peak breeding season is sufficient, and does not define what is meant by "peak" avian breeding season.

The DEIR should analyze and require other feasible mitigation measures to reduce noise pollution from well-stimulation-related activities, such as installing sound-dampening devices, walls, and/or insulation around pumpjacks, compressor stations, and other infrastructure; switching from diesel and gas engines to electric engines; switching from conventional pumps to quieter pump designs (pneumatic pumps or progressive cavity pumps); co-locating infrastructure to a central location rather than disparate locations to minimize the sources of noise pollution (i.e., using a central compressor with sound barrier walls rather than compressors at individual wells); requiring infrastructure with design features that reduce noise; and seasonally restricting activity in areas with sensitive species such as during migration, breeding, and dispersal.

(7) The mitigation measures in the DEIR are completely inadequate to protect wildlife from significant impacts from surface and ground water reductions. The DEIR claims that Mitigation Measures GW-1a, GW-1b, and SWR-3a, in addition to existing regulations and adherence to resource protection standards, would reduce impacts to terrestrial biological resources to a less-than-significant level.[176] The DEIR specifically states that "Mitigation Measure SWR-3a (Ensure Adequate Water Availability) requires project-specific surface water analysis to ensure no adverse impact on fish, wildlife, habitat, recreation, or any downstream users of the water."[177] However, contrary to this claim, SWR-3a (nor GW-1a or 1b) does not require specific analysis of impacts to fish, wildlife, and habitat and has no requirements to

[176] DEIR 10.4-46.
[177] DEIR 10.4-46.

ensure no adverse harms. Likewise, the DEIR provides no evidence that existing regulations and adherence to resource protection standards would adequately reduce harms to wildlife.

(8) The mitigation measures in the DEIR are completely inadequate to protect wildlife from significant impacts to water quality. The DEIR incorrectly claims that that surface hydrology effects that could reduce wildlife habitat would be minimized or avoided through the Surface Water Protection Standards (EIR Section 7.5.3) "which would require siting well stimulation projects 100 feet or farther, wherever feasible, from perennial or intermittent water bodies," and through Mitigation Measure BIOT-6a.[178] In regard to the Water Protection Standard, this Standard is not enforceable and can be dismissed if it is deemed infeasible.[179] Moreover, the DEIR provides no evidence that a 100-foot setback would avoid impacts to local surface hydrology and water quality, for example, from well pads, roads, and spills. BIOT-6a similarly contains no requirements that mitigate the impacts to less-than-significant since jurisdictional waters can be altered and filled as long as future permits are obtained, and wetlands can be destroyed under future vague, deferred mitigation agreements with DOGGR.[180] BIOT-6a has no requirements pertaining to roads that can cause significant harms to water quality. SWR-2a (Implement Erosion Control Plan) is only required prior to the construction of any *new* well and other stimulation-related infrastructure, although the DEIR explicitly acknowledges that there is potential for ground disturbance at *existing* wells due to the large amount of heavy equipment necessary for stimulation procedures.[181] In addition, SWR-2a appears to apply only to floodplains rather than wells in areas outside of floodplains.[182]

11.6.2 Impact BIOT-2: Cause a fish or wildlife population to drop below self-sustaining levels

(1) The DEIR fails to adequately disclose the impacts to fish and wildlife from well stimulation activities that could cause wildlife populations to fall below self-sustaining levels. For example, the DEIR fails to acknowledge that numerous studies have documented declines in abundance of birds, mammals and fish linked to oil and gas development activities.[183] The DEIR also misrepresents the toxic risks of well

[178] DEIR 10.4-46.
[179] DEIR 7-53.
[180] DEIR 10.4-78-79.
[181] DEIR 10.15-42.
[182] DEIR 10.15-42.
[183] Walker, B.L., D.E. Naugle, and K.E. Doherty. (2007). Greater sage-grouse population response to energy. Journal of Wildlife Management 71(8): 2644-54 (Attachment 22); Harju S.M., M.R. Dzialak, R.C. Taylor, L.D. Hayden-Wing, and J.B. Winstead. (2011). Thresholds and time lags in effects of energy development on greater sage-grouse populations. Journal of Wildlife Management 74: 437-448 (Attachment 23); Gilbert, M.M. and A.D. Chalfoun. (2011). Energy development affects populations of sagebrush songbirds in Wyoming. The Journal of Wildlife Management 75(4): 816-824 (Attachment 24); Dale B.C., T.S. Wiens, and L.E. Hamilton. (2008). Abundance of three grassland songbirds in an area of natural gas infill drilling in Alberta, Canada. Proceedings of the Fourth International Partners in Flight Conference: Tundra to Tropics 4: 194-204 (Attachment 25); Hamilton L.E., B.C. Dale, and C.A. Paszkowski. (2011). Effects of disturbance associated with natural gas extraction on the occurrence of three grassland songbirds. Avian Conservation and Ecology 6: 7 (Attachment 26); Ingelfinger, F. and A. Anderson. (2004). Passerine response to roads associated with natural gas extraction in a sagebrush steppe habitat. Western North American Naturalist 64: 385-395 (Attachment 27); Attachment 16; Green, Jessie J., G.L. Adams, and R.

stimulation chemicals to fish and wildlife by inaccurately stating that "specific hydraulic fracking fluids may contain one or more of many minor constituents that may be toxic to plants, fish, or wildlife."[184] One comprehensive study found that 40 percent of the chemicals added to fracking fluids have been found to have ecological effects, indicating that they can harm wildlife.[185] Studies have also documented that fracking fluid discharges into streams have killed aquatic invertebrates and fish, including federally listed species;[186] fracking fluid applications to forest lands have caused widespread mortality of trees and damage to surface soil;[187] and exposure to fracking activity has caused negative health effects and death to wildlife and domestic animals.[188]

(2) The DEIR is wholly deficient in its disclosure, evaluation, and mitigation of the impacts of spills of oil, fracking fluids, produced water, and other chemicals on wildlife. Although not adequately acknowledged by the DEIR, well stimulation activities have the potential to result in oil and other chemical spills during the lifespan of the well, not only at the well pad, but also due to pipeline leaks; truck, train, and other transportation accidents; and spills at processing facilities. Oil and chemical spills can have well-known catastrophic impacts on wildlife due to their toxic effects, the potentially large volume of spills, and the difficulty of containment and clean-up. As noted in the DEIR, produced water spills cannot be contained by traditional oil spill response methods.[189]

The mitigation measures pertaining to spills are completely inadequate to reduce the impacts to biological resources to a less-than-significant level as claimed by the DEIR.[190] The Spill Contingency Plan described under BIOT-2a is vague, incomplete, and relies on deferred mitigation action. The DEIR briefly states that the "applicant will submit a proposed Spill Contingency Plan that identifies and evaluates the best-available technologies to respond to spills of hydraulic fracturing fluids and potential spills of these fluids mixed with crude oil on land, surface water, and ground water."[191] The Plan will be approved by DOGGR after consultation with CDFW. In the case of a spill, the applicant and operator must notify the CDFW Office of Oil Spill Prevention and Response and the State Warning Center in an unspecified time frame,[192] while in the event of any accidental or unauthorized release of material, debris, or substance into any river, lake, or stream, the applicant or operator shall notify CDFW within 14 days.[193] Not only

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Adams. (2012). Examining community level variables of fishes in relation to natural gas development. Southeastern Fishes Council, Annual Meeting Program, November 8-9, 2012, New Orleans, Louisiana. (Attachment 28)

[184] DEIR at 10.4-54.

[185] Colborn, T. et al. (2011). Natural gas operations from a public health perspective. Human and Ecological Risk Assessment 17: 1039-1056. (Attachment 29)

[186] Papoulias, D.M. and A.L. Velasco. (2013). Histopathological analysis of fish from Acorn Fork Creek, Kentucky, exposed to hydraulic fracturing fluid releases. Southwestern Naturalist 12 (Special Issue 4): 92-111. (Attachment 30)

[187] Adams, M.B. (2011) Land Application of Hydrofracturing Fluids Damages a Deciduous Forest Stand in West Virginia. Journal of Environmental Quality 40: 1340-1344. (Attachment 31)

[188] Bamberger, M. and R.E. Oswald. (2012). Impacts of gas drilling on human and animal health. New Solutions 22(1): 51-77. (Attachment 32)

[189] DEIR at 10.4-54.

[190] DEIR 10.4-55.

[191] DEIR 10.4-57.

[192] DEIR 10.4-59.

[193] DEIR 10.4-55.

does this measure leave oil spill response planning largely in the hands of the applicant, it contains no specific mitigation measures for what the spill plan must include. For example, there are no requirements that the plan (1) cover spills not only the well pad but in all areas directly and indirectly affected by the project including pipelines, access roads, and production facilities; (2) effectively respond to a worst-case scenario spill; (3) demonstrate the capacity for full and immediate oil spill containment and response; or (4) demonstrate an ability to effectively protect wildlife species and rehabilitate affected individuals.

(3) MM BIOT-2a is insufficient to protect wildlife from harms from roads and vehicles, including road mortality, acoustic masking, and negative population-level effects.[194] Road mortality is a major factor affecting the conservation status of state and federally listed species in California, including the San Joaquin kit fox, blunt-nosed leopard lizard, and California tiger salamander which overlap with oil fields in the San Joaquin Valley (fox, lizard) and Santa Barbara County (salamander). Roads can cause particularly high mortality and negative population-level effects on amphibians, and mitigation techniques do not have a track record of protecting amphibian populations over the long-term.[195] BIOT-2a states: "the applicant shall specify and enforce vehicle speed limits on access roads within the project vicinity (not applicable to public roads)." However, this measure lacks specificity about what those speed limits are, and fails to evaluate which speed limits would be protective of affected wildlife. The DEIR also fails to include other feasible mitigation measures such as road closures during critical periods such as breeding, dispersal, and migration, and wildlife crossings and under-road tunnels.[196]

(4) The Species-Specific Protection Measures under MM BIOT-2a are inadequate, and rely on vague and deferred mitigation measures. Species-specific protection measures are triggered if DOGGR determines that the proposed project activities "may cause a hazard"[197] for special-status species, upon which DOGGR consults with the appropriate resource agencies to avoid or mitigate the hazard. However, consistent with the ESA, the correct trigger should be whether the project activities "may affect" special-status species. Furthermore, the DEIR does not state the specific mitigation measures or performance standards that will be included in the permit conditions. Instead the DEIR states that the permit conditions "may include"[198] several measures which are vaguely defined (e.g., "work activity or biological monitoring") and deferred. The EIR cannot approve mitigation measures that will be formulated at a future time. First and foremost, the EIR should require the feasible mitigation measure of siting well stimulation activities outside of habitat for special-status species. The EIR should also require an analysis of the vulnerability of each special-status species to well stimulation activities to help guide mitigation, which should include an evaluation of the overlap of the species' habitat with the

[194] Fahrig, L. and T. Rytwinski. (2009). Effects of roads on animal abundance: an empirical review and synthesis. Ecology and Society 14: 21. (Attachment 33)
[195] Beebee, T.J. (2013). Effects of road mortality and mitigation measures on amphibian populations. Conservation Biology 27: 657-668. (Attachment 34)
[196] Glista, D.J., T.L. DeVault, and J.A. DeWoody. (2009). A review of mitigation measures for reducing wildlife mortality on roadways. Landscape and Urban Planning 91: 1-7. (Attachment 35)
[197] DEIR 10.4-60.
[198] DEIR 10.4-60.

Monterey Formation; identification of characteristics that put that species at higher risk such as limited range, small population size, specialized habitat requirements, and high sensitivity to disturbance; and an analysis of potential for exposure to and potential for impacts from the specific well project and the cumulative impacts from well stimulation activities on that species and its habitat.

(5) The DEIR includes species-specific protection measures for two special-status species -- California condor and Nelson's bighorn sheep -- while mitigation measures for other special-status species are deferred. At the most basic level, the EIR fails to require the feasible mitigation measure of siting well stimulation activities outside habitat areas for these highly endangered species.

(6) The DEIR fails to evaluate and mitigate adverse effects of light pollution on wildlife. Well stimulation-related infrastructure can lead to significant amounts of light pollution. For example, the Project Description states that drilling sites are lighted at night to allow for 24-hour operation of the drill rig and the drill mast is lighted for aircraft safety.[199] MM BIOT-2a briefly states that "night lighting, when in use, shall be designed, installed, and maintained to prevent side casting of light towards surrounding fish or wildlife habitat." However, this measure should also specify that site lighting should be directly downward and internally, avoiding site casting, uplighting, wall washes, and lighting where the bulb protrudes from the fixture. Other mitigation measures should be required such as limits on wattages and scheduling activities that require night lighting outside of important periods for affected species.

(7) The DEIR does not evaluate or mitigate the harms to wildlife from wastewater pits and sumps which have been documented to cause injury and mortality for numerous wildlife species.[200] Although DOGGR's final proposed regulations prohibit the storage of well stimulations fluids and other fluids in pits and sumps,[201] lack of agency enforcement and industry compliance have allowed the proliferation of several hundred illegal and unpermitted wastewater pits in California[202] that pose unmitigated hazards to wildlife despite these regulations and must be addressed.

(8) The DEIR fails to disclose, evaluate, and mitigate the impacts to species from air pollution from well stimulation activities. Shale development operations emit pollutants that are harmful to species including nitrogen oxides (NO*x*), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter.[203] For example, NOx and VOCs have direct toxicity and contribute to

[199] DEIR 7-13.
[200] Ramirez, P. Jr. (2010). Bird Mortality in Oil Field Wastewater Disposal Facilities. Environmental Management 46(5): 820-6; Trail, P. (2006). Avian mortality at oil pits in the United States: a review of the problem and efforts for its solution. Environmental Management 38: 532-544 (Attachment 36); Rattner, B.A., J.L. Capizzi, K.A. King, L.J. LeCaptain, M.J. Melancon. (1995). Exposure and Effects of oilfield brine discharges on Western Sandpipers (*Califris mauri)* in Nuecs Bay, Texas. Bull. Environ. Contam. Toxicol. 54: 683-689. (Attachment 39)
[201] DEIR at 7-8.
[202] http://www.latimes.com/local/lanow/la-me-ln-pits-oil-wastewater-20150226-story.html (Attachment 39)
[203] Souther, S., M.W. Tingely, V.D. Popescu, D.T.S. Hayman, M.E. Ryan, T.A. Graves, B. Hartl, and K. Terrell. (2014) Biotic impacts of energy development from shale: research priorities and knowledge gaps. Frontiers in Ecology and the Environment 12: 330-338. (Attachment 40)

ozone (O_3) formation which is a significant pulmonary and respiratory irritant in mammals[204] and negatively affects growth, reproduction, and survival of plants.[205]

(9) The DEIR fails to disclose, evaluate, and mitigate impacts on wildlife from the proliferation of linear corridors and elevated structures like transmission poles and power lines that can facilitate increased predation and parasitism.[206]

11.6.3 Impact BIOT-3: Substantially reduce the number or restrict the range of an endangered, rare, or threatened species

MM BIOT-3a is inadequate to mitigate well stimulation impacts that reduce the number and restrict the range of special-status species. First, Project-specific Mitigation for special-status wildlife and plants is triggered only "if special-status fish or wildlife are located during the field surveys."[207] However, species may be present in the area even if not located during field surveys, and thus this measure should apply to all areas identified as special-status species' habitat even if individuals are not observed in surveys. Second, the DEIR unlawfully relies on deferred mitigation by failing to state the specific mitigation measures or performance standards that will be included in the permit conditions. Further, the DEIR provides no evidence to justify why the 100-foot buffer area surrounding the species' habitat would be sufficient to mitigate harms, nor provides any justification for why compensation lands should occur at a minimal 1:1 ratio, particularly when compensation lands are unproven to effectively replace the value, structure, and function of native habitats that are degraded or destroyed.

11.6.4 Impact BIOT-7: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites

(1) The DEIR fails to adequately disclose and evaluate the impacts of well stimulation on wildlife movements. The DEIR fails to acknowledge the numerous studies documenting that oil and gas development alters species' movements and causes avoidance of habitat areas with increasing densities of oil and gas development. The DEIR also provides no evidence for several of its assertions. For example, the DEIR states that activities located on operating well pads or other production-related disturbed lands would have "negligible effects" on fish or wildlife movements.[208] However, well stimulation activities that increase disturbance, for example through increased truck traffic, human activity, and noise pollution, could have significant effects on wildlife movements in those areas. In addition, as acknowledged by the DEIR, there is potential for ground disturbance at existing wells due to the large amount of heavy equipment necessary for stimulation procedures,[209] and this ground disturbance could lead to impacts on wildlife movements. The DEIR also incorrectly asserts that "well

[204] Attachment 40.
[205] *Ibid.*
[206] Attachment 9.
[207] DEIR at 10.4-68.
[208] DIER at 10.4-80.
[209] DEIR at 10.15-42.

stimulation activities would not significantly affect fish or wildlife movement or habitat fragmentation" if they meet three criteria, including being located outside designated linkage areas or if the work site is surrounded by sufficient natural open space.[210] First, the DEIR fails to define what is meant by a "designated linkage area," making it impossible to assess this criterion. Second, "sufficient natural open space" is undefined, and numerous studies cited in these comments demonstrate that oil and gas development can substantially alter species movements and migratory pathways, even given surrounding open space.

(2) MM BIOT-7a is insufficient to mitigate harms on several counts. This measure only applies to well stimulation applications that require grading, fencing, or site preparation work.[211] The Impact Minimization requirements do not include the feasible mitigation measure of requiring applicants to avoid significant impacts to movement by siting projects outside of important movement areas. The Restoration and Compensation mitigation measures lack any specific requirements or performance measures for mitigating impacts to wildlife movements.

11.7 Section 11.4 of the DEIR (Programmatic Analysis for Specific Oil Fields) Suffers from the Same Deficiencies as Section 10.4 of the DEIR

The programmatic analysis for terrestrial biological resources in the Wilmington, Inglewood, and Sespe Oil and Gas Fields in Section 11.4 of the DEIR relies on the same mitigation measures as in Section 10.4 and suffers from the same deficiencies identified above for Section 10.4 of the DEIR.

12 BIOLOGICAL RESOURCES: COASTAL AND MARINE ENVIRONMENT

CEQA requires an EIR to include a description of the physical environmental conditions in the vicinity of the project from a local and regional perspective at the time environmental review occurs. This environmental setting constitutes the baseline physical conditions by which the lead agency must determine whether an impact is significant.[212] However, the DEIR fails to provide an adequate, accurate, or informative description of the environmental setting in several respects.

(1) The DEIR improperly excludes Study Region 6 from its analysis. The DEIR claims that study regions other than Study Regions 1, 2, and 3 "do not contain coastal and marine resources,"[213] but this is clearly incorrect. Even taking into account the counties that are excluded from analysis in the DEIR,[214] Study Region 6 includes two coastal counties—San Mateo and Humboldt—each with active oil and gas fields, as well as several counties bordering the San Francisco Bay Delta (i.e., Santa Clara, Alameda, Contra

[210] DEIR at 10.4-80.
[211] DEIR at 10.4-81.
[212] CEQA Guidelines § 15125.
[213] DEIR at 10.5-1.
[214] DEIR at 5-11; counties shaded in gray in Figure 5-9.

Costa, and Solano). San Mateo County has an active oil and gas field west of Half Moon Bay on the coast.[215]

(2) The DEIR fails to describe the boundaries of the coastal and marine portions of the study regions, either in the text or in the maps provided in the figures. The coastal and marine portions of the study regions should include state and federal waters and the coastal zone of Study Regions 1, 2, 3 and 6. As acknowledged in the DEIR, DOGGR supervises the drilling, operation, maintenance and plugging and abandonment of oil and gas wells offshore in state waters within three nautical miles of the coastline.[216] State waters contain active oil and gas fields,[217] are underlain by the Monterey Formation,[218] are undergoing well stimulation, and must be included in the project area. Federal waters offshore of Study Regions 1, 2, 3, and 6 should also be included in the project area because offshore well stimulation activities in these waters directly and indirectly impact the state's coastal and marine biological resources. Indeed, impacts to California's coastal and marine resources off of the entire California coast should be considered, because both species and contaminates migrate and there are reasonably foreseeable indirect impacts to resources outside of the identified study regions. In addition, Senate Bill 4 did not geographically limit DOGGR's analysis and such limitations in the marine environment—where we know fish, whales, turtles, birds, and other marine species are not stationary—is unsupported.

(3) The DEIR fails to accurately or adequately describe the environmental setting in Section 10.5.3 (Affected Environment). The DEIR fails to disclose the presence of numerous special-status species in the study regions. For example, the DEIR erroneously states that no federal or state-listed invertebrate species are known to be present in Study Regions 1, 2, or 3. However, the black abalone is a federally listed species that has critical habitat in Study Regions 1, 2, 3, and 6,[219] while the federally endangered white abalone occurs in Study Regions 1, 2, and 3.[220] Similarly, the DEIR wrongly states that no federal or state listed fish species occur in Study Regions 1 or 2. However, the federally endangered Southern California steelhead has critical habitat in Study Regions 1, 2, and 3, the federally threatened South-Central California Coast steelhead has critical habitat in Study Region 3,[221] and the federally endangered tidewater goby has critical habitat in Study Regions 1, 2, 3, and 6.[222] Although not acknowledged by the DEIR, the federally endangered leatherback sea turtle has critical habitat in Study Regions 3 and 6,[223] and loggerhead, green, and olive ridley sea turtles also occur in the Southern California Bight. The DEIR fails to disclose that state threatened Scripps's and Guadalupe murrelets occur in Study Regions 1, 2, and 3, and that many California bird species of special concern use these study regions, including the ashy storm-petrel, black storm-petrel, Cassin's auklet, and tufted puffin.[224] The DEIR inaccurately describes

[215] DEIR at Figure 5-8.
[216] DEIR at 7-3.
[217] DEIR at Figure 5-4 and Figure 5-6.
[218] DEIR at Figure 5-9.
[219] http://www.fisheries.noaa.gov/pr/species/invertebrates/abalone/black-abalone.html (Attachment 41)
[220] http://www.fisheries.noaa.gov/pr/species/invertebrates/abalone/white-abalone.html (Attachment 42)
[221] http://www.fisheries.noaa.gov/pr/species/fish/steelhead-trout.html (Attachment 43)
[222] http://ecos.fws.gov/speciesProfile/profile/speciesProfile?spcode=E071 (Attachment 44)
[223] http://www.nmfs.noaa.gov/pr/images/criticalhabitat/leatherback_westcoast.jpg (Attachment 45)
[224] https://www.dfg.ca.gov/wildlife/nongame/ssc/birds.html (Attachment 46)

the presence of marine mammals in the study regions. The Santa Barbara Channel near the western Channel Islands provides extremely important blue whale habitat that supports the highest densities of blue whales along the U.S. west coast and globally.[225] Another endangered whale, the humpback whale, congregates in the area from May to September. Little is known about the elusive endangered fin whales; however, congregations have been observed near feeding aggregations of blue and humpback whales. Although rare, endangered sperm, right, and killer whales occasionally occur in the area. Gray whales migrate through the region on their way south to breeding grounds and again in the late winter and early spring on their way north to feeding areas, and minke whales are known to occupy the region year-round.

To correct these deficiencies, the EIR should provide complete descriptions and maps of the presence of special-status species and sensitive habitats within the coastal and marine portions of at least the study areas, and because indirect impacts could reasonably extend outside the study area should include maps for the entire California coast, including the sensitive habitat types identified in the Habitat Protection Standard[226] (i.e., critical habitat, recovery areas, federal and California protected areas and California conservation easements, California Marine Protection Areas, and Areas of Special Biological Significance), as well as coastal wetlands and wildlife movement corridors. The EIR should describe the oceanographic regimes within marine study regions, such as the Southern California Bight and the California Current System, which influence species' distributions and composition. Finally, the EIR should not limit the study regions to the coastal and nearshore habitats from the mean high tide mark to 120 feet water depth, which it does without justification.[227]

12.1 The DEIR Fails to Evaluate the Full Range of Direct and Indirect Environmental Impacts of Well Stimulation to Coastal and Marine Biological Resources

Under both CEQA and SB 4, DOGGR is required by law evaluate direct and indirect effects of well stimulation. Under CEQA guidelines, direct impacts are those that result from the project and occur at the same time and place, while indirect impacts are those that are "caused by a project, but can occur later in time or farther removed in distance and are still reasonably foreseeable and related to the operation of the project."[228] In Section 10.5, the DEIR fails to disclose, evaluate, and mitigate the full range of direct and indirect impacts of well stimulation and excludes many of the impacts associated with the full lifecycle of the well undergoing well stimulation, including impacts related to pre-drilling, site preparation, drilling operations, well completion operations, testing and production, well plugging and abandonment, and transport of oil and gas to refineries. The DEIR also fails to acknowledge that well stimulation increases the scope of direct and indirect impacts by prolonging the lifespan of the well.

[225] Irvine, L.M. et al. (2014). Spatial and temporal occurrence of blue whales off the U.S. West Coast, with implications for management. PLoS ONE 9(7): e102959. (Attachment 47)
[226] DEIR at 7-50.
[227] DEIR at 10.5-5.
[228] DEIR at 10.4-42.

12.2 The Cumulative Impacts Analysis for Coastal and Marine Biological Resources is Fatally Flawed

The DEIR's cumulative impacts analysis determines that the "impacts of the project on coastal and marine biological resources, taken together with impacts from other related cumulative projects, are likely to create a significant cumulative effect" but that the "project's incremental contribution to this significant cumulative impact is less than cumulatively considerable."[229] Specifically, the cumulative impacts analysis determines that the project's contribution to cumulative impacts to special-status species, migration corridors, and spill or discharge would be less than cumulatively considerable. Under CEQA, an EIR can determine that a project's contribution to a significant cumulative impact will be rendered less than cumulatively considerable (a) if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulate impact and (b) the lead agency identifies facts and analysis supporting its conclusion that the contribution will be rendered less than cumulatively considerable.[230] The DEIR fails to meet both of these requirements.

In regard to species and migration corridors, the DEIR fails to require any mitigation measures to alleviate the cumulative impacts from the project resulting from oil and chemical spills, noise pollution, light pollution, predation, and other project impacts. Further, the DEIR fails to provide facts or analyses that support its conclusion of non-significance. Instead, many claims are demonstrably inaccurate--for example, that most special-status species are transient visitors and that accidental spills would not impede migrations.[231] In regard to spills, the DEIR similarly fails to require any specific mitigation measures to alleviate the impacts of spills on biological resources and claims without analysis that DOGGR's proposed permanent regulations are sufficient to make the project's contribution less than significant. Given the potentially catastrophic impacts on marine species and habitats from an oil spill resulting from the project, the DEIR's conclusion of non-significance is baseless.

12.3 The DEIR Fails to Utilize the Full Set of Significance Criteria

The DEIR fails to evaluate impacts to coastal and marine biological resources using the full set of significance criteria required by CEQA Guidelines. CEQA Guidelines define a "significant risk" as "a substantial, or potentially substantial, adverse change in any of the physical condition within the area affected by the project."[232] DOGGR is required to evaluate impacts to coastal and marine biological resources using the significance criteria to determine whether a project would result in significant impacts to biological resources,[233] but the DEIR only analyzes impacts under a small subset of these criteria. The EIR must evaluate impacts under the following missing criteria:
(a) Substantially reduce the habitat of a fish or wildlife species;
(b) Cause a fish or wildlife population to drop below self-sustaining levels;
(c) Substantially reduce the number or restrict the range of an endangered, rare, or threatened species;

[229] DEIR at 13-32.
[230] CEQA Guidelines § 15130 (a).
[231] DEIR at 13-32.
[232] CEQA Guidelines § 15382.
[233] DEIR at 10.4-42.

(d) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS;
(e) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS;
(f) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
(g) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Following the analysis in Section 10.4 for terrestrial resources, the EIR should also include an impacts analysis under one additional criterion: "The project could contribute to global climate change and consequent impacts to biodiversity."[234] This criterion is critical given the significant impacts of climate change and ocean acidification on marine species and habitats.

12.4 The DEIR Fails to Adequately Disclose, Evaluate, and Mitigate the Impacts from the Project on Coastal and Marine Biological Resources

Section 10.5.5 (Impact Analysis and Mitigation) is fatally flawed in several respects. First, the DEIR omits disclosure and evaluation of key impacts from the project. Second, the DEIR incorrectly concludes that all evaluated impacts to coastal and marine species and habitats are less than significant (i.e. Class III impacts that are comparatively minor in not meeting or exceeding the subject-specific criteria established to gauge significance[235]). These conclusions are based on conclusory assertions instead of substantial evidence as required by CEQA. In contrast, as documented below, a large body of scientific research demonstrates that many harms to coastal and marine species and habitats from well stimulation activities are significant—including impacts from oil and chemical spills, noise pollution, light pollution, degradation of water quality—and cannot be reduced to a less-than-significant level even with feasible mitigation. As detailed below, the DEIR allows many significant impacts to proceed.

12.5 The DEIR Fails to Adequately Disclose, Evaluate, and Mitigate Significant Impacts on Special-Status Species and Habitats under BIOCM-1 (Substantially Affect Any Species Identified as a Candidate, Sensitive, or Special-status Species or Their Habitat)

(1) The impact analysis in BIOCM-1 makes numerous erroneous statements. First, the DEIR incorrectly claims that Study Regions 1, 2, and 3 have similar composition of special-status species, and that the main species are marine birds and marine mammals. An accurate description of the environmental setting for these study regions would acknowledge the differences in species composition in these areas, as well as the important presence of special-status turtles, fish, and invertebrates. Second, the DEIR makes the unsupported claim that well stimulation activities would be unlikely to have a significant

[234] DEIR at 10.4-43.
[235] DEIR at ES-14.

impact on special-status species for three reasons: (1) Horizontal drilling activities avoid intertidal and rocky reef areas. This is illogical as it ignores the risks from oil and chemical pollution from the project on these habitats. (2) With the exception of the southern sea otter, all rare, threatened, and endangered species are considered transient visitors to the study regions. This is incorrect since many special-status species are residents in the study areas such as black and white abalone, tidewater goby, ashy storm-petrels, and eighteen whale and dolphin species.[236] In addition, a species' seasonal use of the study area does not protect it from impacts. (3) Well stimulation activities would not impact biological resources within MPAs because these activities "would not be conducted in or near any sensitive or protected marine habitat, including MPAs." This assertion is unsupported because there are no requirements in the DEIR or elsewhere that prohibit well stimulation in or near sensitive habitats or near MPAs. Furthermore, there is no mitigation in the DEIR that can ensure pollutants, noise, or other potential impacts will not travel into a marine protected area.

(2) The DEIR "assumes" that any offshore well stimulation within an existing offshore field would require project-specific environmental review.[237] The DEIR cannot make this assumption without specifically requiring that these project-specific environmental reviews take place.

(3) The impact analysis in BIOCM-1 fails to adequately disclose, evaluate, and mitigate the impacts of spills, leaks, and discharges of oil, fracking fluid, and other hazardous chemicals associated with well stimulation activities, and concludes without basis that the impacts from spills are less than significant (Class III).

The DEIR fails to evaluate the potential impacts of spills on coastal and marine species and habitats, and instead cursorily states that "information on potential risk of spills into the marine environment is presented in EIR Section 10.21.5."[238] While Section 10.21.5 evaluates the risk of spills in general, it contains no analyses specific to coastal and marine species and habitats. Although not acknowledged in this section, well stimulation activities have the potential to result in significant oil and chemical spills in the coastal and marine environment during the lifespan of the well, including spills of oil, fracking fluids, flowback, and produced water from wells, platforms, vessels, injection wells, and pipelines. Spill records from platforms off California indicate that accidental spills of oil and other hazardous substances into the marine environment routinely occur during normal operations. A 2001 Minerals Management Service projection calculated the risks of a 1,000 barrel or greater spill from offshore California operations as 41.2% (Federal waters) and 8.4% (State waters) over the upcoming 28 years.[239] The likelihood of a 50-999 barrel spill was estimated at 95% (Federal waters) and 39% (State waters) for the same period.

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[236] McGinnis, M.V. (2006). Negotiating ecology: Marine bioregions and the destruction of the Southern California Bight. Futures of Bioregions 38: 382-405. (Attachment 48)
[237] DEIR at 10.5-13.
[238] 10.5-13-14.
[239] McCrary, M.D et al. 2003. Oil and gas operations offshore California: Status, risks, and safety. Marine Ornithology 31:43-49. (Attachment 49)

Loss of well casing integrity is another important source of contamination. One study reported that 30% of offshore oil wells in the Gulf of Mexico experienced well casing damage in the first five years after drilling, and damage increased over time to 50% after 20 years.[240] The aging of offshore infrastructure poses an added risk for spills and leaks, which will be exacerbated as fracking operations extend the productive lifetime of wells, platforms, and pipelines. Aging poses risks for corrosion, erosion, and fatigue stress to subsea pipelines, subsea equipment, load-bearing structures, and drilling and wells.[241] Subsea pipeline corrosion appears to accelerate over time[242] and can act synergistically with fatigue stress to increase the rate of crack propagation. In the Gulf of Mexico, a 1% increase in platform age corresponded to a 0.4% absolute increase in accident rate.[243] A recent analysis covering 1996-2010 found that accident incident rates, including spills, increased significantly with platform age.[244]

Oil and chemical spills can have well-known catastrophic impacts on coastal and marine wildlife due to their toxic effects, the potentially large volume, and the difficulty of containment and clean-up. As noted in the DEIR, produced water spills cannot be contained by traditional oil spill response methods.[245] Oil spills have a wide array of lethal and sublethal impacts on marine species, including immediate and long-term effects. Petroleum oil is a complex mixture of hundreds of different compounds, mostly hydrocarbons, with different levels of toxicity to wildlife. Polycyclic aromatic hydrocarbons (PAHs) are among the most toxic oil components and have been documented to cause significant impacts on wildlife. Direct impacts to wildlife from exposure to oil include behavioral alteration, suppressed growth, induced or inhibited enzyme systems and other molecular effects, physiological responses, reduced immunity to disease and parasites, histopathological lesions and other cellular effects, tainted flesh, and chronic mortality.[246] Oil can also exert indirect effects on wildlife through reduction of key prey species.[247] The persistence of toxic subsurface oil leading to chronic exposure, even at sublethal levels, can harm wildlife species and ecosystems for decades.[248] The dispersants that will likely be used in

[240] Davies, R.J. et al. 2014. Oil and gas wells and their integrity: Implications for shale and unconventional resource exploitation. Marine and Petroleum Geology 56:239-254 (Attachment 50); Vengosh, A. et al. 2014. A critical review of the risks to water resources from unconventional shale gas development and hydraulic fracturing in the United States. Environmental Science & Technology 48: 8334–8348. (Attachment 51)

[241] [PSA Norway] Petroleum Safety Authority Norway (2006). Material risk – Ageing offshore installations. Prepared by Det Norske Veritas on request from Petroleum Safety Authority Norway. Available at http://www.psa.no/report-archive/category1033.html. (Attachment 52)

[242] Mohd, M.H. and J.K. Paik. 2013. Investigation of the corrosion progress characteristics of offshore subsea oil well tubes. Corrosion Science 67:130-141. (Attachment 53)

[243] An absolute increase such that if a 10 year-old platform had an 8% accident rate, an 11 year-old platform would be expected to have an 8.4% accident rate; Iledare, O.O. et al. 1997. Oil spills, workplace safety and firm size: Evidence from the U.S. Gulf of Mexico OCS. Energy Journal 18:73-89. (Attachment 54)

[244] Muehlenbachs, L. et al. 2013. The impact of water depth on safety and environmental performance in offshore oil and gas production. Energy Policy 55:699-705. (Attachment 55)

[245] DEIR at 10.4-54.

[246] Holdway, D. A. et al. (2002). The acute and chronic effects of wastes associated with offshore oil and gas production on temperate and tropical marine ecological processes. Marine Pollution Bulletin 44:185. (Attachment 56)

[247] Peterson, C.H. et al. (2003). Long-Term ecosystem response to the Exxon Valdez Oil Spill. Science 302: 2082. (Attachment 57)

[248] Id.

response to a spill are also harmful to marine life, including plankton, turtles, fish, corals, and birds. Dispersants release toxic break-down products from oil that, alone or in combination with oil droplets and dispersant chemicals, can make dispersed oil more harmful to marine life than untreated oil. Both the short-term and long-term impacts of dispersants on marine life have not been adequately tested. As acknowledged by the EPA, the "long term effects [of dispersants] on aquatic life are unknown."[249]

The DEIR also fails to acknowledge the scientific evidence that indicates that fracking chemicals used offshore in California can harm or kill a broad array of marine species. Previous research has reported that 40% of the chemicals added to fracking fluids have been found to have ecological effects, indicating that they can harm aquatic and other wildlife.[250] Fracking chemicals reported on FracFocus from 19 fracking events at 19 different wells in California state waters during 2011 to 2013 include at least 10 chemicals that could kill or harm a broad variety of marine organisms, including sea otters, fish, and invertebrates, if released into the environment.[251] The Table below summarizes the scientific studies documenting the harmful effects of these 10 fracking chemicals on marine species.

[249] EPA, http://www.epa.gov/bpspill/dispersants.html
[250] Attachment 29.
[251] Center for Biological Diversity. (2014). Troubled Waters: Offshore Fracking's Threat to California's Ocean, Air and Seismic Stability. Available at http://www.biologicaldiversity.org/campaigns/offshore_fracking/pdfs/Troubled_Waters.pdf (Attachment 59)

Chemical (CAS identifier)	Number of Wells Used (out of 19)	Known Toxic Effects on Marine Life
Nonylphenol Ethoxylates (9016-45-9)	16	Nonylphenol is persistent in the aquatic environment, moderately bioaccumulative, and extremely toxic to aquatic organisms as an endocrine disruptor and inhibitor of development, behavior, growth, and survival
Methylisothiazolinone (26172-55-4, 2682-20-4)	19	genotoxic, neurotoxic
Phenol Formaldehyde Resins (9003-35-4)	19	mutagenic, acute toxicity, target organ toxicity, and carcinogen hazards
Boron Compounds (1330-43-4, 10043-35-3, 121-43-7, 1303-86-2)	19	harms development, growth, and reproduction
Crystalline silica: quartz (X-cide) (14808-60-7)	19	reductions in species richness and biodiversity in benthic communities
Glyoxal (107-22-2)	19	genotoxic, reproductive toxicity, degenerative effects on pancreas and kidney, low to moderate toxicity to animals
Methanol (67-56-1)	19	negative effects on swimming behavior of saltwater fish at sublethal concentrations
Isotridecanol, ethoxylated (9043-30-5)	12	very toxic to aquatic life, accumulation in organisms possible
Monoethanolamine (141-43-5)	4	moderate ecotoxicity (LC50 >1ppm and <100ppm) to aquatic organisms
Alcohols, C12-14, ethoxylated propoxylated (68439-51-0)	2	inherently toxic to aquatic organisms, bioaccumulative; LC50s < 1 mg/L for some algae, invertebrate, and fish species

Nonylphenol ethoxylates (NPEs) and their breakdown product nonylphenol (NP) are particularly toxic to marine species. NP is persistent in the aquatic environment, moderately bioaccumulative, and extremely toxic to aquatic organisms.[252] In addition to its acute toxicity, NP has well-documented endocrine disrupting effects on fish, including the development of intersex fish and altered sex ratios at the

[252] [USEPA] U.S. Environmental Protection Agency (2010). Nonylphenol (NP) and nonylphenol ethoxylates (NPEs) action plan. Available at http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/np-npe.html (Attachment 60)

population level.[253] NP can also inhibit development, growth, and survival of marine invertebrates.[254] Exposure to concentrations as low as 2µg/L significantly altered the swimming behavior of marine copepods.[255] Biomagnification is also a concern for NP. In a study of marine organisms collected from California bays, Diehl et al. (2012) found that NP biomagnified in several trophic relationships: mussel to sea otter, oyster to sea otter, and arrow goby to staghorn sculpin. Benthic organisms are particularly at risk. NP and NPEs absorb easily to suspended solids and settle to the sediment floor, where concentrations can be several orders of magnitude higher than surface waters.[256] Anaerobic conditions on the sea floor can also facilitate the degradation of NPEs into NP, which can persist for years.[257] Exposure to these heavily polluted sediments can lead to bioaccumulation in benthic organisms. Polychaetes collected from Osaka Bay contained NP concentrations two orders of magnitude higher than the sediment from the study area.[258]

Finally, in addition to the deficiencies in disclosing and evaluating impacts, the DEIR claims without basis that adherence to proposed and existing regulations would reduce the potential impacts of spills to a less than significant level.[259] Given the significant dangers that oil and chemical spills pose to the coastal and marine environment, the DEIR must require all feasible mitigation measures to reduce adverse impacts from spills, and the DEIR should classify spills as a Class I impact.

(4) The impact analysis in BIOCM-1 fails to adequately disclose, evaluate, and mitigate the impacts of noise pollution from well stimulation activities, and concludes without basis that noise disturbance impacts would be less than significant.[260] First, the DEIR fails to disclose and evaluate the significant intermittent and chronic noise pollution produced from well stimulation-related activities during the lifetime of the well, including noise from vessel traffic,[261] drilling, well stimulation treatments, maintenance and construction activities, human activity, as well as the potential use of seismic surveys

[253] Diehl, J. et al. (2012). The distribution of 4-nonylphenol in marine organisms of North American Pacific Coast estuaries. Chemosphere 87:490-497. (Attachment 61)

[254] Attachment 61.

[255] Cailleaud, K. et al. (2011). Changes in the swimming behavior of *Eurytemora affinis* (copepod, calanoida) in response to sub-lethal exposure to nonylphenols. Aquatic Toxicology 102:228-231. (Attachment 62)

[256] Vazquez-Duhalt, R. et al. (2005). Nonylphenol, an integrated vision of a pollutant. Scientific review. Applied Ecology and Environmental Research 4:1-25. (Attachment 63)

[257] Arditsoglou, A. and D. Voutsa. (2012). Occurrence and partitioning of endocrine-disrupting compounds in the marine environment of Thermaikos Gulf, Northern Aegean Sea, Greece. Marine Pollution Bulletin 64:2443-2452 (Attachment 64); Ying, G. et al. (2002). Environmental fate of alkylphenols and alkylphenol ethoxylates- a review. Environment International 28:215-226. (Attachment 65)

[258] Nurulnadia, M.Y. et al. (2014). Accumulation of endocrine disrupting chemicals (EDCs) in the polychaete *Paraprionospio* sp. from the Yodo River mouth, Osaka Bay, Japan. Environmental Monitoring and Assessment 186:1453-1463. (Attachment 66)

[259] DEIR 10.5-14.

[260] DEIR at 10.5-13.

[261] Hermannsen, L. et al. (2014). High frequency components of ship noise in shallow water with a discussion of implications for harbor porpoises (*Phocoena phocoena*). Journal of the Acoustical Society of America 136: 1640-1653. (Attachment 67)

and sonar mapping. Offshore fracking increases vessel traffic and associated noise pollution because vessels are needed to transport fracking equipment, fracking fluids and sand, and other fracking-related materials. For example, fracking from offshore platforms is performed from large ships or from "frac skids" that are offloaded from vessels onto the platform.[262] For fracking at offshore islands, barges transport all equipment: on average two barges are needed for equipment, one barge transports the fluid and additives, and one barge carries proppant.[263] Fracking also increases vessel traffic as a result of extending the life of oil and gas operations and increasing interest in oil development in Pacific waters.

Numerous studies have found that noise pollution can be harmful to a wide range of marine species, including marine mammals, fish and cephalopods, by causing physical damage, increasing stress levels, and interfering with important biological functions such as communication, movement, migration, feeding, mating, and rearing young.[264] Noise from ship traffic raises the din against which marine animals must struggle to carry out normal life. A recent study found that blue whale vocalizing in the Southern California Bight is impacted by ship noise and sonar.[265] Noise pollution has also been identified as contributing the declines or lack of recovery for some cetacean species.[266]

Second, the DEIR illogically concludes that noise pollution impacts would be less than significant because special-status species are "typically found in low numbers and are only temporarily present in each study region." Contrary to this assertion, the project area supports the densest concentrations of blue whales along the west coast and globally, gray whales occur in significant numbers in the study region, and the DEIR itself acknowledges that species such as Pacific white-sided dolphins and common dolphins can be found in high numbers in nearshore areas.[267] In addition, there is no scientific basis for claiming that species that use the study region seasonally would somehow escape impacts from noise pollution.

In particular, the DEIR must consider the reasonably foreseeable indirect and direct impacts of seismic testing and mapping in California waters. A large seismic airgun array can produce effective peak pressures of sound higher than those of virtually any other man-made source save explosives;[268] and although airguns are vertically oriented within the water column, horizontal propagation is so significant

[262] DEIR at 7-44.
[263] DEIR at 7-44.
[264] André, M. et al. (2011). Low frequency sounds induce acoustic trauma in cephalopods. Frontiers in Ecology and the Environment 9:489-493 (Attachment 68); Slabbekoorn, H. et al. (2010). A noisy spring: the impact of globally rising underwater sound levels on fish. Trends in Ecology and Evolution 25: 419-427 (Attachment 69); Weilgart, L.S. (2007). The impacts of anthropogenic noise on cetaceans and implications for management. Canadian Journal of Zoology 85:1091-1116. (Attachment 70)
[265] Melcón M.L. et al. (2012). Blue whales respond to anthropogenic noise. PLoS ONE 7(2): e32681. (Attachment 71)
[266] Attachment 70.
[267] DEIR at 10.5-8.
[268] National Research Council, *Ocean Noise and Marine Mammals* (2003).

as to make them, even under present use, one of the leading contributors to low-frequency ambient noise thousands of miles from any given survey.[269]

It is well established that the high-intensity pulses produced by airguns can cause a range of impacts on marine mammals, fish, and other marine life, including broad habitat displacement, disruption of vital behaviors essential to foraging and breeding, loss of biological diversity, and, in some circumstances, injuries and mortalities.[270] Consistent with their acoustic footprint, most of these impacts are felt on an extraordinarily wide geographic scale – especially on endangered baleen whales, whose vocalizations and acoustic sensitivities overlap with the enormous low-frequency energy that airguns put in the water. For example, a single seismic survey has been shown to cause endangered fin and humpback whales to stop vocalizing – a behavior essential to breeding and foraging – over an area at least 100,000 square nautical miles in size, and can cause baleen whales to abandon habitat over the same scale.[271]

Similarly, airgun noise can also mask the calls of vocalizing baleen whales over vast distances, substantially compromising their ability to communicate, feed, find mates, and engage in other vital behavior.[272] Repeated insult from airgun surveys, over months and seasons, would come on top of already urbanized levels of background noise and, cumulatively and individually, would pose a significant threat to populations of marine mammals.

Airguns are known to affect a broad range of marine mammal species. For example, sperm whale foraging appears to decline significantly on exposure to even moderate levels of airgun noise, with potentially serious long-term consequences;[273] and harbor porpoises have been seen to engage in strong avoidance responses fifty miles from an array.[274] Seismic surveys have been implicated in the long-term loss of marine mammal biodiversity off the coast of Brazil.[275] Broader work on other sources

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[269] Nieukirk, S.L., Stafford, K.M., Mellinger, D.K., Dziak, R.P., and Fox, C.G., Low-frequency whale and seismic airgun sounds recorded in the mid-Atlantic Ocean, *Journal of the Acoustical Society of America* 115: 1832-1843 (2004).

[270] *See*, *e.g.*, Hildebrand, J.A., Impacts of anthropogenic sound, *in* Reynolds, J.E. III, Perrin, W.F., Reeves, R.R., Montgomery, S., and Ragen, T.J., eds., *Marine Mammal Research: Conservation beyond Crisis* (2006); Weilgart, L., The impacts of anthropogenic ocean noise on cetaceans and implications for management. *Canadian Journal of Zoology* 85: 1091-1116 (2007).

[271] Clark, C.W., and Gagnon, G.C., Considering the temporal and spatial scales of noise exposures from seismic surveys on baleen whales (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E9); Clark, C.W., pers. comm. with M. Jasny, NRDC (Apr. 2010); *see also* MacLeod, K., Simmonds, M.P., and Murray, E., Abundance of fin (*Balaenoptera physalus*) and sei whales (*B. Borealis*) amid oil exploration and development off northwest Scotland, *Journal of Cetacean Research and Management* 8: 247-254 (2006).

[272] Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources (2009) (IWC Sci. Comm. Doc. SC/61/E10).

[273] Miller, P.J.O., Johnson, M.P., Madsen, P.T., Biassoni, N., Quero, M., and Tyack, P.L., Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico, *Deep-Sea Research I* 56: 1168-1181 (2009).

[274] Bain, D.E., and Williams, R., Long-range effects of airgun noise on marine mammals: responses as a function of received sound level and distance (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E35).

[275] Parente, C.L., Pauline de Araújo, J., and Elisabeth de Araújo, M., Diversity of cetaceans as tool in monitoring environmental impacts of seismic surveys, *Biota Neotropica* 7(1) (2007).

of undersea noise, including noise with predominantly low-frequency components, indicates that beaked whale species would be highly sensitive to seismic noise as well.[276]

Airgun surveys also have important consequences for the health of fisheries. For example, airguns have been shown to dramatically depress catch rates of various commercial species (by 40-80%) over thousands of square kilometers around a single array,[277] leading fishermen in some parts of the world to seek industry compensation for their losses. Other impacts on commercially harvested fish include habitat abandonment – one hypothesized explanation for the fallen catch rates – reduced reproductive performance, and hearing loss.[278] Even brief playbacks of predominantly low-frequency noise from speedboats have been shown to significantly impair the ability of some fish species to forage.[279] Recent data suggest that loud, low-frequency sound also disrupts chorusing in black drum fish, a behavior essential to breeding in this commercial species.[280] Several studies indicate that airgun noise can kill or decrease the viability of fish eggs and larvae.[281]

The DEIR must analyze and mitigate the significant impacts from noise pollution in the study regions. Potential mitigation measures include (a) area and seasonal restrictions on well stimulation-related activities in ecologically important areas and seasons; (b) vessel speed restrictions; and (c) engineering

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[276] Tyack, P.L., Zimmer, W.M.X., Moretti, D., Southall, B.L., Claridge, D.E., Durban, J.W., Clark, C.W., D'Amico, A., DiMarzio, N., Jarvis, S., McCarthy, E., Morrissey, R., Ward, J., and Boyd, I.L. (2011), Beaked whales respond to simulated and actual Navy sonar, PLoS ONE 6(3): e17009. Doi:10.1371/journal.pone.0017009; Soto, N.A., Johnson, M., Madsen, P.T., Tyack, P.L., Bocconcelli, A., and Borsani, J.F. (2006), Does intense ship noise disrupt foraging in deep-diving Cuvier's beaked whales (Ziphius cavirostris)? Mar. Mamm. Sci. 22: 690-699.

[277] Engås, A., Løkkeborg, S., Ona, E., and Soldal, A.V., Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*), *Canadian Journal of Fisheries and Aquatic Sciences* 53: 2238-2249 (1996); *see also* Skalski, J.R., Pearson, W.H., and Malme, C.I., Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (*Sebastes ssp.*), *Canadian Journal of Fisheries and Aquatic Sciences* 49: 1357-1365 (1992).

[278] McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J. and McCabe, K., Marine seismic surveys: analysis and propagation of air-gun signals, and effects of air-gun exposure on humpback whales, sea turtles, fishes, and squid (2000) (report by Curtin U. of Technology); McCauley, R., Fewtrell, J., and Popper, A.N., High intensity anthropogenic sound damages fish ears, *Journal of the Acoustical Society of America* 113: 638-642 (2003); Scholik, A.R., and Yan, H.Y., Effects of boat engine noise on the auditory sensitivity of the fathead minnow, *Pimephales promelas*, *Environmental Biology of Fishes* 63: 203-209 (2002).

[279] Purser, J., and Radford, A.N., Acoustic noise induces attention shifts and reduces foraging performance in three-spined sticklebacks (Gasterosteus aculeatus), PLoS One, 28 Feb. 2011, DOI: 10.1371/journal.pone.0017478 (2011).

[280] Clark, C.W., pers. comm. with M. Jasny, NRDC (Apr. 2010).

[281] Booman, C., Dalen, J., Leivestad, H., Levsen, A., van der Meeren, T., and Toklum, K., Effecter av luftkanonskyting på egg, larver og yngel (Effects from airgun shooting on eggs, larvae, and fry), *Fisken og Havet* 3:1-83 (1996) (Norwegian with English summary); Dalen, J., and Knutsen, G.M., Scaring effects on fish and harmful effects on eggs, larvae and fry by offshore seismic explorations, *in* Merklinger, H.M., *Progress in Underwater Acoustics* 93-102 (1987); Banner, A., and Hyatt, M., Effects of noise on eggs and larvae of two estuarine fishes, *Transactions of the American Fisheries Society* 1:134-36 (1973); L.P. Kostyuchenko, Effect of elastic waves generated in marine seismic prospecting on fish eggs on the Black Sea, *Hydrobiology Journal* 9:45-48 (1973).

modifications to reduce sound levels.[282] The DEIR must recognize that the efficacy of many of these mitigation measures has not been established.[283]

(5) The impact analysis in BIOCM-1 entirely fails to disclose, evaluate, and mitigate the impacts of vessel strikes associated with well stimulation activities. Ship strikes can result in serious injury or fatality, and are a documented threat to endangered Pacific coast populations of fin, humpback, blue, sperm, and killer whales. Ship strikes are an increasing problem in California.[284] Between 2001 and 2010, nearly 50 large whales off the California coast were documented as having been struck by ships.[285] The EIR must evaluate the impacts of ship strikes to marine mammals in the study regions, and mitigate impacts. Mitigation measures include mandatory speed restrictions, restricting vessel activity to shipping lanes located outside of ecologically important areas, and using automatic identification systems for monitoring.[286]

(6) The impact analysis in BIOCM-1 entirely fails to disclose, evaluate, and mitigate the impacts of light pollution associated with well stimulation activities. Well stimulation-related infrastructure can lead to significant amounts of light pollution. For example, the Project Description states that drilling sites are lighted at night to allow for 24-hour operation of the drill rig and the drill mast is lighted for aircraft safety.[287] Seabirds are particularly vulnerable to disorientation, injury, and mortality from light pollution resulting from oil and gas activities. Artificial light attracts seabirds at night, especially nocturnally active species such as alcids, shearwaters, and storm-petrels, and disrupts their normal foraging and breeding activities in several ways.[288] In a phenomenon called light entrapment, seabirds circle lights and flares on vessels and energy platforms instead of foraging or visiting their nests.[289] Seabirds have been documented to collide with lights or structures around lights, causing injury or mortality, or strand on lighted platforms where they are vulnerable to injury, oiling or other feather contamination, and exhaustion.[290] Seabirds in the marine study regions that are particularly vulnerable to light pollution include the state-threatened Scripps's and Guadalupe murrelets, ashy storm-petrel, and black storm-

[282] Huntington, H.P. et al. (2015). Vessels, risks, and rules: planning for safe shipping in the Bering Strait. Marine Policy 51: 119-127; Weilgart, L.S. (2007). (Attachment 72)
[283] Attachment 70.
[284] Zito, Kelly (2010) Whale deaths blamed on busy ship traffic, krill. *San Francisco Chronicle,* Oct. 10. (Attachment 73)
[285] National Marine Fisheries Service (2010c.) Southwest Regional Office, California Marine Mammal Stranding Network Database. (Attachment 74)
[286] Attachment 72; McKenna, M.F. et al. (2012). Response of commercial ships to voluntary speed reduction measure: are voluntary strategies adequate for mitigating ship-strike risk? Coastal management 40:634-650.
[287] DEIR at 7-13.
[288] Montevecchi, W. (2005) Influences of artificial light on marine birds. In C. Rich and T. Longcore, editors. Ecological Consequences of Artificial Night Lighting. Washington, D.C: Island Press, 94-113. (Attachment 75)
[289] Wiese, F.K., et al. (2001) Seabirds at risk around offshore oil platforms in the North-west Atlantic. Marine Pollution Bulletin 42:1285-1290.
[290] Wiese, F.K., et al. (2001) Seabirds at risk around offshore oil platforms in the North-west Atlantic. Marine Pollution Bulletin 42:1285-1290 (Attachment 76); Black, A. (2005) Light induced seabird mortality on vessels operating in the Southern Ocean: incidents and mitigation measures. Antarctic Science 17:67-68 (Attachment 77); Le Corre, M. et al. (2002). Light-induced mortality of petrels: a 4-year study from Réunion Island (Indian Ocean). Biological Conservation 105:93-102. (Attachment 78)

petrel. The EIR must evaluate the impacts of light pollution in the study regions, and mitigate impacts. Potential mitigation measures include (a) directing site lighting downward and internally to avoid side-casting, up-lighting, wall washes, and lighting where the bulb protrudes from the fixture, (b) limits on wattages, and (c) scheduling activities that require night lighting outside of ecologically important periods for affected species.

(7) The impact analysis in BIOCM-1 fails to disclose, evaluate, and mitigate the impacts of increased predation associated with well stimulation activities. Offshore oil and gas platforms in the study regions off California provide perches for peregrine falcons. Peregrines use the oil platforms to hunt from and have been documented killing significant numbers of state-threatened Scripps's murrelets.[291]

(8) The DEIR fails to adequately disclose, evaluate, and mitigate the direct and indirect impacts of well stimulation that lead to habitat reduction, such as noise pollution and water pollution. For example, well stimulation-related activities cause significant intermittent and chronic noise pollution in the marine environment during the lifetime of the well, and numerous studies document that marine noise pollution can cause displacement and abandonment of important habitat areas for marine species.[292] Spills of oil, fracking chemicals, produced water, and other toxins associated with well stimulation can lead to temporary or permanent reduction of habitat areas, including important habitats for threatened and endangered species.[293]

To mitigate impacts from habitat loss, the EIR should require a feasible mitigation measure requiring applicants to site well stimulation activities outside of sensitive habitat areas. Many significant impacts to habitats could be avoided altogether or substantially lessened by prohibiting well stimulation activities within sensitive habitat areas as well as an appropriate buffer zone surrounding these areas. To support this mitigation measure, the EIR should require a comprehensive identification and mapping of sensitive coastal and marine habitat areas, where sensitive habitats include categories proposed to be included in the Vegetation and Habitat Map[294] and Habitat Protection Standard.[295]

12.6 The DEIR Fails to Adequately Disclose, Evaluate, and Mitigate Significant Impacts on Special-Status Species and Habitats under BIOCM-2 (Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites)

The DEIR fails to adequately disclose and evaluate the impacts of well stimulation on wildlife movements and migration, and concludes without basis that impacts are less than significant. The DEIR fails to acknowledge the numerous studies demonstrate that noise pollution, light pollution, and oil and

[291] Bureau of Ocean Energy Management [BOEM]. 2014. BOEM 2014-013 Technical Summary. Using nocturnal surveys to monitor the presence of Ashy Storm-Petrels & Xantus's Murrelets at offshore platforms, Southern California. http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5408.pdf (Attachment 79)
[292] Attachment 70.
[293] Attachment 9.
[294] DEIR at 10.4-47.
[295] DEIR at 7-50-51.

chemical spills associated with oil and gas activities can interfere with the movement and migration of marine species. For example, noise pollution can alter species' movements and causes avoidance and of important habitat areas.[296] Light pollution can cause attraction, particularly for nocturnally active marine bird species.[297] The DEIR briefly acknowledges that marine mammals could be displaced from a migration corridor by a spill.[298]
The DEIR must require specific and enforceable mitigation measures to reduce these impacts.

12.7 The DEIR Fails to Adequately Disclose, Evaluate, and Mitigate Significant Impacts on Special-Status Species and Habitats under BIOCM--3 (Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means)

The DEIR fails to provide substantial evidence to support the claim that the project will have less than significant impacts on federally protected coastal wetlands. Following the analysis under this significance criterion in Section 10.4,[299] the EIR should conclude that there may be Class I impacts and must require specific, enforceable mitigation measures to address these impacts.

12.8 Section 11.5 of the DEIR (Programmatic Analysis for Specific Oil Fields) Suffers from the Same Deficiencies as Section 11.4 of the DEIR.
The programmatic analysis for coastal and marine biological resources in the Wilmington Oil and Gas Field in Section 11.5 of the DEIR suffers from the same deficiencies identified above for Section 11.4 of the DEIR.

13 HAZARDS AND HAZARDOUS MATERIALS: The DEIR fails to properly disclose, analyze, and mitigate the Project's significant hazards and hazardous materials impacts.

Hydraulic fracturing and acid stimulation can expose people, crops, and wildlife to harm from the chemicals involved, as well as naturally occurring heavy metals, such as arsenic, boron, and radioactivity that are brought back to the surface in produced water. The DEIR does not present sufficient information to analyze the toxicology risks posed by hydraulic fracturing additives. It does not address the toxicology risks generically or at the site level. The proposed regulations do not require permit applicants to provide sufficient information for the risks of these additives to be considered at the site level. The DEIR provides a long list of potential additives, but does not analyze their potential environmental impacts. The list of additives is almost certainly incomplete and specific information on the chemicals is lacking. Thus, not knowing the composition of the specific additives nor the amounts in which they would be used during the well stimulation process, there is no basis for estimating the risk of these components with regard to their presence in the produced flowback or produced water.

[296] Attachment 70.
[297] Attachment 75.
[298] DEIR at 10.5-14.
[299] DEIR at 10.4-77.

More specifically, well stimulation operations employ a range of chemicals, many of which are known carcinogens, toxins, or are otherwise hazardous, including toluene, ethylbenzene, xylene, formaldehyde, and hydrofluoric acid. A study of 353 fracturing fluid constituents found that more than 75 percent of them have been shown to affect the skin, eyes, other sensory organs, and the respiratory and gastrointestinal systems; approximately 40–50 percent can affect the central nervous system and the brain, the immune and cardiovascular systems, and the kidneys; 37 percent are known endocrine disruptors; and 25 percent are linked to cancer and mutations.[300] Despite the serious risks to the environment and human health and safety, and the availability of better options, in the DEIR and its mitigation, DOGGR does not place any restrictions on the chemicals that can be used in stimulation fluids. DOGGR must conduct a health risk assessment of the impacts on people and the environment of the use of the specific chemicals used in well stimulation.

Given what is known about the hazardous chemicals found in fracking fluid, and the lack of useful analysis of the health risks from well stimulation, DOGGR must implement an immediate moratorium on the practice at least until an adequate environmental impact report is complete, including an analysis of hazardous materials and the health risks from those chemicals.

If well stimulation does continue, to reduce the impact of harmful chemicals, DOGGR should include a mitigation measure and alternative that mandates the use of less toxic fracking fluid alternatives. Drilling operators should be required to select the lowest toxicity chemicals for use in fracture treatment additives. To address this problem, DOGGR needs to first fully address the risks and harms by the type, volume and concentrations of fracture treatment additives; include a list of prohibited additives; and require the use of non-toxic or less toxic materials to the greatest extent possible. DOGGR with the California Department of Public Health should develop the list of prohibited fracture treatment additives based on the known list of chemicals currently used in hydraulic fracturing and other well stimulation. DOGGR should also develop a process to evaluate newly proposed well stimulation chemical additives to determine whether they should be added to the prohibited list. No chemical should be used until the California Department of Public Health has assessed whether it is protective of human health and the environment, and has determined whether or not it warrants inclusion on the list of prohibited hydraulic fracturing chemical additives. Chemicals that pose a threat to human health should not used in fracking fluid. The burden of proof should be on DOGGR and industry to demonstrate, via scientific and technical data and analysis, and risk assessment work, that any chemical used in fracking fluid does not pose a risk to human health. Fracture treatment additive prohibitions should be included in the EIR as a mitigation measure and codified in the proposed regulations.

Some companies have begun to voluntarily eliminate the use of dangerous chemicals such as diesel, BTEX compounds, and 2-butoxyethanol (2-BE). Halliburton claimed in 2010 to have created a new fracturing fluid that uses chemicals "sourced entirely from the food industry."[301] The US EPA maintains

[300] Attachment 29.

[301] See New York Times article, Halliburton Announces Ecofriendly Fracking Fluid (Nov. 15, 2010) available at: http://www.nytimes.com/gwire/2010/11/15/15greenwire-halliburton-announces-ecofriendly-fracking-flu-80875.html?pagewanted=all (Attachment 80)

its own public registry of "preferred" chemicals for various industrial processes, though it should be noted that in this industry, being "preferred" is not the same as being "safe."[302]

In addition, the fluids and other substances used in well stimulation need to be disposed of carefully. The DEIR fails to establish clear cradle-to-grave collection, testing, transportation, treatment, and disposal requirements for all waste containing toxins or Naturally Occurring Radioactive Material (NORM). Detailed collection, testing, transportation, treatment, and disposal methods for each type of drilling and production waste and equipment containing hazardous materials should be included as a mitigation measure and codified in the proposed regulations. Where data uncertainty exists, additional testing should be required. The hazardous and radioactive content of waste should be verified to ensure appropriate transportation, treatment, and disposal methods are selected, and the testing results should be disclosed to the public.

In the DEIR, DOGGR should consider reclassifying oil and gas wastewater as hazardous waste and evaluating the impacts of requiring disposal in Class I underground injection wells or treatment at hazardous waste facilities when produced water and flowback exhibit hazardous properties. DOGGR should consider requiring waste collection standards for particular, high-risk hazardous materials. At a minimum, DOGGR must propose mitigation that would ensure proper oversight of the disposal of potentially toxic well stimulation wastewater.

Furthermore, in the DEIR, DOGGR does not specifically address secondary containment for chemical and waste transport, mixing, and pumping equipment. The DEIR should be revised to address secondary containment for transport, mixing, and pumping equipment in order to minimize potential soil and water resource impacts from chemical spills.

In order to prevent individual risks from accumulating into a greater issue, DOGGR should create limits as to how much of a given hazardous material may be stored or present at a given site, as well as potential aggregate or temporal limits for storage. DOGGR should consider whether a (perhaps lower) threshold should trigger a public reporting requirement, require a permit, or require the presence of enhanced onsite spill recovery equipment, training, or planning as well.

Time limits for waste removal would seem especially appropriate for use when a well is being decommissioned or has been dormant for a given period of time. DOGGR could also require emergency response drills, either generally or when triggered by a threshold of hazardous material storage or use at a given site.

The lone mitigation measure offered by DOGGR to mitigate the impact of hazards and hazardous materials related to well stimulation includes the requirement for physical barriers between the soil and potential hazardous materials, such as paving or impermeable barriers. MM HAZ-1a provides that these barriers would be required "for all production facilities, regardless of the amount of time they are in

[302] Tollefson, Jeff. Secret of Fracking Fluids Pave Way for Cleaner Recipe: Nature 501,146–147(12 September 2013)doi:10.1038/501146a, available at: http://www.nature.com/news/secrets-of-fracking-fluids-pave-way-for-cleaner-recipe-1.13719 (Attachment 81)

place" not only prior to moving hazardous materials but also to manage surface water runoff and drainage.[303] An individual well can remain in service for decades, and without limits on how long hazardous materials may be stored onsite, hazardous materials may persist on a given site even longer once a well ceases production. DOGGR should include measures to ensure the integrity of these barriers over time. For any kind of barrier, testing must be required to make sure the barrier has been correctly installed, as well as inspections at given intervals to ensure that impermeability has been maintained. For pavement especially, additional inspections should be required after seismic activity past a given threshold in the area. For other barriers, there may be other events that should trigger inspection requirements, e.g. wildfires. A reporting mechanism for inspection reports would ensure accountability and reliability.

The proposed mitigation measure also does nothing to prevent hazardous materials from escaping through the air. Many of the chemicals used in well stimulation are considered air toxics, which can cause adverse health impacts through contact in the air or through inhalation. The South Coast Air Quality Management District, for example, shows dozens of air toxics were used in large quantities in well stimulation activities in the Los Angeles air basin.[304] The DEIR provides no indication that such risks would be lessened by its mitigation measure.

Additionally, DOGGR fails in the DEIR to adequately address the issue of Naturally Occurring Radioactive Materials (NORM). Various geologic formations and locations are known to contain higher NORM concentrations, and when drilling and stimulation is conducted in these zones, those materials can be mobilized and concentrated in wastewater. Before completing the EIR process, DOGGR should determine where these zones are in California's oil- and gas-bearing geologic formations and, identify appropriate mitigations that address the issues presented by concentrated NORM. DOGGR admits that NORM is a potential risk in hydraulic fracturing flowback and produced water and that there are ways to monitor for NORM. However, DOGGR does not mandate such monitoring *or any* related mitigation measures. DOGGR should require monitoring and detection for NORM in addition to identifying mitigation measures to ensure safe disposal of NORM. DOGGR currently lists potential disposal methods, which include "land spreading with dilution" and "land disposal by burial."[305] DOGGR should analyze the safety of these questionable disposal methods and require safe disposal. DOGGR should also make mandatory the mitigation it mentions in the DEIR but currently does not require, including employing best management practices for handling NORM if detected, proper worker health and safety protection with respect to NORM, and proper disposal of NORM.[306]

In addition, NORM levels can potentially present a health risk to workers, particularly when NORM builds up in associated infrastructure. Therefore, DOGGR should address the potential for NORM buildup in contaminated wastewater, as well as wastewater transportation, storage, and disposal. For pipes, commonly used survey instruments should be used to conduct external radiation surveys to check

[303] DEIR at 11.13-20
[304] See Center for Biological Diversity et al., "Air Toxics One-Year Report: Oil Companies Used Millions of Pounds of Air-Polluting Chemicals in Los Angeles Basin Neighborhoods." (June 2014). (Attachment 82)
[305] DEIR 10.13-21
[306] DEIR 10.13-21

for and detect increased levels of NORM building up within pipes. Where radioactivity levels exceed a threshold of 50 microR/hr, a radioactive materials license should be required.

Because the significance of an accident depends both on its probability of occurring and its magnitude, high magnitude-low probability risks are significant impacts under CEQA.[307] The DEIR classifies the risk from hazards and hazardous materials as a class II risk (less than significant) based on a lone mitigation measure. The sole proposed mitigation measure is to "Provide a Physical Barrier on the Ground Surface at the Site Pad . . . and Manage Surface Water Runoff and Drainage." This mitigation measure would not address any of the risks related to physically hazardous situations, worker safety, NORMs, NOAMs, venting into the air, transportation, pipes, supply lines, other conveyance components, human error, natural disasters, or disposal of the well stimulation system or production facilities. Furthermore, the proposed Project would (1) create a significant hazard to the public and environment through the routine transport, use, and disposal of hazardous materials, (2) would create a significant hazard to the public and environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment, (3) are in no way limited by set-backs and so could potentially emit hazardous emissions within one-quarter mile of an existing or proposed school, (4) could be near an airport or private airstrip, (5) impair an emergency evacuation plan or response plan due to large truck traffic and site congestion, particularly in urban oil fields, and (6) could expose people or structures to an increased risk of wildfires due to the use of heavy equipment and combustion engines in remote areas. For all these reasons, without dramatically increased mitigation, the risk from hazards and hazardous materials cannot be less than a class 1 significant and unavoidable impact.

14 GROUNDWATER RESOURCES: The DEIR fails to properly disclose, analyze, and mitigate the project's significant groundwater resources impacts.

14.1 The definition of "protected water" is inadequate.

The definition of "protected water" as used in this EIR is not sufficiently protective of groundwater.

Exclusion of water in hydrocarbon zones is not sufficiently protective. As detailed in the descriptions of groundwater basins included in the EIR, much of California's oil production occurs in relatively shallow formations that often also contain high quality water that may have beneficial uses. In fact, water in these zones often meets the U.S. Environmental Protection Agency's ("EPA") definition of an Underground Source of Drinking Water ("USDW"), which – unlike the EIR's definition – does not categorically exclude water co-located with hydrocarbons.[308] The DEIR fails to explain why it has chosen a definition of protected water that excludes certain groundwater required by state and federal law to be protected.

[307] Guidelines § 15143 ("The significant effects should be discussed with emphasis in proportion to their severity and probability of occurrence.")
[308] 40 CFR § 144.3

Moreover, the formations and water most likely to be impacted by stimulation activities are those co-located with hydrocarbons due to the fact that stimulation fluids are injected directly into these waters.

Exclusion of greater than 10,000 mg/L TDS water is not sufficiently protective. As groundwater resources have become increasingly scarce and treatment technologies have improved, California has turned to lower quality water sources to meet demand. Research performed by the U.S. Geological Survey (USGS) shows that water with up to at least 18,000 mg/L TDS is being considered for use in California.[309] The exclusion of waters with greater than 10,000 mg/L TDS from the definition of "protected water" fails to take into account current and potential future usage of lower quality groundwater.

Exclusion of exempt aquifers is not sufficiently protective. The criteria for granting aquifer exemptions[310] were created three decades ago and have not been updated in that time, despite the fact that, as described above, treatment technology has improved and scarcity is leading to the use of lower quality water sources. These criteria need to be reviewed to see if they are still valid and more broadly, whether the entire aquifer exemption program is still appropriate in an increasingly water constrained world. As such, it is not appropriate to exclude existing exempt aquifers from this analysis, as these could now or in the future serve as sources of usable water.

The exclusion of these waters from the definition of "protected water" means that the analysis of potential impacts and mitigation measures is incomplete.

Recommendation: The definition of protected water should be revised to not categorically exclude water inside hydrocarbon bearing zones, to take into account current and potential future usage of lower quality waters, and to not categorically exclude currently exempt aquifers.

DEIR Must Consider Historic and Continuing Noncompliance with Regulatory Schemes

10.14-3 states "The exempt status of about 11 of the 85 aquifers is currently under review by DOC and EPA." While this was the case when the DEIR was drafted, EPA has since requested that DOGGR commence the exemption process for these aquifers, if DOGGR wishes them to be exempted.[311] Accordingly, it is now clear that these aquifers are not exempt. Further, it has come to light that DOGGR has historically permitted wastewater disposal into protected aquifers.[312] DOGGR proposes to allow

[309] Taylor, K. A., Fram, M. S., Landon, M. K., Kulongoski, J. T., & Faunt, C. C. (2014). *Oil, Gas, and Groundwater Quality in California - a discussion of issues relevant to monitoring the effects of well stimulation at regional scales.* Sacramento: U.S. Geological Survey California Water Science Center.

[310] 40 CFR § 144.7

[311] Letter from Jane Diamond, Director, Water, EPA Region IX to Steven Bohlen, State Oil and Gas Supervisor, DOGGR and Jonathan Bishop, Chief Deputy Director, State Water Resources Control Board (Mar. 9, 2015): "With respect to the 11 aquifers that have historically been treated as exempt, we look forward to working with your agencies to evaluate whether those aquifers meet State and EPA criteria for Class II injection."

[312] Transcript of Hearing, Joint Hearing Senate Natural Resources and Water Committee and Senate Environmental Quality Committee (Mar. 10, 2015).

injections into aquifers protected by law.[313] As a result, the aquifers into which well stimulation waste water was injected are now contaminated.[314]

Recommendation: The DEIR must consider the impact of groundwater in light of this history of noncompliance and the agency's failure to enforce existing legislation.

14.2 Water quantity

14.2.1 The EIR fails to consider water use for stimulation other than hydraulic fracturing.

Currently, stimulation practices fall into two main categories: matrix stimulation and fracture stimulation. For matrix stimulation treatments, fluids are injected below the fracture pressure of the target formation; for fracture stimulation treatments, fluids are injected above the fracture pressure of the target formation. Acid matrix stimulation or "acidizing" is the most common form of matrix stimulation; hydraulic fracturing is the most common form of fracture stimulation. However, operators and researchers are also experimenting with novel forms of stimulation, including plasma pulse stimulation[315], cryogenic fracturing[316], and controlled underground explosions[317].

The EIR only estimates water use for hydraulic fracturing, despite the fact that SB4 specifically covers all forms of well stimulation. In particular, the EIR fails to estimate water use for matrix stimulation operations, in particular matrix acidizing.

Although the SB4 implementing regulations incorporate an arbitrary threshold for distinguishing acid stimulation jobs that are covered by the rules from those that are not, no such threshold applies to the EIR analysis. Therefore, the EIR must consider water quantity impacts from all acid matrix stimulation operations.

The DEIR also fails to account for the water that may be permanently lost due to contamination. Where usable aquifers are contaminated with chemicals in the fluids involved in well stimulation operations (including the produced water from stimulated wells), and cleanup is economically infeasible, which is almost always the case, the water cannot be used and therefore must be included in the amount of water that becomes unavailable due to well stimulation.

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[313] Letter from Steve Bohlen, State Oil and Gas Supervisor, DOGGR, to Jane Diamond, Director, Water Division, EPA Region IX (Feb. 6, 2015), *available at http://sntr.senate.ca.gov/sites/sntr.senate.ca.gov/files/3_10_15_doggr_letter_to_us_epa_and_work_plan_for_coming_into_compliance.pdf*

[314] Transcript of Hearing at 74, Joint Hearing Senate Natural Resources and Water Committee and Senate Environmental Quality Committee (Mar. 10, 2015).

[315] Propell Technologies Group Inc. (2014, October). *Unlocking America's Petroleum.* Retrieved March 8, 2015, from http://content.stockpr.com/propell/media/2142ba931c5ed3e9831c469b6fa33fee.pdf

[316] Wu, Y., Yin, X., Kneafsey, T., Miskimins, J., Cha, M., Patterson, T., et al. (2013). *Development of Non-Contaminating Cryogenic Fracturing Technology for Shale and Tight Gas Reservoirs, Project Number: 10122-30*

[317] Friedmann, S. J. (2011, September 26). Transforming shale gas development and recovery through advanced technology. University of Wyoming WyoCast On-Demand. Retrieved January 9, 2014, from http://wyocast.uwyo.edu/WyoCast/Play/86e345e0abc74d8da3ec3e6a3f9017ff1d

In addition, well stimulation often facilitates subsequent steam injection or other forms of water-intensive enhanced oil recovery. These techniques must be included in any analysis of water use.

Analysis Needed: The EIR must incorporate an analysis of potential water quantity impacts from matrix stimulation operations, including but not limited to matrix acidizing, and all impacts to water quantity.

14.2.2 Proposed Mitigation Measures

The No Well Stimulation Alternative is the only way to protect the public and the environment from the dangers of well stimulation today. We need an immediate moratorium on this risky process. If well stimulation is to proceed, the following mitigation measures would lessen the harm from these dangerous activities.

MM GW-1a. This mitigation measure is feasible and will reduce the potential for harm.

MM GW-1b. This mitigation measure is feasible and will reduce the potential for harm.

MM GW-2a. This mitigation measure is feasible and will reduce the potential for harm.

14.3 Water quality

14.3.1 The EIR fails to consider important conceptual contamination pathways.

The EIR fails to consider three conceptual pathways through which groundwater could be contaminated by well stimulation activities: 1) direct injection of fluids into or above an underground source of drinking water 2) movement of fluids from an injection zone through the confining strata; and 3) lateral movement of fluids from within an injection zone into a protected portion of that stratum[318].

Direct injection of contaminants into usable water

As discussed above, hydrocarbon-bearing zones in California often contain water that meets the federal definition of a USDW and that may have beneficial uses. Stimulation fluids are injected directly into these waters, potentially resulting in contamination.

Additionally, it has recently been exposed that California's wastewater pit permitting process is inadequate. There are hundreds of unpermitted, unlined open pits. Accordingly, the DEIR cannot assume compliance with relevant laws and regulations when considering the impacts of well stimulation on underground water quality.

Mitigation Measures Needed: The direct injection of contaminants into protected or usable water should be prohibited unless operators can demonstrate that the water does not now and will not in the future serve as a source of usable water.

[318] U.S. Environmental Protection Agency, Office of Drinking Water. (1980, May). *Statement of Basis and Purpose, Underground Injection Control Regulations.* Retrieved from http://www.epa.gov/ogwdw/uic/pdfs/rept_uic_statemt_basis_purpose_uic_1980.pdf

Migration of contaminants vertically into protected water due to a lack of confining zone

A geologic confining zone can be generally defined as a geologic formation with sufficient areal extent, impermeability, and absence of transmissive faults and fractures such that it can prevent the vertical migration of injected stimulation fluids or displaced formation fluids into protected water. If an appropriate confining zone is not present, injected or displaced fluids may migrate into groundwater, resulting in contamination. As documented in the EIR, there is frequently little or no vertical separation between hydrocarbon-bearing zones and zones containing protected water in California.

Mitigation Measures Needed: Wells that will be stimulated must be sited such that a suitable confining zone is present. The owner or operator must demonstrate to the satisfaction of the regulator that the confining zone:

Is of sufficient areal extent, based on the unique geographic features of the area, to prevent the movement of injected or displaced fluids into protected water;
Is sufficiently impermeable to prevent the vertical migration of injected or displaced fluids;
Is free of transmissive faults or fractures that could allow the movement of injected or displaced fluids above the stimulated zone; and Contains at least one formation of sufficient thickness and with geomechanical characteristics capable of preventing or arresting vertical propagation of fractures.
The Division may require the operator to identify and characterize additional zones that will impede or contain vertical fluid movement.

Migration of contaminants laterally from non-protected water into protected water

The quality of water contained in a groundwater aquifer may vary laterally, such that protected or usable water may be present in some portions of the aquifer but not others. It is possible that stimulation fluids injected into a portion of an aquifer that does not contain protected or usable water may migrate into a portion an aquifer that does contain protected or usable water.

Mitigation Measures Needed: Operators of stimulated wells must predict, using site characterization, monitoring and operational data, and computational modeling, the projected lateral and vertical migration of stimulation fluids and formation fluids in the subsurface and demonstrate that injected or displaced fluids will not migrate laterally into protected or usable water. This includes but is not limited to:

Maps, cross-sections, and models delineating aquifer extents, volume, and chemistry.
Maps, cross-sections, and models delineating the physical and chemical extent of stimulation operations including hydraulically induced fractures, injected fluids, and displaced formation fluids, based on site-specific data. The physical extent would be defined by the modeled length and height of fractures (if any), horizontal and vertical penetration of stimulation fluids and proppant, and horizontal and vertical extent of the displaced formation fluids. The chemical extent would be defined by that volume of rock in which chemical reactions between the formation, hydrocarbons, formation fluids, or injected fluids may occur, and must take into account potential migration of fluids over time.

14.3.2 The EIR fails to fully consider the potential impacts to groundwater quality from surface spills or leaks during well stimulation.

The EIR focuses only on spills and leaks of "hazardous material." However, spills and leaks of material that may not meet the definition of hazardous (which in fact is not defined in this section of the EIR) can also cause significant impacts to groundwater. Among the most commonly cited environmental impacts of oil and gas production are degradation of soils and water caused by releases of hydrocarbons and co-produced brine, known as "produced water."[319] The critical importance of properly mitigating the risk of spills and leaks is demonstrated by the many tens of studies describing the environmental impacts of hydrocarbon and produced water releases.[320] A multi-year, interdisciplinary study of hydrocarbon and produced water releases at an oil production site in Oklahoma undertaken by the United States Geological Survey ("USGS") found that soil and groundwater at the site were still polluted after more than 60 years of natural attenuation.[321] Contamination caused by releases of hydrocarbons and produced water can be extremely technologically and financially difficult to remediate, if not impossible.

Mitigation Needed: The requirement to provide a physical barrier on the ground surface at the site pad for all production facilities, regardless of the amount of time they are in place, should be required for all stimulation operations, regardless of whether hazardous materials will be used. The proposed mitigation measure also lacks specificity, including but not limited to requirements for the dimensions of physical barriers and acceptable materials. Secondary containment must be required for all well stimulation equipment and material including flowback fluid tanks; waste handling tanks; additive containers; and chemical and waste transport, mixing, and pumping equipment. Such secondary containment must:

Be designed and constructed in accordance with good engineering practices;
Be constructed, coated or lined with materials that are chemically compatible with the environment and the substances to be contained;
Provide adequate freeboard;
Be protected from heavy vehicle or equipment traffic; and
Have a volume of at least 110 percent of the largest storage tank within the containment area.

14.3.3 The EIR fails to fully consider the risks from improperly constructed, maintained, and/or abandoned wells.

The EIR focuses only on spills and leaks of "hazardous material." However, spills and leaks of material that may not meet the definition of hazardous (which in fact is not defined in this section of the EIR) can

[319] Kharaka, Y. K., & Dorsey, N. S. (2005, June). Environmental issues of petroleum exploration and production: Introduction. *Environmental Geosciences, 12*(2), 61-63.
[320] Otton, J. K. (2006). *Environmental aspects of produced-water salt releases in onshore and estuarine petroleum-producing areas of the United States - a bibliography.* Retrieved from U.S. Geological Survey Open-file report 2006-1154: http://pubs.usgs.gov/of/2006/1154/pdf/of06-1154_508.pdf
[321] Kharaka, Y. K., Otton, J. K., & eds. (2003). *Environmental impacts of petroleum production - Initial results from the Osage-Skiatook Petroleum Environmental Research Sites, Osage County, Oklahoma.* U.S. Geological Survey Water-Resources Investigations Report 03-4260.

also cause significant impacts to groundwater. Among the most commonly cited environmental impacts of oil and gas production are degradation of soils and water caused by releases of hydrocarbons and co-produced brine, known as "produced water."[322] The critical importance of properly mitigating the risk of spills and leaks is demonstrated by the many tens of studies describing the environmental impacts of hydrocarbon and produced water releases.[323] A multi-year, interdisciplinary study of hydrocarbon and produced water releases at an oil production site in Oklahoma undertaken by the United States Geological Survey ("USGS") found that soil and groundwater at the site were still polluted after more than 60 years of natural attenuation.[324] Contamination caused by releases of hydrocarbons and produced water can be extremely technologically and financially difficult to remediate, if not impossible.

Mitigation Needed: The requirement to provide a physical barrier on the ground surface at the site pad for all production facilities, regardless of the amount of time they are in place, should be required for all stimulation operations, regardless of whether hazardous materials will be used. The proposed mitigation measure also lacks specificity, including but not limited to requirements for the dimensions of physical barriers and acceptable materials. Secondary containment must be required for all well stimulation equipment and material including flowback fluid tanks; waste handling tanks; additive containers; and chemical and waste transport, mixing, and pumping equipment. Such secondary containment must:

Be designed and constructed in accordance with good engineering practices;
Be constructed, coated or lined with materials that are chemically compatible with the environment and the substances to be contained;
Provide adequate freeboard;
Be protected from heavy vehicle or equipment traffic; and
Have a volume of at least 110 percent of the largest storage tank within the containment area.

14.3.4 The EIR fails to fully consider the risks from improperly constructed, maintained, and/or abandoned wells.

The EIR states that, "…wells represent the most probable potential subsurface pathway for well stimulation liquids and gases to reach protected groundwater." While we concur with this finding, the EIR does not fully characterize the circumstances under which wells may act as contaminant pathways, and therefore the recommended mitigation measures are not sufficient. The final SB4 regulations and DOGGR's existing regulations for well construction, maintenance, and abandonment are also not sufficient to address these risks.

The EIR primarily focuses on the risk to groundwater from the unsealed portion of the annular space between the outer casing and the borehole. The EIR also acknowledges there are additional risks to groundwater from wells, including:

[322] Kharaka & Dorsey, 2005
[323] Otton, 2006
[324] Kharaka & Otton, 2003

- Corroded or damaged casing
- Well stimulation-induced fractures that bypass well seals
- Existing wells within the well stimulation treatment's area of influence
- Deterioration of cement over time
- Inadequate primary cementing due to gas invasion
- Well damage and/or loss of mechanical integrity due to seismic activity

Yet the mitigation measures that are proposed only partially address some of these risks, or in some cases don't address them at all.

Improvements Needed to Proposed Mitigation Measures

Groundwater Protection Standard. This mitigation measure would require that, for wells that will be stimulated and are not within a DWR groundwater basin that "the annular space between the well casing and the subsurface be sealed with cement to fill the annular space to a confining unit below groundwater with 10,000 mg/L TDS water." First, it is unclear to which annular space and well casing this standard would apply. The standard could be interpreted to mean that either:

- Water-protective casing (e.g. surface or intermediate casing) must be set into a confining unit below groundwater with 10,000 mg/L TDS water, and the annular space must be sealed with cement; or
- Intermediate and/or production casing must be cemented with sufficient cement to fill the annular space from the casing shoe to a confining unit below groundwater with 10,000 mg/L TDS water.

Regardless, it seems that the goal of this provision is to ensure that protected water is properly isolated, which is paramount to preventing contamination.

Mitigation Needed: In order to achieve that goal, we recommend that the currently proposed groundwater protection standard be replaced with the following:

- Surface casing setting depth must be shallower than any hydrocarbon-bearing zones and must be set at least 100' but not more than 200' into a competent confining zone below the base of the deepest protected groundwater and be fully cemented to surface by the pump and plug method.
- In areas where the depth to the deepest protected groundwater is not known, operators must estimate this depth. This depth should then be verified by running petrophysical logs, such as resistivity logs, after drilling to the estimated depth. If the depth to the deepest protected water is deeper than estimated, an additional string of casing is required. Surface casing must be of sufficient diameter to allow the use of one or more strings of intermediate casing. All instances of protected water not anticipated on the permit application must be reported including the formation depth and thickness and water flow rate, if known or estimated.
- Intermediate casing must be installed when necessary to isolate protected water not isolated by surface casing. When intermediate casing is installed to protect groundwater, the operator shall

set a full string of new intermediate casing to at least 100' but not more than 200' into a competent confining zone below the base of the deepest protected groundwater and be fully cemented to surface by the pump and plug method.

MM GW-4a. This mitigation measure is intended to address the risk that existing wells adjacent to a well undergoing stimulation may serve as a conduit for contaminants to migrate into protected water. We agree that communication between offset wells during stimulation is a serious problem, risking blow outs in adjacent wells and/or aquifer contamination during well stimulation. A New Mexico oil well recently experienced a blowout, resulting in a spill of more than 8,400 gallons of fracturing fluid, oil, and water. The blowout occurred when a nearby well was being hydraulically fractured and the fracturing fluids intersected this offset well.[325] The incident led the New Mexico Oil Conservation Division to request information about other instances of communication between wells during drilling, completion, stimulation or production operations.[326] Incidents of communication between wells during stimulation have been documented in British Columbia,[327] Pennsylvania,[328,329] Texas, and other states across the country.[330]

The Alberta Energy Regulator (AER), the oil and gas regulator in Alberta, Canada, recognized that communication between wells during fracturing is a serious risk to well integrity and groundwater after a number of spills and blowouts resulted from communication between wells during fracturing. As a result, AER created requirements to address the risk of communication and reduce the likelihood of occurrence.[331] Similarly, Enform, a Canadian oil and gas industry safety association, published recommended practices to manage the risk of communication.[332] We recommend that the Division review these rules and incorporate similar requirements.

The proposed mitigation measure requires that "all wells within the ADSA have effective cement seals, including a minimum 500-foot seal, which covers the base of the protected groundwater. It is not clear what is meant by "a minimum 500-foot seal, which covers the base of the protected groundwater."

Mitigation Needed: In addition to clarifying the above statement, we recommend that the following additional measures be added:

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[325] Jensen, T. (2013, October 18). Fracking fluid blows out nearby well; Cleanup costs, competing technologies at issue. (L. T. Corporation, Ed.) Kasa.com.

[326] State of New Mexico, Energy, Minerals and Natural Resources Department. (2013, October 22). Aztec District III - Request for Information. n.p.

[327] BC Oil and Gas Commission. (2010, May 20). Safety Advisory 2010-03, May 20, 2010: Communication During Fracture Stimulation. n.p.

[328] Detrow, S. (2012, October 9). Perilous Pathways: How Drilling Near An Abandoned Well Produced a Methane Geyser. *StateImpact Pennsylvania*. NPR.

[329] Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management. (2009, October 28). Draft Report - Stray Natural Gas Migration Associated with Oil and Gas Wells.

[330] Vaidyanathan, G. (2013, August 5). When 2 wells meet, spills can often follow. *EnergyWire*. E&E News.

[331] Alberta Energy Board. (2013, May). Directive 083: Hydraulic Fracturing - Subsurface Integrity.

[332] Enform Canada. (2013, March 27). Interim IRP 24: Fracture Stimulation: Interwellbore Communication; An Industry Recommended Practice For the Canadian Oil and Gas Industry. Interim Volume *24, 1st Edition*.

- For all wells within the ADSA, the operator must:
    - Evaluate the adequacy of the well design and construction methods to achieve the goal of isolating protected water
    - Assess the internal and external mechanical integrity of each well identified
    - Prepare a plan for performing corrective action if any of the wells identified are improperly designed, constructed, completed, plugged, or abandoned.
    - Perform an assessment to determine the risk that the stimulation treatment will communicate with each well identified.
    - For each well identified as at-risk for communication, prepare a plan for well control, including but not limited to:
        - A method to monitor for communication
        - A determination of the maximum pressure which the at-risk well can withstand
        - Actions to maintain well control
        - If the at-risk well is not owned or operated by the owner/operator of the well to be stimulated, a plan for coordinating with the offset well operator to prevent loss of well control.

MM GW-4b. The intent of this mitigation measure is appropriate, but believe that more specificity is necessary to ensure protection of groundwater.

Mitigation Needed: The measure should specify that the Groundwater Protection Standard (as modified above) also applies for wells to be stimulated in a DWR-designated groundwater basin and that *in addition*, such wells must also:

- Install a full string of new production casing and fully cement to surface using the pump and plug method. Where the depth of the well makes cementing to surface technically infeasible or could result in lost circulation, multi-stage cementing must be used.

MM GW-4c. The intent of this mitigation measure is appropriate, but we recommend that the survey area be revised to be **two times** the ADSA, to be consistent with section 1784 of the permanent SB4 regulations, Well Stimulation Treatment Area Analysis Design.

MM GW-5a. The intent of this mitigation measure is appropriate, but we recommend that the survey area be revised to be **two times** the ADSA, to be consistent with section 1784 of the permanent SB4 regulations, Well Stimulation Treatment Area Analysis Design.

MM GW-7a. This mitigation measure is appropriate.

Additional Mitigation Measures Needed

Casing Corrosion. The EIR notes that casing corrosion is a potential risk factor to groundwater.

Mitigation Needed: To reduce the risk of external casing corrosion all potential flow zones – as defined in API RP 65-2, Isolating Potential Flow Zones During Well Construction – must be properly isolated. Failure to isolate flow zones can also result in annular overpressurization, which can lead to a loss of

mechanical integrity, putting groundwater at risk, and/or allow crossflow of subsurface fluids, potentially into protected water if it has not been properly isolated.

All well construction materials must be compatible with fluids with which they may come into contact and be resistant to corrosion, erosion, swelling, or degradation that may result from such contact.

Fractures Bypass Seals. The EIR notes that induced fractures could bypass well seals, potentially providing a pathway for contaminants to reach uncemented annular space and possibly protected water. Fractures that bypass well seals could also allow contaminants to migrate above the confining zone and possibly into groundwater.

Mitigation Needed: The final SB4 rules require operators to estimate the ADSA. This estimate must be compared to the height of well seals the depth of any confining zone(s). If fractures could potentially grow beyond well seals or the confining zone, the fracturing operation parameters must be revised.

Deterioration of Well Materials over Time. The EIR notes that well materials can degrade over time, potentially putting protected water at risk.

Mitigation Needed: Internal and external mechanical integrity must be assessed at least yearly.

Inadequate Primary Cementing. The EIR notes that invasion of gas can lead to problems with cementing. In addition, the use of improper cement materials, mixing, handling, or installation methods can also result in poor primary cementing. Remedial cementing is difficult, often take several attempts to perform successfully, and can result in well integrity issues over time. Proper primary cementing is crucial to protecting water resources.

Mitigation Needed:

- Prior to cementing the hole must be prepared to ensure an adequate cement bond by circulating at least two hole volumes of drilling fluid and ensuring that the well is static and all gas flows are killed. Top and bottom wiper plugs and spacer fluids must be used to separate drilling fluid from cement and prevent cement contamination. Casing must be rotated and reciprocated during cementing when possible and when doing so would not present a safety risk.
- Cement must conform to API Specification 10A (Specification for Cement and Material for Well Cementing). Consideration should be given to including gas blockers or static gel strength accelerators if permeable gas-bearing intervals are being cemented, and to including additives resistant to CO2 and H2S degradation if conditions dictate.
- The cement mixture in the zone of critical cement shall have a 72-hour compressive strength of at least 1,200 psi. Cement slurry must be prepared to minimize, to the greatest extent practicable, its free water content. In no event shall the free water separation for the slurry average more than (i) two milliliters per 250 milliliters of cement tested for cement inside the zone of critical cement or (ii) three and one-half milliliters per 250 milliliters of cement tested for cement outside the zone of critical cement. Cement mix water chemistry must be proper for

the cement slurry designs. At a minimum, the water chemistry of the mix water must be tested for pH prior to use, and the cement must be mixed to manufacturer's recommendations. An operator's representative must be on site verifying that the cement mixing, testing, and quality control procedures used for the entire duration of the cement mixing and placement are consistent with the approved engineered design and meet the cement manufacturer recommendations, API standards, and the requirements of this standard.

- Compressive strength tests of cement mixtures without published performance data must be performed in accordance with the current API RP 10B-2. The test temperature must be within 10 degrees Fahrenheit of the formation equilibrium temperature at the top of cement. A better quality of cement may be required where local conditions make it necessary to prevent pollution or provide safer operating conditions.
- All surface, intermediate, and production casing strings must stand under pressure until a compressive strength of 500 psi is reached before drilling out, initiating testing, or disturbing the cement in any way, but in no case should the WOC time be less than 8-hours.
- All surface, intermediate, and production casing strings must be pressure tested. Drilling may not be resumed until a satisfactory pressure test is obtained. Casing must be pressure tested to a minimum of 0.22 psi/foot of casing string length or 1500 psi, whichever is greater, but not to exceed 80% of the minimum internal yield. If the pressure declines more than 10% in a 30-minute test or if there are other indications of a leak, corrective action must be taken.
- For surface casing, radial cement evaluation logs must be run if there are indications of an inadequate cement job. For intermediate and production casing, radial cement evaluation logs must be run on all strings of cemented casing that isolate protected water, potential flow zones, through which stimulation will be performed, and/or when there are indications of an inadequate cement job. If the cement evaluation logs indicate inadequate cementing then remedial operations must be performed prior to commencing completion operations. If the deficiencies cannot be remedied, the well shall be plugged and abandoned.

Inadequate Well Design and/or Construction. Older wells may have been designed and constructed with practices not acceptable by today's standards and that may endanger groundwater. In particular, shallow wells in the state have sometimes been constructed without water protective casing and/or with a single string of casing, including in areas with protected groundwater. The annular space in these wells may also not be fully cemented.

Properly constructed wells typically have at least two and often three barriers between protected water and fluids contained in the well: 1) surface casing 2) production casing 3) production tubing. These redundant barriers are necessary to help reduce the risk that protected water will be impacted should one barrier fail. Wells lacking surface casing/redundant barriers put protected water at serious risk in the case of a well integrity failure due to the fact that both protected water and hydrocarbon-bearing zones are contained behind the same string of casing.

In wells with a single string of casing, even cementing over protected water as required by the Groundwater Protection Standard proposed in the EIR is not sufficient to adequately safeguard protected water.

Mitigation Needed: Stimulation should be prohibited in wells in which protected water and hydrocarbons are isolated behind the same string of casing. Casing strings that isolate protected water should not be perforated for the purposes of stimulation, production, or injection.

15 SURFACE WATER RESOURCES: the DEIR fails to properly disclose, analyze, and mitigate the project's significant surface water resources impacts.

15.1 Significant statewide impacts that have not been disclosed and/or mitigated

15.1.1 The Draft EIR Impermissibly Relies on the Effect of Proposed Regulations

In determining the impacts on surface water quality, the Draft EIR "assumes the implementation of the proposed SB-4 related regulations." (10.15-33). For the reasons set out above this approach is improper.

15.1.2 The Draft EIR fails to disclose, analyze and mitigate impacts from well stimulation treatment projects that may occur after the well stimulation treatment is complete.

Impact SWR-1 discusses water quality degradation that may result from construction and well development activities, such as drilling, as well as well stimulation.[333] No disclosure or discussion is provided, however, of any impacts to surface waters that may occur after drilling and well stimulation treatment from wells that are idle and especially from wells that are plugged or abandoned improperly.[334] Because there is likelihood that fluids or other pollutants associated with well stimulation can escape an idle, improperly abandoned or plugged well and enter surface waters, the Draft EIR must disclose and mitigate these impacts.

15.1.3 The Draft EIR's discussion of Impact SWR-3 fails to disclose and analyze significant impacts on water quantity resulting from well stimulation treatment pollution discharged to surface waters designated for water supply.

All six Study Regions studied in the Draft EIR include water bodies designated for water supply beneficial uses, including industrial, municipal or agricultural water supply.[335] Polluted discharges associated with well stimulation treatments occurring in the six Study Regions therefore have the potential to not only degrade water quality, but, as a result of the increased pollution, may reduce the future availability of these water bodies as water supply. Thus, well stimulation treatment pollution may also "substantial[ly] diminish surface water quantity." Yet, the Draft EIR contains no discussion of this impact and the only

[333] DEIR section 10.15, pp. 34-38.
[334] *See* Draft EIR Section 7, p. 20
[335] Draft EIR Section 10.15, pp. 16, 19, 22, 24-25, 27 and 30

discussion associated with Impact SWR-3 is related to reduction in water quantity due to direct diversion of water from surface streams and sources for the purposes of conducting well stimulation treatments.[336] Given California's significant drought, the Draft EIR must disclose and mitigate impacts on water supply from well stimulation treatment pollution.

15.1.4 Proposed mitigation measures are inadequate to address and reduce Impact SWR-1a to less than significant

The Draft EIR recognizes that hydraulic fracturing and acid stimulation treatments could have significant impacts on surface water quality and result in violation of "water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade or diminish surface water quality."[337] To mitigate these serious impacts, the Draft EIR requires a Storm Water Pollution Prevention Plan ("SWPPP") to be developed for all new construction associated with well stimulation treatments regardless of size.[338] Notably, no monitoring of discharges or receiving waters is required under the Draft EIR to actually demonstrate that well stimulation treatment projects comply with water quality standards and ensure that any violations of these standards and degradation in water quality will be adequately mitigated by the responsible parties.

Contrary to the Draft EIR's assertion, the proposed mitigation measure will not ensure that well stimulation treatment projects will not result in violation of water quality standards because the measure provides no assurance that the SWPPP, although developed, will be adequate to address construction stormwater pollution impacts. DOGGR has no expertise in reviewing SWPPPs and the Water Boards, which under the General Construction Stormwater Permit regulate construction sites of one acre or more, are not required to review or approve the SWPPPs submitted by well stimulation treatment project operators, even for construction sites larger than one acre.[339] The Draft EIR does not specify which agency, if any will be charged with evaluating the adequacy of the SWPPPs developed for well stimulation sites. Thus, MM SWR-1a provides no assurances that the SWPPPs developed and implemented at well stimulation sites throughout California will be adequate to address Impact SWR-1.

Further, while the General Construction Stormwater Permit mandates the development of a SWPPP for sites subject to the Permit, it does not require the developed SWPPP be in fact implemented. *Id.* Instead the Permit requires dischargers to implement certain BMPs and meet Numeric Action Levels. *Id.* However, neither of these Permit requirements are proposed and evaluated as potential mitigation measures in the Draft EIR. Thus without follow up inspections by DOGGR or any other agency to confirm a SWPPP, even if adequately designed, is implemented at all sites where well stimulation treatments occur, the currently proposed Mitigation Measure SWR-1a will fail to mitigate Impact SWR-1. In fact, for

[336] Draft EIR Section 10.15, pp. 43-44
[337] Draft EIR Section 10.15, p. 34 (Impact SWR-1)
[338] Draft EIR Section 10.15, p. 38
[339] *See* California Construction General Stormwater Permit, Order No. 2009-0009-DWQ (amended by Order Nos. 2010-0014-DWQ and 2012-006-DWQ), Factsheet at 3, available at http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/wqo_2009_0009_complete.pdf (last visited on March 12, 2015)

projects that last less than 30-days the mitigation measure will result in little if any protection to surface water quality in light of the lack of any mandatory secondary containment under 14 C.C.R. 1786. As described in our comments on the Hazards and Hazardous Materials and Groundwater sections, the MM HAZ-1a mitigation measure is also not sufficient to address this issue.

Finally, the Draft EIR's Surface Water Protection Standard discussed in Section 7.5.3 and relied on in Section 10.15.5's analysis of impacts and mitigation measures will not help ensure that water quality standards are not violated and surface water quality is not diminished or degraded. The Surface Water Protection Standard only applies to wells located outside of existing oil and gas fields and to new onshore wells.[340] Thus, no existing wells or offshore wells have to comply with this standard and the standard will not provide any mitigation for surface water quality impacts from these wells.[341] In addition, there is no justification provided for using a 100-foot setback from surface water for onshore well pads rather than a larger setback which will also be more protective of the surface waters.[342] Second, any minimal protection afforded by the setback is limited only to onshore wells, thus allowing all offshore well pads to be located without any setback to inland and ocean surface waters.[343]

Furthermore, even for onshore wells DOGGR has the discretion to override the 100-foot setback and allow well pads to be constructed and located closer to surface waters if the setback cannot be feasibly achieved or is unnecessary to avoid significant impacts on water bodies.[344] The Draft EIR states that an applicant seeking a shorter setback must submit to DOGGR "a written justification for [the] proposed narrower setback" but there are no requirements related to the type of information and technical demonstration that must be included in the "written justification."[345] As a result, as a practical matter, neither the DOGGR nor the public in reviewing the Draft EIR can reasonably determine what kind of information will provide the basis for DOGGR's decision to approve a deviation from the 100-foot setback. There are no limitations on the distance by which the setback can be reduced so, presumably a well stimulation treatment operator can construct a well pad within a few feet of a river bank.[346] More importantly, since DOGGR lacks the necessary expertise to evaluate surface water impacts, the agency's determination that the applicant's "written justification" for a shorter setback and associated mitigation measures "will not cause a significant effect to the potentially affected water bodies."[347]

For all of these reasons, the Surface Water Protection Standard will not mitigate, either alone or together with MM SWR-1a the impacts to water quality of surface waters to less than significant.

15.1.5 Proposed mitigation measures are inadequate to address and reduce Impact SWR-3 to less than significant

[340] Draft EIR Section 7.5.3, p. 53
[341] *Id.*
[342] *See* Draft EIR Section 7.5.3, p.53; Section 10.15, p. 37
[343] *See* Draft EIR Section 7.5.3, p. 53
[344] *See id.*
[345] *See id.*
[346] *See id.*
[347] *See id.*

The Draft EIR acknowledges that well stimulation treatment projects use a substantial amount of potable water and can have a significant impact on water supply in California.[348] The mitigation measures proposed to address these significant impacts referred to as Impact SWR-3 (Substantially diminish surface water quantity) will fail to reduce this impact's significance. First, while Mitigation Measure SWR-3a requires DOGGR to coordinate with the permit applicant and identified suppliers to determine if supplies of water for the well stimulation treatment are available and that well stimulation treatments will not impact other existing water users or necessitate new or expanded water entitlements or treatment facilities, no specific details are provided as to the documents and information that DOGGR will need to make that determination.[349] The Draft EIR simply states that DOGGR, an agency with no expertise in evaluating impact on water supplies, must "obtain assurances" that water availability for the project is adequate but it is unclear what these assurances consist of and what level of assurances will be sufficient to make the determination that water is indeed adequate and will not impact other users.[350] Further, DOGGR is allowed to approve a project even if there are no assurances of water supply so long as DOGGR "require[s] the applicant to identify a feasible alternative means of obtaining a water supply that meets DOGGR standards and does not adversely affect the other existing water users or cause significant environmental effects."[351] However, it is unclear what "DOGGR standards" are and in what situations the alternative means of obtaining water supply proposed by the applicant will "cause significant environmental effects."[352] This lack of specific requirements and guidance is especially concerning in light of California's severe drought.[353] Due to the lack of specifics associated with DOGGR's determination of water supply adequacy it is impossible to evaluate whether the proposed MM SWR-3a will in fact reduce Impact SWR-3 to less than significant.

Next, the Draft EIR's reliance on the Water Recycling Standard described in Section 7.5.1 to mitigate Impact SWR-3 to less than significant is similarly without basis. The Water Recycling Standards have a limited application: they only "apply outside of existing oil and gas fields and at new wells within existing fields."[354] Thus, well stimulation treatments conducted in existing wells within existing well fields will not be subject to the Water Recycling Standard and as a result well stimulation treatments at these wells will impact water quantity. Moreover, this standard only requires a permit applicant to make a "good faith effort to identify any recycled water or saline groundwater potentially available for use in the well stimulation treatment" but, again, not parameters are provided for what kind or level of effort by the project applicant will be considered a "good faith effort."[355] Moreover, under the Water Recycling Standard no input from the Regional Water Boards or the State Water Board is required in the preparation of the draft study on the feasibility of using recycled water.[356] Finally, despite the fact that

[348] Draft EIR Section 10.15, pp. 43-44
[349] Draft EIR Section 10.15, p. 45
[350] *Id.*
[351] *Id.*
[352] *Id.*
[353] Draft EIR Section 10.15, p. 14
[354] Draft EIR Section 7.5.1, p. 48
[355] Draft EIR Section 7.5.1, p. 49
[356] *Id.*

the water recycling study submitted with the well stimulation treatment permit is finalized and approved by DOGGR as part of the permit, the EIR does not envision any civil or other penalties for violations of the final water recycling requirements. Instead, under the Water Recycling Standard permittees who violate the water recycling provisions of their well stimulation treatment permit are required to propose to DOGGR recommendations on avoiding minor violations in future well stimulation treatment projects or, for major violation, recommendations regarding environmental restitution "so as to achieve indirectly the practical equivalent of the water savings or efficiencies that the Water Recycling Standards are intended to achieve."[357] DOGGR has discretion to require environmental restitution.[358] As a result, permittees have no incentive to comply with the Water Recycling Standard as implemented in the water recycling study incorporated in their permit and can choose to violate the standard, and their Permit, without consequences. The Water Recycling Standard, will therefore result in a minimal to no reduction of the significant impacts on water supply posed by well stimulation treatments in California.

For all of these reasons, the mitigation measures proposed to address Impact SWR-3 will not in fact reduce this impact to less than significant.

15.2 Significant impacts at specific oil fields that have not been disclosed and/or mitigated

The Draft EIR fails to disclose and mitigate significant impacts on surface water quality from well stimulation treatments projects in the Wilmington, Inglewood and Sespe Oil and Gas Fields which may occur after well stimulation treatment is complete. Similarly, the Draft EIR fails to disclose and mitigate significant impacts on water quantity from pollution associated with well stimulation treatments in all three oil and gas fields.

Further, the mitigation measures proposed to address and reduce Impacts SWR-1 and SWR-3 in all three oil and gas fields are inadequate.

16 NOISE AND VIBRATION: the DEIR fails to properly disclose, analyze, and mitigate the project's significant noise impacts.

Under CEQA, "it is the policy of the state" to "[t]ake all action necessary to provide the people of this state with . . . freedom from excessive noise."[359] Despite this mandate, DOGGR seems to overlook and all but entirely reject as a minor and temporary nuisance, the significant impact of environmental noise caused by well stimulation activities. Contrary to this characterization, well stimulation sites are very noisy and, particularly in California, can be close to homes. In fact, public health experts have identified

[357] DEIR Section 7.5.1, p. 50
[358] *Id.*
[359] Pub. Res. Code § 21001(b)

noise as a ubiquitous health threat for communities near oil and gas development sites and studies have found noise levels above safety thresholds.[360]

This makes intuitive sense and is scientifically supported. Well stimulation is an industrial process that generates prolonged periods of noise pollution for workers and nearby communities. Well pad preparation, drilling, and well stimulation generate significant noise levels for neighboring residences, schools, and work places. The noise—from trucks, generators, drilling operations, and pumps—can occur intermittently for days at a time and over several years as wells are stimulated and reworked many times.[361] Often, drilling operation continues 24 hours a day until completion, which means surrounding areas could be exposed to significant noise from drill rigs, air compressors, drill pipe connections, and elevator operations during sensitive nighttime hours.[362] During the hydraulic fracturing process, up to 20 diesel-pumper trucks operating simultaneously are necessary to inject the required water volume and achieve the necessary pressure.[363] The practice of drilling multiple wells per well pad at higher well density can further increase the duration, frequency, and intensity of noise pollution. As a result of the expansion of well stimulation into populated areas, a growing number of people are potentially exposed to harmful noise pollution.

The well stimulation noise and vibration impact assessments presented by DOGGR in the DEIS contain important flaws that understate the impacts. For example, the drilling and well stimulation impact assessment presented is for one well, ignoring the cumulative impact of multiple wells being developed at the same time.[364] Even using the analysis for a single well, the sound levels associated with the well stimulation process at 500 ft from the well would result in noise levels recognized to cause hearing damage if experienced for 8 hours or more.[365] The DEIR fails to adequately describe what these increases in noise will mean in terms of communication interference, sleep interference, physiological responses, and annoyance.

DOGGR fails to identify or quantify the noise impacts from venting or flaring. Flaring can continue 24 hours a day for weeks or months, and it is a loud, long-term noise impact that must be considered. In our work with the Walt and Marilee Desatoff family in Shafter, CA that abandoned their home following

[360] Maryland Institute for Applied Environmental Health, "Potential Public Health Impacts of Natural Gas Development and Production in the Marcellus Shale in Western Maryland," University of Maryland, School of Public Health, 2014 (Attachment 83); Roxana Z. Witter, et al., "Health Impact Assessment for Battlement Mesa, Garfield County Colorado," www.garfield-county.com/public-health/documents/1%20%20%20Complete%20HIA%20without%20Appendix%20D.pdf, 2010. (Attachment 84)
[361] Alan Krupnick, Hal Gordon, Sheila Olmstead, "Pathways to Dialogue: What the Experts Say about the Environmental Risks of Shale Gas Development," Resources for the Future, 2013. (Attachment 85)
[362] New York State Department of Environmental Conservation, "Revised Draft SGEIS on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing in the Marcellus Shale and Other Low-Permeability Gas Reservoirs," September 2011, http://www.dec.ny.gov/data/dmn/rdsgeisfull0911.pdf.
[363] Id.
[364] DEIR 10.17-14
[365] DEIR 10.17-15

a well stimulation project, it was the flaring noise that the family found most difficult to endure.[366] Walter Desatoff, in a video interview talks about the noise from hydraulic fracturing in Shafter, CA says "it's been a major influence on us and the way you do everyday things. And it gets to you. Especially that flare got to me because it was nonstop, just a roar."[367] Marilee Desatoff, in her explanation for why she left Shafter, she says that she "could not have family over anymore, we couldn't sleep at night, because you could hear this noise. And that became a stressful situation for us."[368]

Transportation-related noise impacts are not quantified in the DEIS. DOGGR fails to consider the noise or vibration caused by well stimulation construction, including, e.g., earth moving equipment.

Nor does DOGGR consider the impact of new development, increased growth, construction, and heavier traffic in communities with well stimulation. If well stimulation is expected to induce economic growth, or at least, to bring in outsiders to do the various jobs associated with well stimulation, the impact of that population increase must also be considered. One of those impacts is increased noise.

Potential noise effects on livestock or wildlife are also not evaluated, even though the noise of a single well—and even more so the combination of noise of multiple wells—could affect livestock and wildlife (especially sensitive bird species).

Seismic testing and vibroseis trucks are often used before a well stimulation treatment to identify oil reserves and survey the local geology. Seismic testing and vibroseis trucks are a well stimulation related activity that must be considered in the DEIS. Seismic testing and related noise and vibration impacts and low-frequency noise impacts (which are associated with health impacts) are currently not addressed in the DEIS. Seismic testing should also be considered for its potential effects on water supplies, structures, private property damage, and aging infrastructure. Among other mitigation measures, setbacks and time of day restrictions should be developed for seismic testing.

DOGGR identifies only one mitigation measure to guard against the harmful impacts of sound. We support the first mitigation measure[369], but it does not go far enough and it includes a highly problematic exception. First, DOGGR should expand the list of sensitive receptors to include farm and wildlife considerations. Critical habitat of threatened or endangered species known to be sensitive to noise should be given the same protections afforded to other sensitive receptors, as well as areas of high biological diversity or naïve wildlife populations that would be disrupted by novel well stimulation activity in their habitat.

[366] A home surrendered, available at: http://switchboard.nrdc.org/blogs/dnagami/videos_how_fracking_is_affecti.html
[367] A home surrendered, available at: http://switchboard.nrdc.org/blogs/dnagami/videos_how_fracking_is_affecti.html
[368] A home surrendered, available at: http://switchboard.nrdc.org/blogs/dnagami/videos_how_fracking_is_affecti.html
[369] MM NOI-1a

Second, DOGGR does not explicitly require the specific noise reducing measures it lists (i.e. a 16 ft noise barrier between residential land uses and well pad, that pump diesel engine drives be placed into enclosures, and to install muffler technology on diesel engines). Those measures should be mandatory.

Third, if the noise reduction to 70 dBA is deemed technologically infeasible, the well stimulation project should not be permitted to proceed. Temporary lodging is absolutely not an acceptable alternative. DOGGR must not ever require any school, nursing home, day care, or hospital to relocate for a well stimulation project, whose impacts could go on for extended periods of time if the well is reworked or flaring is required to control emissions. This is an unacceptable hardship that could result in long-term human hardship, including serious physical and mental health impacts.

While prohibiting well stimulation is the only way to entirely eliminate noise impacts, several additional strategies can be used to mitigate noise caused by well stimulation. The American Petroleum Institute recognizes that noise is best mitigated by distance and appropriate direction of noise.[370] Mitigation can be achieved by directing noise-generating equipment away from receptors, selecting an appropriate location for access roads, and scheduling the more significant noise-generating activities during the day. Additionally, site-specific permit conditions such as requiring the measurement of ambient noise levels prior to beginning operations, specifying daytime and nighttime noise level limits, using noise reduction equipment, limiting certain noisy activities to specific hours, installing temporary sound barriers, providing advance notice of the drilling schedule to nearby receptors, and limiting hydraulic fracturing operations to a single well at a time, should be implemented in order to mitigate noise.[371] Increased noise monitoring at and near unconventional oil and gas development sites and further research into characterizing noise pollution in the vicinity of well sites in terms of its sources, intensities, frequencies, and duration can help develop more effective mitigation measures.[372]

These additional noise mitigation commitments should be identified and incorporated into the proposed regulations or permit conditions to ensure they are enforceable.

17 SEISMICITY: The DEIR fails to adequately consider significant risks from seismic activity.

Despite substantial evidence that well stimulation and subsequent wastewater injection may cause significant earthquakes, as they have in many parts of the world, the DEIR ignores these studies and the potential harm to Californians. As such, the DEIR is woefully inadequate and fails to consider the true extent of potential harm from seismic activity.

[370] American Petroleum Institute, "Practices for Mitigating Surface Impacts Associated with Hydraulic Fracturing," http://www.api.org/~/media/files/policy/exploration/hf3_e7.pdf, 2011. (Attachment 86)
[371] New York State Department of Environmental Conservation, "Revised Draft SGEIS on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing in the Marcellus Shale and Other Low-Permeability Gas Reservoirs," 7-130–7-132, September 2011, http://www.dec.ny.gov/data/dmn/rdsgeisfull0911.pdf.
[372] Tanja Srebotnjak, "I can't hear you: Noise pollution is a health threat near unconventional oil and gas sites," Natural Resources Defense Council Staff Blog, 2014. (Attachment 87)

CEQA Guidelines define a "significant risk" as "a substantial, or potentially substantial, adverse change in any of the physical condition within the area affected by the project."[373] Specifically, a project has a significant impact to geology when it "exposes people or structures to potential substantial adverse effects, including the risk of loss, or injury, or death involving: rupture of a known earthquake fault …; strong seismic ground shaking; seismic-related ground failure; [or] cause an induced seismic event including ground shaking and ground failure…"[374]

The DEIR states that the majority of potential environmental impacts would be adverse but less than significant or reduced to a less than significant level.[375] But scientific studies have shown that the risk from seismic activity is substantial, and given California's numerous and potentially critically stressed fault lines, the potential for harm is great for well stimulation and associated activity in this state.

17.1 The DEIR must evaluate all direct and indirect environmental impacts of well stimulation.

Under both CEQA and SB 4, DOGGR is required by law evaluate indirect effects of well stimulation. CEQA mandates that a lead agency evaluate, in addition to direct effects, all "reasonably foreseeable indirect physical change."[376] SB 4 requires that the final EIR be completed "pursuant to" CEQA[377], which contains clear mandates that indirect effects be included in the EIR. The DEIR itself states that indirect impacts are those that are "caused by a project, but can occur later in time or farther removed in distance and are still reasonably foreseeable and related to the operation of the project."[378] The DEIR fails to adequately analyze these indirect impacts with regard to seismic activity. It also constitutes an improper segmentation of a project to divide its environmental impacts among different stages of the same process.

17.2 The DEIR Erroneously Excludes Wastewater Disposal from Its Assessment of Induced Seismicity

One entirely foreseeable environmental physical change is the vast amounts of wastewater produced after a well stimulation treatment and the associated risk of harm from wastewater injection wells that dispose of spent well stimulation treatment fluid and produced water from the treated well. After virtually all well stimulation treatments, a combination of flowback fluid and produced water is brought to the surface. The creation of massive amounts of wastewater is an inevitable consequence of well stimulation, as is the fact that most of this fluid is disposed of in wastewater disposal wells around the state. These foreseeable effects of well stimulation must be fully evaluated in order to properly understand the severity of risk from seismic activity.

The DEIR improperly limits its evaluation of the risk of seismic events to those that are triggered directly and in the immediate aftermath of a well stimulation event. While well stimulation itself can be the

[373] CEQA Guidelines § 15382.
[374] CEQA Guidelines, Appx. G.
[375] DEIR at 10.11-37.
[376] Pub. Res. Code § 21065; CEQA Guidelines §§ 15064, 15065(a)(4).
[377] Pub. Res. Code § 3161(b)(3).
[378] DEIR at 10.11-35.

trigger of seismic events, limiting the review to well stimulation misses a substantial body of scientific literature demonstrating that the injection of wastewater, the direct byproduct of well stimulation, poses a greater risk of induced earthquakes.

The wastewater generated as a byproduct of hydraulic fracturing and fracturing-enabled production has been linked to a dramatic increase in seismic activity in states where the wastewater is injected into wastewater disposal wells.[379] As wastewater disposal has increased due to hydraulic fracturing, so have the frequency and the strength of earthquakes in Oklahoma. Near Prague, Oklahoma, injection wells disposing of flowback and produced water from hydraulically fractured wells caused a magnitude 5.7 earthquake—the largest ever recorded in Oklahoma—in November 2011. The record-setting tremor destroyed 14 homes, injured 2 people, and caused millions of dollars' worth of damage to homes and buildings near the epicenter.[380]

From 1978 to 2008, Oklahoma on average only 2 earthquakes per year that were M3.0 or larger.[381] But in 2014, Oklahoma experienced 585 earthquakes of M3.0 or above in just one year.[382] Oklahoma is not alone. Researchers at the USGS found that the rate of earthquakes greater than magnitude 3.0 in the central and eastern United States has increased significantly in the past decade, from an average of 21/year from 1967 through 2000 to more than 300 in the years 2010 through 2012, with 188 occurring in 2011 alone.[383] This increase in seismicity coincides with wastewater injection.[384]

In California, which is heavily faulted, the potential harm from induced seismic activity is of particular concern. A survey of the state found that over half of California's injection wells are located within 10 miles of an active fault.[385] Six percent are within a mile.[386] In addition, some oil fields in California produce abnormally high amounts of water for each barrel of oil. Some wells in the San Joaquin Valley, for example, can produce up to 50 barrels of water for every barrel of oil.[387] Allowing well stimulation to expand in California will increase the need for injection wells to store millions more gallons of waste fluid, further increasing the danger of triggering earthquakes. The DEIR completely ignores this reasonably foreseeable consequence of allowing well stimulation to continue unabated.

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[379] Keranen, K.M. et al., Sharp Increase in Central Oklahoma Seismicity since 2008 induced by Massive Wastewater Injeciton, Sciencexpress (July 3, 2014), http://www.sciencemag.org/content/early/recent ("Keranen 2014") (Attachment 88); Ellsworth, William L., Injection-Induced Earthquakes, Science 341, 1225942, doi: 10.1126/science.1225942 (2013). (Attachment 91)

[380] Attachment 88.

[381] USGS, Record Number of Oklahoma Tremors Raises Possibility of Damaging Earthquakes, Updated USGS-Oklahoma Geological Survey Joint Statement on Oklahoma Earthquakes (May 2, 2014), http://earthquake.usgs.gov/contactus/golden/newsrelease_05022014.php. (Attachment 89)

[382] Soragen, M., "Shaken More than 580 Times, Okla. Is Top State for Quakes in 2014," E&E News, Jan. 5, 2015 (citing U.S. Geological Survey data). (Attachment 90)

[383] Attachment 91.

[384] "Induced Earthquakes." U.S. Geological Survey, 1 Jan. 2015. Web. 13 Mar. 2015. <http://earthquake.usgs.gov/research/induced/>.

[385] Shaky Ground Report 2014. (Attachment 92)

[386] *Ibid.*

[387] Attachment 6.

17.3 Current regulations do not lessen the threat of earthquakes from injection wells.

The DEIR incorrectly states that "applicable laws and regulation … provide protection regarding geology."[388] This is untrue. The UIC program, which regulates "any subsurface injection,"[389] including wastewater disposal that is directly attributable to well stimulation, has no provision that would lessen the threat of an induced seismic event. The UIC contains no provision that would limit the amount of wastewater injected into a well, nor a restriction on how close to a known fault such a well could operate. Contrary to DOGGR's assertion, the regulations do not "help[] ensure that the potential for resulting seismic activity is minimal."[390] Under these regulations, injection wells will continue to dispose of wastewater from wells undergoing well stimulation, with the attendant risk of seismic activity in the state.

DOGGR vows to revise the UIC program in early 2015, but it cannot rely on future regulations to address present risks. The current UIC regulations, which apply to wastewater received directly from wells that are stimulated, do not protect the public from the dangers of induced seismicity.

17.4 Seismic activity induced by oil withdrawal is not addressed.

The DEIR recognizes that oil withdrawal has caused major earthquakes in California, including a M6.5 earthquake in Coalinga in 1983.[391] Even though well stimulation is conducted *for the express purpose* of increasing the amount of oil production from a well, the DEIR does not evaluate what the risks from this direct impact would be, nor does the DEIR offer mitigation measures that would lessen the risk of seismic activity caused by oil withdrawal. Oil withdrawal is a completely foreseeable consequence of well stimulation, and under CEQA these risks should be fully evaluated in the EIR.

17.5 The DEIR understates seismicity caused directly by fracking.

Fracking has been associated directly to seismic events, yet the DEIR dismisses these risks. Evidence is mounting that fracking itself may trigger seismic events large enough to cause significant harm. Researchers determined that a magnitude 4.4 earthquake and as many as 100 aftershocks were caused by hydraulic fracturing near Fox Creek, Canada in January 2015.[392] One study found that 77 earthquakes in Ohio between magnitude 1.0 and 3.0 were likely caused by nearby fracking activity.[393] Fracking has

[388] DEIR at 10.11-37.
[389] 14 CCR § 1724.6. See generally, Id. §§ 1724.6-1724.10.
[390] DEIR at 10.11-51.
[391] DEIR at 10.11-49.
[392] Howell, D., *Researchers Study Aftershocks of Fox Creek Earthquake Possibly Linked to Fracking*, Edmonton Journal, (February 3, 2015) http://www.edmontonjournal.com/Researchers+study+aftershocks+Creek+earthquake+possibly+linked+fracking/10781866/story.html. (Attachment 93)
[393] Skoumal, R., et al, Earthquakes Induced by Hydraulic Fracturing in Poland Township, Ohio, 105 Bulletin of the Seismological Society of America 1 (2015). (Attachment 94)

also directly caused two earthquakes in England[394] and 38 earthquakes in British Columbia, the largest registering at magnitude 3.8.[395]

Increasing the risk of earthquakes in California with additional fracking and wastewater injection endangers the safety of millions of people living near fault lines.

17.6 The well stimulation regulations do not eliminate the threat of earthquakes.

The DEIR assumes that the yet-to-be-implemented well stimulation regulations will mitigate the impact of seismic activity, but such assumptions are misplaced and improper. The well stimulation regulations have not been implemented and DOGGR provides no evidence that the proposed measures would lessen the risk of seismic activity. Because well stimulation will continue to proliferate under the proposed regulations, the risk of induced seismicity will actually continue to *increase* after these regulations are implemented.

The proposed regulations require operators to map *known* faults in the vicinity of the proposed well stimulation[396], but this would not reduce the risk of triggering seismic activity via an unknown fault or a blind thrust fault. As the DEIR itself notes, known faults only account for part of the risk of seismic activity.

Moreover, DOGGR's claim that it would deny a well stimulation application that would occur across a fault line is unsupported except for the agency's own communication conference.[397] Yet there is no requirement in DOGGR's own regulations that would make this a legally enforceable criterion. And where an agency other than DOGGR conducts an environmental review for well stimulation, the best DOGGR can offer is to "encourage"[398] For such measures to be considered as mitigation of a harm, an EIR requires more.

Furthermore, DOGGR's regulations also rely on self-monitoring and self-reporting to alert DOGGR to seismic activity. Given the industry's history of noncompliance, and DOGGR inability to enforce current regulations, the proposed final regulations do not ensure safety, and cannot be relied upon to lessen the risk of seismic activity induced by well stimulation.

DOGGR also lists as one of its assumptions that it "may … consider modification of the requirements or conditions of the well stimulation permitting process in order to ensure protection of public safety and environmental impact."[399] It is entirely inappropriate to list among mitigation measures an abstract, unenforceable, aspirational goal that has no effect whatsoever on the risk of harm from seismic activity.

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[394] UK Department of Energy & Climate Change, Fracking UK Shale: Understanding Earthquake Risk (2014) at 2 (Attachment 95)
[395] BC Oil and Gas Commission, Investigation of Observed Seismicity in the Horn River Basin (August 2012). (Attachment 96)
[396] DOGGR Well Stimulation, Proposed Regulations § 1784.
[397] DEIR at 10.11-38 (citing DOGGR communication conference, November 21, 2014).
[398] E.g., DEIR at 10.11-40.
[399] DEIR at 10.11-38.

Similarly, DOGGR cannot rely, as it does in the DEIR, on local agencies to "address localized impacts." DOGGR merely asserts, without any evidence,[400] that project-specific review would minimize earthquakes locally. DOGGR provides no assurances that such reviews would take place, let alone mitigate the risk of seismic activity. Such unenforceable, conceptual reasoning has no place in an EIR.

17.7 Offshore seismic activity is a significant and unavoidable risk.

The DEIR also mentions seaquakes, but does not adequately describe the extent of danger of these seismic events triggered offshore. While the DEIR admits that such dangers are "a new area of scientific study" and that "to date no research has been done regarding the relationship of well stimulation treatments or offshore disposal well programs to offshore seismology,"[401] the fact remains that these types of events are a significant potential threat.

While studies of the link between well stimulation and seaquakes are far from complete, there is evidence to suggest that seaquakes may be triggered directly by well stimulation events. Well stimulation can trigger small earthquakes on land, the largest recorded event registering at M4.4.[402] And because seawater is a highly efficient carrier of energy, seismicity that may do minimal harm on land can be more destructive at sea. Seaquakes triggered by well stimulation or wastewater injection have the potential to cause a tsunami that is "disproportionately large compared to the small seismic event that triggered it."[403]

The extent of the risk is unknown but potentially catastrophic, and the DEIR admits that there are no known prevention measures or early warning systems.[404] Given these facts, the risk of harm from a seaquake and tsunami triggered by well stimulation or wastewater injection is a significant and unavoidable risk.

17.8 The DEIR understates the risk from unknown faults.

The DIER acknowledges that known faults constitute only a portion of the risk of seismic activity. Well stimulation and associated wastewater injection may trigger seismic activity through an unknown fault as well. Unknown faults, or non-APEFZ faults, have been the cause of major seismic activity in other parts of the country. In addition, the DEIR points to the presence of blind thrust faults throughout many areas where wells stimulation or associated waste injection will occur.

17.9 The mitigation measures are inadequate.

The DEIR offers a number of supposed mitigation measures, but most are unenforceable and do not result with any certainty that the risk of harm from seismic activity can be lessened. For example, DOGGR's assurance that it will direct well operators to "avoid active fault zones" is not accompanied by

[400] DEIR at 10.11-38.
[401] DEIR at 10.6-14
[402] CITE
[403] DEIR at
[404] DEIR at 10.6-18

an enforceable restriction on performing well stimulation near an active fault. DOGGR could allow well stimulation near an active fault if it is "satisfied" that there is no risk.[405] This ability to waive safety requirements, especially when the agency is still developing its understanding of the risk of seismic activity, is troubling. DOGGR further hedges on its commitment to safety by stating that it will impose seismic activity mitigation conditions that *substantially* comply with the active fault avoidance.[406] And DOGGR hedges further by stating it may "modify the proposed language"[407] of the conditions for approval. Furthermore, as stated above DOGGR can only "encourage" other lead agencies to restrict well stimulation near fault lines. In short, the DEIR provides no assurances that the mitigation measure would be applied consistently or effectively.

The setback measures suffer from the same shortcomings. There is no legally enforceable restriction that DOGGR is committed to implementing, stating only that the DOC will establish an "appropriate setback."[408] Even without explaining what setback would be "appropriate" or how DOC will evaluate setback requirements, DOGGR asserts that it may waive any such restriction whenever the agency is "satisfied" that well stimulation will not be affected by a rupture. Given DOGGR's limited understanding of seismic risks, applications that satisfy DOGGR may not reflect the true risk of seismic activity. DOGGR again states that it can only "encourage" other agencies to consider the risks of seismic activity before approving well stimulation. Furthermore, this measure seems to only consider the effect of a seismic event on the well site. Notably, it does not address the risk of a well stimulation event *triggering* a seismic event, and what the appropriate setback should be to avoid potential harm to the environmental and the public.

Other proposed mitigation measures suffer from the same shortcomings. Limiting the number of hydraulically fractured wells, implementing industry accepted practices, conducting ground monitoring, and preparing an earthquake plan do not provide assurances that the risk from seismic activity is adequately mitigated. The measures are either unenforceable or allow DOGGR too much discretion in determining whether they should or should not apply in any given application.

Finally, as mentioned above, these supposed mitigation measures do not address the risk from unknown faults and blind trust faults. Nor do they account for the harm from seismic events induced by wastewater injection resulting from well stimulation.

In short, the supposed mitigation measures do little to lower the substantial potential risk of harm from seismic activity.

17.10 Environmental effects *caused by* seismic activity could be disastrous.

[405] DEIR at 10.11-40.
[406] DEIR at 10.11-40.
[407] DEIR at 10.11-40.
[408] DEIR at 10.11-41.

The DEIR also briefly mentions the potential for a seismic event, whether induced or naturally occurring, to damage a well stimulation operation and cause environmental damage. The risk, however, is improperly minimized.

Any potential risks of conducting well stimulation in California, which experiences frequent natural seismicity, must be evaluated more thoroughly. The DEIR does not discuss what effect a large earthquake would have on wells that have undergone well stimulation. The analysis must include not only wells that are undergoing well stimulation at the exact moment of an earthquake, but all wells that have employed well stimulation at least once in their history. Well stimulation is what allows these wells to operate, and thus they should be included in an analysis of the potential damage from an earthquake. Injection wells must also be a part of this analysis. Wastewater injection is a direct and inevitable result of well stimulation. An evaluation of the risks of an earthquake that omits wastewater disposal wells does not accurately describe the risk of an earthquake.

18 COASTAL PROCESSES AND MARINE WATER QUALITY: The DEIR fails to properly disclose, analyze, and mitigate the project's significant traffic and transportation impacts.

18.1 Significant statewide impacts that have not been disclosed and/or mitigated

18.1.1 The Draft EIR fails to disclose and mitigate significant impacts on marine water quality and coastal processes from onshore well stimulation activities in watersheds draining to the Pacific Ocean

The Draft EIR fails to disclose, discuss and mitigate the significant impacts on marine water quality from onshore well stimulation treatments that occur in watersheds draining to the Pacific Ocean. The analysis of impacts on coastal processes and marine water quality is unjustifiably narrow in that it focuses only on impacts from offshore well stimulation treatments (conducted either through horizontal drilling from onshore to offshore locations or exclusively offshore at an existing island or platform) in only three of the six Study Regions/DOGGR Districts.[409] However, it is well-established that discharges of pollutants in rivers, creeks and watersheds draining to the Pacific Ocean impact and impair marine water quality.[410] Discharges associated with well stimulation activities conducted onshore in watersheds draining to marine waters, such as the Inglewood Oil Field and the Sespe Oil Field, can thus carry harmful pollutants, such as metals, oil, toxics and sediments into rivers, creeks and streams which will in turn transport these pollutants to ocean waters thereby degrading water quality.[411] Moreover, large spills

[409] DEIR Section 10.6, pp. 5-30

[410] *See e.g.* Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants Total Maximum Daily Loads, Final Staff Report prepared by California Regional Water Quality Control Board, Los Angeles Region and U.S. Environmental Protection Agency, Region 9, May 5, 2011, at 43-44, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/66_New/11_0630/03%20Final%20Staff%20Report%2006%2030%2011.pdf (last visited on March 11, 2015) (describing the process of metals and toxic materials being transported by stormwater and urban runoff from the Los Angeles and San Gabriel River watersheds downstream and "deposited within estuarine or marine waters" where they are a source of water quality impairments).

[411] *See* DEIR, Section 10.6.4, pp. 20-21 (an impact on coastal processes and marine water quality is "considered significant if a project would cause any detectable numerical change in the chemical composition of seawater; its

from wastewater disposal tanks or pits at onshore well stimulation sites into inland waterbodies draining to the Pacific Ocean will similarly be carried to marine waters and, depending on the volume of water spilled, may impact ocean waves and currents.[412]

As a result, onshore well stimulation activities conducted in watersheds draining to the Pacific Ocean in all six Study Regions/DOGGR Districts may have significant impacts on marine water quality and coastal processes and all reasonably foreseeable indirect and direct impacts must be disclosed, analyzed and addressed by adequate mitigation measures in the Draft EIR. These impacts may include effects on coastal resources and species that are outside the designated Study Area but who, either because the marine species are known to travel into the study region or because pollutants or impacts could migrate or extend to reach them, must be considered.

18.1.2 The Draft EIR fails to disclose and mitigate the significant impacts on California Areas of Special Biological Significance.

The California Ocean Plan prohibits the "discharge of waste" into Areas of Special Biological Significance.[413] There are 34 Areas of Special Biological Significance designated in California coastal waters.[414] The California Water Code defines "waste" as all "waste substances . . . associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation . . . ."[415] The State Water Resources Control Board has concluded that it is "undisputed that urban runoff contains 'waste' within the meaning of Water Code section 13050(d)."[416] Thus, any pollutants, such as oil, metals, toxic or radioactive materials or sediments, discharged from well stimulation sites and carried by stormwater or occurring in dry weather, are "waste" within the meaning of Ocean Plan and are prohibited from entering Areas of Special Biological Significance. As discussed above, inland surface waters carry pollution to marine waters such as the Areas of Special Biological Significance. Yet, the Draft EIR fails to mention, let alone discuss or propose mitigation measures to address the impacts from onshore well stimulation projects occurring in watersheds draining to Areas of Special Biological Significance.[417]

18.1.3 Mitigation Measure CPMWQ-1a is inadequate

Mitigation measure CPMWQ-1a will fail to reduce significant impacts to marine water quality. First, while the mitigation measure requires DOGGR to consult with the California Coastal Commission and the

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temperature or pH, or other testable characteristics; the magnitude and direction of currents, winds, or waves, and the risk of tsunamis").

[412] *See id.*

[413] 2012 California Ocean Plan at 21, 26 (Section III.E.4(a) and I.2.a) , available at http://www.waterboards.ca.gov/water_issues/programs/ocean/docs/cop2012.pdf (last visited on March 11, 2015).

[414] *Id.* at 56.

[415] Cal. Water Code § 13050(d)

[416] *In re Bldg. Indus. Ass'n*, Order WQ 2001-15 at 12 (Nov. 15, 2001); *see also In re Cal. Dep't of Transp.* at 8-9 ("[T]he plain meaning of the discharge prohibition in the current Ocean Plan applies to storm water runoff.")

[417] *See* DEIR Section 10.6, pp. 21-24.

State Lands Commission to develop a "strategy for the protection of marine water quality,"[418] no consultation is required with the Regional Water Quality Control Boards and the State Water Resources Control Board, which are the agencies specifically tasked with protecting marine water quality.[419] In fact, the California Ocean Plan which sets forth the standards for ocean water quality in state waters is developed and enforced primarily by the water boards.[420] The lack of input from the water boards will almost certainly result in the development of less than adequate marine water quality protection strategy for well stimulation treatment projects.

Second, although it states that DOGGR will require the preparation of a Discharge Prevention Plan and a Spill Contingency Plan as part of the application for well stimulation treatment permit, MM CPMWQ-1a fails to provide the specific elements and requirements of the Discharge Prevention Plan.[421] As a result, the draft EIR does not supply any details that will enable either DOGGR or the public to evaluate and understand whether the Discharge Prevention Plan, alone or in combination with other elements of MM CPMWQ-1a, will adequately mitigate Impact CPMWQ-1.

18.2 Significant impacts at specific oil fields that have not been disclosed and/or mitigated

As discussed above, the Draft EIR improperly fails to disclose, analyze and mitigate impacts on ocean water quality and coastal processes from onshore well stimulation treatments in watersheds draining to the Pacific Ocean. The Inglewood Oil and Gas Field, Wilmington Oil and Gas Field and the Sespe Oil and Gas field are both located in watersheds draining to marine coastal waters.[422] For this reason, the Draft EIR must disclose, analyze and mitigate the impacts on marine water quality and coastal processes from all onshore well stimulation treatments occurring in these oil and gas fields.

Finally, for the reasons provided above, the mitigation impacts proposed to address Impact CPMWQ-1 that may occur from well stimulation treatments occurring in the Wilmington Oil and Gas Field are inadequate.

19 GREENHOUSE GAS EMISSIONS

The DEIR's analysis of greenhouse gas emissions fails to provide an accurate assessment of the total impact of well stimulation. The DEIR understates both the volume of emissions that are likely to result from well stimulation and also the potential severity of the consequences. The mitigation measures set forth by DOGGR are inadequate, and the greenhouse gas impacts will be significant and unavoidable if

[418] DEIR Section 10.6, p. 23
[419] *See* Cal. Wat. Code § 13001 ("It is the intent of the Legislature that the state board and each regional board shall be the principal state agencies with primary responsibility for the coordination and control of water quality.")
[420] *See* 2012 California Ocean Plan at 1-12, available at http://www.waterboards.ca.gov/water_issues/programs/ocean/docs/cop2012.pdf (last visited on March 11, 2015).
[421] DEIR Section 10.6, p. 6-24
[422] DEIR Sections 11.15.3.1, p. 2, 11.15.3.2, p. 5; 11.15.3.3, p. 6

well stimulation is allowed to move forward. DOGGR must revise its impact and mitigation analysis and reconsider its unsupported designation of the Project as the environmentally preferred alternative. Of the alternatives set forth by DOGGR, only Alternative 1 (no well stimulation) will sufficiently address the impacts of greenhouse gas emissions.

Action to address the climate crisis becomes ever more urgent with each passing day. The National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) confirmed that 2014 was the *hottest year ever recorded.*[423] In the National Climate Assessment released by the U.S. Global Change Research Program, experts make clear that "reduc[ing] the risks of some of the worst impacts of climate change" will require "aggressive and sustained greenhouse gas emission reductions" over the course of this century.[424] Indeed, humanity is rapidly consuming the remaining "carbon budget" necessary to preserve a likely chance of holding the average global temperature increase to only 2°C above pre-industrial levels. According to the IPCC, if non-CO_2 forcings are taken into account, total cumulative future anthropogenic emissions of CO_2 must remain below about 1,000 gigatonnes (Gt) to achieve this goal.[425] Some leading scientists—characterizing the effects of even a 2°C increase in average global temperature as "disastrous"—have prescribed a far more stringent carbon budget for coming decades, one that requires phasing out coal use rapidly and leaving other unconventional fossil fuels (including shale oil and gas) "in the ground."[426]

California, for its part, has a mandate to reach 1990 levels of greenhouse gas emissions by the year 2020, equivalent to approximately a 15 percent reduction from a business-as-usual projection. The state must also reduce emission levels to 80 percent below 1990 levels by 2050.[427] In his 2015 Inaugural Address, the Governor reiterated his commitment to reduce greenhouse gas emissions with three new goals for the next fifteen years:

- Increase electricity derived from renewable sources to 50 percent;
- Reduce today's petroleum use in cars and trucks by 50 percent;

[423] National Aeronautics Society of America, *NASA, NOAA find 2014 Warmest Year in Modern Record*, Release 15-010 (Jan. 16, 2015), http://www.nasa.gov/press/2015/january/nasa-determines-2014-warmest-year-in-modern-record/

[424] Melillo, J., et al., *Chapter 1: Overview and Report Findings* in Climate Change Impacts in the United States: The Third National Climate Assessment 14-15 (2014), *available at* http://nca2014.globalchange.gov/downloads (accessed Feb. 24, 2015).

[425] Intergovernmental Panel on Climate Change, Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change; Summary for Policymakers (2013) at 25-26 ("Limiting the warming caused by anthropogenic CO_2 emissions alone with a probability of >33%, >50%, and >66% to less than 2°C since the period 1861–1880, will require cumulative CO_2 emissions from all anthropogenic sources to stay between 0 and about 1570 GtC (5760 $GtCO_2$), 0 and about 1210 GtC (4440 $GtCO_2$), and 0 and about 1000 GtC (3670 $GtCO_2$) since that period, respectively. These upper amounts are reduced to about 900 GtC (3300 $GtCO_2$), 820 GtC (3010 $GtCO_2$), and 790 GtC (2900 $GtCO_2$), respectively, when accounting for non-CO_2 forcings as in RCP2.6. An amount of 515 [445 to 585] GtC (1890 [1630 to 2150] $GtCO_2$), was already emitted by 2011."). *See also* United Nations Environment Programme, The Emissions Gap Report 13-22 (2013) (describing emissions "pathways" consistent with meeting 2°C and 1.5°C targets).

[426] Hansen, James et al., Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature, 8 PLoS One 12: e81648 (2013)

[427] Attachment 2-15.

- Double the efficiency of existing buildings and make heating fuels cleaner.[428]

The DEIR provides no coherent explanation of how well stimulation would align with these goals.

A large group of leading climate scientists sent a letter to the Governor calling for a moratorium on unconventional oil and gas development, stating:

> We believe that the process of unconventional fossil fuel development including shale tight oil and gas development in the Monterey Shale formation using hydraulic fracturing, acidization, and other forms of well stimulation will exacerbate many of these environmental threats, particularly climate disruption, local air and water pollution, and resource consumption.… Shale gas and tight oil development is likely to worsen climate disruption, which would harm California's efforts to be a leader in reducing greenhouse gas emissions….[429]

Increased investment in fossil fuels as opposed to clean energy is the wrong direction for California. Oil and gas production from well stimulation results in emissions of GHGs, and now is a time when we should be moving away from fossil fuels.

Well stimulation requires thousands of truck trips to transport water, chemicals, and equipment to and from the site. In addition to particulate matter, these trucks emit large amounts of carbon dioxide into the air. The construction equipment used to construct the site and to drill the well prior to well stimulation also emit carbon dioxide. The engines used to power drill bits, create pressure, and inject chemicals contribute to the greenhouse gas emissions from the well stimulation site. Finally, ultimate goal of well stimulation is to sell the oil and gas so it can be combusted, leaving massive amounts of carbon dioxide behind.

In addition to carbon dioxide, methane leakage will also significantly contribute to the greenhouse gas footprint of well stimulation and production. Methane is a highly potent greenhouse gas. Though carbon dioxide is emitted in higher volumes, fossil methane's global warming potential is 87 times higher than carbon dioxide over a 20-year period and 36 times higher over a 100-year period.[430]

The full extent of the damage from methane is not known because state and federal agencies routinely use underestimates of methane releases. Actual methane leakage rates have been repeatedly recorded at levels far higher than commonly used estimates. One regional study found methane leakage rates as high as 9 percent.[431] A recent study using atmospheric measurements estimated fossil fuel methane

[428] Attachment 3.
[429] Caldeira, Ken et al, Letter dated Nov. 13, 2013 from twenty scientists and engineers to the Honorable Governor Jerry Brown re environmental threats of unconventional fossil fuel development (2013) *available at* http://www.biologicaldiversity.org/news/press_releases/2013/fracking-11-13-2013.html.
[430] Myrhe, Gunnar & Drew Shindell, *Chapter 8: Anthropogenic and Natural Radiative Forcing* in Climate Change 2013: The Physical Science Basis, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2013).,Table 8.7 at 714, Cambridge Univ. Press (2013).
[431] Karion, Anna et al., Methane emissions estimate from airborne measurements over a western United States natural gas field, American Geophysical Union, doi: 10.1002/grl.50811 (2013) ("Karion 2013").

emissions at more than five times higher than EPA's emissions estimates for oil and gas in some parts of the country.[432] Observations from oil and gas operations in Colorado indicate that methane leakage rates from the production phase alone are around 4%, but could be as high as 7.7%.[433] Meanwhile, leakage rates over a Utah gas field were recently estimated at 6.2 to 11.7%, well above the rates assumed by national inventories.[434] A recent meta-analysis of studies conducted over the last 20 years suggests that EPA's estimate of 1.5% is far too low, and actual leakage rates may be as high as 3.6 to 7.1%.[435]

High rates are likely in California, where there is relatively little infrastructure to capture gas as it escapes the well. One study found methane leakage from the oil industry in and near Los Angeles to be 17 percent.[436] Another study conducted "top-down" measurements of methane in the atmosphere above Los Angeles and found readings up to 61 percent higher than state estimates.[437]

With even a low leakage rate, the amount of methane escaping into the air will significantly add to California's greenhouse gas emissions. Well stimulation and oil and gas production for unconventional shale oil and for the state's extremely heavy oil will undermine progress toward achieving the state's greenhouse gas emission reduction goals. Despite these studies showing significant impacts of methane leakage, the DEIR does not attempt to calculate the Project's total greenhouse gas emissions that include methane leakage. The DEIR's mere acknowledgment of methane leakage as an issue, DEIR 10.12-26, falls short of the analysis CEQA requires.

The DEIR improperly relies on future California Air Resources Board rules for greenhouse gas emissions in the oil and gas sector, claiming that these yet-to-be written regulations will help "avoid and/or minimize potential GHG emissions." [438]

Well stimulation in California would also facilitate the development of some of the most carbon-intensive oil fields in the world.[439] Many oil fields in California require a relatively high amount of energy to either extract or process the oil due to the "heaviness" of the crude or the co-location with water.[440]

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[432] Miller, Scot et al., Anthropogenic Emissions of Methane in the United States, PNAS Early Edition (Oct. 18, 2013), www.pnas.org/cgi/doi/10.1073/pnas.1314392110.
[433] Petron, Gabrielle, et al., Hydrocarbon Emissions Characterization in the Colorado Front Range: A pilot study, 117 Journal of Geophysical Research (2012); Petron, Gabrielle et al., A New Look at Methane and Non-Methane Hydrocarbon Emissions from Oil and Natural Gas Operations in the Colorado Denver - Julesburg Basin, 119 J. Geophys. Res. Atmos. 6836-6852 (2014).
[434] Karion 2013.
[435] Brandt, A.R. et al., Supplementary Materials for Methane Leaks from North American Natural Gas Systems, 343 Science 733 (2014).
[436] Peischl, J. et al., Quantifying Sources of Methane Using Light Alkanes in the Los Angeles Basin, California, 118 J. Geophys. Res. Atmos. 1-17, doi:10.1002/jgrd.50413 (2013) at 15.
[437] Wong, K.W. et al., Mapping CH4:CO2 Ratios in Los Angeles with CLARS-FTS from Mount Wilson, California, 15 Atmos. Chem. Phys. 241-252 (2015).
[438] DEIR at 10.12-23
[439] Attachment 6.
[440] *Ibid.*

In some fields a well may produce as much as 50 barrels of water per barrel of oil.[441] The DEIR does not adequately evaluate the impact of developing California's energy-intensive oil fields.

The DEIR also fails to fully account for direct and indirect greenhouse gas emissions resulting from well stimulation. Downstream emissions from refining and combustion, for example, are not included in the DEIR analysis. Regardless of whether these emissions are subject to a low carbon fuel standard or cap-and-trade regulation, the DEIR must examine the *total* greenhouse gas emissions from well stimulation. No such analysis has occurred here.

The DEIR admits that mitigation measures are inadequate to prevent significant and unavoidable impacts.[442] The mitigation measures that are listed are improperly deferred to later analyses or a project-level environmental review. This is particularly inadequate given the nature of greenhouse gas emissions. As the DEIR states, the major impact of greenhouse gas emissions comes from its cumulative impact. Evaluating each individual project for its cumulative impact on greenhouse gas emissions does not give a meaningful picture of the true harm that results from well stimulation and associated oil and gas development. The program-level of the EIR is the most appropriate venue to discuss and analyze the aggregate cumulative impacts of allowing hundreds of new well stimulation projects to move forward each month. Yet the DEIR makes no attempt to provide a critical analysis of just such an impact.

The mitigation measures also provide very little quantified information about how much greenhouse gas would be reduced by each measure. In fact, part of the mitigation measures is to attempt to quantify greenhouse gas emissions.[443] Without meaningful reduction quantities, the DEIR fails to serve as an informational document that allows the public to understand the extent of impact due to greenhouse gas emissions.

Furthermore, as in many other sections of the DEIR, mitigation measures are not enforceable and leave decisions to future project-level EIRs conducted by other lead agencies.

20 ENVIRONMENTAL JUSTICE

The DEIR fails to provide any meaningful analysis of the environmental justice impacts of well stimulation. The DEIR simply states that the effects will be "unknown." Given that well stimulation already affects minority and disadvantaged communities disproportionately, it is an area that deserves a full analysis. The sole mitigation measure offered is simply to study the issue further. This does not mitigate the effects of well stimulation on environmental justice communities in the least. The analysis as it stands is completely inadequate and offers no opportunity to assess what specific communities will be affected and how.

[441] *Ibid*.
[442] DEIR at 10.12-28.
[443] DEIR at 10.12-30.

Specifically, the EIR must conduct a cumulative impacts analysis that addresses the impacts of well stimulation activities on communities that have been identified as environmental justice communities either by the criteria set forth in the Office of Environmental Health and Hazards' Environmental Health Screening Tool, or by other forms of socioeconomic, race, and cumulative health impacts assessment methods. This cumulative impacts analysis must identify existing sources of pollution affecting environmental justice communities, and address the additional impacts of well stimulation activities on these already overburdened communities.

Much oil and gas development is located near environmental justice communities. New analysis of oil and gas development in California shows that, already, approximately 5.4 million people (14 percent of the state's population) live within a mile of one, or more, of more than 84,000 existing oil and gas wells.[444] More than a third of these people (1.8 million) also live in areas most burdened by environmental pollution as identified by California EPA 's tool (CalEnviroscreen 2.0).[445] These communities, highly vulnerable to additional pollution from oil and gas development, consist primarily of Latinos/Hispanics (69 percent), African Americans (10 percent), and Asian Americans (11 percent).[446] In total, people of color make up nearly 92 percent of the 1.8 million people living within a mile of oil and gas development and in communities already heavily burdened by pollution.

In California, a large portion of oil and gas development occurs in Kern and Los Angeles Counties, home to many low income communities, communities of color, and Spanish speaking communities. These communities already bear disproportionate burdens from air, water, and pesticide pollution. These communities are consistently ranked as having the worst air pollution in the country.[447] It is critical that the EIR analyze the impacts increased oil and gas production has on communities like those found in Kern and Los Angeles Counties.

When examining the increased oil and gas production activity's effect on communities disproportionately impacted by climate change, communities far from the drilling, such as the Native Village of Kivalina in Alaska, must be considered. The small Inupiaq village north of the Arctic Circle, which will be forced to relocate due to the melting ice pack, and many villages like it, are feeling the effects of global warming first and worst. Any analysis of the environmental justice impacts of increased oil and gas production must look at the effect of that increased production on climate change, and the corresponding disproportionate effects on environmental justice communities.

[444] NRDC Report. Drilling in California: Who's at Risk? P. 4 Available at: http://www.nrdc.org/health/files/california-fracking-risks-report.pdf
[445] *Id.*
[446] *Id.*
[447] See, American Lung Association, State of the Air 2013 (2013) available at http://www.lung.org/associations/states/california/advocacy/fight-for-air-quality/sota-2013/state-of-the-air-2013.html.

21 CONCLUSION

DOGGR's proposed Project would fundamentally change the quality of life not only for the millions of Californians currently residing next to active oil wells, but for those living in future well stimulation cites, or on transportation corridors, or near refineries. The profound risks to public health and safety from the Project have been completely obscured, robbing the public of its right to engage in the CEQA process. The DEIR fails to adequately disclose, analyze, and mitigate the Project's significant environmental impacts. DOGGR must give full consideration to the No Well Stimulation Alternative, the only option that stops well stimulation and immediately protects the public and the environment from the potential harms from well stimulation. DOGGR should reject this dangerous Project and, at the very least, impose a moratorium on well stimulation until it can address the flaws in, and recirculate for public comment, a revised DEIR.