Final

CASA DIABLO IV GEOTHERMAL POWER PLANT

Supplemental Environmental Impact Report
State Clearinghouse No. 2011041008

Prepared for
Great Basin Unified Air Pollution
Control District

March 2021

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CHAPTER 1
Introduction

1.1 Purpose

This Final Supplemental Environmental Impact Report (Final SEIR) is an informational document that identifies additions and changes to the Final EIS/EIR that was certified by the Great Basin Unified Air Pollution Control District (GBUAPCD) on July 17, 2014, for the Casa Diablo IV Geothermal Power Plant (Project). This SEIR contains supplemental information to the Final EIS/EIR to adequately inform the public and local officials in the planning and decision-making process regarding two potential and additional mitigation measures to address fugitive n-pentane emissions from the plant: (1) a stronger leak detection and repair (LDAR) program, and (2) the additional use of leakless or low-leak technology.

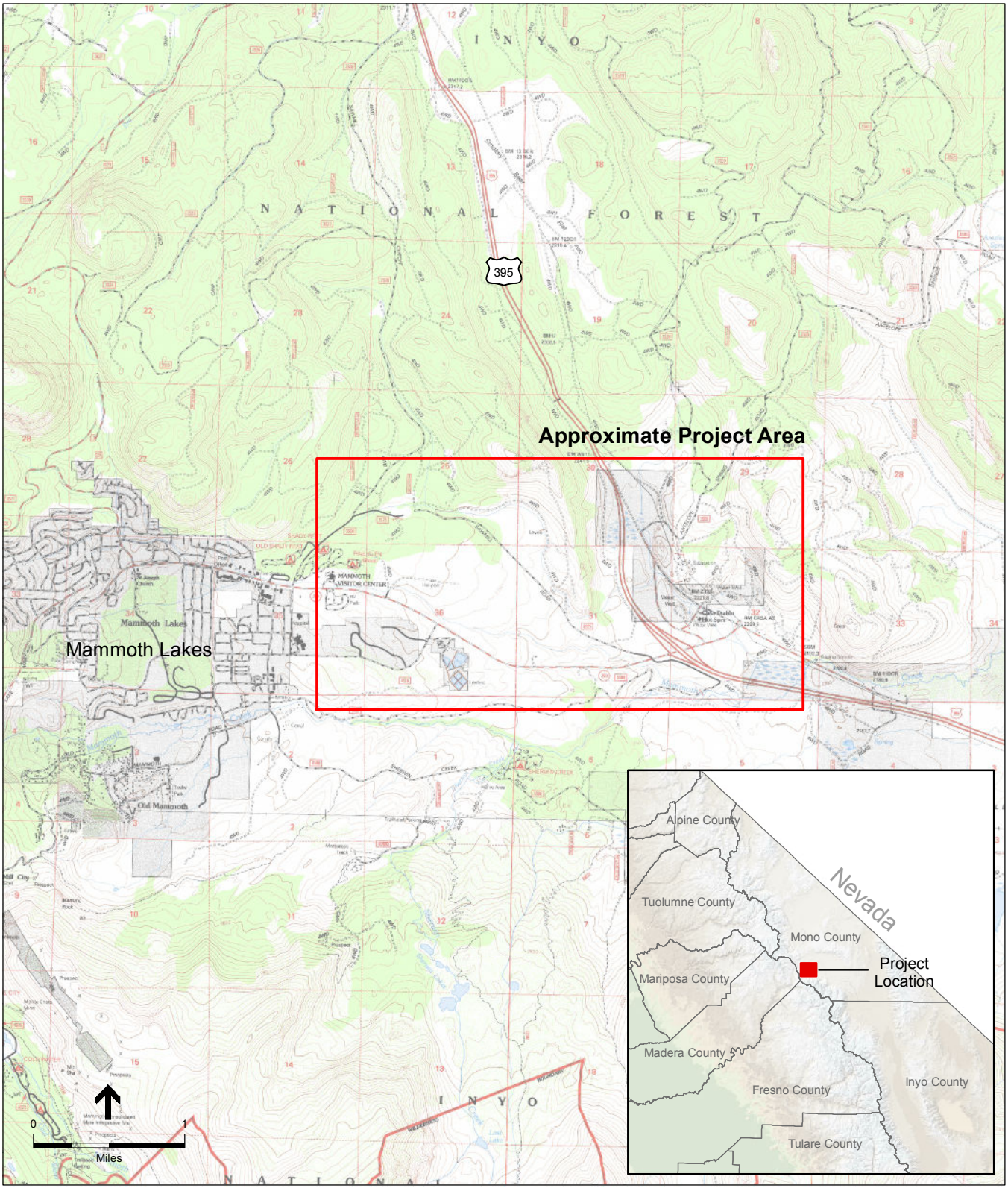
This Final SEIR consists of the Draft SEIR (Appendix A), responses to comments on the Draft SEIR (Chapter 2), and revisions to the Draft SEIR (Section 2.3).

The Final SEIR is available on the District's website and is available for viewing by appointment at the District. The Final SEIR describes the Project and evaluates the feasibility and potential environmental impacts of mitigation measures suggested to reduce reactive organic gas (ROG) emissions by commenters on the Draft SEIR.

1.2 Project Overview

1.2.1 Project Location

As discussed in the Final EIS/EIR, the Project would be located on public land (BLM Geothermal Lease # CACA-11667 and CACA-11667A) in Sections 29 and 32, Township 3 South, and Range 28 East Mount Diablo (MD) Base and Meridian (B&M). This location is approximately two miles east of the Town of Mammoth Lakes in Mono County, California, see **Figure 1-1**. The Project includes construction, operation, and maintenance of a geothermal power plant and up to 16 geothermal resource wells (some new and some existing) and associated pipelines on portions of BLM Geothermal Leases CACA-11667, CACA-14407, CACA-14408 and CACA-11672 located within the Inyo National Forest in Section 25, 26, and 36 of T3S, R27E and Sections 30, 31 and 32 of T3S, R28E, MD B&M. The Project is proposed in the vicinity of the existing Mammoth Pacific L.P. (MPLP) geothermal complex and entirely within the Mono-Long Valley Known Geothermal Resource Area in Mono County, California.



SOURCE: USGS 7.5- minute Old Mammoth topographic quadrangle, 1984

Casa Diablo IV Geothermal Power Plant

Figure 1-1

Project Vicinity Map

Mono County, California

1.2.2 Summary Project Description

Ormat Nevada Inc. (ORNI 50, LLC, or the Applicant), proposes to build, and following the expected 30-year useful life, decommission the Project. The Project would consist of the following facilities:

a) A geothermal power plant consisting of two Ormat Energy Converter (OEC) binary generating units (21.2 megawatts [MW] gross each) with vaporizers, turbines, generators, air-cooled condensers, preheaters, pumps and piping, and related ancillary equipment. The gross power generation of the plant would be 42.4 MW. The estimated auxiliary and parasitic loads (power used within the Project for circulation pumps, fans, well pumps, loss in transformers and cables) is about 9.4 MW, thus providing a net power output of about 33 MW. Additional components of the power plant would include:

   i. A motive fluid system consisting of motive fluid (n-pentane) storage vessels (either one or two vessels in the range of 9,000 to 12,000 gallons) and motive fluid vapor recovery systems (VRUs). Each VRU would consist of a diaphragm pump and a vacuum pump.

   ii. A substation would be constructed on the power plant site and connected to the existing Southern California Edison (SCE) Casa Diablo Substation at Substation Road.

   iii. An overhead 33 kilovolt (kV) transmission line approximately 650 feet (198 meters) long would connect the power plant substation with the SCE Casa Diablo Substation.

b) Up to 16 geothermal wells are proposed. Fourteen of the wells would be located in the Basalt Canyon area and two wells would be located southeast of the proposed power plant east of U.S. Highway 395. The specific locations for these wells would be selected out of the 18 possible locations. The actual number of wells required may be less depending on the productivity of the wells. The final number and location of wells would be determined by modeling and actual drilling results. Approximately half of the wells would be production wells and the other half would be injection wells. Each production well would range in depth from 1,600 to 2,000 feet below ground surface (bgs) and each injection well would be drilled to approximately 2,500 feet bgs. Production wells would be equipped with a down-hole pump powered by a surface electric motor. Thirteen (13) of the 18 potential proposed well locations in the Project area were analyzed and approved for exploratory well development during previous environmental reviews (BLM 2001 and BLM 2005). Two of these previously approved exploratory wells were drilled in 2011.

c) Piping would be installed from production wells to the power plant and from the power plant to the individual injection wells. Two main pipelines would parallel MPLP's existing Basalt Canyon pipeline through Basalt Canyon and would cross beneath U.S. Highway 395 between the well field and the Project site. Where pipelines must cross another pipeline or a road, the crossings would be underground.

d) Power and control cables for the wells would be installed in above-ground cable trays placed on the pipeline supports. Ancillary facilities would include pumps, tanks, valves, controls, and flow monitoring equipment.

1.3 Agency and Public Involvement

1.3.1 Agency and Public Review of the Draft SEIR

The Draft SEIR was made available for agency and public review for 47 days. The comment period began on August 27, 2020, was extended once, and ultimately concluded on October 13, 2020. The Draft SEIR was provided to the State Clearinghouse for circulation to interested state agencies. Printed copies of the Notice of Availability were provided to responsible, trustee, and local agencies as well as the Mono County Recorder. Printed copies of the Draft SEIR and electronic copies of all appendices and all documents referenced in the Draft SEIR were available for public review during normal hours at the Mammoth Lakes Library, and at the District's office by appointment. An electronic copy of the Draft EIR was available for all-hours access on the District's website: https://gbuapcd.org/PermittingAndRules/cd4/

Notifications and updates of the availability of the Draft EIR and information about how to access it were also sent to the District's email listserv. Notice of the availability of the Draft EIR also was published in the Sheet and Mammoth Times. See Appendix B, Public Notices.

1.3.2 Availability of the Final SEIR

An electronic copy of the Final SEIR (including this Response to Comments document) is being provided to Adams Broadwell Joseph & Cardozo, the only commenter on the Draft SEIR. Notice of the availability of this Final SEIR and details about how to access it are also being provided by email to the District's public notice email listserv and to the State Clearinghouse (Appendix C). An electronic version of the Final SEIR is also posted on the District's website: https://gbuapcd.org/cd4/.

The Final SEIR is also available for public review during normal working hours at the following location:

Primary Agency Contact: Luke Eisenhardt, Air Quality Specialist
Great Basin Unified Air Pollution Control District
157 Short Street
Bishop, CA 93514-3537

For general questions and assistance, please email permits@gbuapcd.org or mail to Great Basin Unified Air Pollution Control District, 157 Short Street, Bishop, CA, 93514-3537.

CHAPTER 2
Response to Comments

2.1 Input Received

The District received one letter with comments on the Draft Supplemental Environmental Impact Report (Draft SEIR). The Draft SEIR is provided in Appendix A. The comment letter received was submitted by the law firm of Adams Broadwell Joseph & Cardozo on behalf of Coalition for Responsible Mammoth Development. It is included below. Individual comments within the letter have been delineated for ease in reference as "Comment 1," "Comment 2," et cetera. The letter, with individual comments delineated, is provided in Section 2.2, *Responses to Comments*.

The District also received correspondence from Kenneth A. Malmquist, Principal Engineer at SLR, who, on behalf of Ormat, provided the District with independent input regarding the comments provided by Adams Broadwell Joseph & Cardozo (SLR, 2020). The District has independently reviewed these comments and finds the information to be useful in understanding the technical issues presented by Adams Broadwell Joseph & Cardoza. This information has been independently reviewed and considered, where appropriate, in the District's responses to comments.

Also, in response to the comments received from the Adams Broadwell Joseph & Cardozo, Ormat provided the District with additional input regarding the feasibility of the suggested mitigation measures (Ormat, 2020). Ormat's feasibility analysis has been independently reviewed and considered by the District in its responses to comments.

In addition, the District has communicated with the Bay Area Air Quality Management District (BAAQMD) regarding its rule for fugitive emissions that was referenced by Adams Broadwell Joseph & Cardoza. That information has been reviewed and considered, where appropriate, in the District's response to comments.

2.2 Responses to Comments

2.2.1 Letter: Adams Broadwell Joseph & Cardozo

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October 13, 2020

VIA E-Mail and Overnight Mail

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Re: **COMMENTS ON THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT FOR THE CASA DIABLO IV GEOTHERMAL POWER PLANT PROJECT (SCH NO. 2011041008)**

Dear Ms. Logan and Mr. Hsiao:

We write on behalf of Coalition for Responsible Mammoth Development to provide comments on the Draft Supplemental Environmental Impact Report ("DSEIR")[1] (SCH No. 2011041008), prepared by the Great Basin Unified Air Pollution Control District ("Air District"), pursuant to the California Environmental Quality Act,[2] for the Casa Diablo IV Geothermal Power Plant Project ("Project") proposed by Ormat Nevada Inc. (ORNI 50, LLC or the "Applicant"). As detailed below, the DSEIR fails to implement all feasible mitigation measures to reduce the Project's significant and unavoidable air quality impacts. The District must adopt all feasible mitigation measures to reduce the Project's fugitive reactive organic gases ("ROG") emissions before it can approve the Project. 1

[1] Great Basin Unified Air Pollution Control District, Casa Diablo IV Geothermal Power Plant Draft Supplemental Environmental Impact Report: State Clearinghouse No. 2011041008 (Aug. 2020) (hereinafter "DSEIR"), *available at* https://gbuapcd.org/Docs/PermittingAndRules/CD4/20200820_GBUAPCD_DraftSEIR.pdf.
[2] Pub. Resources Code §§ 21000 *et seq.*

I. INTRODUCTION

The Applicant proposes to build a 33 megawatt (42.4 gross) geothermal power plant and related infrastructure on public land managed by the United States Forest Service and the Bureau of Land Management approximately two miles east of the Town of Mammoth Lakes in Mono County, California.[3] The Project includes construction and operation of a geothermal power plant consisting of two Ormat Energy Converter ("OEC") binary generating units with vaporizers, turbines, generators, air-cooled condensers, preheaters, pumps and piping, and related ancillary equipment.[4] The Project would also include construction, operation, and maintenance of up to 16 geothermal wells and associated pipelines.[5]

The geothermal power plant would include a motive fluid system consisting of motive fluid storage vessels and a motive fluid vapor recovery system.[6] N-pentane would be the motive fluid used to drive the turbines for the project.[7] The system works by using the vaporized n-pentane to turn the 2 turbines, which would together turn a common generator.[8] The generator would produce electricity that is delivered to the Project's substation and transferred to the interconnection transmission line.[9] The vaporized n-pentane would be condensed in an air-cooled tube condenser, turning it back into a liquid, and returned to preheaters and vaporizers to repeat the cycle.[10]

Each OEC unit would contain approximately 180,000 pounds of n-pentane in the vaporizers, preheaters, piping, and n-pentane vapor vessels.[11] Although the motive fluid system is a "closed loop" with no routine emissions into the atmosphere, nearly all of the Project's operational ROG emissions comes from fugitive emissions of n-pentane that leaks from pipes, seals, flanges, valves, and other connections and the vapor recovery system.[12]

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[3] DSEIR at p. 1-1, 1-3.
[4] *Id*. at p. 1-3.
[5] *Ibid*.
[6] *Id*. at p. 1-3, 2-1.
[7] *Id*. at p. 2-1.
[8] *Ibid*.
[9] *Ibid*.
[10] *Ibid*.
[11] *Ibid*.
[12] *Id*. at p. 2-1 to 2-2.

In 2013, the Air District prepared a joint Environmental Impact Statement / Environmental Impact Report ("EIR") for the Project with the assistance of the Bureau of Land Management and the United States Forest Service.[13] Lawsuits were filed challenging the adequacy of the EIR to accurately estimate the amount of ROG emissions and the District's failure to adopt all feasible mitigation measures.[14] The trial court ruled against the petitioners.[15]

On appeal, the court reversed the trial court and held that the District did not adequately analyze whether the additional mitigation measures proposed by petitioners were feasible to limit the Project's significant ROG emissions.[16] Specifically, the court found that the Air District did not analyze whether a stricter leak detection and repair ("LDAR") program and the use of low-leak or leakless technology was feasible for the Project.[17] Because the District failed to analyze the feasibility of these suggested mitigation measures, the court concluded that the District did not have sufficient evidence in the record to conclude that no further mitigation measures were feasible.[18] The court directed the District to provide a reasoned feasibility analysis of the proposed mitigation measures supported by factual information.[19]

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In response to the appellate decision, the Air District prepared the DSEIR, which includes some additional discussion and limited analysis regarding two additional mitigation measures to address ROG emissions from the Project.[20]

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[13] U.S. Dept. of Interior, Bureau of Land Management, U.S. Dept. of Agriculture Forest Serv., Great Basin Unified Air Pollution Control Dist., Casa Diablo IV Geothermal Development Project: Final Joint Environmental Impact Statement and Environmental Impact Report (June 2013) (hereinafter "EIR"), *available at* https://gbuapcd.org/Docs/PermittingAndRules/CD4/cd4_final_eir_volume_1.pdf, https://gbuapcd.org/Docs/PermittingAndRules/CD4/cd4_final_eir_volume_2_appendices_a-f.pdf, https://gbuapcd.org/Docs/PermittingAndRules/CD4/cd4_final_eir_volume_2_appendices_g-h.pdf, https://gbuapcd.org/Docs/PermittingAndRules/CD4/cd4_final_eir_volume_2_attachment_g1_part_1.pdf, https://gbuapcd.org/Docs/PermittingAndRules/CD4/cd4_final_eir_volume_2_attachment_g1_part_3.pdf, https://gbuapcd.org/Docs/PermittingAndRules/CD4/cd4_final_eir_volume_2_attachment_g2_econbenefits_2012.pdf.

[14] *Covington v. Great Basin Unified Air Pollution Control District* (2019) 43 Cal.App.5th 867, 870-71.

[15] *Id.* at p. 872.

[16] *Id.* at p. 871.

[17] *Id.* at p. 878-83.

[18] *Ibid.*

[19] *Id.* at p. 884.

[20] DSEIR at p. 1-7.

We reviewed the DSEIR, its technical appendices, and reference documents with the assistance from air quality expert, Phyllis Fox, Ph.D., P.E., whose comments and qualifications are attached as Attachment A.[21] Based on our review of the DSEIR, we conclude that the Air District failed to comply with the court's directive in *Covington*.

The District abused its discretion and failed to proceed in the manner required by law because it failed to adequately analyze the proposed ROG mitigation measures identified in the appellate decision and failed to adopt all feasible mitigation measures to reduce fugitive ROG emissions to the greatest extent feasible. These defects render the document inadequate for purposes of compliance with CEQA. Specifically, the Air District failed to adopt a more stringent, and demonstrably feasible, lower leak rate threshold as part of its LDAR program. In addition, additional feasible mitigation in the form of optical remote sensing ("ORS") is available to reduce fugitive ROG emissions. The District must cure the DSEIR's fatal defects before it can approve the Project.

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II. STATEMENT OF INTEREST

Coalition for Responsible Mammoth Development is an unincorporated association of individuals and labor organizations with members who may be adversely affected by the potential environmental and public health and safety impacts of the Project. The association includes County residents, James Bailey and Perry Brown, and California Unions for Reliable Energy ("CURE") and its members and families and other individuals that live, recreate and work in Mono County (collectively "Coalition").

The Coalition supports the development of clean, renewable energy technology, including the use of geothermal power generation, where properly analyzed and carefully planned to minimize impacts on public health and the environment. Geothermal projects should take all feasible steps to ensure unavoidable impacts are mitigated to the maximum extent feasible. Only by maintaining the highest standards can energy supply development truly be sustainable.

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[21] **Attachment A**, Letter to Andrew J. Graf, Adams Broadwell Joseph & Cardozo from Phyllis Fox, Ph.D., P.E. re: Comments on Casa Diablo IV Geothermal Power Plant Project Draft Supplemental Environmental Impact Report (Oct. 13, 2020) (*hereinafter* "Fox Comments").

The individual members of Coalition and the members of the affiliated labor organizations live, work, recreate and raise their families in Mono County, including in and around the Town of Mammoth Lakes. They would be directly affected by the Project's environmental and health and safety impacts. Individual members may also work constructing the Project itself. They would be the first in line to be exposed to any air contaminants and health and safety hazards which may be present on the Project site. They each have a personal interest in protecting the Project area from unnecessary, adverse environmental and public health impacts.

The organizational members of Coalition and their members also have an interest in enforcing environmental laws that encourage sustainable development and ensure a safe working environment for the members they represent. Environmentally detrimental projects can jeopardize future jobs by making it more difficult and more expensive for industry to expand in the County, and by making it less desirable for businesses to locate and people to live and recreate in the County, including the Project vicinity. Continued degradation can, and has, caused construction moratoriums and other restrictions on growth that, in turn, reduces future employment opportunities.

Finally, the organizational members of Coalition are concerned with projects that can result in serious environmental harm without providing countervailing economic benefits. CEQA provides a balancing process whereby economic benefits are weighed against significant impacts to the environment.[22] It is in this spirit we offer these comments.

III. THE DSEIR VIOLATES CEQA BECAUSE IT FAILS TO MEANINGFULLY ANALYZE AND IMPLEMENT ALL FEASIBLE MITIGATION MEASURES TO REDUCE THE SIGNFICIANT FUGITIVE ROG EMISSIONS

"CEQA was intended to be interpreted in such a manner as to afford the fullest possible protection to the environment within the reasonable scope of the statutory language."[23] A core tenet of CEQA is to "[p]revent significant, avoidable

[22] Pub. Resources Code § 21081(a)(3); *Citizens for Sensible Development of Bishop Area v. County of Inyo* (1985) 172 Cal.App.3d 151, 171.
[23] *Friends of Mammoth v. Board of Supervisors* (1972) 8 Cal.3d 247, 259; 14 Cal. Code Regs. ("CEQA Guidelines") § 15003(f).

damages to the environment by requiring changes in the projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible."[24] In fact, "***CEQA establishes a duty for public agencies to avoid or minimize environmental damage where feasible***."[25]

A public agency cannot approve a project if there are feasible alternatives or mitigation measures available that would substantially lessen any significant effects that the project would have on the environment.[26] CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors."[27]

"The core of an EIR is the mitigation and alternatives sections."[28] The CEQA Guidelines define mitigation as a measure which (1) avoids the impact altogether by not taking a certain action or parts of an action, (2) ***minimizes the impact by limiting the degree or magnitude of the action and its implementation***, (3) rectifies the impact by repairing, rehabilitating, or restoring the impacted environment, (4) reduces or eliminates the impact overtime by preservation and maintenance operations during the life of the action, and (5) compensates for the impact by replacing or providing substitute resources or environments.[29]

"In deciding whether changes in a project are feasible, an agency may consider specific, economic, environmental, legal, social, and technological factors."[30] The duty to prevent or minimize environmental damage is implemented through the findings required by Public Resources Code § 21081 and CEQA Guidelines § 15091.[31] These sections prohibit a lead agency from approving a project with significant impacts unless it makes one or more of three findings:

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[24] CEQA Guidelines § 15002(a)(2).
[25] *Id.* § 15021(a) (emphasis added).
[26] *Id.* § 15021(a)(2).
[27] Pub. Resources Code § 21061.1; CEQA Guidelines § 15364.
[28] *Citizens of Goleta Valley v. Bd. of Supervisors ("Goleta II")* (1990) 52 Cal.3d 553, 564.
[29] CEQA Guidelines § 15370 (emphasis added).
[30] *Id.* § 15021(b).
[31] Pub. Resources Code § 21081(a); CEQA Guidelines § 15091(a).
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(1) Changes or alterations have been required in, or incorporated into, the project which mitigate or avoid the significant effects on the environment.[32]
(2) Those changes or alterations are within the responsibility and jurisdiction of another public agency and have been, or can and should be, adopted by that other agency.[33]
(3) Specific economic, legal, social, technological, or other considerations make infeasible the mitigation measures or project alternatives identified in the environmental impact report.[34]

These findings must be supported by substantial evidence.[35] Substantial evidence is defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached."[36] It includes "facts, reasonable assumptions predicated on facts, and expert opinion supported by facts,"[37] but it does not include "[a]rgument, speculation, unsubstantiated opinion or narrative, evidence which is clearly erroneous or inaccurate, or evidence of social or economic impacts which do not contribute to or are not caused by physical impacts on the environment."[38]

Rejected alternatives and mitigation measures must be "truly infeasible."[39] When an agency finds a specific alternative or mitigation measure to be infeasible, "its analysis must explain in meaningful detail the reasons and facts supporting the conclusion. The analysis must be sufficiently specific to permit informed decision-making and public participation."[40] Conclusory statements are inadequate.[41] As the Supreme Court recently explained in *Sierra Club v. County of Fresno*:[42]

> When reviewing whether a discussion is sufficient to satisfy CEQA, a court must be satisfied that the EIR (1) includes sufficient detail to

[32] Pub. Resources Code § 21081(a)(1); CEQA Guidelines § 15091(a)(1).
[33] Pub. Resources Code § 21081(a)(2); CEQA Guidelines § 15091(a)(2).
[34] Pub. Resources Code § 21081(a)(3); CEQA Guidelines § 15091(a)(3).
[35] Pub. Resources Code § 21081.5; CEQA Guidelines § 15091(b).
[36] CEQA Guidelines § 15384(a).
[37] *Id.* § 15384(b).
[38] *Id.* § 15384(a).
[39] *City of Marina v. Bd. of Trustees of Cal. State Univ.* (2006) 39 Cal.4th 341, 369.
[40] *Marin Mun. Water Dist. V. KG Land California Corp.* (1991) 235 Cal. App.3d 1652, 1664.
[41] *Village Laguna of Laguna Beach v. Bd. of Supervisors* (1982) 134 Cal.App.3d 1022, 1034-35.
[42] *Sierra Club v. County of Fresno* (2018) 6 Cal.5th 502.

> enable those who did not participate in its preparation to understand and to consider meaningfully the issues the proposed project raises, and (2) makes a reasonable effort to substantively connect a project's air quality impacts to likely ... consequences.[43]

This holding applies equally to an EIR's discussion of impacts and of the adequacy of mitigation measures, and restates the well-established rule that an EIR is inadequate as a matter of law where (1) it omits information required by law and (2) the omission precludes informed decision making by the lead agency or informed participation by the public.[44]

If significant effects still exist after all feasible mitigation measures and alternatives have been implemented, a project may still be approved if the "unmitigated effects are outweighed by the project's benefits."[45] However, the Supreme Court clarified that, "[e]ven when a project's benefits outweigh its unmitigated effects, ***agencies are still required to implement all mitigation measures unless those measures are truly infeasible***."[46] "The lead agency must adopt feasible mitigation measures or project alternatives to reduce the effect to insignificance; to the extent significant impacts remain after mitigation, the agency may still approve the project with a statement of overriding considerations."[47]

A statement of overriding considerations is not a substitute for the required findings on the feasibility of mitigation measures.[48] The statement must also be supported by substantial evidence in the record.[49]

The DSEIR fails to provide "a reasoned analysis supported by factual information" in response to mitigation measures proposed by the *Covington* petitioners, as directed by the Court of Appeal.[50] The DSEIR also fails to adopt two feasible mitigation measures to reduce the Project's significant fugitive ROG emissions to the greatest extent feasible. First, the Air District fails to demonstrate

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[43] *Id.* at 516, citing *Laurel Heights Improvement Assn. v. Regents of University of Cal.* ("*Laurel Heights I*") (1988) 47 Cal.3d 376, 405.
[44] *Id.*; *Madera Oversight Coalition, Inc. v. County of Madera* (2011) 199 Cal.App.4th 48,76-77.
[45] *Sierra Club.* 6 Cal. 5th at 524, citing *Laurel Heights I*, 47 Cal.3d at 391.
[46] *Sierra Club,* 6 Cal. 5th at 524-25 (emphasis added).
[47] *Center for Biological Diversity v. Department of Fish & Wildlife* (2015) 62 Cal.4th 204, 231.
[48] CEQA Guidelines § 15091(f).
[49] *Id.* § 15093(b).
[50] *Covington*, 43 Cal.App.5th at 884.
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that the lower leak rate thresholds for the LDAR program are infeasible. Second, the DSEIR fails to implement ORS, which is a feasible measure that can reduce fugitive ROG emissions. 6 cont.

A. THE DSEIR'S CONCLUSION THAT THERE IS NO ADDITIONAL FEASIBLE MITIGATION AVAILABLE TO REDUCE THE PROJECT'S FUGITIVE ROG EMISSIONS LACKS REASONED ANALYSIS AND IS NOT SUPPORTED BY SUBSTANTIAL EVIDENCE.

The original EIR found that the ROG emissions associated with operation and maintenance of the Project would be approximately 410 pounds per day ("lbs/day") and would vastly exceed the Air District's ROG significance threshold of 55 lbs/day.[51] Therefore, the EIR concluded that the impacts associated with operation and maintenance of the Project would cause or contribute to an exceedance of the state ozone 1-hour and 8-hour air quality standards.[52] The EIR concluded that no additional feasible mitigation measures were available to "substantially reduce" fugitive ROG emissions because the Project would include state of the art equipment and would implement the best available technology to limit emissions.[53] As a result, the EIR concluded that the Project would result in a significant and unavoidable impact related to long-term fugitive emissions of n-pentane.[54] The EIR adopted Mitigation Measures ("MMs") AQ-5 and AQ-6 to ensure that the fugitive releases of n-pentane would be limited to the estimated 410 lbs/day [55] 7

MM AQ-6 originally specified that repairs be implemented on a leak greater than 10,000 parts per million volume ("ppmv").[56] Comments on the original EIR included evidence showing lowering the leak rate would further reduce ROG emissions.[57] For example, air quality expert Dr. Petra Pless recommended that the Project implement a LDAR program consistent with the EPA's LDAR regulations for petroleum refineries and chemical manufacturing facilities.[58] Dr. Fox's recommendations went further, recommending a leak rate of 100 ppm for all

[51] *Id.* at 884; EIR at p. 4.2-4. 4.2-6, 4.2-12.
[52] EIR at p. 4.2-11 to 4.2-14.
[53] *Ibid.*
[54] *Ibid.*
[55] *Id.* at p. 4.2-13, 4.2-21 to 4.2-22,
[56] *Id.* at p. 4.2-22.
[57] *Covington*, 43 Cal.App.5th at 879-80.
[58] *Ibid.*; EIR at p. G-202 to G-204, G-322 to G-324; *see also* DSEIR at p. 4-1 to 4-9.
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fugitive components except pumps, which should have a leak rate no higher than 500 ppm.[59]

7 cont.

The DSEIR revises MM AQ-6 by adding additional requirements to the LDAR program, but it does not modify any of the original EIR's conclusions regarding the significance of the Project's operational ROG emissions. Revised MM AQ-6 would now mandate monthly monitoring of n-pentane emissions from fugitive components using EPA Method 21, an EPA-recommended leak detection methodology and repair protocol for petroleum refineries and chemical manufacturing facilities.[60] If the measured leak concentration exceeds 500 ppmv for pumps and 2,000 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seal, and all other fugitive components, the leak must be minimized as soon as possible but no later than 24 hours after leak discovery.[61] Finally, the revised MM AQ-6 requires leak repair to occur as soon as possible, but no later than 7 days after discovery.[62]

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While these measures include some improvements over the original version of MM AQ-6, the DSEIR continues to reject the lower leak rate thresholds previously proposed by commenters. The DSEIR admits that the lower leak rates are "partially feasible,"[63] yet rejects them with no meaningful or quantitative analysis to support the rejection. Before the District can adopt a statement of overriding considerations, the District must demonstrate that it has adopted "feasible mitigation measures or alternatives" to reduce the Project's significant ROG emissions to the greatest extent feasible.[64]

Since the DSEIR continues to conclude that ROG impacts are significant and unavoidable despite the new additions to MM AQ-6, the DSEIR still fails to comply with CEQA. The District has an ongoing duty to consider and adopt additional feasible mitigation measures or alternatives to further reduce ROG emissions to the greatest extent feasible, including the measures discussed herein.

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[59] *Covington*, 43 Cal.App.5th at 880; *see also* Fox Comments at pp. 7-9, 12-14.
[60] DSEIR at pp. 3-2, 4-5.
[61] *Id.* at p. 4-5.
[62] *Ibid.*
[63] *Id.* at p. 3-5.
[64] Pub. Resources Code § 21081; CEQA Guidelines §§ 15090, 15091.
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1. THE DSEIR FAILS TO DEMONSTRATE THE LOWER LEAK RATE THRESHOLDS ARE INFEASIBLE

The DSEIR's feasibility analysis of enhanced LDAR procedures is misleading and incomplete. The DSEIR claims to analyze the feasibility of implementing the 100 ppmv and 500 ppmv leak definitions previously recommend by Dr. Fox as feasible mitigation. However, the DSEIR does not actually analyze the proposed measures. Instead, the DSEIR states that adoption of the proposed 100 ppmv and 500 ppmv leak definitions would be "partially feasible," then goes on to discuss only the feasibility of implementing the 500 ppmv and 2,000 ppmv leak rates it intends to adopt.[65] The Air District never explains why it contends the more stringent 100 ppmv and 500 ppmv leak definition thresholds proposed by Dr. Fox would not be fully feasible for the Project. 11 12

In her comments on the DSEIR, Dr. Fox explains that implementation of the lower leak rate thresholds would substantially reduce fugitive ROG emissions.[66] Dr. Fox demonstrates that leak rate threshold of 500 ppmv for pumps, and a threshold of 100 ppmv all other fugitive components, is feasible and can substantially reduce the Project's ROG emissions by factors of four to five.[67] The thresholds recommended by Dr. Fox are based on Bay Area Air Quality Management District ("BAAQMD") Rule 8-18, BAAQMD's LDARs program for industrial facilities like the Project which rejected the federal EPA Method 21 thresholds in favor of more effective thresholds and stricter leak mitigation.[68]

As Dr. Fox explains, while Rule 8-18 does not expressly cover geothermal facilities, "[t]he nature of the fugitive components and the motive fluid that leaks (n-penante) in geothermal facilities as described in the DSEIR are similar to the fugitive components in petroleum refineries and chemical plants"[69] which are covered by Rule 8-18. In fact, petroleum refineries, chemical plants (such as synthetic organic chemical manufacturing industry), and on-shore natural gas processing plants all "use similar fugitive components in similar services that 13

[65] DSEIR at p. 3-5.
[66] Fox Comments at pp. 1-9, 12-14.
[67] *Id*. at pp. 8, 13-14.
[68] *Id*. at pp. 2-9, 12-14.
[69] *Id*. at p. 5 (internal citation omitted).

handle fluids with vapor pressures comparable to or higher than the n-pentane motive fluid in geothermal plants."[70]

Dr. Fox further explains that the BAAQMD Rule 8-18 rulemaking process, which Dr. Fox participated in, demonstrated that "all fugitive components are capable of meeting the leak rates of 100 ppm to 500 ppm, regardless of the size or type of facility where they are present."[71] BAAQMD's rulemaking record demonstrated that several hundred thousand fugitive components in a variety of facilities routinely comply with these leak rates.[72] Dr. Fox's comments and the BAAQMD Rule 8-18 rulemaking process therefore provide substantial evidence demonstrating that the lower leak thresholds are feasible, would substantially reduce the Project's ROG emissions, and must be implemented before the Project can be approved. 13 cont.

2. CONSISTENCY WITH FEDERAL STANDARDS DOES NOT MEAN LOWER LEAK RATE THRESHOLDS ARE INFEASIBLE

The DSEIR concludes that adoption of the 2,000 ppmv threshold for pumps and 500 ppmv threshold for all other fugitive components are "generally consistent with the most stringent federal [Clean Air Act] standards for equipment leaks."[73] The Air District's reliance on federal standards misses the point of the proposed lower LDAR thresholds and does not provide a complete picture of all feasible mitigation measures available to reduce n-pentane emissions, as required by CEQA. 14

While compliance with a regulatory permit or other similar process can be identified as mitigation is certain circumstances,[74] the Project is not obligated to comply with the federal standards that were cited in the DSEIR, particularly where, as here, there are more stringent standards available. In this case, the District must ensure that the DSEIR's mitigation measures reduce ROG impacts to the greatest extent feasible. The DSEIR's reliance on less stringent federal standards does not meet this requirement.

[70] *Ibid.*; *see also* DSEIR, appen. B at p. 19 ("The motive fluid (n-pentane) is a hydrocarbon compound commonly found in operations within the SOCMI and petroleum sectors.").
[71] Fox Comments at p. 8.
[72] *Id.* at p. 8.
[73] DSEIR at p. 3-5, 4-5.
[74] CEQA Guidelines § 15126.4(a)(1)(B).
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The DSEIR's reliance on federal Clean Air Act standards suffers from the same flaws that were identified in *Covington*. The *Covington* court concluded that the District's response that the LDAR program will be "conducted per USEPA methods" was inadequate because it failed to explain why the stricter LDAR program would not be feasible for the Project.[75] Here, the DSEIR concludes the 500 ppmv and 2,000 ppmv leak definitions are feasible because they are generally consistent with federal Clean Air Act standards,[76] but it does not explain why the more stringent BAAQMD standards would be infeasible.

14 cont.

To the contrary, the DSEIR acknowledges that the BAAQMD standards would be "partially feasible,"[77] but fails to provide any detail or quantitative analysis to support the District's decision to reject the thresholds. For example, the DSEIR fails to disclose the comparative emissions reductions that would be achieved using EPA Method 21 thresholds versus using the BAAQMD thresholds. Without this information, it is impossible for either the District or the public to assess the difference in ROG emission reductions that would be achieved under each set of thresholds. The DSEIR thus fails to document the emissions reductions that will be lost by the District's failure to implement the proposed 100 ppmv and 500 ppmv leak thresholds. The DSEIR therefore fails to "include sufficient detail to enable those who did not participate in its preparation to understand and to consider meaningfully the issue," as required by CEQA.[78]

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The DSEIR includes a cursory discussion which acknowledges the existence of BAAQMD's equipment leak thresholds, but it fails to analyze them in relation to the Project. The DSEIR states:

> The Bay Area Air Quality Management District (BAAQMD) and the South Coast Air Quality Management District (SCAQMD) have promulgated leak definitions as low as 100 ppmv for some equipment (valves and connections) located at petroleum refineries and chemical plants. Additionally, some BACT determinations for reducing fugitive emissions of organic compounds at major stationary sources of [volatile organic compounds] have also set BACT to include a leak definition threshold of 100 ppmv.[79]

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[75] *Covington*. 43 Cal.App.5th at 912-13.
[76] DSEIR at p. 3-5.
[77] *Ibid*.
[78] *Sierra Club*, 6 Cal.5th at 516.
[79] DSEIR at p. 3-2; *see also id*., appen. B at p. 12.
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Beyond acknowledging the existence of lower thresholds, the DSEIR lacks any analysis of the feasibility of implementing lower leak rate thresholds for the Project. Instead, the DSEIR simply concludes that implementation of the lower thresholds "has the potential to reduce fugitive ROG emissions associated with the Project,"[80] yet rejects them without explanation. Therefore, the DSEIR cannot conclude that the no additional feasible mitigation measures exist to further reduce fugitive ROG emissions. 16 cont.

Dr. Fox's comments provide critical details that are missing from the DSEIR by demonstrating that the 100 ppmv and 500 ppmv thresholds are indeed feasible, would substantially lessen ROG emissions, and should therefore be adopted as additional mitigation for the Project. Dr. Fox explains that the facilities that are subject to the federal standards cited in the DSEIR are substantially similar to the facilities subject to the more stringent BAAQMD rule, and that application of the rule to the Project would facilitate ROG reductions by four or five fold.[81] The facilities regulated by BAAQMD Rule 8-18 "use similar fugitive components in similar services that handle fluids with vapor pressures comparable to or higher than n-pentane motive fluid in geothermal plants."[82] Thus, Dr. Fox concludes that the lower leak rate thresholds are feasible for the Project and must be required as mitigation. 17

3. MITIGATION MEASURE AQ-6 FAILS TO IDENTIFY AND MITIGATE ALL FUGITIVE EMISSION SOURCES

MM AQ-6 requires the Applicant to inspect "flanges valves, pump seals, safety relief valves, n-pentane accumulator vessels, turbine gland seals, and other fugitive components."[83] But the proposed measure excludes several key components from LDAR monitoring.[84] As a result, these components would become a major source of Project ROG emissions that are not regulated by MM AQ-6.[85] 18

For example, Dr. Fox explains that flanges and connectors make up the largest quantity of fugitive components in the Project, but the proposed mitigation

[80] *Id.* at p. 3-5.
[81] Fox Comments at p. 8-9, 11, 14.
[82] *Id.* at p. 5.
[83] DSEIR at p. 4-7 to 4-8.
[84] Fox Comments at p. 6-7.
[85] *Ibid.*

measure excludes connectors from monitoring.[86] Similarly, the purge system, heat exchanges, and turbines are each major sources of ROG emissions, but are not expressly included in the monitoring program.[87] Leaks could also occur in underground piping and around well heads which would not be detected by the proposed LDAR program.[88] Dr. Fox concludes that MM AQ-6's omission of these critical sources of fugitive emissions from monitoring and leak repair is likely to result in significant, unmitigated ROG emissions.[89] MM AQ-6 must be revised to include these emission sources and identify the methods required to detect and mitigate them.

18 cont.

4. THE DSEIR ERRONEOUSLY CONCLUDES THAT THE LOWER LEAK RATE THRESHOLDS WOULD NOT SUBSTANTIALLY REDUCE ROG EMISSIONS

The DSEIR's conclusion that a leak definition threshold of less than 2,000 ppmv for motive fluid pumps and 500 ppmv for all other fugitive components "would not substantially reduces emissions" is conclusory and unsupported by any evidence.[90] In support of this assertion, the Air District first attempts to rely on information contained in the EPA's Leak and Detection Repair: A Best Practices Guide ("LDAR Best Practices Guide"),[91] specifically, Table 4.1, which describes the control effectiveness for an LDAR program at a chemical process unit and a refinery.[92] However, the DSEIR's recitation of this evidence with respect to pumps is factually inaccurate and incomplete.

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The DSEIR claims that Table 4.1 shows that "a monthly monitoring program with a leak rate of 10,000 ppmv can reduce emissions by 76 percent, when referring to liquids, and 88 percent when referring to gas, and a program with a leak rate of 500 ppmv can reduce emissions by 95 percent when referring to liquids, and 96 percent for when referring to gas."[93] While this statement may be true for refinery *valves*, it is not true for *pumps*.

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[86] *Id*. at p. 6.
[87] *Id*. at p. 7.
[88] *Ibid*.
[89] *Ibid*.
[90] DSEIR at p. 3-5.
[91] *Ibid*.
[92] U.S. Environmental Protection Agency, Leak Detection and Repair: A Best Practices Guide (2007) p. 7 (*hereinafter* "LDAR Best Practices Guide"), *available at* https://www.epa.gov/sites/production/files/2014-02/documents/ldarguide.pdf.
[93] *Ibid*.

In fact, Table 4.1 shows that a monthly monitoring program with a leak definition of 10,000 ppmv for refinery pumps can reduce emissions by 68 percent, while a program with a leak definition of 500 ppmv can reduce emissions by 88 percent. Implementing the 500 ppmv for pumps as recommend by Dr. Fox would therefore result in a 20 percent emissions reduction when compared with the EIR's original threshold. Thus, the LDAR Best Practices Guide does not support the DSEIR adoption of a 2,000 ppmv threshold for pumps.

Table 4.1 – Control effectiveness for an LDAR program at a chemical process unit and a refinery.

Equipment Type and Service	Control Effectiveness (% Reduction)		
	Monthly Monitoring 10,000 ppmv Leak Definition	Quarterly Monitoring 10,000 ppmv Leak Definition	500 ppm Leak Definition[a]
Chemical Process Unit			
Valves – Gas Service[b]	87	67	92
Valves – Light Liquid Service[c]	84	61	88
Pumps – Light Liquid Service[c]	69	45	75
Connectors – All Services			93
Refinery			
Valves – Gas Service[b]	88	70	96
Valves – Light Liquid Service[c]	76	61	95
Pumps – Light Liquid Service[c]	68	45	88
Connectors – All Services			81

Source: Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

[a] Control effectiveness attributable to the HON-negotiated equipment leak regulation (40 CFR 63, Subpart H) is estimated based on equipment-specific leak definitions and performance levels. However, pumps subject to the HON at existing process units have a 1,000 to 5,000 ppm leak definition, depending on the type of process.
[b] Gas (vapor) service means the material in contact with the equipment component is in a gaseous state at the process operating conditions.
[c] Light liquid service means the material in contact with the equipment component is in a liquid state in which the sum of the concentration of individual constituents with a vapor pressure above 0.3 kilopascals (kPa) at 20°C is greater than or equal to 20% by weight.

CEQA does not require courts to uphold every agency conclusion simply because it is based on some evidence. Rather, the court is required to find that "argument, speculation, unsubstantiated opinion or narrative, [or] evidence which is clearly inaccurate or erroneous" is not substantial evidence.[94] Courts may reverse an agency's decision if a reasonable person could not reach the conclusion reached by the agency based on the evidence before the agency.[95] Because the DSEIR's feasibility analysis for the pump leak rate threshold relies on clearly erroneous evidence, the DSEIR's conclusions are not supported by substantial evidence.

19 cont.

[94] Pub. Resources Code § 21082.2(c); CEQA Guidelines § 15384(b).
[95] *McMillan v. American Gen. Fin. Corp.* (1976) 60 Cal.App.3d 175, 186.
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Second, the DSEIR's statement that the suggested 100 ppmv and 500 ppmv thresholds will not substantially reduce emissions amounts to a "bare conclusion," in violation of CEQA.[96] The DSEIR must accurately reflect the effect of the proposed air quality mitigation measures.[97] "An EIR's designation of a particular adverse environmental effect as 'significant' does not excuse the EIR's failure to reasonably describe the nature and magnitude of the adverse effect."[98]

Here, the DSEIR relies on an erroneous description of control effectiveness for pumps.[99] Moreover, Table 4.1 does not show the control effectiveness from implementing the suggested 100 ppmv leak rate definition for all fugitive components except pumps or the adopted threshold of 2,000 ppmv for pumps. Other than Table 4.1, neither the DSEIR, nor the Air District's consultant, attempt to quantify the emission reductions that would result from implementing the various leak definition thresholds.[100] The Air District cannot claim a more stringent threshold is incapable of substantially reducing emissions when it provides no evidence showing the comparative effectiveness of the suggested 100 ppmv threshold or the adopted 2,000 ppmv threshold. 20

Dr. Fox concludes that "[i]mplementation of the 100 ppm and 500 ppm leak rates will substantially reduce fugitive ROG emissions."[101] In fact, MM AQ-6 "allows five times more ROG emissions from all fugitive components except pumps and compressors, and four times more ROG emissions from pumps and compressors than routinely achieved for similar components under the BAAQMD rule."[102] Moreover, BAAQMD's Rule 8-18 proceedings demonstrate that ROG emissions from the Project's fugitive components can be reduced by adopting BAAQMD's current leak detection threshold for the Project.[103] Therefore, the District's conclusion that the lower leak rate thresholds would not substantially reduce ROG emissions is not supported by substantial evidence. 21

[96] *Sierra Club,* 6 Cal.5th at 522.
[97] *Ibid.*
[98] *Cleveland National Forest Found. v. San Diego Assn. of Gov'ts (2017)* 3 Cal.5th 497, 514.
[99] DSEIR at p. 3-5.
[100] *Id.*, appen. B at pp. 24-25.
[101] Fox Comments at p. 13.
[102] *Id.* at p. 8, 13-14.
[103] *Id.* at p. 9.
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5. THE DSEIR'S RELIANCE ON *SAN FRANCISCANS FOR REASONABLE GROWTH V. CITY AND COUNTY OF SAN FRANCISCO* IS MISPLACED

The Air District concludes that implementation of leak definitions lower than those adopted in the DSEIR "has the potential to reduce fugitive ROG emissions associated with the Project."[104] However, the DSEIR declines to adopt more stringent leak definitions because further reductions "would not substantially reduce emissions."[105] Although the DSEIR does not expressly identify the legal authority for this proposition, it likely relies on *San Franciscans for Reasonable Growth v. City and County of San Francisco.*[106] The DSEIR's dependence on this case is misplaced because that case did not involve mitigation of a significant and unavoidable impact. 22

In *San Franciscans for Reasonable Growth*, the EIRs at issue did not identify an impact on open space as a significant environmental effect.[107] Nonetheless, the appellants asserted that open space and park fund exactions were necessary to alleviate other identified environmental effects, including increased energy consumption.[108] The court held that the agency had not duty under CEQA to consider the feasibility and available of additional remedies because the project's contribution to cumulative energy impacts was insignificant.[109] The court explained that the agency's "duty to condition project approval on incorporation of feasible mitigation measures only exists when such measures would 'substantially lessen' a significant environmental effect."[110] 23

The agency's duty to mitigate impacts is subject to a higher standard when the agency finds that an environmental impact is significant and unavoidable. In those instances, CEQA requires that lead agencies implement all mitigation measures before the impact can be declared significant and unavoidable, unless those measures are truly infeasible.[111] CEQA must be interpreted to afford the fullest possible protection to the environment within the reasonable scope of the

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[104] DSEIR at p. 3-5.
[105] *Ibid*.
[106] *Covington,* 43 Cal.App.5th at 879, citing *San Franciscans for Reasonable Growth v. City and County of San Francisco* (1989) 209 Cal.App.3d 1502, 1519.
[107] *San Franciscans for Reasonable Growth,* 209 Cal.App.3d at 1517.
[108] *Ibid*.
[109] *Id.* at 1520.
[110] *Id.* at 1519.
[111] Pub. Resources Code § 21081; *Sierra Club,* 6 Cal.5th at 524-25 (emphasis added).
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statutory language.[112] Thus, the agency must determine, based on substantial evidence, whether all proposed mitigation measures are feasible. If the agency concludes the proposed mitigation measure is feasible, then the agency must adopt the measure before it can adopt a statement of overriding considerations.[113]

23 cont.

The Air District has failed to demonstrate that that the lower leak rate thresholds proposed by Dr. Fox are infeasible. Rather, the DSEIR does not dispute that lower thresholds would reduce the Project's operational ROG emissions,[114] and acknowledges that the lower thresholds are at least partially effective.[115] Moreover, unlike the measures proposed in *San Franciscans for Reasonable Growth*, the lower thresholds proposed by Dr. Fox are not just any "nickel and dime mitigation scheme;"[116] rather, they are effective, feasible measures that would substantially reduce ROG emissions as demonstrated during BAAQMD's rulemaking process and in the comments of Dr. Fox, a highly qualified and well-respected air quality expert whose opinions on air quality and health risk impacts have been upheld by the California Court of Appeal and California Supreme Court.[117] Because the lower thresholds are feasible and minimize the Project's significant air quality impacts, CEQA requires that these measures be adopted before it can approve the Project.

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6. THE DSEIR'S "PARTIAL FEASIBILITY" FINDINGS VIOLATE CEQA

The Air District concludes that the suggested leak definition thresholds of 500 ppmv for pumps and 100 ppmv for all other fugitive components are "partially feasible."[118] A finding of "partial feasibility" violates CEQA because it does not sufficiently inform interested parties of the basis for the District's actions. The DSEIR's "partial feasibility" findings would be struck down in the same manner as the "partial mitigation" findings in *Rural Landowners Assn. v. Lodi City Council*.[119]

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[112] *Friends of Mammoth.* 8 Cal.3d at 259.
[113] *Sierra Club.* 6 Cal.5th at 524.
[114] DSEIR at p. 3-5 ("Implementation of a lower leak definition has the potential to reduce fugitive ROG emissions associated with the Project."); Fox Comments at pp. 7-9.
[115] *Sierra Club*, 6 Cal.5th at p. 523.
[116] *San Franciscans for Reasonable Growth,* 209 Cal.App.3d at 1519.
[117] Fox Comments at pp. 1-9, 12-14; *see e.g. Berkeley Keep Jets Over the Bay. v. Board of Port Commissioners* (2001) 91 Cal.App.4th 1344, 1365-67; *Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 317.
[118] DSEIR at p. 3-5.
[119] *Rural Landowners Assn. v. Lodi City Council* (1983) 143 Cal.App.3d 1013, 1023-24.
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In that case, the EIR and Lodi City Council concluded that several of the project's significant impacts (i.e., increased vehicle omissions, construction activities, increased population, increased population, particularly in school aged children) would be "partially mitigated."[120] The trial court found that "partial mitigation' meant the same as "mitigation."[121]

On appeal, the court held that the agency's findings failed to sufficiently apprise interested parties and the courts of the bases for the administrative action.[122] The appellate court explained that the City Council's use of the modifier "partially" was "sufficiently ambiguous to allow for a range of meaning from almost unaffected to almost eliminated."[123] It emphasized that "the finding of 'partial' mitigation is of little value to someone who must decide whether certain recognized significant impacts have been avoided or substantially lessened to an acceptable level" consistent with CEQA's requirements.[124] On remand, the court directed the City Council to "specify whether or not the identified impacts have been avoided or substantially lessened."[125]

Here, as in *Rural Landowners Assn.,* the DSEIR fails to comply with CEQA because interested parties would not able to discern whether the more stringent leak definition thresholds suggested by commenters are truly infeasible. To the contrary, the DSEIR's finding of partial feasibility implies that the lower thresholds are, in fact, feasible.[126] Therefore, CEQA requires that the 100 ppmv and 500 ppmv leak rate thresholds be adopted to mitigate the Project's ROG emissions.

25 cont.

B. OPTICAL REMOTE SENSING IS A FEASIBLE MITIGATION MEASURE THAT MUST BE ADOPTED TO REDUCE THE PROJECT'S FUGITIVE ROG EMISSIONS

ORS measures the emission of VOCs and other pollutants to detect leaks in hard to access places and is more effective than conventional LDAR programs that rely on hand-held monitoring.[127] For example, ORS has been used to discover a pin-

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[120] *Id*. at p. 1023.
[121] *Ibid.*
[122] *Id*. at p. 1024, citing *San Francisco Ecology Center v. City and County of San Francisco* (1975) 48 Cal.App.3d 584, 596.
[123] *Ibid*.
[124] *Id*. at pp. 1023-24 (footnotes omitted).
[125] *Id.* at p. 1024.
[126] *See* Fox Comments at pp. 1-9, 12-14.
[127] *Id*. at pp. 9-12.
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hole size leak in a pipeline buried 30 cm below ground.[128] The Project includes pipelines and geothermal wells which would not be detected by the proposed LDAR program.[129] Dr. Fox explains that implementation of ORS would result in much greater reductions than the proposed LDAR program because ROG emissions from equipment leaks are underestimated by factors of 3 to 20 when utilizing conventional EPA emission factors.[130]

26 cont.

ORS is feasible mitigation for the Project because it is widely used to estimate and monitor ROG emissions at industrial facilities.[131] Therefore, the DSEIR must be revised to implement this additional feasible mitigation measure before it can approve the Project.

IV. THE AIR DISTRICT VIOLATED CEQA AND THE CALIFORNIA PUBLIC RECORDS ACT BY FAILING TO PROVIDE ALL DSEIR REFERENCE DOCUMENTS AND OTHER PUBLIC RECORDS

CEQA requires that "all documents referenced in the draft environmental impact report or negative declaration" shall be made "available for review" during the public review period.[132] The California Public Records Act ("CPRA") further provides that "access to information concerning the conduct of the people's business is a fundamental and necessary right of every person in this state."[133] The CPRA "embodies a strong policy in favor of disclosure of public records, and any refusal to disclose public information must be based on a specific narrowly construed exception to that policy."[134] "If the records sought pertain to the conduct of the people's business, there is public interest in disclosure."[135] The burden of proof and of persuasion of the existence of an exception to disclosure is on the government agency seeking to withhold documents from disclosure.[136]

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[128] Fox Comments at pp. 10-11.
[129] DSEIR at p. 1-3.
[130] Fox Comments at p. 11.
[131] Fox Comments at p. 9-12.
[132] *Ultramar v. South Coast Air Quality Man. Dist.* (1993) 17 Cal.App.4th 689, 699; *see also* CEQA Guidelines § 15087(c)(5) ("all documents incorporated by reference in the EIR will be available for public review" and "readily accessible to the public.").
[133] Gov't Code § 6250.
[134] *Bakersfield City School Dist. v. Superior Court* (2004) 118 Cal.App.4th 1041, 1045; *San Gabriel Tribune v. Superior Court* (1983) 143 Cal.App.3d 762, 772-73.
[135] *Citizens for a Better Environment v. Dept. of Food and Agriculture* (1985) 171 Cal.App.3d 704, 715.
[136] *Id*. at p. 711; Gov't Code § 6255.
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On August 31, 2020, our office submitted a request for immediate access to documents referenced in the DSEIR pursuant to CEQA.[137] That same day, our office also submitted a CPRA request for immediate access to public records referring or related to the Project since the date of our last request on April 14, 2020.[138]

On September 4, 2020, the Air District's counsel requested further clarification regarding our two requests.[139] On September 8, 2020, our office clarified that we submitted two separate request: the first for reference documents pursuant to CEQA, and the second for "public records."[140] We also specifically requested that the responsive documents include the Project permit application that incorporates the stronger LDAR program referenced in the DSEIR, all related correspondences, and the Project's draft air permit.[141]

On September 10, 2020, the Air District's counsel responded that the District had identified documents responsive to our CPRA request.[142] On September 21, 2020, the District produced some, but not all DSEIR reference documents, and did not produce any other "public records."[143] For example, the District failed to provide documents referenced and relied upon by the District's consultant, including the

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[137] Letter to Phillip L. Kiddoo, Air Pollution Control Officer, Great Basin Unified Air Pollution Control District from Sheila M. Sannadan, Adams Broadwell Joseph & Cardozo re: Request for Immediate Access to Documents Referenced in the Draft Supplemental Environmental Impact Report – Casa Diablo IV Geothermal Power Plant Project (SCH No. 2011041008) (Aug. 31, 2020).
[138] Letter to Phillip L. Kiddoo, Air Pollution Control Officer, Great Basin Unified Air Pollution Control District from Sheila M. Sannadan, Adams Broadwell Joseph & Cardozo re: Request for Immediate Access to Public Records – Casa Diablo IV Geothermal Power Plant Project (SCH No. 2011041008) (Aug. 31, 2020).
[139] Letter to Sheila M. Sannadan, Adams Broadwell Joseph & Cardozo from Peter Hsiao, King & Spalding, LLP re: Request for Immediate Access to Documents Referenced in the Draft Supplemental Environmental Impact Report – Casa Diablo IV Geothermal Power Plant Project (SCH No. 2011041008) (Sept. 4, 2020).
[140] Letter to Peter Hsiao, King & Spalding, LLP from Andrew J. Graf, Adams Broadwell Joseph & Cardozo re: Request for Immediate Access to Documents Referenced in the Draft Supplemental Environmental Impact Report – Casa Diablo IV Geothermal Power Plant Project (SCH No. 2011041008) (Sept. 8, 2020).
[141] *Id*. at p. 2.
[142] Letter to Andrew J. Graf, Adams Broadwell Joseph & Cardozo from Peter Hsiao, King & Spalding, LLP (Sept. 10, 2020).
[143] Letter to Adams Broadwell Joseph &Cardozo from Great Basin Unified Air Pollution Control District re: Public Records Act Request Response: Documents Referenced in the Draft Supplemental Environmental Impact Report – Casa Diablo IV Geothermal Power Plant (SCH No. 20111041008) (Sept. 17, 2020).
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documents identified in the references section of Appendix B and the process flow diagrams and piping and instrumentation diagrams provided by the Applicant.[144]

While consultant's files are not always subject to disclosure if the files are not in the possession of the agency, these documents are referenced in the DSEIR, and are therefore subject to mandatory disclosure under CEQA.[145] The District should therefore be in possession of all DSEIR reference documents during the public comment period, and must promptly disclose them upon request by any member of the public.[146] Even if the District did not possess these documents when the DSEIR's public comment period began, our August 31, 2020 letter requesting access to documents referenced in the DSEIR triggered the duty for the District to obtain the files from the consultant to provide to CURE. The District's refusal to timely provide these documents violates CEQA.

28 cont.

Moreover, the District is in violation of the CPRA because it has failed to produce any other public records related to the Project, as specifically requested in our August 31, 2020 CPRA request. The CPRA request sought access to a broader set of public records than the CEQA request, including all public records referring or related to the Project since the date of our last request on April 14, 2020. The District's duty to provide access to public records upon request is governed by CPRA Government Code requirements, which requires public records to be "open to inspection at all times during the office hours of the state or local agency" and provides that "every person has a right to inspect any public record."[147] The duty to provide access to public records pursuant to the CPRA is distinct from, and in addition to, the District's obligation to provide access to the DSEIR reference documents under CEQA.

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Our request included, but was not limited to, any and all materials, applications, correspondence, resolutions, memos, notes, analyses, electronic

[144] Letter to Phillip L. Kiddoo, Air Pollution Control Officer, Great Basin Unified Air Pollution Control District from Andrew J. Graf, Adams Broadwell Joseph & Cardozo re: Request for Extension of Comment Period for the Draft Supplemental Environmental Impact Report – Casa Diablo IV Geothermal Power Plant Project (SCH No. 2011041008), Access to DSEIR Reference Documents, and Access to Responsive Documents Pursuant to the California Public Records Act (Oct. 6, 2020).
[145] Pub. Resources Code § 21092(b)(1); CEQA Guidelines § 15087(c)(5).
[146] *Ibid.*
[147] Gov. Code § 6253(a).
2632-085acp

messages, files, maps, charts, and/or any other documents related to the Project.[148] Yet, the District has not provided CURE with access to a single email or other correspondence sent to or received by the agency regarding the Project between April 14, 2020 and the date of our request.[149] Nor has the District provided access to the permit application which incorporates the LDAR program proposed in the DSEIR or the draft air permit, or any other requested documents.[150] Because the District has not provided access to the requested public records, it is in violation of the CPRA. 29 cont.

V. CONCLUSION

The DSEIR suffers from many of the same defects the *Covington* court found with the original EIR. The Air District failed to adopt all feasible mitigation measures to reduce fugitive ROG emissions, and it failed to provide a "reasoned analysis" of the proposed measures. The District must provide a good-faith, reasoned analysis for not adopting the stricter leak rates in a revised SEIR. 30

In addition, there is substantial evidence demonstrating that implementation of ORS is feasible for the Project and can substantially reduce the Project's fugitive ROG emissions. By contrast, there is insufficient evidence in the record to find that ORS or any other further mitigation measures are infeasible. The Air District cannot approve the Project when additional feasible mitigation measures are available to further reduce fugitive ROG emissions. 31

Finally, the Air District has violated CEQA and the CPRA by failing to produce all documents referenced and relied upon by the DSEIR and all public records referring or related to the Project. 32

We urge the County to fulfill its responsivities under CEQA by rectifying the errors we have identified in a revised SEIR and producing the requested documents. This is the only way the Air District and the public can ensure the Project's significant and unavoidable impacts are mitigated to the maximum extent feasible.

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[148] Email to Peter Hsiao, King & Spalding, LLP from Andrew J. Graf, Adams Broadwell Joseph & Cardozo re: RE: Letter re Great Basin Unified Air Pollution Control District (Oct. 11, 2020).
[149] *Ibid.*
[150] *Ibid.*

Thank you for your consideration of these comments.

Sincerely,

Andrew J. Graf
Associate

Attachment

AJG:acp

2632-085acp

ATTACHMENT A

Phyllis Fox, PhD, PE
745 White Pine Avenue
Rockledge, FL 32955
321-626-6885

October 13, 2020

Andrew Graf
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Dear Mr. Graf:

As you requested, I have reviewed the Draft Supplemental Environmental Impact Report (DSEIR) prepared by the Great Basin Unified Air Pollution Control District (GBUAPCD) for the Casa Diablo IV geothermal power plant project (Project).[1] I have also reviewed the Project's June 2013 Joint Environmental Impact Statement and Environmental Impact Report and its appendices.[2] I previously submitted joint comments with Bill Powers, PE, in September 2013 on the project's draft authority to construct permit.[3]

The proposed facility will emit significant amounts of reactive organic gases (ROG) in the form of n-pentane leaks from components such as pumps, valves, and connectors. These leaks are referred to as "fugitive emissions" because they arise from unintentional losses due to component design, normal wear and tear, improper or incomplete assembly of components, inadequate material specification, manufacturing defects, damage during installation or use, corrosion, fouling, and other environmental effects. Components tend to have greater average emissions when subjected to frequent thermal cycling, vibration, or cryogenic service, such as occurs in geothermal plants. 33

[1] Great Basin Unified Air Pollution Control District, Casa Diablo IV Geothermal Power Plan Draft Supplemental Environmental Impact Report, August 2020.

[2] United States Department of the Interior, Bureau of Land Management, Untied States Department of Agriculture, Forest Service, and Great Basin Unified Air Pollution Control District, Casa Diablo IV Geothermal Development Project Final Joint Environmental Impact Statement and Environmental Impact Report, June 2013.

[3] Fox and Powers, Comments on Draft Authority to Construct Permit Casa Diablo IV Geothermal Development Project, September 12, 2013. Exhibit 1.

The DSEIR requires that the Project use state-of-the-art equipment and best available control technology (BACT) to limit ROG emissions from fugitive components. However, after imposing these controls, ROG emissions remain significant. Thus, all feasible mitigation must be required. Additional feasible mitigation is available to control ROG emissions from fugitive components that is not required in the DSEIR.

The Proposed LDAR Program

The major source of ROG emissions at the facility is from fugitive components including flanges, valves, pumps, and turbine seals.[4] These emissions will be controlled using low-leak technology and a leak detection and repair (LDAR) program. LDAR programs control leaks by periodically measuring the ROG concentration at the face of each component and repairing them within a specified time period if the measured concentration exceeds a specified leak rate. The effectiveness of an LDAR program depends on the leak rate that triggers repair, the frequency of leak monitoring, and the time between detection and mandatory repair or replacement of the leaking component. 34

Project ROG emissions remain significant after imposition of the LDAR program specified in the DSEIR. Thus, all feasible mitigation for ROG emissions from fugitive leaks must be required to satisfy CEQA. The DSEIR asserts that the leak definitions threshold it adopted for mitigation measures at the geothermal plant are "generally consistent with the most stringent federal CAA standards for equipment leaks."[5] Subpart VVa is "Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006."[6] Subpart OOOOa refers to "Standards of Performance for Crude Oil and Natural Gas Facilities for Which Construction, Modification or Reconstruction Commenced After September 18, 2015."[7]

However, as I demonstrate below, these federal standards are not the most effective methods to control fugitive leaks, nor are they the only feasible methods. Thus, the DSEIR failed to require all feasible measures to reduce ROG emissions from fugitive components. Additional mitigation, not required in these federal standards or the DSEIR, is feasible for ROG emissions from fugitive components. Other California 35

[4] Fox/Powers Comments, p. 2, Table 1.

[5] DSEIR, Appendix B, p. 24, footnotes 5 and 6, citing: 40 CFR, Part 60, Subpart VVa and OOOa.

[6] See https://www.law.cornell.edu/cfr/text/40/part-60/subpart-VVa.

[7] See https://www.law.cornell.edu/cfr/text/40/part-60/subpart-OOOOa.

air districts, for example, have developed fugitive emission controls based on the LDAR concept. These other programs use a lower ROG leak rate and other measures that result in significantly lower ROG emissions than the federal LDAR standards relied on in the DSEIR.

Three air districts in California have equipment leak regulations that are more stringent than the LDAR program relied on in the DSEIR. The subject rules are: (1) the Bay Area Air Quality Management District's (BAAQMD) Rule 8-18;[8] (2) the Ventura County Air Pollution Control District's (VCAPCD) Rule 74.7; and (3) the South Coast Air Quality Management District's (SCAQMD) Rule 1173. The BAAQMD rule has been incorporated into the California State Implementation Plan (SIP), making it an enforceable federal law in addition to a mandatory BAAQMD rule.[9] The rules of these four districts are summarized and compared in the Fox/Powers comments.[10]

35 cont.

The most stringent equipment leak requirements that I am aware of are in BAAQMD Rule 8-18.[11] The staff reports prepared by the BAAQMD document the basis for this rule.[12] Table 1 compares BAAQMD Rule 8-18 with the federal regulations governing fugitive components relied on in the DSEIR. A review of Table 1 indicates that the BAAQMD rule is significantly more stringent and will reduce significantly more of the ROG emissions than the federal regulations relied on in the DSEIR.

[8] BAAQMD Regulation 8, Organic Compounds, Rule 18, Equipment Leaks; https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-18-equipment-leaks/documents/rg0818.pdf?la=en.

[9] SIP version of BAAQMD Rule 8-18; http://yosemite.epa.gov/R9/r9sips.nsf/AgencyProvision/B21965BA48A6EC82882569900057D482?OpenDocument.

[10] Fox/Powers Comments, Appendix A: Comparison of the Basic Provisions of the Fugitive Emissions Rules of Four California Air Districts, pdf 558, 599, and 698.

[11] BAAQMD Regulation 8 Rule 18: Equipment Leaks; https://www.baaqmd.gov/rules-and-compliance/rules/reg-8-rule-18-equipment-leaks.

[12] Fox/Powers Comments, BAAQMD, Proposed Amendments, Regulation 8 (Organic Compounds) Rule 18: (Equipment Leaks), pdf 567; and BAAQMD, Proposed Amendments Regulation 8 Rule 18: Equipment Leaks Control Measure SS-16, January 2004, pdf 573, incorporated herein by reference in their entirety.

Table 1: Comparison of BAAQMD Rule 8-18 with Federal Regulations[13]

BAAQMD Reg. 8, Rule 18	40 CFR60 VV, GGG, 40 CFR63 CC
Applicability	
Components at petroleum refineries, chemical plants, bulk plants and bulk terminals.	Affected equipment in petroleum refineries, synthetic organic chemicals manufacturing facilities, onshore natural gas processing plants.
Requirements	
LDAR program for components in light liquid/gas/vapor. Quarterly inspections. Inaccessible components inspected annually.	Pumps and valves inspected monthly. Valves in light liquid/gas/vapor service inspected monthly. After two monthly inspections without leaks, they may be inspected quarterly until a leak is detected.
Leak threshold at 100 ppm for valves, connectors, 500 ppm for pumps, compressors and PRDs in gas/vapor/light liquid service.	Leak threshold at 10,000 ppm for pumps and valves in heavy liquid service.
Leaks detected by operator minimized within 24 hours and repaired within 7 days. A percent of non repairable components may delay repair until unit turnaround. Leaks detected by BAAQMD repaired within 24 hours.	Pumps, valves, PRDs and connectors in light liquid/gas/vapor service leak threshold at 10,000 ppm. Compressors required to have a seal system with barrier fluid. PRDs in gas/vapor service leak threshold at 500 ppm.
	Leaks > 10K ppm 15 days repair maximum, first attempt at repair within 5 days.
Recordkeeping and Reporting	
Submit quarterly reports of non repairable components and their leak rates.	Submit semiannual reports containing the number of components, by type, that were repaired and for which repair was delayed, and the reason for delay.
Test Methods	
U.S. EPA Method 21 for leak screening, ASTM Method D86 for VOC content of liquids.	U.S. EPA Method 21 for leak screening, ASTM E-260, E-168, E-169 for the VOC content, ASTM Method D-2879 for the vapor pressure.

35 cont.

[13] Fox/Powers Comments, pdf 558-559, Appendix A: Comparison of the Basic Provisions of the Fugitive Emissions Rules of Four California Air Districts.

Exemptions	
Components handling liquids with an initial boiling point greater than 302^0 F.	Components that present a safety hazard
Components operating under negative pressure or enclosed systems and PRDs vented to vapor recovery or disposal system.	Components handling fluids with less than 10% by weight VOC.
Pressure vacuum valves on storage tanks.	Components operating under negative pressure, pumps with a closed vent system, PRDs vented to a control device.
PRDs installed for thermal protection of liquid lines provided they are vented to a drain or back in the line	
Administrative requirements for equipment handling organic liquids with an initial boiling point greater than 302^0 F.	

35 cont.

I participated in the development of BAAQMD Rule 8-18, which applies to petroleum refineries, chemical plants, bulk plants, and bulk terminals. The nature of the fugitive components and the motive fluid that leaks (n-pentane) in geothermal facilities, as described in the DSEIR,[14] is similar to fugitive components found in petroleum refineries and chemical plants.

The DSEIR relies on federal LDAR regulations, as summarized in Table 1. These regulations were developed for petroleum refineries, the synthetic organic chemical manufacturing industry (SOCMI), and onshore natural gas processing plants. Neither of these regulations directly addresses geothermal plants, which were minor sources of fugitive emissions when these rules were adopted. However, both rules equally apply to geothermal plants because they use similar fugitive components in similar services that handle fluids with vapor pressures comparable to or higher than the n-pentane motive fluid in geothermal plants.

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In fact, the GBUAPCD's consultant concludes that "[w]ith no documented fugitive emission mitigation measures specific to binary plants in the geothermal power sector available in the public domain, such measures and practices employed in the SOCMI, petroleum refining and upstream oil and gas production industry sectors were evaluated. The motive fluid (n-pentane) is a hydrocarbon compound commonly found in operations within the SOCMI and petroleum sectors."[15] Thus, there is no basis in the record for failing to adopt the most stringent controls for fugitive emissions of ROG.

[14] DSEIR, p. 4-4.

[15] DSEIR, Appendix B, p. 19.

The Proposed LDAR Program Is Not Adequate to Mitigate Significant ROG Impacts

The DSEIR concludes that ROG emissions are significant and unavoidable after adopting all feasible mitigation.[16] However, the DSEIR has failed to require all feasible mitigation. The DSEIR's conclusion is therefore unsupported by the record.

The LDAR program proposed in the DSEIR to control ROG emissions from fugitive leaks requires monthly monitoring of the ROG concentrations from fugitive components using EPA Method 21. If the measured leak concentration exceeds 2,000 ppmv for pumps and 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, the turbine gland seal, and all other fugitive components, the leak must be minimized as soon as possible but no later than 24 hours after leak discovery. Leak repair shall occur as soon as possible and no later than 7 days after discovery.[17]

The DSEIR is ambiguous as to whether connectors will be monitored as the DSEIR does not specifically identify them in Mitigation Measure AQ-6.[18] Nor are they listed in summary Table 1: Feasible LDAR Work Practices for Motive Fluid Process Equipment in VOC (n-Pentane) Service of the consultant's report attached as Appendix B to the DSEIR.[19] Further, the consultant's report states that "[m]onitoring of connectors is not required by NSPS [New Source Performance Standards], but is usually conducted during monitoring surveys for valves."[20] However, elsewhere the consultant asserts that "the LDAR program would focus on valves and connectors."[21] Flanges and connectors make up the largest quantity of fugitive components—440 compared to 4 to 16 for other sources[22]—and thus could become a major source of ROG emissions if excluded from monitoring. While flanges are specifically identified in Mitigation Measure AQ-6 (MMAQ-6),[23] connectors are not, but must be, expressly included in the DSEIR's LDAR program to satisfy CEQA. 37

[16] Joint EIS/EIR at p. 4.2-13.

[17] DSEIR, p. 4-5.

[18] DSEIR, p. 4-5.

[19] DSEIR, Appendix B, p. 24, Table 1 ("Equipment Leak Mitigation Feasibility Analysis").

[20] DSEIR, Appendix B, p. 24, Table 1 ("Equipment Leak Mitigation Feasibility Analysis").

[21] DSEIR, Appendix B, p. 24.

[22] Fox/Powers Comments, p. 2, Table 1.

[23] DSEIR, p. 2-5, pdf 21.

Further, there are other sources of ROG emissions not addressed by MMAQ-6 and not identified in the DSEIR. First, the purge system is a source of fugitive leaks,[24] which are estimated to emit 1,545 lb/yr of ROG. Leaks in the heat exchanges can also release isopentane.[25] Other major sources of leaks not included in the LDAR program include the well heads, the vapor recovery system, and underground piping. Well drilling and operation, for example, emit significant amounts of ROG.[26] MMAQ-6 does not mention these sources of fugitive ROG leaks or include any method to detect and mitigate them.

Elsewhere, the consultant's report indicates that "Rotating equipment (turbines and pumps) equipped with double mechanical seals and barrier fluid systems and PRVs equipped with rupture disks would not be subject to LDAR, consistent with federal standards."[27] This equipment is a major source of the Project's ROG emissions, emitting a total of 194.9 lb/day out of a total of 411 lb/day, or 47% of the total ROG emissions.[28] These major sources of ROG emissions must be included in the DSEIR's LDAR program to satisfy CEQA. MMAQ-6 mentions turbine gland seals, but not pumps equipped with double mechanical seals and barrier fluid system and PRVs equipped with rupture disks. All fugitive sources must be expressly included in the DSEIR's LDAR program to satisfy CEQA. 38

Compliance with BAAQMD Rule 8-18 Will Significantly Reduce ROG Emissions

The DSEIR relies on federal rules that were developed for facilities that are not geothermal plants but rather for petroleum refineries, SOCMI, and onshore natural gas processing plants: facilities similar to those covered by the BAAQMD rule (refineries, chemical plants[29]). Thus, the most stringent set of fugitive emission regulations—those 39

[24] Fox/Powers Comments, p. 2, Table 1.

[25] Letter from Tom Browne, Water Resources Control Engineer, to Ann Logan, Deputy Air Pollution Control Officer, Great Basin Unified Air Pollution Control District, March 27, 2020; https://files.ceqanet.opr.ca.gov/139190-5/attachment/vpPhjLBn3H8IXg-Q7r6SaK1uEvxtU9f8BI0IQvPpxK5DJPZpqmmPqitnS3PHfUMMNJHAWCz3D2q85Ygi0.

[26] FluxSense, Using Solar Occulation Flux and Other Optical Remote Sensing Methods to Measure VOC emissions from a Variety of Stationary Sources in the South Coast Air Basin, September 14, 2017; http://www.aqmd.gov/docs/default-source/fenceline_monitroing/project_2/fluxsense_project2_2015_final_report.pdf?sfvrsn=6.

[27] DSEIR, Appendix B, p. 24.

[28] Fox/Powers Comments, p. 2, Table 1.

[29] A SOCMI facility is a chemical plant.

adopted in BAAQMD Rule 8-18—is applicable to the Project and must be used to mitigate the Project's significant ROG impact to the greatest extent feasible.

The BAAQMD rule sets the leak detection threshold at 100 ppm for all fugitive components except pumps and compressors, which have a leak detection threshold of 500 ppm. In comparison, the DSEIR sets the leak detection threshold at 2,000 ppmv for pumps and 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other fugitive components.[30] Thus, the DSEIR's mitigation measure allows five times more ROG emissions from all fugitive components except pumps and compressors, and four times more ROG emissions from pumps and compressors than routinely achieved for similar components under the BAAQMD rule.

The lower leak rates in the BAAQMD rule are feasible for the Project because the fugitive emission sources at the subject geothermal plant are similar to those found in refineries and chemical plants. In fact, the DSEIR itself relied on leak rates developed for refineries and chemical plants (SOCMI facilities).[31] Further, the gas and liquid streams at leaking geothermal plants are similar to those found in refineries and chemical plants. For example, they have a similar range of vapor pressures that ultimately determine the leak rate. The DSEIR must require all feasible mitigation for significant ROG impacts. The much lower leak rates in BAAQMD Rule 8-18 are feasible for the Project and must therefore be required as mitigation. 39 cont.

The record supporting the BAAQMD Rule 8-18 rulemaking demonstrates that all fugitive components are capable of meeting leak rates of 100 ppm to 500 ppm, regardless of the size or type of facility where they are present.[32] Several hundred thousand fugitive components in refineries, chemical plants, and other facilities within the BAAQMD routinely comply with these leak rates. The Project is equally capable of meeting the BAAQMD Rule 8-18 requirements. The DSEIR failed to identify or analyze the lower leak rates achieved by BAAQMD Rule 8-18. In fact, there is no evidence in the DSEIR that explains why the Project could not comply with BAAQMD Rule 8-18.

[30] DSEIR, p. 4-5.

[31] DSEIR, p. 3-5; Appendix B, p. 24.

[32] Fox/Powers Comments, BAAQMD, Proposed Amendments, Regulation 8 (Organic Compounds) Rule 18: (Equipment Leaks), pdf 567; and BAAQMD, Proposed Amendments, Regulation 8 Rule 18: Equipment Leaks Control Measure SS-16, January 2004, pdf 573, incorporated herein by reference in their entirety.

In my opinion, there are none. Compliance with the 100 ppm and 500 ppm leak rates will substantially reduce significant fugitive ROG emissions.

In comparison, the DSEIR proposes leak detection thresholds that are four to five times higher for all fugitive components, with no quantitative analysis of the comparative emissions reductions achieved under either set of thresholds. By contrast, there is substantial evidence from BAAQMD's Rule 8-18 proceedings demonstrating that ROG emissions from the Project's fugitive components can be reduced by up to a factor of 13 (for the Tesoro Refinery), relative to 1999 levels by adopting the BAAQMD's current leak detection thresholds for the Project.[33]

The 2002 emission inventory for six facilities subject to Rule 8-18 indicate that fugitive emissions declined from 6.71 ton/day in 1999 to 2.32 ton/day or by a factor of three based on the modified 2002 inventory.[34] Elsewhere, BAAQMD staff reports indicate emissions from valves were reduced from 706 lb/day based on the BAAQMD rule to 403 lb/day, or by a factor of 1.8. Table 2.

39 cont.

Table 2. Emission Reductions Achieved for Valves by Compliance with BAAQMD Rule 8-18[35]

	Rule 8-18 Emissions[2] (lbs/day (TPD))	Amended Rule 8-18 Emissions[3] (lbs/day (TPD))	Emission Reductions (lbs/day (TPD))
Valves	706 (0.35)	303 (0.15)	403 (0.20)

Remote Sensing Should Be Required

Remote sensing should be incorporated into the LDAR program to detect fugitive leaks from conventional and other sources of ROG that are not on the LDAR monitoring list in MMAQ-6, including pipelines,[36] geothermal wells,[37] and cooling towers. This is very important because research indicates that a small subset of all

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[33] Fox/Powers Report, pdf 584, Table 3. Fugitive ROG emissions from the Tesoro Refinery were reduced from 1,690 lb/day in 1999 to 128 lb/day in 2002.

[34] Fox/Powers Report, pdf 685, Table 3.

[35] Fox/Powers Report, pdf 545, BAAQMD Report, December 2003, Table 4: Emission Reduction Estimates; BAAQMD Report, Table 2: Emission Reduction Estimates, pdf 584.

[36] FEIR, Table ES-1.

[37] The Project includes 16 geothermal wells, a pipeline, and injection wells, which are major sources of ROG emissions. See FEIR, p. ES-1.

leaking components is responsible for most of the fugitive emissions. These could be identified using "...remote sensing method that would allow quick identification and repair of leaks causing large emissions."[38] Pipelines, for example, can leak at points other than flanges, which would not be detected by the LDAR program. Optical Remove Sensing (ORS) methods, rather than LDAR, are widely used to estimate fugitive ROG emissions at industrial facilities because they can identify leaks not covered by conventional LDAR programs, e.g., underground components or those not readily accessible.[39] These LDAR-based fugitive monitoring programs are known as "Smart LDAR."[40]

40 cont.

A recent study commissioned by the South Coast Air Quality Management District (SCAQMD), for example, used Optical Remote Sensing (ORS) methods to measure the emissions of ROG and other pollutants at six refineries and a tank farm. The study demonstrated that conventional methods used to measure ROG emissions, such as those proposed in the DSEIR, significantly underestimate them.[41] The

[38] Fox/Powers Report, pdf 548, BAAQMD Report, December 2003, Smart LDAR, p. 13.

[39] Allan K. Chambers et al., Direct Measurement of Fugitive Hydrocarbons from a Refinery, *J. Air & Waste Mgmt. Ass'n*, 58:1047-1056 (2008), at 1054 and Table 7; https://www.tandfonline.com/doi/pdf/10.3155/1047-3289.58.8.1047?needAccess=true; IMPEL, Diffuse VOC Emissions, December 2000; http://www.impel.eu/wp-content/uploads/2017/01/Diffuse-VOC-emissions-2000.pdf; U.S. EPA, Office of Inspector General, EPA Can Improve Emissions Factors Development and Management, Evaluation Report, Report No. 2006-P-00017, March 22, 2006, pp. 11-12 (summarizing the Texas 2000 Air Quality Study: "This primarily involved under reporting of emissions from flares, process vents, and cooling towers, as well as from fugitive emissions (leaks). The under-reporting was caused largely due to the use of poor quality emissions factors."); https://www.epa.gov/sites/production/files/2015-11/documents/20060322-2006-p-00017.pdf. U.S. EPA, VOC Fugitive Losses: New Monitors, Emissions Losses, and Potential Policy Gaps, 2006 International Workshop (Oct. 25-27, 2006) (" VOC Fugitive Losses") at vii and 1 ("emissions from refinery and natural gas operations may be 10 to 20 times greater than the amount estimated using standard emission factors."); *id*. at 3 ("Typically, measurements did show some 10 to 20 times higher emissions than calculated at initial measurement activities… Today, after long term experience with the measurements and also after successful improvements of plant operations regarding emissions, emission levels of some 3 to 10 times higher than what is theoretically calculated are typically seen."); https://www3.epa.gov/ttnchie1/efpac/documents/wrkshop_fugvocemissions.pdf.

[40] Miriam Lev-On et al., Methods for Quantification of Mass Emissions from Leaking Process Equipment When Using Optical Imaging for Leak Detection, Environmental Progress, v. 25, no. 1, April 20016; http://signal.ee.bilkent.edu.tr/VOC_Documents/Levon.pdf.

[41] FluxSense Inc., Emission Measurements of VOCs, NO2 and SO2 from Refineries in the South Coast Air Basin Using Solar Occultation Flux and Other Remote Sensing Methods, Final Report, April 11, 2017 (FluxSense Report); https://www.courthousenews.com/wp-content/uploads/2017/06/FluxSense-Study.pdf.

SCAQMD study, for example, discovered a pinhole-size leak in a pipeline buried 30 cm below the ground[42] that would never have been detected using the DSEIR's LDAR program, which only monitors accessible aboveground components. Similar ORS methods have been used in more than 100 fugitive emission studies around the world. They are routinely used in Sweden to annually screen refineries and petrochemical facilities for leaks for at least 10 days every year.[43]

It is well known based on measurement studies that ROG emissions from equipment leaks are underestimated by factors of 3 to 20 when estimated using the conventional emission factors, the basis of the ROG emissions in the DSEIR. The UK's National Physical Laboratory (equivalent to the US National Institute of Standards and Technology) has compared direct measurements of fugitive ROG with those estimated by emission factors for over a decade and found measurements were about three times higher than the emission factor estimates on a plant-wide basis.[44]

Chambers et al. used DIAL to survey fugitive emissions from a refinery. They concluded "Direct measurement [using DIAL or other remote sensing methods] of fugitive emissions is recommended as a way to improve the efficiency and effectiveness of leak repair and to quantify reductions in fugitive emissions as a result of improved leak detection and repair."[45] Finally, EPA auditors using remote sensing methods have found far more leaks than reported by the facility's LDAR program, indicating higher routine emissions than indicated by emission estimates.[46] In response, EPA and others

40 cont.

[42] FluxSense, p. 5.

[43] FluxSense, p. 2.

[44] U.S. EPA, VOC Fugitive Losses: New Monitors, Emissions Losses, and Potential Policy Gaps, 2006 International Workshop (Oct. 25-27, 2006), at 23. See also results of Swedish studies in this same report at p. 213.

[45] Cambers et al., p. 1056.

[46] See, for example, EPA, Enforcement Alert, Proper Monitoring Essential to Reducing 'Fugitive Emissions' Under Leak Detection and Repair Programs, EPA 300-N-99-014, October 1999; https://nepis.epa.gov/Exe/ZyNET.exe/500003SW.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1995+Thru+1999&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C95thru99%5CTxt%5C00000016%5C500003SW.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL#.

have developed a sensor-based systems approach that allows detecting leaks when they first occur, rather than during regularly scheduled LDAR monitoring events.[47]

In sum, remote sensing has been widely used to monitor fugitive emissions from industrial facilities and has been demonstrated to be more effective in identifying leaks than conventional LDAR programs that rely on component-by-component measurements using handheld monitors. I recommend the use of remote sensing in combination with BAAQMD Rule 8-18 to monitor the Project's fugitive ROG emissions as an additional feasible mitigation measure to reduce ROG emissions.

40 cont.

All Feasible Mitigation Must Be Required

Because the resulting ROG emissions remain significant after implementing the DSEIR's proposed LDAR program, additional feasible mitigation must be required. ROG emissions from fugitive components are routinely controlled to levels that are much lower than achieved by implementing the DSEIR's LDAR program as proposed in MM-AQ-6.

The DSEIR incorrectly concludes that "[s]ince n-pentane is neither a listed HAP nor a regulated air toxic compound and the facility is not a major stationary source of ROG, an enhanced LDAR program more stringent than the most rigorous NSPS required for new chemical and natural gas processing plants … is not reasonable or warranted."[48] This is incorrect because under CEQA, all feasible mitigation must be required for significant impacts. The Project's ROG emissions are highly significant, requiring implementation of all feasible mitigation. A much more aggressive LDAR program is feasible, as demonstrated by BAAQMD Regulation 8-18 and by numerous studies using ORS. More effective monitoring that is capable of identifying leaks from equipment not included in the DSEIR, e.g., wells, the cooling tower, and inaccessible components, must therefore be required to mitigate significant ROG impacts.

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The DSEIR itself relies on federal rules that were developed for facilities that are not geothermal plants but rather for petroleum refineries, SOCMI, and onshore natural gas processing plants: facilities similar to those covered by the BAAQMD rule (refineries, chemical plants). A SOCMI facility is a chemical plant. Thus, the DSEIR

[47] Wenfeng Peng and others, A Sensor Network System for Process Unit Emissions Monitoring, Air and Waste Management Association Air Quality Measurement Methods and Technology Conference, April 3, 2019, Abstract ME17; https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=345123&Lab=NRMRL.

[48] DSEIR, pdf 85.

implicitly acknowledges that the Project falls in the same categories of facilities regulated by BAAQMD Rule 8-18, and that the most stringent set of fugitive emission regulations—those adopted in BAAQMD Rule 8-18—could, and must, be used to mitigate the Project's significant ROG impact.

The BAAQMD rule sets the leak detection threshold at 100 ppm for all fugitive components except pumps and compressors, which have a leak detection threshold of 500 ppm. In comparison, the DSEIR sets the leak detection threshold at 2,000 ppmv for pumps and 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other fugitive components.[49] Thus, the DSEIR's mitigation measure allows five times more ROG emissions from all fugitive components except pumps and compressors, and four times more ROG emissions from pumps and compressors than routinely achieved for similar components under the BAAQMD rule.

The lower leak rates in the BAAQMD rule are feasible for the Project because the fugitive emission sources at the subject geothermal plant are similar to those found in refineries and chemical plants. In fact, the DSEIR itself relied on leak rates developed for refineries and chemical plants (SOCMI facilities).[50] Further, the gas and liquid streams at leaking geothermal plants are similar to those found in refineries and chemical plants. For example, they have a similar range of vapor pressures that ultimately determine the leak rate. The DSEIR must require all feasible mitigation for significant ROG impacts. The much lower leak rates in BAAQMD Rule 8-18 are feasible for the Project and must be required as mitigation.

41 cont.

The record supporting the BAAQMD Rule 8-18 rulemaking demonstrates that all fugitive components are capable of meeting leak rates of 100 ppm to 500 ppm, regardless of the size or type of facility where they are present.[51] Several hundred thousand fugitive components in refineries, chemical plants, and other facilities within the BAAQMD routinely comply with these leak rates. The Project is equally capable of meeting the BAAQMD Rule 8-18 requirements. Implementation of the 100 ppm and 500 ppm leak rates will substantially reduce significant fugitive ROG emissions.

[49] DSEIR, p. 4-5.

[50] DSEIR, p. 3-5; Appendix B, p. 24.

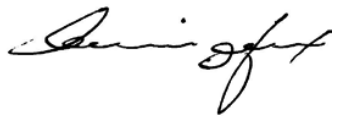
[51] Fox/Powers Comments, BAAQMD, Proposed Amendments, Regulation 8 (Organic Compounds) Rule 18: (Equipment Leaks), pdf 567; and BAAQMD, Proposed Amendments, Regulation 8 Rule 18: Equipment Leaks Control Measure SS-16, January 2004, pdf 573, incorporated herein by reference in their entirety.

In comparison, the DSEIR proposes leak detection thresholds that are four to five times higher for all fugitive components. ROG emissions from the Project's fugitive components can be reduced by factors of four to five by adopting the BAAQMD's leak detection thresholds for the Project. Further reductions can be achieved by adopting optical remote sensing technology.

In sum, additional mitigation is available and feasible to reduce the significant ROG emissions from the Project, including the use of a lower leak rate (100 ppm to 500 ppm) than the 500 to 2,000 ppm leak rates assumed in the DSEIR, inclusion of additional fugitive components, and remote sensing.

41 cont.

Sincerely,



Phyllis Fox, PhD, PE

EXHIBIT 1

Comments
on
Draft Authority to Construct Permit
Casa Diablo IV
Geothermal Development Project

September 12, 2013

by

Phyllis Fox, Ph.D., P.E., BCEE
Consulting Engineer

and

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42

The Project is a 42.4-MW gross (33-MW net) binary power plant and related infrastructure proposed to be located near Mammoth Lakes in Mono County, CA. The power plant would use hot geothermal fluid to vaporize n-pentane in a closed system. The vaporized pentane drives a turbine/generator set, which makes electricity. The vaporized pentane is then condensed in an air-cooled tube condenser, turning it back into a liquid, which is returned to preheaters and vaporizers to repeat the cycle. As this occurs within a closed system, most of the emissions are from equipment leaks. The Project is proposed by Ormat Nevada, Inc. (Ormat), a wholly owned subsidiary of Ormat. The Project is called Casa Diablo 4 (CD-4). It is the fourth similar geothermal facility in the Casa Diablo geothermal development complex, which currently includes MP-I, MP-II, and PLES-1.[1]

I. Emissions

The Project submitted for permitting includes a number of emission sources, including (ATC Ap.[2], pp. 2, 3):

- two 21.2 MW Ormat Energy Converters (OECs);
- four vaporizer systems;
- four turbines;
- two generators;
- four pentane condenser systems;
- four preheater systems;
- eight vapor recovery units (VRUs);
- one maintenance VRU;
- two n-pentane storage tanks;
- various fugitive components including connectors and pumps;
- one 800-bhp emergency standby diesel generator;
- one 400 bhp firewater pump; and
- 14 geothermal wells.

42 cont.

As discussed below, this list is incomplete and the emissions disclosed in the record are significantly underestimated.

A. Emissions Are Underestimated

The ATC Application and Engineering Analysis[3] originally asserted, with no support, that n-pentane (i.e., VOC) emissions from all of this equipment would be no

[1] Mono County, Mammoth Pacific I Replacement Project Draft Environmental Impact Report, July 2011., pp. 1-4 (MP-1 DEIR).

[2] Letter from ORMAT Nevada, to Great Basin Unified Air Pollution Control District, May 24, 2012, Re: Application for Authority to Construct for the CD-4, ORNIE 50, LLC Geothermal Power Plant Development Project, Application 1623-00-12 (ATC Ap.).

[3] GBUAPCD, Permit Processing Appl. 1623-00-12, Mammoth Pacific CDIV Geothermal Power Plant, August 1, 2012. Referred to as the "Engineering Analysis" or EA in these comments.

more than 411 lb/day. The last page of the ATC Application includes an emission calculation which redacts all of the information required to evaluate the claimed emissions. After two Public Records Act Requests,[4] the Great Basin Unified Air Pollution Control District (GBUAPCD or District) supplied an unredacted copy of this table on August 30, 2013,[5] just 10 days before comments were originally due. The data supplied in response to our PRAs is copied below as Table 1.

Table 1.
Emissions Data for Casa Diablo 4

Typical 36MW Air Cooled Ormat Binary Power Plant update 5/1/12
Emission calc
Ref. EPA453/R-95-017 Protocol for Equipment Leak Emission

#	Equipment	Qty.	Rate [Kg/Hr/Source]	Day [Kg]	Year [Kg]	Day [Lb]	Year [Lb]	Notes
1	Valves' Gland - Gas phase	12	0.0268	7.72	2,817	17.02	6,211	
2	Valves' Gland - Liquid phase	10	0.0109	2.62	955	5.77	2,105	
3	Pump seals	10	0.114	27.36	9,986	60.32	22,016	
4	Turbine seals	4	0.636	61.06	22,285	134.61	49,131	
5	Flanges, Connetors, Screwed	440	0.00025	2.64	964	5.82	2,124	
6	Purge System (Normal Process)	16	0.005	1.92	701	4.23	1,545	
	Total Generating units		0.793	103.31	37,708	228	83,132	
7	OEC Operational losses (fill, drain, tube leaks)	2	1.73	83.04	30,310	183	66,821	Based on Ormat O&M expriance
	Total		2.52	186.35	68017.90	411	149,954	

Our review of this table indicates that disclosed emissions from the facility arise from three sources: (1) fugitive components (224 lb/day); (2) purge system, normal process (4.23 lb/day); and (3) OEC operational losses (183 lb/day). These emissions are underestimated and unsupported.

42 cont.

1. Fugitive Emissions Were Underestimated

The first category of emissions was calculated from "average emission factors" for refineries as reported in the reference cited on the table, "Protocol for Equipment Leak Emission Estimates."[6] The record contains no support for choosing average refinery emission factors to represent n-pentane leaks from a geothermal power plant.

First, the Protocol document contains emission factors for equipment leaks in four industries: (1) synthetic organic chemical manufacturing industry (SOCMI); (2) petroleum refining; (3) marketing terminals; and (4) oil and gas production (O&G) operations. A binary power plant does not fall into any of these categories.

Second, different types of emission factors are reported for each of these categories including average, screening ranges, and screening value correlations. No

[4] See Public Records Act Requests dated August 21, 2013 and August 23, 2013.

[5] E-mail from Jan Sudomier, GBUAPCD, to Christina Caro, Lozeau Drury, August 30, 2013, Re: Public Records Act Request re Casa Diablo 4 Geothermal Power Plant.

[6] EPA, Protocol for Equipment Leak Emission Estimates, Report EPA-453/R-95-017, November 1995, Available at: http://www.epa.gov/ttnchie1/efdocs/equiplks.pdf. Referred to as "Protocol" or "Protocol document" in these comments.

support is provided for selecting "average." The "screening" factors were designed for facilities using a leak rate of 10,000 ppmv, which is proposed for this facility.

Third, the Protocol document only provides emission factors for mixtures of volatile organic compounds (VOCs) characteristic of each industrial sector. It does not provide emission factors for single compounds, such a n-pentane. This compound is smaller, more volatile, and present at higher temperatures and pressures than many of the compounds found in the subject VOC gas mixtures. All of these factors tend to result in higher leak rates. Thus, emissions of n-pentane may be greater than reflected in the Protocol emission factors.

Thus, we calculated the fugitive emissions for all combinations of factors to determine the impact of Ormat's assumptions on emissions. The results of our calculations are summarized in Table 2.

Table 2
Fugitive Emissions Calculated
with Protocol Document
Exhibit 1[7]

lb/day	Emission Factor
12	O&G Avg
41	Ref. Corrl.
43	Market Avg
112	SOCMI Avg
224	***Refinery Avg***
288	SOCMI Corrl
772	O&G Screen
852	Market Screen
1656	Refinery Screen
3201	SOCMI Screen

The fugitive emissions for the claimed number and type of components ranges from 12 lb/day (based on average emission factors for oil & gas production) up to 3,201 lb/day (based on screening emission factors for SOCMI facilities), depending upon the industrial segment and type of factor selected to make the calculations.

The average refinery factors selected by Ormat fall near the median of the range. However, as none of these industrial segments are representative of a binary geothermal power plant operating with n-pentane, and n-pentane is likely to be emitted in larger quantities than the gases present in these facilities, an upper bound estimate should have

42 cont.

[7] The following tables from the Protocol Documents were used in these calculations (Ex. 1): SOCMI Average: Table 2-1; SOCMI Screen: Table 2-5; SOCMI Corrl: Table 2-9; Market Avg: Table 2-3; Market Screen: Table 2-7; O&G Avg: Table 2-1; O&G Screen: Table 2-8; Refinery Avg: Table 2-2; Refinery Screen: Table 2-6; Refinery Corrl: Table 2-10.

been used. Further, it is important to use an upper bound estimate here as the proposed ATC does not require any monitoring of fugitive emissions to confirm the estimates based on average refinery emission factors.

In our opinion, based on the calculations in Exhibit 1, n-pentane fugitive emissions could be as high as **3,201 lb/day**, or over ten times higher than estimated by Ormat (224 lb/day), just based on selecting a different set of emission factors. Total emissions could be much higher, as these calculations exclude pressure relief valves and underestimate purge emissions, which are discussed below. The substantial underestimate would never be discovered as the proposed ATC does not require any monitoring of n-pentane from any source, but rather only an inaccurate estimate from volume measurements, which amounts to hunting a needle in a haystack.

2. Pressure Relief Valves Were Excluded From Emissions

The FEIR discloses that "[s]afeguards inherent to the design of the power plant would include relief valves, manual and automatic shutoffs; interlocks, vents, and check valves." FEIR, p. 2-44. Emissions from these "safeguards" must be included in the emission estimate in Table 1.

Pressure relief valves, for example, routinely leak at high rates[8] and vent directly to atmosphere when triggered, releasing large amounts of pentane. These valves would be present on the pentane storage tanks, the vaporizers, and air cooled condensers. There are two storage tanks, four vaporizers and four condensers. Thus, there would be at least 10 PRVs. The valves listed in the equipment inventory in Table 1 are not PRVs as PRVs are not gland valves and the emissions factors used by Ormat in Table 1 are for conventional, non-PRV valves. See, e.g., Protocol document, Table 2-1.

We estimated n-pentane emissions from 10 PRVs using the EPA Protocol emission factors. Our calculations in Exhibit 1 (Tab: "PRVs") indicate PRV emissions would range from 85 lb/day (average screening factor for refineries and SOCMI plants) to 895 lb/day (10,000 ppm screening range for refineries and SOCMI plants), depending upon the specific type of emission factor selected. Thus, Ormat has significantly underestimated daily emissions by omitting a major source of fugitive leaks from its calculations.

3. Purge System Emissions Are Unsupported And Underestimated

The fugitive emission calculations include 4.23 lb/day from 16 purge systems. These emissions were calculated assuming 0.005 kg/hr/source. Table 1. The record does not contain any support for this emission factor. A review of the Protocol document reveals it was not obtained from that source.

42 cont.

[8] U.S. EPA, Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, November 1995, Tables 2-1, 2-2, 2-5, 2-6.

Small amounts of air and water leak into the OEC unit pentane systems, which have to be purged to maintain efficiency. Each OEC unit has eight purge systems, each of which is equipped with a vapor recovery unit to capture and recover pentane. The VRU is reported to recover 99% of the n-pentane vapors. FEIR, p. 2-43; ATC Ap., pp. 2, 5, 7. As discussed elsewhere in these comments, each OEC unit handles 180,000 lbs of n-pentane. One n-pentane delivery would occur per year. Thus, if each VRU is 99% efficient, the n-pentane emissions from the purge systems would be about 10 lb/day (360,000 lb/yr x 0.01/365 = 9.86 lb/day), or over twice as much as disclosed in the ATC Application (4.23 lb/day), as summarized above in Table 1.

4. OEC Operational Losses Are Unsupported

The major source of disclosed emissions is OEC operational losses from filling and draining the OEC units and tube leaks. These emissions are reported at 183 lb/hr or 45% of the total disclosed n-pentane emissions. Table 1. The emission calculations used to derive this estimate is not disclosed. Table 1 notes only that it is "based on Ormat O&M experience." We requested supporting emission information from the District, but support for the OEC operational losses was not provided. (See Public Records Act requests dated Aug. 21, 2013 and Aug. 23, 2013).

Withholding emission information violates Section 114(c) of the Clean Air Act and California Public Record Act regulations, which exclude emission data from the general definition of trade secrete information. The EPA has specifically concluded that the "emission estimation method" constitutes "emission data" subject to this section of the CAA. 56 FR 7042 (2/21/91). The "emission estimation method" for OEC operational losses has not been disclosed anywhere in the public record.

42 cont.

The Public Records Act states that “all information, analyses, plans, or specifications that disclose the nature, extent, quantity or degree of air contaminants or other pollution which any article, machine, equipment or other contrivance will produce, which any . . . air pollution management district [. . .] requires any applicant to provide before the applicant [. . .] operates, sells, rents or uses the article, machine, equipment, or other contrivance, are public records.” Gov. Code §6254.7(a). The Public Records Act further states, “Nothwithstanding any other provision of law, all air pollution emission data, including those emission data which constitute trade secrets as defined in subdivision (d), are public records.” Gov. Code §6254.7(e). The Health and Safety Code §44346(h) states that “all information collected pursuant to this chapter . . . shall be considered ‘air pollution emission data,’ for the purposes of this section.”

B. Emission Sources Are Omitted

Among the disclosed emission sources, listed above from the ATC Application, the following disclosed emission sources were excluded from the 411 lb/day calculated in Table 1:

- two n-pentane storage tanks;

- one 800-bhp emergency standby diesel generator;
- one 400 bhp firewater pump;
- 14 geothermal wells.

First, no emissions are reported for storage tanks. The throughput and type of the storage tanks also are not disclosed, e.g., pressurized tank with pressure relief values, preventing an independent emission estimation. However, tanks typically include fittings which release vapors from enclosed liquids.[9] The emission calculations should be revised to include the two storage tanks, or the ATC revised to require zero emission tanks.

Second, emissions from the generator, firewater pump, and wells are not included in the emission calculations. The Project, as narrowly defined in the Application and Engineering Analysis, is described as consisting of a 42.4 MW binary geothermal power plant supported by 14 wells, an emergency standby diesel generator, and a diesel fire pump. The Engineering Analysis states that the wells, generator, and fire pump will be separately permitted. EA, p. 1. The ATC Application further notes that specific information on the generator and fire pump will be provided in separate Section A-6 applications at a later date. ATC Ap., p. 3. All of the emission sources required to operate the power plant should be included in the same Authority to Construct Permit as they are part of the same "stationary source" under Rule 209-A.

42 cont.

Third, this Project is part of a geothermal development consisting of other similar power plants, on adjacent sites, under common control, operated in unison and all linked together by common pipelines. MP-1 DEIR. The FEIR,[10] for example, notes that "[b]ecause the new power plant would be operated collectively with the existing Casa Diablo geothermal complex, ORNI 50, LLC estimates that only about six new employees would be required for operation of the CD-IV plant." FEIR, p. 2-45. Thus, all of the equipment required to support DC-4 should be aggregated and permitted as a single project. This would require, for example, BACT for the M-1 facility, which is part of this Project.

Fourth, as the n-pentane circulated in the system will be lost through fugitive and other releases and contaminated over time with air and water, it will have to be replaced with fresh n-pentane from time to time. This will require periodic n-pentane deliveries to the site to maintain acceptable operating levels. The record is silent as to the frequency and amount of these deliveries and emissions that would result from them.

The FEIR, for example, indicates that each OEC unit would contain about 180,000 lbs of n-pentane. Thus, the power plant, consisting of two OEC units, would

[9] See, for example, U.S. EPA, AP-42, Chapter 7: Liquid Storage Tanks, Available at: http://www.epa.gov/ttn/chief/ap42/ch07/index.html.

[10] U.S. Department of the Interior, Bureau of Land Management; U.S. Department of Agriculture, Forest Service; and Great Basin Unified Air Pollution Control District, Casa Diablo IV Geothermal Development Project, Final Joint Environmental Impact Statement and Environmental Impact Report, June 2013. Referred to in these comments as the "FEIR."

contain 360,000 lbs of n-pentane. Assuming a loss rate of 411 lb/day, about 0.l% of the motive fluid would be lost every day. As discussed elsewhere in these comments, periodic deliveries, about every 6 months to a year, would be required to maintain a minimum operating level of n-pentane in this system.

The record does not disclose any information on pentane deliveries or minimum motive fluid operating levels and is thus deficient. The pentane will have to be transferred from the transport vehicle, likely tanker trucks, but rail cars would also be feasible, to the two storage tanks. This generally requires a loading rack, which can be major source of emissions, depending upon design. The record is silent on the unloading (and storage) of pentane at the site.

Fifth, the FEIR discloses that "[s]afeguards inherent to the design of the power plant would include relief valves, manual and automatic shutoffs; interlocks, vents, and check valves." FEIR, p. 2-44. All of these "safeguards" would emit n-pentane. The shutoffs, interlocks and check valves are fugitive components and would leak. The vents are stacks that release directly to atmosphere during process upsets. None of these components are included in the equipment list for the Project. Further, the emissions in Table 1 do not include any of these sources.

42 cont.

C. No Basis Is Provided For Declining to Offset The Net Increase In VOC Emissions

The Project is subject to GBUAPCD Rule 209-A, Standards for Authorities to Construct. This rule requires mitigation for net emission increases after the application of BACT if the Air Pollution Control Officer determines that the net emission increase "would cause a new violation of any national ambient air quality standard, or would make any existing violation of any such standard worse, at the point of maximum ground level impact." Rule 209-A, Sec. D.2.a(2).

The APCO failed to make any showing with regard to the federal 8-hr NAAQS for ozone of 0.075 ppm. This is a serious omission as the study area is classified as non-attainment for the State 1-hour and 8-hour ozone ambient air quality standards.[11] FEIR, Table 3.2-2. The California ozone standards are 0.09 ppm 1-hour and 0.070 ppm 8-hour. The CA 8-hr ozone standard is more stringent than the federal 8-hour standard of 0.075 ppm. In fact, exceedances of the California standards have occurred in Mammoth Lakes. EA, p. 5.

While the area is currently unclassified for the federal 8-hr ozone standard, data compiled in the FEIR suggests that VOC emission increases from the Project could cause a new violation or contribute to an existing violation. FEIR, Table 3.2-3. The EA dismisses potential ozone impacts arguing that project emissions (0.2 ton/day) are a small fraction of total VOC emissions in Mono County (20.91 ton/day), which is dominated by natural sources. EA, p. 5.

[11] CARB, 2012 Area Designation for State Ambient Air Quality Standards Ozone, Available at: http://www.arb.ca.gov/desig/adm/2012/state_o3.pdf

This is the wrong test. Rule 209-A requires offsets if the emissions, here amounting to at least 75 ton/yr of VOC, and likely significantly more, up to 467 ton/yr (Ex. 1), would "cause a new violation of any national ambient air quality standard, or would make any existing violations of any such standard worse, at the point of maximum ground level impact." Rule 409-A, Sec. D.2.a(2). This determination requires ozone modeling, which is absent from the record. Thus, the GBUAPCD has no basis for excusing Ormat from offsetting its VOC emissions.

II. The Permit Fails to Impose BACT

Rule 209-A requires the use of best available control technology or BACT. This rule defines BACT as the more stringent of:

a. The most effective emissions control technique which has been achieved in practice, for such category or class of source; or

b. Any other emissions control technique found, after public hearing, by the Air Pollution Control Officer or the Air Resources Board to be technologically feasible and cost/effective for such class or category of sources or for a specific source: or

c. The most effective emission limitation which the EPA certifies is contained in the implementation plan of any State approved under the Clean Air Act for such class or category or source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable. Rule 209-A, Sec. F-1.

42 cont.

The ATC Application and the Engineering Analysis assert that BACT is satisfied without any supporting analysis. The procedure for conducting a BACT analysis is well established as the top-down process laid out in the New Source Review Workshop Manual, which has been upheld in numerous EAB and other cases and incorporated into California regulations. Health & Safety Code §42506 (Manual is available on California Air Resources Board website at http://www.arb.ca.gov/nsr/sb288/90nsrmanual.pdf, and is incorporated herein by reference in its entirety). A responsive top-down BACT analysis is completely missing from this record. Instead, the ATC Application asserts what BACT is without any supporting analysis. The GBUAPCD did not review Ormat's assertions as to what BACT is on the record or perform an independent analysis. As we demonstrate below, BACT has not been required.

The procedure to conduct a top-down BACT analysis is described in the NSR Workshop Manual, p. B.6., (incorporated into California law, Health & Saf. Code §42506), as follows:

TABLE B-1. - KEY STEPS IN THE "TOP-DOWN" BACT PROCESS

STEP 1: IDENTIFY ALL CONTROL TECHNOLOGIES.

- LIST is comprehensive (LAER included).

STEP 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.
- A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review.

STEP 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.
Should include:
- control effectiveness (percent pollutant removed);
- expected emission rate (tons per year);
- expected emission reduction (tons per year);
- energy impacts (BTU, kWh);
- environmental impacts (other media and the emissions of toxic and hazardous air emissions); and
- economic impacts (total cost effectiveness, incremental cost effectiveness).

STEP 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.
- Case-by-case consideration of energy, environmental, and economic impacts.
- If top option is not selected as BACT, evaluate next most effective control option.

STEP 5: SELECT BACT
- Most effective option not rejected is BACT.

As discussed below, the District has failed entirely to conduct any top-down BACT analysis.

42 cont.

A. Fugitive Components

Small pieces of equipment like piping components, valves, connectors, pumps, and various types of fittings and connectors leak small amounts of gases through seals and screw fittings. The majority of the emissions from this Project, over 99% (100[411-4.2]/411=99%) are fugitive emissions. The Engineering Analysis states that a BACT analysis for VOCs is required and further states that it is attached. However, the Engineering Analysis itself does not contain any BACT analysis nor any analysis or critique of Ormat's BACT analysis in the ATC Application and a responsive analysis is not attached.

The Engineering Analysis asserts that fugitive emissions will be "minimized" by using "leakless" technology "where feasible" and performing hand-held monitoring of possible emission escape points. EA, p. 1. The proposed ATC likewise states that "All equipment associated with the motive fluid, will employ leakless technology wherever feasible." ATC, p. 1. Elsewhere, the proposed ATC sets out a leak check and record keeping protocol. ATC, Condition 2. These components of the proposed BACT determination for fugitive components, considered both individually and cumulatively, fail to satisfy BACT as discussed below.

1. Leakless Technology

We agree that leakless technology would satisfy BACT if required in practice. Further, based on our experience, leakless technology is feasible for all fugitive components involved in this Project, based on the level of detail disclosed in the record. However, the proposed ATC does not require any leakless technology at all, but rather only "where feasible." How would feasibility be determined and documented?

The proposed ATC does not establish any criteria to determine feasibility of leakless technology nor any process to document these determinations. Further, where leakless technology is infeasible, assuming any such component(s) exist, low-leak technology would be an acceptable BACT alternative, but is not identified in the record. Low leak technology would include technology such as graphite-packed control valves, bellows-sealed valves, and hermetically sealed valves and flanges, as discussed below.

42 cont.

The requirement for leakless technology must be expanded to explicitly list the components that would be leakless, the ones that would be allowed to leak, and the criteria used to classify them. Further, any infeasibility determination should be certified by a licensed California mechanical engineer and submitted to the GBUAPCD for approval.

2. Leak Detection and Repair (LDAR)

The proposed ATC, Condition 2, specifies a monthly leak check and record keeping program which would be implemented at all components allowed to leak, i.e., components that are not "leakless." This is the second component of the BACT determination for equipment leaks specified in the draft ATC.

A leak detection and repair (LDAR) program controls leaks by measuring the concentration of VOCs at the face of each component. If the measured concentration exceeds a specified leak rate, the component must be repaired in a specified period of time. The theory behind an LDAR program is that by detecting and repairing leaks in an expeditious manner, fugitive emissions will be minimized. The effectiveness of a LDAR program depends on the leak rate, the time between detection and mandatory repair, the frequency of monitoring, and the number of components covered by the program. The CD-4 LDAR program does not comply with BACT.

The CD-4 LDAR program requires monthly monitoring of the VOC concentration from fugitive components using EPA Method 21. If the measured concentration exceeds 10,000 ppmv, the leak must be repaired "as soon as practical." If no leaks greater than 10,000 ppmv are detected for two years, Ormat may petition the District to change the monitoring frequency to quarterly. ATC, Condition 2.

The LDAR program proposed for CD-4 does not satisfy BACT as it is not the most effective LDAR program that has been achieved in practice or the most effective LDAR program contained in implementation plans approved under the Clean Air Act for California.

Two air districts in California have equipment leak regulations that are more stringent than the LDAR BACT requirements in the proposed ATC for CD-4. The subject rules are: (1) the Bay Area Air Quality Management District (BAAQMD)'s Rule 8-18[12] and the Ventura County Air Pollution Control District's (VCAPCD) Rule 74.7. The BAAQMD rule has been incorporated into the California SIP.[13]

The most stringent equipment leak requirements are in BAAQMD Rule 8-18, which establishes BACT for equipment leaks at CD-4. This rule sets the floor for the leak detection threshold at 100 ppm for all fugitive components except pumps and compressors, which have a leak detection threshold of 500 ppm. All detected leaks must be minimized within 24 hours and repaired within 7 days. Leaks are monitored quarterly using EPA Method 21.[14]

42 cont.

Rule 8-18 exempts certain small facilities based on the number of potentially leaking components. However, this exemption does not render the subject leak rates inapplicable for fugitive components at smaller facilities. Rather, the emissions from these small facilities were below the level of concern for the subject rulemaking. Regardless, if the DC-4 project were properly aggregated with other similar units at the site, as discussed elsewhere in these comments, it would not qualify for a small source exemption. Further, the record supporting the BAAQMD Rule 8-18 rulemaking demonstrates that all fugitive components are capable of meeting leak rates of 100 ppm to 500 ppm, regardless of the size or type of facility where they are present.[15] Several

[12] BAAQMD Regulation 8, Organic Compounds, Rule 18, Equipment Leaks, Available at: http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Rules%20and%20Regs/reg%2008/rg0818.ashx?la=en

[13] SIP version of BAAQMD Rule 8-18 available at: http://yosemite.epa.gov/R9/r9sips.nsf/AgencyProvision/B21965BA48A6EC82882569900057D482?OpenDocumenta.

[14] See BAAQMD staff reports on Rule 8-18, attached hereto (Staff Reports dated 12/31/97 and November 2002) and last in series dated December 2003 available at: http://www.arb.ca.gov/pm/pmmeasures/ceffect/reports/baaqmd_8-18_report.pdf, incorporated herein by reference in their entirety.

[15] One of the authors of these comments, Dr. Fox, participated in the development of Rule 8-18. See also: BAAQMD, Proposed Amendments, Regulation 8 Rule 18: Equipment Leaks, Control Measure SS-16,

hundred thousand fugitive components in refineries, chemical plants, and other facilities within the BAAQMD routinely comply with these leak rates.

Further, the BAAQMD has published BACT guidelines for fugitive components. For connectors, achieved in practice BACT is a leak rate of 100 ppm, achieved using graphitic gaskets. For process valves, achieved in practice BACT is a leak rate of 100 ppm, achieved using bellows valves, diaphragm valves, quarter-turn valves, live-loaded valves, or other low-emission valves. For pumps, technologically feasible and cost effective BACT is a leak rate of 100 ppm. The 100-ppm leak rate can be achieved for pumps using double mechanical seals with barrier fluid; magnetically coupled pumps; canned pumps; magnetic fluid sealing technology; or gas seal systems vented to a thermal oxidizer or other approved control device (such as the proposed VRUs). The achieved in practice BACT leak rate for pumps is 500 ppm, achieved using double mechanical seals with barrier fluid. In each case, the leak rate is expressed as methane, measured by EPA Method 21 and to satisfy BACT, the subject leak rate must be accompanied by an approved quarterly inspection and maintenance program.[16] By failing to consider these technologies that have been achieved in practice, the District failed to conduct a top-down BACT analysis.

Thus, BACT for equipment leaks at CD-4 should be a leak rate of 100 ppm for all fugitive components, enforced by quarterly monitoring using EPA Method 21 with minimization of the leak within 24 hours and repair within 7 days. As this is a new facility, it should be constructed so that all fugitive components are accessible for monitoring, obviating any need for exemptions based on location. A higher leak rate for pumps, no higher than the 500 ppm specified in BAAQMD Rule 8-18, must be accompanied by an analysis demonstrating that 100 ppm is not technologically feasible or cost effective in the subject applications. The leak rate of 10,000 ppmv is simply not BACT, and is, in fact, 100 times higher than BACT.

42 cont.

3. Fired Equipment

The Project includes an 800-hp emergency standby diesel generator to supply electrical power for plant auxiliaries when the plant is off line and a 400-bhp emergency standby diesel firewater pump. ATC Ap., p. 3. The ATC Application does not further describe these engines or include a BACT analysis for them, but rather asserts more information will be provided in separate Section A-6 applications at a later date and that the engines will comply with BACT. ATC Ap., p. 3.

However, Rule 209-A, Section F.3, requires that all air-contaminant-emitting equipment at the same property that is owned, operated, or under shared entitlement to use by the same person must be aggregated under the same stationary source for purposes

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Draft Staff Report, December 2003, Available at: http://www.arb.ca.gov/pm/pmmeasures/ceffect/reports/baaqmd_8-18_report.pdf

[16]BAAQMD, BACT Guideline for Flanges, Available at (for flanges): http://hank.baaqmd.gov/pmt/bactworkbook/default.htm

of complying with this rule. Thus, the ATC must be revised to include this fired equipment. The ATC Application (p. 3) asserts that these engines would comply with BACT but the record is silent on what BACT might be. At a minimum, BACT for this equipment would include the use of low sulfur diesel fuel, an oxidation catalyst to control VOCs and CO, and selective catalytic reduction (SCR) to control NOx emissions.

III. Proposed Conditions in the ATC Are Not Enforceable

The proposed conditions in the draft Authority to Construct do not present an adequate basis for issuing a Permit to Operate (PTO) for the reasons explained below.

A. All Air-Contaminant-Emitting Equipment Is Not Listed

The emissions of n-pentane were calculated assuming a certain collection of equipment, including 12 gas-phase gland valves, 10 liquid-phase gland valves, 10 pump seals, 4 turbine seals, 440 flanges and connectors, and 16 purge systems. Table 1. However, the "equipment description for permit" in the draft ATC identifies only generic "pumps" without specifying the number. All other fugitive components that were the basis of the 411 lb/hr emission estimate are not listed at all in the proposed ATC. Finally, some fugitive components, those constituting "safeguards" as discussed above, are not listed at all.

42 cont.

This is problematic as the permit to operate is issued only after an inspection to determine if the listed equipment has been constructed in accordance with approved plans, specifications and conditions in the Authority to Construct. Thus, this facility could be constructed with a different number of fugitive components and hence, emit different amounts of n-pentane, but would be approved anyway as the ATC does not include a complete equipment inventory.

B. The Fugitive Emission Limit Is Not Practically Enforceable

The draft ATC limits "n-pentane" emissions to 411 lb/day. Compliance would be determined by calculation after every pentane delivery and averaged over the number of days since the previous delivery, excluding breakdown emissions. ATC, Condition 1. No direct pentane measurements are proposed.

Emission limits must be practically enforceable, which means they must contain appropriate averaging times, compliance verification procedures and recordkeeping procedures. NSR Manual, p. B.56. Further, these conditions must allow an inspector to verify instantly whether the source is or was complying with the permit conditions. See, e.g., NSR Manual, p. c.4. Generally, daily emission limits require daily monitoring. See, e.g., *Sur Contra la Contaminacion v. EPA*, 202 F.3d 443, 446 (1st Cir. 2000). These conditions are not met for the n-pentane limit.

Pentane emissions would be calculated from deliveries (to replace lost product). The ATC record is silent on how frequently pentane deliveries would occur and thus on

how frequently compliance with the daily limit would be determined. This frequency determines the averaging time, which must be short enough to be "practically enforceable" by an inspector. The averaging time should also be constant, e.g., daily, weekly, monthly.

As discussed elsewhere in these comments, the two OEC units would contain 360,000 lbs of n-pentane. The facility will include two pentane storage tanks with capacities up to 12,000 gallons each. FEIR, p. 2-4. As the density of pentane is 5.22 lb/gal, tank inventory will be about 125,000 lbs (24,000 gal x 5.22 lb/gal = 125,280 lbs). The daily losses of up to 411 lb/day presumably would be replaced using tank inventory. Tank inventory should last about a year (125,000 lb/411 lb/day = 304 days). Thus, pentane deliveries would be infrequent, perhaps every 6 months to a year. The responses to comments on the FEIR support these calculations, indicating one truck delivery per year. FEIR, Appx. H, p. H-110, RTC I9-33.

As compliance is determined by calculation, based only on deliveries, compliance would be infrequently determined, every six moths to a year and perhaps on a nonuniform schedule. This is far too infrequent to assure continuous compliance with a daily limit and is not practically enforceable. In particular, compliance could not be determined at all during the first 6 months to year of operation, before the first delivery occurred. Generally, compliance must be determined no less frequently than monthly and where feasible, continuously, to be practically enforceable. See, *United States v. Cinergy Corp*., 618 F. Supp. 2d 942, 971 (S.D. Ind. 2009) (30-day averaging allowed for continuous emission monitors where 30-day averaging is shown to be more accurate).

42 cont.

The record is also silent on the method that would be used to determine delivered pentane volume. The disclosed emissions, 411 lb/day, amounts to less than 1 gallon per day. The conventional methods used to measure volume could not detect a change of 1 gallon per day. Very precise measurement methods, such as meters and provers, are required.[17] Absent the disclosure of a method to accurately detect losses of less than 1 gallon per day of pentane, the proposed emission limit is not enforceable.

C. Regulated Pollutant Is Not Specified In LDAR Monitoring Protocol

The regulated pollutant is n-pentane. The method used to find leaks uses EPA Method 21. This method does not measure n-pentane per se, but rather organic compounds. It must be calibrated for a specific compound, which is typically methane (one carbon, 4 hydrogen atoms). The draft ATC must be modified to specify that the leak rate is to be measured in ppmv of n-pentane (five carbon, 12 hydrogen atoms) and that the instrument used in Method 21 must be calibrated using n-pentane, rather than methane, which is the usual default.

[17] See, for example, Frank J. Berto, Technology Review of Tank Measurement Errors Reveals Techniques for Greater Accuracy, Oil & Gas Journal, March 3, 1997, Available at: http://www.ogj.com/articles/print/volume-95/issue-9/in-this-issue/refining/technology-review-of-tank-measurement-errors-reveals-techniques-for-greater-accuracy.html

D. No Hydrogen Sulfide Monitoring

The draft ATC includes two emission limits on hydrogen sulfide, 100 grams/MwHr in Condition 5 and 2.5 kg/hr/well in Condition 6. However, the ATC does not require any monitoring or recordkeeping for hydrogen sulfide and is silent on how compliance with these limits would be demonstrated. Without any monitoring, this limit is unenforceable.

E. Emission Management Plan

The proposed ATC must include the BACT emission limits and be enforceable as a practical matter, which mean it must contain appropriate averaging times, compliance verification procedures, and recordkeeping requirements. NSR Manual, p. B.56. The proposed ATC is not enforceable as a practical matter as it excludes all of the methods that would be used to determine compliance, deferring their identification to a future "Emission Management Plan" that would be submitted to the District within 90 days of signing the ATC and not be subject to public review. ATC, Condition 11. The information in this Plan would include:

42 cont.

- method to determine daily pentane volume
- method to calculate pentane loss rate
- method to detect and report breakdown events
- plan to repair breakdown leaks
- maintenance plan for routine monitoring and prevention of pentane leaks

These methods, all deferred to the future outside of the public review process, after the facility has commenced construction and perhaps even after it is fully built, are part of the BACT determination and must be included in the draft ATC submitted for public review. We are concerned, for example, that available methods to measure daily pentane volume and calculate the pentane loss rate may not be adequate to accurately detect 411 lb/day, which represents only 0.1% of the mass of pentane in the system. Thus, this missing information must be provided and the draft ATC recirculated for public review.

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Dr. Fox has over 40 years of experience in the field of environmental engineering, including air pollution control (BACT, BART, MACT, LAER, RACT), greenhouse gas emissions and control, cost effectiveness analyses, water quality and water supply investigations, hydrology, hazardous waste investigations, environmental permitting, nuisance investigations (odor, noise), environmental impact reports, CEQA/NEPA documentation, risk assessments, and litigation support.

EDUCATION

Ph.D. Environmental/Civil Engineering, University of California, Berkeley, 1980.
M.S. Environmental/Civil Engineering, University of California, Berkeley, 1975.
B.S. Physics (with high honors), University of Florida, Gainesville, 1971.

REGISTRATION

Registered Professional Engineer: Arizona (2001-2014: #36701; retired), California (2002-present; CH 6058), Florida (2001-2016; #57886; retired), Georgia (2002-2014; #PE027643; retired), Washington (2002-2014; #38692; retired), Wisconsin (2005-2014; #37595-006; retired)
Board Certified Environmental Engineer, American Academy of Environmental Engineers, Certified in Air Pollution Control (DEE #01-20014), 2002-2014; retired)
Qualified Environmental Professional (QEP), Institute of Professional Environmental Practice (QEP #02-010007, 2001-2015: retired).

PROFESSIONAL HISTORY

Environmental Management, Principal, 1981-present
Lawrence Berkeley National Laboratory, Principal Investigator, 1977-1981
University of California, Berkeley, Program Manager, 1976-1977
Bechtel, Inc., Engineer, 1971-1976, 1964-1966

PROFESSIONAL AFFILIATIONS

American Chemical Society (1981-2010)
Phi Beta Kappa (1970-present)
Sigma Pi Sigma (1970-present)
Who's Who Environmental Registry, PH Publishing, Fort Collins, CO, 1992.
Who's Who in the World, Marquis Who's Who, Inc., Chicago, IL, 11th Ed., p. 371, 1993-present.

Who's Who of American Women, Marquis Who's Who, Inc., Chicago, IL, 13th Ed., p. 264, 1984-present.
Who's Who in Science and Engineering, Marquis Who's Who, Inc., New Providence, NJ, 5th Ed., p. 414, 1999-present.
Who's Who in America, Marquis Who's Who, Inc., 59th Ed., 2005.
Guide to Specialists on Toxic Substances, World Environment Center, New York, NY, p. 80, 1980.
National Research Council Committee on Irrigation-Induced Water Quality Problems (Selenium), Subcommittee on Quality Control/Quality Assurance (1985-1990).
National Research Council Committee on Surface Mining and Reclamation, Subcommittee on Oil Shale (1978-80)

REPRESENTATIVE EXPERIENCE

Performed environmental and engineering investigations, as outlined below, for a wide range of industrial and commercial facilities including: petroleum refineries and upgrades thereto; reformulated fuels projects; refinery upgrades to process heavy sour crudes, including tar sands and light sweet crudes from the Eagle Ford and Bakken Formations; petroleum, gasoline and ethanol distribution terminals; coal, coke, and ore/mineral export terminals; LNG export, import, and storage terminals; crude-by-rail projects; shale oil plants; crude oil/condensate marine and rail terminals; coal gasification and liquefaction plants; oil and gas production, including conventional, thermally enhanced, hydraulic fracking, and acid stimulation techniques; underground storage tanks; pipelines; compressor stations; gasoline stations; landfills; railyards; hazardous waste treatment facilities; nuclear, hydroelectric, geothermal, wood, biomass, waste, tire-derived fuel, gas, oil, coke and coal-fired power plants; wind farms; solar energy facilities; battery storage facilities; transmission lines; airports; hydrogen plants; petroleum coke calcining plants; coke plants; activated carbon manufacturing facilities; asphalt plants; cement plants; incinerators; flares; manufacturing facilities (e.g., semiconductors, electronic assembly, aerospace components, printed circuit boards, amusement park rides); lanthanide processing plants; ammonia plants; nitric acid plants; urea plants; food processing plants; wineries; almond hulling facilities; composting facilities; grain processing facilities; grain elevators; ethanol production facilities; soy bean oil extraction plants; biodiesel plants; paint formulation plants; wastewater treatment plants; marine terminals and ports; gas processing plants; steel mills; iron nugget production facilities; pig iron plant, based on blast furnace technology; direct reduced iron plant; acid regeneration facilities; railcar refinishing facility; battery manufacturing plants; pesticide manufacturing and repackaging facilities; pulp and paper mills; olefin plants; methanol plants; ethylene crackers; alumina plants, desalination plants; battery storage facilities; data centers; covered lagoon anaerobic digesters with biogas generators and upgrading equipment to produce renewable natural gas and electricity; selective catalytic reduction (SCR) systems; selective noncatalytic reduction (SNCR) systems; halogen acid furnaces; contaminated property

redevelopment projects (e.g., Mission Bay, Southern Pacific Railyards, Moscone Center expansion, San Diego Padres Ballpark); residential developments; commercial office parks, campuses, and shopping centers; server farms; transportation plans; and a wide range of mines including sand and gravel, hard rock, limestone, nacholite, coal, molybdenum, gold, zinc, and oil shale.

EXPERT WITNESS/LITIGATION SUPPORT

- For plaintiffs-intervenors (Sierra Club), in civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications at Rush Island Units 1 and 2 and Labadie Energy Center, assist counsel in evaluating best available control technology (BACT) to reduce SO2 emissions, including wet and dry scrubbing, sorbent injection, and offsets. Case settled. *U.S. and Sierra Club vs. Ameren Missouri*, Case No. 4-11 CV 77 RWS, U.S. District Court, Eastern District of Missouri, Eastern Division, September 30, 2019.
- For the California Attorney General, assist in determining compliance with probation terms in the matter of People v. Chevron USA.
- For plaintiffs, assist in developing Petitioners' proof brief for National Parks Conservation Association et al v. U.S. EPA, Petition for Review of Final Administrative Action of the U.S. EPA, In the U.S. Court of Appeals for the Third Circuit, Docket No. 14-3147.
- For plaintiffs, expert witness in civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications (1997-2000) at the Cemex cement plant in Lyons, Colorado. Reviewed produced documents, prepared expert and rebuttal reports on PSD applicability based on NOx emission calculations for a collection of changes considered both individually and collectively. Deposed August 2011. *United States v. Cemex, Inc.*, In U.S. District Court for the District of Colorado (Civil Action No. 09-cv-00019-MSK-MEH). Case settled June 13, 2013.
- For plaintiffs, in civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications (1988 – 2000) at James De Young Units 3, 4, and 5. Reviewed produced documents, analyzed CEMS and EIA data, and prepared netting and BACT analyses for NOx, SO2, and PM10 (PSD case). Expert report February 24, 2010 and affidavit February 20, 2010. *Sierra Club v. City of Holland, et al.*, U.S. District Court, Western District of Michigan (Civil Action 1:08-cv-1183). Case settled. Consent Decree 1/19/14.
- For plaintiffs, in civil action alleging failure to obtain MACT permit, expert on potential to emit hydrogen chloride (HCl) from a new coal-fired boiler. Reviewed record, estimated HCl emissions, wrote expert report June 2010 and March 2013 (Cost to Install a Scrubber at the Lamar Repowering Project Pursuant to Case-by-Case MACT), deposed August 2010 and

March 2013. *Wildearth Guardian et al. v. Lamar Utilities Board*, Civil Action No. 09-cv-02974, U.S. District Court, District of Colorado. Case settled August 2013.

- For plaintiffs, expert witness on permitting, emission calculations, and wastewater treatment for coal-to-gasoline plant. Reviewed produced documents. Assisted in preparation of comments on draft minor source permit. Wrote two affidavits on key issues in case. Presented direct and rebuttal testimony 10/27 - 10/28/10 on permit enforceability and failure to properly calculate potential to emit, including underestimate of flaring emissions and omission of VOC and CO emissions from wastewater treatment, cooling tower, tank roof landings, and malfunctions. *Sierra Club, Ohio Valley Environmental Coalition, Coal River Mountain Watch, West Virginia Highlands Conservancy v. John Benedict, Director, Division of Air Quality, West Virginia Department of Environmental Protection and TransGas Development System, LLC*, Appeal No. 10-01-AQB. Virginia Air Quality Board remanded the permit on March 28, 2011 ordering reconsideration of potential to emit calculations, including: (1) support for assumed flare efficiency; (2) inclusion of startup, shutdown and malfunction emissions; and (3) inclusion of wastewater treatment emissions in potential to emit calculations.
- For plaintiffs, expert on BACT emission limits for gas-fired combined cycle power plant. Prepared declaration in support of CBE's Opposition to the United States' Motion for Entry of Proposed Amended Consent Decree. Assisted in settlement discussions. *U.S. EPA, Plaintiff, Communities for a Better Environment, Intervenor Plaintiff, v. Pacific Gas & Electric Company, et al.*, U.S. District Court, Northern District of California, San Francisco Division, Case No. C-09-4503 SI.
- Technical expert in confidential settlement discussions with large coal-fired utility on BACT control technology and emission limits for NOx, SO2, PM, PM2.5, and CO for new natural gas fired combined cycle and simple cycle turbines with oil backup. (July 2010). Case settled.
- For plaintiffs, expert witness in remedy phase of civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications (1998-99) at Gallagher Units 1 and 3. Reviewed produced documents, prepared expert and rebuttal reports on historic and current-day BACT for SO2, control costs, and excess emissions of SO2. Deposed 11/18/09. *United States et al. v. Cinergy, et al.*, In U.S. District Court for the Southern District of Indiana, Indianapolis Division, Civil Action No. IP99-1693 C-M/S. Settled 12/22/09.
- For plaintiffs, expert witness on MACT, BACT for NOx, and enforceability in an administrative appeal of draft state air permit issued for four 300-MW pet-coke-fired CFBs. Reviewed produced documents and prepared prefiled testimony. Deposed 10/8/09 and 11/9/09. Testified 11/10/09. *Application of Las Brisas Energy Center, LLC for State Air Quality Permit*; before the State Office of Administrative Hearings, Texas. Permit remanded 3/29/10 as LBEC failed to meet burden of proof on a number of issues including MACT.

Texas Court of Appeals dismissed an appeal to reinstate the permit. The Texas Commission on Environmental Quality and Las Brisas Energy Center, LLC sought to overturn the Court of Appeals decision but moved to have their appeal dismissed in August 2013.

- For defense, expert witness in unlawful detainer case involving a gasoline station, minimart, and residential property with contamination from leaking underground storage tanks. Reviewed agency files and inspected site. Presented expert testimony on July 6, 2009, on causes of, nature and extent of subsurface contamination. *A. Singh v. S. Assaedi,* in Contra Costa County Superior Court, CA. Settled August 2009.
- For plaintiffs, expert witness on netting and enforceability for refinery being upgraded to process tar sands crude. Reviewed produced documents. Prepared expert and rebuttal reports addressing use of emission factors for baseline, omitted sources including coker, flares, tank landings and cleaning, and enforceability. Deposed. *In the Matter of Objection to the Issuance of Significant Source Modification Permit No. 089-25484-00453 to BP Products North America Inc., Whiting Business Unit, Save the Dunes Council, Inc., Sierra Club., Inc., Hoosier Environmental Council et al., Petitioners, B. P. Products North American, Respondents/Permittee,* before the Indiana Office of Environmental Adjudication. Case settled.
- For plaintiffs, expert witness on BACT, MACT, and enforceability in appeal of Title V permit issued to 600 MW coal-fired power plant burning Powder River Basin coal. Prepared technical comments on draft air permit. Reviewed record on appeal, drafted BACT, MACT, and enforceability pre-filed testimony. Drafted MACT and enforceability pre-filed rebuttal testimony. Deposed March 24, 2009. Testified June 10, 2009. *In Re: Southwestern Electric Power Company*, Arkansas Pollution Control and Ecology Commission, Consolidated Docket No. 08-006-P. Recommended Decision issued December 9, 2009 upholding issued permit. Commission adopted Recommended Decision January 22, 2010.
- For plaintiffs, expert witness in remedy phase of civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications (1989-1992) at Wabash Units 2, 3 and 5. Reviewed produced documents, prepared expert and rebuttal report on historic and current-day BACT for NOx and SO2, control costs, and excess emissions of NOx, SO2, and mercury. Deposed 10/21/08. *United States et al. v. Cinergy, et al.*, In U.S. District Court for the Southern District of Indiana, Indianapolis Division, Civil Action No. IP99-1693 C-M/S. Testified 2/3/09. Memorandum Opinion & Order 5-29-09 requiring shutdown of Wabash River Units 2, 3, 5 by September 30, 2009, run at baseline until shutdown, and permanently surrender SO2 emission allowances.
- For plaintiffs, expert witness in liability phase of civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for three historic modifications (1997-2001) at two portland cement plants involving three cement kilns. Reviewed produced documents, analyzed CEMS data covering subject period, prepared netting analysis for NOx, SO_2 and CO, and prepared expert and rebuttal reports. *United States v. Cemex California*

Cement, In U.S. District Court for the Central District of California, Eastern Division, Case No. ED CV 07-00223-GW (JCRx). Settled 1/15/09.

- For intervenors Clean Wisconsin and Citizens Utility Board, prepared data requests, reviewed discovery and expert report. Prepared prefiled direct, rebuttal and surrebuttal testimony on cost to extend life of existing Oak Creek Units 5-8 and cost to address future regulatory requirements to determine whether to control or shutdown one or more of the units. Oral testimony 2/5/08. Application for a Certificate of Authority to Install Wet Flue Gas Desulfurization and Selective Catalytic Reduction Facilities and Associated Equipment for Control of Sulfur Dioxide and Nitrogen Oxide Emissions at Oak Creek Power Plant Units 5, 6, 7 and 8, WPSC Docket No. 6630-CE-299.
- For plaintiffs, expert witness on alternatives analysis and BACT for NOx, SO2, total PM10, and sulfuric acid mist in appeal of PSD permit issued to 1200 MW coal fired power plant burning Powder River Basin and/or Central Appalachian coal (Longleaf). Assisted in drafting technical comments on NOx on draft permit. Prepared expert disclosure. Presented 8+ days of direct and rebuttal expert testimony. Attended all 21 days of evidentiary hearing from 9/5/07 – 10/30/07 assisting in all aspects of hearing. *Friends of the Chatahooche and Sierra Club v. Dr. Carol Couch, Director, Environmental Protection Division of Natural Resources Department, Respondent, and Longleaf Energy Associates, Intervener*. ALJ Final Decision 1/11/08 denying petition. ALJ Order vacated & remanded for further proceedings, Fulton County Superior Court, 6/30/08. Court of Appeals of GA remanded the case with directions that the ALJ's final decision be vacated to consider the evidence under the correct standard of review, July 9, 2009. The ALJ issued an opinion April 2, 2010 in favor of the applicant. Final permit issued April 2010.
- For plaintiffs, expert witness on diesel exhaust in inverse condemnation case in which Port expanded maritime operations into residential neighborhoods, subjecting plaintiffs to noise, light, and diesel fumes. Measured real-time diesel particulate concentrations from marine vessels and tug boats on plaintiffs' property. Reviewed documents, depositions, DVDs, and photographs provided by counsel. Deposed. Testified October 24, 2006. *Ann Chargin, Richard Hackett, Carolyn Hackett, et al. v. Stockton Port District*, Superior Court of California, County of San Joaquin, Stockton Branch, No. CV021015. Judge ruled for plaintiffs.
- For plaintiffs, expert witness on NOx emissions and BACT in case alleging failure to obtain necessary permits and install controls on gas-fired combined-cycle turbines. Prepared and reviewed (applicant analyses) of NOx emissions, BACT analyses (water injection, SCR, ultra low NOx burners), and cost-effectiveness analyses based on site visit, plant operating records, stack tests, CEMS data, and turbine and catalyst vendor design information. Participated in negotiations to scope out consent order. *United States v. Nevada Power.* Case settled June 2007, resulting in installation of dry low NOx burners (5 ppm NOx averaged over 1 hr) on four units and a separate solar array at a local business.

- For plaintiffs, expert witness in appeal of PSD permit issued to 850 MW coal fired boiler burning Powder River Basin coal (Iatan Unit 2) on BACT for particulate matter, sulfuric acid mist and opacity and emission calculations for alleged historic violations of PSD. Assisted in drafting technical comments, petition for review, discovery requests, and responses to discovery requests. Reviewed produced documents. Prepared expert report on BACT for particulate matter. Assisted with expert depositions. Deposed February 7, 8, 27, and 28, 2007. *In Re PSD Construction Permit Issued to Great Plains Energy, Kansas City Power & Light – Iatan Generating Station, Sierra Club v. Missouri Department of Natural Resources, Great Plains Energy, and Kansas City Power & Light.* Case settled March 27, 2007, providing offsets for over 6 million ton/yr of CO2 and lower NOx and SO_2 emission limits.
- For plaintiffs, expert witness in remedy phase of civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications of coal-fired boilers and associated equipment. Reviewed produced documents, prepared expert report on cost to retrofit 24 coal-fired power plants with scrubbers designed to remove 99% of the sulfur dioxide from flue gases. Prepared supplemental and expert report on cost estimates and BACT for SO2 for these 24 complaint units. Deposed 1/30/07 and 3/14/07. *United States and State of New York et al. v. American Electric Power*, In U.S. District Court for the Southern District of Ohio, Eastern Division, Consolidated Civil Action Nos. C2-99-1182 and C2-99-1250. Settlement announced 10/9/07.
- For plaintiffs, expert witness on BACT, enforceability, and alternatives analysis in appeal of PSD permit issued for a 270-MW pulverized coal fired boiler burning Powder River Basin coal (City Utilities Springfield Unit 2). Reviewed permitting file and assisted counsel draft petition and prepare and respond to interrogatories and document requests. Reviewed interrogatory responses and produced documents. Assisted with expert depositions. Deposed August 2005. Evidentiary hearings October 2005. *In the Matter of Linda Chipperfield and Sierra Club v. Missouri Department of Natural Resources.* Missouri Supreme Court denied review of adverse lower court rulings August 2007.
- For plaintiffs, expert witness in civil action relating to plume touchdowns at AEP's Gavin coal-fired power plant. Assisted counsel draft interrogatories and document requests. Reviewed responses to interrogatories and produced documents. Prepared expert report "Releases of Sulfuric Acid Mist from the Gavin Power Station." The report evaluates sulfuric acid mist releases to determine if AEP complied with the requirements of CERCLA Section 103(a) and EPCRA Section 304. This report also discusses the formation, chemistry, release characteristics, and abatement of sulfuric acid mist in support of the claim that these releases present an imminent and substantial endangerment to public health under Section 7002(a)(1)(B) of the Resource Conservation and Recovery Act ("RCRA"). *Citizens Against Pollution v. Ohio Power Company*, In the U.S. District Court for the Southern District of Ohio, Eastern Division, Civil Action No. 2-04-cv-371. Case settled 12-8-06.

- For petitioners, expert witness in contested case hearing on BACT, enforceability, and emission estimates for an air permit issued to a 500-MW supercritical Power River Basin coal-fired boiler (Weston Unit 4). Assisted counsel prepare comments on draft air permit and respond to and draft discovery. Reviewed produced file, deposed (7/05), and prepared expert report on BACT and enforceability. Evidentiary hearings September 2005. *In the Matter of an Air Pollution Control Construction Permit Issued to Wisconsin Public Service Corporation for the Construction and Operation of a 500 MW Pulverized Coal-fired Power Plant Known as Weston Unit 4 in Marathon County, Wisconsin*, Case No. IH-04-21. The Final Order, issued 2/10/06, lowered the NOx BACT limit from 0.07 lb/MMBtu to 0.06 lb/MMBtu based on a 30-day average, added a BACT SO2 control efficiency, and required a 0.0005% high efficiency drift eliminator as BACT for the cooling tower. The modified permit, including these provisions, was issued 3/28/07. Additional appeals in progress.
- For plaintiffs, adviser on technical issues related to Citizen Suit against U.S. EPA regarding failure to update New Source Performance Standards for petroleum refineries, 40 CFR 60, Subparts J, VV, and GGG. *Our Children's Earth Foundation and Sierra Club v. U.S. EPA et al.* Case settled July 2005. CD No. C 05-00094 CW, U.S. District Court, Northern District of California – Oakland Division. Proposed revisions to standards of performance for petroleum refineries published 72 FR 27178 (5/14/07).
- For interveners, reviewed proposed Consent Decree settling Clean Air Act violations due to historic modifications of boilers and associated equipment at two coal-fired power plants. In response to stay order, reviewed the record, selected one representative activity at each of seven generating units, and analyzed to identify CAA violations. Identified NSPS and NSR violations for NOx, SO_2, PM/PM10, and sulfuric acid mist. Summarized results in an expert report. *United States of America, and Michael A. Cox, Attorney General of the State of Michigan, ex rel. Michigan Department of Environmental Quality, Plaintiffs, and Clean Wisconsin, Sierra Club, and Citizens' Utility Board, Intervenors, v. Wisconsin Electric Power Company, Defendant*, U.S. District Court for the Eastern District of Wisconsin, Civil Action No. 2:03-CV-00371-CNC. Order issued 10-1-07 denying petition.
- For a coalition of Nevada labor organizations (ACE), reviewed preliminary determination to issue a Class I Air Quality Operating Permit to Construct and supporting files for a 250-MW pulverized coal-fired boiler (Newmont). Prepared about 100 pages of technical analyses and comments on BACT, MACT, emission calculations, and enforceability. Assisted counsel draft petition and reply brief appealing PSD permit to U.S. EPA Environmental Appeals Board (EAB). Order denying review issued 12/21/05. *In re Newmont Nevada Energy Investment, LLC, TS Power Plant*, PSD Appeal No. 05-04 (EAB 2005).
- For petitioners and plaintiffs, reviewed and prepared comments on air quality and hazardous waste based on negative declaration for refinery ultra low sulfur diesel project located in SCAQMD. Reviewed responses to comments and prepared responses. Prepared declaration and presented oral testimony before SCAQMD Hearing Board on exempt sources (cooling towers) and calculation of potential to emit under NSR. Petition for writ of mandate filed

March 2005. Case remanded by Court of Appeals to trial court to direct SCAQMD to re-evaluate the potential environmental significance of NOx emissions resulting from the project in accordance with court's opinion. California Court of Appeals, Second Appellate Division, on December 18, 2007, affirmed in part (as to baseline) and denied in part. *Communities for a Better Environment v. South Coast Air Quality Management District and ConocoPhillips and Carlos Valdez et al v. South Coast Air Quality Management District and ConocoPhillips.* Certified for partial publication 1/16/08. Appellate Court opinion upheld by CA Supreme Court 3/15/10. *(2010) 48 Cal.4th 310*.

- For amici seeking to amend a proposed Consent Decree to settle alleged NSR violations at Chevron refineries, reviewed proposed settlement, related files, subject modifications, and emission calculations. Prepared declaration on emission reductions, identification of NSR and NSPS violations, and BACT/LAER for FCCUs, heaters and boilers, flares, and sulfur recovery plants. *U.S. et al. v. Chevron U.S.A.*, Northern District of California, Case No. C 03-04650. Memorandum and Order Entering Consent Decree issued June 2005. Case No. C 03-4650 CRB.
- For petitioners, prepared declaration on enforceability of periodic monitoring requirements, in response to EPA's revised interpretation of 40 CFR 70.6(c)(1). This revision limited additional monitoring required in Title V permits. 69 FR 3203 (Jan. 22, 2004). *Environmental Integrity Project et al. v. EPA* (U.S. Court of Appeals for the District of Columbia). Court ruled the Act requires all Title V permits to contain monitoring requirements to assure compliance. *Sierra Club v. EPA*, 536 F.3d 673 (D.C. Cir. 2008).
- For interveners in application for authority to construct a 500 MW supercritical coal-fired generating unit before the Wisconsin Public Service Commission, prepared pre-filed written direct and rebuttal testimony with oral cross examination and rebuttal on BACT and MACT (Weston 4). Prepared written comments on BACT, MACT, and enforceability on draft air permit for same facility.
- For property owners in Nevada, evaluated the environmental impacts of a 1,450-MW coal-fired power plant proposed in a rural area adjacent to the Black Rock Desert and Granite Range, including emission calculations, air quality modeling, comments on proposed use permit to collect preconstruction monitoring data, and coordination with agencies and other interested parties. Project cancelled.
- For environmental organizations, reviewed draft PSD permit for a 600-MW coal-fired power plant in West Virginia (Longview). Prepared comments on permit enforceability; coal washing; BACT for SO_2 and PM10; Hg MACT; and MACT for HCl, HF, non-Hg metallic HAPs, and enforceability. Assist plaintiffs draft petition appealing air permit. Retained as expert to develop testimony on MACT, BACT, offsets, enforceability. Participate in settlement discussions. Case settled July 2004.
- For petitioners, reviewed record produced in discovery and prepared affidavit on emissions of carbon monoxide and volatile organic compounds during startup of GE 7FA combustion

turbines to successfully establish plaintiff standing. *Sierra Club et al. v. Georgia Power Company* (Northern District of Georgia).

- For building trades, reviewed air quality permitting action for 1500-MW coal-fired power plant before the Kentucky Department for Environmental Protection (Thoroughbred).
- For petitioners, expert witness in administrative appeal of the PSD/Title V permit issued to a 1500-MW coal-fired power plant. Reviewed over 60,000 pages of produced documents, prepared discovery index, identified and assembled plaintiff exhibits. Deposed. Assisted counsel in drafting discovery requests, with over 30 depositions, witness cross examination, and brief drafting. Presented over 20 days of direct testimony, rebuttal and sur-rebuttal, with cross examination on BACT for NOx, SO_2, and PM/PM10; MACT for Hg and non-Hg metallic HAPs; emission estimates for purposes of Class I and II air modeling; risk assessment; and enforceability of permit limits. Evidentiary hearings from November 2003 to June 2004. *Sierra Club et al. v. Natural Resources & Environmental Protection Cabinet, Division of Air Quality and Thoroughbred Generating Company et al.* Hearing Officer Decision issued August 9, 2005 finding in favor of plaintiffs on counts as to risk, BACT (IGCC/CFB, NOx, SO_2, Hg, Be), single source, enforceability, and errors and omissions. Assist counsel draft exceptions. Cabinet Secretary issued Order April 11, 2006 denying Hearing Offer's report, except as to NOx BACT, Hg, 99% SO2 control and certain errors and omissions.
- For citizens group in Massachusetts, reviewed, commented on, and participated in permitting of pollution control retrofits of coal-fired power plant (Salem Harbor).
- Assisted citizens group and labor union challenge issuance of conditional use permit for a 317,000 ft^2 discount store in Honolulu without any environmental review. In support of a motion for preliminary injunction, prepared 7-page declaration addressing public health impacts of diesel exhaust from vehicles serving the Project. In preparation for trial, prepared 20-page preliminary expert report summarizing results of diesel exhaust and noise measurements at two big box retail stores in Honolulu, estimated diesel PM10 concentrations for Project using ISCST, prepared a cancer health risk assessment based on these analyses, and evaluated noise impacts.
- Assisted environmental organizations to challenge the DOE Finding of No Significant Impact (FONSI) for the Baja California Power and Sempra Energy Resources Cross-Border Transmissions Lines in the U.S. and four associated power plants located in Mexico (DOE EA-1391). Prepared 20-page declaration in support of motion for summary judgment addressing emissions, including CO_2 and NH_3, offsets, BACT, cumulative air quality impacts, alternative cooling systems, and water use and water quality impacts. Plaintiff's motion for summary judgment granted in part. U.S. District Court, Southern District decision concluded that the Environmental Assessment and FONSI violated NEPA and the APA due to their inadequate analysis of the potential controversy surrounding the project, water impacts, impacts from NH_3 and CO_2, alternatives, and cumulative impacts. *Border Power Plant Working Group v. Department of Energy and Bureau of Land Management*, Case No. 02-CV-513-IEG (POR) (May 2, 2003).

- For Sacramento school, reviewed draft air permit issued for diesel generator located across from playfield. Prepared comments on emission estimates, enforceability, BACT, and health impacts of diesel exhaust. Case settled. BUG trap installed on the diesel generator.
- Assisted unions in appeal of Title V permit issued by BAAQMD to carbon plant that manufactured coke. Reviewed District files, identified historic modifications that should have triggered PSD review, and prepared technical comments on Title V permit. Reviewed responses to comments and assisted counsel draft appeal to BAAQMD hearing board, opening brief, motion to strike, and rebuttal brief. Case settled.
- Assisted California Central Coast city obtain controls on a proposed new city that would straddle the Ventura-Los Angeles County boundary. Reviewed several environmental impact reports, prepared an air quality analysis, a diesel exhaust health risk assessment, and detailed review comments. Governor intervened and State dedicated the land for conservation purposes April 2004.
- Assisted Central California city to obtain controls on large alluvial sand quarry and asphalt plant proposing a modernization. Prepared comments on Negative Declaration on air quality, public health, noise, and traffic. Evaluated process flow diagrams and engineering reports to determine whether proposed changes increased plant capacity or substantially modified plant operations. Prepared comments on application for categorical exemption from CEQA. Presented testimony to County Board of Supervisors. Developed controls to mitigate impacts. Assisted counsel draft Petition for Writ. Case settled June 2002. Substantial improvements in plant operations were obtained including cap on throughput, dust control measures, asphalt plant loadout enclosure, and restrictions on truck routes.
- Assisted oil companies on the California Central Coast in defending class action citizen's lawsuit alleging health effects due to emissions from gas processing plant and leaking underground storage tanks. Reviewed regulatory and other files and advised counsel on merits of case. Case settled November 2001.
- Assisted oil company on the California Central Coast in defending property damage claims arising out of a historic oil spill. Reviewed site investigation reports, pump tests, leachability studies, and health risk assessments, participated in design of additional site characterization studies to assess health impacts, and advised counsel on merits of case. Prepare health risk assessment.
- Assisted unions in appeal of Initial Study/Negative Declaration ("IS/ND") for an MTBE phaseout project at a Bay Area refinery. Reviewed IS/ND and supporting agency permitting files and prepared technical comments on air quality, groundwater, and public health impacts. Reviewed responses to comments and final IS/ND and ATC permits and assisted counsel to draft petitions and briefs appealing decision to Air District Hearing Board. Presented sworn direct and rebuttal testimony with cross examination on groundwater impacts of ethanol spills on hydrocarbon contamination at refinery. Hearing Board ruled 5 to 0 in favor of appellants, remanding ATC to district to prepare an EIR.

- Assisted Florida cities in challenging the use of diesel and proposed BACT determinations in prevention of significant deterioration (PSD) permits issued to two 510-MW simple cycle peaking electric generating facilities and one 1,080-MW simple cycle/combined cycle facility. Reviewed permit applications, draft permits, and FDEP engineering evaluations, assisted counsel in drafting petitions and responding to discovery. Participated in settlement discussions. Cases settled or applications withdrawn.
- Assisted large California city in federal lawsuit alleging peaker power plant was violating its federal permit. Reviewed permit file and applicant's engineering and cost feasibility study to reduce emissions through retrofit controls. Advised counsel on feasible and cost-effective NOx, SOx, and PM10 controls for several 1960s diesel-fired Pratt and Whitney peaker turbines. Case settled.
- Assisted coalition of Georgia environmental groups in evaluating BACT determinations and permit conditions in PSD permits issued to several large natural gas-fired simple cycle and combined-cycle power plants. Prepared technical comments on draft PSD permits on BACT, enforceability of limits, and toxic emissions. Reviewed responses to comments, advised counsel on merits of cases, participated in settlement discussions, presented oral and written testimony in adjudicatory hearings, and provided technical assistance as required. Cases settled or won at trial.
- Assisted construction unions in review of air quality permitting actions before the Indiana Department of Environmental Management ("IDEM") for several natural gas-fired simple cycle peaker and combined cycle power plants.
- Assisted coalition of towns and environmental groups in challenging air permits issued to 523 MW dual fuel (natural gas and distillate) combined-cycle power plant in Connecticut. Prepared technical comments on draft permits and 60 pages of written testimony addressing emission estimates, startup/shutdown issues, BACT/LAER analyses, and toxic air emissions. Presented testimony in adjudicatory administrative hearings before the Connecticut Department of Environmental Protection in June 2001 and December 2001.
- Assisted various coalitions of unions, citizens groups, cities, public agencies, and developers in licensing and permitting of over 110 coal, gas, oil, biomass, and pet coke-fired power plants generating over 75,000 MW of electricity. These included base-load, combined cycle, simple cycle, and peaker power plants in Alaska, Arizona, Arkansas, California, Colorado, Georgia, Florida, Illinois, Indiana, Kentucky, Michigan, Missouri, Ohio, Oklahoma, Oregon, Texas, West Virginia, Wisconsin, and elsewhere. Prepared analyses of and comments on applications for certification, preliminary and final staff assessments, and various air, water, wastewater, and solid waste permits issued by local agencies. Presented written and oral testimony before various administrative bodies on hazards of ammonia use and transportation, health effects of air emissions, contaminated property issues, BACT/LAER issues related to SCR and SCONOx, criteria and toxic pollutant emission estimates, MACT analyses, air quality modeling, water supply and water quality issues, and methods to reduce

water use, including dry cooling, parallel dry-wet cooling, hybrid cooling, and zero liquid discharge systems.

- Assisted unions, cities, and neighborhood associations in challenging an EIR issued for the proposed expansion of the Oakland Airport. Reviewed two draft EIRs and prepared a health risk assessment and extensive technical comments on air quality and public health impacts. The California Court of Appeals, First Appellate District, ruled in favor of appellants and plaintiffs, concluding that the EIR "2) erred in using outdated information in assessing the emission of toxic air contaminants (TACs) from jet aircraft; 3) failed to support its decision not to evaluate the health risks associated with the emission of TACs with meaningful analysis," thus accepting my technical arguments and requiring the Port to prepare a new EIR. See *Berkeley Keep Jets Over the Bay Committee, City of San Leandro, and City of Alameda et al. v. Board of Port Commissioners* (August 30, 2001) 111 Cal.Rptr.2d 598.
- Assisted lessor of former gas station with leaking underground storage tanks and TCE contamination from adjacent property. Lessor held option to purchase, which was forfeited based on misrepresentation by remediation contractor as to nature and extent of contamination. Remediation contractor purchased property. Reviewed regulatory agency files and advised counsel on merits of case. Case not filed.
- Advised counsel on merits of several pending actions, including a Proposition 65 case involving groundwater contamination at an explosives manufacturing firm and two former gas stations with leaking underground storage tanks.
- Assisted defendant foundry in Oakland in a lawsuit brought by neighbors alleging property contamination, nuisance, trespass, smoke, and health effects from foundry operation. Inspected and sampled plaintiff's property. Advised counsel on merits of case. Case settled.
- Assisted business owner facing eminent domain eviction. Prepared technical comments on a negative declaration for soil contamination and public health risks from air emissions from a proposed redevelopment project in San Francisco in support of a CEQA lawsuit. Case settled.
- Assisted neighborhood association representing residents living downwind of a Berkeley asphalt plant in separate nuisance and CEQA lawsuits. Prepared technical comments on air quality, odor, and noise impacts, presented testimony at commission and council meetings, participated in community workshops, and participated in settlement discussions. Cases settled. Asphalt plant was upgraded to include air emission and noise controls, including vapor collection system at truck loading station, enclosures for noisy equipment, and improved housekeeping.
- Assisted a Fortune 500 residential home builder in claims alleging health effects from faulty installation of gas appliances. Conducted indoor air quality study, advised counsel on merits of case, and participated in discussions with plaintiffs. Case settled.

- Assisted property owners in Silicon Valley in lawsuit to recover remediation costs from insurer for large TCE plume originating from a manufacturing facility. Conducted investigations to demonstrate sudden and accidental release of TCE, including groundwater modeling, development of method to date spill, preparation of chemical inventory, investigation of historical waste disposal practices and standards, and on-site sewer and storm drainage inspections and sampling. Prepared declaration in opposition to motion for summary judgment. Case settled.
- Assisted residents in east Oakland downwind of a former battery plant in class action lawsuit alleging property contamination from lead emissions. Conducted historical research and dry deposition modeling that substantiated claim. Participated in mediation at JAMS. Case settled.
- Assisted property owners in West Oakland who purchased a former gas station that had leaking underground storage tanks and groundwater contamination. Reviewed agency files and advised counsel on merits of case. Prepared declaration in opposition to summary judgment. Prepared cost estimate to remediate site. Participated in settlement discussions. Case settled.
- Consultant to counsel representing plaintiffs in two Clean Water Act lawsuits involving selenium discharges into San Francisco Bay from refineries. Reviewed files and advised counsel on merits of case. Prepared interrogatory and discovery questions, assisted in deposing opposing experts, and reviewed and interpreted treatability and other technical studies. Judge ruled in favor of plaintiffs.
- Assisted oil company in a complaint filed by a resident of a small California beach community alleging that discharges of tank farm rinse water into the sanitary sewer system caused hydrogen sulfide gas to infiltrate residence, sending occupants to hospital. Inspected accident site, interviewed parties to the event, and reviewed extensive agency files related to incident. Used chemical analysis, field simulations, mass balance calculations, sewer hydraulic simulations with SWMM44, atmospheric dispersion modeling with SCREEN3, odor analyses, and risk assessment calculations to demonstrate that the incident was caused by a faulty drain trap and inadequate slope of sewer lateral on resident's property. Prepared a detailed technical report summarizing these studies. Case settled.
- Assisted large West Coast city in suit alleging that leaking underground storage tanks on city property had damaged the waterproofing on downgradient building, causing leaks in an underground parking structure. Reviewed subsurface hydrogeologic investigations and evaluated studies conducted by others documenting leakage from underground diesel and gasoline tanks. Inspected, tested, and evaluated waterproofing on subsurface parking structure. Waterproofing was substandard. Case settled.
- Assisted residents downwind of gravel mine and asphalt plant in Siskiyou County, California, in suit to obtain CEQA review of air permitting action. Prepared two declarations analyzing

air quality and public health impacts. Judge ruled in favor of plaintiffs, closing mine and asphalt plant.

- Assisted defendant oil company on the California Central Coast in class action lawsuit alleging property damage and health effects from subsurface petroleum contamination. Reviewed documents, prepared risk calculations, and advised counsel on merits of case. Participated in settlement discussions. Case settled.
- Assisted defendant oil company in class action lawsuit alleging health impacts from remediation of petroleum contaminated site on California Central Coast. Reviewed documents, designed and conducted monitoring program, and participated in settlement discussions. Case settled.
- Consultant to attorneys representing irrigation districts and municipal water districts to evaluate a potential challenge of USFWS actions under CVPIA section 3406(b)(2). Reviewed agency files and collected and analyzed hydrology, water quality, and fishery data. Advised counsel on merits of case. Case not filed.
- Assisted residents downwind of a Carson refinery in class action lawsuit involving soil and groundwater contamination, nuisance, property damage, and health effects from air emissions. Reviewed files and provided advice on contaminated soil and groundwater, toxic emissions, and health risks. Prepared declaration on refinery fugitive emissions. Prepared deposition questions and reviewed deposition transcripts on air quality, soil contamination, odors, and health impacts. Case settled.
- Assisted residents downwind of a Contra Costa refinery who were affected by an accidental release of naphtha. Characterized spilled naphtha, estimated emissions, and modeled ambient concentrations of hydrocarbons and sulfur compounds. Deposed. Presented testimony in binding arbitration at JAMS. Judge found in favor of plaintiffs.
- Assisted residents downwind of Contra Costa County refinery in class action lawsuit alleging property damage, nuisance, and health effects from several large accidents as well as routine operations. Reviewed files and prepared analyses of environmental impacts. Prepared declarations, deposed, and presented testimony before jury in one trial and judge in second. Case settled.
- Assisted business owner claiming damages from dust, noise, and vibration during a sewer construction project in San Francisco. Reviewed agency files and PM10 monitoring data and advised counsel on merits of case. Case settled.
- Assisted residents downwind of Contra Costa County refinery in class action lawsuit alleging property damage, nuisance, and health effects. Prepared declaration in opposition to summary judgment, deposed, and presented expert testimony on accidental releases, odor, and nuisance before jury. Case thrown out by judge, but reversed on appeal and not retried.

- Presented testimony in small claims court on behalf of residents claiming health effects from hydrogen sulfide from flaring emissions triggered by a power outage at a Contra Costa County refinery. Analyzed meteorological and air quality data and evaluated potential health risks of exposure to low concentrations of hydrogen sulfide. Judge awarded damages to plaintiffs.
- Assisted construction unions in challenging PSD permit for an Indiana steel mill. Prepared technical comments on draft PSD permit, drafted 70-page appeal of agency permit action to the Environmental Appeals Board challenging permit based on faulty BACT analysis for electric arc furnace and reheat furnace and faulty permit conditions, among others, and drafted briefs responding to four parties. EPA Region V and the EPA General Counsel intervened as amici, supporting petitioners. EAB ruled in favor of petitioners, remanding permit to IDEM on three key issues, including BACT for the reheat furnace and lead emissions from the EAF. Drafted motion to reconsider three issues. Prepared 69 pages of technical comments on revised draft PSD permit. Drafted second EAB appeal addressing lead emissions from the EAF and BACT for reheat furnace based on European experience with SCR/SNCR. Case settled. Permit was substantially improved. See *In re: Steel Dynamics, Inc.*, PSD Appeal Nos. 99-4 & 99-5 (EAB June 22, 2000).
- Assisted defendant urea manufacturer in Alaska in negotiations with USEPA to seek relief from penalties for alleged violations of the Clean Air Act. Reviewed and evaluated regulatory files and monitoring data, prepared technical analysis demonstrating that permit limits were not violated, and participated in negotiations with EPA to dismiss action. Fines were substantially reduced and case closed.
- Assisted construction unions in challenging PSD permitting action for an Indiana grain mill. Prepared technical comments on draft PSD permit and assisted counsel draft appeal of agency permit action to the Environmental Appeals Board challenging permit based on faulty BACT analyses for heaters and boilers and faulty permit conditions, among others. Case settled.
- As part of a consent decree settling a CEQA lawsuit, assisted neighbors of a large west coast port in negotiations with port authority to secure mitigation for air quality impacts. Prepared technical comments on mobile source air quality impacts and mitigation and negotiated a $9 million CEQA mitigation package. Represented neighbors on technical advisory committee established by port to implement the air quality mitigation program. Program successfully implemented.
- Assisted construction unions in challenging permitting action for a California hazardous waste incinerator. Prepared technical comments on draft permit, assisted counsel prepare appeal of EPA permit to the Environmental Appeals Board. Participated in settlement discussions on technical issues with applicant and EPA Region 9. Case settled.

- Assisted environmental group in challenging DTSC Negative Declaration on a hazardous waste treatment facility. Prepared technical comments on risk of upset, water, and health risks. Writ of mandamus issued.
- Assisted several neighborhood associations and cities impacted by quarries, asphalt plants, and cement plants in Alameda, Shasta, Sonoma, and Mendocino counties in obtaining mitigations for dust, air quality, public health, traffic, and noise impacts from facility operations and proposed expansions.
- For over 100 industrial facilities, commercial/campus, and redevelopment projects, developed the record in preparation for CEQA and NEPA lawsuits. Prepared technical comments on hazardous materials, solid wastes, public utilities, noise, worker safety, air quality, public health, water resources, water quality, traffic, and risk of upset sections of EIRs, EISs, FONSIs, initial studies, and negative declarations. Assisted counsel in drafting petitions and briefs and prepared declarations.
- For several large commercial development projects and airports, assisted applicant and counsel prepare defensible CEQA documents, respond to comments, and identify and evaluate "all feasible" mitigation to avoid CEQA challenges. This work included developing mitigation programs to reduce traffic-related air quality impacts based on energy conservation programs, solar, low-emission vehicles, alternative fuels, exhaust treatments, and transportation management associations.

SITE INVESTIGATION/REMEDIATION/CLOSURE

- Technical manager and principal engineer for characterization, remediation, and closure of waste management units at former Colorado oil shale plant. Constituents of concern included BTEX, As, 1,1,1-TCA, and TPH. Completed groundwater monitoring programs, site assessments, work plans, and closure plans for seven process water holding ponds, a refinery sewer system, and processed shale disposal area. Managed design and construction of groundwater treatment system and removal actions and obtained clean closure.
- Principal engineer for characterization, remediation, and closure of process water ponds at a former lanthanide processing plant in Colorado. Designed and implemented groundwater monitoring program and site assessments and prepared closure plan.
- Advised the city of Sacramento on redevelopment of two former railyards. Reviewed work plans, site investigations, risk assessment, RAPS, RI/FSs, and CEQA documents. Participated in the development of mitigation strategies to protect construction and utility workers and the public during remediation, redevelopment, and use of the site, including buffer zones, subslab venting, rail berm containment structure, and an environmental oversight plan.

- Provided technical support for the investigation of a former sanitary landfill that was redeveloped as single family homes. Reviewed and/or prepared portions of numerous documents, including health risk assessments, preliminary endangerment assessments, site investigation reports, work plans, and RI/FSs. Historical research to identify historic waste disposal practices to prepare a preliminary endangerment assessment. Acquired, reviewed, and analyzed the files of 18 federal, state, and local agencies, three sets of construction field notes, analyzed 21 aerial photographs and interviewed 14 individuals associated with operation of former landfill. Assisted counsel in defending lawsuit brought by residents alleging health impacts and diminution of property value due to residual contamination. Prepared summary reports.
- Technical oversight of characterization and remediation of a nitrate plume at an explosives manufacturing facility in Lincoln, CA. Provided interface between owners and consultants. Reviewed site assessments, work plans, closure plans, and RI/FSs.
- Consultant to owner of large western molybdenum mine proposed for NPL listing. Participated in negotiations to scope out consent order and develop scope of work. Participated in studies to determine premining groundwater background to evaluate applicability of water quality standards. Served on technical committees to develop alternatives to mitigate impacts and close the facility, including resloping and grading, various thickness and types of covers, and reclamation. This work included developing and evaluating methods to control surface runoff and erosion, mitigate impacts of acid rock drainage on surface and ground waters, and stabilize nine waste rock piles containing 328 million tons of pyrite-rich, mixed volcanic waste rock (andesites, rhyolite, tuff). Evaluated stability of waste rock piles. Represented client in hearings and meetings with state and federal oversight agencies.

REGULATORY (PARTIAL LIST)

- In June to August 2020, researched and wrote 69 pages of comments on inadequate project description, construction impacts, operational air quality impacts, cumulative air quality impacts, public health impacts, valley fever, hazards, geologic impacts, water use, CEC licensing, and extended lifetime impacts for the repower of a geothermal power plant in Imperial County.
- In June 2020, review revised quarry reclamation plan and draft 27 pages of comments on proposed modification.
- In June and July 2020, researched and wrote 23 pages of comments on cement terminal at Port of Stockton on construction impacts, emission baseline, operational emissions, and greenhouse gas mitigation.

- In May 2020, researched and wrote 10 pages of comments on FEIR for a new apartment project in Contra Costa County on GHG emissions from vegetation removal, mobile sources, and water use and mitigation for same.
- In March/April 2020, researched and wrote 50 pages of comments on IS/MND for battery energy storage project in San Jose (Hummingbird) on inadequate project description, criteria pollutant and GHG emissions, significant and unmitigated energy impacts, cumulative impacts, construction impacts, public health impacts from BESS accidents, and battery handling and transportation accidents. Wrote 15 pages of responses to comments on vendor specifications, battery composition, cumulative impacts, construction impacts, fire control methods, and battery accidents.
- In April 2020, researched and wrote 47 pages of comments on IS/MND for data center in Santa Clara (SV1) on operational NOx emissions; out-of-district emissions; interbasin pollutant transport; omitted emission sources; GHG compliance with plans, policies and regulations; indirect GHG emissions; air quality impacts; construction emissions; cumulative impacts; and risk of upset from battery accidents.
- In March 2020, researched and wrote 30 pages of comments on IS/MND for data center in San Jose (Hummingbird) on operational GHG and criteria pollutant emissions, cumulative impacts, and public health risks. Research and write responses to comments.
- In February-March 2020, researched and wrote 30 pages on an IS/MND for a data center in San Jose (Stack) on operational NOx and GHG emissions, cumulative impacts, heath risks, and odor.
- In February 2020, researched and wrote 33 pages of comments on Initial Study for a battery storage facility in Ventura County (Orni) on criteria pollutant and GHG emissions, worker and public health impacts, cumulative impacts, valley fever, and consistency with general plan.
- In February 2020, researched and wrote 20 pages of comments on valley fever in response to applicant's global response to comments on Valley Fever for a wind project in San Diego County.
- In January 2020, researched and wrote 32 pages of comments on the Orni battery storage facility (BESS) on incomplete project description, cumulative GHG and NOx impacts, BESS accidents, and health impacts, including soil contamination and valley fever.
- In January 2020, research and wrote 41 pages of comments on the DEIR for the NuStar Port of Stockton Liquid Bulk Terminal on operational emission calculations, significant NOx emissions, significant GHG emissions. GHG mitigation, and cumulative impacts.
- In December 2019, researched and wrote 3 pages of comments on the Silverstrand Grid battery storage facility on greenhouse gas emissions.

- In December 2019, researched and wrote 15 pages of comments on the Initial Study for the K2 Pure – Chlorine Rail Transportation Curtailment Project, including on air quality baseline, project description, emissions, cancer risks, risk of upset.
- In November 2019, reviewed agency files and researched and wrote 42 pages of comments on the Belridge Solar Project on compliance with local zoning ordinances, water quality impacts, air quality impacts, and worker and public health impacts due to soil contamination and valley fever.
- In October 2019, researched and wrote 49 pages of comments on IS/MND for data center in Santa Clara, CA on operational criteria pollutants (mobile sources, off-site electricity generation, emergency generators), ambient air quality impacts, greenhouse gas emissions and mitigation, and cumulative impacts.
- In October 2019, researched and wrote 9 pages of comments on the Application, Statement of Basis and draft Permit to Construct and Temporary Permit to Operate for proposed changes at the Paramount Refinery to facilitate refining of biomass-based feedstock to produce renewable fuels.
- In September 2019, reviewed City of Sunnyvale's file on Google's proposed Central Utility Plant and researched and wrote 34 pages of comments on construction and operational air quality impacts, cumulative impacts, and battery fire and explosion impacts. In October 2019, researched and wrote 15 pages of responses to comments.
- In August 2019, research and wrote 37 pages of comments on the DSEIR for the Le Conte Battery Energy Storage System on GHG emissions, hazards and hazardous material impacts, and health impacts.
- In August 2019, researched and wrote 38 pages of comments on IS/MND for the Hanford-Lakeside Dairy digester Project, Kings County, on project description (piecemealing), cumulative impacts, construction impacts, air quality impacts, valley fever and risk of upset.
- In July 2019, researched and wrote 48 pages of comments on IS/MND for the Five Points Pipeline Dairy Digester Cluster Project, including on air quality, cumulative impacts, worker and public health impacts (including on pesticide-contaminated soils), Valley Fever, construction air quality impacts, and risk of upset.
- In June 2019, researched and wrote 15 pages of responses to comments on IS/MND for SV1 Data Center, including operational NOx emissions, air quality analyses, construction emissions, battery hazards, and mitigation plans for noise, vibration, risk management, storm water pollution, and emergency response and evacuation plans.
- In June 2019, researched and wrote 30 pages of comments on DEIR for the Humboldt Wind Energy Project on fire and aesthetic impacts of transmission line, construction air quality impacts and mitigation, and greenhouse gas emissions.

- In May 2019, researched and wrote 25 pages of comments on the DEIR for the ExxonMobil Interim Trucking for Santa Ynez Phased Restart Project on project description, baseline, and mitigation.
- In April 2019, researched and wrote a 16 page letter critiquing the adequacy of the FEIR for CalAm Desalination Project to support a Monterey County Combined Development Permit, consisting of a Use Permit, an Administrative Permit, and Design Approval for the Desalination Plant and Carmel Valley Pump Station.
- In April 2019, researched and wrote 22 pages of comments on DEIR for the Eco-Energy Liquid Bulk Terminal at the Port of Stockton on emissions, air quality impact mitigation, and health risk assessment.
- In March 2019, researched and wrote 43 pages of comments on DEIR for Contanda Renewable Diesel Bulk Liquid Terminal at the Port of Stockton on operational emissions, air quality impacts and mitigation and health risks.
- In February 2019, researched and wrote 36 pages of comments on general cumulative impacts, air quality, accidents, and valley fever for IS/MND for biogas cluster project in Kings County.
- In January 2019, researched and wrote 30 pages of comments on air quality and valley fever for IS/MND for energy storage facility in Kings County.
- In December 2018, researched and wrote 11 pages of comments on air quality for IS/MND for biomass gasification facility in Madera County.
- In December 2018, researched and wrote 10 pages of responses to comments on IS/MND for a wind energy project in Riverside County.
- In December 2018, researched and wrote 12 pages of responses to comments on IS/MND for a large Safeway fueling station in Petaluma. The Planning Commission voted unanimously to require an EIR.
- In November 2018, researched and wrote 30 pages of comments on IS/MND on wind energy project in Riverside County on construction health risks, odor impacts, waste disposal, transportation, construction emissions and mitigation and Valley Fever.
- In November 2018, researched and wrote 32 pages of comments on the DEIR for a solar energy generation and storage project in San Bernardino County on hazards, health risks, odor, construction emissions and mitigation, and Valley Fever.
- In September 2018, researched and wrote 36 pages of comments on the FEIR for the Newland Sierra Project including on greenhouse gas emissions, construction emissions, and cumulative impacts.
- In August 2018, researched and wrote 20 pages of comments on the health risk assessment in the IS/MND for a large Safeway fueling station in Petaluma.

- In August 2018, researched and wrote responses to comments on DEIR for the Newland Sierra Project, San Diego County on greenhouse gas emissions, construction emissions, odor, and Valley Fever.
- In July/August 2018, researched and wrote 12 pages of comments on DEIR for proposed Doheny Desal Project, on GHG, criteria pollutant, and TAC emissions and public health impacts during construction and indirect emissions during operation.
- In June 2018, researched and wrote 12 pages of technical comments rebutting NDDH responses to comments on Meridian Davis Refinery.
- In April 2018, researched and wrote 26 pages of comments on greenhouse gas emissions and mitigation as proposed in the San Diego County Climate Action Plan.
- In April 2018, researched and wrote 24 pages of comments on the FEIR for Monterey County water supply project, including GHG mitigation, air quality impacts and mitigation, and Valley Fever.
- In March-June 2018, researched and wrote 37 pages of comments on the IS/MND for the 2305 Mission College Boulevard Data Center, Santa Clara, California and responded to responses to comments.
- In March 2018, researched and wrote 40 pages of comments on the IS/MND for the Diablo Energy Storage Facility in Pittsburg, California.
- In March 2018, researched and wrote 19 pages of comments on Infill Checklist/Mitigated Negative Declaration for the Legacy@Livermore Project on CalEEMod emission calculations, including NOx and PM10 and construction health risk assessment, including Valley Fever.
- In January 2018, researched and wrote 28 pages of comments on draft Permit to Construct for the Davis Refinery Project, North Dakota, as a minor source of criteria pollutants and HAPs.
- In December 2017, researched and wrote 19 pages of comments on DEIR for the Rialto Bioenergy Facility, Rialto, California.
- In November and December 2017, researched and wrote 6 pages of comments on the Ventura County Air Pollution Control District's Preliminary Determination if Compliance (PDOC) for Mission Rock Energy Center.
- In November 2017, researched and wrote 11 pages of comments on control technology evaluation for the National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry Residual Risk and Technology Review.
- In September and November 2017, prepared comments on revised Negative Declaration for Delicato Winery in San Joaquin County, California.

- In October and November 2017, researched and wrote comments on North City Project Pure Water San Diego Program DEIR/DEIS to reclaim wastewater for municipal use.
- In August 2017, reviewed DEIR on a new residential community in eastern San Diego County (Newland Sierra) and research and wrote 60 pages of comments on air quality, greenhouse gas emissions and health impacts, including Valley Fever.
- In August 2017, reviewed responses to comments on Part 70 operating permit for IGP Methanol's Gulf Coast Methanol Complex, near Myrtle Grove, Louisiana, and researched and wrote comments on metallic HAP issues.
- In July 2017, reviewed the FEIS for an expansion of the Port of Gulfport and researched and wrote 10 pages of comments on air quality and public health.
- In June 2017, reviewed and prepared technical report on an Application for a synthetic minor source construction permit for a new Refinery in North Dakota.
- In June 2017, reviewed responses to NPCA and other comments on the BP Cherry Point Refinery modifications and assisted counsel in evaluating issues to appeal, including GHG BACT, coker heater SCR cost effectiveness analysis, and SO_2 BACT.
- In June 2017, reviewed Part 70 Operating Permit Renewal/Modification for the Noranda Alumina LC/Gramercy Holdings I, LLC alumina processing plant, St. James, Louisiana, and prepared comments on HAP emissions from bauxite feedstock.
- In May and June 2017, reviewed FEIR on Tesoro Integration Project and prepared responses to comments on the DEIR.
- In May 2017, prepared comments on tank VOC and HAP emissions from Tesoro Integration Project, based on real time monitoring at the Tesoro and other refineries in the SCAQMD.
- In April 2017, prepared comments on Negative Declaration for Delicato Winery in San Joaquin County, California.
- In March 2017, reviewed Negative Declaration for Ellmore geothermal facility in Imperial County, California and prepared summary of issues.
- In March 2017, prepared response to Phillips 66 Company's Appeal of the San Luis Obispo County Planning Commission's Decision Denying the Rail Spur Extension Project Proposed for the Santa Maria Refinery.
- In February 2017, researched and wrote comments on Kalama draft Title V permit for 10,000 MT/day methanol production and marine export facility in Kalama, Washington.
- In January 2017, researched and wrote 51 pages of comments on proposed Title V and PSD permits for the St. James Methanol Plant, St. James Louisiana, on BACT and enforceability of permit conditions.

- In December 2016, researched and wrote comments on draft Title V Permit for Yuhuang Chemical Inc. Methanol Plant, St. James, Louisiana, responding to EPA Order addressing enforceability issues.
- In November 2016, researched and wrote comments on Initial Study/Mitigated Negative Declaration for the AES Battery Energy Storage Facility, Long Beach, CA.
- In November 2016, researched and wrote comments on Campo Verde Battery Energy Storage System Draft Environmental Impact Report.
- In October 2016, researched and wrote comments on Title V Permit for NuStar Terminal Operations Partnership L.P, Stockton, CA.
- In October 2016, prepared expert report, Technical Assessment of Achieving the 40 CFR Part 423 Zero Discharge Standard for Bottom Ash Transport Water at the Belle River Power Plant, East China, Michigan. Reported resulted in a 2 year reduction in compliance date for elimination of bottom ash transport water. 1/30/17 DEQ Letter.
- In September 2016, researched and wrote comments on Proposed Title V Permit and Environmental Assessment Statement, Yuhuang Chemical Inc. Methanol Plant, St. James, Louisiana.
- In September 2016, researched and wrote response to "Further Rebuttal in Support of Appeal of Planning Commission Resolution No. 16-1, Denying Use Permit Application 12PLN-00063 and Declining to Certify Final Environmental Impact Report for the Valero Benicia Crude-by-Rail Project.
- In August 2016, reviewed and prepared comments on manuscript: Hutton et al., Freshwater Flows to the San Francisco Bay-Delta Estuary over Nine Decades: Trends Evaluation.
- In August/September 2016, researched and wrote comments on Mitigated Negative Declaration for the Chevron Long Wharf Maintenance and Efficiency Project.
- In July 2016, researched and wrote comments on the Ventura County APCD Preliminary Determination of Compliance and the California Energy Commission Revised Preliminary Staff Assessment for the Puente Power Project.
- In June 2016, researched and wrote comments on an Ordinance (1) Amending the Oakland Municipal Code to Prohibit the Storage and Handling of Coal and Coke at Bulk Material Facilities or Terminals Throughout the City of Oakland and (2) Adopting CEQA Exemption Findings and supporting technical reports. Council approved Ordinance on an 8 to 0 vote on June 27, 2016.
- In May 2016, researched and wrote comments on Draft Title V Permit and Draft Environmental Impact Report for the Tesoro Los Angeles Refinery Integration and Compliance Project.

- In March 2016, researched and wrote comments on Valero's Appeal of Planning Commission's Denial of Valero Crude-by-Rail Project.
- In February 2016, researched and wrote comments on Final Environmental Impact Report, Santa Maria Rail Spur Project.
- In February 2016, researched and wrote comments on Final Environmental Impact Report, Valero Benicia Crude by Rail Project.
- In January 2016, researched and wrote comments on Draft Programmatic Environmental Impact Report for the Southern California Association of Government's (SCAG) 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy.
- In November 2015, researched and wrote comments on Final Environmental Impact Report for Revisions to the Kern County Zoning Ordinance – 2015(C) (Focused on Oil and Gas Local Permitting), November 2015.
- In October 2015, researched and wrote comments on Revised Draft Environmental Report, Valero Benicia Crude by Rail Project.
- In September 2015, prepared report, "Environmental, Health and Safety Impacts of the Proposed Oakland Bulk and Oversized Terminal, and presented oral testimony on September 21, 2015 before Oakland City Council on behalf of the Sierra Club.
- In September 2015, researched and wrote comments on revisions to two chapters of EPA's Air Pollution Control Cost Manual: Docket ID No. EPA-HQ-OAR-2015-0341.
- In June 2015, researched and wrote comments on DEIR for the CalAm Monterey Peninsula Water Supply Project.
- In April 2015, researched and wrote comments on proposed Title V Operating Permit Revision and Prevention of Significant Deterioration Permit for Arizona Public Service's Ocotillo Power Plant Modernization Project (5 GE LMS100 105-MW simple cycle turbines operated as peakers), in Tempe, Arizona; Final permit appealed to EAB.
- In March 2015, researched and wrote "Comments on Proposed Title V Air Permit, Yuhuang Chemical Inc. Methanol Plant, St. James, Louisiana". Client filed petition objecting to the permit. EPA granted majority of issues. In the Matter of Yuhuang Chemical Inc. Methanol Plant, St. James Parish, Louisiana, Permit No. 2560-00295-V0, Issued by the Louisiana Department of Environmental Quality, Petition No. VI-2015-03, Order Responding to the Petitioners' Request for Objection to the Issuance of a Title V Operating Permit, September 1, 2016.
- In February 2015, prepared compilation of BACT cost effectiveness values in support of comments on draft PSD Permit for Bonanza Power Project.
- In January 2015, prepared cost effectiveness analysis for SCR for a 500-MW coal fire power plant, to address unpermitted upgrades in 2000.

- In January 2015, researched and wrote comments on Revised Final Environmental Impact Report for the Phillips 66 Propane Recovery Project. *Communities for a Better Environment et al. v. Contra Costa County et al. Contra Costa County (Superior Court, Contra Costa County, Case No. MSN15-0301, December 1, 2016).*
- In December 2014, researched and wrote "Report on Bakersfield Crude Terminal Permits to Operate." In response, the U.S. EPA cited the Terminal for 10 violations of the Clean Air Act. The Fifth Appellate District Court upheld the finding in this report in CBE et al v. San Joaquin Valley Unified Air Pollution Control District and Bakersfield Crude Terminal LLC et al, Super. Ct. No. 284013, June 23, 2017.
- In December 2014, researched and wrote comments on Revised Draft Environmental Impact Report for the Phillips 66 Propane Recovery Project.
- In November 2014, researched and wrote comments on Revised Draft Environmental Impact Report for Phillips 66 Rail Spur Extension Project and Crude Unloading Project, Santa Maria, CA to allow the import of tar sands crudes.
- In November 2014, researched and wrote comments on Draft Environmental Impact Report for Phillips 66 Ultra Low Sulfur Diesel Project, responding to the California Supreme Court Decision, *Communities for a Better Environment v. South Coast Air Quality Management Dist. (2010) 48 Cal.4th 310.*
- In November 2014, researched and wrote comments on Draft Environmental Impact Report for the Tesoro Avon Marine Oil Terminal Lease Consideration.
- In October 2014, prepared: "Report on Hydrogen Cyanide Emissions from Fluid Catalytic Cracking Units", pursuant to the Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 FR 36880.
- In October 2014, researched and wrote technical comments on Final Environmental Impact Reports for Alon Bakersfield Crude Flexibility Project to build a rail terminal to allow the import/export of tar sands and Bakken crude oils and to upgrade an existing refinery to allow it to process a wide range of crudes.
- In October 2014, researched and wrote technical comments on the Title V Permit Renewal and three De Minimus Significant Revisions for the Tesoro Logistics Marine Terminal in the SCAQMD.
- In September 2014, researched and wrote technical comments on the Draft Environmental Impact Report for the Valero Crude by Rail Project.
- In August 2014, for EPA Region 6, prepared technical report on costing methods for upgrades to existing scrubbers at coal-fired power plants.
- In July 2014, researched and wrote technical comments on Draft Final Environmental Impact Reports for Alon Bakersfield Crude Flexibility Project to build a rail terminal to allow the

import/export of tar sands and Bakken crude oils and to upgrade an existing refinery to allow it to process a wide range of crudes.

- In June 2014, researched and wrote technical report on Initial Study and Draft Negative Declaration for the Tesoro Logistics Storage Tank Replacement and Modification Project.
- In May 2014, researched and wrote technical comments on Intent to Approve a new refinery and petroleum transloading operation in Utah.
- In March and April 2014, prepared declarations on air permits issued for two crude-by-rail terminals in California, modified to switch from importing ethanol to importing Bakken crude oils by rail and transferring to tanker cars. Permits were issued without undergoing CEQA review. One permit was upheld by the San Francisco Superior Court as statute of limitations had run. The Sacramento Air Quality Management District withdrew the second one due to failure to require BACT and conduct CEQA review.
- In March 2014, researched and wrote technical report on Negative Declaration for a proposed modification of the air permit for a bulk petroleum and storage terminal to the allow the import of tar sands and Bakken crude oil by rail and its export by barge, under the New York State Environmental Quality Review Act (SEQRA).
- In February 2014, researched and wrote technical report on proposed modification of air permit for midwest refinery upgrade/expansion to process tar sands crudes.
- In January 2014, prepared cost estimates to capture, transport, and use CO2 in enhanced oil recovery, from the Freeport LNG project based on both Selexol and Amine systems.
- In January 2014, researched and wrote technical report on Draft Environmental Impact Report for Phillips 66 Rail Spur Extension Project, Santa Maria, CA. Comments addressed project description (piecemealing, crude slate), risk of upset analyses, mitigation measures, alternative analyses and cumulative impacts.
- In November 2013, researched and wrote technical report on the Phillips 66 Propane Recovery Project, Rodeo, CA. Comments addressed project description (piecemealing, crude slate) and air quality impacts.
- In September 2013, researched and wrote technical report on the Draft Authority to Construct Permit for the Casa Diablo IV Geothermal Development Project Environmental Impact Report and Declaration in Support of Appeal and Petition for Stay, U.S. Department of the Interior, Board of Land Appeals, Appeal of Decision Record for the Casa Diablo IV Geothermal Development Project.
- In September 2013, researched and wrote technical report on Effluent Limitation Guidelines for Best Available Technology Economically Available (BAT) for Bottom Ash Transport Waters from Coal-Fired Power Plants in the Steam Electric Power Generating Point Source Category.

- In July 2013, researched and wrote technical report on Initial Study/Mitigated Negative Declaration for the Valero Crude by Rail Project, Benicia, California, Use Permit Application 12PLN-00063.
- In July 2013, researched and wrote technical report on fugitive particulate matter emissions from coal train staging at the proposed Coyote Island Terminal, Oregon, for draft Permit No. 25-0015-ST-01.
- In July 2013, researched and wrote technical comments on air quality impacts of the Finger Lakes LPG Storage Facility as reported in various Environmental Impact Statements.
- In July 2013, researched and wrote technical comments on proposed Greenhouse Gas PSD Permit for the Celanese Clear Lake Plant, including cost analysis of CO2 capture, transport, and sequestration.
- In June/July 2013, researched and wrote technical comments on proposed Draft PSD Preconstruction Permit for Greenhouse Gas Emission for the ExxonMobil Chemical Company Baytown Olefins Plant, including cost analysis of CO2 capture, transport, and sequestration.
- In June 2013, researched and wrote technical report on a Mitigated Negative Declaration for a new rail terminal at the Valero Benicia Refinery to import increased amounts of "North American" crudes. Comments addressed air quality impacts of refining increased amounts of tar sands crudes.
- In June 2013, researched and wrote technical report on Draft Environmental Impact Report for the California Ethanol and Power Imperial Valley 1 Project.
- In May 2013, researched and wrote comments on draft PSD permit for major expansion of midwest refinery to process 100% tar sands crudes, including a complex netting analysis involving debottlenecking, piecemealing, and BACT analyses.
- In April 2013, researched and wrote technical report on the Draft Supplemental Environmental Impact Statement (DSEIS) for the Keystone XL Pipeline on air quality impacts from refining increased amount of tar sands crudes at Refineries in PADD 3.
- In October 2012, researched and wrote technical report on the Environmental Review for the Coyote Island Terminal Dock at the Port of Morrow on fugitive particulate matter emissions.
- In October 2012-October 2014, review and evaluate Flint Hills West Application for an expansion/modification for increased (Texas, Eagle Ford Shale) crude processing and related modification, including netting and BACT analysis. Assist in settlement discussions.
- In February 2012, researched and wrote comments on BART analysis in PA Regional Haze SIP, 77 FR 3984 (Jan. 26, 2012). On Sept. 29, 2015, a federal appeals court overturned the U.S. EPA's approval of this plan, based in part on my comments, concluding "..we will vacate the 2014 Final Rule to the extent it approved Pennsylvania's source-specific BART

analysis and remand to the EPA for further proceedings consistent with this Opinion." Nat'l Parks Conservation Assoc. v. EPA, 3d Cir., No. 14-3147, 9/19/15.

- Prepared cost analyses and comments on New York's proposed BART determinations for NOx, SO2, and PM and EPA's proposed approval of BART determinations for Danskammer Generating Station under New York Regional Haze State Implementation Plan and Federal Implementation Plan, 77 FR 51915 (August 28, 2012).
- Prepared cost analyses and comments on NOx BART determinations for Regional Haze State Implementation Plan for State of Nevada, 77 FR 23191 (April 18, 2012) and 77 FR 25660 (May 1, 2012).
- Prepared analyses of and comments on New Source Performance Standards for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, 77 FR 22392 (April 13, 2012).
- Researched and wrote comments on CASPR-BART emission equivalency and NOx and PM BART determinations in EPA proposed approval of State Implementation Plan for Pennsylvania Regional Haze Implementation Plan, 77 FR 3984 (January 26, 2012).
- Researched and wrote comments and statistical analyses on hazardous air pollutants (HAPs) emission controls, monitoring, compliance methods, and the use of surrogates for acid gases, organic HAPs, and metallic HAPs for proposed National Emission Standards for Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units, 76 FR 24976 (May 3, 2011).
- Prepared cost analyses and comments on NOx BART determinations and emission reductions for proposed Federal Implementation Plan for Four Corners Power Plant, 75 FR 64221 (October 19, 2010).
- Prepared cost analyses and comments on NOx BART determinations for Colstrip Units 1- 4 for Montana State Implementation Plan and Regional Haze Federal Implementation Plan, 77 FR 23988 (April 20, 2010).
- For EPA Region 8, prepared report: Revised BART Cost Effectiveness Analysis for Tail-End Selective Catalytic Reduction at the Basin Electric Power Cooperative Leland Olds Station Unit 2 Final Report, March 2011, in support of 76 FR 58570 (Sept. 21, 2011).
- For EPA Region 6, prepared report: Revised BART Cost-Effectiveness Analysis for Selective Catalytic Reduction at the Public Service Company of New Mexico San Juan Generating Station, November 2010, in support of 76 FR 52388 (Aug. 22, 2011).
- For EPA Region 6, prepared report: Revised BART Cost-Effectiveness Analysis for Flue Gas Desulfurization at Coal-Fired Electric Generating Units in Oklahoma: Sooner Units 1 & 2, Muskogee Units 4 & 5, Northeastern Units 3 &4, October 2010, in support of 76 FR 16168

(March 26, 2011). My work was upheld in: *State of Oklahoma v. EPA*, App. Case 12-9526 (10th Cri. July 19, 2013).

- Identified errors in N_2O emission factors in the Mandatory Greenhouse Gas Reporting Rule, 40 CFR 98, and prepared technical analysis to support Petition for Rulemaking to Correct Emissions Factors in the Mandatory Greenhouse Gas Reporting Rule, filed with EPA on 10/28/10.
- Assisted interested parties develop input for and prepare comments on the Information Collection Request for Petroleum Refinery Sector NSPS and NESHAP Residual Risk and Technology Review, 75 FR 60107 (9/29/10).
- Technical reviewer of EPA's "Emission Estimation Protocol for Petroleum Refineries," posted for public comments on CHIEF on 12/23/09, prepared in response to the City of Houston's petition under the Data Quality Act (March 2010).
- Researched and wrote comments on SCR cost effectiveness for EPA's Advanced Notice of Proposed Rulemaking, Assessment of Anticipated Visibility Improvements at Surrounding Class I Areas and Cost Effectiveness of Best Available Retrofit Technology for Four Corners Power Plant and Navajo Generating Station, 74 FR 44313 (August 28, 2009).
- Researched and wrote comments on Proposed Rule for Standards of Performance for Coal Preparation and Processing Plants, 74 FR 25304 (May 27, 2009).
- Prepared comments on draft PSD permit for major expansion of midwest refinery to process up to 100% tar sands crudes. Participated in development of monitoring and controls to mitigate impacts and in negotiating a Consent Decree to settle claims in 2008.
- Reviewed and assisted interested parties prepare comments on proposed Kentucky air toxic regulations at 401 KAR 64:005, 64:010, 64:020, and 64:030 (June 2007).
- Prepared comments on proposed Standards of Performance for Electric Utility Steam Generating Units and Small Industrial-Commercial-Industrial Steam Generating Units, 70 FR 9706 (February 28, 2005).
- Prepared comments on Louisville Air Pollution Control District proposed Strategic Toxic Air Reduction regulations.
- Prepared comments and analysis of BAAQMD Regulation, Rule 11, Flare Monitoring at Petroleum Refineries.
- Prepared comments on Proposed National Emission Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards of Performance for New and Existing Stationary Sources: Electricity Utility Steam Generating Units (MACT standards for coal-fired power plants).

- Prepared Authority to Construct Permit for remediation of a large petroleum-contaminated site on the California Central Coast. Negotiated conditions with agencies and secured permits.
- Prepared Authority to Construct Permit for remediation of a former oil field on the California Central Coast. Participated in negotiations with agencies and secured permits.
- Prepared and/or reviewed hundreds of environmental permits, including NPDES, UIC, Stormwater, Authority to Construct, Prevention of Significant Deterioration, Nonattainment New Source Review, Title V, and RCRA, among others.
- Participated in the development of the CARB document, *Guidance for Power Plant Siting and Best Available Control Technology*, including attending public workshops and filing technical comments.
- Performed data analyses in support of adoption of emergency power restoration standards by the California Public Utilities Commission for "major" power outages, where major is an outage that simultaneously affects 10% of the customer base.
- Drafted portions of the Good Neighbor Ordinance to grant Contra Costa County greater authority over safety of local industry, particularly chemical plants and refineries.
- Participated in drafting BAAQMD Regulation 8, Rule 28, Pressure Relief Devices, including participation in public workshops, review of staff reports, draft rules and other technical materials, preparation of technical comments on staff proposals, research on availability and costs of methods to control PRV releases, and negotiations with staff.
- Participated in amending BAAQMD Regulation 8, Rule 18, Valves and Connectors, including participation in public workshops, review of staff reports, proposed rules and other supporting technical material, preparation of technical comments on staff proposals, research on availability and cost of low-leak technology, and negotiations with staff.
- Participated in amending BAAQMD Regulation 8, Rule 25, Pumps and Compressors, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of low-leak and seal-less technology, and negotiations with staff.
- Participated in amending BAAQMD Regulation 8, Rule 5, Storage of Organic Liquids, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of controlling tank emissions, and presentation of testimony before the Board.
- Participated in amending BAAQMD Regulation 8, Rule 18, Valves and Connectors at Petroleum Refinery Complexes, including participation in public workshops, review of staff reports, proposed rules and other supporting technical material, preparation of technical

comments on staff proposals, research on availability and costs of low-leak technology, and presentation of testimony before the Board.

- Participated in amending BAAQMD Regulation 8, Rule 22, Valves and Flanges at Chemical Plants, etc, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of low-leak technology, and presentation of testimony before the Board.
- Participated in amending BAAQMD Regulation 8, Rule 25, Pump and Compressor Seals, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability of low-leak technology, and presentation of testimony before the Board.
- Participated in the development of the BAAQMD Regulation 2, Rule 5, Toxics, including participation in public workshops, review of staff proposals, and preparation of technical comments.
- Participated in the development of SCAQMD Rule 1402, Control of Toxic Air Contaminants from Existing Sources, and proposed amendments to Rule 1401, New Source Review of Toxic Air Contaminants, in 1993, including review of staff proposals and preparation of technical comments on same.
- Participated in the development of the Sunnyvale Ordinance to Regulate the Storage, Use and Handling of Toxic Gas, which was designed to provide engineering controls for gases that are not otherwise regulated by the Uniform Fire Code.
- Participated in the drafting of the Statewide Water Quality Control Plans for Inland Surface Waters and Enclosed Bays and Estuaries, including participation in workshops, review of draft plans, preparation of technical comments on draft plans, and presentation of testimony before the SWRCB.
- Participated in developing Se permit effluent limitations for the five Bay Area refineries, including review of staff proposals, statistical analyses of Se effluent data, review of literature on aquatic toxicity of Se, preparation of technical comments on several staff proposals, and presentation of testimony before the Bay Area RWQCB.
- Represented the California Department of Water Resources in the 1991 Bay-Delta Hearings before the State Water Resources Control Board, presenting sworn expert testimony with cross examination and rebuttal on a striped bass model developed by the California Department of Fish and Game.
- Represented the State Water Contractors in the 1987 Bay-Delta Hearings before the State Water Resources Control Board, presenting sworn expert testimony with cross examination and rebuttal on natural flows, historical salinity trends in San Francisco Bay, Delta outflow, and hydrodynamics of the South Bay.

- Represented interveners in the licensing of over 20 natural-gas-fired power plants and one coal gasification plant at the California Energy Commission and elsewhere. Reviewed and prepared technical comments on applications for certification, preliminary staff assessments, final staff assessments, preliminary determinations of compliance, final determinations of compliance, and prevention of significant deterioration permits in the areas of air quality, water supply, water quality, biology, public health, worker safety, transportation, site contamination, cooling systems, and hazardous materials. Presented written and oral testimony in evidentiary hearings with cross examination and rebuttal. Participated in technical workshops.
- Represented several parties in the proposed merger of San Diego Gas & Electric and Southern California Edison. Prepared independent technical analyses on health risks, air quality, and water quality. Presented written and oral testimony before the Public Utilities Commission administrative law judge with cross examination and rebuttal.
- Represented a PRP in negotiations with local health and other agencies to establish impact of subsurface contamination on overlying residential properties. Reviewed health studies prepared by agency consultants and worked with agencies and their consultants to evaluate health risks.

WATER QUALITY/RESOURCES

- Directed and participated in research on environmental impacts of energy development in the Colorado River Basin, including contamination of surface and subsurface waters and modeling of flow and chemical transport through fractured aquifers.
- Played a major role in Northern California water resource planning studies since the early 1970s. Prepared portions of the Basin Plans for the Sacramento, San Joaquin, and Delta basins including sections on water supply, water quality, beneficial uses, waste load allocation, and agricultural drainage. Developed water quality models for the Sacramento and San Joaquin Rivers.
- Conducted hundreds of studies over the past 40 years on Delta water supplies and the impacts of exports from the Delta on water quality and biological resources of the Central Valley, Sacramento-San Joaquin Delta, and San Francisco Bay. Typical examples include:
    1. Evaluate historical trends in salinity, temperature, and flow in San Francisco Bay and upstream rivers to determine impacts of water exports on the estuary;
    2. Evaluate the role of exports and natural factors on the food web by exploring the relationship between salinity and primary productivity in San Francisco Bay, upstream rivers, and ocean;
    3. Evaluate the effects of exports, other in-Delta, and upstream factors on the abundance of salmon and striped bass;

4. Review and critique agency fishery models that link water exports with the abundance of striped bass and salmon;
5. Develop a model based on GLMs to estimate the relative impact of exports, water facility operating variables, tidal phase, salinity, temperature, and other variables on the survival of salmon smolts as they migrate through the Delta;
6. Reconstruct the natural hydrology of the Central Valley using water balances, vegetation mapping, reservoir operation models to simulate flood basins, precipitation records, tree ring research, and historical research;
7. Evaluate the relationship between biological indicators of estuary health and down-estuary position of a salinity surrogate (X2);
8. Use real-time fisheries monitoring data to quantify impact of exports on fish migration;
9. Refine/develop statistical theory of autocorrelation and use to assess strength of relationships between biological and flow variables;
10. Collect, compile, and analyze water quality and toxicity data for surface waters in the Central Valley to assess the role of water quality in fishery declines;
11. Assess mitigation measures, including habitat restoration and changes in water project operation, to minimize fishery impacts;
12. Evaluate the impact of unscreened agricultural water diversions on abundance of larval fish;
13. Prepare and present testimony on the impacts of water resources development on Bay hydrodynamics, salinity, and temperature in water rights hearings;
14. Evaluate the impact of boat wakes on shallow water habitat, including interpretation of historical aerial photographs;
15. Evaluate the hydrodynamic and water quality impacts of converting Delta islands into reservoirs;
16. Use a hydrodynamic model to simulate the distribution of larval fish in a tidally influenced estuary;
17. Identify and evaluate non-export factors that may have contributed to fishery declines, including predation, shifts in oceanic conditions, aquatic toxicity from pesticides and mining wastes, salinity intrusion from channel dredging, loss of riparian and marsh habitat, sedimentation from upstream land alternations, and changes in dissolved oxygen, flow, and temperature below dams.

- Developed, directed, and participated in a broad-based research program on environmental issues and control technology for energy industries including petroleum, oil shale, coal mining, and coal slurry transport. Research included evaluation of air and water pollution, development of novel, low-cost technology to treat and dispose of wastes, and development and application of geohydrologic models to evaluate subsurface contamination from in-situ retorting. The program consisted of government and industry contracts and employed 45 technical and administrative personnel.
- Coordinated an industry task force established to investigate the occurrence, causes, and solutions for corrosion/erosion and mechanical/engineering failures in the waterside systems (e.g., condensers, steam generation equipment) of power plants. Corrosion/erosion failures caused by water and steam contamination that were investigated included waterside corrosion caused by poor microbiological treatment of cooling water, steam-side corrosion caused by ammonia-oxygen attack of copper alloys, stress-corrosion cracking of copper alloys in the air cooling sections of condensers, tube sheet leaks, oxygen in-leakage through condensers, volatilization of silica in boilers and carry over and deposition on turbine blades, and iron corrosion on boiler tube walls. Mechanical/engineering failures investigated included: steam impingement attack on the steam side of condenser tubes, tube-to-tube-sheet joint leakage, flow-induced vibration, structural design problems, and mechanical failures due to stresses induced by shutdown, startup and cycling duty, among others. Worked with electric utility plant owners/operators, condenser and boiler vendors, and architect/engineers to collect data to document the occurrence of and causes for these problems, prepared reports summarizing the investigations, and presented the results and participated on a committee of industry experts tasked with identifying solutions to prevent condenser failures.
- Evaluated the cost effectiveness and technical feasibility of using dry cooling and parallel dry-wet cooling to reduce water demands of several large natural-gas fired power plants in California and Arizona.
- Designed and prepared cost estimates for several dry cooling systems (e.g., fin fan heat exchangers) used in chemical plants and refineries.
- Designed, evaluated, and costed several zero liquid discharge systems for power plants.
- Evaluated the impact of agricultural and mining practices on surface water quality of Central Valley steams. Represented municipal water agencies on several federal and state advisory committees tasked with gathering and assessing relevant technical information, developing work plans, and providing oversight of technical work to investigate toxicity issues in the watershed.

AIR QUALITY/PUBLIC HEALTH

- Prepared or reviewed the air quality and public health sections of hundreds of EIRs and EISs on a wide range of industrial, commercial and residential projects.

- Prepared or reviewed hundreds of NSR and PSD permits for a wide range of industrial facilities.
- Designed, implemented, and directed a 2-year-long community air quality monitoring program to assure that residents downwind of a petroleum-contaminated site were not impacted during remediation of petroleum-contaminated soils. The program included real-time monitoring of particulates, diesel exhaust, and BTEX and time integrated monitoring for over 100 chemicals.
- Designed, implemented, and directed a 5-year long source, industrial hygiene, and ambient monitoring program to characterize air emissions, employee exposure, and downwind environmental impacts of a first-generation shale oil plant. The program included stack monitoring of heaters, boilers, incinerators, sulfur recovery units, rock crushers, API separator vents, and wastewater pond fugitives for arsenic, cadmium, chlorine, chromium, mercury, 15 organic indicators (e.g., quinoline, pyrrole, benzo(a)pyrene, thiophene, benzene), sulfur gases, hydrogen cyanide, and ammonia. In many cases, new methods had to be developed or existing methods modified to accommodate the complex matrices of shale plant gases.
- Conducted investigations on the impact of diesel exhaust from truck traffic from a wide range of facilities including mines, large retail centers, light industrial uses, and sports facilities. Conducted traffic surveys, continuously monitored diesel exhaust using an aethalometer, and prepared health risk assessments using resulting data.
- Conducted indoor air quality investigations to assess exposure to natural gas leaks, pesticides, molds and fungi, soil gas from subsurface contamination, and outgasing of carpets, drapes, furniture and construction materials. Prepared health risk assessments using collected data.
- Prepared health risk assessments, emission inventories, air quality analyses, and assisted in the permitting of over 70 1 to 2 MW emergency diesel generators.
- Prepare over 100 health risk assessments, endangerment assessments, and other health-based studies for a wide range of industrial facilities.
- Developed methods to monitor trace elements in gas streams, including a continuous real-time monitor based on the Zeeman atomic absorption spectrometer, to continuously measure mercury and other elements.
- Performed nuisance investigations (odor, noise, dust, smoke, indoor air quality, soil contamination) for businesses, industrial facilities, and residences located proximate to and downwind of pollution sources.

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2.2.2 Responses to Comments

Response to Comment 1

The District disagrees with the general statement from the commenter that the Draft SEIR fails to implement all feasible mitigation measures to reduce the Project's significant and unavoidable air quality impacts. While the commenter references the definition of feasibility in CEQA, it often conflates that definition with the assertion that any measure that is "possible" is also "feasible." The CEQA definition of feasibility calls for a more balanced approach weighing a number of factors to determine the feasibility of a mitigation measure. The commenter largely does not acknowledge or apply this weighing of factors in its comments, The SEIR and the following responses to comments uses the term "feasible" and "feasibility" as defined in CEQA. All feasible mitigation measures to reduce significant and unavoidable air quality impacts, including from fugitive reactive organic gases (ROG) emissions, have been adopted as described in Chapter 2 of the Draft SEIR (Final SEIR Appendix A). The commenter provided additional comments with additional specificity to allow for more detailed responses. See responses to comments below.

Response to Comment 2

The summary provided by the commenter is mostly consistent with the Project Description in Chapter 2 of the Draft SEIR (Final SEIR Appendix A), although the commenter paraphrased portions of the description and inaccurately added quotations around the term closed system, which is not consistent with the Project Description. Because neither the summary nor its inaccuracies raise any material issues concerning the adequacy or accuracy of the Draft SEIR, the salient issues are responded to in more detail in response to more specific comments below.

Response to Comment 3

This general summary of the 2013 Final EIS/EIR (certified July 17, 2014) preparation process and subsequent lawsuit filings and trial court ruling, and this paraphrasing of the Court of Appeal's ruling are acknowledged. Because this comment does not raise any material issues concerning the adequacy or accuracy of the Draft SEIR, the salient issues are responded to in more detail in response to more specific comments below.

Response to Comment 4

The District disagrees with the commenter's opinion as to the adequacy of the District's response to the court's directive in *Covington*. To the contrary, the Draft SEIR complies with all directives from the court as described in detail in the following responses to comments.

The Draft SEIR analyzes the proposed ROG mitigation measures consistent with the decision, and recommends for the District's adoption all feasible measures to reduce fugitive ROG emissions. Contrary to the commenter's suggestion, the Draft SEIR analyzed and incorporated substantially more stringent leak rate definitions in Chapter 2 of the Draft SEIR (Final SEIR

Appendix A), further reducing the LDAR leak rate definition in Mitigation Measure AQ-6 as it appeared in Section 2.2.10 of the 2013 Final EIS/EIR from 10,000 ppmv[1] to 2,000 ppmv for pumps and 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals and all other fugitive components (see Chapter 2 of the Draft SEIR in Final SEIR Appendix A). In addition, for clarity, this Final SEIR revised Mitigation Measure AQ-6 to incorporate the lower leak rate definition of 500 ppmv to include "components with the potential for fugitive emissions." See Responses to Comments 12 and 18 for additional detail.

The commenter also suggests the use of optical remote sensing (ORS), which is a technology neither mentioned in the Court of Appeal's decision nor in previous comments on the 2013 EIS/EIR. Regardless, the Project proposes the use of Best Available Control Technologies (BACT), which includes the use of optical gas imaging (OGI) equipment, an alternative optical sensing system, as described in Mitigation Measure AQ-6 (Draft SEIR Section 2 page 2-5), see Response to Comment 26 for details.

Response to Comment 5

The District disagrees with the commenter's opinion that the Draft SEIR is fatally flawed, and with the suggestion that further analysis is required before decision-makers may consider the EIR or the Project. The District's reasons are explained throughout these responses.

Response to Comment 6

The District disagrees with the commenter's opinion that the Draft SEIR fails to adopt feasible mitigation measures to the greatest extent possible. See Response to Comment 12 for more detail regarding the feasibility determination analysis for the leak rate definitions included in the LDAR program; see Response to Comment 26 for more detail regarding Ormat's implementation of OGI as an element of the LDAR program. Though motive fluid systems at geothermal power plants have many fundamental differences from petroleum refineries and chemical manufacturing facilities, the most stringent federal LDAR work practices determined feasible have been adopted.

Response to Comment 7

Because neither this summary of the impact conclusions of the 2013 Final EIS/EIR, nor the references to comments received on the 2013 Final EIS/EIR raise any material issues concerning the adequacy or accuracy of the Draft SEIR, the salient issues are responded to in more detail in response to more specific comments below.

[1] References cited in this document refer to air pollutant concentrations in parts per million by volume, however some references indicate this with the abbreviation "ppm" while others use "ppmv." For consistency and clarity, air pollutant concentrations in this document are presented as "ppmv," regardless of the source.

Response to Comment 8

The comment accurately states that the Draft SEIR revises Mitigation Measure AQ-6 by adding additional requirements to the LDAR program. As described in Table 3-1 (Draft SEIR at p. 3-4), "Implementation of more stringent LDAR practices has the potential to reduce fugitive reactive organic gases (ROG) emissions associated with the Project." The commenter's note that this did not change the conclusions in the 2013 Final EIS/EIR regarding the significance of ROG emissions is correct.

Response to Comment 9

The comment accurately summarizes revisions to Mitigation Measure AQ-6 identified in Draft SEIR Section 2.2.10.

Response to Comment 10

See Response to Comment 4 regarding the substantial reduction of the leak rate definitions incorporated into Mitigation Measure AQ-6 (see Chapter 2 of Draft SEIR in Final SEIR Appendix A). Section 3.2 of the Draft SEIR evaluated the commenter's suggested leak rate definitions of 500 ppmv for pumps and 100 ppmv for other fugitive components in the Draft SEIR for feasibility. As a result of the analysis, the Draft SEIR revised Mitigation Measure AQ-6 to incorporate lower leak rate definitions of 2,000 ppmv for pumps and 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, and turbine gland seals, and for clarity, this Final SEIR revised Mitigation Measure AQ-6 to incorporate the lower leak rate definition of 500 ppmv for all other "components with the potential for fugitive emissions" (see Response to Comment 18). The Draft SEIR determined it was not feasible to incorporate the commenter's suggested leak rate definitions; however, the Draft SEIR found that lower leak rate definitions than proposed in the 2013 Final EIS/EIR were feasible, resulting in a substantial reduction in fugitive emissions. As a result, the term "partially feasible" referred in the Draft SEIR to the reduced leak rate definitions incorporated in the revised Mitigation Measure AQ-6. Following further consideration in response to this comment, the leak rate definitions in Mitigation Measure AQ-6 of the Draft SEIR continue to represent the limit of feasible leak rate definitions.

Nonetheless, for clarity regarding the feasibility analysis relative to the recommended leak rate definition of 100 ppmv, Item Numbers 3 and 4 in Table 3-1 (Draft SEIR at p. 3-5) have been revised from "Partially Feasible" to "Not Feasible" as shown in underline/strikethrough text below:

For additional information regarding the feasibility of the recommended leak rate definition, see Response to Comment 12.

TABLE 3-1
TECHNICAL FEASIBILITY OF ENHANCED LEAK DETECTION AND REPAIR PROCEDURES

No.	Suggested Measure	Feasibility/Analysis	Conclusion
3	A lower maximum leak definition threshold of 100 ppmv should be established for all fugitive components.	~~**Partially**~~ **Not Feasible.** A maximum leak definition threshold of 100 ppmv for all components with the potential for fugitive emissions is not operationally or economically feasible. Ormat contends that the use of a 100 ppmv leak threshold for all components other than pumps and a leak threshold of 500 ppmv for pumps would require certain Project components to be installed as "leakless" through the use of welds and other seals, which would increase maintenance outages and result in a loss in annual operating capacity from 95 percent to 70 percent and cause an approximately 4.5-million-dollar annual loss in revenue, or approximately $110 million over the 25 -year term. Ormat has stated that this loss in revenue would make the Project infeasible and none of the renewable energy benefits of the Project would be realized (Ormat, 2020). It is feasible for the Project to include a leak rate definition of 500 ppmv for valves, pressure relief ~~values~~ valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other ~~fugitive components~~ components with the potential for fugitive emissions in the motive fluid system ([Draft SEIR] Appendix B). This is a substantial reduction compared to the 10,000 ppmv leak definition threshold identified in the 2013 Final EIS/EIR, but is greater than the suggested leak rate definition of 100 ppmv. The USEPA best practices guide presents a table (Table 4.1 Control Effectiveness for an LDAR Program at a Chemical Process Unit and a Refinery) that summarizes control effectiveness for different parts of a refinery and reports a monthly monitoring program with a leak rate of 10,000 ppmv can reduce emissions by 76 percent, when referring to liquids, and 88 percent when referring to gas, and a program with a leak rate of 500 ppmv can reduce emissions by 95 percent when referring to liquids, and 96 percent for when referring to gas (USEPA, 2007b). Based on these data, leak definitions for the subject components of less than 500 ppmv would not achieve substantially greater emission reductions.	Mitigation Measure AQ-6 has been revised to define the leak rate definition as 500 ppmv for valves, pressure relief ~~values~~ valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all ~~other fugitive components~~ other components with the potential for fugitive emissions except for pumps (see Item 4 below). This leak rate threshold is generally consistent with the most stringent federal CAA standards for equipment leaks ([Draft SEIR] Appendix B). Implementation of a lower leak definition has the potential to reduce fugitive ROG emissions associated with the Project. Further reduction of the leak definition threshold below 500 ppmv would not substantially reduce emissions.
4	A higher leak rate for pumps, no higher than the 500 ppmv as specified in BAAQMD Rule 8-18, can be used if accompanied by an analysis demonstrating that 100 ppmv is not technologically feasible or cost effective in the subject applications.	~~**Partially**~~ **Not Feasible.** A maximum leak definition threshold of 500 ppmv for pumps is not operationally or economically feasible. Ormat indicated that the use of a 100 ppmv leak threshold for all components other than pumps and a 500 ppmv leak threshold for pumps would increase maintenance outages and result in a loss in annual operating capacity from 95 percent to 70 percent and cause an approximately 4.5-million-dollar annual loss in revenue, or approximately $110 million over the 25 year term. Ormat has stated that this loss in revenue would make the Project infeasible and none of the renewable energy benefits of the Project would be realized (Ormat, 2020). It is feasible for the Project to include a leak rate definition of 2,000 ppmv for pumps in the motive fluid system ([Draft SEIR] Appendix B). This is a substantial reduction compared to the 10,000 ppmv leak definition threshold identified in the 2013 Final EIS/EIR, but is greater than the suggested leak rate definition of 100 ppmv or 500 ppmv. The USEPA best practices guide presents a table (Table 4.1 Control Effectiveness for an LDAR Program at a Chemical Process Unit and a Refinery) that summarizes control effectiveness for different parts of a refinery and reports a monthly monitoring program with a leak rate of 10,000 ppmv can reduce emissions by 76 percent, when referring to liquids, and 88 percent when referring to gas,	Mitigation Measure AQ-6 has been revised to define the leak rate threshold to 2,000 ppmv for pumps in the motive fluid system. This leak rate threshold is generally consistent with the most stringent federal CAA standards for equipment leaks ([Draft SEIR] Appendix B). Implementation of a lower leak definition has the potential to reduce fugitive ROG emissions associated with the Project. Further reduction of the leak definition threshold below 2,000 ppmv would not substantially reduce emissions.

TABLE 3-1
TECHNICAL FEASIBILITY OF ENHANCED LEAK DETECTION AND REPAIR PROCEDURES

No.	Suggested Measure	Feasibility/Analysis	Conclusion
		and a program with a leak rate of 500 ppmv can reduce emissions by 95 percent when referring to liquids, and 96 percent for when referring to gas (USEPA, 2007). Based on these data, leak definitions for pumps of less than 2,000 ppmv would not achieve substantially greater emission reductions.	

Response to Comment 11

The District disagrees with the commenter's opinion that the Draft SEIR's feasibility analysis is misleading and incomplete. See Section 3.2 of the Draft SEIR and Response to Comment 12 regarding the feasibility of the suggested LDAR leak rate definitions.

Response to Comment 12

Section 3.2 of the Draft SEIR describes the feasibility analysis conducted to determine the revised leak rate definition included in Mitigation Measure A-6. See Response to Comment 10, where the District has clarified that the commenter's suggested leak detection rate definitions are not feasible. Additional clarification regarding the infeasibility of the commenter's suggested leak rate definitions is provided below.

Operational and Economic Feasibility

Subsequent to the release of the Draft SEIR, Ormat provided the following additional information to the District regarding the leak rate definitions recommended by the commenter. Because the Project is designed to be a "baseload" project, meaning it would operate continuously to meet the minimum level of power demand 24 hours a day, 7 days a week, Ormat has designed and contracted the Project to operate at an approximately 95 percent capacity factor (Ormat, 2020). The 95 percent capacity factor means that the Project would operate for approximately 8,322 hours each year out of the 8,760 hours available.

For context, the USEPA has determined that its Method 21, for monitoring of pumps and valves, and repair of leaks above 2,000 ppmv for pumps and 500 ppmv for valves, is the Best Demonstrated Technology for reducing emissions from equipment leaks at petroleum refineries and chemical manufacturing plants. The USEPA evaluated the cost-effectiveness of lowering the leak definitions even further for valves because there are some state rules and petroleum refinery consent decrees at lower levels. The results of that analysis show that a LDAR program for valves at a leak rate definition lower than 500 ppmv is not cost-effective (USEPA, 2007a). Since 2007, and as recently as 2020, the USEPA has completed a residual risk and technology review and other rulemaking proceedings for several federal standards that has not resulted in a decrease in leak repair thresholds for components with the potential for fugitive emissions (Ormat, 2020).

Given that USEPA's cost-effectiveness evaluation for leak rate definitions was relative to the petroleum refinery and chemical manufacturing industries, and not necessarily applicable to

geothermal power plants, Ormat's operations team provided information regarding the operational and economic feasibility of measures necessary to implement the commenter's recommended leak rate definitions for the Project (Ormat, 2020). To meet the recommended leak rate definitions, Ormat's operations team found that certain Project components would have to be installed using "leakless" connections through the use of welds and other seals (which the proposed motive fluid system already includes to the greatest extent practicable), instead of the proposed conventional methods of joining components using seals, gaskets, and bolted connections. Sealing these components would limit potential leaks; however, routine maintenance and repair would become much more complex and time consuming. For example, rather than simply unbolting, resealing, and re-bolting components to repair leaks and conduct other repairs, leakless-sealed components would have to be cut. This would involve more "hot work," which is more complicated and time-consuming given the safety procedures required due to the flammable nature of n-pentane, when it would not ordinarily be required (for additional discussion of the logistics required for hot work, see Draft SEIR at pp. 2-3, 2-4, 3-7, 4-2, and 4-3).

Ormat's operations team has estimated that the time required to conduct routine maintenance on the components required to be leakless due to the recommended leak rate definitions would increase four- or five-fold compared to the Project as proposed. Specifically, Ormat estimates that the additional time required for maintenance activities would result in a reduction of its proposed energy production capacity factor from approximately 95 percent to approximately 70 percent. In terms of hours per year, out of the possible 8,760 hours, a 70 percent capacity would result in approximately 6,132 operational hours. Therefore, compared to the approximately 8,322 hours of operation at 95 percent capacity, implementation of the commenter's recommended leak rate definitions would result in a loss of approximately 2,190 hours of energy production (Ormat, 2020).

The loss of 2,190 hours of generation at the proposed geothermal plant would result in a reduction of 65,700 megawatt hours (MWh) annually of Renewable Portfolio Standard qualified renewable generation each year assuming a conservative capacity of 30 MW (the net power output of the Project is proposed to be about 33 MW). Over the assumed 25-year life of the Project's Power Purchase agreement (PPA), this would result in the loss of 54,750 hours or 1,642,500 MWh of renewable generation (Ormat, 2020).

Assuming a monetary value of $75.50 per MWh generated, which is the recent Southern California Public Power Authority (SCPPA) portfolio PPA price, the loss in operating capacity from 95 percent to 70 percent would result in an approximately $4.5 million loss in annual revenue, or approximately $110 million over the 25-year life of the Project. Such losses would make the Project operationally or economically infeasible (Ormat, 2020), and would fundamentally change the Project to the point that Ormat states they would be forced to abandon the Project.

Taken together, these factors have been weighed by the District, and substantial evidence regarding the economic, technical, operational, and other issues supports the District's determination that implementation of leak rate definitions lower than the leak rate definitions included in Draft SEIR Mitigation Measure AQ-6, is not feasible. See Table 3-1.

Environmental Feasibility

Decreasing the available capacity and energy from renewable energy resources would also hamper the state from achieving its goal of decreased reliance upon non-renewable resources to serve the state's electrical needs. Specifically, California requires all electric utilities to procure electricity from Renewable Portfolio Standard eligible resources each year. Senate Bill 100 (2018) requires all electric utilities in California to increase their annual renewable procurement to 60 percent by 2030, and requires all the state's electricity to come from carbon-free resources by 2045.

Geothermal power plants do not contribute to the carbon intensity of the electric grid. California's greenhouse gas Cap-and-Trade Program is designed to fight climate change by reducing California's greenhouse gas pollution. Cap-and-Trade was designed by the California Air Resources Board to achieve the goals of the Global Warming Solutions Act of 2006 (AB 32) as updated by Senate Bill 32 (2016). Introducing new geothermal power generation to the electricity grid will help the effort to decarbonize California's electric system. Geothermal power plants are expressly exempt from the state's Cap-and-Trade Regulation precisely because they support the decarbonization of California's electrical grid. Geothermal power plants are renewable energy resources eligible to meet California's Renewable Portfolio Standard. The Draft SEIR correctly recognized that the Project would displace higher emitting fossil fuel plants (see Draft SEIR Section 1.1.3).

During the hours the Project would be shutdown, these greenhouse gas benefits would not accrue, as additional fossil-fueled power plants could be required to operate during the shutdown. As discussed above, Ormat estimates that implementation of the commenter's proposed leak rate definitions could reduce the capacity factor of the Project from its proposed value of 95 percent to approximately 70 percent, resulting in a loss of approximately 2,190 hours of renewable energy generation per year (Ormat, 2020). The reduction in hours could also drop the greenhouse gas displacement benefits of the Project by that same amount, approximately 25 percent. A 25 percent reduction of the 89,000 metric tons of carbon dioxide equivalents (CO_2e; a standard measure to compare the global warming potential of various greenhouse gases) per year, as calculated in the 2013 Final EIS/EIR, could forgo 25 percent of that annual benefit, or approximately 22,250 metric tons of CO_2e per year. Over 25 years the loss of this renewable geothermal energy could result in a generation increase of 556,250 metric tons of CO_2e.

Renewable generation from the Project could also result in substantial reductions of criteria pollutants compared to fossil-fueled generation. A 2017 study by Oak Ridge National Laboratory estimated nitrogen oxides (NO_x) emission rates for fossil fueled power plants (ORNL, 2017). The NO_x emission rates, expressed in pounds of NO_x per megawatt hour, for coal power plants was 2.09 pounds per MWh and 0.37 pounds per MWh for natural gas power plants. The Project's geothermal technology avoids such NO_x emissions. The estimated loss of 2,190 hours of renewable energy generation per year from implementation of the commenter's suggested leak rate definitions could result in more criteria pollutants to replace the baseload renewable energy that would be lost from the Project. A loss of 65,700 MWh per year of geothermal power replaced with either natural gas power or coal power could result in estimated excess NO_x emissions of 24,300 or 137,300 pounds per year, respectively. Such emission increases could create negative impacts on the environment and support a determination regarding the infeasibility of the suggested mitigation (Ormat, 2020).

In sum, the reduced capacity factor from 95 percent to 70 percent weighs against the feasibility of the suggested mitigation measures. The Project's substantial benefits, including the renewable energy benefits, are important factors in the preceding feasibility analysis. Taking the analysis of the loss of 2,190 hours of renewable energy generation per year and extrapolating it out to the entire loss of the Project (95 percent of an entire year, which is 8,322 hours), the State of California could lose 249,660 MWh per year (based upon the conservative 30 MW plant generation used above) of renewable geothermal power that may be made up for with either natural gas or coal powered electricity generation. The loss of the Project could result in the emission of the full 89,000 metric tons of CO_2e that the Project could have offset, as well as 92,370 pounds per year of NO_x emissions from natural gas powered electrical generation or 521,790 pounds per year of NO_x emissions from coal fired electrical generation. The entire loss of the Project could be a detriment for the State in achieving its goals for renewable and carbon-free energy sources. Each of these factors standing alone, or in combination, provide substantial evidence supporting the District's determination regarding the feasibility of the suggested mitigation measures.

Response to Comment 13

The commenter recommends leak rate thresholds for the Project that are based on the Bay Area Air Quality Management District (BAAQMD) Rule 8-18: Equipment Leaks. While the commenter notes that BAAQMD Rule 8-18 does not expressly cover geothermal facilities, the commenter proceeds to state the thresholds should apply to the Project while failing to note several critical points. First, the lower leak detection thresholds in BAAQMD Rule 8-18 were adopted to address BAAQMD's federal and state ozone nonattainment, as well as to reduce toxic air contaminants (BAAQMD, 2004; BAAQMD, 2015b). Second, Rule 8-18 was specifically written to only apply to the largest facilities under the jurisdiction of the BAAQMD. The leak rate thresholds in the BAAQMD for a similarly sized facility to the Casa Diablo IV Geothermal Power Plant Project would be less stringent than those adopted by Mitigation Measure AQ-6. Finally, the LDAR program that would be required pursuant to implementation of Mitigation Measure AQ-6 (which includes monthly monitoring and a leak rate definition of 2,000 ppmv for pumps and 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other components with the potential for fugitive emissions) is generally equivalent to the BAAQMD Rule 8-18 requirements in terms of overall control effectiveness, as determined using USEPA and California Air Pollution Control Officers Association (CAPCOA) methods (see below).

BAAQMD Rule 8-18 Purpose and Intent

BAAQMD Rule 8-18, Equipment Leaks, was first adopted in 1980 and was amended in 1992 and 2004, with minor changes in 1998 and 2002. Rule amendments in 1992 significantly lowered the allowable leak concentration limits to the lowest in the country, with the primary intent to limit emissions at the five large refineries in the Bay Area to address the federal and state ozone nonattainment status of the Bay Area (BAAQMD, 1992; BAAQMD, 2004; BAAQMD, 2015b). Unlike the Bay Area, the area of Mono County where the Casa Diablo IV Geothermal Power Plant Project is located is designated attainment for all federal air quality standards including ozone. Mono County is designated nonattainment for ozone for the California Ambient Air Quality Standard (CARB, 2019) and although local sources of ROGs may contribute to ozone formation, the primary cause of the infrequent ozone exceedances in Mono County is transport

from the San Joaquin Valley Air Basin. California Air Resources Board (CARB) determined that "...emission sources within the Great Basin Valleys could not have generated the exceedances" (GBUAPCD, 1991). In contrast, numerous local anthropogenic sources including large industrial facilities and mobile sources are the primary source of ozone precursor emissions in the Bay Area (BAAQMD, 2017).

In addition to addressing federal and state air quality standards, the leak concentration thresholds established by BAAQMD Rule 8-18 were also adopted to protect public health by reducing emissions of toxic air containments (BAAQMD, 1992; BAAQMD, 2004; BAAQMD, 2015b). As discussed in the Draft SEIR, the ROG that constitutes the fugitive emissions for the Project is n-pentane, a regulated ozone precursor and volatile organic compound (VOC). However, n-pentane is not classified as a regulated toxic air contaminant (TAC) in California and is not classified as a hazardous air pollutant (HAP) under the federal Clean Air Act.

BAAQMD Rule 8-18 Applicability

BAAQMD Rule 8-18 is not applicable to this project type or size. As stated by BAAQMD (BAAQMD, 2015b) regarding the purpose of Rule 8-18: “The goal of this rulemaking is to achieve further reductions in fugitive emissions of volatile organic compounds (including toxic organics) at refineries.” The District acknowledges that petroleum refineries and chemical plants use similar components with the potential for fugitive emissions in similar services that handle fluids with vapor pressures comparable to or higher than the n-pentane motive fluid in geothermal plants. However, fugitives from those fluids tend to be toxic and therefore are materially different than the motive fluid that would be used for the Project, which are not defined as toxic air contaminants by the California EPA or hazardous air pollutants by the U.S. EPA.

The facilities regulated by BAAQMD Rule 8-18 involve the manufacturing, storage, transfer, and/or the transportation of commercial quantities of ROGs, TACs, and HAPs. In contrast, instead of manufacturing, processing, transferring, or storing such chemicals, the proposed geothermal plant would use motive fluid in a closed-loop system for the purpose of producing electricity. The manufacturing processes of petroleum refineries, chemical plants, bulk plants or terminals, gasoline bulk terminals, and gasoline cargo tanks regulated by BAAQMD Rule 8-18 are materially different than the production of renewable geothermal energy, which uses a comparably smaller amount of n-pentane.

Even if BAAQMD Rule 8-18 did apply to a geothermal facility (which it does not), the proposed Ormat facility would be exempt as meeting the definition of a “small facility.” BAAQMD Rule 8-18-111 (BAAQMD, 2015a) exempts facilities that “have less than 100 valves or less than 10 pumps and compressors.” Embedded within the Rule is a determination of the benefits of the rule and the balance against the operational and technical burdens and costs. The proposed motive fluid system would have less than 100 valves, less than 10 pumps, and no compressors in motive fluid service (SLR, 2020). Equipment component counts from a typical refinery or chemical plant average 7,400 valves and 100 pumps (USEPA, 2007b). If using the commenter’s logic of applying BAAQMD refinery regulations to the Project, the leak rate thresholds in the BAAQMD for a similarly sized facility to the Casa Diablo IV Geothermal Power Plant Project would be

10,000 ppmv as set by BAAQMD Rule 8-22 (BAAQMD, 1994) and would be less stringent than those that would be adopted by Mitigation Measure AQ-6.

Mitigation Measure AQ-6 versus BAAQMD Rule 8-18 Emission Reductions

Implementation of Draft SEIR Mitigation Measure AQ-6 would be generally as effective in reducing ROG emissions compared to implementation of BAAQMD Rule 8-18 leak definition thresholds recommended by the commenter. As stated in Response to Comment 4, above, the LDAR procedures described in Mitigation Measure AQ-6 includes a leak rate definitions of 2,000 ppmv for pumps and 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other components with the potential for fugitive emissions, and is consistent with the most stringent federal Clean Air Act program rules applicable to petroleum refineries, chemical manufacturing facilities, and natural gas processing plants (see Response to Comment 18 for revised Mitigation Measure AQ-6 text). The District finds the commenter's analysis incorrect as Mitigation Measure AQ-6 LDAR requirements are generally equivalent to the BAAQMD Rule 8-18 requirements in terms of overall control effectiveness, as determined using USEPA and CAPCOA methods.

The District disagrees with the commenter's opinion that leak rate definitions lower than 500 ppmv would substantially reduce emissions by a factor of up to five. As presented in the Draft SEIR (pp. 3-4, paragraph 1), USEPA data that indicate leak rate definitions lower than 500 ppmv do not achieve substantially greater emission reductions. In addition, as noted on Draft SEIR pp. 3-4, paragraph 2, the independent engineering review conducted for the Project found that more stringent measures were not reasonable nor warranted. Nonetheless, a more stringent LDAR program than set in the 2013 Final EIS/EIR was determined to be feasible and the emission reductions achieved by Mitigation Measure AQ-6 are comparable to BAAQMD Rule 8-18.

SLR prepared and submitted information included in the table below, which the District has independently evaluated and supplemented, to illustrate the difference between an LDAR program using a 500 ppmv leak rate definition for valves with monthly screening versus a program following BAAQMD Rule 8-18 (100 ppmv leak rate definition for valves with quarterly screening). The CAPCOA-recommended correlation equation for valves were used to estimate emissions from a single leaking valve at the leak rate definition values for each LDAR program (CAPCOA, 1999). A worst-case assumption for hours leaking was determined based on the total hours in the monitoring period (quarterly or monthly); i.e., thirty 24-hour days per month and three months per quarter. As shown in Table 1 below, the estimated ROG emissions based on the correlation equations are similar for Mitigation Measure AQ-6 and the BAAQMD Rule 8-18. Although the BAAQMD leak rate definition is lower, the quarterly monitoring frequency is higher than the monthly monitoring required by Mitigation Measure AQ-6. BAAQMD Rule 8-18 does contain provisions for more monthly monitoring for components found to be leaking for three consecutive quarters. However, the facility may revert to quarterly monitoring following four consecutive months of being leak free. Additionally, under Rule 8-18, if certain conditions are met, the inspection period may be extended from quarterly to annually. The more frequent monitoring (monthly versus quarterly) required by Mitigation Measure AQ-6 offsets the higher leak rate definition. The LDAR program

that would be required pursuant to implementation of Mitigation Measure AQ-6 is generally as effective as the BAAQMD program recommended by the commenter.

TABLE 2-1
ESTIMATED ROG EMISSIONS BASED ON THE CAPCOA-RECOMMENDED CORRELATION EQUATION FOR VALVES

Component Type/ Service Type	Correlation Equation (kg/hr)	LDAR Program	SV (ppmv)	Emissions Per Component		Monitoring Frequency	Maximum Hours Leaking Before Repair	Maximum ROG Emissions During Leak Period (lb)
				Kg/hr	Lb/hr			
Valves/All	2.27E-06(SV)^0.747	BAAQMD Rule 8-18	100	0.00007	0.00016	Quarterly	2160	0.34
		MM AQ-6	500	0.00024	0.00052	Monthly	720	0.37
Pump seals/All	5.07E-05(SV)^0.622	BAAQMD Rule 8-18	500	0.0024	0.0053	Quarterly	2160	11.52
		MM AQ-6	2,000	0.0057	0.0126	Monthly	720	9.10

SOURCE: SLR, 2020; as modified by GBUAPCD.

For the reasons described above, the LDAR program identified in Mitigation Measure AQ-6, including the use of a 500 ppmv leak rate definition for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals and all other components with the potential for fugitive emissions; and 2,000 ppmv leak rate definition for pumps, is as generally as effective in light liquid service as the BAAQMD Rule 8-18 standards recommended by the commenter. To summarize:

- The monthly monitoring frequency under Mitigation Measure AQ-6 is more stringent than the quarterly frequency prescribed in BAAQMD Rule 8-18;
- The seven-day leak repair interval under Mitigation Measure AQ-6 is equivalent to BAAQMD Rule 8-18; and
- The LDAR program under Mitigation Measure AQ-6 includes additional visual inspections and optical gas imaging surveys supplementing instrument monitoring not required by BAAQMD Rule 8-18.

Therefore, although the Project would not be subject to BAAQMD Rule 8-18, the LDAR program that would be implemented pursuant to Mitigation Measure AQ-6 would be generally as effective at reducing fugitive ROG emissions as implementation of a program under BAAQMD Rule 8-18.

Response to Comment 14

As described above in Responses to Comments 12 and 13, although a leak rate definition below 500 ppmv is not feasible, Draft SEIR Mitigation Measure AQ-6 includes the lowest leak rate definition identified as feasible, and is lower than identified in the 2013 Final EIS/EIR. Additionally, with the higher monitoring frequency and reduced leak rate definitions required by

Mitigation Measure AQ-6, leak rate definitions below 500 ppmv are not needed to achieve comparable emission reductions.

Response to Comment 15

See Response to Comment 10 regarding the District's clarification. For additional details regarding the feasibility of the suggested leak rate definitions as well as why implementation of the suggested leak rate definitions would not substantially reduce emissions, see Response to Comment 13.

Response to Comment 16

Draft SEIR pp. 3-4, paragraph 1, presents USEPA data that indicate leak rate definitions lower than the 500 ppmv and 2,000 ppmv definitions do not achieve substantially greater emission reductions. This has also been substantiated by independent analysis conducted by SLR. See Response to Comment 13.

Response to Comment 17

The District does not agree with Dr. Fox's conclusions that the lower leak rate definitions are feasible for the Project and would substantially lessen ROG emissions. See Responses to Comments 12 and 13 regarding feasibility details for the commenter's suggested leak rate definitions. As previously noted, with the higher monitoring frequency and the reduced leak rate definitions required by Mitigation Measure AQ-6, leak rate definitions below 500 ppmv are not needed to achieve comparable emission reductions.

Response to Comment 18

Draft SEIR Mitigation Measure AQ-6 does not exclude any components with the potential for fugitive emissions in motive fluid (n-pentane) service. Mitigation Measure AQ-6 explicitly lists flanges, valves, pump seals, safety relief valves, n-pentane accumulator vessels, and turbine gland seals; and for clarity, the term "fugitive components" has been revised here to "components with the potential for fugitive emissions." In addition, to correct a typographic error, the word "values" in the sixth sentence of Mitigation Measure AQ-6 has been removed and replaced with the word "valves." For the complete text of revised Mitigation Measure AQ-6, with changes tracked, see below.

> **Mitigation Measure AQ-6:** Implementation of Enhanced Leak Detection and Repair (LDAR) Program. ORNI 50, LLC shall obtain a portable Volatile Organic Compound (VOC) leak detector capable of meeting the performance specifications described in USEPA's Method 21. This instrument shall be properly maintained, calibrated, and made readily available at all times on the property site. Inspections utilizing the instrument shall be conducted at a minimum on a monthly basis to assist ORNI 50, LLC personnel in detecting n-pentane leaks from all flanges, valves, pump seals, safety relief valves, n-pentane accumulator vessels, turbine gland seals, and other ~~fugitive components~~ components with the potential for fugitive emissions. In addition to a USEPA Method 21 portable analyzer, monthly inspections shall include the use of a held infrared camera and

visual inspection and observation. Pumps shall be visually inspected weekly. Whenever a leak is detected that is greater than 2,000 ppmv for pumps or 500 ppmv for valves, pressure relief ~~values~~ valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other ~~fugitive components~~ components with the potential for fugitive emissions, ORNI 50, LLC shall initiate repairs as soon as possible. Once a leak is discovered, ORNI 50, LLC shall tag and log its location, record the leak concentration, record the date, and record the dates of each repair attempt. Minimization of a leak shall occur as soon as possible and no later than 24 hours after the leak discovery. Repair of a leak shall occur as soon as possible and no later than 7 days after the leak discovery. A report that includes the six-month average daily emission calculations and n-pentane purchases shall be submitted electronically to the GBUAPCD within 30 days from the end of each calendar quarter. A summary record of the leak repairs made shall also be submitted to the GBUAPCD when reporting n-pentane losses.

Regarding connectors, as described in the Draft SEIR (at p. 2-2), the Applicant has maximized the use of welded connections, which are leakless. To the extent screwed connectors are included in the motive fluid process, such connectors would be part of the LDAR program, and fall under the "components with the potential for fugitive emissions" listed in Final SEIR Mitigation Measure AQ-6.

Regarding purge systems, heat exchangers, turbines and other equipment, to the extent such systems include flanges, valves, seals, safety relief valves, and other components with the potential for fugitive emissions in n-pentane service, such components would be part of the LDAR program. Process streams in vacuum service, if any, would be excluded from LDAR. Finally, the motive fluid system in n-pentane service does not include underground piping, nor any well heads. Such equipment would not be included in the LDAR program.

Response to Comment 19

The District disagrees with the commenter's opinion regarding the support of the Draft SEIR's conclusions. Substantial evidence supporting a 2,000 ppmv leak definition threshold for pumps and 500 ppmv for all other components with the potential for fugitive emissions is provided in the Draft SEIR Section 3.2, as well as in Responses to Comments 12, 13, and 39.

Response to Comment 20

The District disagrees with the commenter's characterization of the Draft SEIR's impact analysis. See Draft SEIR Section 3.2 for a detailed description of the emissions reductions and feasibility of the commenter's suggested leak rate definitions. Additionally, see Response to Comment 12 for additional details regarding the feasibility determination of the commenter's suggested leak rate definitions.

Response to Comment 21

The District disagrees with the commenter's conclusions that the reduced leak rates in BAAQMD's Rule 8-18 would substantially reduce fugitive ROG emissions in comparison to Mitigation Measure

AQ-6. Because of the higher monitoring frequency in Mitigation Measure AQ-6, the emission reductions between the two programs are similar. See Responses to Comments 13 and 39.

Response to Comment 22

The commenter's summary of the effectiveness of leak rate definitions is inconsistent with the conclusions in Table 3-1 of the Draft SEIR (at p. 3-4 et seq.). As described in Table 3-1, Mitigation Measure AQ-6 has been revised to define the leak rate definition as 500 ppmv and 2,000 ppmv depending on the component type. The Draft SEIR continues to state that the implementation of a lower leak rate definition has the potential to reduce fugitive ROG emissions associated with the Project (Draft SEIR Table 3-1 at p. 3-4). The Draft SEIR continues to clarify that a further reduction of the leak rate definition threshold below 500 ppmv is not feasible and would not substantially reduce emissions.

Response to Comment 23

Because this discussion of the potential applicability of *San Franciscans for Reasonable Growth v. City and County of San Francisco* does not raise any material issues concerning the adequacy or accuracy of the Draft SEIR, the salient issues are responded to in more detail in response to more specific comments below.

Response to Comment 24

The District disagrees with the commenter's opinion. The Draft SEIR, and now this Final SEIR, clearly demonstrate that the leak definition thresholds recommended by the commenter are infeasible. See Response to Comment 12 regarding feasibility of the suggested leak rate definition. The Commenter's linear calculation of potential additional emissions reduction is not accurate; see Response to Comment 39 for details.

Response to Comment 25

The term "partially feasible" referred in the Draft SEIR to the reduced leak rate definitions incorporated in the revised Mitigation Measure AQ-6. For clarity, Item Numbers 3 and 4 in Table 3-1 (Draft SEIR at p. 3-5) have been revised from "Partially Feasible" to "Not Feasible." See Response to Comment 12 regarding feasibility of the suggested leak rate definition. See Response to Comment 10 for clarification of the term partial feasibility.

Response to Comment 26

The commenter suggests the use of optical remote sensing (ORS) to detect leaks. Although, the use of ORS was not mentioned previously in comments on the original EIS/EIR (2013), nor in the Court of Appeal's *Covington* decision, the use of optical gas imaging (OGI) equipment, an alternative optical sensing system, is incorporated in the LDAR as a component of Mitigation Measure AQ-6. The Draft SEIR describes Mitigation Measure AQ-6 (Chapter 2 at p. 2-5 in Final SEIR Appendix A) which includes the use of OGI as part of the Project's monitoring program. OGI can be conducted using handheld infrared cameras to survey components with the potential

for fugitive emissions and identify equipment leaks. Infrared cameras are OGI devices. OGI is a passive system that creates an image based on the absorption of infrared wavelengths. A gas cloud containing certain hydrocarbons (i.e., leaks) will show up as black or white plumes (depending on the instrument settings and characteristics of the leak) on the OGI instrument screen. OGI can be used to identify specific pieces of equipment that are leaking and the OGI device can monitor many more pieces of equipment than can be monitored using instrument monitoring (Method 21) over the same period of time (SLR, 2020). Per the requirements of Draft SEIR Mitigation Measure AQ-6, monthly inspections shall include the use of a hand-held infrared camera; therefore, use of OGI will occur with implementation of Mitigation Measure AQ-6.

The commenter is correct that the Project contains pipelines and geothermal wells that are not part of the LDAR program. The LDAR program addresses potential fugitive emissions to the motive fluid system which uses n-pentane as its working fluid. The geothermal wells and pipelines mentioned by the commenter are not part of the motive fluid system, do not contain n-pentane, do not contribute to the Project's air quality impacts, and therefore are excluded from the LDAR program.

Response to Comment 27

The District disagrees with the commenter's assertion that it was denied access to documents referenced in the Draft SEIR. The commenter conflates the requirements of CEQA with those of the California Public Records Act. The District fully complied with both. First, under CEQA, all of the documents in the District's possession that were referenced in the Draft SEIR were made available at all times for review, inspection, and copying at the District's Offices. The correspondence referenced by the commenter is included in the administrative record for this Final SEIR so that their original text may be reviewed rather than the self-characterizations of those communications by the commenter. In particular, the commenter omits the District's full response by letter on September 4, 2020, where it offered to set up an appointment at the District office to review the documents referenced in the Draft SEIR as provided by CEQA Guidelines Section 15087(c)(5). The commenter did not attempt to make an appointment and took no action to use this opportunity for review of the relevant documents. The District fully complied with CEQA.

The commenter alternatively sought these same documents under the Public Records Act. The District responded by letter dated September 20, 2020, that it would provide these documents and upon payment of the costs, provided those documents to the commenter. The commenter does not dispute that all documents referenced in the Draft SEIR were provided in full and on time to it. The District fully complied with the Public Records Act.

Response to Comment 28

The District disagrees with the commenter's assertion that the District had a duty to provide it with documents that were in the possession of an independent expert, Kenneth A. Malmquist, Principal Engineer at SLR, who assisted Ormat in submitting comments on the SEIR. That expert is not an employee or consultant retained by the District and there was no duty to produce the author's

reference documents in response to a Public Records Act request. Most, if not all, of these documents are in the public domain and equally available to the commenter, who does not indicate it made any effort to obtain those documents from the author, or went to a library or other reference source. On this point, the commenter's description of *Consolidated Irrigation District v. Superior Court* (2012), 205 Cal.App.4th 697, 710 is materially incomplete. That case addresses the document in the possession of a sub-consultant to the agency. It, therefore, has no application to the author of an expert report who is not a consultant to the agency, as in this case. Nevertheless, in response to the comment, the District has requested copies of the reference documents to be made part of the administrative record for the Final SEIR.

Response to Comment 29

The District disagrees with the commenter's further assertions regarding the District's compliance with the Public Records Act. First, as noted above, the commenter does not allege a violation of CEQA in commenting on the Draft SEIR, it rather seeks to raise issues regarding another statute, and shows no prejudice here. The District informed the commenter in responding to its request that the deliberative process privilege applied to these documents. In addition, a party such as the commenter may not use the Public Records Act to circumvent the orderly and required process for preparation of the administrative record for this CEQA analysis. Second, the commenter's request was overbroad in seeking documents that had not been created, or that are exempt or otherwise privileged. The commenter asserts it was not given electronic mails or other correspondences sent to or received by the agency regarding the Project between April 14, 2020, and the date of its request. All of the comments on the Draft SEIR were provided and based upon a reasonable search; all responsive, non-privileged documents were provided under the direction of the District's legal counsel. The commenter says it was not provided the permit application, which incorporates the LDAR program proposed in the Draft SEIR; however, that document had yet to be created since those mitigation measures were not yet final. The Draft SEIR further complies with CEQA by providing substantial evidence supporting the analysis and findings of the report. The public had the information to understand and comment upon the Draft SEIR and its discussion of air quality mitigation measures. The District, by making this information readily available in the Draft SEIR and its supporting documents, on its website and in its offices for inspection by appointment, complied with the procedural requirements of CEQA, both as to their letter and intent. The commenter shows no prejudice, and its comment should be directed toward the provisions of the California Public Records Act.

Response to Comment 30

All feasible mitigation measures for the Project have been adopted as described in Draft SEIR Chapter 2 (Final SEIR Appendix A). See Response to Comment 12.

Response to Comment 31

As an alternative to ORS, the use of OGI is required per implementation of Draft SEIR Mitigation Measure AQ-6. See Response to Comment 26.

Response to Comment 32

The District disagrees with the commenter and believes it has fully complied with CEQA by making all documents in its possession that were referenced in the SEIR available to the public as provided in CEQA Guidelines Section 15087(c)(5). The District also fully complied with the California Public Records Act, which allows for the assertion of the deliberative process and other privileges, which the District properly invoked. The commenter fails to address or specifically raise a challenge to the assertion of privilege and exceptions, and fails to show prejudice, thereby waiving those arguments for failure to exhaust its administrative remedies. Because the commenter is a law firm, it had constructive and actual notice of this requirement and its waiver was with that knowledge.

Response to Comment 33

Because this comment does not raise any material issues concerning the accuracy or adequacy of the Draft SEIR, the salient issues are responded to in more detail in response to more specific comments below.

Response to Comment 34

The commenter's summary of the proposed LDAR program is consistent with the information provided in the Draft SEIR (see, e.g., Draft SEIR Chapter 2 at pp. 2-5, 2-6 in Final SEIR Appendix A).

Response to Comment 35

BAAQMD Rule 8-18 applies to large petroleum refineries, chemical plants, bulk gasoline plants and bulk gasoline terminals. The rule requires quarterly leak surveys, a 7-day repair interval, and leak rate definition (action level) thresholds of 100 ppmv for components with the potential for fugitive emissions and 500 ppmv for pumps. The rule does not apply to "small facilities" with less than 100 valves or less than 10 pumps and compressors. However, using the commenter's logic of applying BAAQMD regulations to the Project, the leak rate thresholds in the BAAQMD for a similarly sized facility to the Casa Diablo IV Geothermal Power Plant Project would be 10,000 ppmv as set by BAAQMD Rule 8-22 and would be less stringent than those adopted by Mitigation Measure AQ-6. See Response to Comment 13 for further information regarding BAAQMD Rule 8-18. Although the Project would be exempt from BAAQMD Rule 8-18, the LDAR program identified in Draft SEIR Mitigation Measure AQ-6 requires more frequent monitoring than BAAQMD Rule 8-18, and thus achieves similar emission reductions as those that would be achieved under Rule 8-18.

The District has considered whether Table 1, Comparison of BAAQMD Rule 8-18 with Federal Regulations, presented by the commenter, could support the commenter's claim that BAAQMD Rule 8-18 is "significantly more stringent" and would reduce significantly more ROG emissions than Draft SEIR Mitigation Measure AQ-6, and finds that it does not. In Table 1, a leak rate definition threshold of 100 ppmv (required by BAAQMD rule 8-18) is compared with a 10,000 ppmv leak rate definition threshold set out in federal New Source Performance Standards (NSPS)

and Maximum Available Control Technology (MACT) standards applicable to synthetic organic chemical manufacturing industry process units and petroleum refineries. However, Table 1 compares BAAQMD Rule 8-18, amended in 2015, with Federal NSPS promulgated in the 1980s (Subparts VV and GGG) and the Petroleum Refinery MACT promulgated in 1995 (Subpart C). Draft SEIR Mitigation Measure AQ-6 is consistent with more current and stringent Federal NSPS, Subpart VVa[2] and GGGa,[3] and Refinery MACT Subpart CC,[4] all of which were promulgated or amended in 2007 or later (SLR, 2020). Most importantly, Draft SEIR Mitigation Measure AQ-6 adopts a monthly monitoring frequency with a leak rate definition of 2,000 ppmv for pumps and 500 ppmv for valves and other components with the potential for fugitive emissions, which is consistent with the most stringent federal LDAR requirements.

As illustrated in Response to Comment 13, the claim that the BAAQMD Rule 8-18 LDAR standard is more stringent is not supported. For additional discussion and analysis related to BAAQMD Rule 8-18, see Response to Comment 13.

In addition to the Bay Area Air Quality Management District, the commenter also discusses two other California air districts' equipment leak regulations. As with BAAQMD Rule 8-18, the District finds the regulations cited by the commenter are not applicable or appropriate to directly apply to the Project. More importantly, the emission reductions achieved by Mitigation Measure AQ-6 are generally comparable or exceed the measures suggested by the commenter. Ventura County Air Pollution Control District (VCAPCD) Rule 74.7 focuses on petroleum refineries and chemical plants (VCAPCD 1996), as is evident from its title: "Fugitive Emissions of Reactive Organic Compounds (ROC) At Petroleum Refineries and Chemical Plants." VCAPCD Rule 74.7 is limited in its application to chemical plants or petroleum refineries, and prohibits operation of a component if such component is emitting a "major gas leak," which is defined to be more than 10,000 ppmv. Chemical plants are defined as "any facility engaged in producing organic or inorganic chemicals and/or manufacturing products by chemical processes. A "Petroleum Refinery" is defined as "any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through distillation of petroleum or through redistillation, cracking, rearrangement, or reforming of unfinished petroleum derivatives, as defined in the SIC Code 2911, Petroleum Refining." (VCAPCD, 1996)

South Coast Air Quality Management District (South Coast AQMD) Rule 1173 broadly applies to components at refineries, chemical plants, lubricating oil and grease re-refiners, marine terminals, oil and gas production fields, natural gas processing plants, and pipeline transfer stations (South Coast AQMD 2009). The rule sets a leak rate definition threshold for components

[2] 40 C.F.R. Part 60, Subpart VVa—Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006. 72 Fed. Reg. 64883, November 16, 2007, and later amendments.

[3] 40 C.F.R. Part 60, Subpart GGGa—Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006. 72 Fed. Reg. 64896, November 16, 2007, and later amendments.

[4] 40 C.F.R. Part 63, Subpart CC—National Emission Standards for Hazardous Air Pollutants From Petroleum Refineries [60 FR 43260, August 18, 1995, as amended at 61 FR 29880, June 12, 1996; 63 FR 44141, Aug. 18, 1998; 80 FR 75244, Dec. 1, 2015; 81 FR 45241, July 13, 2016; 83 FR 60714, Nov. 26, 2018; 85 FR 6082, February 4, 2020.

in light liquid/gas/vapor service at 10,000 ppmv. The LDAR program identified in Draft SEIR Mitigation Measure AQ-6 is more stringent than South Coast AQMD Rule 1173.

Equipment leak and LDAR work practice standards required by California air districts, state agencies, and the federal Clean Air Act standards rely on leak rate definitions in terms of ppmv as measured using USEPA Method 21. Mass or volume emission rates correlate with, but are not directly proportional to, leak concentration. As discussed in Response to Comment 13, two components registering the same leak concentration can have different leak "rates." Therefore, the conclusion by the commenter that a lower leak rate definition threshold equates to lower emissions is not supported. Monitoring frequency (e.g., monthly, quarterly, etc.) and repair interval (days from leak discovery to repair) also impact the effectiveness of LDAR programs. The District is not aware of "other measures" (i.e., other than LDAR) adopted as part of other air district standards that would result in lower fugitive ROG emissions from equipment leaks associated with the Project.

Importantly, as previously discussed, geothermal power plants are not regulated by these other air district rules. On the basis of the industry type and use subject to BAAQMD Rule 8-18, VCAPCD Rule 74.7, and South Coast AQMD Rule 1173, these rules do not apply to geothermal power plants such as the proposed Project (SLR, 2020). Additionally, individual air districts adopt rules with different stringencies for specific purposes, such as to address federal and state attainment statuses, to reduce public health impacts from facilities releasing toxics, or to address other local issues. It is important to consider all the factors including air quality attainment status, source type and size, and the nature of the emissions before comparing different stringencies set by various other air districts regulations.

Response to Comment 36

The District disagrees that the referenced BAAQMD rules apply to the Project. The application of BAAQMD Rule 8-18 to the Project is not appropriate due to both the size and nature of the facility. Petroleum refineries and chemical plants may handle fluids with vapor pressures comparable to or higher than n-pentane, but vapors from those facilities tend to be toxic air pollutants. N-pentane is not a toxic air pollutant (Draft SEIR at p. 1-7, paragraph 2). See also Response to Comment 13 and 35.

Response to Comment 37

The Draft SEIR is clear that connectors would be monitored pursuant to Mitigation Measure AQ-6. In the context of Mitigation Measure AQ-6, connectors are considered "components with the potential for fugitive emissions." As stated in revised Mitigation Measure AQ-6, "Inspections utilizing the instrument shall be conducted at a minimum on a monthly basis to assist ORNI 50, LLC personnel in detecting n-pentane leaks from all flanges, valves, pump seals, safety relief valves, n-pentane accumulator vessels, turbine gland seals, and other components with the potential for fugitive emissions." See also Response to Comment 18.

Response to Comment 38

The comment does not apply to geothermal systems or the fugitive emissions addressed within the scope of this SEIR. There are no fugitive n-pentane emissions associated with well heads, vapor recovery system, and underground piping. As the commenter states and as addressed in the 2013 Final EIS/EIR, there are emissions associated with the purge system and heat exchangers. However, addressing further emission reductions from these parts of the Project were not in the Court of Appeal's *Covington* decision and no further response is required. See also Response to Comment 18.

Response to Comment 39

The District disagrees with the commenter's conclusions. To the District's knowledge, following research and inquiry, there are no available studies of the control effectiveness of lowering the leak rate definitions or the monitoring frequencies for an LDAR program at any geothermal power plants that have been published; nevertheless, broad inferences can be made from studies conducted by USEPA in the 1980s and from LDAR control effectiveness estimates for refinery process units. Still, while data from refineries are utilized in the Draft SEIR to make inferences, that does not mean that control measures applicable to a large refinery to control toxic emissions are necessary or are feasible for a geothermal plant. See Response to Comment 12 for more information on mitigation feasibility.

More importantly, under an LDAR program it is not solely the leak rate definition that impacts the potential fugitive emissions. An increased monitoring frequency can have as great of a bearing on potential emissions as decreased leak rate definitions. The commenter relies singularly on the lower leak rate definition of BAAQMD Rule 8-18 in comparison to Mitigation Measure AQ-6, while failing to account for the higher monitoring frequency required by Mitigation Measure AQ-6. See Table 1 in Response to Comment 13, which demonstrates comparable fugitive emissions between Mitigation Measure AQ-6 and BAAQMD Rule 8-18 when accounting for the differing leak rate definitions and monitoring frequencies.

As described in Draft SEIR Section 3.2 (at p. 3-4), USEPA determined control effectiveness for an LDAR program at refinery process units, including valves in gas/vapor service, valves in light liquid service, and pumps in light liquid service (Table 4.1 Control Effectiveness for an LDAR Program at a Chemical Process Unit and a Refinery (USEPA, 2007b)). A comparison of the control effectiveness was completed for quarterly and monthly monitoring programs with leak rates of 10,000 ppmv and 500 ppmv. It found that control effectiveness increases with increased monitoring frequency; i.e., quarterly versus monthly. When considering the monthly monitoring at the 10,000 ppmv leak rate definition versus the 500 ppmv leak rate definition, the control effectiveness increases from 88 percent to 96 percent, an 8 percent difference. BAAQMD Rule 8-18 requires quarterly monitoring (BAAQMD, 2015a), while implementation of Mitigation Measure AQ-6 would require monthly monitoring (Draft SEIR at p. 2-5). The incremental difference between a program at 500 ppmv with monthly monitoring (as would be required under Mitigation Measure AQ-6 for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other components with the potential for fugitive emissions; see Response to Comment 18) versus the 100 ppmv threshold with quarterly monitoring, set by BAAQMD Rule 8-

18 would be far less than asserted by the commenter. While the 100 ppmv threshold has been determined to be infeasible for the Project (as described in detail in Response to Comment 12), the control effectiveness of the Draft SEIR Mitigation Measure AQ-6 LDAR program is generally comparable that of the BAAQMD program because the increased monitoring frequency would offset the lower leak rate definition.

Response to Comment 40

See Response to Comment 26 regarding ORS. The FluxSense Inc. study about refinery emissions within the jurisdiction of the South Coast AQMD that was cited by the commenter is not applicable in the current context. The cited study included mobile surveys using two ORS techniques: Solar Occultation Flux (SOF) and Mobile Differential Optical Absorption Spectroscopy (SkyDOAS). Measurements were conducted around the perimeters of six refineries in the South Coast Air Basin to estimate facility-wide emission fluxes of VOCs, sulfur dioxide (SO_2) and nitrogen dioxide (NO_2). These "open path" ORS techniques were complemented by extractive optical methods, including Mobile extractive Fourier Transform Infra-Red spectroscopy (MeFTIR) and Mobile White cell DOAS (MWDOAS) to map ground concentrations of alkanes, methane, and aromatic VOCs and to calculate inferred fluxes for methane and aromatics. The required wind information was collected using a stationary Light Detection and Ranging (wind-LIDAR); which provides vertical wind profiles and conventional wind mast measurements. The study was designed to characterize and quantify mass emissions of VOCs, NO_x, and SO_2 from each facility. This and similar campaigns complemented with tracer correlation and OGI have been conducted to annually screen large refineries in Sweden (SLR, 2020).

The ORS technologies described in the study are not designed to identify a leaking component such that repairs can be made to eliminate the leak. Rather, these ORS technologies are used to quantify the total flux (kilograms per hour) from an entire facility. While the study does report a case where mobile ORS methods detected elevated concentrations of alkanes in an area of a refinery, OGI was needed to identify the leaking component so that repairs could be initiated (SLR, 2020).

As the commenter points out, the cited investigation discovered a pinhole-size leak in a pipeline buried 30 centimeters below the ground. In fact, an infrared OGI camera was used to find the leak after elevated concentrations were detected in the area. Therefore, use of OGI could find such a leak; however, no underground pipelines would be associated with the Project's motive fluid system.

The combination of SOF and other open-path measurement technologies and techniques used in Sweden are only used in annual studies and not routinely. The LDAR program included in Mitigation Measure AQ-6, which includes both traditional Method 21 techniques and OGI surveys at a monthly frequency, is the appropriate method to mitigate fugitive emissions of ROG from the motive fluid system.

Response to Comment 41

The District disagrees with the commenter's characterization of the Draft SEIR as acknowledging that the Project is subject to BAAQMD Rule 8-18. To the contrary, Draft SEIR Section 1.1 and

Section 3.2.2 describe the difference between facilities where BAAQMD Rule 8-18 may apply and explain how the Project is distinguishable. Although the Draft SEIR concludes that the application of BAAQMD Rule 8-18 to the Project is not appropriate, Mitigation Measure AQ-6 achieves comparable emission reductions. See Response to Comment 12 for further details regarding the rationale, and for further clarification of the infeasibility of the lower leak definition suggested by the commenter. See Response to Comment 13 for further details regarding analysis of applicability of BAAQMD Rule 8-18 and the comparable emissions reductions when comparing Mitigation Measure AQ-6 with BAAQMD Rule 8-18. See also Response to Comment 39 regarding the incorrect emission reduction estimation presented by the commenter. See also Response to Comment 26.

Response to Comment 42

Receipt of these September 12, 2013 comments on the draft Authority to Construct Permit for the Project are acknowledged. However, because they do not raise issues about the adequacy or the accuracy of the Draft SEIR, which addresses the control of fugitive ROG emissions as directed by the court in *Covington v. Great Basin Unified Air Pollution Control District* (2019) 43 Cal.App.5th 867, no response is provided.

2.3 Summary of Changes to Draft SEIR

In response to the comments received on the Draft SEIR, revised versions of Table 3-1 and Mitigation Measure AQ-6 are shown below. Refer to Response to Comment 10 and Response to Comment 18 for versions that show the changes from the Draft SEIR to the Final SEIR tracked. See Chapter 4 of the Draft SEIR (at p. 4-7) in Final SEIR Appendix A for the original version of Table 3-1 and the version of Mitigation Measure AQ-6 that shows the changes from the 2013 Final EIR to the Draft SEIR.

Revised Table 3-1 (Clean)

TABLE 3-1
TECHNICAL FEASIBILITY OF ENHANCED LEAK DETECTION AND REPAIR PROCEDURES

No.	Suggested Measure	Feasibility/Analysis	Conclusion
3	A lower maximum leak definition threshold of 100 ppmv should be established for all fugitive components.	**Not Feasible.** A maximum leak definition threshold of 100 ppmv for all components with the potential for fugitive emissions is not operationally or economically feasible. Ormat contends that the use of a 100 ppmv leak threshold for all components other than pumps and a leak threshold of 500 ppmv for pumps would require certain Project components to be installed as "leakless" through the use of welds and other seals, which would increase maintenance outages and result in a loss in annual operating capacity from 95 percent to 70 percent and cause an approximately 4.5-million-dollar annual loss in revenue, or approximately $110 million over the 25 -year term. Ormat has stated that this loss in revenue would make the Project infeasible and none of the renewable energy benefits of the Project would be realized (Ormat, 2020). It is feasible for the Project to include a leak rate definition of 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other components with the potential for fugitive emissions in the motive fluid system ([Draft SEIR] Appendix B). This is a substantial reduction compared to the 10,000 ppmv leak definition threshold identified in the 2013 Final EIS/EIR, but is greater than the suggested leak rate definition of 100 ppmv. The USEPA best practices guide presents a table (Table 4.1 Control Effectiveness for an LDAR Program at a Chemical Process Unit and a Refinery) that summarizes control effectiveness for different parts of a refinery and reports a monthly monitoring program with a leak rate of 10,000 ppmv can reduce emissions by 76 percent, when referring to liquids, and 88 percent when referring to gas, and a program with a leak rate of 500 ppmv can reduce emissions by 95 percent when referring to liquids, and 96 percent for when referring to gas (USEPA, 2007b). Based on these data, leak definitions for the subject components of less than 500 ppmv would not achieve substantially greater emission reductions.	Mitigation Measure AQ-6 has been revised to define the leak rate definition as 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other components with the potential for fugitive emissions except for pumps (see Item 4 below). This leak rate threshold is generally consistent with the most stringent federal CAA standards for equipment leaks ([Draft SEIR] Appendix B). Implementation of a lower leak definition has the potential to reduce fugitive ROG emissions associated with the Project. Further reduction of the leak definition threshold below 500 ppmv would not substantially reduce emissions.

TABLE 3-1
TECHNICAL FEASIBILITY OF ENHANCED LEAK DETECTION AND REPAIR PROCEDURES

No.	Suggested Measure	Feasibility/Analysis	Conclusion
4	A higher leak rate for pumps, no higher than the 500 ppmv as specified in BAAQMD Rule 8-18, can be used if accompanied by an analysis demonstrating that 100 ppmv is not technologically feasible or cost effective in the subject applications.	**Not Feasible.** A maximum leak definition threshold of 500 ppmv for pumps is not operationally or economically feasible. Ormat indicated that the use of a 100 ppmv leak threshold for all components other than pumps and a 500 ppmv leak threshold for pumps would increase maintenance outages and result in a loss in annual operating capacity from 95 percent to 70 percent and cause an approximately 4.5-million-dollar annual loss in revenue, or approximately $110 million over the 25 year term. Ormat has stated that this loss in revenue would make the Project infeasible and none of the renewable energy benefits of the Project would be realized (Ormat, 2020). It is feasible for the Project to include a leak rate definition of 2,000 ppmv for pumps in the motive fluid system ([Draft SEIR] Appendix B). This is a substantial reduction compared to the 10,000 ppmv leak definition threshold identified in the 2013 Final EIS/EIR, but is greater than the suggested leak rate definition of 100 ppmv or 500 ppmv. The USEPA best practices guide presents a table (Table 4.1 Control Effectiveness for an LDAR Program at a Chemical Process Unit and a Refinery) that summarizes control effectiveness for different parts of a refinery and reports a monthly monitoring program with a leak rate of 10,000 ppmv can reduce emissions by 76 percent, when referring to liquids, and 88 percent when referring to gas, and a program with a leak rate of 500 ppmv can reduce emissions by 95 percent when referring to liquids, and 96 percent for when referring to gas (USEPA, 2007). Based on these data, leak definitions for pumps of less than 2,000 ppmv would not achieve substantially greater emission reductions.	Mitigation Measure AQ-6 has been revised to define the leak rate threshold to 2,000 ppmv for pumps in the motive fluid system. This leak rate threshold is generally consistent with the most stringent federal CAA standards for equipment leaks ([Draft SEIR] Appendix B). Implementation of a lower leak definition has the potential to reduce fugitive ROG emissions associated with the Project. Further reduction of the leak definition threshold below 2,000 ppmv would not substantially reduce emissions.

Revised Mitigation Measure AQ-6 (Clean)

Mitigation Measure AQ-6: Implementation of Enhanced Leak Detection and Repair (LDAR) Program. ORNI 50, LLC shall obtain a portable Volatile Organic Compound (VOC) leak detector capable of meeting the performance specifications described in USEPA's Method 21. This instrument shall be properly maintained, calibrated, and made readily available at all times on the property site. Inspections utilizing the instrument shall be conducted at a minimum on a monthly basis to assist ORNI 50, LLC personnel in detecting n-pentane leaks from all flanges, valves, pump seals, safety relief valves, n-pentane accumulator vessels, turbine gland seals, and other components with the potential for fugitive emissions. In addition to a USEPA Method 21 portable analyzer, monthly inspections shall include the use of a held infrared camera and visual inspection and observation. Pumps shall be visually inspected weekly. Whenever a leak is detected that is greater than 2,000 ppmv for pumps or 500 ppmv for valves, pressure relief valves, flanges, n-pentane accumulator vessels, turbine gland seals, and all other components with the potential for fugitive emissions, ORNI 50, LLC shall initiate repairs as soon as possible. Once a leak is discovered, ORNI 50, LLC shall tag and log its location, record

the leak concentration, record the date, and record the dates of each repair attempt. Minimization of a leak shall occur as soon as possible and no later than 24 hours after the leak discovery. Repair of a leak shall occur as soon as possible and no later than 7 days after the leak discovery. A report that includes the six-month average daily emission calculations and n-pentane purchases shall be submitted electronically to the GBUAPCD within 30 days from the end of each calendar quarter. A summary record of the leak repairs made shall also be submitted to the GBUAPCD when reporting n-pentane losses.

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USEPA, 2007b. Leak Detection and Repair: A Best Practices Guide, 2007 p. 5.

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CHAPTER 3
Final Supplemental EIR Preparation

3.1 Lead Agency

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Appendix A
Draft Supplemental Environmental Impact Report

ESA

CASA DIABLO IV GEOTHERMAL POWER PLANT DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT

State Clearinghouse No. 2011041008

Prepared for
Great Basin Unified Air Pollution
Control District

August 2020

CASA DIABLO IV GEOTHERMAL POWER PLANT DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT

State Clearinghouse No. 2011041008

Prepared for
Great Basin Unified Air Pollution
Control District

August 2020

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CHAPTER 1
Introduction

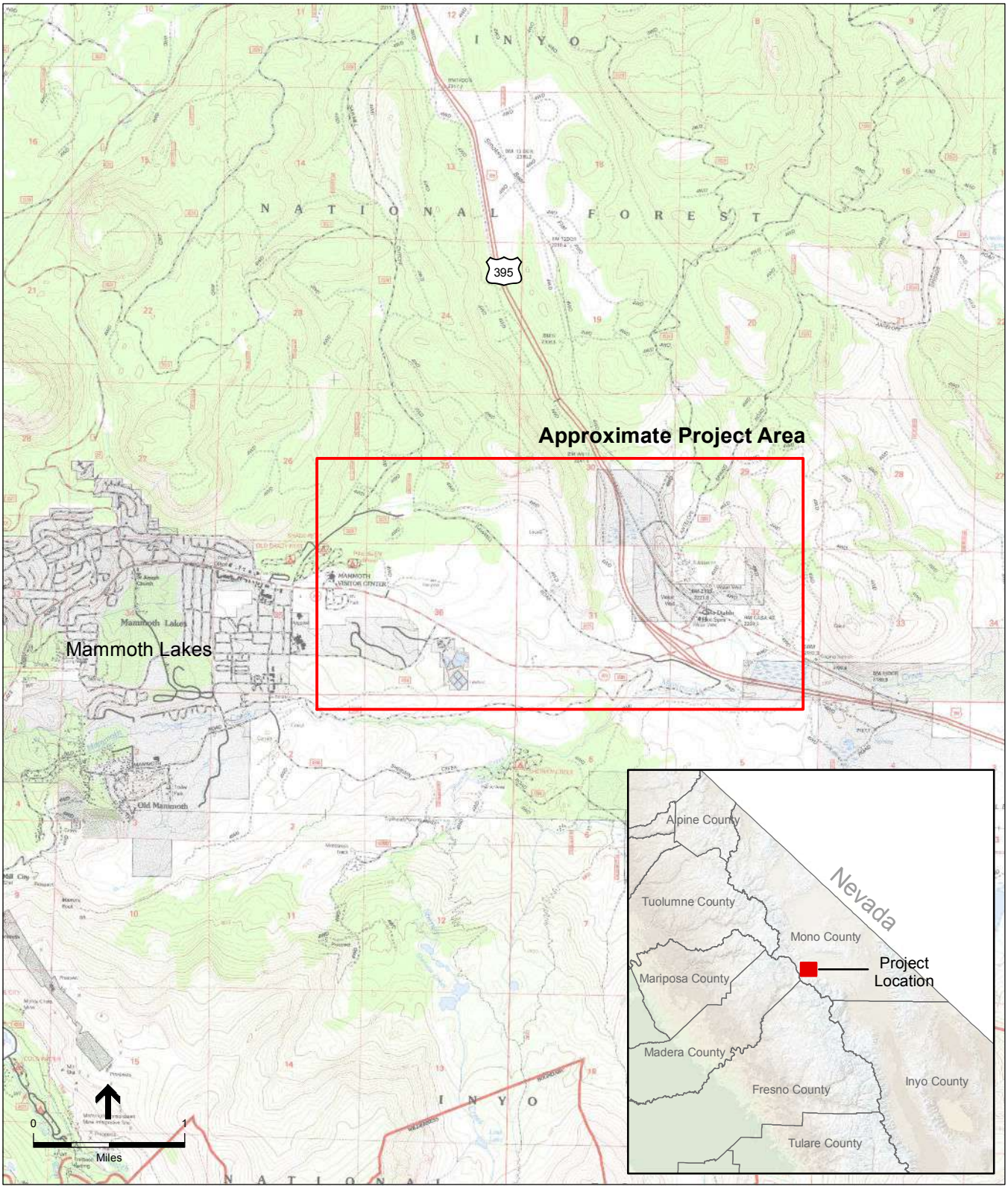
This Draft Supplemental Environmental Impact Report (Draft SEIR) is an informational document that identifies additions and changes to the Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) that was certified by the Great Basin Unified Air Pollution Control District (GBUAPCD) on July 17, 2014, for the Casa Diablo IV Geothermal Power Plant (Project). This Draft SEIR contains supplemental information to the Final EIS/EIR to adequately inform the public and local officials in the planning and decision-making process regarding two potential and additional mitigation measures to address fugitive n-pentane emissions from the plant: (1) a stronger leak detection and repair (LDAR) program, and (2) the additional use of leakless or low-leak technology. This Draft SEIR is not meant to determine whether the Project should be approved.

GBUAPCD is accepting agency and public comments on the material included in this Draft SEIR until the close of business on Monday, October 12, 2020, as described later in the section. GBUAPCD will respond to substantive comments on significant environmental issues within the scope of this Draft SEIR and will include them in a Final SEIR to be considered for certification by GBUAPCD.

1.1 Summary Project Description and Background

1.1.1 Project Location

As discussed in the Final EIS/EIR, the Project would be located on public land (BLM Geothermal Lease # CACA-11667 and CACA-11667A) in Sections 29 and 32, Township 3 South, and Range 28 East Mount Diablo (MD) Base and Meridian (B&M). This location is approximately two miles east of the Town of Mammoth Lakes in Mono County, California. A location map of the Project area is attached to this Draft SEIR as **Figure 1**. The Project includes construction, operation, and maintenance of a geothermal power plant and up to 16 geothermal resource wells (some new and some existing) and associated pipelines on portions of BLM Geothermal Leases CACA-11667, CACA-14407, CACA-14408 and CACA-11672 located within the Inyo National Forest in Section 25, 26, and 36 of T3S, R27E and Sections 30, 31 and 32 of T3S, R28E, MD B&M. The Project is proposed in the vicinity of the existing Mammoth Pacific L.P. (MPLP) geothermal complex and entirely within the Mono-Long Valley Known Geothermal Resource Area in Mono County, California.



SOURCE: USGS 7.5- minute Old Mammoth topographic quadrangle, 1984

Casa Diablo IV Geothermal Power Plant

Figure 1

Project Vicinity Map

Mono County, California

1.1.2 Summary Project Description

Ormat Nevada Inc. (ORNI 50, LLC, or the Applicant), proposes to build, and following the expected 30-year useful life, decommission the Project. The Project would consist of the following facilities:

a) A geothermal power plant consisting of two Ormat Energy Converter (OEC) binary generating units (21.2 megawatts [MW] gross each) with vaporizers, turbines, generators, air-cooled condensers, preheaters, pumps and piping, and related ancillary equipment. The gross power generation of the plant would be 42.4 MW. The estimated auxiliary and parasitic loads (power used within the Project for circulation pumps, fans, well pumps, loss in transformers and cables) is about 9.4 MW, thus providing a net power output of about 33 MW. Additional components of the power plant would include:

   i. A motive fluid system consisting of motive fluid (n-pentane) storage vessels (either one or two vessels in the range of 9,000 to 12,000 gallons) and motive fluid vapor recovery systems (VRUs). Each VRU would consist of a diaphragm pump and a vacuum pump.

   ii. A substation would be constructed on the power plant site and connected to the existing Southern California Edison (SCE) Casa Diablo Substation at Substation Road.

   iii. An overhead 33 kilovolt (kV) transmission line approximately 650 feet (198 meters) long would connect the power plant substation with the SCE Casa Diablo Substation.

b) Up to 16 geothermal wells are proposed. Fourteen of the wells would be located in the Basalt Canyon area and two wells would be located southeast of the proposed power plant east of U.S. Highway 395. The specific locations for these wells would be selected out of the 18 possible locations shown in **Figure 2**. The actual number of wells required may be less depending on the productivity of the wells. The final number and location of wells would be determined by modeling and actual drilling results. Approximately half of the wells would be production wells and the other half would be injection wells. Each production well would range in depth from 1,600 to 2,000 feet below ground surface (bgs) and each injection well would be drilled to approximately 2,500 feet bgs. Production wells would be equipped with a down-hole pump powered by a surface electric motor. Thirteen (13) of the 18 potential proposed well locations in the Project area were analyzed and approved for exploratory well development during previous environmental reviews (BLM 2001 and BLM 2005). Two of these previously-approved exploratory wells were drilled in 2011.

c) Piping would be installed from production wells to the power plant and from the power plant to the individual injection wells. Two main pipelines would parallel MPLP's existing Basalt Canyon pipeline through Basalt Canyon and would cross beneath U.S. Highway 395 between the well field and the Project site. Where pipelines must cross another pipeline or a road, the crossings would be underground.

d) Power and control cables for the wells would be installed in above-ground cable trays placed on the pipeline supports. Ancillary facilities would include pumps, tanks, valves, controls, and flow monitoring equipment.

1.1.3 Background

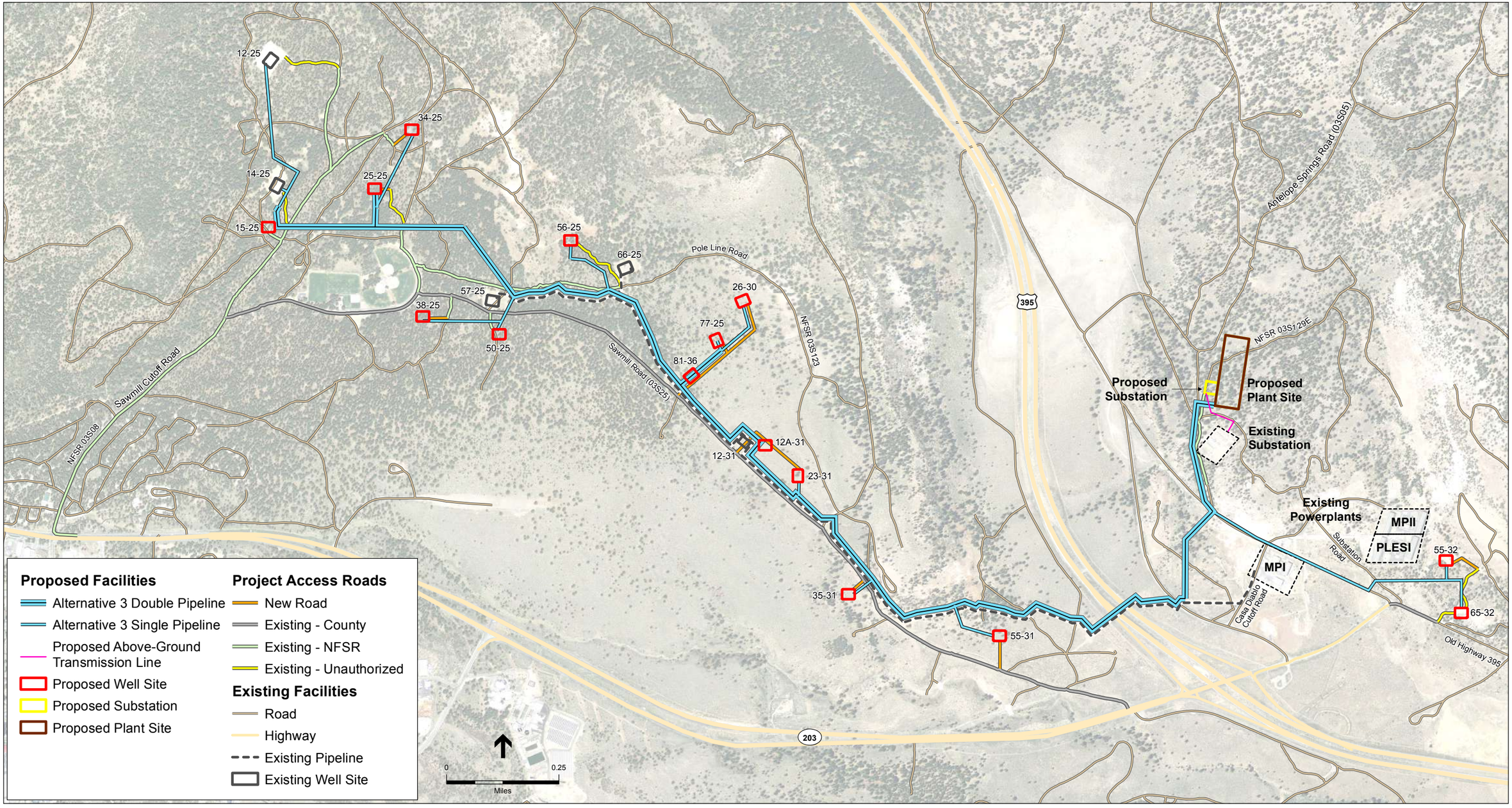
California's Renewable Portfolio Standard requires energy companies to increase their use of renewable-energy resources to 33 percent of total procurement by 2020. In addition, California adopted the Global Warming Solutions Act of 2006 (California Health and Safety Code, Section 38500 *et seq*.) to reduce statewide greenhouse gas (GHG) emissions to 1990 levels by 2020. In 2008, to attain this goal, the California Air Resources Board (CARB) directed that energy from renewable sources be increased to 33 percent by 2020. The proposed Project supports California's goals to reduce GHG and other pollutant emissions, decrease the nation's dependence on fossil fuels, and increase the use of renewable energy resources.

By using a geothermal reservoir as its energy source, the Project eliminates air emissions that would be produced by a traditional fossil fuel fired power plant. An equivalent natural gas power plant (33 MW) would produce an estimated 130,000 metric tons per year of direct GHG emissions in the form of carbon dioxide emissions, as well as other air pollutants, for the same amount of power generated by the Project. A similar-sized coal-fired power plant (33 MW) would produce an estimated 260,000 metric tons per year of direct GHG emissions in the form of carbon dioxide (BlueSkyModel, 2020). As stated in the 2013 Final EIS/EIR, the Project is estimated to generate up to 505 metric tons of carbon dioxide emission per year, including direct and indirect emissions. These emissions savings for the Project in comparison with traditional power plants are substantial.

The Project, its environmental impacts, and its feasible mitigations measures were fully analyzed in the Final EIS/EIR, with the exception of the possible additional fugitive emissions mitigation measures discussed in this SEIR. The Project was the subject of a Draft EIS/EIR that was circulated in November 2012. Following the development of responses to comments received on the Draft EIS/EIR, a Final EIS/EIR was prepared in 2013 and GBUAPCD certified the EIR and filed a Notice of Determination on July 17, 2014.

Subsequently, the Final EIS/EIR was the subject of a Petition for Writ of Mandate by petitioners alleging in relevant part that additional discussion of the feasibility of fugitive emission mitigation measures was required under the California Environmental Quality Act (CEQA). The trial court ruled in favor of the GBUAPCD on all claims finding that the GBUAPCD's "process was proper," the "findings were supported by substantial evidence" and, despite contentions to the contrary, "the administrative record demonstrates a thorough and exhaustive study by various experts based on complete data from the past decades to the present."

Petitioners appealed the decision of the trial court. Upon review, the Court of Appeal affirmed the trial court's decision on all grounds except the two addressed in this SEIR. The Court of Appeal concluded "[t]hat the District was the proper lead agency, and that the permit limiting the daily ROG [reactive organic gas] emissions is sufficient evidence of the amount of the emissions." However, it also concluded that "the District did not adequately analyze whether the additional mitigation measures proposed by petitioners were feasible to limit ROG emissions." Specifically, the Court of Appeal ordered "[t]he District to provide a reasoned analysis supported by factual information in response to the mitigation measures proposed by the petitioners..." *Covington v. Great Basin Unified Air Pollution Control District* (2019) 43 Cal.App.5th 867.



SOURCE: 2013 FEIS-EIR Figure 2-14

Casa Diablo IV Geothermal Power Plant

Figure 2
Casa Diablo IV Geothermal Power Plant

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In response, this Draft SEIR provides the additional discussion and analysis identified by the Court of Appeal regarding two potential and additional mitigation measures to address fugitive ROG emissions from the plant: (1) a stronger LDAR program, and (2) the additional use of leakless or low-leak technology. For any such measures determined to be feasible, this Draft SEIR evaluates them pursuant to CEQA Guidelines Section 15126.4, including whether environmental impacts would result from their implementation.

Generally, leakless or low-leak technology is reserved for use for facilities where fugitive emissions of hazardous air pollutants (HAP) or toxic air contaminants (TAC) are present. By contrast, for the Project, the ROG which constitutes the fugitive emissions for the Project is normal-pentane (n-pentane), the working fluid (motive fluid) to be used in the proposed geothermal power plant. N-pentane is a regulated ozone precursor in the form of ROG and volatile organic compound (VOC), but is not classified as a regulated TAC in California and is not classified as a HAP under the federal Clean Air Act. According to Section 39655 of the California Health and Safety Code, a TAC is "an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health." In addition, United States Environmental Protection Agency (USEPA) has identified HAPs as pollutants known to cause cancer and other serious health impacts, such as reproductive effects or birth defects, or adverse environmental effects. Therefore, n-pentane is not considered by the State to increase mortality or serious illness, or otherwise to pose a hazard to human health. Further, it is not considered by the federal government to cause cancer or other serious health impacts.

1.2 Environmental Review under the California Environmental Quality Act

This section describes the process by which GBUAPCD will review the Project and the Draft SEIR.

1.2.1 Notice of Preparation

GBUAPCD initiated the environmental review process for this SEIR by filing a Notice of Preparation (NOP) with the State Clearinghouse and Responsible and Trustee Agencies on February 26, 2020. The public comment period concluded on March 27, 2020. A summary of the comments received is included in **Appendix A**.

1.2.2 Draft SEIR

This document constitutes the Draft SEIR. This and other environmental documents associated with the Project may be found on GBUAPCD's webpage at: **https://gbuapcd.org/cd4**

Public Notice and Public Review

This Draft SEIR will be available for public review for a 45-calendar-day period (i.e., from Thursday, August 27, 2020, through 5 p.m. on Monday, October 12, 2020), during which time written comments on the Draft SEIR may be submitted to GBUAPCD as provided below.

Responses to all substantive comments on the Draft SEIR will be prepared and included in the Final SEIR. Comments outside the limited scope of the Draft SEIR will not be addressed in the Final SEIR. The SEIR addresses the feasibility and potential environmental effects of potential mitigation measures identified in comments on the 2012 Draft EIS/EIR to reduce the proposed Project's fugitive ROG emissions.

All comments or questions regarding the Draft SEIR should be addressed as follows:

By email to: permits@gbuapcd.org

By mail to: Primary Agency Contact: Ann Logan
Great Basin Unified Air Pollution Control District
157 Short Street
Bishop, CA 93514-3537

1.2.3 Final SEIR and Certification

Following the public review period, a Final SEIR will be prepared. The Final SEIR will include written responses to substantive written comments on the Draft SEIR received during the public review period. CEQA does not require that a public meeting be held to accept verbal comments on a Draft SEIR, and no public meeting is proposed.

Consistent with CEQA's requirements for review of an SEIR, GBUAPCD will wait at least 10 days after issuance of the Final SEIR before taking action on the Project. Upon review and consideration of the Final SEIR, GBUAPCD may take action to approve, conditionally approve, revise, or reject the Project. A decision to approve the Project would be accompanied by written findings and a Mitigation Monitoring and Reporting Program (MMRP).

1.3 Organization of the Draft SEIR

Under CEQA and per the Court of Appeal's directives, GBUAPCD's responsibility for environmental review at this stage is limited to the feasibility and potential environmental effects of the mitigation measures identified in the Court of Appeal's decision to potentially further mitigate the proposed Project's fugitive ROG emissions. Accordingly, the Draft SEIR is a document comprised of the following:

Introduction: Chapter 1 includes a brief project description and an overview of the background to the Draft SEIR. The Introduction also describes the process that will be followed during the public review of the Draft SEIR and the preparation and consideration of a Final SEIR.

Project Description: Chapter 2 relies on and refers to the project description provided in the 2013 Final EIS/EIR except as to those portions that are being updated. Necessary details about the project description are provided in Chapter 2, with amendments to the original text shown via tracked changes (i.e., additions are <u>underlined</u> and deletions are ~~crossed out~~).

Feasibility and Analysis of Suggested Mitigation Measures: Chapter 3 provides a detailed analysis of the feasibility of the two potential and additional mitigation measures to address

fugitive n-pentane emissions from the plant: (1) a stronger LDAR program, and (2) the additional use of leakless or low-leak technology.

Revised Responses to Comments: Chapter 4 provides revised responses to comments received on the 2012 Draft EIS/EIR relating to issues within the scope of this SEIR. Amendments to the original text of the responses to comments are shown via tracked changes (i.e., additions are underlined and deletions are ~~crossed out~~).

Report Preparation: Chapter 5 identifies preparers and recipients of the Draft SEIR.

Appendix A: A summary of the scoping process conducted to support the SEIR is included as Appendix A.

Appendix B: Casa Diablo IV Geothermal Project Feasibility Analysis of Available Equipment Leak Mitigation Measures: Low-Emissions and Leakless Design Technologies (SLR, 2020). An independent technical report by Kenneth A. Malmquist analyzing the feasibility of low-leak and leakless design technologies, as well as more stringent leak detection and repair practices, is included as Appendix B.

1.4 Intended Uses of the SEIR

Once complete and certified, the 2013 Final EIS/EIR and Final SEIR will provide the CEQA compliance documentation upon which GBUAPCD's reconsideration of, and action on, all applicable air quality permits and other approvals (collectively, "approvals") for the Project may be based. Responsible and Trustee agencies also may rely on the 2013 Final EIS/EIR and Final SEIR in issuing approvals or other necessary authorizations.

1.5 References

BlueSkyModel, 2020. "1 kilowatt-hour" webpage. Obtained online at: https://blueskymodel.org/kilowatt-hour. Accessed: August 10, 2020.

SLR International Corporation (SLR), 2020. Feasibility Analysis of Available Equipment Leak Mitigation Measures: Low-Emissions and Leakless Design Technologies, prepared for the Great Basin Unified Air Pollution Control District. July 2020.

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CHAPTER 2
Project Description

This Draft SEIR evaluates the same project that was approved in the 2013 Final EIS/EIR – the initial proposal as modified by Alternative 3 (the "Project"). A summary of the Project is provided in Sections 1.1.1 and 1.1.2 of this Draft SEIR. More specifically, the GBUAPCD's preferred alternative, Modified Pipeline Alternative (Alternative 3) was identified in the 2013 Final EIS/EIR as the Environmentally Superior Alternative. Relative to the Applicant-proposed Alternative 1, the Project modifies the geothermal production and injection pipeline alignments in Basalt Canyon, slightly alters the location of proposed well 26-30, and places pipeline crossings underground. The purposes of this alignment and well location are to minimize potential effects of the Applicant's proposal on biological and cultural resources and to reduce potential visual effects. Power plant and wellfield construction, operation, and decommissioning would be the same as Alternative 1. For the complete detailed description of the Project, refer to the 2013 Final EIS/EIR Section 2.

This Draft SEIR Chapter 2 includes only those portions of the Project Description that have been updated or changed as part of this Draft SEIR. Additions are <u>underlined</u> and deletions are ~~crossed out~~. Some changes reflect clarifications of the Applicant's standard operating procedures which are part of the Project but were not fully described in the EIS/EIR, but were fully analyzed. In some cases, these clarifications are similar to the implementation of measures suggested in the comment letters on the Draft EIS/EIR being addressed in this SEIR. For clarification, those suggested measures are described in the edits below.

Fifth paragraph, pages 2-40 and 2-43 of the Final EIS/EIR:

Motive Fluid System

A light hydrocarbon compound (n-pentane) would be the motive fluid used to drive the turbines for this Project. The system works by using the vaporized motive fluid, n-pentane, from the level 1 and level 2 vaporizers to turn the level 1 and level 2 turbines, which together would turn a common generator. The generator would produce the electricity that would be delivered to the CD-IV substation and transferred to the interconnection transmission line. The vaporized n-pentane would then be condensed in an air-cooled tube condenser, turning it back into a liquid, and returned to the preheaters and vaporizers to repeat the cycle. Each OEC [Ormat Energy Converter] Unit would contain approximately 180,000 pounds of n-pentane in the vaporizers, preheaters, condensers, piping, and n-pentane vapor vessels (either one or two vessels, likely in the range of 9,000 to 12,000 gallons (34 to 45 kl)). The motive fluid system is closed loop, and there are no routine emissions to the atmosphere. However, there can be fugitive

leaks of the n-pentane from pipes, seals, flanges, valves, and other connections and from vapor recovery systems. As described in Appendix B, design measures to reduce the potential for fugitive emissions from the motive fluid process include:

1. Double mechanical seal and barrier fluid systems meeting American Petroleum Institute (API) standards for turbines (API Plan 53B) and centrifugal pumps (API Plan 52) and instrumentation to detect pressure loss and leaks of the barrier fluid systems;
2. Rotational butterfly valves inherently lower in leaks from stem seals than linear sliding stem control valves and meeting or exceeding API specifications;
3. Graphite packing systems for gate valves meeting or exceeding API 600 Trim 8 configuration;
4. Sealless pneumatic (air) diaphragm pumps for evacuating motive fluid from isolated portions of the motive fluid process after isolation for equipment replacement or repair;
5. Combination of butterfly valves and isolation valves in a double block and bleed seal to eliminate leaks from isolated piping and equipment while motive fluid is evacuated;
6. Flanged connections for equipment that is or may be routinely removed for replacement or repair to facilitate safe maintenance while reducing the potential for n-pentane releases during such activities;
7. Flanges and gaskets compatible with motive fluid and meeting ASME specifications;
8. Direct acting pressure relief valves (PRV) meeting stringent API seat tightness standards;
9. Rupture disks to minimize leaks from PRVs; and
10. Use of leakless welded connections to the greatest extent practicable.

In addition, small amounts of air or water (noncondensible gases) typically leak into the OEC unit pentane system in the air condensers and accumulate in the loop over time, which eventually reduces the operating efficiency of the system and therefore needs to be purged out of the system. In order to remove the air, each OEC condenser would have several integrated purge units that are also equipped with VRUs to capture and recover motive fluid that may be entrained in it. This not only is effective emissions control but also helps to reduce operating costs. Because the motive fluid is expensive, it is economically beneficial to capture and return as much motive fluid to the system as possible.

Third paragraph, page 2-43 of the Final EIS/EIR:

2.2.7.6 Power Plant

Motive Fluid System

Some OEC Unit major maintenance activities require that at least a portion of an OEC Unit be cleared of pentane liquid and vapors prior to performing the maintenance activities that include "hot work" on the motive fluid system that would consist of cutting, welding, and brazing. The only hot work that would be needed for the proposed motive fluid systems would be very infrequent and would occur near flange connections for maintenance access. To control and minimize pentane emissions during these infrequent major maintenance activities, the liquid pentane would first be drained from the section of the OEC Unit (preheater, vaporizer or condenser) to be maintained or repaired and transferred to either another section of the OEC Unit, the pentane storage tanks, or another OEC Unit. The Maintenance VRU [vapor recovery unit] diaphragm pump and vacuum pump would then be used to evacuate and compress most of the remaining pentane vapors, returning the pentane liquid to the other sections of the OEC Unit, the pentane storage tanks, or another OEC Unit. As with the integrated VRUs, this maintenance VRU not only assists with emissions control, but with returning a raw material back to the system to help reduce operating costs.

The Applicant designs its geothermal facilities to minimize the need to conduct hot work on the motive fluid system due to the inherent safety issues, including an elevated risk of fire and explosion hazards due to the potential for fugitive motive fluid leaks to ignite (see N-pentane Fire Suppression discussion below). All of the system components are proposed to be welded based on standard design, with the exception of the proposed use of flanges for major maintenance access points for pumps, turbines, and the main control valves. Flanges are proposed for the major access points in order to conduct safe maintenance that does not involve hot work. For example, pipeline runs, elbows, transitions, and other minor access points would be welded, while major access points such as valves, pumps, turbines, and main control valves would be flanged in case they would ever need to be replaced and instrumentation would need to be threaded to allow for calibration and/or replacement.

Pages 2-44 and 2-45 of the Final EIS/EIR:

N-pentane Fire Suppression

Bulk quantities n–pentane would be stored in pressure vessels and bulk storage containers on the power plant site. Numerous engineering, fire–control, and safety measures would be integrated into the Project to prevent releases of n–pentane, prevent fires, and to respond to and control fires and other emergencies. Some of the fire prevention, detection, and control systems that would be included in the design of the CD-IV plant include the following:

1. Safeguards inherent to the design of the power plant would include relief valves, manual and automatic shutoffs, interlocks, vents, and check valves.

2. MPLP [Mammoth Pacific L.P.] would revise its Emergency Response Plan and Risk Management Plan/California Accidental Release Prevention Plan (RMP/CalARP) programs at the existing Casa Diablo facilities to incorporate the CD-IV plant. MPLP staff would continue to receive training on these emergency response programs to help become aware of hazards, prevent incidents, and what to do if an emergency incident should occur.

3. The fire and n–pentane detection systems, as well as fire-fighting system, would comply with National Fire Protection Association standards.

4. Normal pentane–specific vapor sensors and flame detectors would be placed at strategic locations around the turbine, motive fluid pumps, and motive fluid storage tank and these would be connected to the power plant computer control system to quickly alert the plant operators to any such potentially hazardous situations. The existing control room itself would not need to be modified, but there would be new controls and monitors for the new plant.

5. An automatic water deluge sprinkler system would be installed on the n–pentane storage vessels (which contain n–pentane in liquid phase) that would automatically activate when a flame detector is activated to cool and protect the vessels.

6. Water nozzles/monitors would be placed at the power plant site to be used to minimize the risk of a fire spreading should one start within the power plant. ORNI 50 would not install or use an automated system because of the operator discretion required to prevent the spread of a flammable liquid fire.

7. For fires involving leaks of flammable gases such as n–pentane, many experts agree that the best method of extinguishment is to isolate the source of the fuel. Refer to the following excerpt from a Material Safety Data Sheet (MSDS) for n–pentane:

   > *The only safe way to extinguish an n–pentane fire is to stop the flow. Cylinders exposed to fire may rupture with violent force. Keep cylinders cool by applying water from a maximum possible distance with a water spray. Avoid spreading burning liquid with water used for cooling.*

   Therefore, automatic fire suppression systems on equipment containing n–pentane would not be used. Instead, manual and automatic shutoffs, interlocks, vents, and check valves, would be the first line of prevention and defense in the event of a fire emergency.

8. All manned/occupied and electrical buildings would have an approved automatic fire suppression system as required by code. The electrical systems would utilize an FM–200® waterless fire suppression system.

9. The water–based fire protection system would include a new fire water storage tank (approximately 340,000 gallons) and a diesel–powered (approximately 400 brake horsepower) fire water pump. Geothermal fluid would be the source of water stored in the fire water storage tank.

10. Fire suppression equipment and tools at the site would include the fire suppression system noted above, fire extinguishers, tools, and mobile equipment.

11. To prevent worker injury due to the hazards associated with "hot work," all work on the motive fluid system that would include cutting, welding, and brazing would be conducted pursuant to ORNI 50 LLC's Hot Work Procedure No. SMP 10 (Mammoth Pacific L.P., 2018).

Page 2-51 of the Final EIS/EIR:

2.2.9 Project Design Measures for Environmental Protection

Air Quality

1. *AQ-1*: ORNI 50, LLC will apply water during the construction and utilization of pads and access roads as necessary to control dust. Dust will not be discharged into the air for a period or periods aggregating more than three minutes in any one-hour that is as dark or darker in shade as that designated as No. 1 on the Ringelmann Chart.

2. *AQ-2*: ORNI 50, LLC will also comply with any requirements prescribed by the Great Basin Unified Air Pollution Control District (GBUAPCD) concerning emissions of air pollutants from construction engines or hydrogen sulfide from operating geothermal wells. The drilling rigs will be registered in the CARB Portable Engine Registration Program.

3. *AQ-3*: ORNI 50, LLC will utilize best available equipment and design to minimize emissions of n-pentane. This will include the use of Best Available Control Technology (BACT) as required by GBUAPCD Rule 209-A to limit emissions of n-pentane.

4. *AQ-4*: ORNI 50, LLC will apply for an air permit to construct and operate the wells and power plant. The Project will conform to GBUAPCD requirements for controlling emissions.

Pages 2-54 and 2-53 of the Final EIS/EIR:

2.2.10 Mitigation Measures

Mitigation Measure AQ-6: Implementation of Enhanced Leak Detection and Repair (LDAR) Program. ORNI 50, LLC shall obtain a portable Volatile Organic Compound (VOC) leak detector capable of meeting the performance specifications described in USEPA's ~~Source Test Reference~~ Method 21. This instrument shall be properly maintained, calibrated, and made readily available at all times on the property site. Inspections utilizing t~~T~~he instrument shall be ~~used at least~~ conducted at a minimum on a monthly basis to assist ORNI 50, LLC personnel in detecting n-pentane leaks from all flanges, valves, pump seals, safety relief valves, n-pentane accumulator vessels, ~~and~~ turbine gland seals, and other fugitive components. In addition to a USEPA Method 21 portable analyzer, monthly inspections shall include the use of a held infrared camera and visual inspection and observation. Pumps shall be visually inspected weekly. Whenever a leak is detected that is greater than ~~10,000 ppmv~~ 2,000 ppmv for pumps or 500 ppmv for valves, pressure relief values, flanges, n-pentane accumulator vessels, turbine gland seals, and all other fugitive components ~~from any aforementioned equipment~~, ORNI 50, LLC shall initiate repairs as soon as ~~practical~~ possible. Once a leak is discovered, ORNI 50,

LLC shall tag and log its location, record the leak concentration, record the date, and record the dates of each repair attempt. Minimization of a leak shall occur as soon as possible and no later than 24 hours after the leak discovery. Repair of a leak shall occur as soon as possible and no later than 7 days after the leak discovery. A report that includes the six-month average daily emission calculations and n-pentane purchases shall be submitted electronically to the GBUAPCD within 30 days from the end of each calendar quarter. A summary record of the leak repairs made shall also be submitted to the GBUAPCD when reporting n-pentane losses.

The following references have been added to pages 10-2 and 10-3 of the Final EIS/EIR Chapter 10, References:

Chapter 2, References

Mammoth Pacific, L.P., 2018. Hot Work Procedure, Procedure No. SMP 10. Revision Date: 9/8/2018.

U.S. Environmental Protection Agency (USEPA), 2007. Leak Detection and Repair, A Best Practices Guide. October 2007.

USEPA, 2017. Method 21 – Determination of Volatile Organic Compound Leaks. Obtained online at: https://www.epa.gov/sites/production/files/2017-08/documents/method_21.pdf.

CHAPTER 3
Feasibility and Analysis of Suggested Mitigation Measures

As discussed in Chapter 1, the Court of Appeal's decision identified two potential and additional mitigation measures to address fugitive n-pentane emissions from the plant: (1) a stronger LDAR program, and (2) the additional use of leakless or low-leak technology. The Court found that all other challenged aspects of the 2013 Final EIS/EIR were sufficient.

In such an instance, the CEQA Guidelines provide that Lead Agencies "need not expand the scope of analysis on remand beyond that specified by the Court" [CEQA Guidelines Section 15234(d)]. Accordingly, this Chapter is specific to analyzing the suggested mitigation measures for operational fugitive ROG emissions only. Persons wishing to view the complete text from the 2013 Final EIS/EIR may do so at these locations:

On line at:

https://gbuapcd.org/cd4

By appointment, at the:

Great Basin Unified Air Pollution Control District
157 Short Street
Bishop, CA 93514-3537

Please contact GBUAPCD at 760-872-8211 or at permits@gbuapcd.org to schedule an appointment.

3.1 Introduction

Under California Public Resources Code Sections 21002 and 21801, public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects. The term "feasible" is defined in CEQA Guideline Section 15364 as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account the economic, environmental, legal, social, and technological factors." See also Public Resources Code Section 21061.1. If any suggested mitigation is found to be infeasible the lead agency must explain why and support that determination with substantial evidence, presented in its findings and a statement of overriding considerations (CEQA Guidelines Sections 15091 and 15093). The suggested mitigation measures analyzed in the following sections were proposed by petitioners in original comments to the 2012 Draft EIS/EIR and during the Court's proceeding. This Chapter summarizes an analysis of the feasibility of the suggested mitigation measures. Additional detail

regarding the feasibility of measures is provided in Appendix B. The measures are discussed based on the following two categories: 1) enhanced leak detection and repair procedures; and 2) leakless and/or low-leak technology.

Where implementation of the petitioner suggested mitigation measures was included as part of the Project previously, clarification to that effect has been provided in Chapter 2.

3.2 Enhanced Leak Detection and Repair Procedures

3.2.1 Description

Comment Letter I9 on the Draft EIS/EIR suggested that the Project adopt the USEPA's Method 21 VOC leak detection methodology and USEPA's leak detection and repair (LDAR) Method 21 regulations for petroleum refineries and chemical manufacturing facilities (Final EIS/EIR Appendix G, Comments I9-32 and I9-172). The USEPA LDAR best practices guidance (USEPA, 2007) was used in preparation of the Final EIS/EIR to develop Mitigation Measure AQ-6 (2013 Final EIS/EIR, Chapter 2). Consistent with USEPA guidance, in the 2013 Final EIS/EIR Mitigation Measure AQ-6 originally specified that repairs be implemented on a leak greater than 10,000 parts per million, volume (ppmv) and that monitoring for leaks should be conducted on a quarterly basis.

3.2.2 Feasibility, Analysis, and Conclusions

The USEPA LDAR best practices guidance (USEPA, 2007) is feasible for use on the Project and was used in determining appropriate mitigation measures proposed within the 2013 Final EIS/EIR. The guidance states that typical refinery or chemical plants can emit 600 to 700 tons per year of volatile organic compounds (also referred to as ROGs) from leaking equipment, thus LDAR programs are implemented to control emissions to the extent possible. For comparison, the Project has calculated an estimated fugitive ROG leak rate of 410 pounds per day, which equates to about 74 tons per year. Although voluntary, the USEPA specifies additional practices that can be taken to improve leak detection monitoring reliability including:

Use of a lower than required leak definition. Leak concentration thresholds ("leak definitions") for VOCs in the federal standards range from 500 to 10,000 ppmv. As defined in USEPA's BACT for Fugitive Emissions of Hydrocarbons, a leak is an emission of VOCs that measures at least 10,000 ppmv, and a leak repair is defined as a concentration measured as 1,000 ppmv or lower (USEPA, 2016). Lower leak definition thresholds of 500 ppmv or lower are typically associated with emissions of HAPs at facilities subject to National Emission Standards for Hazardous Air Pollutants (USEPA, 2007). The Bay Area Air Quality Management District (BAAQMD) and the South Coast Air Quality Management District (SCAQMD) have promulgated leak definitions as low as 100 ppmv for some equipment (valves and connections) located at petroleum refineries and chemical plants. Additionally, some BACT determinations for reducing fugitive emissions of organic compounds at major stationary sources of VOCs have also set BACT to include a leak definition threshold of 100 ppmv (see Appendix B, Section 2.2.1).

More frequent monitoring than required. LDAR work practices generally stipulate a monitoring frequency specific to component type (valves, etc.) and service (gas/vapor, light liquid or heavy liquid). For example, rather than monitoring quarterly, some refineries monitor monthly.

Established Quality Assurance/Quality Control procedures. Several refineries have initiated a program to ensure the accuracy and completeness of the monitoring results submitted by the monitoring team (in-house or contractor).

In addition to voluntary practices, some federal settlements (consent decrees) have stipulated "enhanced LDAR program" or "ELP" requirements for certain defendants, including owners and operators of petroleum refineries or chemical plants (see Appendix B, Section 2.2.1). Elements of ELP work practices have included, for example:

- Reduced leak definition thresholds for certain equipment – e.g., from 10,000 ppm to 500 ppm for valves;
- Increased leak survey frequencies – e.g., monthly;
- Implement action levels below leak definition thresholds triggering repair;
- Tightened schedules for "first attempt at repair" and final repair of leaking equipment;
- Repair verification monitoring;
- Limited delay of repair; and
- Internal or third-party audits of LDAR program.

Best practices for first attempts at repair for valves include (see Appendix B, Section 4.6):

1) Tightening of bonnet bolts;
2) Replacement of bonnet bolts;
3) Tightening of packing gland nuts; and
4) Injection of lubricant into lubricated packing.

Other best practices describe employee programs and attitudes that would not be subject to analysis. Further investigation of lowering the required leak definition revealed that this process is generally applied to equipment that does not meet performance criteria (40 CFR Section 63.180) and is subject to the Hazardous Organic National Emission Standards for Hazardous Air Pollutants (USEPA, 2007). According to the Clean Air Act Section 112(b), Hazardous Air Pollutants, n-pentane is not listed or considered a HAP. The USEPA has identified HAPs as pollutants known to cause cancer and other serious health impacts, such as reproductive effects or birth defects, or adverse environmental effects. Therefore, n-pentane is not considered by the federal government to cause cancer or serious illness. The Project requires the use of BACT and thus would not use equipment that does not meet performance criteria. Future treatment of equipment that may eventually incur wear and tear would be addressed with an approved emission management plan, as required by and detailed in the 2013 Final EIS/EIR Mitigation Measure AQ-5.

Evidence was provided by petitioners that for refineries, a quarterly monitoring program with leak rate of 10,000 ppmv will reduce emissions by 70 percent, while a leak rate of 500 ppmv with monthly monitoring will reduce emissions by 95 percent. The USEPA best practices guide presents a table (Table 4.1 Control Effectiveness for an LDAR Program at a Chemical Process Unit and a Refinery) that summarizes control effectiveness for different parts of a refinery and reports a monthly monitoring program with a leak rate of 10,000 ppmv can reduce emissions by 76 percent, when referring to liquids, and 88 percent when referring to gas, and a program with a leak rate of 500 ppmv can reduce emissions by 95 percent when referring to liquids, and 96 percent for when referring to gas (USEPA, 2007). Based on these USEPA data, leak definitions lower than 500 ppmv do not achieve substantially greater emission reductions.

Because n-pentane is not a listed HAP or a regulated air toxic compound and the Project is not a major stationary source of VOC as defined in 40 CFR section 52.21, an independent engineering review of the Project found that an enhanced LDAR program more stringent than the most rigorous USEPA New Source Performance Standards required for new chemical and natural gas processing plants is neither reasonable nor warranted for the Project (see Appendix B, Section 4.6). Nonetheless, a more stringent LDAR program is potentially feasible. Mitigation Measure AQ-6 has been revised from the 2013 Final EIS/EIR to include increased inspection frequency, lower leak definition threshold, and more stringent leak minimization and repair requirements.

Table 3-1 describes the technical feasibility of the suggested enhanced LDAR procedures as they relate to the Project, and includes analysis and conclusions of the effects that implementation of the measures would have on the ROG emissions estimate and impact findings of the Final EIS/EIR.

TABLE 3-1
TECHNICAL FEASIBILITY OF ENHANCED LEAK DETECTION AND REPAIR PROCEDURES

No.	Suggested Measure	Feasibility/Analysis	Conclusion
1	Implement USEPA's leak detection and repair (LDAR) regulations for petroleum refineries and chemical manufacturing facilities following the USEPA's Leak Detection and Repair Compliance Assistance Guidance - A Best Practices Guide (USEPA, 2007).	**Feasible.** It is feasible for the Project to be operated with procedures that meet or exceed USEPA LDAR guidance including more frequent inspections, lower leak definition threshold, and more stringent repair requirements.	The Project would follow the USEPA LDAR guidance. Mitigation Measure AQ-6 has been revised to include LDAR requirements that meet or exceed USEPA LDAR guidance. Implementation of more stringent LDAR practices has the potential to reduce fugitive ROG emissions associated with the Project.
2	Monitor for fugitive reactive organic gas (ROG) leaks with a USEPA Method 21 portable analyzer.	**Feasible.** Inspections utilizing a USEPA Method 21 portable analyzer were required per Mitigation Measure AQ-6 in the 2013 Final EIS/EIR. In addition to the portable analyzer, it is feasible to inspect the plant with a hand held infrared camera for leak checks.	Mitigation Measure AQ-6 has been revised to require use of a hand held infrared camera in addition to a USEPA Method 21 portable analyzer. There is no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.

TABLE 3-1 (CONTINUED)
TECHNICAL FEASIBILITY OF ENHANCED LEAK DETECTION AND REPAIR PROCEDURES

No.	Suggested Measure	Feasibility/Analysis	Conclusion
3	A lower maximum leak definition threshold of 100 ppmv should be established for all fugitive components.	**Partially Feasible.** It is feasible for the Project to include a leak rate definition of 500 ppmv for valves, pressure relief values, flanges, n-pentane accumulator vessels, turbine gland seals, and all other fugitive components in the motive fluid system (Appendix B). This is a substantial reduction compared to the 10,000 ppmv leak definition threshold identified in the 2013 Final EIS/EIR, but is greater than the suggested leak rate definition of 100 ppmv. The USEPA best practices guide presents a table (Table 4.1 Control Effectiveness for an LDAR Program at a Chemical Process Unit and a Refinery) that summarizes control effectiveness for different parts of a refinery and reports a monthly monitoring program with a leak rate of 10,000 ppmv can reduce emissions by 76 percent, when referring to liquids, and 88 percent when referring to gas, and a program with a leak rate of 500 ppmv can reduce emissions by 95 percent when referring to liquids, and 96 percent for when referring to gas (USEPA, 2007). Based on these data, leak definitions for the subject components of less than 500 ppmv would not achieve substantially greater emission reductions.	Mitigation Measure AQ-6 has been revised to define the leak rate definition as 500 ppmv for valves, pressure relief values, flanges, n-pentane accumulator vessels, turbine gland seals, and all other fugitive components. This leak rate threshold is generally consistent with the most stringent federal CAA standards for equipment leaks (Appendix B). Implementation of a lower leak definition has the potential to reduce fugitive ROG emissions associated with the Project. Further reduction of the leak definition threshold below 500 ppmv would not substantially reduce emissions.
4	A higher leak rate for pumps, no higher than the 500 ppmv as specified in BAAQMD Rule 8-18, can be used if accompanied by an analysis demonstrating that 100 ppmv is not technologically feasible or cost effective in the subject applications.	**Partially Feasible.** It is feasible for the Project to include a leak rate definition of 2,000 ppmv for pumps in the motive fluid system (Appendix B). This is a substantial reduction compared to the 10,000 ppmv leak definition threshold identified in the 2013 Final EIS/EIR, but is greater than the suggested leak rate definition of 100 ppmv or 500 ppmv. The USEPA best practices guide presents a table (Table 4.1 Control Effectiveness for an LDAR Program at a Chemical Process Unit and a Refinery) that summarizes control effectiveness for different parts of a refinery and reports a monthly monitoring program with a leak rate of 10,000 ppmv can reduce emissions by 76 percent, when referring to liquids, and 88 percent when referring to gas, and a program with a leak rate of 500 ppmv can reduce emissions by 95 percent when referring to liquids, and 96 percent for when referring to gas (USEPA, 2007). Based on these data, leak definitions for pumps of less than 2,000 ppmv would not achieve substantially greater emission reductions.	Mitigation Measure AQ-6 has been revised to define the leak rate threshold to 2,000 ppmv for pumps in the motive fluid system. This leak rate threshold is generally consistent with the most stringent federal CAA standards for equipment leaks (Appendix B). Implementation of a lower leak definition has the potential to reduce fugitive ROG emissions associated with the Project. Further reduction of the leak definition threshold below 2,000 ppmv would not substantially reduce emissions.
5	Leak rates are to be enforced by conducting quarterly inspections.	**Feasible.** Quarterly inspections were required per Mitigation Measure AQ-6 in the 2013 Final EIS/EIR. More frequent monthly inspections are feasible.	Mitigation Measure AQ-6 has been revised to require monthly inspections. Implementation of more frequent inspections has the potential to reduce fugitive ROG emissions associated with the Project.

TABLE 3-1 (CONTINUED)
TECHNICAL FEASIBILITY OF ENHANCED LEAK DETECTION AND REPAIR PROCEDURES

No.	Suggested Measure	Feasibility/Analysis	Conclusion
6	Minimization of a detected leak shall occur within 24 hours and repair within 7 days.	**Feasible.** The 2013 Final EIS/EIR Mitigation Measure AQ-6 stated repairs should be initiated as soon as possible. More specific and more stringent minimization and repair timelines are feasible (Appendix B).	Mitigation Measure AQ-6 has been revised to state minimization of a leak shall occur as soon as possible and no later than 24 hours after the leak discovery. Repair of a leak shall occur as soon as possible and no later than 7 days after the leak discovery. Implementation of more stringent leak repair timelines has the potential to reduce fugitive ROG emissions associated with the Project.

3.3 Leakless and Low-leak Technology

3.3.1 Description

Comment letter I9 on the Draft EIS/EIR suggested that the Project adopt leakless and/or low-leak technology. Leakless technology involves welded connections that do not leak. Low-leak technology includes bellows and diaphragm valves, double seal pumps with or without barrier fluid, diaphragm pumps, canned motor pumps, and magnetic drive pumps. These pieces of equipment have been demonstrated to have low fugitive emission leak rates. Petitioners' experts also recommended the use of graphite-packed control valves and hermetically sealed valves and flanges, which are also examples of low-leak equipment.

3.3.2 Feasibility, Analysis, and Conclusions

Leakless technology is feasible for the majority of the Project and is proposed to be implemented; however, it would not be feasible for certain equipment to have welded connections, and not all low-leak equipment would be feasible and/or applicable to the Project. BACT is required for the Project and due to quality improvements, in some cases the equipment selected would exceed the capabilities of leakless or low-leak technology.

Table 3-2 describes the technical feasibility of the suggested leakless and low-leak technology as they relate to the Project, and includes analysis of the effects that implementation of the measures would have on the ROG emissions estimate and impact findings of the Final EIS/EIR.

TABLE 3-2
TECHNICAL FEASIBILITY OF LEAKLESS AND LOW-LEAK TECHNOLOGY

No.	Suggested Measure	Feasibility/Analysis	Conclusion
1	Use leakless technology for all equipment components that could result in fugitive leaks of the motive fluid n-pentane (e.g., welded connections). For example, screwed or threaded flanges should not be used.	**Not Feasible for the entire system**. All of the system components are proposed to be welded based on standard design, with the exception of the proposed use of flanges for major maintenance access points for pumps, turbines, and major control valves. Flanges are proposed for the major access points in order to conduct safe maintenance; welded valves are not easily maintained without full evacuation (i.e., completely drained) of the n-pentane. Maintenance of leakless welded components at major access points would be less safe to remove and replace due to the "hot work" that would be required to maintain the valves. Hot work consists of cutting, welding, and brazing. Threaded connections are proposed only for small bore piping. Ormat designs its geothermal facilities to minimize the need to conduct hot work on the motive fluid system and has hot work procedures in place (Mammoth Pacific, L.P., 2018, Procedure No. SMP 10, *Hot Work Procedure*). Prior to conducting any hot work on the motive fluid systems, the system must be rendered gas free. The only hot work that would be needed on the proposed motive systems would be very infrequent and would occur near flange connections for maintenance access. The reason why not all components are proposed to be welded is because hot work poses a safety issue associated with elevated risk of fire and explosion hazards due to the potential for motive fluid leaks. In addition, removing a welded valve for maintenance involves more risk for n-pentane leaks than from a leaking flange.	Implementation of leakless technology has been incorporated into the Project to the greatest extent feasible and the Project Description has been revised to clarify its use of leakless technology (see Chapter 2). This results in no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.
2	Project Design Measure AQ-3 should be revised to specifically refer to "BACT as required by GBUAPCD Rule 209-A Section D (for new stationary sources of emissions which would result in a net increase in emissions of 250 or more pounds/day)" instead of "best available equipment and design" for which no legal definition exists."	**Feasible.** Implementation of BACT is required by GBUAPCD regulations. Per GBUAPCD Rule 209-A, *Standards for Authorities to Construct*, BACT is required for facilities with the potential to emit pollutants in excess of listed threshold amounts. For volatile organic compounds (VOCs), an ozone precursor similar to reactive organic gases (ROG), the threshold is 250 pounds per day. The estimated maximum emissions of the Project are approximately 410 pounds per day triggering the requirement for BACT. Per GBUAPCD Rule 209-A, BACT is defined as: Best Available Control Technology (BACT) means for any source the more stringent of: a. The most effective emissions control technique which has been achieved in practice, for such category or class of source; or b. Any other emissions control technique found, after public hearing, by the Air Pollution Control Officer or the Air Resources Board to be technologically feasible and cost/effective for such class or category of sources or for a specific source; or c. The most effective emission limitation which the EPA certifies is contained in the implementation plan of any State approved under the Clean Air Act for such class or category or source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable. In no event shall the emission rate reflected by the control technique or limitation exceed the amount allowable under applicable new source performance standards.	For clarity, Project Design Measure AQ-3 has been revised to acknowledge the Project requires BACT per GBUAPCD Rule 209-A to limit emissions of n-pentane. This results in no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.

TABLE 3-2 (CONTINUED)
TECHNICAL FEASIBILITY OF LEAKLESS AND LOW-LEAK TECHNOLOGY

No.	Suggested Measure	Feasibility/Analysis	Conclusion
3	Provide a top-down analysis of control efficiencies for vapor recovery devices and revise the BACT determination accordingly.	**Feasible.** GBUAPCD will complete a BACT analysis as part of its permitting processes for the Project.	GBUAPCD would complete a BACT analysis as part of its permitting processes for the Project if it is approved. This results in no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.
4	Use leakless valves, i.e., bellows valves and diaphragm valves.	**Not Feasible/Not Applicable.** Diaphragm valves are not as reliable and have a much shorter service life than the metal valves currently used. The control valves utilized in the Project design have superior operation for motive fluid application than bellows-sealed valves and diaphragm valves. The proposed control valves are quarter turn valves that isolate better (bellows-sealed valves are not applicable). Diaphragm valves can fail more readily than the proposed control valves. Also, diaphragm valves are usually used for granular solids and viscous flows and are not applicable to a motive fluid system. In addition, an independent review of specifications for diaphragm valves found none that meet the pressure and temperature specifications required for the Project, and that they are not available in the sizes needed for the Project (see Appendix B, Section 4.4). Bellows-sealed valves are not suitable for the project. Similar to diaphragm valves, it is Ormat's experience that they have a tendency to fail and are more complicated. These are often used for hazardous materials applications. In addition, the size of valves used for the motive fluid system are larger than available standard bellows-sealed valves. Also, linear sliding stem globe and gate valves, the only available type of valve for which bellows are designed, are not technically suited for motive fluid flow control while minimizing pressure drop of the system. Bellows-sealed valves can only be used in linear designs and cannot be used in rotational valves required for the Project (see Appendix B, Section 4.4).	No changes to the Project. There would be no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.
5	Use low-leak dual seals for pumps with or without barrier fluid.	**Feasible.** The proposed process cycle pumps would have a double mechanical seal with API Plan 52 unpressurized barrier oil, with pressure and level leak detection instrumentation. Turbines are proposed to have double mechanical seal with API Plan 53B pressurized barrier oil with pressure and level leak detection instrumentation (Swagelok, 2020).	Already proposed as part of the Project. The Project Description has been revised to clarify its use of low-leak dual seals for pumps (see Chapter 2). There is no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.

TABLE 3-2 (CONTINUED)
TECHNICAL FEASIBILITY OF LEAKLESS AND LOW-LEAK TECHNOLOGY

No.	Suggested Measure	Feasibility/Analysis	Conclusion
6	Use low-leak diaphragm pumps.	**Feasible for very limited use on small transfer pumps.** Not feasible for meeting the continuous high-rate flow required for circulation of the motive fluid. Ormat uses some diaphragm pumps on smaller applications. But the pressures required for the large cycle motive fluid pumps makes use of diaphragm pumps infeasible due to pressure limitations. Maximum flow for a diaphragm pump is 280 gallons per minute (gpm), with a maximum operating pressure of 100 pounds per square inch (psi). See diaphragm pump data sheet (Sandpiper, 2017). This flow rate and maximum pressure are not applicable for Ormat's motive fluid system. Note that Ormat considers the operating pressure of the proposed motive fluid system to be proprietary information and confidential. The diaphragm itself on this pump can leak, it cannot offer steady flow, the pump does not fit to several working points and makes control on the work point difficult. This pump type has difficulty with in parallel/column connections.	Already proposed as part of the Project. The Project Description has been revised to clarify its use of low-leak diaphragm pumps for small transfer pump applications with maximum flow of 280 gpm and maximum operating pressure of 100 psi (see Chapter 2). There is no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.
7	Use low-leak canned motor pumps.	**Feasible for very limited use.** Not feasible for large capacity continuous duty cycle pumps. Ormat uses canned motor pumps where feasible on smaller applications. But the flow and pressures required for the large cycle motive fluid pumps makes use of canned motor pumps infeasible due to pressure limitations. Maximum flow for a canned motor pump is 423 gpm, with a maximum operating pressure is 17 psi (Star Pump Alliance, 2020). This flow rate and maximum pressure are not applicable for Ormat's motive fluid system. Note that Ormat considers the operating pressure of the proposed motive fluid system to be proprietary information and confidential. In addition, independent research of canned motor pumps manufactured in the U.S. or U.K. was unable to identify a design capacity sufficient to meet the size, gallons per minute, and "head" capacity required for the motive liquid feed pumps (see Appendix B, Section 4.4).	Already proposed as part of the Project. The Project Description has been revised to clarify its use of low-leak canned pumps for small transfer pump applications with maximum operating pressure of 17 psi (see Chapter 2). There is no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.
8	Use low-leak magnetic drive pumps.	**Not Feasible.** Not feasible for large capacity continuous duty cycle pumps. Unavailable in the capacity requirements for the cycle pumps. It is Ormat's experience that motors are not reliable and have more failures than the API Plan 52 pumps they are using. Each failure results in a large leak compared to the operation with the API Plan 52 pumps that have a double mechanical seal with API Plan 52 unpressurized barrier oil, with pressure and level leak detection instrumentation (Ormat, 2016). In addition, independent research of magnetic drive pumps manufactured in the U.S. or U.K. was unable to identify a design capacity sufficient to meet the size, gallons per minute, and "head" capacity required for the motive liquid feed pumps (see Appendix B, Section 4.4).	No changes to the Project. There would be no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.

TABLE 3-2 (CONTINUED)
TECHNICAL FEASIBILITY OF LEAKLESS AND LOW-LEAK TECHNOLOGY

No.	Suggested Measure	Feasibility/Analysis	Conclusion
9	Use low-leak graphite-packed control valves.	**Feasible.** Ormat uses graphite packing with API 600 Trim 8 configuration for all its manual valves.	Already proposed as part of the Project. The Project Description has been revised to clarify its use of low-leak graphite-packed control valves (see Chapter 2). There is no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.
10	Use low-leak hermetically sealed valves and flanges.	**Not Feasible/Not Applicable.** See bellows valves, above	No changes to the Project. There is no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.
11	Use low-leak double mechanical pump seals with barrier fluid. Use low-leak magnetically coupled pumps. Use low-leak magnetic fluid sealing technology for pumps.	**Feasible.** See dual seals for pumps with or without barrier fluid, above	
14	Use low-leak gas seal systems for pumps vented to a thermal oxidizer or other approved control device (such as vapor recovery units).	**Not Feasible.** Based on Ormat's experience with its existing geothermal plants, vent gas systems are less reliable and introduce more potential leak points than the proposed pumps with double mechanical seals with barrier fluid.	No changes to the Project. There is no change to the Final EIS/EIR fugitive n-pentane emission estimates or conclusions.

3.4 References

Ormat, 2016. Plan 52 (FM/ATEX) Flanged, Drawing Number 0.002.46.523.0. Approved March 27, 2016.

Mammoth Pacific, L.P., 2018. Hot Work Procedure, Procedure No. SMP 10. Revision Date: 9/8/2018.

Sandpiper, 2017. 3" Sandpiper non-metallic AODD Ball Valve Pump, Class Leading Performance, Easiest to Maintain, 2017.

SLR International Corporation (SLR), 2020. Feasibility Analysis of Available Equipment Leak Mitigation Measures: Low-Emissions and Leakless Design Technologies, prepared for the Great Basin Unified Air Pollution Control District. July 2020.

Star Pump Alliance, 2020. Canned motor pumps – function, advantages, and applications, 2020.

Swagelok, 2020. API Plan 53B Barrier Fluid Pressurized by Bladder Accumulator. Obtained online on April 30, 2020, at: https://www.swagelok.com/en/services/design-assembly/mechanical-seal-support-systems/between-seal-planassemblies/api-plan-53b.

U.S. Environmental Protection Agency (USEPA), 2007. Leak Detection and Repair, A Best Practices Guide. October 2007.

U.S. Environmental Protection Agency (USEPA), 2016. New Source Review (NSR) Archives, BACT for Fugitive Emissions of Hydrocarbons 8.10, last updated February 21, 2016. Obtained online at: https://archive.epa.gov/airquality/ttnnsr01/web/html/p8_10.html.

U.S. Environmental Protection Agency (USEPA), 2017. Method 21 – Determination of Volatile Organic Compound Leaks. Obtained online at: https://www.epa.gov/sites/production/files/2017-08/documents/method_21.pdf.

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CHAPTER 4
Revised Responses to Comments

4.1 Introduction

Comment letter I9 submitted by the California Unions for Reliable Energy (CURE) is included in Appendix G of the 2013 Final EIS/EIR. The specific comments from Comment letter I9 relevant to the scope of this Draft SEIR (Comments I9-32, I9-170, I9-171, and I9-172) have been repeated (shown in italics) in this section for the reader's convenience. Each comment is followed by the response with revisions indicating additions as <u>underlined</u> and deletions as ~~crossed out~~.

4.2 Revised Response to Comment Letter from CURE

Comment I9-32:

Reactive Organic Gas ("ROG") emissions are almost exclusively related to fugitive emissions of the motive fluid, n-pentane, at the binary power plant. The Applicant estimates the Project will result in 410.0 lb/day and 74.8 tons/year ROG from fugitive n-pentane emissions, in exceedance of the applicable CEQA thresholds.[187]

> *The draft EIS/EIR claims that the Project*
>
> *[i]s proposed to include state of the art equipment and best available technology that would limit fugitive ROG (i.e., n-pentane) emissions and that no additional feasible mitigation measures are available to further substantially reduce fugitive ROG emissions, and the CD-IV Project would result in a significant and unavoidable impact related to long-term fugitive emissions of n-pentane.*[188]

Dr. Pless recommends including in a revised draft EIS/EIR additional and/or more stringent, existing, feasible best available control technology for operational emissions of ROG.[189]

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[187] *Id., at Tables 4.2-4 and 4.2-5, p. 4.2-12.*
[188] *Id., at p. 4.2-11 (emphasis added).*
[189] *Pless Comments, p. 12.*

Feasible mitigation exists to reduce the Project's significant ROG emissions. Pless recommends incorporating leakless technology for motive fluid systems.[190] *Pless notes that the Applicant's proposed use of screwed or threaded, flanges will result in leakage no matter how carefully executed while welded connections on the other hand do not (unless defective). Thus, welded connections would eliminate 100% of the emissions.*[191] *Leakless equipment*

technology is routinely used and required for construction of new or modified existing refineries and chemical facilities and is equally feasible for the Project.[192]

Pless also shows that additional and/or more stringent mitigation measures for the leak detection and repair program are feasible. While the Applicant's proposed BACT measure for equipment leaks includes the "placement of pentane specific vapor sensors at strategic locations", as well as "leak checks, inspections, monitoring, and leak logging," Pless finds those measures inadequate to address smaller and slow leaks and therefore not BACT for the Project.[193] *Instead, Pless recommends the USEPA's leak detection and repair ("LDAR') regulations for petroleum refineries and chemical manufacturing facilities. The implementation of LDAR is feasible, as it incorporates the elements of the proposed inspection program with additions, such as quantification of fugitive ROG leaks with a portable analyzer.*[194]

A revised draft EIS/EIR should include a mitigation measure requirement to use leakless components for all equipment components that could result in fugitive leaks of the motive fluid n-pentane as well as a mitigation measure that includes the use of LDAR following the USEPA's Best Practices Guide [195]

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[190] *Id. at p. 13.*
[191] *Ibid.*
[192] *Id.*
[193] *Id. at p. 14.*
[194] *Ibid.*
[195] *Id., see also; USEPA, Leak Detection and Repair Compliance Assistance Guidance, A Best Practice Guide (Attachment P).*

I9-32 Response:

The commenter indicates that there are feasible mitigation measures available to reduce fugitive n-pentane emissions beyond the best available technology proposed for the CD-IV Project. The commenter also lists the Applicant's proposed emission reduction concepts and technologies. This comment is noted.

The commenter indicates that the CD-IV Project's motive fluid system should use leakless technology to avoid fugitive emissions of n-pentane. The proposed motive fluid system does include ~~limited~~ leakless technology, including welded connections ~~wherever~~ to the greatest extent feasible ~~and practical~~ (Ormat 2013). All of the system components are proposed to be welded based on standard design, with the exception of the proposed use of flanges for major maintenance access points for pumps, turbines, and the main control valves. Flanges are proposed for the major access points in order to conduct safe maintenance. For example, pipeline runs, elbows, transitions, and other minor access points would be welded~~. Leakless technology would not be feasible or practicable for some components of the motive fluid system. For example~~, while major access points such as valves, pumps, turbines, and main control valves would be flanged in case they would ever need to be replaced and instrumentation would need to be threaded to allow for calibration and/or replacement.

Maintenance at major access points requiring the removal and replacement of leakless welded components would be less safe because it would require relatively frequent "hot work" on the

motive fluid system that would consist of cutting, welding, and brazing. The Applicant designs its geothermal facilities to minimize the need to conduct hot work on the motive fluid system due to the inherent safety issues, including elevated risk of fire and explosion hazards due to the potential for motive fluid leaks to ignite. When hot work is required, the Applicant has specific procedures in place to reduce the fire and explosion risks to the extent achievable, including purging (i.e., draining) all n-pentane from the fluid motive system (Mammoth Pacific L.P., 2018). In addition, because of these safety procedures, removing a welded component for maintenance involves a greater potential for n-pentane leaks than from a leaking flange because a small amount of non-condensed n-pentane vapors would be discharged to the atmosphere during the purge. The only hot work that would be needed for the proposed motive fluid systems would be very infrequent and would occur near flange connections for maintenance access. This information has been added to the Project Description to include a discussion of hot work, and its inherent hazards (see Draft SEIR Section 2). Based on these issues, it would not be feasible for components at major access points of the motive fluid system to be welded.

In addition to welding components to control leaks, bellows and diaphragm valves are used in some hazardous materials applications to control leaks. In a bellows valve, a welded seal divides the lower half of the valve, where the system flow media resides, from the upper parts of the valve, where actuation is initiated; the stem, which is entirely encased in a metal bellows, moves up and down without rotating, sealing over the inlet (Adkins, 2011). By contrast, diaphragm valves each contain a thin plastic or metal diaphragm that flexes up and down to create a leak-tight seal over the inlet (Id.). Either type can be a good choice depending on the specific circumstances when the seal to atmosphere is critical and access for maintenance is limited; however, neither is the best choice for the Project (ORNI 50 LLC, 2020). Ormat's experience, including five decades of operation of more than 150 geothermal plants with more than 2,100 MW of geothermal capacity, informs the Applicant's determination that diaphragm valves are not as reliable and have much shorter service life than the metal valves proposed for the Project. Diaphragm valves can fail more readily then the proposed control valves and are usually used for granular solids or viscous flows (Ormat, 2019). Thus, diaphragm valves are not applicable to a motive fluid system. Similarly to diaphragm valves, it is the Applicant's experience that bellow valves have a tendency to fail and are more complicated to operate. The control valves the Applicant uses operate more reliably and are better suited than bellows and diaphragm valves for the motive fluid application.

An independent review of specifications for diaphragm valves found that none meet the pressure and temperature specifications required for the Project, and that they are not available in the sizes needed for the Project (see Appendix B, Section 4.3). Also, linear sliding stem globe and gate valves, the only available type of valve for which bellows are available, are not technically suited for motive fluid flow control while minimizing pressure drop of the system. Bellows sealed valves can only be used in linear designs and cannot be used in rotational valves required for the Project (see Appendix B, Section 4.4). Therefore, bellows valves and diaphragm valves are not feasible or applicable to the Project. The proposed control valves are quarter turn valves that more efficiently isolate the motive fluid. Information has been added to the Project Description to include a discussion of the proposed valve types (see Draft SEIR Section 2).

The Project would also include the use of dual seal pumps to control ROG leaks. Process cycle pumps proposed for the Project would have a double mechanical seal with API Plan 52 technology for unpressurized barrier oil and pressure and level leak detection instrumentation (Ormat, 2016). Turbines are proposed to have a double mechanical seal with API Plan 53B pressurized barrier oil technology also with pressure and level leak detection instrumentation (Swagelok, 2020). Discussion of the proposed process cycle pumps types has been added to the Project Description (see Draft SEIR Section 2).

Use of diaphragm and canned pumps are also options to control pump leaks in some circumstances; however, these pumps are not feasible for the continuously operating large cycle pumps that would be required for the Project due to very limited capacity and/or operating pressure limits. The Applicant does propose to use diaphragm and/or canned pumps for some of the smaller applications, but the pressures required for the large cycle motive fluid pumps makes use of these pumps infeasible for that application. Maximum flow for a diaphragm pump is 280 gallons per minute (gpm), with a maximum operating pressure of 100 psi (Sandpiper, 2017). Maximum flow for a canned motor pump is 423 gpm, with a maximum operating pressure of 17 psi (Star Pump Alliance, 2020). The Applicant considers the operating pressure of its proposed motive fluid system to be proprietary information and a confidential trade secret, but has demonstrated to GBUAPCD that the maximum flow rates and pressures of available diaphragm and canned pumps are insufficient for incorporation into the Applicant's motive fluid system.[1] In addition, the diaphragm portion of diaphragm pumps can leak, it cannot offer steady flow, the pump does not fit to several working points, and it makes control on the work point difficult. In the Applicant's experience, this pump type also has difficulty with in parallel/column connections which would be needed for the Project. Discussion of the proposed diaphragm and canned pumps for some of the smaller applications has been added to the Project Description (see Draft SEIR Section 2).

Magnetic drive pumps can also reduce pump leaks; however, these pumps are not technologically feasible for large capacity continuous duty cycle pumps and are unavailable in the capacity requirements for the cycle pumps needed for the Project. It is Applicant's experience that the motors on magnetic drive pumps are not reliable and have more failures than the API Plan 52 pumps proposed for the Project. Any failure of a magnetic drive pump would result in a large ROG leak compared to operations of the proposed API Plan 52 pumps. Use of gas seal systems for pumps vented to a thermal oxidizer or other approved control device (such as vapor recovery units) can also be effective in reducing leaks for some industrial chemical applications; however, based on the Applicant's previous experience at more than 150 geothermal plants, vent gas systems are less reliable and introduce more potential leak points than the proposed pumps with double mechanical seals with barrier fluid, and are therefore not a practicable option for the Project.

The Project would include the use of graphite-packed control valves with API 600 Trim 8 configuration for all its manual valves to control ROG leaks (Werner Sölken, 2020). Discussion

[1] Public Resources Code Section 21160 provides CEQA lead agencies with broad authority to require applicants to provide information necessary to evaluate the significance of potential adverse environmental impacts of the projects they propose. If trade secrets (as defined in Government Code Section 6254.7) are needed to accomplish this task, then they must be submitted to the lead agency. However, the lead agency is precluded from disclosing the trade secrets in an EIR or otherwise as part of the public record (Public Resources Code Section 21160; 14 Cal. Code Regs. Section 15120(d)).

of the proposed graphite-packed control valves has been added to the Project Description (see Draft SEIR Section 2).

The commenter also indicates that the Draft EIS/EIR should be revised to require USEPA leak detection and repair methods. The Permit to Operate would include monitoring requirements per USEPA regulatory methods, including ~~Reference~~ Method 21 (USEPA, 2017). The exact terms and conditions of the Permit to Operate the plant would not be identified until after Project approval; therefore, it is appropriate for the EIS/EIR to identify binding mitigation that will be consistent with the requirements of the permit to ensure that leak detection monitoring is conducted per USEPA methods. Mitigation Measure AQ-6 has been added to Section 4.2.9, *Mitigation Measures*, on Draft EIS/EIR page 4.2-20 (see Response I9-172 for new Mitigation Measure AQ-6) and includes additional requirements, which meet or exceed USEPA leak detection and repair (LDAR) guidelines. The revisions to Mitigation Measure AQ-6 include a requirement for monthly inspections utilizing a USEPA Method 21 portable analyzer and the use of a handheld infrared camera, implementation of a leak definition of 2,000 ppmv for pumps and 500 ppmv for valves, pressure relief values, flanges, n-pentane accumulator vessels, turbine gland seals, and all other fugitive components, and specific leak minimization and repair timelines. These leak rate definitions are generally consistent with the most stringent federal CAA standards for equipment leaks (Appendix B). For leak minimization and repair timelines, AQ-6 has been revised to require that minimization of a leak shall occur as soon as possible and no later than 24 hours after the leak discovery and repair of a leak shall occur as soon as possible and no later than 7 days after the leak discovery.

The fugitive emissions from the Project as mitigated are comparatively small when compared to the emissions of greenhouse gas (GHG) forming compounds from conventional coal-fired or natural gas power plants. The emission savings and corresponding environmental benefits from a geothermal renewable energy facility should be balanced against the fugitive emissions, showing the net benefits of the Project on air quality and climate change. By using a geothermal reservoir as its energy source, the Project eliminates air emissions that would be produced by a traditional fossil fuel fired power plant. An equivalent natural gas power plant (33 MW) would produce an estimated 130,000 metric tons per year of direct GHG emissions in the form of carbon dioxide emissions, as well as other air pollutants, for the same amount of power generated by the Project. A similar-sized coal-fired power plant (33 MW) would produce an estimated 260,000 metric tons per year of direct GHG emissions in the form of carbon dioxide (BlueSkyModel, 2020).

Comment I9-170:

> *Leakless Technology for Motive Fluid System*
>
> *An additional technology available to reduce fugitive emissions of n-pentane from equipment leaks is the use of leakless technology for the Project's motive fluid system. Pipes, valves, pumps and other equipment are commonly connected using flanges that are welded or screwed. Here, it appears that the Applicant proposes to use screwed, or threaded, flanges.[40] Threaded flanges leak, no matter how carefully executed; welded connections on the other hand do not (unless defective) and, thus, eliminate 100% of the emissions. Thus, reducing the number of valves, flanges and connectors, while undoubtedly effective, as proposed, is only the first step in reducing fugitive equipment leaks. Instead, BACT for the Project's motive fluid system is the use of leakless equipment components, a technology that is routinely required for construction of new or modification of existing refineries and chemical facilities and equally feasible here. The Draft EIS/EIR should be revised to require the use of leakless components for all equipment components that could result in fugitive leaks of the motive fluid n-pentane. Further Project Design Measure AQ-3 should be revised to specifically refer*

to "BACT as required by GBUAPCD Rule 209-A, Section D (for new stationary sources of emissions which would result in a net increase in emissions of 250 or more lb/day of any air pollutant or precursor except for CO and particulate matter)" instead of "best available equipment and design" for which no legal definition exists.

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40 Ibid, Attachment "Typical 36MW Air Cooled Ormat Binary Power Plant, Emissions calc" dated May 1, 2012: "Flanges, Connectors [sic], Scrwed.

I9-170 Response:

The commenter indicates that the CD-IV Project's motive fluid system should use leakless technology to avoid fugitive emissions of n-pentane. The proposed motive fluid system does include limited leakless technology, including welded connections wherever feasible and practical (ORNI 50, LLC, 2013). The use of leakless components for all equipment components that could result in fugitive leaks of the motive fluid n-pentane is not feasible due to safety concerns regarding hot work which are discussed in detail in the previous response. See Response I9-32, for details.

In addition, EIS/EIR Project Design Measure AQ-3 (as set forth in 2013 Final EIR Section 2.2.9, p. 2-51) has been revised for clarity, as shown below.

> AQ-3: ORNI 50, LLC will utilize best available equipment and design to minimize emissions of n-pentane. This will include the use of Best Available Control Technology (BACT) as required by GBUAPCD Rule 209-A to limit emissions of n-pentane. ~~For example, pipeline runs, elbows, and transitions would be welded. Leakless technology would not be feasible or practicable for some components of the motive fluid system. For example, valves would be flanged in case they would ever need to be replaced and instrumentation would need to be threaded to allow for calibration and/or replacement.~~

Comment I9-171:

Vapor Recovery Unit Control Efficiency

The Applicant proposes a 99% control efficiency as BACT for the vapor recovery devices. Yet, the Draft EIR states that "other facilities similar to what is proposed for the CD-IV Project have demonstrated better than 99.6 percent efficiency in controlling and recovering n-pentane emissions during normal operations,"[41] Thus, it appears that BACT, as demonstrated in practice, is 99.6% rather than 99% control efficiency. The Draft EIR (and the ATC Application to the GBUAPCD) should provide a top-down analysis of control efficiency for vapor recovery devices and revise the BACT determination accordingly.

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41 Draft EIS/R, p. 4.2-12, emphasis added.

I9-171 Response:

It appears that the commenter is referencing the second bullet of the proposed BACT technologies shown in Comment I9-169; however, that bullet is in reference to proposed vapor

recovery devices that are estimated to return at least 99 percent of the motive fluid back to the system. Therefore, the 99 percent is a reference to the efficiency of returning motive fluid back to the system, which is not a direct reference to the efficiency of controlling and recovering n-pentane emissions. GBUAPCD will complete a BACT analysis as part of its permit to construct and operate processes for the Project if it is approved.

Comment I9-172:

Leak Detection and Repair Program

The Applicant's proposed BACT measures for equipment leaks include the "placement of pentane-specific vapor sensors at strategic locations" as well as "leak checks, inspections, monitoring, and leak logging." While the proposed measures may prevent help prevent significant leaks, they are not adequate to address smaller and slow leaks and do not constitute BACT for the Project. The USEPA has developed leak detection and repair ("LDAR") regulations for petroleum refineries and chemical manufacturing facilities. Implementation of an LDAR program is equally feasible for the Project's motive fluid system. LDAR incorporates the elements of the proposed inspection program but goes further. For example, it requires quantification of fugitive ROG leaks with a portable analyzer (per USEPA Reference Method 21). The Draft EIR should be revised to require as a mitigation measure the use of LDAR following USEPA's Best Practices Guide.[42]

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[42] *USEPA, Leak Detection and Repair Compliance Assistance Guidance, A Best Practices Guide; http://www.epa.gov/compliance/resources/publications/assistance/Idarguide.pdf.*

I9-172 Response:

The commenter indicates that the Draft EIS/EIR should be revised to require USEPA leak detection and repair methods. The Permit to Operate would include monitoring requirements per USEPA regulatory methods, including ~~Reference~~ Method 21. The exact terms and conditions of the Permit to Operate the plant would not be identified until after Project approval; therefore, it is appropriate for the EIS/EIR to identify binding mitigation that will be consistent with the requirements of the permit to ensure that leak detection monitoring is conducted per USEPA methods, including monitoring for fugitive ROG leaks with a portable analyzer. Mitigation Measure AQ-6 has been added to Section 4.2.9, *Mitigation Measures*, on Draft EIS/EIR page 4.2-20 as follows. Refer to Response I9-32 for additional details.

> **Mitigation Measure AQ-6:** Implementation of Enhanced Leak Detection and Repair (LDAR) Program. ORNI 50, LLC shall obtain a portable Volatile Organic Compound (VOC) leak detector capable of meeting the performance specifications described in USEPA's ~~Source Test Reference~~ Method 21. This instrument shall be properly maintained, calibrated, and made readily available at all times on the property site. Inspections utilizing t~~T~~he instrument shall be ~~used at least~~ conducted at a minimum on a monthly basis to assist ORNI 50, LLC personnel in detecting n-pentane leaks from all flanges, valves, pump seals, safety relief valves, n-pentane accumulator vessels, ~~and~~ turbine gland seals, and other fugitive components. In addition to a USEPA Method 21 portable analyzer, monthly inspections shall include the use of a held infrared camera and visual inspection and observation. Pumps shall be visually inspected weekly. Whenever a

leak is detected that is greater than ~~10,000 ppmv~~ 2,000 ppmv for pumps or 500 ppmv for valves, pressure relief values, flanges, n-pentane accumulator vessels, turbine gland seals, and all other fugitive components ~~from any aforementioned equipment~~, ORNI 50, LLC shall initiate repairs as soon as ~~practical~~ possible. Once a leak is discovered, ORNI 50, LLC shall tag and log its location, record the leak concentration, record the date, and record the dates of each repair attempt. Minimization of a leak shall occur as soon as possible and no later than 24 hours after the leak discovery. Repair of a leak shall occur as soon as possible and no later than 7 days after the leak discovery. A report that includes the six-month average daily emission calculations and n-pentane purchases shall be submitted electronically to the GBUAPCD within 30 days from the end of each calendar quarter. A summary record of the leak repairs made shall also be submitted to the GBUAPCD when reporting n-pentane losses.

The following references have been added to the Final EIS/EIR Chapter 10, References:

Chapter 10, References

Adkins, 2011. Matching valve type to function: A tutorial in valve selection. Available online: https://www.eng.ufl.edu/labsafety/wp-content/uploads/sites/28/2015/04/Valve-Selection.pdf. June 2011.

BlueSkyModel, 2020. "1 kilowatt-hour" webpage. Obtained online at: https://blueskymodel.org/kilowatt-hour. Accessed: August 10, 2020.

Mammoth Pacific L.P., 2018. Hot Work Procedure, Procedure No. SMP 10, Revision Date: September 8, 2018.

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Sandpiper, 2017, 3" Sandpiper non-metallic AODD Ball Valve Pump, Class Leading Performance, Easiest to Maintain, 2017.

Star Pump Alliance, 2020. Canned motor pumps – function, advantages, and applications, 2020.

Swagelok, 2020. API Plan 53B Barrier Fluid Pressurized by Bladder Accumulator. Obtained online on April 30, 2020, at: https://www.swagelok.com/en/services/design-assembly/mechanical-seal-support-systems/between-seal-planassemblies/api-plan-53b.

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Werner Sölken, 2020. Valves Guide, Trim of Valves, API 600 Valve Trim No. Accessed on line at: http://www.wermac.org/valves/valves_general_trim.html, April 30, 2020.

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CHAPTER 5
Report Preparation

5.1 Lead Agency

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5.3 Recipients of the Draft SEIR

Great Basin Unified Air Pollution Control District

Phillip L. Kiddoo
Ann Logan
Luke Eisenhardt
Tom Schaniel

Ormat Inc.

Melissa Wendt

Federal Agencies

Name/Contact	Agency/Organization
Dale Johnson	Bureau of Land Management- Bishop
Erin Noesser	U.S. Forest Service

State Agencies

Name/Contact	Agency/Organization
Morgan, Scott	State Clearinghouse
Earl Whithycombe	California Air Resources Board
Gavin McCreary, Project Manager, Site Evaluation and Remediation Unit	Department of Toxic Substances Control
Nancy Gonzalez-Lopez, Staff Services Analyst	Native American Heritage Commission

Local Agencies

Name/Contact	Agency/Organization
Betty Hylton	Mammoth Community Water District
Mark Busby	Mammoth Community Water District
Stephanie Hake	Mammoth Community Water District
Jeff Fitzsimmons, PG Engineering Geologist; and Tom Browne, PhD, PE Water Resources Control Engineer	Lahontan Regional Water Quality Control Board
Gerry Le Francois, Executive Director	Mono County Local Agency Formation Commission
Wendy Sugimura (Community Development Department)	Mono County
Schreeneen Dedman	Mono County
Shannon Kendall	Mono County Clerk-Recorder
Darcy Ellis	Inyo County
John Carl Vallejo	Inyo County Counsel
Grace Chuchla	Inyo County Counsel
Sandra Moberly (Community and Economic Development Director)	Town of Mammoth Lakes
Fred Stump	GBUAPCD Governing Board
Matt Kingsley	GBUAPCD Governing Board
Ron Hames	GBUAPCD Governing Board
John Peters	GBUAPCD Governing Board
Arrash Agahi	Los Angeles Department of Water and Power
Lizbeth Calderon	Los Angeles Department of Water and Power
Clint Kautsky	Los Angeles Department of Water and Power
Jevon Lam	Los Angeles Department of Water and Power
Julie Marte	Los Angeles Department of Water and Power
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Michael Tsai	Los Angeles Department of Water and Power
Jaime Valenzuela	Los Angeles Department of Water and Power

Tribal Governments

Name/Contact	Agency/Organization
Cindy Duriscoe	Big Pine Paiute Tribe
Mel Joseph	Lone Pine Paiute Shoshone Reservation
Sally Manning	Big Pine Paiute Tribe

Notices of the Availability of the Draft SEIR also were provided to the following organizations and individuals:

Name/Contact	Agency/Organization
	Mammoth Lakes Library
Rhonda Duggan	
Ceal Klingler	
Andre Long	
Liz O'Sullivan	
Ronald Ward	Rio Tinto Minerals
Sheila Sannadan	Adams Broadwell Joseph & Cardozo
Rebecca Davis	Lozeau Drury
Stacey Oborne	Lozeau Drury
Komalpreet Toor	Lozeau Drury
Sheila Sannadan	Adams Broadwell Joseph & Cardozo

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APPENDIX A
Scoping Summary

1. Introduction

The Great Basin Unified Air Pollution Control District (GBUAPCD) formally began the process of determining the scope of issues to be evaluated in the Supplemental Environmental Impact Report (SEIR) (a process called "scoping") when it issued a Notice of Preparation (NOP) of an SEIR for the Casa Diablo IV Geothermal Power Plant Project (Project) on February 26, 2020.

The NOP initiated agency consultation about the scope and content of information to be analyzed in the SEIR and invited early public input about potential environmental concerns (Pub. Res. Code Section 21080.4(a); CEQA Guidelines Sections 15082(b), 15083). CEQA Guidelines Section 15083 provides that a "Lead Agency may…consult directly with any person…it believes will be concerned with the environmental effects of the project." Scoping is the process of early consultation with the affected agencies and public prior to completion of a Draft SEIR. Section 15083(a) states that scoping can be "helpful to agencies in identifying the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in depth in an EIR and in eliminating from detailed study issues found not to be important." Scoping is an effective way to bring together and consider the concerns of affected State, regional, and local agencies, the project proponent, and other interested persons (CEQA Guidelines Section 15083(b)).

This Scoping Summary provides an overview summarizes the comments provided by agencies during the 30-day scoping period, which closed on March 27, 2020. The GBUAPCD will use scoping comments as a tool to ensure the preparation of a comprehensive SEIR tailored to agency concerns. Under CEQA Guidelines Section 15234(d), which defines the scope of what a Lead Agency is to consider in the event of a remand, the analysis of all potential environmental effects of the Project will not be revisited in the SEIR. Instead, the SEIR will inform the public and local officials in the planning and decision-making process regarding two potential and additional mitigation to address fugitive n-pentane emissions from the plant: (1) a stronger leak detection and repair (LDAR) program, and (2) the additional use of leakless or low-leak technology. Therefore, pursuant to CEQA Guidelines Section 15082, all public comments that address these issues will be considered in the SEIR process.[1]

[1] Comments not within the scope of CEQA will not be addressed through the CEQA process.

2. Scoping Comments

The GBUAPCD received four sets of comments during the public comment period, and one set of comments after the public comment period concluded. Copies of the comments are provided as attachments to this Scoping Summary. Commenting parties are listed in **Table 1** and summaries of the issues identified by the commenters are provided in Section 2.1, *Issues to be Considered in the SEIR Under CEQA*, and Section 2.2, *Issues Not Analyzed in the SEIR Under CEQA*.

TABLE 1
PARTIES THAT SUBMITTED SCOPING COMMENTS

Agency/Group	Name, Title	Received Date
Department of Toxic Substances Control, Site Mitigation and Restoration Program	Gavin McCreary, Project Manager, Site Evaluation and Remediation Unit	April 16, 2020
Lahontan Regional Water Quality Control Board	Jeff Fitzsimmons, PG Engineering Geologist; and Tom Browne, PhD, PE Water Resources Control Engineer	March 27, 2020
Mono County Local Agency Formation Commission	Gerry Le Francois, Executive Director	March 26, 2020
Native American Heritage Commission	Nancy Gonzalez-Lopez, Staff Services Analyst	February 26, 2020
Town of Mammoth Lakes, Community and Economic Development Department, Planning Division	Gina Montecallo, Assistant Planner	March 27, 2020

2.1 Issues to be Considered in the SEIR under CEQA

Issues that were identified by the Lahontan Regional Water Quality Control Board (LRWQCB) and the Town of Mammoth Lakes, Community and Economic Development Department, Planning Division that will be considered in the SEIR under CEQA are described below.

Lahontan Regional Water Quality Control Board

The LRWQCB requested that the SEIR identify and list the specific mitigation measures that will be implemented to prevent leaks of the working fluid to the environment. The mitigation measures should include procedures to identify and quantify n-pentane losses from the process, including both vapor and aqueous phase.

Response to Comment:

The SEIR identifies and evaluates the feasibility of specific mitigation measures identified in the Court of Appeal's decision that may reduce or prevent fugitive leaks of the working fluid in its vapor phase to the environment. Analysis of leaks in the aqueous phase into the environment is outside the scope of the SEIR.

Town of Mammoth Lakes, Community and Economic Development Department, Planning Division

The Town of Mammoth Lakes, Community and Economic Development Department, Planning Division requested that the SEIR demonstrate the effectiveness of the proposed mitigation measures for reducing the Project's fugitive ROG emissions.

Response to Comment:

The SEIR presents, discusses, and analyzes the feasibility of specific mitigation measures for reducing the Project's fugitive ROG emissions, including their effectiveness.

2.2 Issues Not Analyzed in the SEIR under CEQA

Per the Court of Appeal's directives, the SEIR addresses two potential and additional mitigation to address fugitive n-pentane emissions from the plant: (1) a stronger leak detection and repair (LDAR) program, and (2) the additional use of leakless or low-leak technology. The following agency comments that do not address these issues are considered to be outside the scope of the SEIR, and will not be considered in the SEIR process. Issues outside the SEIR scope and included in this summary are acknowledged so that they may be considered as part of non-CEQA decision-making process.

Department of Toxic Substances Control, Site Mitigation and Restoration Program

The Department of Toxic Substance Control (DTSC) recommended that a number of issues related to hazards and hazardous materials be addressed in the SEIR, including:

- The potential for historic or future activities to release hazardous wastes/substances on the Project site;
- The need to collect soil samples for aerially deposited lead prior to performing any intrusive activities;
- Proper investigation for mine waste should be discussed;
- Surveys should be conducted for the presence of lead-based paints or products, mercury, asbestos containing materials, and polychlorinated biphenyl caulk;
- Sampling should be conducted to ensure that the imported soil is free of contamination; and
- Current and former agricultural lands should be evaluated in accordance with DTSC's 2008 Interim Guidance for Sampling Agricultural Properties (Third Revision).

Lahontan Regional Water Quality Control Board

The LRWQCB recommended that a number of issues related to contamination of geothermal resources and groundwater be addressed in the SEIR, including:

- The presence of isobutane in fumaroles and hot springs reported by Evans, et al (2004) in the Mammoth Geothermal Complex area must be considered in the environmental analysis, particularly the fate and transport of working fluids in the subsurface.
- The SEIR must identify and list the specific mitigation measures that will be implemented to prevent leaks of the working fluid to the environment. The mitigation measures should include a monitoring program to monitor the geothermal resource for n-pentane pre- and post-injection; and a monitoring program that includes an adequate number of groundwater monitoring wells to ensure the earliest detections of n-pentane in the shallow water aquifer.
- The SEIR must identify all potential working fluids that may be used for the Casa Diablo IV Project and include an analysis of the potential impacts and hazards that these working fluids pose to all environment resources. Mitigation measures must be included in the SEIR to reduce all potential impacts to a less than significant level.
- Water Board staff request the opportunity to review and approve any contingency plans that address the containment and cleanup of any spills and/or discharges to the ground, surface water, and/or groundwater, as these spills and/or discharges have the potential to impact water quality.

Mono County Local Agency Formation Commission

Mono County Local Agency Formation Commission commented that if use of reclaimed water is considered in the future, the approval of using reclaimed water being supplied by the Mono County Water District outside of their district boundary would require Local Agency Formation Commission approval.

Native American Heritage Commission

The Native American Heritage Commission provided comments that summarized CEQA and NEPA legal requirements relative to tribal cultural resources and consultations, including compliance with Assembly Bill 52 and Senate Bill 18.

Town of Mammoth Lakes, Community and Economic Development Department, Planning Division

The Town of Mammoth Lakes, Community and Economic Development Department, Planning Division requested that the SEIR address:

- Analysis of exposed pipes for the event of a pipe break or crack that could cause super-heated steam or liquid to escape.
- Analysis of options that limit the time period between drilling, construction, and up until capping of the well head so that emissions are minimized.
- List all potential emissions associated with geothermal areas.

3. Consideration of Issues Raised in Scoping Process

A primary purpose of this Scoping Summary is to document the process of soliciting and identifying comments from agencies and the public. The scoping process provides the means to determine those issues that interested participants consider to be the principal areas for study and analysis. Every issue that has been raised during scoping that falls within the scope of this SEIR and CEQA as discussed above, will be addressed and/or be considered in the SEIR. Issues raised that fall outside the scope of this SEIR are acknowledged and included in this summary so that they may be considered as part of the non-CEQA decision-making processes.

APPENDIX B

Feasibility Analysis of Available Equipment Leak Mitigation Measures: Low-Emissions and Leakless Design Technologies

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CASA DIABLO IV GEOTHERMAL PROJECT

Feasibility Analysis of Available Equipment Leak Mitigation Measures: Low-Emissions and Leakless Design Technologies

Directed to:

Ann Logan, Great Basin Unified Air Pollution Control District

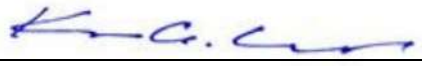
July 2020

Feasibility Analysis of Available Equipment Leak Mitigation Measures: Low-Emissions and Leakless Design Technologies

Directed to:

Ann Logan
Great Basin Unified Air Pollution Control District

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.



Kenneth A. Malmquist
Managing Principal Engineer

CONTENTS

APPENDICES

ACRONYMS

ANSI	American National Standards Institute, Inc.
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
C	Celsius (degrees)
CAA	Clean Air Act
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CMP	canned motor drive
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
F	Fahrenheit (degrees)
gpm	gallons per minute
HAP	hazardous air pollutant
hr	hour
IR	infrared
ISO	International Organization for Standardization
kg	kilogram
kPa	kilopascals
LDAR	leak detection and repair
MAWP	maximum allowable working pressure
MDP	magnetic drive pump
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
n-pentane	normal-pentane
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPS	nominal pipe size
NSPS	New Source Performance Standards
OEC	Ormat Energy Converter
OGI	optical gas imaging
PD	positive displacement
ppm	parts per million
ppmv	parts per million, volume basis
PRV	pressure relief valve
psi	pounds per square inch pressure
psig	pounds per square inch gauge pressure
ROG	reactive organic gases
SEIR	Supplemental Environmental Impact Report
SOCMI	synthetic organic chemical manufacturing industry
SV	screening value (ppmv)
TOC	total organic carbon
TOG	total organic gases
VHAP	volatile HAP
VOC	volatile organic compound

SUMMARY

Ormat Nevada Inc. (Ormat) proposes to build the Casa Diablo IV Geothermal Power Plant (Project) consisting of two Ormat Energy Converter (OEC) binary generating units. The Final Joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Project was certified by the Great Basin Unified Air Pollution Control District (GBUAPCD or "the District") on July 18, 2014. The District is the lead agency. A Supplemental (SEIR) addressing additions and changes to the Final EIS/EIR will be considered for certification by the District. The SEIR is focused on the feasibility of implementing additional measures beyond Ormat's standard process design, as generally described in the EIS/EIR, to mitigate fugitive emissions of "motive fluid" from pump seals, valves and other equipment composing the closed-loop motive fluid system within the OEC. Motive fluid will be composed of normal-pentane (n-pentane), a low-boiling point hydrocarbon (Great Basin Unified Air Pollution Control District, et al., 2013). The motive fluid is a regulated reactive organic gas (ROG) and volatile organic compound (VOC), but n-pentane is not classified as a regulated air toxic compound in California and is not classified as a hazardous air pollutant (HAP) under the federal Clean Air Act (CAA).

SLR International Corporation (SLR) was retained to evaluate the feasibility of implementing leakless and low-leak fugitive emissions mitigation measures as may be applicable to certain equipment within the motive fluid system. This report will supplement the SEIR for the Project to be considered for certification by the District.

SLR reviewed current codes, standards and specifications for design and best engineering practices pertaining to specific equipment used in the motive fluid system, primarily including rotating equipment (turbines and pumps) seal systems, rotational valves (ball valves and butterfly valves) and gate valves.

SLR reviewed the proposed motive fluid process design, as generally described in the EIS/EIR and based on detailed information provided by Ormat, including process flow diagrams and piping and instrumentation diagrams. SLR identified specific types of equipment included in Ormat's design for the Project, including rotating equipment (turbines and centrifugal pumps), valves and connectors (screwed, flanged or welded). SLR then assessed engineering design measures already incorporated into Ormat's standard design that are intended to reduce fugitive emissions from equipment failure and leaks. Finally, SLR evaluated the feasibility of implementing additional mitigation measures to further reduce fugitive emissions. Additional mitigation measures would include feasible measures not already included in the project design.

SLR found that Ormat's standard design package includes reliable equipment meeting best engineering codes and standards to reduce the potential for equipment failure and leaks that would result in emissions of n-pentane. SLR also found that many of Ormat's design measures that result in reduced fugitive emissions were not explicitly articulated in the final EIS/EIR. SLR has listed equipment used in Ormat's standard engineering package intended to maximize reliability and mechanical integrity, while reducing the potential for leaks. The standard design package described in Section 1 provides the baseline for SLR's review of the feasibility of implementing additional mitigation measures.

SLR's evaluation of mitigation measures focused on the feasibility of using certain so called "leakless" and "low-leak" technologies, including: "leakless" bellows valves and diaphragm valves; and "sealless" pumps, including diaphragm pumps, canned motor pumps (CMPs) and magnetic drive pumps (MDPs). SLR listed available fugitive emission mitigation technologies for each equipment type and application to the process and eliminated technically infeasible options. For example, some technologies are not suitable for certain process conditions such as high temperature, high flowrate or certain fluid types.

For turbine and centrifugal pump seal systems, which represent the highest potential for fugitive emissions of any equipment within the motive fluid system, SLR finds that the double mechanical seal and barrier fluid systems used by Ormat represent the best available technology for mitigating leaks. Sealless pumps such as magnetic drive and canned motor pumps are not available in the size and capacity needed and are therefore technically infeasible for the motive fluid system.

The motive fluid system design includes numerous quarter-turn rotational butterfly valves used for process flow control. Butterfly valves inherently have a low pressure drop across the valve. A low pressure drop is critical to avoid condensation of motive fluid to liquid before passing through the turbine. Furthermore, rotational butterfly valves inherently less subject to stem seal degradation than linear sliding stem control valve packing systems. We find that the rotational butterfly valves proposed by Ormat for motive fluid flow control meet API engineering standards and represent best engineering practice. Bellows sealed valves are designed exclusively for linear valve stem designs (globe valves and gate valves) and cannot be used for rotational valve designs such as butterfly valves and ball valves. Rotational butterfly valves achieve the required control valve function within the motive fluid process – tight flow control with minimum pressure drop. Linear sliding stem valves (globe valves and gate valves) and diaphragm valve designs do not meet the functional design of the motive fluid system and are not feasible.

Manual gate valves equipped with graphite packing will be used for process isolation to facilitate removal of critical equipment for replacement and repair. The gate valves are open during normal operations. In conjunction with butterfly valves, the gate valves provide a double block and bleed system during process isolation to eliminate or minimize leakage. Bellows are technically feasible for some gate valve applications and commercially available for some pipe sizes, but bellows gate valves are not available for all pipe sizes within the motive fluid system. In addition, we find that the additional measure of installing bellows-sealed gate valves does not reduce the potential for fugitive emissions beyond that achieved using graphite packing systems combined with routine leak detection and repair (LDAR) work practices. SLR finds that bellows sealed valves are not available in all of the sizes required for use in the motive fluid system and are not otherwise feasible for the isolation valves.

Ormat has to the greatest extent feasible used welded connections for piping and fittings and minimized flanged and screwed connectors in its process design. For technical and safety reasons, it is not possible to completely eliminate flanged and screwed connections. Some critical valves and components must be connected using flanges to facilitate safe and efficient removal for replacement or repair purposes. Equipment components installed using welded connections must be installed and removed for repair or replacement using "hot work," including cutting, welding, and brazing. Hot work on process components in n-pentane service poses an elevated risk of fire and explosion due to the potential for flammable motive fluid leaks. In addition, removing a welded valve for repair or replacement involves more risk for n-pentane leaks than from a flange. A flanged connection with properly selected and installed gasket

seals has a low potential for leaks. SLR finds that best engineering practices have been implemented to minimize potential leaks from flanges and connectors. Work practices to be implemented upon project startup, including an LDAR program, will mitigate leaks from flanged and screwed connections.

We find that it is feasible to implement an LDAR program with lower leak definition thresholds for valves, more frequent monitoring and tighter repair schedules than was proposed in the EIS/EIR.

Additional background and the results of SLR's review and conclusions are provided in the following sections. The author's curriculum vitae is provided as Appendix A.

1. PROCESS AND EQUIPMENT DESCRIPTION

This section provides a description of Ormat's proposed motive fluid system design, as generally described in the EIS/EIR (Great Basin Unified Air Pollution Control District, et al., 2013). The following description details measures to mitigate fugitive emissions from equipment leaks that are part of Ormat's standard design.

1.1 BINARY PROCESS OVERVIEW

Geothermal fluid is extracted from an underground reservoir and flows from the wellhead through pipelines to heat exchangers in the OEC. Inside the heat exchangers, the geothermal fluid heats and vaporizes a secondary organic "motive fluid" with a low boiling point. The motive fluid vapors drive turbines, which rotate generators to produce power. The vapors are then condensed to liquid phase in a condenser cooled by air. Condensed motive fluid (liquid phase) is recycled back into the heat exchangers by pumps, completing the cycle in a closed loop system. The cooled geothermal fluid is re-injected into the reservoir.

1.2 MOTIVE FLUID SYSTEM PROCESS EQUIPMENT DESCRIPTION

The motive fluid cycle is a closed loop system composed of steel piping, pressure vessels, shell and tube heat exchanger vessels, centrifugal pumps, valves, flanges and connectors, and turbines. Fugitive emissions of motive fluid may result from equipment leaks. Primary equipment proposed to be used in the motive fluid process that may potentially leak includes:

1. Rotating equipment seals (turbines and centrifugal pumps)
2. Butterfly flow control valves
3. Manual gate isolation valves
4. Flanged and screwed connections
5. Pressure relief devices

1.2.1 ROTATING EQUIPMENT SEAL SYSTEMS

Each turbine will be equipped with dual mechanical seals and pressurized barrier fluid systems meeting American Petroleum Institute (API) Standard 682 (API, 2014). The seal system design will meet API Std 682 Plan 53B standards for pressurized barrier system (closed circuit) for use in seal systems with high pressures and/or for hazardous or environmentally harmful processes. The seal and barrier fluid system will also be equipped with a sensor that will detect failure of the seal system, the barrier fluid system, or both.

Vertical centrifugal pumps will be used to pump condensed motive fluid (liquid phase) to the heat exchangers. The centrifugal pumps will each be equipped with dual mechanical seals and non-pressurized barrier/buffer fluid system conforming to API Std 682 Plan 52 (API, 2014).

1.2.2 VALVES

1.2.2.1 Control Valves

Flow control valves used in the motive fluid system will be quarter-turn rotary butterfly valves ranging from 8 to 20 inches nominal pipe size (NPS). Butterfly valves meet specifications set out in API Standard 609, including specifications for valve shaft seals (API, 2016). Quarter-turn butterfly valves will be used for on/off service, but will also function to regulate flow. One-quarter turn fully opens or closes the valves.

The proposed motive fluid system design includes two one-inch NPS ball valves meeting API Standard 608–Metal Ball Valves with Flanged, Threaded and Welding Ends (API, 2020) and API Standard 6D–Specification for Pipeline and Piping Valves (API, 2014).

1.2.2.2 Isolation Gate Valves

Manual gate valves will be used to safely isolate portions of the motive fluid system to facilitate maintenance, repair or replacement of process equipment components. Gate valves will be equipped with flexible graphite packing meeting API specifications to achieve low leak performance. The gate valves will meet specifications in API Standard 6D (API, 2014); API Standard 600 (API, 2014); API Standard 603 (API, 2018); and other referenced standards.

In conjunction with butterfly valves, the gate valves provide a double block and bleed system during maintenance to eliminate or minimize leakage during process isolation activities.

1.2.3 PIPING CONNECTIONS

Welded (“leakless”) connections will be used to the greatest extent possible to connect piping and certain fittings used in the motive fluid system.

Turbines, pumps, control valves, isolation valves and other equipment will be installed with flanged connections to enable safe removal for repair or replacement and minimize risk inherent to hot work necessary to remove equipment with welded connections. Flanged connections are sealed with gaskets or ring material as suitable for process conditions and meeting American Society of Mechanical Engineers (ASME) Standard Metallic Gaskets for Pipe Flanges (ASME, 2017).

Some smaller NPS pipe and instrumentation may be installed to piping and vessels using threaded connections.

1.2.4 PRESSURE RELIEF VALVES

Direct acting pressure relief valves (PRVs) conforming to specifications set out in API Standard 527 – Seat Tightness of Pressure Relief Valves (API, 2014) will be used for emergency pressure relief. For safety purposes PRVs must be configured to vent directly to atmosphere to relieve pressure in the event of an overpressure process condition, but the normal operating condition of each PRV is closed (sealed). To

minimize or eliminate leakage to atmosphere from each PRV seal during non-relief events, a rupture disk will be installed upstream of each PRV in n-pentane service. Each PRV and rupture disk will be equipped with a “tattle tale” pressure gauge to provide a visual indication of the integrity of the rupture disk. A pressure indication of the space between the PRV and rupture disk indicates a leak.

1.2.5 DIAPHRAGM PUMPS

Small, two- to three-inch NPS, portable pneumatic (air-driven) double diaphragm pumps will be used to drain and transfer motive fluid from isolated portions of the process to storage during maintenance, replacement and repair activities.

2. REVIEW OF STANDARDS AND PRACTICES FOR MINIMIZING EQUIPMENT LEAKS

Equipment is selected for any process design based on material and chemical considerations and best fit for the process, for example based on temperature, pressure, flow and duty. Once the equipment type is selected as appropriate for the functional requirements of the process design, the selection may be optimized to eliminate or reduce maintenance requirements and equipment leaks. Minimizing or eliminating leaks is desired for safety, environmental and economic reasons. In the case of motive fluid, n-pentane is costly. Some equipment leak mitigation measures may be required by regulation, but design according to codes and standards and following industry best practices ensures optimal performance and safety. This section provides a review of current equipment design codes and standards, regulatory standards for equipment leaks, and available alternative designs for leakless and low-leak equipment.

2.1 EQUIPMENT DESIGN STANDARDS REVIEW

ANSI, API, ASME, International Organization for Standardization (ISO), MSS and other organizations set standards for code development worldwide. Codes and standards are used to define systems, tests and equipment design, including standards relevant to rotating equipment seal systems, valves and other equipment. Manufacturers and process design engineers are not required by any rule or law to meet design standards, but adherence to API and other standards is the norm in petroleum and chemical processes when the highest quality is needed. Purchase of equipment by Ormat is based on specification sheets requiring adherence to these standards.

2.1.1 API DESIGN STANDARDS

API standards are used worldwide in petroleum and petrochemical industry sectors and are appropriate for application to the light hydrocarbon motive fluid (n-pentane) system. API standards are developed under API's American National Standards Institute (ANSI) accredited process, ensuring that the API standards are recognized not only for their technical rigor but also their third-party accreditation which facilitates acceptance by state, federal, and increasingly international regulators (API, 2020).

2.1.1.1 Rotating Equipment Seal Systems

Leaks from turbines and centrifugal pumps occur at the rotating shaft seal. Mechanical seal systems combined with barrier fluid systems prevent leaks of motive fluid from the rotating shaft. All shaft seals leak to some extent, but leaks are minimized by design using double mechanical seals with a suitable barrier fluid system such that the leaked fluid may be the barrier fluid instead of the process fluid. Ormat uses a heavy seal oil for barrier fluid.

API Standard 682 specifies requirements and gives recommendations for centrifugal and rotary pumps used in the petroleum, natural gas and chemical industries. Rotating shaft sealing systems conforming to API Standard 682 are intended to operate continuously for 25,000 hours without the need for

replacement while complying with either local emission regulations, or exhibiting a maximum leak screening value of 1,000 parts per million by volume (ppmv) as measured using EPA Method 21 (EPA, 2017), whichever is more stringent.

API Standard 682 includes standards for double ("dual" or "tandem") mechanical seal systems. Laboratory testing and field evaluation have demonstrated that properly designed tandem mechanical seals can be used on light hydrocarbon pumps to maintain near zero emission levels (<50 ppm) (Key, Wang, & Lavelle, 1991). API Standard 682 includes specifications for dual mechanical seal systems with pressurized or unpressurized barrier fluid systems. EPA's recommended best practices provides that leaks from pumps can also be reduced by using dual seals with or without barrier fluid (EPA, 2016).

2.1.1.2 Butterfly Valves

API Standard 609, Butterfly Valves: Double-flanged, Lug- and Wafer-type, provides specifications for butterfly valves, including shaft and seals (API, 2016). Ormat's design includes butterfly valves meeting API Standard 609 specifications.

A key advantage of rotary-style control valves in managing fugitive emissions is the rotating motion of the valve stem as the valve is opened and closed. The stem stays within the stem seal or packing area, minimizing the possibility of introducing foreign particles or debris into the sealing interfaces. As a result, these valves are typically more effective in reducing the possibility of fugitive emissions leakage, and normally deliver greater reliability and operating efficiency from this perspective (Wing & Smith, 2012).

The butterfly valve consists of a flat, circular disk hinged in its center, which closes or fully opens with a quarter turn. Seating for the disk is supplied by metal seats or resilient types of material like elastomers and plastics. Because of the advances in seating material, butterfly valves have found general acceptance in the oil, gas, chemical, water, and process fields. The valve is often used in place of a gate valve, but has the added advantage of flow regulation (Emerson, 2017). The ASME B31. 1 code (ASME, 2018) lists three valves standards, excluding cast iron and bronze valves. The standards are: 1) ASME B16. 34, Valves–Flanged, Threaded, and Weld End (ASME, 2017); 2) Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS) SP-67-2017: Butterfly Valves (MSS, 2017) and MSS SP-68-2017: High Pressure Butterfly Valves with Offset Design (MSS, 2017).

2.1.1.3 Gate Valves

API Standard 600 Steel Gate Valves—Flanged and Butt-Welding Ends, Bolted Bonnets specifies packing material suitable for steam and petroleum fluids for temperature range from -29 °C to 538 °C (-20 °F to 1000 °F) (API, 2015).

Gate valves are used for on/off service and are designed to operate fully open or fully closed. Because of excessive vibration and wear created in partially-closed gates, the valves are not intended for throttling or flow regulation (Emerson, 2017). Gate valves are generally "multi-turn" valves, operated manually using a handwheel which moves a stem connected to a wedge or double disk upward or downward in a linear motion until the closure contact the valve seat.

As a consequence of physical wear due to linear stem motion and other physical or chemical degradation, external leaks (fugitive emissions) of process fluid may result by way of the stem/packing seals. Stem seals are composed of one- or two-piece packing material that encircles the stem. As the packing bolt is tightened down on the stem, the gasket is crushed, filling the space between the stem and the body housing. Packing materials are selected based on process fluid type and other process variables, primarily temperature and pressure. Graphite packing has been shown to meet stringent tightness class (≤200 ppm measured leakage) based on production testing using helium (ISO, 2015).

2.1.1.4 Ball Valves

Rotary ball valve contains a ball-shaped plug within a valve body which regulates flow. The ball has a circular hole or flow-way through its center and when turned one-quarter of the way, the flow stops. Ball valves dissipate relatively little flow stream energy due to streamlined internal contours and minimal turbulence. (Emerson, 2017). Ball valves have low pressure drop and can open and close quickly. Ball valves are best suited for on-off control and are not optimal for throttling control.

API specifications for ball valves include API Standard 608–Metal Ball Valves with Flanged, Threaded and Welding Ends (API, 2020) and API Specification 6D–Specification for Pipeline and Piping Valves (API, 2014). API Standard 608 specifies the requirements for metal ball valves suitable for petroleum, petrochemical and industrial applications that have butt-welding or flanged ends for NPS 1/2 through NPS 20 and threaded or socket-welding ends for NPS 1/4 through NPS 2, corresponding to the nominal pipe sizes in ASME B36.10M. The standard also applies to metal ball valves in pressure classes 150, 300, and 600 for flanged and butt-welding ends and in pressure classes 150, 300, 600, and 800 for socket-welding and threaded ends. API Specification 6D specifies requirements and provides recommendations for the design, manufacturing, testing, and documentation of ball, check, gate, and plug valves for application in pipeline systems meeting ISO 13623 or similar requirements for the petroleum and natural gas industries.

To minimize external leaks, the standards specify that materials for stem seals, body seals and gaskets must be suitable for use at the maximum operating temperature and corresponding maximum pressure rating of the valve as stated by the valve manufacturer. Metallic parts of any flange gasket must have corrosion resisting properties equal to or superior to the shell material.

2.1.1.5 Flanges and Gaskets

API Specification 6A specifies requirements for the performance, dimensional and functional interchangeability, design, materials, testing, inspection, welding, marking, handling, storing, shipment, purchasing, repair, and remanufacture of wellhead and tree equipment for use in the petroleum and natural gas industries (API, 2018). ASME B16.20 Metallic Gaskets for Pipe Flanges covers materials, dimensions, tolerances, and markings for metal ring-joint gaskets, spiral-wound metal gaskets, metal-jacketed gaskets, and grooved metal gaskets with covering layers. These gaskets are dimensionally suitable for use with flanges described in reference flange standards ASME B16.5, ASME B16.47, API Specification 6A, and ISO 10423 (ASM171). Gasket material for flanges is also addressed in API standards for valves, including for example API Standard 608 and 609. In accordance with API standards and

recommended practices and to minimize the potential for gasket failure and leaks, gasket materials are selected to suit process conditions, such as temperature, pressure, and chemical characteristics.

2.1.1.6 Pressure Relief Valves

PRVs are safety devices designed to protect a pressurized vessel, piping or equipment from an overpressure event that could cause the pressure to increase beyond the maximum allowable working pressure (MAWP). Since the normal operation condition for a PRV is closed, one important consideration is the valve's ability to maintain a tight seal. The valve part alignment and the selection of materials of construction all play a key role to meet industry seat leakage standards such as API Standard 527 – Seat Tightness of Pressure Relief Valves (API, 2014) which is often used for process PRVs built per ASME Section VIII. API Standard 527 requires the valve seat to be tested for tightness normally at 90 percent of the set pressure. The API standard acceptance criteria allows minor bubble leakage at this operating pressure but this allowed leakage is many orders of magnitude more stringent than required for other types of valves (Emerson, 2012).

PRVs may be used independently or in combination with rupture disks to provide the required protection against excessive pressure that may result in a catastrophic release. PRVs and rupture disk devices are designed to meet API Standard 520 (API, 2014), which references API Standard 527. API Standard 527 covers specifications for flanged steel pressure relief valves and provides basic requirements such as orifice designation and area, valve size, pressure rating, materials etc. for direct spring-loaded pressure relief valves and pilot-operated pressure relief valves.

2.2 REGULATORY STANDARDS REVIEW

Equipment leaks of VOC and hazardous air pollutants (HAP) are regulated by Federal CAA programs and state/local air quality regulations for certain source categories. ROG, as defined by the California Air Resources Board, are regulated in California. Both VOC and ROG include total organic gas (TOG) minus certain excluded compounds.[1] The n-pentane motive fluid is a light hydrocarbon classified as a VOC and a ROG, but that is not a listed air toxic or HAP.[2]

2.2.1 LEAK DETECTION AND REPAIR

Federal CAA program regulations, including New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and other rules, require implementation of LDAR programs for certain "affected facilities."[3] LDAR work practices are designed to reduce fugitive emission of regulated VOC or HAP by identifying and eliminating equipment leaks. In general,

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[1] Volatile organic compounds (VOC) and reactive organic gases (ROG) each includes any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, and excluding certain listed compounds such as methane and ethane.

[2] Hazardous air pollutant means any air pollutant listed in or pursuant to section 112(b) of the Act. There are 187 listed hazardous air pollutants.

[3] 40 C.F.R. Parts 60, 61, 63 and 65

"equipment" means pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, and flanges or other connectors "in VOC service," "in volatile HAP (VHAP) service," and any devices or systems otherwise regulated by a rule (subpart). LDAR programs require the use of portable instruments, optical gas imaging (OGI), or sensory methods (audible, visual, olfactory) to identify leaks based on a threshold established by the referencing standards. For instrument monitoring using EPA Method 21, regulatory leak thresholds are defined in terms of a ppmv concentration reading, total organic carbon (TOC) basis. Leak concentration thresholds ("leak definitions") in the federal standards range from 500 to 10,000 ppmv TOC. The Bay Area Air Pollution Control District (BAAQMD) and the South Coast Air Pollution Control District (SCAQMD) have promulgated leak definitions as low as 100 ppmv for some equipment (valves and connections) located at petroleum refineries and chemical plants. Best available control technology (BACT) determinations for reducing fugitive emissions of organic compounds at "major stationary sources" of VOC have also set BACT to include a leak definition threshold of 100 ppmv. For sensory methods, a leak is defined as observed evidence of a potential leak, for example dripping liquid. For OGI, a leak is generally defined as any visible emission from a fugitive emissions component observed using the infrared (IR) camera. LDAR requirements are found in 47 individual subparts, each addressing specific industrial source categories (EPA, 2017). Federal LDAR program standards primarily regulate "affected facilities" in the synthetic organic chemical manufacturing industry (SOCMI) and other chemical and petrochemical segments, and the petroleum refining, natural gas processing, and crude oil and natural gas production sectors. There are no federal LDAR standards explicitly applicable to the geothermal power industry sector.

Some federal settlements (consent decrees) have stipulated "enhanced LDAR program" or "ELP" requirements for certain defendants, including owners and operators of petroleum refineries or chemical plants. Elements of so called ELP work practices have included for example:

- Reduced leak definition thresholds for certain equipment – e.g., from 10,000 ppm to 500 ppm for valves
- Increased leak survey frequencies – e.g., quarterly
- Implement action levels below leak definition thresholds triggering repair
- Tightened schedules for "first attempt at repair" and final repair of leaking equipment
- Repair verification monitoring
- Limited delay of repair
- Internal/third-party audits of LDAR program

LDAR work practices generally stipulate a monitoring frequency specific to component type (valves, etc.) and service (gas/vapor, light liquid or heavy liquid), for example monthly, quarterly, semiannually or annually. Repair deadlines in terms of days after leaks are discovered are also provided.

Pumps equipped with a dual mechanical seal system that includes a barrier fluid system meeting specified design and work practice standards are exempt from routine LDAR requirements under federal standard for SOCMI facilities and other referencing standards.[4]

2.3 ALTERNATIVE DESIGN PRACTICES REVIEW

Incremental reductions in fugitive emissions from equipment leaks can be achieved without altering the fundamental design of the process using available alternative equipment designs, if feasible and safe. In addition, fugitive emissions from pumps and valves can be reduced through the use of "leakless" valves and "sealless" pumps, if technically and economically feasible.

Common leakless valves include bellows valves and diaphragm valves. Sealless pumps include diaphragm pumps, canned motor pumps, and magnetic drive pumps. Leaks from pumps can also be reduced by using dual seals with or without barrier fluid (EPA, 2016). Technical feasibility of using leakless valves and sealless pumps may be limited by process operating conditions, including temperature and pressure, fluid properties and heavy use, materials of construction and other considerations (EPA, 2016). Conformance with these practices is not required by state or federal regulation.

Equipment design alternatives that may be considered to reduce fugitive emissions from equipment leaks are described in the following sections. Equipment design alternatives may be considered only if technically and economically feasible and within the functional constraints of the process design. That is to say, equipment alternatives may be selected for process units within the construct of the process design, but the process design would not be substantially altered only for purposes of accommodating an alternative equipment selection to incrementally reduce the potential fugitive emissions.

2.3.1 ROTARY VALVES VERSUS SLIDING STEM VALVES

Leaks from valves occur from gasketed flanged connectors (discussed separately) and packing systems. Linear sliding (rising and lowering) stem valves, including gate and globe designs, account for higher fugitive emissions than rotary designs, including butterfly and ball designs. The rising and rubbing motion inherent in sliding stem designs is more difficult to seal properly than the short, 90-degree rotary motion of a stem in a quarter-turn butterfly or ball valve. Linear valves are, in general, more cost-effective for flow control and are widely used in chemical plants, petroleum refineries and oil and gas production and gas processing applications. The use of rotary flow control valves in lieu of less expensive linear valves results in lower leak rates and reduced operation and maintenance.

[4] 40 C.F.R. Part 60 Subpart VVa—Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006. §60.482-2a(d)

2.3.2 GRAPHITE PACKING SYSTEMS

Flexible graphite packing is chemically resistant and self-lubricating, and capable of sealing to extremely low levels of leakage for applications subject to parts per million (ppm) limits (ISO, 2015). Subject to economic feasibility, the use of graphite packing systems versus traditional packing designs is a good practice for reducing equipment leaks from sliding stem gate valves and globe valves.

2.3.3 SEALLESS CENTRIFUGAL PUMPS

Shaft seals are a principal source of leakage in conventional centrifugal pumps. Sealless pumps avoid use of shaft seals for primary containment. The term “sealless” is a generic industrial word used for pumps not employing dynamic seals such as mechanical shaft seals, centrifugal seals, or packing as the primary method of sealing liquid of vapor from the atmosphere. “Hermetic” would accurately describe the construction of sealless pumps. It is understood that static seals may be used in pumps that are designated “sealless.” Use of the term “sealless” should not be construed as any type of warrantee or guarantee against pump leaks (ANSI, 2016).

Sealless pumps fall into two categories: magnetic driven pump (MDP) and canned motor pump (CMP). Sealless pump design eliminates the dynamic shaft seal between the wetted end of a centrifugal pump and the atmosphere by enclosing the pump and its rotor assembly inside a pressure vessel with the pumped fluid. The pressure vessel or "primary containment" is sealed by static seals, such as gaskets or O-rings. The inner rotor assembly is driven by a rotating magnetic field that is transmitted through a containment barrier. Standards for sealless centrifugal pumps for petroleum, petrochemical, and gas industry process service are set out in API Standard 685 (API, 2011).

Advantages and limitations of sealless pumps are described below (ANSI, 2016). Properly designed, applied, and operated sealless pumps may offer the following advantages:

- No leakage through primary containment to the environment during normal operation.
- Optional backup secondary containment or control.
- No loss of valuable liquids.
- Lower noise levels (CMP designs).
- Suction pressure usually does not affect the axial thrust.
- No periodic shaft seal replacement cost.

Technical limitations of sealless pumps include:

- Temperature of motor windings (CMP) or magnet components (MDP)
- Control of bearing environment is required to provide clean liquid, not vapor, for good bearing life.
- Primary containment device is relatively thin and corrosion potential shall be carefully considered.
- With some circulation plans for volatile liquids, drive-generated heat may affect the net positive suction head required.
- Overheating of drive section may occur with loss of flow or loss of suction.

- Size/capacity limitations

2.3.4 DIAPHRAGM PUMPS

Diaphragm pumps are sealless reciprocating positive displacement pumps driven either by electric motor or powered pneumatically by air or gas. Diaphragm pumps are widely used in certain applications where the fluid is a slurry or contains particulates. Diaphragm pumps are best for low-flow rate applications.

API Standard 675 Positive Displacement Pumps - Controlled Volume for Petroleum, Chemical, and Gas Industry Services specifies minimum requirements for reciprocating, controlled volume pumps and pump units for use in the petroleum, petrochemical, and gas industry services (API, 2015).

Properly designed, applied, and operated reciprocating positive displacement diaphragm pumps may offer the following advantages:

- Best suited for high pressure, low flow applications.
- Optimal for slurries or particle-laden streams
- Suitable for abrasive and corrosive liquid applications
- Available in pneumatic (air or gas driven) or electric
- Portable/transportable models
- Sealless

Technical limitations of reciprocating positive displacement diaphragm pumps include:

- High maintenance and short life
- Pulsation
- Size/capacity limitations
- Low maximum speed
- Not suitable for high-rate, continuous flow

2.3.5 DIAPHRAGM VALVES

Diaphragm valves are designed to control flow in corrosive services where line content could adversely affect valve components. Other applications for diaphragm valves are in services where contamination from outside sources cannot be tolerated; for example, the pharmaceutical and food industries. Diaphragm valves differ from other valves in that the body of the valve and line content is sealed off from all moving parts of the valve by a flexible diaphragm. This flexible diaphragm seal prevents stem packing leakage of line content and flow contamination by packing lubricants. Diaphragm valves are suitable for flows which are viscous or contain solids. There are many types of diaphragm materials available, depending on service and temperature conditions. (Emerson, 2017).

Diaphragm life (replacement interval) is dependent on the diaphragm material type, stem travel distance and other factors.

Properly designed, applied, and operated diaphragm valves may offer the following advantages:

- Diaphragm valves are particularly suited for the handling of corrosive fluids, fibrous slurries, radioactive fluids, or other fluids that must remain free from contamination
- Diaphragm valves can also be used for throttling service
- The operating mechanism of a diaphragm valve is not exposed to the media within the pipeline
- There are no packing glands to maintain and no possibility of stem leakage in valves
- Tight shut-off
- Easy maintenance

Primary technical limitations of diaphragm valves include:

- Working temperatures and pressures are limited by the diaphragm material. Generally the pressures are limited to 200 psi (1,380 kPa) and temperatures up to 400 °F (204 °C)
- Diaphragm valves are available in limited sizes, usually NPS ½ to 12 (DN 15 to 300)

2.3.6 BELLOWS VALVES

A bellows-sealed valve is designed with a metal bellows that expands or contracts with the linear stroke of the valve while providing a solid, permanent barrier between the fluid medium in the valve body and any potential leak paths to the atmosphere. The most common valve types to be fitted with bellow seals are the gate and globe designs, which are suited for use with bellows due to their internal construction and axial movement of the valve stem. Bellows technology cannot be applied to rotational valves such as butterfly valves and ball valves, as the valve movement is not linear.

For gate and globe valves the stem/packing leak path is the most vulnerable leak path to the environment in the valve design. The valve's packing is a dynamic seal and must perform its function during idle periods, when pressure and temperatures can fluctuate within the full pressure/temperature capability of the valve, and during periods when the valve stem is stroked (Jolly, 2020). A Bellow Seal Valve is designed to eliminate any leak paths at the bonnet joint and packing. The valve, with its bellows and seal-welded construction, totally confines the flow media within the valve pressure boundary. The valve packing is totally isolated by the bellows from the flowing medium and serves in a back-up role only (Vogt, 2020). Bellows seal bonnets are used when no leakage (less than 1x10-6 cc/sec of helium) along the stem can be tolerated. Bellows-sealed valves are often used when the process fluid is toxic, volatile, radioactive, or very expensive (Emerson, 2017).

There are a number of limitations that can be expected from a bellows valve. They can be summarized as follows (Jolly, 2020):

- **Cycle Life**: Bellows have a finite life when used in valves that expose them to pressure fluctuations and full compression and extension loads. BS-5352 requires that bellows gate valves have a 2000 cycle life and globe valves to have a 10,000 cycle life. The cycle life limitation may not allow their use in some highly stroked valves whose cycle life exceeds the bellows life. The cycle life limitation will require a quality backup packing system to overcome a leak in the bellows.

- **Pressure Retention Capability**: Since bellows are designed with the intent that thin wall formulas be used, bellows with membrane thickness that provide flexibility and low spring rates are the outcome. It is highly unlikely that bellows can be designed to interface with larger high pressure valves that have traditionally used the thick wall formulas in designing of the pressure boundary. Bellows for use in gate and globe valves that must be designed to retain high pressures while providing flexibility and a low spring rate may be impossible.

- **Size Limitation**: The operating torque of a standard gate or globe valve is influenced by the area of the stem and the operating pressure acting on this area. The load on a bellows valve stem is a function of the bellows inside/outside diameters. The size of the bellows required to accommodate the stem, pressure and stroke of larger valves may lead to a bellows with a spring rate and unbalanced area on the valve stem so large that it will be impractical to operate when used in a gate or globe valve.

- **Corrosion Control**: The selection of the material for the bellows will be critical. Matching of service to the bellows material will require greater caution because unlike the pressure boundary of a valve there is no inherent corrosion allowance in the bellows of a bellows valve. Bellows are typically available in 304, 316, 321 stainless steels, Inconels 600 and 625, Incoloy 825, Monel 400, and Hastelloy “C” materials.

- **Envelope Dimensions**: Bellows gate valves will have a much greater height than the conventional gate valves. The bellows must be designed to accommodate the high stroke requirements of a gate valve. This leads to a long bellows that requires the bellows gate valve to be extended, impacting on piping configuration and layout.

- **Bellows Valve Costs**: It is expected that bellows valves will be anywhere from 3 to 10 times more expensive than their standard packed valve equivalent. This higher cost is primarily due to the cost of the bellows, and interfacing it to the valve pressure boundary. The higher price tag for reliable bellows valves still may be economically attractive when reviewed in regard to emerging EPA requirements and incentives.

2.3.7 LEAKLESS VERSUS FLANGED CONNECTIONS

Minimizing equipment leak components in process design is a best practice for reducing the potential for fugitive emissions. For example, to the extent feasible based on process considerations, welded connections may be used for some piping and fittings instead of screwed or flanged connections. Any equipment component connected to piping using welded connections can only be removed using risky hot work (cutting, welding, and brazing) any time replacement or repair is necessary. Hot work presents elevated fire and explosion hazards due to the potential for flammable motive fluid leaks to ignite. In addition, removing a welded component for maintenance involves a greater potential for n-pentane leaks than from a leaking flange because a small amount of non-condensed n-pentane vapors would be discharged to the atmosphere during the purge. Consequently, for certain equipment components that would require frequent replacement or repair over the life of the project, the use of flanged connections is a best practice.

3. COMPARISON OF PROPOSED PROCESS WITH EXISTING BINARY PLANTS

SLR looked for practices and measures for reducing fugitive emissions from equipment leaks of motive fluids from other binary geothermal plants for comparison with Ormat's proposed project. We found one study reporting fugitive emissions of motive fluid from three binary plants in California and located within the GBUAPCD and the Imperial County Air Pollution Control District. The results of the study, *Binary Power Plant CO_2 Life Cycle Emissions Including Isobutane Fugitive Leakage*, were presented at the Workshop on Geothermal Reservoir Engineering held at Stanford University in 2017 (Mattson, Mallozzi, & Mines, 2017). The report compiled data from the three binary plants, which had been operating for more than 25 years. Each binary plant used iso-butane as the motive fluid, but the binary cycle was otherwise comparable to Ormat's proposed project.

The results, derived from motive fluid "inventory changes" over a 15 month period, indicated that a well maintained binary plant releases approximately 0.13 grams of motive fluid (isobutane) per kilowatt-hour (g/kWh) from "normal leakage of valves and seals." A well maintained plant is contrasted with a binary plant experiencing equipment failures. The Ormat project will be newly constructed and will include more recent equipment technologies, so the emissions from a "well maintained plant" is comparable. In any case, we found no studies or other information describing specific design measures to mitigate fugitive emissions from equipment leaks for a binary plant.

With no documented fugitive emission mitigation measures specific to binary plants in the geothermal power sector available in the public domain, such measures and practices employed in the SOCMI, petroleum refining and upstream oil and gas production industry sectors were evaluated. The motive fluid (n-pentane) is a hydrocarbon compound commonly found in operations within the SOCMI and petroleum sectors.

4. FEASIBILITY ANALYSIS

An analysis of additional fugitive emission mitigation measures that may be available and feasible to further reduce the potential for leaks from the motive fluid process beyond the project design described in the EIS/EIR is presented. The term "feasible" is defined in the CEQA Guidelines § 15364 as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors."

As part of the project generally described in the EIS/EIR, Ormat has proposed design measures that effectively reduce the potential for fugitive emissions from the motive fluid process, including:

1. Double mechanical seal and barrier fluid systems meeting API standards for turbines and centrifugal pumps and measures to detect the failure of barrier fluid systems
2. Rotational butterfly valves inherently lower in leaks from stem seals than linear sliding stem control valves and meeting or exceeding API specifications
3. Graphite packing systems for gate valves meeting or exceeding API specifications
4. Sealless pneumatic (air) diaphragm pumps for evacuating motive fluid from isolated portions of the motive fluid process after isolation for equipment replacement or repair
5. Combination of butterfly valves and isolation valves in a double block and bleed seal to eliminate leaks from isolated piping and equipment while motive fluid is evacuated
6. Flanged connections for equipment that is or may be routinely removed for replacement or repair to facilitate safe maintenance while reducing the potential for n-pentane releases during such activities
7. Flanges and gaskets compatible with motive fluid and meeting ASME specifications
8. Direct acting PRVs meeting stringent API seat tightness standards
9. Rupture disks to minimize leaks from PRVs
10. Use of leakless welded connections to the greatest extent practicable

The equipment components listed above are part of Ormat's standard design, as generally described in the EIS/EIR. These "standard" measures, however, were not detailed in that document.

The following feasibility analysis addresses alternative equipment design, including so called "leakless" valve and "sealless" pump technologies, not already proposed for the project. The feasibility analysis also addresses "enhanced" LDAR work practices, including certain practices not proposed in the original EIS/EIR.

4.1 DEMONSTRATION OF INFEASIBILITY OF SEALLESS CENTRIFUGAL PUMPS

The range of hydraulic design capacities of sealless pumps is limited. In *A User's Engineering Review of Sealless Pump Design Limitations and Features* (Hernandez, 1991), the author presented sealless pump

performance ranges (pumping capacities) available worldwide at the time. SLR conducted online research and we were unable to find CMPs or MDPs manufactured in the U.S. or U.K. with a design capacity sufficient to meet the size (NPS), gallons per minute (gpm) and "head" capacity (feet) required for the motive liquid feed pumps. Use of sealless pumps in the motive fluid system design is not feasible at this time.

4.2 DEMONSTRATION OF INFEASIBILITY OF DIAPHRAGM PUMPS FOR MOTIVE FLUID CIRCULATION

Circulation of motive liquid requires continuous high flowrate (>1,500 gpm) pumping capacity. Diaphragm pumps are designed to pump at a low pulsating flowrate. Diaphragm pumps are not capable of accommodating high-rate, continuous flow design requirements. In addition, the maximum design capacities of diaphragm pumps currently manufactured are insufficient to achieve the the design flow capacity for the motive fluid system. Notwithstanding pumping capacity limitations, diaphragm pumps are not reliable for continuous heavy-duty use. Frequent replacement of diaphragms is necessary, resulting in increased operation and maintenance costs.

For all of these reasons, diaphragm pumps are not feasible for application as motive liquid feed/recycle pumps.

4.3 DEMONSTRATION OF INFEASIBILITY OF DIAPHRAGM VALVES

Diaphragm valves are considered "leakless," but leaks and releases of liquid to the environment do occur as a consequence of liquid leaks between diaphragm and valve body, and tears and ruptures of the diaphragm. To mitigate diaphragm failure due to physical wear and chemical degradation, the diaphragm must be replaced on a routine basis, resulting in costly process downtime and increased operating and maintenance costs, as well as safety concerns. Rupture of a diaphragm and the resulting release of process fluid has far greater environmental consequences than a leak from the seal of a conventional valve.

The operating temperature of the motive fluid may exceed 300 °F with operating pressures exceeding 400 psig. Maximum line pressure specifications for diaphragm valves decrease with increasing size (NPS) and increasing temperature as a function of diaphragm material type. Each diaphragm material has a maximum recommended temperature specification and each valve make/model has working pressure and temperature limits. We could find no diaphragm valves meeting the pressure and temperature specifications.

Lastly, carbon steel diaphragm valves are not commercially available in the sizes needed. The motive fluid process piping sections where control valves are utilized range from 12 to 20 inches NPS. Diaphragm valves are available in sizes less than 12 inches NPS.

Diaphragm valves are not feasible for use in the motive fluid system.

4.4 DEMONSTRATION OF INFEASIBILITY OF BELLOWS VALVES

Bellows seal valves are considered "leakless," but as with any equipment, physical wear can result in bellows failure and leakage of process fluid. Cycle life of bellows is impacted by stroke and cyclic pressure. The cycle life limitation will require a quality backup packing system to overcome a leak in the bellows (Vogt, 2020). A demonstration of infeasibility of bellows sealed control valves and gate valves is provided in the following discussion.

4.4.1 FLOW CONTROL VALVES

Bellows seals are used in sliding-stem globe valves and gate valves, as described in Section 2.3.6. Flow control within the proposed motive fluid process will be accomplished using rotational butterfly valves, which are best suited for rapid (quarter-turn) closure and flow control with minimum pressure drop across the valve. A pressure drop results in cooling and the potential for liquid condensation in the flow line. Liquid droplets are damaging to turbines. Linear sliding stem globe and gate valves for which bellows are exclusively designed are not technically suited for motive fluid flow control while minimizing pressure drop. Butterfly valves and ball valves are rotational designs. Bellows sealed valves can only be used in linear designs and cannot be used in rotational valves. Consequently, bellows seal valves are not a technical feasible alternative technology for motive fluid flow control.

4.4.2 MANUALLY OPERATED GATE VALVES

As discussed in Section 1.2.2.2, manually operated gate valves with graphite packing will be used for process isolation in the motive fluid system. Process isolation and evacuation of motive fluid is necessary to facilitate safe maintenance, repair and replacement of critical equipment in n-pentane service. The gate valves range in size (NPS) from 4 to 12 inches. In general, bellows sealed gate valves are technically feasible to function as isolation valves, however there are limitations in valve sizes currently manufactured and commercially available. The largest steel bellows sealed gate valves with suitable pressure and temperature ratings found to be commercially available are 10-inch NPS. It is expected that bellows valves will be anywhere from 3 to 10 times more expensive than a standard packed valve equivalent (Vogt, 2020).

We can estimate the incremental reduction in potential fugitive emissions resulting from replacing a traditional packed valve with a bellows sealed valve using equipment leak emission factors and correlations developed by EPA (EPA, 1995). EPA collected data on equipment leak emissions of TOC from refineries, marketing terminals, oil and gas production operations, and SOCMI process units. Based on equipment leak data, EPA developed equipment leak emission estimation approaches and emission factors for equipment in those industry sectors. Emission factors in terms of kilograms TOC emitted per hour per source (kg/hr/source) for equipment (valves, connectors, etc.) and service (e.g., gas and light liquid) were developed where those emission factors could be applied to the number of each type of component in each service at a facility to yield mass emissions (kg/hr) of TOC. The service categories are defined based on the state (gas or liquid) at process operating conditions. The n-pentane motive fluid is in gas phase after the heat exchangers and in light liquid phase after condensation.

EPA combined the refinery, marketing terminal data, and oil and gas production operations data to develop petroleum industry correlations for equipment leaks. For valves (all services), correlation equations were developed to estimate mass emissions from a leaking valve in terms of kb/hr/valve based on leak screening values. A screening value (SV) is a measure of the concentration of leaking compounds in the ambient air that provides an indication of the leak rate from an equipment piece, and is measured in units of ppm. The correlation equation for valves is provided below (EPA, 1995):

$$LEAK = 2.29E\text{-}06 * SV^{0.746}$$

Where:

LEAK = mass emissions of TOC (kg/hr/source)

Using the correlation equation above and conservatively applying a screening value of 500 ppmv for valves, a gate valve may emit up to 4.6 pounds of n-pentane per year per valve, equivalent to 0.002 tons per year n-pentane per valve.

Assuming a zero leak rate for bellows sealed valves is achievable in practice, the 4.6 pounds per year per valve emission rate represents the difference between a bellows sealed valve and a valve with graphite packing. The 500 ppmv screening value is the leak definition threshold for an LDAR program (see discussion in Section 4.6). A valve observed to be leaking at a concentration at or above 500 ppm must be repaired and re-monitored. In practice, an infrequently used isolation valve with graphite packing may not leak at levels at or above the screening level. There are seven gate valves used for isolation in the motive fluid system design. Based on the correlation described above at the 500 ppm SV, the incremental increase in combined total potential VOC/ROG (n-pentane) emissions is 32 pounds per year, equivalent to 16 one thousandths of a ton per year.

Size limitations of bellows-sealed valves notwithstanding, for gate valves used infrequently for process isolation, bellows technology would not reduce fugitive emissions beyond reductions already achieved by graphite packing materials combined with LDAR work practices (500 ppmv SV). In practice, a gate valve with graphite packing would be expected to achieve leak rates less than 200 ppmv. Consequently, we find that bellows sealed valves are not feasible for use as isolation valves in the motive fluid system.

4.5 LEAKLESS CONNECTIONS

Welded (“leakless”) connections are used in the motive fluid system design to the greatest extent practical and wherever feasible for piping, fittings and other components. Welded connections are not technically feasible for all equipment, including control valves, pumps and other equipment that must be periodically removed for repair or replacement in a safe manner. Ormat’s motive fluid system design minimizes the need for cutting, welding, and brazing (“hot work”), which poses safety concerns and risk of fire and explosion hazards due to the potential for motive fluid leaks. In addition, removing a welded valve for maintenance involves more risk for n-pentane leaks than from a properly designed and installed flange.

The use of welded connections is not feasible for turbines, pumps, control valves and other critical components. Properly installed flanges with appropriate gaskets can achieve low-leak performance.

4.6 FEASIBILITY OF IMPLEMENTING MORE STRINGENT LDAR WORK PRACTICES

The LDAR program described in the Final EIS/EIR provided that the leak be repaired "as soon as practical" where the leak exceeds 10,000 ppmv. No timeline for "first attempt at repair" and final repair was prescribed.

Development and implementation of a more stringent LDAR program for equipment in VOC service is technically and economically feasible and widely achieved in practice by petroleum refineries and chemical plants. The motive fluid system is not comparable to a petroleum refinery or chemical plant in terms of the quantity of fugitive emissions components and the potential for VOC and air toxic/HAP compound emissions from equipment leaks, but n-pentane is a VOC and equipment within the motive fluid system is "in VOC service." Feasible LDAR work practices for equipment in VOC service that are generally consistent with the most stringent federal CAA standards for equipment leaks[5] and including alternative provisions for OGI survey programs provided by CAA standards for crude oil and natural gas production[6] are summarized in Table 1.

Table 1 Feasible LDAR Work Practices for Motive Fluid Process Equipment in VOC (n-Pentane) Service

EQUIPMENT	LEAK DEFINITION[7]	MONITORING FREQUENCY	EXCLUSIONS FROM MONITORING
Pumps	Visual indications of liquids dripping from seal or 2,000 ppmv	Weekly visual inspections; monitor if visual indication of a leak cannot be eliminated	Each pump equipped with a dual mechanical seal system that includes a barrier fluid system
PRVs	500 ppmv or visible emissions observed using OGI	Quarterly	PRVs equipped with a rupture disk upstream of the pressure relief device
Valves	500 ppmv or visible emissions observed using OGI	Quarterly	Valves in vacuum service

A feasible best practice for an LDAR program would also include routine monitoring of flanged and screwed connectors in n-pentane service at some frequency. Monitoring of connectors is not required by NSPS, but is usually conducted during monitoring surveys for valves.

The centrifugal pumps used for motive fluid circulation are equipped with double mechanical seals and a barrier fluid system, as describe in Section 1.2. PRVs are equipped with rupture disks, as described in Section 1.2.4. Such equipment would be exempt from routine monitoring (LDAR) under the federal standards. Consequently, the LDAR program would focus on valves and connectors.

[5] Federal NSPS at 40 C.F.R. Part 60 subpart VVa. 72 FR 64883, Nov. 16, 2007
[6] Federal NSPS at 40 C.F.R. Part 60 subpart OOOOa. 81 FR 35898, June 3, 2016, as amended at 83 FR 10638, Mar. 12, 2018
[7] As determined using EPA Method 21 (ppmv) or visual indication of a leak using optical gas imaging or visual means.

Consistent with federal NSPS for chemical plants, when a leak is detected from a valve or connector, it shall be repaired as soon as practicable, but no later than 15 calendar days after the leak is detected. A first attempt at repair shall be made no later than 5 calendar days after each leak is detected. Best practices for first attempts at repair for valves include:

(1) Tightening of bonnet bolts;
(2) Replacement of bonnet bolts;
(3) Tightening of packing gland nuts;
(4) Injection of lubricant into lubricated packing.

Since n-pentane is neither a listed HAP nor a regulated air toxic compound and the facility is not a major stationary source of VOC, an enhanced LDAR program more stringent than the most rigorous NSPS required for new chemical and natural gas processing plants, as described above and summarized in Table 1, is not reasonable or warranted.

5. CONCLUSIONS

For all of the reasons described above and in keeping with international codes and standards and EPA guidance, we find that Ormat's proposed motive fluid system design follows best available design standards for rotating equipment, valves and connectors and incorporates best practices for minimizing the potential for fugitive emissions of ROG and VOC from equipment leaks. No additional available sealless, leakless or low-leak technologies are feasible to further reduce fugitive emissions from equipment leaks. Evidence described in Section 4 demonstrates that the alternative sealless, leakless or low-leak technologies described in Section 2.3 are infeasible for one or more of the following reasons:

- Unable to perform the intended physical function within the motive fluid process;
- Incompatible or unsuited for the motive fluid process conditions (temperature, pressure, flowrate, chemical properties or duty);
- Not available in the size or maximum design capacity needed;
- Not effective in mitigating the potential for equipment leaks beyond that already achieved through the combination of Ormat's standard process design and a robust LDAR program; and/or
- Presents unnecessary fire and explosion hazards associated with routine replacement and repair.

We find that it is feasible to enhance the LDAR work practices proposed in the EIS/EIR for valves in n-pentane service to generally conform to federal NSPS applicable to and achieved in practice for affected SOCMI and petroleum industry plants. For valves, a screening level (leak definition) of 500 ppmv TOC (Method 21) or emissions observed using OGI is feasible. The LDAR program would include quarterly leak surveys of valves using either Method 21 or OGI. When a leak is observed as defined above, a first attempt at repair shall be made no later than 5 calendar days after each leak is detected. Final repair should be completed as soon as practicable, but no later than 15 calendar days after the leak is detected, unless a delay of repair is warranted. Delay of repair of valves for which leaks have been detected would be allowed if repair within 15 days is technically infeasible without a motive fluid process unit shutdown. Repair of such equipment shall occur before the end of the next process unit shutdown and monitoring to verify repair must occur within 15 days after startup of the process unit. LDAR work practices would focus on valves and connectors. Rotating equipment (turbines and pumps) equipped with double mechanical seals and barrier fluid systems and PRVs equipped with rupture disks would not be subject to LDAR, consistent with federal standards.

Process design measures already incorporated into Ormat's standard design as generally described in the EIS/EIR and additional LDAR work practice mitigation measures combine to minimize the potential for fugitive emissions of ROG/VOC from equipment leaks within the motive fluid process.

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APPENDIX A

AUTHOR'S RESUME

Feasibility Analysis of Available Equipment Leak Mitigation Measures: Low-Emissions and Leakless Design Technologies

July 2020

KENNY MALMQUIST

Managing Principal/Fort Collins, Colorado
+1 970 999 3981/kmalmquist@slrconsulting.com

Kenny Malmquist is a Petroleum Engineer with over 32 years of diverse professional experience in air quality engineering consulting. He is an experienced technical consultant familiar with processes, systems and operations within the upstream oil and gas, gas processing, petroleum refining, chemical/petrochemical, power, mining, manufacturing and other industry sectors. Mr. Malmquist is widely experienced with air quality standards, regulations and permitting programs administered by EPA and state/local agencies throughout the U.S. Since 1989, he has provided air quality engineering, permitting and compliance solutions to clients operating across North America. He is expert in EPA CAA programs, specializing in NSPS and NESHAP standards and regulations affecting the numerous industry sectors. Mr. Malmquist has been retained to provide nontestimonial technical support to clients' inside and outside legal counsel in a variety of complex civil and criminal litigation matters, particularly pertaining to government allegations of federal CAA violations. Kenny began his consulting career in California and he is familiar with ARB, SCAQMD, BAAQMD and other district air programs. Mr. Malmquist is a Managing Principal in SLR's air practice in Colorado.

EXPERIENCE

- **Measurement and Quantification of Fugitive Emissions of Organic Compounds and Managing Compliance with Equipment Leak Standards for VOC, HAP and GHGs**

Develop, audit, implement and manage leak detection and repair programs and monitoring plans for facilities throughout the U.S. in the chemical, refining, gas processing and upstream oil and gas industry sectors. Conduct fugitive equipment component counts supporting emission inventory development. Experience with monitoring surveys using portable analyzers (EPA Method 21) to identify leaks exceeding threshold-based volume concentrations for organic compounds from valves, flanges/connectors, pumps, pressure relief devices, etc. Observe qualitative indications of equipment leaks using optical gas imaging (OGI). Quantify mass emissions of organic compounds (methane, GHG, VOC, ROG, HAP) from fugitive emission components based on emission factors for process streams in gas/vapor, light liquid, heavy liquid and oil/water service. Determine mass emissions of air pollutants from pressure relief devices and process vents using equation of state process simulation and other techniques. Assure compliance with Federal NSPS and NESHAP rules regulating equipment leaks including. Complete HAP potential to emit and major source determinations, including fugitive emissions. Measure ambient or fenceline concentrations of target organic compounds using reference sampling and analytical methods. Advise clients in evaluation of emerging fugitive emission measurement methods, including optical and open-path technologies.

- **Air Quality Consulting to the U.S. Petroleum Industry**

Air quality engineering technical and regulatory compliance consulting support to major and independent oil and gas companies and assets from the Alaska North Slope to California, Appalachia, the Mid-Continent, Gulf Coast and the Rockies.

EDUCATION

- B.S., Petroleum Engineering, University of Wyoming, 1983

AREAS OF EXPERTISE

- Air Quality Permitting and Regulatory Compliance
- Federal CAA Programs - NSPS & MACT/NESHAP
- State and Local Air Quality Programs throughout the U.S.
- RACT/BACT/LAER
- Hydrocarbon Liquid Storage and Handling, Vapor Recovery, Controls, and Flaring Issues
- Production tank battery adequate design evaluations
- Conventional and Unconventional Crude Oil and Natural Gas Exploration and Production
- Natural Gas Gathering, Treating, and Processing
- Hydrocarbon Processing and Petroleum Refining
- Compliance Planning and Implementation
- Air Quality Compliance Audits and Transactional Due Diligence
- Support to Internal/Outside Counsel in Defense Against Government Civil and Criminal Investigations and Enforcement Actions
- Fugitive Emissions Assessments and Leak Detection and Repair (LDAR)

- **Legal Support, Multiple Clients and Geographies.**

Nontestimonial technical support to clients' inside and outside legal counsel in a variety of complex civil and criminal litigation matters pertaining to government allegations of federal CAA violations. Routinely support legal counsel in preparing response to information requests pursuant to Section 114 of the Clean Air Act, 42 U.S.C. § 7414 (Section 114 requests) and Grand Jury subpoenas and resolution of EPA, state and local agency enforcement matters.

- **NEPA Support, Oil and Gas.**

Support air quality aspects of EA and EIS development for large geographically dispersed oil and gas development on state and federal lands. Develop point source and fugitive emission inventories for a variety of development activities.

- **Air Quality Permitting for Upstream Crude Oil and Natural Gas Resources, Multiple Clients and Geographies.**

Air quality permitting services to clients producing from large geographically dispersed conventional and unconventional resources in basins throughout the U.S. Experienced with air permitting programs administered by state, local and federal jurisdictions in all petroleum producing states. Minor- and major-source preconstruction NSR permitting (PSD and NNSR), RACT/BACT/LAER determinations, and Title V operating permits. Experienced in permitting programs administered by EPA for stationary sources within Indian Lands.

- **Natural Gas Production, Gathering, Treating, Processing, Compression, Transportation and LNG Liquefaction/Gasification**

Experienced in natural gas production, treating (dehydration and sweetening), NGL extraction, compression, condensate and NGL handling, flares and flare gas recovery systems, process vents, combustion systems and LDAR. Expert in federal CAA and state/local programs affecting the natural gas industry sectors. Practiced in hydrocarbon phase behavior, equation of state process simulators and dynamic models in characterizing process stream composition and properties and air emissions from process vents and combustion systems. Experience with LNG liquefaction and gasification processes.

- **Tank Battery Vapor Collection and Control System Evaluation, Multiple Clients/Assets**

Engineering evaluations of upstream production tank system vapor collection and controls to ensure adequate design to accommodate peak vapor flow conditions during normal operations without venting. Use dynamic model to trend tank system pressure versus time to identify zero cost or cost-effective solutions to eliminate "routine venting" of unburned gases, reduce the volume of vented gas (planned and unplanned nonroutine venting) and improve efficiency of vent systems. Completed independent third-party audits of tank system modeling guidelines and design evaluations for large production assets in Colorado and North Dakota.

- **Federal Clean Air Act Technical Consulting, Hydrocarbon Liquid Storage and Handling, Multiple Clients and Geographies.**

Providing expert consultation in federal CAA and local programs affecting crude oil, condensate and produced water separation, treating and processing, storage and transfer operations in the upstream oil and gas industry sector.

- **Technical Consulting, Methane and GHG**

Methane and GHG emission inventory development pursuant to the federal Mandatory GHG Reporting Program, state emission inventory requirements, corporate metrics reporting, permitting and regulatory compliance and engineering evaluations for numerous producers and operations spanning North America. Expert in quantifying fugitive and point source methane emissions using a combination of direct measurements, sampling and analysis, steady state and dynamic process simulation software tools, published emission factors and other traditional and novel approaches. Gather and manage activity data for extensive and geographically dispersed production assets.

KENNY MALMQUIST
Managing Principal/Fort Collins, Colorado
+1 970 999 3981/kmalmquist@slrconsulting.com

- **Petroleum Refineries and Terminals, Multiple Clients and States.**

Air quality regulatory compliance consultant to major petroleum refiners and terminal operators in Alaska, California, Washington, Montana, Utah, Colorado, North Dakota, Indiana, Ohio, Texas and the U.S. Virgin Islands. Conducted air quality regulatory compliance audits of refineries and marine terminals.

- **Compliance Self-Evaluations, Third-Party Audits and Transactional Due Diligence Reviews of Oil and Gas Production and Midstream Operations, Multiple Assets.**

Audit team leader and auditor for numerous air quality compliance self-evaluations, third-party audits and transactional due diligence reviews of extensive and geographically-dispersed production and pipeline gathering system assets located on Indian Lands and lands under state and federal jurisdiction across the U.S.

- **Confidential Clients, Legal Support, Bakken (North Dakota).**

Retained by two separate outside law firms representing two Bakken crude oil producers to provide technical support in responding to CAA Section 114 Information Requests issued by EPA Region 8 surrounding design and operation of tank battery vapor collection and control systems.

- **Confidential Client, Air Quality Regulatory Compliance Self-Evaluation**

Retained by a national law firm representing an oil and gas producer operating in seven U.S. states. Conducted a desktop audit encompassing thousands of sites located throughout the midcontinent.

- **Air Quality Compliance Audits, Confidential Clients – Texas.**

In separate matters, retained by outside counsel to conduct self-evaluations of a petroleum refinery, compressor stations and gas processing plants in west Texas under the Texas Audit Privilege Act and an agreement with EPA. Focused on assessment of compliance with NSPS and MACT programs, including Refinery Sector Rule.

- **Third-Party Audit, Confidential Client, Colorado.**

Retained by oil and gas producer to conduct independent third-party audit of engineering evaluations of numerous production tank systems, as required by a Consent Decree.

- **Legal Support, Confidential Client, Major Petroleum Company.**

Retained by outside law firm representing major petroleum refiner to provide consulting support in connection with a grand jury subpoena and investigation by the U.S. DOJ and EPA CID arising out of allegations of noncompliance with federal CAA programs affecting flare gas recovery systems.

- **Transactional Due Diligence, Major Petroleum Company.**

In separate transactions, retained by outside law firm representing potential buyers of two marine terminals.

- **Legal Support, Confidential Client, Major Petroleum Company.**

Retained by outside counsel representing major petroleum company to provide consulting support in connection with an investigation by EPA CID and DOJ in connection with allegations of CAA violations pertaining to large crude oil process tanks and NSPS Subpart Kb at company's crude oil production facilities.

- **Legal Support, Confidential Client, Crude Oil Pipeline Company.**

Worked with client's internal and outside counsel to successfully defend client against state agency enforcement action related to alleged CAA violations of the Organic Liquids Distribution MACT rule at client's crude oil pipeline terminal facilities.

- **Legal Support and Air Quality Compliance Self-Evaluation, Confidential Client, Utah.**

Retained by client's internal counsel to provide consulting assistance in preparation of a response to an EPA Section 114 request related to allegations of CAA violations of major source MACT standards

and requirements for glycol dehydration units and stationary reciprocating internal combustion engines at five compressor stations operated by client on state and tribal lands in the Uinta Basin.

- **Legal Support, Confidential Client, Upstream Oil and Gas Production Company, Utah.**

Worked with client's internal and outside counsel in successfully defending client against a civil enforcement action by EPA Region 8 and DOJ pursuant to 25 allegations of Clean Air Act violations at three gas gathering pipeline system compressor stations and two gas plants in the Uinta Basin.

- **Legal Support, Confidential Client, Major Oil and Gas Company, West Virginia.**

Supported client's internal and outside counsel and EHS staff to self-assess compliance with air quality standards and regulations and permitting programs administered by the West Virginia DEP for upstream gas production and booster compression sites.

- **Confidential Client, Regulatory Compliance Self-Assessment, Permian Basin, Texas.**

Supported client's external counsel in conducting asset-wide assessment of potential to emit and regulatory applicability determinations related to client's extensive and geographically dispersed Permian Basin production asset.

- **Air Quality Self-Evaluation, Confidential Client, North Dakota and Eastern Montana.**

At the direction of client's outside counsel, supported self evaluation of client's extensive Bakken and Three-Forks crude oil production assets located on the Fort Berthold Indian Reservation under the jurisdiction of EPA Region 8 and numerous sites located on lands under the jurisdiction of the North Dakota Department of Health and Montana Department of Environmental Quality.

- **Confidential Client, Upstream Oil and Gas Production Company, Colorado.**

Worked with client's internal and outside counsel to respond to state agency enforcement action related to allegations of CAA violations pertaining to the oil and gas production, stationary reciprocating internal combustion engine and organic liquids distribution MACT rules.

- **Confidential Client, Compliance Assessment, Oil and Gas Company, Colorado.**

Worked with client's outside counsel to develop a comprehensive review of federal MACT standards relevant to area and major sources comprising a large oil and gas production operation, including numerous well sites, central gathering, treating and processing facilities and ancillary operations.

- **NSPS OOOO Support, San Juan Basin Business Unit.**

Worked with client's engineering and HSE staff to assess working, breathing and flashing losses from production tanks using process simulation (ProMax® and E&P Tank). Developed production rate-based VOC emission factors used in NSPS Subpart OOOO applicability determinations.

- **MACT Applicability and Compliance, Multiple Locations, AK North Slope and Cook Inlet.**

Quantified HAP emissions and evaluated other rule applicability criteria for over 40 oil and natural gas production facilities, drill sites and supporting facilities operating on the Alaska North Slope. Evaluated 16 onshore and offshore production facilities in the Cook Inlet of Alaska.

Appendix B
Public Notices

PUBLIC NOTICES

Notice Inviting Bids

TOWN OF MAMMOTH LAKES, CA
PUBLIC WORKS DEPARTMENT
NOTICE INVITING BIDS
CAP 15-008
The Town of Mammoth Lakes will receive sealed bids for the work shown on the plans entitled:

TOWN OF MAMMOTH LAKES COMMUNITY RECREATION CENTER
In the Town of Mammoth Lakes for The Town of Mammoth Lakes, California

Bids will be received at the Office of the Town Clerk of the Town of Mammoth Lakes located at:
437 Old Mammoth Road, Suite 230,
Mammoth Lakes, California 93546
until 4:00 pm on Friday September 25, 2020 at which time they will be publicly opened and read.

Proposal forms and Contract Documents for this work are included in the specifications.

GENERAL DESCRIPTION: Project includes the construction of the Town's Community Recreation Center. The new 41,000SF multi-use facility is to be located at Mammoth Creek Park at 686 Old Mammoth Road, Mammoth Lakes, CA. The Tensile Fabric Structure will house an Olympic sized ice rink/multi-purpose court along with associated public and private spaces such as entry hall and lobby, restrooms, locker rooms, mechanical rooms, and storage areas. The ice rink will be a complete turnkey system with all mechanical, plumbing, and ancillary systems incorporated as specified. The project also includes site work such as concrete curbs and sidewalks, entry canopy and drainage improvements. The Town will be furnishing the ice rink dasher boards, ice rink chiller system, and Tensile Structure. Contractor to coordinate Scope of Work with others, as necessary.

The engineer's estimate to complete the base bid is between $7,000,000 and $7,300,000. The work includes full compliance with all applicable laws, rules, and regulations. The work shall be completed within the time set forth in the Contract.

A non-mandatory pre-bid meeting will be held at the main conference room at the Town Offices on September 15,2020 at 10:00AM, located at 437 Old Mammoth Road, Suite 230, Mammoth Lakes, California. This meeting will be hosted using zoom please contact hhayes@townofmammothlakes.ca.gov to be sent presentation materials before the meeting.

The contractor shall have a valid Class B Contractor license, a Driver's License, and a current Business Tax Certificate and shall maintain all required licenses throughout the duration of the Contract. The Contractor

Technical questions should be directed to Haislip Hayes, PE Engineering Manager, Department of Public Works, Town of Mammoth Lakes, California, telephone (760) 965-3652. Oral clarifications are non-binding and any changes shall be issued by written addenda only.

This project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations. Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at Town offices. Future effective general prevailing wage rates, which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates. A copy of the rates shall be posted by the successful bidder at the job site. The successful bidder and all subcontractor(s) under him shall comply with all applicable Labor Code provisions, which include but are not limited to the payment of not less than the required prevailing wage rates to all worked employed by them in the execution of the Contract, the employment of apprentices, the hours or labor and the debarment of contractors and subcontractors.

Pursuant to Public Contract Code section 22300, the successful bidder may substitute certain securities for funds withheld by the Town to ensure performance under the Contract.

This Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. In bidding on this project, it shall be the Bidder's sole responsibility to evaluate and include the cost of complying with all labor compliance requirements under this contract and applicable law in its bid.
The Contract will be awarded to the responsible bidder submitting the lowest responsive bid on the base bid. The Town reserves the right to waive any informality or irregularity in a bid. The Town of Mammoth Lakes reserves the right to reject any and/or all bids, or to utilize any alternative procedures authorized by the Public Contracts Codes Sections 20166 and 20167. Submission of a bid shall be deemed conclusive evidence that the bidder has thoroughly examined the plans, specifications and the site of all work and the bid takes all costs into account. Each bid shall remain good for a minimum of sixty (60) days after bid opening.

TOWN OF MAMMOTH LAKES, CALIFORNIA
Jamie Gray, TOWN CLERK
DATED: August 21, 2020

TS #2020-0145

Notice of Availability

Notice of Availability of a Draft Supplemental Environmental Impact Report for the Casa Diablo IV Geothermal Power Plant Project

The Great Basin Unified Air Pollution Control District is the Lead Agency pursuant to the California Environmental Quality Act (CEQA) and prepared a Draft Supplemental Environmental Impact Report (SEIR) for the proposed Casa Diablo IV Geothermal Power Plant Project (proposed Project). The District prepared the Draft SEIR in response to the 2019 Appellate Court's decision in Covington v. Great Basin Unified Air Pollution Control District (2019) 43 Cal.App.5th 867, which addressed a CEQA challenge to the 2013 Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the proposed Project.

In response to the decision made by the Court of Appeals, the Draft SEIR contains supplemental information and analysis to the 2013 Final EIS/EIR to adequately inform the public and local officials in the planning and decision-making process regarding two potential and additional mitigation measures to address reactive organic gas (ROG) emissions from the plant: (1) a stronger leak detection and repair (LDAR) program, and (2) the additional use of leakless or low-leak technology.

Copies of the Draft SEIR and the NOA will be available for review at the District's website at http://www.gbuapcd.org/cd4. Copies of the Draft SEIR will also be available for review by appointment only at the District office located at 157 Short Street, Bishop, CA 93514. Please call 760-872-8211 to schedule an appointment. Copies of the Draft SEIR are also available for review at the Mammoth Lakes Branch Library at 400 Sierra Park Rd, Mammoth Lakes, CA 93546.

Comments on the Draft SEIR will be accepted during the 45-day public review period that will commence on August 27, 2020, and ending at 5:00 p.m. on October 12, 2020. Written comments may be submitted via email to permits@gbuapcd or via mail to the District's office at 157 Short Street, Bishop, CA 93514. Names and addresses of commenters will become part of the public record. For further information, contact Ann Logan, Deputy Air Pollution Control Officer at (760) 872-8211.

TS #2020-0147

Notice of Public Hearing

NOTICE OF AVAILABILITY OF PROPOSED 2020-2021 COUNTY BUDGET DOCUMENTS AND PUBLIC HEARING THEREON BY THE MONO COUNTY BOARD OF SUPERVISORS

Notice is hereby given that the proposed County budget documents for fiscal year 2020-2021 will be available to members of the general public on August 29, 2020, on the Mono County website and in the north and south county offices of the County Administrative Officer, Courthouse annex 1, Bridgeport, California (760) 932.5412 and 1290 Tavern Road, Mammoth Lakes, California.

Notice is also hereby given that the Board of Supervisors, County of Mono, will meet at the time and place specified below for the purpose of conducting a public hearing regarding the fiscal year 2020-2021 proposed budget, preparatory to making a final determination thereon. Any member of the general public may appear at the hearing and be heard regarding any item of the budget or for the inclusion of additional items. The public hearing will commence at 1 p.m.

As part of the meeting of the board on Tuesday, September 8, 2020 via teleconferencing with members of the board attending from separate, remote locations, members of the public may join the public hearing by logging into the Zoom webinar. The Board may continue the public hearing to Tuesday, September 15, 2020 if necessary and thereafter in its discretion.

Robert Lawson
County Administrative Officer

TS #2020-0144

Fictitious Business Name Statement

The Following Person
Is Doing Business As:

Subway # 13428

Mammoth Subs Inc.
26 Old Mammoth Road, P.O. Box 4093
Mammoth Lakes, Ca. 93546

This business is conducted by an Corporation.The registrant commenced to transact business under the fictitious business nam listed above on April 21, 2006. This statement was filed with the County Clerk of

PUBLIC NOTICES

NOTICE OF PETITION TO ADMINISTER ESTATE OF CARMEL RUSH BILLEB

To all heirs, beneficiaries, creditors, contingent creditors, and persons who may otherwise be interested in the will or estate, or both, of **CARMEL RUSH BILLEB**

A Petition for Probate has been filed by VICTORIA C. DANIELS in the Superior Court of California, County of Mono, Mono County Superior Court Case No. PR202013.

The Petition for Probate requests that VICTORIA C. DANIELS be appointed as personal representative to administer the estate of the decedent.

The petition requests the decedent's will and codicils, if any, be admitted to probate. The will and any codicils are available for examination in the file kept by the court.

The petition requests authority to administer the estate under the Independent Administration of Estates Act. The independent administration authority will be granted unless an interested person files an objection to the petition and shows good cause why the court should not grant the authority.

A hearing on the petition will be held in Mono County Superior Court as follows: Date: **September 10, 2020**, Time: **9:30 am.** The address of the court:100 Thompson's Way, Mammoth Lakes, CA 93546.

If you object to the granting of the petition, you should appear at the hearing and state your objections or file written objections with the court before the hearing. Your appearance may be in person or by your attorney.

If you are a creditor or a contingent creditor of the deceased, you must file your claim with the court and mail a copy to the personal representative appointed by the court within four months from the date of first issuance of letters as provided in Probate Code section 9100. The time for filing claims will not expire before four months from the hearing date noticed above.

You may examine the file kept by the court. If you are a person interested in the estate, you may file with the court a Request for Special Notice (form DE-154) of the filing of an inventory and appraisal of estate assets or of any petition or account as provided in Probate Code section 1250. A Request for Special Notice form is available from the court clerk.

Attorney for Petitioner: Linda D. Hess, Law Offices of Linda D. Hess, 106 South Main Street, Suite 201, Bishop, CA 93514 and P. O. Box 351, Mammoth Lakes, CA 93546.

(MT 08.27, 09.03, 09.10, 2020 #19302)

Notice of Availability of a Draft Supplemental Environmental Impact Report for the Casa Diablo IV Geothermal Power Plant Project

The Great Basin Unified Air Pollution Control District is the Lead Agency pursuant to the California Environmental Quality Act (CEQA) and prepared a Draft Supplemental Environmental Impact Report (SEIR) for the proposed Casa Diablo IV Geothermal Power Plant Project (proposed Project). The District prepared the Draft SEIR in response to the 2019 Appellate Court's decision in Covington v. Great Basin Unified Air Pollution Control District (2019) 43 Cal.App.5th 867, which addressed a CEQA challenge to the 2013 Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the proposed Project.

In response to the decision made by the Court of Appeals, the Draft SEIR contains supplemental information and analysis to the 2013 Final EIS/EIR to adequately inform the public and local officials in the planning and decision-making process regarding two potential and additional mitigation measures to address reactive organic gas (ROG) emissions from the plant: (1) a stronger leak detection and repair (LDAR) program, and (2) the additional use of leakless or low-leak technology.

Copies of the Draft SEIR and the NOA will be available for review at the District's website at http://www.gbuapcd.org/cd4. Copies of the Draft SEIR will also be available for review by appointment only at the District office located at 157 Short Street, Bishop, CA 93514. Please call 760-872-8211 to schedule an appointment. Copies of the Draft SEIR are also available for review at the Mammoth Lakes Branch Library at 400 Sierra Park Rd, Mammoth Lakes, CA 93546.

Comments on the Draft SEIR will be accepted during the 45-day public review period that will commence on August 27, 2020, and ending at 5:00 p.m. on October 12, 2020. Written comments may be submitted via email to permits@gbuapcd.com or via mail to the District's office at 157 Short Street, Bishop, CA 93514. Names and addresses of commenters will become part of the public record. For further information, contact Ann Logan, Deputy Air Pollution Control Officer at (760) 872-8211.

(MT 08.27, 2020 #19305)

PUBLIC NOTICES

NOTICE OF SALE OF REAL PROPERTY AT PRIVATE SALE CASE NO. 19STPB10099

In the Superior Court of the State of California, for the County of Los Angeles

In the Matter of the Conservatorship of the Person and Estate of Margaret Hodge, conservatee.

Notice is hereby given that the undersigned will sell at Private Sale, to the highest and best bidder, on or after the 11th day of September, 2020, at the office of Jesse Reyes, Mammoth Realty Group 501 Old Mammoth Road, Mammoth Lakes, CA 93546, Telephone: (760) 709-6677; Anngel Benoun, Dilbeck Estates and Christie's International Real Estate, 17279 Ventura Boulevard, Encino, CA 91316, Telephone: (818) 728-2396, all the right, title and interest of said conservatee, in and to all the certain real property, situated in the City of Mammoth Lakes, County of Mono, State of California, particularly described as follows:

A condominium estate of inheritance, or perpetual estate, as defined in section 783 of the civil code of the State of California, consisting of that certain real property in the town of Mammoth Lakes, County of Mono, State of California, described as follows:

1. A separate interest in and to the airspace identified as Unit No. 88 of Woodstock as per map therefor recorded in book 8 of Maps, at Pages 6 through 6-h, inclusive, in the Office of the County Recorder of Mono County, State of California, (hereinafter "Map") as said unit is defined in the Declaration of Covenants, Conditions and Restrictions for said subdivision recorded in Book 142, at Pages 2 through 35, inclusive, of the Official Records of the County Recorder of Mono County, California, on August 17, 1972, as amended by Amendment to Declaration of Covenants, Conditions an Restrictions recorded in Book 152, pages 471 through 481, inclusive, of Official Records of Mono County, California, April 5, 1873 (collectively hereinafter "Declaration"), together with the following appurtenant easements:

A. An exclusive easement for ingress and egress to and from each unit, in, over and through the common area of Woodstock so long as the title to the condominium conveyed herein remains in grantor;

B. A non-exclusive easement under and beneath the surface of the common area of Woodstock per the map thereof to maintain existing utility lines thereunder and to place and maintain additional utility lines thereunder; to provide water, electricity, gas, telephone, television and sewerage service for residential use to said unit, said easement to be along the shortest and most convenient route between said unit and the nearest public utility line or lines;

C. A non-exclusive easement for ingress to and egress from and repair of the unit granted herein through and over and along the common area of said Woodstock.

D. An exclusive easement to use that portion of the surface of the common area of Woodstock so designated as garage 112 in Exhibit "D" of the Declaration above mentioned.

E. Such other appurtenant easements as are provided to the owner of the unit conveyed hereby in the Declaration.

2. An undivided 1/108th interest in common in and to the common area of Woodstock, as per the map thereof. The interest granted in this paragraph 2 is subject to increase of a maximum fractional interest for 1/57th in the event additional phases are not annexed to Woodstock, as provided in the Declaration.

Excepting therefrom the interest of the town of Mammoth Lakes as described in the dedication Grant Deed recorded January 2o, 1987 in Book 469 Page 589 Official Records.

APN: 033-301-088-000

More commonly known as: 1629 MAJESTIC PINES DR. #88, MAMMOTH LAKES, CA 93546

TERMS OF SALE ARE CASH, IN "AS-IS" CONDITION. TEN PERCENT OF AMOUNT BID TO BE DEPOSTED WITH BID.

Dated August 20, 2020

MAYA RUBIN

Conservator of the Person and Estate.

Attorney(s) at Law:

MarvanLaw, A.P.C.

500 S. Grand Ave., Suite 1490

Los Angeles, CA 90071

8/27, 9/3, 9/10/20

CNS-3392284#

MAMMOTH TIMES **08.27, 09.03, 09.10, 2020 #19303**

Appendix C
Recipients of Final Supplemental EIR Notification

ESA

APPENDIX C
Recipients of the Final SEIR Notification

An email notification of the availability of the Final SEIR was sent to the following agencies, organizations, and individuals

Great Basin Unified Air Pollution Control District

Phillip L. Kiddoo
Ann Logan
Luke Eisenhardt
Tom Schaniel

Ormat Inc.

Melissa Wendt

Federal Agencies

Name/Contact	Agency/Organization
Dale Johnson	Bureau of Land Management- Bishop
Erin Noesser	U.S. Forest Service

State Agencies

Name/Contact	Agency/Organization
Morgan, Scott	State Clearinghouse
Earl Whithycombe	California Air Resources Board
Gavin McCreary, Project Manager, Site Evaluation and Remediation Unit	Department of Toxic Substances Control
Nancy Gonzalez-Lopez, Staff Services Analyst	Native American Heritage Commission

Local Agencies

Name/Contact	Agency/Organization
Betty Hylton	Mammoth Community Water District
Mark Busby	Mammoth Community Water District
Stephanie Hake	Mammoth Community Water District
Jeff Fitzsimmons, PG Engineering Geologist; and Tom Browne, PhD, PE Water Resources Control Engineer	Lahontan Regional Water Quality Control Board

Local Agencies

Name/Contact	Agency/Organization
Gerry Le Francois, Executive Director	Mono County Local Agency Formation Commission
Wendy Sugimura (Community Development Department)	Mono County
Schreeneen Dedman	Mono County
Queenie Barnard	Mono County
Shannon Kendall	Mono County Clerk-Recorder
Darcy Ellis	Inyo County
John Carl Vallejo	Inyo County Counsel
Grace Chuchla	Inyo County Counsel
Sandra Moberly (Community and Economic Development Director)	Town of Mammoth Lakes
David Griffith	GBUAPCD Governing Board
John Wentworth	GBUAPCD Governing Board
Fred Stump	GBUAPCD Governing Board
Matt Kingsley	GBUAPCD Governing Board
Ron Hames	GBUAPCD Governing Board
John Peters	GBUAPCD Governing Board
Arrash Agahi	Los Angeles Department of Water and Power
Lizbeth Calderon	Los Angeles Department of Water and Power
Clint Kautsky	Los Angeles Department of Water and Power
Jevon Lam	Los Angeles Department of Water and Power
Julie Marte	Los Angeles Department of Water and Power
Clarence Martin	Los Angeles Department of Water and Power
Nelson Mejia	Los Angeles Department of Water and Power
Roderick Tashima	Los Angeles Department of Water and Power
Michael Tsai	Los Angeles Department of Water and Power
Jaime Valenzuela	Los Angeles Department of Water and Power

Tribal Governments

Name/Contact	Agency/Organization
Cindy Duriscoe	Big Pine Paiute Tribe
Mel Joseph	Lone Pine Paiute Shoshone Reservation
Sally Manning	Big Pine Paiute Tribe

Notices of the Availability of the Draft SEIR also were provided to the following organizations and individuals:

Name/Contact	Agency/Organization
Rhonda Duggan	
Ceal Klingler	
Andre Long	
Liz O'Sullivan	
Ronald Ward	Rio Tinto Minerals
Sheila Sannadan	Adams Broadwell Joseph & Cardozo
Rebecca Davis	Lozeau Drury
Stacey Oborne	Lozeau Drury
Komalpreet Toor	Lozeau Drury
Sheila Sannadan	Adams Broadwell Joseph & Cardozo
James Charles	Sierra Wave
Jim Hilton	South Tahoe Public Utility District
Paul Lamos	
Geoffrey McQuilkin	Mono Lake Committee
Ted Schade	

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