



COLUMBIA RIVERKEEPER

P.O. Box 950  
Hood River, OR 97031  
(541) 387-3030  
[columbiariverkeeper.org](http://columbiariverkeeper.org)

June 12, 2025

NWR Air Quality Permit Coordinator  
Oregon DEQ  
700 NE Multnomah St, Suite 600  
Portland, OR 97232

*Sent via email to: NWRAQPermits@deq.oregon.gov*

**Re: Comments on Zenith Energy's Draft Air Contaminant Discharge Permit**

Dear Lisa Ball:

Please accept the following comments on Zenith Energy Terminal Holdings LLC's (Zenith) draft air contaminant discharge permit (ACDP), on behalf of Columbia Riverkeeper. Columbia Riverkeeper is a 501(c)(3) nonprofit organization with a mission to protect and restore the water quality of the Columbia River and all life connected to it. Columbia Riverkeeper has over 20,000 members in Oregon and Washington, including thousands who live and work in Portland, Oregon. Columbia Riverkeeper regularly comments on decisions impacting water quality, climate, and salmon habitat in the Columbia River. Columbia Riverkeeper has historically engaged on issues at the Zenith facility, due to its proximity to the confluence of the Columbia and Willamette rivers and the environmental and public health impacts associated with increased throughput at the Zenith facility.

This draft permit incorrectly determines that Zenith's activities will be within the new, reduced emissions limits. From 2022 to 2024, based on Zenith's own reporting, emissions at the facility have exceeded those requested in the new permit.<sup>1</sup> Yet, Zenith concludes that it will nearly double its fuel throughput after 2027, add more railcar racks and storage tanks, and operate three new pipelines—all while emitting less than its current operations. This does not add up. What Zenith is proposing is an expansion disguised as a transition to renewable fuels, designed to increase the amount of toxic, flammable fuel transported through our communities and waterways. To get here, Zenith characterizes its emissions using assumptions rooted in the best case scenario rather than reality. We urge DEQ to take a realistic approach to evaluating Zenith's potential emissions. Doing so necessitates denial of the ACDP due to Zenith's inability to meet the emissions limits.

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<sup>1</sup> DEQ, Zenith Energy ACDP Review Report at 19. In 2024, Zenith decreased crude oil and increased renewable throughput: VOC emissions increased. *See* Portland City Council, Portland City Council Work Session - Zenith Energy Portland Terminal, at 1:28:46 (YouTube, Jan. 21, 2025) <https://www.youtube.com/watch?v=HOojS1yrAyc>. Compare Zenith Energy [2024 Title V Annual Report](#) at 37, with Zenith Energy 2023 Title V Annual Report at 40.

## *Permit History*

When Zenith acquired the Portland terminal in 2017, it inherited an outsized Title V air permit originally designed for asphalt production—an extremely pollution-intensive industry. Because this permit is inappropriate for Zenith’s fossil fuel storage and transport facility, Columbia Riverkeeper advocated for DEQ and the City of Portland to require new permits to more appropriately address Zenith’s pollution and land use activities. In 2021, DEQ required Zenith to obtain a new Land Use Compatibility Statement (LUCS) from the City of Portland to cover Zenith’s fossil fuel storage and shipment activities. Later that year, the City of Portland denied Zenith’s request for a LUCS because it did not comply with the City’s comprehensive plan. Because a LUCS is required for an air permit, DEQ then proposed a denial of Zenith’s Title V renewal application.

In 2022, while the City of Portland and Columbia Riverkeeper were defending the City’s LUCS denial in court—and winning—the City issued a new LUCS for the facility in exchange for Zenith’s agreement to follow certain conditions. The most important conditions, for the purposes of this comment, are Zenith’s commitment to phase out crude oil by October 2027, and to limit its volatile organic compound (VOC) emissions to below 40 tons per year (tpy).<sup>2</sup>

Shortly after receiving its 2022 conditional LUCS, Zenith applied for an ACDP with DEQ. DEQ first issued a public notice and draft permit in October 2024. In November, as a result of DEQ’s investigation into Zenith’s use of the neighboring McCall dock, DEQ “paused” the permitting process and required Zenith to obtain a new Land Use Compatibility Statement (LUCS) from the City of Portland, covering all tax lots where Zenith operates.<sup>3</sup> DEQ issued a second public notice and draft permit on April 7, 2025.

While Columbia Riverkeeper appreciates DEQ’s November 2024 investigation into Zenith’s activities, we note that the back-and-forth nature of this permitting process has made it difficult to track the actual and intended changes to the proposed permit and raises questions about DEQ’s transparency with the public. Since Zenith’s 2022 ACDP application, Zenith’s proposal has changed—Zenith now proposes to handle a significant amount of Sustainable Aviation Fuel (SAF), new fuel blending activities, permit coverage of its previously unauthorized pipeline infrastructure connecting to the McCall dock, and allowance of additional engine operation. And, despite DEQ calling for a “pause”<sup>4</sup> in the permit process between October 2024 and April 2025, DEQ indicated that it will not consider public comments submitted between

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<sup>2</sup> City of Portland, Zenith Energy 2022 LUCS, Condition 3 at 3 (“The requested ACDP will require volatile organic compound (VOC) emissions be less than 40 tpy.”).

<sup>3</sup> DEQ, Zenith Energy [2025 LUCS](#) (Feb. 3, 2025).

<sup>4</sup> *DEQ continues pause of Zenith Energy’s air quality permitting process, issues civil penalty*, DEQ (Dec. 16, 2024), <https://apps.oregon.gov/oregon-newsroom/OR/DEQ/Posts/Post/DEQ-continues-pause-of-Zeniths-air-quality-permitting-process-issues-penalty>

those dates. All of these elements make it difficult for the public to understand what Zenith is proposing and engage effectively with the permitting process.

Zenith's request, through a new ACDP, would result in fewer state inspections and reporting requirements in exchange for a reduction in allowable emissions compared to their current permit. Zenith's application achieves a "reduction" in VOCs not through any actual changes to its facility or pollution control technology, but by mathematical sleight of hand.<sup>5</sup> The following comment describes pathways for DEQ to deny Zenith's ACDP application.

### **I. Zenith will exceed the VOC limit.**

Zenith's application requests a VOC limit of 39 tpy,<sup>6</sup> based on its agreement with the City of Portland to keep emissions below 40 tpy in the 2022 conditional LUCS. VOCs are well known for their adverse effects on public health and the environment.<sup>7</sup> A precursor to ozone, VOCs cause respiratory and other dangerous health effects, even at low levels of exposure.<sup>8</sup> This is of particular concern in areas where natural weather conditions such as stagnated air—a common occurrence in Portland—exacerbate those effects. Zenith's application relies on a set of assumptions in its calculations to present a scenario that meets the VOC limit. These assumptions create a floor for what Zenith could emit, rather than a realistic picture of VOC emissions from its operations. DEQ accepts Zenith's assumptions, resulting in a draft permit that does not account for the reality of emissions at the site.

Zenith seeks a VOC PSEL of < 40 tpy, presumably to stay below the significant emissions rate (SER) for VOC and thus avoid being categorized as a non-federal "major source" under OAR 340-200-0020(90)(a) for purposes of Oregon's New Source Review and/or Prevention of Significant Deterioration program (State NSR).<sup>9</sup> 40 tpy is the significant emissions rate (SER) for VOC in areas other than serious or extreme ozone nonattainment areas.<sup>10</sup> Because the Zenith Facility is located in the Portland-Vancouver maintenance area for ozone, and because VOCs are precursors of ozone formation, construction of a new source or major modifications of

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<sup>5</sup> Columbia Riverkeeper retained an expert, Dr. Sahu, to analyze the draft permit and application materials, including the underlying calculations. See Technical Comments on the Proposed DEQ ACDP Permit No: 26-2025-ST-1 for the Zenith Energy Terminals Holdings, LLC by Dr. Ranajit (Ron) Sahu (2025) (hereinafter "Technical Comments").

<sup>6</sup> DEQ, Zenith Energy ACDP [Application](#) at 1 (Nov. 11, 2022) ("At all times that the ACDP is in effect (i.e., both before and after the phase-out of crude oil), Zenith will comply with the 39 ton/year VOC Plant Site Emission Limit.").

<sup>7</sup> See *Basic Information about Carbon Monoxide (CO) Outdoor Air Pollution*, EPA, <https://bit.ly/31Tn9he> (last updated June 21, 2024); *Basic Information about Ozone*, EPA, <https://bit.ly/3IC6OOO> (last updated Mar. 11, 2025).

<sup>8</sup> See, e.g., *Ozone*, American Lung Association, <https://bit.ly/3ylAs6p> (last updated June 9, 2025) (explaining certain health risks caused by ozone pollution).

<sup>9</sup> See, e.g., Review Report at 16 (noting that the Facility "will not trigger a new source review evaluation so long as Zenith complies with the PSELs specified in Paragraph 24.").

<sup>10</sup> OAR § 340-200-0020(160)(i).

an existing source at the Facility that have VOC emissions equal to or greater than 40 tpy over the netting basis<sup>11</sup> would result in the Facility being a “major source” for State NSR purposes.<sup>12</sup> The State NSR program imposes additional regulatory burdens upon major sources, but they also provide myriad public health and environmental benefits. As applicable to Zenith, these would include application of best available control technology (BACT) for emissions increases that result from a major modification and compliance with the air quality protection requirements of OAR 340-224-0260(2).

DEQ has accepted at face value the VOC emissions estimates in Zenith’s application, which are dangerously and misleadingly close to the crucial 40 tpy threshold. As explained in detail in the enclosed Technical Comments by Dr. Ron Sahu, both DEQ and Zenith have significantly underestimated the facility’s VOC emissions, and the facility is almost certainly a major source of VOC subject to State NSR. At a minimum, DEQ must more thoroughly review and revise the legal and technical basis for estimating fugitive VOC emissions from the Zenith Facility prior to issuance of a final ACDP.

**A. The PIPE emissions factors used by DEQ are unsupported and significantly underestimate the potential VOC emissions.**

DEQ consented to Zenith’s proposal to significantly reduce the emissions factors for many sources of VOC emissions at the facility, most notably the Facility’s piping components (PIPE) emissions, stating that

Zenith is no longer required to differentiate between leaking and non-leaking components or perform leak detection and repair under 40 CFR 60 Subpart GGG because it no longer considered a “Petroleum Refinery”. The previous PIPE emission factors were specific to refineries. With Zenith now operating as a marketing terminal, the new emission factors are for marketing terminals from EPA’s “Protocol for Equipment Leak Emission Estimates”.<sup>13</sup>

As discussed in Dr. Sahu’s report, DEQ’s decision to classify Zenith as a “marketing terminal” instead of a “petroleum refinery” led to a significant reduction (i.e., an underestimation) in the

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<sup>11</sup> The proposed netting basis for the Zenith Facility under the ACDP is 0 tpy, *see* Review Report at 18–19, and thus any actual or potential emissions (PTE) of 40 tpy VOC or greater would trigger State NSR requirements.

<sup>12</sup> *Id.*; OAR § 340-224-0010(2)(a).

<sup>13</sup> Review Report at 22.

amount of VOC emissions from the Facility.<sup>14</sup> That decision is also unsupported by fact and is inconsistent with DEQ regulations and guidance.

***1. Zenith is not a “marketing terminal.”***

DEQ’s chosen emission factors were derived from an EPA memorandum called *1995 Protocol for Equipment Leak Emission Estimates*,<sup>15</sup> but there is no rational basis for concluding that Zenith is a “marketing terminal” as that term is used in the 1995 Protocol. The 1995 Protocol does not itself define the term “marketing terminal”, but it appears EPA was merely incorporating the usage previously employed by the American Petroleum Institute (API) and its contractor Radian Corporation.<sup>16</sup> That 1993 API report is not widely available to the public, was not cited in the Review Report, and was presumably not considered by DEQ.

As explained by Dr. Sahu, the term “marketing terminal” is generally understood to mean a facility for the storage and wholesaling of end-use petroleum products such as gasoline, diesel fuel, and jet fuel.<sup>17</sup> Marketing terminals do not handle or store crude oil or other unrefined petroleum products.

***2. The 1995 Protocol’s emissions factors for “marketing terminals” are unreliable.***

Of perhaps a greater concern, the emissions factors for marketing terminals in the 1995 Protocol are unsupported and unreliable for several reasons. First, as EPA itself notes, they are based largely upon bagging data collected more than three decades ago (in 1993) from a paltry three marketing terminals.<sup>18</sup> EPA even explained that the origin of the data was suspect: “[I]ittle documentation is available for the marketing terminal data because the data were collected and delivered directly to EPA with no formal report being written.”<sup>19</sup>

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<sup>14</sup> EPA’s new source performance standards for “equipment leaks of VOC in petroleum refineries” constructed or modified after 1983 or before 2006 at 40 C.F.R. Part 60, Subpart GGG defines a “petroleum refinery” as “any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through the distillation of petroleum, or through the redistillation, cracking, or reforming of unfinished petroleum derivatives.” 40 C.F.R. § 60.591. There are no Clean Air Act NSPS or regulatory definitions of a “marketing terminal.”

<sup>15</sup> EPA, *1995 Protocol for Equipment Leak Emission Estimates*, (Nov. 1995) (EPA-453/R-95-017) (hereinafter “1995 Protocol”).

<sup>16</sup> See 1995 Protocol at 2–7 (citing the source of the marketing terminal data: an American Petroleum Institute publication called *Development of Fugitive Emission Factors and Emission Profiles for Petroleum Marketing Terminals, Volumes I and II*, API 4588, Radian Corporation (1993)).

<sup>17</sup> Technical Comments at 7.

<sup>18</sup> 1995 Protocol at 2–7. (As EPA explains, “bagging data” are “equipment leak rate data” measured by “enclosing individual equipment in in a ‘bag’ and measuring mass emissions” that are then used to “develop unit-specific leak rate/screening value correlations.” 1995 Protocol at 1–3.)

<sup>19</sup> *Id.* at C–14.

Second, as the California Air Pollution Control Officers Association (CAPCOA) and the California Air Resources Board (CARB) have determined, the 1995 Protocol (and API data it relies upon) is rife with technical errors that “significantly affect estimates of fugitive hydrocarbon emissions” from such facilities.<sup>20</sup> Among the flaws identified by CARB were (a) analysis of the bagged data that “did not account for hydrocarbon leaking into the bags”; (b) averaging of emissions factors that did not “represent the emissions from both controlled and uncontrolled facilities”; (c) inconsistencies in the “component count methodology used in the underlying studies”; and (d) the underlying studies’ use of “organic vapor analyzers (OVAs) equipped with dilution probes” that have “undemonstrated reliability.”<sup>21</sup> DEQ should review the 1999 CARB Guidelines and other available critiques of the 1995 Protocol and make adjustments to the fugitive emissions factors as necessary.

Third, DEQ’s use of the marketing terminal emissions factors from the 1995 Protocol is inconsistent with its own internal management directive, *Emission Factor Guidance for NSR Regulated Pollutants*.<sup>22</sup> For example:

- The data compilation reflected in the 1995 Protocol does not fit within the “presumptive hierarchy of the types of information that should best approximate actual emissions” and thus should not be used as the basis for developing emissions estimates at the Zenith Facility.<sup>23</sup>
- DEQ has ignored the fact that Zenith will likely have “different emissions based on changes to raw materials, products or operating conditions,”—e.g., handling of crude oil vs. naphtha vs. jet fuel—and thus “emission factors may be needed for each operating condition. This would require establishing multiple emission factors and tracking the amount of time operated under each process/product.”<sup>24</sup>
- DEQ has ignored the requirement to develop “additional technical support or source test data” for the emission factors derived from the 1995 Protocol because they are “inappropriate or invalid[.]”<sup>25</sup>
- DEQ failed to require sufficient source test data to support the VOC emissions factors, given that the factors in the 1995 Protocol are of “poor quality” and are not “representative of the current configuration of” the piping at the Zenith Facility.<sup>26</sup>

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<sup>20</sup> California Air Pollution Control Officers Association/California Air Review Board, *California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities* (Feb. 1999) (“1999 CARB Guidelines”) at 2.

<sup>21</sup> *Id.* at 2–3.

<sup>22</sup> DEQ, *Emission Factor Guidance for NSR Regulated Pollutants* (June 2024) (“Emissions Factor IMD”).

<sup>23</sup> *Id.* at 5.

<sup>24</sup> *Id.* at 6.

<sup>25</sup> *Id.*

<sup>26</sup> *Id.* at 9.

- DEQ failed to “evaluate” the “applicability and quality of the published emission factors” found in the 1995 Protocol before using them as the basis for the Zenith Facility’s VOC PSEL.<sup>27</sup>

For these reasons, DEQ’s conclusion that the Zenith Facility is a “marketing terminal” and its reliance on EPA’s 1995 Protocol for the emissions factors for Zenith’s piping components were flawed and led to an underestimation of the Facility’s potential to emit VOCs.

## **B. There is insufficient support for DEQ’s assumed Naphtha vapor pressure.**

As Dr. Sahu explains, DEQ assumed a Reid Vapor Pressure (RVP) of 5.0 psi for renewable naphtha at the Zenith Facility when calculating fugitive VOC emissions.<sup>28</sup> But there are no data to support such a low RVP.<sup>29</sup> Because higher RVP lead to higher fugitive VOC emissions, DEQ’s assumption matters, especially because there is so little margin for the Zenith Facility’s VOC emissions.

The Draft ACDP recognizes that the RVP of liquids handled at the Zenith Facility will not be a constant 5.0 psi, but rather will vary depending on the liquid.<sup>30</sup> Given such variability it is incumbent upon DEQ to require additional data to support the assumed fugitive VOC emissions from naphtha handling. Other state agencies such as those in California, by contrast, correctly require additional data, often including the true vapor pressure (TVP) of fuels and other liquids, when determining fugitive emissions for air permitting purposes:

Regardless of the method used to ascertain the emission rate from tanks with vapor control, when applications to modify organic liquid storage tanks are submitted the District may **require information on** the service, throughput, and **true vapor pressure** of liquids stored in tanks. While this information generally will not be specified on the permit, it may be used to determine when proposed changes at a stationary source result in a NSR Modification due a change in the method of operation.<sup>31</sup>

Here, because the assumptions underlying the vapor pressure of the naphtha to be handled at the Zenith Facility are based on a single unverified data point, further analysis by DEQ is required before the ACDP can be issued.

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<sup>27</sup> *Id.* at 9.

<sup>28</sup> Technical Comments at 8.

<sup>29</sup> *See id.*

<sup>30</sup> *See* ACDP at 11, Condition 3.3(a) (requiring VOC controls when “loading out any volatile organic liquid with a Reid vapor pressure of 27.6 kPa (4.0 psi) or more from rail and truck” emissions sources).

<sup>31</sup> San Joaquin Valley Air Pollution Control District, *Procedures for Quantifying Fugitive VOC Emissions At Petroleum and SOCMF Facilities* (Sept. 15, 2005) at 10 (emphasis added).

**C. DEQ failed to include uncaptured loading emissions from its VOC emissions calculations.**

As noted by Dr. Sahu, DEQ also failed to include uncaptured loading emissions of VOC in the emissions calculations for the Zenith Facility.<sup>32</sup> This error was presumably based on the unsupported assumption that there will be no such emissions because the permit requires all equipment used in Zenith’s liquid product loading operations to be “leak free and vapor tight.”<sup>33</sup>

DEQ’s own regulations recognize that there can, and likely will, be some VOC emissions from a source or operation that is “vapor tight.” That phrase is defined as a condition that exists where the concentration of VOC that “does not exceed 10,000 ppm (expressed as methane) above background” when measured one centimeter from the source.<sup>34</sup> In other words, a source can meet DEQ’s definition of “vapor tight” even if it has emissions that cause an increase in the concentration of VOC of 9,999 ppm above background. Notably, DEQ’s definition of “vapor tight” differs from other agencies that have a much more stringent definition.<sup>35</sup>

DEQ’s apparent determination that there will be no uncaptured loading emissions of VOC at the Zenith Facility thus cannot be squared with the agency’s own regulatory definition of “vapor tight.” It bears noting that an increase of 9,999 ppm of VOC is a significant increase, and if such emissions occur simultaneously from multiple loading components at the Zenith Facility it will likely result in VOC emissions greater than 40 tpy.

**D. There is insufficient support for DEQ’s assumption that the vapor control unit has or will achieve 99.8% control efficiency.**

As Dr. Sahu also explains, DEQ accepted Zenith’s assumed control efficiency of 99.8% for the vapor control unit (VCU) without any support or verification.<sup>36</sup>

As DEQ recognizes, the actual control efficiency of the VCU can vary depending on a number of variables—and indeed the Zenith VCU’s control efficiency is anything but certain.<sup>37</sup> DEQ notes that the emissions test performed in December 2022 are unreliable because “the inlet

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<sup>32</sup> Technical Comments at 9.

<sup>33</sup> ACDP at 10, Condition 3.1(d)(i).

<sup>34</sup> OAR § 340-232-0030(65).

<sup>35</sup> See South Coast Air Quality Mgmt. Dist. Rule 1178(c)(44) (defining “vapor tight” as “a condition that exists when the reading on a portable hydrocarbon analyzer is less than 500 parts per million (ppm), expressed as methane, above background, measured using EPA Reference Method 21.”); Del. Code Ann. 22a-174-20(a)(1)(R) (defining “vapor-tight” as meaning “not capable of allowing the passage of gases at the pressures encountered.”).

<sup>36</sup> Technical Comments at 9–10.

<sup>37</sup> See, e.g., Draft ACDP at 29, Condition 9.4 (permitting Zenith to “use 95% or the value determined during the most recent approved stack test” when calculating the VCU’s control efficiency for PSEL compliance purposes); *id.* at 31, Condition 10.1(c) (recognizing the possibility that stack tests may show that the VCU’s control efficiency is actually “less than 99%”).



was not tested according to the approved test method (EPA Method 25B)” and thus the unit’s VOC reported removal efficiency of > 99% is for “informational purposes only” and “cannot be used for compliance purposes.”<sup>38</sup>

## **II. The ACDP lacks enforceable provisions to ensure compliance with the PSELs.**

The Draft ACDP includes various PSEL “compliance demonstration” conditions that, as written, are insufficient to ensure that the PSELs will in fact be met. Dr. Sahu’s report explains that many of the conditions are flawed and seriously underestimate Zenith’s emissions, due to unsupported assumptions—in particular those related to VOC vapor control systems and the efficiency of the VCU.<sup>39</sup> This is, again, especially problematic for VOC emissions given the thin margin between the (too low) emissions estimates in the application and the 39 tpy PSEL.

The primary compliance demonstration method in the permit relies on emission factors, and the draft ACDP requires Zenith to use the same flawed VOC emissions factors it used to underestimate VOC emissions in the first place.<sup>40</sup> Most concerning is DEQ’s continued reliance on the marketing terminal emission factors for PIPE components in the 1995 Protocol as the basis for PSEL compliance. As discussed above, those emissions factors are suspect and must be scrutinized by DEQ. While the ACDP requires “an emission factor verification test for NO<sub>x</sub> and CO from the MVCU exhaust stack”,<sup>41</sup> it does not require the same for VOC. This failure runs counter to DEQ guidance.<sup>42</sup>

As for the VCU specifically, the ACDP is ambiguous as to the timing of the initial test under the reissued ACDP. While the ACDP appears to require testing to “determine compliance with the mass emission limitation (5.7 g/m<sup>3</sup>) or the 95% VOC reduction limit specified in condition 3.1c. . . within 24 months from the date of the most recent source test”,<sup>43</sup> the Review Report notes that the most recent test of the VCU was performed in December of 2022, more than 24 months ago.<sup>44</sup> The ACDP should be revised to require a VOC emissions test of the VCU within 6 months of permit issuance.

While the Draft ACDP notes that “[t]he PSEL is a federally enforceable limit on the potential to emit”,<sup>45</sup> the PSEL and related permit conditions lack the attributes of “practicable

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<sup>38</sup> Review Report at 30.

<sup>39</sup> See Technical Comments at 10–13.

<sup>40</sup> See Draft ACDP at 28, Condition 9.2; *id.* at 47–48, Condition 18.0.

<sup>41</sup> Draft ACDP, Condition 10.1(b).

<sup>42</sup> See DEQ Emissions Factor IMD at 2 (noting that “some emissions units may have emission rates greater than the emission factor” and that “[s]ource testing should be required to verify emission factors for larger emissions units[.]”).

<sup>43</sup> Draft ACDP at 31, Condition 10.1(a)

<sup>44</sup> Review Report at 30.

<sup>45</sup> Draft ACDP at 19.

enforceability” that would satisfy EPA guidance.<sup>46</sup> Notably, as the NSR Workshop Manual provides, all pollution control equipment with a specified efficiency level, the ACDP should include “those operating parameters and assumptions the writer should include those operating parameters and assumptions upon which the permitting agency depended to determine that controls would achieve [the] given efficiency.”<sup>47</sup>

Given these flaws, both alone and in combination with the clear under-estimation of the Zenith Facility’s likely VOC emissions discussed above, the ACDP does not reflect the Facility’s “*planned* mode of operation”<sup>48</sup> and cannot shield the Facility from major source status.

DEQ should incorporate the Review Report into the body of the permit to ensure that it is enforceable.<sup>49</sup> As currently written, the ACDP and its conditions are enforceable, but the Review Report is not. This leaves out many crucial details, such as the specific counts of piping components covered by the ACDP, and renders them unenforceable.

### **III. DEQ should deny Zenith’s application based on its history of noncompliance and because the facility presents a serious danger to public health, safety, and the environment.**

DEQ has authority to revoke an ACDP based on noncompliance or violation.<sup>50</sup> DEQ may also “revoke or refuse to renew” an ACDP “[i]f DEQ finds there is a serious danger to the public health, safety or the environment caused by a permittee’s activities.”<sup>51</sup> DEQ may also deny Zenith’s ACDP application on these grounds. Zenith’s ACDP is effectively a “renewal” because it replaces the permit Zenith currently operates under. Additionally, DEQ’s authority to deny a permit application on the grounds listed in OAR 340-216-0082(4)(a) and (b) is implied by the regulations. If DEQ could not consider a permittee’s past compliance or dangerous activities in a new permit, entities could evade DEQ’s authority to revoke an existing permit by applying for a new permit. DEQ should deny the permit based on Zenith’s extensive history of noncompliance and the danger Zenith presents to public health, safety, and the environment.

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<sup>46</sup> See EPA, *Draft New Source Review Workshop Manual* (Oct. 1990) (“NSR Workshop Manual”).

<sup>47</sup> *Id.* at c.5.

<sup>48</sup> *Id.* at c.6 (emphasis in original).

<sup>49</sup> Technical Comments at 10.

<sup>50</sup> OAR § 340-216-0082(4)(a).

<sup>51</sup> OAR § 340-216-0082(4)(b).

### A. DEQ should deny the permit based on Zenith's history of noncompliance.

Since arriving in Portland in 2017, Zenith has accumulated roughly 20 violations from DEQ.<sup>52</sup> These violations range from failing to notify DEQ of tank startup, to installing unauthorized infrastructure to handle additional fossil fuels. To name a few:

- In 2018, Zenith submitted a Notice of Construction to construct 32 new rail car off-loading stations, assuring DEQ that the new infrastructure would result in “no new throughput.”<sup>53</sup> Zenith significantly increased throughput each year and plans to significantly increase throughput in the future.<sup>54</sup>
- From November 2018 to December 2022, Zenith failed to submit a required test of its marine vapor control unit, to demonstrate whether it was effectively capturing air pollution.
- In October 2018, Zenith stored volatile liquid products in multiple fixed roof storage tanks, instead of the required floating-roof tanks that provide better pollution control.
- In 2019, Zenith failed to conduct a proper spill drill—using diesel fuel instead of the heavier and more hazardous tar sands oil that Zenith was handling at the time.<sup>55</sup>
- In 2020, Columbia Riverkeeper and Willamette Riverkeeper sent a Notice of Intent to sue Zenith for violating its Construction Stormwater permit.<sup>56</sup> In 2021, Zenith settled and agreed to pay \$115,000 to the Bird Alliance of Oregon in lieu of civil penalties.

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<sup>52</sup> Kate Murphy, *Bad News, Turns Out Zenith's Legacy of Lies and Violations is Worse Than We Realized.*, Columbia Riverkeeper (Nov. 7, 2024), <https://www.columbiariverkeeper.org/2024/zenith-energys-legacy-of-violations-and-lies/>.

<sup>53</sup> DEQ, Zenith Energy Off-Permit Change Notification (July 27, 2018), <https://www.columbiariverkeeper.org/wp-content/uploads/2024/11/Zenith-Off-Permit-Change-Notification-no-new-throughput-doc.pdf>.

<sup>54</sup> Gosia Wozniacka, *Zenith Energy is moving more crude, diesel through Portland*, The Oregonian (Feb. 22, 2023), <https://www.oregonlive.com/environment/2023/02/zenith-energy-is-moving-more-crude-diesel-through-portland.html>. While DEQ has not issued a violation for this, we include it because it demonstrates Zenith's comfort with misleading regulators. *See also* Gordon R. Friedman, *Portland's mayor's staff left believing false information after briefing by oil terminal execs, notes indicate*, The Oregonian (updated Sept. 5, 2019), <https://www.oregonlive.com/portland/2019/08/portland-oil-terminal-execs-gave-mayors-staff-false-information.html>.

<sup>55</sup> Gordon R. Friedman, *Oregon exporter dodged crude oil spill preparedness drill*, The Oregonian (updated May 7, 2019), <https://www.oregonlive.com/portland/2019/04/oregon-exporter-dodged-crude-oil-spill-preparedness-drill.html>.

<sup>56</sup> Cassandra Profita, *Groups threaten to sue Portland oil terminal owner*, OPB (Jan. 11, 2021), <https://www.opb.org/article/2021/01/11/portland-oregon-zenith-energy-oil-lawsuit/>.

The most egregious: Zenith’s installation of piping infrastructure to facilitate fossil fuel shipment to a separate dock, without permission from DEQ.<sup>57</sup> This unauthorized use went undetected by DEQ for over two and a half years. Community members learned about the violation through a records request, and pushed DEQ to look into the matter further.<sup>58</sup> DEQ’s investigation resulted in a fine for operating at a neighboring dock without authorization under Zenith’s air permit.<sup>59</sup> Now, DEQ proposes to write this use into the new air permit.

DEQ would be entirely justified to deny Zenith’s permit based on former noncompliance and violations. Granting Zenith’s permit after this track record would send a signal to industrial polluters that DEQ is willing to issue violation after violation with no real consequence. If DEQ does not have the resources to investigate *known* violations,<sup>60</sup> how can it ensure that Zenith will comply with its new permit? Zenith has demonstrated its preference to act first, and ask permission later—this is not how the law works, and DEQ should not reward this behavior by issuing a permit with less inspection and reporting requirements.

## **B. Zenith presents serious danger to public health, safety, and the environment.**

Zenith’s fuel terminal operations are inherently dangerous—liquid fuels can ignite, explode, spill into waterways, and create air pollution that is harmful to human health. Zenith is sited in the Critical Energy Infrastructure (CEI) Hub, which houses over 90% of the liquid fuel in Oregon and sits atop unstable soil that will liquify in the event of an earthquake.<sup>61</sup> The risk of an accident, spill, or major infrastructure failure in this location is well-documented, and amplified due to its proximity to the Willamette River and dense urban population.<sup>62</sup> Unfortunately, train

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<sup>57</sup> Gosia Wozniacka, *Controversial air permit for Zenith Energy will undergo Oregon review process*, The Oregonian (updated Oct. 11, 2024), <https://www.oregonlive.com/environment/2024/10/controversial-air-permit-for-zenith-energy-will-undergo-o-oregon-review-process.html> ; <https://www.oregon.gov/deq/Programs/Documents/zenithInspect1124.pdf>.

<sup>58</sup> Gosia Wozniacka, *State puts hold on Zenith Energy’s controversial air permit process in surprise move*, The Oregonian (updated Nov. 15, 2024), <https://www.oregonlive.com/environment/2024/11/state-puts-hold-on-zenith-energys-controversial-air-permit-process-in-surprise-move.html> (“This is a complete result of the public process. We’re very proud of our community for bringing questions up that pushed us to investigate further,” said Lisa Ball, DEQ air quality permit manager.).

<sup>59</sup> DEQ, *supra* note 4, <https://apps.oregon.gov/oregon-newsroom/OR/DEQ/Posts/Post/DEQ-continues-pause-of-Zeniths-air-quality-permitting-process-issues-penalty>.

<sup>60</sup> DEQ admitted that it did not conduct an investigation earlier “because the agency is understaffed due to limited funding.” Wozniacka, *supra* note 48, <https://www.oregonlive.com/environment/2024/11/state-puts-hold-on-zenith-energys-controversial-air-permit-process-in-surprise-move.html>.

<sup>61</sup> Multnomah County Office of Sustainability, CEI Hub Seismic Risk Analysis (Feb. 26, 2025), <https://multco.us/info/cei-hub-seismic-risk-analysis>.

<sup>62</sup> *Id.*

derailments are not uncommon, and present the risk of catastrophic environmental damage. After the 2016 Mosier oil train derailment and fire<sup>63</sup> the Columbia River Inter-Tribal Fish Commission aptly noted, “[t]he accident is a reminder that we should be reducing, not increasing the number of oil and coal trains along the river.”<sup>64</sup>

For purposes of environmental and safety risks, Zenith’s commitment to replace crude oil throughput with renewable naphtha is not an improvement. When compared to renewable diesel and crude oil, renewable naphtha is more flammable, increasing the risk and consequences of explosions and flashbacks—events where vapors are heavier than air and spread near the ground, travel a considerable distance to a source of ignition, and flash back.<sup>65</sup> In 2022, a naphtha release at an Ohio refinery caused a vapor cloud that ignited, killing two employees and resulting in \$597 million in property damage.<sup>66</sup> In 2023, a smoke plume from a naphtha leak and ignition exposed Louisiana communities in Cancer Alley to high levels of PM 2.5 and benzene.<sup>67</sup> In 1999, an earthquake in Turkey caused a naphtha tank farm fire sparked by the collision of a floating roof seal against a tank wall.<sup>68</sup> Has DEQ assessed the public health and safety risks of Zenith replacing its crude oil throughput with renewable naphtha?

This permit would pave the way for Zenith to expand beyond its current capacity, by adding more unloading racks and three new pipelines. The application reveals Zenith’s intent to increase fuel throughput by nearly double its current operations after 2027.<sup>69</sup> More trucks, trains,

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<sup>63</sup> *Oil Train Derails Near Hood River*, OPB (June 3, 2016),

<https://www.opb.org/news/series/oil-trains/oil-train-derails-hood-river-mosier-school/>.

<sup>64</sup> Press Release, Columbia River Inter-Tribal Fish Commission, Mosier Oil Train Derailment Statement, <https://critfc.org/press-releases/mosier-oil-train-derailment-statement/>.

<sup>65</sup> *Compare Safety Data Sheet: Crude Oil*, Valero,

[https://www.valero.com/sites/default/files/2019-12/sds\\_us\\_-\\_501\\_ghs\\_-\\_crude\\_oil\\_rev1\\_0.pdf](https://www.valero.com/sites/default/files/2019-12/sds_us_-_501_ghs_-_crude_oil_rev1_0.pdf) and *Safety Data Sheet: Renewable Diesel*, Renewable Energy Group,

[https://www.regi.com/filesimages/SDS%20Sheets/SDS\\_400-US%20Renewable%20Diesel%20SDS%202020414.pdf](https://www.regi.com/filesimages/SDS%20Sheets/SDS_400-US%20Renewable%20Diesel%20SDS%202020414.pdf), with *Safety Data Sheet: Renewable Naphtha*, Valero,

<https://www.valero.com/sites/default/files/valero-documents/Renewable-Naphtha-US-English-959013.pdf> (showing renewable naphtha is in the highest hazard class for flammable liquids).

<sup>66</sup> *Fatal Naphtha Release and Fire at BP-Husky Toledo Refinery*, U.S. Chemical Safety and Hazard Investigation Board (June 2024), [https://www.csb.gov/assets/1/6/final\\_report\\_-\\_20241.pdf](https://www.csb.gov/assets/1/6/final_report_-_20241.pdf).

<sup>67</sup> *Chemical Fire at Marathon Refinery*, Forensic Architecture (Sept. 9, 2024),

<https://forensic-architecture.org/investigation/chemical-fire-marathon-refinery> (“PM 2.5 is a particularly dangerous form of fine airborne particle, both odourless and invisible to the naked eye. Exposure to PM 2.5 has been linked to cardiovascular, neurological and respiratory impacts and is a likely human carcinogen. Even short-term exposure of up to 24 hours has been associated with premature mortality. . . . Benzene, meanwhile, is a human carcinogen. Short term exposure impacts the respiratory system, while long term exposure is linked to a significant increase in cancer risk, particularly leukaemia.”).

<sup>68</sup> Peter Dusicka & Gregory Norton, *Liquid Storage Tanks at the Critical Energy Infrastructure (CEI) Hub: Seismic Assessment of Tank Inventory*, Portland Bureau of Emergency Management (May 2019) at 7, <https://efiles.portlandoregon.gov/record/15379924/file/document>.

<sup>69</sup> See Zenith Energy 2024 Annual Report at Table 7-1 (showing 385,193,042 gallons of crude and diesel throughput in 2024); Zenith Energy ACDP Application at Table 3-7 (showing 746,901,960 gallons of distillates and renewable naphtha throughput post-2027, converted from bbl/year).

and ships create more opportunities for leaks, spills, and fires at the CEI hub. Zenith's history of noncompliance intensifies these risks, resulting in an unacceptable danger to public health, safety, and the environment.

#### **IV. Miscellaneous issues DEQ should consider.**

##### **A. DEQ is likely underestimating Zenith's HAPs emissions.**

As Dr. Sahu notes in his Technical Comments, some of the VOCs emitted at the Zenith Facility are also HAPs.<sup>70</sup> Because Zenith has grossly underestimated its potential to emit VOCs, it has also underestimated its potential to emit certain HAPs. Moreover, the HAP emissions estimates lack sufficient support and must be more closely scrutinized by DEQ.

##### **B. Zenith has failed to provide a breakdown of fuels in the "distillate" category.**

Since learning about Zenith's promise to end its crude oil operations by October 2027, the public has sought information regarding the other types and quantities of fuels Zenith currently handles, and will handle in the future. Zenith purports to replace its crude throughput with "renewable" fuels, but does not provide enough information about the types and quantities of fuels it will handle. Different fuels have different properties, including risk profiles and spill cleanup characteristics. For this reason, it is important for DEQ and the public to understand the types and quantities of fuel moving through Zenith's facility, as well as our communities and waterways.

Throughout the application, Zenith categorizes its terminal products into six categories, one of these being the "Distillates Category."<sup>71</sup> The distillates category includes: Biodiesel, Renewable Diesel, Ultra-low Sulfur Diesel, Jet Fuel (Jet A, Jet Kerosene), and Sustainable Aviation Fuel. Because petroleum products and renewable fuels are lumped into the same category, it is not possible to distinguish between fuel types. This undermines Zenith's purported "transition" to renewable fuel products and obscures important data points for tracking fossil fuel movement through the site.

Columbia Riverkeeper, via public records request, asked DEQ for information regarding throughput quantities for fuels in the distillate category. In response, "DEQ did not provide throughput quantities for each individual distillate because Zenith reports total throughput for the entire distillate category."<sup>72</sup> DEQ should require this information to get a full picture of Zenith's

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<sup>70</sup> Technical Comments at 1-2.

<sup>71</sup> The complete list is: Crude Oil (prior to 10/03/2027), Aviation Gasoline (Av-Gas), Distillates Category, Ethanol with up to 5% gasoline, Renewable Naphtha, and Renewable Feedstocks. Zenith Energy ACDP [Application](#), at 2-1 (Table 2-1).

<sup>72</sup> DEQ, Response to Columbia Riverkeeper's Records Request R000820-040325 ("This approach is consistent with DEQ's reporting expectations, as all distillate products have similar vapor pressures – the main property used in calculating emissions from product handling.").

past, current, and future activities. This would allow DEQ and the public to understand the risks associated with Zenith’s facility, as well as how much of the total throughput are “renewable” fuels versus fossil fuels. To be clear, Zenith’s agreement to end crude oil operations by October 2027 is not a commitment to fully transition to renewable fuels. Zenith will continue moving fossil fuel products such as petroleum diesel, aviation gasoline, and jet fuel. It is nefarious for a company claiming a “renewable fuel transition”<sup>73</sup> to obscure these details—and DEQ should not go along with it.

### **C. DEQ should not accept a “conditional” LUCS, or rely on multiple LUCS.**

As Columbia Riverkeeper raised in its April 2023 petition to the Environmental Quality Commission,<sup>74</sup> DEQ’s acceptance of the 2022 conditional LUCS presents enforceability<sup>75</sup> issues and makes it difficult to ensure that DEQ and the City of Portland are on the same page regarding Zenith’s activities. By accepting a conditional LUCS, DEQ must now spend additional resources cross-checking the permits for consistency and communicating with City officials to avoid permitting activities that are not allowed on the LUCS. It would be a tremendous burden for DEQ to allow and enforce special LUCS conditions for all industrial polluters. This also complicates transparency—it is much more difficult for the public to understand what is being proposed and engage effectively with these processes.

To complicate matters further, DEQ relies on three separate LUCS for the air permit.<sup>76</sup> This piecemeal approach allows—and encourages—Zenith to obtain permission for parts of its expansion without presenting the entire picture to regulators and the public. For example, the air permit authorizes four new railcar unloading racks as “future projects.”<sup>77</sup> These additional unloading racks will facilitate Zenith’s growth in fuel throughput by allowing Zenith to unload more fuel at any given time.<sup>78</sup> The 2025 LUCS states: “No new storage tanks or rail racks (whether for fossil fuels, renewable fuels, or non-fuel products) are proposed in connection with this LUCS application.”<sup>79</sup> However, the 2022 conditional LUCS contains a footnote attached to identical language claiming the future rail racks were approved in Zenith’s 2021 LUCS for

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<sup>73</sup> *Portland Terminal*, Zenith Energy, <https://www.zenithterminals.com/terminals/portland-terminal>.

<sup>74</sup> Petition for Declaratory Ruling from Northwest Environmental Defense Center at al. to the Environmental Quality Commission (Apr. 8, 2024).

<sup>75</sup> Columbia Riverkeeper supports DEQ’s inclusion of the LUCS conditions into the air permit as special conditions.

<sup>76</sup> Zenith’s three permits are: PR 20-179970 LUCS (Apr. 16, 2021); PR 22-182133 LUCS (Oct. 3, 2022); PR 24-105576 LUCS (Feb. 3, 2025). City of Portland, Office of the City Attorney, Records Request Center, [https://portlandor.govqa.us/WEBAPP/\\_rs/\(S\(evv3iyvikvhdchvpi2lkr2t0\)\)/BusinessDisplay.aspx?sSessionID=&did=35&cat=0](https://portlandor.govqa.us/WEBAPP/_rs/(S(evv3iyvikvhdchvpi2lkr2t0))/BusinessDisplay.aspx?sSessionID=&did=35&cat=0).

<sup>77</sup> See DEQ, Zenith Energy Draft ACDP Permit (May 9, 2025) at 5 (listing these new tracks as TRACK\_RC\_4, 5, 6, & 7).

<sup>78</sup> Even if these new racks are limited to non-fossil fuel products, the addition of new racks frees up existing unloading racks for fossil fuels.

<sup>79</sup> Zenith Energy [2025 LUCS](#) at 1.



non-fossil fuel infrastructure.<sup>80</sup> At best, this approach is confusing. At worst, it enables Zenith to obscure its operations by burying information in multiple documents, over the course of several years.

## V. Conclusion

DEQ's ongoing support of Zenith and willingness to invest countless hours of staff time into ensuring Zenith's continued operation seriously undermine DEQ's mission: "to be a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water." At a time when federal environmental protections are under attack, Oregonians look to DEQ to stand firm against polluters—especially ones that violate the law. We urge DEQ to deny Zenith's ACDP permit and restore public confidence in Oregon's commitment to clean air.

Sincerely,



Audrey Leonard

Staff Attorney, Columbia Riverkeeper



Jamie Saul

Executive Director, Wild & Scenic Law Center

cc: [leah.feldon@deq.oregon.gov](mailto:leah.feldon@deq.oregon.gov); [david.graiver@deq.oregon.gov](mailto:david.graiver@deq.oregon.gov);  
[michael.loch@deq.oregon.gov](mailto:michael.loch@deq.oregon.gov); [councilor.pirtle-guiney@portlandoregon.gov](mailto:councilor.pirtle-guiney@portlandoregon.gov);  
[R10\\_Air\\_Permits@epa.gov](mailto:R10_Air_Permits@epa.gov); [Meyer.Dan@epa.gov](mailto:Meyer.Dan@epa.gov)

## Attachments:

Technical Comments on the Proposed DEQ ACDP Permit No: 26-2025-ST-1 for the Zenith Energy Terminals Holdings, LLC, by Dr. Ranajit (Ron) Sahu

## Folder: Sources Cited in Columbia Riverkeeper's Comments

- American Petroleum Institute, *Development of Fugitive Emission Factors and Emission Profiles for Petroleum Marketing Terminals, Volumes I and II*, API 4588, Radian Corporation (1993)

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<sup>80</sup> Zenith Energy 2022 LUCS at 2 n. 2 ("The City previously issued PR 20-179970 LUCS for new rail racks at the site to support bulk distribution of renewable fuels and non-fuel products.").



- California Air Pollution Control Officers Association/California Air/California Air Resources Board, *California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities* (Feb. 1999) (“1999 CARB Guidelines”)
- California Air Resources Board, Rule 462 (1999)
- DEQ, *Emission Factor Guidance for NSR Regulated Pollutants* (June 2024) (“Emissions Factor IMD”)
- EPA, *1995 Protocol for Equipment Leak Emission Estimates* (Nov. 1995) (EPA-453/R-95-017) (“1995 Protocol”)
- EPA, *Control of Volatile Organic Compound Leaks from Petroleum Refinery Equipment* (June 1978)
- EPA, *Draft New Source Review Workshop Manual* (Oct. 1990) (“NSR Workshop Manual”)
- EPA, *EPCRA Guidance for Petroleum Bulk Storage Facilities* (Oct. 1997)
- EPA, *Memorandum: Guidance on Limiting Potential to Emit in New Source Permitting* (June 13, 1989)
- South Coast Air Quality Mgmt. Dist., *Guidelines for Reporting VOC Emissions from Component Leaks* (Feb. 2015)
- South Coast Air Quality Mgmt. Dist., Rule 1178(c)(44)

# **Technical Comments on the Proposed DEQ ACDP Permit No: 26-2025-ST-1 for the Zenith Energy Terminals Holdings, LLC (“Zenith”)**

**by**

**Dr. Ranajit (Ron) Sahu, Consultant<sup>1</sup>**

## **A. Introduction**

I provide technical comments on this draft permitting action<sup>2</sup> based on my review of the permitting record including the various documents cited in these comments as well as others that I have considered and relied upon and based on my over thirty-five years of air pollution consulting experience, including almost thirty years of work in Oregon for a range of clients including Oregon Governmental entities, industrial sources and various community groups and non-governmental organizations.

My technical comments are not exhaustive. They do not address every short-coming or deficiency in the record. I have selected my comments based on materiality – i.e., to highlight those issues where the deficiency is material and should therefore either be corrected or for which the DEQ has to provide a sound and technically-supported basis for its position.

## **B. Summary**

As noted in the DEQ’s Review Report accompanying this permit as well as the permit application submitted by the Applicant (“Application”),<sup>3</sup> the DEQ is proposing to issue a non-major source air permit (i.e., the ACDP) to this applicant to permit the release of numerous air pollutants including hazardous air pollutants (HAPs) as a result of its receipt, storage, and transloading of various hydrocarbon products into marine vessels.

In particular, the applicant has requested and DEQ proposes to grant this facility a Plant Site Emission Limit (PSEL) for VOCs of 39 tons per year,<sup>4</sup> which is just below the 40 tons per year threshold for a non-Federal major source for purposes of the New Source Review (NSR)/Prevention of Significant Deterioration (PSD) air permitting program in Oregon. Similarly, considering that some of these VOCs are also HAPs, DEQ is determining that the potential HAP

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<sup>1</sup> Resume provided in Attachment A.

<sup>2</sup> My comments address the April 7, 2025 draft of the ACDP and accompanying Review Report.

<sup>3</sup> Bridgewater Group Inc., Application for a Standard Air Contaminant Discharge Permit, Zenith Energy Terminal Facility, Portland Oregon, November 11, 2022. Hereafter “Application.”

<sup>4</sup> Draft Permit, Condition 8.1.

emissions from operations will not exceed the respective major source of HAPs (i.e., 10 tons per year of any single HAP and/or 25 tons per year for all HAPs that can be emitted) – again, making this facility a minor source of HAP emissions.

Both of these determinations, i.e., for VOCs and HAPs, are not technically supported. For VOCs in particular, given the non-existent margin between the PSEL of 39 tons per year and the non-Federal major source threshold of 40 tons per year in Oregon, even a small error in underestimating the VOC PSEL will catapult the facility into non-Federal major source status. As these comments show, there are numerous plausible reasons why VOC emissions from operations covered by this permitting action have been most certainly underestimated. While any one of these reasons would be sufficient to call into question the 39 tons per year PSEL, there is no doubt that the collective result of all of the various underestimations means that this facility should be classified as a non-Federal major source.

For HAPs, while the current HAP estimates leave more margin between the 10/25 tons per year major source thresholds,<sup>5</sup> the current estimates are not properly supported and need to be reassessed, in light of the underestimated VOC emissions. I cannot rule out the possibility that this facility would also be a major source of HAP emissions in addition to being a non-Federal major source of VOC emissions. This is a consequential issue since, as the DEQ's own Review Report notes, by escaping major HAP source status, at least three additional applicable federal regulations do not apply to this facility which otherwise should.<sup>6</sup>

Finally, as a conceptual matter, I note in these introductory remarks that establishing a PSEL of 39 tons per year when the non-Federal major source threshold is 40 tons per year logically implies that the permit should contain requirements such as:

- continuous monitoring;
- testing;
- verification of assumed emission factors;
- verification of assumed emissions calculation methodologies;
- verification of assumptions for control device efficiency on a continuous basis;
- verification of the assumption that 100 percent of loading VOCs will be captured; and
- verification of VOC emissions from the thousands of fugitive VOC sources including those that may be leaking; etc.

to ensure that the applicant/operator can, in fact, demonstrate that its VOC emissions are accurate and precise such that that can be as great as 39 tons per year but no greater. Unfortunately, the ACDP contains no such assurances. In fact Condition 8.3, for example, requires that same emission factors used to calculate the PSEL be used to demonstrate compliance with the PSEL – a circular argument that conveniently avoids any mention of the accuracy of the emissions factors

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<sup>5</sup> Per the Review Report, paragraph 34, the Potential to Emit for toluene (the single highest HAP) was 2.41 tons per year while the Potential to Emit for all HAPs was 10.18 tons per year. Neither of these estimates are properly supported as I note later in my comments.

<sup>6</sup> See paragraphs 49, 50, and 51 in the Review Report. The avoided Federal regulations include 40 CFR 63 Subpart R, 40 CFR 63 Subpart Y, and 40 CFR 63 Subpart EEEE.

and assumptions in Condition 8.3 and Condition 18 referenced in it. Yet, that accuracy demonstration is crucial because the PSEL of 39 tons per year is an absolute limit that cannot be exceeded.

Thus, the PSEL of 39 tons per year is based on nothing more than a belief in the accuracy of the emissions calculations – with no basis whatsoever; and, in fact, evidence to the contrary.

After discussing the VOC (and HAP) emissions shortcomings, I do briefly address some specific issues in the proposed ACDP and Review Report at the end.

### C. Reasons the VOC PSEL Has Been Dramatically Underestimated

As noted prior, the draft permit has justified issuing an ACDP instead of a non-Federal major source permit for the Zenith facility because the facility has proposed (and DEQ has accepted) that its VOC PSEL in the future will be 39 tons per year, which is barely below the non-Federal major source threshold of 40 tons per year in Oregon.

Before I discuss multiple reasons why the 39 tons per year VOC PSEL is dramatically underestimated (and, frankly, it does not have to be dramatically underestimated since even a bare underestimate would put the facility over the 40 tons per year non-Federal major source threshold), it is worth excerpting the prior VOC emissions estimates prepared for the facility, for context.

First, paragraph 25 from the Review Report, excerpted below shows that VOC emissions from the facility even in the last two years shown (i.e., 2023 and 2022) were greater than 40 tons per year. And even greater than that in 2018 for example. The old asphalt refinery was not operational in any of these years.

25. Actual annual emissions (in tons) from Zenith since 2018 are included in the table below:

Pollutant	2018	2019	2020	2021	2022	2023
PM	0.05	0.05	0.05	0.08	0.09	0.10
PM <sub>10</sub>	0.05	0.05	0.05	0.08	0.09	0.10
PM <sub>2.5</sub>	NR	NR	NR	NR	NR	NR
CO	1.16	1.60	1.63	13.9	5.45	6.09
NO <sub>x</sub>	3.33	1.90	1.94	3.39	3.44	3.89
SO <sub>2</sub>	0.03	0.03	0.03	0.17	0.17	0.19
VOC	69.72	20.5	25.2	33.0	49.5	43.1
GHG	1,848	6,000	5,747	4,445	4,515	5,103
H <sub>2</sub> S	0	0	0	0	0	0.22

- a. Zenith was not required to report PM<sub>2.5</sub> emissions as part of their existing Title V Permit.

Next, I show below the VOC emissions from the 2024 Annual Report below. It was over 43 tons per year for VOCs.

Zenith Energy Terminals Portland  
VOC Plant Site Emission Summary  
Summary Permit No. 26-2025

PSEL = 89.5 tons/year (reduced from 179 tpy by LUCS Notice of Decision from City of Portland)

Month	Year	BOILER FURNACE	TRACK	OIL/W	FGTVOC	FW	FIXTANK, EXTANK, INTANK	MLOAD	Total Monthly VOC	Rolling 12- month VOC
		(tons/month)	(tons/month)	(tons/month)	(tons/month)	(tons/month)	(tons/month)	(tons/month)	(tons/month)	(tons/year)
January	2024	0.0126	0.0179	0.0273	2.20	0.00	0.84	0.210	3.31	43.23
February	2024	0.0086	0.0211	0.0045	2.06	0.00	0.85	0.181	3.13	43.26
March	2024	0.0056	0.0214	0.0096	2.20	0.00	0.99	0.161	3.38	43.47
April	2024	0.0036	0.0372	0.0056	2.13	0.10	0.96	0.185	3.42	43.69
May	2024	0.0029	0.0490	0.0042	2.20	0.05	1.18	0.224	3.71	43.55
June	2024	0.0020	0.0608	0.0000	2.13	0.00	1.34	0.192	3.73	43.03
July	2024	0.0035	0.0773	0.0000	2.20	0.00	1.64	0.270	4.19	42.98
August	2024	0.0020	0.0759	0.0000	2.20	0.00	1.54	0.221	4.04	42.76
September	2024	0.0023	0.0482	0.0000	2.13	0.21	1.36	0.247	3.99	42.72
October	2024	0.0042	0.0356	0.0000	2.20	0.33	1.09	0.343	4.01	43.02
November	2024	0.0046	0.0144	0.0061	2.13	0.00	0.78	0.264	3.21	42.95
December	2024	0.0035	0.0119	0.0191	2.20	0.00	0.69	0.126	3.05	43.16
Annual Total		0.0555	0.471	0.076	25.98	0.697	13.26	2.62	43.16	--
Annual Maximum		--	--	--	--	--	--	--	--	43.69

In fact, setting aside the smaller contributors, as calculated by the company itself, the two largest components of the VOC emissions in the 2024 report (as well as prior reports) are Fugitive Emissions from the many components at the facility (which will increase as part of the ACDP) – with almost 26 tons per year in 2024; and emissions from the storage tanks – with more than 13 tons per year in 2024.

With this context, I next show the estimate of the future VOC PSEL as estimated in the Application. It was done for two scenarios: for crude oil loading (excerpted as Table 3-10 from the Application), which will be phased out after October 3, 2027 and then for renewable naphtha loading (excerpted as Table 3-11 from the Application), which will continue long term.

**Table 3-10 Terminal Emissions Summary- Prior to Oct. 3, 2027 (tons/yr)**

Source	VOC	NOx	CO	SO2	PM/PM10/ PM2.5	Anthropogenic GHG CO2e	H2S	Combined Total HAPs	Largest Individual* HAP
Tanks (EXTANK/INTANK/FIXTANK)	27.32						0.10	7.22	1.77
Truck & Rail Loading Racks (TRACK)	1.62							0.03	0.02
Marine Loading (MLOAD)	3.87						0.01	1.03	0.23
Fugitive Equipment Leaks (FGTVOC)	2.54						0.01	0.86	0.18
Oil/Water Separators (OIL/W)	2.78							0.94	0.19
Marine VCU (MVCU)	0.02	4.76	6.34	0.21	0.08	4,267		0.004	0.001
Boiler (B4)	0.40	7.19	6.04	0.19	0.18	8,578		0.01	0.003
Boiler (B5)	0.40	7.21	6.06	0.19	0.18	8,609		0.01	0.003
Heater (F2)	0.35	6.44	5.41	0.17	0.16	7,687		0.01	0.002
Facility Total	39.28	25.60	23.85	0.75	0.60	29,141	0.13	10.11	2.40

\* Toluene

**Table 3-11 Terminal Emissions Summary- On and After Oct. 3, 2027 (tons/yr)**

Source	VOC	NOx	CO	SO2	PM/PM10 /PM2.5	Anthropogenic GHG CO2e	Combined Total HAPs	Largest Individual* HAP
Tanks (EXTANK/INTANK/FIXTANK)	26.42						1.41	0.88
Truck & Rail Loading Racks (TRACK)	2.04						0.04	0
Marine Loading (MLOAD)	4.10						0.18	0.11
Fugitive Equipment Leaks (FGTVOC)	2.54						0.13	0.13
Oil/Water Separators (OIL/W)	2.78						0.14	0.14
Marine VCU (MVCU)	0.02	4.92	6.56	0.01	0.08	578	0.004	0.0002
Boiler (B4)	0.40	7.19	6.04	0.19	0.18	8,578	0.01	0.0005
Boiler (B5)	0.40	7.21	6.06	0.19	0.18	8,609	0.01	0.0005
Heater (F2)	0.35	6.44	5.41	0.17	0.16	7,687	0.01	0.0004
<b>Facility Total</b>	<b>39.04</b>	<b>25.76</b>	<b>24.07</b>	<b>0.55</b>	<b>0.60</b>	<b>25,452</b>	<b>1.94</b>	<b>1.26</b>

\* Hexane

The total VOC in either case is over 39 tons per year but less than 40 tons per year. This is the basis for the PSEL of 39 tons per year (rounded down, I must add, given the calculations above in the Application).

Crucially, while the tank emissions in either Tables 3-10 or 3-11 above are around 26 to 27 tons per year (each considerably more than the 13 or so tons per year in the 2024 annual report – reflecting higher throughput volumes), the fugitive emissions estimates in Tables 3-10 or 3-11 are only 2.54 tons per year – which is less than 1/10<sup>th</sup> of the 25.98 tons per year estimated in the 2024 Annual Report. It begs the question. What changed to make the fugitive emissions go down so much. The answer is that nothing changed physically at the plant – other than that there will be more sources (components) emitting fugitive emissions in the future. Rather, the method of calculating fugitive emissions changed, resulting in this vast reduction – in two crucial ways. In the sections below, I will first examine and refute the basis of this paper-reduction of the fugitive VOC estimate. I will then discuss how even the tank emissions estimate is understated given the lack of support for the crucial input parameter, namely the vapor pressure of the renewable naphtha, which dominates the tank emissions.

I will conclude this section by then noting that in addition to these two sources of underestimation, there are additional reasons why the VOC PSEL is underestimated, including omission of uncaptured loading emissions from marine vessels and the unsupported assumption that the VCU which will control loading emissions will have an efficiency of 99.8% at all times.

#### C1. Fugitive Emissions Are Underestimated Because DEQ Mistakenly Allowed the Use of Wrong Emission Factors

As noted in the Review Report, DEQ states, as part of the piping components (PIPE) emissions calculations that “Zenith was originally permitted as an asphalt refinery so they utilized refinery emission factors....With Zenith now operating as a marketing terminal the ACDP PTE and PSEL compliance calculations utilize the marketing terminal emission factor.” I note that the source document for both the current (refinery) and proposed future (marketing terminal) fugitive

emission factors is a 1995 EPA document called “Protocol for Equipment Leak Emission Estimates, EPA-453-R-95-017.

The Review Report, in paragraph 26 states that the new emission factors “are more representative of operations at Zenith....”

DEQ is fundamentally mistaken. The Zenith facility is not a marketing terminal. As anyone with a basic understanding of how petroleum products (i.e., fuels such as gasoline, diesel, Jet fuel, etc.) are distributed in the US, marketing terminals refer to facilities, with tanks, where these products are stored prior to distribution to retail facilities. As such the 1995 source document references to emission factors for marketing terminals references these types of petroleum fuel distribution facilities – i.e., ones that store and distribute gasoline (primarily), or some diesel and aviation fuels set as various grades of Jet fuel. Crucially no marketing terminal anywhere handles crude oil or renewable naphtha – which are not fuels but rather source oils that will be converted later in refineries to fuels like gasoline, diesel, and jets.

While the Zenith facility will handle fuels (i.e., distillates, including perhaps gasoline type products), it will not distribute these distillates to retail gas stations. It is therefore not a marketing terminal. In addition, crucially, the Zenith facility will handle substantial quantities of non-fuels like crude oil in the near term and then renewable naphtha. The Application notes that roughly between 8 and 9 million barrels of crude and/or renewable naphtha will be handled at the facility.<sup>7</sup> These substances are never handled at a marketing terminal.

Thus, allowing the use of the much lower emission factors from the 1995 document for marketing terminals as opposed to the higher emission factors for refineries (which do handle and store crude oils and naphthas, like at Zenith), the DEQ wrongly and dramatically underestimates the future VOC PSEL for fugitives. Since there is simply no margin between the 39 ton per year PSEL with this inappropriate assumption and the 40 tons per year non-Federal major source threshold, the use of the refinery fugitive emission factors for all crude and naphtha piping components will dramatically increase the VOC PSEL to well over 40 tons per year.

## C2. Fugitive Emissions Are Also Understated Because They Do Not Include Far Higher Emissions from Leaking Components

Any large collection of piping components, such as the thousands of such components at the Zenith facility will have a certain number of leaking components. Fugitive emissions are far greater from such leaking components as compared to non-leaking components.

Yet, even though the Annual Reports, including the most recent 2024 Annual Report accepts that some of these components could be leaking,<sup>8</sup> the ACDP Application for fugitives (i.e., to support

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<sup>7</sup> Application, Table 3-3.

<sup>8</sup> See, for example, Tables 4-3 and 4-4 (see column titled “Leaking Components” in either Table)



the dramatically low 2.54 tons per year value) does not include any leaking components. The 2.54 tons per year estimate is therefore also underestimated as a result of this omission.

### C3. Tank Emissions Estimates Are Underestimated As A Result of Using A Low Vapor Pressure for Renewable Naphtha

Since renewable naphtha will be handled at the facility in the long term, I use that as an example for VOC emissions underestimation. By way of context, all other factors notwithstanding, the emissions of a volatile material depends on its vapor pressure. The higher the vapor pressure, the greater the emissions. Therefore, it is important to properly support the vapor pressure of any substance for which VOC emissions are calculated.

The record provided in support of this permitting action confirm that the Reid Vapor Pressure for naphtha used in the calculations was 5.0 psi.<sup>9</sup> See the example excerpt from the calculation spreadsheets.

Fixed Roof Temps				
		Month #	1	2
Spread Sheet Tank #	Location	Variable/Calculation	January	February
FLT - 1	Portland	P <sub>A</sub>	14.7	14.7
		Comp 1 Name	Naphtha	Naphtha
		Comp 1 Type	Refined Petroleum Stock	Refined Petroleum Stock
		Comp 2 Name		
		Comp 2 Type	#N/A	#N/A
		x <sub>1</sub>	1	1
		x <sub>2</sub>	0	0
		T <sub>LA</sub>	44.72428861	46.28075963
		RVP <sub>1</sub>	5	5
		S <sub>1</sub>	2.5	2.5

The only Safety Data Sheet (SDS) for renewable naphtha included in the Application is from a supplier, Neste. That SDS shows a vapor pressure in normal units of 18.5 kPa at 20 C. However, since the Reid Vapor Pressure is at 100 F, this value is not comparable.

I note that other suppliers of renewable naphtha report much higher than 5 psi for vapor pressure. As an example Diamond Green Diesel<sup>10</sup> reports a value of 9.5 psi at 100 F. See excerpt below.



## SAFETY DATA SHEET

### 1. Identification

Product identifier

Renewable Naphtha

<sup>9</sup> As an example, see the calculation spreadsheets. See also pdf page 1797 of 5110.

<sup>10</sup> <https://www.valero.com/sites/default/files/valero-documents/Renewable-Naphtha-US-English-959013.pdf>

### 3. Composition/information on ingredients

#### Mixtures

Chemical name	CAS number	%
Alkanes C4-9 branched and linear	2529890-37-5	≤ 100
Composition comments	All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.	
Explosive limit - upper (%)	Not available.	
Vapor pressure	9.5 psi at 100°F	
Vapor density	Not available.	

It is clear that renewable naphtha can have varying compositions, depending on supplier. And, clearly, using a higher vapor pressure of 9.5 psi as opposed to 5.0 as used in the Application, will increase calculated VOC emissions. Since the permit does not compel Zenith to either only use Neste as the renewable naphtha and nor does it have any requirement for Zenith to only handle renewable naphthas with RVPs of no more than 5.0 psi as used in its calculations, the estimated VOC emissions from the tanks using this 5.0 psi cannot be relied upon and are more likely than not to have been underestimated.

This is another reason that the 39 tons per year PSEL is underestimated.

#### C4. Uncaptured Loading Emissions from Vessels Are Not Included in the VOC Emissions Calculations

As I note in the next section, various conditions in the permit require that vessels that are loaded with products be vapor tight. This leaves the impression that when such vessels are loaded, the displaced vapors are only directed to the capture system and thence to the VCU – from the Chevron dock, where the higher vapor pressure products such as crude and naphtha are loaded. But vapor tightness does not mean that no VOCs can escape. The applicable regulations for vapor-tight vessels, simply requires that they hold pressure within a certain tolerance, and are then deemed to be vapor tight. Therefore, there is no assurance that all displaced vapors from loading will, in fact, be captured (a pre-requisite) before they are then controlled.

Any uncaptured loading emissions are, by definition, not controlled. These do not appear to have been accounted for, with any support, in the VOC PSEL calculation. As a result, the PSEL is underestimated.

#### C5. The Assumed VCU Control Efficiency of 99.8% is Not Supported

It is assumed in the calculations that all loading VOC emissions for crudes and naphthas will be captured (not true, per comment above) and then controlled in the VCU with an efficiency of

99.8%. There is no basis provided in the record for this assumption, however. In fact the Application simply states that, “[A] 99.8% control efficiency is assumed for the MVCU.”<sup>11</sup>

In the next section, I will discuss why the various permit conditions relating to the VCU cannot and do not assure that this control efficiency will be demonstrably met. In particular, simply requiring that a minimum temperature be met, without regard to the composition of the vapors to be destroyed in the VCU (which, in turn, is a function of the exact type of cargo to be loaded and the prior cargo in the vessel), does not assure that the control efficiency will be met.

#### **D. Comments on Specific Permit Conditions in the Draft ACDP and Certain Items from the Review Report**

D1. Condition 1.7. Whereas previous versions of the ACDP included the actual number of various piping components which contribute to fugitive emissions – that, as noted prior – are severely underestimated, the draft ACDP completely deletes the piping component from the face of the permit and relegates it to the Review Report. The ACDP and its conditions are enforceable. The DEQ Review Report is not. It makes no sense to shift the crucial details (i.e., the specific counts of various piping components covered by the ACDP) of these fugitive emissions to the Review Report and make these emissions unenforceable. The component details, as excerpted below from the Review Report, should be put back into the body of the ACDP.

iii. A summary of the quantity and types of components is included in the table below.

Type of Component	Terminal & Marine*	Manifest Railcar racks (TRACK_RC 4, 5, 6, and 7)
Number of HL Valves (V <sub>HL</sub> )	2,557	567
Number of LL Valves (V <sub>LL</sub> )	53	0
Number of G Valves (V <sub>G</sub> )	0	0
Number of Pump seals (P <sub>HL</sub> )	75	24
Number of Pump seals (P <sub>LL</sub> )	2	0
Pressure Relief Valves (PRV)	0	27
Connectors (fittings)	7,984	2,250
Open Ended Lines	55	0

\* Terminal & Marine includes existing railcar racks and February 2025 NoA connections

D2. Condition 1.4. The Vapor Combustion Unit (VCU), the control device for the marine loading activity at the Chevron dock (MLOAD-C) is noted as having a control efficiency for VOCs as 99.8%. However, the entire record contains no support for how this is possible under all loading circumstances – i.e., for all VOC vapors of varying composition (depending on the product being

<sup>11</sup> Application, Section 3.3

loaded and conditions of loading) coming to the VCU from MLOAD-C on a continuous basis. At best, the record contains a single source test<sup>12</sup> lasting just a few hours, when this efficiency was met. That is not a sufficient basis for this assumption that has to be met on a continuous basis since DEQ is allowing the use of this efficiency value for annual emissions calculations. Even if the temperature of the VCU is maintained at or above 1400 degrees F or the temperature during the test when the 99.8% efficiency was met (per Condition 3.4<sup>13</sup>), that does not guarantee that this efficiency will be met for all compositions of the vapors from the loading of all products at MLOAD-C. The reliance on just the temperature is incorrect when the composition of the vapors are not assured to be the same at all times as during the short test time period.

I also note that should this same VCU be later used to control loading vapors from the McCall dock, namely MLOAD-M – which is conditionally allowed by the ACDP per condition 3.1 – clearly the compositions of the vapors will be even more different than test conditions, making the 99.8 percent control efficiency even more unsupported.

D3. Condition 2.5. Nuisance and Odors. The condition states that nuisance conditions will be “verified by DEQ personnel.” This is, on its face, unworkable. For facilities such as this terminal, nuisances such as odors can be transient depending on activities being conducted and meteorological conditions, which can change from minute-to-minute. By the time an odor compliant is called in to DEQ and the DEQ is able to respond, changing conditions may not confirm odors that were present when the compliant was called in. This is common. Thus, a DEQ finding of no odors does not establish the lack of odors.

In fact, DEQ demonstrates its own ineffectiveness in implementing this condition, when it stated, in paragraph 21 of the Review Report that it was “unable to determine whether Zenith was responsible for specific odors....”

This condition should be changed to presume that odors reported by the community are, *prima facie*, valid – requiring no further verification by the DEQ or unless DEQ can determine otherwise. Perhaps DEQ should consider assigning a permanent staff member at the facility at all times.

D4. Condition 3.1(b) states that “[E]ach loading berth at the marine terminal and all marine tank vessels used to transfer liquid product must be equipped with the vapor collection system designed to collect all displaced VOC vapors....” (emphasis added). As noted earlier, the requirement to collect all displaced vapors means 100% capture of the displaced vapors. Indeed that is what the emissions calculations supporting the 39 tons pr year VOC PSEL assume. However, even so-called vapor tight marine vessels are not 100% vapor tight, only that they meet acceptable levels of leakiness. In reality, the demonstration of vapor-tightness, such as in EPA

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<sup>12</sup> Conducted in December 2022, per Condition 18. See also paragraph 58 of the Review Report for additional deficiencies noted for this test, including that the control efficiency could not be determined because the inlet VOC into the VCU was not tested.

<sup>13</sup> Condition 3.4 is additional weak since it required that minimum temperatures be met on an hourly average basis per 3.4(a). That of course means that the temperature at the VCU could be substantially below the required minimum temperature (with attendant low control efficiencies) for periods of time. There is no need to have a 1-hour averaging for VCU temperature in Condition 3.4 or anywhere else. Any minimum temperature should be met at all times, based on a continuous temperature monitor.

regulations at 40 CFR 63, Subpart Y, for vessels simply allows that vessels leak at or below an acceptably slow rate (i.e., losing pressure at a slow rate). This does not mean 100% capture. This condition, therefore, will not be met. I ask the DEQ to show otherwise. Furthermore, as noted prior, the emissions calculations should account for such uncaptured loading vapors which will undergo no control – clearly and single-handedly, causing the PSEL to be much greater than 40 tons per year.

Similarly Condition 3.1(d)(i) requires a demonstration of “...leak free and vapor tight...” Since this confirmation will be via EPA Method 21 per Condition 3.1(d)(ii), which allows for substantial VOC concentrations which deeming the covered components as leak free, this condition does not ensure zero emissions from such leak free and vapor tight components. The condition is misleading.

D5. Condition 3.2 similar to the comment above, requires a certification that vessels be leak free, vapor tight, and in good working condition – to be demonstrated by EPA Method 21 (or some other method). For the same reasons noted above, this does not ensure that all vapors will in fact be captured and sent to the VCU. The DEQ needs to account for the uncaptured emissions from such “leak free, vapor tight” vessels and add them to the PSEL. Or, the DEQ needs to show why this condition will allow 100% capture, as currently assumed.

D6. Condition 3.3. The requirement in Condition 3.3(a)(i) that “all displaced VOC vapors” from loading be collected, cannot be demonstrated, for the same reasons noted above.

D7. Condition 4.2. This condition contains numerous technical conditions in (a) through (i). However, it is not clear that they can all be met on a continuous basis given the frequencies noted in Condition 4.3. I ask the DEQ to support the stated frequencies in Condition 4.3 (i.e., semi-annual, annual, or even once every five years) and how they can assure continuous compliance with all of the requirements in Condition 4.2.

D8. Same comment as above for the internal floating roof tank conditions 4.4 and associated frequencies in Condition 4.5.

D9. Condition 7.0 requires that Pollution Control Devices and Processes – such as the VCU must be properly functioning at all times. How will this condition be demonstrated. Note my prior comment that simply assuring that Condition 3.4 is met is inadequate for this demonstration.

D10. The DEQ does not explain the basis for the 0.1 factor in the equation for  $E_G$ . Presumably, it is a saturation factor, given the form of this equation, for gasoline vapors displaced, but the basis for this value of 0.1, which does not appear in the saturation factor tables cited in the permit – is not explained. In fact, none of the saturation factors in the table (excerpted below) are as low as 0.1. I ask the DEQ to explain.

Saturation Factors for Calculating Petroleum Liquid Loading Losses		
Carrier	Mode of Operation	Saturation Factor
Tank trucks and rail cars	Submerged Loading	
	Clean cargo tank	0.50
	Dedicated normal service	0.60
	Dedicated vapor balance service	1.00
	Splash Loading	
	Clean cargo tank	1.45
	Dedicated normal service	1.45
Marine vessels	Submerged loading	
	Ships	0.2
	Barges	0.5

D11. Condition 10(f) explicitly allows that adjustments can be made to emission control parameters during the source test and two hours prior to the source test. This means that the source test can be “gamed” to pass regardless of how the control system actually operates on a day in and day out basis. Of course this means that DEQ is allowing a non-representative stack test to masquerade as being representative of all operating conditions. Which makes no sense. The DEQ should not allow and encourage such blatant gaming of stack tests.

D12. Condition 12.2 for excess emissions seems to imply that excess emissions are indicated by opacity exceedances. That, of course, makes no sense for a source with mainly VOC emissions which have no opacity.

D13. In Condition 13.1, the requirement is to notify DEQ of excess emissions events “...if the excess emission is of a nature that could endanger public health...” Since the VOC emissions from this facility include numerous HAPs, which, by definition are classified as such because of their adverse health effects, this condition means that all excess emissions events must be reported to the DEQ unless the operator can show that the event released no HAPs. This DEQ should make this clear in the condition.

D14. Condition 18 contains a list of emission factors. However, it contains no discussion whatsoever about the accuracy of any of the emission factors – in particular, those drawn from AP-42 and from the 1995 SOCFI Protocol Table 2-3 for the fugitive emissions calculations. I have noted the inappropriate basis for using all AP-42 emission factors and those from the 1995 SOCFI document in the previous emissions calculations comments.

D15. The Section on Compliance History appears to be very abbreviated, brief, and factually incorrect. Based on the record I have reviewed, there appears to be a longer list of potential compliance issues at this facility. It is not clear how DEQ has arrived at the discussion of the facility’s compliance history in the Review Report. It should provide the basis for excluding other instances of non-compliance noted in the public record.

**Attachment A**

**Resume**

## **RANAJIT (RON) SAHU, PH.D, CEM (NEVADA)**

### **CONSULTANT, ENVIRONMENTAL AND ENERGY ISSUES**

**311 North Story Place**

**Alhambra, CA 91801**

**Phone: 702.683.5466**

**e-mail (preferred): [ronsahu@gmail.com](mailto:ronsahu@gmail.com); [sahuron@earthlink.net](mailto:sahuron@earthlink.net)**

### **EXPERIENCE SUMMARY**

Dr. Sahu has over thirty four years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment for a wide range of emissions sources including stationary and mobile sources; soils and groundwater remediation including landfills as remedy; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.), multimedia/multi-pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has almost thirty five years of project management experience and has successfully managed and executed hundreds of projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past three decades include various trade associations as well as individual companies such as steel mills, petroleum refineries, chemical plants, cement manufacturers, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, land development companies, and various entities in the public sector including EPA, the US Dept. of Justice, several states (including New York, New Jersey, Connecticut, Kansas, Oregon, New Mexico, Pennsylvania, and others), various agencies such as the California DTSC, and various cities and municipalities. Dr. Sahu has executed projects in all 50 US states, numerous local jurisdictions and internationally.

In addition to consulting, for approximately two decades, Dr. Sahu taught numerous courses in several Southern California universities as adjunct faculty, including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management). He also taught at Caltech, his alma mater (various engineering courses), at the University of Southern California (air pollution controls) and at California State University, Fullerton (transportation and air quality).

Of particular relevance, Dr. Sahu is the Nevada CEM overseeing the large Basic Remediation Company (BRC) cleanup of soil and groundwater from WWII-era contamination to residential land use. He and his remediation team, working under his direction, obtained all of the soil No Further Action (NFA) determinations from the NDEP, which is allowing residential development to proceed at the Site. Over 6000 homes have already been built and are occupied. All of the technical analyses, including the many risk assessments that were conducted as part of the project including statistical sampling based confirmatory data analysis, geospatial analysis, COPC determination methods, assessment of site background conditions, DQO activities, risk pathway selection, assessment of exposure parameters (deterministic and probabilistic), and the presentation of risk calculations to regulators and the public – were done directly under his supervision. He also led the public communication aspects as well as providing environmental clarifications, as needed, to the many builders who are associated with the site. As a matter of record, contaminants at the site included: volatile organic compounds (VOCs) including PCE, TCE, chloroform, etc.; semi-volatiles;



organochlorine pesticides; asbestos; various metals including lead and arsenic; dioxins; perchlorate; PCBs; and radioactive nuclides.

Dr. Sahu has and continues to provide expert witness services in a number of environmental and engineering areas discussed above in both state and Federal courts as well as before administrative bodies (please see Annex A).

#### **EXPERIENCE RECORD**

- 2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.), public sector (such as the US Department of Justice), and public interest group clients with project management, environmental consulting, project management, as well as regulatory and engineering support consulting services.
- 1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for Air Quality/Geosciences/Hazardous Waste Groups**, Pasadena, CA.
- Parsons ES, **Manager for Air Source Testing Services.** Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.
- 1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department.
- 1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department.
- 1989-1990 Kinetics Technology International, Corp. **Development Engineer.** Involved in thermal engineering R&D and project work related to low-NOx ceramic radiant burners, fired heater NOx reduction, SCR design, and fired heater retrofitting.
- 1988-1989 Heat Transfer Research, Inc. **Research Engineer.** Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

#### **EDUCATION**

- 1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.
- 1984 M. S., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.
- 1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

#### **TEACHING EXPERIENCE**

##### Caltech

"Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.

"Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.

"Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.

"Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.

"Thermodynamics and Heat Transfer," Fall and Winter Terms of 1996-1997.

##### U.C. Riverside, Extension

"Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.

"Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992-2010.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

#### Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years beginning 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years beginning 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Various years beginning 2006.

#### University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

#### University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007, Spring 2008, Spring 2009.

#### International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

### **PROFESSIONAL AFFILIATIONS AND HONORS**

**President of India Gold Medal, IIT Kharagpur, India, 1983.**

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, 1987-mid-1990s.

Air and Waste Management Association, West Coast Section, 1989-mid-2000s.

#### **PROFESSIONAL CERTIFICATIONS**

EIT, California (#XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, 2000 - 2021.

CEM, State of Nevada (#EM-1699).

#### **PUBLICATIONS (PARTIAL LIST)**

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R. Gavalas, *Combust. Flame*, **77**, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in "**Combustion Measurements**" (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NO<sub>x</sub> Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

"From Purchase of Landmark Environmental Insurance to Remediation: Case Study in Henderson, Nevada," with Robin E. Bain and Jill Quillin, presented at the AQMA Annual Meeting, Florida, 2001.

"The Jones Act Contribution to Global Warming, Acid Rain and Toxic Air Contaminants," with Charles W. Botsford, presented at the AQMA Annual Meeting, Florida, 2001.

**PRESENTATIONS (PARTIAL LIST)**

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

## Annex A

### Expert Litigation Support

#### A. Occasions where Dr. Sahu has provided Written or Oral testimony before Congress:

1. In July 2012, provided expert written and oral testimony to the House Subcommittee on Energy and the Environment, Committee on Science, Space, and Technology at a Hearing entitled “Hitting the Ethanol Blend Wall – Examining the Science on E15.”

#### B. Matters for which Dr. Sahu has provided affidavits and expert reports include:

2. Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.
3. Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the United States in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).
4. Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the United States in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).
5. Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the United States in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (Middle District of North Carolina).
6. Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the United States in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.*, C2-99-1182, C2-99-1250 (Southern District of Ohio).
7. Affidavit (March 2005) on behalf of the Minnesota Center for Environmental Advocacy and others in the matter of the Application of Heron Lake BioEnergy LLC to construct and operate an ethanol production facility – submitted to the Minnesota Pollution Control Agency.
8. Expert Report and Deposition (10/31/2005 and 11/1/2005) on behalf of the United States in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc.*, 5:04-cv-00034-KSF (Eastern District of Kentucky).
9. Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.
10. Expert Report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.
11. Expert Report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.

12. Expert Report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.
13. Expert Report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo's eight new proposed PRB-fired PC boilers located at seven TX sites.
14. Expert Testimony (July 2007) on behalf of the Izaak Walton League of America and others in connection with the acquisition of power by Xcel Energy from the proposed Gascoyne Power Plant – at the State of Minnesota, Office of Administrative Hearings for the Minnesota PUC (MPUC No. E002/CN-06-1518; OAH No. 12-2500-17857-2).
15. Affidavit (July 2007) Comments on the Big Cajun I Draft Permit on behalf of the Sierra Club – submitted to the Louisiana DEQ.
16. Expert Report and Deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.*, 2:05cv0885 (Western District of Pennsylvania).
17. Expert Reports and Pre-filed Testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.
18. Expert Report and Deposition (October 2007) on behalf of MTD Products Inc., in connection with *General Power Products, LLC v MTD Products Inc.*, 1:06 CVA 0143 (Southern District of Ohio, Western Division).
19. Expert Report and Deposition (June 2008) on behalf of Sierra Club and others in the matter of permit challenges (Title V: 28.0801-29 and PSD: 28.0803-PSD) for the Big Stone II unit, proposed to be located near Milbank, South Dakota.
20. Expert Reports, Affidavit, and Deposition (August 15, 2008) on behalf of Earthjustice in the matter of air permit challenge (CT-4631) for the Basin Electric Dry Fork station, under construction near Gillette, Wyoming before the Environmental Quality Council of the State of Wyoming.
21. Affidavits (May 2010/June 2010 in the Office of Administrative Hearings)/Declaration and Expert Report (November 2009 in the Office of Administrative Hearings) on behalf of NRDC and the Southern Environmental Law Center in the matter of the air permit challenge for Duke Cliffside Unit 6. Office of Administrative Hearing Matters 08 EHR 0771, 0835 and 0836 and 09 HER 3102, 3174, and 3176 (consolidated).
22. Declaration (August 2008), Expert Report (January 2009), and Declaration (May 2009) on behalf of Southern Alliance for Clean Energy in the matter of the air permit challenge for Duke Cliffside Unit 6. *Southern Alliance for Clean Energy et al., v. Duke Energy Carolinas, LLC*, Case No. 1:08-cv-00318-LHT-DLH (Western District of North Carolina, Asheville Division).
23. Declaration (August 2008) on behalf of the Sierra Club in the matter of Dominion Wise County plant MACT.us
24. Expert Report (June 2008) on behalf of Sierra Club for the Green Energy Resource Recovery Project, MACT Analysis.
25. Expert Report (February 2009) on behalf of Sierra Club and the Environmental Integrity Project in the matter of the air permit challenge for NRG Limestone's proposed Unit 3 in Texas.
26. Expert Report (June 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*
27. Expert Report (August 2009) on behalf of Sierra Club and the Southern Environmental Law Center in the matter of the air permit challenge for Santee Cooper's proposed Pee Dee plant in South Carolina).
28. Statements (May 2008 and September 2009) on behalf of the Minnesota Center for Environmental Advocacy to the Minnesota Pollution Control Agency in the matter of the Minnesota Haze State Implementation Plans.

29. Expert Report (August 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
30. Expert Report and Rebuttal Report (September 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.
31. Expert Report (December 2009) and Rebuttal reports (May 2010 and June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).
32. Pre-filed Testimony (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
33. Pre-filed Testimony (July 2010) and Written Rebuttal Testimony (August 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions*, No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.
34. Expert Report (August 2010) and Rebuttal Expert Report (October 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Liability Phase.
35. Declaration (August 2010), Reply Declaration (November 2010), Expert Report (April 2011), Supplemental and Rebuttal Expert Report (July 2011) on behalf of the United States in the matter of DTE Energy Company and Detroit Edison Company (Monroe Unit 2). *United States of America v. DTE Energy Company and Detroit Edison Company*, Civil Action No. 2:10-cv-13101-BAF-RSW (Eastern District of Michigan).
36. Expert Report and Deposition (August 2010) as well as Affidavit (September 2010) on behalf of Kentucky Waterways Alliance, Sierra Club, and Valley Watch in the matter of challenges to the NPDES permit issued for the Trimble County power plant by the Kentucky Energy and Environment Cabinet to Louisville Gas and Electric, File No. DOW-41106-047.
37. Expert Report (August 2010), Rebuttal Expert Report (September 2010), Supplemental Expert Report (September 2011), and Declaration (November 2011) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)’s Cherokee power plant. No. 09-cv-1862 (District of Colorado).
38. Written Direct Expert Testimony (August 2010) and Affidavit (February 2012) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).
39. Deposition (August 2010) on behalf of Environmental Defense, in the matter of the remanded permit challenge to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
40. Expert Report, Supplemental/Rebuttal Expert Report, and Declarations (October 2010, November 2010, September 2012) on behalf of New Mexico Environment Department (Plaintiff-Intervenor), Grand Canyon Trust and Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. Public Service Company of New Mexico* (PNM), Civil No. 1:02-CV-0552 BB/ATC (ACE) (District of New Mexico).
41. Expert Report (October 2010) and Rebuttal Expert Report (November 2010) (BART Determinations for PSCo Hayden and CSU Martin Drake units) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.
42. Expert Report (November 2010) (BART Determinations for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

43. Declaration (November 2010) on behalf of the Sierra Club in connection with the Martin Lake Station Units 1, 2, and 3. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Case No. 5:10-cv-00156-DF-CMC (Eastern District of Texas, Texarkana Division).
44. Pre-Filed Testimony (January 2011) and Declaration (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).
45. Declaration (February 2011) in the matter of the Draft Title V Permit for RRI Energy MidAtlantic Power Holdings LLC Shawville Generating Station (Pennsylvania), ID No. 17-00001 on behalf of the Sierra Club.
46. Expert Report (March 2011), Rebuttal Expert Report (June 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).
47. Declaration (April 2011) and Expert Report (July 16, 2012) in the matter of the Lower Colorado River Authority (LCRA)'s Fayette (Sam Seymour) Power Plant on behalf of the Texas Campaign for the Environment. *Texas Campaign for the Environment v. Lower Colorado River Authority*, Civil Action No. 4:11-cv-00791 (Southern District of Texas, Houston Division).
48. Declaration (June 2011) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.
49. Expert Report (June 2011) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).
50. Declaration (August 2011) in the matter of the Sandy Creek Energy Associates L.P. Sandy Creek Power Plant on behalf of Sierra Club and Public Citizen. *Sierra Club, Inc. and Public Citizen, Inc. v. Sandy Creek Energy Associates, L.P.*, Civil Action No. A-08-CA-648-LY (Western District of Texas, Austin Division).
51. Expert Report (October 2011) on behalf of the Defendants in the matter of *John Quiles and Jeanette Quiles et al. v. Bradford-White Corporation, MTD Products, Inc., Kohler Co., et al.*, Case No. 3:10-cv-747 (TJM/DEP) (Northern District of New York).
52. Declaration (October 2011) on behalf of the Plaintiffs in the matter of *American Nurses Association et al. (Plaintiffs), v. US EPA (Defendant)*, Case No. 1:08-cv-02198-RMC (US District Court for the District of Columbia).
53. Declaration (February 2012) and Second Declaration (February 2012) in the matter of *Washington Environmental Council and Sierra Club Washington State Chapter v. Washington State Department of Ecology and Western States Petroleum Association*, Case No. 11-417-MJP (Western District of Washington).
54. Expert Report (March 2012) and Supplemental Expert Report (November 2013) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.*, Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).
55. Declaration (March 2012) in the matter of *Center for Biological Diversity, et al. v. United States Environmental Protection Agency*, Case No. 11-1101 (consolidated with 11-1285, 11-1328 and 11-1336) (US Court of Appeals for the District of Columbia Circuit).
56. Declaration (March 2012) in the matter of *Sierra Club v. The Kansas Department of Health and Environment*, Case No. 11-105,493-AS (Holcomb power plant) (Supreme Court of the State of Kansas).
57. Declaration (March 2012) in the matter of the Las Brisas Energy Center *Environmental Defense Fund et al., v. Texas Commission on Environmental Quality*, Cause No. D-1-GN-11-001364 (District Court of Travis County, Texas, 261<sup>st</sup> Judicial District).
58. Expert Report (April 2012), Supplemental and Rebuttal Expert Report (July 2012), and Supplemental Rebuttal Expert Report (August 2012) on behalf of the states of New Jersey and Connecticut in the matter of



- the Portland Power plant *State of New Jersey and State of Connecticut (Intervenor-Plaintiff) v. RRI Energy Mid-Atlantic Power Holdings et al.*, Civil Action No. 07-CV-5298 (JKG) (Eastern District of Pennsylvania).
59. Declaration (April 2012) in the matter of the EPA's EGU MATS Rule, on behalf of the Environmental Integrity Project.
  60. Expert Report (August 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Harm Phase.
  61. Declaration (September 2012) in the Matter of the Application of *Energy Answers Incinerator, Inc.* for a Certificate of Public Convenience and Necessity to Construct a 120 MW Generating Facility in Baltimore City, Maryland, before the Public Service Commission of Maryland, Case No. 9199.
  62. Expert Report (October 2012) on behalf of the Appellants (Robert Concilus and Leah Humes) in the matter of Robert Concilus and Leah Humes v. Commonwealth of Pennsylvania Department of Environmental Protection and Crawford Renewable Energy, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2011-167-R.
  63. Expert Report (October 2012), Supplemental Expert Report (January 2013), and Affidavit (June 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.
  64. Pre-filed Testimony (October 2012) on behalf of No-Sag in the matter of the North Springfield Sustainable Energy Project before the State of Vermont, Public Service Board.
  65. Pre-filed Testimony (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.
  66. Expert Report (February 2013) on behalf of Petitioners in the matter of Credence Crematory, Cause No. 12-A-J-4538 before the Indiana Office of Environmental Adjudication.
  67. Expert Report (April 2013), Rebuttal report (July 2013), and Declarations (October 2013, November 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).
  68. Declaration (April 2013) on behalf of Petitioners in the matter of *Sierra Club, et al., (Petitioners) v. Environmental Protection Agency et al. (Respondents)*, Case No., 13-1112, (Court of Appeals, District of Columbia Circuit).
  69. Expert Report (May 2013) and Rebuttal Expert Report (July 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).
  70. Declaration (August 2013) on behalf of A. J. Acosta Company, Inc., in the matter of *A. J. Acosta Company, Inc., v. County of San Bernardino*, Case No. CIVSS803651.
  71. Comments (October 2013) on behalf of the Washington Environmental Council and the Sierra Club in the matter of the Washington State Oil Refinery RACT (for Greenhouse Gases), submitted to the Washington State Department of Ecology, the Northwest Clean Air Agency, and the Puget Sound Clean Air Agency.
  72. Statement (November 2013) on behalf of various Environmental Organizations in the matter of the Boswell Energy Center (BEC) Unit 4 Environmental Retrofit Project, to the Minnesota Public Utilities Commission, Docket No. E-015/M-12-920.
  73. Expert Report (December 2013) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

74. Expert Testimony (December 2013) on behalf of the Sierra Club in the matter of Public Service Company of New Hampshire Merrimack Station Scrubber Project and Cost Recovery, Docket No. DE 11-250, to the State of New Hampshire Public Utilities Commission.
75. Expert Report (January 2014) on behalf of Baja, Inc., in *Baja, Inc., v. Automotive Testing and Development Services, Inc. et. al.*, Civil Action No. 8:13-CV-02057-GRA (District of South Carolina, Anderson/Greenwood Division).
76. Declaration (March 2014) on behalf of the Center for International Environmental Law, Chesapeake Climate Action Network, Friends of the Earth, Pacific Environment, and the Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. the Export-Import Bank (Ex-Im Bank) of the United States*, Civil Action No. 13-1820 RC (District Court for the District of Columbia).
77. Declaration (April 2014) on behalf of Respondent-Intervenors in the matter of *Mexichem Specialty Resins Inc., et al., (Petitioners) v Environmental Protection Agency et al.*, Case No., 12-1260 (and Consolidated Case Nos. 12-1263, 12-1265, 12-1266, and 12-1267), (Court of Appeals, District of Columbia Circuit).
78. Direct Prefiled Testimony (June 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17319 (Michigan Public Service Commission).
79. Expert Report (June 2014) on behalf of ECM Biofilms in the matter of the US Federal Trade Commission (FTC) v. ECM Biofilms (FTC Docket #9358).
80. Direct Prefiled Testimony (August 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of Consumers Energy Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17317 (Michigan Public Service Commission).
81. Declaration (July 2014) on behalf of Public Health Intervenors in the matter of *EME Homer City Generation v. US EPA* (Case No. 11-1302 and consolidated cases) relating to the lifting of the stay entered by the Court on December 30, 2011 (US Court of Appeals for the District of Columbia).
82. Expert Report (September 2014), Rebuttal Expert Report (December 2014) and Supplemental Expert Report (March 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and PacifiCorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).
83. Expert Report (November 2014) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).
84. *Declaration (January 2015) relating to Startup/Shutdown in the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.*
85. Pre-filed Direct Testimony (March 2015), Supplemental Testimony (May 2015), and Surrebuttal Testimony (December 2015) on behalf of Friends of the Columbia Gorge in the matter of the Application for a Site Certificate for the Troutdale Energy Center before the Oregon Energy Facility Siting Council.
86. Brief of Amici Curiae Experts in Air Pollution Control and Air Quality Regulation in Support of the Respondents, On Writs of Certiorari to the US Court of Appeals for the District of Columbia, No. 14-46, 47, 48. *Michigan et. al., (Petitioners) v. EPA et. al., Utility Air Regulatory Group (Petitioners) v. EPA et. al., National Mining Association et. al., (Petitioner) v. EPA et. al.*, (Supreme Court of the United States).
87. Expert Report (March 2015) and Rebuttal Expert Report (January 2016) on behalf of Plaintiffs in the matter of *Conservation Law Foundation v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

88. Declaration (April 2015) relating to various Technical Corrections for the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.
89. Direct Prefiled Testimony (May 2015) on behalf of the Michigan Environmental Council, the Natural Resources Defense Council, and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Increase its Rates, Amend its Rate Schedules and Rules Governing the Distribution and Supply of Electric Energy and for Miscellaneous Accounting Authority, Case No. U-17767 (Michigan Public Service Commission).
90. Expert Report (July 2015) and Rebuttal Expert Report (July 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).
91. Declaration (August 2015, Docket No. 1570376) in support of “Opposition of Respondent-Intervenors American Lung Association, et. al., to Tri-State Generation’s Emergency Motion;” Declaration (September 2015, Docket No. 1574820) in support of “Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors for Remand Without Vacatur;” Declaration (October 2015) in support of “Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors to State and Certain Industry Petitioners’ Motion to Govern, *White Stallion Energy Center, LLC v. US EPA*, Case No. 12-1100 (US Court of Appeals for the District of Columbia).
92. Declaration (September 2015) in support of the Draft Title V Permit for Dickerson Generating Station (Proposed Permit No 24-031-0019) on behalf of the Environmental Integrity Project.
93. Expert Report (Liability Phase) (December 2015) and Rebuttal Expert Report (February 2016) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., Environmental Law and Policy Center, and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).
94. Declaration (December 2015) in support of the Petition to Object to the Title V Permit for Morgantown Generating Station (Proposed Permit No 24-017-0014) on behalf of the Environmental Integrity Project.
95. Expert Report (November 2015) on behalf of Appellants in the matter of *Sierra Club, et al. v. Craig W. Butler, Director of Ohio Environmental Protection Agency et al.*, ERAC Case No. 14-256814.
96. Affidavit (January 2016) on behalf of Bridgewatch Detroit in the matter of *Bridgewatch Detroit v. Waterfront Petroleum Terminal Co., and Waterfront Terminal Holdings, LLC.*, in the Circuit Court for the County of Wayne, State of Michigan.
97. Expert Report (February 2016) and Rebuttal Expert Report (July 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.
98. Direct Testimony (May 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.
99. Declaration (June 2016) relating to deficiencies in air quality analysis for the proposed Millenium Bulk Terminal, Port of Longview, Washington.
100. Declaration (December 2016) relating to EPA’s refusal to set limits on PM emissions from coal-fired power plants that reflect pollution reductions achievable with fabric filters on behalf of Environmental Integrity Project, Clean Air Council, Chesapeake Climate Action Network, Downwinders at Risk represented by Earthjustice in the matter of *ARIPPA v EPA, Case No. 15-1180*. (D.C. Circuit Court of Appeals).
101. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

102. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Backus Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
103. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Drakulic Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
104. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Deutsch Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
105. Affidavit (February 2017) pertaining to deficiencies water discharge compliance issues at the Wood River Refinery in the matter of *People of the State of Illinois (Plaintiff) v. Phillips 66 Company, ConocoPhillips Company, WRB Refining LP (Defendants)*, Case No. 16-CH-656, (Circuit Court for the Third Judicial Circuit, Madison County, Illinois).
106. Expert Report (March 2017) on behalf of the Plaintiff pertaining to non-degradation analysis for waste water discharges from a power plant in the matter of *Sierra Club (Plaintiff) v. Pennsylvania Department of Environmental Protection (PADEP) and Lackawanna Energy Center*, Docket No. 2016-047-L (consolidated), (Pennsylvania Environmental Hearing Board).
107. Expert Report (March 2017) on behalf of the Plaintiff pertaining to air emissions from the Heritage incinerator in East Liverpool, Ohio in the matter of *Save our County (Plaintiff) v. Heritage Thermal Services, Inc. (Defendant)*, Case No. 4:16-CV-1544-BYP, (US District Court for the Northern District of Ohio, Eastern Division).
108. Rebuttal Expert Report (June 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight (Plaintiffs) v Coyote Creek Mining Company LLC (Defendant)*, Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).
109. Expert Affidavit (August 2017) and Penalty/Remedy Expert Affidavit (October 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant,)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).
110. Expert Report (August 2017) on behalf of Appellant in the matter of *Patricia Ann Troiano (Appellant) v. Upper Burrell Township Zoning Hearing Board (Appellee)*, Court of Common Pleas of Westmoreland County, Pennsylvania, Civil Division.
111. Expert Report (October 2017), Supplemental Expert Report (October 2017), and Rebuttal Expert Report (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).
112. Declaration (December 2017) on behalf of the Environmental Integrity Project in the matter of permit issuance for ATI Flat Rolled Products Holdings, Breckenridge, PA to the Allegheny County Health Department.
113. Expert Report (Harm Phase) (January 2018), Rebuttal Expert Report (Harm Phase) (May 2018) and Supplemental Expert Report (Harm Phase) (April 2019) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).
114. Declaration (February 2018) on behalf of the Chesapeake Bay Foundation, et. al., in the matter of the Section 126 Petition filed by the state of Maryland in *State of Maryland v. Pruitt (Defendant)*, Civil Action No. JKB-17-2939 (Consolidated with No. JKB-17-2873) (US District Court for the District of Maryland).
115. Direct Pre-filed Testimony (March 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of *NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC*, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington).

116. Expert Affidavit (April 2018) and Second Expert Affidavit (May 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.
117. Direct Pre-filed Testimony and Affidavit (December 2018) on behalf of Sierra Club and Texas Campaign for the Environment (Appellants) in the contested case hearing before the Texas State Office of Administrative Hearings in Docket Nos. 582-18-4846, 582-18-4847 (Application of GCGV Asset Holding, LLC for Air Quality Permit Nos. 146425/PSDTX1518 and 146459/PSDTX1520 in San Patricio County, Texas).
118. Expert Report (February 2019) on behalf of Sierra Club in the State of Florida, Division of Administrative Hearings, Case No. 18-2124EPP, Tampa Electric Company Big Bend Unit 1 Modernization Project Power Plant Siting Application No. PA79-12-A2.
119. Declaration (March 2019) on behalf of Earthjustice in the matter of comments on the renewal of the Title V Federal Operating Permit for Valero Houston refinery.
120. Expert Report (March 2019) on behalf of Plaintiffs for Class Certification in the matter of *Resendez et al v Precision Castparts Corporation* in the Circuit Court for the State of Oregon, County of Multnomah, Case No. 16cv16164.
121. Expert Report (June 2019), Affidavit (July 2019) and Rebuttal Expert Report (September 2019) on behalf of Appellants relating to the NPDES permit for the Cheswick power plant in the matter of *Three Rivers Waterkeeper and Sierra Club (Appellants) v. State of Pennsylvania Department of Environmental Protection (Appellee) and NRG Power Midwest (Permittee)*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-088-R.
122. Affidavit/Expert Report (August 2019) relating to the appeal of air permits issued to PTTGCA on behalf of Appellants in the matter of *Sierra Club (Appellants) v. Craig Butler, Director, et. al., Ohio EPA (Appellees)* before the State of Ohio Environmental Review Appeals Commission (ERAC), Case Nos. ERAC-19-6988 through -6991.
123. Expert Report (October 2019) relating to the appeal of air permit (Plan Approval) on behalf of Appellants in the matter of *Clean Air Council and Environmental Integrity Project (Appellants) v. Commonwealth of Pennsylvania Department of Environmental Protection and Sunoco Partners Marketing and Terminals L.P.*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-057-L.
124. Expert Report (December 2019), Affidavit (March 2020), Supplemental Expert Report (July 2020), and Declaration (February 2021) on behalf of Earthjustice in the matter of *Objection to the Issuance of PSD/NSR and Title V permits for Riverview Energy Corporation*, Dale, Indiana, before the Indiana Office of Environmental Adjudication, Cause No. 19-A-J-5073.
125. Affidavit (December 2019) on behalf of Plaintiff-Intervenor (Surfrider Foundation) in the matter of *United States and the State of Indiana (Plaintiffs), Surfrider Foundation (Plaintiff-Intervenor), and City of Chicago (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant)*, Civil Action No. 2:18-cv-00127 (US District Court for the Northern District of Indiana, Hammond Division).
126. Declarations (January 2020, February 2020, May 2020, July 2020, and August 2020) and Pre-filed Testimony (April 2021) in support of Petitioner's Motion for Stay of PSCAA NOC Order of Approval No. 11386 in the matter of the *Puyallup Tribe of Indians v. Puget Sound Clean Air Agency (PSCAA) and Puget Sound Energy (PSE)*, before the State of Washington Pollution Control Hearings Board, PCHB No. P19-088.
127. Expert Report (April 2020) on behalf of the plaintiff in the matter of Orion Engineered Carbons, GmbH (Plaintiff) vs. Evonik Operations, GmbH (formerly Evonik Degussa GmbH) (Respondent), before the German Arbitration Institute, Case No. DIS-SV-2019-00216.
128. Expert Independent Evaluation Report (June 2020) for *PacifiCorp's Decommissioning Costs Study Reports dated January 15, 2020 and March 13, 2020 relating to the closures of the Hunter, Huntington, Dave Johnston, Jim Bridger, Naughton, Wyodak, Hayden, and Colstrip (Units 3&4) plants*, prepared for the Oregon Public Utility Commission (Oregon PUC).

129. Direct Pre-filed Testimony (July 2020) on behalf of the Sierra Club in the matter of *the Application of the Ohio State University for a certificate of Environmental Compatibility and Public Need to Construct a Combined Heat and Power Facility in Franklin County, Ohio*, before the Ohio Power Siting Board, Case No. 19-1641-EL-BGN.
130. Expert Report (August 2020) and Rebuttal Expert Report (September 2020) on behalf of WildEarth Guardians (petitioners) in the matter of *the Appeals of the Air Quality Permit No. 7482-MI Issued to 3 Bear Delaware Operating – NM LLC (EIB No. 20-21(A) and Registrations Nos. 8729, 8730, and 8733 under General Construction Permit for Oil and Gas Facilities (EIB No. 20-33 (A)*, before the State of New Mexico, Environmental Improvement Board.
131. Expert Report (July 2020) on the *Initial Economic Impact Analysis (EIA) for A Proposal To Regulate NOx Emissions from Natural Gas Fired Rich-Burn Natural Gas Reciprocating Internal Combustion Engines (RICE) Greater Than 100 Horsepower* prepared on behalf of Earthjustice and the National Parks Conservation Association in the matter of Regulation Number 7, Alternate Rules before the Colorado Air Quality Control Commission.
132. Expert Report (August 2020) and Supplemental Expert Report (February 2021) on the Potential Remedies to Avoid Adverse Thermal Impacts from the Merrimack Station on behalf of Plaintiffs in the matter of *Sierra Club Inc. and the Conservation Law Foundation (Plaintiffs) v. Granite Shore Power, LLC et. al., (Defendants)*, Civil Action No. 19-cv-216-JL (US District Court for the District of New Hampshire.)
133. Expert Report (August 2020) and Supplemental Expert Report (December 2020) on behalf of Plaintiffs in the matter of *PennEnvironment Inc., and Clean Air Council (Plaintiffs) and Allegheny County Health Department (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant)*, Civil Action No. 2-19-cv-00484-MJH (US District Court for the Western District of Pennsylvania.)
134. Pre-filed Direct Testimony (October 2020) and Sur-rebuttal Testimony (November 2020) on behalf of petitioners (Ten Persons Group, including citizens, the Town of Braintree, the Town of Hingham, and the City of Quincy) in the matter of Algonquin Gas Transmission LLC, Weymouth MA, No. X266786 Air Quality Plan Approval, before the Commonwealth of Massachusetts, Department of Environmental Protection, the Office of Appeals and Dispute Resolution, OADR Docket Nos. 2019-008, 2019-009, 2019010, 2019-011, 2019-012 and 2019-013.
135. Expert Report (November 2020) on behalf of Protect PT in the matter of *Protect PT v. Commonwealth of Pennsylvania Department of Environmental Protection and Apex Energy (PA) LLC*, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2018-080-R (consolidated with 2019-101-R)(the “Drakulic Appeal”).
136. Expert Report (December 2020) on behalf of Plaintiffs in the matter of *Sierra Club Inc. (Plaintiff) v. GenOn Power Midwest LP (Defendants)*, Civil Action No. 2-19-cv-01284-WSS (US District Court for the Western District of Pennsylvania.)
137. Pre-filed Testimony (January 2021) on behalf of the Plaintiffs (Shrimpers and Fishermen of the Rio Grande Valley represented by Texas RioGrande Legal Aid, Inc.) in the matter of the Appeal of Texas Commission on Environmental Quality (TCEQ) Permit Nos. 147681, PSDTX1522, GHGPSDTX172 for the Jupiter Brownsville Heavy Condensate Upgrader Facility, Cameron County, before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-21-0111, TCEQ Docket No. 2020-1080-AIR.
138. Expert Reports (March 2021 and May 2021) regarding the Aries Newark LLC Sludge Processing Facility, Application No. CPB 20-74, Central Planning Board, City of Newark, New Jersey.
139. Expert Report (April 2021) for *Charles Johnson Jr. (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 2:20-CV-01329 (Related to 12-968 BELO in MDL No. 2179). (US District Court for the Eastern District of Louisiana, New Orleans Division).
140. Affidavit (April 2021) for *Clayton Faerber et.al., (Plaintiff), v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 20-CV-00328 01329 (Related to 12-968 BELO in MDL No. 2179). (US District Court for the Southern District of Mississippi).

141. Expert Report (April 2021, June 2023) for *Floyd Ruffin (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 2:20-cv-00334-CJB-JCW (US District Court for the Eastern District of Louisiana, New Orleans Division).
142. Expert Report (April 2021) and Sur-Rebuttal Report (June 2021) on behalf of the Plaintiffs in the matter of *Modern Holdings, LLC, et al. (Plaintiffs) v. Corning Inc., et al. (Defendants)*, Civil Action No. 5:13-cv-00405-GFVT, (US District Court for the Eastern District of Kentucky, Central Division at Lexington).
143. Expert Report (May 2021) for *Clifford Osmer (Plaintiff) v. BP Exploration and Production Inc., et. al., (Defendants)* related to No. 18-CV-12557 (US District Court for the Eastern District of Louisiana).
144. Expert Report (May 2021) and Rebuttal Expert Report (January 2022) for *James Noel (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 1:19-CV-00694-JB-MU-C (US District Court for the Southern District of Alabama, Southern Division).
145. Expert Report (June 2021) and Declarations (May 2021 and June 2021) on behalf of Plaintiffs in the matter of *Sierra Club (Plaintiff) v. Woodville Pellets, LLC (Defendant)*, Civil Action No. 9:20-cv-00178-MJT (US District Court for the Eastern District of Texas, Lufkin Division.)
146. Expert Witness Disclosure (June 2021) on behalf of the Plaintiffs in the matter of *Jay Burdick, et. al., (Plaintiffs) v. Tanoga Inc. (d/b/a Taconic) (Defendant)*, Index No. 253835, (State of New York Supreme Court, County of Rensselaer).
147. Expert Report (June 2021) on behalf of Appellants in the matter of *PennEnvironment and Earthworks (Appellants) v. Commonwealth of Pennsylvania Department of Environmental Protection (Appellee) and MarkWest Liberty Midstream and resource, LLC (Permittee)*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2020-002-R.
148. Expert Report (June 2021) for *Antonia Saavedra-Vargas (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 2:18-CV-11461 (US District Court for the Eastern District of Louisiana, New Orleans Division).
149. Affidavit (June 2021) for Lourdes Rubi in the matter of *Lourdes Rubi (Plaintiff) v. BP Exploration and Production Inc., et. al., (Defendants)*, related to 12-968 BELO in MDL No. 2179 (US District Court for the Eastern District of Louisiana, New Orleans Division).
150. Expert Report (June 2021) for *Wallace Smith (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 2:19-CV-12880 (US District Court for the Eastern District of Louisiana, New Orleans Division).
151. Declaration (July 2021) on behalf of Plaintiffs in the matter of *Stephanie Mackey and Nick Migliore, on behalf of themselves and all others similarly situated (Plaintiffs) v. Chemtool Inc. and Lubrizol Corporation (Defendants)*, Case No. 2021-L-0000165, State of Illinois, Circuit Court of the 17<sup>th</sup> Judicial Circuit, Winnebago County.
152. Declaration (July 2021, August 2021) on behalf of Petitioners in the matter of the Petition for a Hearing on the Merits Regarding Air Quality Permit No. 3340-RMD issued to New Mexico Terminal Services, LLC by *Mountain View Neighborhood Association et. al., (Petitioners) v. City of Albuquerque Environmental Health Department*, AQCB Petition No. 2020-1 before the Albuquerque-Bernalillo County Air Quality Control Board.
153. Expert Disclosure (September 2021), Affidavit (May 2023), and Affirmation (May 2024) on behalf of the Plaintiffs in the matter of *State of New York, Town of Hempstead, Town of Brookhaven, Incorporated Village of Garden City and Long Island Power Authority et. al., (Plaintiffs) v. Covanta Hempstead Company et. al., (Defendants)*, Index No. 7549/2013 before the Supreme Court of the State of New York, County of Nassau.
154. Expert Report (October 2021) for *John A. Battiste (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 1:21-CV-00118 (US District Court for the Southern District of Alabama, Mobile Division)
155. Declaration/Expert Report (October 2021) for *Charles K. Grasley et. al., (Plaintiffs) v. Chemtool Incorporated (Defendant)*, Case No. 2021-L-0000162 (State of Illinois, In the Circuit Court of the 17<sup>th</sup> Judicial Circuit, Winnebago County).

156. Declaration (October 2021) and Expert Report (November 2021) on behalf of the Plaintiffs in the matter of Toll Brothers, Inc., and Porter Ranch Development Company (Plaintiffs) v. Sempra Energy, Southern California Gas Company et. al., (Defendants), Southern California [Aliso Canyon] Gas Leak Cases, JCCP No.: 4861, Lead Case No.: BC674622, Superior Court of the State of California for the County of Los Angeles.
157. Expert Report (November 2021) and Declaration (September 2022) on behalf of Plaintiffs in Re: Deepwater Horizon BELO Cases, Case No. 3:19cv963-MCR-GRJ (US District Court for the Northern District of Florida, Pensacola Division).
158. Declaration (November 2021) for the *United States of America and the State of Kansas, Department of Health and Environment (Plaintiffs) v. Coffeyville Resources Refining & Marketing, LLC (Defendant)*, Civ. No. 6:04-cv-01064-JAR-KGG (US District Court for the District of Kansas).
159. Expert Report/Affidavit (December 2021) on behalf of the City of Detroit in the matter of Marathon Petroleum Company (Claimant) v. City of Detroit Building Safety Engineering and Environmental Department, BSEED Case No. MCR 2018-2525, DAH Appeal No. 21-SWA-01, before the State of Michigan, City of Detroit Department of Appeals and Hearings.
160. Expert Report (December 2021) for *John Pabst (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 21-CV-00290 (US District Court for the Eastern District of Louisiana).
161. Expert Report (December 2021) for *Audrey Annette Tillery-Perdue individually and as person representative of the estate of Eddie Lewis Perdue (Plaintiff) v. BP Exploration and Production Inc., et. al., (Defendant)*, Civil Action No. 5:19-cv-00052-MCR-GRJ (US District Court for the Northern District of Florida, Pensacola Division).
162. Expert Report (February 2022) for *Richard Dufour (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 19-cv-00591 (US District Court for the Southern District of Mississippi).
163. Expert Report (February 2022) and Rebuttal Expert Report (June 2022, in preparation) for *Kamuda (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-010475 (Circuit Court of Cook County, Illinois).
164. Expert Report (February 2022) in the matter of the *Appeal Petition for Hearing on Air Quality Permit No. 8585 on behalf of Earth Care New Mexico et. al., (Petitioners) v. New Mexico Environment Department and Associated Asphalt and Materials, LLC (Applicant)*, No. EIB 21-48 before the State of New Mexico Environmental Improvement Board.
165. Expert Report (March 2022), Affidavit (June 2022), Supplemental Expert Report (April 2023) in the matter of *Clean Air Council et. al., (Appellants) v. Commonwealth of Pennsylvania, Department of Environmental Protection (Appellee) and Renovo Energy Center (Permittee)* EHB Docket No. 2021-055-R before the Commonwealth of Pennsylvania Environmental Hearing Board.
166. Declaration (March 2022) in the matter of Max Midstream Texas LLC Air Quality Permit No. 162941 for the Seahawk Crude Condensate Terminal in Calhoun County Texas, TCEQ Docket No. 2022-0157-AIR, before the Texas Commission on Environmental Quality.
167. Expert Pre-filed Testimony (April 2022) in the matter of Application of TPC Group LLC for New State and PSD Air Quality Permits (various), TCEQ Docket No. 2021-1422-AIR, SOAH Docket No. 582-22-0799, Before the Texas State Office of Administrative Hearings.
168. Expert Report (April 2022) and Rebuttal Report (August 2022) for *Teresa Fornek (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-010744 (Circuit Court of Cook County, Illinois.)
169. Rule 26 Disclosure (May 2022) in the matter of the *Water Works and Sewer Board of the City of Gadsden (Plaintiff) v. 3M Company, et. al., (Defendants)*, Civil Action No.: 31 CV-2016-900676.00 (Circuit County of Etowah County, Alabama)
170. Expert Report (June 2022) for *Heather Schumacher (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-011939 (Circuit Court of Cook County, Illinois.)



171. Expert Report (June 2022), Rebuttal Reports (August 2022, September 2022) for Plaintiffs in *Phylliss Grayson et. al. (Plaintiffs), v Lockheed Martin Corporation (Defendant)*, Case No. 6:20-cv-01770. (US District Court for the Middle District of Florida – Orlando Division.)
172. Expert Affidavit (July 2022) for Center for Environmental Rights in connection with the 2019 South Africa Integrated Resource Plan in *African Climate Alliance et. al. v. The Minister of Mineral Resources and Energy et. al.*, in the High Court of South Africa, Gauteng Division, Pretoria.
173. Expert Affidavit (July 2022) for Center for Environmental Rights in connection with the Limpopo Mine (Lephalale Coal Mines Ltd.) in *Earthlife Africa v. The Minister of Forestry, Fisheries and Environment et. al.*, in the High Court of South Africa, Gauteng Division, Pretoria, Case No. 9149/2022.
174. Pre-filed Testimony (July 2022) and Rebuttal Testimony (September 2020) on behalf of the Puyallup Tribe of Indians in the matter of *Washington Utilities and Transportation Commission (Complainant) v. Puget Sound Energy (Respondent)* before the Washington Utilities and Transportation Commission, Docket UE-220066 and UG-220067 (Consolidated).
175. Expert Report (September 2022) *Clean Air Council, Citizens for Pennsylvania's Future, Mountain Watershed Association (Appellants) v. Allegheny County Health Department (Appellee) and Allegheny Energy Center (Intervenor, Permittee)*, Case No. 21-043 before the Hearing Officer of the Allegheny County Health Department.
176. Expert Affidavit (October 2022) for *Concerned Citizens of Cook County GA (Petitioner) v. Georgia Department of Natural Resources (Respondent) and Spectrum Energy Georgia, LLC (Respondent Intervenor)* before the Office of State Administrative Hearings, State of Georgia, Docket No: 2303405-OSAH-BNR-AQ-37-Barnes.
177. Expert Rebuttal Report (January 2023), Supplemental Rebuttal Expert Report (March 2023, May 2023, November 2023) for *Ann Jordan et. al., and Blake Darnell (Plaintiffs) v. Terumo BCT et. al., (Defendants)* before District Court, Jefferson County, Colorado Case Numbers: 2020CV031457, 2021CV030474 (consolidated with 2020CV031457) and 2020CV03148.
178. Expert Report (January 2023) and Rebuttal Expert Report (April 2023) for *Potomac Riverkeeper and Sierra Club (Plaintiffs) v. Virginia Electric and Power Company (Defendant)*, Civil Action No. 2:21-CV-23 (Kleeh) (US District Court for the Northern District of West Virginia, Elkins Division).
179. Affidavit (January 2023) for *Richard Dufour (Plaintiff), v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 1:19-cv-00591-HSO-BWR (Related to 12-968 BELO in MDL No. 2179). (US District Court for the Southern District of Mississippi).
180. Expert Report (January 2023) and Supplemental Expert Report (July 2023) on behalf of Plaintiffs in the matter of *Stephanie Mackey et. al., (Plaintiffs) v. Chemtool Inc. et. al., (Defendants) and Holian Insulation Company Inc. (Third-party Defendant)*, Case No.: 3:21-cv-50283, U.S. District Court, Northern District of Illinois, Western Division.
181. Expert Report (February 2023) for *Vervicia Henderson, et al. (Plaintiff) v. Lockheed Martin Corporation (Defendant)*, Case No. 6:21-cv-01363, U.S. District Court, Middle District of Florida, Orlando Division.
182. Expert Report (February 2023) for *Carol Davis (Plaintiff) v. Lockheed Martin Corporation (Defendant)*, Case No. 6:22-cv-81-RBD-EJK, U.S. District Court, Middle District of Florida, Orlando Division.
183. Expert Report (February 2023) for Mark Letart (Plaintiff), et al. v. Union Carbide Corporation, et al. (Defendants), Case No. 2:19-cv-877, U.S. District Court, Southern District of West Virginia, Charleston Division.
184. Affidavit (March 2023) on behalf of plaintiffs in the matter of the *State of New Mexico, ex rel. Raul Torrez, Attorney General (Plaintiffs) v. Sterigenics US LLC, Sotera Health Holdings, LLC, Sotera Health LLC and Sotera Health Company (Defendants)*, Case No.: D-307-CV-2020-02629, State of New Mexico, Third Judicial District Court, County of Dona Ana
185. Pre-filed Direct Testimony (March 2023) in the matter of *Algonquin Gas Transmission LLC., on behalf of Community Residents (Petitioners)*, Commonwealth of Massachusetts Department of Environmental

- Protection, Office of Appeals and Dispute Resolution, OADR Docket Nos. 2017-011 and 012, Waterways Application License No. W16-4600, Weymouth Mass.
186. Declaration (April 2023) in the matter of Sierra Club (Plaintiff) v. Tennessee Valley Authority in the matter of the Johnsonville Aeroderivative Combustion Turbines Project, Case No.: 3:22-cv-1054, U.S., District Court, Middle District of Tennessee, Nashville Division.
  187. Expert Report (May 2023/June 2023), Affidavit (April 2023) and Declaration (July 2023) for *Ezequiel Caraballo-Pache (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 8:20-cv-00263-SCB-JSS (US District Court for the Middle District of Florida, Tampa Division).
  188. Affidavit (May 2023) for *Lawrence Tucei (Plaintiff), v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 1:22-cv-00078-HSO-BWR (US District Court for the Southern District of Mississippi).
  189. Expert Report (May 2023/June 2023) for *Vincent Culliver (Plaintiff), v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 3:21-cv-4942-MCR/HTC (US District Court for the Northern District of Florida).
  190. Expert Report (June 2023) for *Matthew Williams (Plaintiff), v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 1:22-cv-00278-LG-BWR (US District Court for the Southern District of Mississippi).
  191. Declaration (June 2023) in support of public commenters relating to the Michigan Department of Environment Great Lakes and Energy (EGLE)’s Annual Network Monitoring Plan 2024.
  192. Expert Report (July 2023) and Rebuttal Expert Report (September 2023) relating to Greenhouse Gas and Energy Management (GEMM2) for Manufacturing in Colorado (September 2023) on behalf of Environmental Defense Fund.
  193. Pre-filed Direct Testimony (July 2023) on behalf of Citizens for Environmental Justice in the matter of the permit Application of Valero Refining-Texas, LP for Modification to State and Prevention of Significant Deterioration Air Quality Permits No. 38754 and PSDTX324M15 before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-23-14975, TCEQ Docket No. 2023-0203-AIR.
  194. Declaration (August 2023) in support of comments by Environmental Defense Fund in connection with the “Good Neighbor Plan” for the 2015 Ozone National Ambient Air Quality Standards, published at 88 Fed. Reg. 36,654 (June 5, 2023) (“Final Rule”), Docket ID No. EPA-HQ-OAR-2021-0668.
  195. Expert Report (August 2023) on behalf of Appellants in the matter of *PennEnvironment and Sierra Club (Appellants) v. Commonwealth of Pennsylvania, Department of Environmental Protection, (Appellee), and PPG Industries, Inc. (Permittee)*, EHB Docket No. 2022-032-B. Environmental Hearing Board, Department of Environmental Protection, State of Pennsylvania.
  196. Pre-filed Testimony (September 2023) and Cross Answering Testimony (October 2023) on behalf of the Puyallup Tribe of Indians in the matter of *Washington Utilities and Transportation Commission (Complainant) v. Puget Sound Energy (Respondent)*, Docket: UG-230393. Before the Washington Utilities and Transportation Commission.
  197. Expert Report (December 2023) on behalf of plaintiffs in the matter of *PennEnvironment and Sierra Club (Plaintiffs) v. PPG Industries, Inc. (Defendant)*. Case No.: Civil Action Nos. 2:12-cv-00342, 2:12-cv-00527, 2:13-cv-01395, 1:13-cv-01396, 2:14cv-00229 (consolidated). U.S. District Court Western District of Pennsylvania.
  198. Expert Report (December 2023) and Rebuttal Expert Report (June 2024) on behalf of the plaintiff in the matter of *Jennifer Perrotti (Plaintiff) v. Lockheed Martin Corporation (Defendant)*. Case No. 6:22-cv-01338 in the U.S. District Court Middle District of Florida – Orlando Division.
  199. Expert Report (Tranche 1 - January 2024, Tranche 2 – May 2024, Tranche 3 – June 2024) and Rebuttal Report (Tranche 1 – June 2024) on behalf of the plaintiffs in the matter of *Emily Glass et. al., (Plaintiff) v. B. Braun Medical Inc., et. al., (Defendants)*. Case No. 00315 (May Term 2021) and Consolidated Cases in the First Judicial District of Pennsylvania Court of Common Pleas of Philadelphia County.

200. Expert Report (February 2024) and Supplemental Expert Report (March 2024) on behalf of the plaintiff in the matter of *Kathleen Koch (Plaintiff) v. Medline Industries, Inc. et. al. and Vantage Specialty Chemicals, Inc. (Defendants)*. Case No. 2320 L 000686 in the Circuit Court of Cook County, IL.
201. Expert Report (April 2024 and August 2024) on behalf of the plaintiff in the matter of *Paula Johnson et. al., (Plaintiff) v. Prairie Farms Dairy, Inc. et. al., (Defendants)*. Case No. 2017 L 001562 in the Circuit Court, Third Judicial Circuit Madison County, Illinois.
202. Expert Report (April 2024) on behalf of the plaintiffs in the matter of *Tom Mutz et al., (Plaintiffs) v. Sterigenics US, LLC (Defendants)*. Civil Action File No. 20-A-3448 in the State Court of Cobb County, State of Georgia.
203. Expert Report (April 2024), Declaration (August 2024) and Rebuttal Expert Report (November 2024) on behalf of the plaintiff in the matter of *United States of America (plaintiff) v. EES Coke Battery, LLC (Defendant)*. Civil Action No. 22-11191 in the US District Court for the Eastern District of Michigan.
204. Affidavit on behalf of the petitioner (April 2024) in the matter of Dr. Darren Masier (Petitioner) v. North Carolina State University (Expected Adverse Party). File No. 24CV013058-910 in the General Court of Justice, Superior Court Division, Wake County, North Carolina.
205. Affirmation (June 2024) on behalf of the petitioners in the matter of Gwendolyn Harris et. al. (Petitioners) v. Marie Therese Dominguez (Commissioner of the New York State Department of Transportation) et. al., (Respondents) in the Supreme Court of the State of New York, County of Erie relating to the Kensington Expressway.
206. Expert Report (July 2024) on behalf of the Plaintiff in the matter of *Mourad Abdelaziz et. al., (Plaintiff) v. B. Braun Medical Inc., (Defendant)*. Case No. 2020-C-1984 in the Pennsylvania Court of Common Pleas, Lehigh County.
207. Prefiled Direct Testimony (August 2024) on behalf of *Sierra Club and Portland Citizens United in the matter of the permit Application by Corpus Christie Liquefaction LLC* for Air Quality Permit Nos. 105710 and PSDTX1306M1 before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-24-14373, TCEQ Docket No. 2023-1474-AIR.
208. Expert Report (August 2024) on behalf of the Plaintiff in the matter of *Pamela Knobbe (Plaintiff) v. Isomedix Operations, Inc., and Cosmed Group, Inc. (Defendants)*. Case No. 2022 L 008574 in re. Medline EtO Release, Consolidated with 2023 L 00686 in the Circuit Court of Cook County, Illinois.
209. Expert Rebuttal Report (September 2024) for *Eve Isaacks et. al., (Plaintiffs) v. Terumo BCT et. al., (Defendants)* before District Court, Jefferson County, Colorado Case Numbers: 2022CV031124 (consolidated with *Douglass et. al.* 2023CV30085).
210. Prefiled Direct Testimony (October 2024) and Rebuttal Testimony (December 2024) on behalf of the *Sierra Club in the matter of the Application of Duke Energy Kentucky, Inc. for a Certificate of Public Convenience and Necessity* to Convert its Wet FGD etc. Case No. 2024-00152 before the Public Service Commission, Commonwealth of Kentucky.
211. Expert Report (December 2024) on behalf of the plaintiffs in the matter of *Mary Beth Tamm et. al., (Plaintiff), Cibelli (Case No. 2023-L-011216) and Wagner (Case No. 2024-L-009290) v. Sterigenics U.S., LLC, et. al., (Defendants)*, Case No. 2023-L-5701 in the Circuit Court of Cook County, Illinois.

C. Occasions where Dr. Sahu has provided oral testimony in depositions, at trial or in similar proceedings include the following:

212. Deposition on behalf of Rocky Mountain Steel Mills, Inc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill.

213. Trial Testimony (February 2002) on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.
214. Trial Testimony (February 2003) on behalf of the United States in the Ohio Edison NSR Cases, *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).
215. Trial Testimony (June 2003) on behalf of the United States in the Illinois Power NSR Case, *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).
216. Deposition (10/20/2005) on behalf of the United States in connection with the Cinergy NSR Case. *United States, et al. v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (Southern District of Indiana).
217. Oral Testimony (August 2006) on behalf of the Appalachian Center for the Economy and the Environment re. the Western Greenbrier plant, WV before the West Virginia DEP.
218. Oral Testimony (May 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) re. the Thompson River Cogeneration plant before the Montana Board of Environmental Review.
219. Oral Testimony (October 2007) on behalf of the Sierra Club re. the Sevier Power Plant before the Utah Air Quality Board.
220. Oral Testimony (August 2008) on behalf of the Sierra Club and Clean Water re. Big Stone Unit II before the South Dakota Board of Minerals and the Environment.
221. Oral Testimony (February 2009) on behalf of the Sierra Club and the Southern Environmental Law Center re. Santee Cooper Pee Dee units before the South Carolina Board of Health and Environmental Control.
222. Oral Testimony (February 2009) on behalf of the Sierra Club and the Environmental Integrity Project re. NRG Limestone Unit 3 before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.
223. Deposition (July 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*
224. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Coletto Creek coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
225. Deposition (October 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
226. Deposition (October 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.
227. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Tenaska coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH). (April 2010).
228. Oral Testimony (November 2009) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.
229. Deposition (December 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).
230. Oral Testimony (February 2010) on behalf of the Environmental Defense Fund re. the White Stallion Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.
231. Deposition (June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).
232. Trial Testimony (September 2010) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, State of Maryland, and State of New Jersey (Plaintiffs)

- in connection with the Allegheny Energy NSR Case in US District Court in the Western District of Pennsylvania. *Plaintiffs v. Allegheny Energy Inc., et al.*, 2:05cv0885 (Western District of Pennsylvania).
233. Oral Direct and Rebuttal Testimony (September 2010) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).
234. Oral Testimony (September 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions*, No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.
235. Oral Testimony (October 2010) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.
236. Oral Testimony (November 2010) regarding BART for PSCo Hayden, CSU Martin Drake units before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.
237. Oral Testimony (December 2010) regarding BART for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.
238. Deposition (December 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).
239. Deposition (February 2011 and January 2012) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)’s Cherokee power plant. No. 09-cv-1862 (D. Colo.).
240. Oral Testimony (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).
241. Deposition (August 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).
242. Deposition (July 2011) and Oral Testimony at Hearing (February 2012) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.
243. Oral Testimony at Hearing (March 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).
244. Oral Testimony at Hearing (April 2012) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).
245. Oral Testimony at Hearing (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.
246. Deposition (March 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.
247. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).
248. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

249. Deposition (February 2014) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).
250. Trial Testimony (February 2014) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.*, Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).
251. Trial Testimony (February 2014) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).
252. Deposition (June 2014) and Trial (August 2014) on behalf of ECM Biofilms in the matter of the *US Federal Trade Commission (FTC) v. ECM Biofilms* (FTC Docket #9358).
253. Deposition (February 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and PacifiCorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).
254. Oral Testimony at Hearing (April 2015) and Testimony via Zoom (April 2024) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).
255. Deposition (August 2015) on behalf of Plaintiff in the matter of *Conservation Law Foundation (Plaintiff) v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).
256. Testimony at Hearing (August 2015) on behalf of the Sierra Club in the matter of *Amendments to 35 Illinois Administrative Code Parts 214, 217, and 225* before the Illinois Pollution Control Board, R15-21.
257. Deposition (May 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).
258. Trial Testimony (October 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).
259. Deposition (April 2016) on behalf of the Plaintiffs in *Natural Resources Defense Council, Respiratory Health Association, and Sierra Club (Plaintiffs) v. Illinois Power Resources LLC and Illinois Power Resources Generation LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (Central District of Illinois, Peoria Division).
260. Trial Testimony at Hearing (July 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.
261. Trial Testimony (December 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.
262. Trial Testimony (July-August 2016) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).
263. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

264. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Backus Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
265. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Drakulic Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
266. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Deutsch Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.
267. Deposition Testimony (July 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight v Coyote Creek Mining Company LLC (Defendant)* Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).
268. Deposition Testimony (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).
269. Deposition Testimony (December 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).
270. Deposition Testimony (January 2018) in the matter of National Parks Conservation Association (NPCA) v. State of Washington Department of Ecology and British Petroleum (BP) before the Washington Pollution Control Hearing Board, Case No. 17-055.
271. Trial Testimony (January 2018) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).
272. Trial Testimony (April 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington).
273. Deposition (June 2018) (harm Phase) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).
274. Trial Testimony (July 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.
275. Deposition (January 2019) and Trial Testimony (January 2019) on behalf of Sierra Club and Texas Campaign for the Environment (Appellants) in the contested case hearing before the Texas State Office of Administrative Hearings in Docket Nos. 582-18-4846, 582-18-4847 (Application of GCGV Asset Holding, LLC for Air Quality Permit Nos. 146425/PSDTX1518 and 146459/PSDTX1520 in San Patricio County, Texas).
276. Deposition (February 2019) and Trial Testimony (March 2019) on behalf of Sierra Club in the State of Florida, Division of Administrative Hearings, Case No. 18-2124EPP, Tampa Electric Company Big Bend Unit 1 Modernization Project Power Plant Siting Application No. PA79-12-A2.
277. Deposition (June 2019) relating to the appeal of air permits issued to PTTGCA on behalf of Appellants in the matter of *Sierra Club (Appellants) v. Craig Butler, Director, et. al., Ohio EPA (Appellees)* before the State of Ohio Environmental Review Appeals Commission (ERAC), Case Nos. ERAC-19-6988 through - 6991.

278. Deposition (September 2019) on behalf of Appellants relating to the NPDES permit for the Cheswick power plant in the matter of *Three Rivers Waterkeeper and Sierra Club (Appellants) v. State of Pennsylvania Department of Environmental Protection (Appellee) and NRG Power Midwest (Permittee)*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-088-R.
279. Deposition (December 2019) on behalf of the Plaintiffs in the matter of David Kovac, individually and on behalf of wrongful death class of Irene Kovac v. BP Corporation North America Inc., Circuit Court of Jackson County, Missouri (Independence), Case No. 1816-CV12417.
280. Deposition (February 2020, virtual) and testimony at Hearing (August 2020, virtual) on behalf of Earthjustice in the matter of *Objection to the Issuance of PSD/NSR and Title V permits for Riverview Energy Corporation*, Dale, Indiana, before the Indiana Office of Environmental Adjudication, Cause No. 19-A-J-5073.
281. Hearing (July 14-15, 2020, virtual) on behalf of the Sierra Club in the matter of *the Application of the Ohio State University for a certificate of Environmental Compatibility and Public Need to Construct a Combined Heat and Power Facility in Franklin County, Ohio*, before the Ohio Power Siting Board, Case No. 19-1641-EL-BGN.
282. Hearing (September 2020, virtual) on behalf of WildEarth Guardians (petitioners) in the matter of *the Appeals of the Air Quality Permit No. 7482-M1 Issued to 3 Bear Delaware Operating – NM LLC (EIB No. 20-21(A) and Registrations Nos. 8729, 8730, and 8733 under General Construction Permit for Oil and Gas Facilities (EIB No. 20-33 (A))*, before the State of New Mexico, Environmental Improvement Board.
283. Deposition (December 2020, March 4-5, 2021, all virtual) and Hearing (April 2021, virtual) in support of Petitioner’s Motion for Stay of PSCAA NOC Order of Approval No. 11386 in the matter of the *Puyallup Tribe of Indians v. Puget Sound Clean Air Agency (PSCAA) and Puget Sound Energy (PSE)*, before the State of Washington Pollution Control Hearings Board, PCHB No. P19-088.
284. Hearing (September 2020, virtual) on the *Initial Economic Impact Analysis (EIA) for A Proposal To Regulate NOx Emissions from Natural Gas Fired Rich-Burn Natural Gas Reciprocating Internal Combustion Engines (RICE) Greater Than 100 Horsepower* prepared on behalf of Earthjustice and the National Parks Conservation Association in the matter of Regulation Number 7, Alternate Rules before the Colorado Air Quality Control Commission.
285. Deposition (December 2020, virtual and Hearing February 2021, virtual) on behalf of the Plaintiffs (Shrimpers and Fishermen of the Rio Grande Valley represented by Texas RioGrande Legal Aid, Inc.) in the matter of the Appeal of Texas Commission on Environmental Quality (TCEQ) Permit Nos. 147681, PSDTX1522, GHGPSDTX172 for the Jupiter Brownsville Heavy Condensate Upgrader Facility, Cameron County, before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-21-0111, TCEQ Docket No. 2020-1080-AIR.
286. Deposition (January 2021, virtual) on behalf of Plaintiffs in the matter of *PennEnvironment Inc., and Clean Air Council (Plaintiffs) and Allegheny County Health Department (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant)*, Civil Action No. 2-19-cv-00484-MJH (US District Court for the Western District of Pennsylvania.)
287. Deposition (February 2021, virtual) on behalf of Plaintiffs in the matter of *Sierra Club Inc. (Plaintiff) v. GenOn Power Midwest LP (Defendants)*, Civil Action No. 2-19-cv-01284-WSS (US District Court for the Western District of Pennsylvania.)
288. Deposition (April 2021, virtual) on the Potential Remedies to Avoid Adverse Thermal Impacts from the Merrimack Station on behalf of Plaintiffs in the matter of *Sierra Club Inc. and the Conservation Law Foundation (Plaintiffs) v. Granite Shore Power, LLC et. al., (Defendants)*, Civil Action No. 19-cv-216-JL (US District Court for the District of New Hampshire.)
289. Deposition (June 2021, virtual) on behalf of Plaintiffs in the matter of *Sierra Club (Plaintiff) v. Woodville Pellets, LLC (Defendant)*, Civil Action No. 9:20-cv-00178-MJT (US District Court for the Eastern District of Texas, Lufkin Division).
290. Deposition (June 2021, virtual) on behalf of the Plaintiffs in the matter of *Modern Holdings, LLC, et al. (Plaintiffs) v. Corning Inc., et al. (Defendants)*, Civil Action No. 5:13-cv-00405-GFVT, (US District Court for the Eastern District of Kentucky, Central Division at Lexington).



291. Testimony (June 2021, virtual) regarding the Aries Newark LLC Sludge Processing Facility, Application No. CPB 20-74, (Central Planning Board, City of Newark, New Jersey).
292. Testimony at Hearing (October 2021) on behalf of Evraz Rocky Mountain Steel in the matter of Colorado's Proposed Revisions to Regulation 22, the Greenhouse Gas Emissions and Energy Management for the Manufacturing Sector in Colorado (GEMM Rule), before the Colorado Air Quality Control Commission.
293. Deposition (November 2021) for *Charles Johnson Jr. (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 2:20-CV-01329 (Related to 12-968 BELO in MDL No. 2179). (US District Court for the Eastern District of Louisiana).
294. Testimony at Hearing (November 2021) on behalf of *National Parks Conservation Association, et. al.*, in the matter of the Proposed Revisions to Colorado's Regional Haze State Implementation Plan (SIP) and Colorado Regulation 23, before the Colorado Air Quality Control Commission.
295. Deposition (December 2021) on behalf of Plaintiffs in Re: Deepwater Horizon BELO Cases, Case No. 3:19cv963-MCR-GRJ (US District Court for the Northern District of Florida, Pensacola Division).
296. Deposition (December 2021) for *James Noel (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 1:19-CV-00694-JB-MU-C (US District Court for the Southern District of Alabama, Southern Division).
297. Testimony at Hearing (February 2022, virtual) in the matter of the *Appeal Petition for Hearing on Air Quality Permit No. 8585 on behalf of Earth Care New Mexico et. al., (Petitioners) v. New Mexico Environment Department and Associated Asphalt and Materials, LLC (Applicant)*, No. EIB 21-48 before the State of New Mexico Environmental Improvement Board.
298. Deposition (March 2022) and Rebuttal Deposition (July 2022) for *Kamuda (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-010475 (Circuit Court of Cook County, Illinois.)
299. Deposition (April 2022, virtual) in the matter of Application of TPC Group LLC for New State and PSD Air Quality Permits (various), TCEQ Docket No. 2021-1422-AIR, SOAH Docket No. 582-22-0799, Before the Texas State Office of Administrative Hearings.
300. Deposition (May 2022, virtual) in the matter of the *Water Works and Sewer Board of the City of Gadsden (Plaintiff) v. 3M Company, et. al., (Defendants)*, Civil Action No.: 31 CV-2016-900676.00 (Circuit County of Etowah County, Alabama)
301. Deposition (June 2022 and September 2022, both virtual) for *Teresa Fornek (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-010744 (Circuit Court of Cook County, Illinois.)
302. Deposition (June 2022, virtual) on behalf of the Plaintiffs in the matter of Toll Brothers, Inc., and Porter Ranch Development Company (Plaintiffs) v. Sempra Energy, Southern California Gas Company et. al., (Defendants), Southern California [Aliso Canyon] Gas Leak Cases, JCCP No.: 4861, Lead Case No.: BC674622, Superior Court of the State of California for the County of Los Angeles.
303. Deposition (July 2022) for *Richard Dufour (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 19-cv-00591 (US District Court for the Southern District of Mississippi).
304. Trial (August 2022) on behalf of the Plaintiffs in the matter of *Modern Holdings, LLC, et al. (Plaintiffs) v. Phillips (Defendants)*, Civil Action No. 5:13-cv-00405-GFVT, (US District Court for the Eastern District of Kentucky, Central Division at Lexington).
305. Trial (August 2022, in person) for *Susan Kamuda (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-010475 (Circuit Court of Cook County, Illinois).
306. Deposition (September 2022, virtual) for *Heather Schumacher (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-010744 (Circuit Court of Cook County, Illinois.)
307. Deposition (September 2022) on behalf of Plaintiffs in *Phylliss Grayson et. al. (Plaintiffs), v Lockheed Martin Corporation (Defendant)*, Case No. 6:20-cv-01770. (US District Court for the Middle District of Florida – Orlando Division.)

308. Deposition (September 2022) for *Teresa Fornek (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-010475 (Circuit Court of Cook County, Illinois).
309. Hearing (October 2022) on behalf of the Puyallup Tribe of Indians in the matter of *Washington Utilities and Transportation Commission (Complainant) v. Puget Sound Energy (Respondent)* before the Washington Utilities and Transportation Commission, Docket UE-220066 and UG-220067 (Consolidated).
310. Trial (October 2022, in person) for *Teresa Fornek (Plaintiff) v. Sterigenics U.S., LLC, et. al., (Defendant)*, Case No. 2018-L-010475 (Circuit Court of Cook County, Illinois).
311. Depositions (March 2023, June 2023) for *Ann Jordan et. al., and Blake Darnell (Plaintiffs) v. Terumo BCT et. al., (Defendants)* before District Court, Jefferson County, Colorado Case Numbers: 2020CV031457, 2021CV030474 (consolidated with 2020CV031457) and 2020CV03148.
312. Depositions (March 2023, April 2023, May 2023) for Quinn Buczek (Plaintiff) v. Sterigenics US, LLC, Sotera Health, LLC, Prologis First US Properties, LP, et. al., (Defendants) before State Court of Gwinnett County, State of Georgia, Case No. Civil Action File No. 20-C-05918-S1.
313. Deposition (May 2023) for *Potomac Riverkeeper and Sierra Club (Plaintiffs) v. Virginia Electric and Power Company (Defendant)*, Civil Action No. 2:21-CV-23 (Kleeh) (US District Court for the Northern District of West Virginia, Elkins Division).
314. Deposition (May 2023) for Mark Letart (Plaintiff), et al. v. Union Carbide Corporation, et al. (Defendants), Case No. 2:19-cv-877, U.S. District Court, Southern District of West Virginia, Charleston Division.
315. Testimony at Hearing on behalf of Evraz North America In the Matter of Colorado Air Quality Regulation Proposed Revisions to Regulation Number 3 to establish enhanced Modeling, monitoring and permitting requirements for Stationary sources in disproportionately impacted communities 5 CCR 1001-5, before the Air Quality Control Commission, State of Colorado.
316. Deposition (2023) and Daubert Hearing (August 2024) for *Vervicia Henderson, et al. (Plaintiff) v. Lockheed Martin Corporation (Defendant)*, Case No. 6:21-cv-01363, U.S. District Court, Middle District of Florida, Orlando Division.
317. Testimony at Hearing (July 2023) *Clean Air Council, Citizens for Pennsylvania's Future, Mountain Watershed Association (Appellants) v. Allegheny County Health Department (Appellee) and Allegheny Energy Center* (Intervenor, Permittee), Case No. 21-043 before the Hearing Officer of the Allegheny County Health Department.
318. Deposition (July 2023) for *Ezequiel Caraballo-Pache (Plaintiff) v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 8:20-cv-00263-SCB-JSS (US District Court for the Middle District of Florida, Tampa Division).
319. Deposition (August 2023) for *Floyd Ruffin (Plaintiff), v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 2:20-cv-00334-CJB-JCW (US District Court for the Eastern District of Louisiana, New Orleans Division).
320. Deposition (August 2023) on behalf of petitioners in *Doreen Carey et; al., (Petitioners) v. Fulcrum Centerpoint LLC. (Permittee/Respondent) and Indiana Department of Environmental Management (Respondent)*, Permit Number 089-44042-00660, before the Indiana Office of Environmental Adjudication.
321. Deposition (August 2023) on behalf of the Plaintiff in the *Water Works and Sewer Board of the Town of Centre, Alabama v. 3M Company, et. al.*, Civil Action No.: CV-2017-900049. Circuit Court of Cherokee County, State of Georgia.
322. Deposition (August 2023) for *Matthew Williams (Plaintiff), v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 1:22-cv-00278-LG-BWR (US District Court for the Southern District of Mississippi).
323. Deposition (September 2023) for *Vincent Culliver (Plaintiff), v. BP Exploration and Production Inc., et. al. (Defendant)*, Civil Action No. 3:21-cv-4942-MCR/HTC (US District Court for the Northern District of Florida).

324. Testimony at Hearing for Greenhouse Gas and Energy Management (GEMM2) for Manufacturing in Colorado (September 2023) on behalf of Environmental Defense Fund.
325. Testimony at Hearing (October 2023) in the matter of *Algonquin Gas Transmission LLC*, on behalf of *Community Residents* (Petitioners), Commonwealth of Massachusetts Department of Environmental Protection, Office of Appeals and Dispute Resolution, OADR Docket Nos. 2017-011 and 012, Waterways Application License No. W16-4600, Weymouth Mass.
326. Testimony at Hearing (August 2023) on behalf of Citizens for Environmental Justice in the matter of the permit Application of Valero Refining-Texas, LP for Modification to State and Prevention of Significant Deterioration Air Quality Permits No. 38754 and PSDTX324M15 before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-23-14975, TCEQ Docket No. 2023-0203-AIR.
327. Testimony at Hearing (September 2023) on behalf of Appellants in the matter of *PennEnvironment and Sierra Club (Appellants) v. Commonwealth of Pennsylvania, Department of Environmental Protection, (Appellee), and PPG Industries, Inc. (Permittee)*, EHB Docket No. 2022-032-B. Environmental Hearing Board, Department of Environmental Protection, State of Pennsylvania.
328. Testimony at Hearing (November 2023) on behalf of the Puyallup Tribe of Indians in the matter of *Washington Utilities and Transportation Commission (Complainant) v. Puget Sound Energy (Respondent)*, Docket: UG-230393. Before the Washington Utilities and Transportation Commission.
329. Deposition (February 6, 2024, July 2024) in the matter of *Gena M. McLendon (Plaintiff) v. Becton, Dickinson and Company, et. al. (Defendants)*, on behalf of the Plaintiff in Civil Action File No. 20-C-07123-S1 in the State Court of Gwinnett County, State of Georgia.
330. Testimony at Hearing (February 7, 2024) in the matter of *Jefferson County Foundation, et. al., (Appellants) v. Laura M. Crowder, Director, Division of Air Quality, Department of Environmental Protection (Appellee)*, No. 23-02.AQB on behalf of the Appellant, before the West Virginia Air Quality Hearing Board, Charleston, WV. Also, testimony in related matter No. 23-01-AQB (Roxul USA Inc., d/b/a Rockwool v. same Appellee at No. 23-02-AQB).
331. Deposition (February 2024) and Trial testimony (June 2024) on behalf of the Plaintiffs in the matter of *Penn Environment and Sierra Club (Plaintiffs) v. PPG Industries, Inc. (Defendants)*. Case No. 2:12-CV-00342 in the US District Court for the Western District of Pennsylvania.
332. Deposition (March 2024 and April 2024) on behalf of the Plaintiff in the matter of *Kathleen Koch (Plaintiff) v. Medline Industries, Inc. et. al. and Vantage Specialty Chemicals, Inc. (Defendants)*. Case No. 2320 L 000686 in the Circuit Court of Cook County, IL.
333. Deposition (May 2024 and September 2024) on behalf of the plaintiff in the matter of *Paula Johnson et. al., (Plaintiff) v. Prairie Farms Dairy, Inc. et. al., (Defendants)*. Case No. 2017 L 001562 in the Circuit Court, Third Judicial Circuit Madison County, Illinois.
334. Deposition (August 2024) on behalf of the plaintiffs in the matter of *Tom Mutz et al., (Plaintiffs) v. Sterigenics US, LLC (Defendants)*. Civil Action File No. 20-A-3448 in the State Court of Cobb County, State of Georgia.
335. Deposition (October 2024 and November 2024) in the matter of *Gary B. Walker (Plaintiff) v. Becton, Dickinson and Company, et. al. (Defendants)*, on behalf of the Plaintiff in Civil Action File No. 21-C-08201-S1 in the State Court of Gwinnett County, State of Georgia.
336. Trial (November 2024) on behalf of the plaintiffs in the matter of *Emily Glass et. al., (Plaintiff) v. B. Braun Medical Inc., et. al., (Defendants)*. Case No. 00315 (May Term 2021) and Consolidated Cases in the First Judicial District of Pennsylvania Court of Common Pleas of Philadelphia County.
337. Deposition (August 2024) on behalf of the plaintiff in the matter of *Jennifer Perrotti (Plaintiff) v. Lockheed Martin Corporation (Defendant)*. Case No. 6:22-cv-01338 in the U.S. District Court Middle District of Florida – Orlando Division.
338. Deposition (August 2024) and Hearing (September 2024) on behalf of *Sierra Club and Portland Citizens United in the matter of the permit Application by Corpus Christie Liquefaction LLC* for Air Quality Permit Nos. 105710 and PSDTX1306M1 before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-24-14373, TCEQ Docket No. 2023-1474-AIR.

339. Deposition (September 2024) and Trial (December 2024) on behalf of the Plaintiff in the matter of *Pamela Knobbe (Plaintiff) v. Isomedix Operations, Inc., and Cosmed Group, Inc. (Defendants)*. Case No. 2022 L 008574 in re. Medline EtO Release, Consolidated with 2023 L 00686 in the Circuit Court of Cook County, Illinois.
340. Deposition (December 2024) for *Eve Isaacks et. al., (Plaintiffs) v. Terumo BCT et. al., (Defendants)* before District Court, Jefferson County, Colorado Case Numbers: 2022CV031124 (consolidated with *Douglass et. al.* 2023CV30085).

## **2025 Matters**

- January 8 (3<sup>rd</sup> Supp/Rebuttal for BBraun)
- January 14 (Deposition: Willowbrook Cibelli/Wagner). In-person, Monterey Park Courtyard-by-Marriott
- January 31 (Prefiled Testimony and Deposition) Cheniere Stage 3/Trains 8 and 9 Texas SOAH Challenge. SOAH Docket No. 582-25-02533, TCEQ Docket No. 2024-1197-AIR, Application by Corpus Christie Liquefaction, LLC for Amendment of Air Quality Permit Nos. 139479 AND PSDTX1496M1
- February 6, 7, 10, 11 (Testified at Trial, Terumo. Case Number: 2022CV031124. Consolidated with Douglass, et al. [2023CV30085] District Court, Jefferson County, Colorado, Plaintiffs: EVE ISAACKS on behalf of decedent DORETA ELAINE ISAACKS, et al., v. Defendants: TERUMO BCT STERILIZATION SERVICES, INC., et. al.
- February 27. Deposition on behalf of Appellants Friends of Grays Harbor, et. al., v ORCAA, the City of Hoquiam, and Pacific Northwest Renewable Energy LLC (PNWRE) before the State of Washington Pollution Control Hearings Board, PCHB No. 24-037.
- March 6 (Testimony at Hearing) Cheniere Stage 3/Trains 8 and 9 Texas SOAH Challenge. SOAH Docket No. 582-25-02533, TCEQ Docket No. 2024-1197-AIR, Application by Corpus Christie Liquefaction, LLC for Amendment of Air Quality Permit Nos. 139479 AND PSDTX1496M1
- March 18 (Expert Report). Tom Mutz et. al., Plaintiffs v. Sterigenics U.S., LLC, et. al., Defendants. State Court of Cobb County, State of Georgia Civil Action No: 20-A3448. Additional Related Cases: Emma J. Bonner 21-A2420; Mary Ann Harrell 21-A4396.
- April 17 (Testified at Trial) and April 28 (Rebuttal Testimony via Zoom) Gary Walker, Plaintiff v. Becton, Dickinson, and Company, et. al., Defendant in the State Court of Gwinnett County, State of Georgia, Civil Action No.: 21-C-08201-S1
- May 6 (Testified at Deposition). Tom Mutz et. al., Plaintiffs v. Sterigenics U.S., LLC, et. al., Defendants. State Court of Cobb County, State of Georgia Civil Action No: 20-A3448. Additional Related Cases: Emma J. Bonner 21-A2420; Mary Ann Harrell 21-A4396.
- May 19. Expert Report on behalf of Appellants Friends of Grays Harbor, et. al., v ORCAA, the City of Hoquiam, and Pacific Northwest Renewable Energy LLC (PNWRE) before the State of Washington Pollution Control Hearings Board, PCHB No. 24-037.