



888 17th St. NW, Suite 810
Washington, DC 20006
Main: 202-296-8800
Fax: 202-296-8822
environmentalintegrity.org

November 10, 2025

VIA ELECTRONIC SUBMISSION & ELECTRONIC MAIL

California Air Resources Board

Landfill Methane Regulation

LMR@arb.ca.gov

<https://ww2.arb.ca.gov/lispub/comm/bclist.php>

RE: Comments on Proposed Amendments to the Regulation on Methane Emissions from Municipal Solid Waste Landfills.

To Whom It May Concern,

The Environmental Integrity Project (“EIP”) respectfully submits the following comments to the California Air Resources Board (“CARB”) on the proposed amendments to the Regulation on Methane Emissions from Municipal Solid Waste Landfills (“LMR”)¹.

We hope that CARB will consider these recommendations and include revisions to the final LMR. Specifically, we recommend that CARB:

- Continue improving to SEM requirements, including:
 - Requiring that SEM occur only during normal atmospheric conditions;
 - More clearly incorporating the UAS OTM-51 Method;
 - Improving walking pattern monitoring requirements;
- Include a fenceline monitoring requirement, or in the alternative, require landfills to conduct fenceline monitoring for at least six months to assist CARB in developing a fenceline standard in the LMR;
- Require autotuning technology for landfills with persistent problems and those that use an energy recovery control device;
- Include stronger cover requirements;
- Prevent subsurface elevated temperature events and landfill fires through:
 - Setting the maximum temperature threshold at 131 degrees Fahrenheit;
 - Improve the enhanced wellhead monitoring requirements to better prevent subsurface elevated temperature events.

We appreciate your consideration of our comments.

¹ Cal. Code Regs. tit. 17§§ 95460-95476 (2010).

I. Review of previous recommendations

On January 24, 2025, EIP, RMI, Californians Against Waste (“CAW”) and Industrious Labs submitted extensive recommendations for CARB to consider as they revised the LMR (“January 2025 Letter”), also included as **Attachment A**.² We appreciate that CARB adopted many of our recommendations in the proposed amendments to the LMR.

Regarding surface emission monitoring (“SEM”) requirements, we support CARB’s proposal to reduce the concentration threshold from 500 ppmv to 200 ppmv. We also appreciate that CARB followed our recommendations for including a process for approval of alternative test methods and requiring the use of advanced technologies in difficult to monitor areas, including no longer exempting the active face from SEM monitoring requirements. We also appreciate the improvements made to recordkeeping and reporting requirements related to SEM. In sections below, we continue to advocate for recommendations to improve SEM that we included in our January 2025 Letter.

EIP continues to encourage CARB to include a fenceline monitoring standard in the LMR. We included specific recommendations for how CARB could establish a fenceline standard in our January 2025 Letter. If CARB chooses to not include a fenceline monitoring standard in the LMR, EIP encourages CARB to require landfills to conduct fenceline monitoring for at least six months as part of an information request to inform developing a fenceline standard.

We also made various recommendations for how CARB should improve requirements for gas collection and control systems (“GCCS”). We appreciate that CARB included proposed amendments to address flooded wells and system downtime and requiring earlier installation of a GCCS. We also support the proposed amendments that align with our recommendations to require site-specific component leak monitoring and repairs. We continue to urge CARB, in the final LMR, to require that landfills with persistent issues install and operate an automated wellhead tuning system. We also encourage CARB to adopt Alternative 2 described in CARB’s Initial Statement of Reasons (“ISOR”), which are more stringent amendments to require installing and operating automated wellhead tuning at landfills that use an energy recovery control device.

Although CARB included some meaningful amendments to address issues with landfill cover, the proposed amendments in the LMR fall short of what is needed. We recommend that CARB set minimum standards for cover material.

² In August of 2025, we reiterated some of these recommendations and included several additional recommendations related to landfill fires and subsurface elevated temperature events in comments we submitted on CARB’s proposed concepts. These comments are included as **Attachment B**.

Finally, we appreciate and support many of the proposed amendments that address mitigating and preventing subsurface elevated temperature (“SET”) events. We also offer further comments on how to further strengthen these requirements in the LMR.

II. SEM Improvements

As identified in the 2024 EPA Enforcement Alert, operators and their contractors are failing to comply with the SEM requirements in the federal Clean Air Act (“CAA”).³ Specifically, EPA noted that “[r]ecent inspections also revealed widespread shortcomings in the SEM program at MSW landfills, including methane emissions at higher rates of exceedance, with many above 50,000 ppm, which is 100 times higher than the regulatory limit.”⁴ Issues such as monitoring speed and time, departing from the established path, expired calibration gas, and improperly excluding areas from monitoring were also documented by EPA.⁵

EIP appreciates the proposed amendments that address these deficiencies. We also appreciate the proposed amendments that reflect recommendations we made in our January 2025 Letter. However, we still encourage CARB to make further improvements to SEM, as described in more detail in sections below.

A. CARB should require that SEM occur only during normal atmospheric conditions

In our January 2025 Letter, we recommended that CARB require that SEM occur only during normal atmospheric conditions. Several sections of the proposed amendments require keeping meteorological data, including barometric pressure.⁶ Although Proposed Section 9541(c)(3)(C) adjusts the section to require recording barometric pressure during the sampling period, it falls short of requiring that SEM occurs only during normal atmospheric conditions.

As previously described in our January 2025 Letter, it is well-documented that higher methane emissions are directly associated with atmospheric conditions, like lower barometric pressure.⁷ Studies conclude that “fluctuations in barometric pressure have a more pronounced correlation with landfill gas recovery than the absolute pressure values, highlighting the importance of changes in barometric pressure in determining LFG recovery efficiency.”⁸

³ 40 C.F.R. §§63.1958(d), 63.1960(c)-(d). 2024 EPA MSW Landfill Enforcement Alert.

⁴ *Id.*

⁵ *Id.*

⁶ Sections 95470(a)(1)(E), 95471(c)(2)(D), 95471(c)(3)(C). CARB, *Staff Report*, IV.A. at 113 (Sept. 23, 2025), at 69, 92, available at <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2025/LMR/isor.pdf> [hereinafter “2025 ISOR”].

⁷ GCCS White Paper at 5.

⁸ *Id.* at 6.

Accordingly, CARB should require in the final LMR that monitoring is conducted when atmospheric (also barometric) pressure is representative of normal site conditions⁹. Wellheads are operated with respect to atmospheric pressure. Therefore, short-term variability in the local pressure can impact the effectiveness of the GCCS, where the vacuum pressure is set monthly, and thus impacts surface emissions. Emissions decrease when atmospheric pressure rises and increase when the pressure falls.¹⁰ Canada's ECCC cautions in technical guidance that SEM should not be conducted "[i]f atmospheric pressure is rising sharply or is considerably higher than the average for the area."¹¹ Therefore, SEM conducted during periods of elevated atmospheric pressure would result in atypical measurements.

CARB should keep the recordkeeping requirements to show that SEM is conducted when barometric pressure is within the range of average daily variation at the site. However, data tracking alone is not enough. CARB must also ensure that SEM is not selectively conducted at times when methane concentrations are unusually low due to atmospheric conditions. Without a requirement that SEM must be conducted during normal atmospheric conditions, CARB cannot guard against such selective monitoring. We strongly urge CARB to include in its final rule a requirement ensuring that SEM is performed under normal atmospheric conditions.

B. CARB should more expressly allow the UAS OTM-51 method.

EIP appreciates CARB's consideration of our recommendations on establishing a process for approval of alternative test methods by including the proposed amendments in Proposed Section 95471(e) that create this process. The ISOR includes a rationale for this section that references EPA's mechanism to approve SEM instruments or procedures, citing specifically to OTM-51. However, OTM-51 is not expressly referenced in the proposed rule itself. Thus, it appears that, in order for a landfill operator to utilize this method, that operator would still have to seek individual approval of OTM-51, which seems unnecessary as this methodology was already vetted by the EPA.

In our January 2025 Letter, EIP urged CARB to incorporate UAS OTM-51 method, subject to all appropriate limitations and provisions explained in EPA's ALT-150 Letter, into the LMR revisions. By expressly including this method in the regulatory text, CARB would make clear that UAS-based monitoring is allowed as an alternative for performing SEM without the

⁹ Although current Clean Air Act requirements stipulate that "[m]onitoring must be performed during typical meteorological conditions," the LMR does not contain this requirement. 40 C.F.R. §§ 60.35f(c)(3), 60.765(c)(3). Moreover, the recommendations included in this section would require operators to document that SEM occurred during normal operating conditions.

¹⁰ James L. Hanson & Nazli Yesiller, Cal. Polytechnic State Univ., *Estimation and Comparison of Methane, Nitrous Oxide, and Trace Volatile Organic Compound Emissions and Gas Collection System Efficiencies in California Landfills* 22 (2020), <https://ww2.arb.ca.gov/sites/default/files/2020-06/CalPoly%20LFG%20Flux%20and%20Collection%20Efficiencies%203-30-2020.pdf>; Liukang Xu, et. al., *Impact of Changes in Barometric Pressure on Landfill Methane Emission*, 28 Glob. Biogeochemical Cycles 679, 685 (2014), <https://doi.org/10.1002/2013GB004571>.

¹¹ Env't and Climate Change Can., *Estimating, Measuring and Monitoring Landfill Methane-Technical Guidance Document* 30 (last updated April 17, 2023), <https://drive.google.com/file/d/1fqods0nXDSEUEmZu7nnkHZwXfGtemWPr/view?usp=sharing> [hereinafter "ECCC Technical Guidance"].

need for separate approval.¹² In its recently updated landfill methane regulations, the State of Washington was the first state to explicitly allow the option of using ALT-150 for SEM, and ECCC is also proposing that ALT-150 be allowed in its SEM requirements.¹³ CARB should follow Washington and Canada's examples and more explicitly allow for operators to use this specific, already approved method.

C. CARB should improve walking pattern monitoring requirements.

EIP appreciates CARB's adoption of our recommendation to decrease the walking pattern to 25-foot spacing for the entire landfill in Proposed Section 95471(c)(1)(C)1. CARB includes some meaningful improvements in Proposed Section 95470(b)(3)(E), which adjusts the 100-foot spacing interval to 25 feet when an exceedance is found. Proposed Section 95471(c)(2)(B) is a proposed subsection that establishes that the entire contiguous area exceeding the concentration limit whenever an instantaneous exceedance is detected. However, EIP still recommends that CARB further improve the walking pattern requirements.

CARB should include a walking speed (e.g. one meter per second (1 m/s)). By specifying a walking speed, CARB could address deficiencies noted by EPA in their recent enforcement alert (e.g. if the pace on the serpentine path is too fast, the equipment will not have adequate time to identify an elevated concentration).¹⁴

III. CARB should have included a fenceline monitoring standard.

As described in our January 2025 Letter, in the past several years, EPA finalized fenceline monitoring requirements for the refinery¹⁵, chemical manufacturing¹⁶, coke oven¹⁷ and integrated iron and steel sectors¹⁸. EPA promulgated these fenceline monitoring requirements and associated work practice requirements to mitigate fugitive emissions and other difficult-to-

¹² Operators in California would benefit from this clarity. In its ALT-150 Approval Letter, EPA states that “[f]or subpart Cf of 40 CFR 60, which is an Emission Guideline to be used by delegated state and local authorities to develop an individual State Plan, the availability or applicability of this alternative method must be determined on a case-by-case basis.” ALT-150 Approval Letter at 8. By specifically including this method in the LMR revisions, CARB eliminates the confusion of “case-by-case basis” in seeking approval from EPA to use the alternative method.

¹³ UAS White Paper at 4.

¹⁴ 2024 EPA MSW Landfill Enforcement Alert.

¹⁵ National Emission Standards for Hazardous Air Pollutants: Petroleum Refinery Sector, 85 Fed. Reg. 6064 (Feb. 4, 2020) (codified at 40 C.F.R. § 63.658).

¹⁶ New Source Performance Standards for the Synthetic Organic Chemical Manufacturing Industry and National Emission Standards for Hazardous Air Pollutants for the Synthetic Organic Chemical Manufacturing Industry and Group I & II Polymers and Resins Industry, 89 Fed. Reg. 42932 (May 16, 2024) (codified at 40 C.F.R. pt. 63, Subpart F).

¹⁷ National Emission Standards for Hazardous Air Pollutants for Coke Ovens: Pushing, Quenching, and Battery Stacks, and Coke Oven Batteries; Residual Risk and Technology Review, and Periodic Technology Review, 89 Fed. Reg. 55684 (July 5, 2024) (codified at 40 C.F.R. § 63.314).

¹⁸ National Emission Standards for Hazardous Air Pollutants for Coke Ovens: Pushing, Quenching, and Battery Stacks, and Coke Oven Batteries; Residual Risk and Technology Review, and Periodic Technology Review, 89 Fed. Reg. 23294 (April 3, 2024) (codified at 40 C.F.R. § 63.7792).

monitor sources, e.g. equipment leaks.¹⁹ Fenceline concentrations dropped by an average of 30 percent since the refinery sector's fenceline monitoring requirements went into effect.²⁰

Unfortunately, CARB did not include any fenceline standard in the proposed amendments to the LMR, nor did CARB explain its decision not to do so in the ISOR. EIP continues to urge CARB to include a fenceline standard in the LMR, or at the very least, require landfills to conduct fenceline monitoring for at least six months to assist CARB in developing a fenceline standard in the LMR.

A. EIP urges CARB to include a fenceline standard in the final LMR.

Although landfills and the refinery sectors are different, because of the large footprint of a landfill and variability in emissions, requiring fenceline monitoring—alongside more robust SEM monitoring and a super emitter response program (“SERP”)—could indicate when, and generally, where, there are elevated emissions at landfills.²¹

EPA chose to first establish a fenceline standard for the refinery sector to address fugitive emissions.²² EPA's reasoning for establishing the fenceline standard was that they were “concerned regarding the potential for high emissions from these fugitive sources due to the difficulties in monitoring actual emission levels.”²³ EPA reasoned that “[t]his approach would provide the owner or operator with the flexibility to determine how best to reduce HAP emissions to ensure levels remain below the fenceline concentration action level,” and that “[f]enceline monitoring will identify a significant increase in emissions in a timely manner[,] which would allow corrective action measures to occur more rapidly than it would if a source relied solely on the traditional infrequent monitoring and inspection methods.”²⁴ EPA's rationale for establishing the fenceline standard was that

[h]istorically, improved information through measurement data has often led to emission reductions. However, without a specific emission limitation, there may be no incentive for owners or operators to act on the additional information. Therefore, as part of the fenceline monitoring approach, we seek to develop a not-to-be exceeded annual fenceline concentration, above which refinery owners or operators would be required to implement corrective action to reduce their fenceline concentration.”²⁵

Years later, EPA established similar fenceline standards for three other sectors, in large part due to the success of the refinery fenceline standard at reducing fugitive emissions.

¹⁹ Fenceline Monitoring White Paper at 1.

²⁰ *Id.* at 2.

²¹ *Id.*

²² Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 Fed. Reg. 36880, 36920 (June 30, 2014).

²³ *Id.*

²⁴ *Id.*

²⁵ *Id.*

Especially considering CARB’s dual commitment in the LMR to reducing air toxics from MSW landfills²⁶, CARB is likely leaving meaningful, affordable and achievable emission reductions on the table by not including a fenceline standard in the proposed amendments to the LMR. In fact, as previously explained in our January 2025 letter, state agencies already required fenceline monitoring in consent decrees for landfills.²⁷ Instead of placing monitors around the entire perimeter of the landfill, monitors are placed at strategic locations on the landfill perimeter—close to both the active face and surrounding communities (where applicable).²⁸ In response to excessive odor complaints and a significant SET event, CARB and the South Coast Air Quality Management District (“SCAQMD”) are already requiring Chiquita Canyon Landfill to conduct monitoring along the fenceline.²⁹ As suggested in our January 2025 Letter, CARB can look to the flyover study and associated modeling conducted by the Michigan EGLE and other agencies to determine the number of monitors needed.³⁰

However, any fenceline monitoring requirements that CARB considers should not serve only an informational purpose. Fenceline monitoring must be paired with an action level that when an operator exceeds it, they are required to perform corrective action.³¹ CARB should establish an action level for methane and other hazardous air pollutants that triggers root cause analysis and corrective action by the operator. Because methane could be produced by nearby sources—such as farms, wetlands, composting facilities—CARB should allow sources to submit site-specific monitoring plans that include site-specific modeling that assesses the particular landfills’ fugitive methane emissions.³² However, CARB should conduct robust oversight of these site-specific monitoring plans to ensure that they adequately address fugitive emissions from each particular landfill.³³

²⁶ “The Proposed Amendments would reduce emissions of landfill gas, including methane and copollutants like toxic air contaminants (TAC) and volatile organic compounds (VOC). This is accomplished through multiple provisions that result in improved gas capture, improved monitoring and testing of gas control devices with energy recovery, and improved surface cover.” 2025 ISOR at 113.

²⁷ *Fenceline Monitoring White Paper*. at 3.

²⁸ *Id.*

²⁹ See Chiquita Canyon, *Community Air Monitoring Program*, available at <https://chiquitacanyon.com/reports/community-air-monitoring-program/> (last visited Nov. 5, 2025).

³⁰ *Fenceline Monitoring White Paper* at 4.

³¹ The Arbor Hills landfill fenceline monitoring includes an action level and corrective action requirements. Consent Decree, at 21-25, App G., *Michigan Dep’t of Env’t, Great Lakes and Energy v. Arbor Hills Landfill, Inc.* No. 2020-0593-CE. See *Fenceline Monitoring White Paper*

³² *Id.* at 8.

³³ In September of 2024, EPA’s Office of Inspector General (“OIG”) conducted an audit of the oversight of the benzene fenceline monitoring requirements for refineries. Env’t Prot Agency, Office of Inspector General, *Oversight to Ensure that All Refineries Comply with the Benzene Fenceline Monitoring Regulations*, Report No. 23-P-0030 (Sept. 6, 2023), https://www.epaoig.gov/sites/default/files/reports/2023-09/epaoig_20230906-23-p-0030_errata.pdf (last visited Sept. 19, 2023). The report included a finding that site-specific monitoring plans did not include required monitoring needed to verify offsite source contributions to fenceline benzene levels. *Id.* As a result, EPA-approved site-specific monitoring plans for refineries relied solely upon modeling that likely overestimates near-field source emissions, resulting in unwarranted downward adjustment to the delta c value. *Id.* CARB should note this OIG report and avoid these and similar issues when approving site-specific monitoring plans.

Moreover, CARB could draw from fenceline monitoring requirements in California's own refinery community monitoring and fenceline monitoring requirements³⁴ and recent federal fenceline monitoring requirements for refineries³⁵ and coke ovens³⁶ to establish methane concentration monitoring requirements. For example, CARB could consider establishing a methane action level that would trigger implementing a corrective action plan within twenty-four (24) hours.³⁷ Corrective actions could include application of additional daily cover and/or installing/repairing horizontal collectors. CARB should also include in the established method and in the monitoring plan that the owner or operator shall collect and record meteorological data.³⁸

Finally, CARB should require that all data is posted publicly and expeditiously. At landfills in both Michigan and North Carolina, after years of odor complaints and due to other compliance issues, the state agencies required fenceline monitoring and that the results be posted publicly, also requiring robust community engagement.³⁹ EGLE notes that odors from the Michigan landfill (though complaints are still received) are reduced.⁴⁰

B. Alternatively, at minimum, CARB should require all landfills to conduct fenceline monitoring for at least six months for the purpose of developing a fenceline standard.

Before EPA proposed new rules for the integrated iron and steel, coke ovens and chemical manufacturing sectors, EPA used its authority under Section 114 of the Clean Air Act to require some of the sources to conduct fenceline monitoring to obtain fenceline concentrations of hazardous air pollutants.⁴¹ The vast majority of sources conducting this monitoring measured hazardous air pollutant concentrations much higher than what they were estimating and reporting.⁴²

CARB also has data-gathering authority. CARB is permitted under 42 U.S.C. §7414(b)(1) to submit to the EPA Administrator a procedure for carrying out Section 114 information requests in California. CARB should similarly require either all or a subset of MSW

³⁴ See Cal. Health & Safety Code § 42705.6.

³⁵ See 40 C.F.R. § 63.658.

³⁶ See 40 C.F.R. § 63.

³⁷ See 40 C.F.R. § 63.314(e).

³⁸ See 40 C.F.R. §63.314(b).

³⁹ Fenceline Monitoring White Paper at 6-7.

⁴⁰ *Id.*

⁴¹ Coke ovens they measured benzene concentrations, while the integrated iron and steel sector measure total chromium and chemical manufacturing set action levels for various hazardous air pollutants. *See supra* Notes 22-24.

⁴² See Song, Lisa, "The EPA Let Companies Estimate Their Own Pollution Levels. We Discovered Real Emissions are Far Worse," *ProPublica* (October 30, 2025) available at <https://www.propublica.org/article/epa-air-pollution-pittsburgh-clairton-coke-works>; EIP, *The Steel Industry's Hazardous Air Pollution* (August 31, 2025) available at <https://environmentalintegrity.org/wp-content/uploads/2025/08/Steel-report-8.21.25.pdf>.

landfills in California⁴³ to conduct at least six months of fenceline monitoring to help CARB develop a fenceline standard for the LMR.⁴⁴

Because CARB is the leading innovator in the regulatory landscape for landfill methane regulation, this process presents the perfect opportunity for CARB to continue to lead. Fenceline monitoring represents a major step forward in reducing fugitive emissions in recent years. Even on the precipice of finalizing what will likely be the strongest regulations in the country for MSW landfills, CARB should consider, at the very least, gathering more accurate data on fenceline concentrations of methane and hazardous air pollutants to establish a fenceline standard. As evidenced by the success of the refinery fenceline standard, CARB could be leaving meaningful and achievable fugitive emission reductions on the table by failing to even collect information needed to develop a fenceline standard.

IV. CARB should require installation and operation of automated well tuning at all wells on landfills that use an energy recovery control device.

In our January 2025 Letter, we asked CARB to consider requiring remote wellhead tuning technologies. We pointed to the benefits of these technologies that are able to dynamically adjust GCCS parameters like vacuum pressure and flow rates in response to real-time data collected through continuous monitoring of atmospheric conditions.⁴⁵ We also recommended that CARB require automated wellhead tuning at landfills with persistent issues, which CARB included as a proposed concept.⁴⁶ However, CARB did not require any automated wellhead monitoring at any landfills.

In the ISOR, CARB describes Alternative 2: Adopting More Stringent Amendments Alternative, which would add to the proposed amendments a requirement to install and operate continuous wellhead monitoring with automated well tuning at all wells on landfills that use an energy recovery control device (e.g., an engine, gas turbine, or boiler that produces heat or electricity).⁴⁷ The continuous wellhead monitoring systems provide continuous measurement of wellhead parameters (rather than the typical monthly monitoring required by the Proposed Amendments) and the automated tuning is designed to improve gas collection efficiency and/or gas quality by responding to real-time conditions with wellhead vacuum adjustments.

Automated wellhead tuning technologies, which are in use at many landfills across the U.S., as discussed in our January 2025 Letter, are able to dynamically adjust GCCS parameters

⁴³ If CARB selects a subset of landfills, it should be made up of those landfills that CARB determines would be a representative sample of all California landfills, including those CARB expects to have the highest fenceline concentrations.

⁴⁴ 42 U.S.C. §7412(a)(1)(D)

⁴⁵ *Id.*

⁴⁶ California Air Resources Board, *Potential Updates to the Landfill Methane Regulation*, Public Workshop (Dec. 18, 2024) at 58 available at https://ww2.arb.ca.gov/sites/default/files/2024-12/Staff_Presentation_on_Potential_Updates_to_the_Landfill_Methane_Regulation.pdf.

⁴⁷ 2025 ISOR at 138.

like vacuum pressure and flow rates in response to real-time data collected through continuous monitoring of atmospheric conditions.⁴⁸ This technology has the potential to actively monitor gas collection wells, notify operators as soon as issues occur, identify out-of-range parameters, and allow for automatic wellhead tuning.⁴⁹ Automated wellhead tuning can also allow operators to identify issues much more frequently than once per month, and thus could also result in a more well-functioning GCCS and reduce damage to the GCCS.⁵⁰ The automated system is also capable of improving gas quality by optimizing the balance between oxygen and methane content, which reduces air intrusion risks.⁵¹

Accordingly, we encourage CARB to adopt this more stringent standard in Alternative 2, requiring autotuning technology at landfills that use an energy recovery device. Especially where a number of California landfills already utilize the technology, this more stringent alternative would be appropriate. SCS Engineers estimates that costs would be more affordable over time than traditional manual monitoring.⁵² CARB should also require automated wellhead tuning at landfills with persistent issues.

V. CARB should include stronger cover requirements in the LMR.

A. Previous recommendations

As explained in EIP’s January 2025 Letter, a Cal Poly field investigation of methane gas emissions from a representative set of California landfills analyzed all operational parameters at landfills and emissions measured on the ground.⁵³ The researchers found that the type of cover on a landfill was a significant factor impacting the flux of emissions.⁵⁴ Specifically, they found higher methane emissions with the use of intermediate and daily covers and lower methane emissions as the percentage of the landfill area with final cover increased.⁵⁵ The report recommended (1) limiting the working face; and (2), installation of intermediate cover within days—not weeks—of waste placement to avoid the higher emissions from daily cover.⁵⁶ Specific recommendations included:

⁴⁸ *Id.*

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² SCS Engineers, *US EPA Landfill Technology Workshop-SCS RMC Automated Wellheads* (October 29, 2024) at slides 5-6, available at <https://www.regulations.gov/document/EPA-HQ-OAR-2024-0453-0038>.

⁵³ James L. Hanson & Nazli Yesiller, Cal. Polytechnic State Univ., *Estimation and Comparison of Methane, Nitrous Oxide, and Trace Volatile Organic Compound Emissions and Gas Collection System Efficiencies in California Landfills* (2020), <https://ww2.arb.ca.gov/sites/default/files/2020-06/CalPoly%20LFG%20Flux%20and%20Collection%20Efficiencies%203-30-2020.pdf> [hereinafter “Cal Poly Report”].

⁵⁴ *Id.* at 23.

⁵⁵ *Id.* at 5.

⁵⁶ *Id.* at 351.

- (1) for daily cover: minimize the area and duration of coverage and avoid highly porous and open structure bulk materials;
- (2) for intermediate cover: increase thickness up to one (1) meter (about three (3) feet) with fines content over 30%, and minimize area; and
- (3) for final cover: thickness of over 150 cm (about 4.9 feet), fines over 60%, clay over 12%, and plasticity over 20%.⁵⁷

Moreover, in their white paper, EPA states that “additional regulatory measures would be needed to ensure the ongoing maintenance and durability of landfill covers. Bare soils, in particular, are especially vulnerable to damage from precipitation, which can compromise cover effectiveness and increase the potential for emissions.”⁵⁸ Thus, CARB should include in the final a new section for landfill cover, enumerating specific requirements for daily, intermediate and final cover. CARB should ensure that these requirements are also in concert with any solid waste requirements for MSW landfills. The requirements should set standards for cover material and outline specific required actions to ensure cover integrity maintenance, such that every month the landfill operators must visually inspect the entirety of the landfill cover, both interim and final. Where visual investigations indicate elevated concentrations of landfill gas, the owner or operator should conduct SEM.

CARB included some proposed amendments that addressed the recommendations in our January 2025 Letter. CARB defines cover material in 95475(a)(10) as:

soils/earthen materials or alternative materials used in covering compacted solid wastes in a disposal site. Cover material may serve as daily, intermediate or final cover.

(A) "Daily Cover" means cover material placed on the entire surface of the active face at least at the end of each operating day in order to control vectors, fire, odors, blowing litter and scavenging.

(B) "Intermediate Cover" means cover material placed on all fill surfaces where additional cells are not to be constructed for 180 days or more to control vectors, fires, odors, blowing litter, scavenging, and drainage.

(C) "Final Cover" means cover material that represents the permanently exposed final surface of a fill.

CARB requires a cover monitoring plan in Section 95464(b)(6) (and associated recordkeeping requirements in Section 95470(a)(1)(CC)) and a cover integrity assessment in Sections 95469(a)(4)(A), 95469(e)(3), 95469(e)(5)-(6), 95471(k) (and associated recordkeeping requirements in Sections 95470(a)(1)(DD)).

⁵⁷ Cal Poly Report at 350-351.

⁵⁸ Intermediate and Final Cover White Paper at 14.

B. CARB should include more specific requirements for cover, especially daily cover.

First, EIP appreciates that CARB defined cover materials to consist of soils/earthen materials. However, we maintain that CARB should not allow alternative materials. Alternative daily cover (“ADC”) should rarely, if ever, be used. Although ADCs are designed to meet daily regulatory requirements, many of the materials used do not sufficiently oxidize methane and allow more liquid infiltration, which leads to higher leachate levels.⁵⁹ In its recent white paper series, EPA states that “[f]or landfills subject to NSPS/EG control requirements, minimum standards and test methods for NMOC and methane mitigation from ADCs could be established to ensure equivalency to six inches of soil, or a stricter standard. This would not conflict with state approval of ADC for all landfills in the solid waste context, but rather would be establishing further standards for landfills required to mitigate their NMOC and methane emissions under the NSPS/EG framework.”⁶⁰ Several states have already identified performance-based standards for evaluation of suitability of ADC.⁶¹ CARB should require that any operator using ADC submit demonstration that the ADC controls odors, methane and NMOC. CARB should establish a test method for operators to ensure that the permeability of ADC is equivalent to six (6) inches of compacted soil, or a stricter standard.⁶² CARB should also require more frequent cover performance monitoring⁶³ for landfills that choose to use ADC.

Next, CARB should establish minimum requirements for permeability in covers that will be in place for an extended period of time (intermediate and final covers). Selection of soils should also consider properties that would promote oxidation such as texture, porosity, and pH.

Third, improvements to intermediate and final landfill covers can mitigate landfill gas emissions by promoting methane oxidation and enhancing the efficiency of gas collection systems.⁶⁴ Beginning with intermediate cover, CARB should consider whether to require that intermediate covers incorporate a high permeability layer near the surface.⁶⁵ CARB should also increase the required thickness of intermediate cover to ensure proper methane mitigation.⁶⁶

⁵⁹ The EPA said in recent white paper that “[t]here have been many instances where intermediate covers are used for long periods of time—decades, in some cases. Potential regulation changes could include mandating the installation of final or enhanced cover once a landfill cell reaches its final grade or after a predetermined number of years to avoid long term intermediate covers. This could be enforced by requiring landfill design plans to include a specified timeline for waste placement in each cell, along with a detailed schedule for installing the final cover once waste placement is complete. Similarly, regulation requirements could strengthen around the depth of intermediate covers to ensure proper methane mitigation.” Work Face and Daily Cover White Paper at 10. 11-12.

⁶⁰ Work Face and Daily Cover White Paper at 11.

⁶¹ “Ohio EPA (2023) identified that ASTM D 6826 and 7008 provide methods for evaluating certain types of ADC, including efficacy for odor control based on ASTM E 96 Test Methods for Water Vapor Transmission of Materials. Wisconsin Department of Natural Resources (2014) similarly recommends use of ASTM E 96 to evaluate potential odor control, and notes that certain ADC types can contribute to odors and emissions issues.” *Id.* at 12.

⁶² *Id.*

⁶³ EPA defined performance monitoring for ADC as “[m]onitoring the performance of ADCs over time is critical to assess their effectiveness in controlling odors, preventing litter, minimizing disease transmission, and addressing other landfill concerns. Regular inspections, field testing, and data analysis enable proactive management of ADC application and adjustment as needed.” *Id.*

⁶⁴ Intermediate and Final Cover White Paper at 3.

⁶⁵ *Id.* at 9.

⁶⁶ *Id.* at 14.

Three feet of soil cover, as recommended by Hanson et. al.⁶⁷, would more effectively control methane emissions. While the Cover Monitoring Plans and Cover Integrity Assessments are important improvements, CARB should still require that operators submit a cover design plan, or require a landfill cover section in the design plan already required under the LMR, in which they demonstrate careful material choice and design relevant to the climate and waste characteristics of their landfill. CARB should also require that intermediate cover within one (1) month.

Finally, federal solid waste regulations mandate that final cover systems are designed to minimize liquid infiltration and prevent soil erosion and must include at least 18 inches of earthen material as an infiltration or barrier layer, topped by at least six inches of another earthen layer that facilitates vegetative growth.⁶⁸ CARB should include in the cover requirement section of the LMR revision specific requirements for final cover that build off of the solid waste requirements. CARB should require that final cover be installed on an ongoing basis once a landfill cell reaches its final grade or after a predetermined number of years in order to avoid long term use of intermediate covers.⁶⁹ CARB should require that the cover design plan (or the cover section of the design plan) include a specified timeline for waste placement in each cell along with a detailed schedule for installing final cover once waste placement is complete.⁷⁰

VI. Periodic monitoring during GCCS downtime

Proposed Section 95464(e)(1) of the LMR requires that operators minimize gas collection system component downtime and use mitigation measures to minimize emissions. However, the proposed rule does not include any requirements that would ensure that the mitigation measures are functioning. CARB should require periodic monitoring before and during GCCS downtime to ensure that the mitigation measures are effective. Monitoring activities such as those proposed for unsafe-to-walk areas in Proposed Section 95471(d) could be used to safely assess the effectiveness of the mitigation measures.

VII. Preventing SET events and landfill fires through enhanced wellhead monitoring

As evidenced by the fire at Chiquita Canyon Landfill, SET events are extremely difficult to contain once they begin. CARB should consider stronger requirements to prevent SET events.

First, the most common type of landfill fire occurs between the surface and two feet below the landfill soil cover, i.e., surface fires, where fuel and oxygen are abundant. The other type of landfill fire is a subsurface fire or smolder that varies with depth depending⁷¹ on landfill operations, heat sources, available oxygen, and other factors. Subsurface smolder events can last multiple years to decades⁷² as the smolder thermally keeps breaking down surrounding combustible MSW. If not properly addressed, a SET Event that is limited to one area will

⁶⁷ Cal Poly Report at 350-351.

⁶⁸ See 40 C.F.R. §258, subpart F.

⁶⁹ Intermediate and Final Cover White Paper at 14.

⁷⁰ *Id.*

⁷¹ *Landfill Fires Guidance Document*, CalRecycle, <https://calrecycle.ca.gov/swfacilities/lffiresguide/>

⁷² Alan McNarie, *Old fire, new tricks*, The Hawaii Independent, (Oct. 20, 2008).

become a smolder and may spread to the entire landfill facility if it is not isolated and contained. SET Events present a significant environmental threat by emitting pungent odors (reduced sulfur compounds and organic acids), VOCs, such as benzene, and particulate matter.⁷³ In general, gas concentrations of NMOCs from MSW landfills double with every 18°F (7.7°C) increase in waste temperature.⁷⁴

Next, SET events are mainly caused by oxygen intrusion, waste temperature increases and leachate recirculation. Oxygen intrusion can occur from overdrawing the GCCS. The typical vacuum applied to a gas extraction well is approximately 125–250 mm (5–10 inches) of water column.⁷⁵ When landfill operators use a higher vacuum to enhance methane recovery for energy production or to control odors and emissions, i.e., overdraw the gas collection system, oxygen can enter the landfill through damaged gas wellhead seals and cracks, cracks in the soil cover, ADC, poorly compacted cover soils especially on side slopes, and unsaturated subsurface materials. The use of insufficient daily cover—like ADC and fine grained covers⁷⁶—can contribute to oxygen intrusion and thus SET event risk.⁷⁷ The introduction of oxygen in the waste mass and accumulation of heat via aerobic biodegradation⁷⁸ or another exothermic process can provide the necessary conditions to initiate and sustain the subsurface thermal breakdown or spontaneous combustion of MSW.

A. Impact of landfill fires and/or SET events

The temperature of waste itself is relevant to the risk of a SET event and the degradation of control equipment (e.g. the GCCS, leachate system and liners). Smoldering of MSW can generate temperatures that can reach 1,225°F (665°C)^{79,80} and smoldering combustion has been

⁷³ Nammari, Emissions From a Controlled Fire in Municipal Solid Waste Bales, 24 *Waste Management* 9-18 (2004).

⁷⁴ LFG Energy Project Development Handbook, Chapter 2: Landfill Gas Modeling, (Sept. 13, 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/pdh_chapter2.pdf, at 8.

⁷⁵ United States Army Corps of Engineering, Landfill Off-Gas Collection and Treatment Systems 3-17 (2008).

⁷⁶ “For example, air intrusion was initially facilitated by using a thin sand cover (which has a higher air conductivity than a fine-grained soil cover) at the Sint Maarten Landfill. Stark et al, Managing Hurricane Debris and Elevated Temperatures, *Proceedings of Specialty Conf. GEO-EXTREME 2021*, ASCE, Savannah, GA, November, Geotechnical Special Publication 328, 1-10 (2021).

⁷⁷ Aerobic decomposition can start from these and other actions that allow oxygen to enter the waste mass, such as, rapid settlement, poorly compacted or inadequate soil covers, especially on side slopes, abandoned gravel access roads, uncapped borings, leachate sumps, drainage systems, leaky penetrations and wells into the MSW, and passive venting systems. Changes in atmospheric pressure from cold fronts can also move landfill gas out or air into a landfill. Nastev et al, Gas Production and Migration in Landfills and Geological Materials, 52 *Journal of Contaminant Hydrology* 187-211 (2001).

⁷⁸ Comparing the enthalpies of aerobic and anaerobic reactions, heat generated in anaerobic decomposition is approximately 5% of the heat produced from the aerobic reaction. Nastev et al, Gas Production and Migration in Landfills and Geological Materials, 52 *Journal of Contaminant Hydrology* 187-211 (2001). As a result, waste temperatures in aerobic conditions are in the range of 140 to 176°F (60–80°C), while anaerobic landfills have temperatures ranging from only 77 to 104°F (25 to 45°C). Lefebvre et al, The Role of Aerobic Activity on Refuse Temperature Rise, I. Landfill Experimental Study, 18 *Waste Management & Research* 444-452 (2000); Hanson et al, Spatial and Temporal Temperature Distributions in Municipal Solid Waste Landfills, 1388 *Journal of Environmental Engineering* 804-814 (2010).

⁷⁹ Virginia Tech Expert Panel, *Bristol Landfill Expert Panel Report*, (April 25, 2022), available at <https://www.bristolva.org/649/Bristol-Landfill-Expert-Panel-Report>.

⁸⁰ As measured in two MSWLFs undergoing smoldering combustion. *Id.*

documented to persist within an MSW landfill as low as 212 to 248°F (100 to 120°C)⁸¹ and from 392 to 572°F (200 to 300°C) with measured temperatures as high as 1,292°F (700°C).⁸² Deep subsurface fires have measured temperatures of 176 to 446°F (80 to 230°C).⁸³ As a result of smoldering combustion, waste temperatures can rise to sufficient levels to thermally degrade, pyrolyze, or char MSW.

The damage to control equipment can be seen with sustained temperatures as low as 150 degrees Fahrenheit⁸⁴ and high-density polyethylene (“HDPE”) can lose half its strength at every 60 degrees Fahrenheit rise in temperature, and at 140 degrees Fahrenheit, HDPE will buckle at small loads.⁸⁵ As temperatures increase in a landfill, the concentration of some volatile organic compounds (“VOCs”) can increase by one to two orders of magnitude⁸⁶.

Pollution impacts from fires and/or SET events, in general, are concentrations of some VOC emissions from MSW landfills double with every 18 degrees Fahrenheit temperature increase.⁸⁷ Some NMOCs are known or suspected carcinogens and are classified as hazardous air pollutants (“HAPs”). Benzene and methyl ethyl ketone are consistently found at elevated levels at the surface and in the collected LFG during SET event investigations.⁸⁸ The VOCs produced from smoldering MSW typically include acetonitrile, acetone, benzene, 2-butanone (MEK), carbon disulfide, and tetrahydrofuran. Other VOCs detected in smoldering incidents include ethyl acetate, toluene, vinyl acetate, and xylene.⁸⁹

B. The Federal New Source Performance Standards and Emission Guidelines retain the 131 degrees Fahrenheit standard.

Because CARB is considering alignment with the federal standards as it sets a temperature threshold, the history of these standards is important. CARB should not merely align with the higher National Emission Standards for Hazardous Air Pollutants (“NESHAP”) threshold. As discussed in depth in these subsections, sufficient evidence shows that the New Source Performance Standards (“NSPS”) and Emission Guidelines (“EGs”) threshold of 131 degrees Fahrenheit is more protective than that in the NESHAP. Given California’s recent

⁸¹ Ettala, Landfill Fires in Finland, 14 Waste Management & Research 61 (1996).

⁸² Ettala, Emissions From Simulated Deep-Seated Fires in Domestic Waste, 14 *Chemosphere* 626-639 (2008).

⁸³ Lönnermark, Emissions From Simulated Deep-Seated Fires in Domestic Waste, 70 *Chemosphere* 626-639 (2008).

⁸⁴ over a year can impact geosynthetic bottom liner systems' service life and integrity. High-density polyethylene can lose half its strength at every 60°F (33°C) rise in temperature, and at 140°F (60°C), high-density polyethylene will buckle at small loads. Tetra Tech, *When Temperatures Rise—The Challenges of Hot Landfills*, Tetra Tech (May 18, 2018), <https://www.tetrattech.com/insights/when-temperatures-rise-the-challenges-of-hot-landfills/>.

⁸⁵ Tetra Tech, *When Temperatures Rise—The Challenges of Hot Landfills*, Tetra Tech (May 18, 2018), <https://www.tetrattech.com/insights/when-temperatures-rise-the-challenges-of-hot-landfills/>.

⁸⁶ *Id.* at 1, 12.

⁸⁷ Agency for Toxic Substances and Disease Registry (ATSDR). (2001), “Chapter 2: Landfill gas basics. Landfill gas primer—An overview for environmental health professionals,” “Chapter 3: Landfill Gas Safety and Health Issues.”

⁸⁸ Data Evaluation of the Subsurface Smoldering Event at the Bridgeton Landfill, (June 16, 2013), <https://semspub.epa.gov/work/07/30286004.pdf>, at 8.

⁸⁹ *Id.*

experience with landfill fires, CARB should adopt more protective requirements to prevent additional fires.

Over time, the EPA's air quality standards for landfills were revised to weaken requirements for addressing temperature as well as nitrogen and oxygen content at landfills. A temperature limit of 131 degrees Fahrenheit was set in the 1996 NSPS because this temperature was cited by industry as a temperature that indicates that there may be a subsurface problem.⁹⁰ Nitrogen levels were limited to 20% with a corresponding oxygen level of 5%.⁹¹ But operators were allowed to set higher parameters if "supporting data [showed] that the elevated parameter [did] not cause fires or significantly inhibit anaerobic decomposition by killing methanogens."⁹²

However, landfill operators argued to EPA during a subsequent revision that, due to variability among landfill sites, these thresholds were difficult to meet and that approval of alternative parameters was often delayed, preventing efficient operation of collection systems.⁹³ Operators further claimed that these standards were unnecessary because landfill operators are already incentivized to reduce the risk of fire and explosions at their sites.⁹⁴ Ultimately, the temperature⁹⁵ standard was maintained in the 2016 NSPS and the nitrogen and oxygen standards were eliminated. Operators are required to monitor oxygen and nitrogen content but there are no associated reporting thresholds or corrective actions.⁹⁶

In the 2020 NESHAP revisions, EPA weakened the temperature standard by increasing it to 145 degrees Fahrenheit and the rule replicated the NSPS approach to nitrogen and oxygen content, requiring monitoring but no corrective action or reporting.⁹⁷ In addition, in the 2020 NESHAP revisions, EPA finalized "minor edits" to the 2016 NSPS and EGs "allowing landfills to demonstrate compliance with the 'major compliance provisions' of the NESHAP in lieu of complying with the analogous provisions in the NSPS and EGs."⁹⁸ Subparts XXX⁹⁹ and Cf¹⁰⁰, the NSPS and EGs respectively, provide operators the option to comply instead with the NESHAP "major compliance provisions." However, the NESHAP provides no analogous "major compliance provisions" referring back to the EGs and NSPS. Thus, a source may choose to

⁹⁰ EPA 1995 Background, *supra* note 269, at 1-42.

⁹¹ *Id.* at 1-41, 1-42.

⁹² 40 C.F.R. § 60.753(c) (1996).

⁹³ Letter from Waste Management to Hillary Ward, Sector Policies and Programs Division, EPA Off. of Air Quality, at 2 (Sept. 27, 2011), <https://www.regulations.gov/document/EPA-HQ-OAR-2014-0451-0017>.

⁹⁴ EPA, *Landfills NSPS Technical Meeting*, at 3 (Oct. 22, 2012), <https://www.regulations.gov/document/EPA-HQ-OAR-2014-0451-0003>.

⁹⁵ 40 C.F.R. § 60.36f(a)(5)(ii).

⁹⁶ 40 CFR § 60.766(b)(2)(i)-(ii), (g) (requiring a device that records flow every 15 minutes).

⁹⁷ See Standards of Performance for Municipal Solid Waste Landfills, 81 Fed. Reg. 59332.

⁹⁸ National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills Residual Risk and Technology Review, 85 Fed. Reg. 17244, 17248 (Mar. 26, 2020) (codified at 40 C.F.R. pts. 60 and 63).

⁹⁹ 40 C.F.R. § 60.762(b)(2)(iv), 767(g), (j).

¹⁰⁰ "For approval, a state plan must include provisions for the operational standards in this section (as well as the provisions in §§ 60.36f and 60.37f, or the operational standards in § 63.1958 of this chapter (as well as the provisions in §§ 63.1960 of this chapter and 63.1961 of this chapter), or both as alternative means of compliance, for an MSW landfill with a gas collection and control system used to comply with the provisions of § 60.33f(b) and (c). Once the owner or operator begins to comply with the provisions of § 63.1958 of this chapter, the owner or operator must continue to operate the collection and control device according to those provisions and cannot return to the provisions of this section." 40 C.F.R. § 60.34f; *see also* 40 C.F.R. § 60.36f, 37f, 38f(k) (2016).

comply with the NESHAP rather than the corresponding provisions of the NSPS and EGs. Practically, this amounts to operators otherwise subject to the NSPS or EGs being allowed to instead comply with the operational standards for the GCCS and the compliance provisions of the NESHAP.

However, EPA's own analysis of the NESHAP rule indicates that temperatures below 145 degrees can indicate possible fire hazards. When EPA established the 145 degree standard, it cited a Solid Waste Association of North America ("SWANA") manual of practice for landfill GCCS, which states:

*polyvinyl chloride piping begins to fail at 145 °F and fails at 165 °F, temperatures above 140 °F could indicate aerobic conditions [meaning the presence of oxygen, posing a fire risk], and landfill gas temperature over 135 °F indicates a possible subsurface oxidation event (SOE)[rapid and self-sustaining combustion of organic waste that is exposed to oxygen (aerobic conditions)].*¹⁰¹.

Therefore, the use of 145 F as a temperature threshold in EPA's 2020 NESHAP revisions does not provide a sufficient rationale for CARB to use this threshold. EPA weakened its original temperature threshold of 131 degrees Fahrenheit in 2020, revising it to 145 degrees Fahrenheit while acknowledging significant increased risks at temperatures below 145 degrees Fahrenheit. If CARB elects to use 145 degrees Fahrenheit as a threshold, it should have an independent basis for doing so.

C. CARB Should strongly consider revising Section 95464(d) to establish a 131 degrees Fahrenheit standard.

In Proposed Section 95464(d), CARB establishes a wellhead standard of 145 degrees Fahrenheit. In the ISOR, while rightly pointing to the disastrous outcomes from SET events and landfill fires, CARB reasons that aligning with the federal requirements is sufficient rationale for setting the maximum temperature standard at 145 degrees Fahrenheit. This is a mistake. CARB should instead establish a maximum temperature standard of 131 degrees Fahrenheit, aligning instead with the NSPS and EGs.

In fact, in the ISOR, CARB explains that elevated landfill gas temperatures can potentially damage wells and lead to degraded performance of the GCCS, resulting in excess emissions.¹⁰² However, CARB fails to account for the damage that begins and is possible at temperatures lower than 145 degrees Fahrenheit as described in Section VII.A above.

Moreover, while high oxygen concentrations greater than five percent may be acceptable for short periods if gas wellhead temperatures are below 131 degrees Fahrenheit, the risk of a SET Event increases as the temperature exceeds 131 degrees Fahrenheit with oxygen of five

¹⁰¹ National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills Residual Risk and Technology Review, 84 Fed. Reg. at 36691 (*citing* SWANA/National Renewable Energy Laboratory (NREL), *Landfill Gas Operation and Maintenance Manual of Practice* 9-8 (1997), <https://www.nrel.gov/docs/legosti/fy97/23070.pdf>) (emphasis added).

¹⁰² 2025 ISOR at 29.

percent or greater. Also, as the gas wellhead temperature exceeds 170 degrees Fahrenheit, the potential for a SET Event becoming a smolder is higher if oxygen is at or above five percent. Additionally, as temperatures increase in a landfill, the concentration of some VOCs can increase by one to two orders of magnitude.¹⁰³

Accordingly, EIP urges CARB not to finalize its proposal to align with the 145 degrees Fahrenheit threshold in EPA's weakened 2020 NESHAP revisions. Because degradation of GCCS components can begin as low as 140 degrees Fahrenheit and the increase in VOC emissions associated with elevated temperatures, CARB should instead include the standard of 131 degrees Fahrenheit.

D. CARB should improve the enhanced wellhead monitoring requirements to better prevent SET events.

Proposed Section 95469(e) includes CARB's proposed revised wellhead monitoring requirements. CARB explains in the ISOR that:

[r]outine monitoring of gas collection system data and prompt corrective action can prevent GCCS failures that result in excess emissions. Data from wellhead monitoring can signal the need to adjust the level of vacuum (well "tuning" or adjusting blowers), repair or improve the landfill surface cover, investigate potential damage or obstructions in the well or other components, and prevent potential conditions that may risk landfill subsurface fires or reactions. Requirements to take action only in response to measured values above a given limit (i.e., an exceedance) miss opportunities for early intervention in response to changing trends. Similarly, when repeated exceedances suggest initial corrective actions did not address the root of the problem, the Regulation lacks provisions for more significant corrective actions and more frequent monitoring.¹⁰⁴

EIP appreciates CARB's intention to include proposed amendments aimed at preventing SET events and fires. We offer additional recommendations to those we raised in August of 2025 (in **Attachment B**) below to further strengthen these proposed amendments.

First, because we urge CARB to set the maximum threshold at 131 degrees Fahrenheit, CARB should also adjust the enhanced monitoring requirements accordingly. Therefore, the requirements currently associated with 145 degrees Fahrenheit threshold (Proposed Section 95469(e)(4)) should instead correspond to a 131 degrees Fahrenheit threshold.

Next, for exceedances of the 145 F threshold, CARB should finalize the same requirements it currently proposes for that temperature threshold but with more expedited timelines for enhanced monitoring and root cause analysis and corrective actions (currently Proposed Section 95469(e)(3), which should instead apply to 145 degrees Fahrenheit).

¹⁰³ Thalhammer, Todd, "Data Evaluation of the Subsurface Smoldering Event at the Bridgeton Landfill" (June 17, 2013) at 8, available at <https://dnrservices.mo.gov/bridgeton/docs/DataEvaFinal.pdf>.

¹⁰⁴ 2025 ISOR at 12.

Proposed Section 95469(e)(4) should also be revised to require that once a temperature is measured to exceed 145 degrees Fahrenheit, the operator shall also conduct measurements to ascertain CO is not greater than 500 ppm and measure oxygen levels to ascertain that they are not greater than five percent oxygen. Corrective action should be required within five calendar days for either of these exceedances. For the entirety of Proposed Section 95469(e), CARB should consider expediting the timelines for corrective action.

Additionally, CARB should include requirements with the 131 degrees Fahrenheit maximum threshold that correspond to the GCCS material used, as indicated in **Table 1** below:

Table 1: Temperature, Oxygen, LFG Well Material Requirements to Reduce SET Events.¹⁰⁵

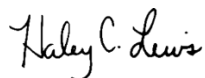
Temperature Limit	Oxygen Limit	LFG Well Material
> 131°F (55°C)	<5.0%	PVC/HDPE
> 145°F (63°C)	<3.0%	CPVC/Steel
> 170°F (77°C)	<2.0%	CPVC/Steel
> 200°F (93°C)	<1.0%	Steel

CARB should also require that landfills sending gas to waste-to-energy plants restrict oxygen to not more than five percent at the delivery point.

Finally, CARB could allow wells with higher operating values to be excluded from this standard only if they measure oxygen levels below two percent and CO concentrations below 250 ppm.

We appreciate the opportunity to submit these comments.\

Respectfully Submitted,



Haley Lewis
Senior Attorney
Environmental Integrity Project
888 17th Street, NW, Suite 810
Washington, DC 20006

Leah Kelly
Senior Attorney
Environmental Integrity Project
888 17th Street, NW, Suite 810
Washington, DC 20006

¹⁰⁵ Hammer Consulting Service, Todd Thalhamer P.E., April 2025. See Sino Pipe Factory, “Understanding the Hdpe Pipe Temperature Ratin,” <https://sinopipefactory.com/blog/hdpe-pipe-temperature-rating/> (last visited May 22, 2025); PES.TEC, *Temperature Range for HDPE Pipe Use*, Edition 0707, <https://www.pes-tec.com/images/pestec-docs/products/PR-600-HDPE-Pipe/TI/TI-600-5-Temperature-Range-for-HDPE-pipe-use.pdf> (last visited May 22, 2025)