









April 25, 2025

Anthy Alexiades California Air Resources Board 1001 | Street Sacramento, CA 95814

RE: Landfill Methane Rule Update – Landfill Operator Comments on Proposed Regulatory Concepts

Dear Anthy,

Thank you again for taking the time to meet this past month with representatives from industry and local government regarding pending updates to the Landfill Methane Rule. Our dialogue was helpful and provided a clear understanding of CARB's priorities related to the rule update. As we discussed, representatives of landfill owners and operators are providing comments on the various topics that will be discussed within the first draft of the regulation that will be presented this fall.

Our perspective on each category is presented in bullet form below.

Overall Focus of Rule Update

- The rule should focus on source Identification, safe methane capture and removal– At the December workshop, CARB presented a wide range of issues that could be encompassed by the rule update which are varied and complex. Our view is that utilizing these three elements as the guiding principles will serve to keep the modifications focused on critical items that warrant update since the last regulatory revision. This will provide CARB and interested parties with the most accurate, relevant information on methane emissions that are the most cost effective.
- <u>Selective application of amendments based upon facility emissions</u> Many of the issues driving the need for an update are caused by circumstances at individual facilities. Where possible, we suggest the employment of higher standards for facilities that warrant additional oversight. This

will avoid the placement of additional compliance requirements on facilities that are meeting existing regulatory criteria (including the current version of the LMR).

- <u>Reliance on technology while recognizing limitations</u> Significant advancements have been made in remote methane detection. While these tools are helpful in identifying which areas of a given facility require attention, uncertainties remain with respect to the detecting and quantifying methane emissions from landfills. These technologies rely on proprietary assumptions, algorithms and models to derive emission results. Transparent, open-sourced standard methods for detecting and quantifying landfill emissions are necessary before advanced technologies can be used for regulatory compliance. Use of these tools may allow for automation of some Surface Emissions Monitoring that is being manually performed today. Additionally, they could be used to screen areas of the landfill that are currently exempt from monitoring (ie. side slopes). However, the tools should not be used in lieu of field confirmation for compliance versus established regulatory thresholds as they do not offer that level of precision.
- <u>Need for site-specific approaches</u> We are cognizant of the increased level of visibility that methane emissions are receiving. To that end, we look forward to working towards revised regulatory criteria that aid in the goals outlined in the first bullet above that allow for flexibility and site-specific approaches. One-size-fits-all approaches are not appropriate for landfills with variable designs, waste acceptance, topography and climatology. We appreciate that this needs to be accomplished in a manner that provides CARB with visibility into site-specific data.

1. Technology

- New Technology Directional versus compliance While several significant advancements have been made in the past ten years relative to remote detection of methane emissions, our belief is that they are best suited as directional tools versus a means of accurate data gathering in relation to compliance thresholds. Drone, satellite and flyover imagery along with portable handheld equipment are incredibly useful in terms of providing our field teams with initial screening/guidance of where to focus our field-based monitoring. The output of the different tools is variable in terms of the locations of methane emissions and at times have yielded false positives as supported by 2023-2024 controlled release studies conducted at WM's closed landfill¹. In May-June 2025, controlled release studies operated by FluxLab will advance methane measurement technologies with the goal to improve quantification and detection methodologies by applying them in realistic landfill conditions such as large-scale spatial variability, mixed emission types (point and area sources), and interference caused by complex topography and meteorological factors.
- Some of the undersigned organizations have experimented with several advanced technologies to assess how they may inform operations such as add-on features to quarterly drone topographical surveys that are performed for airspace consumption. The added features are methane signature mapping platforms that provide a general sense of where additional focus could be placed at a given facility (used as a screening tool only). However, the output at times has conflicted with satellite or flyover imagery gathered in relatively adjacent time periods. While not a compliance

¹ A Controlled Release Experiment for Investigating Methane Measurement Performance at Landfills, Final report Prepared by Fluxlab, St. Francis Xavier University, Antigonish, Canada (2024) for EREF. See <u>Controlled Release Study</u> <u>Report</u>

tool, it has assisted field teams in gathering data in an efficient manner and from segments of the facility that are difficult to access.

Another example is the use of satellite observations for high level screening of where to target deployment of higher resolution technologies and to understand best practices for gas collection and control systems—a "find it fix it" approach. The use of this equipment could be a topic area for future discussion in terms of how and when it could be employed as CARB works to establish standards and methods through field studies. To use advanced technologies for regulatory purposes, industry requires:

- Accurate, reliable and repeatable results from the technologies. We need confidence in the results.
- Standard methods and procedures that are technically feasible, scalable and cost effective.

Our proposal would be to not include the use of this technology as a statewide mandated requirement but employ it as a directional tool only for facilities that have consistently exhibited higher levels of methane emissions. Establishment of criteria that define this subset of facilities will be critical so there is clear understanding of where additional screening tools may be deployed.

• Industry involvement in review of proposed "approved" technology - Claims made by vendors as to the capabilities of their equipment at times have been overstated. To that end, the process included in the rule relative to "approving" technologies needs to include industry input. This will allow for the inclusion of actual field data noted in the automated well head monitoring and tuning segment (Item #3 below). Should the use of various technologies referenced in this transmittal be considered, our group believes it is critical that any platform placed into the regulations as "approved" needs to be thoroughly vetted and benefit from input from all stakeholders. We urge CARB to focus on determining a process for vetting technology rather than on mandating specific technologies.

To support methods development, CARB and industry should be able answer these questions, at minimum:

- How to address emissions variation throughout the day/night as most measurements are taken during clear daytime conditions?
- How to weight episodic (construction, maintenance) events?
- How to reconcile differences in measurements of emissions using same technologies (e.g., satellite vendors) and then different technologies (drones v portable analyzers)?
- How to modernize equivalency demonstration for alternative monitoring/measurement technologies?
- How determine what is actionable versus observable?
- <u>Monitoring frequency</u> For the majority of active and closed facilities statewide, quarterly surface emissions monitoring has proven sufficient. *If CARB is considering more frequent monitoring, that* may be suitable for facilities with consistent elevated methane emissions and if so, the interstitial events may be conducted using the tools described above (ie. drone based with methane signature capabilities). More dialogue will be necessary to establish meaningful criteria relative to what facilities are subject to enhanced monitoring frequency.

2. Surface Emissions Monitoring

Excluded Areas – Discussion of inclusion of areas currently exempt from surface emissions monitoring needs to occur with respect to employee safety, facility throughput relative to working face size, and other factors such as weather and collateral effects of working on difficult grades. To that end, we believe that remote sensing equipment (ie. drones, handheld devices) could be of use for amended criteria which add surface emissions monitoring on currently exempt areas such as steep slopes on a quarterly monitoring cycle. These tools will assist with general identification of problematic areas that require further attention but cannot be employed to verify compliance with regulatory thresholds. Mitigation timelines for areas of concern would be dependent upon access, type of repair and equipment needed, etc.

Additionally, landfills experiencing extreme weather conditions will need to delay response and as such, the rule should build in allowances for such conditions (ie. snow, atypical rainfall events). We would request that CARB staff consider additional time for mitigation of side slope occurrences due to the difficulties and safety concerns associated with affecting repairs in these areas.

Relative to construction and corresponding GCCS downtime, our comments noted above relative to limitations of these tools should be considered. Given the site-by-site nature of construction logistics at landfills, it is not feasible to develop a standard that fits every facility in the state. Our comments in Item #4 below (ie. GCCS downtime) provide more detail in this regard.

In terms of the working face, employee and customer safety are paramount and could be at risk if the size of the working face is limited to a prescribed amount in the regulation. Working face dimensions vary widely even within a given facility at any time (ie. wedge fills vs. flat dimensional placement). Attempts to state that the working face can only be a certain dimension would most likely exacerbate traffic issues, impair safe utilization of heavy equipment, could place customers and employees at risk, and fundamentally constrain the daily operation of the landfills to safely and properly dispose of municipal solid waste. *Limitations on working face size would have collateral implications that far exceed the benefits of such a requirement*.

- Instantaneous Surface Emission Standard 500 vs. 200 ppm Adjustment to this threshold needs to be considered relative to the increased amount of landfill gas that will be removed from a given facility because of a change in criteria. Extensive dialogue with our group on this topic would indicate that while the threshold change for instantaneous surface emissions could be an emblematic move towards more stringent compliance standards, we have a difficult time equating the change to enhanced gas recovery. In fact, the number of readings that fall within this band based on review of our data is minimal and would be cause for a great deal of attention to be diverted from larger scale focus areas such as management of emissions from construction areas and more difficult to reach areas (ie. steep side slopes). Adverse collateral effects could also include excessive oxygen introduction into the waste mass that could potentially cause subsurface elevated temperature events. *Our recommendation is to leave the current 500 ppm instantaneous compliance threshold as is and focus on other changes that will have more impact on overall methane removal.*
- <u>Corrective Action and Re-monitoring Timeline Correction of an exceedance within the first 10- or</u> <u>20-day re-monitoring period is sufficient for many but not all exceedances</u>. Some occurrences will require air permitting approvals while others may involve safety concerns. Establishing an

absolute timeline for all corrections is not feasible. Alternative timeline notifications can address these circumstances but obtaining agency approvals has historically been a significant challenge. While we recognize that the U.S. EPA Emission Guidelines require re-monitoring 1 month after the initial exceedance, installation of a new/replacement well may not be warranted depending upon the type and location of exceedance.

Focus of resources on overall facility compliance versus potentially redundant QA/QC seems to be the prudent approach. *Lastly, we are amenable to adjusting the start of the 120-day timeline after a third exceedance for installation of a new/replacement well being tied to the initial exceedance.* Allowances should be incorporated into the rule for circumstances beyond the control of the facility operator (ie. drill rig availability and supply chain disruption).

- Instantaneous & aggregate exceedances Initiation of remedial actions following persistent exceedances in a grid or subdivision could be warranted. <u>The concept of 10 instantaneous or 5</u> <u>integrated exceedances is worth exploring in greater detail.</u> <u>However, the span of time represented</u> <u>should be one year vs. the three years noted in the workshop materials</u>. The actions noted in the workshop materials (ie. cover integrity inspection, GCCS analysis and follow on remediation) could all be initiated following exceedance of the agreed upon criteria.
- <u>Determining Full Extent of Surface Leaks</u> While we are open to discussing some of the concepts outlined on page 39 of the December workshop materials, stair stepping outward compliance post-mitigation of an exceedance could prove to be challenging. <u>Our view is that once an exceedance is identified, mitigated and the repair at that location verified, future SEM events (quarterly or interstitial) will identify if the repair has migrated spatially.</u> Discussions with our field teams on this topic raised concerns relative to what extent the spatial verification would be required and potentially non-productive effort expended to verify if the mitigation activity has caused migration of an exceedance.

3. <u>Automated Well Head Monitoring & Tuning</u>

Effectiveness re: enhanced methane capture – Our view of the value associated with utilization of automated well head monitoring and tuning equipment is mixed. Gas capture data for the Eastern Landfill in Baltimore County Maryland is attached and illustrates some of the concerns related to installation of the LoCI automated well head monitoring and tuning equipment. *The before and after comparison of total landfill gas captured does not show an increase in methane capture and even shows a decreasing trend in the latter portion of the period measured (see attached email and data summary)*. As noted in the email summary from SCS, other issues related to vendor responsiveness, output calibration to GEM readings and reliability were also concerns. *We do not believe the case cannot be made for mandatory usage of these tools. Their deployment should be at the discretion of the facility operator.*

• Expense versus value added – We are cognizant of the hierarchy of priorities associated with this rule update. To that end, extraction of landfill gas and reduction of emissions from active or closed landfills should be the core focus. However, that goal needs to be achieved relative to return on invested capital or ongoing expense as well as how our field operations allocate their time. *The expense associated with either outright purchase or leasing of this equipment and ongoing operating costs isn't justified by the results we have seen to date.* Those funds are better allocated to adding infrastructure and ensuring the gas extraction equipment that is installed is operating effectively.

As noted previously, at times equipment vendors make claims that their platforms yield results that are not factual or durable. Follow through by these organizations on equipment repair and adjustment has been lacking. Collateral effects of the equipment self-adjusting a given component to "optimal parameters" have included exceedances in nearby zones and pre-mature component deactivation. Lastly, aggregated individual component flow rates have not aligned with actual measured rates at the flare or LFGTE intakes. This has exaggerated the extent of improvement in overall gas capture that has been claimed by more than one vendor. *In summary, we believe that deployment of this equipment should be at the discretion of the facility operator and not become a mandated regulatory requirement or criteria.*

4. <u>Gas Collection System Downtime and Operating Parameters</u>

<u>Allowed downtime must be dependent on type and scale of construction activity</u> – Recognizing the data provided during the workshop, some adjustment to current allowances and exemptions may be appropriate. *To that end, we believe some combination of well re-connection at the end of each workday, limitations on the number of wells that can be disconnected at once, and mitigation measures for components that will be out of service for more than 2-3 days could be acceptable. These parameters should be discussed in more detail and could be of assistance in reducing methane emissions.</u>*

The workshop materials reference limitations on the size of the working face as a potential means of mitigating some of these emissions. <u>A basis for not pursuing this approach is provided in Item 2</u> <u>above, which notes the logistical as well as health and safety considerations for site operations.</u> Practical limitations on the duration of GCCS downtime could provide measurable improvement in terms of emissions associated with construction activities.

- Initiation of mitigation measures Some period of component downtime may be appropriate as a trigger for further mitigation measures to be employed. A proposed limit on component downtime of not less than 5 days prior to implementation of mitigation measures may be appropriate if proper construction planning is implemented. There could be limitations on the number of wells disconnected at any one time as a percentage of the total wells installed at the facility with the ability to request a higher value should circumstances warrant. Establishment of an absolute number of wells would be difficult given the variations in facility size, GCCS infrastructure, historical operating practices and daily throughput.
- <u>Gas collection system operating parameters</u> We question whether this information will be
 predictive of the ultimate goals of the rule amendments, namely, reduction of methane emissions.
 All facilities are different and ideal system pressure at one facility may vary dramatically from
 another. We have typically used gas flow rates as a measure of system performance and an
 indicator of whether optimal extraction is occurring given the GCCS in place. In both cases, these
 metrics and setpoints would vary dramatically from one facility to another and attempting to
 accurately define them in a regulatory package would be incredibly difficult. *However, further
 discussion is warranted as to additional parameters, such as system pressure, could be
 incorporated into the revised rule. We are amenable to consideration of options as long as no sitespecific baselines are established, and the parameters are used as tools to refine and optimize
 GCCS operation and not as compliance thresholds.*

5. <u>Reporting & Record Keeping & Criteria</u>

- <u>Standardization of reporting format</u> <u>We support the development of a standardized digital</u> <u>reporting format</u>. We would recommend some informal working sessions with our consultants and field environmental teams so that the tool can be developed in a manner that aligns with how data is gathered and stored. Automation of data transfer from field equipment and host systems to the tool is also critical in terms of efficiency and quality control.
- <u>Alignment with other regulatory requirements</u> To the extent possible, federal, state, and local policies regulating landfill emissions should align to reduce conflicting requirements on operators and ensure consistency and certainty of implementation. Further conversation is warranted to ensure Air District rules are not precluding efficient implementation of the LMR.
- <u>Reporting Criteria</u> <u>The rule's monitoring and reporting parameters should be consistent with</u> <u>federal requirements</u>. Any criteria developed in this regard should be captured at primary GCCS junctures.

6. Declining Gas Generation - Semicontinuous/permanent shut down (facility wide or component)

Site specific comprehensive plan vs. threshold approach – Each landfill differs in terms of many factors (ie. in place waste, climate, types of materials accepted, historical management practices, etc.). The assignment of a minimum threshold of gas recovery in terms of MMBtu/hour or some other measure may not be an appropriate metric to determine whether semi-continuous or full shut down of a gas collection system or component is warranted.

Our proposal would be that in the event an owner/operator of a facility requests semi-continuous or permanent shutdown of a gas collection and recovery system, they should submit a request that provides the basis for their proposed course of action. The request should be supported by factors such as those outlined in the December 2024 Workshop presentation deck. On <u>a facility-wide</u> basis, a request for semi-continuous or permanent shut down could include:

- Demonstration that the site has, and will be, in compliance with all related regulatory and permit requirements using data analysis, compliance history, historical gas generation, etc.
- Proposed surface emissions monitoring frequency, scope, and criteria for reestablishment to current regulatory standards should continual exceedances occur
- Establishment of a <u>site-specific</u> maximum total emissions threshold in MT CH4/yr based on gas collection rates and other relevant metrics
- Use of a pilot phase semi-continuous operation of increasing intervals of GCCS downtime with follow on monitoring per protocol outlined above to verify whether assumptions supporting the proposed actions are accurate over time

On a *component basis*, the following performance-based factors could be used to determine whether decommissioning or replacement is warranted:

- > Determine whether components are operating effectively and not impaired (ie. casing cave in or fluid buildup is lack of gas flow caused by generation or well impairment)
- > Determine whether a lower capacity device is warranted or feasible (well, blower, flare)

- Once these two data points have been obtained, determine whether removal of a component or device will cause surface emissions to exceed regulatory thresholds
- Similar approach to facility wide comment re: use of pilot phase to verify that assumptions are verified (follow approved monitoring plan of successively longer periods of nonoperation for component(s)).

CARB should not establish state-wide numeric thresholds for overall or hourly emissions from a facility that would serve as the basis for reduced or complete cessation of a GCCS operation or an individual component. *Each site is unique and should an operator desire to make a request for either one, factors such as those outlined above should be required in the regulation to be included in that request.* Including specific numeric thresholds, such as the one referenced in the Canadian regulation in the workshop deck, could possibly lead to premature decommissioning of components or unfairly prohibit operators from making the case that all or a portion of a GCCS system is no longer needed.

7. <u>Third Party Gas Control System Operators</u>

We would like to discuss this item further and one concept to consider is that a third-party gas control system operator is subject to the rule if it "receives" landfill gas. This would be for facilities that receive the gas for cogeneration of electricity or those that operate landfill gas upgrading facilities. Additionally making it allowable, but not mandatory, for third party gas system operators to achieve compliance by providing necessary information to landfill operators could assist with reporting consolidation and lessen the burden on CARB staff.

We look forward to discussing this submission with your team in greater detail. Thank you again for your engagement with our respective organizations.

Sincerely,

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