

ARB Landfill Methane Regulation Update

I. **Summary**

a. Landfills Under 450,000 Tons-in-Place

- i. Increases annual reporting obligations and requires owners/operators to annually calculate landfill gas heat input capacity.

b. Remotely Detected Emissions Plumes

- i. Allows ARB to notify landfills by e-mail if a drone, satellite, or other monitor detects an emission plume and requires the owner/operator to expeditiously monitor surface missions and components to detect and remedy any leaks.
- ii. Narrows scope of exempt facilities from those that “*receive* only demolition, inert, or non-decomposable waste” to those that “*contain* only demolition, inert, or non-decomposable wastes.

c. New Component Leak and Cover Monitoring Plan Requirements

- i. Requires owners/operators to develop and implement a component leak monitoring plan and a cover integrity monitoring plan within 90 days of the regulation’s effective date.

d. New Requirement to Install Horizontal Collectors and Cassion Wells

- i. Requires owner/operator of facilities that accept more than 200,000 tons of solid waste annually to install horizontal collectors or caisson wells in areas of new waste placement after 15 vertical feet of solid waste has been placed.

e. Resubmission and/or Repeal of Alternative Compliance Measures

- i. Requires owners/operators to submit to the Executive Officer any alternative compliance approval documentation in their possession (and all documents submitted as part of the original request) by April 1, 2027. ARB will review those documents and determine whether to continue or reject those alternative compliance measures. Any previously approved alternative compliance option becomes invalid on January 1, 2028 unless the owner/operator resubmits the approval and documentation for Executive Officer review by April 1, 2027.

f. Gas System Operation

- i. Limits gas control system downtime to 120 hours in a calendar year.
- ii. Requires wells to be operated under a vacuum and with an interior wellhead temperature of less than or equal to 145 degrees Fahrenheit.
- iii. Requires the owner/operator to minimize gas collection and control system downtime and limits the number of wells that may be offline at any one time.

ARB Landfill Methane Regulation Update

g. Gas System Monitoring

- i. Deletes monitoring exemptions for the working face or areas where the cover material has been removed and establishes pathways to monitor unsafe-to-walk surface areas.
- ii. Requires quarterly monitoring of gas control system equipment and monthly monitoring of the cover and wellheads.
- iii. Requires owners/operators to conduct wellhead parameter trend analyses and undertake enhanced monitoring and down well temperature monitoring if temperature, oxygen content, pressure, methane content, or methane to carbon dioxide ratios exceed specified levels.
- iv. Requires semiannual well liquid level monitoring and triggers response if the liquid level exceeds 50% of the screened interval length.
- v. Establishes timeframes and obligations to conduct corrective actions, root cause analyses, and corrective action analyses based on emissions exceedances, oxygen concentration exceedances, or positive pressure observations.
- vi. Increases the frequency for monitoring closed areas of landfills and
- vii. Requires the owner/operator to notify the Executive Officer at least 15 calendar days prior to scheduled surface emissions monitoring events.

h. Temperature-Based Requirements

- i. Establishes new requirements to perform collection system assessments and cover integrity assessments if landfill gas temperature exceeds 131 degrees and triggers enhanced monitoring if that temperature continues for more than 60 days.
- ii. Requires enhanced monitoring, downwell temperature monitoring, and corrective action if landfill gas exceeds 145 degrees at the wellhead or any point in the well. Provides that failure to complete corrective actions and return temperature below 145 degrees within 120 calendar days is a violation.
- iii. Requires expedited corrective action if the landfill gas exceeds 170 degrees at the wellhead or any point in the well AND carbon monoxide concentration is greater than or equal to 1,000ppmv. Provides that failure to complete corrective actions within 15 calendar days will be considered a violation.

i. Reporting

- i. Significantly increases reporting obligations to ARB or the local air district.
-

ARB Landfill Methane Regulation Update

II. Narrower Scope of Exempt Facilities

- a. Narrows the scope of the exemption for construction and demolition waste, inert waste, or non-decomposable waste facilities. Existing law exempts facilities that receive only demolition, inert, or non-decomposable waste. Revisions narrow the exemption to those facilities that contain only demolition, inert, or non-decomposable wastes.

III. Uncontrolled Landfills (Landfills without a required gas collection and control system)

- a. Replaces the requirement to file an annual Waste in Place Report with new requirements to calculate and report annually the landfill gas heat input capacity. If the calculated landfill gas heat input capacity is over 3.0 million Btu/hour, the owner/operator must install a landfill gas collection system (LGCS) and perform monitoring unless four consecutive quarterly monitoring periods show no measured concentration of methane of 200ppm or greater using instantaneous surface monitoring procedures.
- b. Requires uncontrolled landfills to report the following to the Executive Officer annually:
 - i. Contact and general facility information.
 - ii. Total amount of solid waste deposited each year the landfill was in operation.
 - iii. Total landfill surface area with each cover type.
 - iv. All required surface emissions monitoring data (if landfill gas heat input capacity is greater than or equal to 3MMBtu/hr)
 - v. 100-year historical annual average precipitation recorded at the County level or at the nearest weather station.
 - vi. Volume of leachate or other liquid deposited or injected into the landfill.
 - vii. Calculated landfill gas heat input capacity.
 - viii. Measurements of landfill gas flow rate and methane content for landfills with carbon adsorption or passive venting systems.

IV. Design Plans for Gas Control Systems

- a. For systems that begin accepting landfill gas after July 1, 2027, the owner/operator must submit a design plan to the Executive Officer at least six months before accepting landfill gas. The Executive Officer shall review and approve or disapprove the design plan within 120 days.
- b. Shortens the timeframe for installation and operation of a gas collection and control system from 18 months to six months after approval of the Design Plan for active MSW landfills and from 30 months to 18 months for closed or inactive MSW landfills.

ARB Landfill Methane Regulation Update

V. New Requirements for Horizontal Collectors or Caisson Wells

Requires the owner/operator of an MSW landfill that accepted at least 200,000 tons of solid waste per year in any of the three prior calendar years to install horizontal collectors or caisson wells in areas of new waste placement, with operation beginning when both:

- a. At least 15 vertical feet of solid waste has been placed over the horizontal collector or bottom of the caisson well AND
- b. Positive pressure has been detected in the horizontal collector or caisson well based on monthly measurements.

VI. Gas Collection System Requirements

a. Operation

- i. Requires the owner/operator to immediately shut down the gas mover system and close valves in gas control and collection systems that are not operating.
- ii. Limits gas control system downtime to 120 hours in a calendar year.
- iii. Requires wells to be operated under a vacuum unless there is a fire or elevated wellhead gas temperature, in which case the owner/operator must record instances of when positive pressure occurs to avoid a fire.
- iv. Requires wells to be operated with an interior wellhead temperature of less than or equal to 145 degrees Fahrenheit.
- v. Provides examples of methane mitigation measures that may be used during shutdowns and removes exemptions from the 500ppmv surface methane emission limit.
- vi. Requires the owner/operator to minimize gas collection and control system downtime with the component returned to operation no more than five calendar days following initial shutdown. If the component cannot be returned to operation within that time, a notice must be filed with the Executive Officer that includes monitoring records showing the shutdown is not resulting in excess methane emissions.
- vii. Limits the number of wells that may be offline at any one time to five wells or 5% of the total number of wells at the MSW landfill, whichever is greater, unless the shutdowns are necessary to prevent or extinguish a fire.
- viii. Allows for alternative corrective actions in lieu of installing a new or replacement well.

b. Monitoring

ARB Landfill Methane Regulation Update

- i. Requires each gas control device to be equipped with a device capable of recording the gas flow rate and system pressure at least every 15 minutes and to electronically archive that information.
 - ii. Requires gas measurement points at each inlet and outlet of the treatment system to record and electronically archive gas flow every 15 minutes and methane content at least every three hours.
 - iii. Requires temperature sensors to have an accuracy of +/- 1% and record the temperature at least every 15 minutes.
 - iv. Requires internal combustion engines and gas turbines to have oxygen and temperature sensors in the exhaust gas stream to record oxygen content and temperature at least every 15 minutes.
 - v. Deletes monitoring exemptions for the working face or areas where the cover material has been removed and refuse exposed to install, expand, replace, or repair components of the gas system.
 - vi. Requires unsafe-to-walk surface areas to be monitored during the same quarter the surface emission monitoring occurred and allows monitoring those areas using alternative procedures.
 - vii. Requires owners/operators to monitor components containing landfill gas under positive pressure quarterly for leaks.
 - viii. Requires gas control system equipment monitoring to record the composition of the gas collected at least monthly.
 - ix. Requires gas flow rate to be recorded at each gas control device at least every 15 minutes and to report any changes of greater than 20% over a three-hour period of operation.
- c. ***Monthly Wellhead Monitoring*** - Requires monthly wellhead monitoring to include information on temperature, flow rate, and gas composition in percent methane, carbon dioxide, and oxygen by volume at least monthly.
- i. Requires re-monitoring 15 calendar days after corrective actions related to positive pressure. Requires a root cause analysis if the problem cannot be corrected within 15 calendar days. Requires a corrective action analysis if corrective actions cannot be fully implemented within 60 days and development of an implementation schedule to complete the corrective action within 120 days.
 - ii. Provides that if there are three positive pressure readings over a twelve-month period at a particular well, the owner/operator must:
 - 1. Perform a collection system assessment in a 200' radius around the well within 30 days and correct any issues within 60 days of the third positive pressure reading.

ARB Landfill Methane Regulation Update

2. Monitor wellhead pressure on at least a weekly basis. Allows monthly monitoring to resume one year after positive pressures are detected in no more than 15% of the weekly measurements provided that all instances can be corrected within the same week. If positive pressure is detected in more than 15% of the weekly measurements over a year, the owner/operator must install a system to continuously monitor well pressure.
- iii. Requires flare combustion temperature to be recorded every 15 minutes.
- d. Requires corrective actions related to surface monitoring to be initiated within three calendar days and monitoring within one month of the initial exceedance.
- e. Changes the frequency for monitoring closed areas with final cover from annually to every third quarter.
- f. Deletes the relaxed/annual monitoring for closed or inactive MSW landfills that can demonstrate there were no measured exceedances for the previous three years.
- g. Recurring Exceedances**
 - i. Requires the owner/operator of a MSW landfill that has either five initial instantaneous exceedances or three initial integrated exceedances within a single grid over a rolling 12-month period to:
 1. Complete a collection system assessment and a cover integrity assessment within 30 days (and correct any issues identified within 60 days)
 2. Increase the frequency of surface emissions monitoring to a monthly interval.
- h. High Oxygen**
 - i. Requires an owner/operator to perform a collection system assessment and cover integrity assessment in a 200' radius around the well within 30 calendar days of an oxygen reading at or above five percent and to correct any issues within 60 calendar days.
 - ii. If there are three instances of oxygen content measurements above 5% in a 12-month period, the owner/operator must conduct enhanced monitoring and down well temperature monitoring within seven calendar days of the third reading.
 - iii. Enhanced monitoring may be discontinued if four consecutive weekly carbon monoxide readings are under 100ppmv and temperature is under 131 degrees.

ARB Landfill Methane Regulation Update

i. Wellhead Parameter Trend Analysis - Requires the owner/operator to examine monthly well records and:

- i. Begin enhanced monitoring and down well temperature monitoring within seven calendar days if the temperature at a particular well increases by more than 20% compared to the prior monthly measurement.
- ii. Perform a collection system assessment and cover integrity assessment in a 200' radius around the well within 30 calendar days if the oxygen content at a particular well increases by more than two percentage points compared to the prior monthly measurement.
- iii. Report in the annual gas collection and control system report the cause of a change between the monthly and rolling average parameter value for gauge pressure, methane content, or methane to carbon dioxide ratio changes.

j. Semiannual Well Liquid Level Monitoring

- i. Requires the owner/operator to monitor the liquid level in each well twice per year, including once between February and April and once between September and November
- ii. If the liquid level exceeds 50% of the screened interval length, corrective actions must remove liquids or other obstructions and re-monitor within 120 days. Monitoring must be increased to quarterly until four consecutive quarterly measurements do not exceed 50% of the screened interval length.
- iii. If the liquid level exceeds 50% of the screen interval length for three consecutive monitoring events or 75% of the screened interval length for two consecutive monitoring events, the owner/operator shall install and operate a liquids pump within 120 calendar days of the reading.

VII. Remotely Detected Emission Plumes

- a. Allows the Executive Officer to notify the owner/operator of a methane emission plume remotely detected at their facility *by email*.
- b. Requires the owner/operator to perform source emissions and component leak monitoring within five calendar days of notice and take corrective action within three calendar days.
- c. For uncontrolled MSW landfills, the owner/operator shall perform instantaneous surface emission monitoring across the entire landfill within 30 calendar days.
- d. Requires owners and operators that receive a notification of a remotely detected emission plume to report to the Executive Officer:
 - i. Within 8 calendar days of receiving the notification, the date of follow-up on monitoring, instrument used, number of exceedances of the surface

ARB Landfill Methane Regulation Update

emissions limit and component leaks, location and description of the source of each exceedance/component leak, an initial mitigation plan for each exceedance/leak (including whether the issue was successfully addressed and re-monitored), and a description of any activities that may have contributed to the plume.

- ii. Within 5 calendar days after the re-monitoring, the repair date, re-monitoring dates, and concentrations.
- iii. Within 35 calendar days after receiving the notification, date of follow-up monitoring, instrument used, and records of exceedances of the surface methane concentration.

VIII. Temperature-Based Requirements

a. If landfill gas exceeds 131 degrees, owner/operator must

- i. Perform a collection system assessment and cover integrity assessment in a 200' radius around the well within 30 days of exceeding the temperature standard and correct any issues within 60 days of the exceedance.
- ii. Reduce oxygen content in the wellhead by specified amounts based upon temperatures.
- iii. If the temperature remains over 131 degrees for at least 60 days, the owner/operator must
 - 1. Begin weekly enhanced monitoring at the well and other wells within 200' until the well temperature falls below 131 degrees. Enhanced monitoring may be conducted monthly if four consecutive weekly carbon monoxide readings are under 100ppmv.
 - 2. Monitor monthly down well temperature of landfill gas every 10 vertical feet in that well and other wells within 200'.

b. If landfill gas exceeds 145 degrees at the wellhead or any point in the well, the owner/operator must:

- i. Begin enhanced monitoring and down well temperature monitoring
- ii. Initiate corrective action within five calendar days
- iii. If temperatures cannot be reduced below 145 degrees within 15 calendar days of the first measurement of exceedance, the owner/operator must conduct a root cause analysis, collection system assessment, and cover integrity assessment and correct the temperature as soon as practicable, but not less than 60 days after the first measurement exceedance.
- iv. If corrective actions cannot be fully implemented within 60 days, the owner/operator must conduct a corrective action analysis and develop an

ARB Landfill Methane Regulation Update

implementation schedule to complete the corrective action as soon as practicable, but not less than 120 days after the first exceedance.

- v. Provides that failure to complete corrective actions and return temperature below 145 degrees within 120 calendar days is a violation.
- c. If landfill gas exceeds 170 degrees at the wellhead or any point in the well AND carbon monoxide concentration is greater than or equal to 1,000ppmv, the owner/operator must
 - i. Complete corrective actions within 15 calendar days or the exceedance will be considered a violation.
 - ii. Submit a 24-hour high temperature report to the Executive Officer within 24-hours of the first measurement.

IX. Semi-Continuous Operation and Permanent Shutdown of Gas Collection Systems

- a. Establishes a new framework for when and how an owner/operator may request that the gas system can be operated semi-continuously or be permanently shut down

X. Alternative Compliance Measures

- a. Requires owners/operators to submit to the Executive Officer any alternative compliance approval documentation in their possession (and all documents submitted as part of the original request) by April 1, 2027.
 - i. Provides that previously approved alternative compliance options become invalid on January 1, 2028 unless the owner/operator resubmits the approval and documentation for Executive Officer review by April 1, 2027.
- b. Allows the Executive Officer to review and reject a previously approved alternative compliance option.
- c. Provides that pending alternative requests are not effective until approved in writing.

XI. Recordkeeping

- a. Requires an owner/operator to maintain for five years:
- b. Records of gas collection system downtime exceeding 1 day (currently 5 days).
- c. All surface emissions monitoring data, including concentration reading, location coordinates, time, and date.
- d. All wind speed and barometric pressure readings for the duration of all surface emissions monitoring.
- e. All component leak monitoring data, including concentration reading at each monitored component, identification number, and time and date of measurement.

ARB Landfill Methane Regulation Update

- f. Records of all monitoring performed using alternative procedures for unsafe-to-walk areas.
- g. Records of wellhead monitoring, including time/date of measurement, gas flow rate, temperature, pressure, gas composition, and liquid level.
- h. Records of re-monitoring required after positive wellhead gauge pressure measurements.
- i. Records of any wellhead temperature or oxygen content exceedances/increases and information on associated corrective actions and re-monitoring.
- j. Records of all root cause analyses, corrective action analyses, enhanced wellhead monitoring, downwell temperature monitoring, monthly wellhead parameter trend analyses, well liquid levels of 50% of the screened interval length, and associated corrective actions.
- k. Records of each well installed as part of a gas collection system expansion, including well material, diameter, depth, perforated length, date of initial waste placement, reason for installation, etc.
- l. Clarifies that annual solid waste acceptance rate and the amount of waste-in-place must be reported in tons.
- m. Total volume of leachate and all other liquids added or recirculated, and surface area over which the leachate or liquids are recirculated/applied.
- n. Information on all 3-hour periods during which the average oxygen content or temperature of an internal combustion engine or gas turbine was outside the range of the manufacturer's specifications.
- o. Information on all 3-hour periods of operation during which the total gas flow rate to all gas control devices changed by more than 20% over the average in the prior rolling 12-month period.
- p. Records of any periods when gas collection system pressure deviated by more than 20% from the setpoint pressure for at least three hours.
- q. Component leak monitoring plans.
- r. Records demonstrating compliance with cover monitoring requirements, cover integrity assessments, and collection system assessments.
- s. Requires the *Annual Gas Collection and Control System Report* to include additional information on: landfill operational status; first and last years waste was accepted; expected year of final closure; year the gas collection and control system was initially installed and in full operation; total volume of landfill gas supplied to a third-party (including composition and recipient); total amount of landfill gas sold or otherwise used; type and amount of supplemental fuel burned with landfill gas; methane destruction efficiency; total volume of landfill gas received (and composition), its end use, and information on any associated

ARB Landfill Methane Regulation Update

incentive program; descriptions of alternative compliance options used by the facility, and the number of hours the gas collection system was operating normally and gas flow was sent to a destruction device on an annual basis.

- t. Requires the *Annual Gas Collection and Control System Report* to include electronic topographic maps that can be viewed in a geographic information system with separate files showing:
 - i. Changes in the perimeter of the permitted disposal area, area of the landfill under which solid waste has been placed, areas with daily and intermediate cover.
 - ii. Engineering plan views of the gas collection and control system with location of wells.
 - iii. Monitoring grids.
 - iv. Unsafe-to-walk areas monitored using alternate procedures.
 - v. Areas of the landfill surface excluded from surface emissions monitoring.
 - vi. Areas of the working face with waste in place less than 180 days, the date when filling began, and the date surface emissions monitoring was conducted.
- u. *Quarterly Monitoring Data* – Requires owners/operators to submit to the Executive Officer quarterly monitoring data of all surface emissions, component leak, and wellhead monitoring.
- v. Requires the owner/operator to notify the Executive Officer at least 15 calendar days prior to scheduled surface emissions monitoring events.

XII. Component Leak Monitoring Plan

Requires the owner/operator to develop a component leak monitoring plan within 90 days of the effective date of the regulation (or 90 days after the initial start of the gas system). The plan must include procedures and timelines for conducting monitoring and repairs, a sitemap and diagram showing where all components to be monitored are located, and a list of all components to be monitored.

XIII. Cover Monitoring Plan

Requires the owner/operator to implement a plan to monitor cover integrity on a monthly basis and implement any necessary cover repairs or maintenance. The plan must be developed within 90 days of the effective date of the regulations and include protocols and procedures to identify and address exposed waste, leachate breakouts, and erosion gullies.

XIV. Well Decommissioning

Allows a well to be permanently decommissioned only if the wellhead methane content exhibits a long-term (60 month) declining trend and is below 20% by volume

ARB Landfill Methane Regulation Update

OR the full radius of the decommissioned well is covered by the radii of influence of other wells to maintain active gas extraction in the area.

XV. Enhanced Wellhead Monitoring Requires:

- a. Visual observations for subsurface oxidation events (smoke, smoldering ash, damage to well) within the radius of influence of the well
- b. Monitoring of temperature of the landfill gas at the wellhead
- c. Monitoring oxygen, carbon dioxide, and methane content of landfill gas at the wellhead
- d. Monitoring and determining carbon monoxide concentrations

XVI. Collection System Assessment Requires:

- a. Analysis of wellhead monitoring data from the previous twelve months to identify any unusual changes (outside the range of each well's typical historical month-to-month variation) in gas flow rate, gas composition, and gauge pressure and determine the reasons for any changes.
- b. Physical investigation of the gas collection system to check for cracked, damaged, broken, pinched, plugged, watered-in, or otherwise impaired collection system components and wellbore seals.
- c. Repair or replacement of pinched, broken, or compromised wells.

XVII. Cover Integrity Assessment Requires:

Investigation of surface cover and all cover penetrations for signs of cover integrity deficiencies, including thickness, grain size and other specifications that do not meet regulatory requirements, visible cracks, signs of erosion including channels or rills, animal burrows, penetrations that lack seals or have cracked or broken seals, and for engineered or synthetic covers deficiencies include punctures, tears, or seam failures.