CALIFORNIA
AIR RESOURCES BOARD

Landfill Methane Regulation: Factsheet

CARB's role in regulating landfills

Methane is generated in landfills when microbes break down organic waste in the absence of oxygen. Methane is a potent greenhouse gas and a short-lived climate pollutant.[1] Taking action to reduce methane emissions will rapidly reduce concentrations in the atmosphere, slowing the pace of temperature rise in this decade. Landfills are the second largest source of methane emissions in California.

CARB's Landfill Methane Regulation is designed to reduce methane emissions by requiring the installation and operation of landfill gas collection and control systems (GCCS) that capture and destroy landfill gas. Controlling landfill gas also reduces emissions of co-pollutants found in trace quantities in landfill gas, such as toxic air contaminants, volatile organic compounds, and odorous compounds.

In addition to CARB, federal, State, and local agencies all play a role in regulating landfills including but not limited to:

- Local air districts in California play a lead role in regulating stationary sources of air pollution, including issuing permits for landfill GCCS. Local air districts regulate enclosed flares and other landfill gas combustion devices used to destroy methane and co-pollutants, and respond to nuisance and odor complaints.
- CalRecycle regulates solid waste handling, processing, and disposal activities to protect public health and safety and the environment by supporting solid waste local enforcement agencies.
- The State Water Resources Control Board and their nine Regional Water Quality Control Boards (collectively, the Water Boards) regulate discharges to land that could impact surface water and groundwater quality, including regulatory and permitting requirements for landfills.
- The Department of Toxic Substances Control regulates facilities for disposal of hazardous waste.
- U.S. EPA regulates emissions of volatile organic compounds from landfills through requirements similar to those in the LMR.

Authority granted to CARB in AB 32

CARB regulates methane emissions from landfills pursuant to authority granted by Assembly Bill (AB) 32, the Global Warming Solutions Act of 2006.[2] AB 32 requires CARB to

[1] Methane has a relatively short atmospheric lifetime of 7 to 12 years.
[2] Núñez, Chapter 488, Statutes of 2006, codified as Health and Safety Code section 38500-38599.

adopt regulations to achieve the maximum technologically feasible and cost-effective greenhouse gas emissions reductions. The Board approved landfill methane capture in 2007, as one of nine discrete early action measures under AB 32. CARB then enacted the Landfill Methane Regulation (LMR) that became effective in 2010.

CARB's Landfill Methane Regulation

The LMR is designed to reduce methane emissions from municipal solid waste landfills. It requires owners and operators of certain landfills to install and optimally operate GCCS to capture and destroy methane in landfill gas. It additionally requires monitoring for methane leaks and GCCS performance parameters, fixing leaks and performance issues, and reporting data to CARB and local air districts.

Statewide, 188 landfills are subject to the LMR, 153 of which are required to operate a GCCS. The remaining 35 are subject to annual requirements to determine and report whether they meet the criteria that require installation of a GCCS. Approximately 60% of these landfills are actively accepting waste while the remaining 40% are closed.[3] Of the 188 total landfills subject to the LMR, 48 are privately-owned and 140 are government-owned; however, because privately-owned landfills are larger on average, there is a similar total quantity of waste contained in privately-owned and government-owned landfills. Over 95% of the waste historically disposed in California is located in landfills that operate a GCCS.

Neither AB 32 nor the LMR alter other health and safety regulations and requirements at landfills

The LMR is separate from existing regulations and permits for municipal solid waste landfills from CalRecycle, the Water Boards, local air districts, and U.S. EPA. As described in section 95474 of the LMR,[4] compliance with the LMR does not exempt entities from complying with other federal, State, or local law, or from permitting requirements. As directed by AB 32, the LMR is designed to complement, and not interfere with, ongoing efforts to achieve and enforce federal and state ambient air quality standards and to reduce toxic air contaminant emissions. Further, the regulation does not limit the authority and tools available to respective regulatory agencies to respond to violations or emergencies that fall within their jurisdiction and oversight.

[3] Landfills continue to generate methane for decades after they stop accepting waste and therefore must continue to operate the GCCS after closure.

[4] Cal. Code Regs., tit. 17, § 95474.

Why LMR updates are being proposed now

Since its adoption in 2010, California's LMR has served as the model for rules adopted by several other states and contains provisions more stringent than federal requirements.[5] In 2021, the landmark United Nations Global Methane Assessment determined that methane mitigation is one of the best ways of limiting near-term warming and the most cost-effective strategies to achieve the Paris Agreement's 1.5° C target rely on reductions in methane emissions by 2030.[6]

California recognized the importance of reducing methane emissions with the passage of Senate Bill (SB) 1383 in 2016. SB 1383 established the State's goal to reduce methane emissions 40% from 2013 levels by 2030.[7] Both diverting organic waste away from landfills and improving landfill gas collection and control have been key strategies identified in CARB's Scoping Plans to reducing waste sector emissions.[8,9,10] CARB's 2022 Scoping Plan to Achieve Carbon Neutrality[11] identified strategies for achieving methane emissions reductions from landfills and determined that while reducing landfill disposal is the most effective means of achieving long-term methane reductions, reducing emissions from waste already in place at landfills is also critical to achieve near-term reductions.

Over the past decade, CARB has conducted and funded innovative research to better understand sources of methane emissions and advance the deployment of new technologies to detect emissions.[12,13,14] The outcomes of this and other research, and the rapid development of emerging technologies, have revealed new opportunities to improve collection and control of methane emissions from landfills. For example, methane plume mapping studies have helped create an understanding of the role management practices

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[5] *California State Plan for Compliance with U.S. EPA's Landfill Emission Guidelines | California Air Resources Board*. See Appendix E: Comparison of the Major Provisions of the Emission Guidelines and California's Landfill Methane Regulation.

[6] *Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions (unep.org)*

[7] Lara, Chapter 395, Statutes of 2016, codified as Health and Safety code sections 39730.5, 39730.6, 39730.7, and 39730.8; and Public Resources Code Chapter 13.1 (commencing with Section 42652) to Part 3 of Division 30.

[8] *2008 Scoping Plan | California Air Resources Board*

[9] *2013 Scoping Plan | California Air Resources Board*

[10] *2017 Scoping Plan | California Air Resources Board*

[11] *2022 Scoping Plan | California Air Resources Board*

[12] *Methane Hotspots Research | California Air Resources Board*

[13] *Estimation and Comparison of Methane, Nitrous Oxide, and Trace Volatile Organic Compound Emissions and Gas Collection System Efficiencies in California Landfills | California Air Resources Board*

[14] *The California Methane Survey (energy.ca.gov)*

play in reducing methane emissions and informing new mitigation strategies.[15,16] The State's $100 million investment[17] to purchase methane plume data from a commercial satellite company provides actionable information to find and fix the largest methane leaks across the State. The proposed updates to the LMR leverage these advances in technology and research. The proposed updates also benefit from CARB's and the air districts' experience implementing and enforcing the LMR, as well as by public feedback gathered through a public process that began in 2023. As the pace of research and technology development accelerates, and as more data becomes available from the proposed updates to the LMR reporting requirements, CARB may consider a more accelerated schedule for future updates to the LMR.

Progress at landfills to meet SB 1383 requirements

SB 1383[18] requires CARB to implement its Short-Lived Climate Pollutant Reduction Strategy[19] to achieve methane emissions reductions of 40% below 2013 levels by 2030. The 2022 Scoping Plan projected that the State was likely to achieve half of the required reductions without additional action. As the second-largest source of methane emissions in the State, reducing emissions from landfills is critical to achieving the 2030 target. SB 1383 also requires CalRecycle, in consultation with CARB, to adopt regulations to achieve a 75% reduction in statewide organic waste disposal in landfills from 2014 levels by 2025 and to improve rates of edible food recovery for human consumption. Short-Lived Climate Pollutants (SLCP) Regulations to reduce organic waste disposal pursuant to SB 1383 became effective on January 1, 2022.[20] The State has made substantial progress towards waste diversion and recycling targets as innovative new programs are implemented to reduce waste generation, recover edible food, expand markets for products made from recovered organics, and direct resources to their highest and best use.[21,22]

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[15] *Investigating Major Sources of Methane Emissions at US Landfills | Environmental Science & Technology*

[16] *Summary Report of the 2020, 2021, and 2023 Airborne Methane Plume Mapping Studies | California Air Resources Board*

[17] *California State Budget: 2022-2023 (ebudget.ca.gov)*

[18] Lara, Chapter 395, Statutes of 2016, codified as Health and Safety code sections 39730.5, 39730.6, 39730.7, and 39730.8; and Public Resources Code Chapter 13.1 (commencing with Section 42652) to Part 3 of Division 30.

[19] *Final Short-Lived Climate Pollutant Reduction Strategy | California Air Resources Board*

[20] *Short-Lived Climate Pollutants (SLCP): Organic Waste Reductions (calrecycle.ca.gov)*

[21] *State of Disposal and Recycling in California (calrecycle.ca.gov)*

[22] *California's Climate Progress on SB 1383 (calrecycle.ca.gov)*