BEFORE THE COLORADO AIR QUALITY CONTROL COMMISSION
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

JOINT PREHEARING STATEMENT OF
ENVIRONMENTAL DEFENSE FUND AND ECO-CYCLE

IN THE MATTER OF PROPOSED REGULATION NUMBER 31

Environmental Defense Fund ("EDF") and Eco-Cycle, Inc. ("Eco-Cycle"), by and through the undersigned counsel, and pursuant to the Notice of Rulemaking Hearing issued by the Air Quality Control Commission ("Commission") on May 1, 2025, hereby submit their Joint Prehearing Statement in the above-captioned matter.

EXECUTIVE SUMMARY

EDF and Eco-Cycle support the Colorado Department of Public Health and Environment ("CDPHE") Air Pollution Control Division's ("Division" or "APCD") landfill methane program in Regulation 31, designed to achieve near-term reductions of methane emissions from municipal solid waste ("MSW") landfills statewide. Addressing methane emissions from MSW landfills will help continue Colorado's leadership in reducing harmful climate and health-harming pollution, helping to protect communities and to avoid the most dangerous impacts of climate change.

The draft rule proposed by the Division ("Proposed Rule") is important and necessary at a time when MSW landfills are the third largest source of methane emissions in the State and current federal regulations are outdated and insufficient for controlling methane emissions from the sector. The Proposed Rule adequately addresses landfill methane by establishing appropriate: (i) regulatory thresholds for determining whether an MSW landfill requires a gas collection and control system ("GCCS"), including system design, installation, and operational requirements; (ii) surface emissions monitoring ("SEM") and GCCS leak inspection requirements; (iii) remote methane monitoring requirements, including notification requirements for certain extraordinary methane release events; (iv) landfill cover requirements; and (v) recordkeeping and reporting requirements. As demonstrated by other states that have already adopted similar standards ahead of Colorado on landfill methane, the strategies proposed in the Proposed Rule are common sense measures that are designed and proven to effectively manage methane emissions, and its harmful co-pollutants, from MSW landfills.

However, the Proposed Rule can be improved in several respects to help meet the climate and health goals of the State, with these rule changes being reflected in the Alternative Proposal submitted by GreenLatinos. *First*, the final rule should provide MSW landfill owners and operators a reasonable period of time, *e.g.*, 180 calendar days, to submit GCCS design plans to the Division for approval, if required under the Proposed Rule; 12 months is unnecessarily long and undermines the Proposed Rule's purpose of achieving near-term methane emission reductions. *Second*, the final rule should require the Division to submit notifications to MSW landfill operators

in rare instances of extraordinary methane release events, if remote methane sensing detections or reports meet the Division's guidelines for timeliness, data quality, completeness, significance, and other requirements for evaluating remote sensing detections or reports. Relatedly, the final rule should require the Division to make remote sensing detections and reports publicly available, including investigation findings and corrective actions to address qualifying releases. *Third*, the final rule should require MSW landfill owners and operators to obtain approval from CDPHE's Hazardous Materials and Waste Management Division ("HMWMD") to use intermediate cover for an extended period of time before replacing it with more protective final cover. *Fourth*, the final rule should require MSW landfill owners and operators to maintain records of the monthly average landfill working face area and waste placement volume and current operating protocols to minimize the area of the working face and corresponding methane emissions. *Finally*, the final rule's Statement of Basis and Purpose ("SBAP") should expressly acknowledge the program's co-benefits, specifically, that it reduces ozone-forming non-methane organic compounds ("NMOC"), as well as other toxic air pollutants, including toluene, benzene, xylene, n-hexane, mixed xylenes, ethyl benzene, formaldehyde, and hydrogen sulfide ("H_2S"). Those benefits should likewise be included in the Economic Impact Analysis ("EIA") to the extent feasible. While this Prehearing Statement focuses on these key elements, EDF and Eco-Cycle broadly support the Alternative Proposal submitted by GreenLatinos with its prehearing statement.

EDF and Eco-Cycle remain committed to and very interested in working with the Division and other stakeholders to resolve the concerns of EDF and Eco-Cycle and those raised by other parties.

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I. EDF AND ECO-CYCLE'S GENERAL POSITION

This is a critical moment for Colorado to address methane emissions from MSW landfills. The need to arrest climate change before its impacts become overwhelming and to protect public health has never been more apparent. To that end, it is imperative that the Commission adopt the Division's state-of-the-art regulation that meaningfully controls climate warming methane emissions from MSW landfills, the third largest source of methane statewide, in accordance with Colorado's statutory GHG pollution reduction targets and Greenhouse Gas Pollution Reduction Roadmap 2.0 ("Roadmap 2.0") and achieve meaningful near-term reductions in other harmful air pollutants from MSW landfills. EDF and Eco-Cycle generally support the Proposed Rule and propose several changes where it can be improved or clarified.

II. BACKGROUND ON EDF AND ECO-CYCLE

EDF is a non-profit organization that brings together science, law, economics, and policy to create positive impacts on the environment. With more than three million members and activists, nearly 120,000 of whom live in Colorado, the organization has worked for over three decades to protect Colorado's air quality and address the climate crisis. As part of this work, EDF frequently participates in rulemakings before the Commission and collaborates closely with the Division and other stakeholders.

Eco-Cycle is non-profit social enterprise that launched recycling in Colorado in 1976. Today, Eco-Cycle is one of the nation's oldest and largest non-profit recyclers. Eco-Cycle's mission is to innovate, implement, and advocate for local and global Zero Waste solutions to foster a more regenerative, equitable, and climate-resilient future. Eco-Cycle regularly engages with CDPHE on waste reduction, landfills, recycling, and composting issues, advocating for state legislation, and participating in public policy processes to achieve state solid waste and climate goals. Eco-Cycle has long been a public messenger about the negative effects of landfilling organic materials and advocated for the inclusion of landfill pollution regulations in Governor Polis' Roadmap 2.0. Eco-Cycle also promotes "upstream" solutions to prevent valuable materials from being landfilled in the first place and instead diverted into more beneficial uses; as such, Eco-Cycle pioneered the first commercial compost programs in our region, and was a lead organization in promoting CDPHE to pursue its Colorado Statewide Organics Management Plan in 2022 and Colorado Organics Diversion Study in 2024.

III. STATEMENT OF LEGAL AND FACTUAL ISSUES

A. Climate Change is a Major Threat in Colorado.

Climate change poses a major threat to Colorado and Coloradans. Adverse effects of climate change, like increasing wildfires, earlier snowmelt and drought, and worsening heatwaves are already being felt in Colorado. Colorado recently experienced our hottest September on record, with a mean temperature 5.2°F above average.[1] The Marshall Fire in Boulder County in late December 2021 caused two deaths and destroyed more than $2 billion in property, making it the

[1] EDF_ECO_PHS_EX-001, National Weather Service, *Denver Monthly Climate Summary September, 2024*, https://www.weather.gov/media/bou/Sep2024Climate.pdf.

most costly wildfire in state history.[2] The fire was stoked by an extremely dry and warm fall and early winter, which increased the "flammability and amount of dead and dry plants [and] provided a perfect bio-fuel for the Marshall fire."[3] The Marshall fire burned one year after the historic summer of 2020, which saw the three largest recorded fires in Colorado history.[4] The devastating wildfires that occurred in Southern California in January are an all-too-harsh reminder of the destructive fires Colorado has also suffered in recent years. Last year was the hottest year on record,[5] and was also the first year the global average temperature breached 1.5°C above the preindustrial level. July 22, 2024 was the hottest day recorded in human history.[6]

According to the National Oceanic and Atmospheric Administration, human-caused global warming is the main driver of increased and more intense wildfires throughout the western United States ("U.S.")[7] Moreover, experts warn that climate change increases the likelihood of winter fires like the Marshall fire, as warmer autumns make it more likely that Colorado's dry season and windy season overlap.[8] Increased wildfire risk is just one of the many ways climate change is harming Colorado. Hotter temperatures increase infrastructure costs,[9] threaten public health,[10] and could devastate economies in mountain communities reliant on winter tourism.[11] Warming

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[2] EDF_ECO_PHS_EX-002, Noelle Phillips, *Marshall fire started by week-old embers on Twelve Tribes property and a sparking Xcel power line, Boulder sheriff says*, DENVER POST (June 8, 2023), https://www.denverpost.com/2023/06/08/marshall-fire-cause-origina-investigation-boulder-colorado/.

[3] EDF_ECO_PHS_EX-003, Rebecca Lindsey, *La Niña, climate change, and bad luck: the climate context of Colorado's Marshall Fire*, CLIMATE.GOV (Jan. 19, 2022), https://www.climate.gov/news-features/event-tracker/la-ni%C3%B1a-climate-change-and-bad-luck-climate-context-colorado%E2%80%99s-marshall.

[4] EDF_ECO_PHS_EX-004, Colorado Division of Fire Prevention & Control, *Historical Wildfire Information*, WILDFIRE INFORMATION CENTER (2025), https://dfpc.colorado.gov/sections/wildfire-information-center/historical-wildfire-information.

[5] EDF_ECO_PHS_EX-005, National Oceanic and Atmospheric Administration, *2024 was the world's warmest year on record* (Jan. 10, 2025), https://www.noaa.gov/news/2024-was-worlds-warmest-year-on-record.

[6] EDF_ECO_PHS_EX-006, World Meteorological Organization (WMO), *Earth experiences warmest day in recent history* (July 24, 2024), https://wmo.int/media/news/earth-experiences-warmest-day-recent-history#:~:text=On%2022%20July%202024%2C%20the,earlier%20on%206%20July%202023.

[7] EDF_ECO_PHS_EX-007, Rong Fu, *Study Shows That Climate Change is the Main Driver of Increasing Fire Weather in the Western U.S.*, DROUGHT.GOV (Nov. 9, 2021), https://www.drought.gov/news/study-shows-climate-change-main-driver-increasing-fire-weather-western-us.

[8] *See* EDF_ECO_PHS_EX-003.

[9] EDF_ECO_PHS_EX-008, Colorado Department of Transportation, *Colorado Climate Plan: State Level Policies and Strategies to Mitigate and Adapt*, 3 (2015), https://www.codot.gov/programs/environmental/Sustainability/colorado-climate-plan-2015.

[10] For example, about 30% of Denver's housing stock is without air conditioning. *See* EDF_ECO_PHS_EX-009, Denver Office of Climate Action, Sustainability & Resiliency, *The Energize Denver Renewable Heating and Cooling Plan: Resilient Existing Building and Homes*, ES1 (2021), https://www.denvergov.org/files/assets/public/climate-action/documents/hpbh/renewable-hampc/denver-renewable-heating-and-cooling-plan_june-2021.pdf.

[11] At the Breckenridge ski resort, continued high GHG emissions would mean that by mid-century about half of winter days (mid-November to mid-April) would be above freezing, compared with about one-third of days in the baseline, and in the hottest years, 57 to 78 percent of those days. *See* EDF_ECO_PHS_EX-010, S. Saunders, et al., *Climate Projections in Summit County, Colorado,* ROCKY MOUNTAIN CLIMATE ORGANIZATION, 17 (Aug. 2021),

temperatures change the hydrologic cycle in ways that decrease snowpack and exacerbate drought.[12] Hotter and drier conditions also make Colorado's forests more vulnerable to beetles and pests.[13] Without strong action, the negative effects of climate change will continue to worsen.

B. Recent Data Show that Climate Change is Accelerating.

Reducing emissions of climate pollutants—including those in Colorado—will help address these harms. The Intergovernmental Panel on Climate Change ("IPCC") Sixth Assessment Synthesis Report concluded "with high confidence that human caused climate change is the main driver" of "more frequent and more intense" extreme weather events like those experienced this summer.[14] The IPCC Report also concluded with high confidence that the "likelihood of abrupt and irreversible changes and their impacts increase with higher global warming levels," and that "current mitigation and adaption actions and policies are not sufficient."[15]

Even more recently, the World Meteorological Organization issued an update that confirmed that 2023 "broke many records including the warmest year."[16] Between 2024 and 2028, "[g]lobal temperatures are likely to continue at record levels." It is eighty-six percent (86%) likely that one of these five years will exceed temperatures in 2023.[17] Methane emissions specifically "continued to increase in 2023," leading to atmospheric concentrations that "were higher than at any time in at least 800,000 years."[18]

C. Immediate Reductions in Methane are Particularly Important.

Methane is a short-lived GHG, lasting only about 7-12 years in the atmosphere;[19] however, methane is potent and has a warming effect more than 80 times greater than carbon

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https://www.rockymountainclimate.org/images/SummitProjectionsFinal.pdfhttps://www.summitcountyco.gov/DocumentCenter/View/33131/55-Page-Report_Climate-Projections-in-Summit-County-Co.

[12] EDF_ECO_PHS_EX-011, P. Gonzalez et al., *Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II*, U.S. NATIONAL PARK SERVICE, 1112 (2018), https://nca2018.globalchange.gov/downloads/NCA4_Ch25_Southwest_Full.pdf (Volume II represents the consensus of government scientists and is the latest and best explanation of the impacts of climate change in the United States).

[13] EDF_ECO_PHS_EX-012, U.S. Environmental Protection Agency (EPA), *What Climate Change Means for Colorado*, EPA 430-F-16-008 (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-co.pdf.

[14] EDF_ECO_PHS_EX-013, Intergovernmental Panel on Climate Change (IPCC), *Synthesis Rep. of the IPCC Sixth Assessment Rep. (AR6)* 66, 12, IPCC AR6 SYR (2023).

[15] *Id.*

[16] EDF_ECO_PHS_EX-014, WMO, *WMO Global Annual to Decadal Climate Update: 2024-2028*, 5 (June 5, 2024), https://library.wmo.int/viewer/68910/download?file=WMO_GADCU_2024-2028_en.pdf&type=pdf&navigator=1.

[17] *Id.* at 7.

[18] EDF_ECO_PHS_EX-015, Copernicus, *The 2023 Annual Climate Summary: Global Climate Highlights 2023* (Jan. 9, 2024), https://climate.copernicus.eu/global-climate-highlights-2023.

[19] EDF_ECO_PHS_EX-016, National Aeronautics and Space Administration, *Methane*, https://climate.nasa.gov/vital-signs/methane/?intent=121.

dioxide ("CO_2") over a 20-year time horizon.[20] The contribution of Working Group III to the IPCC Assessment Reports found with "high confidence" that "[a]s methane has a short lifetime but is a potent GHG, strong, rapid and sustained reductions in methane emissions can limit near-term warming and improve air quality by reducing global surface ozone."[21] Therefore, reducing methane emissions in the near-term is critical for slowing the rate of climate change[22] and pursuing mitigation measures now could slow the global-mean rate of near-term decadal warming by about 30%.[23] In addition, new research shows that immediate action to reduce methane emissions could help preserve Arctic summer sea ice this century.[24]

Methane from landfills is both a national and global problem. Data show that many landfills around the world are poorly controlled and release large methane plumes, which need to be quickly stopped.[25] In the U.S., MSW landfills are the third largest source of anthropogenic methane emissions. According to the U.S. Environmental Protection Agency ("EPA"), MSW landfills accounted for 14% of anthropogenic methane emissions in the U.S. in 2022, third only to oil and gas systems (30%) and livestock enteric fermentation (27%).[26] Accordingly, policy intervention is necessary for reducing methane emissions from MSW landfills, which will continue to be large sources of methane emissions well into the future. Adopting practical, modern, and commonsense solutions in Colorado that achieve immediate reductions in methane from landfills will create a scalable model for other jurisdictions to follow as well.

D. Colorado's MSW Landfills Emit Meaningful Amounts of Methane, Which Must be Curtailed to Meet Statewide GHG Reduction Goals.

Landfills are the third largest source of methane emissions in Colorado.[27] Colorado's GHG inventory reported 1.445 million metric tons ("mmt") of carbon dioxide equivalent ("CO_2eq") of emissions from MSW landfills in 2020, or approximately 1.1% of state-wide GHG emissions, excluding Land Use, Land-Use Change and Forestry ("LULUCF").[28] This estimate uses a 100-

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20 IPCC, 2021: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, 2391 pp. doi: 10.1017/9781009157896.

21 EDF_ECO_PHS_EX-017, IPCC, 2023: *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp., doi: 10.59327/IPCC/AR6-9789291691647.

22 EDF_ECO_PHS_EX-018, Smith, Kirk R., et al., *U.S. Climate Change Science Programs Synthesis and Assessment Product 3.2, Climate Projections Based on Emissions Scenarios for Long-Lived and Short Lived Radiatively Active Gases and Aerosols*, 64-65 (2008) https://www.globalchange.gov/sites/globalchange/files/sap3-2-draft3.pdf.

23 EDF_ECO_PHS_EX-019, Ocko, I.B. et al., *Acting rapidly to deploy readily available methane mitigation measures by sector can immediately slow global warming,* 1, 2021 Environ. Res. Lett. 16(054042) (May 4, 2021).

24 EDF_ECO_PHS_EX-020, Environmental Defense Fund (EDF), *New study: Swift methane action could help save Arctic summer sea ice, forestall global warming impacts* (Mar. 15, 2022).

25 Carbon Mapper, *Repeat Observations of Global Waste Methane Sources* (Feb. 12, 2024), https://carbonmapper.org/articles/repeat-observations.

26 EDF_ECO_PHS_EX-021, U.S. EPA, *Landfill Methane Outreach Program (LMOP)*, https://www.epa.gov/lmop/basic-information-about-landfill-gas.

27 Air Pollution Control Division (APCD), *Memorandum of Notice: Regulation Number 31*, 1 (Apr. 17, 2025).

28 APCD, *Landfill Methane Rule Technical Working Group Meeting #1*, Slide 3 (Aug. 27, 2024).

year global warming potential ("GWP") for methane. Because methane is a key target for near-term reductions due to its relatively short lifetime, its GWP should be assessed over a shorter period of time. Using the 20-year GWP for methane (IPCC AR5 GWP 20 = 84), Colorado's 2020 MSW landfill emissions are equivalent to 4.33 mmt CO_2eq, or 2.0% of state-wide CO_2eq emissions, excluding LULUCF. The actual figure is even larger because Colorado's GHG inventory likely underestimates total emissions from MSW landfills, as remote sensing surveys point to widespread underestimation of emissions in official inventories.[29]

During the 2019 legislative session, Colorado's General Assembly adopted legislation setting statewide GHG emission reduction targets of 26% by 2025, 50% by 2030, 65% by 2035, 75% by 2040, and 100% by 2050, as compared to 2005 levels.[30] In February 2024, Colorado released its Roadmap 2.0, which identifies reducing methane emissions from landfills as a near-term action necessary to achieve Colorado's statutory statewide GHG reduction goals.[31] Given methane's relatively short lifetime, and Colorado's policy to achieve near-term GHG reductions, Colorado should take swift action to curtail methane emissions from Colorado's MSW landfills, as called for in its Roadmap 2.0.

E. Reducing Methane Emissions from Landfills Provides Critical Air Pollution Benefits to Nearby Communities.

In addition to slowing near-term warming and advancing Colorado's climate goals, addressing MSW landfill methane emissions will improve air quality and protect public health. Methane and co-emitted NMOC are important precursors for tropospheric ozone, which is of particular concern to Coloradans on the Front Range living in a "severe" ozone nonattainment area. Further, landfill methane is co-emitted with odorous compounds and hazardous air pollutants ("HAPs") that can harm human health, including benzene, toluene, and vinyl chloride.[32] Therefore, better monitoring and control of landfill methane emissions will also secure important air pollution reductions. Colorado has some of the largest landfills in the country, by waste acceptance, which are located near major population centers across the State.[33] And, at least 30 landfills are located within one mile of a disproportionately impacted community in Colorado.[34]

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[29] *See, e.g.,* EDF_ECO_PHS_EX-022, Nesser et al., *High-resolution U.S. methane emissions inferred from an inversion of 2019 TROPOMI satellite data: contributions from individual states, urban areas, and landfills*, Atmos. Chem. & Physics 1-36 (2024), https://acp.copernicus.org/articles/24/5069/2024; EDF_ECO_PHS_EX-023, Cusworth, D.H., Duren, R.M., et al., *Quantifying methane emissions from United States landfills*, 383 Science 1499-1504 (2024), https://www.science.org/doi/10.1126/science.adi7735.

[30] Colorado General Assembly, House Bill 19-1261, *Climate Action Plan to Reduce Pollution* (signed May 30, 2019), https://leg.colorado.gov/sites/default/files/2019a_1261_signed.pdf; Colo. Rev. Stat. § 25-7-102(2)(g).

[31] Colorado Greenhouse Gas Pollution Reduction Roadmap 2.0, 36 (Feb. 2024), https://energyoffice.colorado.gov/climate-energy/ghg-pollution-reduction-roadmap-20.

[32] EDF_ECO_PHS_EX-024, U.S. EPA, *Landfill Methane Outreach Program, FAQs*, https://www.epa.gov/lmop/frequent-questions-about-landfill-gas.

[33] EDF_ECO_PHS_EX-025, Kevin Budris, *Landfills and Injustice: The State of Burying Trash in the United States*, Just Zero (2025), https://www.just-zero.org/reports/issue-briefs/landfills-and-injustice/.

[34] Colorado Department of Public Health and Environment (CDPHE) Workshop, *Landfill Methane Rule Public Meeting*, https://www.youtube.com/watch?v=DQjpM1krSMg (44:00) (Jan. 11, 2025).

F. Colorado Should Continue its Leadership on Methane.

Colorado is widely recognized for its leadership in designing, adopting, and implementing regulations and technologies to reduce methane emissions from the oil and gas sector. The State should build from this important leadership by adopting state of the art regulations that will minimize methane emissions from MSW landfills. Scientific imperatives, increasing costs of climate change-related disasters, and public concern about the issue make Colorado's leadership on this issue essential.

IV. The Proposed Rule Advances State Climate Policy by Achieving Near-Term Methane Reductions from MSW Landfills, Colorado's Third Largest Source of Methane.

A. Background on Landfills in Colorado.

1. Municipal Solid Waste Management

Colorado's Solid Waste Regulations define "municipal solid waste" as "solid waste from household, community, commercial and industrial sources that does not contain hazardous wastes…."[35] MSW typically consists of durable and non-durable goods, including organic materials such as food waste, yard debris, wood, cardboard, and other paper and fiber-based materials, generated from residential, commercial, and industrial sources.

MSW is typically managed in one of the following four ways: (1) source reduction and reuse, (2) recycling and composting, (3) energy recovery, and (4) treatment and disposal. Source reduction and reuse cut waste by using fewer materials, extending product life, and promoting repair and repurposing. This keeps organic waste out of landfills and reduces methane generation in the first instance. Recycling makes new products from used materials, reducing raw material demand. Composting transforms organic waste into soil, cutting methane emissions by over 50% compared to landfilling.[36] Energy recovery converts non-recyclable waste into energy (*i.e.*, electricity, heat, or fuel) through processes like incineration, gasification, and pyrolysis. Treatment and disposal cover methods for waste that cannot be reduced, reused, recycled, or recovered, including landfilling and thermal treatment.

2. MSW Landfills

An MSW landfill is simply a discrete area of land or excavation where MSW, including organic waste, is buried for long-term disposal.[37] MSW landfills are constructed, filled, and closed in cells; typically, one cell is open at a time for waste placement. MSW landfills may either be privately owned and operated, publicly owned and operated, or publicly owned and privately operated. Additionally, MSW landfills can differ in terms of the types of wastes they accept. For instance, some landfills may only accept MSW, while others may also accept construction and demolition materials and debris and/or non-hazardous industrial wastes. MSW landfills can also

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35 6 CCR 1007-2, Part 1, §1.2.

36 EDF_ECO_PHS_EX-026, Project Drawdown, *Composting*, https://drawdown.org/solutions/composting.

37 EDF_ECO_PHS_EX-027, U.S. EPA, *Municipal Solid Waste Landfills*, https://www.epa.gov/landfills/municipal-solid-waste-landfills.

vary considerably by size. Some landfills may only accept a few thousand cubic yards of MSW per year, while other landfills may handle more than five million cubic yards of MSW per year.

Landfilling is the primary means of long-term MSW disposal in Colorado. According to CDPHE's 2018 Waste Composition of Municipal Solid Waste Disposal study, 37.1% of material landfilled in Colorado is organic.[38]

3. Landfill Gas

When organic waste is deposited in a MSW landfill, the organic waste undergoes an anaerobic (oxygen-free) decomposition process that generates a complex mixture of gases, generally known as landfill gas ("LFG"). By volume, LFG is predominantly comprised of methane and CO_2, but it also contains fractions of other harmful air pollutants that pose significant environmental and public health concerns, including ozone-forming NMOC, ammonia, and H_2S.[39] Colorado recently listed H_2S as one of five priority air toxics in Air Quality Control Commission Regulation Number 30, and ammonia is a significant contributor to regional haze and nitrogen deposition at Rocky Mountain National Park. MSW landfills also emit numerous other HAPs, including benzene, toluene, ethyl benzene and xylenes ("BTEX"), n-hexane, methanol, methylene chloride, and other harmful air pollutants that cause serious health effects, including cancer, and damage to respiratory, immune, nervous system and reproductive health.[40]

LFG can be managed through combustion, but that process can result in the release of health-harming air pollution. Similarly, upgrading LFG to produce pipeline quality gas often requires combustion of the waste gas portion of LFG and may also require the release of non-pipeline quality portions of gas produced through combustion. If the system is not managed to avoid leaks, optimizing gas collection for pipeline quality methane can lead to higher fugitive emissions at the landfill as well.[41]

4. Methane Generation and Emissions Over Time

Methane is gradually but unevenly generated and emitted from MSW landfills over time. Methane generation can be highly variable across an MSW landfill because higher rates of methane are generated in areas containing a greater fraction of organic material in the waste, lower levels of oxygen, and higher moisture content and temperature in the waste layer.[42] Additionally, the degree to which methane produced in a landfill can escape into the atmosphere depends on the

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[38] EDF_ECO_PHS_EX-028, CDPHE, *Waste Composition of Municipal Solid Waste Disposal* (2018) https://cdphe.colorado.gov/hm/swreports.

[39] EDF_ECO_PHS_EX-029, Agency for Toxic Substances and Disease Registry (ATSDR), *Landfill Gas Primer: An Overview for Environmental Health Professionals,* 3 (Nov. 2001), https://www.atsdr.cdc.gov/hac/landfill/html/intro.html.

[40] EDF_ECO_PHS_EX-030, U.S. EPA, *Residual Risk Assessment for the Municipal Solid Waste Landfills Source Category in Support of the 2019 Risk and Technology Review Proposed Rule*, EPA-HQ-OAR-2002-0047 (May 2019).

[41] EDF_ECO_PHS_EX-031, Scarpelli, T., et al., *Investigating Major Sources of Methane Emissions at US Landfills*, Envt'l Sci. & Tech. 58(49), 21,553 (Nov. 29, 2024), https://pubs.acs.org/doi/10.1021/acs.est.4c07572.

[42] *See id.*

composition and condition of the landfill cover, whether the landfill has GCCS, and, if so, its effectiveness in capturing and controlling LFG.

Methane production typically increases several months after MSW is placed into the landfill and the initial supply of oxygen deposited with the waste layer is depleted, thereby triggering the bacterial, anaerobic (low-oxygen) decomposition process discussed above. Because organic waste decomposes relatively quickly, timely installation of GCCS is critical for achieving significant methane reductions. Although methane generation rates decline after the first few years after MSW deposition, methane continues to be generated within the landfill as MSW slowly decomposes for the subsequent 20 years or more.[43] As illustrated by Figure 1 of the Division's Initial EIA, the level of methane generated by an MSW landfill increases during the landfill's operational lifespan and peaks just prior to closure.[44] Methane generation levels then gradually decrease over time during the landfill closure stage and in post-closure, though the landfill can still generate and emit methane for 50 years or more after it is no longer active.[45] This typical trend of methane generation underscores the importance of abating methane emissions from MSW landfills as soon as possible after waste is deposited.

5. Avoiding Methane Through Organics Diversion

While outside the scope of this rulemaking, organics diversion policies and programs can avoid methane emissions from MSW landfills in the first instance. Organics diversion policies and programs are generally designed to divert organic wastes away from MSW landfills where they will generate methane, and instead direct them towards beneficial uses, such as composting, mulching, and creating biochar, given the outsized role organic materials play in landfill methane generation. A 2024 report from EPA found that buried food waste was responsible for 58% of methane emissions from landfills, and calculated that 834 metric tons ("mt") CO_2eq are emitted per 1,000 tons of food waste landfilled.[46] Accordingly, organics diversion policies and programs should continue to remain a key strategy for Colorado to avoid methane generation in the first instance. Moreover, an MSW landfill subject to Regulation Number 31 could implement an organics diversion program as a means of keeping the landfill's methane generation rate below the regulatory trigger for installing and operating GCCS in Part C of the Proposed Rule. However, policies to ensure complete organics diversion are not yet in place and there is a significant amount of organic waste already in Colorado's MSW landfills.[47] Therefore, strategies to control methane from MSW landfills remain a critical complement to organics diversion efforts.

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43 *See* EDF_ECO_PHS_EX-029, at 8.

44 *See* APCD, *Initial Economic Impact Analysis*, 11 (Apr. 17, 2025).

45 *See* EDF_ECO_PHS_EX-029, at 8.

46 EDF_ECO_PHS_EX-032, U.S. EPA, *Quantifying Methane Emissions from Landfilled Food Waste*, 9 (Oct. 2023) https://www.epa.gov/land-research/quantifying-methane-emissions-landfilled-food-waste.

47 *See generally* EDF_ECO_PHS_EX-033, Eco-Cycle, *Organics Diversion Opportunities in Colorado* (July 11, 2025).

6. Controlling Landfill Methane

The primary approach for controlling methane emissions from MSW landfills is installing a GCCS, which consists of a series of pipes and wells spread across the landfill that draw in LFG and route it to a flare. A GCCS is a common component of modern sanitary landfills. Since the early 1990's, a GCCS in some form has been required for large landfills to reduce odors and NMOC emissions and to increase safety by controlling gas migration.[48] According to EPA, over 90% of MSW landfilled in the U.S. is disposed in landfills that have a GCCS in place.[49]

A modern, active GCCS consists of a network of LFG extraction wells, including vertical wells and horizontal collectors (consisting of perforated pipes), along with pipework and suction pumps or blowers designed and installed to extract LFG from cells of decomposing waste. An active GCCS is operated with monitoring devices, adjustable valves, and pumps to accommodate changing conditions. Gas collection wells need to be protected from damage by vehicles, and heavy equipment, as well as from excess liquid that can impede gas flow. Increased barometric pressure can introduce air into the system, reducing methane concentration and flow rate. Monitoring and tuning are needed to identify GCCS damage and to respond to variations in ambient conditions. Passive systems, which lack pumps and blowers and instead rely on natural variations in gas pressure and concentration, have been used for some applications but are not recommended for effective LFG capture.

Gas collection (capture) efficiencies depend on the design and operation of the collection system, as well as the design, installation, and integrity of the landfill cover. EPA estimates that the average collection efficiency of GCCS systems across the U.S. is approximately 73%.[50] However, well-engineered and properly operated and monitored GCCS systems in landfills with final cover should have substantially higher capture efficiencies. SCS Engineers estimated mid-range default values for landfills with an active GCCS, which are 60% for areas under daily cover, 75% for areas under intermediate cover, and 95% for areas with final cover.[51] These estimates emphasize the importance of transitioning from daily to intermediate to final cover as quickly as feasibly possible.

In addition, captured gas may be burned on-site to produce heat or electricity, cleaned to produce renewable natural gas ("RNG"), or combusted in flares. Open flame flares are the simplest technology but are comparatively challenging to monitor and control for efficient combustion, which often leads to lower methane destruction than intended and the release of additional harmful methane and other pollution. Enclosed flares, which feature burners surrounded by fire-resistant walls that extend above the flame, offer more stable and efficient combustion and are easier to control compared to open flares. Other devices, such as thermal oxidizers, similarly provide improved pollution control in comparison to open flares.

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48 *See* EDF_ECO_PHS_EX-029, at 53.

49 EDF_ECO_PHS_EX-034, U.S. EPA, *White Paper Series: Municipal Solid Waste Landfills – Advancements in Technology and Operating Practices, Increasing Landfill Gas Collection Rates*, 3 (Oct. 25, 2024).

50 *Id.*

51 EDF_ECO_PHS_EX-035, SCS Engineers, *Current MSW Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills*, 10 (Jan. 2009), .

B. Existing Regulations are Outdated and Do Not Include Modern Control Strategies.

As discussed in Section III.D., MSW landfills are Colorado's third largest source of methane emissions and a significant source of harmful air pollution. Additionally, the State's emissions inventory very likely understates the amount of methane emissions that Colorado's MSW landfills actually emit.[52] Notwithstanding this fact, existing regulations fail to require or incentivize adoption of modern control strategies for curbing methane emissions from MSW landfills.

State and local governments play an important role in adopting standards for MSW landfills. Landfills are typically subject to both solid and hazardous waste regulations and air pollution regulations. Their permit requirements must meet or exceed federal criteria for environmental protection. Landfills are subject to both air quality regulations and solid or hazardous waste regulations. For MSW landfills, EPA criteria established under Subpart D of the Resource Conservation and Recovery Act ("RCRA")[53] cover landfill location, design, operations, leachate collection and removal, groundwater monitoring and corrective action, closure and post-closure management, and financial assurance for post-closure care.[54] Under the federal criteria, landfills must install and maintain daily cover on active waste placement zones of 6 inches soil depth. When a waste placement zone is closed, landfills must install final low-permeability cover that includes a top layer to minimize erosion. Routine inspections are required to ensure cover integrity. Federal criteria under RCRA require monitoring methane levels for purposes of explosive gas control in facility structures and at the property boundary. Landfills must continue post-closure care for up to 30 years, including maintaining integrity of final cover, maintaining the leachate collection system, and continuing groundwater and methane gas monitoring.

Currently, MSW landfills in Colorado are primarily regulated by HMWMD and are subject to Colorado's Solid Waste Regulations (6 CCR 1007-2). These regulations include siting, design, operations, closure, post-closure, and corrective action requirements that meet or exceed the federal criteria. Of particular relevance to methane emissions, active MSW landfills must maintain "adequate cover" as defined for three stages:

> (a) Daily cover: At least six inches (6") of earthen material or other suitable material placed over the exposed solid waste at the end of each operating day, or at such frequencies as needed to prevent or minimize nuisance conditions;
>
> (b) Intermediate cover: At least one foot (1') of earthen material or other suitable material placed over solid wastes in areas left temporarily unused for at least one month, but not finally closed; and

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52 EDF, *Interactive Landfill Map*, https://landfills.edf.org/interactive/.

53 42 U.S.C. §§ 6941-6949a.

54 40 C.F.R. Part 258.

(c) Final cover: Final cover design should be selected from alternatives presented in Subsection 3.5.3.[55]

Subsection 3.5.3 allows for final cover consisting of an 18 inch earthen infiltration layer and 6 inch erosion layer capable of sustaining vegetation; a composite cover with a 6 inch soil foundation layer and a geomembrane covered by soil rooting and seedbed layers; or an alternative approved by the Division.[56] Daily and intermediate covers are intended to reduce odors and control litter and rodents, among other purposes, while final cover is designed to minimize infiltration of liquids and minimize soil erosion.

Federal air quality regulations promulgated by EPA also apply to some Colorado landfills. Colorado has adopted federal New Source Performance Standards ("NSPS") and Emissions Guidelines ("EG") requirements for landfills, including 40 C.F.R. Part 60, Subpart XXX for "new" MSW landfills that commenced construction, reconstruction or modification after July 17, 2014, and 40 C.F.R. Part 60, Subpart Cf for "existing" landfills for which construction, reconstruction, or modification was commenced prior to that date. Landfills are only subject to these EPA standards if they have a design capacity of 2.5 mmt and 2.5 million cubic meters of waste or more.

While EPA updated the federal standards in 2016, those standards do not reflect best practices and modern pollution controls, including earlier installation and expansion of GCCS. EDF filed a petition for reconsideration, requesting the agency adopt more protective standards, though the agency has not yet done so. Given the important opportunities for additional pollution reductions, many states have moved ahead to develop more protective standards, similar to the Division's Proposed Rule.

The Commission adopted its Subpart Cf plan following EPA's EG model rule in May 2020, with the requirements going into effect on December 9, 2021. In part because of the delay, the federal standards in place today are more than a decade out of date. EPA has recently recognized the need for updated rules and published a series of whitepapers evaluating modern control techniques; however, the current administration has not taken any steps to advance this effort. Furthermore, the existing requirements for monitoring and controlling emissions at MSW landfills were developed to address NMOC, not methane. While monitoring methods and measures to control NMOC can also help to measure and reduce methane emissions, the overlap is not complete. Given the important contributions of NMOC to odors, health effects, and ozone formation, and the GHG potency of methane, both pollutants need to be directly and fully addressed.

The existing air pollution standards for Colorado MSW landfills promulgated by EPA in Subparts XXX and Cf will not fully protect Coloradans in numerous ways, some of which are described here. First, in adopting those standards, EPA declined to require enclosed combustion devices despite finding that those devices were both cost-effective and the best way to control

[55] 6 CCR 1007-2, Part 1, § 1.2.
[56] *Id.* § 3.5.3.

methane and health-harming pollution.[57] Second, EPA's thresholds for requiring GCCS installation only capture a fraction of total MSW landfills nationwide, despite EPA's broad recognition that lower thresholds would lead to greater emissions reductions while remaining cost-effective and feasible.[58] Third, EPA's timelines for installing GCCS are too long, allowing significant methane emissions to escape prior to GCCS installation. Again, EPA has determined that earlier GCCS installation is cost effective and would lead to greater emission reductions.[59] Fourth, EPA's SEM standards fail to ensure the landfill is comprehensively monitored. EPA requires SEM monitoring on a quarterly basis with walking patterns using 100-foot intervals. This large spacing allows significant emissions to go undetected and unaddressed. By contrast, the Proposed Rule includes 25-foot intervals, as required in other states, which ensures far greater coverage of emissions. Finally, EPA has not updated its regulations to require the use of biocovers and other improved cover practices even though they have been demonstrated to reduce emissions from MSW landfills.

V. EDF AND ECO-CYCLE SUPPORT THE DIVISION'S PROPOSED RULE.

As a general matter, EDF and Eco-Cycle support the Division's Proposed Rule, which would significantly reduce methane emissions from MSW landfills statewide. For the foregoing reasons, certain provisions—including but not limited those discussed herein—are especially important for monitoring, collecting, and controlling methane emissions from MSW landfills.

A. The Proposed Rule's SEM Requirements to Determine Whether an Owner or Operator of an MSW Landfill Must Install GCCS, and to Ensure GCCS and Cover Integrity, are Important and Necessary.

The Proposed Rule's SEM requirements include important updates to better determine when GCCS must be installed at an MSW landfill and ensure GCCS and cover integrity are maintained after installation. Effective SEM at MSW landfills is essential to ensuring methane is properly detected and controlled. The Proposed Rule establishes a consistent framework for how and when monitoring must be performed, using standardized methods and equipment. By ensuring routine inspections, detailed mapping, and timely corrective actions, the Proposed Rule is designed to minimize harmful emissions, protect air quality, and support long-term environmental performance. This proactive approach also helps MSW landfills reduce pollution that impacts surrounding communities.

The Proposed Rule allows the use of several additional methods beyond the currently required EPA Reference Method 21, which provides flexibility to operators and can also provide cost savings. In addition to conducting SEM using EPA Reference Method 21, the Proposed Rule properly allows the use of the following methods: (1) a drone-based method (EPA Other Test

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[57] EDF_ECO_PHS_EX-036, Environmental Integrity Project, et al., *Petition for Rulemaking to Revise the New Source Performance Standards and Emission Guidelines for Municipal Solid Waste Landfills*, 10-11 (June 22, 2023), https://environmentalintegrity.org/wp-content/uploads/2023/06/FINAL-Petition-for-Rulemaking-CAA-111-Landfills.pdf.

[58] *Id.* at 15-18.

[59] *Id.* at 19-22.

Method 51 ("OTM-51")); (2) a handheld tunable diode laser absorption spectroscopy ("TDLAS") method; and (3) any future EPA- or Division-approved method for SEM.[60] These additional methods provide flexibility to operators and, in some cases, cost savings opportunities over the currently required EPA Reference Method 21. Further, the flexibility built into Part D, § I.A.4., which allows use of methods approved in the future, recognizes that advancements are currently underway in various technologies and deployment platforms, which demonstrate a strong potential to further maximize efficiency of SEM in the future without the need for an additional rulemaking.

The Proposed Rule includes a 25-foot spacing requirement for SEM in Part D, § I.B.2. Studies have shown that this spacing interval improves the effectiveness and performance of the currently approved SEM methods. The Proposed Rule's 25-foot spacing interval requirement for SEM is a significant improvement over EPA's 100-foot spacing interval requirement and is consistent with the requirements of other states, including California, Oregon, Washington, and Maryland. Recent controlled release testing at FluxLab's Simulation Facility of Landfill Emission Experiments ("SIMFLEX") located in Petrolia, Ontario, demonstrate significant improvements in detection capabilities for EPA Reference Method 21 SEM when the tighter spacing is used.[61] In particular, the studies indicate that tighter spacing increases the likelihood of detecting smaller leaks before they disperse. Specifically, the SIMFLEX results show a decrease in the detection limit from 50 kg/hr at 100-foot spacing to < 20 kg/hr at 25-foot spacing where 200 ppm is the leak threshold.[62] This tighter spacing is further justified when compared to EPA's requirement of a 500 ppm leak threshold at 100-foot spacing, which is equivalent to a detection limit of 150 kg/hr. The additional emissions reduction potential provided through improved detection significantly increases the effectiveness of the SEM requirements beyond the estimates in the Initial EIA.

B. The Proposed Rule's GCCS Installation Thresholds are Appropriate.

The Proposed Rule requires owners and operators of MSW landfills that generate more than 664 mt (732 short tons) but less than 1,814 mt (2,000 short tons) of methane per year to either install and operate a GCCS, or conduct quarterly SEM monitoring to demonstrate GCCS is not needed to keep surface methane concentrations below regulatory limits.[63] MSW landfills generating more than 1,814 mt (2,000 short tons) of methane per year are required to install and operate GCCS.[64] These are reasonable requirements based on conservative estimates of the quantity of methane needed to flare off LFG without needing supplemental fuel. As these provisions are implemented, the Division should carefully monitor SEM reports to ensure that the thresholds prevent unnecessary methane releases. The Division should also continue to investigate whether lower capacity flares or other effective destruction methods could be used by MSW landfills with methane generation rates below 664 mt.

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60 APCD, *Draft Regulation Number 31*, Part, D, § I.A (June 24, 2025) (hereafter, "APCD Proposed Rule").

61 *See* FluxLab, *Simulation Facility for Landfill Emissions Experiments (SIMFLEX)*, https://fluxlab.ca/simflex/.

62 EDF_ECO_PHS_EX-037, Risk, D., et al., *Learnings in Landfill Emission Direct Measurement Techniques*, FluxLab, https://fluxlab.ca/wp-content/uploads/2025/03/Risk_FluxLab_EREF_2025_Summit_March.pptx.

63 APCD Proposed Rule, *supra* note 60, at Part B, § II.D.

64 *Id.* § II.E.

GCCS is considered a standard component of modern MSW landfills. As noted above, EPA estimates that over 90% of MSW landfilled in the U.S. is disposed in landfills with a GCCS.[65] As the Division notes in its Initial EIA, twelve Colorado landfills already have GCCS in place to comply with federal NSPS and EGs, and two others have voluntarily deployed GCCS. Concerns about whether GCCS costs are warranted at a given landfill are sufficiently addressed by providing MSW landfill owners and operators the option to conduct SEM to demonstrate that GCCS is not needed. Similarly, MSW landfills can implement organics diversion strategies that can help to keep emissions below GCCS installation thresholds. California has had similar requirements in place since 2010, indicating that they are technically and economically reasonable.

In addition to preventing emissions of methane, NMOC, and HAPs, GCCS give MSW landfills the chance to recover energy from LFG, either by using it onsite as fuel for heat or electricity generation, or by cleaning it for sale as RNG.[66] Energy recovery projects offer the potential for MSW landfills to offset compliance costs for installing GCCS. According to EPA, at least 17 of Colorado's 37 MSW landfills included in its Landfill Methane Outreach Program ("LMOP") database are candidates for deploying energy recovery projects, or already have them.[67] Accounting for MSW landfills' abilities to deploy energy recovery projects could further reduce the Proposed Rule's compliance costs.

To minimize methane releases, owners and operators of MSW landfills should be required to install and extend GCCS as quickly as feasible after methane generation and/or surface concentration limits have been exceeded. Methane generation starts soon after waste begins to decompose and the rate of production can peak within months to a few years, so it is vital that the timelines in the Proposed Rule not be further lengthened. Evidence that food waste degrades more quickly than previously thought supports the need to install and expand GCCS quickly. According to EPA, "[a]n estimated 61 percent of methane generated by landfilled food waste is not captured by landfill gas collection systems and is released to the atmosphere."[68] Furthermore,"[b]ecause food waste decays relatively quickly, [under current federal regulations] its emissions often occur before landfill gas collection systems are installed or expanded."[69] It is technically feasible to install a gas collection system and collect methane as waste is being buried.[70] In fact, Michigan law requires new landfills, or expansions, to have an active GCCS installed before waste is accepted.[71] The Division's proposed requirement that MSW landfills accepting more than 300,000 tons of waste per year extend GCCS to new cells before waste is placed, while allowing up to 12 months after waste placement for smaller landfills, represents a compromise—it helps smaller landfills comply but results in lost opportunities to capture early emissions.[72]

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65 *See* EDF_ECO_PHS_EX-034, at 3.

66 EDF_ECO_PHS_EX-038, U.S. EPA, *Benefits of Landfill Gas Energy Projects*, https://www.epa.gov/lmop/benefits-landfill-gas-energy-projects.

67 EDF_ECO_PHS_EX-039, U.S. EPA, *Project and Landfill Data by State*, https://www.epa.gov/lmop/project-and-landfill-data-state.

68 *See* EDF_ECO_PHS_EX-032, at 9.

69 *Id.* at iii.

70 SCS Engineers, *Solid Waste Workshop 2024*, https://www.youtube.com/watch?v=N69xkNu4SZI.

71 Mich. Comp. Laws (MCL), Part 115, § 324.11512h (2025).

72 APCD Proposed Rule, *supra* note 60, at Part C, § I.H.

C. The Proposed Rule's GCCS Component Leak Monitoring Requirements are Appropriate and Provide Operational Flexibility to Operators.

The Proposed Rule provides MSW landfill owners and operators with a broad suite of pre-approved methods that can be used for conducting required GCCS component leak monitoring.[73] EPA Reference Method 21 is a well-established method for identifying leaks on individual components and provides MSW landfill owners and operators with an opportunity to streamline their GCCS component leak monitoring with their SEM, both of which can utilize the same gas detectors. Optical Gas Imaging ("OGI") is also a well-established method for identifying leaks on individual components and is required for leak detection at oil and gas operations in Colorado under Regulation 7. Handheld TDLAS is a developing technology, but one vendor, Xplorobot,[74] has received approval from EPA as a methane alternative test method for detecting fugitive emissions at oil and gas operations.[75] This methane alternative test method 003 (MATM-003)[76] could potentially be adopted in full by the Division, or modified as needed, to quickly provide a third option for GCCS component leaks. In addition to the foregoing methods, the Proposed Rule appropriately includes pathways for the use of alternative methods for GCCS component leak monitoring in the future. In so doing, the Proposed Rule encourages development and deployment of new and innovative GCCS leak detection technologies and methods as they are developed.

The Proposed Rule also establishes appropriate regulatory thresholds—200 ppmv (EPA Reference Method 21) and 200 ppm-m (TDLAS)—for leaks that must be repaired.[77] These thresholds are also consistent with surface emission concentrations requiring action. The Proposed Rule's standard for an OGI detection constituting a leak that requires action is appropriate as well. Because OGI only provides a visual image, and not a concentration, visible emissions are considered leaks requiring repairs, consistent with EPA's Appendix K to Part 60.

When a GCCS component leak is identified, it must be repaired and verified within certain specified timeframes in order to minimize the duration of the leak. Specifically, the Proposed Rule requires a first attempt to repair a component leak within 5 calendar days.[78] The repair must be completed within 15 calendar days of discovery, unless the parts or replacement equipment needed for repair are unavailable.[79] And, the Proposed Rule requires the repaired leak to be re-monitored within 5 calendar days of repair completion to verify that the repair was effective.[80]

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73 *See* APCD Proposed Rule, *supra* note 60, at Part D, § II.A.1.

74 Xplorobot, *A New Paradigm in Detection and Quantification of Methane Emissions*, https://www.xplorobot.com/laser-ogi.

75 EDF_ECO_PHS_EX-040, U.S. EPA, *EPA Approval of Xplorobot Methane ATM (MATM-003)* (Jan. 14, 2025), https://www.epa.gov/system/files/documents/2025-01/final_approval_methane-atm_xplorobot_signed.pdf.

76 EDF_ECO_PHS_EX-041, Exploration Robotics Technologies, Inc., *Xploroblot Laser Gas Imager Alternative Test Method (MATM-003*) (Jan. 14, 2025), https://www.epa.gov/system/files/documents/2025-01/exploration-robotics-alternative-test-method-matm-003.pdf.

77 *See* APCD Proposed Rule, *supra* note 60, at Part D, § II.A.4.

78 *Id.* § II.A.4.a.

79 *Id.*

80 *Id.* § II.A.4.c.

However, it would also be appropriate to require repair verification within the same 15 calendar day deadline for final repair completion. The sequencing of repair and verification provided in the Proposed Rule could create situations where repairs are not verified as complete until 5 calendar days after the 15 calendar day repair deadline. Requiring verification through re-monitoring before considering a repair complete is reasonable and consistent with EPA's definition of repair in all leak detection and repair programs. For example, repaired means that equipment is adjusted, or otherwise altered, in order to eliminate a leak as defined in the applicable sections of this subpart and, except for leaks identified in accordance with §§ 60.482-2b(b)(2)(ii) and (d)(6)(ii) and (iii), 60.482-3b(f), and 60.482-10b(f)(1)(ii), is re-monitored as specified in § 60.485b(b) to verify that emissions from the equipment are below the applicable leak definition at 40 C.F.R. Part 60, subpart VVb.

D. The Proposed Rule's Biocover or Biofilter Standards are Important and Necessary.

In addition or as an alternative to GCCS, some MSW landfills use biocover or biofilters containing aerobic methanotrophic bacteria to convert methane to CO_2 as LFG migrates through the cover or filter material.[81] These systems can also decrease emissions of H_2S, ammonia, and NMOC, including BTEX and other hazardous organic compounds.[82] Biofilters are contained units (covered or uncovered) filled with porous material and mulch or compost that provides the aerobic conditions needed to support methanotrophic bacteria, with LFG conveyed into the unit directly from a gas vent or collection system, either by active or passive means. Biocovers are placed directly atop a landfill waste layer, and consist of a layer of compost on top of a layer of porous material such as gravel. The efficiency of methane oxidation in biofilters and biocovers varies, but studies have shown high levels of methane oxidation (above 80%) can be achieved in well-functioning systems.[83] Biocover may be especially beneficial for use as intermediate cover because standard intermediate cover allows fugitive methane to escape at the stage when the rate of methane production is especially high, even with GCCS in place.

E. The Proposed Rule's Remote Sensing Program is Appropriately Designed to Detect Large Methane Emission Events from MSW Landfills.

Colorado has an excellent opportunity to reduce statewide methane emissions by integrating remote sensing observations into its landfill methane program in Regulation 31. The remote methane monitoring provisions in Part E of the Proposed Rule are a vital component of Colorado's landfill methane program, as prompt detection and remediation of large methane releases is key to reducing overall emissions.

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[81] EDF_ECO_PHS_EX-042, Kjeldsen, P. & Scheutz, C., *Solid Waste Landfilling – Concepts, Processes, Technology: Landfill Gas Management by Methane Oxidation*, 478-79, 482 (2019).

[82] EDF_ECO_PHS_EX-043, Ménard, C., et al., *Biofiltration of Methane and Trace Gases from Landfills: A Review*, 40-41 Environ. Rev. 20(1) (2012); EDF_ECO_PHS_EX-044, Bogner, J. E., et al., *Effectiveness of a Florida Landfill Biocover for Reduction of CH_4 and NMHC Emissions*, Envt'l Sci. & Tech. 44(4) (Jan. 14, 2010).

[83] EDF_ECO_PHS_EX-045, Scheutz, C., et al. *Processes and Technologies for Mitigation of Landfill Gas Emissions by Microbial Methane Oxidation*, Waste Manag. & Res. 27(5) (July 7, 2009); *see also* EDF_ECO_PHS_EX-042.

EPA's Methane Super Emitter Program ("SEP") for remote sensing of methane emissions from oil and gas operations provides a valuable head start for Colorado's landfill effort.[84] The SEP has provided a model for how such a program could work and established requirements for third-party certification. CDPHE has already been working with Carbon Mapper Inc.,[85] which was certified as a third-party notifier for the oil and gas SEP in January 2025.[86] Carbon Mapper's certification is based on an aircraft-mounted system using an Airborne Visible/Infrared Imaging Spectrometer ("AVIRIS"). The same system has demonstrated proficiency for detecting landfill methane plumes. The Colorado Energy Office has received a $129 million award from EPA for a "decarbonization accelerator," a portion of which is to be used to reduce methane from coal mines and landfills.[87] Part of this funding is expected to be directed toward supporting remote detections of landfill methane and establishing a state platform for notifications and reporting that is tailored to the landfill sector.

The Proposed Rule appropriately requires landfill operators to promptly investigate, mitigate, and report back on certain large methane releases upon notification by the Division. In addition, the Proposed Rule appropriately requires that participating third parties be certified by EPA or the Division, providing further assurances of the rigor of any potential notifications. The Proposed Rule's listing of required corrective actions is also critical for setting expectations for both MSW landfill operators and the public. These include the requirement that repeated detections of releases above 207 kg/hr^{-1} trigger installation of a GCCS at MSW landfills that do not already have one, unless the release can be explained by approved waste excavation or mining activities.[88] This requirement is reasonable because an average release rate of 207 kg/hr^{-1} equates to an annual rate of 1,814 mt per year, which would trigger GCCS installation based on calculated emissions.

The Proposed Rule appropriately requires reports of plume detections to include details of the emissions detection technology along with a visualization of the plume and estimated release rate. This information will allow the Division to ensure plume detection reports are reliable and useful to landfill operators. Between the pre-certification requirements and the supporting information provided with individual detection reports, landfill operators and the public will be able to rely on notifications being legitimate and accurate to a reasonable degree of certainty.

F. The Proposed Rule Establishes Appropriate Gas Destruction Requirements, Which are Important and Necessary.

The Division correctly recognizes that enclosed flares are a highly effective method for destroying LFG to reduce pollution. The Proposed Rule appropriately requires enclosed flares be

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[84] EDF_ECO_PHS_EX-046, U.S. EPA, *Methane Super Emitter Program*, https://www.epa.gov/compliance/methane-super-emitter-program.

[85] EDF_ECO_PHS_EX-047, CDPHE, *Aerial Methane Plume Mapping Summary Report* (October 2024).

[86] EDF_ECO_PHS_EX-048, U.S. EPA, *Third Party Certifications*, https://www.epa.gov/emc/third-party-certifications.

[87] APCD, *Landfill Methane Rule Technical Working Group Meeting # 4*, Slide 9 (Oct. 15, 2024).

[88] APCD Proposed Rule, *supra* note 60, at Part E, § I.C.

used in the vast majority of instances where LFG is flared, with limited exceptions for landfills that recently installed open flares. Enclosed flares provide numerous benefits over open flares because they can be more efficiently monitored and operated to maximize destruction efficiency.[89] By contrast, open flares, many of which are operated according to the requirements in 40 C.F.R. § 60.18, have been widely observed to achieve far lower methane destruction than intended.[90] To realize the methane and air pollution reduction benefits of the Proposed Rule, it is therefore critical that enclosed flares be used with limited exception.[91] Both open and enclosed flares require robust monitoring and careful operation to achieve high levels of LFG destruction. Robust monitoring and testing of operational parameters are likewise necessary to ensure methane reductions targeted by the Proposed Rule are realized. We largely support the Division's proposed standards for enclosed flares, although we provide suggested improvements detailed in Dr. Sahu's expert report.

VI. AREAS OF IMPROVEMENT

A. The Proposed Rule's Proposed GCCS Installation Timelines Should be Accelerated.

In its original version of the Proposed Rule, the Division required owners and operators of MSW landfills requiring GCCS to submit GCCS design plans to the Division within 180 calendar days of triggering GCCS installation. In the latest version of the Proposed Rule, the Division extended the timeline for submitting design plans from 180 calendar days to 12 months, seemingly in response to input from landfills indicating that the original period is insufficient.[92] This, paired with an additional 18 month period for GCCS installation at an active landfill after the submission deadline for the design plan,[93] means that the overall timeframe proposed by the Division (30 months) is the same as existing federal standards that some Colorado landfills already have to comply with.[94] The period for new GCCS installation at an inactive or closed landfill is even longer (24 months), providing owners and operators of such landfills a total of 36 months to comply.[95]

Shorter timeframes for GCCS installation are reasonable and consistent with other state standards. Landfill owners and operators do not need 12 months to develop and submit design plans to the Division and an additional 18-24 months to then install a GCCS (for a total of 30-36 months), depending on whether the landfill is active or not. Landfill operators can anticipate the need for GCCS to be installed as waste placement proceeds and thus plan and design systems in advance to comply with a 180 calendar day timeframe. Landfills can begin to prepare design plans for GCCS installation as soon as the regulation is adopted, including active landfills, which can

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89 EDF_ECO_PHS_EX-049, Expert Report of Dr. Ranajit Sahu, 5-6 (July 11, 2025).

90 *See, e.g.,* EDF_ECO_PHS_EX-050, Plant, G., et al., *Inefficient and Unlit Natural Gas Flares Both Emit Large Quantities of Methane*, 1,566, Science 377(6614) (Sept. 29, 2022), https://www.science.org/doi/10.1126/science.abq0385.

91 *See* EDF_ECO_PHS_EX-049, at 3-4.

92 APCD Proposed Rule, *supra* note 60, at Part C, § I.A.1.

93 *Id.* § I.C.

94 *See* EDF_ECO_PHS_EX-034, at 4-5.

95 APCD Proposed Rule, *supra* note 60, at Part C, § I.D.

begin preparing design plans in anticipation of methane generation rate limits being exceeded. Indeed, Washington and Michigan require GCCS installation within 18 months of an exceedance.[96] Colorado should accelerate its timelines consistent with those it originally proposed to ensure capture of this landfill methane pollution. Therefore, EDF and Eco-Cycle urge the Commission to revert back to the 180 calendar day timeline for submitting GCCS design plans to the Division, as originally proposed.

B. The SBAP Should Reflect the Full Suite of Benefits Realized by Achieving Methane and Harmful Air Pollution Reductions from MSW Landfills.

The importance of the full suite of benefits Regulation 31 will deliver should be expressly recognized in in the SBAP. Accordingly, EDF and Eco-Cycle recommend adding the following statement to the SBAP:

> In addition to methane reductions, the monitoring and control requirements in Regulation Number 31 will reduced emissions of non-methane organic compounds that contribute to formation of ozone, and reduced emissions of toxic air pollutants including toluene, benzene, m-xylene, n-hexane, mixed xylenes, ethyl benzene, formaldehyde and hydrogen sulfide.

Those benefits should also be recognized in the Division's EIA, to the extent feasible.

C. Extended Use of Intermediate Cover Should be Subject to HMWMD Approval.

The Proposed Rule appropriately requires that, at larger landfills, if new intermediate cover installed on or after January 1, 2026, will be in place for longer than 180 days (before the area is closed and final cover installed), it must be a biocover that includes a permeable gas distribution layer as well as a methane oxidation layer, which has been approved by HMWMD.[97] This is an important requirement for decreasing methane emissions, as the time when intermediate cover is used instead of final cover is likely to include the time of peak methane production from the waste and can go on for years.[98] Replacing a conventional intermediate cover with a properly designed and operated biocover has been shown to be effective in converting methane to CO_2, a less potent GHG. Biocover can also mitigate emissions of NMOC and HAPs.[99]

As proposed, the intermediate cover requirement provides operators with appropriate flexibility. They are not required to use biocover, but instead can use conventional intermediate cover if they use it for no more than 180 days before replacing it with more protective final cover. As a complement to this provision, the Commission should ensure that intermediate cover is not

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96 *See* EDF_ECO_PHS_EX-034, at 4-6 (discussing shorter overall timeframes for GCCS design plan submission and installation in other state regulations).

97 APCD Proposed Rule, *supra* note 60, at Part F, § I.A.1.

98 Colorado's Solid Waste Regulations define "adequate" intermediate cover as "[a]t least one foot of earthen material or other suitable material placed over solid wastes in areas left temporarily unused for at least one month…[,]" but do not specify how long intermediate cover can be used. *See* 6 CCR 1007-2, Part 1, §1.2.

99 *See generally* EDF_ECO_PHS_EX-043.

used for an excessively long time before being replaced with more protective final cover. The length of time intermediate cover will be used should be made subject to HMWMD approval as part of its review of the cover design.

D. EDF and Eco-Cycle Recommend Requiring Operators be Notified for a Limited Type of Extraordinary Methane Releases at MSW Landfills.

EDF and Eco-Cycle agree that the Division should review third-party remote methane detection reports prior to notifying operators; however, the public and third-parties need assurance that notifications will only be required when legitimate and actionable detection reports are received. This requirement is critical to the long-term success of the Division's remote methane sensing program—third-parties may not participate in the program if rigorous and credible data they generate are not used. Furthermore, third-parties and MSW landfill owners and operators will benefit from clear articulation of the criteria that will be used to determine if a notification must be issued. To that end, EDF and Eco-Cycle support the following revisions to Part E, § I.A. proposed by GreenLatinos (indicated in red with Division redlines shown in blue):

> I.A. The Division ~~may~~ will issue a notification to the owner or operator of an MSW landfill of a qualified methane emissions detection(s) at or from the landfill that has been obtained from remote methane monitoring carried out by third parties or at the direction the Division according to the following requirements.
>
> > I.A.1. The technology used for the remote methane monitoring has been approved by the Division or the technology has obtained third-party certification under the United States Environmental Protection Agency's (EPA) Methane Super Emitter Program pursuant to 40 CFR, § 60.5371b(b) (August 1, 2024). The process for approval of remote methane monitoring technologies by the Division will consider the following:
> >
> > > I.A.1.a. Ability to identify and localize methane emissions that originate from a specific location or area at an MSW landfill.
> > >
> > > I.A.1.b. Demonstrated past performance of methane emission detection from MSW landfills with accessible data in the public domain.
> > >
> > > I.A.1.c. Ability to quantify methane emission rates and their uncertainties using established methodologies and publicly available quality assurance and quality control protocol.
> > >
> > > I.A.1.d. Ability to detect methane emissions without physical access to the MSW landfill.
>
> I.A.2. The qualified emission detections submitted to the Division are timely and indicate with reasonable certainty that significant emissions are occurring, as informed by the Division's guidelines for data quality and completeness.

I.A.~~23~~. The notification ~~is~~ will be sent electronically to the owner or operator of the MSW landfill within 7 business days of the Division receiving the monitoring data and ~~contains~~ will contain the following information.

These revisions help to strike an appropriate balance by (1) affording the Division sufficient discretion to determine whether a third-party detection report submitted to the Division meets certain minimum data quality and completeness criteria, and (2) guaranteeing that extraordinarily large methane releases, which meet such minimum criteria, will trigger a notification to operators. This approach ensures that operators will be made aware of extraordinarily large methane releases, thereby allowing them to take action(s) to mitigate the release and to take the corrective actions necessary to fix the root cause(s) of the release, but also ensures that the Division is not required to issue notifications for non-qualifying releases.

Furthermore, the public has a substantial interest in receiving prompt notification about large methane releases from MSW landfills, as well as information about investigative findings and any corrective action(s) taken. Third-party notifiers and scientific researchers also have interests in understanding what activities or conditions were associated with large releases and the actions taken to address them. Accordingly, EDF and Eco-Cycle support the following new Part E, § I.F. proposed by GreenLatinos

I.F. The Division will provide public notice of detections of emissions:

I.F.1. For detections reported by third parties, within seven days of receipt from the third party. The public notices will include the received report. If the Division finds that the report does not meet the Division's guidelines for timeliness, data quality, completeness, or significance, the public notice will summarize that finding.

I.F.2. For all qualified detections, within 30 days of receipt of a report on investigation findings and follow-up actions. The public notice of the event will include a summary of the detection and response results.

The Division could streamline disclosure of public notices under this section by standardizing reporting requirements, creating standard public notice forms, and developing a web portal for the program through which the public can access public notices issued by the Division.

E. The Proposed Rule Should Include Recordkeeping Requirements for the MSW Landfill's Working Face.

Part D, § I.E.1 of the Proposed Rule appropriately requires efforts to minimize methane emissions from the MSW landfill's working face. This requirement is appropriate because recent remote sensing studies have identified the working face as a common source of high levels of methane emissions.[100] Therefore, the Proposed Rule should be modified to require records of the size and location of the working face, and the protocols employed to minimize working face emissions. This information would likewise be relevant in instances where remote sensing detects

[100] *See* EDF_ECO_PHS_EX-031, at 21,551-52.

a plume coming from the working face. Accordingly, EDF and Eco-Cycle support the following new Part H, § I.A.25 proposed by GreenLatinos (indicated in red):

> I.A. The owner or operator of an MSW landfill subject to this regulation must maintain the following records for at least five years and provide them to the Division upon request.
>
> > I.A.25 Records of monthly average working face area and waste placement volume and current operating protocols to minimize the area of the working face and corresponding methane emissions, as required in Part D, I.E.1.

F. The Proposed Rule Should Include More Robust Monitoring and Operational Standards Applicable to Limited Instances When Open Flares May Be Used.

As discussed in more detail in Dr. Sahu's expert report, open flares are generally not an effective method for destroying LFG and cannot be guaranteed to achieve the methane reductions contemplated by the Proposed Rule. Therefore, their use should be eliminated or minimized to the greatest degree possible. The Proposed Rule, however, includes limited exceptions in which open flares may be permissible. In any situation where open flares are used, robust monitoring and operational standards are required. The Proposed Rule currently includes a cross reference to an outdated federal regulatory provision first adopted in 1986, 40 C.F.R. 60.18, for the operation of open flares.[101] Open flares in the oil and gas sector, many of which follow the requirements of 40 C.F.R. 60.18, have been widely observed to combust at a far lower efficiency than what is required and assumed.[102] The Division should therefore not rely on a cross reference to 40 C.F.R. 60.18, and should instead incorporate a cross reference to the more recent and improvement open flares standards at 40 C.F.R. 63.670. Those standards were more recently updated to include improved metrics for monitoring open flare performance and will therefore provide greater assurances that open flares are operating in an efficient manner.[103]

VII. ISSUES TO BE RESOLVED BY THE COMMISSION

The issues to be resolved by the Commission at the August hearing include:

- Whether to adopt the Division's proposed rule and SBAP language.
- Whether to adopt GreenLatinos' Alternate rule and SBAP language, particularly the sections discussed in this Prehearing Statement.

VIII. EXHIBITS

A summary of all exhibits, including voluminous exhibits, attached by EDF and Eco-Cycle

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101 *See* EDF_ECO_PHS_EX-049, *at* 7.

102 *See* EDF_ECO_PHS_EX-050, at 1,566.

103 *See* EDF_ECO_PHS_EX-049, at 7-8.

to this Prehearing Statement and incorporated herein by reference, is included in the Exhibit Table of Contents, EDF_PHS_EX-TOC. Exhibits also include reports and other technical documents referenced in this Prehearing Statement. EDF and Eco-Cycle reserve the right to list further exhibits or revise exhibit lists in response to other parties' prehearing statements, including the Division's prehearing statement, and any alternate proposals submitted by parties. EDF and Eco-Cycle will identify any further exhibits necessary as part of their rebuttal statement. EDF and Eco-Cycle reserve the right to respond to information, exhibits, and arguments submitted by other parties.

IX. ESTIMATE OF TIME

EDF and Eco-Cycle request a time allocation of **90** minutes for direct testimony, rebuttal testimony, and cross-examination of other parties' witnesses.

X. EXHIBITS; WITNESS AND WRITTEN TESTIMONY

EDF and Eco-Cycle are submitting an expert report by Dr. Sahu but not submitting additional written testimony with this prehearing statement, and reserve the right to submit written rebuttal testimony in response to the Division's or other parties' prehearing statements.

EDF and Eco-Cycle may introduce the following witnesses:

- **Edwin LaMair**, Environmental Defense Fund.
- **Peter Zalzal**, Environmental Defense Fund.
- **Karen Marsh**, Lumina Sky Consulting PC.
- **Ryan Call**, Eco-Cycle.
- **Suzanne Jones**, Eco-Cycle.
- **Dr. Ranajit Sahu,** Expert.
- **Tom Bloomfield**, Kaplan Kirsch LLP.
- **Tim Roth**, Kaplan Kirsch LLP.
- Any witnesses identified by any other party.
- Any other witnesses that may be needed for rebuttal or impeachment purposes.

XI. CONCLUSION

EDF and Eco-Cycle respectfully urge the Commission to adopt the Division's Prehearing Proposal in addition to the changes proposed herein. EDF and Eco-Cycle look forward to continuing to engage with the Division and other parties to resolve and narrow issues prior to the rulemaking hearing.

Respectfully submitted this 11th day of July, 2025.

By: */s/ Thomas A. Bloomfield*
Thomas A. Bloomfield, #35281
Timothy A. Roth, #57691
Kaplan Kirsch LLP
1675 Broadway, Suite 2300
Denver, CO 80202
Phone: (303) 825-7000
Email: tbloomfield@kaplankirsch.com
Email: troth@kaplankirsch.com

Counsel for Environmental Defense Fund and Eco-Cycle

CERTIFICATE OF SERVICE

I hereby certify that on this 11th day of July 2025, an electronic copy of this **JOINT PREHEARING STATEMENT BY ENVIRONMENTAL DEFENSE FUND AND ECO-CYCLE, INC.** was delivered to the following via email:

Air Quality Control Commission
jeramy.murray@state.co.us
cdphe.aqcc@state.co.us
robyn.wille@coag.gov
cory.haller@coag.gov
airsupport@coag.gov

Air Pollution Control Division
michael.ogletree@state.co.us
timothya.taylor@state.co.us
sarah.quigley@coag.gov
barbara.dory@coag.gov

Archuleta County
mtorres@archuletacounty.org

Black and Brown Parents United
rachael.bpuf@gmail.com

City and County of Denver
zachery.clayton@denvergov.org
dave.wilmoth@denvergov.org

City of Glenwood Springs
liz.mauro@cogs.us

Colorado Energy Office
jackie.calicchio@coag.gov
phalen.kohlruss@coag.gov
kacey.higgerson@coag.gov
wil.mannes@state.co.us
michael.a.turner@state.co.us

Delta County
cfuller@deltacountyco.gov
wkoontz@deltacountyco.gov

EDF and Eco-Cycle
tbloomfield@kaplankirsch.com
Ryan@ecocycle.org
pzalzal@edf.org
troth@kaplankirsch.com
elamair@edf.org

Garfield County
DFiscus@garfieldcountyco.gov
kwynn@garfieldcountyco.gov
bhenderson@garfieldcountyco.gov

GreenLatinos
brianloma@greenlatinos.org
jessicaherrera@greenlatinos.org
aschluntz@earthjustice.org
msasso@catf.us

Kiowa County
Kiowaco.landfill@gmail.com

Kit Carson County
brandon.beechley@kitcarsoncounty.org

Lake County
sclark@lakecountyco.gov

Mesa County
jennifer.richardson@mesacounty.us
ccolclasure@bwenergylaw.com
thanrahan@bwenergylaw.com
todd.starr@mesacounty.us

Montezuma County
mjarmon@co.montezuma.co.us

Montrose County
bwallace@montrosecounty.net

Morgan County
tmalone@co.morgan.co.us

The National Waste and Recycling Association (NWRA)
agermain@wasterecycling.org
rhering@wasterecycling.org

Otero County Landfill
jhowells@oterogov.org

Pitkin County Solid Waste Center
Tyler.Carvell@pitkincounty.com

Republic Services
nwuestenberg@republicservices.com
SDerus@republicservices.com

Rio Blanco County
thad.white@rbc.us
reece.melton@rbc.us

San Luis Valley Regional Solid Waste Authority
manager@slvlandfill.com
operations@slvlandfill.com

SCS Engineers
psullivan@scsengineers.com
eguignon@scsengineers.com
wchaley@scsengineers.com

The Solid Waste Association of North America (SWANA)-Rocky Mountain Chapter
jmidkiff@wcgrp.com

Summit County
aaron.byrne@summitcountyco.gov
jeffrey.huntley@summitcountyco.gov

Waste Connections
dalton.ellis@wasteconnections.com

Waste Management of Colorado, Inc., Waste Management Disposal Services of Colorado, Inc., and Conservation Services, Inc.
jbiever@williamsweese.com
ctaylor@williamsweese.com
cmccabe@mankogold.com
jdehner1@wm.com
tmille32@wm.com
bdodek@wm.com
khanna@mankogold.com

Weaver Consultants Group
mstutz@wcgrp.com
mgreen@wcgrp.com

By: *<u>/s/ William Trull</u>*
Kaplan Kirsch LLP