OFFICE OF AIR QUALITY PLANNING AND STANDARDS
RESEARCH TRIANGLE PARK, NC 27711

2/21/2025

Dr. Caroline Alden
LongPath Technologies, Inc.
5480 Valmont Rd., Ste. 150
Boulder, CO 80301

Dear Dr. Alden:

We are writing in response to your submission on behalf of LongPath Technologies, Inc., located in Boulder, Colorado, dated September 19, 2024, and final submission dated January 16, 2025, in which you request the approval of an "Alternative Test Method for Methane Detection Technology" under the New Source Performance Standards for Crude Oil and Natural Gas Facilities for which construction, modification or reconstruction commenced after December 6, 2022 (40 CFR Part 60, Subpart OOOOb). We are considering this request under 40 CFR 60.5398b(d), based on the information you have submitted (as described below). The EPA's Office of Air Quality Planning and Standards has been delegated certain authorities under this provision, including authority to consider and/or approve alternative test methods for methane detection technology.

As we understand, LongPath Technologies, Inc., has developed a measurement solution, LongPath Emissions Sensing Network™, that uses open-path laser absorption spectroscopy principles coupled with plume modeling and atmospheric inversion to quantify methane emissions at facility-level resolution.

To support your submittal, you have provided the following documents associated with your submission, either submitted through EPA's publicly facing portal or through EPA's Confidential Business Information (CBI) Office when a CBI claim was made:

- Executive Summary documents initially submitted September 19, 2024, updated January 16, 2025, which is a publicly facing portal submission that describes submission information, technical summary of the technology, summary of documents submitted and additional contextualizing information. See §60.5398b(d)(2) and §60.5398b(d)(3)(i)-(ii).

- Description of Technology document submitted on September 19, 2024 which is a publicly facing document that describes that details the relevant measurement technology including measurement theory, instrumentation, application, and known limitations. LongPath supplemented the publicly facing document with additional documentation claimed as Confidential Business Information (CBI) (submitted September 19, 2024 and January 2, 2025), which includes further proprietary information and data regarding how the technology works. See §60.5398b(d)(3)(iii)-(v) and §60.5398b(d)(3)(vi)(B) & D.

- Publications and reports, listed below, were submitted through the public portal on September 19, 2024. Additional data and reports, claimed as CBI, were received on September 19, 2024 and January 2, 2025. These materials, including a third party validation study, serve as supporting evidence that LongPath can appropriately detect methane emissions at the 1 kg/hr threshold, as applied in the field. See §60.5398b(d)(3)(vi)(A).

    - Coburn, S., Alden, C., et. al. 2022. Long Distance Continuous Methane Emissions Monitoring with Dual Frequency Comb Spectroscopy: deployment and blind testing in complex emissions scenarios. https://arxiv.org/abs/2009.10853.
    - Alden, C., Wright, R., et. al. 2020. Temporal Variability of Emissions Revealed by Continuous, Long-Term Monitoring of an Underground Natural Gas Storage Facility. https://pubs.acs.org/action/showCitFormats?doi=10.1021/acs.est.0c03175&ref=pdf.
    - Alden, C., Coburn, S., et. al. 2019. Single-Blind Quantification of Natural Gas Leaks from 1 km Distance Using Frequency Combs. https://pubs.acs.org/doi/10.1021/acs.est.8b06259.
    - Coburn, S., Alden, C., et. al. 2018. Regional trace-gas source attribution using a field-deployed dual frequency comb spectrometer. https://doi.org/10.1364/OPTICA.5.000320
    - Alden, C., Ghosh, S., et. al. 2018. Bootstrap inversion technique for atmospheric trace gas source detection and quantification using long open-path laser measurements. http://www.atmos-meas-tech.net/11/1565/2018/.
    - Rieker, G.B., Giorgetta, F. R., et. al. 2014. Frequency-comb-based remote sensing of greenhouse gases over kilometer air paths. http://dx.doi.org/10.1364/OPTICA.1.000290.

- A sampling protocol titled “LongPath Emissions Sensing Network™ Technology: Fugitive Methane Emission Monitoring.” EPA received the final version on January 16, 2025 through the public portal, which includes all the required procedures and applicable quality assurance and control requirements, consistent with your operation of the solution, and consistent with the requirements in §60.5398b(d)(3)(vi)(C).

EPA conducted an initial review of the submitted material, based on this review and receipt of additional information and consistent with the requirements in §60.5398b(d)(1)(i), EPA determined your submission to be complete.

Based on a review of the provided material and a recognition that LongPath Technologies, Inc. meets the criteria found in §60.5398b(d)(2), we have determined that your LongPath Emissions Sensing Network™ meets the periodic screening requirements for 1, 2, 3, 5, 10, and 15 kg/hr detection thresholds. Given the sampling protocol for each detection threshold is identical, ALTTECH-50 through ALTTECH-55 were used to develop a single alternative test method, **MATM-005**, with multiple detection threshold options. Additionally, we are approving your solution for use by an owner or operator, on an affected facility, subject to the caveats included in the protocol, for the alternative periodic screening process as described in §60.5398b(b).

Furthermore, your LongPath Emissions Sensing Network™ may be used as an alternative to fugitive emissions monitoring under the New Source Performance Standards for Crude Oil and Natural Gas Facilities for which construction, modification or reconstruction commenced after September 18, 2015, and on or before December 6, 2022 (40 CFR Part 60, Subpart OOOOa) provided the owner or operator using the solution complies with§60.5398b, including the notification, recordkeeping, and reporting requirements outlined in §60.5424b.

Because the alternative method may be used by owners and operators subject to the monitoring of fugitive emissions components affected facilities, and inspection and monitoring of covers and closed vent systems subject to 40 CFR part 60, Subparts OOOOa and OOOOb, we will post this letter as **MATM-005** on the EPA website at https://www.epa.gov/emc/oil-and-gas-alternative-test-methods for use by interested parties.

This approval letter is not an implied or express endorsement by EPA of any specific companies or products, as EPA does not promote the products, services, or enterprises of non-federal entities. This letter may be freely distributed and used for non-commercial, scientific and educational purposes. The use of the official EPA Seal and Logo is intended for US Government purposes only and may only be reproduced and used with the express, written permission of EPA's Office of Public Affairs. Further, the EPA Seal or Logo may not be used in a way that implies an EPA endorsement.

If you should have any questions or require further information regarding this approval, please contact my staff at MethaneATM@epa.gov.

Sincerely,

STEFFAN JOHNSON

Digitally signed by STEFFAN JOHNSON
Date: 2025.02.21 10:36:38 -05'00'

Steffan M. Johnson, Group Leader
Measurement Technology Group

cc:
Greg Fried, OECA/AED
Elizabeth Leturgey, OECA/OC
Ned Shappley, OAQPS/AQAD
Karen Wesson, OAQPS/AQAD
Regional Testing Contacts

Attachments (2)

LongPath Technologies - Alternative Test Method (MATM-005).pdf

Memo to the Docket, Acceptance Justification: LongPath Emissions Sensing Network™ (Technology)

MEMORANDUM

TO: EPA-HQ-OAR-2024-0619

FROM: Paul Van Rooy, EPA

DATE: February 21, 2025

Subject: **Acceptance Justification: LongPath Emissions Sensing Network™ (Technology)**

This Memorandum summarizes EPA's consideration of the technical basis of LongPath's Emissions Sensing Network documented in ALTTECH-50 (1 kg/hr detection threshold), ALTTECH-51 (2 kg/hr), ALTTECH-52 (3 kg/hr), ALTTECH-53 (5 kg/hr), ALTTECH-54 (10 kg/hr), and ALTTECH-55 (15 kg/hr), which were initially submitted on September 19, 2024, as part of the Advanced Methane Detection Alternative Test Method program (40 CFR 60.5398b(d)). The final submission of documents occurred on January 16, 2025. The sampling protocol, titled "LongPath Emissions Sensing Network™ Technology: Fugitive Methane Emission Monitoring," is identical between all submissions; the only difference between the submissions is the emission rate at which an alert requiring follow up action is sent to the owner/operator. Documents contained in the submissions ALTTECH-50 through ALTTECH-55 were used to develop a single alternative test method, MATM-005. EPA's consideration of this technology under this program and its application to the Advanced Methane Detection Alternative Test Method program is further described in EPA's approval letter dated February 21, 2025[1]. This Memorandum provides additional rationale for EPA's decision to approve that technology, as described in the February 21, 2025 letter. This Memorandum also includes a summary of meetings between LongPath and EPA staff related LongPath's request for approval of this technology.

The LongPath Emissions Sensing Network™ periodic screening technology, documented in ALTTECH-50 through ALTTECH-55, uses open-path laser absorption spectroscopy principles coupled with plume modeling and atmospheric inversion to quantify methane emissions at facility-level resolution during periodic site surveys at applicable oil and gas facilities. Extensive details on how this technology works are included in the Description of Technology document, consistent with 40 CFR 60.5398b(d)(3)(iii), 40 CFR 60.5398b(d)(3)(iv), and 40 CFR 60.5398b(d)(3)(v). Longpath submitted a redacted version of the Description of Technology document to the public-facing portal; a full version of the Description of Technology document, which includes information claimed as confidential, was submitted as Confidential Business Information (CBI). To provide further insight into how this technology is used in the field and

[1] This request is approved as "MATM-005." See https://www.epa.gov/emc/oil-and-gas-alternative-test-methods.

additional supporting information suggesting this technology meets the aggregate detection threshold in the field, LongPath also submitted several end-user documents, data sets, and SOPs as CBI in addition to peer-reviewed journal articles submitted in the public-facing portal, per 40 CFR 60.5398b(d)(3)(vi).

This method, MATM-005, requires an initial siting procedure where LongPath uses knowledge of the facility lay out, topography, historical meteorological data, and other information to develop a site design. Retroreflectors are installed on the site along with a central node, which holds an anemometer and the laser spectrometer. After installation, a preliminary periodic screening event is triggered to ensure a periodic screening can be completed within 7 days. During a periodic screening, laser light is pointed to each retroreflector on the facility; the spectrometer measured the laser light absorbance across the path length to calculate integrated path methane concentrations (ppm-meter). The integrated path concentration is converted to mass emission rate (kg/hr) using plume and inverse modeling techniques with inputs collected using the anemometer. This process is continued is repeated until 3.5 hours of valid data are collected.

The 90% Probability of Detection (PoD) for MATM-005, as determined through blind emissions testing lasting on average 3.5 hours each at The Methane Emissions Technology Evaluation Center (METEC) facility, is 0.06 kg/hr; 100% of steady and intermittent emissions events above 0.096 kg/hr were identified during blind testing. These data supporting the PoD are included in Section 13 of MATM-005; additional data and test descriptions supporting the PoD, claimed as CBI, were also made available to the review team. To account for impacts of siting variations, equipment locations, and environmental conditions on the method's 90% PoD, LongPath developed a conversion to calculate a site-specific minimum detection limit. In MATM-005, this value is used as a data quality indicator to ensure all valid data has a minimum detection limit below the alerting threshold. Given LongPath provided evidence supporting their technology can detect methane emission rates of 0.06 kg/hr with 90% PoD, MATM-005 can be used for any of the following detection thresholds: 1 kg/hr, 2 kg/hr, 3 kg/hr, 5 kg/hr, 10 kg/hr, or 15 kg/hr.

In MATM-005, LongPath has established and outlined an envelope of operations that is supported by data. The method clearly lays out the collection parameters and associated Data Quality Indicators (DQI) for component methane emission detections to ensure only data deemed valid is used for calculating emission rates. The method specifies how a periodic screening emission rate is determined using the median of discrete valid preliminary real-time estimates, how much data is required for each periodic screening emissions (3.5 hours), and when a periodic screening emission rate would trigger an "alert" requiring regulatory follow-up for repair and repair verification.

The method also includes a monitoring and response plan that is recommended to be used by the owner/operators after an alert is triggered. This monitoring and response plan calls for owner/operators to conduct a full facility follow up when LongPath Emission Sensing Network™ detects a facility-wide methane emission rate above the defined detection threshold (1 kg/hr, 2 kg/hr, 3 kg/hr, 5 kg/hr, 10 kg/hr, or 15 kg/hr). The detection threshold is defined by the owner/operator prior to screening. In some cases, LongPath may provide additional data to owners/operators that separates fugitive emissions from allowed emission and localizes the leak(s) using models; this additional data falls outside of the scope of the approved method and shall not influence the full facility follow up conducted by the owner/operator. The purpose of including this recommended monitoring and response plan is to provide enforcement as well as owner/operators an example of how the results of a periodic screening event conducted using the LongPath Emission Sensing Network™ are expected to be treated and acted on. The owner/operator is not required to use this recommended monitoring and response plan. The owner/operator using the monitoring and response plan is responsible for ensuring they meet all the regulatory requirements per 40 CFR 60.5398b(b).

LongPath provided sufficient supporting evidence to support this method's ability to meet the aggregate detection threshold, per 40 CFR 60.5398b(d)(3)(vi). The following is a brief list of the validation data included in the application (most of these data were submitted as CBI):

- METEC Controlled Release Study: this is the most substantial data set provided by LongPath. This dataset was used to determine the 90% probability of detection to be 0.06 kg/hr.
- Additional supporting validation data from other locations across the U.S. includes ~2-10 observations per site. Concentrations of identified leaks were typically above 5 kg/hr.
    - Midland Basin Metered Rate vs LongPath Rate
    - Delaware Basin LongPath identified leaks and operator verified presence of leak (no metered rate)
    - Delaware Basin LongPath rate vs metered rate
    - Delaware Basin controlled release
    - Haynesville Basin controlled release on site
- Several other general observations of leak identification using the LongPath Emission Sensing Network™; these leaks were found and fixed by the owner/operator, and the follow up using the LongPath Emission Sensing Network™ indicates a decrease in concentration (no metered information). Basins listed below:

- Denver Julesburg Basin
- Haynesville Basin
- Permian Basin
- Appalachian/Marcellus Basin
- Bakken Basin
- Anadarko Basin
- Eagle Ford Basin
- Greater Green River Basin

In addition to these validation data, LongPath also included an analysis of the METEC study testing conditions. Environmental conditions (wind speed, temperature, relative humidity, etc.) were compared to relative error (LongPath rate / Metered rate) as evidence to support the envelope of operation. LongPath was not required to provide localization or special resolution validation data because they submitted as facility-level resolution, per 40 CFR 60.5398b(d)(3)(vii).

LongPath's request for an alternative test method for methane detection technology was submitted and reviewed per the requirements in 40 CFR 60.5398b(d)(1). Based on the submitted materials, LongPath meets the requirements for a submitting entity, per 40 CFR 60.5398b(d)(2). LongPath's request includes all the information required per 40 CFR 60.5398b(d)(3).

Meeting Summary between EPA Measurement Technology Group and LongPath

Date	Venue	Participants	Topics
2024-08-26	Teams Call	Caroline Alden, Sean Coburn, Lewis Boyd, Amanda Makowiecki, Doug Chipponeri, David Youngquist, Will Jones, Paul Van Rooy, Michael Stovern, Carlos Valle Díaz	Initial Meeting on Alternative Test Method (ATM) comments provided by the review team for discussion. This meeting focused on the LongPath Continuous Monitoring ATM. The discussions in this meeting were also relevant to the Periodic Screening Methods.
2024-09-11	Teams Call	Caroline Alden, Paul Van Rooy	Brief (30 minute) follow up to initial meeting to discuss LongPath questions regarding application process

2024-10-09	Teams Call	Caroline Alden, Lewis Boyd, Paul Van Rooy, Michael Stovern, Carlos Valle Díaz	Shifting focus away from Continuous Monitoring application to Periodic Screening application. Meeting to discuss validation data, calibration requirements, probability of detection, localization, siting, and how a periodic test would be conducted.
2024-10-28	Teams Call	Caroline Alden, Paul Van Rooy, Michael Stovern, Carlos Valle Díaz	Discuss open questions EPA has regarding ATM: Defining detections, defining alerts, resolution requirements, draft monitoring plan.
2024-10-31	Teams Call	Caroline Alden, Paul Van Rooy, Michael Stovern, Carlos Valle Díaz	Discuss potential use of Emission factors for non-fugitive emissions in the Periodic Application
2024-11-18	Teams Call	Caroline Alden, Paul Van Rooy	Brief discussion clarifying and elaborating on EPA's review feedback for LongPath
2024-11-25	Teams Call	Caroline Alden, Paul Van Rooy	Brief discussion clarifying and elaborating on EPA's review feedback for LongPath. Focus on how the owner/operator can and cannot use LongPath technology to influence follow up requirements after an alert.
2024-12-05	Teams Call	Caroline Alden, Paul Van Rooy	Brief discussion clarifying and elaborating on EPA's review feedback for LongPath
2024-12-19	Teams Call	Caroline Alden, Paul Van Rooy	Brief discussion clarifying and elaborating on EPA's review feedback for LongPath. Focused on site segmentation, technology resolution, and follow up requirements.
2025-01-02	Teams Call	Caroline Alden, Paul Van Rooy	Brief discussion clarifying and elaborating on EPA's review feedback for LongPath. Focused on defining valid data points and calculating a single emission rate for periodic screening.
2024-01-09	Teams Call	Caroline Alden, Paul Van Rooy	Brief discussion clarifying and elaborating on EPA's most recent review feedback for LongPath
2024-01-16	Teams Call	Caroline Alden, Paul Van Rooy	Final discussion between EPA and LongPath regarding minor edits to the ATM and to discuss steps that must be complete prior to approving this technology.