



United States Environmental Protection Agency
Office of Enforcement and Compliance Assurance
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National Enforcement Investigations Center

NEIC

NEICVP1578E01

NEIC CIVIL GMAP REPORT

GMAP R7 Kansas City
Kansas and Missouri (various locations)

Investigation Dates:

April 22–25, 2024

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APPENDICES (*NEIC-created documents)

- A* FLIR Camera Log (1 page, 5 mp4 files)
- B* Air Canister Sample Log (1 page)
- C* NEIC Laboratory Analytical Results (15 pages)
- D* Chain of Custody Record (4 pages)
- E ERG Laboratory Analytical Report (21 pages)
- F* GMAP Mapping Surveys (127 kml files)
- G* GMAP Measurement Background and Overview of GMAP Mapping Surveys (4 pages)

**This Contents page shows all the sections contained in this report
and provides a clear indication of the end of this report.**

INVESTIGATION OVERVIEW

PROJECT OBJECTIVE

U.S. Environmental Protection Agency (EPA) Region 7 (Region) requested that EPA's National Enforcement Investigations Center (NEIC) conduct a Geospatial Measurement of Air Pollution (GMAP) survey of various locations in and around the Kansas City metropolitan area in the states of Kansas and Missouri. The objective of this GMAP investigation was to monitor air pollutant concentrations and to locate and characterize emissions plumes near several facilities identified by the Region. NEIC's GMAP provides data on the presence and concentration of various air pollutants described below. GMAP is a screening tool that may help government agencies, regulated entities, and the public more easily define environmental conditions and identify emissions sources where further investigation is warranted.

NEIC conducted the requested GMAP survey from April 22–25, 2024. In some situations, optical gas imaging (OGI) was conducted using forward-looking infrared (FLIR) cameras to better locate potential sources of elevated air pollutant concentrations detected by GMAP. As part of the GMAP investigation, NEIC also collected air canister samples to compare laboratory and GMAP measurements and quantitate additional compounds not detected by GMAP instruments.

NEIC's GMAP is equipped to perform EPA draft Other Test Method (OTM) 33 and draft OTM 33A. NEIC's GMAP consists of a vehicle equipped with:

- A cavity ring-down spectrometer (CRDS) for methane (CH₄) and ethylene oxide (EtO) measurements
- A differential ultraviolet absorption spectrometer (DUVAS) for benzene (BEN), toluene (TOL), m-xylene (XYM), and p-xylene (XYP) (collectively referred to as BTX) measurements
- A photoionization detector (PID) for total volatile organic compound (VOC) measurements
- A global positioning system (GPS) receiver
- An ultrasonic anemometer for measuring 3-dimensional wind vectors
- A compact weather station that provides motion-corrected wind speed and direction
- A mechanism for collecting air canister samples

Team members for this project are listed in **Table 1**.

Table 1. PROJECT TEAM MEMBERS		
Team Member	Organization	Project Role
Philip Myers	NEIC	Project manager (PM)
Conor Goulding	NEIC	Field team member
Amy Harvey	NEIC	Analytical project manager (APM)
Melissa Rosa	NEIC	Laboratory team member
REGIONAL AND OTHER CONTACTS:		
Tracey Casburn	EPA Region 7	EPA Region 7 point of contact
Joe Terriquez	EPA Region 7	EPA Region 7 point of contact, field team member
Sean Bergin	EPA Region 7	Field team member

FIELD ACTIVITIES SUMMARY

NEIC GMAP operator Philip Myers performed draft OTM 33 air monitoring using NEIC's GMAP in and around various locations in Kansas and Missouri, on April 22–25, 2024. A total of 146 mapping runs (i.e., individual surveys represented by unique map files) were conducted to measure ambient concentrations of CH₄, EtO, VOCs, and BTX. The routes traversed for all mapping runs are depicted in **Figure 1** by the green line.

The routes shown in **Figure 1** include GMAP monitoring conducted on public roads through select areas and near facilities of interest. In addition, NEIC's GMAP made site entry to the facilities listed in **Table 2**.

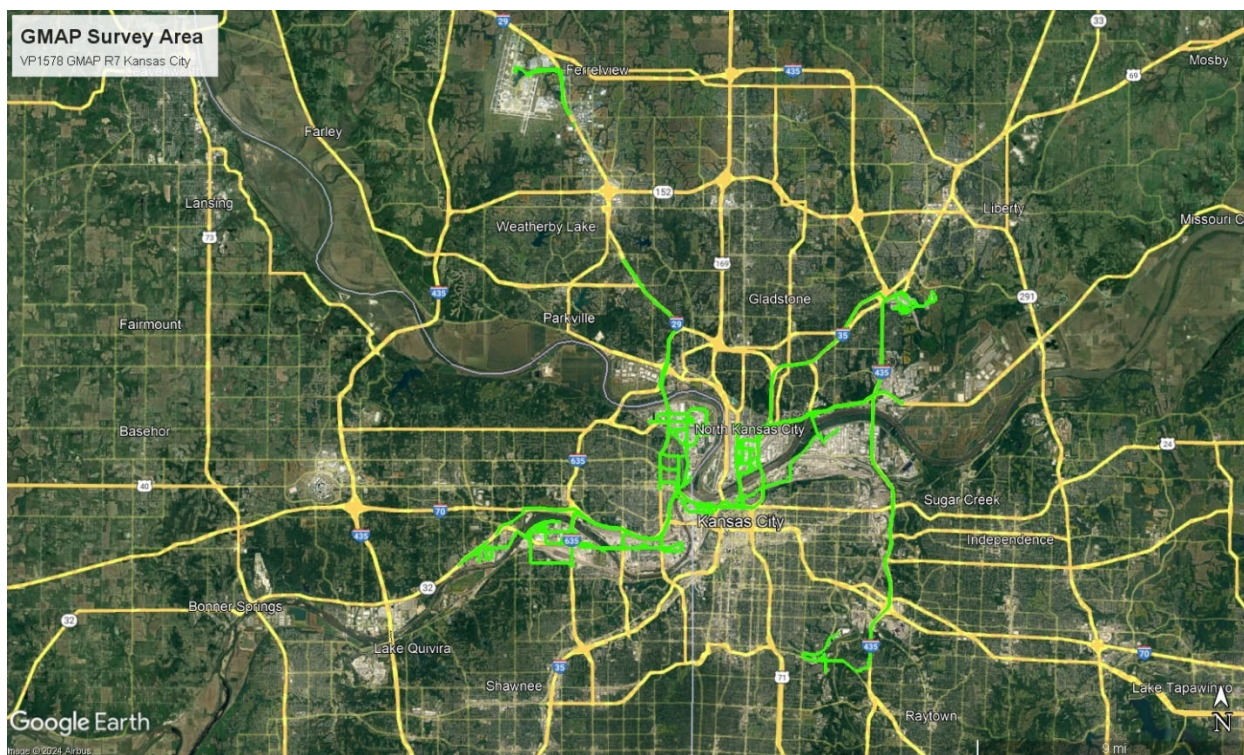


Figure 1. GMAP mapping runs, VP1578 GMAP R7 Kansas City

Table 2. GMAP SITE ENTRY FACILITIES

Date	Company / Facility Name	Facility Address	Facility Representative and Contact Information
4/22/2024	Harcros Chemicals, Inc.	5200 Speaker Rd, Kansas City, KS 66106	Ryan Doyle (913) 321-3131
4/22/2024	General Motors (GM) Fairfax	3201 Fairfax Trafficway, Kansas City, KS 66115	Bill Bahn (913) 573-7000
4/24/2024	Ford Kansas City Assembly Plant	8121 US-69, Kansas City, MO 64119	Stephanie Luebbering (816) 459-1249
4/24/2024	Ingredion	1001 Bedford Ave, North Kansas City, MO 64116	Keith McMillan (816) 283-1600

Philip Myers used a FLIR model GFx320 infrared imaging camera to identify sources of emissions detected by GMAP. NEIC collected 5 videos with the FLIR camera (**Appendix A**). A FLIR camera video log is included in **Appendix A** with all videos captured as part of this project.

Philip Myers collected 6 air samples in canisters for analysis by NEIC's Laboratory. These samples include a field blank (S06 / Canister No. 10024) taken at Station Location 240425_MA47, duplicate samples (S01 and S02 / Canister Nos. 10007 and 3072) at Station Location 240422_MA19, and duplicate samples (S04 and S05 / Canister Nos. 4606 and 4601) at Station Location 240425_MA22. Canister samples were collected to compare laboratory and GMAP measurements and to quantitate additional compounds not detected by GMAP instruments. The Air Canister Sample Log is provided in **Appendix B**. The canister analysis results are in **Appendix C**. A copy of the chain of custody record showing all samples analyzed by NEIC's laboratory is in **Appendix D**.

Three additional samples were collected for analysis by Eastern Research Group (ERG): canister 42163 was collected at 9:05 AM on April 24, 2024, canister 42166 was collected at 1:05 PM on April 25, 2024, and canister 40455 was collected at 1:15 PM on April 25, 2024. All canisters were collected by Philip Myers. NEIC personnel arranged shipment of the samples to ERG's laboratory in Morrisville, North Carolina, via FedEx on April 25, 2024. ERG analyzed the samples by EPA Compendium Method TO-15, including analysis for EtO. The ERG report is **Appendix E**. Note that ERG reports the sampling time as the end of the sampling period, where as NEIC reports the sampling time as the start of the sampling period. As such, ERG's report lists the sampling times as one minute later: for example, ERG's report shows canister 42163 was collected at 9:06 AM on April 24, 2024.

All environmental measurement activities were performed in accordance with the NEIC quality system. All field sampling and measurements described in this report are within the scope of

NEIC's ISO/IEC 17025 accreditation issued by the ANSI National Accreditation Board (certificate No. FT-0303), with the exception of measurements collected from the motion-corrected anemometer and laboratory analysis performed by ERG and conclusions based on those results. The GMAP motion-corrected anemometer cannot be calibrated as a complete system; therefore, the uncertainty of this instrument cannot be verified.

Instrument calibration verifications were performed twice each day, before and after GMAP surveying was conducted, with the exception of the final day (April 25). On April 25, a pre-survey calibration verification was conducted, but a post-survey calibration verification was not performed due to inclement weather. For each calibration verification event, known concentrations of analytes were analyzed and the responses were logged as calibration logfiles. All instrument responses were found to meet the acceptance criteria.

On April 24, 2024, at 1:20 PM, while collecting data (240424_MA19.txt) in the vicinity of Ingredion, the GMAP instrumentation system rebooted. Data-logging was stopped at this point to relocate the GMAP vehicle to EPA Region 7 facilities to charge the battery bank. Data-logging was resumed at 2:33 PM as the vehicle left the EPA Region 7 facilities to continue surveying at Ingredion.

On April 25, 2024, at 1:20 PM, light rain was observed, and rain became heavier as the day progressed. Data-logging was stopped and the GMAP instrumentation system was shut down at approximately 2:17 PM, due to heavy rain and inclement weather. Elevated humidity (80% or greater relative humidity) has the potential to impact the function of the CRDS, DUVAS, and PID. While generating mapping files, no abnormal readings were observed that would indicate impacts from elevated humidity.

While surveying in atmospheres with CH₄ concentrations greater than 4.7 parts per million [ppm], possible false positive EtO readings were observed. Also, erroneous EtO readings (greater than 1,000 parts per billion [ppb] and less than -1,000 ppb) were observed when surveying in atmospheres of greater than 10 ppm CH₄. Due to the limitations of the instrument, EtO is not reported when either the measured CH₄ concentration is greater than 10 ppm or the measured maximum EtO concentration in a logfile coincides with a rapid change in CH₄ concentration.

Table 3 summarizes field sampling and measurement activities.

Table 3. SUMMARY OF ALL FIELD SAMPLING AND/OR MEASUREMENTS PERFORMED			
Location/Identifier (Station/Sample No.)	Dates	Method and/or Procedure ¹ , and Equipment	Sampler/ Measurer Name
All areas monitored	4/22/2024–4/25/2024	Methods: EPA draft OTM 33: Geospatial Measurement of Air Pollution, Remote Emissions Quantification Equipment: NEIC GMAP consisting of: Picarro CRDS Model: G2920 Serial No.: 4555-UV1059 DUVAS Model: DV3000 Serial No.: DV1003 PID sensor Part No.: MiniPID2-HS (Ion Science) Serial No.: 254220782 Airmar weather station Model: 200WX Serial No.: 3445952 Hemisphere GPS Model: Crescent R100 Serial Number: 0734-4068-003	Philip Myers
NEIC laboratory samples: S01 / 10007, S02 / 3072, S03 / 00280, S04 / 4606, S05 / 4601, S06 / 10024 ERG laboratory samples: 42163, 42166, 40455	4/22/2024, 4/24/2024, 4/25/2024	Method: <i>Air Sampling</i> , NEICPROC/11-008 Equipment: Canisters	Philip Myers
All areas monitored	4/22/2024–4/25/2024	Method: <i>Global Positioning System (GPS) Data Collection</i> , NEICPROC/10-007 Equipment: Hemisphere GPS Model: Crescent R100 Serial Number: 0734-4068-003	Philip Myers
¹ The current version of each procedure, at the time of the investigation, was followed.			

The field logbook and project file contain further information regarding calibration, sampling, and analytical activities performed for this project.

LABORATORY ACTIVITIES SUMMARY

Conor Goulding drove the samples collected during this project from Kansas City, Missouri, to the NEIC Laboratory in Denver, Colorado, and arrived on April 26, 2024. The canisters were received by Amy Harvey on April 30, 2024.

The laboratory team cleaned and checked the canisters for contamination prior to field deployment. After cleaning, the canisters were evacuated then given to the field team for sample collection. After the laboratory team received the canister samples collected in the field, the canisters were pressurized/diluted, then analyzed for a subset of the VOCs listed in EPA Compendium Method TO-15A. Data quality summaries, including uncertainty measurements, for all laboratory measurements are maintained in the project file.

Table 4 summarizes the analytical methods followed, as well as the analysts and dates of the analyses. All analytical results for the project are in **Appendix C**, including quantitation limits for TO-15A and tentatively identified compounds detected in the TO-15A analyses.

Table 4. ANALYTICAL OBJECTIVE, TECHNIQUE, METHOD; ANALYST; AND DATE PERFORMED			
Analytical Objective, Technique, and Method ¹	NEIC Analyst	Samples Analyzed by Method (Station No.)	Date(s) Performed
Analytical Objective: Quantitatively measure the concentrations of VOCs in ambient air collected in canisters. Technique: Cryogenically focused gas chromatography with time-of-flight mass spectrometry Method: EPA Compendium Method TO-15A: Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)	Melissa Rosa	S01 S02 S03 S04 S05 S06	Clean checks: March 29– April 3, 2024 Canisters analyzed: May 2–13, 2024
¹ Data quality summaries, including uncertainty measurements, for all laboratory measurements are maintained in the project file.			

GMAP ELEVATED READINGS

Concentration values derived from the GMAP mapping files are plotted in Google Earth Pro (GEP) maps. These maps are saved as Google Earth keyhole markup language (kml) files and are in **Appendix F**. Select elevated analyte concentrations, as described below, are presented in **Table 5**.

Mapping and stationary concentrations greater than or equal to the “red” threshold in the kml files (as defined in “GMAP Measurement Background and Overview of GMAP Mapping Surveys,” **Appendix G**) appear as bold red italics in **Table 5**. Concentrations greater than the reporting limit but less than the “red” threshold in the kml files appear as plain font style in **Table 5**. To highlight the highest magnitude emission measurement mapping runs, only those GMAP log files with one or more analytes meeting the “red” threshold are included in **Table 5**. As mentioned above, due to the limitations of the Picarro G2920 CRDS instrument, EtO is not reported when CH₄ is greater than 10 ppm or the measured maximum EtO concentration in a logfile coincides with a rapid change in CH₄ concentration.

Table 5: SELECT ELEVATED GMAP READINGS

Date	Facility Name / Geographic Area	Address / Location	GMAP Log File (*.txt)	GMAP Reading				FLIR File Name	Air Canister No.
				CH ₄ (ppm)	EtO (ppb)	TOL (ppb)	VOC (ppb)		
4/22/2024	Highway 69, Fairfax	Kansas City Metro. Area	240422_MA02		11.7				
4/22/2024	Harcros Chemicals, Inc	Kansas City, KS	240422_MA07		11.6				
4/22/2024	Harcros Chemicals, Inc	Kansas City, KS	240422_MA19		5.3		305		10007, 3072
4/22/2024	GM Fairfax	Kansas City, KS	240422_MA24	5.29	5.6				
4/22/2024	GM Fairfax	Kansas City, KS	240422_MA27	21.0	NR ¹				
4/22/2024	GM Fairfax	Kansas City, KS	240422_MA28	12.4	NR ¹				
4/22/2024	GM Fairfax	Kansas City, KS	240422_MA29	7.72	NR ²				
4/22/2024		Kansas City, KS	240422_MA30		13.1				
4/22/2024	North Kansas City Beverage	Kansas City, MO	240422_MA32	6.68	9.8				
4/22/2024	North Kansas City Beverage	Kansas City, MO	240422_MA35	8.70	7.1				
4/23/2024	ExxonMobil (Mobil Lube) Regional Distribution Center	Kansas City, KS	240423_MA09		12.2				
4/23/2024	Kindleberger Rd	Kansas City, KS	240423_MA12		11.8				
4/23/2024	Hwy 69, Fairfax	Kansas City Metro. Area	240423_MA25		13.2				
4/24/2024	American Contract Systems	Kansas City, MO	240424_MA02		12.6				
4/24/2024	American Contract Systems	Kansas City, MO	240424_MA03		93.6				ERG Can. 42163
4/24/2024	American Contract Systems	Kansas City, MO	240424_MA04		19.0				00280
4/24/2024	American Contract Systems	Kansas City, MO	240424_MA05		19.6				
4/24/2024	American Contract Systems	Kansas City, MO	240424_MA06		33.9				

Table 5: SELECT ELEVATED GMAP READINGS

Date	Facility Name / Geographic Area	Address / Location	GMAP Log File (*.txt)	GMAP Reading				FLIR File Name	Air Canister No.
				CH ₄ (ppm)	EtO (ppb)	TOL (ppb)	VOC (ppb)		
4/24/2024	Highway 69, Fairfax	Kansas City Metro. Area	240424_MA30		10.1				
4/25/2024	Highway 69, Fairfax	Kansas City Metro. Area	240425_MA01		10.0				
4/25/2024	Pentair Kansas City Operations	Kansas City, KS	240425_MA17			68	587		
4/25/2024	Pentair Kansas City Operations	Kansas City, KS	240425_MA19			41	306		
4/25/2024	Pentair Kansas City Operations	Kansas City, KS	240425_MA20		5.1	55	354		
4/25/2024	Pentair Kansas City Operations	Kansas City, KS	240425_MA21			65	349		
4/25/2024	Pentair Kansas City Operations	Kansas City, KS	240425_MA22		5.5	49	314		4606, 4601
4/25/2024	Art's Mexican Products	Kansas City, KS	240425_MA24	4.72	NR ²				
4/25/2024	Art's Mexican Products	Kansas City, KS	240425_MA26	5.86	5.7				
4/25/2024	Art's Mexican Products	Kansas City, KS	240425_MA27	7.73	NR ²			MOV_0397.mp4	
4/25/2024	American Contract Systems	Kansas City, MO	240425_MA37		10.7				
4/25/2024	American Contract Systems	Kansas City, MO	240425_MA38		25.0				ERG Can. 42166
4/25/2024	American Contract Systems	Kansas City, MO	240425_MA39		20.9				ERG Can. 40455
Notes: NEIC has evaluated measurements of uncertainty for these reported values, and uncertainty calculations are maintained in the project file. BEN and XYM were not detected above the reporting limit at any locations. XYP was detected above reporting limit at one location (240424_MA19) but not at sufficient concentration to be included in this table. NR¹: Not reported—elevated EtO concentration is a possible artifact of measuring a high (greater than 10 ppm) CH₄ concentration atmosphere. NR²: Not reported—elevated EtO concentration is a possible artifact of a simultaneous rapid change in CH₄ concentration.									