Discover: Advanced Mobile Leak Detection & Emissions Management

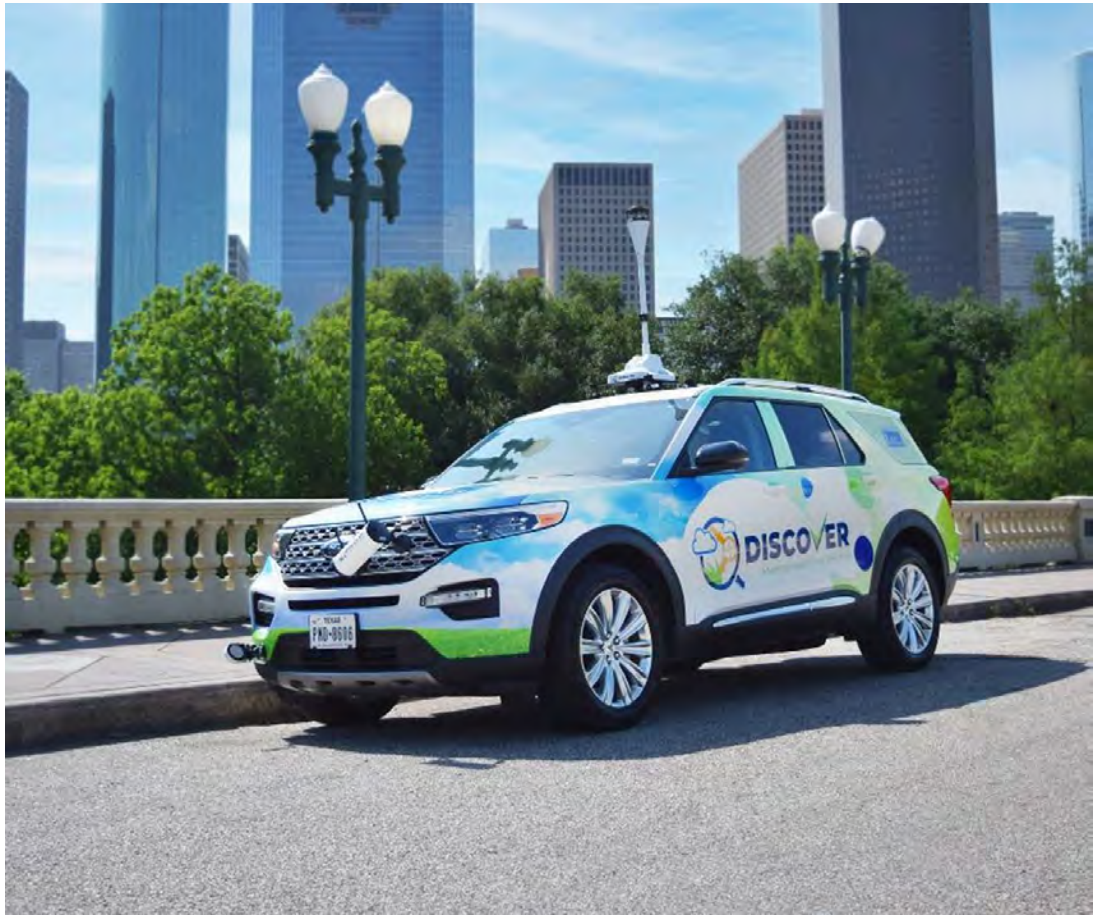
Eric Six - Heath

Energy Nexus | Annual Technical Conference

Fuelling the Future

HEATH (formerly Heath Consultants Inc.)

- Founded in 1933
- Provide leak detection products & field services from wellhead to burner tip – upstream, midstream & downstream operations
- Corporate headquartered in Houston, Texas USA
- Manufacturing facility in Houston, Texas USA
- Field & Repair Offices across the United States
- Currently 1,800+ employee's
- Direct sales in the United States
- Distributor network across the rest of the World
- Partnerships with an array of R&D and Universities



Heath is PSI's Commercial Partner Since 1998

2005

2019

2022

PHYSICAL SCIENCES INC.


GPS
Anemometer
Detection Unit
DISCOVER
Advanced Mobile Leak Detection
Computer/ Tablet with
Proprietary Software

Easily Mounts on Different Vehicles

AMLD – on and off-road ability

- Can survey both Distribution, Transmission, and Gathering – based on access to the location.
- Distribution can survey up to 20 – 25 miles per day. Transmission and Gathering milage will be dependent on access.

Specifications

Gases Detected
- Simultaneous Detection of Methane and Ethane (specific to methane / ethane)

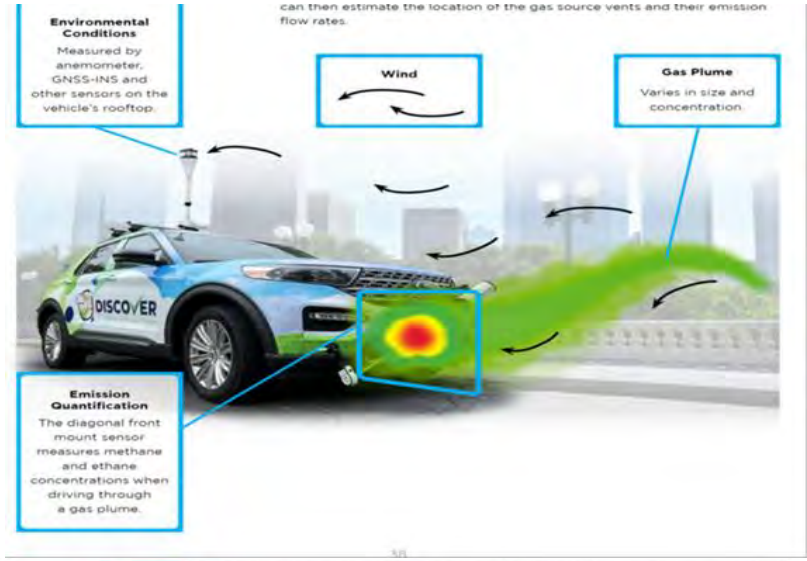
Sensor Technology
- Open-Air Fixed Path Mid-IR TDLAS (Tunable Diode Laser Absorption Spectroscopy)

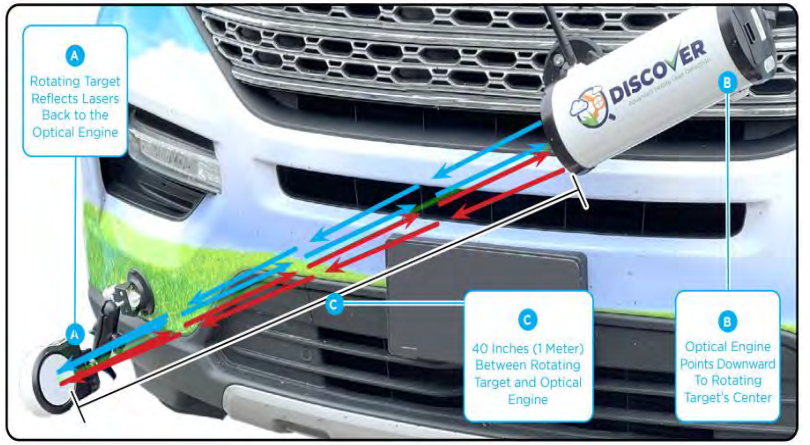
Sensitivity & Resolution
- Methane: < 100 PPB at 10 Hz, < 30 PPB at 1 Hz
- Ethane: < 15 PPB at 10 Hz, < 5 PPB at 1 Hz

Selectivity
- No Cross-sensitivity to humidity, other hydrocarbons or industrial gases

Response Time
- Sample frequency of 100 Hz, Data update rate of 10 Hz (minimum sample rate 100 reads per second)

Ability to detect 10 cm (4 inches) wide plume at 10 m/s (22 MPH) vehicle speed





Open vs. Closed Path Detection

Discover's Open Path System:
Instant Detection
Gas Travel Time = 0 seconds
Gas Cell Turnover Time = 0.1 seconds

Closed Path System:
Diluted Gas Sample and Delayed Response
Gas Travel Time = 2-3 seconds
Gas Cell Turnover Time = 2 seconds

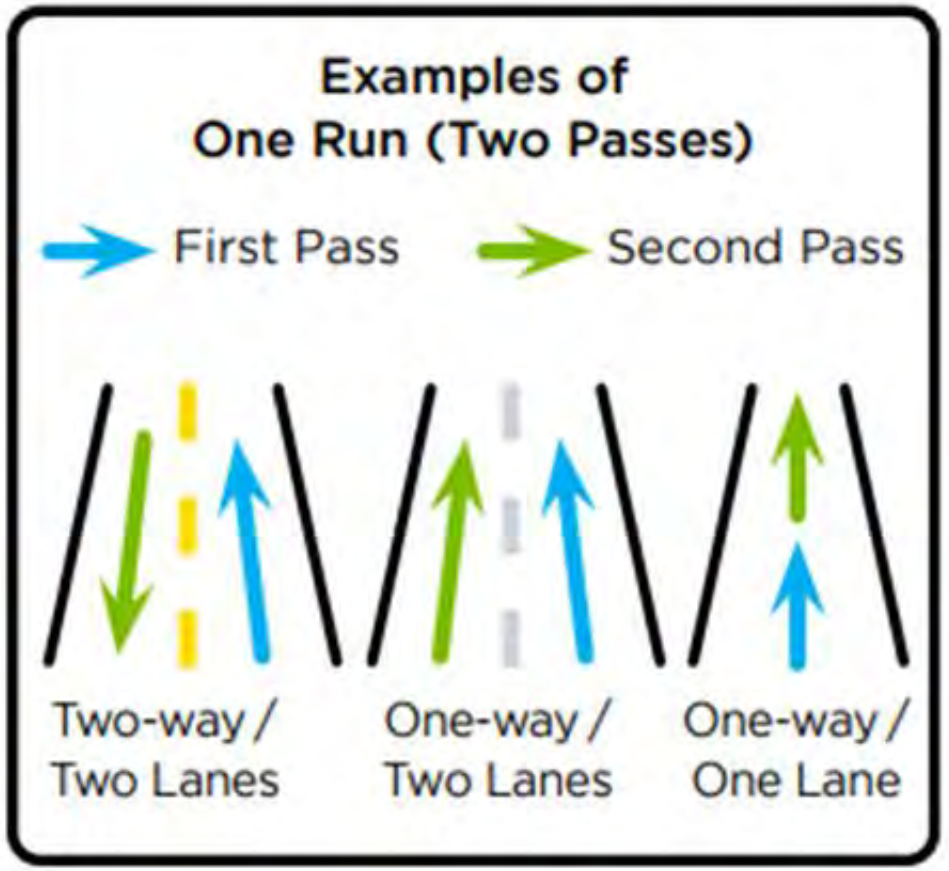
Survey Recommendations

Super Emitter Survey

- Data Gathering Only Mode (Post Processing Only)
- Typical 10 SCFH (0.2 kg/hr.) detection threshold
- 1 – 2 Runs (2 – 4 Passes)
- Vehicle speed: 25 mph ; Wind Speed: < 15 mph
- Easy Survey, negligible false positives and false negatives
- Day time survey or nighttime survey

Compliance Survey

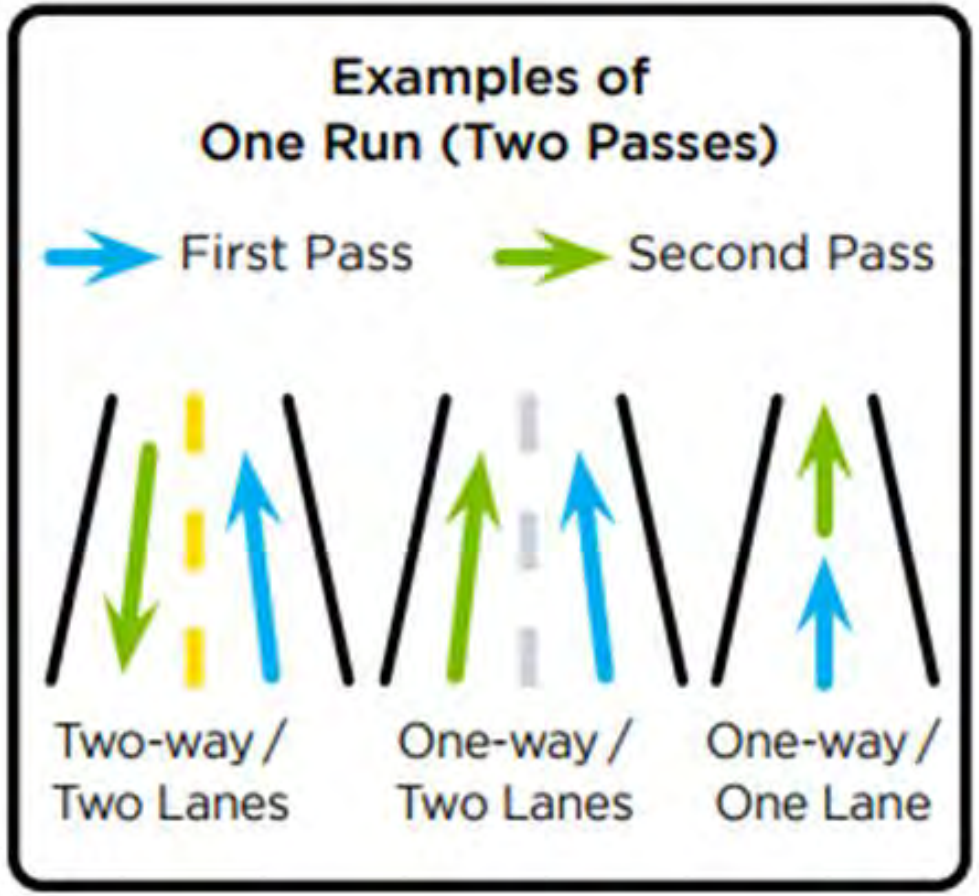
- Real time and Post Processing
- Typical 0.1 SCFH and 100 – 200 PPB Methane detection threshold
- 2 – 3 runs (4 – 6 passes) recommended on multiple days
- Vehicle Speed: 10 – 20 mph, Wind Speed: 15 < mph
- Early morning, late evening or nighttime survey recommended



Survey Recommendations (cont'd)

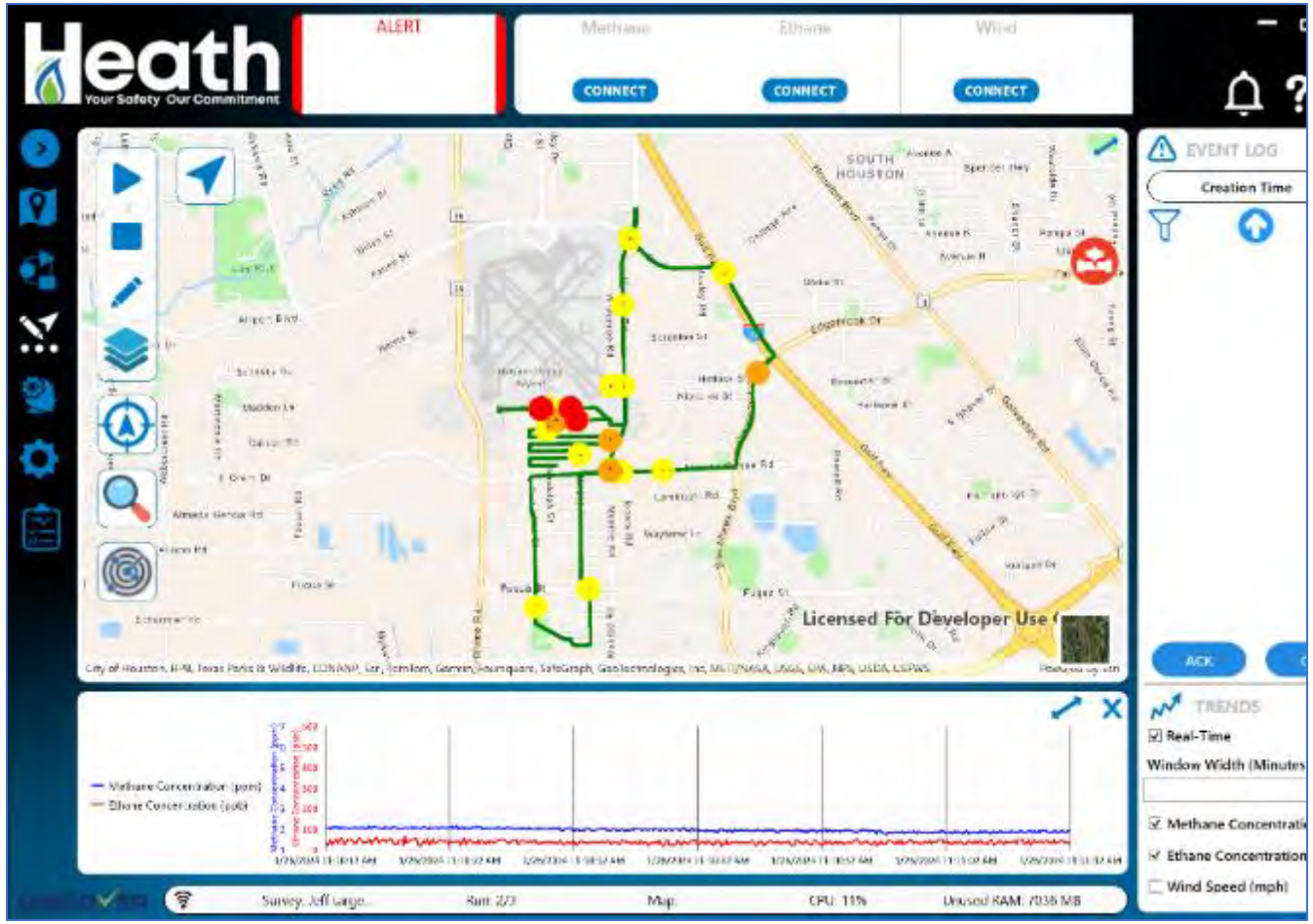
Transmission Compliance Survey Parameters

- Mode: Real Time and/or Data Gathering Only
- Detection Threshold: 100-200 PPB methane
- Coverage Plan: one run (2 passes)
- Vehicle Speed: 10-25 mph
- Wind Speed: < 15 mph
- Time of Day: Day time.



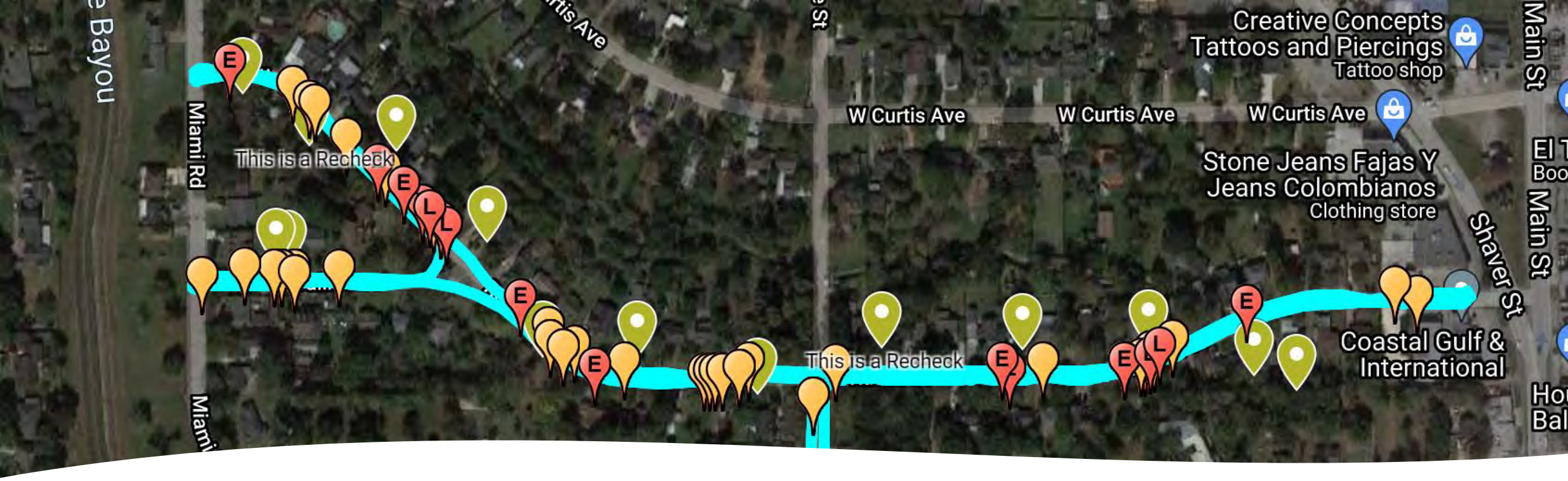
Discover - Graphical User Interface (GUI)

- Microsoft Surface Tablet
- Simple and easy to use
- Status indicators for all critical components
- Color coded indications
- Route completion highlights



Survey Area Coverage

- Coverage is indicated by overlaying a translucent layer around the areas driven.
- One can add an asset layer on the same map as shown here to see what pipes have been covered by the Discover-AMLD.
- Coverage distance depends on leak flow rate chosen, true wind speed and direction in the area at the time of drive.
- Aggregation of multiple passes can be used to improve coverage

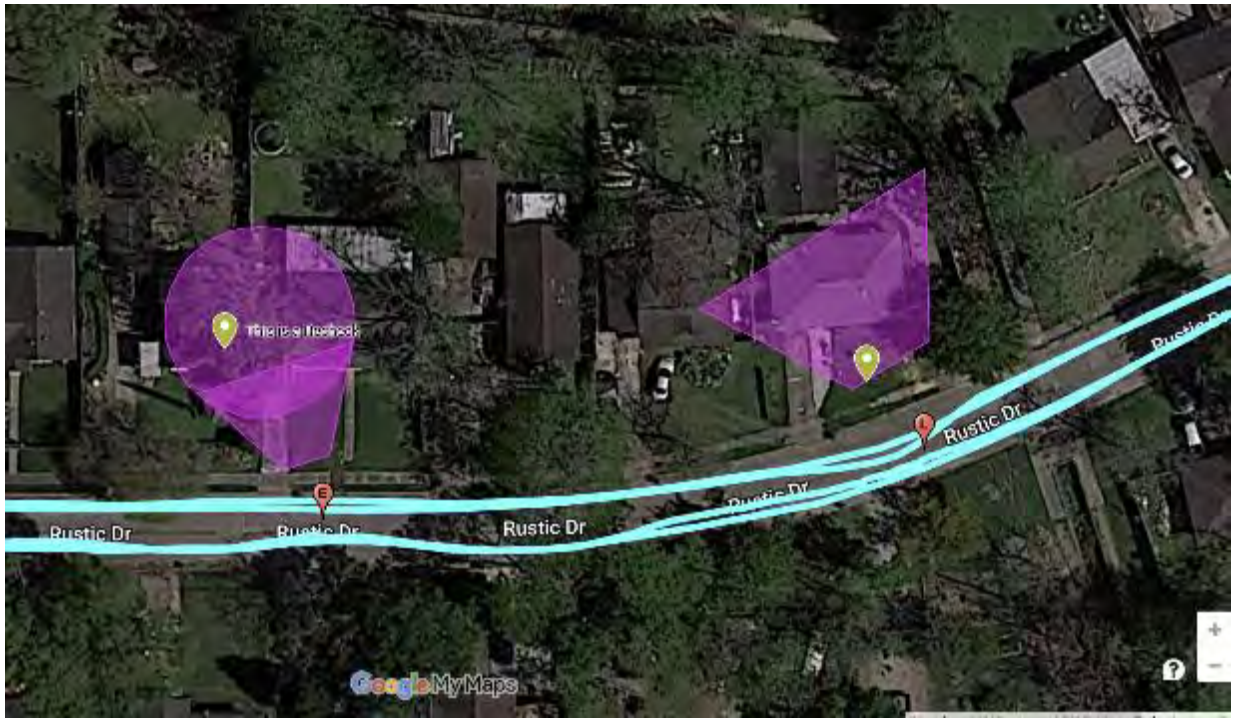


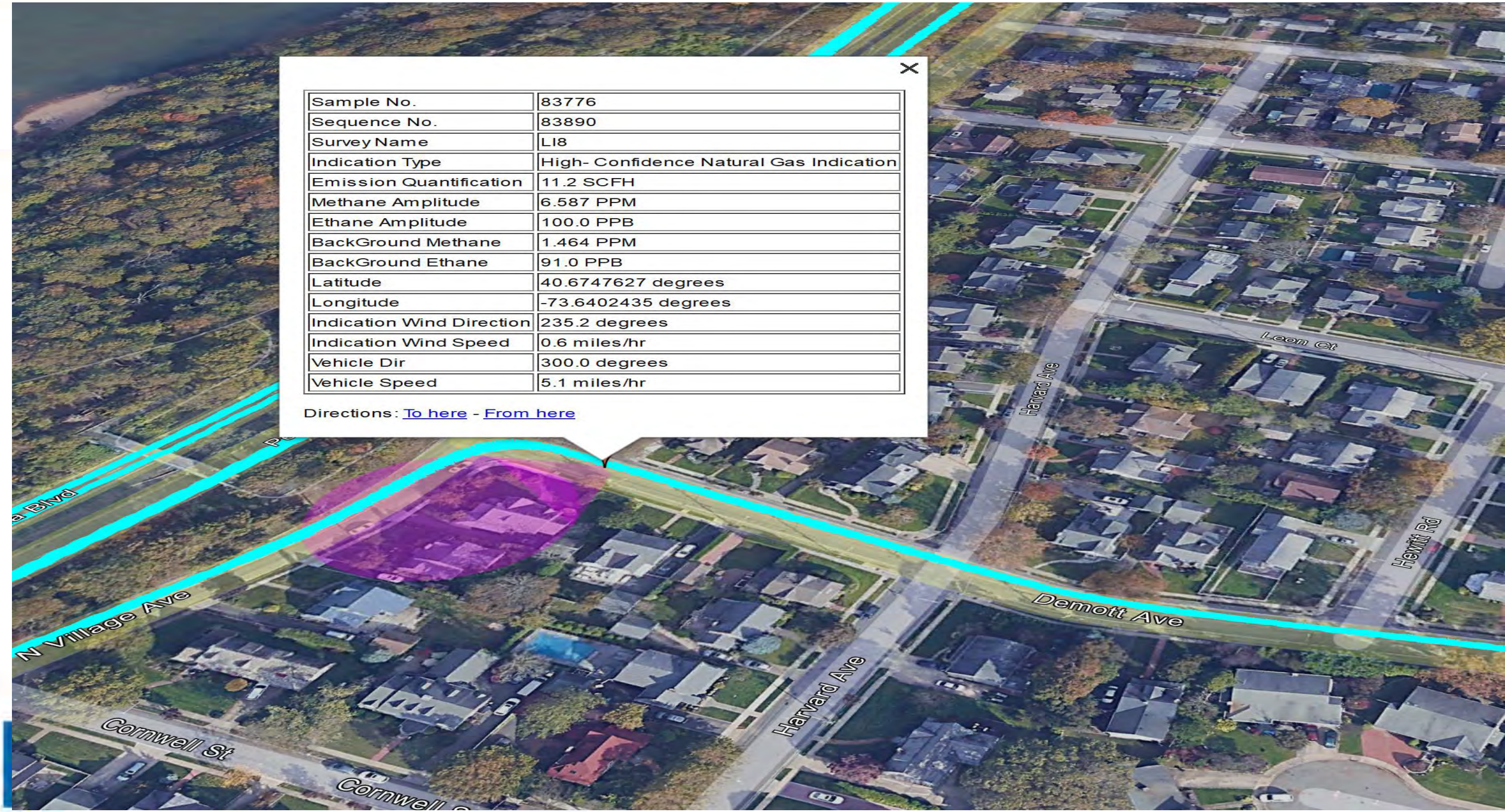
The importance of sample rate/response time

- 100Hz (100 reads/second) equals more data aggregation enabling better decisions for true leak detection.
- Higher precision localization and Emissions rate
- Drive routes faster – average speed 10 - 15 mph

Field Test Example - Localization & Quantification

- The Quantification & Localization with data can be downloaded in a pdf report and an interactive KML/KMZ.
- Available immediately after survey through Cloud platform.
- Green pointers are actual leaks confirmed through walking survey after Discover had found them.




Sample No. 83776
Sequence No. 83890
Survey Name LI8
Indication Type High- Confidence Natural Gas Indication
Emission Quantification 11.2 SCFH
Methane Amplitude 6.587 PPM
Ethane Amplitude 100.0 PPB
BackGround Methane 1.464 PPM
BackGround Ethane 91.0 PPB
Latitude 40.6747627 degrees
Longitude -73.6402435 degrees
Indication Wind Direction 235.2 degrees
Indication Wind Speed 0.6 miles/hr
Vehicle Dir 300.0 degrees
Vehicle Speed 5.1 miles/hr
Directions: To here - From here
Leon Ct
Harvard Ave
Hewitt Rd
Demott Ave
N Village Ave
Cornwell St
Harvard Ave

Real-Time Indications & Coverage

- Indication arrows and colors help localize and differentiate

Real Time Verification

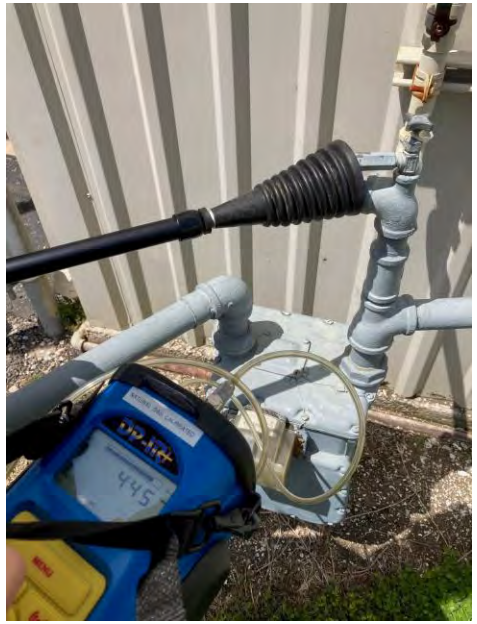
- RMLD-CS

- DP-IR

Leak Investigation Procedure

- a. The leak indications will be forwarded to the Discover Investigation Specialist to inspect and grade accordingly. Using both the DP-IR + and RMLD-CS.

- b. Once the Discover Investigation Specialist determines the potential leak indication area, they will leak survey the ENTIRE area regardless of whether a leak has been detected or not. The objective is to find ALL gradable leaks within the potential leak indication area, as there can be multiple leaks detected within a single potential leak investigation area.



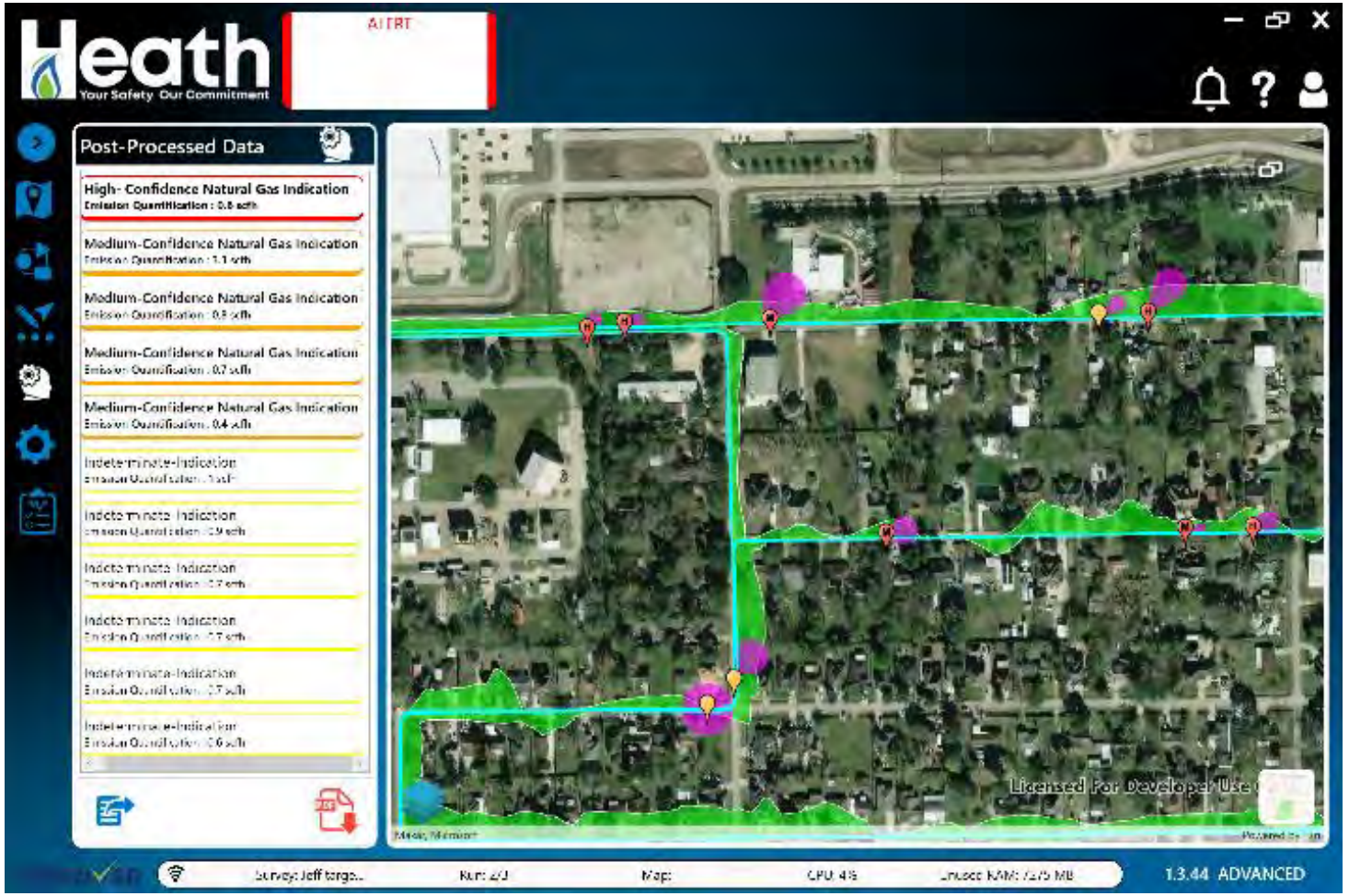
No leak is detected

- If there is no confirmed detection of a leak indication anywhere in the potential (coned area) leak indication area as indicated from the DISCOVER AMLD survey, expand the survey .
- Dependent on location – Urban, Suburban, or Rural on how far to expand the search.
- If Indeterminate: Could be coming from a leak that is listed as Red - M (Medium Confidence Natural Gas) that may be in the vicinity. Check map indications and wind directions for RED listed leaks that are close by. Expand search area as deemed necessary.

RED -M

- If there is no confirmed detection of an operator leak or methane from another source after an expanded investigation, the indicated area should be resurveyed with the DISCOVER AMLD to “clear” the initial indication.

Post Run Indication Mapping



Post Survey PDF Reports

DISCOVER

Leak Analytics Report

General

Survey Name	Covington 2	Start Time	06/07/2023 06:52 utc
Surveyor/s	11	End Time	06/07/2023 07:30 utc
Total Distance Traveled	8.07 miles	Total Emissions	3.19 scfh

Analysis Parameters Settings

Methane Threshold	0.15 ppm	Coverage Flowrate	0.5 scfh
Ethane Threshold	15 ppb	Methane Emissions Filter	0 scfh
Indication Cluster Distance	82 feet	Methane Ethane Ratio	30

Measurement Statistics

Maximum Methane Amplitude	3.238 ppm	Maximum Ethane Amplitude	212 ppb
Average Wind Speed	3.15 miles/hr	Maximum Wind Speed	13 miles/hr
Average Vehicle Speed	14.01 miles/hr	Maximum Vehicle Speed	38.59 miles/hr
Maximum Quantification	1.24 scfh		

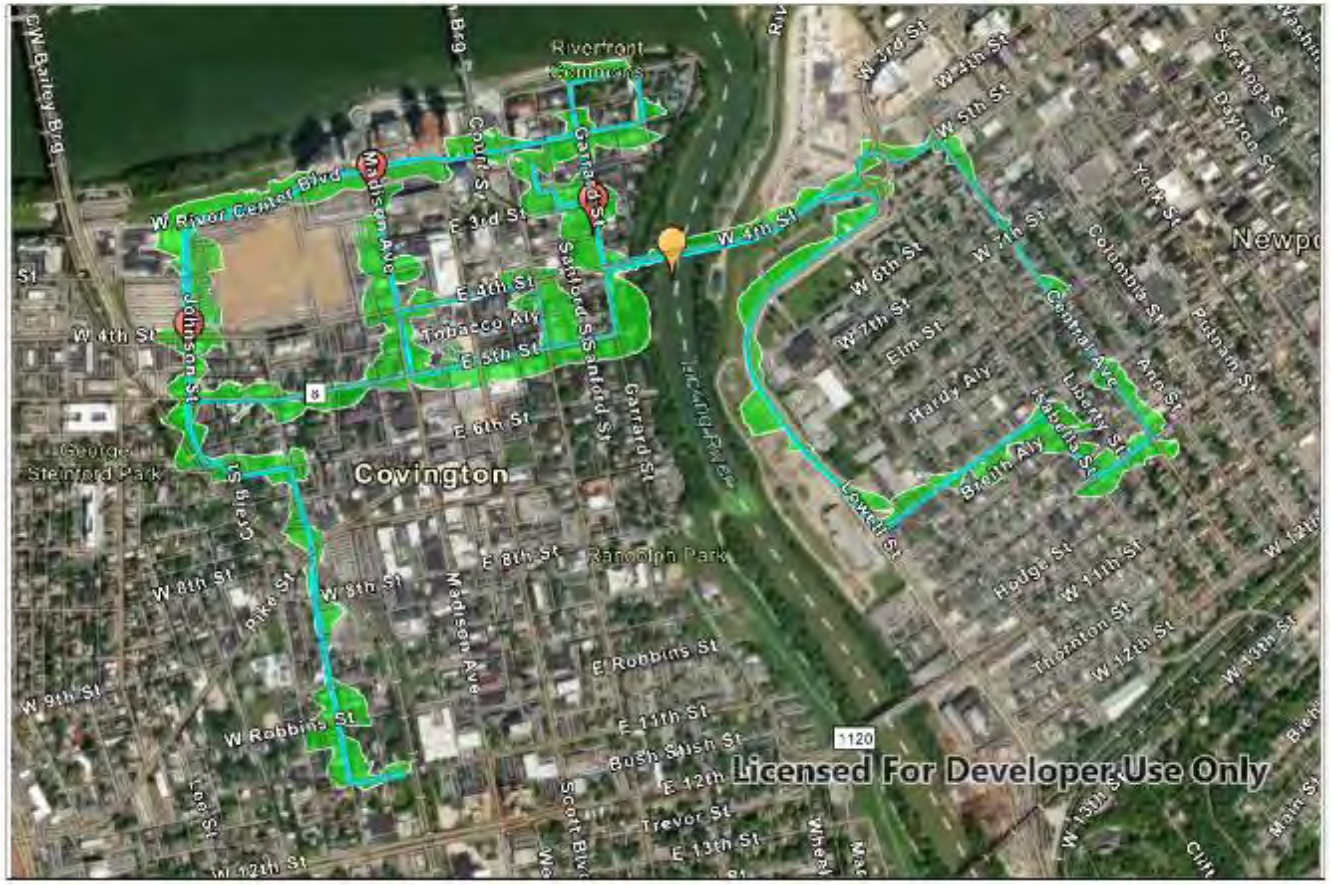
Result Overview

	Natural Gas	Indeterminant	Sewer Gas	Total
Indications Count	3	1	0	4

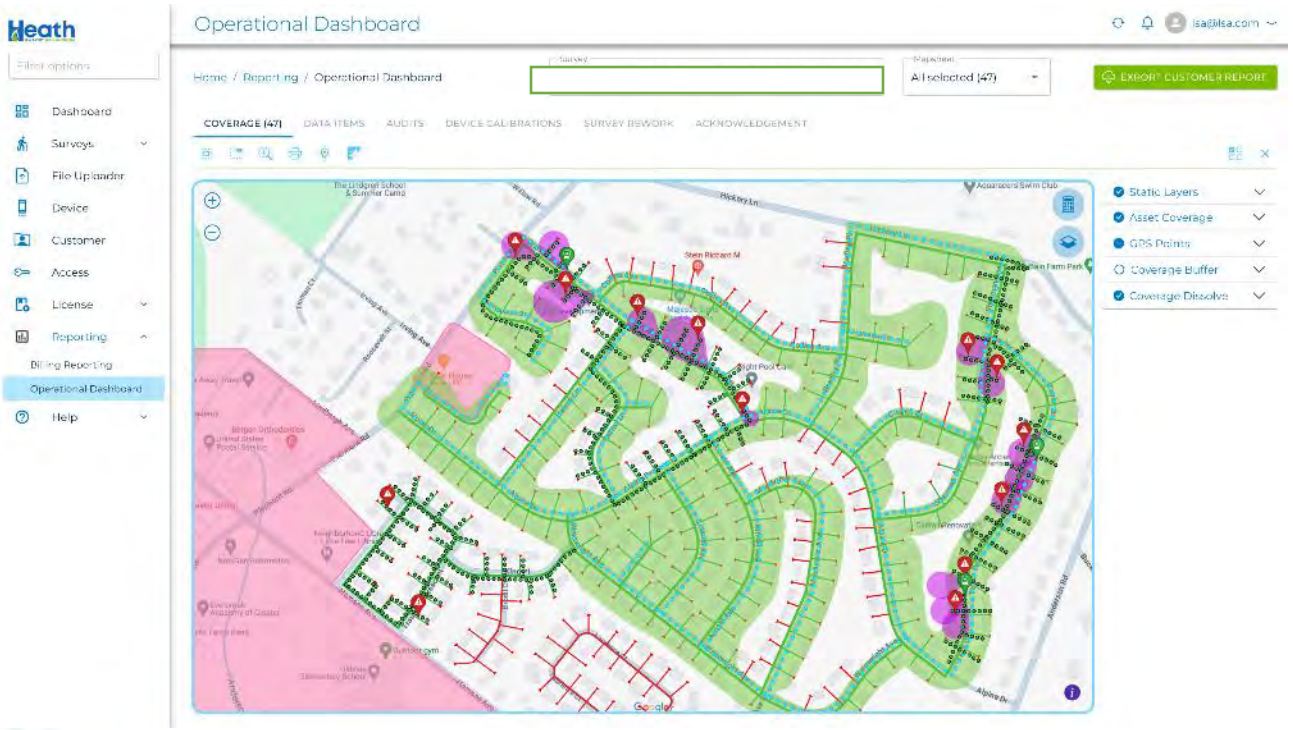
Survey Runs

Run #	Start	End	Anomalies	Distance Covered In Run
1	06/07/2023 06:52 utc	06/07/2023 07:22 utc	0.0 %	6.3 miles
2	06/07/2023 07:22 utc	06/07/2023 07:30 utc	0.0 %	1.78 miles

Complete Survey Route

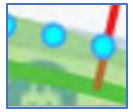


Web Portal – Survey Management



Coverage area

Indications



Walking survey GPS

Confirmed leaks

Discover Data Analytics Tech Package

FEATURE	LITE EDITION Discover Analytics (Included)	ADVANCED EDITION Discover Analytics (Subscription Based)	ENTERPRISE EDITION Discover Integrated with Leak Survey Software (LSS) Platform (Subscription Based)
Automatic Software Maintenance Updates	✓	✓	✓
Self-Calibration Logs (CSV Files)	✓	✓	✓
Load Client Maps and Assets (SHP, GDB or KML Files)	✓	✓	✓
Indications in Real Time	✓	✓	✓
Discrimination between Natural Gas and Bio-Gas	✓	✓	✓
Direction for Emission Source in Real Time	✓	✓	✓
Automatic Software Feature Updates		✓	✓
Post Processed Indications aggregated for one or multiple Passes		✓	✓
Post Processed Indication Localization (KML Files)		✓	✓
Post Processed Indication Quantification (KML Files)		✓	✓
Post Processed Coverage of Assets (KML Files)		✓	✓
PDF Reports of Results		✓	✓
Web portal for managing & visualizing survey data			✓
Web portal for advance analytics including historical data			✓

- Built on Microsoft Azure
- Over the air updates
- Continuous improvement
- Data security
- Customer facing portal

To conclude – Discover AMLD

- More miles per hour of coverage than walking survey
  - Walking survey can vary based on location of service lines and mains (backyard easements verses front easements): less than a mile to a few miles per day
  - Verses driving coverage of up to 20 miles per day
- Can decrease labor hours – less time to complete a survey and more time spent in identifying and grading leakage.
- AMLD has found leaks that walking surveys have missed
- Can be influence by environmental factors

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Questions?

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Technical Services Manager

Heath

Your Safety Our Commitment