Empowering Cities with Intelligent Environmental Insights

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About Us

Air Monitoring Data & Intelligence

Bridging the Gap in Environmental Data for Smarter, Sustainable Decisions

- **Global Presence:** Offices in Canada and USA, projects worldwide.
- **Innovation in DNA:** AI Powered and Patented Technology.
- **Cutting-Edge Hardware:** Advancing hyperlocal, cost-effective sensing.
- **Limitless Analytics:** Infinite possibilities to extract intelligence from the vast data collected.

Technology Highlights

Extremely Scalable and Cost-Effective

- Same device form factor for **Fixed, Mobile or Aerial (Drone)** deployments.

Rugged

- Tested extensively in extreme cold and intense heat and can withstand a wide temperature range **(-25 to +75 °C)**

Small Footprint

- **~1.6 Kgs (3.5 Lbs.)**
- Low power consumption – Direct Power or Solar (optional)
- WiFi or Cellular communication
- Onboard storage

Easy Installation & Maintenance

- Designed to be **plug-and-play**
- No regular maintenance required – **Only annual maintenance** for sensor servicing
- No special expertise required to deploy.

Single Device for Comprehensive Measurements

- **Upto 14 sensors** from a 30+ and growing sensor catalog
- Air Quality, Odors and Meteorological Factors

Key Differentiator

Patented Algorithms for Software Self-Calibration

- **Significant cost, maintenance, and resource advantages compared to hardware calibration**
- **Multiple Generations of AI Algorithms Developed from Near Reference to Predictive Calibration**
- **Multi-Layered Calibration to address issues like sensor ageing and drift.**
  - **Source OEM**
  - **ESI in-lab**
  - **Continuous software AI-powered self-calibration**

ESI's AI Powered Solution

A single device can house upto 14 sensors SIMULATANEOUSLY (from a 30+ and growing sensor catalog)

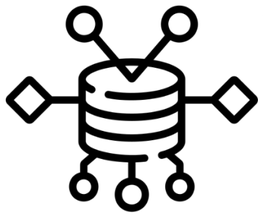
Single Device

Devices can be deployed as a single unit or a network of sensors.

The solution is CUSTOMIZED based on client needs.

Multiple Device Network

ESI's data platform can easily integrate external data sources to create extensive datasets

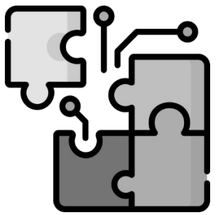


External Data API's

Cloud Data Storage & Management Platform

ESI Web Dashboard

Advanced Analytics & Modelling



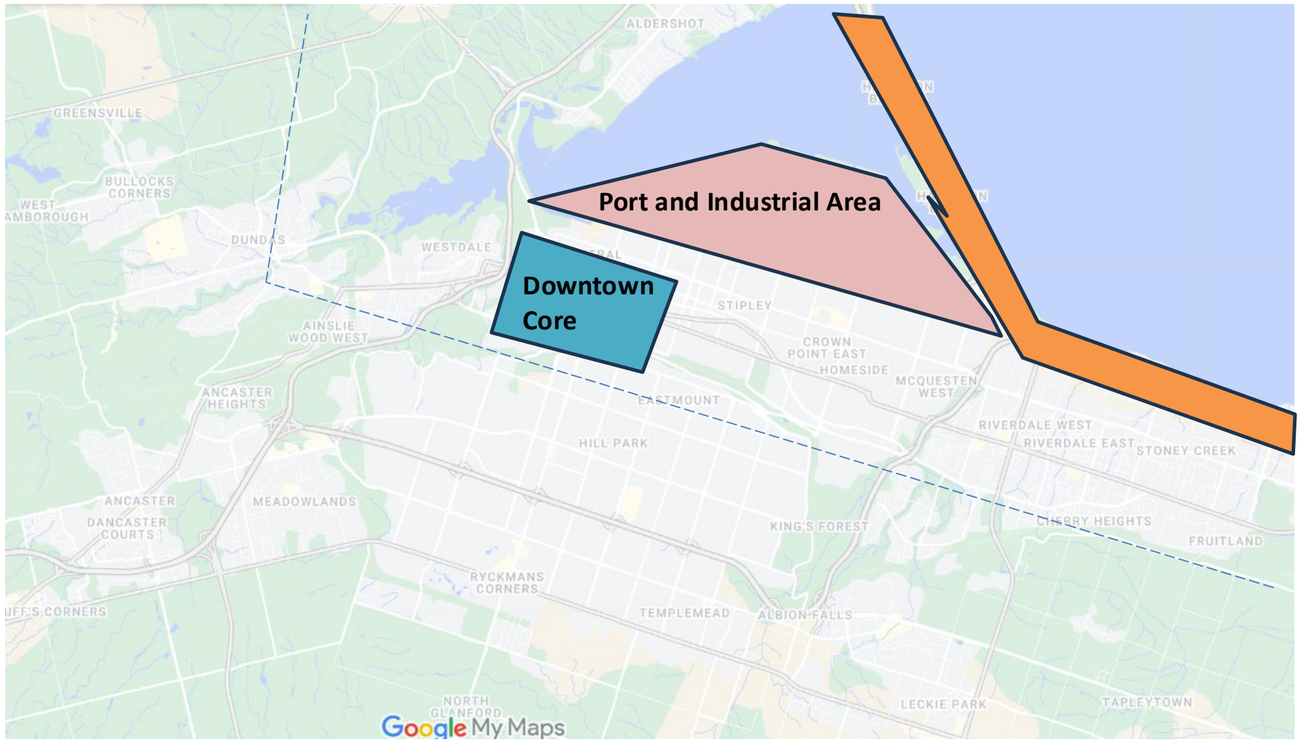
Data API's Integration into Existing Systems & 3rd Party Apps

The ESI Advantage

Item/Feature	ESI Technology
Cost	• Affordable • Low-power sensors
Data Availability	• Mobile + stationary + Aerial network Dense coverage • Large Sensor Catalog (Over 30+ sensors available)
Limited/Partial Solutions	• Full-stack: hardware, software, analytics
Scalability	• Lightweight, mobile, easy to deploy
Integration	• Open APIs, cloud-based analytics • Inward data integration for layered analytics
Expertise Required	• AI-driven self-calibration, minimal maintenance
Form Factor	• Small size – less power consumption, easier deployment, greater choice of location

City of Hamilton: A Brief Overview

- Heavy industrial activity – air quality and odours a constant challenge
- The City is always looking for ways to enhance community livability and foster improved environmental and public health outcomes while supporting regional economic prosperity.



Critical Industrial Hub
(Port of Hamilton and Industrial presence)

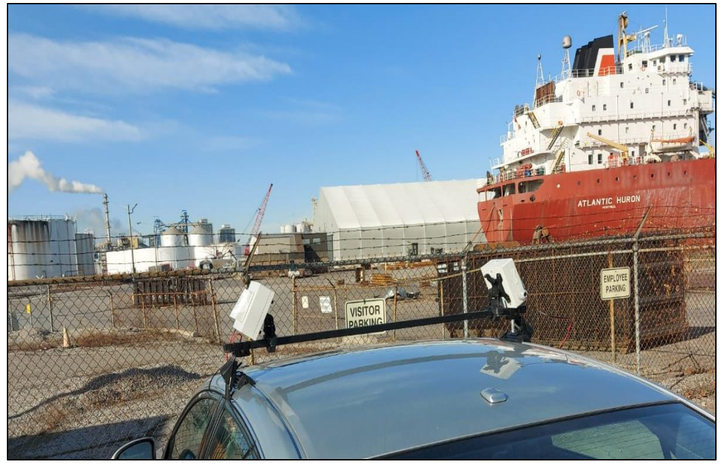
Major Highway
(Toronto – Niagara Region & US Border)

Niagara Escarpment
(Geological Feature – Divides city into 2)

Stage 1: Air Quality Baseline

Study area – Wards 1, 2 and 3, City of Hamilton

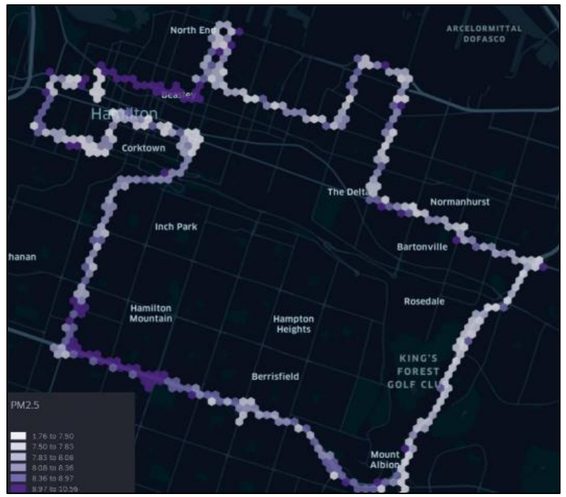
- Concerns over air quality – and impacts to sensitive land uses such as Hospitals, Schools and Care Facilities
- Measure levels of ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2) and sulfur dioxide (SO2).
- Measure Temperature, Humidity, Pressure and Wind to correlate pollution data with environmental factors.
- Improve air quality and proactive management of hot spots and address resident concerns.



Stage 2: Extended Baseline of Transportation Corridor

Extended Study Area – Lincoln Parkway, Red Hill Valley Parkway, City of Hamilton

- Public Health coordination with Transportation Division in Public Works Department.
- Policy efforts to reduce pollution within the downtown (and lower City) by alterations to truck routes.
- Benchmarking air quality along extended study area before and measure post-intervention to understand the impact of rerouting.

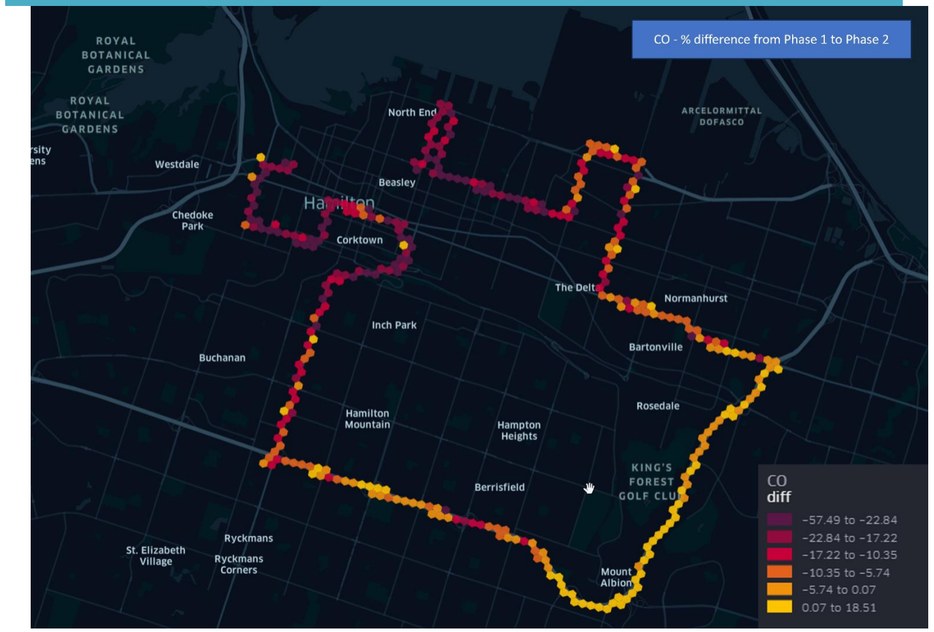


Stage 3: Post Intervention Analysis

Extended Study Area – Lincoln Alexander and Red Hill Valley Parkways, City of Hamilton

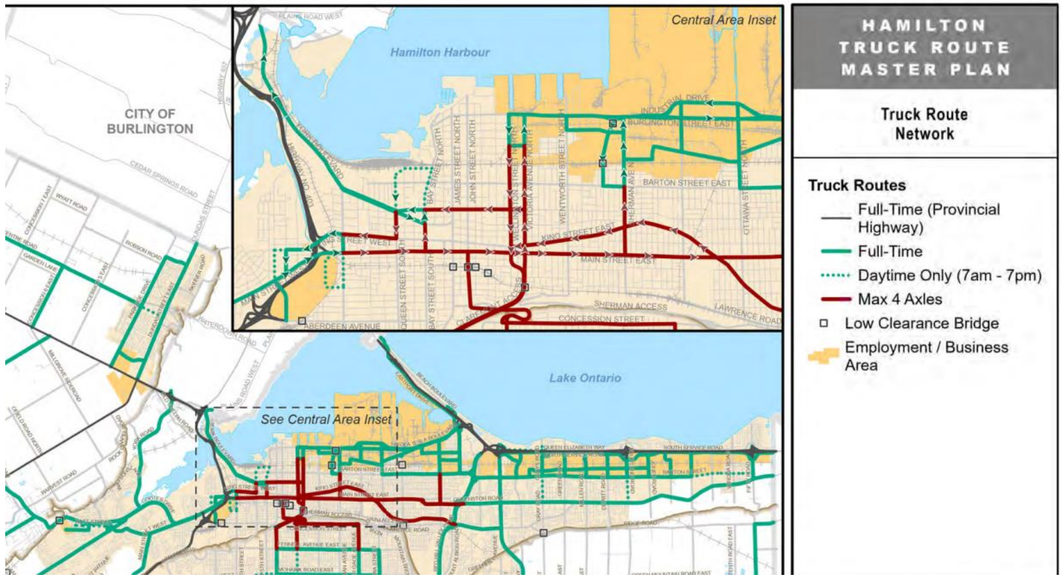
- Policy efforts to reduce pollution from the downtown core by making alterations to truck routes.
- Benchmarking air quality along extended study area before and measure post-intervention to understand the impact of rerouting.

% difference in spatial average concentration of CO from Phase 1 to Phase 2



Stage 4: Policy Changes

- Air Quality and this study were one of the inputs for policy changes suggested and implemented at the City of Hamilton in 2023-2024 as part of the 2022 Truck Route Master Plan.
- These adjustments were introduced to:
  - Enhance community livability
  - Foster improved environmental and public health outcomes
  - While supporting regional economic prosperity
- The primary objective is to guide trucks onto appropriate roadways, thereby helping to mitigate issues such as noise pollution, vibration, and enhancing safety for vulnerable road users.



Town of Milton: A Brief Overview

- Milton is projected to experience significant population growth, with the town's population expected to reach 400,400 by 2051, an increase of 263,000 from 2021.
- Proximity to industrial zones and Highway 401 – a significant source of emissions impacting air quality
- The Town of Milton is exploring bus fleet electrification to improve air quality, reduce emissions, and enhance public health while supporting sustainable urban growth.
- Its part of a Zero Emission Fleet Transition Plan intends to serve as a roadmap for Milton Transit to convert their transit fleet to zero emission by 2030.

Niagara Escarpment
(Geological Feature – Passes around Milton through the west turning northwest from beyond the 401)

Major Highway
(401 Toronto – Windsor Corridor)

Stage 1: Baseline Data for Scenario Modeling

Study area – Town of Milton

- The Town of Milton is exploring bus fleet electrification to improve air quality, reduce emissions, and enhance public health while supporting sustainable urban growth.
- Establish current pollution levels along major bus routes and near sensitive areas.
- Provide data inputs for modeling to evaluate the projected benefits of fleet electrification.

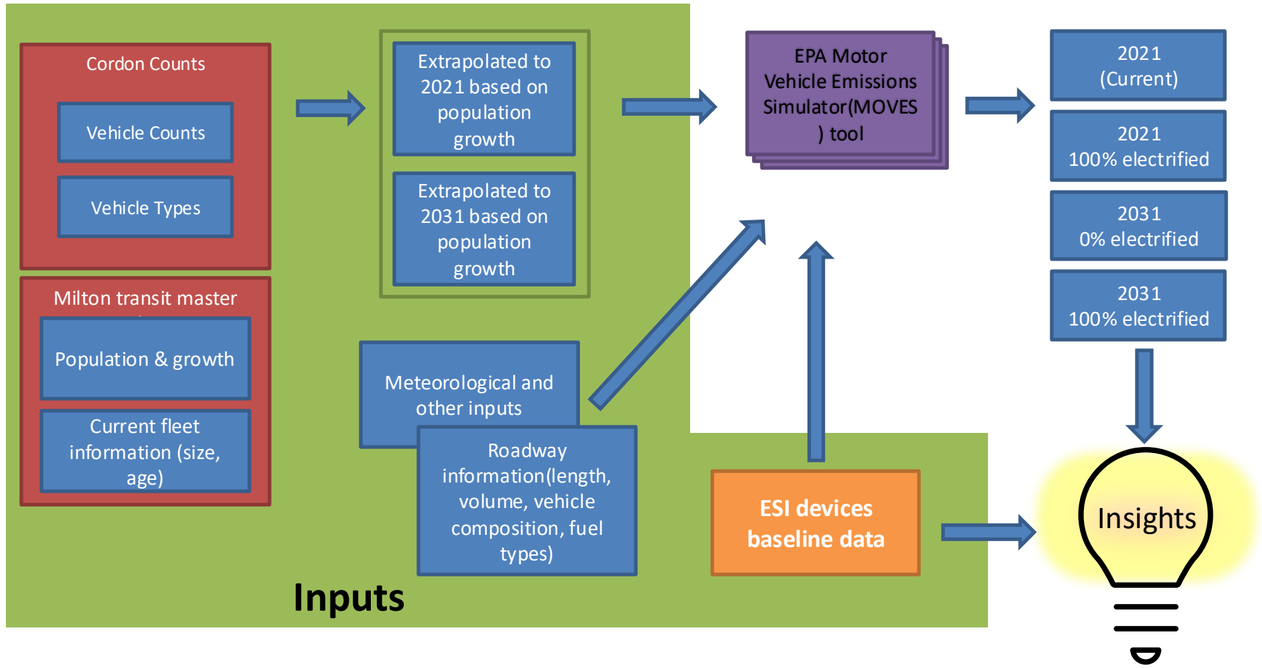
Deployment on and in Milton buses

Milton Bus Routes

Output Data Sample

Stage 2: Scenario Modeling

- Used vehicle count data, transit master plan growth projections, and roadway characteristics to model emissions.
- Incorporated meteorological conditions to evaluate pollutant dispersion.
- Leveraged US EPA MOVES emissions modeling tool to assess:
  - 2021 Current Fleet (Baseline)
  - 2021 100% Electrified Fleet
  - 2031 Projected Fleet (0% Electrified)
  - 2031 Projected Fleet (100% Electrified)



Stage 3: Insights and Action

- Quantified emission reductions under different electrification scenarios.
- Tangential Results: Dust Level inside bus are higher than outdoor. Specifically shoot up at particular time of day. Cleaning schedule changes.
- **Study Impact**: Our findings **contributed to Milton investing in bus fleet electrification**, supporting sustainable transit initiatives.

NEWS

Milton Transit pilot will convert diesel bus to electric

First municipality in Canada to convert mid-life diesel bus to electric battery power

MILTON The Canadian Champion

By Milton Canadian Champion

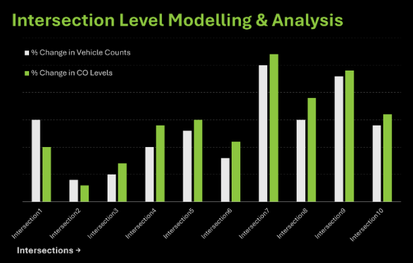
Tuesday, May 2, 2023 | 1 min to read

The converted bus is expected to be operational in early 2024. - Town of Milton website

One Technology, Diverse Use-Cases

ESI Air Monitoring Data

Urban Planning



- Scenario Modeling
- Smart City Integration
- NetZero Initiatives
- Wildfire Remediation

Community Monitoring

- Areas of High Pollution
- Mapping Air Quality & Trends
- Environmental Justice Initiatives
- Sensitive Population Health & Safety Monitoring

Transportation Planning

- Fleet Electrification
- In-Service Mobile Emissions Measurements (IMET)
- Traffic Policy Effectiveness

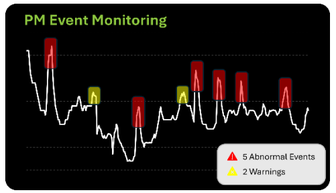
Urban Construction & Industry

- Fenceline Monitoring at construction sites
- Assess Impact of large industrial facilities on air quality

Hybrid vs. Diesel Emission Testing

Infrastructure Planning

Smart City Integration
(City of Tallinn)

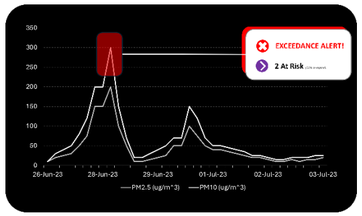


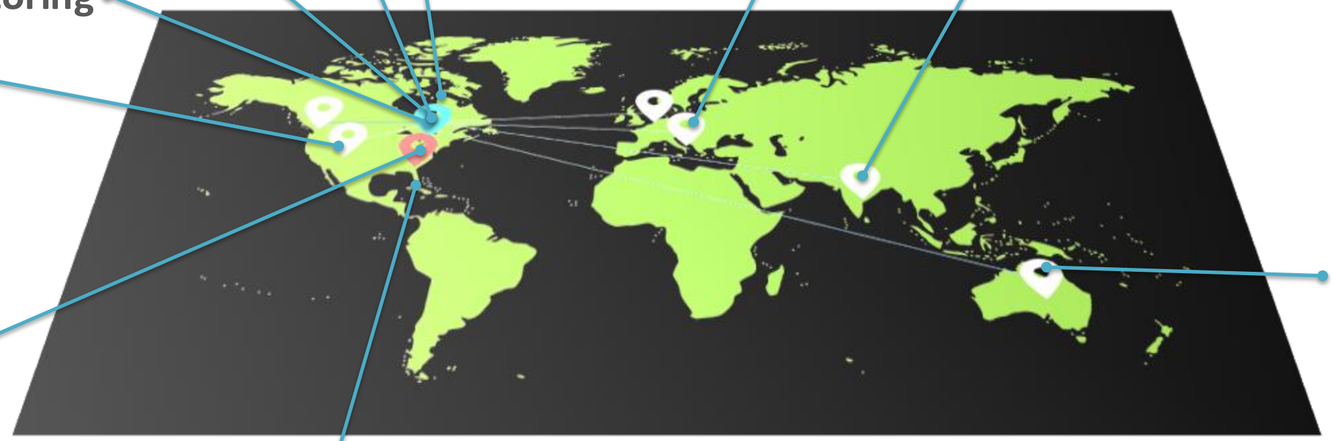
Public Health & Safety

Construction Worksite 24*7 Monitoring

Metro Corridor Monitoring
(City of Hyderabad)

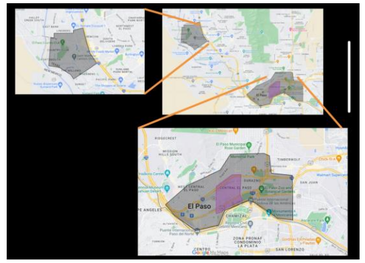
Wildfire Remediation





Emissions Flux Monitoring

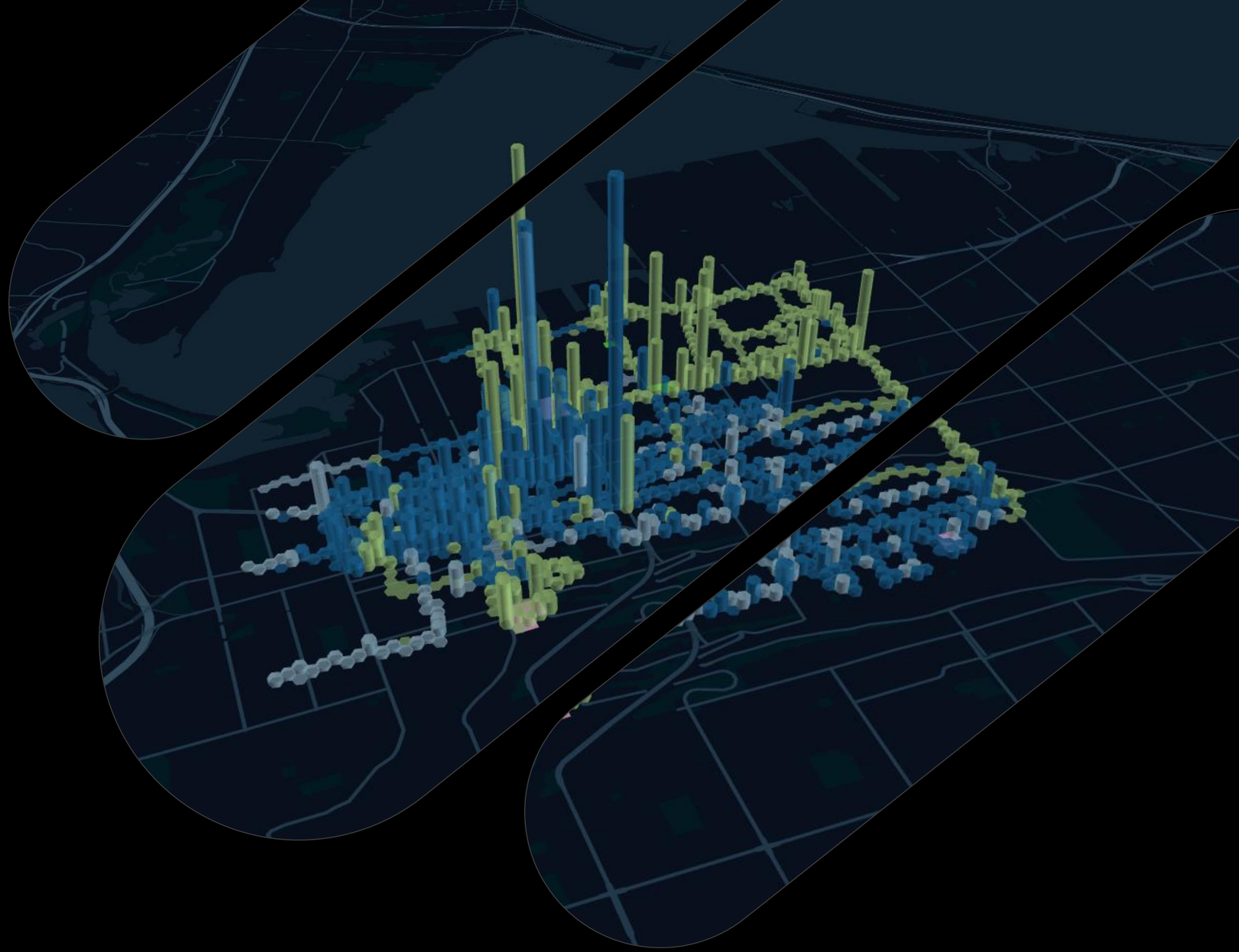
US EPA Community Monitoring



Open-Pit Mine Fenceline Monitoring

Growing Global Presence

Examples of Delivered Projects



Customer Stories

Transportation Planning

Client : Town of Milton, Ontario, Canada

Context

- Town of Milton planning to upgrade public bus fleet to electrified buses.

Requirement

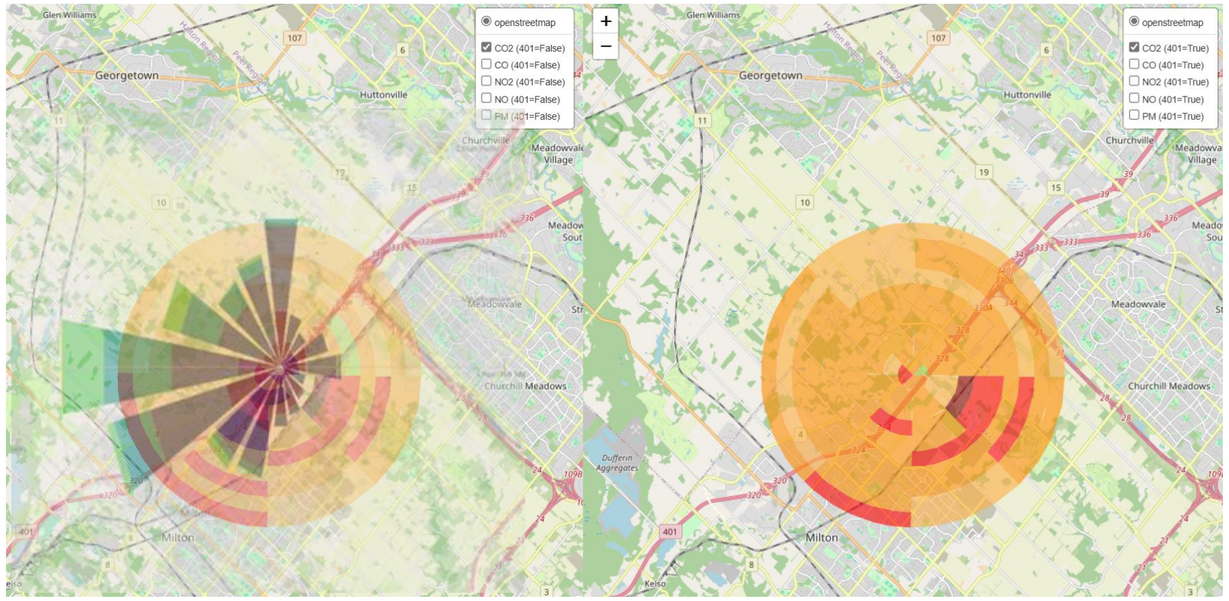
- ROI Analysis and Environmental Impact of bus electrification.

Solution

- Automated data capture with units on buses for establishment of ambient air level baseline.
- EPA MOVES modelling for transportation emissions and custom scenario modelling for cause-effect analysis.

Result

- ROI demonstration with Environmental Impact analysis and reporting.
- Comprehensive analysis Milton’s air quality based on collected data.



Customer Stories

Industrial Facility Air Quality Impact

Client : Utilities Provider, Ontario, Canada

Context

- Atura Power needed air quality monitoring to distinguish facility emissions from Highway 401 traffic and other surrounding facilities around the Town of Milton.

Requirement

- Fixed & mobile monitoring for accurate air quality tracking.
- Data modelling and analysis for public engagement.

Solution

- 4 fixed monitors at facility boundary (N, S, E, W) – 24/7 data collection.
- 3 mobile monitors on ESI vehicles covering buffer zones & 401 corridor.
- 10 data collection days/month across AM, PM, and off-peak periods.

Result

- Accurate emissions dataset for source attribution.
- Data-driven impact assessment.
- Improved public transparency & engagement.

Customer Stories

Infrastructure Planning

Client : City of Hamilton, Ontario, Canada

Context

- City of Hamilton planned a downtown core emissions and odour reduction initiative by changing truck routes to bypass certain city areas.

Requirement

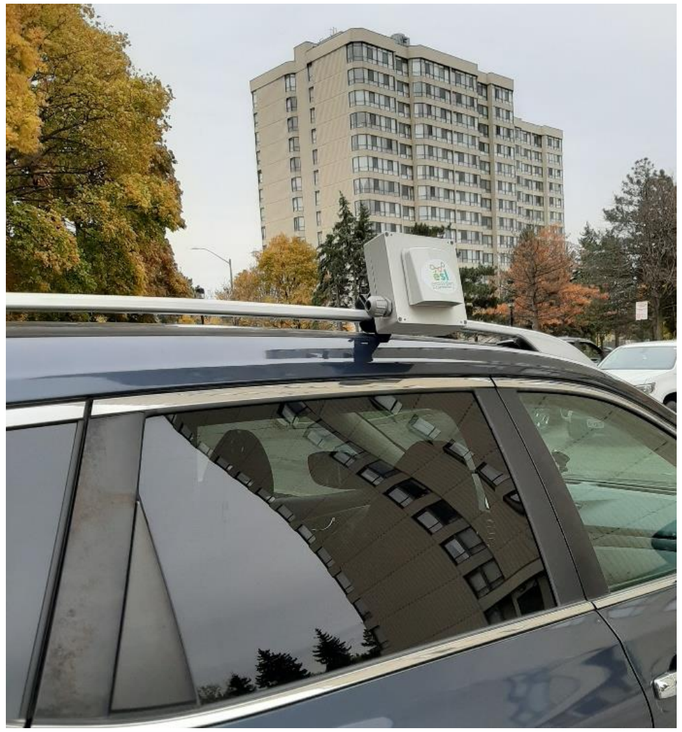
- Impact Assessment of Pollution reduction initiative and actions.

Solution

- Create a baseline of ambient air level pre-initiative.
- Data collection and analysis post-initiative execution to understand differences in air quality levels along truck route corridor.

Result

- Impact Analysis and comprehensive reporting of Action-Effect analysis for pollution and odour reduction Initiatives.
- Enabling Informed decision making and policy creation.



Customer Stories

Urban Monitoring – Public Health

Client : City of Hamilton, Ontario, Canada

Context

- City of Hamilton was experiencing elevated odour complaints and concerns over Air Quality in the city's downtown core with several Public complaints from areas closer to the port.

Requirement

- Air Quality data collection and odour hotspot and source identification, within a 25 SQKM. Area of interest with focus on critical locations like hospitals and green spaces.

Solution

- Mobile Monitoring of Area of Interest over several seasons with units deployed on ESI vehicles.
- Spatial Analysis for Hotspot identification.
- Critical Location Monitoring, Analysis & Reporting.

Result

- Establishment of Pollution and Odour Hotspots.
- Critical Location identification and Monitoring.
- Comprehensive Public Health initiative analysis.

Customer Stories

Smart City Technology Integration

Client : City of Tallinn, Estonia

Context

- City of Tallinn, Estonia integrating a new smart city platform that is being developed by Arcadis.

Requirement

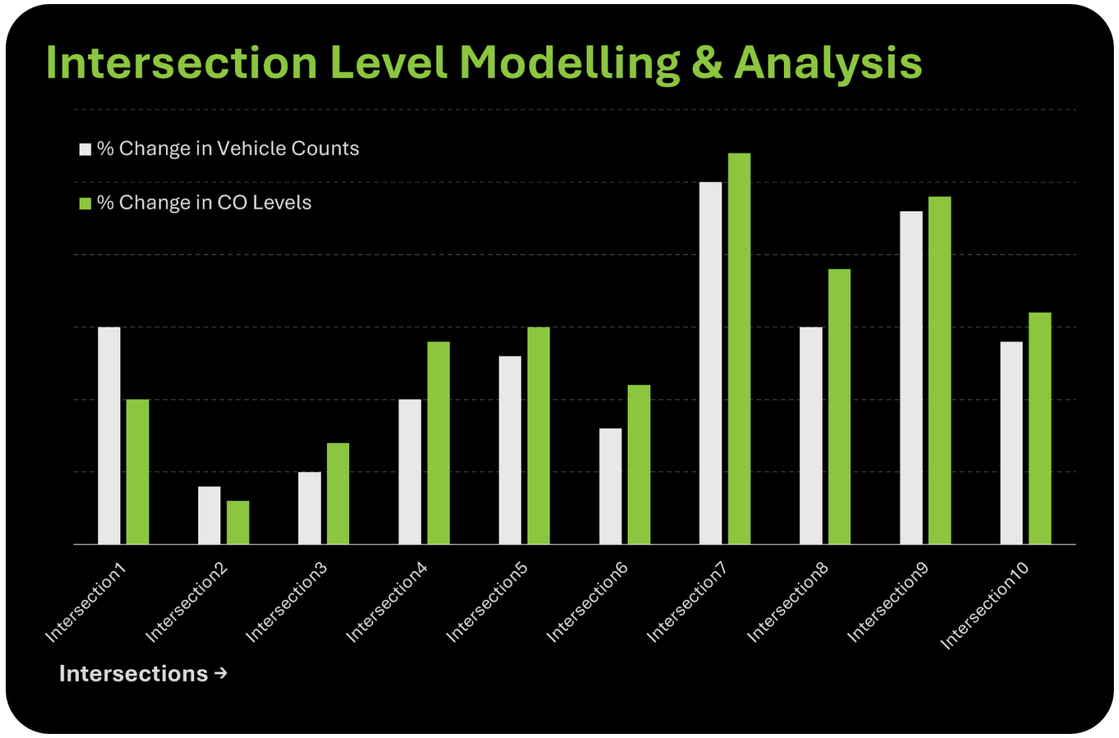
- 24*7 Monitoring and data, Integration into smart city platform.
- Large and comprehensive coverage.

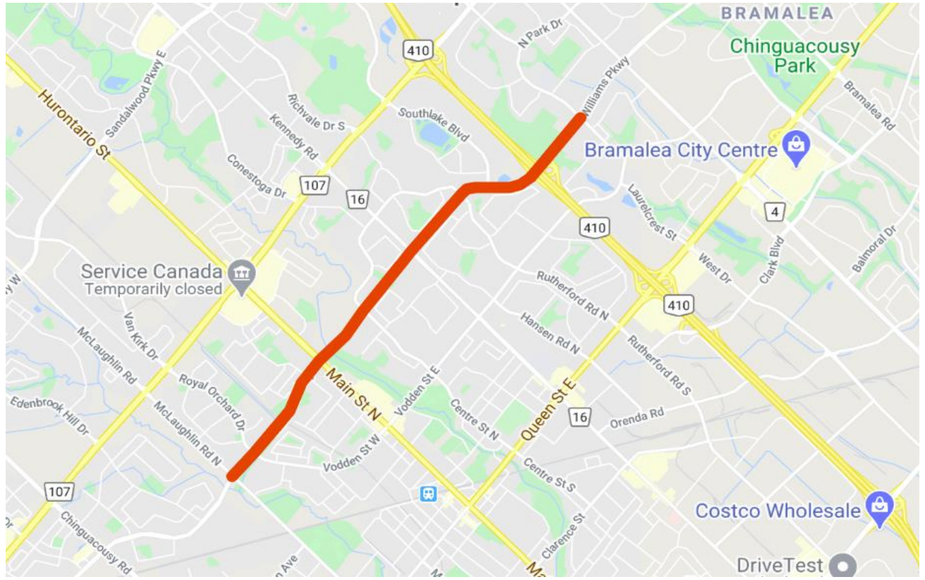
Solution

- Stationary & Mobile data collection of pollutants and odour causing substances.
- Real-time mobile data collection device deployed on streetcar.
- Smart City Integration.

Result

- Innovative low maintenance data collection.
- Data integration into smart city platform.
- Advanced Analytics like pollutant hotspots and heat islands.





Customer Stories

Urban Mobility Planning & Impact Analysis

Client : City of Brampton, Ontario, Canada

Context

- City of Brampton was planning to expand a major roadway as part of their Vision 2041 Infrastructure expansion planning.

Requirement

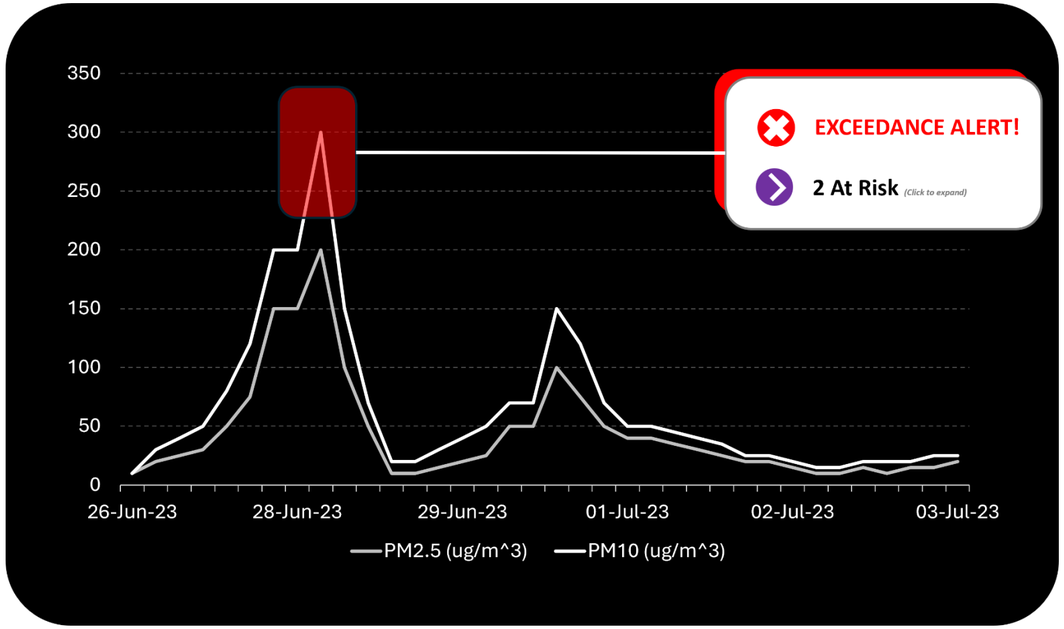
- Scenario Construction & Modelling for Impact Analysis.

Solution

- Multi-Scenario Air Quality Impact Modelling and Impact Analysis.
- EPA MOVES modelling for transportation emissions.

Result

- Impact analysis for informed decision making on roadway expansion.
- Comprehensive Insights from Multi-Scenario and intersection Modelling.



Customer Stories

Construction Site 24*7 Fenceline Monitoring

Client : Metrolinx Canada (Site: Aurora, Ontario, Canada)

Context

- Construction work in a suburban area. Local by-law required continuous PM monitoring.

Requirement

- Real-Time PM Monitoring at a construction site.
- Threshold Exceedance Alerts & Source Identification.

Solution

- Monitoring design, operation and maintenance.
- Comprehensive PM monitoring & automated threshold exceedance alerts.

Result

- 24*7 real-time Monitoring.
- Configurable Threshold exceedance Alerts & Notifications.

Customer Stories

Data for Academic Research

Client: McMaster University, Canada

Context

- McMaster University's research team aimed to enhance their urban mobility research model with high-resolution data related to air quality and emissions in urban environments.

Requirement

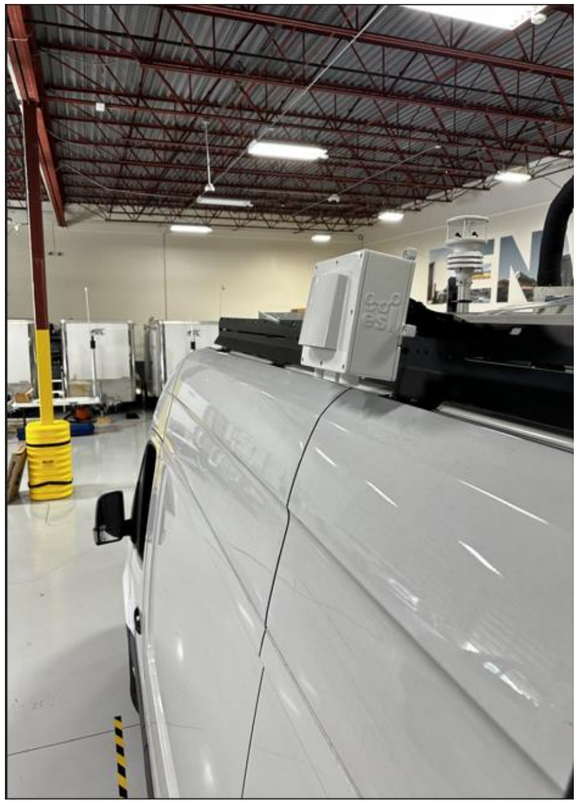
- Access to a broad data set covering different pollutants and environmental conditions across multiple locations.
- Data Integration for developing and refining analytical models.

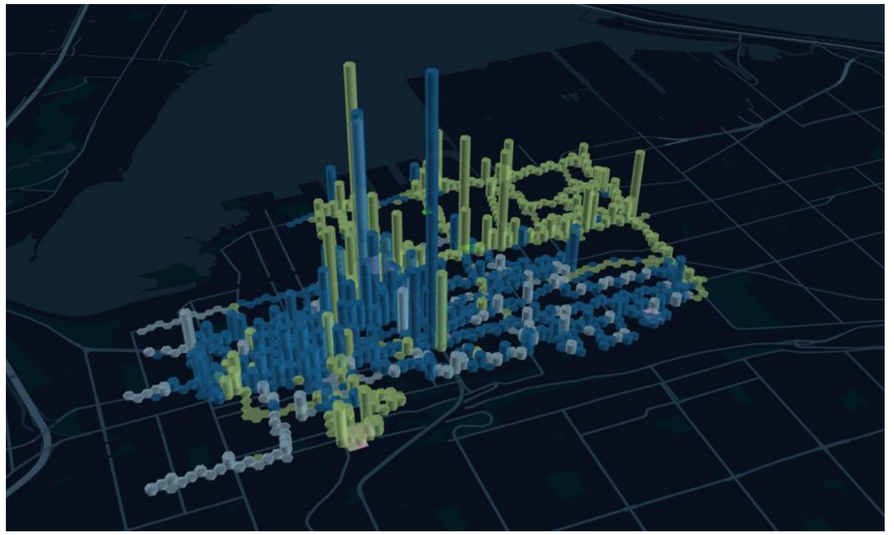
Solution

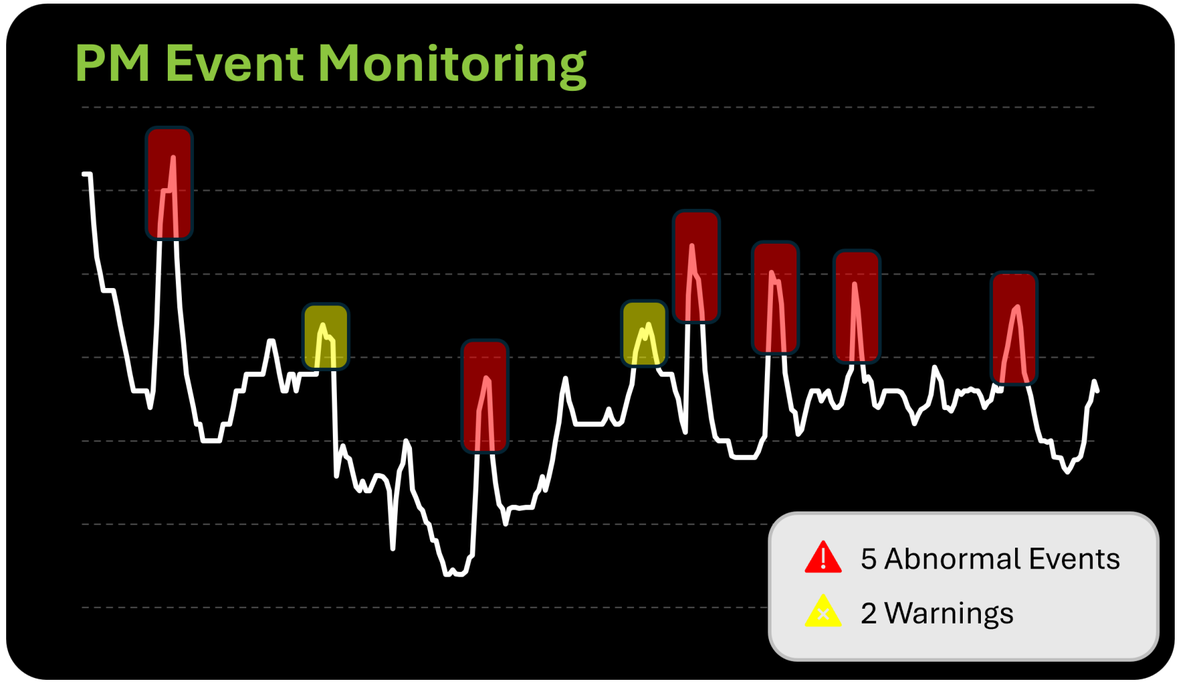
- Collaborative approach: ESI worked with McMaster University to ensure seamless data integration and interpretation for research purposes.

Result

- Model Improvement: ESI's data supported cutting-edge research, contributing to broader academic understanding of air quality dynamics in urban environments.







Customer Stories

Wildfire Remediation

Client : Arcadis (Site: Village of Lytton, British Columbia, Canada)

Context

- Village of Lytton was devastated by Wildfire and was looking for continuous dust monitoring to inform authorities during wildfire remediation efforts.

Requirement

- Air Quality data collected at strategic locations and continuously monitor dust levels.

Solution

- Two ESI units deployed north and south of Lytton to measure dust concentration.
- Real-time PM monitoring for event identification and Health and Safety Alerts.

Result

- Effective dust monitoring and event identification.
- Comprehensive insights and real-time alerts.

Customer Stories

Cement Manufacturing Impact Analysis

Client: Cement Manufacturer, Ontario, Canada

Context

- Ontario based Cement Manufacturer wanted a deeper understanding on the emissions – both pollutants and odorous compounds - from a manufacturing plant that is adjacent a major highway.

Requirement

- Impact Assessment of Emissions from primary stack and other sources.
- Data Collection with a wide area coverage.

Solution

- Drone deployment for data collection.
- Real-time data collection and comprehensive analysis.

Result

- Innovative technology with Comprehensive Data collection.
- Understanding of surrounding community impact.

Customer Stories

Mine Perimeter Monitoring

Client: Arcadis Group (Site: Chino Mine, New Mexico, USA)

Context

- Address surrounding community complaints on odours and air quality from operations at Chino Mine, New Mexico.

Requirement

- Baseline measurements to aid large-scale project design.

Solution

- Perimeter mobile monitoring.
- Baseline measurement and benchmark with regulatory equipment.

Result

- Effective monitoring in compliment with regulatory equipment.
- Community impact mitigation planning and directional trends for regulatory monitoring plan.

Thank You

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