



AIR MONITORING DATA & INTELLIGENCE

PRODUCT SPECIFICATIONS DOCUMENT

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MONITOR ANYWHERE WITH **UNMATCHED ROBUSTNESS**

COMPREHENSIVE END-TO-END **SOLUTION**

SIMPLICITY REDEFINED

Monitor **ANYWHERE**



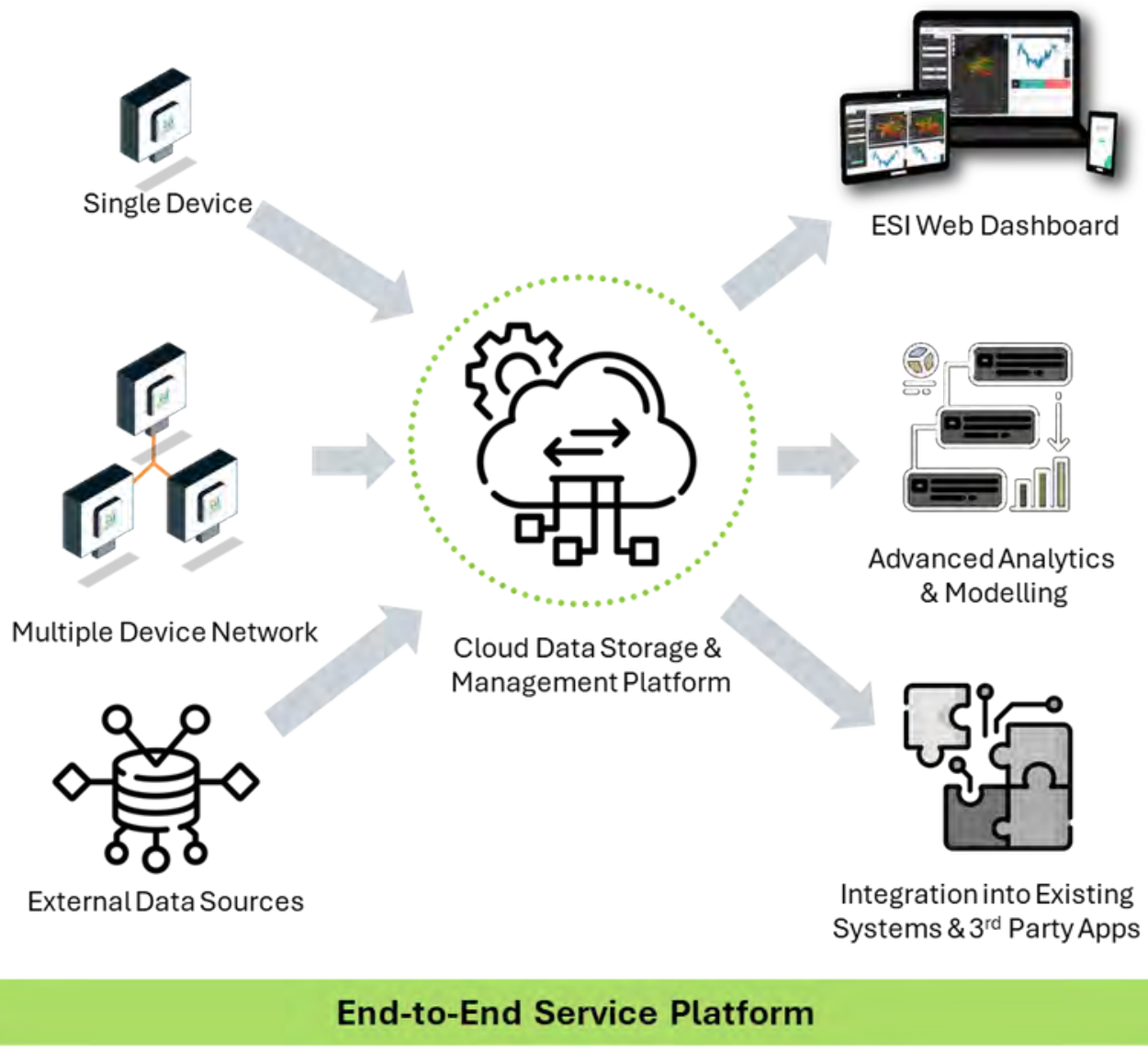
HARDWARE HIGHLIGHTS

- Measurement of gaseous, odour and environmental parameters all with 1 device - **Up to 14 sensors in a single device.**
- **Plug & Play:** automatic connection to ESI cloud data platform
- **Robust device** with dynamic sampling and improved protection against the elements - heat, moisture, precipitation and/or corrosive environments
- **On-board storage** for automated data saving : no consequence in case of lost communication service.
- **Very high sensitivity** to capture low level gas and particulate concentrations
- **Modular, easy to use** and move on-site: no extra cables.
- Requires **only annual maintenance** for sensors renewal.
- Small Footprint (~ 2 KGS), Low Power consumption, Zero Hassle.
- **Remote diagnosis:** Real-time monitoring of sensors' lifetime, battery charge and power supply



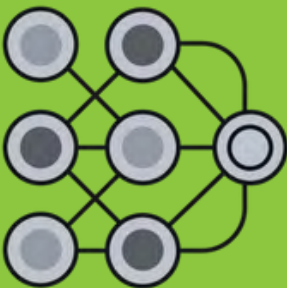
Studies commissioned by ESI and in collaboration with MECP (Ministry of Environment and Parks, Ontario) have shown very good agreement with reference measurements.

SOLUTION



ESI's PATENTED ADVANTAGE

Software Calibration Using Patented AI Algorithms



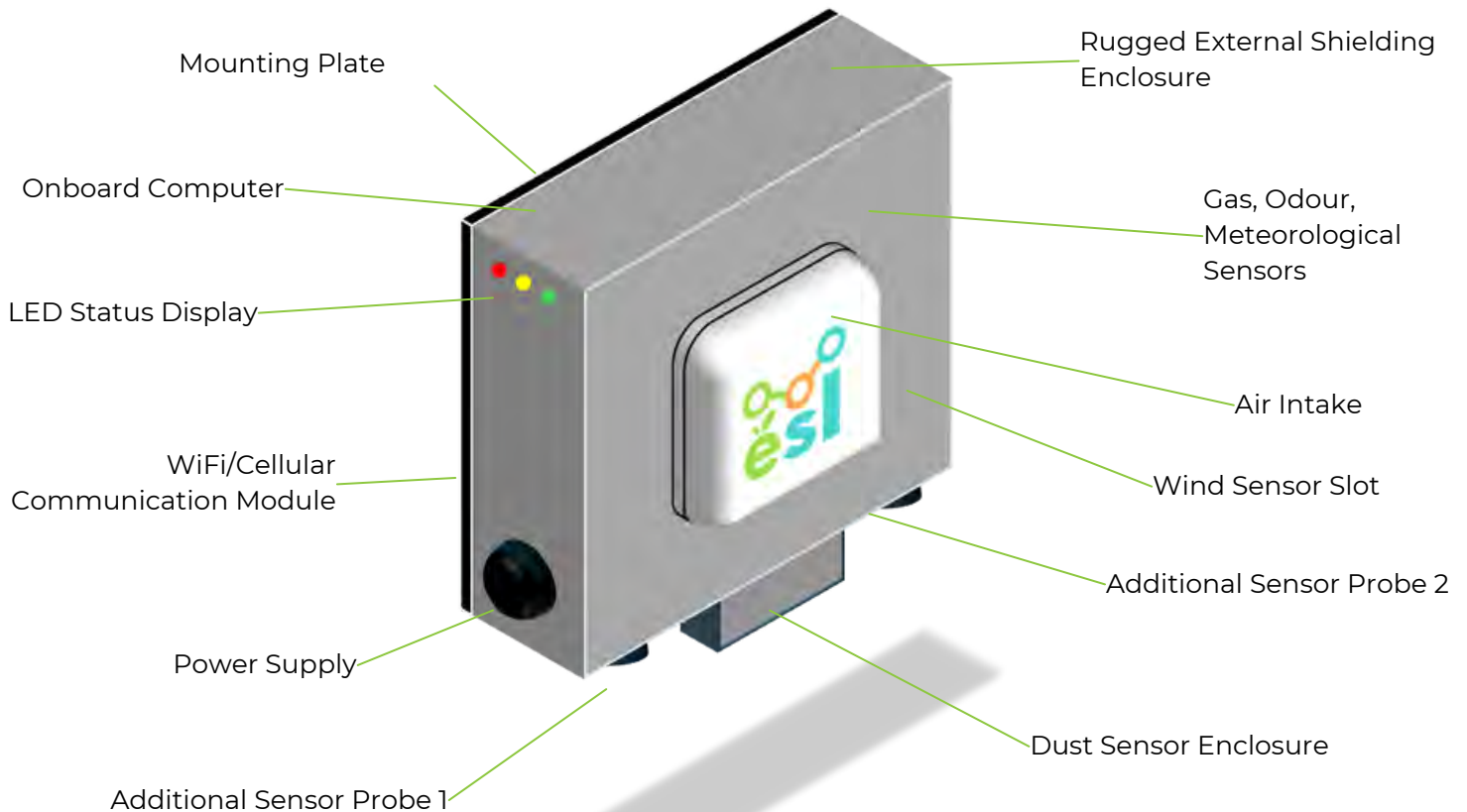
Multiple Generations of Algorithms Developed:

- Initial approach: near reference calibration
- Advanced approach: predictive calibration

Significant cost, maintenance, and resource advantages compared to hardware calibration

Multi-layered calibration from source OEM to ESI in-lab and continuous software calibration, addressing issues like sensor drift resulting in superior accuracy & reliability over low-cost sensors.

DEVICE SPECIFICATIONS



Factor	Description
Power Autonomy	AC Mains, DC - 6V/9V/12V/24V , Solar Power with Battery (optional), Direct Power from Vehicle
Power Consumption	2.0 W (Minimum), 6.5 W (Maximum)
Dimensions	7"x7"x3.15"(x4.5" including front air vent)
Weight	~ 1.2 kg (2.7lb)
Enclosure	NylonPolymer
Operating Condition Range	-25C to +75C Temperature; 5-95% RH
Typical Operating Conditions	Rated -10C up to +60C Temperature; 5-95% RH
Operation Mode	Stationary, Mobile (Car, bus, tram etc. mount), Aerial (Drone, UAV mount)
IP Rating	IP68
Communications	Wi-Fi/Cellular- 3G/4G/LTE
Sampling Frequency	4 to 10 Seconds per minute per Sensor
Geolocation	GPS
Device Data Storage	Internal storage on micro-SD card of all data in case of loss of cellular communication. Onboard data store for >1 year of storage; Backup network buffer cache memory with 18 Hours storage
Sensor Capacity	Up to 14 Sensors Simultaneously (From a total catalogue of 20+ Sensors & Growing)
Gas Sensors	CO, NO2, SO2, O3, CO2, CH4, NH3, IAQ, EtOH, Cl2, C2H4, NO, HCHO, H2, Black Carbon Indicator, LEL (lower explosive limit)/Flammable Gas
Odour Sensors	H2S, total VOCs, VOC Index and NOx Index
Meteorological Sensors	Temperature, Relative Humidity, Barometric Pressure, Wind Speed and Direction
PM Sensors	PM1, PM2.5, PM4, PM10
Environment Factor Sensor	Noise, Vibration
Remote Management	Bidirectional; Over-the-Air Upgrades
Security	Encryption, TLS, TrustedBoot, Anomaly Detection

SENSOR SPECIFICATIONS

GAS SENSOR SPECIFICATIONS

Sensor	Technology	Range	Resolution	Accuracy (Normalized RMSE)	Precision Performance (R ² Score)	Typical Error (MAE)	Lower Detection Limit
CO (Carbon Monoxide)	Electrochemical	0 to 1000000 ppb	0.1 ppb	± 3%	0.93	± 2.0 ppb	1 ppb
NO2 (Nitrogen Dioxide)	Electrochemical	0 to 5000 ppb	0.1 ppb	± 5%	0.93	± 1.5 ppb	0.1 ppb
O3 (Ozone)	Electrochemical	0 to 10000 ppb	0.1 ppb	± 4%	0.96	± 1.5 ppb	0.1 ppb
SO2 (Sulphur Dioxide)	Electrochemical	0 to 20000 ppb	0.1 ppb	± 3%	0.87	± 1.0 ppb	0.1 ppb

PARTICULATE MATTER SENSOR SPECIFICATIONS

Sensor	Technology	Range	Resolution	Accuracy (Normalized RMSE)	Precision Performance (R ² Score)	Typical Error (MAE)	Lower Detection Limit
PM (Particulate Matter) PM 2.5	Optical Particle Counter	0 to 1000 µg/m3	0.1 µg/m3	± 3%	0.95	± 0.7 µg/m3	0.5 µg/m3
PM (Particulate Matter) PM 10	Optical Particle Counter	0 to 1000 µg/m3	0.1 µg/m3	± 5%	0.84	± 6.5 µg/m3	0.7 µg/m3

Note: Above metrics are based on ESI's co-location test results which were performed over 2-12 months results in several locations and countries.

Accuracy (nRMSE): quantifies prediction error as a percentage, showing how well the self-calibration model performs relative to the reference data range.

Typical Error (MAE): MAE measures the average absolute error between predicted and actual (reference) values, It tells us how close the self-calibration model's outputs are to the true (reference) values on average.

Calibration Precision Performance (R² Score): R² measures how well the model explains the variance in the data. ESI's self-calibration model's calibration precision, as indicated by an R² score of 0.XX, demonstrates that XX% of the variance in the reference data is captured by ESI's model.

NOISE SENSOR SPECIFICATIONS

Sensor	Technology	Measuring Range	Measurement Error
Noise	Electret Condenser Microphone (ECM)	30dBA ~ 130dBA	±1.5dB

VIBRATION SENSOR SPECIFICATIONS

Sensor	Technology	Measuring Range	Measurement Error
Vibration	MEMS	±2g, ±4g, ±8g, ±16g (Selectable based on application)	0.000061 g/LSB (±2g mode) 0.000122 g/LSB (±4g mode) 0.000244 g/LSB (±8g mode) 0.000488 g/LSB (±16g mode)

GAS SENSOR SPECIFICATIONS

Sensor	Technology	Range	Resolution	Accuracy	High Confidence Lower Detection Limit
NO (Nitrogen Oxide)	Electrochemical	0 to 20 ppm	0.1 ppb	± 1%	0.02 ppm
C2H4 (Ethylene)	Electrochemical	0 to 100 ppm	0.1 ppb	± 1%	0.02 ppm
HCHO (Formaldehyde)	Electrochemical	0 to 20 ppm	0.1 ppb	± 1%	0.05 ppm
IAQ (Indoor Air Quality)	Electrochemical	0 to 100 ppm	0.1 ppb	± 0.5 %	0.2 ppm
Cl (Chlorine)	Electrochemical	0 to 20 ppm	0.1 ppb	± 2 %	0.02 ppm
EtOH (Alcohol)	Electrochemical	0 to 1000 ppm	0.1 ppb	± 1%	1 ppm
H2 (Hydrogen)	Electrochemical	0 to 250 ppm	0.1 ppb	± 1%	1 ppm
RESP (Respiratory Irritants)	Electrochemical	0 to 20 ppm	0.1 ppb	± 1%	0.02 ppm
NH3 (Ammonia)- Variant 1	Electrochemical	0 to 200 ppm	0.1 ppb	± 0.4 % ± 4 ppm	0.08 ppm
NH3 (Ammonia)- Variant 2	Electrochemical	0 to 400 ppm	0.1 ppb	± 0.4 % ± 4 ppm	0.08 ppm
NH3 (Ammonia)-- Variant 3	Electrochemical	0 to 1000 ppm	0.1 ppb	± 0.4 % ± 4 ppm	0.08 ppm
NH3 (Ammonia)-- Variant 4	Electrochemical	0 to 1500 ppm	0.1 ppb	± 0.4 % ± 4 ppm	0.08 ppm
CH4 (Methane) - Variant 1	Molecular Property Spectrometry	500 - 1500 ppm	1 ppm	-	500 ppm
CH4 (Methane) - Variant 2	Molecular Property Spectrometry	50-1000000 ppm	1 ppm	± 10%	50 ppm
CO2 (Carbon Dioxide)	Photoacoustic NDIR	0 to 40000 ppm	1 ppm	± (50 ppm+2.5% of reading) @ 400-1,000ppm	1 ppm
				± (50 ppm+3% of reading) @ 1,001-2,000ppm	
				± (40 ppm+5% of reading) @ 2,001-5,000ppm	

METEOROLOGICAL SENSOR SPECIFICATIONS

Sensor	Technology	Range	Resolution	Accuracy	High Confidence Lower Detection Limit
Temperature	Solid State	-40 to 85 °C	0.01 °C	Full Accuracy from 0 to 65 °C	-40 °C
Relative Humidity	Solid State	0 to 100% RH	0.008 %RH	± 3%	0% RH
Atmospheric Pressure	Solid State	300 – 1100 hPa	0.18 hPa	< 1.7 hPa	300 hPa
Wind Speed & Direction	Ultrasonic Anemometer	Wind speed:0 ~ 40m/s; Wind direction:0~360°	0.01 m/s, 1°	Wind speed ±0.5+2%FS	No Limit
				Wind direction: ±3°	

ODOUR SENSOR SPECIFICATIONS

Sensor	Technology	Range	Resolution	Accuracy	High Confidence Lower Detection Limit
H2S (Hydrogen Sulphide)	Electrochemical	0 to 50 ppm	0.1 ppb	± 1%	1 ppb
tVOC (Total VOCs) (Based on Isobutylene)	Metal Oxide Sensor	0 to 1000 ppb	0.1 ppb	-	1 ppb
VOC Index (Based on Ethanol)	Metal Oxide Sensor	0 -1000 ppm of ethanol equivalent	0.05 ppm	<±15 VOC Index points or % m.v. (whichever is larger)	0.05 ppm

FLAMMABLE GAS SENSOR SPECIFICATIONS

Sensor	Technology	Range	Resolution	Standard
Flammable Gas	Molecular Property Spectrometry (MPS)	0 to 100 % LEL	0.1% LEL	LEL values are based on ISO Standard

Class	Gas Type	Gas	Avg. Molecular Weight (g/mol)	Avg. Density (kg/m³)	# of Carbon Atoms
1	Hydrogen	Hydrogen	2.0	0.09	0
2	Hydrogen Mixture	-	1-14	0.1-0.6	Varies
3	Methane/Natural Gas	Methane	16-19	0.6-0.9	1-2
4	Light Gas/Light Gas Mixture	Ethane, Isobutane, Isobutylene, Isopropanol, Propane, Propylene, Ethylene	27-75	1.2-2.5	1-4
5	Medium Gas/Medium Gas Mixture	MEK, Pentane, Acetone, Heptane	50-120	1.5-4.0	2-8
6	Heavy Gas/Heavy Gas Mixture	Octane, Styrene, Toluene, Xylene	>80	>3.5	6+

The measurement of Class-4, Class-5, and Class-6 gases using the MPS sensor depends on site-specific factors and the primary emissions characteristic of the location.

PERFORMANCE BENCHMARKING

We continuously conduct co-location studies with reference stations in different locations to guarantee the highest quality results.

For more and latest Co-Location study results, please visit:

[**ESI Performance Benchmarking**](#)



DATA & INTELLIGENCE

Web Dashboard (SaaS)



Data APIs (DaaS)



Advanced Analytics

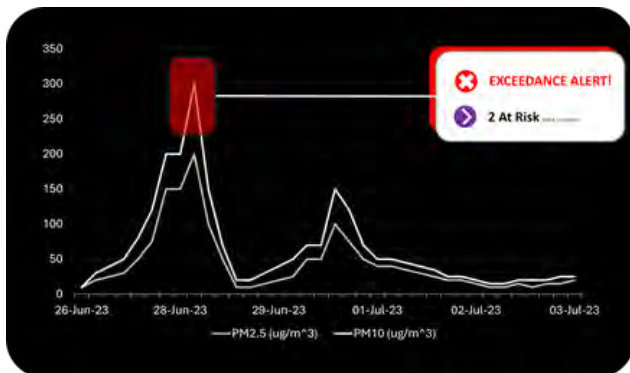


Custom Integration

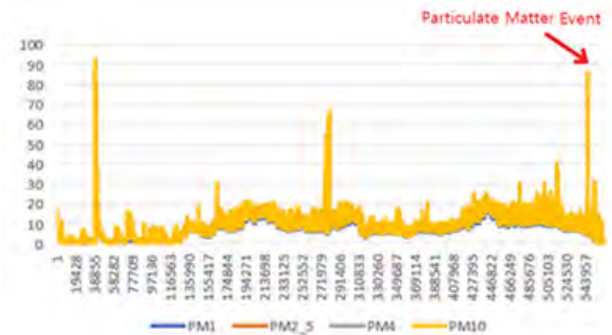


- **Data access via API** REST, FTP server, SFTP server, Secured browser (from mobile phone, tablet or PC).
- Customizable Threshold Exceedance **Monitoring and Alerts**.
- Friendly and adaptive user interface.
- Secured database hosted on our server or local setup (customizable).
- **Real-time monitoring and management** of all sites through only one interface
- **Dynamic air quality data view:** tables, graphs, filters...
- Data storage for up to 3 years
- **Data download** (.xlsx, .csv, .pdf, .jpeg...)

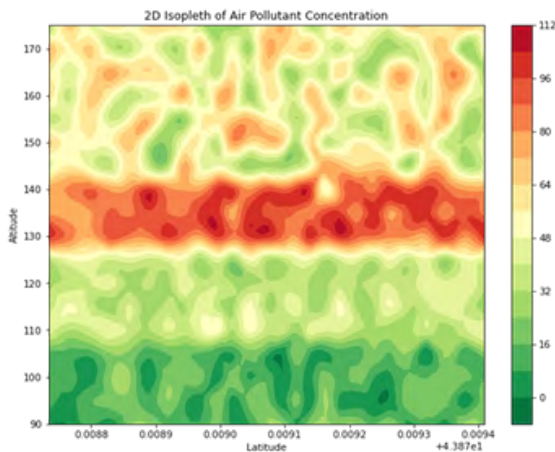
DATA & INTELLIGENCE



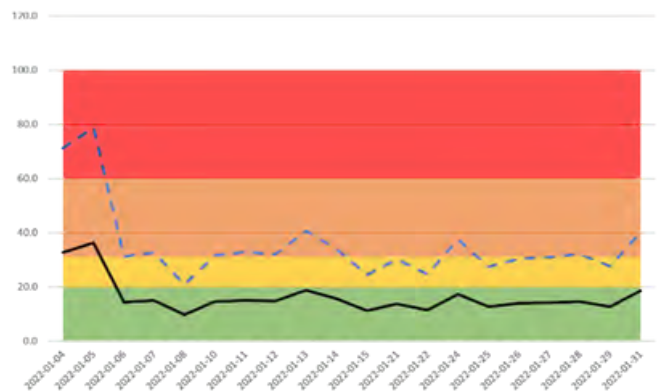
Automated Alerts & Notifications



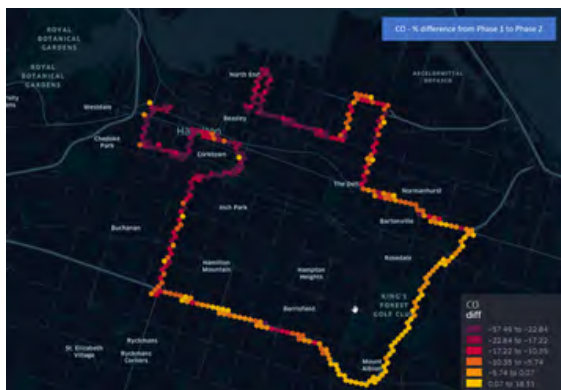
24*7 Real-Time Monitoring



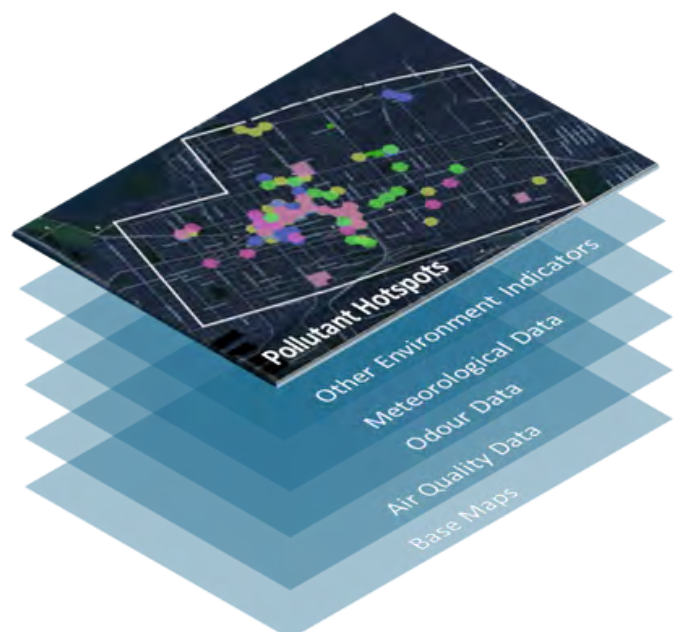
Aerial Distribution Maps



Temporal Trends



Spatial Maps



Layered Insights

GROWING GLOBAL PRESENCE



Offices in Canada & USA



Projects Worldwide

“AT THE HEART OF OUR MISSION IS A COMMITMENT TO ENVIRONMENTAL STEWARDSHIP, PROVIDING REVOLUTIONARY DATA AND INTELLIGENCE SOLUTIONS, DRIVEN BY OUR INNOVATIVE AI-POWERED TECHNOLOGY, AN ENTERPRISING TEAM AND A COMMITMENT TO EXCELLENCE.”



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