



## **Emissions Innovation and How to Defend Yourself in a World of Accusations**

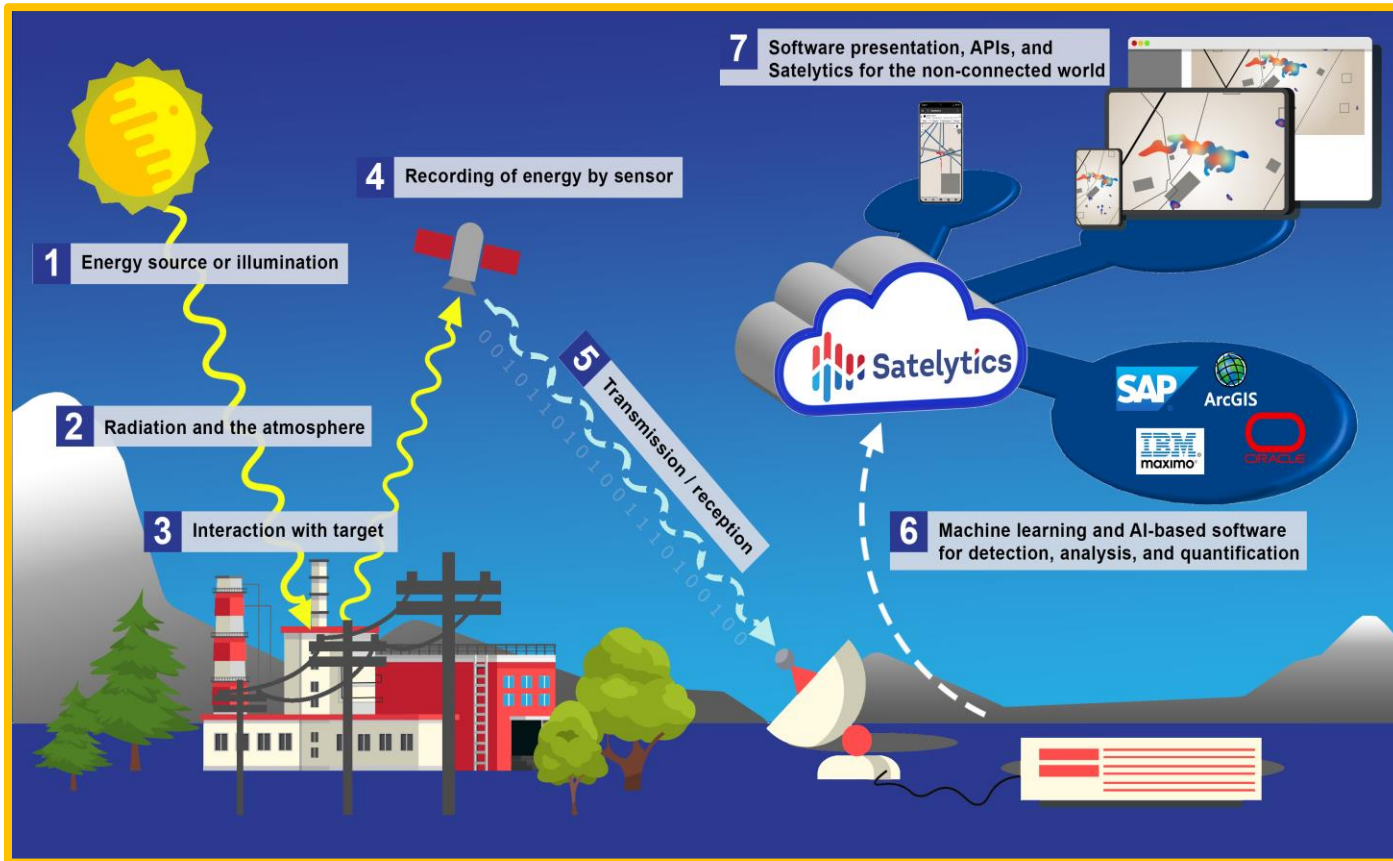
Prepared For:



Texas Independent  
Producers and Royalty  
Owners Association

**Sean Donegan**  
President and CEO  
Satelytics, Inc.

# How Our Solution Works



- 1) **Energy Source or Illumination** - sunlight illuminates the target.
- 2) **Radiation and the Atmosphere** - atmospheric distortion of the reflected energy is accounted for in the analysis.
- 3) **Interaction with the Target** - energy reflects off the target and is distorted in the reflection.
- 4) **Recording of Energy by the Sensor** - a sensor records the reflected electromagnetic radiation.
- 5) **Transmission, Reception, and Processing** - energy recorded by the sensor is transmitted, then received and processed at a ground station.
- 6) **Software Detects, Analyzes, and Quantifies** - the data is analyzed using artificial intelligence-based software — algorithms designed to extract and quantify measurements of the target.
- 7) **Presentation of Analytics** — Data and imagery is presented in a customer-defined form to allow decision-making and immediate action.
- 8) **Device Platform** — Data, analytics, and imagery are accessible on smartphones, tablets, and browsers. Alerts are also delivered by text message.

# What are the Sources of Data

## Data Acquisition, From Where, How Often, and What the Future Holds

Satelytics takes in multi and hyperspectral data from a variety of third-party sources including enterprise satellite data providers using conventional and nano-satellite arrays, plane or drone aerial imagery, and fixed or persistent camera platforms.

### Perspective on Scale and Capture

3,000 sq over the Bakken

Satellite 11 minutes

Plane 2 days

UAV 100 acres 6 hours



Satellites



Nano-satellites



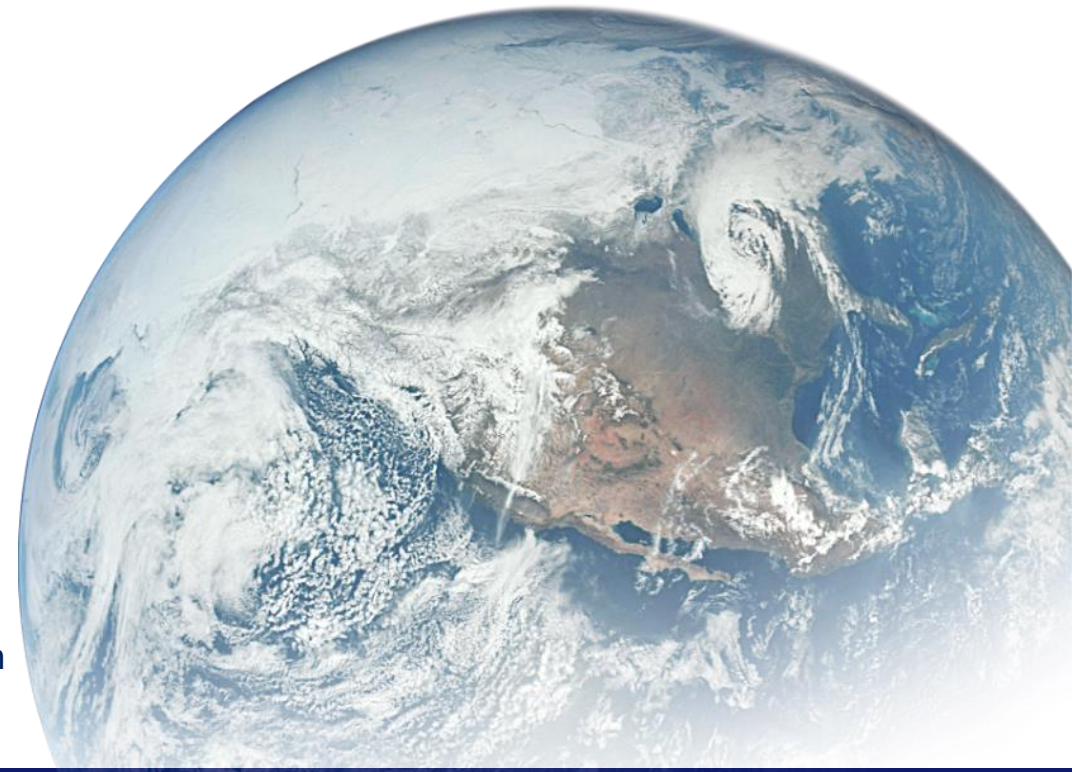
Aircraft



Drone/UAV



Fixed/Persistent Platform





# Alerts with Specificity, Location, and Measurement, Not Directionless Data

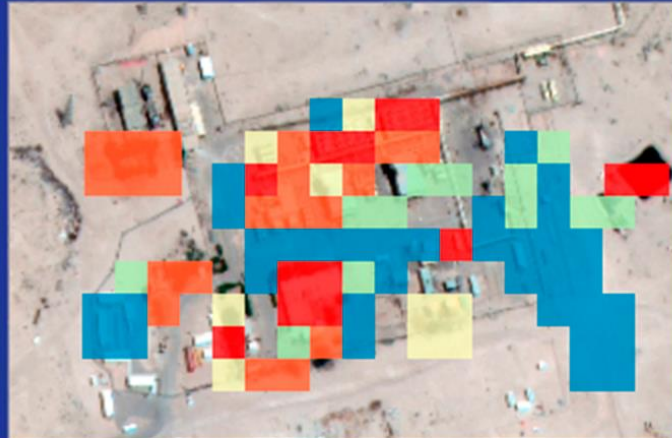
Spatial resolution is critical when identifying source and quantifying methane emissions

Image from Satellite A



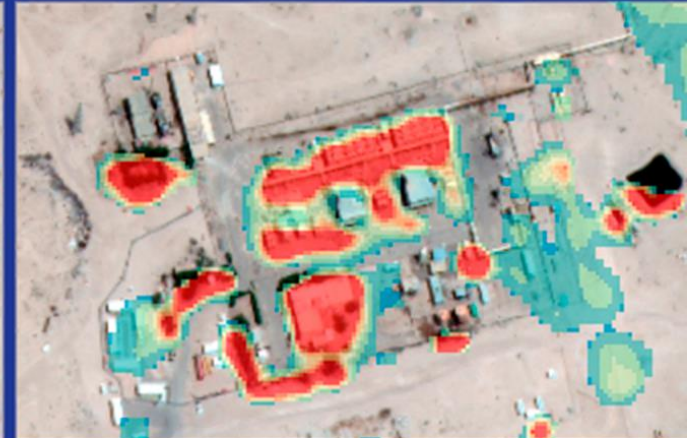
100m x 100m pixels

Image from Satellite B



30m x 30m pixels or  
25m x 25m pixels  
*(small variation between the two)*

Satetytics using SWiR



3.7m x 3.7m pixels

Satetytics pinpoints source location and measures plume and flowrate

- For methane: 3.7-m by 3.7-m pixels enable source identification at the component level
- For all other measurements, 30-cm to 46-cm resolution yields specificity to help you get the earliest possible notification of trouble.



# Satelytics

## GEOSPATIAL ANALYSIS

### Physical Analysis

- ✓ Change Detection
- ✓ Encroachment Analysis
- ✓ Land Use Identification
- ✓ Land Movement Analysis
- ✓ Population Identification
- ✓ Bathymetry
- ✓ Relative Sediment
- ✓ Turbidity
- ✓ Total Suspended Solids
- ✓ Surface Water Temperature
- ✓ Theft Detection
- ✓ Digital Terrain Model
- ✓ Digital Surface Model

### Chemical Analysis

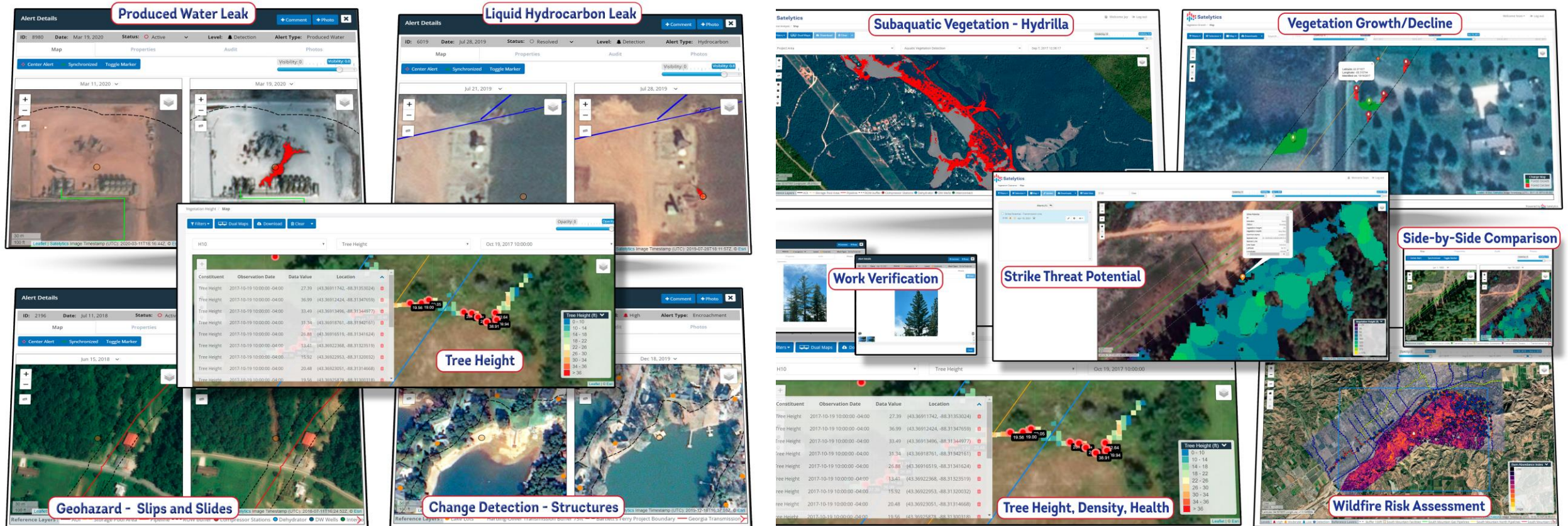
- ✓ Liquid Hydrocarbon Leak Detection
- ✓ Produced Water Leak Detection
- ✓ Methane Leak Detection (on land)
- ✓ Methane Leak Detection (over water)
- ✓ Acid Mine Drainage
- ✓ Phosphorus
- ✓ Arsenic
- ✓ Barium
- ✓ Calcium
- ✓ Chloride
- ✓ Copper
- ✓ Iron
- ✓ Manganese
- ✓ Molybdenum
- ✓ PFAS
- ✓ Nitrogen
- ✓ pH

### Biological Analysis

- ✓ Vegetation Management
- ✓ Chlorophyll-a
- ✓ Phycocyanin
- ✓ Submerged Aquatic Vegetation
- ✓ Tree Density
- ✓ Tree Height
- ✓ Tree Speciation
- ✓ Tree Health (growing season)
- ✓ Tree Health (life cycle)



# Run one or ALL algorithms at the same time....

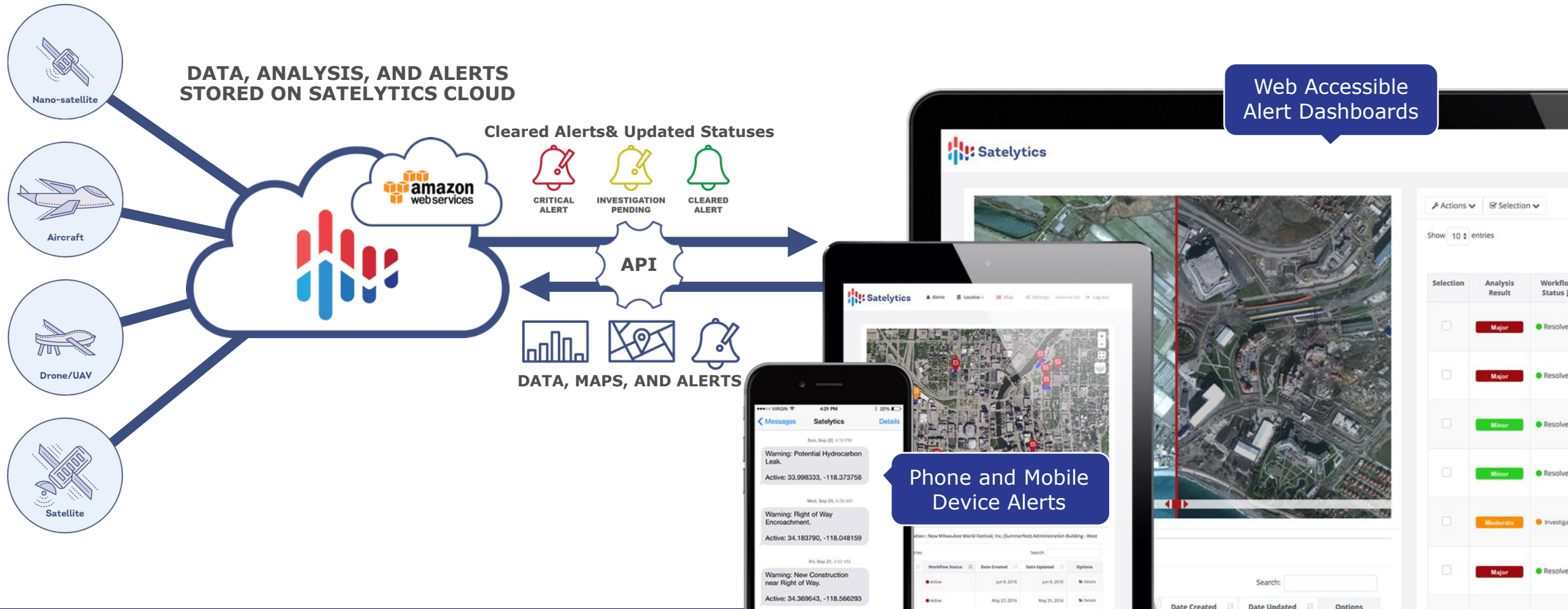


# Why Satelytics stand out – Customer First, Fast Data Delivery, and Actionable

- A challenge focus – Forward operating area, data results within hours of capture, minimize loss and consequences
- Satelytics.io hosted on AWS or Azure instances across the world for data privacy rules.
- Satelytics works **ONLY** with its industry segment clients, no regulators, government and or NGO's.
- Clients never have to sleep with one eye open wondering if Satelytics is playing both sides of the fence.
- Detection of constituents, precision in location and Quantification earmarks Satelytics unique selling points
- Algorithms are passive, contained inside of satelytics.io and ALL 40 can be run simultaneously
- World firsts in the algorithm portfolio includes Methane Emissions, PFAS, CO2, Hydrogen (R&D), Tree speciation; height and health, Produced Water, and Liquid Hydrocarbon.
- All cloud based, no installation on any platform; tablet, browser, or smartphone. No user license fees, and **EVEN** mobile platform for a “non-connected” work environments.



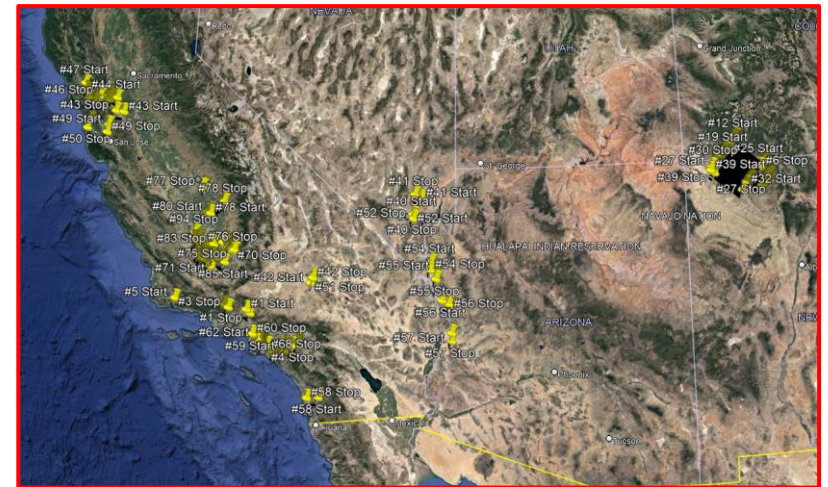
# Cloud hosted, User platforms; Tablet, Browser, Smartphone, and Integration with other Software Applications





## Emissions and the pursuit by Regulators, Government and NGO's

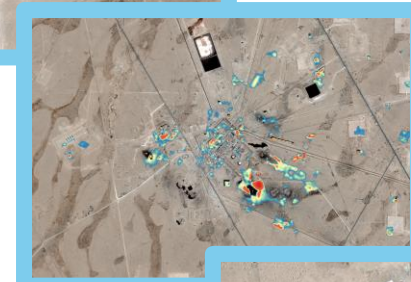
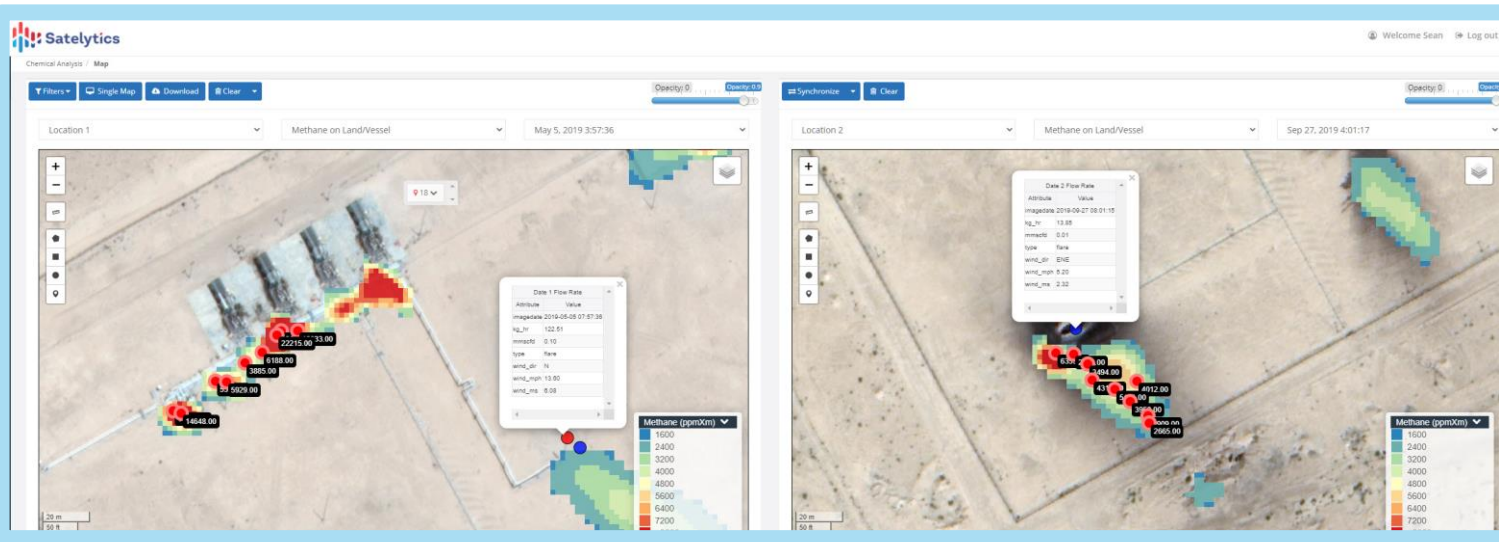
- Airborne base sensor that has been acquiring data since 1986 and carries a hyperspectral sensor from 400nm to 2500nm.
- AVIRIS focuses on greenhouse gas detection, mineralogy, and anthropogenic changes on earth and environment.
- Spatial Resolution 1.0m to 17.0m
- Carbon Mapper
- 296 flights, CH<sub>4</sub> and CO<sub>2</sub> mapping California, 4 Corners and Southern Nevada
- Target, oil and gas, utilities, landfills, and pipelines



# Emissions Detection focus on Methane Leak

Satellytics measures not only the plume but also flowrates

# Methane Detection and Quantification over the Middle East



Methane Plume can be detected to a low of 10 ppmXm

Flowrates have been detected to a low of 1kg/hour or 8 scfm

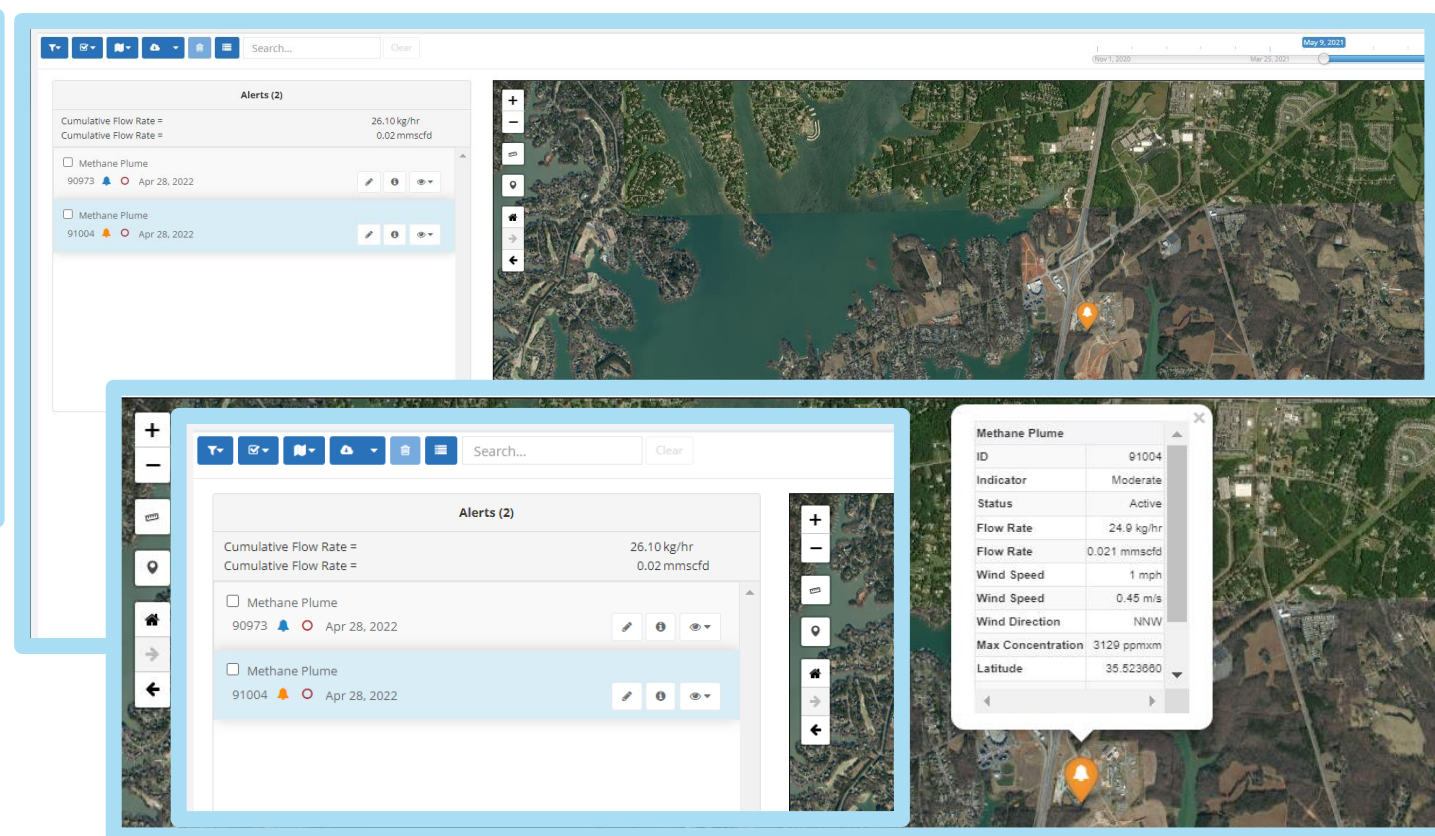
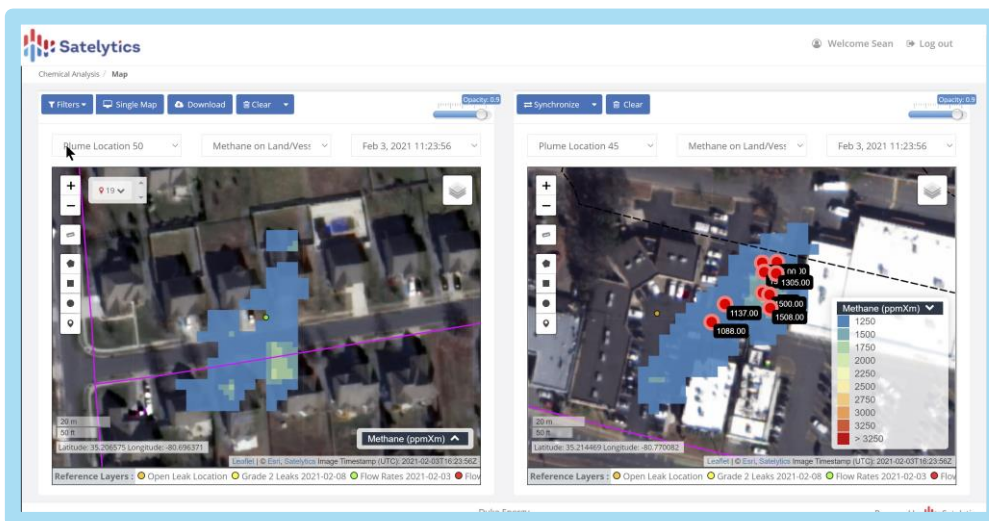




# Results published with some of our Upstream and Midstream Clients – Algorithm Accuracies

Location (Date)	wind speed (m/s)	Flow Rate (kg/hr)	Actual (kg/hr)	ERROR (%)
METEC (3/4/2020)	1.84	12.39	13.12	5.56
VIVER (12/7/2017)	2.07	59.02	56	-5.39

# Traditional LDAR, measurements can be Aggregated for Baseline and ESG using Actual Data

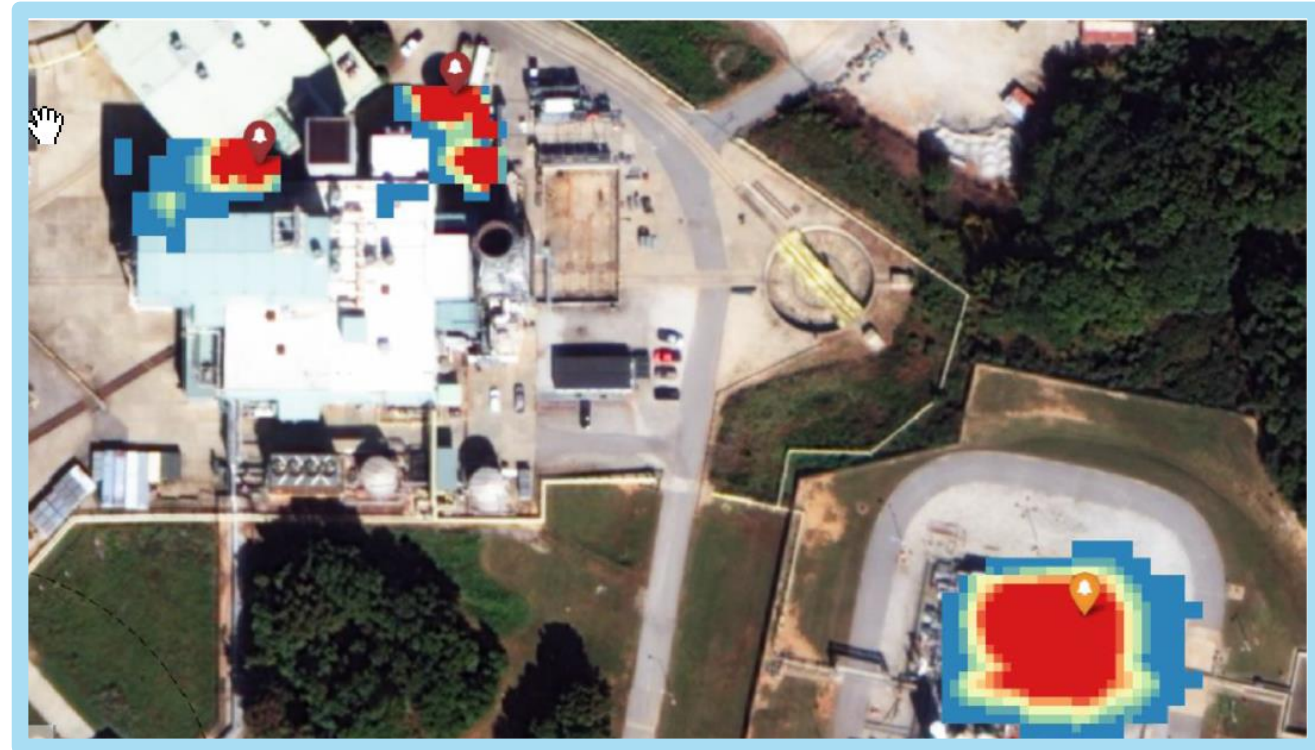
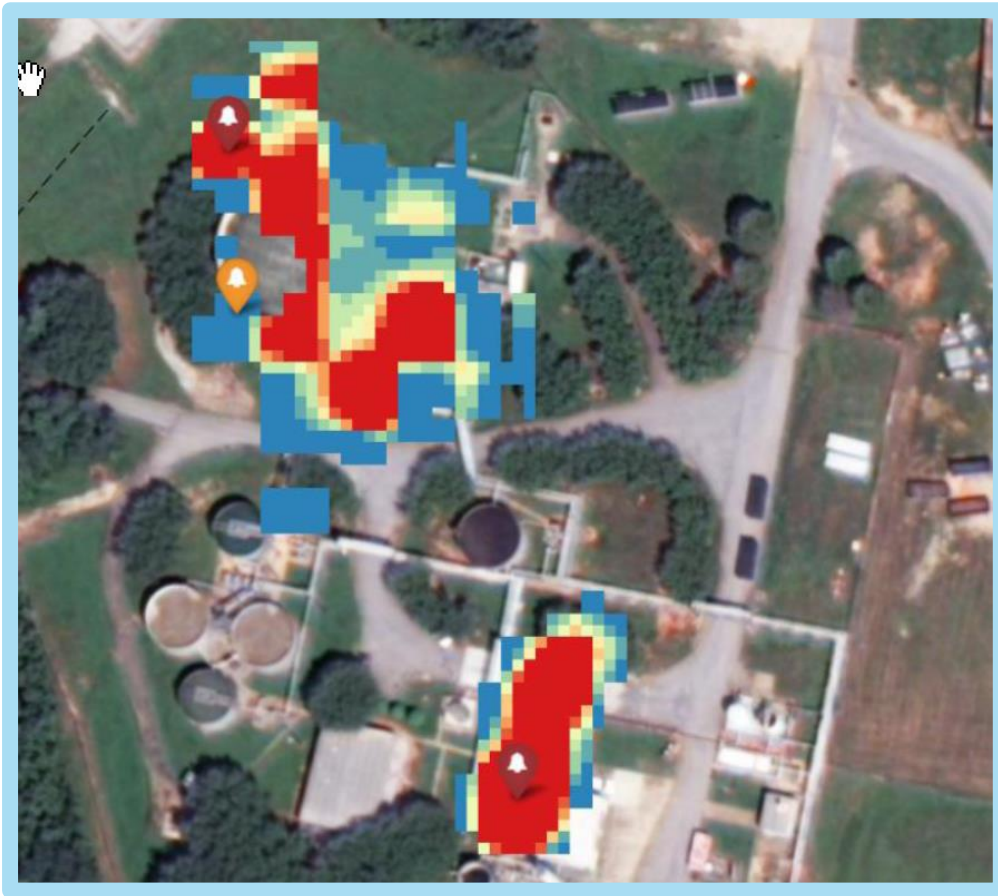


Measuring both plume and flow rates using Satelytics' algorithms

Satelytics.io allows for dual screens to show multi dates or multi locations

Satelytics.io allows users to ring fence an area, a facility or an individual emission to provide a cumulative data set on plume and flowrate

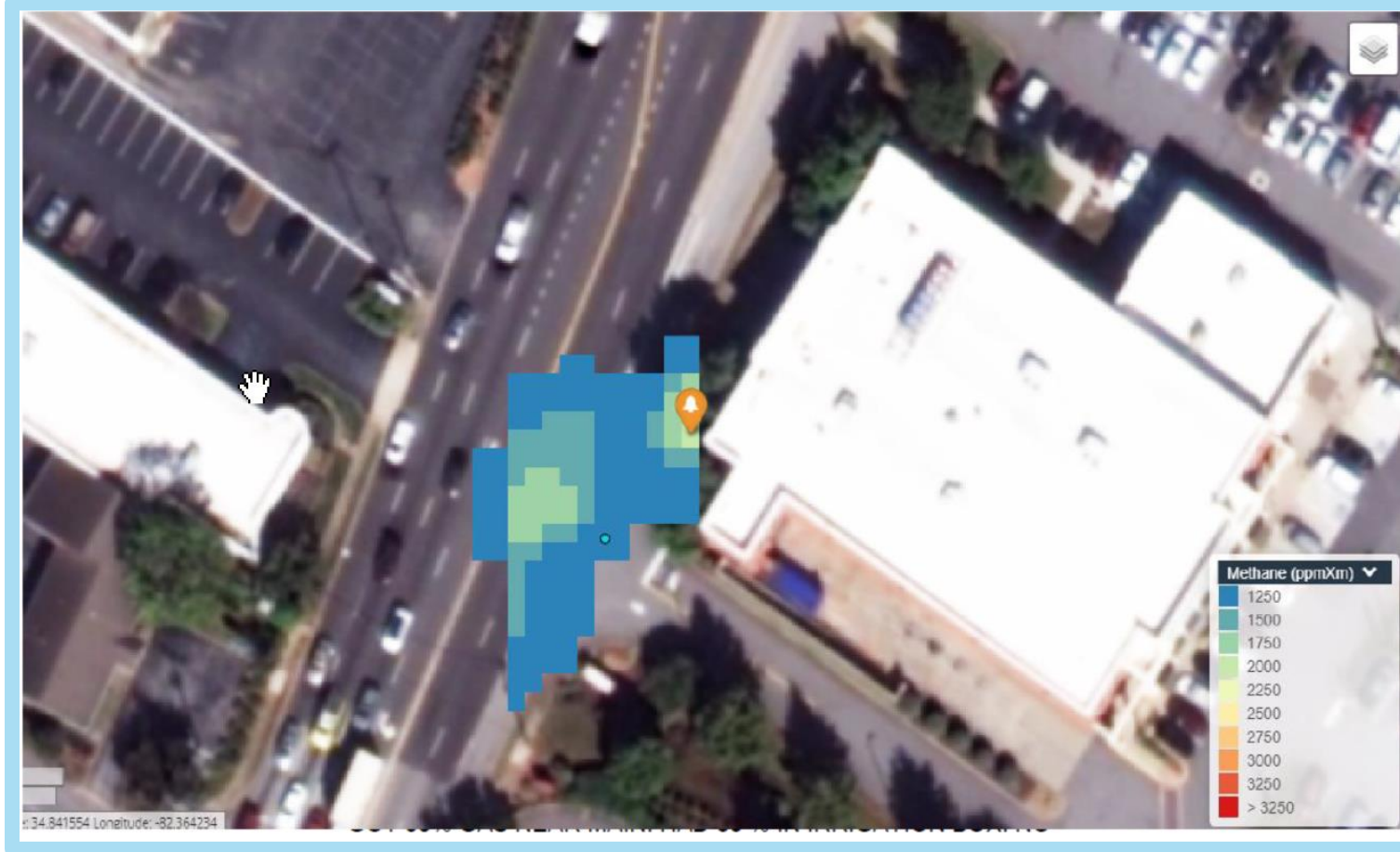
## Data Stewardship – Addressing Upstream and Downstream Leaks



Leaks were “unknown” to the customer before using Satelytics.io



## Urban domain methane measured in parts per million and flow rates in kg/hour



**Measuring both plume and flow rates using Satelytics' algorithms**  
– source of leak marked with alert symbols chosen by customer



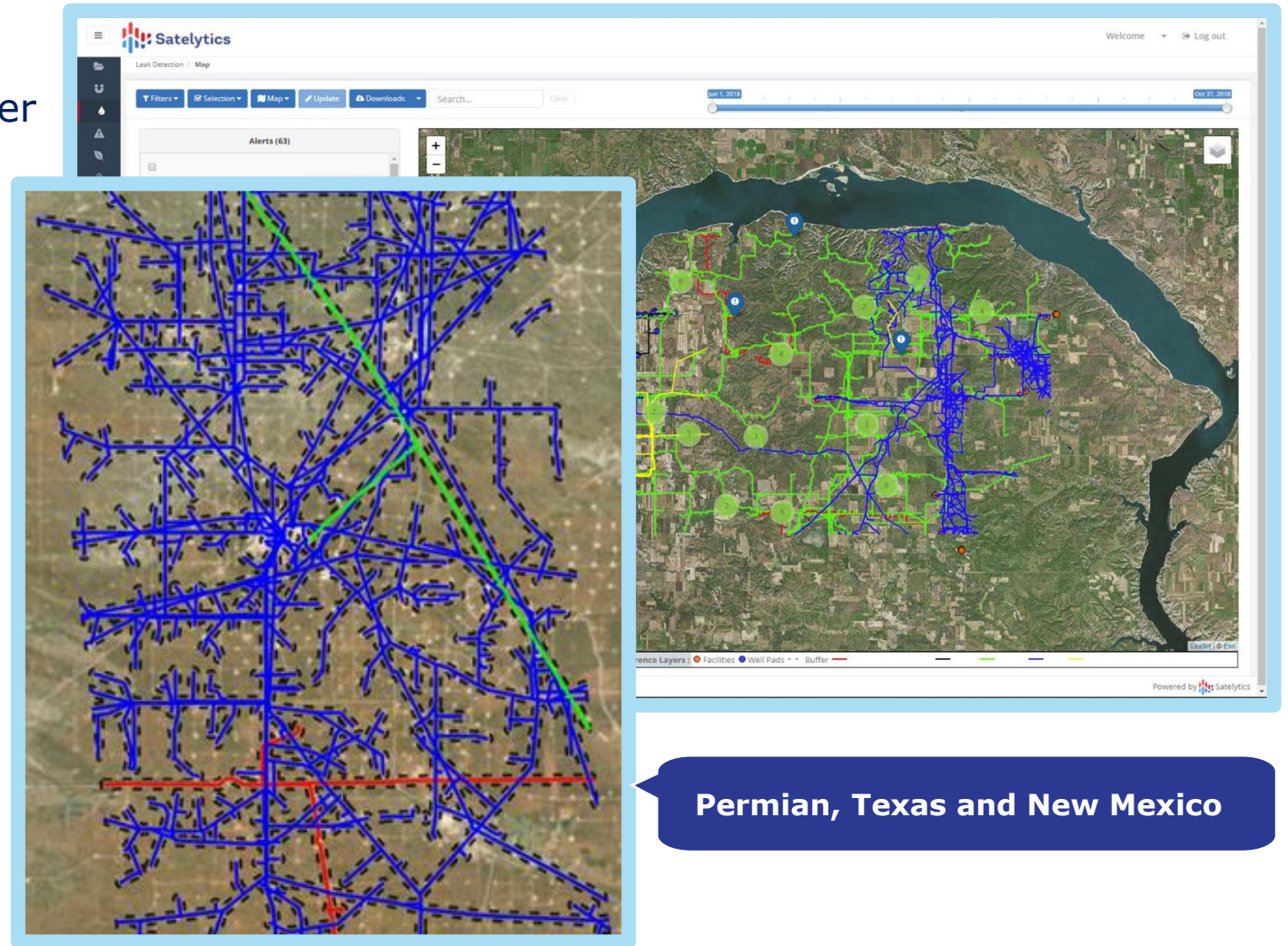
**The meter has a small leak 200 ppmXm seen in image to the right below the insulated union**

# iPIPE - weekly analysis over Bakken and Permian Basins

iPIPE a consortium of oil and gas operators over North Dakota, new Mexico and Texas use satelytics.io to monitor operations weekly



## iPIPE

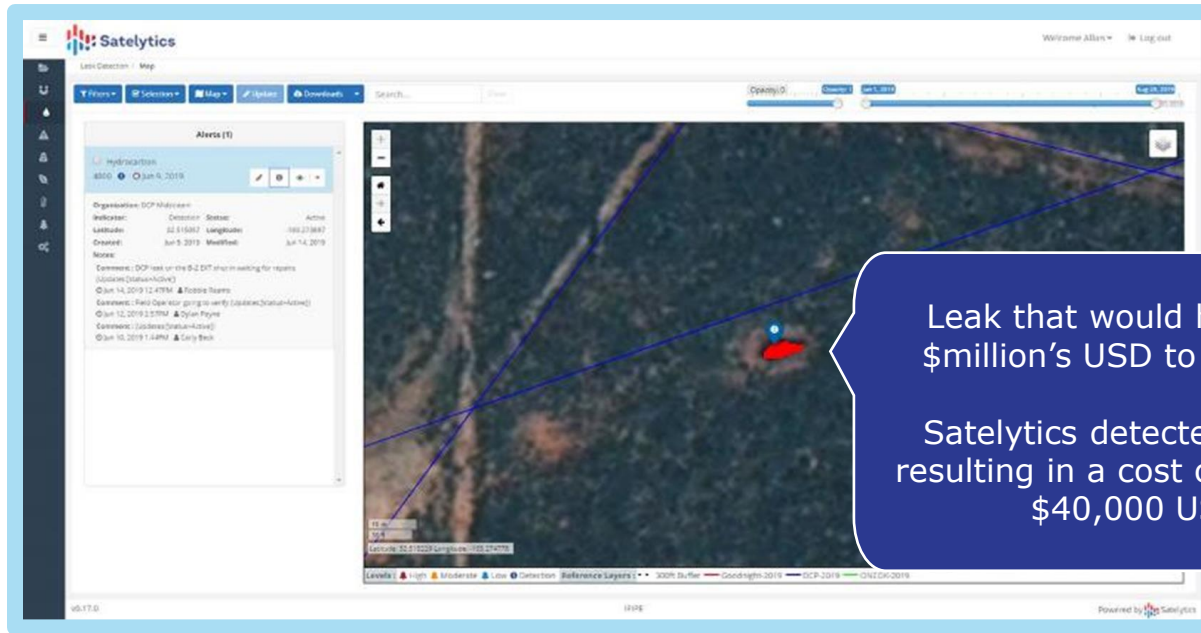


Permian, Texas and New Mexico



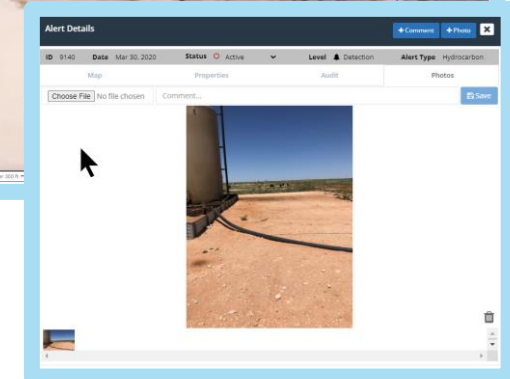
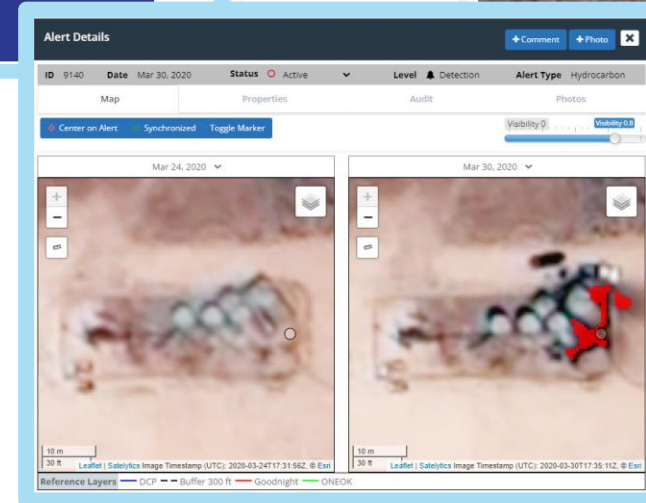
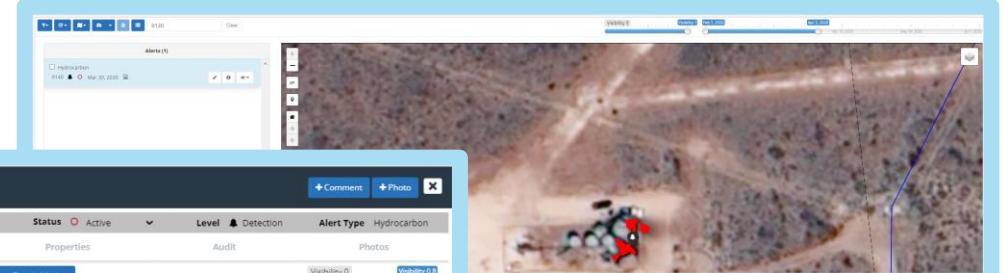
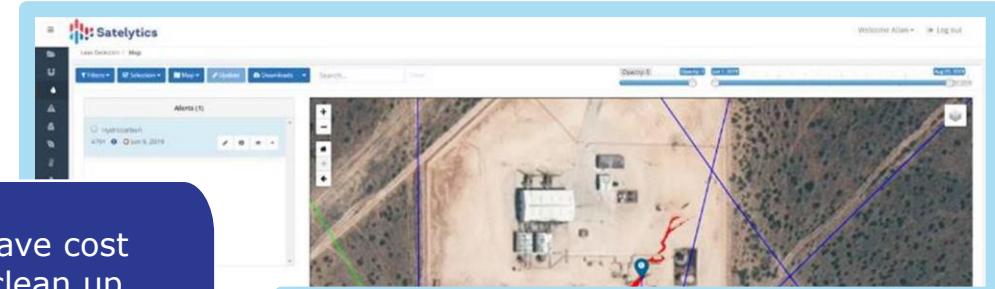
# Satelytics Early Detection and Alerts saving Millions of \$'s USD

## Other alerts over the Permian



Leak that would have cost \$million's USD to clean up.

Satelytics detected it early resulting in a cost of less than \$40,000 USD



- **KEY PERFORMANCE DATA -New Mexico and Texas - week one over the area**
  - **46 confirmed hydrocarbon leaks**  
4809, 4808, 4807, 4805, 4804, 4803, 4802, 4801, 4800, 4799, 4798, 4796, 4795, 4794, 4792, 4791, 4790, 4789, 4970, 4969, 4968, 4966, 5009, 5008, 5007, 5006, 5005, 5004, 5187, 5186, 5571, 5570, 5568, 5567, 5566, 5584, 5582, 5581, 5580, 6063, 6062, 6061, 6060, 6059, 6058, 6057
  - **7 confirmed produced water leaks**  
4972, 4971, 4967, 5107, 5106, 5583, 5579



# Key Performance Data over Permian Basin in Week One

iPIPE

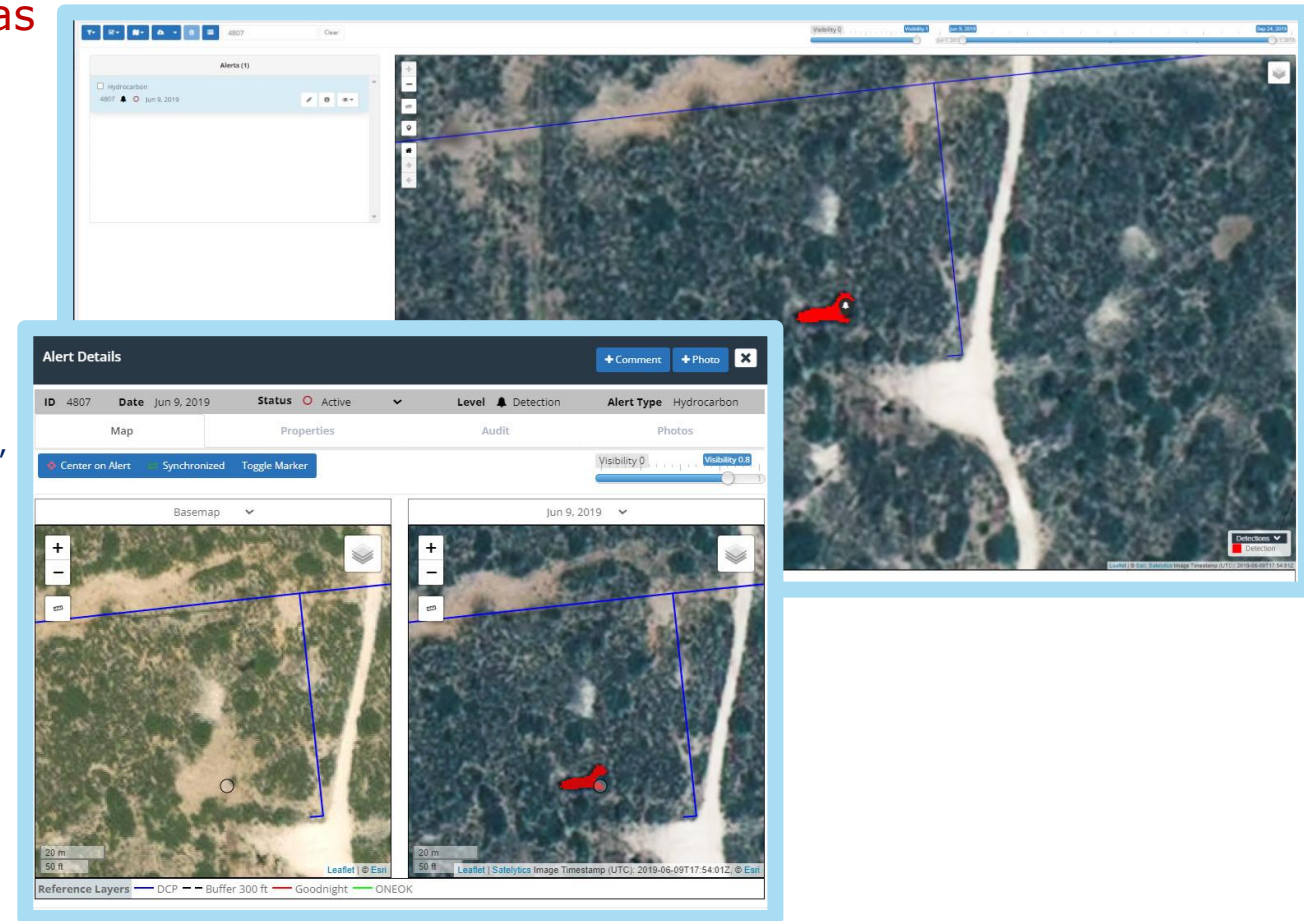
- KEY PERFORMANCE DATA - New Mexico and Texas week one (1) over the area

## 46 confirmed hydrocarbon leaks

Alert ID's - 4809, 4808, 4807, 4805, 4804, 4803, 4802, 4801, 4800, 4799, 4798, 4796, 4795, 4794, 4792, 4791, 4790, 4789, 4970, 4969, 4968, 4966, 5009, 5008, 5007, 5006, 5005, 5004, 5187, 5186, 5571, 5570, 5568, 5567, 5566, 5584, 5582, 5581, 5580, 6063, 6062, 6061, 6060, 6059, 6058, 6057

## 7 confirmed produced water leaks

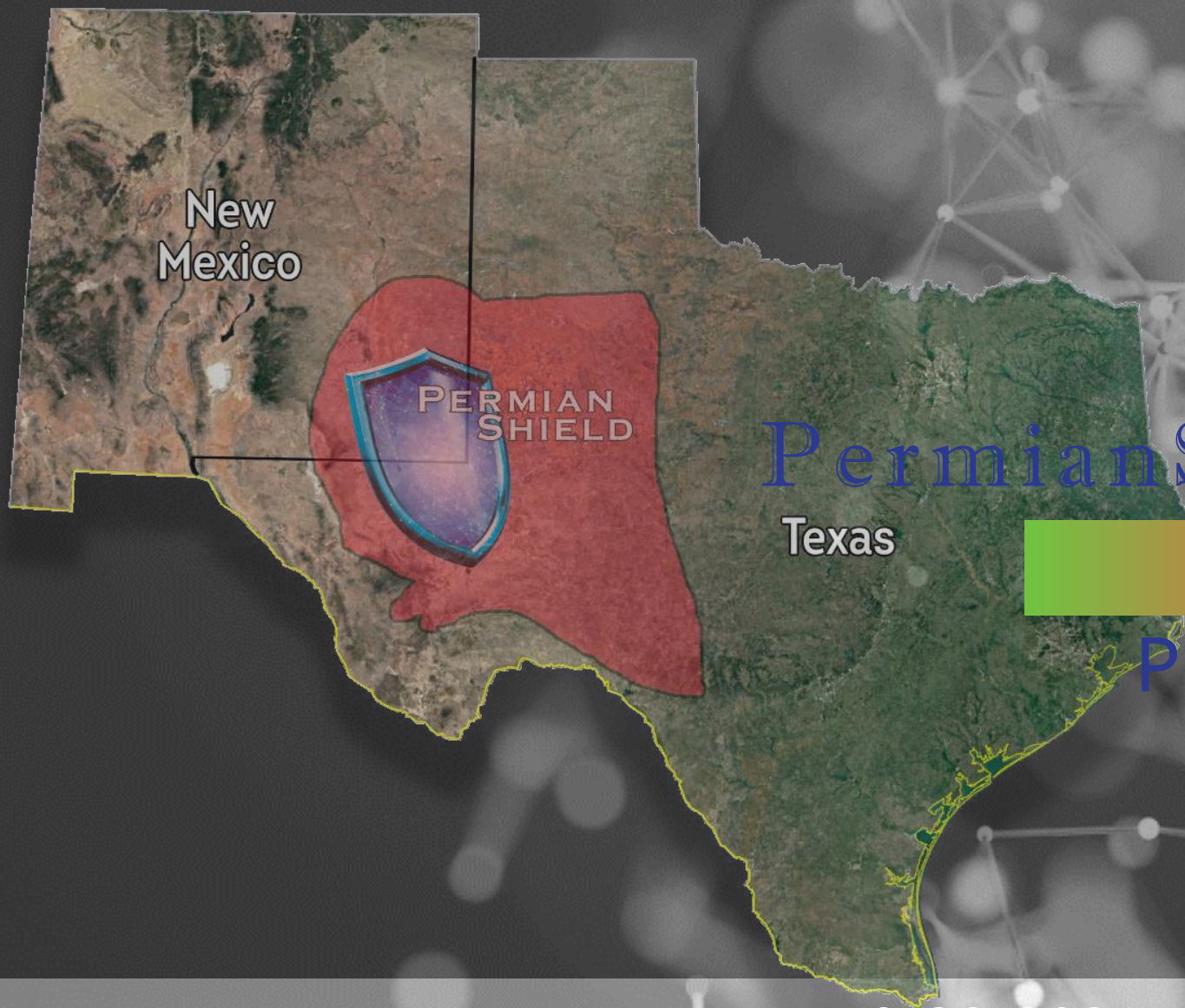
Alert ID's - 4972, 4971, 4967, 5107, 5106, 5583, 5579



# Satellytics is “kicking off” Permian Shield







PermianSHIELD

Texas

VALUE  
PROPOSITION



# Value Proposition

**Geospatial analytics applied to widely-dispersed, overlapping assets of oil & gas and pipeline operators.**

**Early warning of events and hazards that cause financial, environmental, and public relations pain points.**

**Because these assets are overlapping in oil-producing basins, a joint industry or consortium approach to using Satelytics drives efficiencies and is the only logical solution.**

Share costs

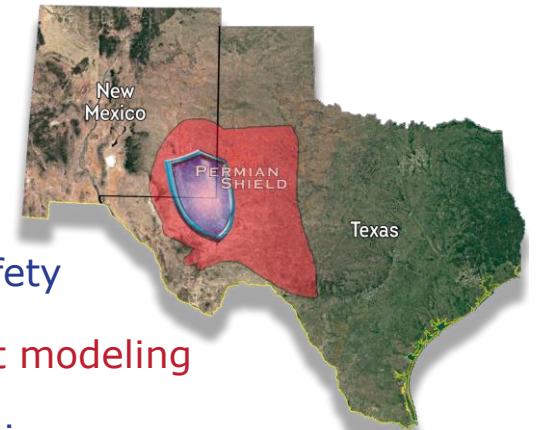
Reduce risk by early detection

Less field hours, thus improved safety

Report on measurements, not modeling

Reduced insurance premiums

Use advanced technology instead of human factor

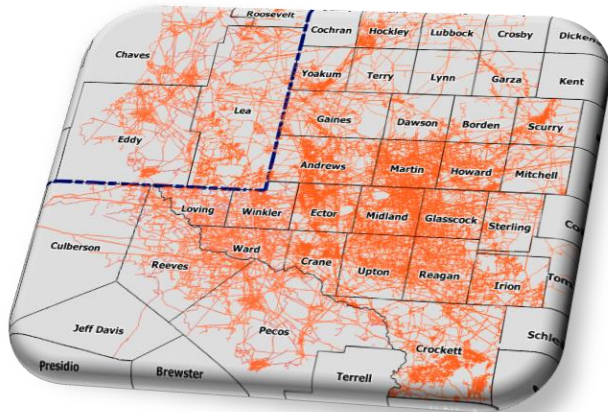


## Cooperation in non-competitive space

- Data is the most expensive ingredient in geospatial analytics.
- Each company only sees its own data.
- Efficiencies and overlapping infrastructure drives participant's individual cost down.
- Secure data only seen by each participants user community

➡ Share the data costs NOT any OUTCOMES.

### OVERLAPPING ASSETS, PRIVATE CONCERNS



Only logical path is to monitor as a community

- Pipeline leaks (crude oil and produced water)
- Methane emissions
- Encroachments
- Land movements
- Water quality

**But, maintain company integrity and data privacy**



# Satelytics' Customers





**Our objective was to provoke thought, challenge existing methods, and illustrate how your peers are putting technology to some pressing challenges**

**Questions Please!**





Questions, comments, and suggestions please share with...

Sean Donegan

[sdonegan@satelytics.com](mailto:sdonegan@satelytics.com)

Mobile +001 (440) 725 6135