



Prepared For:



# How Satelytics Works

## Data Acquisition

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.



Satellites



Nano-satellites



Aircraft



Drone/UAV



Fixed/Persistent Platform



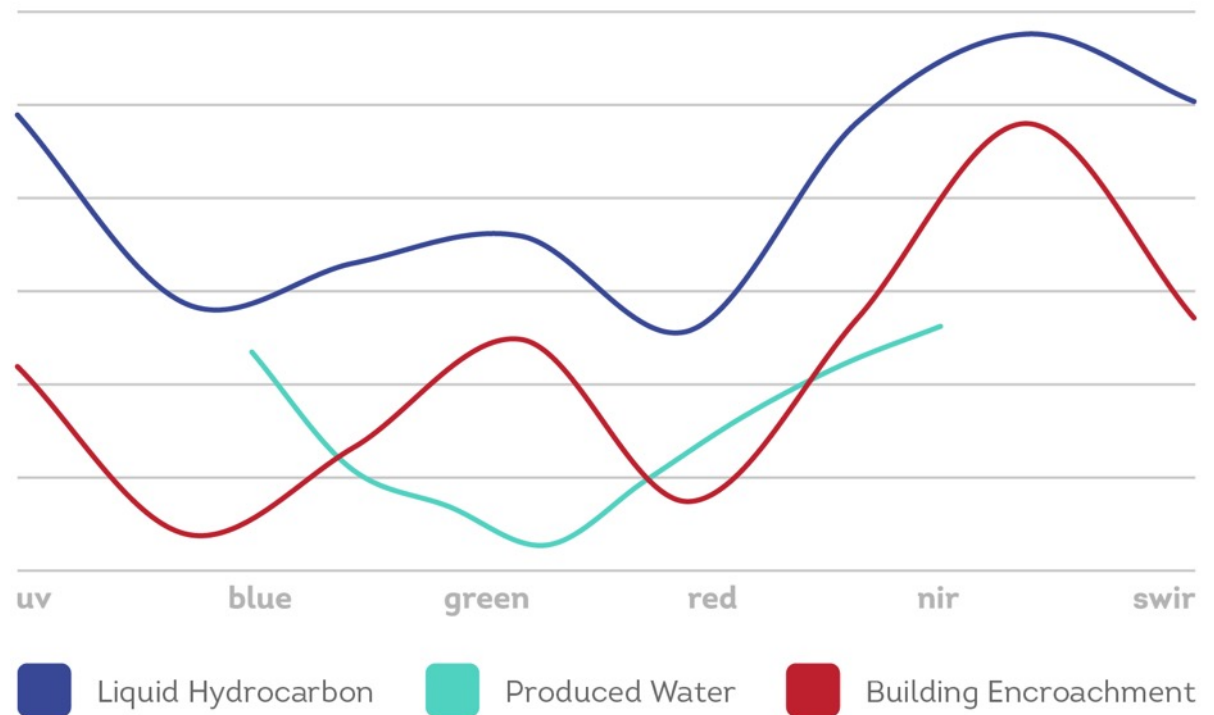
# How Satelytics Works

## Algorithms

Satelytics applies complex, machine learning algorithms to isolate the spectral signatures of objects and phenomena contained in the data, or the pixels, of an image.

Using different bands and computing techniques, our scientists can determine whatever it is we're observing using those spectral signatures.

## Spectral Signatures



# How Satelytics Works

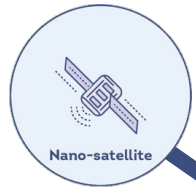
## Analytics

Satelytics processes petabytes of data comprising thousands of individual aerial or satellite images and builds a repository of spectral signatures.

We can then use Satelytics to run predictive models or render that data into interactive displays, alerts, and visualizations.



# Integration With Other Software Applications on a Number of Platforms



Nano-satellite



Aircraft



Drone/UAV



Satellite

DATA, ANALYSIS, AND ALERTS  
STORED ON SATELYTICS CLOUD



Cleared Alerts & Updated Statuses



DATA, MAPS, AND ALERTS

Web Accessible  
Alert Dashboards

Selection	Analysis Result	Workflow Status
<input type="checkbox"/>	Major	Resolved
<input type="checkbox"/>	Major	Resolved
<input type="checkbox"/>	Minor	Resolved
<input type="checkbox"/>	Minor	Resolved
<input type="checkbox"/>	Moderate	Investigation
<input type="checkbox"/>	Major	Resolved

Phone and Mobile  
Device Alerts

Warning: Potential Hydrocarbon Leak.  
Active: 33.998333, -118.373758

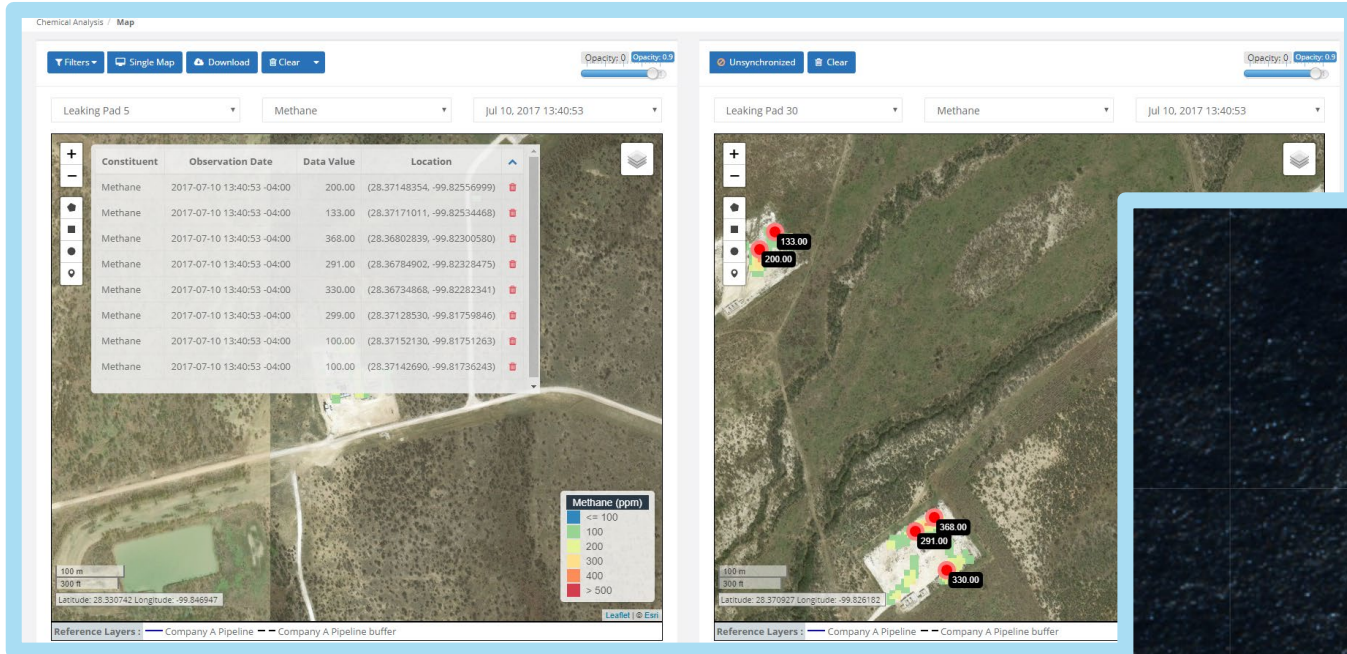
Warning: Right of Way Encroachment.  
Active: 34.183790, -118.048159

Warning: New Construction near Right of Way.  
Active: 34.369643, -118.566293

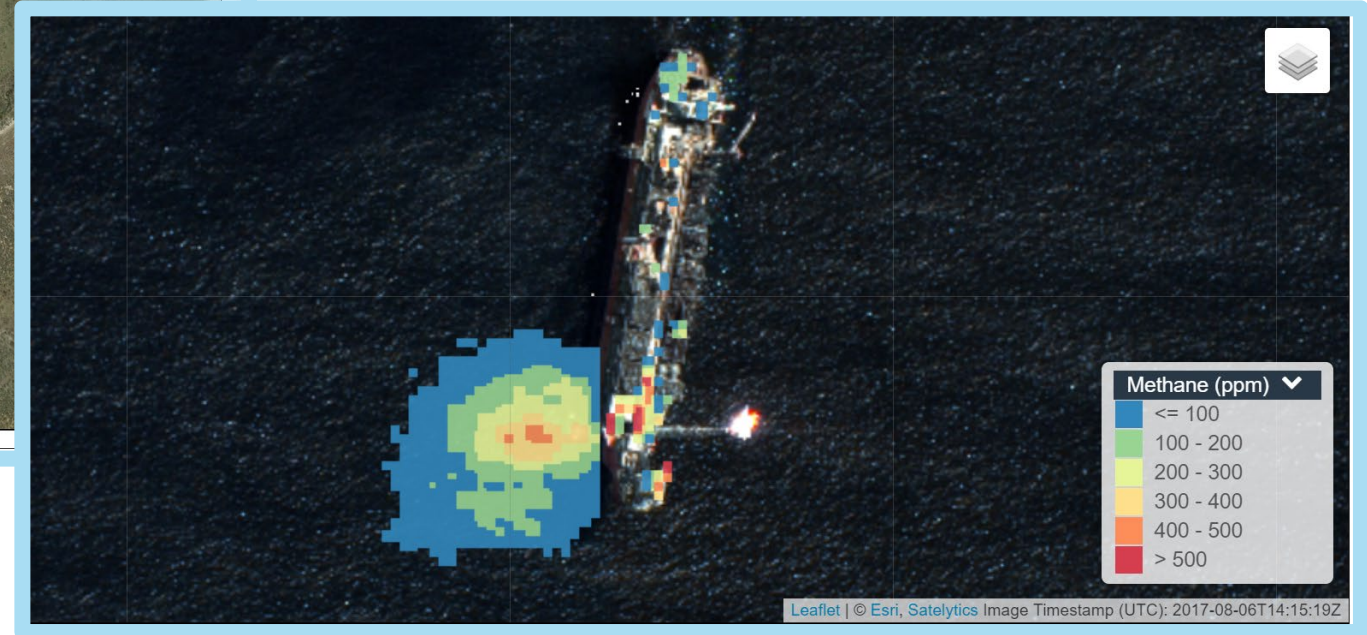
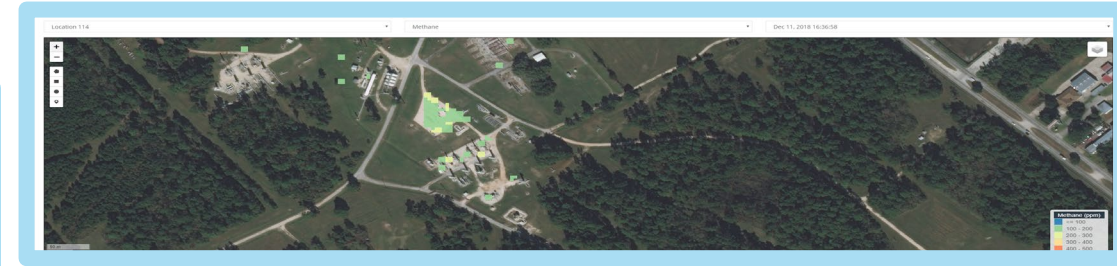
# Methane Leak Detection

Gas leak detection during the Aliso Canyon gas leak near Porter Ranch, Los Angeles using satellite data.

# Anadarko, bp, and Energy Transfer Partners were early adopters



Anadarko Operational Area in Texas



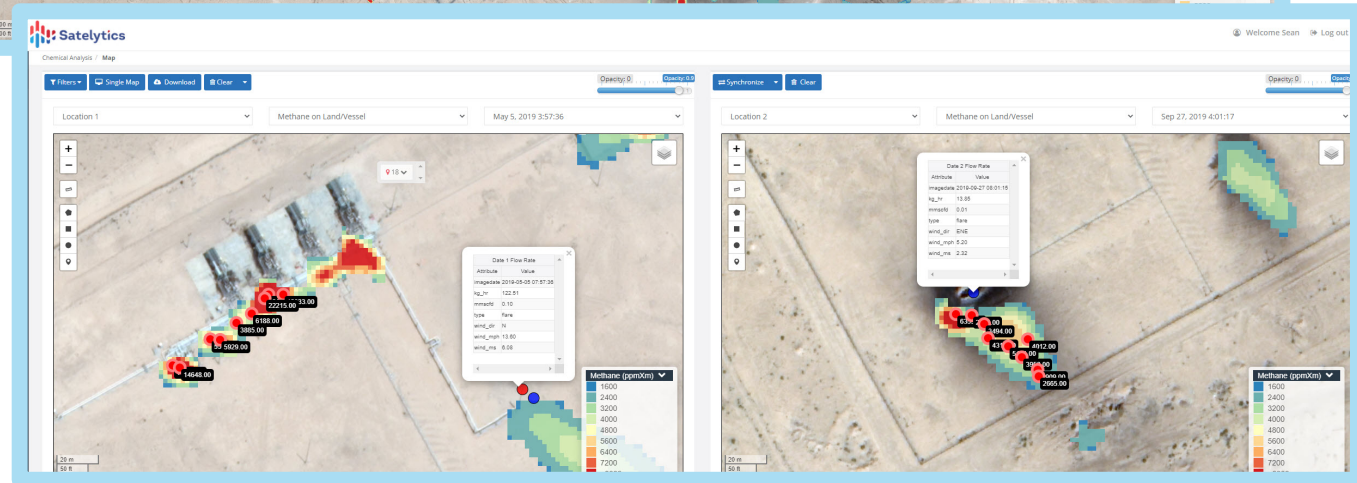
Methane Concentration

BP's Operational Area in Angola

# Anadarko, bp, and Energy Transfer Partners were early adopters



Measuring both plume and flow rates using Satelytics' algorithms



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



## Current Results – 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

# VIVER Comparison – Original Capture - December 7, 2017

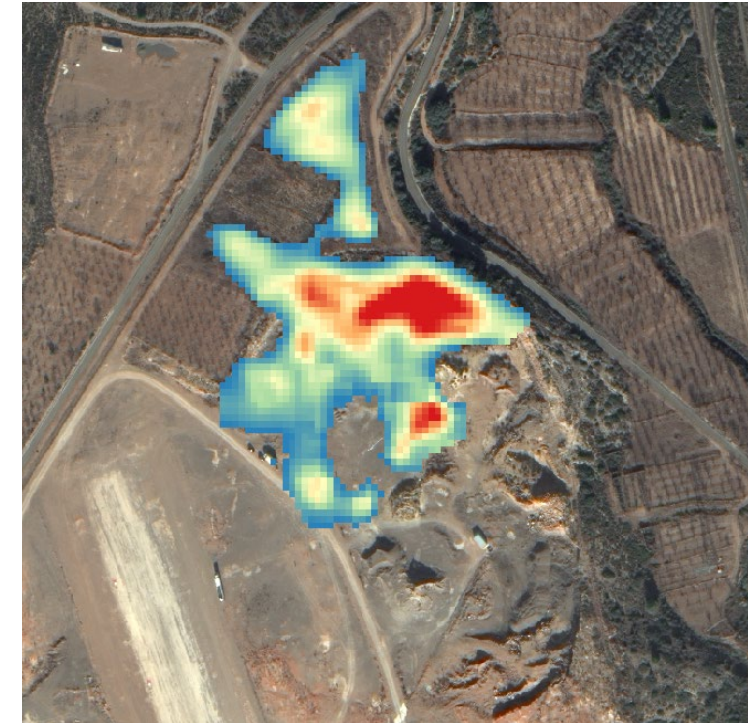
**Details Release Rate: 56 kg/hr Wind Speed:  $\sim 2.07$  m/s Wind Direction:  $\sim 198^\circ$**



**First Release**



**Improving**

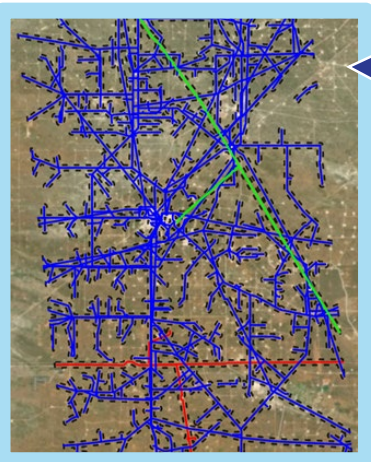


**Today**

# World First – iPIPE consortium over the Bakken

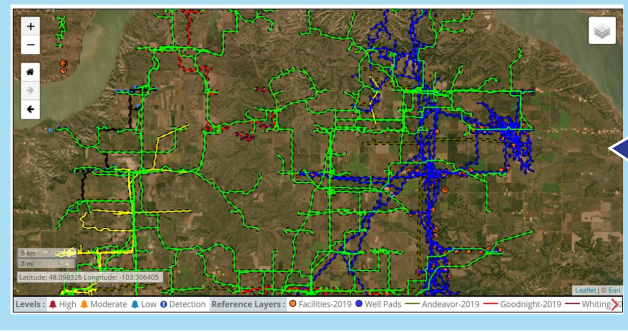


# iPIPE Members - weekly analysis over Bakken and Permian Basins



Permian, Texas and New Mexico

Logos of iPIPE member companies: Andeavor, Equinor, Goodnight Midstream, Hess, Oasis Midstream Partners, Oneok, Whiting, DCP Midstream, and Enbridge.



Bakken, North Dakota

Produced water leak

Liquid hydrocarbon leak

Vegetation tree height

Land movement - slips and slides

Change detection structures



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

A leak detected early would have cost millions of dollars in remediation. This was identified with costs in the tens of thousands

The screenshot displays the Satelytics web application interface. At the top, the Satelytics logo and navigation options like 'Welcome' and 'Log out' are visible. Below the header, there's a 'Leak Detection / Map' section with various controls including filters, selection, map, update, and download options. A sidebar on the left shows a list of alerts, with two alerts listed: ID 3149 and 3150, both dated Oct 17, 2018. The main map area shows a satellite view of an oil field with a network of blue lines representing well pads and facilities. A detailed 'Image Comparison' window is open, showing two satellite images of a well pad. The left image is from Sep 5, 2018, and the right image is from Sep 28, 2018. The right image shows a red area indicating a leak. The comparison window includes fields for 'ID: 3143', 'Date: Sep 28, 2018', 'Status: Resolved', 'Level: Detection', and 'Alert Type: Hydrocarbon'. It also has buttons for 'Center Alert', 'Synchronized', and 'Toggle Marker', and an 'Opacity' slider. At the bottom, a legend identifies 'Facilities' (orange circle), 'Well Pads' (blue circle), and 'Buffer' (red line). The interface is powered by Satelytics.



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

The screenshot displays the Satelytics web application interface. At the top, the Satelytics logo is visible on the left, and the user name 'Welcome Allan' and 'Logout' are on the right. Below the header, there are navigation tabs for 'Filters', 'Scenarios', 'Map', 'Updates', and 'Downloads'. A search bar and a date range selector (set to 'Jun 5, 2019') are also present. The main content area is split into two parts: a left-hand 'Alerts (1)' panel and a central satellite map. The alert panel shows details for a 'Hydrocarbon' alert detected on 'Jun 5, 2019'. It lists the organization as 'DCP Midstream', the location as 'Midland, Texas', and provides coordinates (Latitude: 32.515937, Longitude: -102.273687). A 'Notes' section contains several entries, including a comment about a DCP leak on the 9-2 DKT and subsequent updates. The satellite map shows a red circular alert marker over a field area, with blue lines indicating a 300m buffer zone. A legend at the bottom of the map identifies various layers like 'High', 'Moderate', 'Low', 'Detection', and 'Reference Layers'. The bottom of the interface shows the version 'v5.17.0', the acronym 'IPIRE', and the text 'Powered by Satelytics'.

Alerts (1)

Hydrocarbon  
6300 • Jun 5, 2019

Organization: DCP Midstream

Indicator:	Detection	Status:	Active
Latitude:	32.515937	Longitude:	-102.273687
Created:	Jun 5, 2019	Modified:	Jun 14, 2019

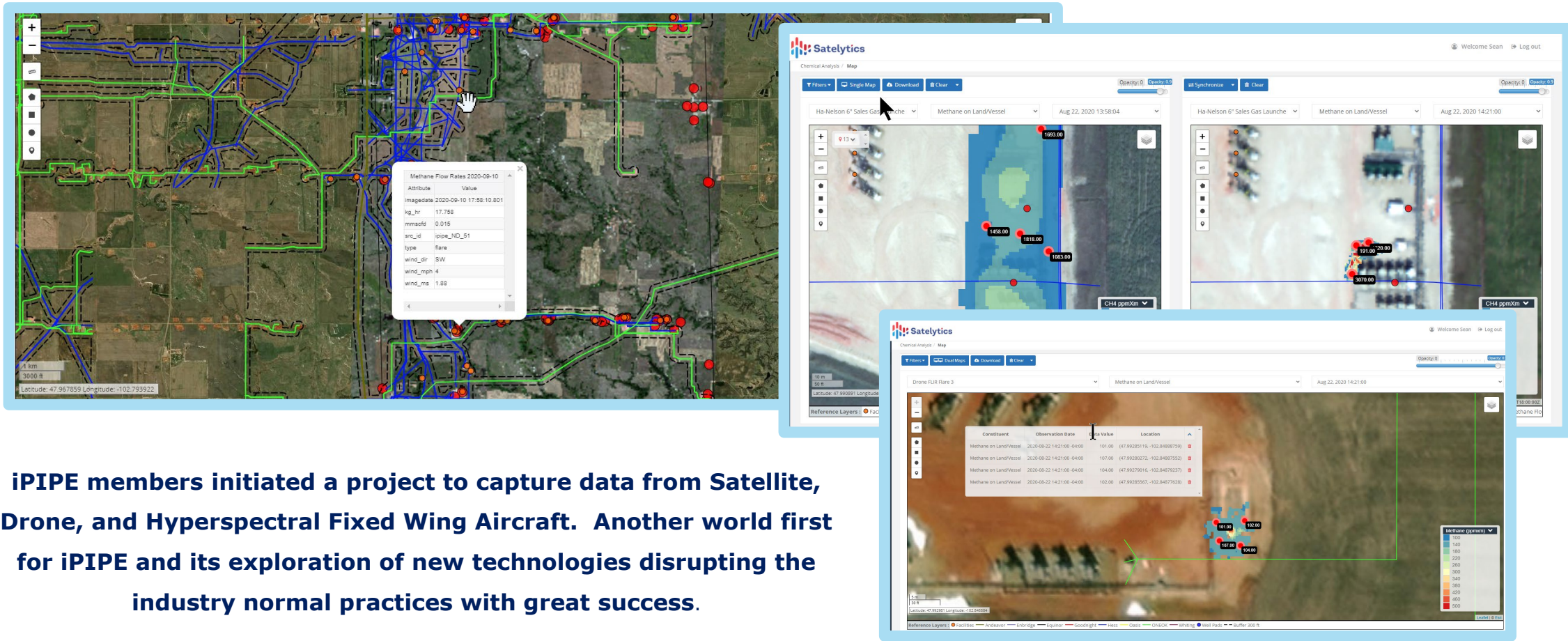
Notes:

- Comment: DCP leak on the 9-2 DKT show in setting for repairs (Updates/Status=Active)
- Jun 14, 2019 12:47PM • Toggle Teams
- Comment: Field Operator going to verify (Updates/Status=Active)
- Jun 12, 2019 2:57PM • Dylan Payne
- Comment: (Updates/Status=Active)
- Jun 10, 2019 1:44PM • Carly Beck

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

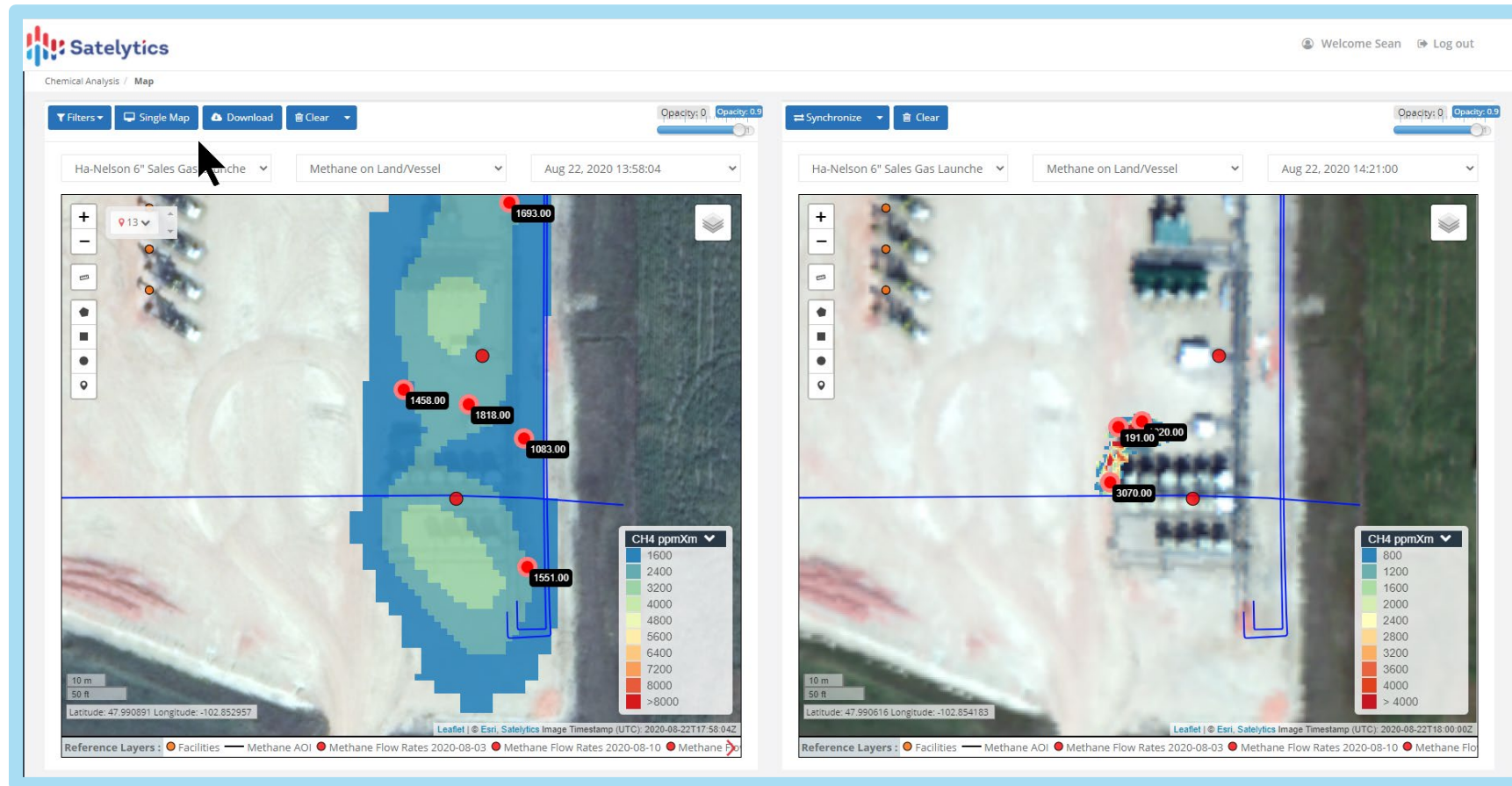
Satelytics detected it early resulting in a cost of less than \$40,000 USD

## Data Fusion – Taking Data from Satellite, Drone, and Fixed Wing Hyperspectral Aircraft



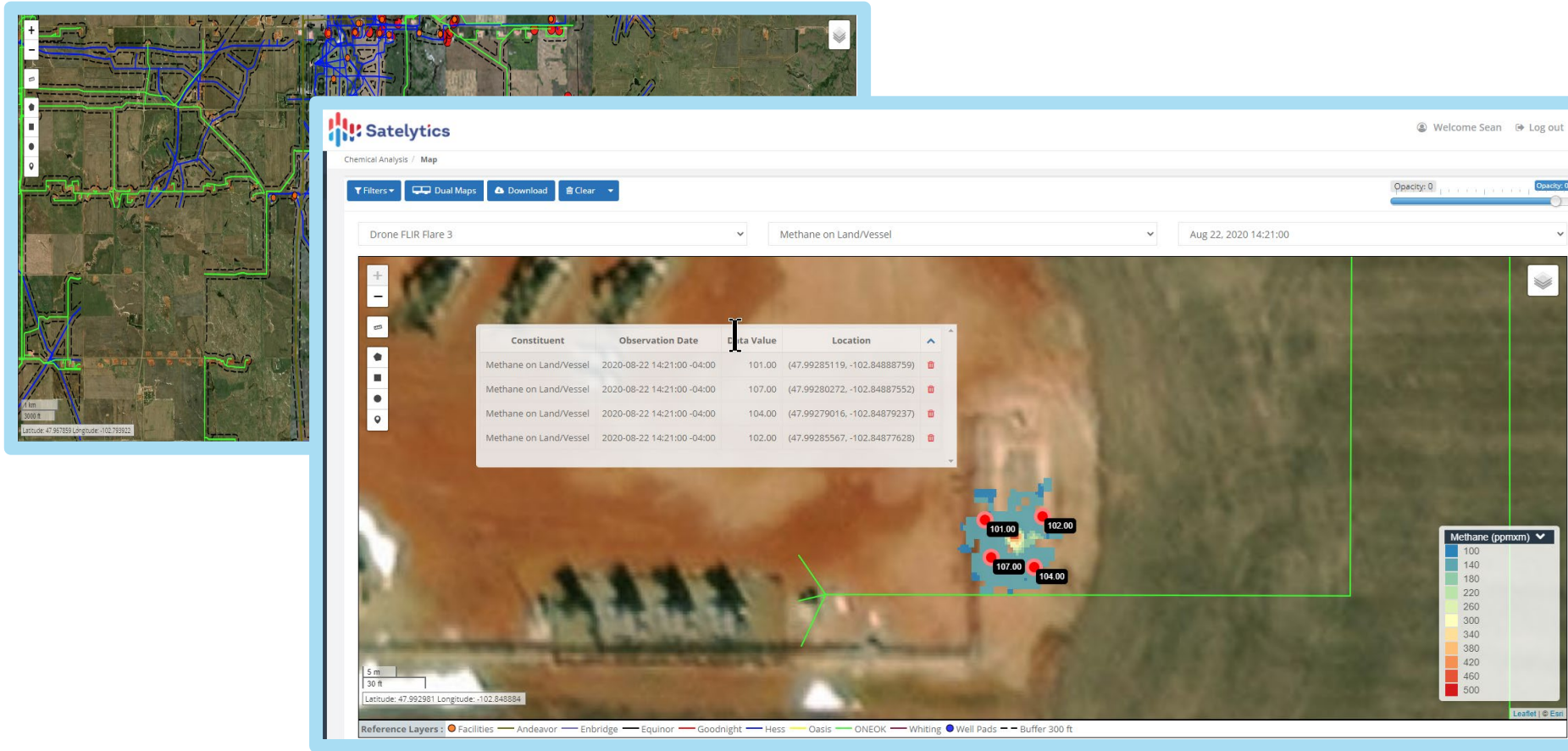
**iPIPE members initiated a project to capture data from Satellite, Drone, and Hyperspectral Fixed Wing Aircraft. Another world first for iPIPE and its exploration of new technologies disrupting the industry normal practices with great success.**

## Data Fusion – Measuring Flow Rates and Plumes using SWIR and Hyperspectral





## Data Fusion – Satellite data using SWIR to identify, quantify Methane both Plumes and Flow Rates



**Drone data  
captured over the  
Bakken, measuring  
the methane plume  
in parts per million**



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

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