



Detecting Nascent Pipeline Leaks

Rick Schrynemeeckers

Schrynemeeckers@AGIsurveys.net

- Pipeline leaks occur and can cost companies **billions** of dollars.
- Current leak detection methods primarily detect significant or catastrophic leaks.
- The Amplified Geochemical Imaging (AGI) technology is the only method that can detect nascent leaks, thus preventing catastrophic leaks and **saving companies billions of dollars**.
- The AGI method is unique, patented and **cannot be duplicated**.
- Field trials over the last couple of years have definitively shown this new application to AGI's existing technology works well.
- AGI does not currently have the resources or industry contacts to penetrate the pipeline market in an efficient or rapid manner.
- Amplified Geochemical Imaging is currently seeking a Commercialization Partner to help bring this new application to the market.

The Problem - Pipeline Leaks



The United States has more than 2.4 million miles of pipeline and 72,000 miles of crude oil pipe.

The U.S. boasts the world's largest network of pipelines, nearly enough to circle the globe three times.

But, unfortunately pipelines can and do leak.

Real World Example: One of Many



In 2018 Enbridge spilled over 1,000,000 gallons of tar sands oil in Michigan's Kalamazoo river.

Fine: \$177 mm

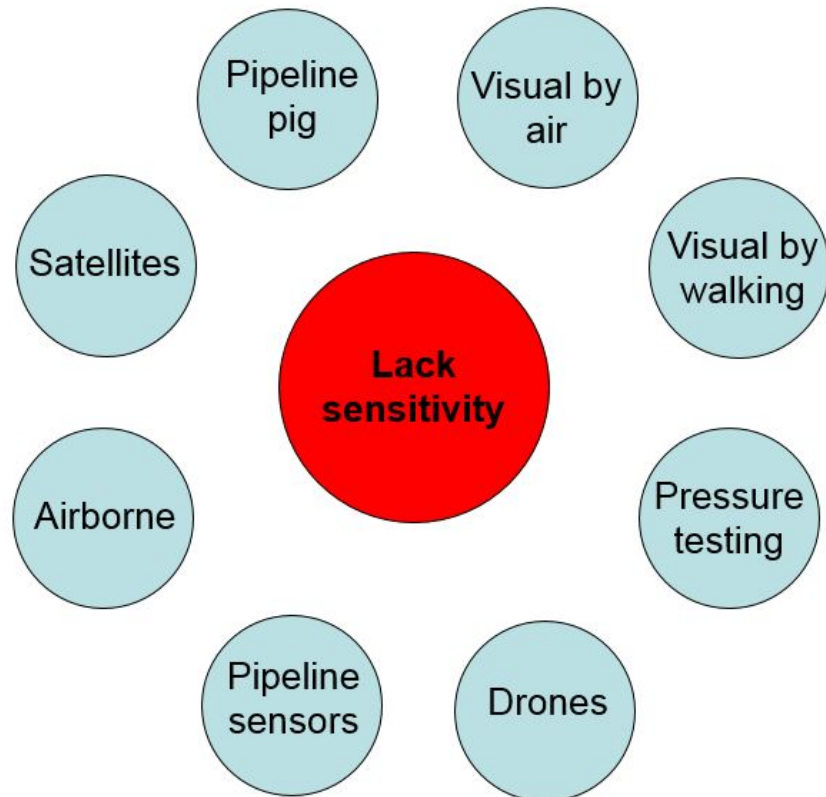
Clean-up costs: \$1.2 billion

Legal fees: ????



The Other Problem

Leak Detection Options



Pressure Test

$$t = \frac{PD}{2(SEW + PY)} \quad (3a)$$

$$t = \frac{P(d + 2c)}{2[SEW - P(1 - Y)]} \quad (3b)$$

Min. reqd. thickness,

Min. reqd. nominal pipe thickness = $t_m / (1 - 0.125)$ or $t_m + a$

where .125(12.5%) = mill tolerance for seamless pipes per ASTM std.

a = mill tolerance in mm for other pipes per ASTM std.

P=internal design pressure
D=OD of pipe
S=Allowable Stress
E=Weld Quality factor
Y=Factor from code
W=weld joint strength reduction factor
c= sum of mechanical allowances, corrosion, erosion etc.

$t_m = t + c$

This **thickness to be rounded off** to the **next higher schedule**.

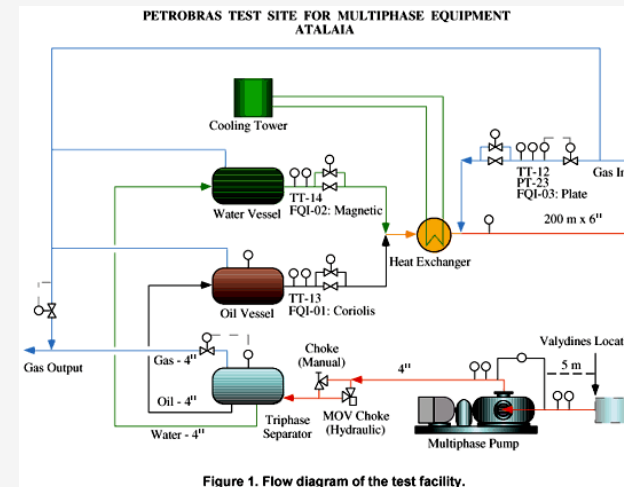


Figure 1. Flow diagram of the test facility.



The Solution - AGI's Method

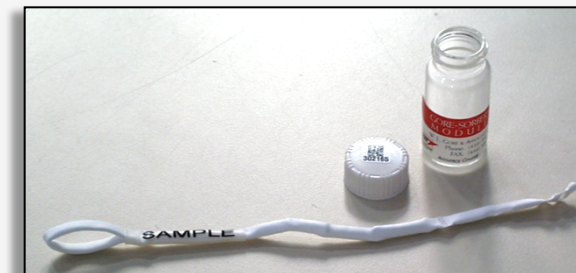
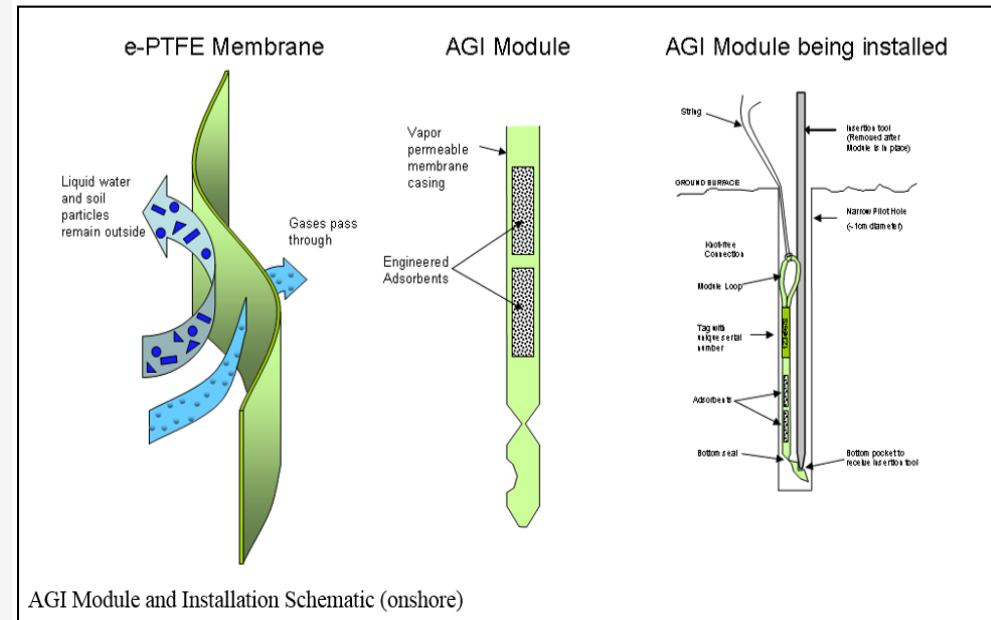
Surface geochemistry provides another option for the measurement of pipeline leakage.

AGI's technology is the most sensitive soil gas surface detection system in the world.

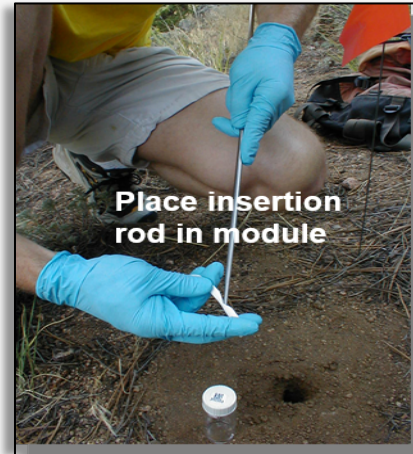
AGI achieves this by using a **patented** passive sorber – [services cannot be duplicated](#).

Hydrocarbon vapors pass through the membrane and concentrate on the polymers within.

This results in a 1,000-fold lower, parts per billion (ppb), detection of hydrocarbons.



Deployment



The AGI modules are typically deployed just below the surface along the pipeline.

The field person drills a 1" diameter hole to a depth of approximately 3 feet for each module, as seen on the right.

The module is then inserted into the hole. Once completed the hole is collapsed to cover the module.

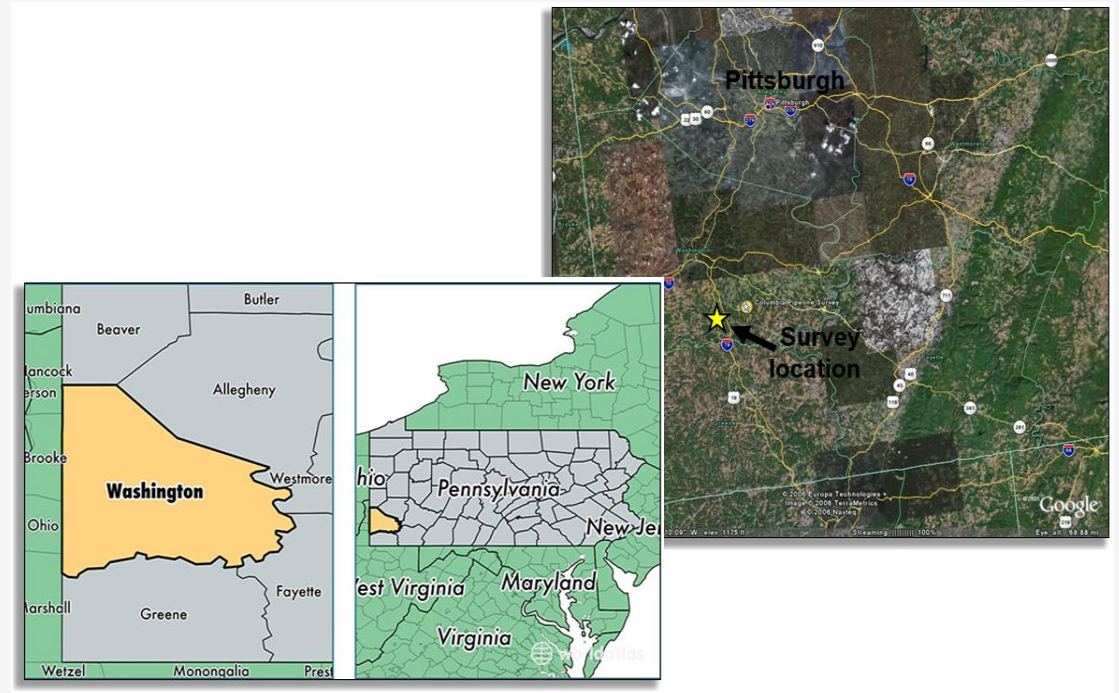
Modules are typically retrieved within 2 – 4 days.

Columbia Pipeline Case Study

This Columbia pipeline case study took place in southwest Pennsylvania, just south of Pittsburgh.

The natural gas pipeline was buried at a depth of approximately 6 feet.

Approximately 85 passive samplers were deployed just below the surface along the 1 mile survey with variable spacing between 50 – 75 feet.



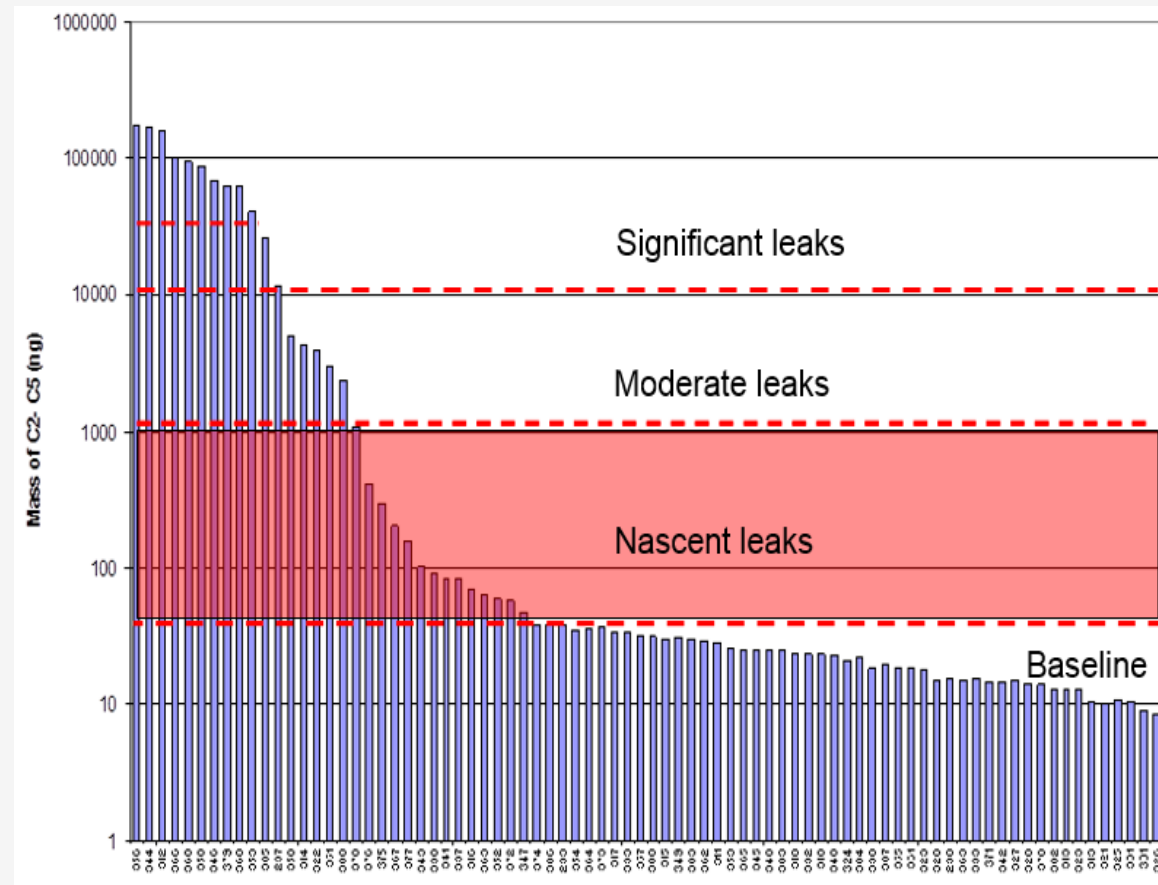
Four Major Divisions in the Data Set

The AGI method detected compounds from C_2 – C_5 and plotted them on a log scale from highest to lowest.

The data indicated 12 samples above the 10,000 ng level, quickly identifying 12 significant leak points along the pipeline.

The data also identified 6 moderate leaks between 1,000 – 10,000 ng.

The data identified 13 possible nascent leaks between 80 – 1,000 ng along the pipeline, that would not be detectable by other methods.



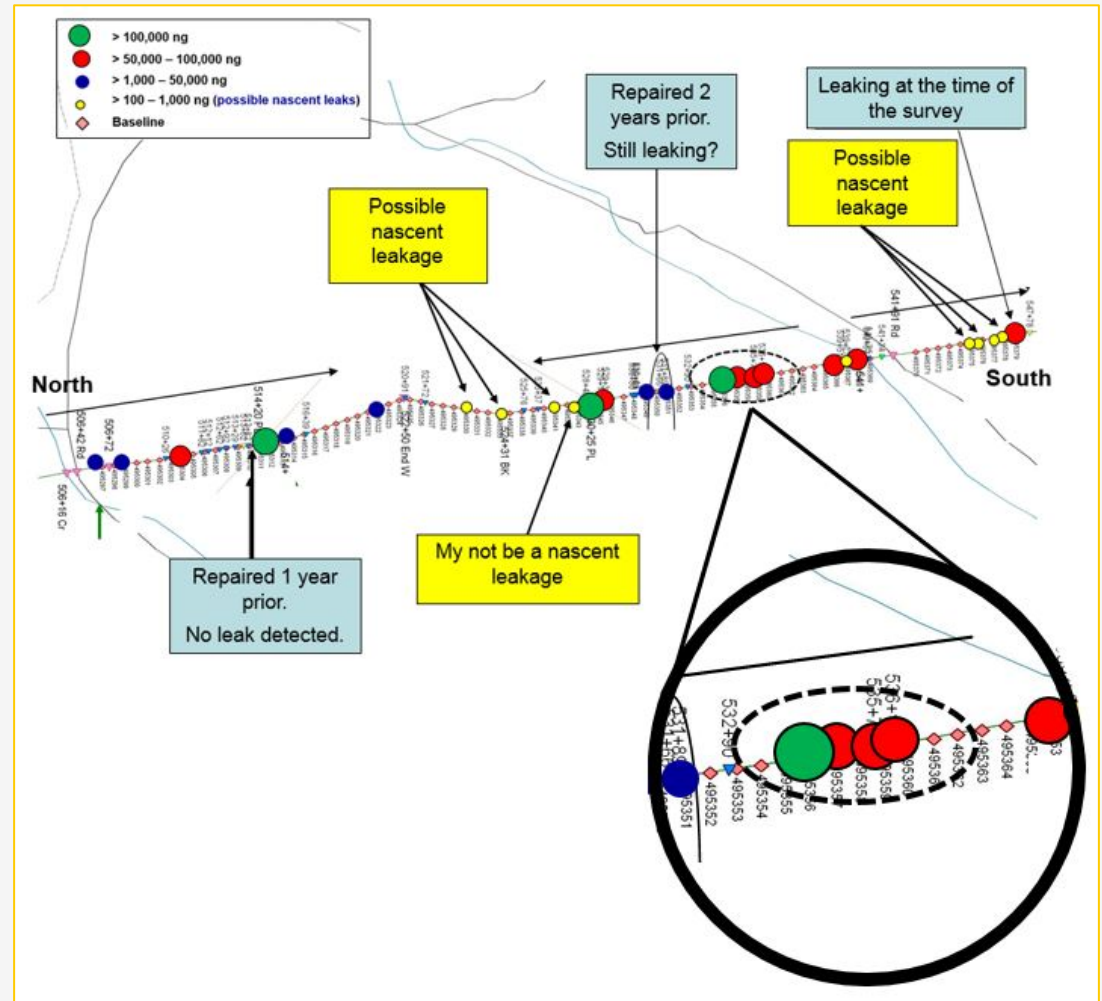
200 ft of Pipe with Substantial Leakage

On the right the natural gas intensities (i.e. the sum of $C_2 - C_5$) are plotted along the pipeline map.

As noted in the legend, the larger the dot the greater the natural gas intensity.

The most critical area of the pipeline may be the black dashed ellipse with the green dot with three red dots adjacent to it.

This indicates a 200 ft section of pipeline with the most substantial leakage along the pipeline.



Worrisome Nascent Leaks Detected

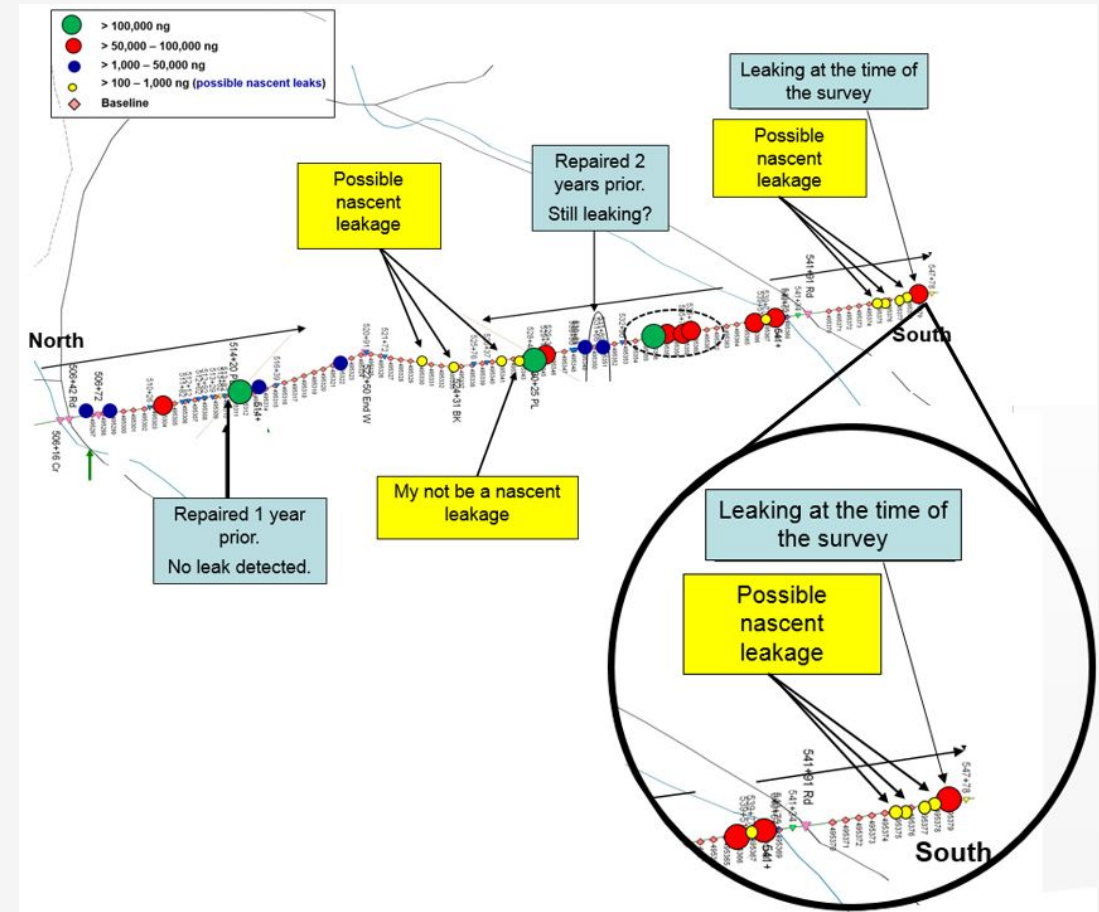
Note the red bubble at the far right end of the pipeline. This was a known leak by the client.

The AGI methodology correctly identified the strong leak.

Note there are four nascent leaks just north of the known leak.

The corrosion that caused the known leak may have been spreading northward.

As seen here, the AGI data provides the ability to make repairs before the nascent leaks become a significant breach.



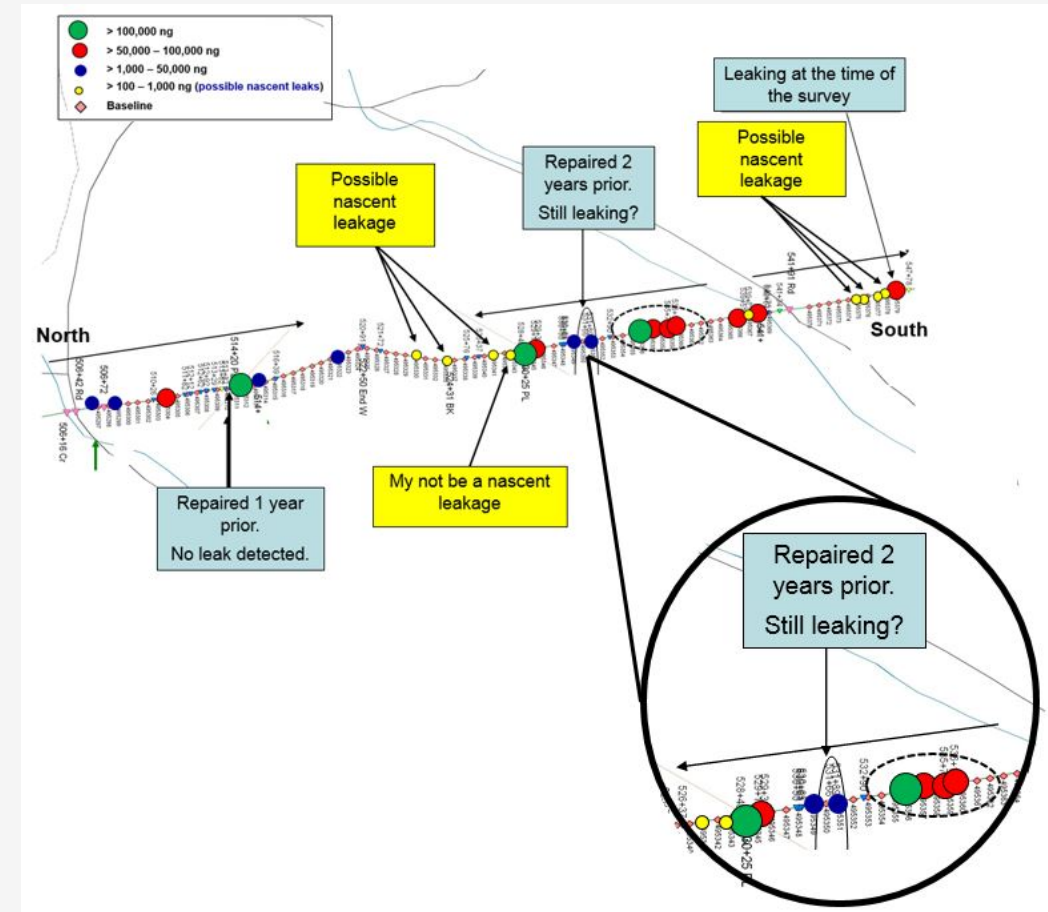
Efficacy of Pipeline Repairs

Moving northward along the pipeline note there are two blue dots just north of the black dashed ellipse.

Repairs were performed at this location two years prior to the survey.

Low level concentrations of natural gas in the soil indicate that:

- the soil at the leak site was not removed or remediated, or
- repairs were temporary at best, and leakage has returned.

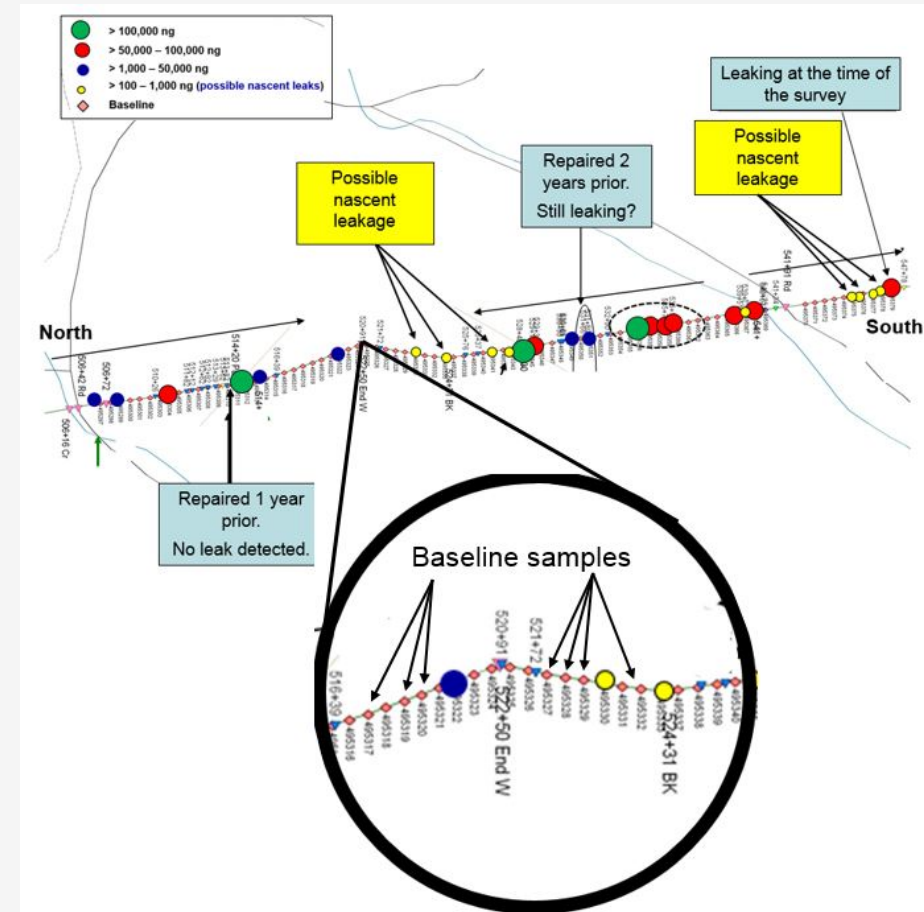


Documenting Intact Sections of Pipe

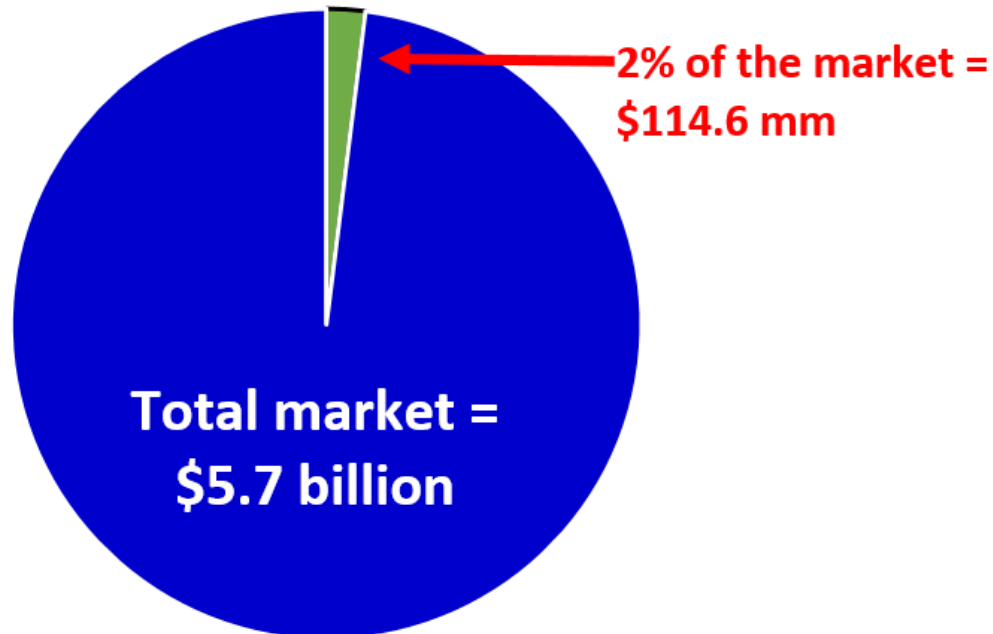
The extreme sensitivity of the method provides the ability to derive statistically based background concentrations for *in situ* organics.

The baseline samples are noted with a pink diamond along the pipeline.

This capability provides the ability to easily monitor changes over time and provides great baseline monitoring for regulators.



Pipeline Monitoring Market

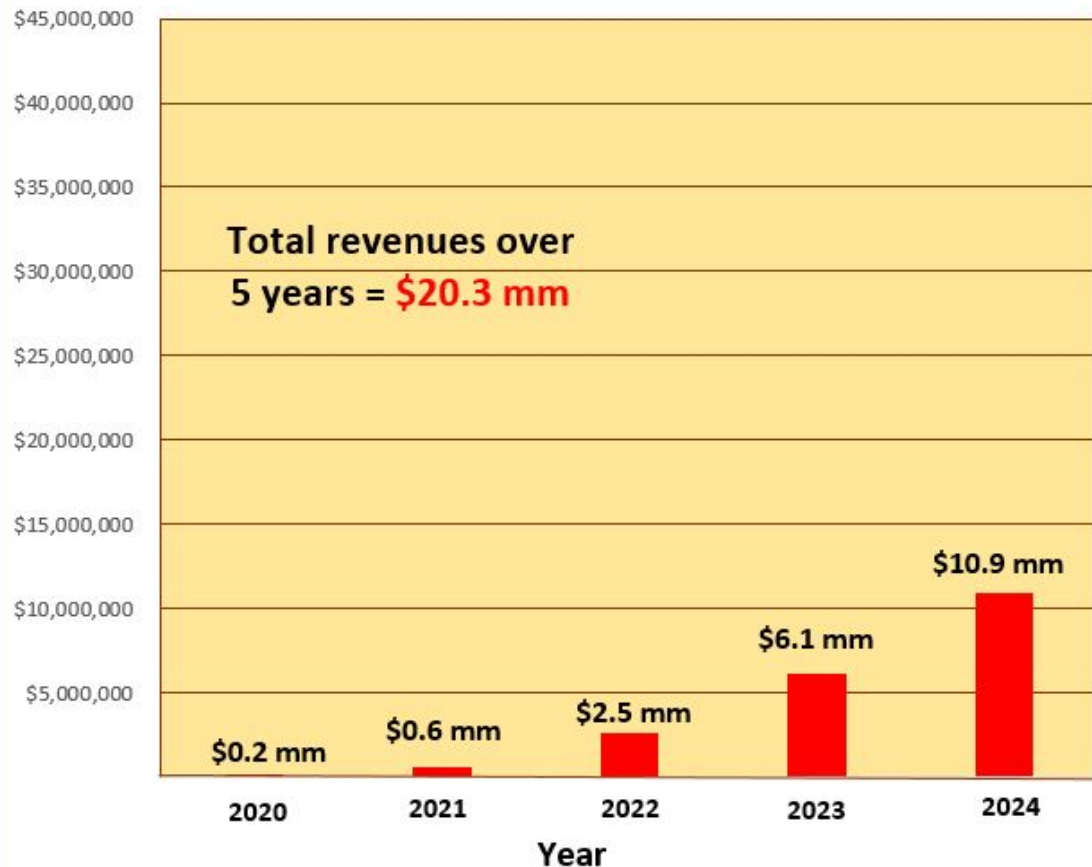


Estimates of the pipeline monitoring market range from ~\$5.7 billion - \$7.0 billion.

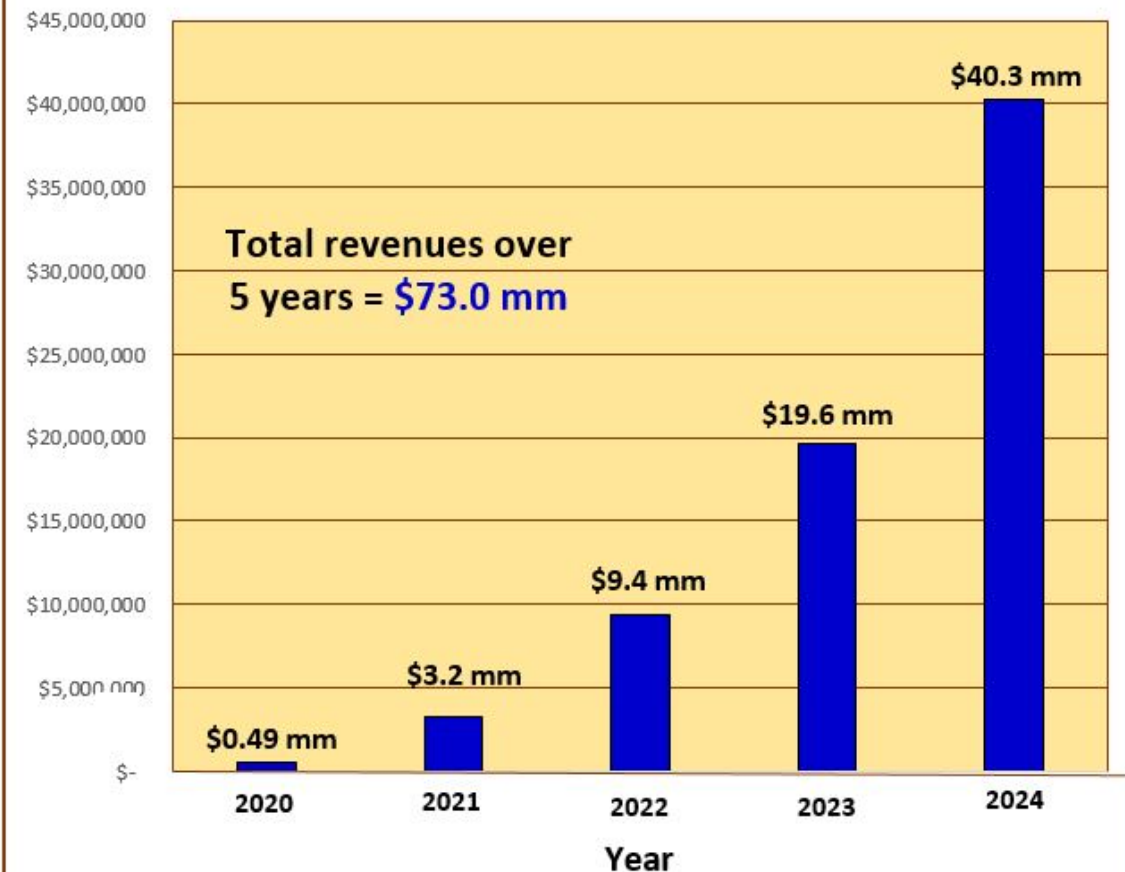
If Amplified Geochemical Imaging were to capture only 2% of the market share that would amount to **\$114.6 million dollars**.

Seeking a Commercialization Partner

Organic Growth Revenue Projection



Commercialized Revenue Projection



Leaks are bad for business.

They can cost billions.

We've got the solution.

Thank You!





Contact Information

For additional information contact:

Rick Schrynmeeckers

(281) 782-8914

Schrynmeeckers@AGI surveys.net

www.AGIsurveys.net

To view a brief video providing more detail, click on this link:

<https://spark.adobe.com/video/bAPNcYcj07BKF>

