



MINE SHIFT: EXAMINING GROUND DISPLACEMENT IMPACT ON MINES AROUND THE WORLD

The Jeffrey Asbestos Mine Val-del-Sources, Quebec.

The Jeffrey Mine

At its height, the Jeffrey mine in Asbestos, Quebec, produced half of the world's asbestos.

It was the largest open pit asbestos mine on the planet, driving much of Canada's growth to the largest world asbestos producer in an industry totaling \$1.2 billion a year at its peak.

Opened in 1879, it ran for 122 years before a combination of the discovery of the mineral's deadly properties and cessation of government subsidies forced it to close in 2001.

It was formally decommissioned in 2012 and left to continue simply as a controversial and burdensome neighbour for the residents of Asbestos – driven largely by the association with its carcinogenic namesake.

Less than a decade later and the Asbestos name was similarly decommissioned, with the town overwhelmingly voting for a new identity in 2020: Val-del-Sources.

But while the new name proved a breath of fresh air for the near 7,000 residents, the mine remains. The sights and sounds of mining activity replaced by a mass of blue water filling the 2km diameter, 350m deep open pit.

For Mine Shift, it represents a key area of interest for our latest analysis thanks to its proximity to a significant residential population and the increased risk of landslides caused by decades of groundwork.



MINE SHIFT: THE JEFFREY ASBESTOS MINE IN QUEBEC.

The Jeffrey Asbestos Mine

KEY FACTS

Ownership	Johns Manville
Opened	1881
Closed	2001
Depth	350m
Mining method	Open pit
Capacity	600m kg per year



Catalyst Analysis:

Having been inactive for 22 years, our interest was in reviewing historical land change to identify any notable ground displacement trends worth monitoring.

To do that, we deployed Small-Baseline Differential Interferometry (SBAS-DInSAR) to extract the displacements, velocities and cumulative displacements between 10 April 2022 and 31 October 2022.

We used a Small Baseline Subset (SBAS) technique for pairs selection, with a maximum perpendicular baseline of +/- 200m and a maximum temporal baseline of 120 days, 117 InSAR pairs formed from the 18 scenes to create a series of interferograms.

The phase unwrapping was performed using a SNAPHU algorithm. With the unwrapped phases utilized, we were able to calculate the displacements and velocities from a stack of non-overlapping line of sight (LOS) displacements layers.

The output displacement estimates are solved for each acquisition interval using a 'least squares' technique.

It's worth noting the redundancy of interferograms generated by the SBAS technique helps to calculate the displacements and estimate the velocities but also to estimate the topographic error and the atmospheric noise and reduce their impact on the calculated displacements and velocities.





What our analysis found:

Our team analysed an approximate 2,000km² area surrounding the Jeffrey Mine and recorded a predominantly stable set of displacement results, with distribution centered on 0.

However, there were two areas of significant interest. The first one (fig. 1) was located on the northern wall of the mine where an expanse of positive displacement up to 24mm is evident.

One possible explanation is falling debris from the upper shelves of the mine accumulating at the lower levels, creating stacked towers of rock and material.

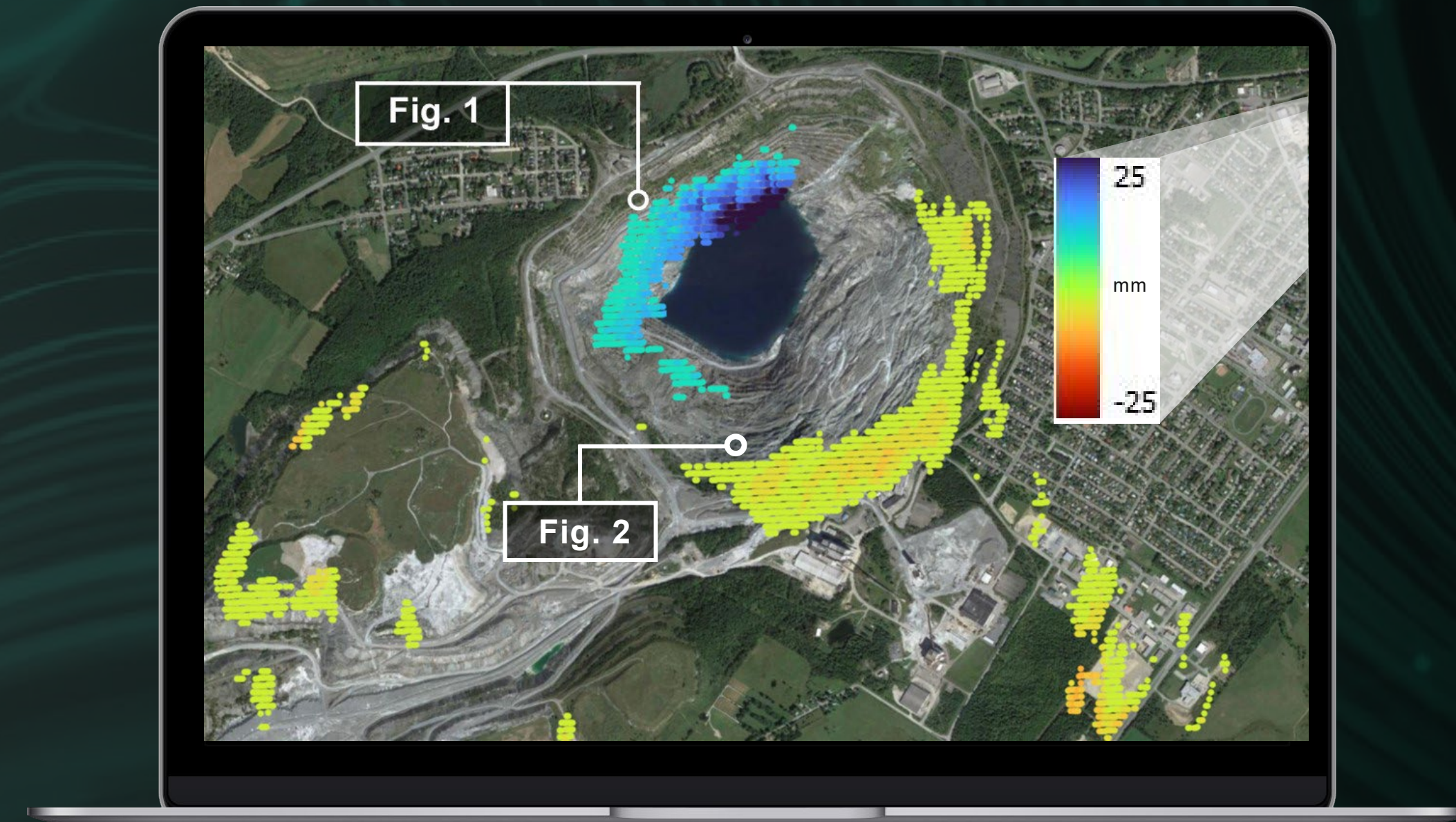
If right, this presents no immediate concern but still requires longer term monitoring to ensure it remains within safe parameters.

The second area (fig. 2), however, requires much closer attention. On the southeast side of the mine, close to commercial

property, there is a large area of negative displacement.

Over the course of our reporting timeframe – April 22 to October 22 – we identified a sustained trend of ground shift from -0.1mm to -4mm.

Like the first area, while this isn't an immediate concern, the results require closer monitoring to protect against any sudden potential risk to ground integrity surrounding property and population



The value of this analysis

The intent of our analysis, and indeed of earth observation in general, is to highlight how the sensitivity to ground changes can be used as an early warning indicator of areas that require more monitoring.

Satellite-based change analysis coupled with in situ ground monitoring equipment and surveying can be used as an effective risk reduction solution.

Significant structural failures, breaches or collapses can occur suddenly, and they can have both catastrophic human and economic impact.

Traditional monitoring, maintenance, and risk mitigation strategies play a key role in preventing them, but they have their limitations, including operational costs and the potential safety of the maintenance teams.

Earth observation harnesses the power of satellites to conduct regular monitoring of critical sites, with near-real time data delivery, which is perfect for maintenance teams to augment existing strategies at much lower cost than intermittent manual checks.

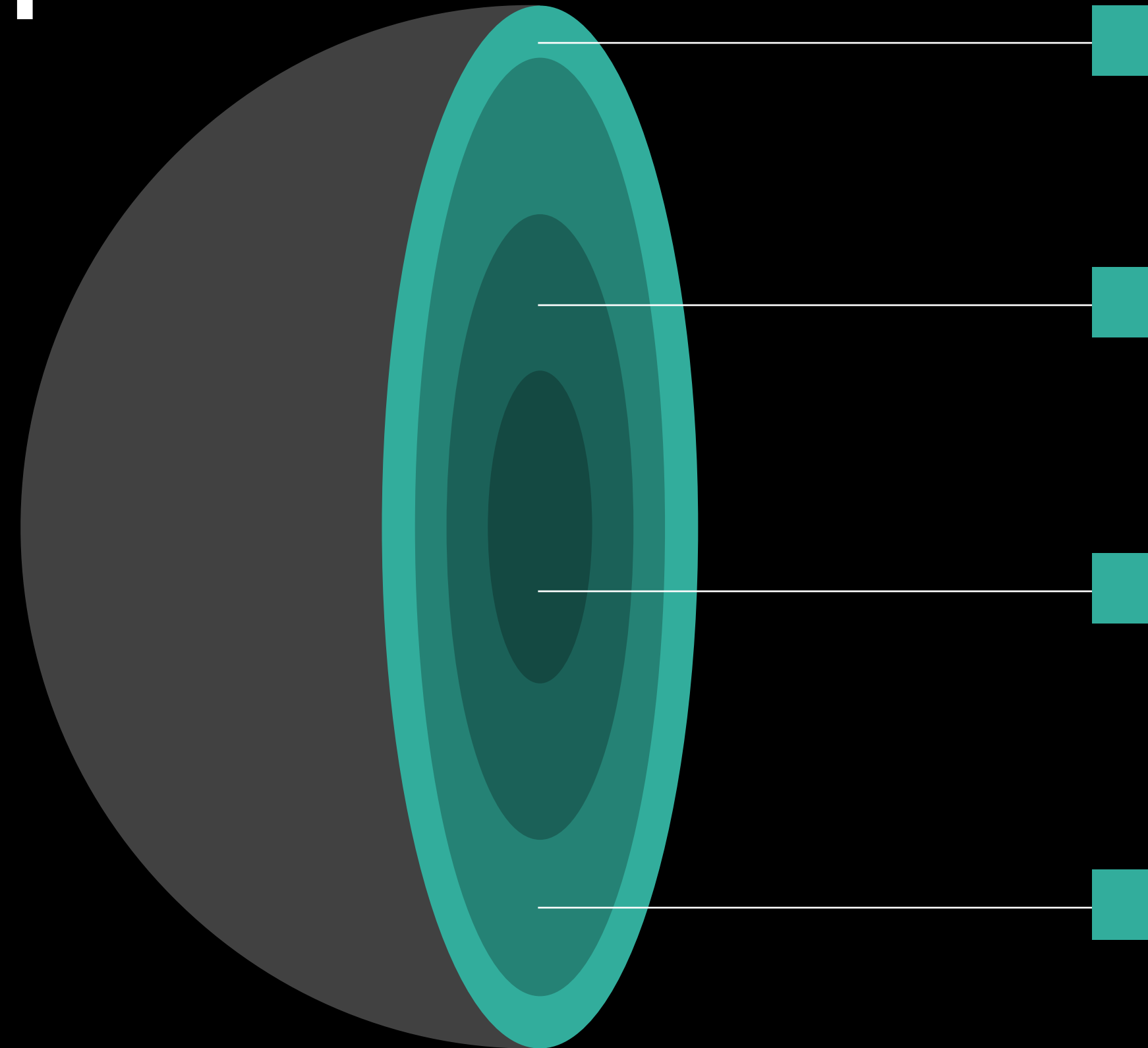
For businesses who have already embedded this technology into their workflows are now better equipped than ever to monitor their sites and be alerted to the dangers of ground displacement.

Not only does this improve existing strategies, but it also keeps people safer, reduces costs, and improves efficiency.



MINE SHIFT: THE JEFFREY ASBESTOS MINE IN QUEBEC.

Discover what CATALYST can do for you



Earth observation and ground displacement technology is no longer a tool for the specialists.

Thanks to our cloud-based innovations, CATALYST solutions are available to all businesses, teams, and decision makers.

Integrated seamlessly into your workflows without the need for technology upgrades, they can have an immediate transformative impact on your strategies and outcomes.

**Discover what they can do for you.
Get in touch with our team today.**



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