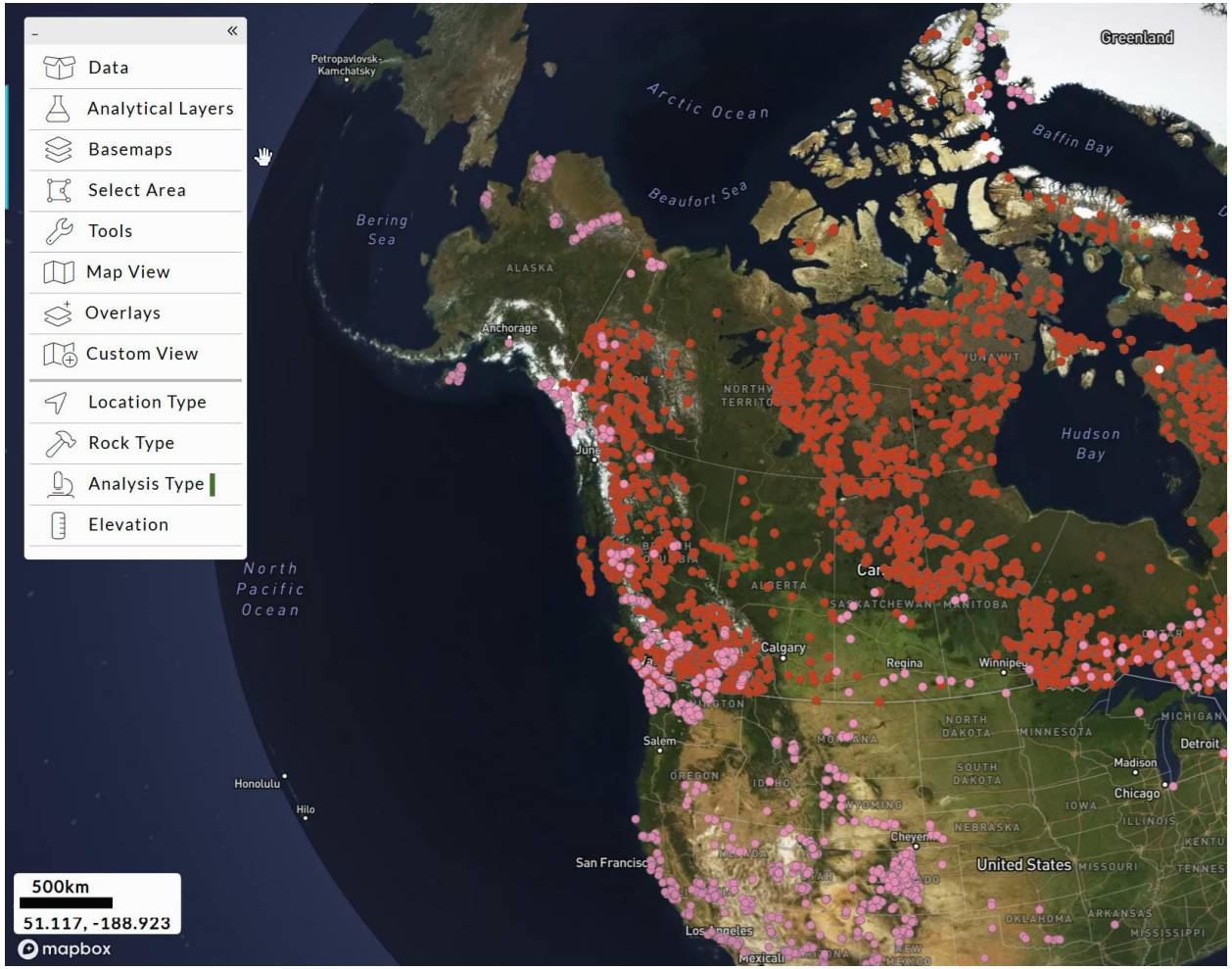
A Global Relational Data Platform:

Set to Transform Contamination Reporting and Environmental Data Management

Keith Dimech

RMIT University, Lithodat



Introductions

Keith Dimech

- Geology and Geophysics Undergraduate
- Previously worked in mining exploration and environmental consulting
- Currently Environment and Sustainability Manager at John Holland
- >10 years delivering environmental approvals Major Infrastructure projects.
- AWA - Victorian Branch Committee Member, Beyond Zero Specialist Network Chair
- eMBA at RMIT between 2023-2025
- Captone Business Research project:
  - *1 year study of the approvals, construction and contamination sector.*

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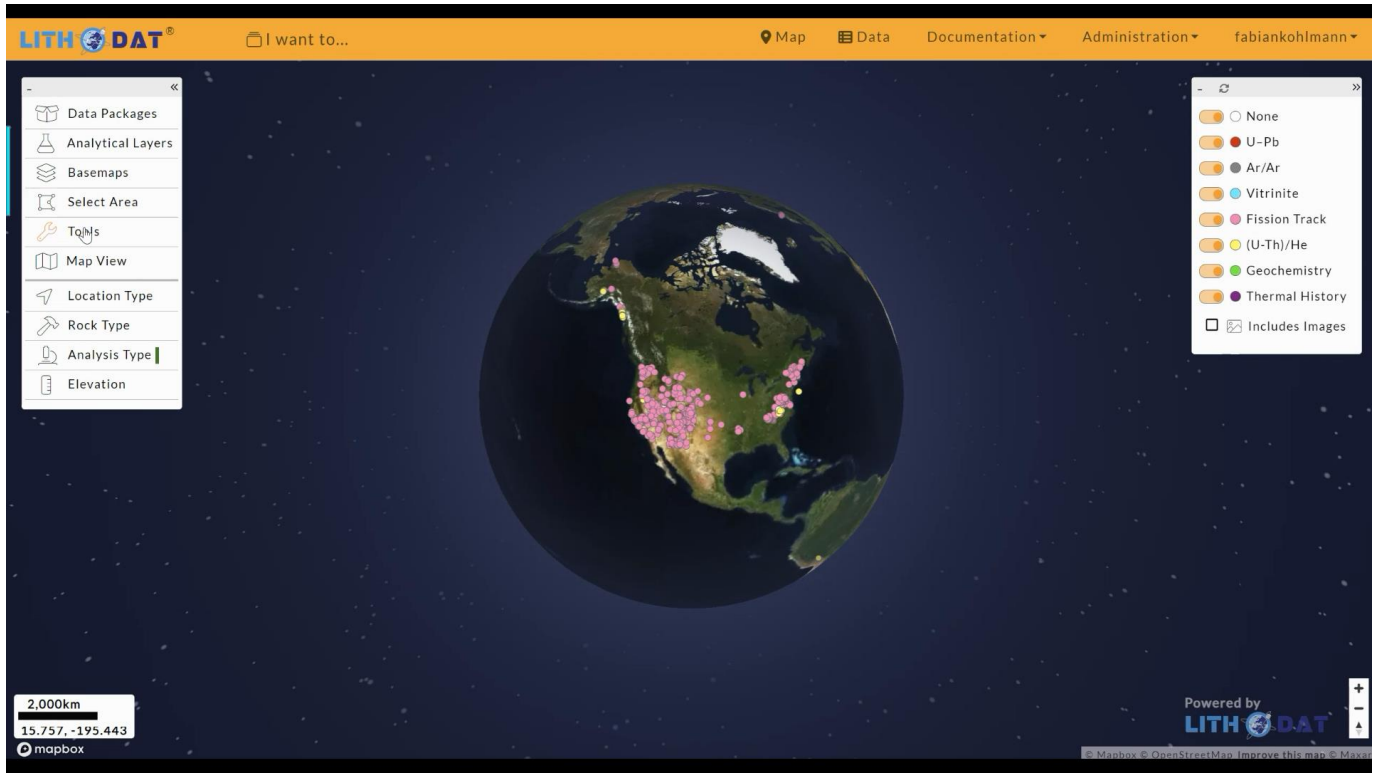
REPORTING TOOL

Melbourne Based Data Company

- Provider of powerful, cloud-hosted platforms for spatial geoscience data discovery, integration, and analytics
- Trusted by national government geological surveys.
- Designed and Operate EarthBank - the global academic repository for geo-chemistry data.
- Designed and Operate Isotopes.au – CSIRO stable isotope data platform
- Developer of the Diagnostic Environmental Reporting Tool a tool for managing environmental chemistry



Environmental Chemistry

Environmental & Contamination Chemistry

Industrially significant

Purpose:

- Environmental sampling seeks compliance-confirming contaminant levels stay within legal limits or trigger remediation. Generally, soil, air quality or water chemistry.

Size:

- Sector is worth $100B US globally - Environmental sampling occurs across multiple regulated industries such as construction, mining, water, agriculture, waste, manufacturing, etc.

FAIR data:

- Millions of data are created each year.
- A lack of Findable, Accessible, Interoperable, Reusable (FAIR) makes that rich data completely usable.

Environmental & Contamination Chemistry

Integral in the Water Industry

- Mandated by regulations – every part of the water sector:
  - Drinking Water Quality
  - Recycled Water
  - Surface Waters (Rivers, Catchments, Stormwater...)
  - Agricultural / Stock Water
  - Groundwater contamination, Groundwater Levels
  - Trade Waste
  - Capital Projects
  - Air Quality and Odour
  - Soils and Biodiversity
- Growing wide concerns with persistent contamination from PFAS, Microplastics, Pesticides, Heavy Metals, Algae, Salination, Pharmaceuticals and Nutrients.
- Analysis through lab-based instruments, field instruments and remote sensing

What are Environmental Thresholds

Environmental Chemistry in Practice

- Environmental thresholds are numerical level of chemical concentrations that determine if it is considered "safe" or "contaminated."
- Thresholds are only triggered under **legal events:**
  - Land or product sale
  - Construction
  - Planning change
  - Incidents
- Globally - all environmental regulatory frameworks utilise static thresholds.
- Because of this thresholds are inherently backward looking, do not incentive continuous monitoring (McPherson et al., 2022).

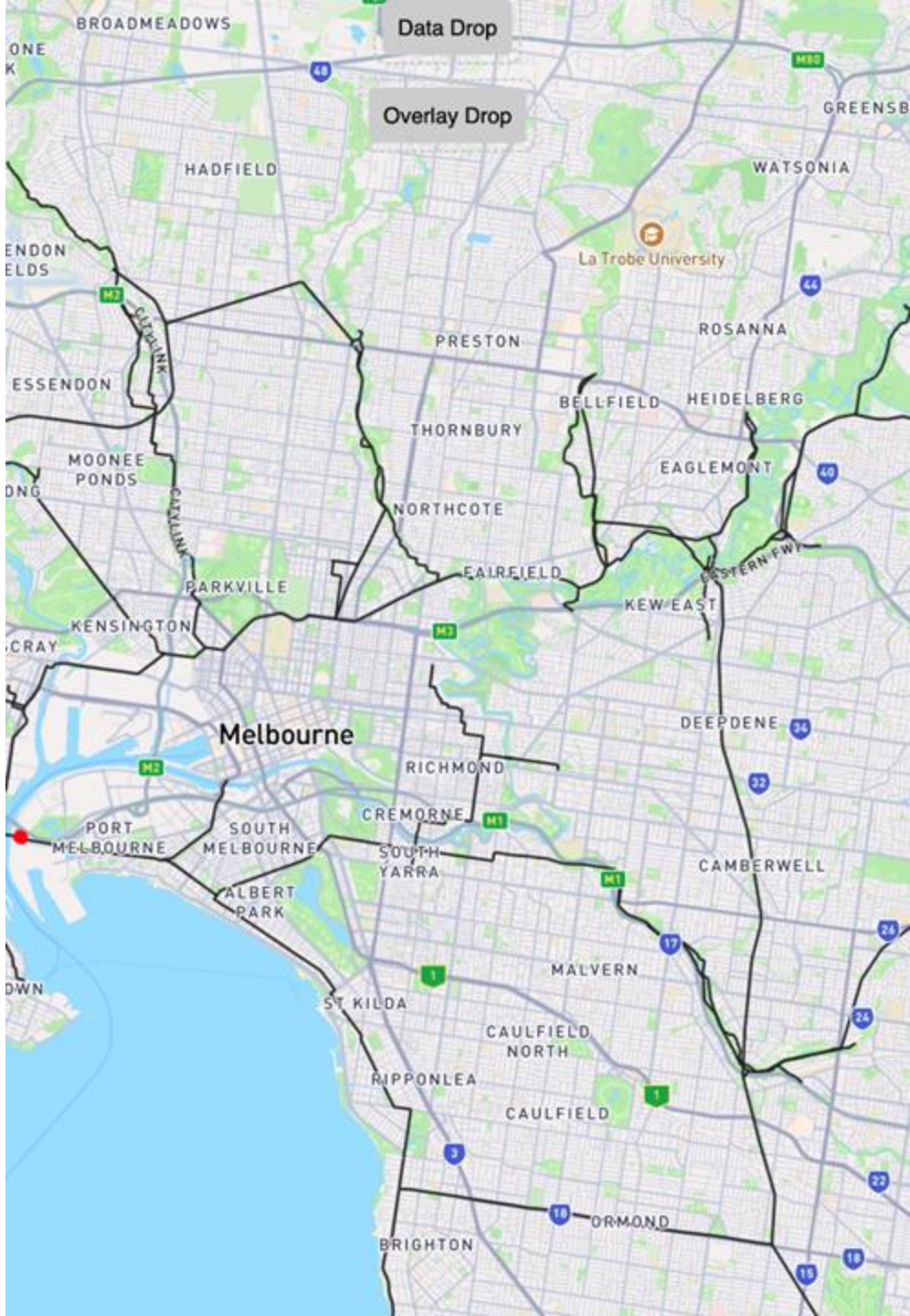
New draft guidelines for PFAS chemicals Chemical	Existing ADWG level	Draft updated level
PFOS	**70** ng/L or 70 parts per trillion (Less than 0.07 micrograms per litre of PFOS and PFHxS combined)	**4 ng/L** (Less than 0.004 micrograms per litre)
PFHxS	**30 ng/L** (Less than 0.03 micrograms per litre)	
PFOA	**560** ng/L, or 560 parts per trillion (Less than 0.56 micrograms per litre)	**200** ng/L (Less than 0.2 micrograms per litre)
PFBS		**1000** ng/L (Less than 1.0 micrograms per litre)

What could change?
Why should it?

New Era, New Possibilities

With advances in big data, AI, cloud systems, and real-time sensors, we can now generate the real time insights needed to support faster, smarter environmental decisions.

- Decarbonisation depends on access to critical minerals.
- The circular economy demands traceable, high-quality data.
- Cities need to revitalise historically contaminated sites for housing.
- Water scarcity and pollution require precise contaminant tracking, particularly with recent salinity, drought or algae crisis.
- Agriculture must balance productivity with soil and nutrient health.
- Globally there has been 73% decline monitored Biodiversity - protection hinges on understanding chemical stressors



The Research

Industry Research - A Qualitative Study

This research employed

Commissioned by:

Lithodat Pty Ltd

Led by:

- Keith Dimech, Business Research Graduate at RMIT University, an Australian Environment & Sustainability Industry Leader.

Research Aims

- Investigate Lithodats new software offering – the Diagnostic Environmental Reporting Tool – and get industry feedback.
- Investigate why environmental data workflows remain inefficient
- Investigate the limitations of current environmental regulation
- Explore barriers to adoption for modern advanced systems
- Systems Thinking Application - Viable Systems Model (VSM)

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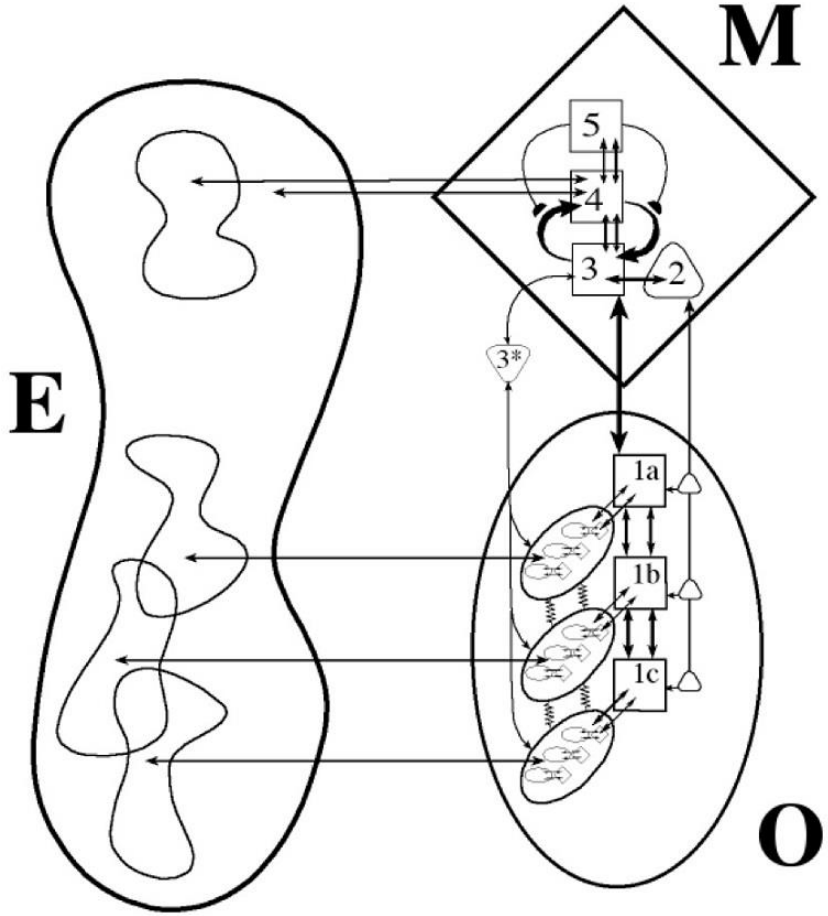
Industry Research - A Qualitative Study

This research employed

8-month study including:

- 40 Paper Literature Review investigating current academic thinking of environmental thresholds and chemistry
- 12 semi-structured interviews with professionals across Australian consulting, construction, regulators, legal, and research sectors.
- Each interview lasted approximately one hour and was transcribed verbatim
- Transcripts thematically coded.
- Key themes were then aligned with the Viable Systems Model
- A final report was issued outlining the findings - a summarized version available in for the at this conference.

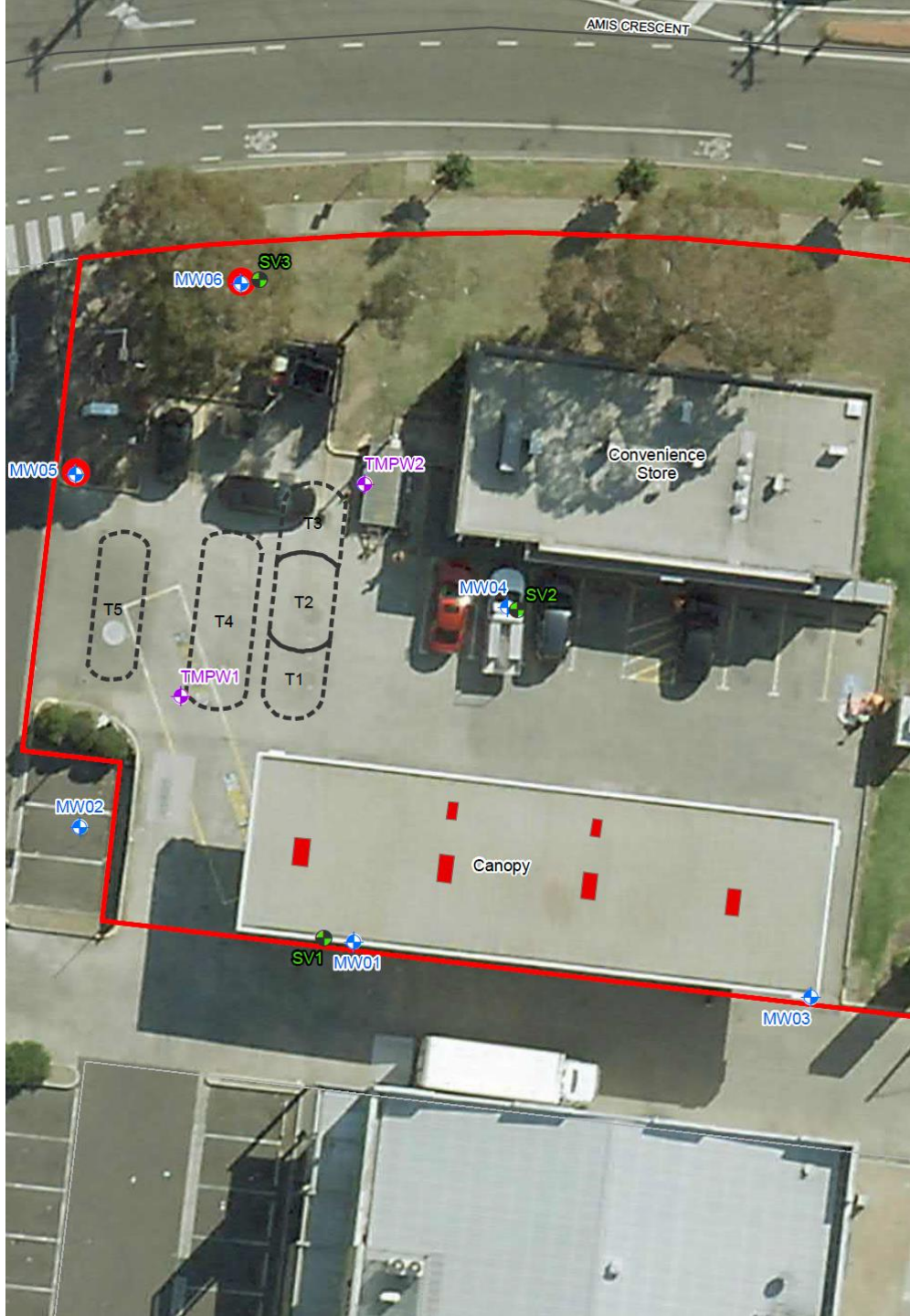


Findings

Business Research Findings

Systemic Inefficiencies

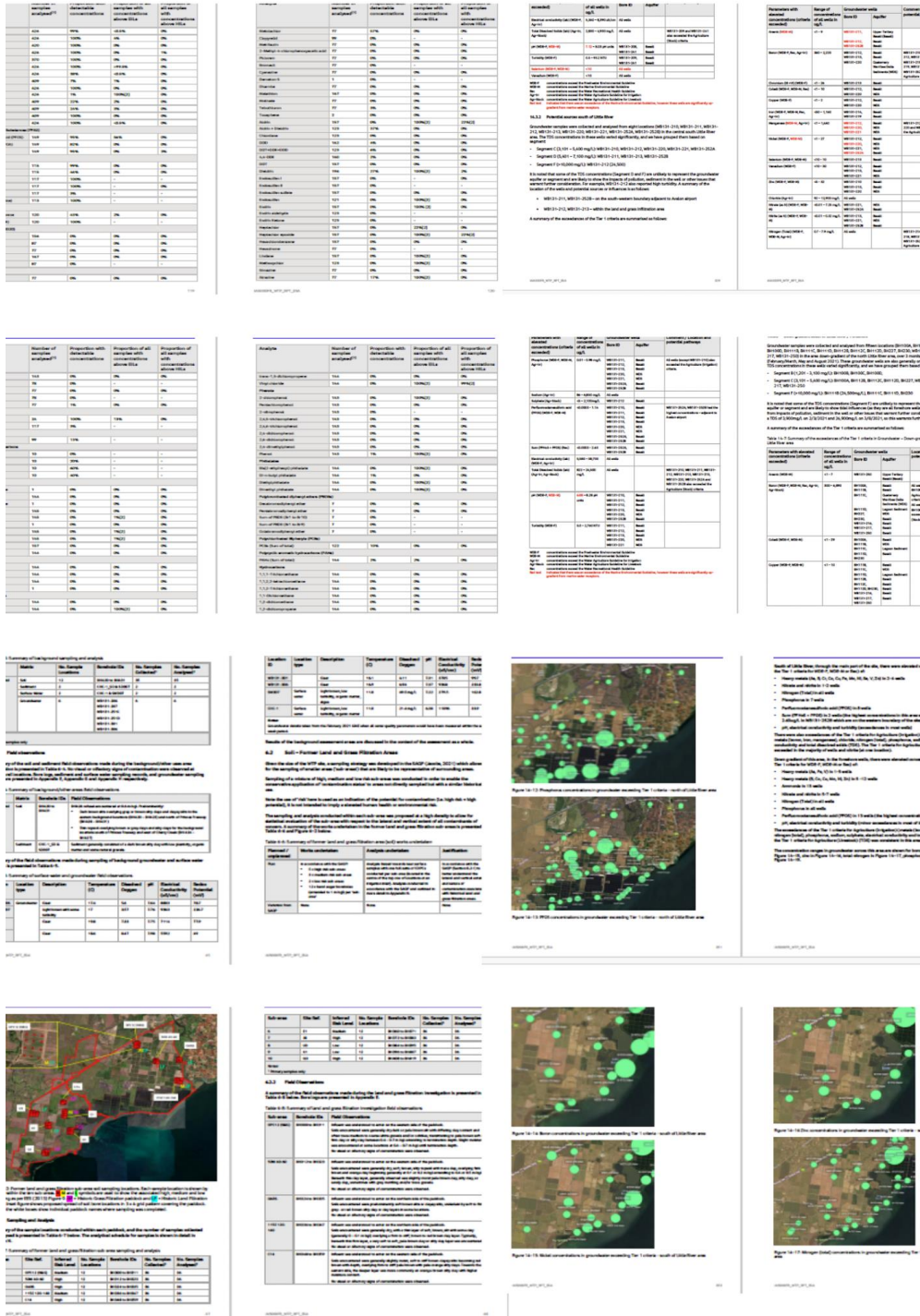
- Millions of data **points locked in PDFs** and siloed systems
- Reporting is consultant-led, opaque, **manual**, and inconsistent
- **Table-based** analysis tools are slow and error-prone, relying on conditional formatting to flag exceedances
- Poor handovers and formats lead to **data loss** and duplication
- **Rework, resampling, and lengthy reports** inflate costs
- New investigations often **ignore existing data** as it is to difficult to access
- Overengineered reporting **delays decisions** without adding value
- Every regulator, agency and authority **produces public data**. However, that data that is not FAIR (Findable, Accessible, Interoperable, Reusable).



Business Research Findings

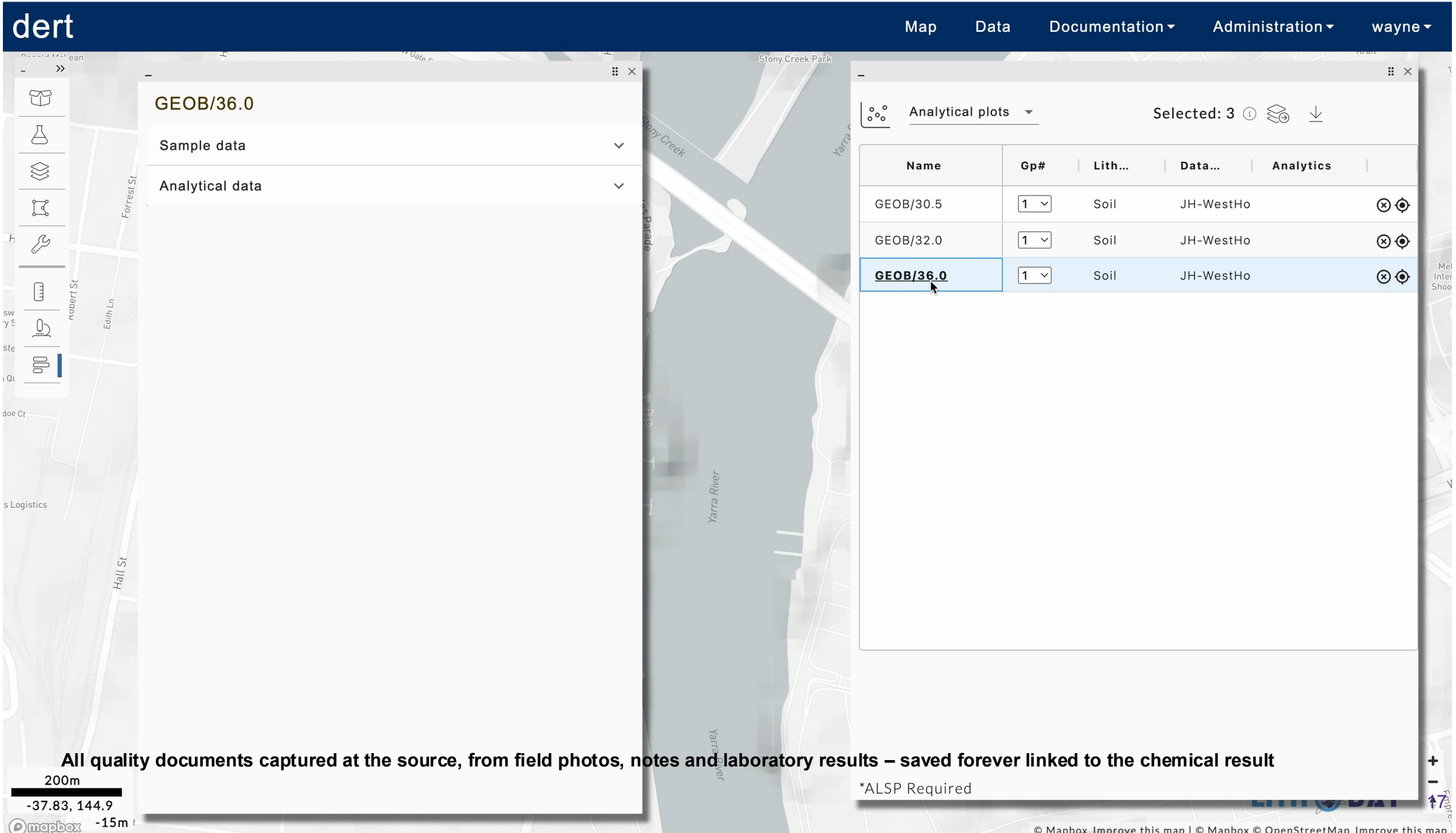
Built in Cost and Delays

- A typical environmental assessment will be **above 10,000 pages** of reporting.
- **6 – 12 month lags** from data collection to final approval are common, especially on complex jobs.
- Lab results for a site are with-held **until full analysis** and review – missing preventative actions.
- Identical reports are sent and reviewed **by multiple regulators**, each reviewing in isolation and slowing progress.
- Basic investigations often exceed $25k, **with mega projects reaching $10m**, driven by rework and data manipulation.
- Consequences of poor data management can be **astronomical**.
- Sites are **frequently resampled due** to inaccessible or lost data, costing tens of thousands in redundant work.



Demonstration

Automated ingestion pipelines, flexible to absorb multiple data streams into a modern viewing platform in standardised, machine-readable formats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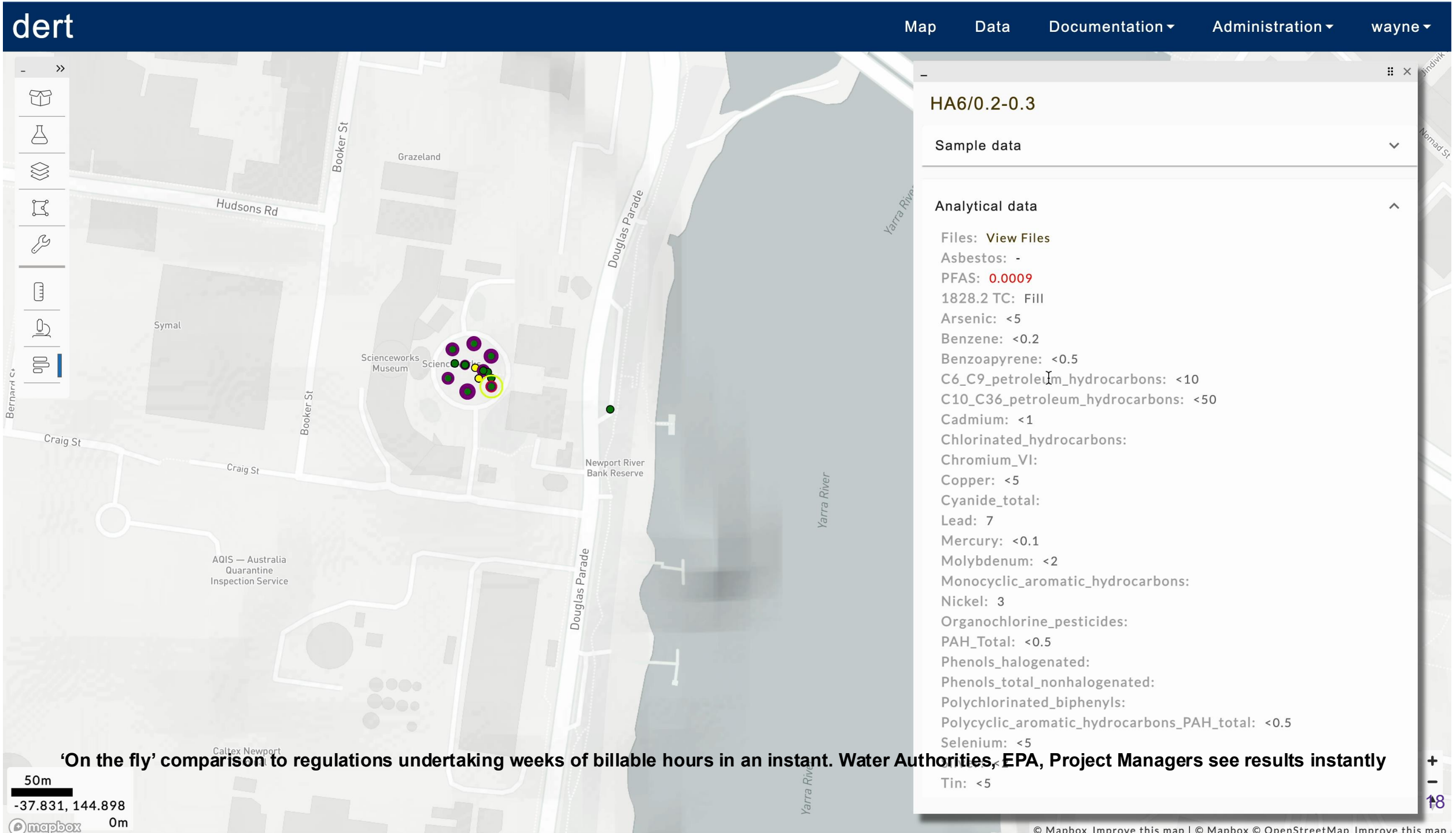
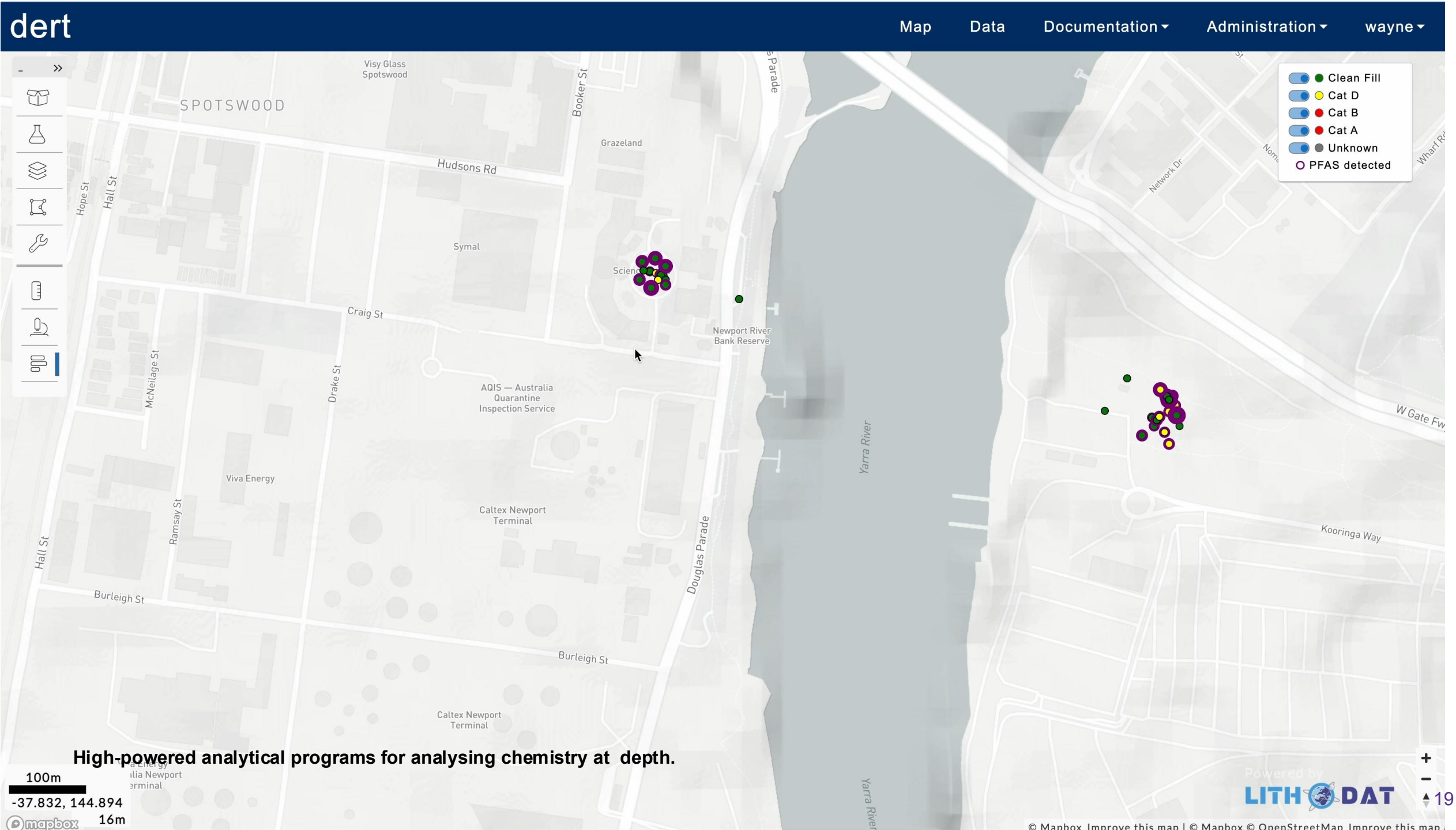
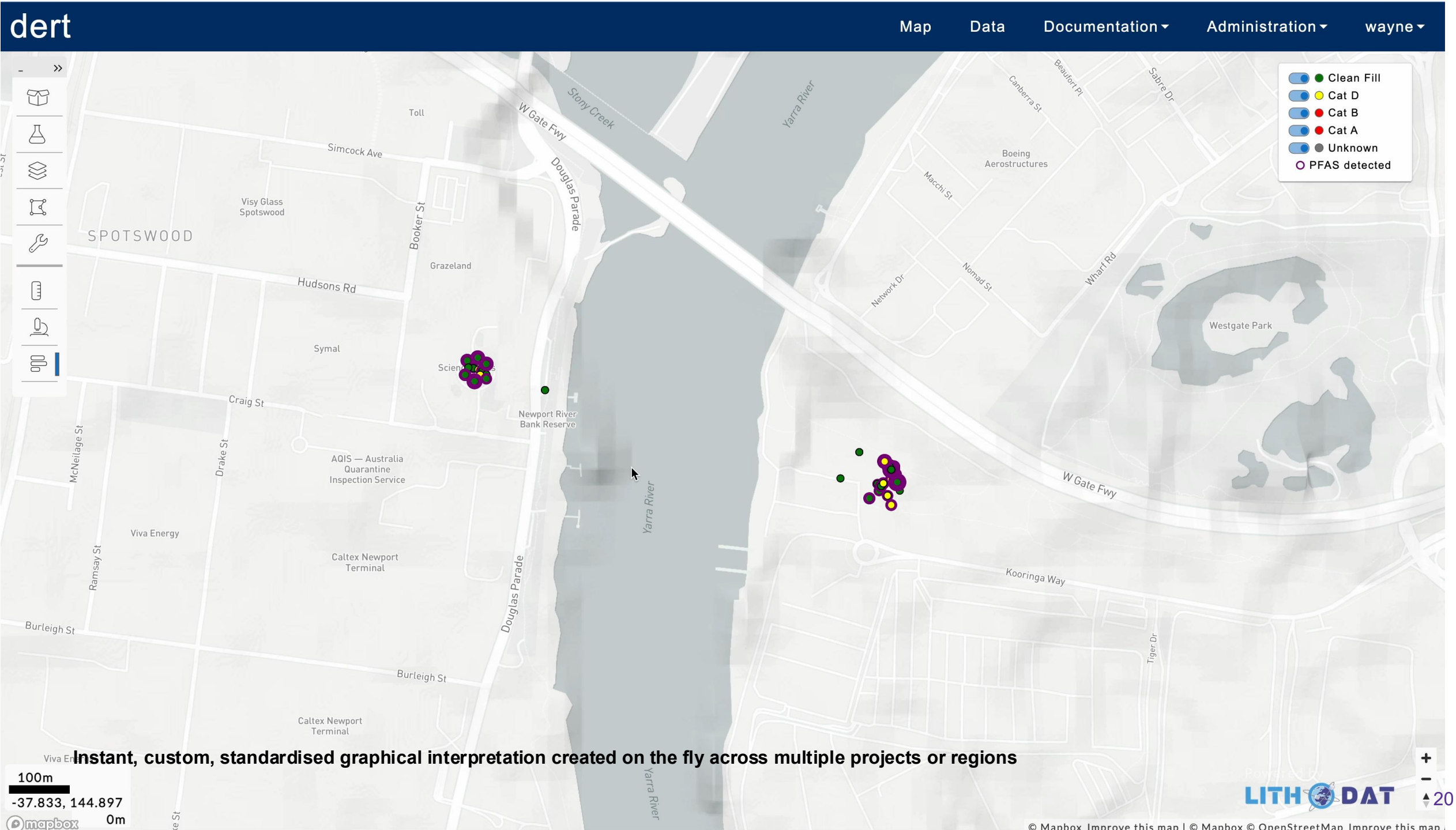


‘On the fly’ comparison to regulations undertaking weeks of billable hours in an instant. Water Authorities, EPA, Project Managers see results instantly

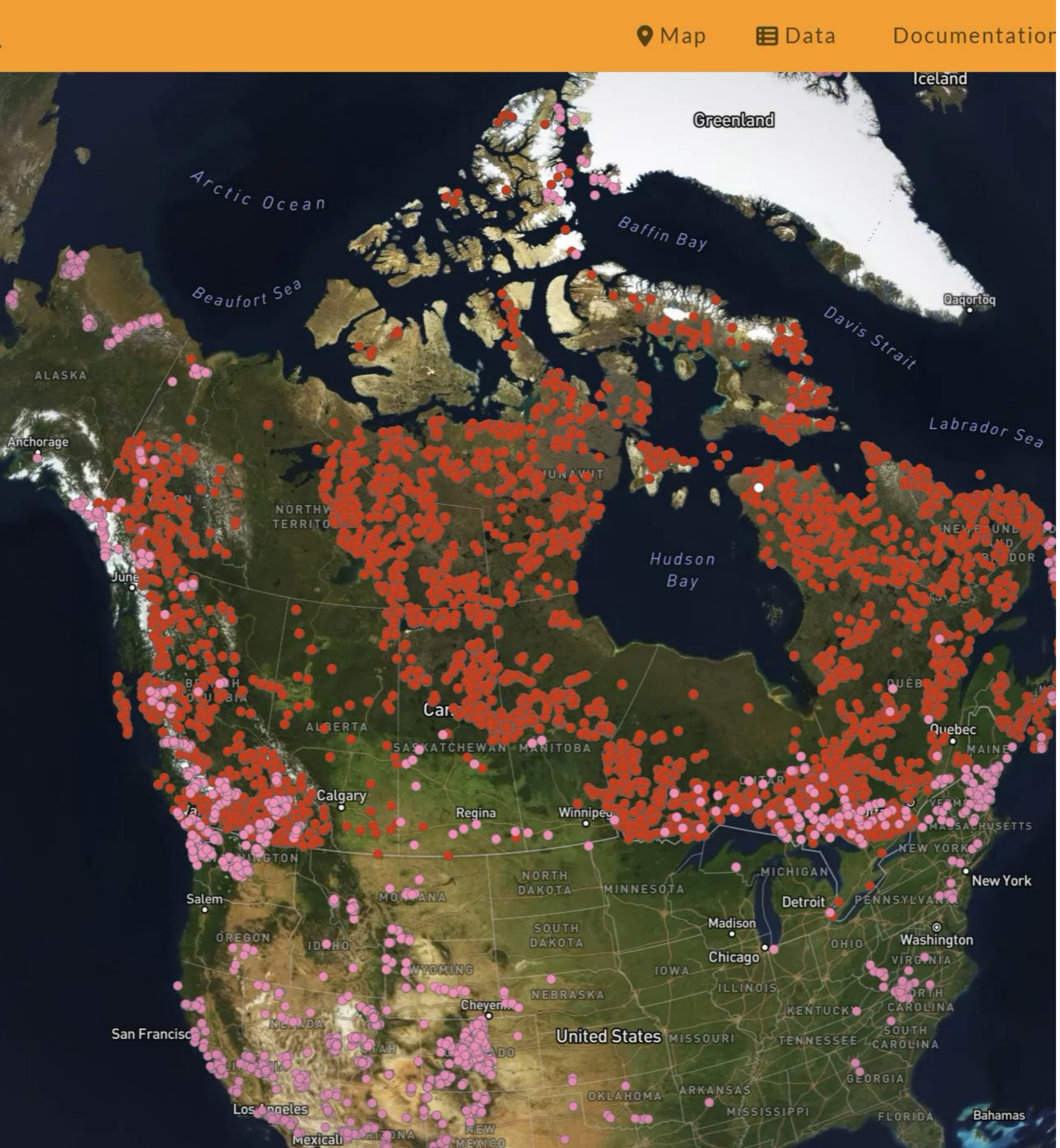


High-powered analytical programs for analysing chemistry at depth.



Instant, custom, standardised graphical interpretation created on the fly across multiple projects or regions

Dynamic Thresholds and Global Health Monitoring



A New Operating System for Planetary Health

Potential for dynamic ecosystem monitoring

- Real time analysis to speed up field assessments, highlight errors and reduce workload
- A future where ecosystem health and human health can be modelled and evaluated in real time
- Approvals fast-tracked using open-source APIs - co-developed by industry, government and citizens
- Tapping into existing high-quality data, removing the need for new surveys in already well-mapped areas
- A tool that delivers filtered, relevant data to decision-makers
- National datasets continuously updated by field season results, satellites, and citizen science
- Biodiversity trends, pollution, flows, and human health outbreaks mapped dynamically
- Regulations that are centred on risk, not industry based – provide the balance between environmental risk and regulatory accuracy.
- Interventions guided by predictive models, not triggered by breaches
- A living system of environmental governance - adaptive, intelligent, and in sync with conditions on the ground
- Promoting monitoring and enabling early action before harm escalates

Beyond Zero Specialist Network

AUSTRALIAN WATER ASSOCIATION

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Thank you

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Read the Conference Paper:

Read the Full Report:

EarthBank: