

Digital in Restoration

**Technical Excellence Environmental
Restoration**

Antwerp, April 17, 2024



Agenda

1 **Digital Drivers and Data Process**

5 **Examples Progress Tracking**

2 **Examples Initial Assessment and Planning**

6 **Examples Artificial Intelligence**

3 **Examples Data Collection**

4 **Examples Visualization and Advanced Data Analysis**

Digital Drivers and Data Process



Digital Drivers



Efficiency

Automated systems increase efficiency by streamlining data collection, analysis, and reporting processes, reducing human error, and enabling real-time decision-making



Quality

High-quality data is essential for accurately assessing environmental risks, comprehending contamination, making informed technology selections, efficiently planning remediation efforts, and reliably monitoring the progress of remediation.



Value

High-quality data and increased efficiency add value by accelerating decision-making processes, improving the effectiveness of remediation activities, and ultimately reducing costs and risks associated



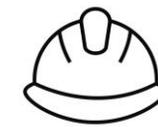
Communication

Better communication with stakeholders by facilitating efficient sharing of project information, enabling real-time collaboration, and providing transparent access to data, ultimately fostering greater engagement, understanding, and alignment of objectives



People

Empowering people by shifting focus from repetitive tasks to higher value analysis, to grow and upskill through access to advanced technologies, ultimately fostering a more dynamic, skilled, and motivated workforce



Safety

Worker safety is enhanced by minimizing field visits, providing real-time alerts, and addressing remote working challenges.

Efficiency gains achieved in BR Dam break project

Automation

Smart data collection.
Automated workflows.

Data Collection

4

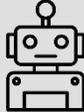
Applications



Workflows

+40

Python Scripts



Data Quality

+10

Python Scripts



Database

+10m

Records



Data Engineering

Optimized data management and quality.

Automated processes

-50%

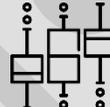
Processing time



Data Analyses in R

+10

Templates



Azure SQL Analytics

-50%

Dataflow Time



Analytics Products

+200

Dashboards and Reports



Maps and Analytics

3

Integration Features



Automated Maps

-80%

Elaborating time



ArcGIS

+8k

Maps



Cartography

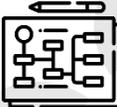
Automated maps. WebGIS and BI integration.

Key Numbers

Standardization

-60%

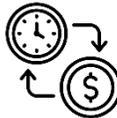
Time to deploy new workflows



Time Spending

-20%

Savings



People

20

Full Time



Scalability

3

New Facilities



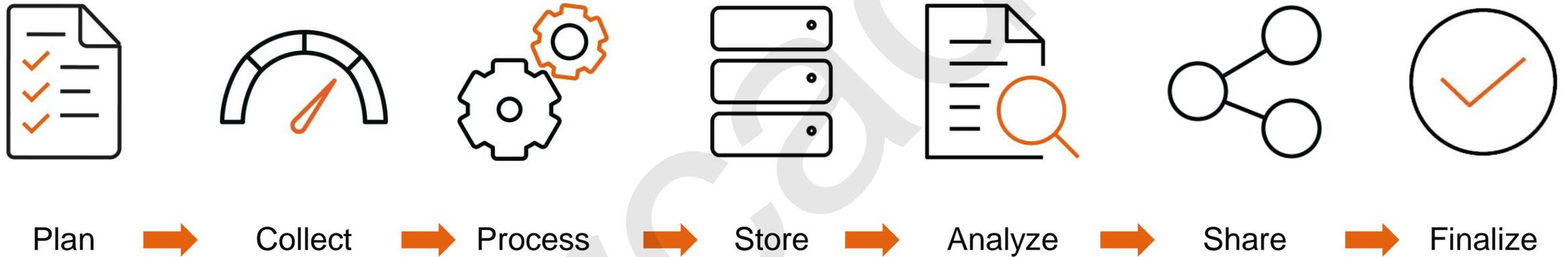
New Data

+6k

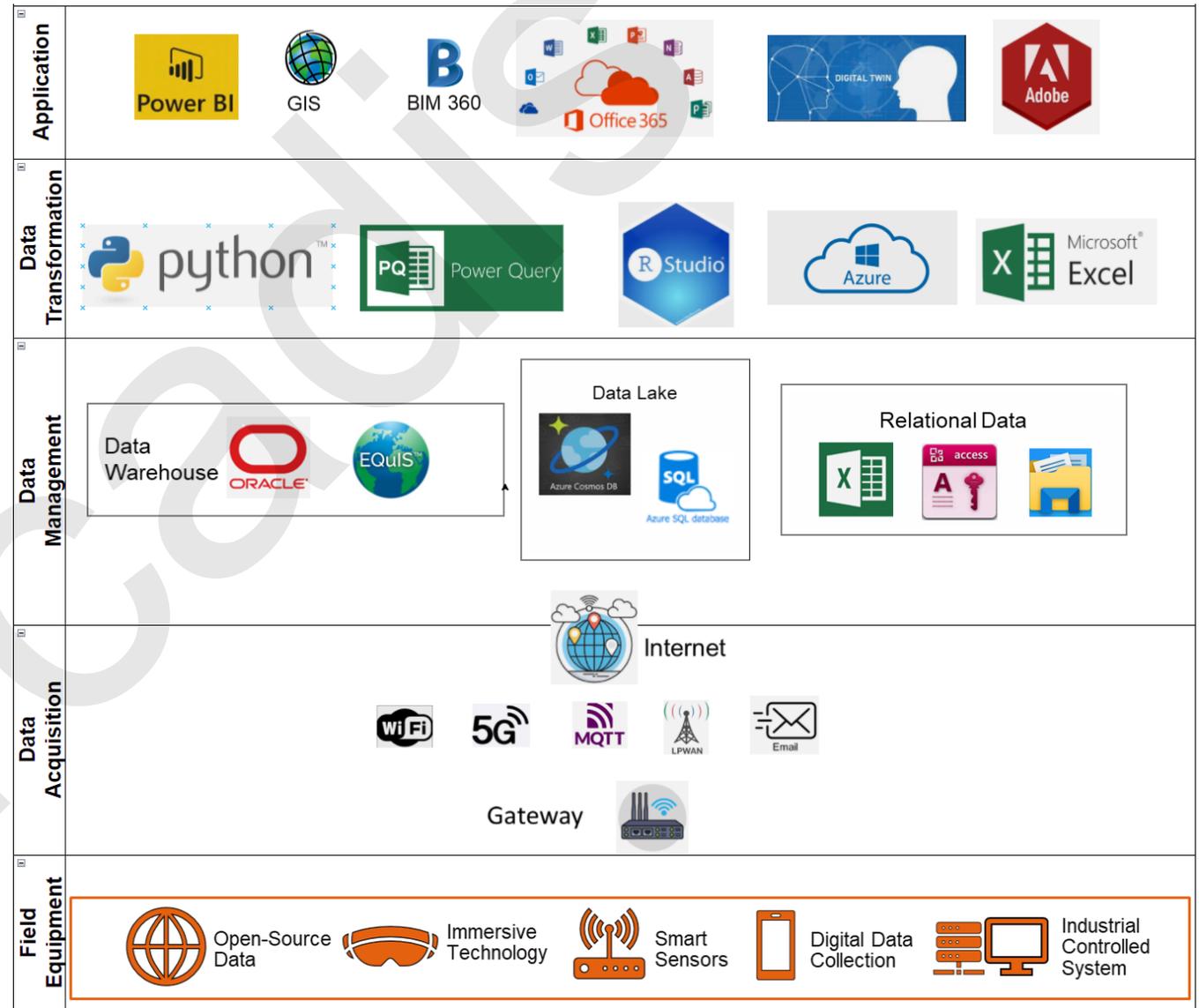
Daily Registers



Data Process

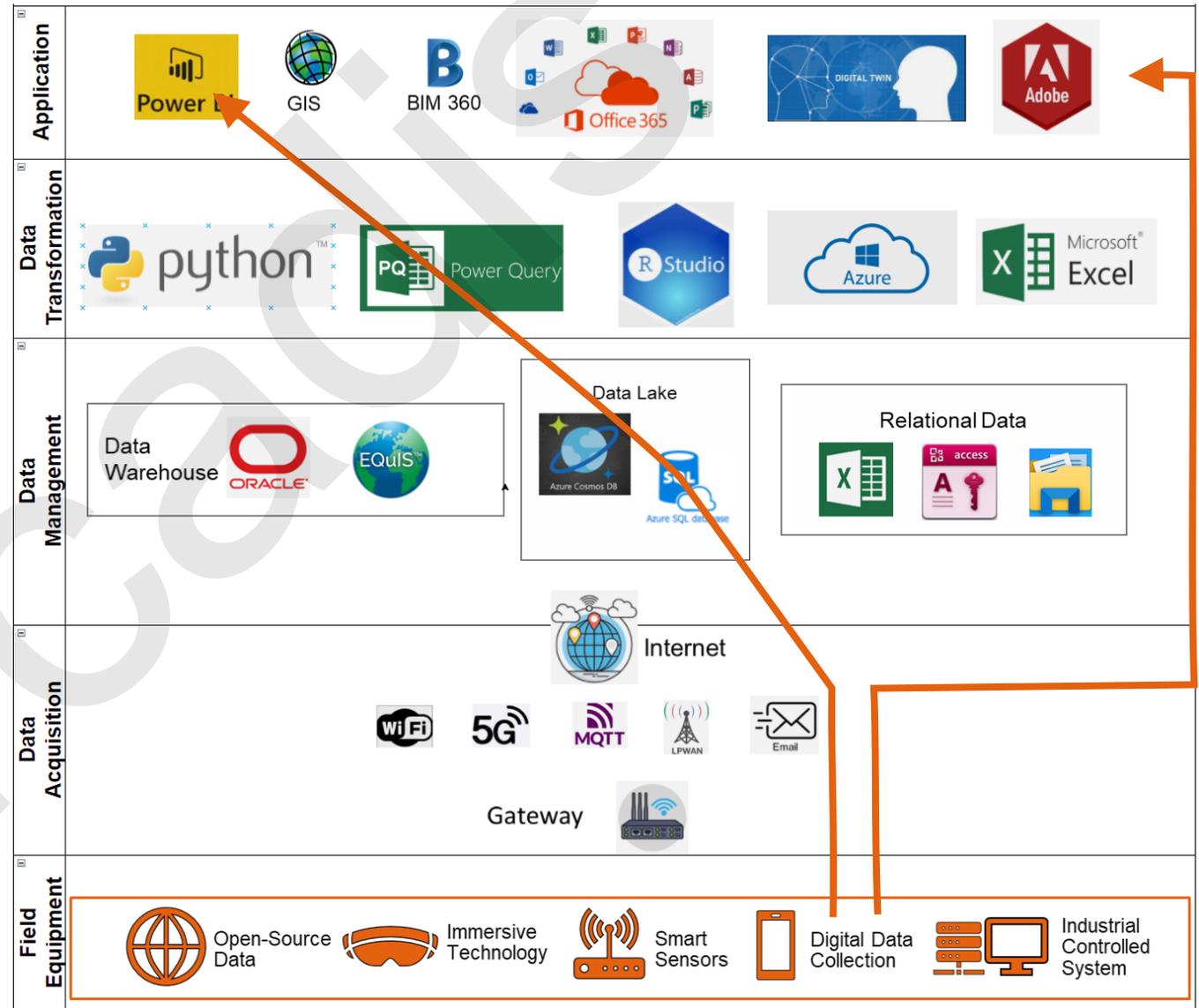


Example of a Mature Cloud Platform

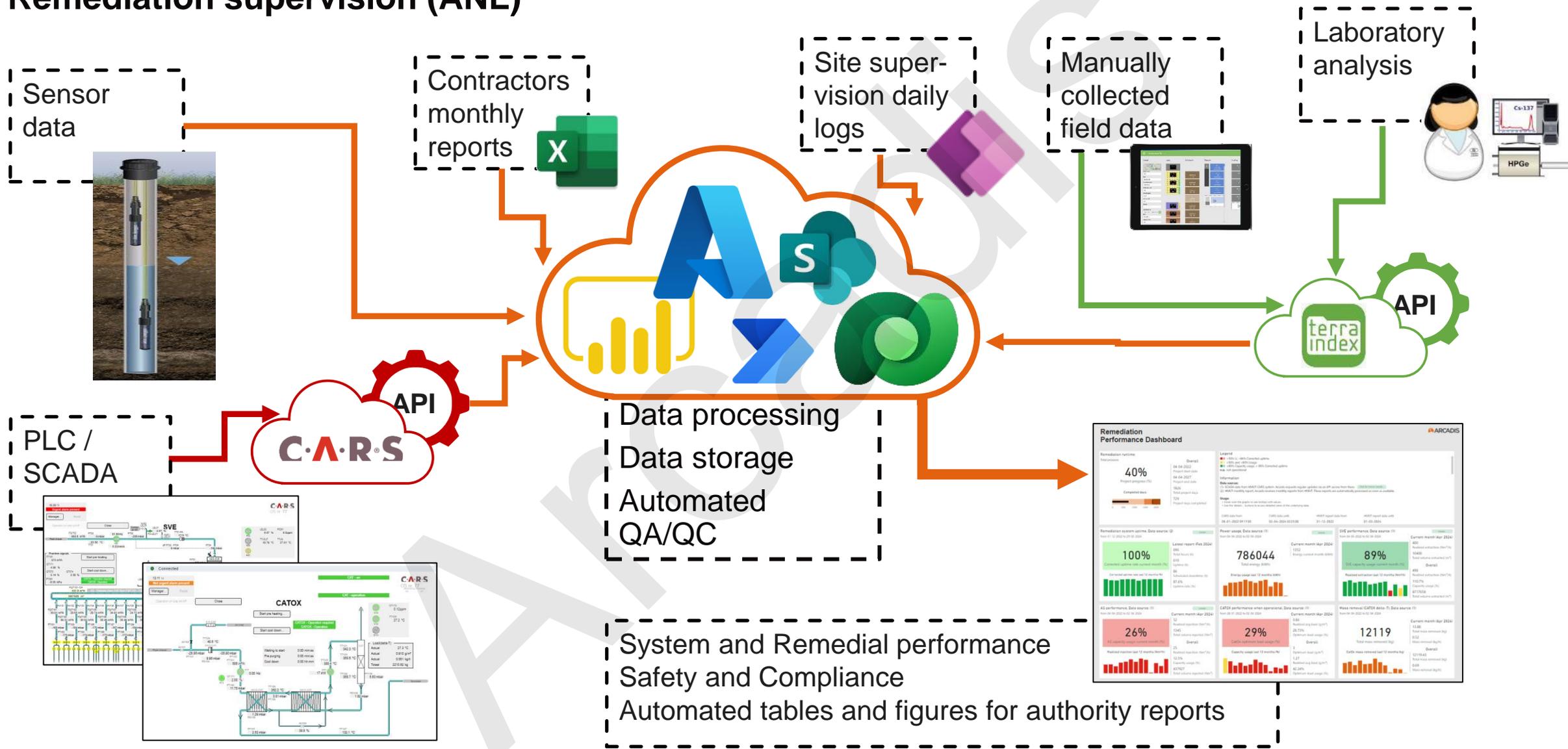


Simple example

Automated reporting of field collected data

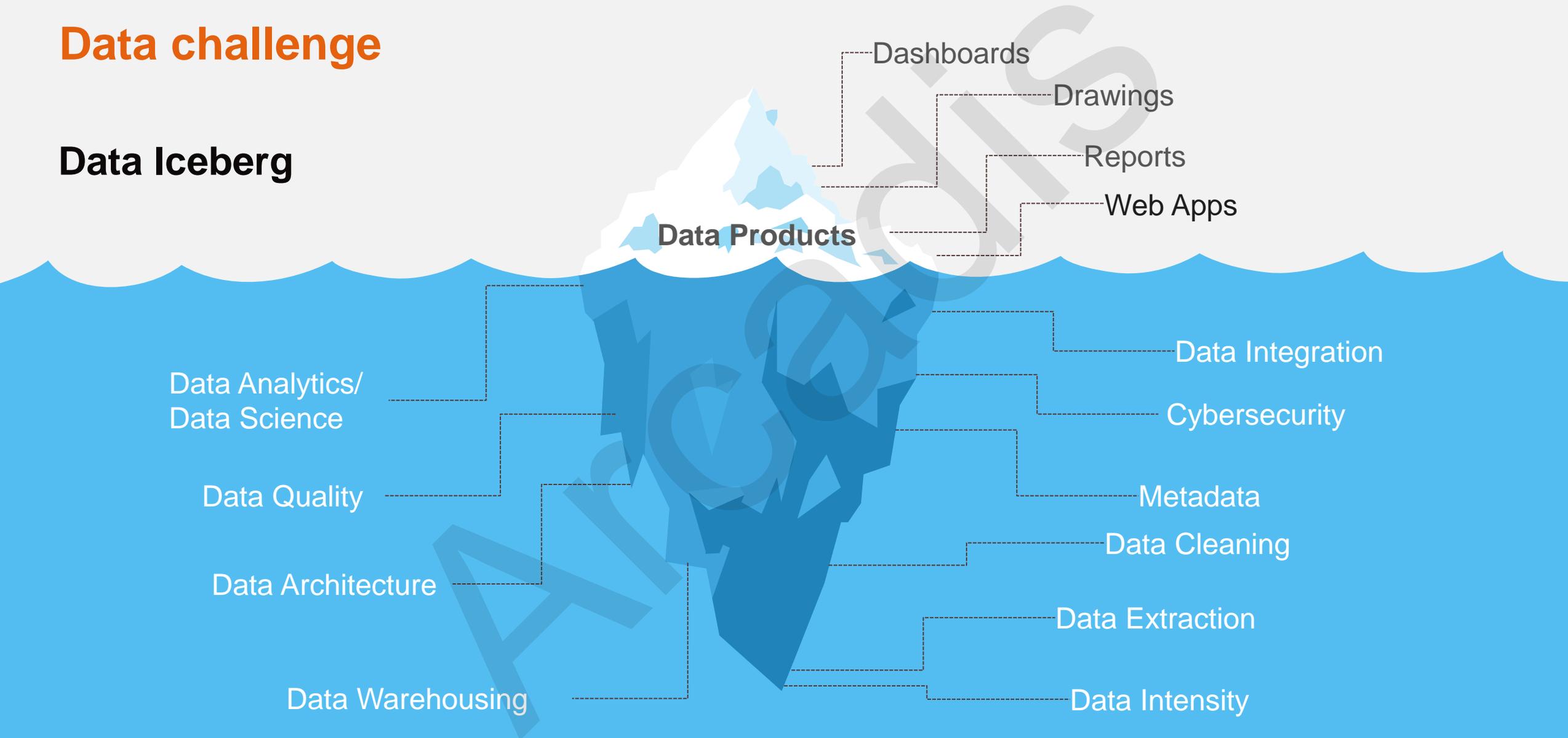


Complex example Remediation supervision (ANL)



Data challenge

Data Iceberg



Conclusion



- Think in advance about data collection, management, and reporting when setting up new projects



- Evaluate and plan your data needs and data intensity early in your project



- Collect data and automate for a purpose and find the right balance



- Recognize the maturity of technology and supporting architecture



**Examples:
Initial Assessment
and Planning**

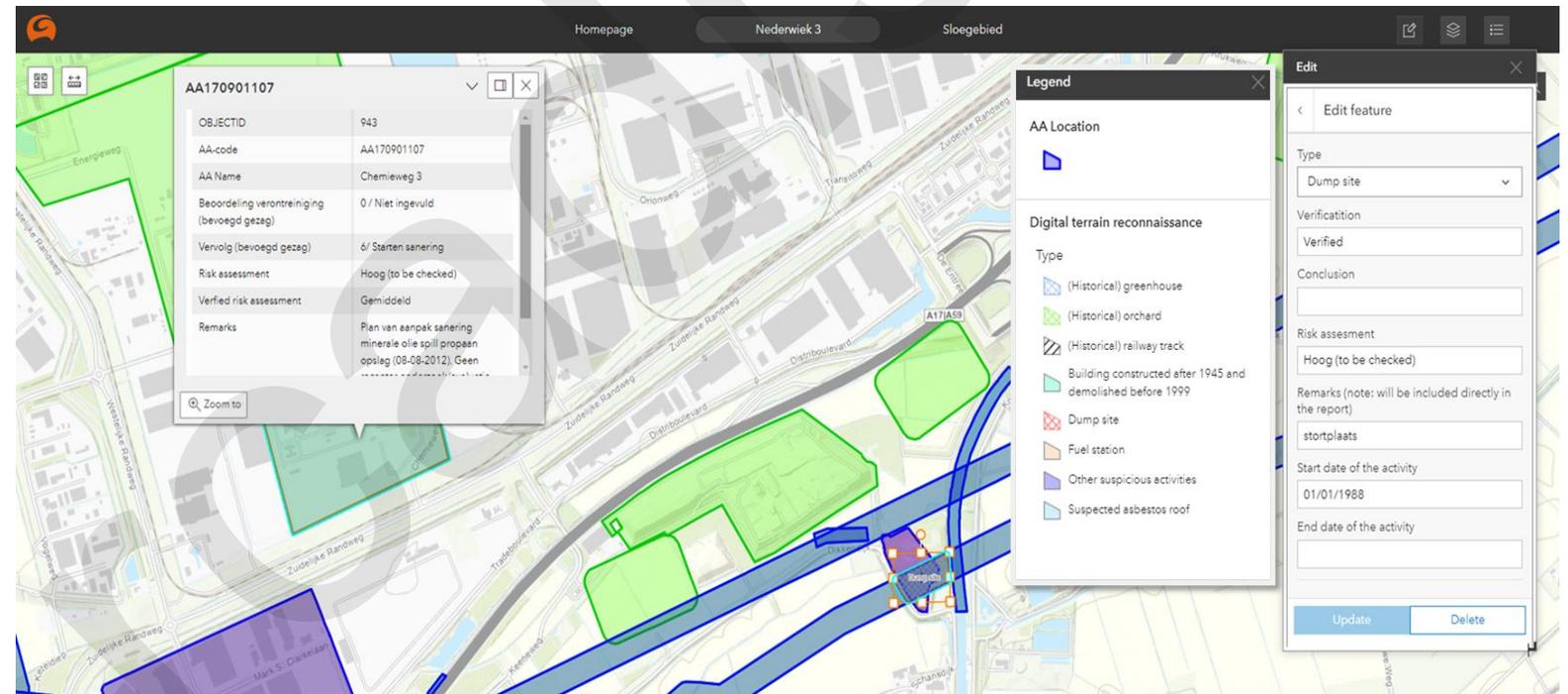
Drilling database - Web and mobile (DE)

- All recorded drilling data in GeODin
- Web and Mobile
- Daily sync



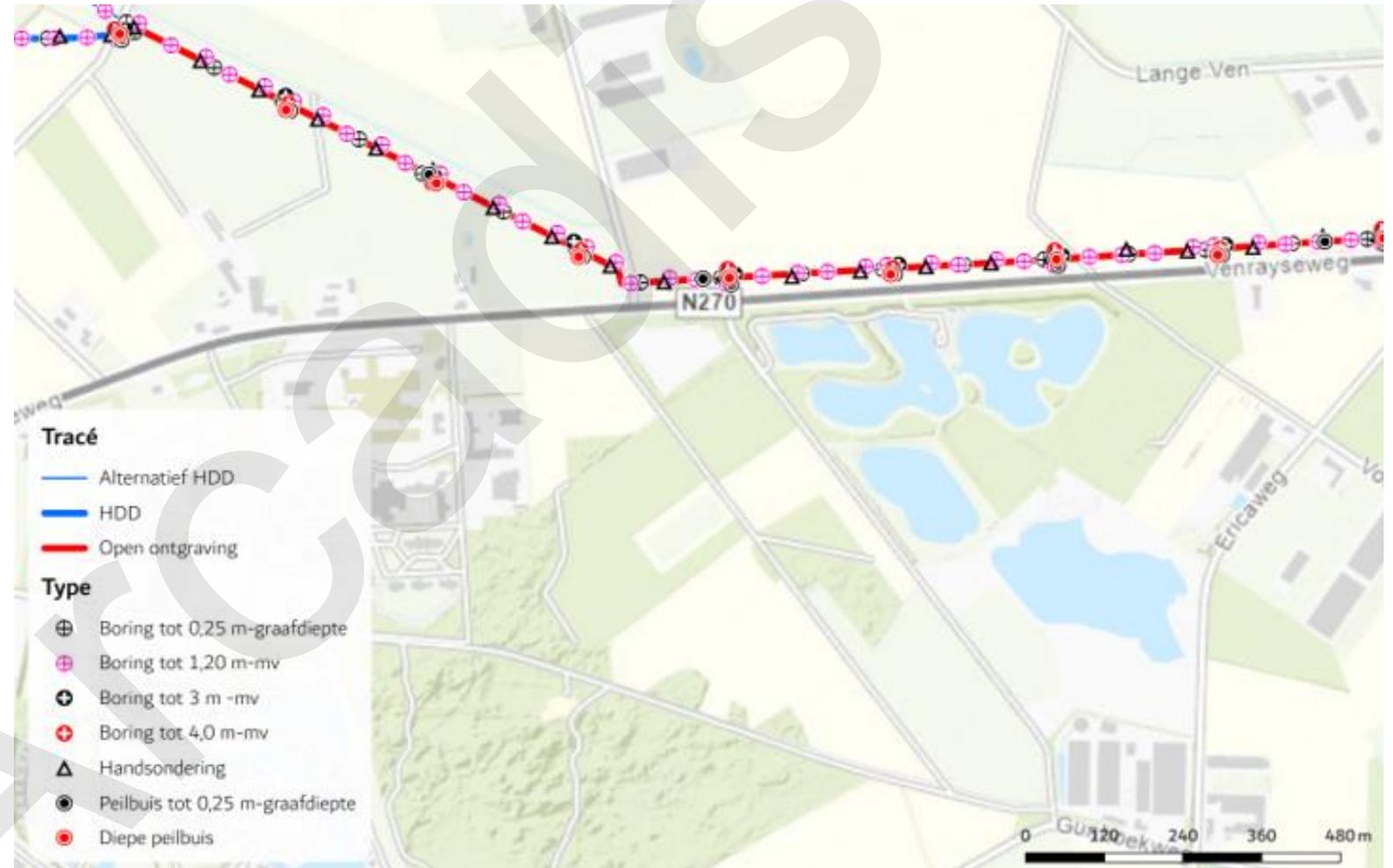
Environmental impact analysis pre-study (NL)

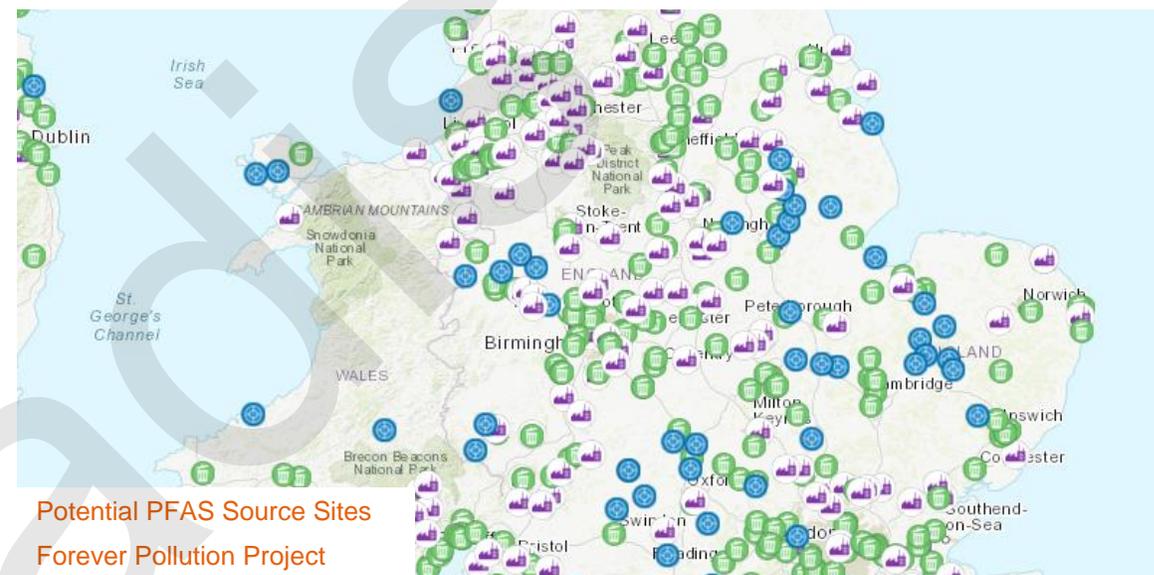
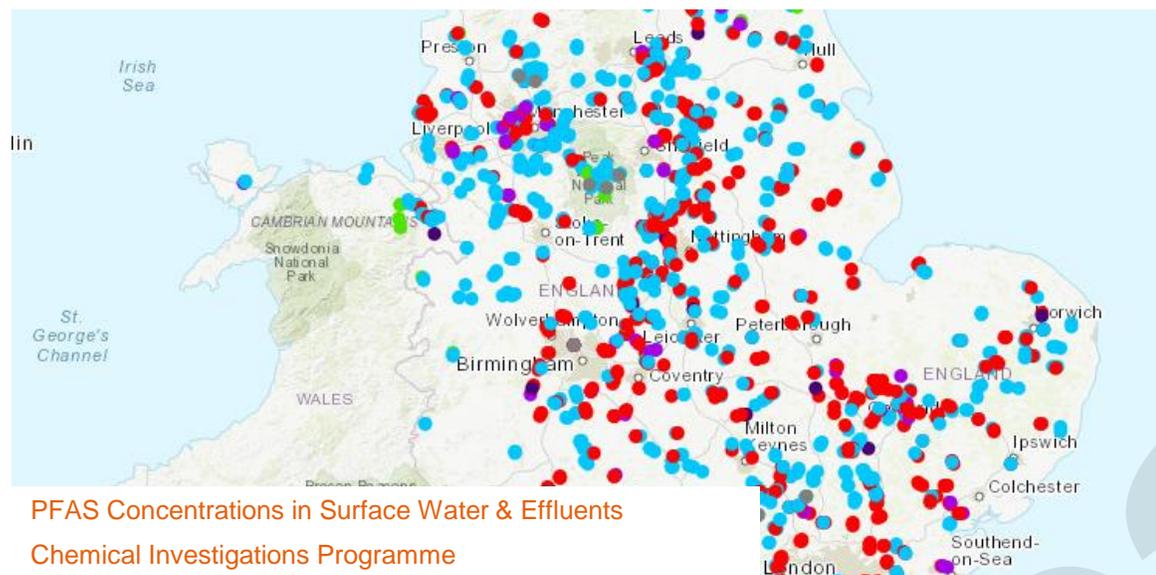
- WebGIS app for EIA pre-study
- Collaboration tool ANL-GEC
- Viewer with "edit" function
- Digital site surveys for soil-contaminating activities
- Scores based on historical reports
- Project progress tracking



Automated drilling plan (NL)

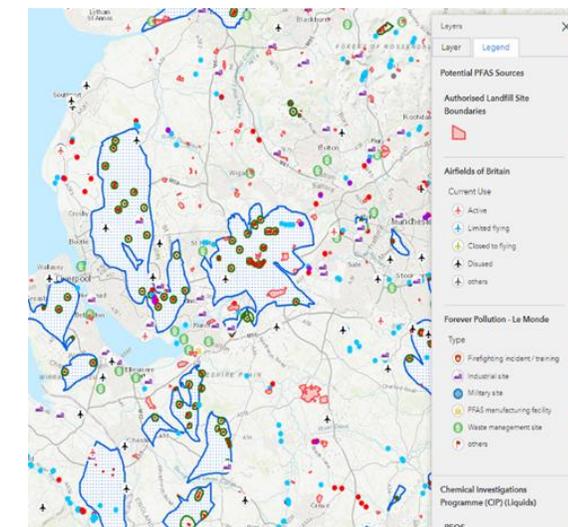
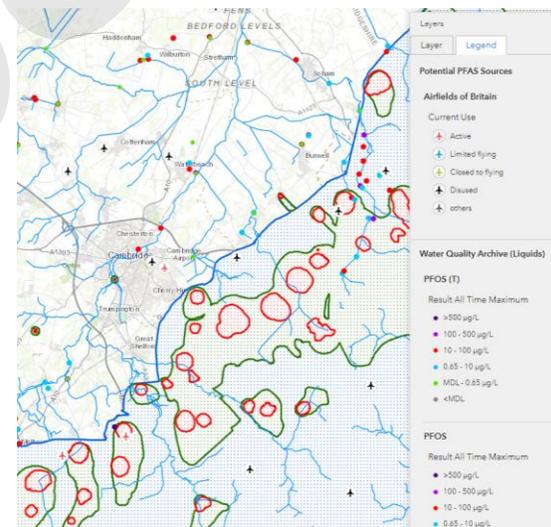
- Automated creation of drilling plan based on legislation/client specifications
- Specialist can edit drilling plan in WebGIS
- GEC makes final maps, XY tables and other needed files





PFAS SmartAtlas (UK) - Preview

- PFAS detections in the environment – EA Water Quality Archives / WIMS, Chemical Investigations Programme
- Environmental sensitivity – drinking water protection zones, aquifer vulnerability, geology, etc
- Potential PFAS source sites – airfields, landfills, stormwater overflows, forever pollution project data
- Supports - desk studies, portfolio vulnerability assessments, off site source identification, ambient concentrations, bid preparation



PFAS Regulatory Tracker (US)

- Tracks US regulations
- To be expanded globally
- Customizable for highlighting relevant regions
- Allows filtering by state, media type, and compound

PFAS Standards - United States

View state standards by clicking on the map or using the filters.

State or Jurisdiction: All

Media: All

Type: All

Compound: All

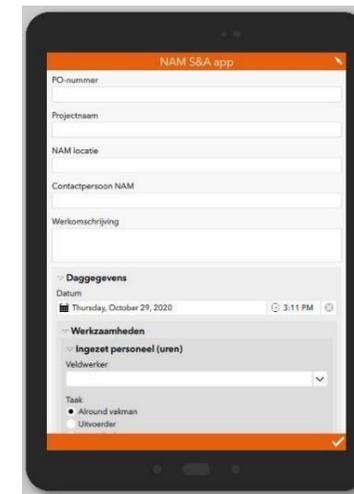
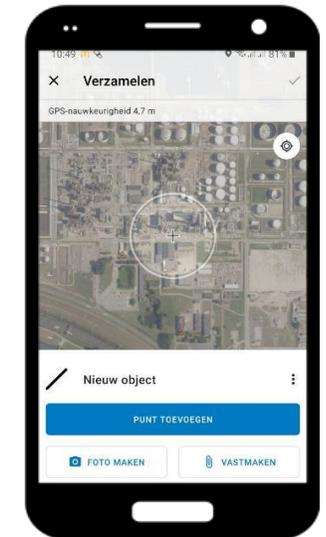
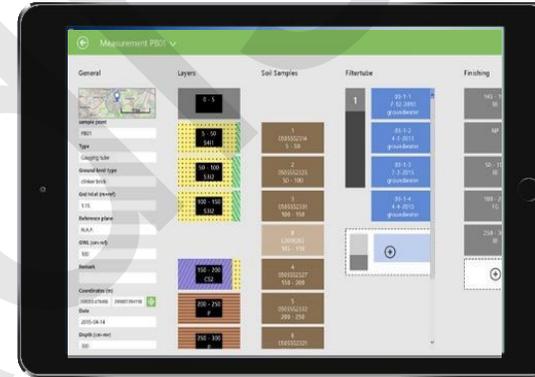
Enforceable or Advisory: All

State or Jurisdiction	Media	Type	Compound	Value	Units	Regulated as Summation	Enforceable or Advisory	Proposed or Promulgated
Alaska	Drinking Water	Action Level	PFOA	70	ng/L	Yes	Enforceable	Promulgated
Alaska	Drinking Water	Action Level	PFOS	70	ng/L	Yes	Enforceable	Promulgated
Alaska	Groundwater	Action Level	PFOA	70	ng/L	Yes	Enforceable	Promulgated
Alaska	Groundwater	Action Level	PFOS	70	ng/L	Yes	Enforceable	Promulgated
Alaska	Groundwater	Cleanup Level	PFOA	400	ng/L	Yes	Enforceable	Promulgated
Alaska	Groundwater	Cleanup Level	PFOS	400	ng/L	No	Enforceable	Promulgated
Alaska	Soil	Remediation - Arctic Zone - ...	PFOA	2.2	mg/kg	No	Enforceable	Promulgated
Alaska	Soil	Remediation - Arctic Zone - ...	PFOS	2.2	mg/kg	No	Enforceable	Promulgated
Alaska	Soil	Remediation - Migration to ...	PFOA	0.0017	mg/kg	No	Enforceable	Promulgated
Alaska	Soil	Remediation - Migration to ...	PFOS	0.003	mg/kg	No	Enforceable	Promulgated
Alaska	Soil	Remediation - Over 40° Zo...	PFOA	1.3	mg/kg	No	Enforceable	Promulgated
Alaska	Soil	Remediation - Over 40° Zo...	PFOS	1.3	mg/kg	No	Enforceable	Promulgated
Alaska	Soil	Remediation - Under 40° Z...	PFOA	1.6	mg/kg	No	Enforceable	Promulgated
Alaska	Soil	Remediation - Under 40° Z...	PFOS	1.6	mg/kg	No	Enforceable	Promulgated
Alaska	Surface Water	Action Level	PFOA	70	ng/L	Yes	Enforceable	Promulgated
Alaska	Surface Water	Action Level	PFOS	70	ng/L	Yes	Enforceable	Promulgated
California	Drinking Water	Notification Level	PFBS	500	ng/L	No	Enforceable	Promulgated
California	Drinking Water	Notification Level	PFHxS	3	ng/L	No	Advisory	Promulgated
California	Drinking Water	Notification Level	PFOA	5.1	ng/L	No	Enforceable	Promulgated
California	Drinking Water	Notification Level	PFOS	6.5	ng/L	No	Enforceable	Promulgated
California	Drinking Water	Public Health Goal	PFOA	0.007	ng/L	No	Advisory	Proposed
California	Drinking Water	Public Health Goal	PFOS	1	ng/L	No	Advisory	Proposed
California	Drinking Water	Response Level	PFBS	5,000	ng/L	No	Enforceable	Promulgated
California	Drinking Water	Response Level	PFHxS	20	ng/L	No	Advisory	Promulgated
Total								

**Examples:
Data collection**

A man in a grey sweater is standing in a server room, looking at a laptop. The room is filled with rows of server racks, and the lighting is dim with blue tones. A large, faint watermark is visible in the background.

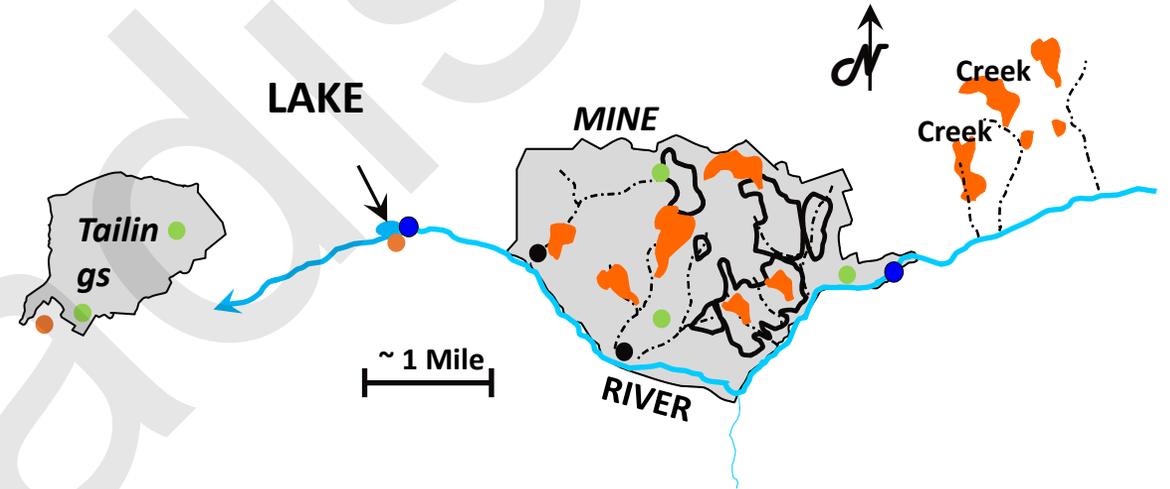
FieldNow™ (Global)



Sensors (US)

Mine Site Monitoring Program

- A storm water runoff monitoring program to measure potential runoff that could discharge into the river.
- Waste Rock Pile Stability monitoring program.
 - Vibrating Wire
 - Inclinometers
- Onsite weather monitoring program
- SCADA Remediation system monitoring program
 - Groundwater barrier

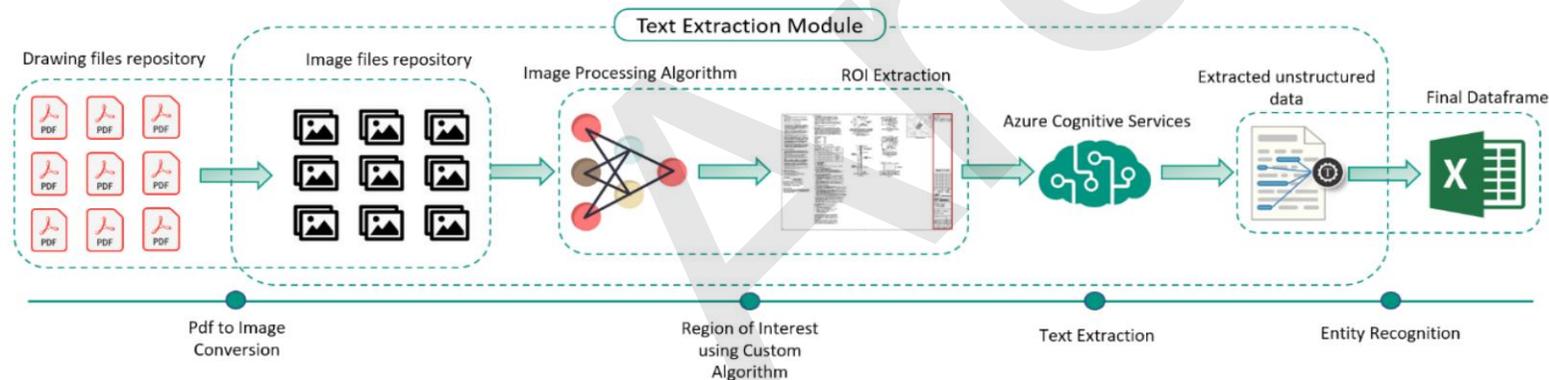
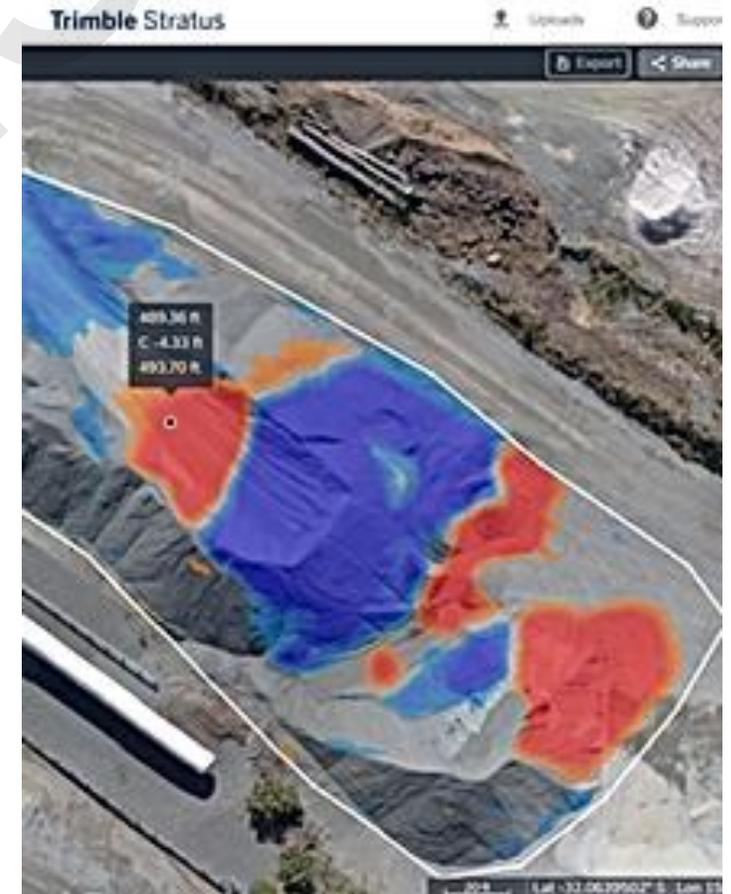


- ALTERATION SCAR
- ROCK PILE MONITORING LOCATIONS
- RIVER MONITORING LOCATIONS
- SURFACE WATER MONITORING LOCATIONS
- WEATHER STATIONS
- SCADA SYSTEMS

Immersive technology

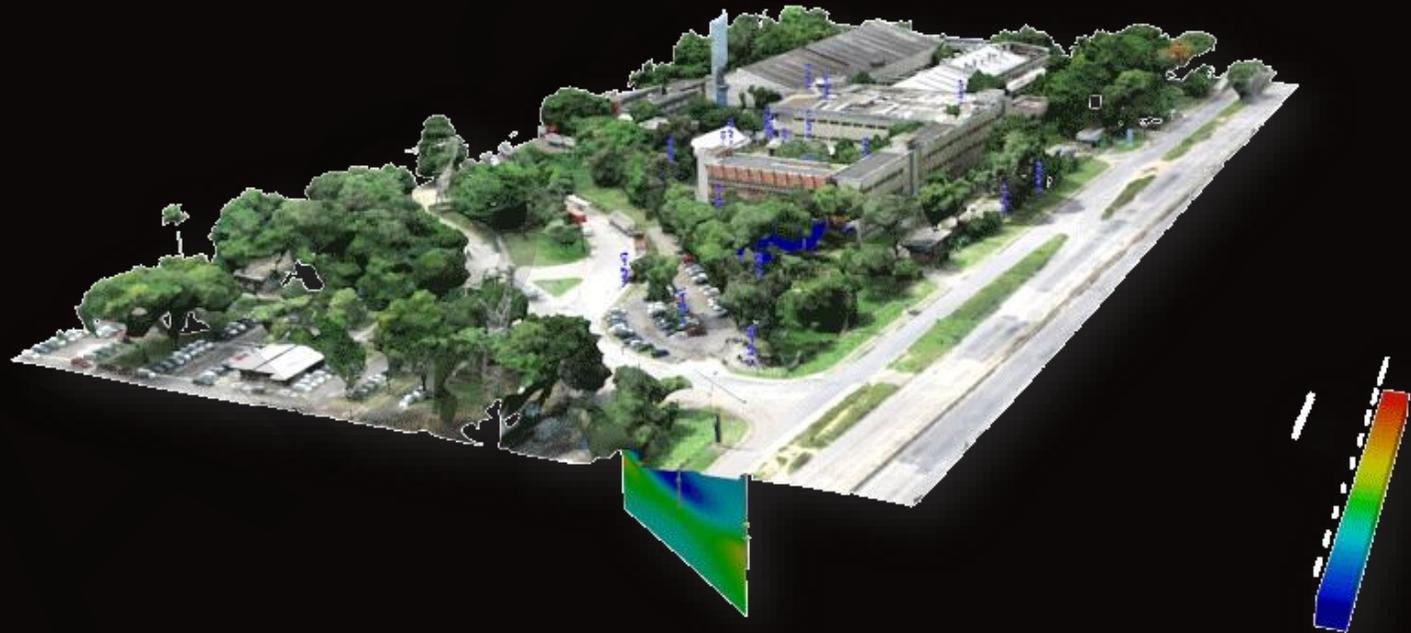
Examples:

- Drones
- AI: Bulk digitizing historical reports
- (Public) API's and webservice

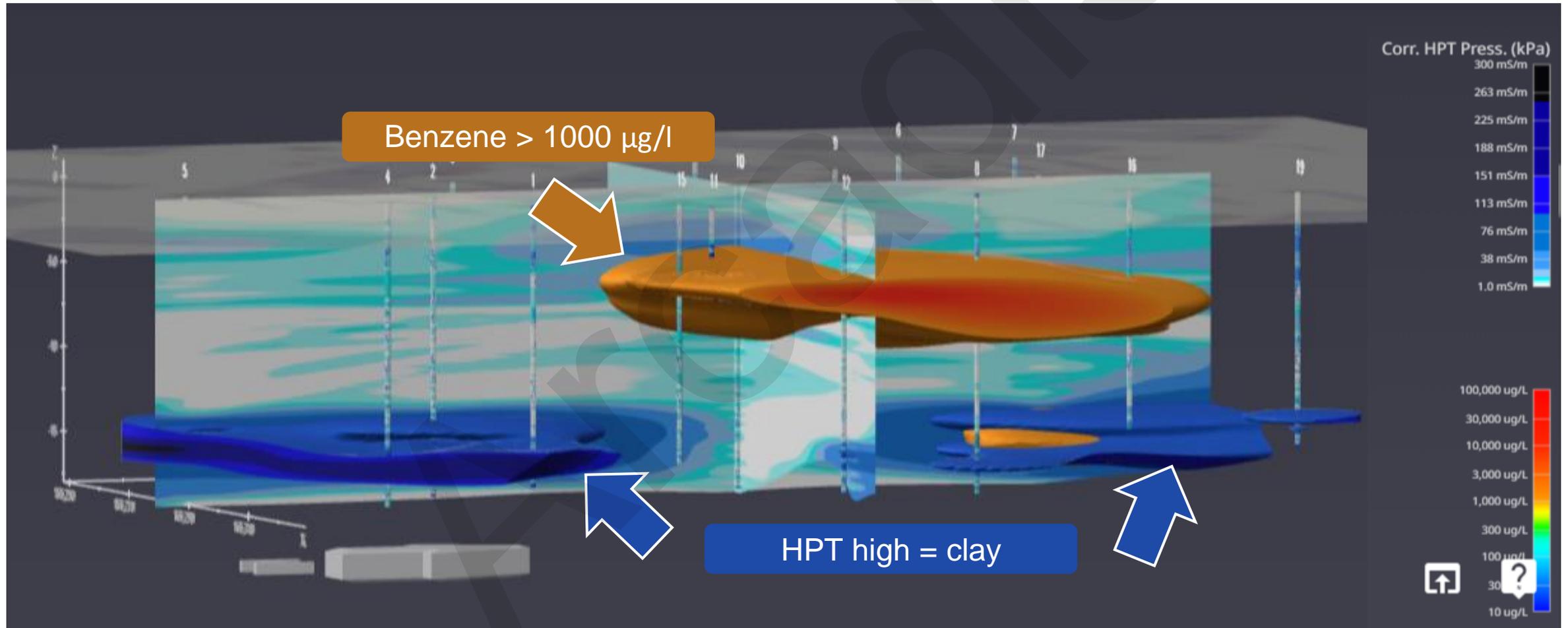


Source: [SkySense Drone Solutions](#)

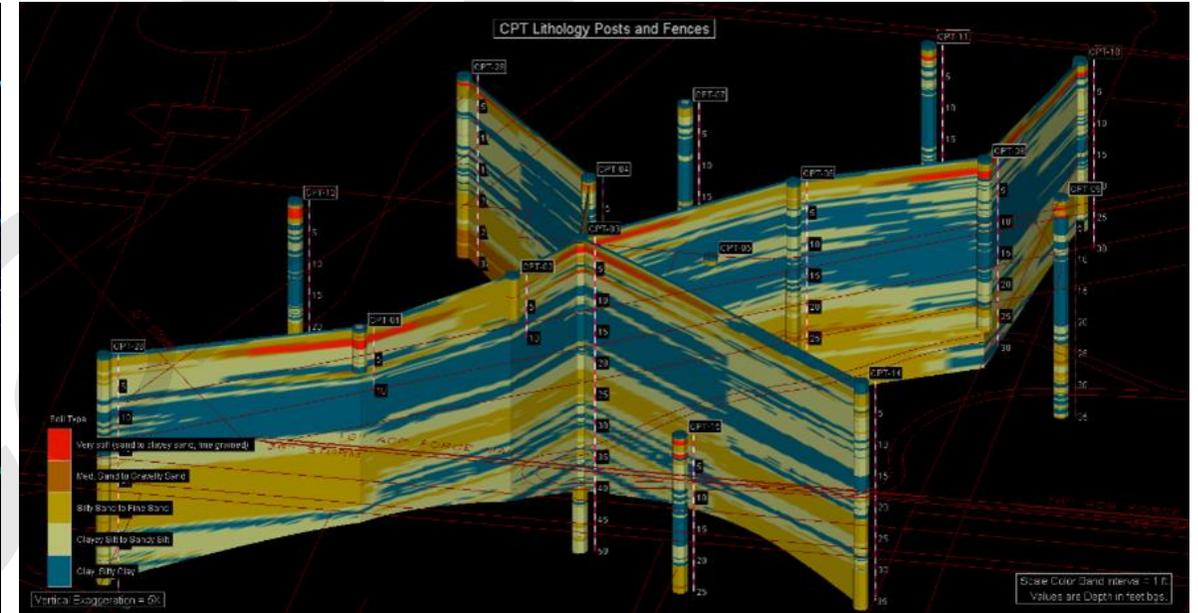
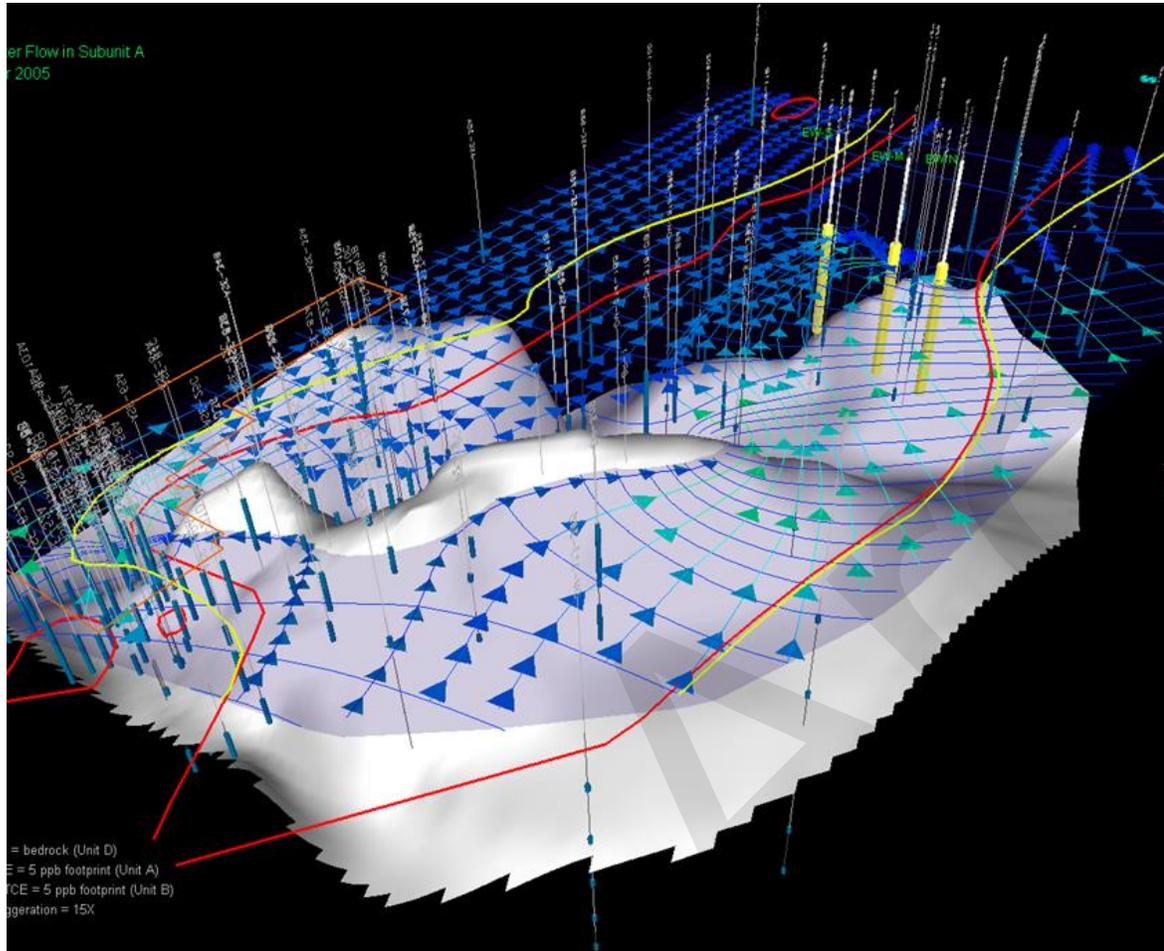
Examples: Visualization and Advanced Data Analysis



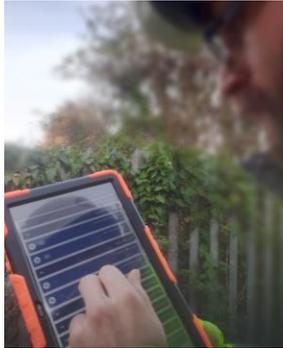
Membrane Interface Probe (MIP) + Hydraulic Profiling Tool (NL)



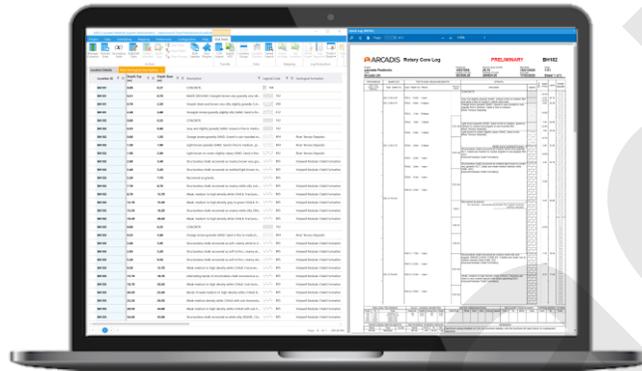
Geology, hydrology and contaminant footprint (US)



Digital Data Collection with automated 3D Modelling (UK)



Fully digital data collection

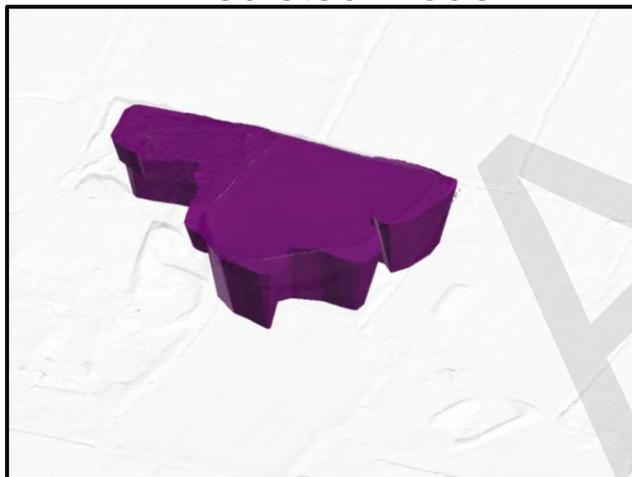


Real-time data review

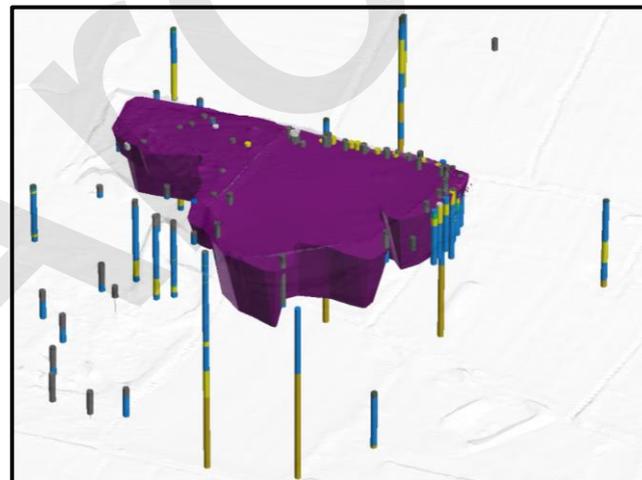


3D visualisation of the data within the context of the whole site.

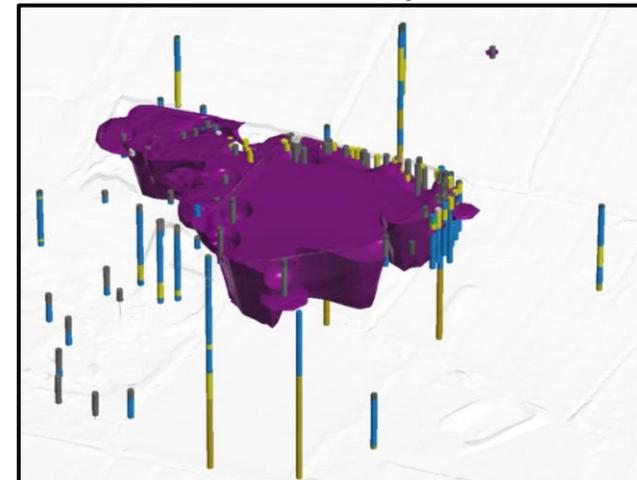
Predicted Model



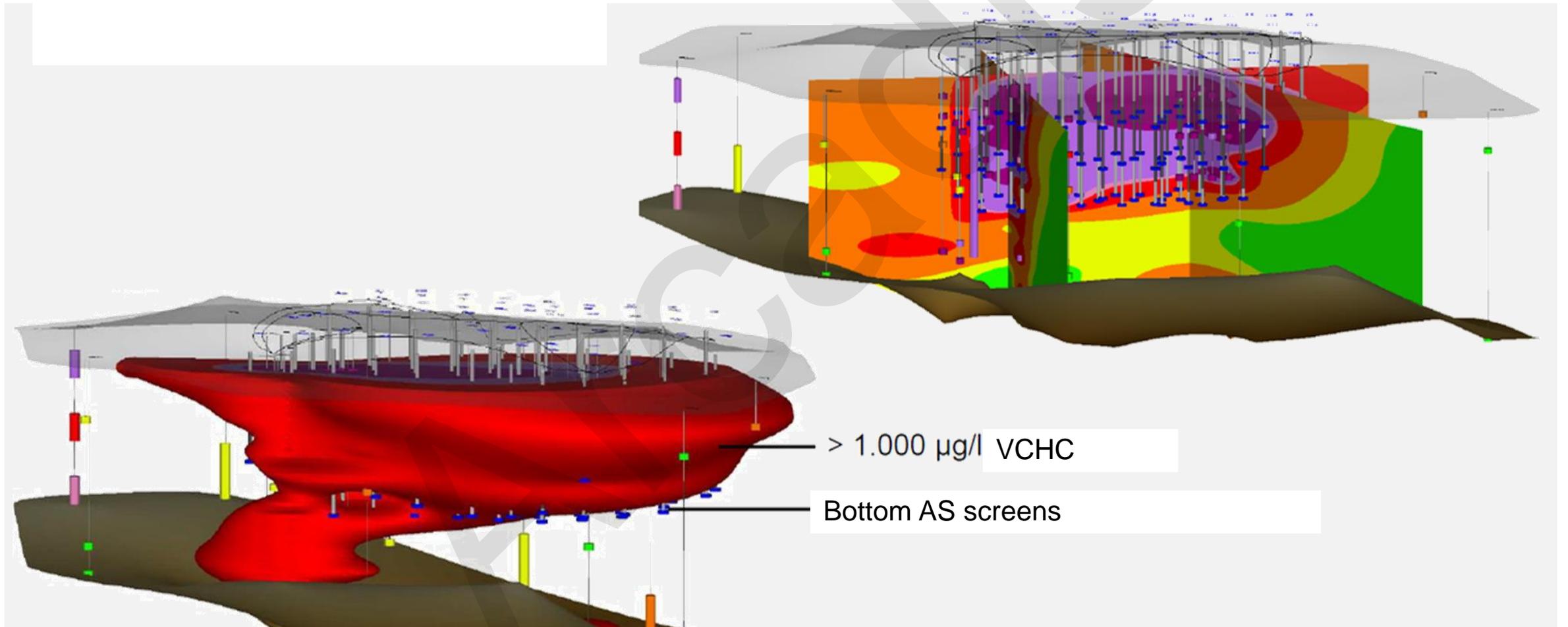
Site Investigation



Automatic Update

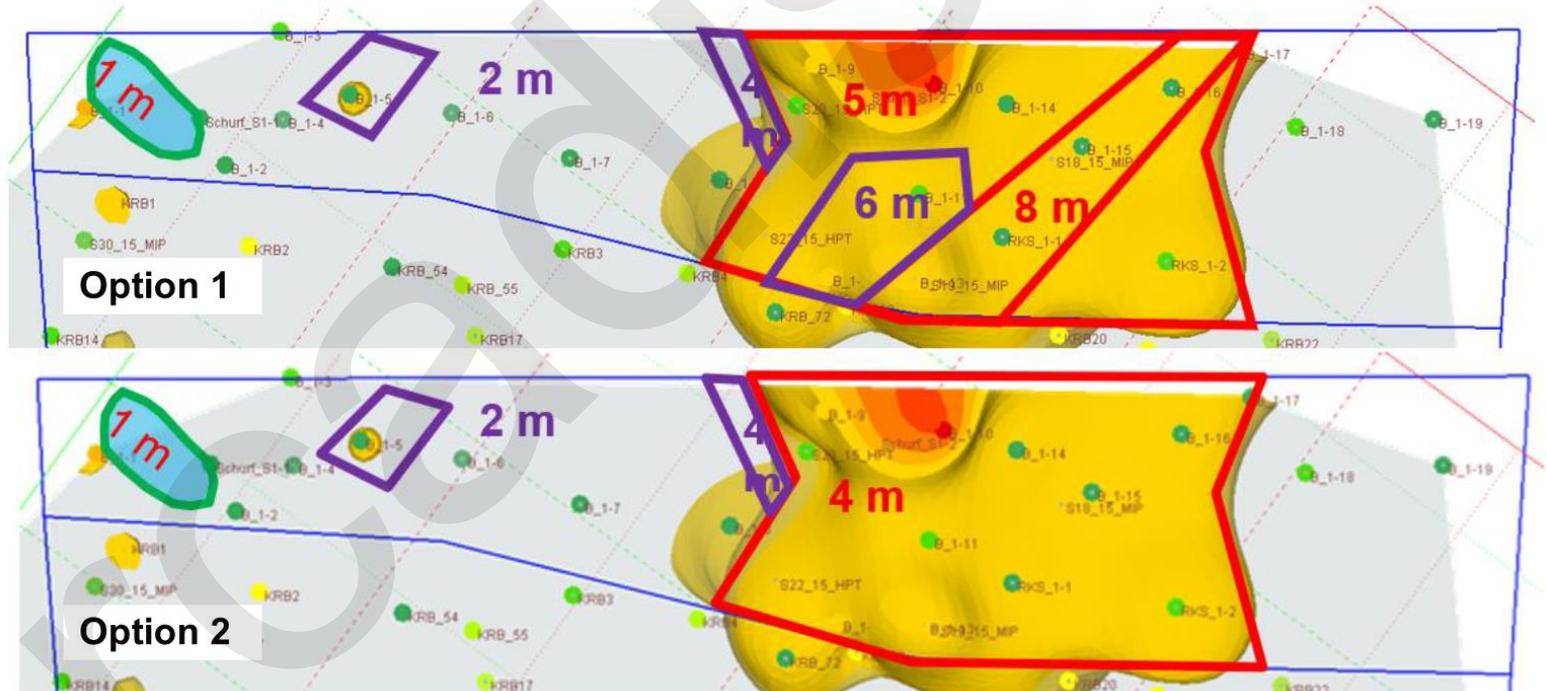


Strategic placement of Air sparging wells (DE)



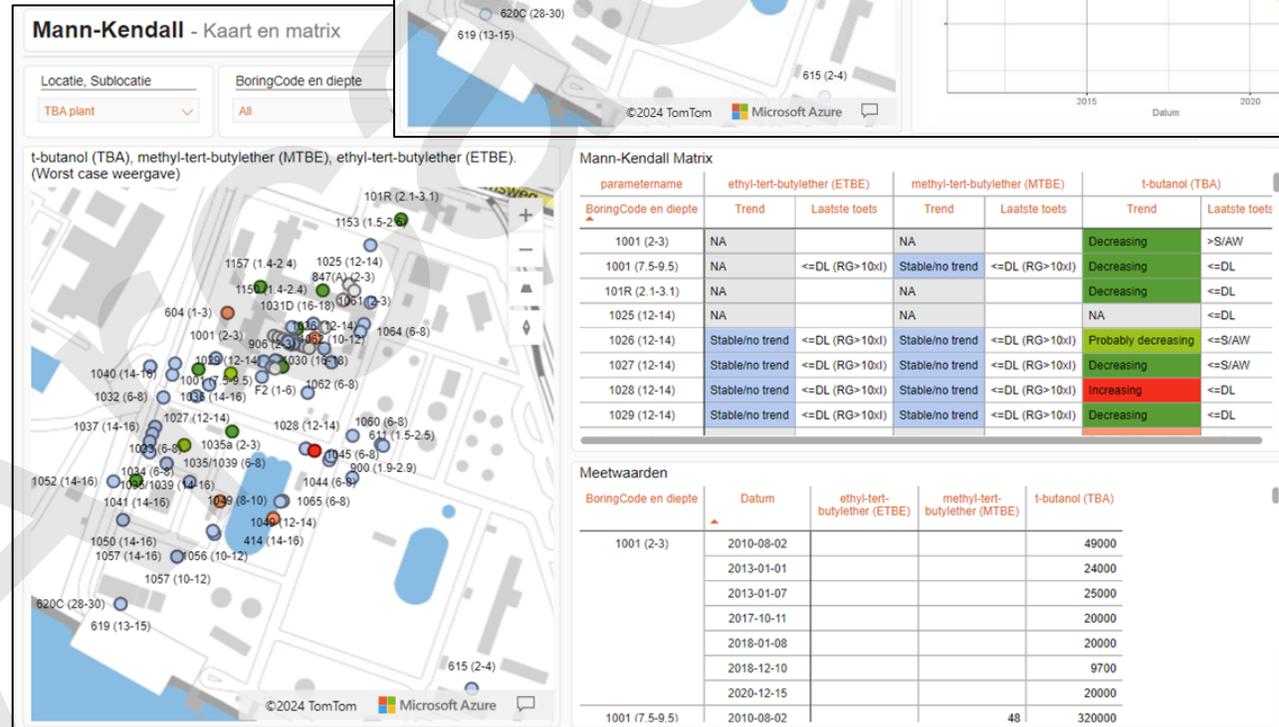
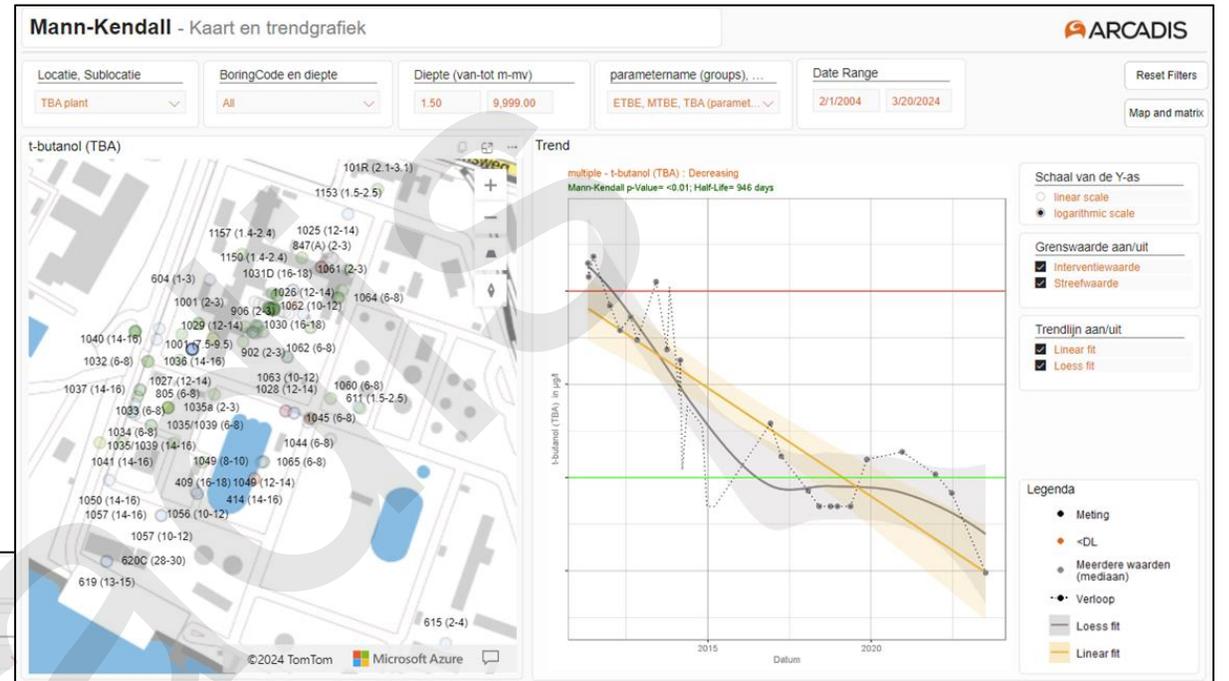
Mass balance calculation and option assessment (DE)

- Calculate volumes and contaminant mass
- Compare options for remediation planning



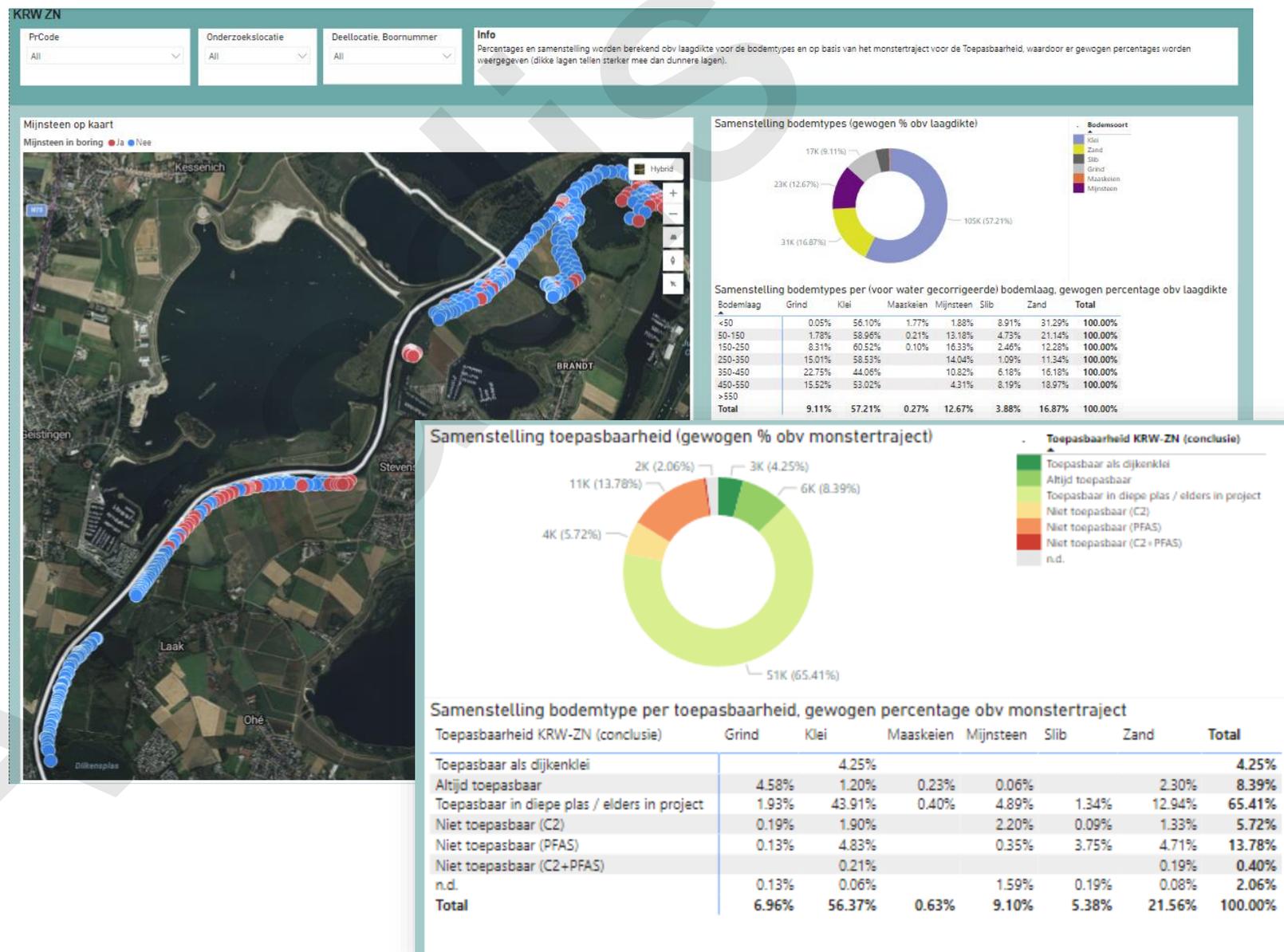
Mann-Kendall Trend Analysis (NL)

- Screen(s) or site(s)
- Map: latest result
- Matrix: monitoring well by parameter
- Trend: single parameter



Soil management (NL)

- Soil management plan
- Re-use options per type of soil dredged or excavated from riverbeds and banks



Examples: Progress Tracking





Site investigation tracker (UK)

- Recording and visualizing site investigation data
- Monitors progress and health/safety
- Enables status updates and information capture
- Provides visibility to clients and site managers
- Ideal for large, complex investigations

check access permissions

Multiple selections

Location Name

Search

Status

- Select all
- Needs Vax
- Normal
- Refused - Cancelled
- Removed from programme

- Additional work required
- Removed from scope
- Refusal
- Needs markout
- Needs utility clearance
- Needs permit to dig
- Ready to core/breakout
- Ready to handpit
- Ready to drill
- Ready for development

Precondition survey findings **Postcondition survey findings** **Refusal / Completion comments**

Work Status Overview

Click to open in Fulcrum

1

Step	Progress
Utility Markout	Completed
Utility Markout	Outstanding
Utility Clearance	Completed
Utility Clearance	n/a
Utility Clearance	Outstanding
Permit to dig	Completed
Permit to dig	n/a
Permit to dig	Outstanding
Coring	Completed
Coring	n/a
Coring	Outstanding
Handpit	Completed

Locations being shown

1475

Remediation Progress Monitoring (US)

AIR SPARGE MONITORING DASHBOARD PLANT 2

9/3/2020 6/4/2021



Select Zone, Well, or Ctrl+Click Multiple Wells

- Select all
- Zone 1
 - WELL [AIR SPAR...
 - AS-19-E02
 - AS-19-E05
 - AS-19-E08
 - AS-19-G01
 - AS-19-G03
 - AS-19-G06
 - AS-19-G09
- Zone 2
 - WELL [AIR SPAR...
 - AS-19-E01
 - AS-19-E04
 - AS-19-E07
 - AS-19-E10
 - AS-19-G02
 - AS-19-G05
 - AS-19-G08

Latest Zone(s) in Operation
["Zone 1 and 4"]

Well Field by Asset

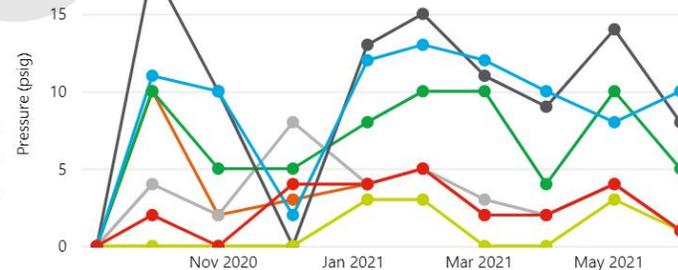


Latest Average Pressure of Selected Wells: **4** psig
2021-06-04

Pressure (psig)

Location ID

- AS-19-E01
- AS-19-E04
- AS-19-E07
- AS-19-E10
- AS-19-G02
- AS-19-G05
- AS-19-G08

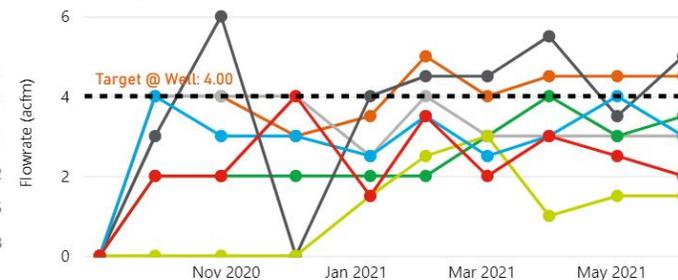


Latest Cumulative Flowrate of Selected Wells: **189** acfm
2021-06-04

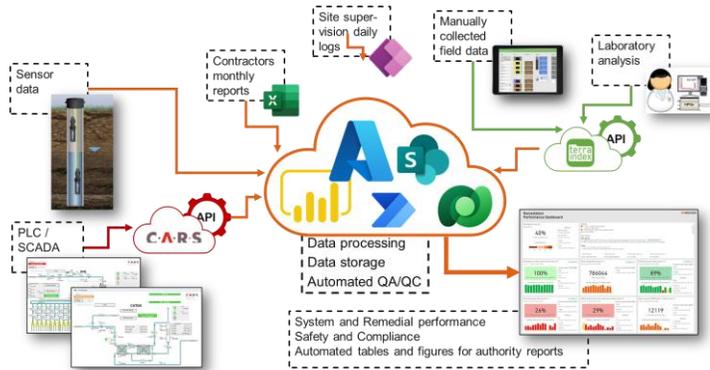
Flowrate (acfm)

Location ID

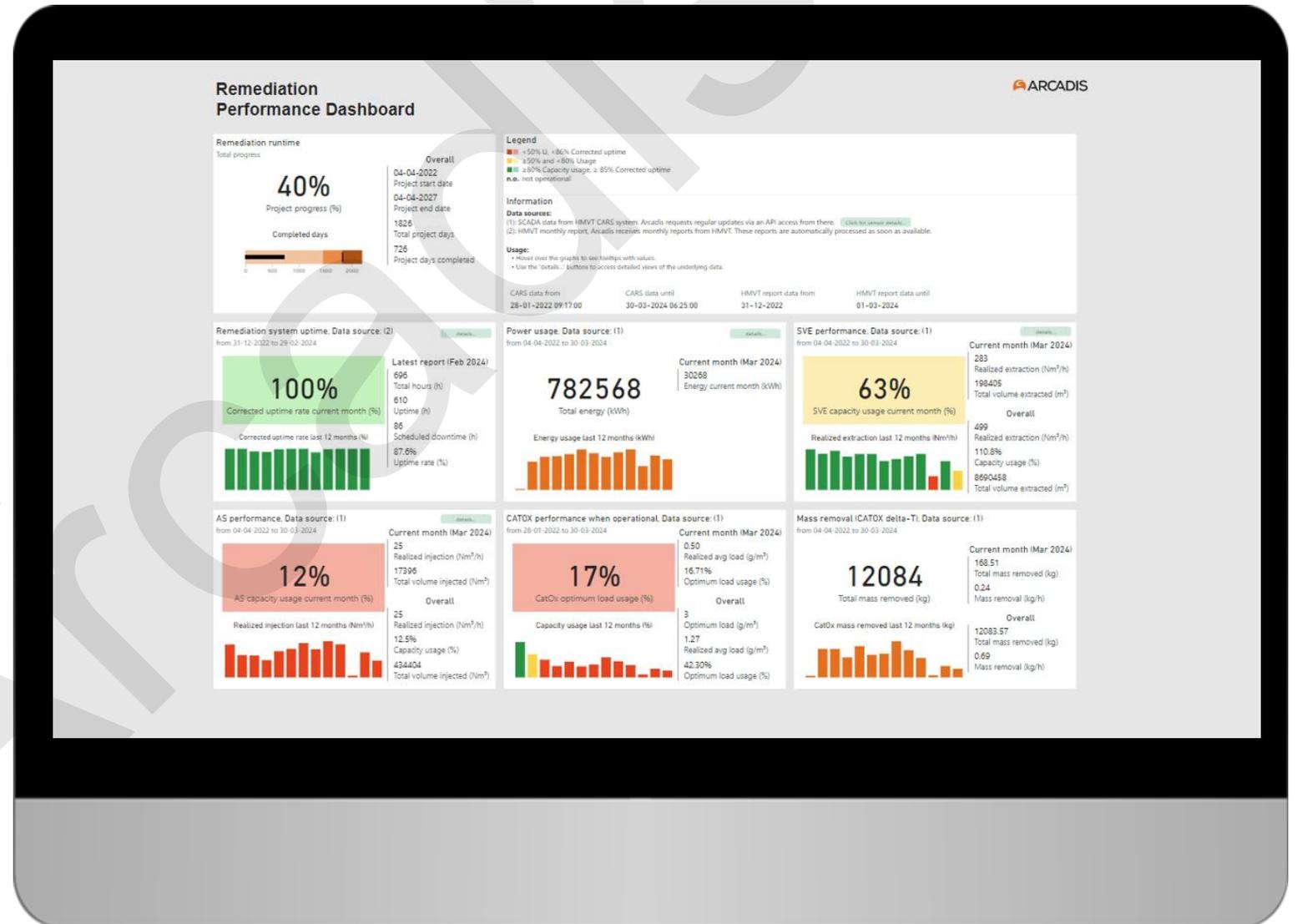
- AS-19-E01
- AS-19-E04
- AS-19-E07
- AS-19-E10
- AS-19-G02
- AS-19-G05
- AS-19-G08



Remediation (NL)



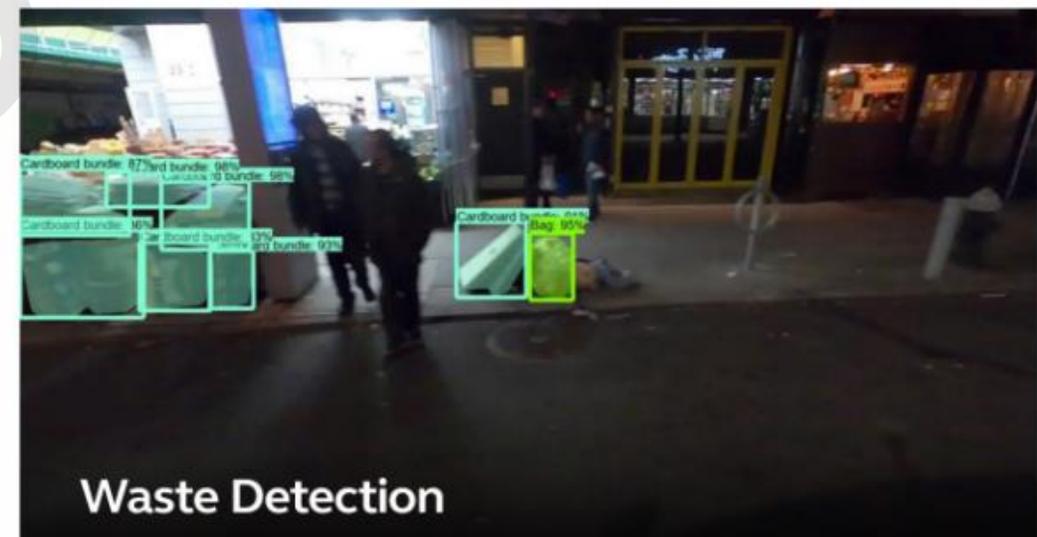
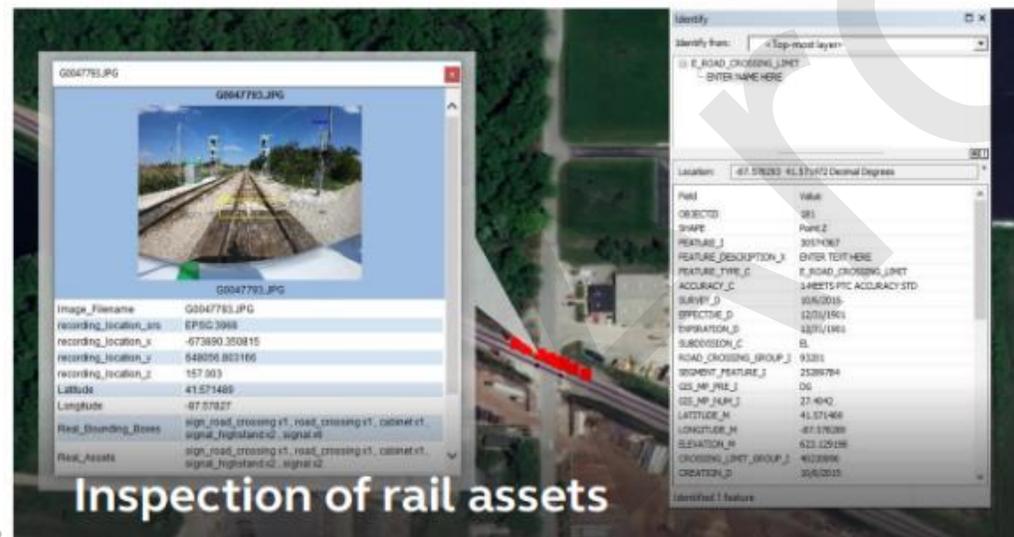
- Progress and Performance
- Safety and Compliance
- Supervision and Steering
- Details



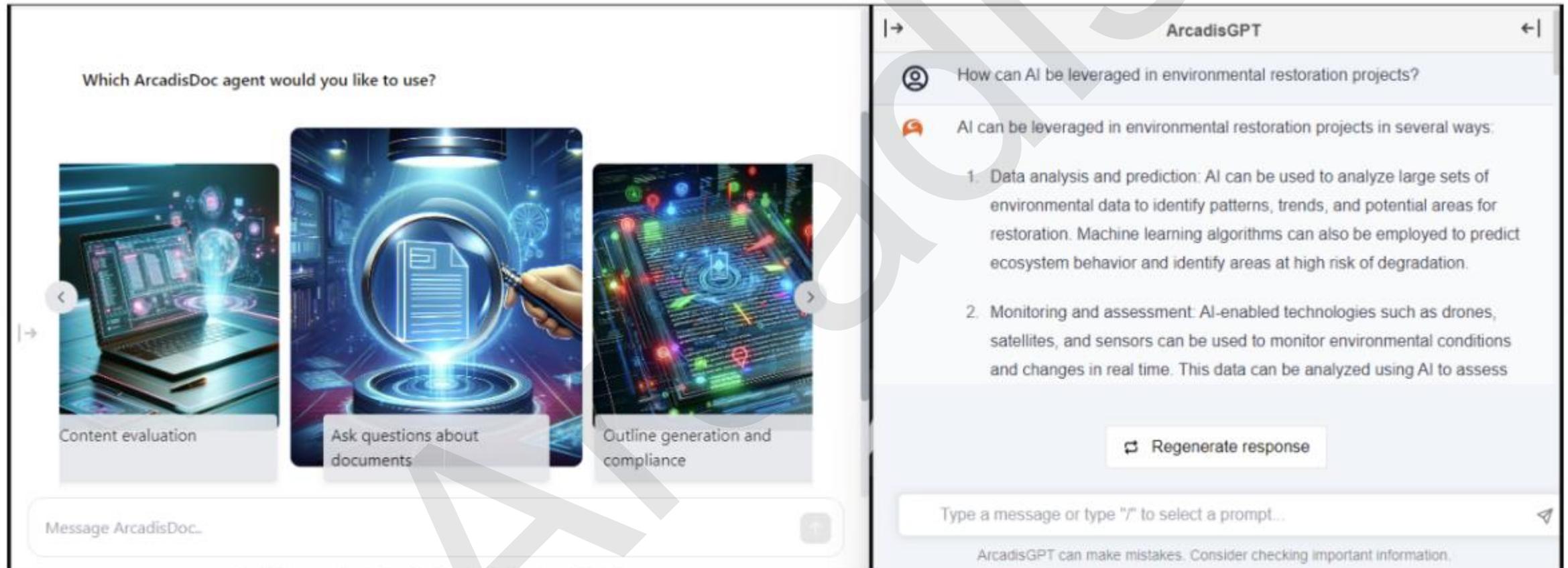
Artificial Intelligence



Computer vision: Arcadis' Intelligent Asset Insights (IAI)



Generative AI: ArcadisGPT and ArcadisDoc



ArcadisDoc and ArcadisGPT are applications to create content and analyze documents using Generative AI

Generative AI: Microsoft Copilot



Microsoft 365 Chat

Get quick answers in Teams, Bing, or Microsoft365.com. You can ask Copilot to find anything you need from your organization.



Microsoft Teams

Can answer your questions about a meeting, chat, or channel. Copilot can suggest follow-up questions, summarize different perspectives from the group, and provide the highlights of long chat conversations.



Microsoft Outlook

Start emails quickly. Save time writing emails with Copilot as your drafting partner.



Microsoft Word

Get a summary, or you can ask specific, open-ended questions about your document or draft a document.



Microsoft PowerPoint

Turn Word documents into presentations.



Microsoft Excel

Get a better understanding of your data, highlight parts of your data, get quick visualizations, or create new columns with formulas for your Excel tables.

Embracing Responsible AI in Site Evaluation and Restoration



Bing Image Creator (powered by DALL-E 3)
 Prompt: "artificial intelligence in environmental restoration"

AI is expected to have a game-changing influence on the way we work by improving decision making, increasing efficiency and creating competitive advantage

Arcadis is committed to the **responsible and innovative integration of AI**, recognizing both its potential and the challenges that must be addressed.

- **Short Term:** Improving efficiency in routine tasks.
- **Longer Term:** Leveraging AI throughout the complete project lifecycle.



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