# CDM Smith

# Digital Overview

**CAPABILITY STATEMENT**

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# Digital Services

**Data is one of your greatest assets, and we're here to turn your data into insight**

Our goal is to provide exceptional data architecture to convert raw data into actionable insights that can inform decision-making.

The critical question is always, "**What do you want to do with your data?**"

At CDM Smith, our experienced data and geospatial experts collaborate with water, environmental and engineering specialists to deliver customised and cutting-edge solutions that enable our clients to comprehend and utilise data for efficient communication and informed decision-making.

We design and implement data collection and analytics frameworks for environmental, water, engineering and human health projects in the public and private sectors. The data collected is then presented in an easily understandable manner through the use of visually appealing tools such as interactive reports, dashboards, web maps, and custom-built applications.

This combination of skills empowers our clients to solve complex problems once considered insurmountable due to uncertainty in the data or the vast volume and variety of data available. Our goal is to provide exceptional data architecture to convert raw data into actionable insights that can inform decision-making.

A lot of time and expense can go into collecting and maintaining data from existing programs and historical records. The generation of data through these programs represents a significant investment. However, the level of investment in communicating its meaning isn't always equal.

At CDM Smith, we add value to traditional programs by making data management and communication easy with tailored outputs to assist interpretation and communication, making the data more accessible through the delivery of insights.

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# Data Science & Analytics

**Analysing data to transform environmental & operational information into insights.**

Our focus is to allow organisations to harness the power of data to make advised and actionable decisions. Data science and analytics is the process of examining, cleaning, transforming, and modelling data to discover useful information, draw conclusions, and support decision-making.

As a CDM Smith client, you'll be set up to leverage your data to

- Make better-informed decisions based on factual evidence rather an intuition or assumptions

- Identify trends and patterns that would be difficult to detect otherwise, enabling them to make more accurate and effective decisions

- Optimise operations and identify areas of inefficiencies, reducing waste in the supply chain, reducing costs

- Improve stakeholder and community experiences by identifying needs and clearer communications

- Identify new opportunities for growth and innovation

### Descriptive Analytics

Statistical analysis, data intelligence, and data mining services to develop insights into historical and real-time environments.

### Predictive Analytics

Artificial intelligence and machine learning algorithms to automate and scale data-driven decisions based on the outputs of trained, tested, and evaluated models.

### Geospatial Analytics

Incorporating spatial data and features into statistical methods for specific locations

### Diagnostic Analytics

Root cause analysis, isolate confounding variables, and model cause-effect relationships to uncover why an event of interest is happening/ happened to help inform design or implement effective interventions.

### Prescriptive Analytics

Application of decision science techniques, e.g. cost-benefit analysis, decision and risk analysis, and optimisation, to inform complex decisions by identifying the preferred course of action based on uncertainties and risk tolerance.

## PROJECTS IN FOCUS

### Data Mapping of Aquifer Properties and Recharge

CDM Smith was tasked by the Victorian Department of Environment, Land, Water and Planning to develop a way to improve the legacy of groundwater knowledge by developing a new method to map existing information gathered from past studies of aquifer/aquitard properties across the State of Victoria. The project was commissioned to develop a single and accessible point of reference for key hydrogeological data for groundwater practitioners engaging in groundwater assessments and modelling in the state.

An interactive dashboard was produced with a Map View, which presents charts summarising the aquifer properties across all available aquifers. The product collated and processed all available aquifer data across Victoria into a single user-friendly platform that summarised complex data in a transparent format that connected back to the information sources.

The project featured:

- Collaboration with national research bodies (including CSIRO) to ensure access to quality and complete sets of data.

- Development of a simplistic user-centric design to ensure an intuitive navigation approach and prevent any cumbersomeness arising from the large volume of data.

- Creating a bespoke and adaptable design that could read a variety of raw data formats, allowing for the integration of new data as they become available.

- Development of a novel method to intersect various spatial layers to generate an improved output that presents details of all intersected sources.
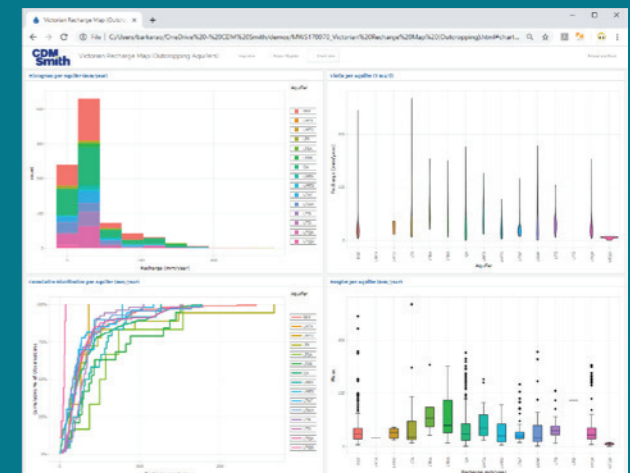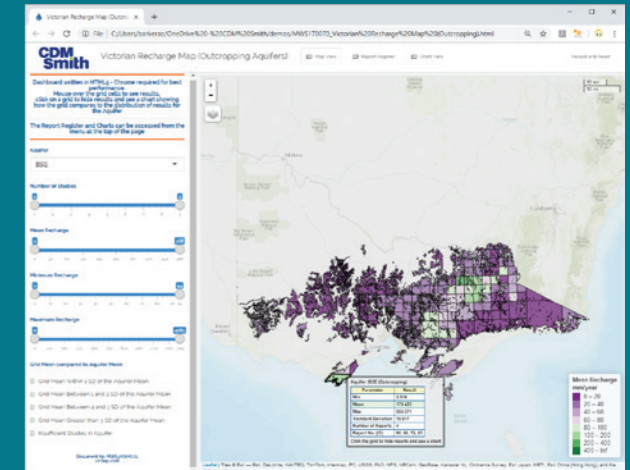
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# Data Visualisation

**Clear, usable data that tells a story.**

CDM Smith combines data's visual representation with compelling storytelling to deliver meaningful insights that are easily understood and inspire action, including design development, deployment, and maintenance of strategic, operational, and analytical dashboards to support decision-making across multiple stakeholders.

As an environmental, water and engineering firm, we understand your data and provide clients additional benefits through data visualisation by using visual representations to communicate complex information and insights effectively.

Data visualisation can help make complex data more accessible, understandable, and actionable for clients and stakeholders.

**Communicating environmental risks and impacts:** Using maps, charts, and graphs, the extent of environmental risks and impacts, such as air and water pollution, deforestation, and habitat loss, can be understood. Within an engineering and asset management context, opportunities can be identified to optimise design and performance and reduce cost and safety risks.

**Identifying trends and patterns:** Data visualisations can help identify trends and patterns in data, such as changes in temperature, precipitation, or land use, which can inform environmental management decisions. Within an engineering and asset management context, combining diverse data sources can reveal opportunities to improve efficiency and make other optimisations.

**Showing progress and success:** Visualizing data can help show the progress and success of management initiatives and provide feedback to stakeholders, demonstrating the effectiveness of specific strategies and programs.

**Engaging stakeholders:** BUsing advanced visualisations, you can engage stakeholders, including regulators, internal approvers, traditional owners and community groups, to assist with quickly understanding complex issues and the need for action.

**Communicating complex information:** Data can be complicated to understand. Data visualisation can help simplify this information and share it in an easily understandable way with a diverse range of stakeholders.

**Enhancing decision-making:** Data visualisation can help make quicker and more informed decisions by providing insights and information you may not have been able to identify otherwise.

**Improving transparency:** By sharing data with stakeholders in a visual format, you can increase transparency and build trust.

**Saving time and resources:** Data visualisation can help you quickly identify critical information, saving them time and resources that would have otherwise been spent analysing data manually.

## PROJECT IN FOCUS

### VicTrack CHAMP Dashboard (Contaminated Land Hazard Assessment and Mapping Program)

In response to new EPA Act requirements, VicTrack proposed a refresh to its contamination management system described as the "Contaminated Land Hazard Assessment and Mapping Program" (CHAMP), which aims to address previously identified data gaps and limitations of the previous internal systems, coincide with new legislative changes, spatially depicts areas of impact, marry with VicTrack's enterprise risk management framework, as well as improve efficiencies in the management of contaminated land.

CDM Smith was engaged to develop the CHAMP Dashboard, which included:

- Working closely with VicTrack to scope and design the system
- Design and development of a bespoke database to store all required information (including uploaded data, spatial layers, queries and calculations)
- Development of a web-based interface that allows VicTrack to:
  - Upload details of contamination reports/assessments (including associated spatial boundaries)
  - Upload VicTrack GIS layers
  - Assign hazard consequence ratings to reports
  - Automatically summarise reports into precinct-level information, including risk calculations for different contamination themes
  - Visualise risks via an interactive map
  - Interrogate, filter and export all information available at the report and precinct levels.



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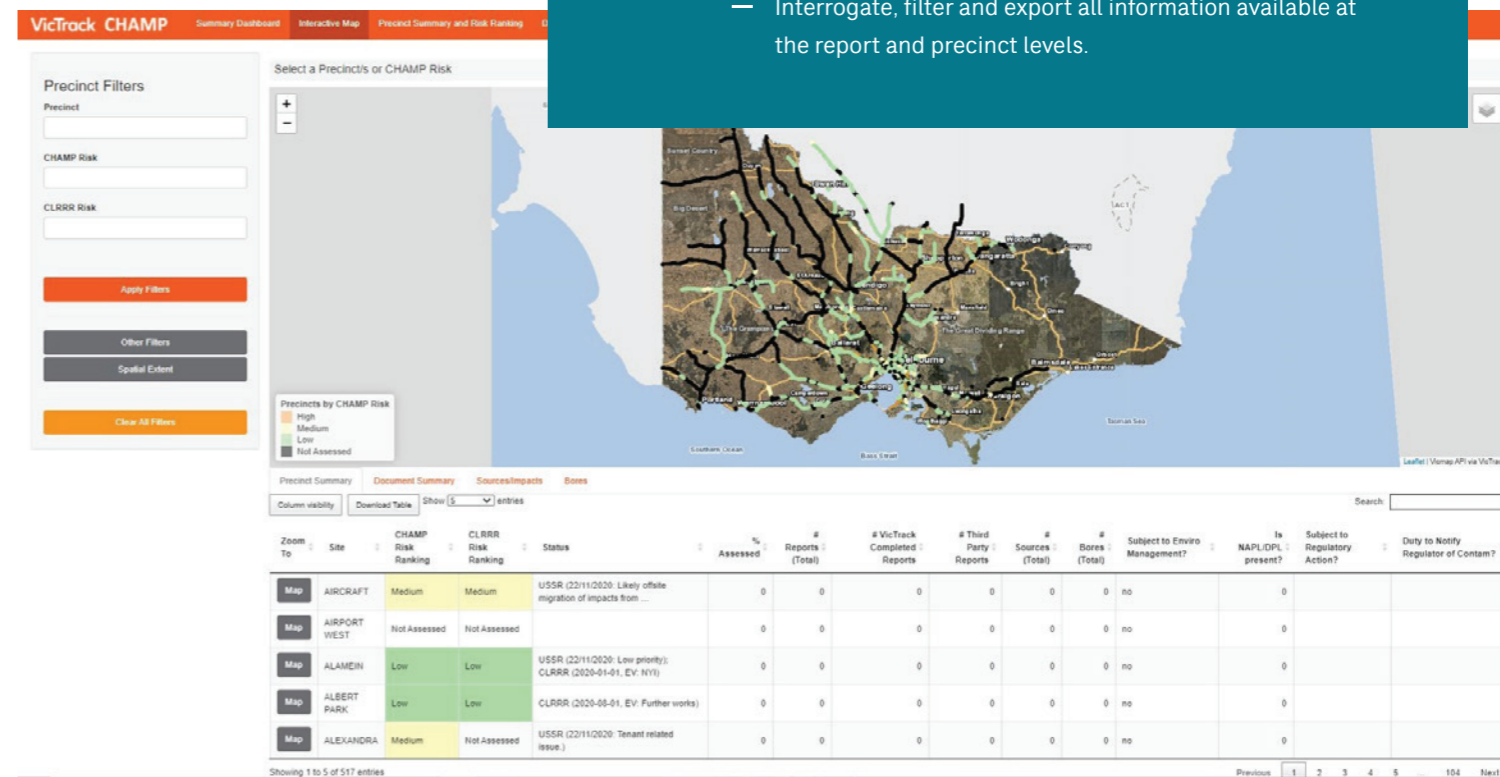
# Remote Sensing & Data Acquisition

**Leveraging drones, remote sensing, and machine learning to solve environmental challenges.**

CDM Smith's Sky Wave is Sky Wave™ combines drone technology and artificial intelligence to track and analyse surface changes. Our multi-disciplined team can create a custom plan integrating data collection, analysis, and delivery to provide tech-based, data-centric solutions.

Across a digital pipeline, we fuse data collection, management, processing, analysis, and design, in an efficient digital pipeline to support informed conclusions and decision-making. Pick a part or combination of our digital pipeline process.

**Data Processing, Interpretation, and Analysis:** Information acquired from remote sensing instruments is processed to be used across various applications.

**Fast and Efficient:** Reaching the last km and overcoming in-country commuting, delivery and distribution challenges.

**Reduce Safety Risk:** Retrieve a vast amount of data from diverse geographies, including remote and hard-to-access areas, with minimised risk.

**Real-Time Engineering Aerial Data Inspections (READI)** enables clients to complete tasks like mapping and environmental monitoring.

## DELIVERYING A RANGE OF SERVICES

CDM Smith is harnessing the power of remote sensing and drone technology to help clients view, monitor and operate the environment, water, and areas faster and more efficiently.

Our specialist team members cover all areas from data acquisition through to analysis, transforming raw data into information used to develop system knowledge and actionable intelligence to better plan, prioritise and track projects, optimise operations, assess risks and forecast future performance.

- Mapping/Surveying
- Site monitoring
- Data processing, interpretation and analysis
- Environmental monitoring: vegetation, surface water, drought and flooding
- Reporting
- Repeated inspections
- User-friendly digital platform

- Specialised offering based on site and need
- Increase the efficiency and effectiveness of engagement efforts
- Identify and manage social impacts
- Meet regulatory requirements and best practice standards
- Increase community confidence and enhance reputation.
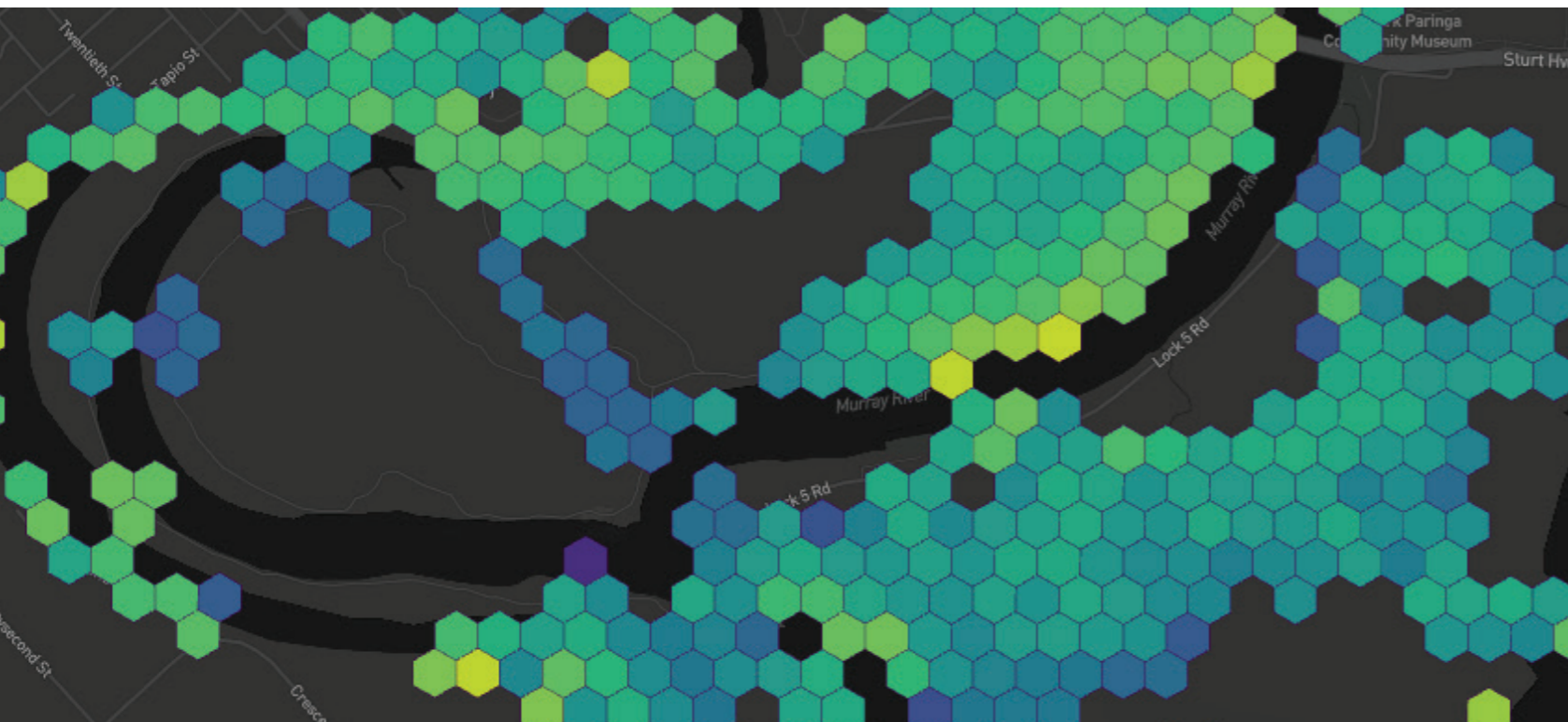
## PROJECTS IN FOCUS

### NDVI Landscape Mapping for Pike and Katarapko Floodplains

The project's objective was to demonstrate the potential for remote sensing applications for the characterisation of forest canopy health to support the environmental watering of Pike and Katarapko Floodplains.

Normalised Difference Vegetation Index (NDVI) was used from Sentinel-2 to develop a spatial and temporal trend in forest canopy response to water availability within the floodplains. NDVI measures the greenness of vegetation based on the relationship between red and near-infrared light reflectance. It can indicate photosynthetic activity and used as a proxy for vegetation condition, which is DEW monitors using on-ground survey methods at the designated transect locations.

Data capture was performed using Sentinel-2 satellite multispectral imagery. Using the lidar-derived canopy height model, forest canopy patches were selected for data extraction to ensure the processed data targets the forest canopy and filters out areas such as grass, shrubby vegetation, and nonvegetated areas. Data processing, analysis and app development were undertaken using the R Programming Language (R Core Team, 2022). Results were presented using web-based dashboards.

Two outputs were generated. The first shows the temporal trends for the existing monitoring transects used for field-based monitoring. The second shows the landscape level spatial and temporal trends for forest patches with the existing mapped extents of black box and river red gums.

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# GIS & Spatial

GIS provides a powerful tool for analysing and visualising geographical data and helps to solve problems in various fields by providing a spatial context for data analysis and decision-making.

The technology is used for capturing, storing, analysing, managing, and presenting data related to positions on the Earth's surface. GIS combines maps and databases to represent data visually and allows users to analyse and understand the data's patterns, relationships, and trends.

GIS can be used for various purposes, such as creating digital maps, analysing the distribution of natural resources, studying the impact of land use changes, and managing public services. As a result, it is widely used in various fields, including geography, urban planning, environmental management, transportation, and marketing.

It has a wide range of applications in various industries and fields, including:

- Environmental Management: GIS can be used to manage natural resources, such as forests, water, and minerals, and to analyse environmental problems, such as pollution and climate change.

- Engineering and Construction: GIS can help with design trade-offs, constraints analysis and clash detection. Once construction begins, GIS can assist with detailed site planning, material and plant tracking, and progress monitoring.

- Asset Management: GIS is ideally placed to gather, analyse and visualise the large quantity of otherwise disparate data required to safely and efficiently manage assets at any scale.

- Urban and Regional Planning: GIS can support land use planning, zoning, transportation planning, and urban development.

- Transportation: GIS can analyse transportation data and support transportation planning, route optimisation, and traffic management.

- Government and Public Services: GIS can be used to support the delivery of public services, such as police and fire protection, waste management, and utilities. Disaster Response and Emergency Management: GIS can be used to respond to natural disasters, such as hurricanes, earthquakes, and floods, and to support emergency management and evacuation planning.

- Healthcare: GIS can analyse health data and support public health planning and disease control efforts.

- Marketing and Business Intelligence: GIS can analyse customer data and market trends and support market segmentation, site selection, and direct marketing efforts.



## PROJECTS IN FOCUS

### BHP Expansion

BHP is currently planning and constructing several new greenfield and brownfield projects to support expansions in both their WA Iron Ore and Nickel businesses. Each project has a substantial scope, and the projects together represent a major program of work. Spatial Data is the lifeblood of making informed timely decisions to enable the planning and delivery of these projects and is critical for reducing project risk. We are working with BHP providing strategic advice on data management along with GIS support to Approvals, Engineering and Construction Readiness teams. This includes creating dashboards and other digital tools to support construction planning and progress tracking, the development of data standards and procedures and continued strategic advice on managing data across these projects. We have built a suite of custom GIS interfaces for each project, bringing together data from various engineering data management and construction tracking systems. Within an Environment concept, we have developed a custom App to support the planning, permitting, tracking and reporting of land disturbance. These innovations are massively reducing the cost and risk associated with the delivery of these Investments.

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# Project Examples

## High-Value At-Risk Groundwater Dependent Ecosystems (GDE) Layer

Following recommendations by a previous project (GDE Framework) completed by CDM Smith, the Department of Environment, Land, Water and Planning requested that CDM Smith develop a state-wide map of the extent and location of hydrologically at-risk high-value GDEs, a prioritisation mechanism for the GDEs and science-based future management and protection methods.

Using the Australian Standard for risk assessment (AS/NZS ISO 31000:2009, Risk management – Principles and Guidelines), a risk matrix along with spatial and non-spatial data were combined to identify and rate the possible risks that might affect the GDEs.

The consequences of changing groundwater regimes and the likelihood of groundwater extraction impacting at-risk GDEs were considered and used to determine the risks to high-value GDEs and prioritise their management.

The project produced a comprehensive state-wide map of the extent and location of high-value GDEs. The map also shows high-value GDEs at risk from groundwater extraction.

The project was delivered in an interactive HTML format that ensured that users would not require access to specialised software or skills (i.e. GIS software and skillsets) to be able to access the information. The flexibility of the programming language also ensured that newer information about developing threats to a GDE (i.e. new groundwater pumping) could be introduced to the design without the need to rebuild the geodatabase.

## Digital Asset Database for the Queensland Government

The QLD Government engaged CDM Smith to deliver a pilot project for improving the management and maintenance of water and wastewater treatment assets in remote indigenous communities in QLD. The project is focused on providing a database and user interfaces for the communities to use when conducting maintenance on the assets.

CDM Smith's role in the project was to scope, design, develop and trial the digital asset management system for water and wastewater treatment assets in one remote Aboriginal Council in QLD. We worked with various government and community stakeholders to gain a detailed understanding of current approaches to asset maintenance. We then scoped, designed and built a bespoke database for storing and managing asset maintenance data. Three different user interfaces were developed for collecting and reporting asset data (a mobile app for operations staff, an admin interface for an operations manager, and an interactive online dashboard for the government).

## Water Asset Data Analytics, Data Management, and Asset Management Plans

South East Water implemented an asset management plan by embedding data science techniques into everyday activities. These approaches are founded on open-source technologies, e.g., QGIS, R, RStudio, and Shiny Server. CDM Smith assisted South East Water with developing and implementing this project through data analysis, development, and spatial data management.

The project involved creating a bespoke asset data analytics framework that allows asset information to be seamlessly integrated, analysed, and reported on in an updatable and consistent manner.

The framework allows interactive documents, applications, and dashboards to be readily produced; these are used to engage with staff to highlight asset issues, assist with decision making and monitor the performance of the asset management plans.

These are proving to be very effective communication and engagement tools and have freed up staff to look into asset issues more.

The project included the delivery of services relating to:

- Development of ETL procedures to connect import and/ or connect to asset data sources across the business

- User needs assessments to document existing business processes and identifying solutions to streamline and improve data quality to enable automation

- Data collation and database management for asset data across the entire southeast water area

- A combination of large-scale Geospatial and non-spatial datasets aggregated to present findings and insights

## Data Supports Groundwater Investigation at Melbourne Airport

Melbourne Airport engaged CDM Smith to prepare a preliminary hydrogeology assessment to conceptualise groundwater flow underneath the Melbourne airport site.

CDM Smith used multiple lines of evidence such as modelling, data analysis (elevation, climate and groundwater) and local site knowledge to develop a preliminary conceptual site model. Using Leapfrog Modelling software enabled CDM Smith to create a detailed 3-D preliminary conceptual model of the site's groundwater flow and the likely interaction between the hydrostratigraphic units.

The objectives of this assessment include the following:

- Provide a clear understanding of the site's aquifers and groundwater levels to help in developing integrated water management options for the Airport, and

- Develop an understanding of the role groundwater plays as a potential pathway for contaminants from the airport to waterways, as a recent water sampling confirmed the presence of contaminants within waterways associated with the Melbourne Airport

The CDM Smith use of a geological model and available site data (elevation, climate and groundwater data) highlighted the role the topography, aquifer leakage and groundwater discharge into the creeks via springs would play in transporting contaminants. In addition, the modelling of the groundwater flow paths indicated that the likely destination of the site's contaminant hotspots would be the local waterways.

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# What Makes CDM Smith Different?

**CDM Smith Australia is your project partner for value-driven, integrative environmental and water solutions. Powered through passion. Leading through actions.  Backed by results.**

Through aptitude and commitment to listening to your needs, thinking about the right solution for your unique situation, and delivering high-quality results.

Our leadership and flexibility in design and delivery distinguish CDM in our approach and provision of environmental and water projects.

Informed by our client-focused ethos, CDM Smith Australia works with you to respond to varying project requirements and exceed expectations time and time again. We listen carefully to our client's needs, think about strategic and practical solutions to address these requirements, and then deliver solutions promptly and cost-effectively.

We take pride in the quality of service and deliverables we provide to our clients. We undertake all projects following our ISO 9001:2008 certified quality assurance/quality control protocols.

Our company has a Quality Management System of policies, processes, and procedures applied to our business model of pursuing, capturing, executing, and closing projects or fulfilling other client contractual obligations.

## LOCAL LEADERS, GLOBAL EXPERTISE

**Sonia  Finucane**
National Discipline Leader, Asset Closure and ESG
Principal Environmental Scientist

**Linda Kirchner**
National Discipline Leader, Environmental Approvals and Planning
Principal Environmental Scientist

**David Malins**
National Discipline Leader, Digital

**Christian Wallis**
National Discipline Leader, Environmental
Principal Environmental Scientist

**Jon Fawcett**
National Discipline Leader,  Water
Principal Environmental Scientist

**Kristen Collins**
National Discipline Leader, Development Assitance Services
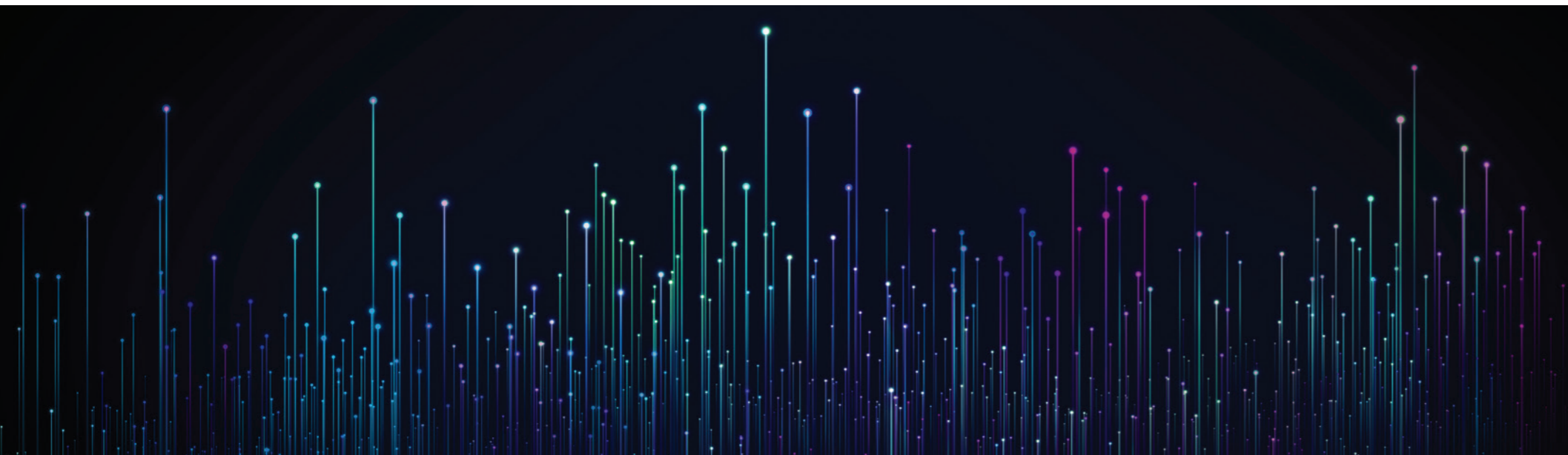
**Katrina Mattingley**
Regional Team Leader, Southern
Associate Environmental Scientist

**Paul Davey**
Regional Team Leader, Northern
Principal Environmental Scientist

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# About CDM Smith Australia

**CDM Smith Australia is an employee-owned environment, water and social consultancy company inspired by innovative, engaging and future-focused solutions.**

We guide and transform projects through passionate people and deliver value-driven results. Using a multidisciplinary approach, we incorporate the latest evidence-based thinking and digital know-how to ensure forward-thinking solutions for your project.

With decades of experience developing and helping organisations meet their environmental needs, our end goal is to give your project progressive solutions for the changing landscape.

With several locations across Australia, you'll receive the personal attention of a local company with the vision and expertise of a much larger organisation.

You'll have access to leading services across various areas at CDM Smith Australia. As a full-service consulting organisation, we deliver exceptional client service, quality results, and enduring value across the project life cycle. Collaborating with public and private clients worldwide across climate resilience, mining and resources, traditional and modern energy, government, industry and manufacturing, transport and infrastructure, and water utilities.

**GLOBAL STRENGTH WITH A LOCAL PRESENCE**

As a critical component of CDM Smith's International Service Unit, CDM Smith Australia is an agile specialist group with access to a global network of subject matter experts and the best available information. This enables us to be flexible and responsive to client requirements while driving innovation.

CDM Smith can support projects in various jurisdictions in Australia and internationally based on a sound understanding of fundamental local, state and national
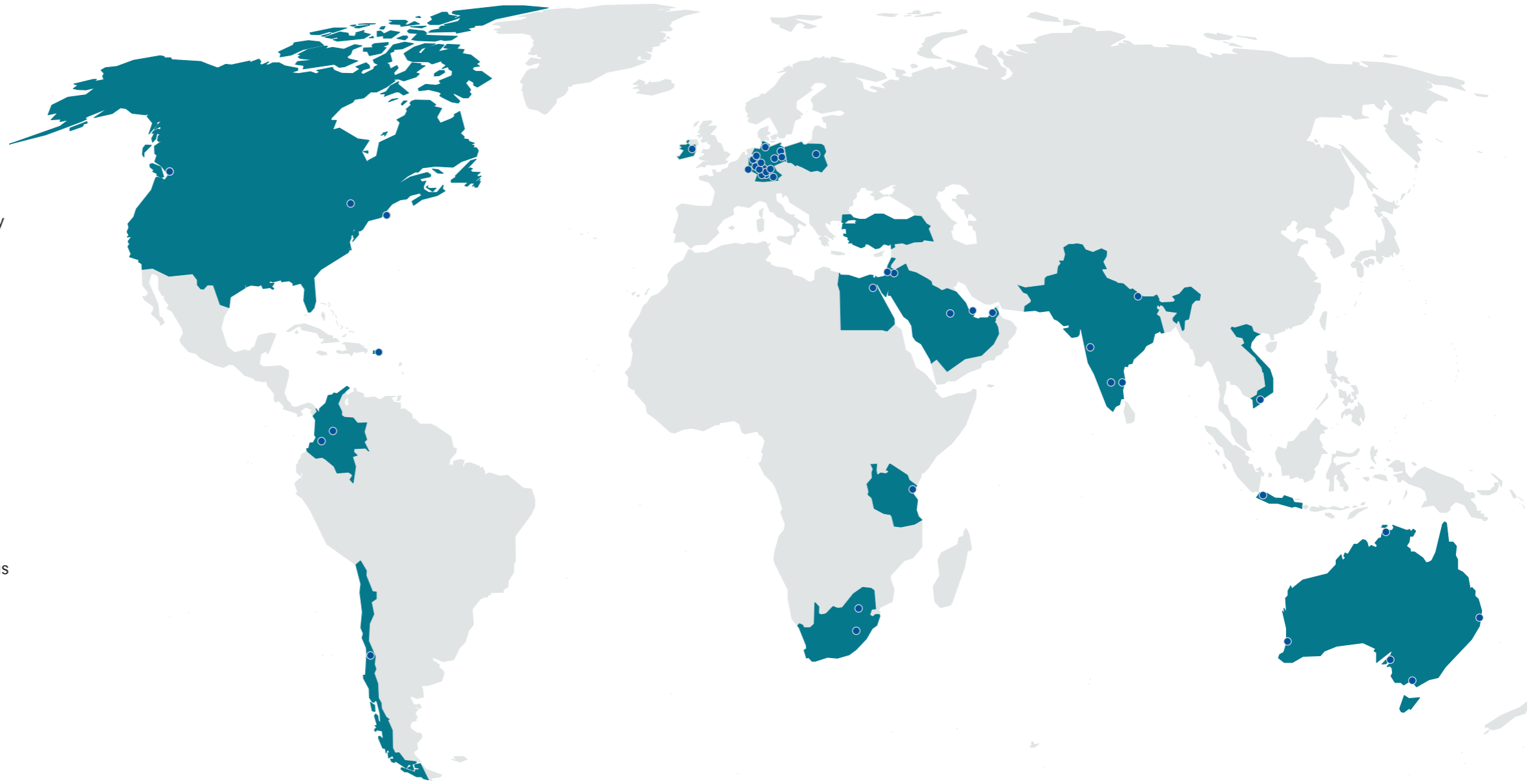
regulatory and planning familiarity. We leverage our global resources, expertise and experience to provide our clients with exceptional service, quality results and enduring value.

Globally, CDM Smith is an employee-owned company that has provided lasting and integrated solutions to public and private clients worldwide since 1947. In 2022, the company celebrated its 75th anniversary, an industry milestone.

**130 Offices**

**5,500 Employees**

**+70 R&D Projects Yearly**

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