# ASSET DATA VISUALISATION

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## ABSTRACT

Modern Asset Management Systems and Tools are about reducing the friction between the data and users so that engineers can focus on improved solutions. Our dashboards and GIS tools allow for the visualisation and active management of individual jobs. Solutions have been developed to remove paper-based data capture so that inspection and fault information can easily be shared with key stakeholders, speeding up decision making processes. On operations and maintenance contracts with high work volumes and significant numbers of complex assets these tools have led to improved efficiency.

Downer has significant expertise in the application of GIS and is one of only three Esri Gold Partners in New Zealand. This has allowed Downer to develop a range of GIS tools to support its Infrastructure Services business. The use of GIS dashboards linked to real time job management information aids in the dispatching process to visualise data held within the work management system. In addition, inspection data is captured electronically in the field and is immediately available for viewing through a portal. This enables real time access to inspection information by multiple stakeholders.

Some of the many benefits from the field data capture tools have included:

- Confirmation that routine activities have been completed as scheduled (providing clients with confidence that 'we do what we say we do');
- Identification and rescheduling of work that could not be accessed;
- Monitoring productivity, activities completed per day, km travelled per task;
- Identification of hotspots and optimisation of maintenance, inspection or cleaning frequencies;
- Identifying and recording asset condition and defects and making recommendations for capital improvements;
- Assigning and verifying field assets to a unique asset ID (previously this was not possible and is fundamental if the information is to be of value to the asset managers);
- Scheduling tool;
- Easy access to current information by the client;
- Spatial view of information that can also be presented as Excel data for analysis

## KEYWORDS

- **Data Visualisation**
- **Sharing asset data**
- **Esri GIS**

# 1 INTRODUCTION

This paper outlines how Downer has applied Esri ArcGIS applications to successfully provide efficiencies on maintenance contracts. Fundamentally it's about streamlining the flow of data from field observations to decision makers, which supports data driven decision making. The accuracy and speed of reporting is key to both good operational performance and asset management.

Fundamental principles are:

- Active management of work flow via dashboard views.
- Removal of paper-based forms via field apps.
- Data analysis and standardised reporting of key matrix.

# 2 ESRI ARCGIS APPLICATIONS AND TOOLS

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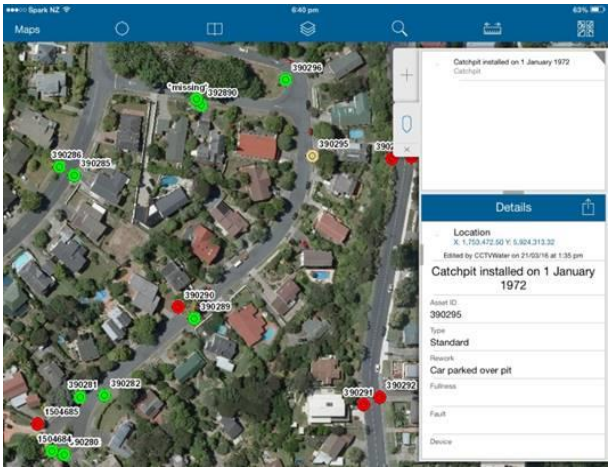
The following section summarises some of the GIS tools and associated benefits that Downer has developed.

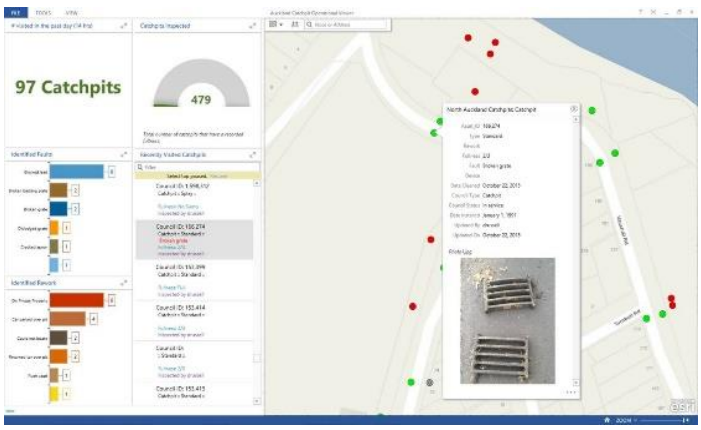
## 2.1 DATA CAPTURE

The rapid advancement in smart phone technology, apps and geographic information is changing the way we capture field data. It is now easier to capture photos, video, and standardised data, and GPS location via smart phones and tablets. Downer has made the most of this smart mobile technology and continues to invest to support operational service delivery. Some of the GIS applications that have been used are outline below.

### ASSET COLLECTOR

This application allows asset data to be captured in the field against a specific location or asset ID, including photographs.

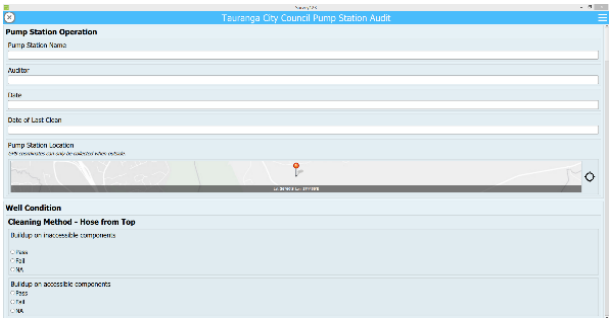


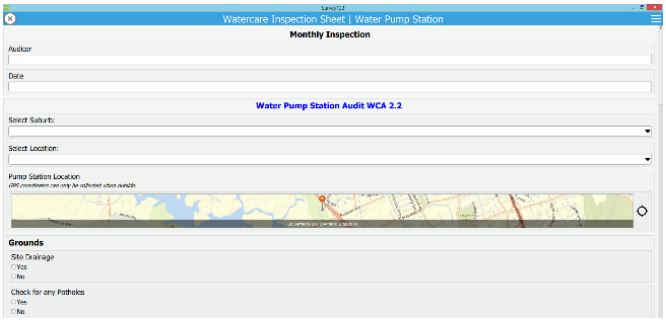

*Screenshot: Catch pit locations and data.*

### SURVEY 123 AND GEOFORMS

Updating pump station operational data and recording of inspection information (base asset data, network data, and overflow information) in electronic form and visualising information via GIS web portal provides ease of access to both field based and office based staff. Site inspection results and reports are captured in the field using standard templates and for information to be stored centrally for ease of access and analysis (snapshot below).




*Screenshot: Pump station inspection report.*



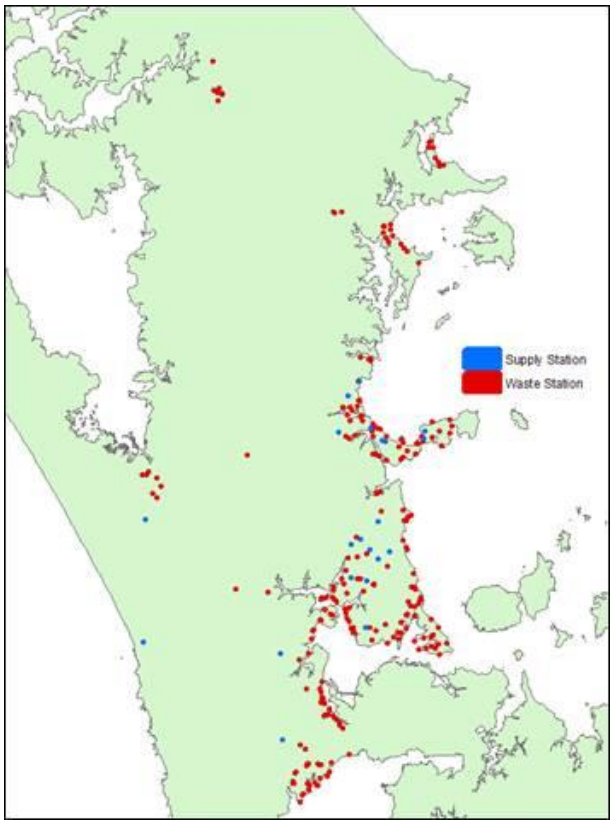

*Screenshot: form for capturing data in the field.*

## 2.2 OPTIMISING ROUTES

Another key aspect is being able to determine the best route to undertake the work, reducing unnecessary travel time.

### NETWORK ROUTE ANALYSIS

Our analyst's run various route options to determine the shortest route for cyclic work and routine inspections to optimise travel time and enable better scheduling of crews.



## 2.3 ACTIVE MANAGEMENT OF WORK

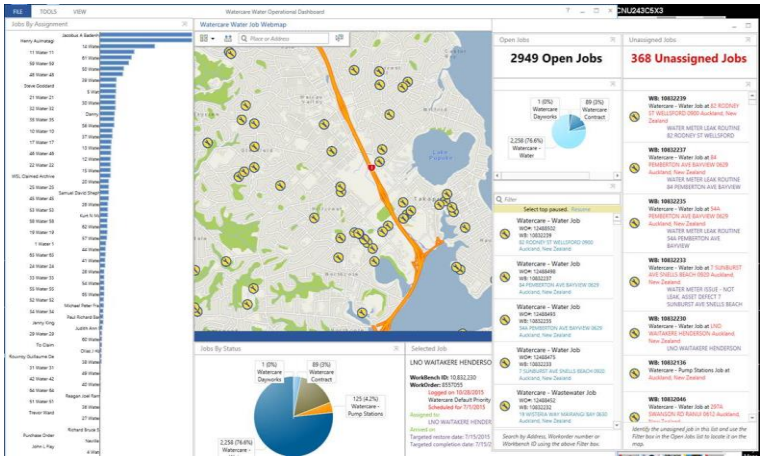
One of the key challenges with a large workforce is the ability to actively manage multiple work streams while still achieving key performance outcomes. In order to aid this process we have developed a number of detailed operational dashboards that expose multiple data sources into one view. Providing the ability to drill down to more detailed information as required while exposing key matrix in real time.

### WEB PORTAL

We use GIS map portal to share and view inspection information enabling real time sharing of work completed and faults identified.

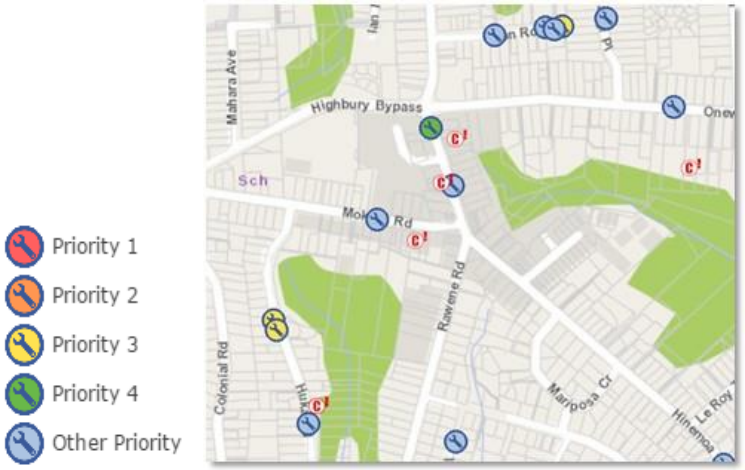
### OPERATIONAL DASHBOARD

Dashboards are used to track and dispatch both planned and reactive jobs.



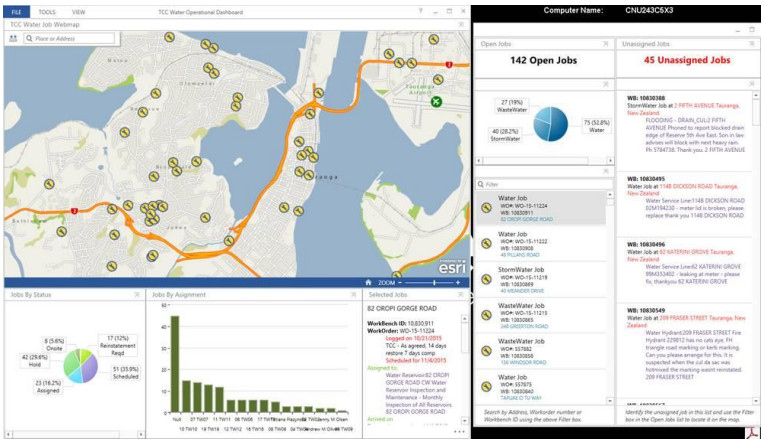

*Screenshot: Operational dashboard.*

Using a colour coded priority system the status of jobs is easily recognisable. Additional symbols have been used to identify key customers that field crews can click on using their field device to determine any special needs or notifications that have been agreed and set up with the customer.




*Colour coded priority view.*

Dashboards allow visual presentation of operational data such as work activities, priorities and status.




*Screenshot: Job locations, priorities and status.*

**BENEFITS**

Some of the many benefits from the field data capture tools have included:

- Confirmation that routine activities have been completed as scheduled (providing clients with confidence that 'we do what we say we do');
- Identification and rescheduling of work that could not be accessed;
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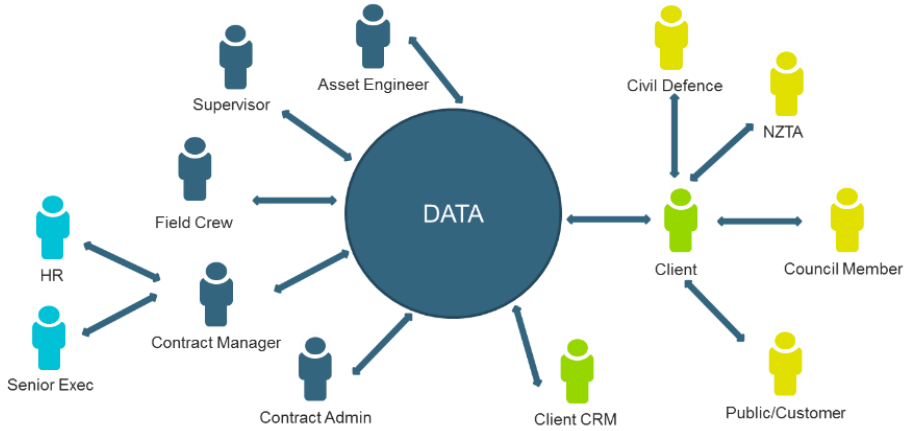
Spatial view of information that can also be presented as Excel data for analysis.

## 2.4 WHANGANUI ALLIANCE EXAMPLE

### DATA SHARING CHALLENGE

During a major civil defence emergency one of the key challenges is how to effectively communicate accurate information, that changes rapidly as the emergency unfolds, with multiple stakeholders. Key questions from the response team:

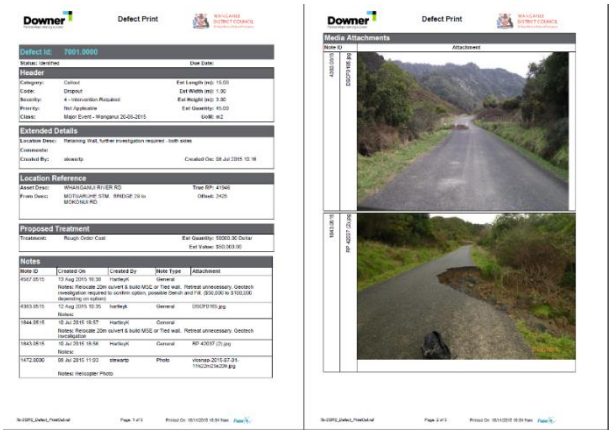
- How do we capture, manage and report information to relevant stakeholders?
- How do we do this effectively without duplication of effort, loss of data, or wasted time extracting information?



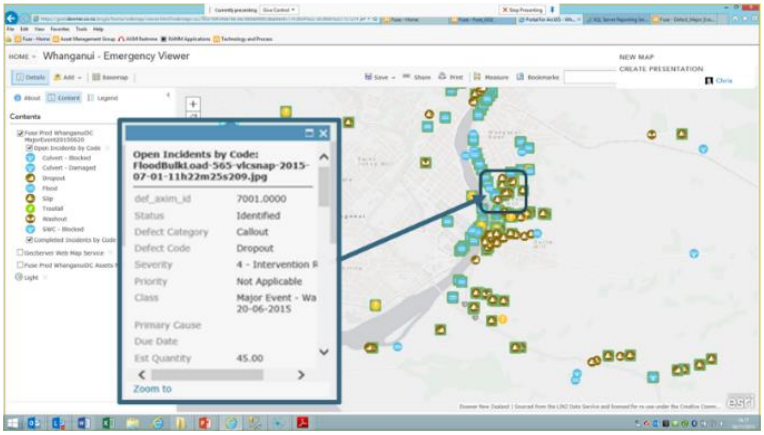

### RESPONSE

Fundamental to Downer's response was its comprehensive asset and job management system (Fuse) that had just gone live as part of a new alliance contract between Downer and the Wanganui DC. As part of the Fuse implementation, the Alliance team had setup reporting frameworks with:

- Automated, standardised reporting.
- Reports developed with regard to specific needs from internal users, client, or NZTA. For example, the 'Summarised Defects by Road' report detailing location, quantity and rough estimate of repair costs. Also, detailed reports for each defect including photos.
- Access both internally and externally via SharePoint, to allow multiple stakeholders to view information.




*Sample defect report.*



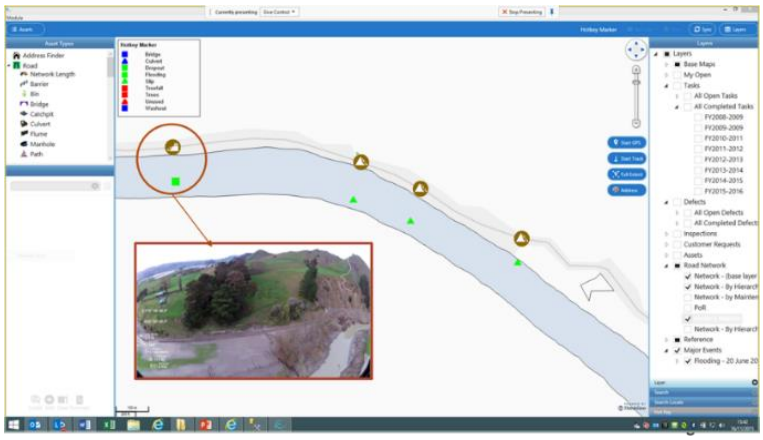

*Screenshot: Wanganui Emergency Viewer.*

During the event Fuse was used to record location and quantities of defects during and after the event. Customer requests, received via the client call centre, were recorded in Fuse and assigned to crews for inspection/repair. Defects which were identified by the inspectors/field crew were linked to the relevant customer requests in Fuse. Downer also hired a helicopter to capture video for roads which we unable to be accessed. This gave greater coverage to the extent of the flooding damage, and defects identified using video footage were geospatially located, and could be recorded in Fuse against the network section. The system allowed full traceability and history of all jobs against the asset. Detailed information was available on expected time to complete individual repairs which assisted communication with customers (for example - areas without access may take four days to get assistance due to the slips along their road). Timely and accurate costings were provided to council due to a significant reduction in effort required to capture costs against completed work. All information was logged consistently within Fuse.

During the event Esri ArcGIS dashboards and maps were used with standardised symbology for event types, which made it easy to visualise the type and location of faults across the roading network. This assisted with the dispatching of crews and aligning their skills, plant and equipment with the nature and location of the fault.

The sharing and access to event information in real time via web portals to multiple stakeholders, with access to multimedia meant timely communication of information such as progress notes, photos, and video. This kept stakeholders informed as to how the clean-up works were progressing without tying up call centre, supervisors and field staff.

The new technology gave the ability to take spatially captured information and reference to linear network (helicopter video footage for example as shown below). This greatly reduced the time required to gain information about the extent of damage and repair requirements.



*Screenshot: Spatially captured info - video footage.*

Previously it would have taken several months to fully identify the extent of damage and estimate the repair cost. For this major civil defense emergency the estimated cost of repair work was determined within two weeks by linking video and photo footage information to network assets and quantifying time and cost estimates.

The visualisation of information via GIS interface was used in meetings with Council Board members. Unlike written materials with multiple page reports and spreadsheets the visualisation of the information made the communication process with key decision makers very easy as they were able to easily see the extent of the damage and impact on key parts of the roading network.

# 3 CONCLUSIONS

Modern spatially based asset and work management systems linked to GIS tools, with clear business process, can significantly improve the effectiveness of operations and maintenance contracts. The utilisation of best technology to visualise data as it is captured adds real value in reducing timeframes from the collection of data to the distribution of information to multiple stakeholders. Well-structured business processes that remove the duplication of effort, paper based data capture, and manual intervention improves operational effectiveness.

Another major outcome is that key decision makers and stakeholders benefit from improvements in receiving key information from field crews in a timely manner, which enables good data-based decision making to occur.