

GIS4EM Multi-Tenanted Approach to AGOL Applications for Emergency Management (Mackenzie, Hurunui and Kaikoura District Councils, New Zealand)

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ABSTRACT

With the Hurunui (HDC), Mackenzie (MDC) and Kaikoura (KDC) District Councils sharing their Geographic Information Systems (GIS) and Information Technology (IT) resources since 2017 it was decided to work on a GIS strategy for Emergency Management (EM) that would be applicable for all three councils as in the past geospatial skills and tools did not get equally utilised at all three councils during emergency and training events.

ArcGIS Online (AGOL) was chosen as a common platform for a fully cloud based approach to the new Emergency Management Applications. The core modules of these applications are *Story maps*, *Web AppBuilder*, *Survey123*, *Operations Dashboard*, *Workforce*, *Explorer* and *AppStudio*.

The development of these applications is a work-in-progress situation which is driven by the constant conversation and testing between the GIS team and the Emergency Management (EM) departments and work flows are being developed to integrate these applications into the existing functions of the Emergency Operations Centres (EOC).

We believe once finalised this set of applications will add great functionality to New Zealand's Coordinated Incident Management System (CIMS) used in EOCs by providing interactive and cloud based visual geospatial information, situational awareness, forecasting, task management and task tracking.

Keywords

GIS, AGOL Solutions, Emergency Management, Mackenzie, New Zealand

INTRODUCTION

New Zealand is a country prone to many natural disasters such as cyclones, floods, tsunamis, earthquakes, landslides, rock falls, volcanic eruptions, snow avalanches, heavy snow and fires. Add to this all kinds of manmade disasters such as transport accidents, epidemics, building or structural accidents, interruptions or loss of lifelines and mining disasters – New Zealand has experienced them all.

With a number of major events such as the Kaikoura Earthquakes, The Franz Joseph Floods, Cyclone Cook and the Port Hills Fires occurring in 2016 and 2017, it was admitted that GIS proved critical to all functions of the EOCs but was coordinated poorly across the country. It was recognized that GIS is rarely considered in New Zealand emergency management planning, documentation or protocols nor was there any formal group in New Zealand that addressed how GIS is best used in Emergency Management. The approach to GIS in Emergency Management has always been ad hoc and / or unplanned (NZGIS4EM, 2018).

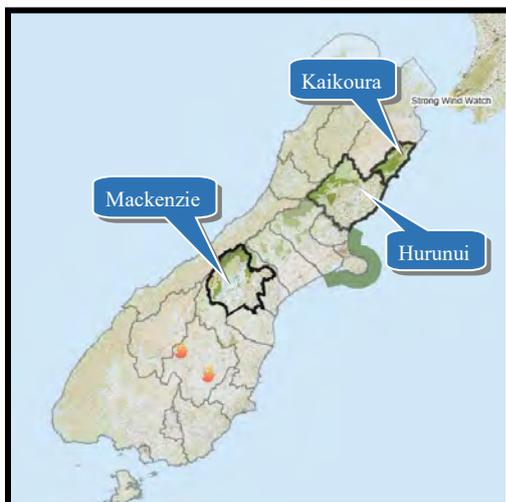
A **Ministerial Review – Better Responses to Natural Disasters and Other Emergencies** from November 2017 states that:

“New Zealand’s intelligence infrastructure and hardware has not been sufficient to deliver an accurate and comprehensive common operating picture during recent large scale emergencies. [...] There is no current agreement between the core agencies on what information forms the common operating picture (e.g. lifelines information, where cordons are, isolated geographical areas, welfare needs) and how information from multiple sources can be drawn together to give a common picture.”

Consequently in 2017 a few crucial things happened:

- The NZGIS4EM (New Zealand GIS for Emergency Management) user community was formed where discussion is facilitated and best practices for GIS in Emergency Management in New Zealand is shared on platforms such as Slack and GeoNet.
- A series of Eagle Technology facilitated NZGIS4EM workshops were held across the country to demonstrate how AGOL solutions could be utilised to develop practical and mostly cloud based GIS Applications that can be used in emergency situations.
- NZGIS4EM special interest groups were formed which are now meeting on a regular basis to develop geospatial emergency response solutions that can be used at local, regional and national level.

It was decided to use the Mackenzie District as a pilot region for the development of AGOL Emergency Management Applications for the three districts and once finalised these solutions would then be deployed to the Hurunui and Kaikoura Districts. Hence this paper is going to present the Mackenzie experience of developing AGOL Applications for Emergency Management.



To add some location reference - all three districts are located on New Zealand’s South Island with the Mackenzie District being right in the centre and the Hurunui and Kaikoura Districts located north of Christchurch along the East Coast (see Figure 1). What those districts have in common is their large share of rugged mountainous terrain as part of the Southern Alps of New Zealand with relatively small but significant population bases (densities ranging from 0.63/km² (Mackenzie District) to 1.8/km² (Kaikoura District)) and transport infrastructure of national significance. Chances of a major event such as a magnitude seven or eight earthquake along the Alpine Fault (a geological fault that runs almost the entire length of New Zealand’s South Island) is a reality with New Zealand being overdue for an event of such caliber.

Figure 1. Location Map

PHASES OF EMERGENCY RESPONSE AND RECOVERY

The New Zealand Ministry of Civil Defence and Emergency Management (MCDEM) states that “the New Zealand integrated approach to civil defence emergency management can be described by the four areas of activity, known as the ‘4Rs’” – **Reduction, Readiness, Response and Recovery**. MDCDEM defines these activities as follows:

Reduction: Identifying and analysing long-term risks to human life and property from hazards; taking steps to eliminate these risks if practicable, and, if not, reducing the magnitude of their impact and the likelihood of their occurring.

Readiness: Developing operational systems and capabilities before a civil defence emergency happens; including self-help and response programmes for the general public, and specific programmes for emergency services, lifeline utilities and other agencies.

Response: Actions taken immediately before, during or directly after a civil defence emergency to save lives and protect property, and to help communities recover.

Recovery: The coordinated efforts and processes to bring about the immediate, medium-term and long-term holistic regeneration of a community following a civil defence emergency.

While the applications described in this paper are aimed to support all four areas of activity, a special focus for this paper is on **Response** and **Recovery**. For these areas of activity a **phase approach** has been introduced to the NZGIS4EM group by Dr. Paul Doherty, former employee of Eagle Technology. This approach has been adopted from a similar model described in the “National Damage Assessment Data Set and Dictionary for Phase 2 Assessments” document published by the Australasian Fire and Emergency Services Council (AFAC) in 2016.

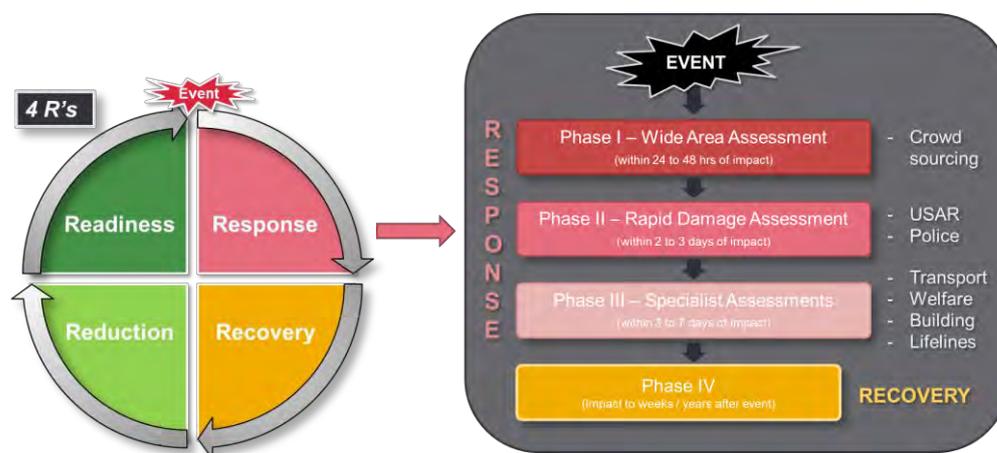


Figure 2. Phases of Emergency Response and Recovery

Phase I stands for “Wide Area Assessment” which is carried out within 24 to 48 hours of impact and mainly evolves around crowdsourcing.

Phase II stands for “Rapid Damage Assessment” and is conducted within 2 to 3 days of impact by NZUSAR (New Zealand Urban Search and Rescue), NZFS (NZ Fire Service), NZRT (NZ Response Teams) and other response teams. Whether Phase II comes into action will probably depend on the size of the event and the degree of risk to lives and structures. Smaller events might lead straight into Phase III.

Phase III of the Emergency Response activities embraces more detailed assessments for Welfare, Buildings, Lifelines and Transport and takes place within 3 to 7 days of impact.

Phase IV stands for Incident Recovery and can be seen as the period starting right at the time of the emergency event and can continue on for several years after the event. It is believed that a successful deployment of Phases I to III can lead to a quicker and smoother transition into Phase IV.

AGOL SOLUTIONS AND CAPABILITIES

The Civil Defence GIS applications developed for the pilot region incorporate the following AGOL modules:

- Web AppBuilder
- Survey123
- Operations Dashboard
- Workforce
- Explorer
- AppStudio

All applications are contained in a tabbed AGOL storymap called **MDC Incident Briefing – Map Series**:

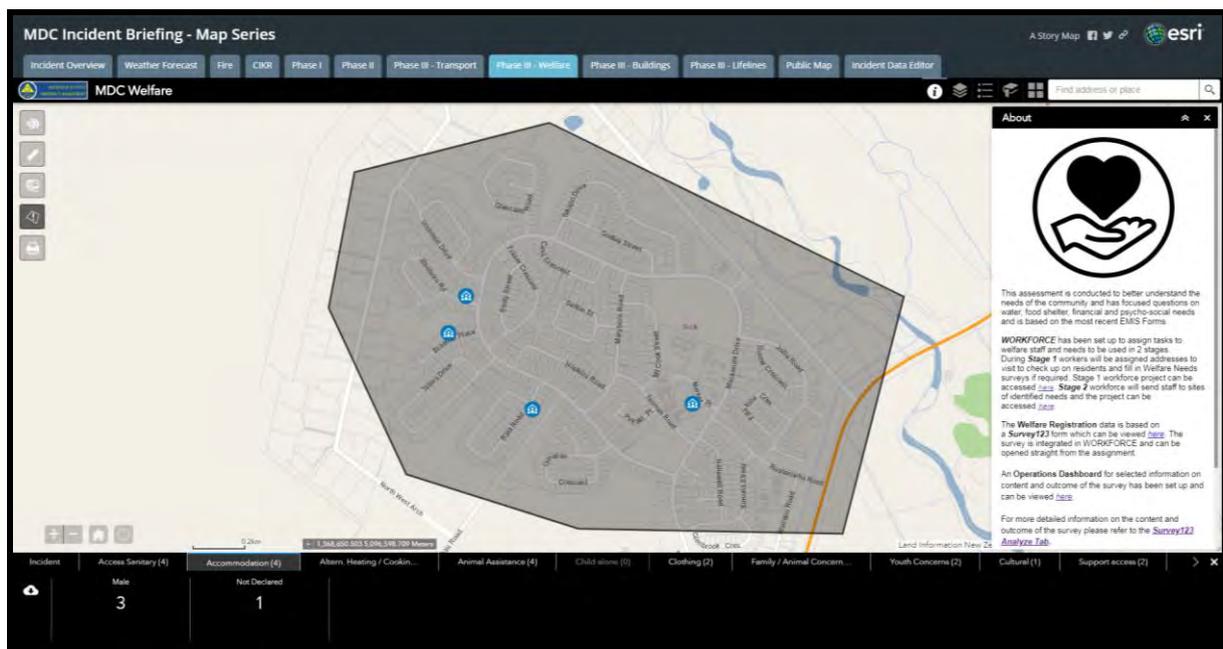


Figure 3. MDC Incident Briefing – Map Series

Besides standard tools like *Legend*, *Layer List*, *Bookmarks*, *Basemap Switcher* and *Print function*, most applications are equipped with **Reporting**, **Situational Awareness** and **Features Near Me** tools and hold links to other applications such as **Survey123 Surveys**, **Survey123 Analyse Tabs**, **Operation Dashboards**, **Workforce** projects and **User Manuals** that are part of a specific operations workflow (e.g. Welfare, Buildings, Lifelines, Transportation).

The applications have been developed to support operations and decision making in the EOC. The following section will describe the functionality of some of the key applications of the tabbed **MDC Incident Briefing – Map Series** at the time this paper was written.

Incident Overview

This section provides an overview of the current emergency situation with a number of pre-defined incident related GIS layers in the background that will need to be turned on / edited to fit the incident at the time. These include base data such as freezing levels, potential flooding layers, fault hazard areas, fault lines, active layers such as MetService CAP Alerts, Active Hurricanes, Recent Earthquakes and current fires as well as incident data such as Civil Defence Incident Points, Evacuation Zones, Hazard Lines / Areas and Snow Zones. This application might be most useful when compiling situation and status reports for incident briefings.

Fire

This section holds Canterbury wide datasets all around fire constraints, resources and values requiring protecting and is based on a project called “*Strategic Tactical Fire Management Planning (STFMP) – Multi-Agency Approach*” by Rural Fire. The project was initiated in 2006 and the data in this map is as recent as 2013

The objective of the project was to identify, analyse, evaluate and treat fire risk and hazard.

At this point it is not quite clear whether the project is being continued.

Phase I – Wide Area Damage Assessment

Wide Area Damage Assessment is the initial assessment to be carried out within the first 24 to 48 hours of an event and mainly evolves around crowdsourcing.

Damage reports can be submitted via a public survey123 survey set up to gather incident damage information. This survey can be used both in form of a public *phone app* and as an online *web survey* and will provide a first snapshot of the severity of an event and damage caused by it. The AGOL modules used for Phase I include Survey123, AppStudio, Web AppBuilder and Operations Dashboard. The gathered incident damage information instantly feeds into council’s mapping and intelligence systems.

Phase II – Rapid Damage Assessment

For Phase II a nationally agreed upon *Survey123 assessment form* for rapid damage assessments has been developed. The assessment is usually being carried out by NZUSAR (New Zealand Urban Search and Rescue), NZFS (New Zealand Fire Service) and NZRT (New Zealand Response Teams).

Two pathways to conduct these assessments have been identified:

- 1) A *Survey123* and *Workforce* integrated approach
- 2) A *Survey123* and *Explorer* integrated approach

Workforce is an AGOL module that allows to create *task assignments* based on map locations. It works in two ways: a) *Dispatchers* would use a desktop version of this module to create and assign tasks while b) *Fieldworkers* will use a mobile application to respond to and carry out tasks assigned to them. Fieldworker’s locations, progress status and work load can be tracked and monitored by the dispatcher which will help the dispatcher with managing their field staff.

Explorer is a mobile map viewing solution that can be used online and offline.

Both approaches achieve an automated adoption of location information such as address and geopoint by survey123 when integrated with workforce or explorer.

The outcome of the survey can be examined using the incorporated *Situational Awareness* tool (highlights the number of damaged features within a selected area) and *Reporting* tool (a printable report containing relevant information on the damaged features including a location map). These tools have been included in most applications of the Map Series.

Phase III - Transport

The transportation app looks at transportation related data such as road closures and restrictions (Local and NZTA), bridges, culverts, cattle stops and side drains. A *Survey123 form* in conjunction with a *Workforce* project is being used to conduct *Road Inspections* to confirm Phase I damage reports.

Phase III – Welfare

This application has been set up for welfare managers to gain an insight into the welfare needs of people within the incident area. The application centers around a *Welfare Needs Assessment* (Survey123) which is conducted to better understand the needs of the community and includes focused questions on water, food, shelter, financial and psycho-social needs. The questions are based on the most recent EMIS (Emergency Management Information System) Forms.

Workforce has been set up for task assignments and is being used in 2 stages. During *Stage 1* a *systematic welfare needs assessment* within identified impact areas is carried out while during *Stage 2* identified needs are specifically being addressed.

Work in Progress Insight Paper – Geospatial and temporal information capture, management, and analytics in support of Disaster Decision Making
Proceedings of ISCRAM Asia Pacific 2018 (K. Stock and D. Bunker, eds).

The outcomes of these welfare assessments can be examined using **Situational Awareness** and **Reporting** tools described earlier in this document. The “**Welfare Needs Near Me**” tool highlights identified needs at a selected site or address.

An **Operations Dashboard** provides Welfare outcomes at a glance.

Phase III – Building

This section is set up for the emergency manager and managers for building inspections to track the progress on post-disaster building inspections.

The application shows outcomes of three nationally agreed on **Survey123 assessment forms** used for **Earthquake, Flooding** and **Geotechnical** Rapid Assessments. These forms are based on the [MBIE Standard](#) and are very important to recovery. Some of the core outcomes of these assessments are Building Placards, Safety Cordons and Barricades.

An integrated approach using **Workforce** and **Survey123** has been chosen to carry out Building Inspections.

An **Operations Dashboard** has been set up for most relevant outcomes of these surveys to be seen at a glance.

The **Analyse tab of Survey123** can be used for more detailed outcomes.

The Phase III - Building application also holds the **Situational Awareness** and **Reporting** tools described earlier in this document and a “**RBA (Rapid Building Assessment) Outcomes Near Me**” tool can be used to list core assessment outcomes at identified addresses without having to cross check against the map layer list and legend.

Phase III – Lifelines

This application informs Asset Managers about the status of all **Lifelines** (Power, Water, and Telecom) during and after an event. The **Status Data** is constantly being updated by MDC. Filters have been applied to all layers so only features that carry a status other than "intact" will display in this map.

The usual **Situational Awareness** and **Reporting** tools have been added for a quick overview of damaged lifelines assets within a selected area.

Public Map

This application provides the public with incident related information such as road closures or restrictions, the location of emergency assistance facilities / distribution points and information board locations.

Incident Data Editor

This application holds all editable **Incident Data** and is the go-to platform and only location where incident data can be edited while in all other applications of the map series data can only be viewed. Pop-ups for the editable layers have been configured in a way so only the most relevant attributes are visible and the editing process can be completed quickly and efficiently. Any edits made using the Incident Data Editor will immediately reflect in the other applications described above and can be queried using the described tools.

The following two pages show an overview of key **AGOL Solutions** and **Capabilities** currently developed for the Mackenzie District Council.

Multi-Tenanted Approach to AGOL Applications for
Emergency Management

MDC AGOL SOLUTIONS		CDEM 4 Rs				EVENT	RESPONSE				RECOVERY
PRODUCTS AND MODULES OVERVIEW		REDUCTION	READINESS				Incident	Phase 1	Phase 2	Phase 3	Phase 4
RESPONSE PHASE		Essential Elements of information	Current Operating Capability	Training and Exercises	Phase 0		Personal Safety	Wide Area Assessment	Rapid Damage Assessment	Specialist Ops	Recovery Ops > BAU
INTELLIGENCE PRIORITIES		BAU	BAU	BAU	Up to days before Impact		Impact	Within 24-48 hrs of impact	Within 2-3 Days of Impact	Within 3-7 Days of Impact	From Impact to weeks / years after impact
TIMEFRAME											
PRODUCT NAME	MODULE										
Base Data	Feature Layer										
Pre-defined Incident Data	Feature Layer										
Pre-defined Status Data	Feature Layer										
Live Feed Data (National / International)	Feature Layer										
Incident Briefing Storymap	WebApp Builder										
Incident Overview App	WebApp Builder										
Weather Forecast App	Windy.com										
Transportation App	WebApp Builder										
Road Inspections Survey	Survey123										
Transport workforce project	Workforce										
Fire App	WebApp Builder										
CIKR App	WebApp Builder										
Critical Infrastructure Survey	Survey123										
Phase I App	WebApp Builder										
Damage Assessment (Crowdsource)	Survey123, AppStudio										
Crowdsource Photo Storymap	WebApp Builder										
Phase II App	WebApp Builder										
NZUSAR Rapid Damage Assessment	Survey123										
NZUSAR Workforce project	Workforce										
Phase III - Welfare App	WebApp Builder										
Welfare Needs Assessment Survey	Survey123										
Welfare Operations Dashboard	Operations Dashboard										
Welfare Workforce Projects 1 & 2	Workforce										
Phase III - Building App	WebApp Builder										
Rapid Building Assessment Survey	Survey123										
Geotechnical Assessment Survey	Survey123										
Building Assessment Operations Dashboard	Operations Dashboard										
Building Assessment Workforce Project	Workforce										
Phase III - Lifelines App	WebApp Builder										
Lifelines workforce project	Workforce										
Lifelines Operations Dashboard	Operations Dashboard										
Public Information Map Journal	WebApp Builder										
Incident Data Editor	WebApp Builder										
Offline Responder Explorer Map	Explorer										

LEGEND: Build Phase Build / Use Use

PRODUCT NAME	MODULE	CAPABILITIES
Critical Infrastructure Survey	Survey123	Captures information on critical infrastructure including generator and fuel availability, photo capture.
Vulnerable People Survey	Survey124	Captures information on vulnerable people mainly based on medical conditions.
Road Inspections Survey	Survey123	Captures information on road and bridge conditions , obstacles, vehicle access and other information relevant to roading.
NZUSAR Rapid Damage Assessment	Survey123	Captures information on structure conditions and demographic situations as well as event impacts on people. Photo capture, National Standard.
Welfare Needs Assessment Survey	Survey123	Captures information on identified welfare needs , national standard.
Rapid Building Assessment Survey	Survey123	Captures information on building damage and usability , national standard.
Geotechnical Assessment Survey	Survey123	Captures information on land instability and conjunction with rapid building assessment .
Damage Assessment (Crowdsource)	Survey124	Captures information on damage including photo capture ; designed for crowdsourcing data capture as part of Phase I - Wide Area Assessment.
Incident Briefing Storymap	WebApp Builder	Acts as a container of all Emergency Management relevant applications.
Incident Overview App	WebApp Builder	Provides an overview of the incident situation including live feed data on weather, fires, and quakes and EOC decisions made.
Transportation App	WebApp Builder	Provides information on road and bridge closures and restrictions ; holds Situational Awareness and Reporting tools and as well as NZTA and other live feed data ; links up all transport related apps (Survey123, Workforce).
Fire App	WebApp Builder	Provides Canterbury wide information on fire constraints and resources as well as values requiring protection and is based on STFMP project outcomes. The app also holds thermal hotspots and MetService live feed data.
CIKR App	WebApp Builder	Provides information in critical infrastructure and key resources .
Phase I App	WebApp Builder	Wide Area Assessment App mainly looking at crowdsourced data submitted by staff and the public using Crowdsource Photo Storymap and Damage Report Phone App.
Crowdsource Photo Storymap	WebApp Builder	Allows the public to contribute photos with captions .
Damage Report Phone App	AppStudio	Allows staff or members of the public to submit damage reports based on predefined damage types and attach camera photos.
Phase II App	WebApp Builder	Rapid Damage Assessment App mapping out NZUSAR Rapid Damage Assessment outcomes and providing Reporting and Situational Awareness functionality (tools) as well as a link to a Phase II Workforce project for task assignments.
Phase III - Welfare App	WebApp Builder	Provides information on Welfare Needs Assessment outcomes based on associated survey (see above) and incorporates Reporting and Situational Awareness tools; provides links to associated Workforce projects, Operations Dashboard , Survey123 Analyse tab and User Manuals .
Phase III - Building App	WebApp Builder	Provides information on Building Assessment outcomes based on associated survey and incorporates Reporting and Situational awareness tools; provides links to associated Workforce project, Operations Dashboard , Survey123 Analyse tab and User Manuals .
Phase III - Lifelines App	WebApp Builder	Provides information on Compromised Lifelines and incorporates Reporting and Situational Awareness tools;
Public Information Map Journal	WebApp Builder	Provides public with information on the Current Emergency Situation as well as material to help the public to prepare for and cope with an emergency event.
Incident Data Editor	WebApp Builder	Allows for Editing of all pre-defined Incident Data .
Welfare Operations Dashboard	Operations Dashboard	Provides an at-a-glance view of key outcomes of the Welfare Needs Assessment utilising maps, charts, graphs and total numbers.
Building Assessment Operations Dashboard	Operations Dashboard	Provides an at-a-glance view of key outcomes of the Building Assessment utilising maps, charts, graphs and total numbers.
Lifelines Operations Dashboard	Operations Dashboard	Provides an at-a-glance view of compromised Lifelines utilising maps, charts, graphs and total numbers.
NZUSAR Workforce project	Workforce	Allows for Task Assignments to carry out Rapid Damage Assessments based on Phase I - Wide Area Assessment outcomes.
Transport workforce project	Workforce	Allows for Task Assignments to carry out Road Inspections .
Welfare Workforce Project 1	Workforce	Allows for Task Assignments to carry out systematic Welfare Needs Assessments .
Welfare Workforce Projects 2	Workforce	Allows for Task Assignments based on outcomes of Welfare Needs Assessments .
Building Assessment Workforce Project	Workforce	Allows for Task Assignments to carry out systematic Building Assessments .
Lifelines workforce project	Workforce	Allows for Task Assignments to carry out Lifelines Inspections .
Offline Responder Explorer Map	Explorer	Provides crucial Geospatial Information for Offline Fieldworkers .

DATA

The core of all AGOL applications are **Base and Incident Data** which were identified and created / obtained before and alongside the development process of all applications described above. The data incorporated in the applications at the time this paper was written is listed in the table below and is a work in progress. As part of the deployment of described applications to the Hurunui and Kaikoura District Councils, base and incident data will be further extended based on local and regional requirements.

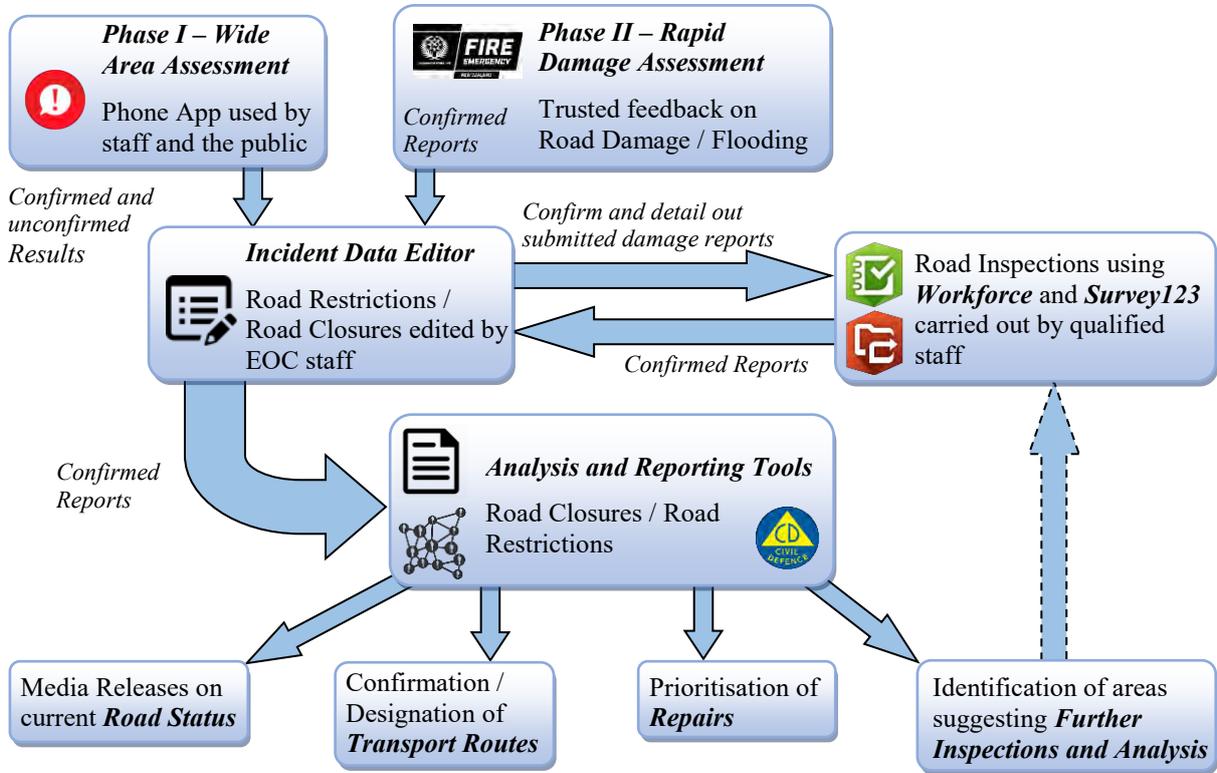
MDC AGOL SOLUTIONS - DATA

BASE DATA	TYPE	HOSTED BY	INCIDENT DATA	TYPE	HOSTED BY
MODIS Thermal Activity	Live Feed	ESRI	Civil Defence Incident Points	Feature Layer	MDC_GIS
Active Hurricanes	Live Feed	ESRI	Evacuations Zones	Feature Layer	MDC_GIS
MetService CAP Alerts	Live Feed	EagleGIS	Civil Defence Hazard Lines	Feature Layer	MDC_GIS
1000 recent earthquake points	Live Feed	GNS Science	Civil Defence Hazard Areas	Feature Layer	MDC_GIS
New Zealand Fault Lines	WMS	Methanex	Snow Levels	Feature Layer	MDC_GIS
New Zealand Demographics for Emergency Management	Feature Layer	EagleGIS	MDC Road Inspections	Survey123	MDC_GIS
Waimate, Mackenzie and part Waitaki liquefaction susceptibility (2008)	Feature Layer	canterburymaps	NZTA Highway Information (points and lines)	Live Feed	EagleGIS
TA Boundaries	Feature Layer	MDC_GIS	Road Closures - Status Layer	Feature Layer	MDC_GIS
Addresses	Feature Layer	MDC_GIS	Roading Assets (Bridges, Culverts, Cattle Stops, Street Lights, Side Drains) - Status Layers	Feature Layer	MDC_GIS
Roads	Feature Layer	MDC_GIS	Photos - Crowdsourc	Feature Layer	MDC_GIS
Walking Tracks	Feature Layer	MDC_GIS	Damage reports - Crowdsourc	Feature Layer	MDC_GIS
Property Boundaries	Feature Layer	MDC_GIS	NZUSAR Assessment	Survey123	MDC_GIS
Contours 20m and 0.5m	Feature Layer	MDC_GIS	Civil Defence Centres - Status	Feature Layer	MCDEMNZ
Owners and Ratepayers	Feature Layer	MDC_GIS	EOCs - Status	Feature Layer	MDC_GIS
Ostler Fault Hazard Area	Feature Layer	MDC_GIS	CD Coordinating Hubs - Status	Feature Layer	MDC_GIS
Potential Flooding Areas	Feature Layer	MDC_GIS	Welfare Needs Assessment	Survey123	MDC_GIS
Kimbell Flood Risk	Feature Layer	MDC_GIS	Welfare Centres - Status	Feature Layer	MDC_GIS
Flood Hazard Canal Breach Area	Feature Layer	MDC_GIS	Emergency Shelters - Status	Feature Layer	MDC_GIS
Freezing levels (various altitudes)	Feature Layer	MDC_GIS	Earthquake Rapid Assessment	Survey123	MDC_GIS
Roading Assets (Bridges, Culverts, Cattle Stops, Street Lights, Side Drains)	Feature Layer	MDC_GIS	Flooding Rapid Assessment	Survey123	MDC_GIS
Water Assets (Water Main, Stormwater, Sewer - points, lines, areas)	Feature Layer	MDC_GIS	Geotechnical Assessment	Survey123	MDC_GIS
Building Footprints	Feature Layer	MDC_GIS	Alpine Energy Assets - Status Layers	Feature Layer	MDC_GIS
Building Category	Feature Layer	MDC_GIS	Transpower Structures, Lines and Sites - Status Layers	Feature Layer	MDC_GIS
Critical Infrastructure	Survey123	MDC_GIS	New Zealand Cell Phone Towers - Status Layer	Feature Layer	MDC_GIS
Key Resources	Feature Layer	MDC_GIS	Water Assets (Water Main, Stormwater, Sewer - points, lines, areas) - Status Layers	Feature Layer	MDC_GIS
New Zealand Health Services	Feature Layer	MDC_GIS			
New Zealand Education Providers	Feature Layer	MDC_GIS			
New Zealand Emergency Services	Feature Layer	MDC_GIS			
New Zealand Cell Phone Towers	Feature Layer	EagleGIS			
Transpower Structures, Lines and Sites	Feature Layer	MDC_GIS			
Alpine Energy Assets	Feature Layer	MDC_GIS			
Fire - Resources, Constraints and Values requiring protecting	Feature Layer	MDC_GIS			
Vulnerable People	Survey123	MDC_GIS			

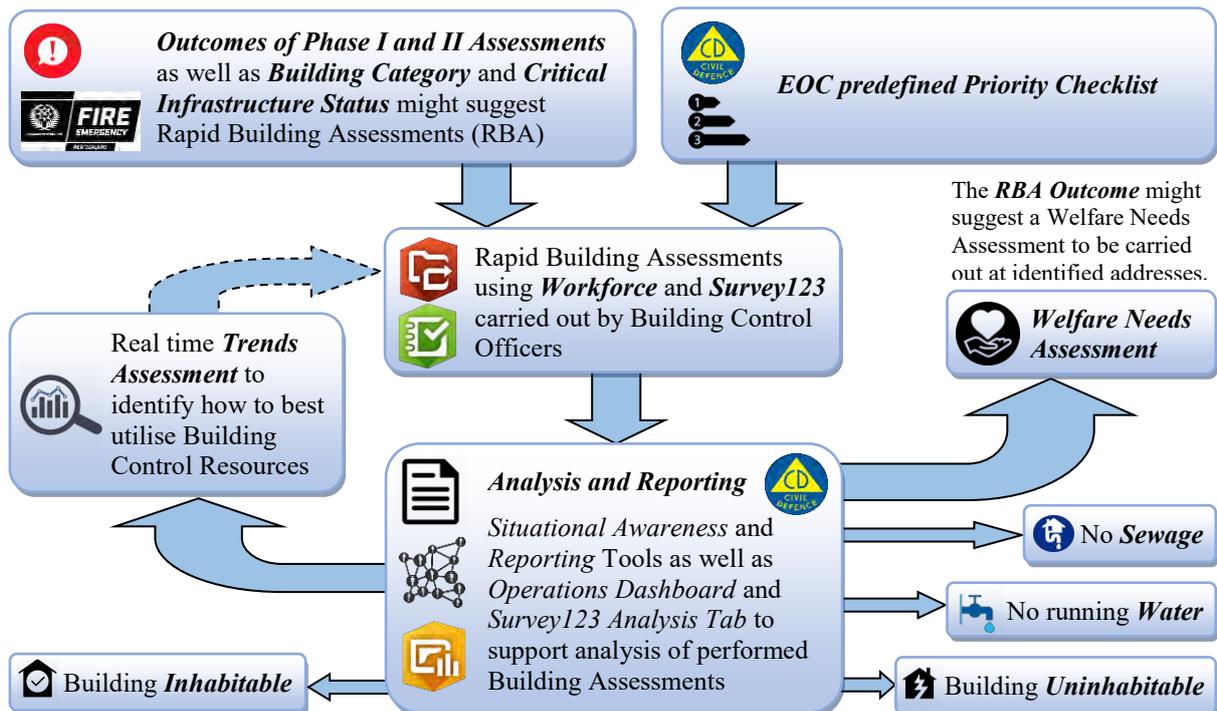
WORKFLOWS

This section of the report looks at selected workflows based on the emergency response applications described above. These workflows were still under review at the time this document was written.

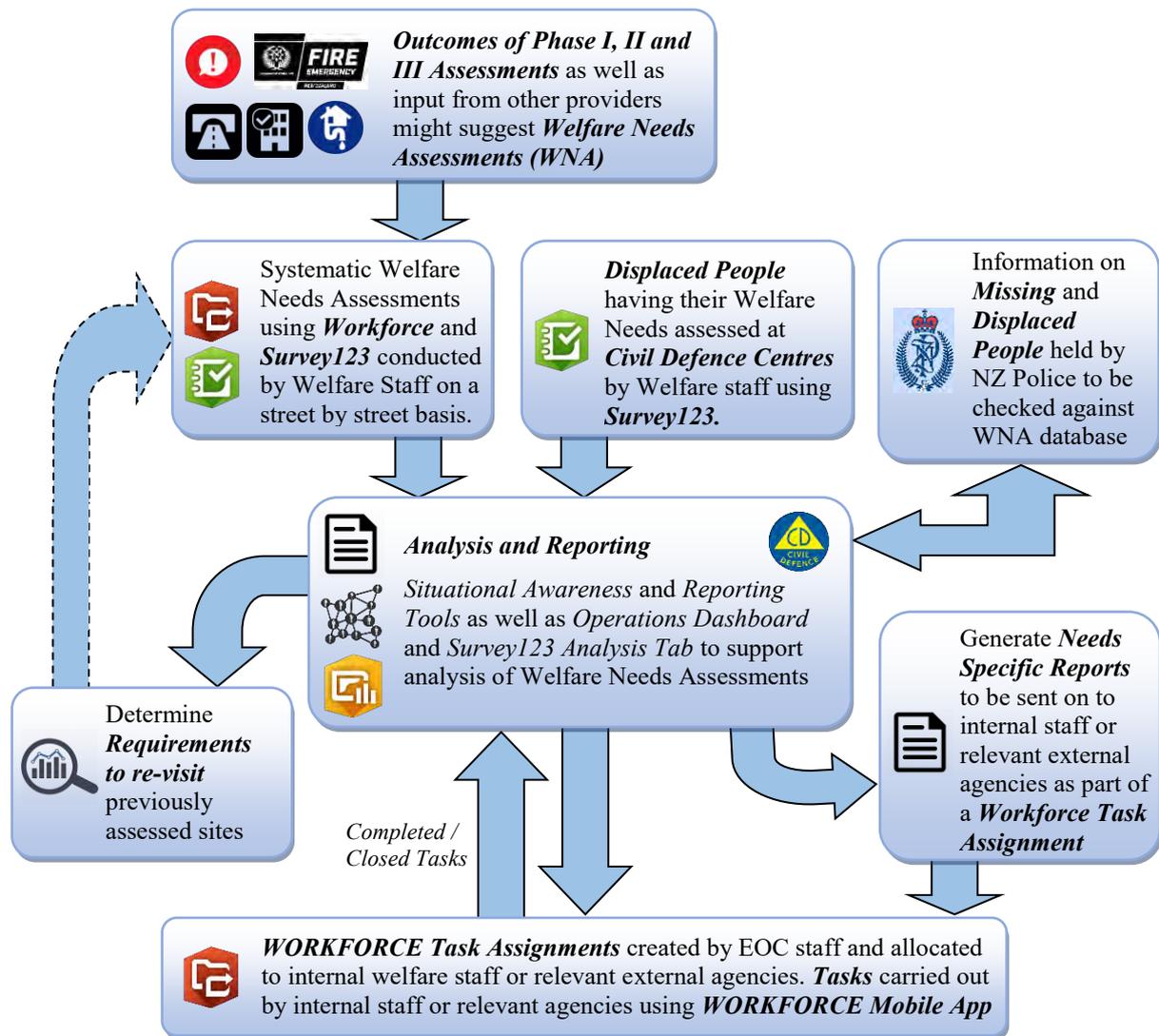
Transportation



Building Assessments



Welfare Needs Assessments



CONCLUSIONS

The development of the described applications is a work-in-progress situation which is driven by the constant conversation and testing between the GIS team, the Emergency Management (EM) officers and external parties involved. *Figure 4* shows how described applications could add value to all functions of the existing Emergency Operations Centre (EOC).

The standards applied to these applications are limited and mainly based on the learnings from the 2017 NZGIS4EM workshop and subsequent documentation authored by Paul Doherty. Regional and national standards on symbology, base and incident data, processes, workflows and general technical standards were being worked on by members of the NZGIS4EM group as well as external agencies at the time this paper was written and will be implemented once publically available.

The Author is aware that the applications described in the earlier sections of this document rely on network connectivity and offline capabilities need to be worked on alongside and aligned with the development of described online applications. Other identified constraints to the use of described applications is the required availability of computer hardware and mobile devices as well as the need to upskill EOC staff to gain familiarity and efficiency using described applications. It is believed though that the benefits of using described applications in emergency response activities will outweigh their limitations.

These benefits include:

- The use of mobile technology for data collection and gathering,
- The instant access and visibility of gathered and collected data,
- The ability to share data,
- The ability to create Situational Awareness,
- The understanding that there is only one source of truth,
- The belief that by using described applications, emergency response activities can be carried out more efficiently and accurately which will promote an easier transition into emergency recovery mode.

The anticipated tasks for the future with regards to achieving a multi-tenanted approach to AGOL Applications for Emergency Management on a local level for the Mackenzie, Hurunui and Kaikoura District Councils will include:

- A complete deployment and expansion of all described applications to the Hurunui and Kaikoura Districts
- A focus on offline workflows (aligned with the development of online solutions)
- The adoption of regional and national standards as they emerge
- The constant incorporation of technology improvements and changes
- The inclusion of drone capabilities for imagery capture (Drone2Map)

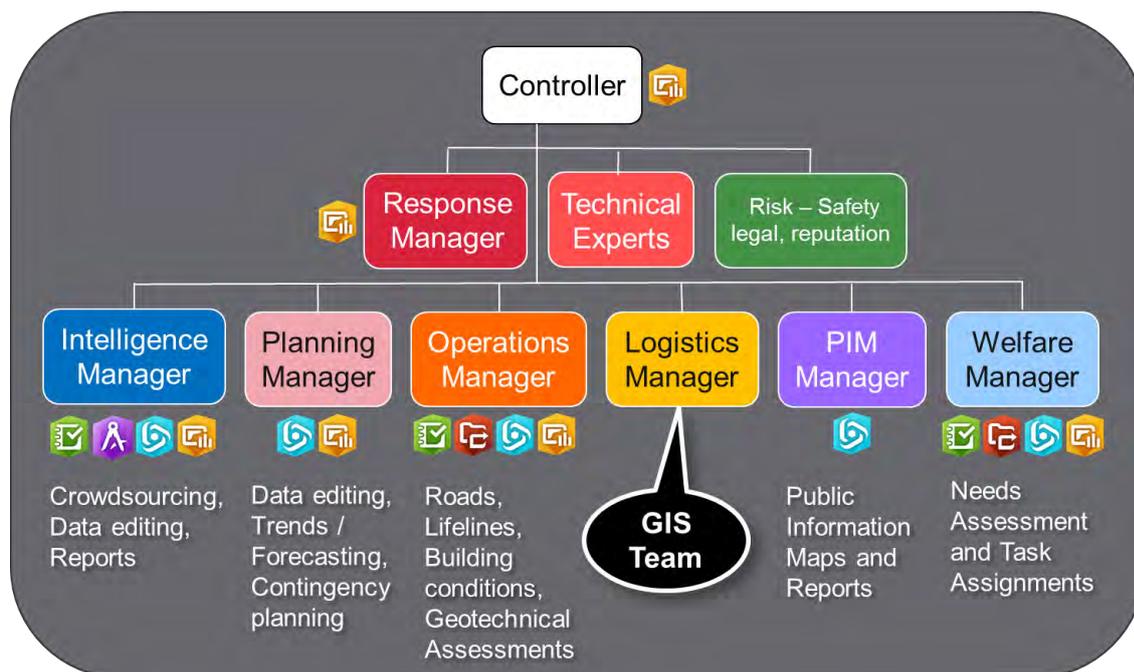


Figure 4. AGOL applications supporting functions of the EOC (CIMS structure)

With regards to described online and offline applications, we believe once finalised and deployed to all three districts these applications will add great functionality to the Coordinated Incident Management System (CIMS) used by all three authorities by providing interactive and cloud based visual geospatial information, situational awareness, reporting, forecasting, task management and task tracking.

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