WATERCARE GIS – SURVIVING AMALGAMATION AND MOVING FORWARD

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ABSTRACT

As a result of the Local Government (Tamaki Makaurau Reorganisation) Act of 2009, effective from 1 November 2010, Watercare as a Council Organisation of Auckland Council, became the sole provider of integrated water supply and wastewater services to Auckland.

The company grew rapidly from its previous role of providing bulk water and wastewater services to six of the local authorities in the Auckland Region, to a large company that needed to serve the 1.4 million customers it inherited.

The existing Watercare GIS also had to rapidly grow to cope with a massive increase of asset data - from 35,000 to over 1 million assets. This included taking the GIS spatial and other asset data held by the seven local authority GIS and asset data systems and integrating this information into a new single GIS database and Asset Management Information System.

During this phase, it was quickly realised that not all water and wastewater network GIS and asset data is the same!

This paper discusses the challenges that were experienced at the time of integration in dealing with these disparate datasets, how these were overcome and how we are now moving forward.

KEYWORDS

GIS, Geographic Information Systems, Asset Management, ESRI

1 INTRODUCTION

In 2009 the Tamaki Makaurau Reorganisation Local Government Act was passed which set in motion the change to the local government structure in Auckland.

This Act created the Super City out of the Auckland Regional Council and the seven local councils, being the Rodney District, North Shore City, Waitakere City, Auckland City, Manukau City, Papakura District and Franklin District.

Part of the Act stated that Watercare Services Limited would be responsible for the delivery and management of the water and wastewater networks for the Auckland Region with effect from 1 November 2010.

Watercare up till that point, had been the bulk supplier of treated water to six of the local councils and collected and treated wastewater from four local councils at its Mangere Wastewater Treatment Plant. The company had a total asset count of 35,000 assets which included over 850km of pipelines.

The proposed integration of the Local Network Operators (LNOs) assets would increase Watercare's total asset count to over 1 million including nearly 17,000 km of water and wastewater pipelines. These local network assets would need to be incorporated into the existing Geographic Information System (GIS) and into a new Asset Management Information System (AMIS).

To prepare for the integration, Watercare initiated a major project called Project 1. This included sub-projects for all aspects of the business from customer services and billing to Information Technology.

For GIS, this integration would include a significant data collection, transformation and load project, as well as a software upgrade project. These projects would have to be planned for and executed prior to 1 November 2010 a period of only eight months.

2 THE PROJECT DIMENSIONS

2.1 GIS SOFTWARE UPGRADE

In preparation for the amalgamation of the data from the LNOs, it was decided that the current in use version of the ESRI GIS software should be upgraded along with the development of a new internal GIS Web viewer as this would provide a stable, modern platform for the GIS going forward.

Eagle Technology (Watercare's ESRI software vendor) were contracted to assist with this development and deployment.

The existing ArcIMS viewer was made obsolete and a new ArcGIS server environment was developed. The GIS web viewer was based on the Adobe Flex viewer graphical user interface (GUI). This deployment was designed to be mostly out of the box with minimal customisation undertaken. Customisation was necessary to ensure that some of the functionality that users previously had in the ESRI ArcIMS viewer was carried over to the new Adobe Flex viewer.

2.2 ASSET MANAGEMENT INFORMATION SYSTEM (AMIS)

At the time, Watercare was using the Mosaic financial system for the storage and management of transmission assets financial records – the GIS was the master database for all assets. It was determined that this system would not be a suitable environment for integrating the local network assets. Infor's Hansen local government management software system was chosen as the AMIS to be utilised for the local network assets.

This decision was based on the fact that three of the LNOs were using this application for their asset data storage and management. It was also presumed that this would make the collection and integration of the non-spatial data a more streamlined process. Hansen was at version 7 - there was no associated spatial viewer.

2.3 DOCUMENT MANAGEMENT SYSTEM (DMS)

Watercare had an existing well utilised and managed version of Bentley's ProjectWise project collaboration and information software that was being used for the storage and retrieval of asbuilt information and other corporate documentation.

A new database environment was set up within the existing ProjectWise application. This would be used for the storage and retrieval of the new local network asbuilt plans, files and other documentation that would need to be processed from 1 November 2010. This software has since been extensively used with over 10000 asbuilt records captured since the integration in 2010.

A major benefit of using this software is that it has a linear work-flow process manager. This has proved to be invaluable for managing and tracking the large amount of incoming asbuilt information through new developments (subdivisions), internal operations and maintenance works as well as Watercare capital projects.

2.4 GIS DATA MODEL

Watercare had an existing data model for the transmission spatial data but it was deemed to be overly detailed for local network assets. A new local network data model had to be developed prior to the collection of the spatial asset information.

This model was defined, based on the Waitakere City Council model, as it was deemed to be a relatively comprehensive schema that would be suitable for Watercare's needs.

2.5 RESOURCES

The Watercare GIS team prior to integration was not adequately resourced to be able to undertake a project of this size. To overcome this, key technical GIS staff from the LNOs with specialist knowledge of the GIS data and environments at their own organisations were seconded to assist with the project.

Other key technical staff and consultants where required were engaged. This was particularly necessary for the migration of the non-spatial asset data into the Hansen application.

3 PROJECT EXECUTION

3.1 GIS DATA COLLECTION

The first phase of the project was the collection of the Geospatial and related asset data from the existing LNOs.

Contact was made with the relevant GIS Team leads at the LNO's with a request for them to provide sample data. From this exercise, it was learned very early on that there were major differences in the data models of the LNO's. The level of completeness and sophistication of the attribute information varied widely.

One of the major issues faced was to understand the differences between the various naming/description of the assets between each LNO. This issue was further exacerbated where there was also a lack of consistency within a LNO database.

To overcome this, Safe Software's FME ETL software was used. This is an advanced data extract, transformation and load software tool that facilitates the development of transformers by way of an intuitive GUI.

The GIS project team specialists used this tool to map the asset information from the existing LNO's GIS data models to the new Watercare GIS model. Several iterations of these transformers had to be built to overcome the inconsistencies in the data that were found.

On completion of the collection, discovery and transformation phase, the FME software was also used to bulk load the transformed assets into the new Watercare GIS model.

3.2 NON - SPATIAL DATA COLLECTION

A similar parallel project (undertaken by a different project team) was the mapping of the non-spatial data from the various LNO asset databases that had to be uploaded and stored in Watercare's Hansen implementation. The LNO's had followed varying methods of storing the asset data - either in their GIS database or in Hansen.

This project team experienced similar data issues to the GIS project team in integrating this data. Once again, the major issues were the disparate data models and the asset naming or description differences.

It must be noted that due to the tight time constraints for the completion of Project 1, data cleansing was not part of the project brief. All assets whether good or bad had to be captured into the Watercare systems - no assessment was made as to the suitability of the records being captured.

3.3 GIS - HANSEN INTEGRATION

The second phase of the project was to integrate the new spatial data in GIS with the non-spatial/attribute data that had been uploaded into Hansen. Hansen was viewed as the master database that contained the asset attribute data and all related information such as history of work orders and asset values.

The GIS project methodology for this phase was to ensure that all spatial GIS records had a corresponding record in the Hansen application. The key link between the data in these two systems is the Hansen Compkey – this is the only unique identifier across all the Hansen asset type database tables.

Two issues were found during this linking process.

Firstly, it was found that there were a number of spatial features that did not have a corresponding asset in the Hansen database and secondly, there were also a large number of assets in the Hansen database that did not have a corresponding GIS feature to link to.

At this stage of the project, due to tight project deadlines, these mismatches were not resolved – to do this, a future project would need to be undertaken. Outlined in detail in 'Watercare Post Integration – Asset Management System Improvements' (Stewart, 2015).

These mismatch and basic asset attribute completeness issues (being installation date, diameter, pipe material, service status and asset ownership) were especially highlighted at the first revaluation of the assets in 2011.

In order to ensure auditors compliance for the 2013 revaluation, a major project was implemented to update this basic information by using broad assumptions to update all matched records in the GIS/Hansen databases.

All records that had a spatial match in Hansen with missing or unknown information were updated using geo-processing techniques within the GIS toolset. Business rules were developed prior to this work to ensure that the methodology that was developed would provide logical query results.

The predominant methodology was to identify the nearest neighbour with complete information and to allocate the same information to the asset with the missing asset attribute information. This was performed at the database level by using SQL queries to query and update the data. The pipe flow direction was also used to validate these queries in order to ensure that for example, an upstream pipe was not of a larger diameter than the adjoining downstream pipe.

Where it was not possible to follow this methodology, a more detailed visual inspection was made and assumed attribution applied. An example of this would be to apply an assumed installation date to AC pipe material based on an Engineers estimate of AC material pipes not being installed post 1985.

To ensure that the users of the asset data were made aware of the level of assumption, a reliability rating was given to all assets affected.

Work has been on-going to continually improve the accuracy and completeness of the asset data that Watercare inherited at integration. New, undiscovered data issues tend to surface from time to time as the organisation uses the data for their daily workflows and decision making. Each of these remediation tasks is undertaken as a mini project in order to disrupt the business as usual tasks of the GIS and Asset Management team as minimally as possible. The resultant gain from this remediation is a significant gain in the reliability of the assets as well as staff confidence in using the information.

3.4 MOVING FORWARD

It is now nearly five years since integration. Due to the various completed and other ongoing data cleansing and remediation initiatives over these years, we are now in a position where we (and the other asset data/GIS users) have more confidence in the spatial and related asset data. This means that reporting on the assets can now be done with a higher level of confidence and consistency.

The GIS team has leveraged the ESRI software platform for web and mobile deployments and are now in a position to provide our users with web and mobile solutions to ensure that their needs for operating and managing our networks are met. Future developments will ensure that changed information can be captured on site in an efficient manner and that updates to the databases can be made as automated as possible, eliminating the need for hand drawn asbuilts.

To ensure continued accuracy and completeness of all new assets captured, a standardised asbuilt creation, validation and upload tool developed in conjunction with A2K Technologies, called blackbox22, has been implemented. This utility ensures that Watercare's asbuilt and asset data standards are adhered to when contractors submit asbuilts for our capital programmes projects. Consistent, compliant and complete asbuilt information can now be captured with ease – in many cases within hours, rather than days as per previous. Unfortunately, for various reasons, it is not yet possible for this to be deployed for all incoming asbuilts but this is something we are working on with Auckland Council.

A major project to deploy SAP as the corporate financial and asset management application was undertaken in 2013. This made the Mosaic system redundant as all transmission assets and their financial records were migrated to SAP. SAP is now the master database for these assets. The asset Equipment ID is the unique identifier link between SAP and the GIS spatial record.

The current version of Hansen, version 7 has reached end of life. Investigation into a replacement strategy will need to be undertaken in the near future.

4 CONCLUSIONS

For any other local government organisations faced with an integration of this nature, it is survivable.

Key to the success of undertaking a similar integration project would be to ensure that the project team have a thorough understanding of the types of assets that are to be integrated with a view to developing a data model that can be normalised – particularly around developing consistent asset naming and descriptors.

Deciding on the base level of information required for asset management is critical – thereafter, all assets should be upgraded to meet this minimum level of completeness as a first data remediation. It is acceptable to make broad assumptions to achieve this, as long as the level of reliability is recorded against all assets where these assumptions have been made. This is so that users do not misinterpret the accuracy of the information within the GIS/AMIS in their decision making process.

It is also essential to define a "today forward" data editing procedure within a constrained environment at the outset of the project in order to ensure that all new assets will be captured in a consistent, complying manner.

Data remediation will always be an ongoing task as new unknown data discrepancies are discovered through the use of the newly integrated data. Undertaking these smaller remediation projects will have a minimal disruption impact to the business as usual of the team managing the asset data, but the resultant remediated data will have a significant impact on the reliability of the asset data from a user's perspective.

REFERENCES

Stewart G (2015) 'Watercare Post Integration – Asset Management System Improvements', Water New Zealand Conference 2015.

NOMENCLATURE

AMIS	Asset Management Information System
GIS	Geographical Information System or Geospatial Information System
GUI	Graphical User Interface, an icon or menu driven application to interact with software.
LNO	Local Network Operator, the water and wastewater service provider of the Councils prior to integration
Local Network Assets	Water and wastewater assets formerly owned and operated by the water and wastewater service provider of the Councils prior to integration

Transmission Assets	Assets relating to the bulk supply, treatment and transmission of water and wastewater