“HOW CATCHMENT MANAGEMENT CAN BE DELIVERED FOR THE ONE AUCKLAND WATERSHEDS TO MEET HIGH EXPECTATIONS”

Damian Young (BE Env)
Morphum Environmental Ltd.

Jan Heijs
North Shore City Council

ABSTRACT

The Auckland Regional Council (ARC) has been working under existing governance to provide guidance for local authorities on how to structure and prepare Integrated Catchment Management Plans (ICMP). The aim of this project is to provide consistent outputs. However, this is not the case as institutional capacity, available budgets, community expectation and business practices of the individual councils are critical factors in the production of consistent planning outputs. It has become apparent that the systems and technical tools that support the calculations and designs/plans that are generated are proving to be increasingly important.

The integration of information through Geographical Information Systems (GIS) and documented management systems can allow multi-department/organisational collaborations to flourish. Under a ‘total watershed management approach’ that includes infrastructure, such as roads, wastewater/water supply and multiple land uses, it is possible to combine visions and resources to achieve more sustainable results.

Given that the seven local councils in Auckland will be merged into a ‘One Auckland’ super council, it is imperative that the tools are available and the business processes well understood to take advantage of the expected benefits of amalgamation. This paper investigates just what might be required in the ‘One Auckland Scenario’ to achieve integrated catchment management best practice.

KEYWORDS

Infrastructure, institutional capacity, total watershed management, business, collaboration.

1 INTRODUCTION

Across the Auckland region, local councils — with guidance and support from the Auckland Regional Council (ARC) — have been responsible for the development of Integrated Catchment Management Plans (ICMPs). These plans are used to define how a Watershed (drainage basin) and its cumulative parts should be managed and controlled, not just for stormwater, but also for wastewater systems.

All geographic areas have their individual community, political and environmental nuances. Some districts are developing, have rural communities with low energy receiving environments such as estuaries. Others have developed urban areas, reticulated water and stormwater draining to high energy coastal systems. Despite these differences ICMPs are expected to deliver a level of certainty, direction and information to the numerous stakeholders. This is central in many ways to how we plan for the future.

Since their inception in the Auckland region in 2004, there has been considerable discussion and debate around the objectives and outcomes of ICMPs including their regulatory and legislative objectives (e.g. quadruple bottom line and the Resource Management Act 1991), level of required detail and their use in achieving sustainable development outcomes. Further to this it has become increasingly clear institutional capacity, community expectation and business practices of the individual councils are critical factors in the production of consistent planning outputs. This is not to say that much of the work in ICMPs undertaken to date has not been of a high standard, but that true planning integration is a demanding discipline that must focus on more than calculations, designs or plans that are generated. Plans are notoriously static as documents (and should not be) and are legendarily difficult to execute.

The changes to the governance structure of the Auckland region have meant city managers and planners are now faced with a simpler yet potentially more demanding task. Being on the verge of deconstructing the seven local councils in Auckland to rebuild a 'One Auckland' super council it is increasingly clear that having the correct tools and business processes will underpin successfully taking advantage of the expected benefits of amalgamation. This paper investigates just what might be required in the 'One Auckland Scenario' to hopefully achieve integrated catchment management best practice, discussing the institutional capacity, tools and business practices that might be needed for the Auckland Council and the Council Controlled Organisations (CCOs).

1.1 RESEARCH

This paper has been developed through discussions on the ICMPs process with industry representatives and with a focus on stormwater. This involved having face-to-face discussions with many of the practitioners creating ICMPs to get a clearer understanding of the challenges they face. This also allowed for a better appreciation of how they work within their given organisations, their successes and the issues they face in delivery. It is also based on the personal experiences and involvement in the development of ICMPs at North Shore City Council over a six year period. Contributors have been acknowledged at the end of this paper.

1.2 THE AUCKLAND SETTING

The Auckland Region extends from Wellsford in the north to Pukekohe in the south. It is made up of seven districts and includes the largest city in New Zealand which drains to three major harbours. The region is currently home to an estimated 1.37 million people with a projected population of 1.77 million by 2026. It is the fastest growing area and the most heavily populated part of New Zealand.

Auckland is a coastal city that has hundreds of small catchments that drain to estuaries and the sea. This poses a logistical and technical challenge. Not only are there many catchments that end at the sea but they also discharge to two different ocean bodies (the Pacific and the Tasman Sea) and three major harbours.

It is also a place of major change. 'During the coldest part of the last ice age – just 20,000 years ago – the sea level fell to 130 metres lower than present. Although other

parts of New Zealand were glacier and ice cap covered, the Auckland region was still covered in forest. Today's harbours and the Hauraki Gulf were forested valleys, with streams flowing seawards across broad coastal plains. In Auckland a small river flowed down the forested Waitemata valley and straight out past Motutapu hills beneath what is now Rangitoto Island. From there it still had 120 kilometres to flow to reach the coast out beyond Great Barrier and the Mokohinau Islands. All of the islands were hills and ridges joined together by lower lying valleys and plains.' (Auckland City Council, 2006).

What was left after this post glacial and ice-age period was an isthmus which is a narrow strip of land connecting two larger land areas on either side. The hills and ridges once joined by low lying valleys became a multitude of smaller catchments draining to tidal estuaries and coastal areas. This complex hydraulic and topographical setting makes the management of stormwater and wastewater systems particularly challenging.

1.3 INTEGRATED CATCHMENT MANAGEMENT PLANNING

The Auckland Regional Council considers that 'The Integrated Catchment Management Plan' identifies important characteristics of a catchment in which resource management problems exist or may occur as a result of (re)development or other major changes in activity patterns. An Integrated Catchment Management Plan identifies the natural and physical constraints of the catchment that control the form and intensity of growth/land use (ARC, ICMP Funding Eligibility Guideline., 2006). General requirements of ICMPs are:

- Catchment delineation, characterisation and land use planning;
- Receiving environments (Stream, aquifers and marine receiving environments) and Settling zone trend analyses;
- Hydrological and hydraulic requirements,
- Contaminant management,
- Best Practicable Options Analysis,
- Management Recommendations/Works Programmes;
- Consultation,
- Intuitional Capacity,
- Monitoring,
- Monitoring of stormwater and wastewater works.

ICMP's are used to define how a watershed and its cumulative parts should be managed. This approach is used in many parts of the world. The main focus is to consider issues and strategic objectives for wastewater, stormwater and land use management and planning, and also to provide recommendations for physical improvement works amongst others. These plans are used as a tool in urban/development areas and in rural/undeveloped areas.

In the rural/undeveloped areas they tend to focus on the sustainable management of land, with particular regards to land development, water management and allocation. In the larger catchments of New Zealand, water as a resource for commercial purpose is finite, so the balance with environmental sustainability is a key driver.

In the Auckland context ICMPs are developed and owned by the local authorities to manage wastewater and stormwater discharges, diversions and associated activities within catchment or district areas. There is a greater emphasis on the basis of intensive urban and commercialised land use on flooding, contaminant management and discharges to receiving environments associated with networks. Experiences related to the ICMPs process in urban environments are the main source for of this paper.

1.3.1 MORE THAN PIPES AND FLOODING

Until 2004, Catchment Management Plans (CMPs) had largely been about identifying stormwater flooding, analysing network capacity and providing options for management of identified issues (Hellberg, Davis, Feeney, & and Allen, 2010). In many ways they were just about pipes and flooding. Although dependant on councils defining the scope of the study, environmental considerations such as water quality and the receiving environment were taken into account, but not in a consistent manner.

This was then broadened following the establishment of the ARC Stormwater Action Plan with CMPs referred to as Integrated Catchment Management Plans (ICMPs). The intention being that ICMPs would include more than just stormwater volume and discharge rate control but also consider water quality, receiving environments and contaminant management and modelling.

Although ICMPs are non-statutory documents, they are closely related to other planning documents (which they must be consistent with) prepared under the Resource Management Act 1991 and the Local Government Act 2002.

Figure 1: Links of ICMPs with other planning instruments (Source: the ARC ICMP Funding Eligibility Guideline, 2006) shows the connections of ICMPs with other planning instruments.

Figure 1: Links of ICMPs with other planning instruments (Source: the ARC ICMP Funding Eligibility Guideline, 2006)

1.3.2 WHO PREPARES ICMPs?

Overall, consultants undertake the bulk of the technical work for the development of ICMPs. However the level of internal and external resourcing differs across the region. Council officers prepare the scope of services for the consultants with the outputs driven by ARC requirements and the approach of the individual councils. Internal quality assurance and implementation of plans are generally the responsibility of council officers.

It has been observed that consultants can sometimes find it difficult to deliver to client and council expectations as there can be a lack of clarity and objective direction. However, professional consultancy firms provide an invaluable resource to councils. Without the provision of their expertise and skills many key council services would not be delivered. The following general statements can be made with regards to the allocation and availability of resources for the development and preparation of ICMPs and the balance between the benefits and drawbacks of outsource resource use:

- Overall consultancy services are extensively used in the development of plans for most council(s) in the Auckland region.
- The ratio of insource vs. outsource differs across the region. With no clear trend based on resource level requirement e.g. smaller and larger councils can have essentially the same ratio.
- Plans are generally prepared using existing council data without a dedicated effort in asset validation or research prior to preparation. Consequently consultants have to prepare plans without key information limiting the scope and quality of delivery.
- Data flows between external parties and councils are typically poor with little consistency for either party.

- Brownfield issues and options are very difficult to scope. This is because either strategic internal information is unavailable or not made available to outside parties, and key network or process knowledge is retained by key council staff members without them knowing who to communicate with.

- ICMPs for greenfield catchments usually focus on planning and modelling which tends to result in clearer outputs and is simpler in terms of data flow.

- ICMPs to-date are generally a desktop exercise. Issues often arise when recommendations for improvement cause problems related to:

    - acceptance (community, stakeholders)

    - costs

    - feasibility

    - ease of consenting

    - out of date

    - scope change

    - lack of ownership (blaming the consultant for getting it wrong).

Many of the problems noted – including overall issues of communication, lack of information sharing and deficits in collective understanding, both within councils and external parties – have potential solutions which are associated with organisational and management values and practices.

2 BUSINESS PROCESS, TOOLS AND RESOURCES

2.1 MORE THAN JUST A PLAN

The preparation of an ICMP is not an easy undertaking – whatever the location or geographic setting. When a successful planning process produces a robust, well thought-out document, the tendency would be to think that the task has been achieved. However it has not. The overwhelming truth of the matter is that the systems and technical tools that support the calculations and designs/plans that are generated are proving to be increasingly important.

2.2 CRITICAL LIMITING FACTORS IN THE PRODUCTION OF CONSISTENT QUALITY PLANNING OUTPUTS AND IMPLEMENTATION

The critical limiting factors in the production and implementation of ICMPs are considered to be the following:

- Lack of Geographic Information System (GIS) resource availability,

- Limited in-house modelling technical knowledge. This results in difficulties in model scoping, survey, design and quality assurance procedures. Experience has shown a large variability in the quality and usefulness of modelling outputs.

- Life Cycle Data Management (lack of processes to plan data capture and house data in a useable manner).
- Discourse with district planning processes,
- Limited asset data information (connectivity, levels, validation),
- Planned integration with other stakeholders (other council departments) with the intent to agree on scope of the planning work, recommendations and mutual implications and alignment of proposed works.
- Receiving environment information and availability,
- Human resource capacity,
- Limited information sharing between council and/or regional groups.

The objective of identifying these factors is to improve the understanding of the business processes and tools that may be required to produce more effective plans and manage the infrastructure of the city in an optimised manner.

The integration of information sets through GIS and documented management systems can allow multi-department/organisational collaborations to flourish. This could include the management of infrastructure, such as roads, wastewater/water supply and multiple land uses, under a “total watershed management approach”.

2.3 DATA LIFECYCLE MANAGEMENT – FROM CRADLE TO GRAVE

Data Life Cycle Management (DLCM) is the process of managing the phases in which data moves through an organisation. The different phases include how the organisation collects, stores, processes and disseminates key data. Key data defines the most critical or important elements that are relevant to supporting an internal organisation’s specific business processes. For councils this is particularly important because it is data that is the currency of business. Without the information about billing addresses, public infrastructure or roads, it would be impossible for councils to deliver essential levels of service.

DLCM may not immediately seem like a high priority business activity in the development of catchment plans. In the past, when information was largely paper based, this may have been the case, with the most tangible and important outputs being the plan, flood maps and/or capital works options . Traditionally information required for ICMPs was collected once and not subsequently maintained (and often lost over time). This is generally inefficient.

However modern hardware and software tools now mean that all data can be collected under strict rules that allow them to become highly valuable, not just to support the ICMP process but also for other business processes including land use planning, transport, operations and consenting. For example, the cadastral survey information collected during the process of computational model hydraulic construction might have x, y and z data for a number of assets and land use features such as culverts and building floor levels. The objective of DLCM, in this case, would be to ensure that this x, y and z data are assigned to the records for pipes and building footprints. The result being that information about the piped network can be updated and a property can have a record stored about its floor level. This is a very simple example, but in spite of this, it is probably highly likely that this sort of information is not retained and/or updated by councils at all or if it is then it is not accessible to council officers or the public.

2.3.1 ADVANTAGES OF KNOWING THE WHY AND HOW OF DATA COLLECTION

The teams, groups and individuals within councils that manage the data flow, structure and functionality are often organisationally remote from the parties who use the information. This separation does not encourage the identification of potential benefits and positive spin-offs from the investigation, analysis and planning undertaken for ICMPs development.

The advantages of knowing why data is being collected and the format it should be in is vitally important if DLCM is to be achieved. From the perspective of the catchment manager, they require clear rules to support their internal processes and to communicate to outside parties using and providing data to councils about expected format and content.

2.3.2 ASSET INSPECTION, VALIDATION AND SURVEY

Asset validation and inspection should be undertaken as part of catchment investigation whenever budget allows. Experience has shown that existing asset information, generally held in council GIS/Asset management systems, is incomplete and unreliable. Asset validation and inspection can be achieved through the use of internal and external operators using the latest equipment, including GPS survey, Closed Circuit Television (CCTV) and mobile computers.

For example, CCTV inspection is driven by the need for good clean data for network modelling development. As with all data collection, data lifecycle management should require that data is ‘purpose captured’ to be used in corporate updates and ‘as-built’ generation.

The other positive spinoffs from asset validation and inspection is in asset management and GIS, including targeted renewal programmes and improvement of GIS data, which encourages greater confidence to users who then actively silicate the information.

2.4 HUMAN RESOURCES

Investment in human resources is vital. If councils can retain staff that are well trained and provided with the appropriate tools, they are in a much better position to support each other and to provide a robust sounding board for outside resources to deliver high quality outputs.

2.4.1 DATA CHAMPIONS

A “data champion” is an individual within a team or group who has sufficient technical abilities in the area of data management and analysis to communicate and advocate for the efficient use of data. Without people who have this ability, there is no means to ensure that information collected or generated as part of the ICMP process will be utilised, stored or used to improve business processes. A data champion can act to facilitate better communication between data management teams and with the end-users of the data. This means having data, tools and interface structures that are appropriate for the purpose. Data champions are passionate about data and developing new efficient processes and also about working through any issues of non-cooperation that arise between parties.

These individuals should have the mandate to cross organisational structure. In particular be able to work across departments and CCOs.

2.4.2 KEY LIAISON STAFF AND SLEEPERS

In the world of espionage a sleeper agent is a spy who is placed in a target country or organisation, not to undertake an immediate mission, but rather to act as a potential asset if activated. The concept of a sleeper in a council's organisational structure is similar with a slight twist. In this context a technical officer, who may be a stormwater/wastewater professional, may be placed in a transport organisation to work on issues relating to this discipline. In this way they would become a key liaison for external and internal parties regarding stormwater for transport but would actually be supported from a management hierarchy perspective in a stormwater management structure. The objective of a 'sleeper' would be to encourage collaboration and maximise the sharing of information and ideas between departments or CCOs. In practice, they would be similar to a relationship manager.

2.4.3 QUALITY ASSURANCE

Quality assurance of models, survey, and management options is often not undertaken by councils. In particular quality assurance of technical deliverables is challenging when there is a lack of technical expertise. With models, experience has shown a large variability in the quality and usefulness of modelling outputs.

The feedback from a robust review of planning deliverables can be extremely useful for consulting resources as they can refine and develop procedures, planning and options resulting in better outcomes.

3 MULTI-DEPARTMENT AND ORGANISATIONAL COLLABORATION

Multi-department and organisational collaboration is essential to meet objectives and outcomes and share benefits. There are of course a number of barriers to this sort of collaboration as it is often secondary to the goals and driver of the individual departments/organisations. In particular project implementation and performance targets will generally not include any targets or measures for positive results generated through interdepartmental collaboration.

The following tools and methods might be required to encourage multi department and organisation collaboration in the 'One Council Scenario':

- Single platform GIS systems with a customised interface that takes into account user profiles necessary to support collaboration e.g. consenting teams having full access to environmental data-sets.
- Procedures for the capture, maintenance and analysis of data, sharing of results and generation of customised tools in the most efficient way.
- All planned projects shown to all users as required in a GIS based platform,
- Issues and opportunities within a catchment shown as GIS layers and updatable to selected users.
- A structured organisational process that provides for procedural changes to be initiated from findings and experience of council departments including CCOs.

- All major capital works projects to include a collaboration with other departments that is documented and is Key Performance Indicator (KPI) based.

The following are examples of successful interdepartmental collaborations observed that provide some indication of how this process might be used in practice.

3.1 OVERLAND FLOW PATHS, TRANSPORT AND CONSENTS

Although stormwater practitioners may take the bulk of the responsibility in stormwater management, it is impossible for any land use practitioner to avoid having to manage stormwater in one way or another. The study and management of Overland Flow Paths (OLFPs) provide an excellent example of this and present many challenges to the numerous parties involved. In North Shore City, approximately 70 per cent of flooding complaints are related to OLFPs as opposed to backwater generated floodplains.

Management of OLFPs is an essential part of effective stormwater management and planning, and therefore from an ICMP perspective, the initial task in regards to OLFP is to determine their locations, magnitude (depending on return event) and their impacts.

Through the use of a Light Detecting and Ranging (LiDAR) survey and GIS tools it is possible to map and calculate the alignment and magnitude of OLFPs throughout entire developed areas. The properties affected are easily identified and shown on plans and maps. Inspections are required to ground truth the modelling outputs and modify these when required at field visits, using electronic data capture. This involves assessment of features including the source of the flow, its continuity, obstructions and who may be responsible for rectifying assessed problems.

OLFPs studies carried out as part of the North Shore City Council ICMP flood management modules have resulted in procedural changes to the consents and inspection process, with an overall positive benefit to both the council and the community.

The principal findings concluded from studies to-date are (Young and Tate 2007):

- The obstruction of recognised OLFPs in developed areas of the city is typically frequent and substantial
- Slab-on-ground development combined with inappropriate landscaping leads to frequent and significant risks of floor flooding for properties in OLFPs.
- The careful design and construction of roads, berms and vehicle crossings is key to minimising the adverse effects of overland flow
- Private drainage is typically non-effective or non-existent,
- There is a widespread need for education of risks and remedies within the development community and general public.
- OLFP analysis is an important tool in the study of wastewater network infiltration and overflow reduction strategies.
- OLFP can contribute to inflow problems into the wastewater network, potentially causing wet weather overflows from the wastewater network.
- The need to include OLFP assessments and prevention of potential OLFP issues during consenting processes.

Successful interdepartmental collaboration involved the following departments, with workshops seminars and information sharing being core to the process:

- Stormwater operations and planning,
- Wastewater operations and planning,
- Environmental compliance and consents,
- Transport,
- Parks.

The resulting significant resource from this exercise utilised both citywide analysis and individual property assessments. It is an excellent example of how CCOs might have to work together in ICMPs implementation and business process development.

3.2 CONTAMINANT MANAGEMENT, ASSET DATA AND CONSENTS

North Shore City Council developed a GIS based contaminant model to assess the effectiveness of various stormwater treatment options to reduce the contaminant loadings in receiving environments. This model was designed as a tool in the development of ICMPs and uses multiple land use datasets. It serves to integrate the manipulation of the spatial data and modelling processes for the estimation of stormwater contaminant loads and the simulation of various treatment options to reduce contaminant loadings.

This tool utilised the knowledge and experience of individuals from different disciplines, allowing for the business needs of stormwater planners to scope the scale and/or feasibility of projects to construct stormwater treatment devices, minimising the effects of contaminants. Stormwater managers can then benefit from investigating high contaminant source areas and quantifying the efficiency of existing stormwater treatment devices.

The goal of this collaboration was to plan for the management of contaminants. To achieve this, a number of building blocks had to be constructed and hurdles surmounted. This was only possible through the collaboration of multiple departments. In order to design the model, accurate information about ponds had to be used. This led to scrutiny of the pond and treatment device datasets resulting in the generation of a spatial ponds layer in a database format (previously the data had been in an Excel format). This provided an asset data management team with clean information that was used as the basis for a corporatized dataset standardised with asset data rules.

From the preparation of an ICMP and the objective of managing contaminants, there was a flow-on effect of additional benefits through interdepartmental collaboration. Once this information was available it could then be shared with a wider group. The operations and maintenance team work with environmental services (planning and consents) to provide guidance and controls on the discharge of stormwater to existing ponds. It is critical for the consents staff to know which catchments area the pond services and whether the pond to be discharged to is compliant with the ARC Technical Publication 10 standard. With the information generated via the development of the contaminant model this is now achievable and has become a tool to manage consenting processes.

There are two critical factors to consider in terms of this scenario:

1. The importance of having the institutional capacity to manage the tasks and work streams to deliver the outcome and;

2. Being cognisant of the potential benefits and positive spin-offs from spending time and money on generating clean information datasets that are fit for the purpose.

This second point is particularly important as it does not preclude a largely outsourced resource model but simply reinforces the need to consider DLCM at every stage of the ICMP process.

This project involved the following departments, with workshops seminars and information sharing being core to the process:

- Stormwater operations and planning,
- Environmental compliance and consents.
- GIS and information management.

3.3 INFORMING LAND USE PLANNING PROCESSES

Catchment planning can and should provide important information into land use planning processes. Examples of this include the Long Bay Structure Plan and the Pukekohe South ICMP.

The Long Bay structure planning process used valuable modelling and stream data to support the planning process, including an Environment Court process. The quality of the data was the foundation of this process. It involved planners, wastewater/stormwater managers and ecologists.

The Pukekohe South ICMP provided the direction and stimulus for district plan land-use changes from intensive cropping, which was causing excessive sedimentation and blocking the primary drainage system, resulting in flooding. This was supported and facilitated by the involvement of council planners in a collaborative exercise.

3.4 STREAM MANAGEMENT AND ASSET SURVEY

One of the fundamental reasons for stream and asset survey is to enable classification for management purposes. Stream assessment and categorisation is an important step towards the development of ICMPs. ARC Technical Publication 232 (TP 232) Framework and Management of Urban Streams in the Auckland Region (August 2004), sets out a management framework for urban streams in the Auckland region.

This type of investigation has multiple purposes beyond just ICMPs and contributes integrally to network consenting (e.g. NSCC), watercourse management (e.g. ACC) and stormwater activity management plans (e.g. Waitakere City Council (WCC)).

For example, Project Twin Streams in Waitakere City, was born from a project aimed at managing and alleviating flooding and has now developed into a community partnership restoring 56 kilometres of Waitakere stream banks. This has occurred through an integrated community development approach. The ICMP process has been able to take advantage of this work and use it to drive priority and direction for mitigation. This collaborative approach is considered best practice throughout the region. The stream and asset survey undertaken in Waitakere, required for ICMPs is designed to be integrated into the corporate information management system (Hansen) with photos and data links.

Table 1: Drivers for Stream and Asset Survey and Relationship to ICMP

General Survey Parameters	ICMP Development & Stream Classification	Potential District Planning	Modelling	Asset Management	City Plan (LTCCP)	Network Management Plan	Network Consent Application
Ecological	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Engineering	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wetlands	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inanga Spawning	Yes	Yes	No	No	Yes	Yes	Yes
Fish Sites	Yes	Yes	No	Yes	Yes	Yes	Yes
Stream Mouths	Yes	Yes	No	No	Yes	No	Yes

Community groups such as Friends of the Whau, Friends of Oakley Creek and the Kaipatiki Ecological Restoration Project can benefit from the information generated from stream and asset survey. Education and action initiatives including Enviro Schools and Wai Care can and are included in ICMPs, often being involved in the implementation of projects particularly in the area of stream restoration.

4 CONCLUSIONS

This paper has aimed to investigate and present what might be required in the 'One Auckland Scenario' to achieve Integrated Catchment Management Planning best practice.

How can ICMP be prepared and implemented in a 'One Council' scenario? Firstly by clearly understanding the institutional capacity, community expectations and business practices of the individual councils and using this information to build on, rather than starting from scratch. The integration of information sets through GIS and documented management systems will be crucial for multi-department/organisational collaborations to flourish.

Secondly, implementation of plans require that council business processes are developed and fit for purposes including quality assurance, data management and robust and dynamic information systems. Work stream and management structures should provide for procedural changes to be initiated from findings of their organisations or CCOs.

4.1 COLLABORATION AND INTEGRATION

Multi-department and organisational collaboration will be essential to meet high expectations for watershed management. However, collaboration is often a secondary project priority to delivery. If performance targets or KPIs were required for collaboration as part of the project quality assurance procedures, it would assist in achieving expected positive results from the Auckland Council restructure.

Discussions with stormwater managers, as part of research conducted for this paper, support the need for material collaboration and the means to achieve it. This could be facilitated through the development and design of a Council Collaboration Tool (CCT) which would be a central portal for all CCOs and Auckland Council.

4.2 DATA MANAGEMENT

Data flow between outside parties and councils are largely poor with little consistency for either party. Rules and procedures need to be established to support internal and external parties. Datasets are often not used to full potential within councils. This is often because no system exists to manage the data. Additionally the teams, groups and individuals who manage data systems are organisationally remote from the parties who use the information.

These inconsistencies and data discourse could be improved through the establishment of Data Life Cycle Management procedures. Additionally having council staff assigned as data champions within their group or team would help to manage the flow and quality of data.

4.3 GIS RESOURCES

A single platform GIS system with a customised interface that takes into account user profiles is necessary to support collaboration e.g. consenting teams having full access to environmental datasets. All planned projects shown to all users as required in a GIS based platform including services available to all users is required. If information about parks, pipes and people cannot be viewed by all city managers including CCOs, it will be difficult to have integrated management.

4.4 HUMAN RESOURCES

Investment in human resources is vital. If councils can retain staff that are well trained and provided with the appropriate tools, they are in a much better position to support each other and to provide a robust sounding board for their outside resources to deliver high quality outputs.

Although some of the technical work can be effectively outsourced, corporate knowledge and ownership is critical to:

- Ensure good quality and consistency of outsourced work undertaken,
- Implement recommendations,
- Efficiently update and maintain ICMPs,
- Achieve savings in catchment planning related costs.

This would mean that teams or groups should be able to undertake the tasks at management and quality assurance levels and should not be technically destitute

ACKNOWLEDGEMENTS

We would like to acknowledge the help and time given by the following people:

Grant Ockleston - Auckland City Council

Claudia Helberg - Auckland Regional Council

Claire Feeney - Environment and Business Group

Godfrey White - Franklin District Council

Barry Carter - North Shore City Council

Micheal Lindgreen - Metrowater

Kim Buchannaan - Rodney District Council

Helen Chin - Waitakere City Council

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