Council Briefing Agenda

Date:	12 August, 2021
Time:	10:30 am
Location:	Council Chamber Forum North, Rust Avenue Whangarei
Elected Members:	Her Worship the Mayor Sheryl Mai (Chairperson) Cr Gavin Benney Cr Vince Cocurullo Cr Nicholas Connop Cr Ken Couper Cr Tricia Cutforth Cr Shelley Deeming Cr Jayne Golightly Cr Phil Halse Cr Greg Innes Cr Greg Martin Cr Anna Murphy Cr Carol Peters Cr Simon Reid

For any queries regarding this meeting please contact the Whangarei District Council on (09) 430-4200.

Pages

2.1 Norfolk Ave – Reotahi Reserve Classification

Meeting:	Council Briefing
Date of meeting:	12 August 2021
Reporting officer:	Sue Hodge, Manager Parks and Recreation Sarah Irwin, Team Leader Infrastructure Planning

1 Purpose

To provide an update on the progress with formalising access across reserves administered by the Council's Parks and Recreation Department at Norfolk Rd, Reotahi.

Figure 1: Aerial Image Depicting the Relevant Utility and Plantation Reserves owned and administered by Council

2 Background

This issue was last brought to Council on the 20 August 2020 to identify the most appropriate way forward for a number of houses that do not currently have legal vehicular access to Norfolk Avenue and have informally used a section of utility and plantation reserve for access.

At this meeting Option 3 – Change reserve classification to Local Purpose Accessway and grant easements to individual property owners for vehicular access was approved.

3 Discussion

The public notification of the intent to classify Part Lot 40 Deeds 863 as Local Purpose (Access) Reserve was undertaken from the 12 June to the 12 July 2021.

Two submissions were received both supporting the classification with comments on how the easement process should progress.

The next steps will be to bring a decision report to Council to consider the recommendation to classify the reserve under the Reserves Act 1977 delegation and to establish the next steps for Council to consider regarding the negation of access easements with the affected residents.

4 Attachments

1. Summary of submissions

Attachment 1: Summary of submissions

Classification of Land – Reotahi

Submitter	Support / Against	Summary of submission
Shane Galpin	Support	Support reclassification to enable residents to have legal access. Discussion on status of structures on the access and in easement area Discussion on formation standards and limits on number of properties.
Whangarei Heads Citizens Association	Support	Support reclassification to enable residents to have legal access. Discussion on limits on number of properties. Discussion on ensuring Te Aroroa trail is not affected.

Whangarei District Council

2.2 Blue Green Network Programme Update

Meeting:	Council Briefing
Date of meeting:	12 August 2021
Reporting officer:	Shelley Wharton, Manager Infrastructure Planning & Capital Works

1 Purpose

The purpose of this agenda is to update on the overall status of the Blue Green Network Programme and the status of various projects that sit under the programme.

2 Background

Council adopted the Blue Green Network Strategy for Whangarei City in 2016. The strategy aims to create an attractive and environmentally sustainable urban environment that also addresses threats from flooding and future climate change.

Blue-Green networks are a way of planning, based around waterways (blue), and planting and parks (green). These are managed together through a combination of infrastructure, ecological restoration and urban design to connect people and nature across the city.

Funding for the programme was provided within the 2018-21 Long Term Plan commencing last financial year 2020-21.The Blue Green Network Programme continues to be funded within the 2021-31 Long Term Plan from a combination of the Parks, Stormwater, and Transport (portion of shared paths) activities. Excluding the transport component, the programme budget is $19.9 million over 10 years, which is an average of $2m per year.

3 Discussion

In preparation for the 2021-31 Long Term Plan analysis of the Blue Green Network Strategy was carried out, background information was collected such as work done to date and property ownership, and collaboration meetings were held with key parties including department managers and Northland Regional Council.

Based on the background work a detailed programme of work was developed which included prioritisation of projects based on a number of factors including:

- Completion of key connections or sections of work
- Availability of land to implement the projects (ownership/leases)
- Opportunities and alignment with other projects (eg Raumanga Shared Path)
- Availability of key information (eg flood modelling, stormwater network modelling)
- Level of difficulty to implement (eg easier upstream sections, or more difficult in the city centre)
- Supporting other strategies and priorities of council

To support this complex 10 year plus programme of work a GIS tool has been developed which enables clear communications on project status across a broad audience, easy

updating and sharing of information, and management of the programme. Eventually a public version of this tool will be available on the Whangarei District Council website.

A programme governance structure has been established and steering group meetings have been occurring over the past few months, including representatives from key departments and Northland Regional Council natural hazards and climate change areas.

The works/projects prioritised for implementation over the next 3 years are:

- Works adjacent to Lovers Lane Bridge, the new Civic Centre site and through Cafler Park due to other projects providing opportunities to achieve efficiencies.
- Works to Raumanga Stream alongside the Raumanga Shared Path project.
- Completion of planting and connections at Tikipunga such as extending the path to Gillingham Road.
- Waiarohia Loop– from the Pocket Park along the southern side of Waiarohia Stream to Okara Drive bridge, then along the northern side of Waiarohia Stream and Herekino Street to Hihiaua Cultural Centre, and connecting back to the Hatea Loop.

Stormwater catchment planning work which is being done separately is integral to progressing other parts of the Blue Green Network Programme. For example, stormwater modelling of networks and flooding are required to test potential design solutions to reduce flooding around the Waiarohia and Raumanga Streams between Water Street, Woods Road, and Porowini/Maunu Roads. Stormwater catchment planning work will also identify key areas for stormwater quality treatment, which contributes to improving water quality which is an outcome of the Blue Green Network Strategy.

As separate work on Climate Adaptation Te Taitokerau progresses, any impacts on the Blue Green Network Programme will be monitored and assessed.

A recent success was the community planting days in June run by Whitebait Connection and Mountains to Sea Conservation Trust as part of the Whangarei Matariki Festival, and funded through the Blue Green Network Programme. Over 2000 native plants were planted in the riparian margin of the Waitaua Stream in Tikipunga, which is in the upper Hatea catchment. Various school groups attended over two days as part of their environmental education, and another open public planting day was also held. Restoration of riparian margins is an important part of improving water quality, providing shading and habitat for terrestrial and aquatic fauna.

A presentation will accompany this briefing including maps to clearly identify the areas referred to above.

2.3 Stormwater Catchment Planning Update

Meeting:	Council Briefing
Date of meeting:	12 August 2021
Reporting officer:	Shelley Wharton, Manager Infrastructure Planning & Capital Works

1 Purpose

The purpose of this agenda item is to update on progress with stormwater catchment planning and stormwater network discharge consents.

2 Background

Stormwater Management is the management of relationships between land surfaces and the quantity and quality of water to protect people, property and the mauri (life force) of water, including groundwater, freshwater and coastal water.

As part of managing stormwater, council is required to comply with various legislation, policies and standards, to obtain consents for its activities and comply with those consents.

The Regional Plan for Northland was recently updated by Northland Regional Council (NRC), which has resulted in the catchment planning and consenting requirements changing substantially over the past few years. The focus is now on consenting urban areas rather than the previous consenting of river works, stream clearing, diverting streams, and discharging to streams which were covered by catchment plans prepared between 1980 and 2001, which are no longer fit for purpose.

The new Regional Plan rules don't require the attachment of a catchment management plan with an application for a network discharge consent, leaving some uncertainty around what will be required. This also unlocked the potential for a better way of doing things, leading to a digital catchment management approach that is integrated into everyday work. We are keeping NRC informed as to the status of planning work and the approach being taken which they are satisfied with at this time.

In 2018 a programme of work including a stormwater consenting strategy and stormwater catchment planning commenced. This work has been intermittent due to staff vacancies. Information on stormwater networks, asset data, catchment data and existing consents has been gathered and analysed. Data gaps were identified, and a programme of data collection is ongoing to enable robust planning.

The National Policy Statement for Freshwater Management (NPSFM) was updated in August 2020. It now includes a requirement for local authorities to give effect to Te Mana o te Wai, which is a stronger requirement than previous versions of the NPSFM.

Aspects of the NPSFM applying to freshwater wetlands and coastal wetlands, which are included in the Regional Plan for Northland and are currently under appeal, contain some uncertainties that are potentially problematic for aspects of stormwater management and consenting. Until the appeals are resolved this uncertainty remains, making planning risky due to the potential for rework if the rules are amended by the courts.

The parallel work on the Te Ao Maori Decision Making Framework and Matauranga Maori projects continuing over the next 8 months will also be an important guide and information source for stormwater catchment planning work.

3 Discussion

3.1 National Policy Statement on Freshwater Management 2020 and Te Mana o te Wai

The 'Essential Freshwater: Te Mana o te Wai Factsheet' published by the Ministry for the Environment and Ministry for Primary Industries in September 2020 outlines the requirements under the NPSFM 2020, which requires local authorities to:

- Give effect to Te Mana o te Wai,
- Include tangata whenua and communities need to be involved in developing long-term visions for waterbodies,
- Actively include tangata whenua in freshwater management (including decision making processes, policy, plans and monitoring).

Te Mana o te Wai imposes a hierarchy of obligations set out as three priorities. The hierarchy does not mean, however, that in every case the water needs to be restored to a pristine state before the other needs in the hierarchy can be addressed.

First Priority:	The health and well-being of water.
Second Priority:	The health needs of people (such as drinking water).
Third Priority:	The ability of people and communities to provide for their social, economic and cultural well-being.

Te Mana o te Wai has six principles to inform its implementation:

Mana whakahaere: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater.

Kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations.

Manaakitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others.

Governance: the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future.

Stewardship: the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations.

Care and respect: the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation.

These requirements of the NPSFM 2020 have caused a rethink about how best to continue with stormwater catchment planning engagement and consultation work while giving effect to Te Mana o te Wai. This potentially has quite far reaching consequences across many areas of the council's governance and business therefore further discussion and analysis of options is required to agree an approach before commencing any new work in this space.

3.2 Stormwater Catchment Planning

Work done to date on catchment planning has largely been background research, identifying catchment areas, identifying gaps, data collection, and mapping to fulfil the information needs to plan what needs to happen in the catchments in terms of issues and future projects to resolve the issues.

This data collection work is continuing using a data-driven catchment planning approach where the information is able to be used on a daily basis to inform tasks, provide better customer responses and scoping new projects on a prioritised basis.

A number of enabling projects have been completed to date including the following: Examples are included in a presentation to accompany this report.

- Creation of a GIS portal to share information across functions
- Development of a Digital Terrain Elevation Model
- Asset data collection priorities and information capture
- Catchments, sub-catchments, and receiving environments mapped
- Contour maps developed, and updated using latest LIDAR information
- Overland flowpaths mapped based on terrain model and contour maps
- Mapped where overland flowpaths intersect building footprints
- Mapped where flood extents intersect building footprints
- Mapped areas where stormwater controls e.g. attenuation, have been deemed unnecessary due to various considerations
- Locate surface depressions which cause ponding of surface water
- Developed a geometric stormwater network to understand flow direction

Work currently under way includes:

- Updating the overland flowpaths and other datasets with the new LIDAR information
- Asset data collection continues
- New areas to target data collection are being prioritised
- Impervious surfaces (hard surfaces that stop water infiltrating into the ground) are being mapped.
- Determining the stormwater catchment and network modelling required to inform catchment planning activities.
- Revising stormwater components of the Environmental Engineering Standards
- Specifying the type of stream and network information that needs to be collected.
- Completing the mapping of information related to the July 2020 flood event, including customer requests, validation of flood levels on the ground, and generic insurance claim information which can be used alongside the above mapped information such as overland flowpaths and building intersections to identify the highest priority areas for investigation and potential future projects to resolve the issues.

Wherever possible we are working collaboratively with Northland Regional Council, Kaipara District Council and Far North District Council, both to gain efficiencies where we can and, in light of the potential for Three Waters Reforms, identify where consistent methods and data will be most useful in future.

Future work over the next 6 months includes:

- Communications and engagement planning for involving tangata whenua and communities in preparing long term visions for waterbodies.

- Determining the type of operational catchment governance structure(s) that may be needed to fulfil the requirements of Te Mana o te Wai.
- Stormwater modelling of key areas to analyse issues and inform technical solutions. Modelling will be complementary to the work done by NRC to avoid duplication and align boundary conditions such as sea level scenarios.
- Clarifying areas of responsibility between the NRC and WDC where there is potential for gaps or cross-over, particularly where river flood mitigation works could impact stormwater drainage and surface water flows in the catchment.
- Further collection of data such as network information, stormwater outfalls, fish passage barriers, riparian vegetation extents.
- Identification of contaminant sources and contaminant loads in stormwater and receiving environments.
- Data analysis to identify priority areas for more in-depth investigation of flooding issues, stream works, and network criticality.
- Integrating aspects of climate change adaptation and mitigation into stormwater catchment planning.

3.3 Stormwater Network Discharge Consent

While catchment planning work continues, a process of working collaboratively with NRC to agree the statutory information requirements and ways in which they can be satisfied will be progressed, potentially through an extended pre-application phase. This will ensure a smoother consent processing phase once the consent is lodged at NRC.

Community consultation is an expected part of the consent process, so early community engagement and involvement of tangata whenua in decision making are also key aspects of obtaining a network discharge consent.

3.4 Technical Paper published and presented at Stormwater Conference 2021

A technical paper titled ‘The Journey of Integrated Catchment Planning in Whangarei’ was jointly authored by Shelley Wharton, Manager Infrastructure Planning & Capital Works at WDC and Damian Young, Director of Zealandia Consulting for the Stormwater Conference 2021. The paper was also presented at the conference held 12-14 May 2021. The published paper is attached for information.

4 Attachments

The Journey of Integrated Catchment Planning in Whangarei – May 2021

THE JOURNEY OF INTEGRATED CATCHMENT PLANNING IN WHANGĀREI

D J Young, Zealandia Consulting Ltd, Northcote Point, Auckland
S D Wharton, Whangarei District Council, Rust Avenue, Whangārei, Northland

ABSTRACT

Whangarei District Council (WDC) has embraced modern concepts of catchment planning, which has included a more holistic approach to the data and information collected, collated, and generated as part of otherwise discrete processes, investigations, and reports. It is the intention of this paper to tell the story of discovery and learnings which have come to light from this journey.

For too long catchment management plans have sat on shelves around the country or been stored as pdf files on the respective organisations' networks. Once used to obtain a discharge consent, they may be referred to occasionally, but mostly they are long, complex, and difficult to interpret and put to practical everyday use. So why would we create more of the same catchment management plan documents?

With new rules coming into effect under the Northland Regional Plan which no longer specify the attachment of a catchment management plan when applying for a stormwater discharge consent, there was an opportunity to rethink the usefulness of traditional catchment management plans.

WDC asked the question: How could things be done differently? Starting with the desired outcome, a set of useful, everyday tools, that when brought together, would form the basis of an Interactive Catchment Management Plan. These tools should support and enable staff to identify issues, update and analyse data, prioritise projects and optimise programme delivery.

Integrated data solutions can be developed through disciplines of data science, business process architecture, and keen journalistic technical skill sets, focused on defining their user requirements of frontline staff and key stakeholders. It's crucial to actually ask people what they want and how they need it. The solutions are often at hand, and front-line staff or stakeholders tend to be custodians of this knowledge.

To this end Whangarei District Council initiated a Discovery Phase, with the aim to substantially improve stormwater catchment planning and management, to define technical delivery platforms, information and data storage structures, and targeted workflow tools.

Defining the outcomes desired of a catchment planning process was key to understanding the type of data needed. A key part of this is understanding who will use the data and what they will use it for, whether external consultants and private developers, consents staff, or internal stormwater planning and operations staff.

The process of developing the data and tools is iterative and relies on all parties being open to new ideas, taking some risks around doing things differently, and importantly working in a collaborative way with many parties including the regional council.

Implementation is a critical step in any new project or system. This was carefully considered in terms of training, providing guidelines, and ongoing support to ensure the tools and data could be used to best effect.

This paper is intended to communicate and share, a story about:

- Outcomes - some insight into the ways data could be used every day by staff and customers, in turn, informs the types of interactive tools needed
- The discovery and learnings around Interactive tools and their uses
- Platform(s) used and understandings
- Steps in the process and key learnings

This approach has resulted in many benefits, integration opportunities, and scalability of defined tools, systems, and delivery mechanisms. However, as is most typically the case, the adoption and integration both technically and culturally, of new tools and systems is understandably challenging and requires prudent forethought and planning to best achieve the original intent and outcomes around data-driven catchment planning, guidance, rules, and delivery methods.

The intent is to inform other councils and utility operators across New Zealand in order to share hopefully valuable insights and strategies which could be of benefit to many, but also to engage an active dialogue with other practitioners to better serve all councils who unsurprisingly face similar issues.

KEYWORDS

Stormwater, Catchment planning, GIS, Interactive Tools, Adaptive Management, Collaboration

PRESENTER PROFILE

Damian Young is an Environmental Engineer who has led both science and engineering teams for over 17 years. He has a 21-year history in the development of environmental consultancy businesses including Co-founding Morphum Environmental and Seditrol New Zealand Ltd. His career started in 1993 in Green retail and clothing. He is currently the founding Director of Zealandia Consulting, managing clients, deliverables, and leading business development, to best meet the needs of collaborators and clients from the North and South Islands of New Zealand to Australia. He works in a wide spectrum of discipline areas including; aquatic and marine sciences, environmental GIS, catchment to coast environmental management, strategic planning, stream, and environmental engineering.

Shelley Wharton is an environmental engineering manager with 20 years' experience in local government leadership roles across Tāmaki Makaurau Auckland and Te Tai Tokerau Northland. Areas of expertise include three waters, land development, setting engineering standards and rules for sustainable stormwater practices, and delivery of complex, integrated infrastructure programmes.

1 INTRODUCTION

In 2018 Whangarei District Council (WDC) commenced a process of defining the outcomes of a new stormwater catchment strategy project which would progress through various

stages of discovery, data collection, planning, collaboration, information sharing, and eventually lead to stormwater catchment planning documentation, processes and tools that would support application to the Northland Regional Council (NRC) for network discharge consents.

The issue of usability of the information to be generated was identified early on in the process. For too long catchment management plans have sat on shelves around the country or been stored as pdf files on the respective organisations' networks. Once used to obtain a discharge consent, they may be referred to occasionally, but mostly they are long, complex, and difficult to interpret and put to practical everyday use. So why create more of the same catchment management plan documents?

WDC desired a modern approach to catchment planning that took advantage of big data, analytics and spatial representation of data wherever possible. This required a holistic approach to data and information, while looking for tools to assist every day work. This has resulted in a journey of discovery, embracing opportunities for change, while learning and adapting along the way. Figure 1 defines this process and depicts the functional linkages between discovery, analysis and process refinement to inform collaborative technical outcomes to deliver adaptive catchment management outcomes.

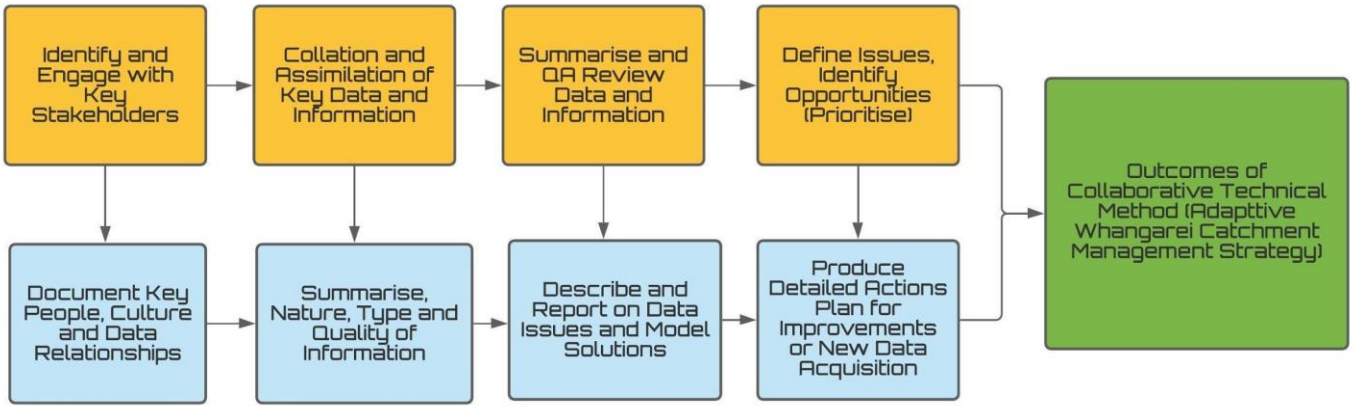

Figure 1: Collaborative Work Process

2 DISCUSSION

2.1 OPPORTUNITY FOR CHANGE

With new rules proposed, and later coming into effect, under the Northland Regional Plan, which no longer specify the attachment of a catchment management plan when applying for a stormwater discharge consent, there was an opportunity to rethink the usefulness of traditional catchment management plans.

WDC asked the question: How could things be done differently? The answer? By starting with the desired outcome: a set of useful, everyday tools that, when brought together, would form the basis of an *Interactive* Catchment Management Plan. These tools should support and enable staff to identify issues, update and analyse data, prioritise projects and optimise programme delivery.

2.2 DISCOVERY PHASE

2.2.1 CURRENT STATE

Whangarei District Council (WDC) initiated a Discovery Phase, with the aim to substantially improve stormwater catchment planning and management, to define technical delivery platforms, information and data storage structures, and targeted workflow tools.

As in many parts of New Zealand, WDC had a few scattered catchment management plans in pdf format with outdated information, a few discrete network consents, older models, and substantial asset data limitations due to operational budget constraints.

2.2.2 ENVIRONMENTAL OVERVIEW (SCAN) IN A STORMWATER CONTEXT

The current environment in relation to stormwater activities has a lot of uncertainty and potential for significant change. It is important to recognise these factors and create an adaptable framework and set of tools that will endure changes. New items have been added throughout the process, which then require review and adjustment of the process as necessary to ensure future and ongoing compliance. The environmental scan has so far identified the following key factors to be considered:

- Three Waters reform being progressed by the Central Government.
- New legislation and regulator of three waters services including stronger implementation of Te Mana o te Wai.
- Intention to set new water quality standards for stormwater discharges.
- National Policy Statement for Freshwater Management updated in 2020.
- New Zealand Coastal Policy Statement 2010.
- Increasing attention on development and infrastructure in hazard areas, including from the insurance industry.
- Declaration of a climate emergency by the New Zealand Government and by Whangarei District Council.
- Resource Management Act reform along with new legislation to address climate change and natural hazards.
- New LIDAR information for Te Tai Tokerau Northland Region.

Image One: Sensitive Marine Receiving Environment Whangarei CBD

2.2.3 ISSUES AND OPPORTUNITIES

A lack of consolidated catchment information causes repeat work and therefore increased costs for staff and consultants. Conflicts often arise between developers, their consultants, and consenting staff due to inconsistencies of approach to stormwater analysis and solutions. There is an opportunity to provide clear guidance with consistent baseline information that reduces time, cost and conflict. Essentially this issue undermines positive stormwater initiatives, generates confusion and wastes precious time.

Limited understanding of network performance, systemic catchment issues, and therefore identification of appropriate solutions, is acting to slow the capital works programme process. Visibility of the forward works programme is limited due to people being unsure of the priority to attach to the various stormwater issues. This also reduces the Council's effectiveness to secure the appropriate level of capital funding to optimally manage the stormwater network.

Whangārei District has a very long coastline with many coastal communities and infrastructure on or near the coast, with the result being a district that is susceptible to climate change risks. Regional work has commenced to identify risk areas and create adaptive pathways however this will take many years. NRC have been very interested in a collaborative approach towards risk and data management with numerous "design sprint" type meetings and briefings having been conducted to openly share ideas about method, information and data sharing.

In the meantime there is some uncertainty about the level of investment that should go into stormwater infrastructure in the lower catchment areas. Better catchment information which can integrate with regional models and adapt to changing boundary conditions (i.e. sea level rise driven priorities) will provide additional certainty about where to invest in infrastructure, as well as the relevant design parameters that should be used.

At the outset of any project there is, of course, the opportunity to implement best practice, or even to set a new standard for the future.

2.2.4 BEST PRACTICE

There are many examples of best practice integrated catchment management plans, however they are mostly static documents delivered at a point in time to obtain a network consent. Although these documents contain useful information it is often presented in a restrictive pdf document format which is inaccessible to a wide audience due to their length and narrow focus of outputs.

Best practice in terms of delivering projects with a focus on environmental outcomes now includes tangata whenua, with collaboration and co-design at the project level as a minimum, or partnership at the governance level seen as the optimum practice.

Tangata whenua involvement in decision-making throughout the catchment planning process is missing from the majority of catchment management plans. These documents are largely prepared by stormwater experts (i.e. engineers and scientists) in the absence of meaningful input from tangata whenua from the earliest stages. Often tangata whenua are only 'consulted' on the final document when there is little appetite to make substantive changes.

The National Policy Statement for Freshwater Management, updated in 2020, becomes a critical guiding factor for preparing a new stormwater catchment management plan. There is a clear requirement that local authorities give effect to Te Mana o te Wai, include tangata whenua and communities in developing long-term visions for waterbodies, and actively include tangata whenua in freshwater management (including decision making processes, policy, plans, and monitoring).

It is important to point out that such integral involvement of tangata whenua requires the regional or local authority to plan appropriately in terms of the time and budgets allowed to enable appropriate resourcing and compensation of tangata whenua for their time and expertise on matters of Te Ao Māori (Māori worldview) and Mātauranga Māori (Māori knowledge) of the local environments over many hundreds of years.

Te Mana o te Wai imposes a hierarchy of obligations. The hierarchy does not mean, however, that in every case the water needs to be restored to a pristine state before the other needs in the hierarchy can be addressed (MfE & MPI, 2020).

First Priority: The health and well-being of water.

Second Priority: The health needs of people (such as drinking water).

Third Priority: The ability of people and communities to provide for their social, economic and cultural well-being.

Six principles of Te Mana o te Wai shown in Figure 2 inform its implementation.

The six principles

Mana whakahaere: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater

Kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations

Manaakitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others

Governance: the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future

Stewardship: the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations

Care and respect: the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation

*Figure 2: Six Principles of Te Mana o Te Wai (*MfE & MPI, 2020)

The principles of Te Mana o te Wai and the concept of mauri (life force) go some way to explaining the relationship of tangata whenua to water. For further context of Te Ao Māori worldview as it applies to water, we can think of waterways as living, breathing entities in

their own right that sustain us and that we, in turn, sustain in a state of health. The whakataukī 'Ko wai ko au, ko au ko wai' explains the depth of the relationship Māori have with water, stating 'I am the water, and the water is me'.

2.3 OUTCOMES FOCUS

2.3.1 DEFINING THE DESIRED OUTCOMES

Defining the outcomes desired of a catchment planning process was key to understanding the type of data needed. A key part of this is understanding who will use the data and what they will use it for, whether consultants and private developers, consents staff, or council stormwater planning and operations staff. Again, outcomes have been updated to reflect the changing legislative environment affecting stormwater activities.

The key outcomes desired of this catchment planning exercise are:

- Provide information that is required to obtain a network discharge consent.
- Provide information that is accessible and useful for everyday work of the varied users of the data outputs.
- A collaborative process between key internal users, iwi/hapū, the regional council where functions need to integrate, and adjacent councils where catchments cross boundaries.
- Recognise and integrate the concept of mauri (life force) and the requirements of Te Mana o te Wai into planning processes and decision-making.
- Provide information that is dynamic and easily updatable following business processes.
- Use spatial data wherever possible for ease of data consumption and analysis.
- Enable more efficient and effective business practices that meet audit requirements.
- Scalable and adaptable to changing legislation and water regulations.
- Able to optimise and prioritise capital works, inform the 30 year infrastructure strategy, and provide a 10-year capital works pipeline aligned to land use including growth projects that then inform the charging of development contributions to new developments.

Amendment of the original outcome about mauri was necessary to more clearly state implementation of Te Mana o te Wai principles in relation to NPSFM (2020), particularly including tangata whenua in decision making processes. This pivot part way through the process is seen as positive, and will add to the process rather than detract or delay. There is still work to be done in this space, which will potentially see further amendment of outcomes.

Fortunately substantive rework wasn't necessary because the work done up to then had been focused on defining catchments, improving asset and network data, obtaining accurate LIDAR, preliminary overland flow path analysis, and defining the tools required to meet certain end-user needs. These workstreams would have been done anyway, and because of the requirement for adaptability and integration they are easily updated if required through the integration of tangata whenua in decision making on stormwater catchment planning.

2.3.2 DEFINING THE END USER NEEDS

The end users of catchment management plan information are wide and varied, so it is important to understand their needs from the outset. There are the obvious users who work directly within the stormwater management field, however there are many other not-so-obvious users who can also benefit significantly from clear and consistent information.

The identified users of catchment management planning information include:

- Tangata whenua (in delivering their obligations under Te Mana o te Wai).
- Regional council consenting and monitoring staff.
- Stormwater planning engineers (network upgrades and other capital works).
- Stormwater network engineers and operations/maintenance staff.
- Other infrastructure planning engineers (e.g. wastewater, roading, utilities).
- Development engineers (subdivision and land development).
- Resource consents and building consent staff (natural hazard assessments).
- District plan and regional plan staff (plan changes).
- Council's customer services and other customer-facing staff (day-to-day advice).
- Staff issuing LIMs (Land Information Memoranda).
- Developers (assessing potential projects).
- Consultants and contractors (designers, technical advisors).
- Purchasers or sellers of property (including their lawyers, insurers, real estate agents).

For those users external to the council, the availability of catchment information (such as network capacity, extent of overland flow paths (OLFPs) and floodplains, and potential future capital works upgrades) can save significant amounts of money on individual site assessments and give more certainty of the development potential of properties, avoiding conflict during consent processes.

2.3.3 ADAPTIVE CATCHMENT MANAGEMENT PLANNING

WDC's adaptive and strategic approach can be defined as a 'high-level plan' to achieve one or more goals under conditions of variability, and/or a plan of positive actions designed to achieve long-term planning goals and integration with existing core systems and values.

When confronted with complex and multifaceted challenges, it is good practice to develop a strategy to support meeting objectives and stated outcomes. WDC sees that to be adaptive it's necessary to make sure that the elements which serve to deliver stormwater services and planning, are founded on robust, but in themselves adaptable, electronic information platforms.

2.4 COLLABORATION

2.4.1 BUILDING BLOCKS OF COLLABORATION

Collaboration is difficult to achieve in most circumstances and sometimes even feels impossible, however, this can be dramatically improved and potential possibilities achieved, when the following conditions can be created:

- Digital Transparency is sought, which basically means any information that can be available is available and readily viewable, digestible and usable by the stakeholders and key groups involved in the collaboration process. E.g. reported flooding incidence or information that supports prioritisation of any capital project.
- Unified Methodology Approach - too often individuals and groups that seek collaborative outcomes use disparate methods in an attempt to reach agreed goals or objectives. When more focus is placed on how work is done this assists to unify approaches, minimise wasted effort and resources, and benefit the quality and completeness of catchment investigations and consequential planning outcomes.
- Culture of Collaboration- There are certain values that underpin collaboration and these in turn support open, honest and concise sharing of technical information, organisational resources and the consequential buy in of individuals and stakeholders to work towards shared outcomes. These include: shared data standards, active acknowledgement of workflow and problem-solving processes and a unified projects register.

The process of developing the data and tools is iterative and relies on all parties being open to new ideas, taking some risks around doing things differently, and importantly working in a collaborative way with many parties including the Regional Council.

2.4.2 DATA INTEGRATION TO SUPPORT COLLABORATIVE OUTCOMES

A core part of the process of defining and planning for integrated catchment management is to understand the quality, quantity and type of data and information available for planning, prioritisation and ultimately informing future capital projects and planning rules.

WDC, like many other councils around New Zealand, are responsible for a multiplicity of data and information that serves to inform daily practice and business processes. These tend to be often considered as disparate information sets, however there is real potential in the rationalisation and amalgamation of these types of valuable core business information and data sets. Over the last three years WDC and their consultant partners, have taken a holistic view of the current systems and data available to them. This has helped to inform and define a clear path to a more amalgamated data environment, allowing for WDC to operate in a more holistic way.

2.5 DATA IS POWERFUL, BUT ONLY IF IT'S USEFUL

Integrated data solutions can be developed through the disciplines of data science, business process architecture, and keen journalistic technical skill sets focused on defining the user requirements of frontline staff and key stakeholders. It is crucial to actually ask people what they want and how they need it. The solutions are often at hand, and front-line staff or stakeholders tend to be custodians of this knowledge.

To avoid collecting data for data's sake, existing data limitations were considered in relation to the outcomes desired. Where additional key pieces of data would contribute to outcomes, that data was collected and input to the systems. Starting with poor to average stormwater asset data meant that quite a lot of data collection was needed. Highest priority was allocated to those key data improvements necessary to progress the catchment planning work itself.

A process of documenting data structures, use, intent and function has been conducted throughout the discovery phases of the Stormwater Strategy due diligence process. This resulted in the "data landscape" being more clearly defined. An example of this is Stormwater Asset Data interrogation using GIS queries, where contrasting results and symbologies are used to count and depict the gaps in data for manhole inverts throughout the CBD area, which has resulted in a refined and prioritised data acquisition process via specific gaps being filled by CCTV and Survey contracts.

2.6 INTEGRATION

There are various, often divergent, information sources and business processes which make up the core components of stormwater assessment, operations and planning, from customer complaints about local flooding to information which supports the assessment of subdivision applications. An integrated approach to stormwater management and planning is underpinned by the sharing, prioritisation and dissemination of technical information as depicted in Figure 3.

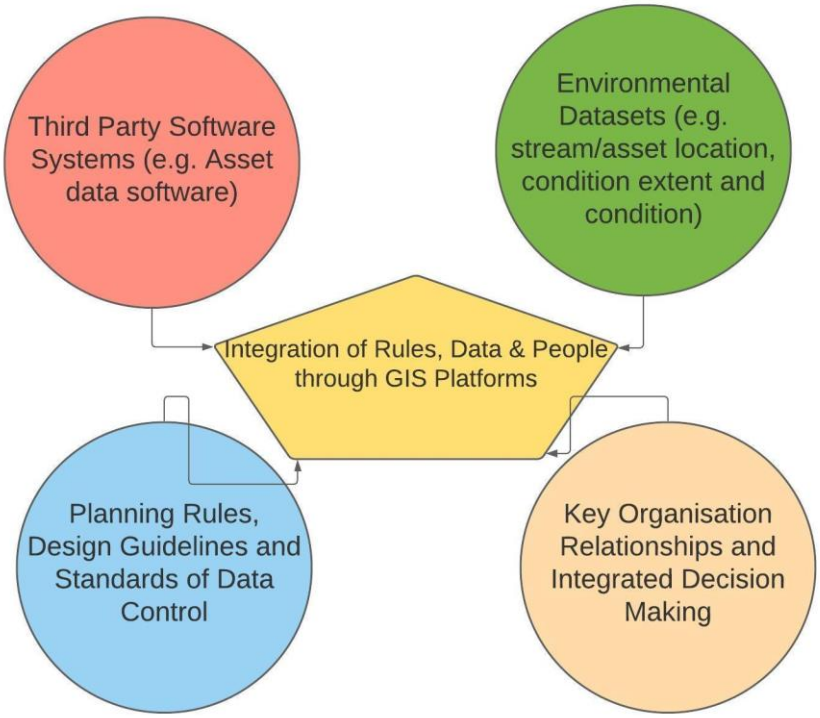

Figure 3: Integration Conceptual Model

2.7 TECHNICAL DELIVERY PLATFORMS

2.7.1 GIS

One of the primary objectives in the design of an integrated catchment delivery system, is to encourage geo-spatial representation of data and information on easily accessible and understandable mapping environments, such as ArcGIS and Story Map boards.

Spatial data representation needs to be updatable and have user defined data functions, such as being able to populate an issues and opportunities workspace, and being highly accessible to all users to ensure transparency.

A fundamental part of the WDC adaptive strategy is to structure the GIS platform in a form that will be fit for purpose for the proposed stormwater planning management tools.

With a fit for purpose GIS and asset management information system established there is a need to ensure all future asset information is captured and stored in the system in accordance with the developed standards and processes across council. Accurate asset management data and associated metadata for existing assets can be updated into the system in a prioritised programme over a period of years.

This will ideally function as a viewer of GIS type information (e.g. Council layers, Waka Kotahi, Department of Conservation (DOC)) but also provide options for defined user data and information input. Additionally, online tools for network tracing (e.g. for pollution source tracking) can be made available and be used in operational activities.

2.7.2 MODELLING

Stormwater modelling is a highly skilled, resource-demanding and software-delivered approach to stormwater management. Numerous catchment models had been created in the past for WDC but these have typically been conducted in non-uniform and disparate software that are not readily usable in a current context as the results are file-focused and cannot be easily used to define option analysis at the local network issue level.

Modelling of key parts of the catchments has been undertaken, but not a full network model due to multiple data limitations.

Although modelling is obviously important there are limitations as to its usability. A key outcome of any future modelling work is the ability to translate model outputs into easily accessible and understandable information for all users.

By reviewing the collective data sets outlined above plus more detailed hydraulic modelling undertaken to date, a programme can then be determined for future hydraulic modelling requirements by considering benefit and cost. It is anticipated that detailed hydraulic modelling will be targeted to assess specific complex or localised issues rather than detailed catchment wide modelling.

Priority will be given to data collection, modelling and options assessment for the city centre area to inform implementation of the Blue Green Network Strategy ("*WDC aims to create an attractive and environmentally sustainable urban environment that also addresses threats from flooding and future climate change. Blue/green networks are a way of planning, based around waterways (blue), and planting and parks (green)"*). Additionally growth response and known flooding issues will be prioritised through the collation and communication of catchment information to support adaptive and interactive management.

Image Two: GIS and Modelling can be used to identify and define contaminant sources

2.8 INTERACTIVE TOOLS AND PORTALS

2.8.1 OVERLAND FLOWPATHS

WDC needed to understand the location of overland flow paths in the city that potentially may form when the primary piped stormwater network is blocked or has exceeded its design capacity. WDC further needed to understand the location of depressions in the surface which may accumulate water during large rainfall events. This information can be used to identify properties that may potentially be affected by surface flows during rainfall events that exceed the current level of service, or to identify areas requiring further investigation prior to future development.

While the WDC overland flow paths provide a useful indication of potential surface flow routes when the primary stormwater network is compromised, their true value is realised when they are used in conjunction with other spatial datasets to inform high-level flood management and planning decisions. Further value can be added by estimating peak flow rates for each part of the network under different design storm conditions. A number of recommendations are made below to indicate ways in which the current overland flow paths network may be used to support decision making, and how the current network may be enhanced to support further analysis.

Potential applications of the existing datasets include:

- Intersect overland flow paths and depressions with building footprints to provide a high-level assessment of potential flood hazards and potential implications in terms of damage to private and/or public property.
- Potentially affected properties can be prioritised for further investigation (and ground-truthing) on the basis of the catchment area of the intersecting flow path.
- Overlay district plan zones with overland flow paths and surface depressions to identify potential constraints on future development.
- Use the flow accumulation surface from which the overland flow paths were derived to identify the catchment area draining to any point on the network to support hydrological investigations.
- Create a geometric network from flow paths to embed flow directionality and connectivity information. This enables upstream and downstream network tracing functions to be performed to identify, for example, potential sources of contamination at a particular point in the network, or to aggregate particular attributes, such as contaminant loads, through the network.

The existing overland flow paths network could be enhanced in the following ways:

- Undertake additional burning (conditioning of the surface through definition of surface correction) of breach lines in the smaller depressions to allow more accurate formation of flow paths in the upper tributaries.
- Extrude buildings from the Digital Elevation Model (using a building footprints layer if this exists) and repeat the delineation process so that flow paths are realigned around, rather than ignoring, built structures.
- Calculate peak flow rates for various return period events for each reach of the network based on varying catchment areas and times of concentration (and therefore varying design storm intensities) throughout the network.
- Refine the burning approach, based on local knowledge, by setting culvert diameter thresholds to define those culverts which will continue to convey flows while the remainder of the network is blocked.

It will be possible to move to more advanced 1D/2D models to show overland flow path extents when more accurate LIDAR is available and the Regional Council have updated the

river models and can provide boundary conditions for updated coastal hazard mapping with various climate change scenarios.

2.8.2 ISSUES AND OPPORTUNITIES PORTAL

WDC are designing an Issues and Opportunities Geospatial Portal which will allow users to define issues or opportunities by groups such as:

- Flood Management
- Network Management
- Water Quality Management
- Watercourse Management

These are then further defined through pick list options to include investigation, project or planning actions such those depicted in the list following:

- Rain on Grid Modelling
- Detailed Modelling
- Overland Flow Paths Assessment
- CCTV Inspection and Asset Validation
- Network Data Gap Investigation
- Water Quality Sub-Catchment Improvement
- Water Quality On-Lot Improvement
- Public - Wetland
- Proposed SW Management Devices for Growth
- Point Source
- Non-point Source
- Erosion Mitigation
- Aquatic Weed Control
- Existing Bank Lining (poor condition)
- Fish Species
- Fish Barrier Removal and Remediation
- Riparian Improvement
- Naturalisation and Treatment
- Greenfinger- Greenspace and plantings along open channels and drains
- Potential Inanga spawning sites
- Fencing and stock exclusion
- Daylighting potentials

The aim is that any mapping or electronic platform would be interactive and able to be updated with new issues and opportunities by many users.

Further analysis by planning engineers will inform maintenance, renewals and the capital works programme. This tool will be a critical part of integration into everyday operational practices, whether customer services staff taking requests for service or maintenance contractors out on site.

WDC sees that the opportunities can extend to other infrastructure which could be changed to improve stormwater outcomes, for example bridge supports, wastewater pipe bridges, pump stations, or even buildings and their gully traps, into the future.

2.8.3 RECEIVING ENVIRONMENTS AND COMPLIANCE

WDC identifies significant ecological areas as part of the Protected Natural Area Network (PNAN), which is part of the Protected Natural Area Programme (PNAP). While priority areas for protection are those containing broadleaf forests, freshwater wetlands, riverine

flood forests, estuarine systems, and areas of kiwi habitat, other habitats throughout the wider urban area are also recognised in the Protected Natural Area Programme.

The areas around Whangārei City and surrounding settlements are predominantly modified agricultural, residential and commercial landscapes, largely cleared of native bush, however there are some significant areas of native forest at Pukenui, Parihaka and along the Hātea River. A number of regional and national datasets are available to support decision making regarding terrestrial ecological types. These include DOC Land, Landscape Sensitivity, PNAP and Threatened Environment layers.

The aim of the Protected Natural Area Programme is to identify, by a process of field survey and evaluation, natural areas of significance throughout New Zealand, to retain the greatest possible diversity of landform and vegetation patterns. To achieve this, representative biological and landscape features that are common or extensive within an Ecological District are considered for protection, as well as those features that are special or unique.

From the upper catchment to the coast, Whangārei has a unique and diverse setting. It includes steep terrain, a volcanic landscape, a regionally significant harbour and port, large areas of estuarine and inter-tidal flat habitat types. Seagrass meadows in the Whangārei Harbour are a highly valued ecosystem.

While suffering loss of almost all of the 1400 hectares of seagrass meadow in the 1960s recovery began in the 1980s and in conjunction with transplant trials almost 40% of the former meadow area has now regenerated.

Although a significant extent of the flood plain and lower waterway areas have been modified through reclamation, agricultural, light industrial, commercial and even residential development, the upper catchments still retain natural morphological relief, intact native forest remnants (although modified through logging) that provide high value hydro-ecosystem services and high instream values, with intact (although often modified) riparian margins.

Urban waterways are relatively high quality for a settlement of this size but are exposed to ongoing pressures due to piped discharges in both existing urban/agricultural and newly developed growth areas. The degree of ecological impact, in terms of freshwater system ecology, is spatially concentrated on the watercourses which discharge through land of gentler relief. Subsequently the denser developed areas e.g. Whangārei central, tend to have impacted on waterway "naturalness" (i.e. degree of modification), this includes agricultural land use areas and waterways reaches which are more likely to have modified banks, or beds or both e.g. very typically through urban areas where reaches have a channelised geometry to support flood water conveyance.

Mapping of catchments and sub-catchments with compliance rules around discharge locations and discharge quality requirements for redevelopment, new development or new infrastructure is to form a core component of stream management and prioritisation for WDC. The roll out of desktop and in-field assessments over the coming years will be integral to informing this prioritised programme.

Optimisation of stormwater quality treatment device locations in existing or new development areas is desirable to actively manage future operations and maintenance requirements and their associated budgets. It should be noted that actively managing the efficiencies of scale and location are critical to keeping the costs of stormwater quality treatment affordable.

2.8.4 MONITORING NETWORK CONSENT COMPLIANCE

Mapping of monitoring results for discharge quality can be used to easily demonstrate compliance and quickly identify areas of non-compliance where additional works may be required. This is intended to be supported by the Issues and Opportunities Geospatial Portal, which will allow for a holistic view of:

- Streams and Receiving Environments
- Protected Natural Areas
- Stormwater Networks and NRC Conveyance Infrastructure
- Sub-Catchment Definition Types - (to inform consent planning)
- Infrastructure Condition e.g. outfall erosion or fish passage barriers
- Projects e.g. flood mitigation, water quality and/or monitoring

2.8.5 STREAM CLASSIFICATION AND STATE OF THE ENVIRONMENT

WDC intends on developing a programme for watercourse management. This will initially involve considering roles and responsibilities of WDC, NRC, tangata whenua, and landowners and establishing appropriate policies. The framework will inform the extent and type of data, monitoring and interventions required and the overall programme for stream classification. Considering known issues with discharges to farm drains and likely issues such as stream erosion this will form an important part of the strategy.

Image Three: Showing Stream Whangarei CBD (Zealandia Consulting 2021)

Waterway assessment and compilation of baseline information would include the development of a management type decision framework. Watercourses will be defined into manageable units, for the purposes of assessing sections against objectives and identifying management actions, such as riparian protection, erosion remediation and habitat enhancement.

This categorisation then would support a capital works programme and potentially provide a key information source in the definition of development contributions to support waterway management and resilience.

Central to this is to map and identify streams by name, classify according to stream type and function, an example of which is shown in the Stream Management Type Classification Table in Figure 4. The methodology will serve to identify works required to increase mauri (life force) such as outfall improvements, erosion protection, fish passage barrier mitigation, habitat restoration, or water quality improvements requirements.

Management Action Priorities by Watercourse Management Type												
Watercourse Management Type	**Management Actions**											
	Investigate future impacts	Channel erosion Protection	Channel erosion remediation	Outfall erosion remediation	Improve riparian vegetation	Fish barrier mitigation	Naturalisation of channels	Day lighting of piped streams	Improved amenity values	Water quality improvements	Protection of ecological values	Fencing and Stock Exclusion
Piped Stream	M					H		H		L		
Closed Stormwater Network Utility	L							L		L		
Lined Channel A	M	M	M	M	H	H	H		M	M		
Lined Channel B	L	L	L	L	M	L	L		M	M		
Farm Drainage Canal	M	L	M	M	M	M	L		L	M	L	H
Open Watercourse Minor Disturbance	H	H	L	M	H	M			M	M	H	M
Open Watercourse Moderate Disturbance	M	M	M	M	M	H	L		M	M	M	M
Open Watercourse Major Disturbance	M	M	H	H	H	H	L		M	H	L	L

Figure 4: Stream Management Type Classification Table (MEL 2016)

2.8.6 PLANNING OF CAPITAL WORKS AND DEVELOPMENT CONTRIBUTIONS

WDC has a Blue Green Network Strategy which encompasses a variety of outcomes relating to improving major streams, rivers and their margins through Whangārei City. Many of these river areas cross over the freshwater and marine interface with important fish habitats, migration and spawning areas included. These are highly visible areas with many in the heart of the city, but also subject to climate change impacts. Catchment planning and modelling work is absolutely critical to informing the Blue Green Network capital works programme priorities and design parameters.

Mapping of a stormwater forward works programme is needed to inform Long Term Plan processes, the Forward Works Viewer, developers, consultants and contractors, and feed into the Infrastructure Pipeline collated by the New Zealand Infrastructure Commission.

Setting development contributions for stormwater is a future goal for WDC. This is considered possible through the use of cost estimation modelling using the range of

geospatial datasets currently being designed, created and compiled. In effect this links the costs to WDC of providing infrastructure to mitigate the effects of growth by having more refined information about asset condition and network capacity with the solutions to stormwater issues.

2.8.7 TECHNICAL GUIDANCE ON USE OF DATA

Since all data comes with assumptions and limitations, it is imperative to ensure the users understand the nature of the data and what it can, or cannot, be used for.

A Technical Data Guidance Document initiative is to be established to record, control and document data formats, quality and guidance on its use. This is intended to include an Interactive Tool Specification that will support the implementation of the adaptive management platform.

2.9 KEY LEARNINGS

2.9.1 TANGATA WHENUA AND TE MANA O TE WAI

Updates to the NPSFM in 2020 made clear the requirement for regional and local government to include tangata whenua in decision making, policy, planning and monitoring of anything that relates to freshwater. This has required a slight change to the process started in 2018, but not significant due to the inclusion of outcomes which already focused on the mauri, or life force, of the waters.

For Te Tai Tokerau Northland however, this adds a level of complexity that doesn't exist in the majority of New Zealand because tangata whenua work at hapū level, not iwi level. In Whangārei District this means instead of dealing with four iwi, there are up to 124 hapū depending on the area of interest.

There are eight hapū/hapū clusters formally representing the district's hapū on WDC's Te Kārearea Strategic Partnership Forum Standing Committee at council governance level, but this doesn't necessarily apply to delivery of projects or infrastructure operations. Essentially, this structure is still subject to change therefore the stormwater catchment planning process needs to be flexible and adaptable to the changing governance environment.

2.9.2 CHAMPIONS AND RESOURCES

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 adaptive catchment management development.

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

It is vitally important to have champions of the stormwater strategy and practices, who will help others to embrace new ways of working. This includes the identification and appointment of '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 catchment analysis process will be 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 as well as working through any issues of non-cooperation that arise between parties.

There are of course obvious difficulties of maintaining adequate resource levels and expertise within a small organisation. This highlights the importance of working with consultants who can collaborate and adapt as the process unfolds.

3 CONCLUSIONS

This approach has resulted in many benefits, integration opportunities, and scalability of defined tools, systems, and delivery mechanisms. However, as is most typically the case, the adoption and integration both technically and culturally, of new tools and systems is understandably challenging and requires prudent forethought and planning to best achieve the original intent and outcomes around data-driven catchment planning, guidance, rules, and delivery methods.

The intent is to inform other councils and utility operators across New Zealand in order to share hopefully valuable insights and strategies which could be of benefit to many, but also to engage an active dialogue with other practitioners to better serve all councils who unsurprisingly face similar issues.

In conclusion WDC seek to invest and support a robust planning and assessment programme that can take advantage of the latest information technology platforms and be adaptable and responsive to current and future needs including to:

- Provide a projection of future demand for stormwater services taking into account demand factors such as land use changes, population growth, climate change and potential changes in legislation.
- Provide a high level understanding of stormwater quantity and quality and associated effects now and in the future.
- Provide geospatial information to enable WDC to use it to support analysis, planning and management of stormwater activities.
- Inform the district wide stormwater planning required to facilitate growth and assist compliance requirements and actions.
- Enable efficiencies to be achieved in carrying out stormwater management activities including the development of stormwater catchment plan information.
- Provide a district wide stormwater works programme to inform Annual Plans, the 10 year Long Term Plan, and the 30 year Infrastructure Strategy, and compare to existing provisions and policy.

This is an ongoing project and therefore it is anticipated there will be numerous new learnings and understandings that are garnered over the coming period and we look forward to sharing these as they come into focus.

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REFERENCES

2021 Stormwater Conference & Expo

Ministry for the Environment (MfE) and Ministry for Primary Industries (MPI) (September 2020) 'Essential Freshwater: Te Mana o te Wai Factsheet' Publication number INFO968

Morphum Environmental Ltd (MEL) (2019) 'Whangārei Catchment Management Strategic Assessment'

Morphum Environmental Ltd (MEL) (2016) 'Hamilton City Stormwater Master Plan'.