

# STORMWATER MANAGEMENT DEVICES FOR THE AUCKLAND REGION – SUCCESS IN OUR SITES

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## ABSTRACT

One of the consequences of city growth is that stormwater runoff occurs in greater volumes and higher velocities. To mitigate this, and still allow our city to grow, Auckland Council has adopted an approach which recognises the importance of preserving and enhancing natural hydrology as part of the infrastructure development process. The Unitary Plan, with its strong emphasis on incorporating green infrastructure into urban design, allows for high development growth while maximising social, cultural and environmental outcomes.

To achieve this, it was important that Council produced design approaches for implementing water sensitive design for stormwater management, so that developers and their designers and contractors can achieve the outcomes required by the Unitary Plan. *Stormwater Management Devices in the Auckland Region* (GD01) provides detailed interpretive designs for implementing these green infrastructure provisions.

In developing this document, Auckland Council's Engineering and Technical Services Department has changed how we develop technical guidance. We have engaged comprehensively with internal experts, industry and Mana Whenua, as well as elected officials, from scoping onwards, to develop this guideline to replace TP10 for maximum user friendliness. The document contains concise specifications for building wetlands, bioretention devices, swales, pervious paving and green roofs, along with other devices, presented in a clear and user friendly format.

This paper presents some of the key challenges that were faced in undertaking an integrated consultation approach including:

### Consultation:

- Developing a Community of Practice with diverse stakeholders from diverse backgrounds
- Working with Mana Whenua to align the outcomes with core cultural values
- Aligning expectations across the region and communicating the new approach

### Interpretation:

- Teasing out the key differences between the Unitary Plan provisions and its predecessor, the Air, Land and Water Plan
- Interpreting provisions around imperviousness

### Design and approach:

- Allowing the right people to have a voice around design and specifications
- Finding consensus on how to design complex site-specific devices such as wetlands

Although the process has not been without its challenges, the result is an approach to water sensitive design that paves the way for building a greener, more resilient city. As Auckland grows, so should its natural health and liveability.

## **KEYWORDS**

**Auckland, stormwater, water sensitive design**

## **INTRODUCTION**

With population forecasts for Auckland projected to increase by over one million people in the next 30 years, greater pressure will be placed on our natural systems (and associated ecosystem services) and the infrastructure designed to support the city. The Auckland Plan (Auckland Council, 2012) identifies a need to reduce the impact of stormwater on the receiving environment. A key aspect of reducing the impact of stormwater is water sensitive design which is essential to support Auckland Plan's vision.

Auckland needs innovation around stormwater management to help deliver on a range of urban development objectives, including but not limited to:

- Reducing pollution
- Reducing erosion
- Protecting marine and freshwater systems
- Reducing flooding
- Allowing urban development while preserving and restoring our land and waterways.

A water sensitive design approach enables all these objectives, and encompasses liveability objectives including cultural significance, connected and empowered communities, biodiversity, enhanced public green space and healthier waterways.

To address the need for guidance around such stormwater innovation, the Engineering and Technical Services Department of Auckland Council set about developing the Guideline Document GD2017:001 *Stormwater Management Devices in the Auckland Region* (referred to as GD01). This Guideline Document builds on the principles presented in Technical Publication 10 *Stormwater Management Devices: Design Guidelines Manual Second Edition* (TP10) (2003) as well as Auckland Council Guideline Document GD2015:004 *Water Sensitive Design for Stormwater* (GD04) (2015), by providing technical guidance for the selection, design and use of stormwater management devices in the Auckland context as an integral part of water sensitive design.

The application of water sensitive design (defined in the Auckland Unitary Plan as "integrated stormwater management") is required under the Auckland Unitary Plan, in brownfield and greenfield developments. Water sensitive design approaches should be considered in all instances as part of an integrated stormwater network.

The GD01 document provides user-friendly design guide to developers, designers and regulators on current good practice specific to the requirements of the Auckland Unitary

Plan. It also provides detailed design considerations aligned with the Auckland Council philosophy of stormwater management, where cultural values, social needs and natural features are considered as part of the functional design of the stormwater network, to achieve a resilient and sustainable outcome under the principles of water sensitive design. It also provides clear guidance on some of the processes Auckland Council requires for vesting of these assets to Council.

The guideline document provides design guidance for the following stormwater management devices:

- Pervious paving (including porous or permeable paving)
- Bioretention devices (including rain gardens)
- Green roofs (living roofs)
- Rainwater tanks
- Swales
- Infiltration devices
- Wetlands
- Ponds (including dry detention ponds).

This paper presents a summary of the processes employed to develop the GD01 Guideline Document, together with challenges and learnings. It also discusses the council's knowledge dissemination approach for GD01, mainly based on a comprehensive training programme, and its importance for building the required level of competencies based on the end user needs.

## **METHODS**

Auckland Council has established a standard methodology, outlined below, for scoping guidance documents, which determined the overall framework and types of devices to be covered. This paper focuses on the project's team work undertaken in the final two years of the document's development. In this time, a comprehensive and collaborative process was employed which built on the previous work of many individuals and sought greater industry involvement.

### **Literature review**

A comprehensive review of national and international stormwater management research and control guidelines was carried out to acknowledge and understand current best practice procedures and guideline approaches.

### **Collation of prior technical reports**

Over the years, many technical reports had been developed for the design of specific stormwater treatment devices. These had been developed prior to the Unitary Plan and, while they contained valid design approaches, there was little consistency in the design approaches, language used or alignment to Auckland region-specific requirements. These documents were all assessed and reviewed with the overarching aim to simplify and

standardise the content such that core design principles were adhered to and that the content was completely aligned with Auckland regulatory requirements.

## Gap analysis

In light of stormwater provisions in the new Unitary Plan (2016), a gap analysis of the TP10 document was undertaken to identify areas which required focus. This gap analysis identified elements of each design which could benefit from updates, based on case studies from the Auckland region, as well as best practice from overseas. More importantly, the gap analysis determined the need for clarifications around interpreting the Unitary Plan provisions for stormwater management which were significantly different to those presented in TP10.

## Key differences between TP10 and GD01

There are a number of distinct changes in the approach to stormwater management brought about through the Auckland Unitary Plan. These changes have an impact on the stormwater management approaches for both water quality and quantity (Table 1).

*Table 1: Key differences between TP10 and GD0*

	TP10 <sup>1</sup>	GD01
Regulatory driver	Auckland Regional Plan: Air, Land and Water Plan & and several district plans	Auckland Unitary Plan
Water quality volume	1/3rd of 2-year, 24-hour API (approx. 25 mm)	90 <sup>th</sup> tile of 24-hour storm event (approx. 25 mm)
Water quality flow	~18 mm/hr	10 mm/hr
Water quality management	75% TSS removal	Design performance-based (with the understanding that properly sized and designed devices will meet certain aspects of removal requirements for pollutants)
Water quality target areas	None identified	High contaminant generating car parks and roads
Susceptible areas	None identified	SMAF1 and SMAF 2

## Panel of subject matter experts

During the gap analysis, it was determined that a very specific skill set was needed to develop the GD01 document. While technical expertise is a priority in any design process, there was a distinct need to incorporate a clear understanding of the specific regulatory environment. It was also seen as a necessary step to have firm “buy-in” from Auckland Council staff that the approach being taken was one that would be supported in the long term. To this end, a panel of subject matter experts was developed using talent from within Auckland Council drawing from Healthy Waters, Regulatory and Environmental Services. This panel of subject matter experts worked together closely throughout the

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<sup>1</sup> Auckland Regional Council TP10 Stormwater Management Devices Design Guidance Manual (1992 and 2003 update) 2018 Stormwater Conference

project to develop the design approaches for each chapter. Where specific knowledge was needed (e.g. planting and whole-of-life costing), appropriate experts were brought in. This model was very different to previous guidance documents developed for Council. One of the challenges of this approach was bringing together diverse practitioners from a range of departments into one work programme. The challenge was overcome by having tacit management support for all participants to prioritise the work and a clear understanding of the overarching benefits this approach would bring.

### **Stakeholder Consultation**

Another change in how this guidance document was developed was the recognition that it was vital that direction be provided by key stakeholders to ensure the guidance document would be fit-for-purpose on release. The input of Mana Whenua and industry was essential to this process.

#### ***Mana Whenua:***

Recognising the cultural significance of protecting our waterways, and acknowledging customary guardianship of our environment, the ETS team partnered throughout with Mana Whenua. A key focus of the development of GD01 was to incorporate Mana Whenua values into the core of all design processes. To this end, all 19 iwi in the Auckland region were invited to participate in the guideline's development.

Two workshops were held with all kaitiaki invited to participate. In addition, updates were provided in three hui where specific issues were addressed. Based on the feedback received, and group discussions held, a comprehensive section was developed and incorporated into the introduction of GD01 which summarised how to design stormwater treatment devices to reflect Mana Whenua values. This section was unanimously approved by the kaitiaki involved for incorporation into the document and forms a strong impetus for the adoption of GD01 by Mana Whenua.

#### ***Community of Practice:***

A concurrent phase toward developing this guideline was considering and addressing the concerns and issues from industry. To this end, a Community of Practice was set up consisting of council staff and industry practitioners / representatives. Nominations were sought from professional associations and industry bodies (e.g. Water NZ, IPWEA, IPENZ, MfE, MBIE, etc.) to provide an expert input into the development of this guidance document. Representatives were included from not-for-profits, construction, developers, consultants, central government and research institutes.

Three Community of Practice workshops were held between late 2015 and mid-2016. The attendance at these events was high with participants engaged around providing comprehensive, targeted input / feedback on what would be required in the document to adequately address the current industry issues. At the last workshop, attendees were invited to sign up for a focus group where they could contribute directly into each section of GD01. All those who registered were then sent the full draft of the document uploaded to a OneDrive site. This focus group was then given the opportunity to provide refined, specific feedback on all elements of the document. As part of the review process, the focus group responses were collated, summarized and addressed.

#### ***Auckland Council staff:***

Concurrent to the Mana Whenua and industry consultation, the buy-in from internal stakeholders was also crucial. A wide-ranging consultation process was undertaken within

Auckland Council with specific input from Healthy Waters, Regulatory Services, Auckland Transport, Community Facilities, Legal and Environmental Services. All consultation was done at the high level (forming a basis for overarching principles and process) as well as at the detailed level (where specific expertise could contribute to specific design elements). In this way, the very best internal expertise was incorporated with the document.

One of the challenges of this process was converging on an agreed outcome with a diverse set of experts, which was successfully managed through group discussions focusing on achieving what was considered best for Auckland residents and visitors

In addition to the invaluable input provided by council technical subject matter experts a separate group of Regulatory Services staff provided expert peer review of the document to ensure consistency with the Auckland Council regulatory environment.

### ***Sign-off:***

After all consultation and drafting of the document had been completed, Council managers were also asked to review and request changes (if needed) to the document and provide approval for its use by their departments. Also, the document followed and complied with the council's Research, Investigation and Monitoring Unit (RIMU) review and sign off process. The final editorial review and approval for publication was done by the Council's Chief Engineer.

### **Next steps**

For GD01 to be successful and provide the benefits from Council investment, it must be adopted by users. Although the collaborative approach is a good start to staff and industry buy-in, a multi-pronged approach has been developed focussing on wide dissemination and making the document as easy to learn and use as possible.

### ***Training:***

A comprehensive GD01 training programme is being developed for launch in 2018. This training includes both basic and advanced training modules and has been designed for multiple user competencies. The intent is to incorporate modern learning opportunities including e-learning modules, with self-direction from the participant and on-line forums for peer conversations and feedback. The training has been developed by the authors and key contributors to address core learning gaps in the industry.

The training will be launched to internal staff initially through the Auckland Council training portal and then rolled out to external audiences depending on demand. It will provide all users of GD01 with consistent messaging on how to use the document and the wider context of how to build using 21<sup>st</sup> century water sensitive design best practice.

### ***On-line GD01 Calculator:***

An on-line GD01 calculator has been developed which assists users in accurately calculating both retention and detention volumes, as well as sizing for different devices (including rainwater tanks, swales with and without check dams, and bioretention devices). This calculator has been tested extensively by council staff. Consideration is currently being given to how this is made available to external users.

### ***Pocket guides:***

A series of tools, in an easy to access pocket guide format, have been developed to address the construction of devices. These are intended for regulatory and project staff to understand and communicate to constructors the purpose of the device, site considerations and constraints, safety design considerations, etc. The pocket guides are designed with comprehensive use of photos, diagrams, flow charts, etc. combined with simple instructions that help make sure the final build is in accordance with the GD01 design requirements and specifications. Consideration is currently being given to how these are made available to external users.

### **CONCLUSION**

As a Unitary Authority, encompassing both infrastructure provision and regulation of development effects, Auckland Council has taken a lead role in the development and implementation of best practice guidance across a range of activities including but not limited to water sensitive design, stormwater quantity and quality management, to enable the Unitary Plan. In line with this, Engineering and Technical Services Department has produced a user-friendly GD01 Stormwater Management Devices Design Guidance for Auckland Region for developers, designers and regulators on current good practice specific to the requirements of the Auckland Unitary Plan.

On this project, the Council trialled a new way of developing guidance, which focussed on working with, and engaging with, industry experts from scoping onwards, to guide the document to meet industry needs. It has also sought support from councillors and the relevant industry bodies. Recognising the cultural significance of protecting our waterways, and acknowledging customary guardianship of our environment, the team has partnered throughout with Mana Whenua. The document incorporates international best practice in a way that prioritises the user's needs rather than focusing on the science. This has resulted in a user-friendly guideline that is clear in format, easy to follow, well-illustrated with photographs and diagrams of practice. Its implementation is supported by a comprehensive training programme, on-line calculator, series of pocket guides, and other tools.

This collaborative and user-focussed approach, while time consuming, has been proven to produce a highly improved outcome, and will be adopted on all future guidance developed by the Engineering and Technical Services department of Auckland Council.

### **AKNOWLEDGMENTS**

The team at Auckland Council is grateful to numerous individuals (as named in the acknowledgment page of the document itself) for their input and successful development of the GD01 document. Without the insights, experience and goodwill of these people, this document would not have achieved the high level of quality and buy-in that it has. The final document is a culmination of innumerable hours of contribution and engagement where people from many different backgrounds and experiences brought

their best to the table to produce a document considered crucial to developing a world-class city.

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