

# ON-LOT STORMWATER...A LOT TO LEARN

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## ABSTRACT

Across New Zealand, as councils and communities respond to the need to protect our precious freshwater resources and reflect the principles of Te Mana o te Wai, there is increasing emphasis on stormwater management within private properties. Land use faces unprecedented pressure; stormwater management directly competes with housing, roads and recreational demands. The space needed to manage stormwater in the public realm simply may not be available. Whether it is on-lot rainwater tanks, soakage devices or raingardens, these devices are designed and constructed to provide long term water quality and quantity improvements. Long-term functionality is increasingly imperative to achieving the long-term health of waterways and is reliant on maintenance by homeowners.

A Hamilton City Council (HCC) District Plan rule requiring on lot stormwater management through a water efficiency measure took effect from 2014 and was implemented from 2016. As a result, on-lot stormwater devices are now being recorded against the Building Consent. HCC now has over 1,500 recorded devices, mostly on residential properties. The device type can be mandated through catchment plans or must meet the District Plan rule, which is currently being updated through a plan change to propose 10mm retention for all residential properties. High risk or high contaminant sites are required to do more.

HCC identified the need for an on-lot auditing process to be developed to ensure that the intended water quality and quantity outcomes were realised over the lifecycle of these private assets as well as to provide assurance to Waikato Regional Council (WRC) that the assets are providing environmental protection in accordance with HCC's comprehensive stormwater discharge consent (CSDC) conditions. Further, future infill development across existing urban areas (intensification) may require widespread use of on-lot measures due to limited space in the public realm to manage stormwater from increased impervious surfaces. If this is the case the reliance on on-lot devices to provide robust water quality/quantity performance is likely to increase.

HCC and Morphum Environmental worked together to develop a city wide on-lot audit programme with robust data structure. This programme included:

- Update the process to record, assess and report on devices
- Spatially map devices
- On-lot audit schemas with specific requirements for each device type
- A pilot audit of an initial 63 properties
- A semi-automated system for results, follow up actions and reporting
- Engagement with property owners through calling cards and subsequent summary letters
- Development of educational brochures detailing how to resolve the typical issues.

The pilot audit was undertaken in mid-2022 over the course of three days and found:

- Valuable for assessors to have information on-hand while on site (i.e., as-built plans)
- A clear need to educate residents on what assets they have on their property and maintenance requirements.

- Devices constructed in-line with current design requirements were easy to inspect and were generally operating well.
- Raingardens had a much higher number of non-compliant assessments when compared to tanks and soakage devices that were able to be assessed. This highlighted the complexities associated rain gardens.

100 devices are being audited in April/May 2023.

## **KEYWORDS**

**Stormwater Management; on lot; Water sensitive design; WSD; audit; water quality**

## **PRESENTER PROFILE**

Andrea Phillips has worked at Hamilton City Council for 17 years. Her current role is in the strategic planning stormwater space, working towards Councils vision 'to improve the wellbeing of Hamiltonians', and the vision of Te Ture Whaimana "A future where a healthy Waikato River sustains abundant life and prosperous communities who, in turn, are all responsible for restoring and protecting the health and wellbeing of the Waikato River, and all it embraces, for generations to come."

## **1 INTRODUCTION**

On lot stormwater management devices have been required throughout Hamilton City Council (HCC) for decades. These were traditionally soakage devices but have evolved to other devices such as rainwater reuse, detention, bio-retention and permeable pavement solutions. Managing stormwater at source is an important part of the stormwater system, as growth drives increased impervious surfaces, which means existing networks and receiving environments cannot cope. Water Sensitive Design (WSD) promotes the management of stormwater runoff as close to source as possible. This provides for the retention and infiltration of stormwater throughout a catchment, and thereby reduces the potential for lower catchment stormwater effects. These outcomes need to be balanced with lifecycle costs and maintenance considerations including the ability for homeowners to undertake routine maintenance on devices within lots.

A District Plan rule requiring on lot stormwater management through a water efficiency measure took effect from 2014 (Operative in Part Hamilton District Plan 2014) and was implemented from 2016. On lot stormwater devices are being recorded against the Building Consent within the Property, Regulatory and Financial system, Authority. Details of device options are found within the 'Three Waters Management Practice Notes' on the Council website.

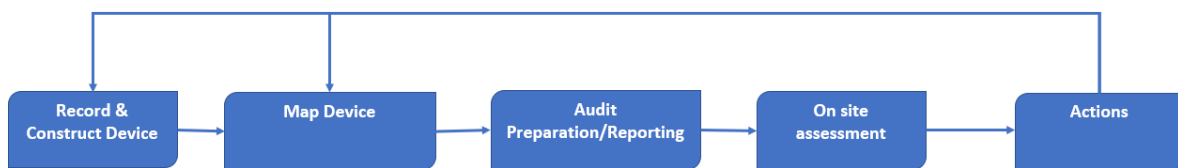
The on-lot auditing process is now being developed to ensure that the intended water quality and quantity outcomes are realised over the lifecycle of private assets and provide assurance to Waikato Regional Council (WRC) that these private assets are providing environmental protection in accordance with comprehensive stormwater discharge consent (CSDC) conditions. Further, future infill development across existing urban areas (intensification) may require widespread use of on lot measures due to limited space in the public realm to manage stormwater from increased impervious surfaces. If this is the case the reliance on on-lot devices to provide robust water quality/quantity performance is likely to increase.

## 2 AUDIT SETUP

The intent of the project was to create a process that provided sufficient confidence to WRC that the level of on-lot asset monitoring met their regulatory requirements, but also provides HCC with a process that doesn't look to replace Authority as the key location for compliance monitoring but aligns with it and ensures the outputs can be integrated back in if required.

A project team including members from HCC City Waters, 3 Wates Uni, Information Services, GIS, Planning Guidance and Building teams across Council and external consultants, Morphem Environmental, developed an on-lot stormwater device process. Figure 1 below, provides a high-level outline of the five key steps that now form the process, with brief details of each step provided below

Figure 1: Key steps in On-Lot Stormwater Management Devices



The below further explains the five key steps.

### 2.1 RECORD & CONSTRUCT DEVICE

HCC have developed a Stormwater Requirements GIS layer which details any specific on lot requirements at a catchment scale, usually informed through the development of Integrated Catchment Management Plans (ICMPs).

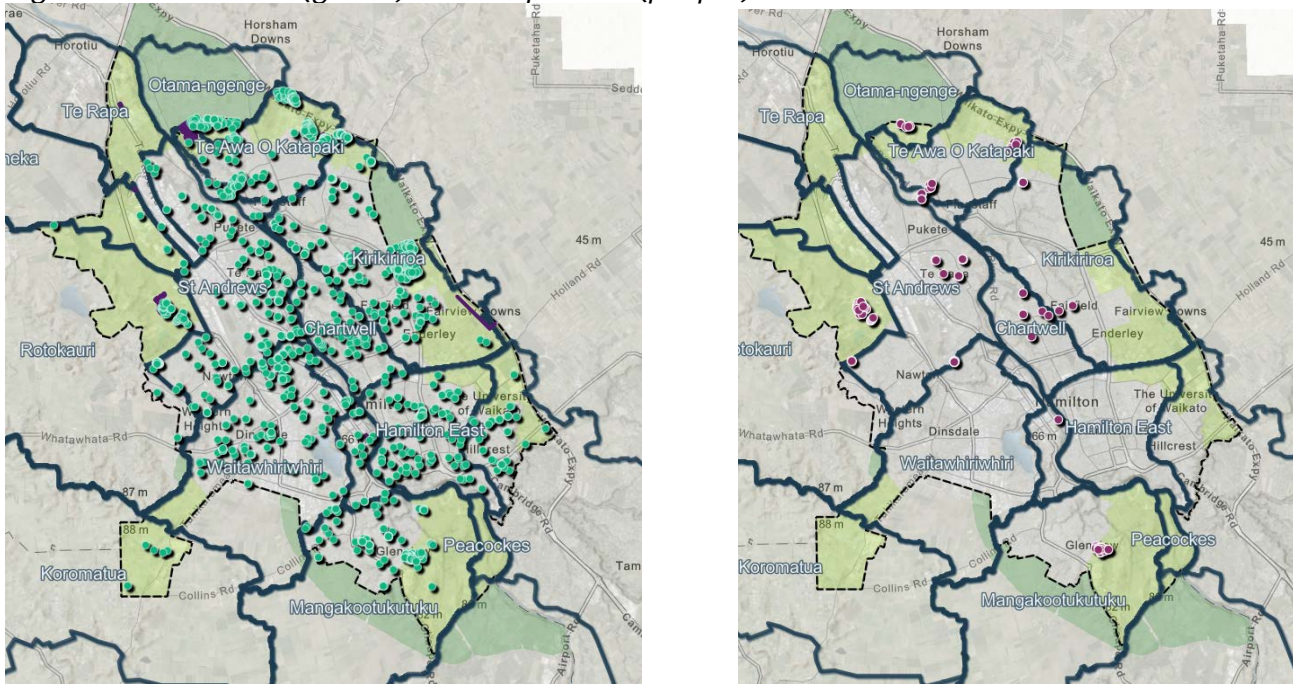
The existing Authority processes has remained in place, which includes HCC planners recording an Authority Stormwater Device checklist as new building consents are received.

### 2.2 MAP DEVICE

An on-lot asset GIS layer was created and became the current point-of-truth for the on-lot assessment process. This layer has been created based on asset data exported directly from Authority and maintains the Authority naming conventions and structures to ensure compatibility.

The data is made available to HCC staff through the internal Stormwater Masterplan viewer. All existing on-lot devices are represented by symbols for asset types, and colour coding to show the status of each asset (for example, due for annual inspection, due for recall inspection). Figure 2 below shows all recorded on-lot devices (green) and those that have been inspected (purple).

Figure 2: Recorded (green) and inspected (purple) on-lot devices



### 2.3 AUDIT PREPARATION/REPORTING

An annual list of properties to assess is prepared by taking a selection of the devices mapped out of Authority. The initial pilot study (see below) included a list of 70 assets, but a current assessment in April/May 2023 is targeting 100 properties to be assessed.

Selecting properties for each audit has focused on assessing clusters of assets within neighbourhoods to optimise travel time for assessors but can take other risk priorities or monitoring outcomes into account, as well any properties to be reassessed due to issues with access or remediation works having been requested.

Prior to undertaking the assessments, as-built plans are sourced from Council's Content Manager system, which provides any correspondence, reports and plans associated with each property. The as-built plans are used (where available) to pinpoint on the GIS map the exact (or expected) location of each asset within the property, along with any additional detailed provided such as size and asset type. All available information, including a copy of the as-built is made available to the field assessor through the Field Maps application, as detailed below.

The final step in the audit preparation process is to send an introduction letter to both residents and property owners (if different) to inform them of the assessment and give them the opportunity to respond with any access issues. This is also a required step through HCC's Stormwater Bylaw should this result in further action later on.

### 2.4 ON SITE ASSESSMENT

On site, auditors seek to gain access to each property on the assessment list and undertake the on-lot audit utilising Field Maps application, available on smart phones and tables. The audit forms utilise conditional formatting to allow the assessor to select the type of asset being assessed, and then only answer the relevant questions relating to it.

Assessed assets are categorised into one of the following groups:

- Compliant
- Minor non-compliance

- Non-compliant
- Not assessed.

Criteria for compliant, minor non-compliance and non-compliant are asset specific. Further details can be found below. Any asset that is unable to be assessed due to locked gates, buried asset etc are recorded as "Not Assessed". Recommendations for rectification works based on issues identified by the assessor are communicated to the property owner and resident, as detailed in the section below.

All properties visited receive a calling card in the letterbox or direct to the resident (if home) informing the resident that the assessment is complete and providing contact details of any follow up questions.

## 2.5 ACTIONS

Upon completion of the audit, all the assessment data is run through a series of quality assurance checks, before being used to generate site specific letters to property owners and residents (if different). A combination of GIS processes and mail merges are used to generate the letters, which help to the recipient of the findings of the assessment including any recommended rectification tasks.

The site findings are also reflected in an on-lot GIS map, with inspection status, recall date (if applicable) or elevated action required recorded. HCC is currently exploring a suite of enforcement options with the aim to have clear enforcement outcomes that will include positive enforcement actions such as awarding consistent compliance through to court prosecution for repeated non-compliance.

## 3 PILOT STUDY

To test the process, a pilot audit of 63 devices was completed in mid-2022 over the course of three days. The intent of the first day of the pilot study was to test the process and make modifications prior to undertaking the remaining assessments.

### 3.1 PILOT STUDY RESULTS

Table 1 summarises the results of the audit:

*Table 1: Summary results from 2022 Pilot Study Audit*

Asset Type	Compliant	Minor non-compliance	Non-Compliant	Not Assessed	Total
Raingardens	7	10	5	0	22
Tanks	9			5	14
Soakage	3		1	23	27
<b>Total</b>					<b>63</b>

The following section relate specifically to the findings for each of the three different asset types assessed during the pilot assessment.



### 3.1.1 RAINGARDENS

Raingardens were the most complicated assets both from an assessment and a maintenance perspective.

In order for different assessors to consistently assess rain gardens across different auditing periods, a scoring criteria was developed based on the ten attributes assessed on site for each rain garden.

Using this scoring criteria, each rain garden was classified into one of the following categories:

- Compliant
- Minor non-compliance
- Non-compliant
- Not assessed

Examples of each of status are shown in figures 3-8 below from the pilot audit:

#### **Compliant**

*Figure 3: Compliant rain garden with good vegetation*



*Figure 4: Compliant rain garden in concrete surround*





**Minor non-compliance**

*Figure 5: Rain garden with improved plant density required*



*Figure 6: Rain garden with improved plant density required*



**Non compliant**

*Figure 7: non-compliant raingarden with no vegetation*





Figure 8: Non-compliant raingarden with no vegetation



It was particularly evident from the assessments, as well as discussions with residents, that there was limited understanding of the purpose and benefits of raingardens on private properties.

In order to assist with this, all standard issues identified for each asset were listed in individual letters sent to the residents, informing them of specific areas for improvement to their assets. Below are some examples:

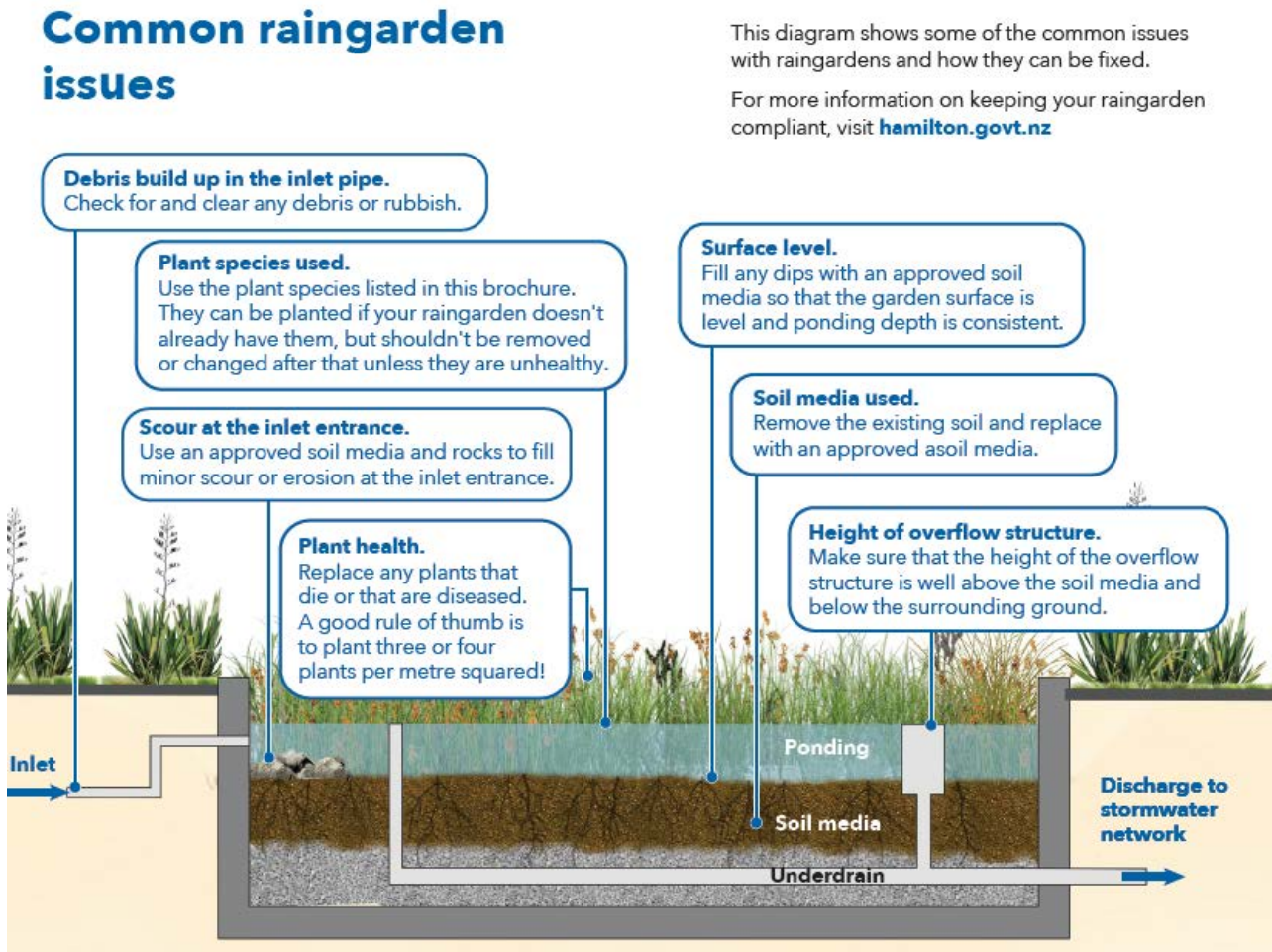
Figure 9: Examples of raingarden issues identified and communicated to property owners

<p>During our visit we found the following issues with the raingarden:</p> <ul style="list-style-type: none"><li>• Incorrect plant selection</li><li>• Not enough plants</li><li>• The media (soil) isn't level across the whole rain garden</li><li>• Wrong media has been used</li><li>• Height of the overflow is too low</li></ul>	<p>During our visit we found the following issues with the raingarden:</p> <ul style="list-style-type: none"><li>• Not enough plants</li><li>• The media (soil) isn't level across the whole rain garden</li><li>• Height of the overflow is too low</li></ul>
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This was then further supported by the educational brochures sent with the letters, which outlined how residents were able to rectify these issues. Figure 10 shows an extract from the raingarden educational brochure:



Figure 10: Example from the rain garden educational brochure



### 3.1.2 SOAKAGE

It was evident from the assessment that soakage assets installed prior to the recent updates to HCC Practice Notes were very difficult to find and/or access due largely to:

- Buried soakage devices with no easy inspection point; or
- Poor workmanship around manhole lids

Of the 23 soakage devices assessed, 17 (all in the same area) were able to be assessed due to the lack of access chambers for any of the assets. This was further reiterated by discussions with the residents who were present during the assessments, most of whom had no idea that there was a soakage device within their property.

These findings have been conveyed to HCC's building officers to reiterate the importance of ensuring access to all private assets is maintained. They will ensure the designs are in accordance with the practice notes at the time of approving consents.

### 3.1.3 RAINWATER TANKS

All rainwater tanks that were able to be assessed were found to be compliant. Where owners were present during the assessments, they were aware of the relevance of their tank and its function.

Tanks that couldn't be assessed were largely due to being buried and didn't have visible access points. As identified above with soakage assets, it is essential that all underground assets have a clear and maintained access point.

## 4 CONCLUSIONS

Overall process improvements that were identified from the pilot assessment included:

- It is more efficient to assess all on lot assets in a neighbourhood, than selecting individual assets spread across the city.
- It is important for assessors to have as much information as possible on-hand while on site (i.e. as-built plans) to assist in identifying and assessing assets efficiently.
- Based on discussions with residents and findings of the assessments, there is a clear need to keep educating residents on what assets they have on their property and what they should be doing to maintain them. As a result, the following key communication tools were developed through the course of the project:
  - *Initial letter to resident* - An introduction letter was developed, informing all affected residents and property owners that a site visit was to be undertaken, and provided contact details for any issues including access. Any feedback received from residents was then conveyed to field assessors through the data capture tool. This ensured they were aware of any access issues they were likely to experience on site (i.e. dogs, locked gates etc).
  - *Calling card* - A brief calling card was developed which included space for assessors to hand-write any key findings or discussion points from the assessment. Where residents were home, this was hand delivered and discussed at the time of the assessment. Where residents were out, the calling card was placed in the letterbox and included contact details for any follow up questions.
  - *Summary Letter* - As detailed above, property specific letters were sent to inform residents and property owners the findings of the assessment for their specific asset (raingarden, soakage or tank), any recommended tasks to be undertaken, and whether the assessor would be back to reassess the asset. The letter was generated through a combination of GIS processes and a mail merge. Each letter reflected the content of the Educational Pamphlets, as detailed below.
  - *Educational Pamphlets* - Three educational pamphlets (raingarden, soakage and tank) were created to provide simple instructions to residents on how to remediate their asset(s), if required, as well as details on recommended on-going maintenance. The pamphlets were designed to be read and understood by property owners, but also reflective of detailed content available to technical experts in HCC's three waters practice notes.

A subsequent audit of 100 assets is currently in process, at time of writing. Results from the audit, including any new recommendations will be included in the conference presentation.