On Lot Stormwater… A lot to learn

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MORPHUM environmental

Hamilton City Council
Te kaunihera o Kirikiriroa

Today's presentation

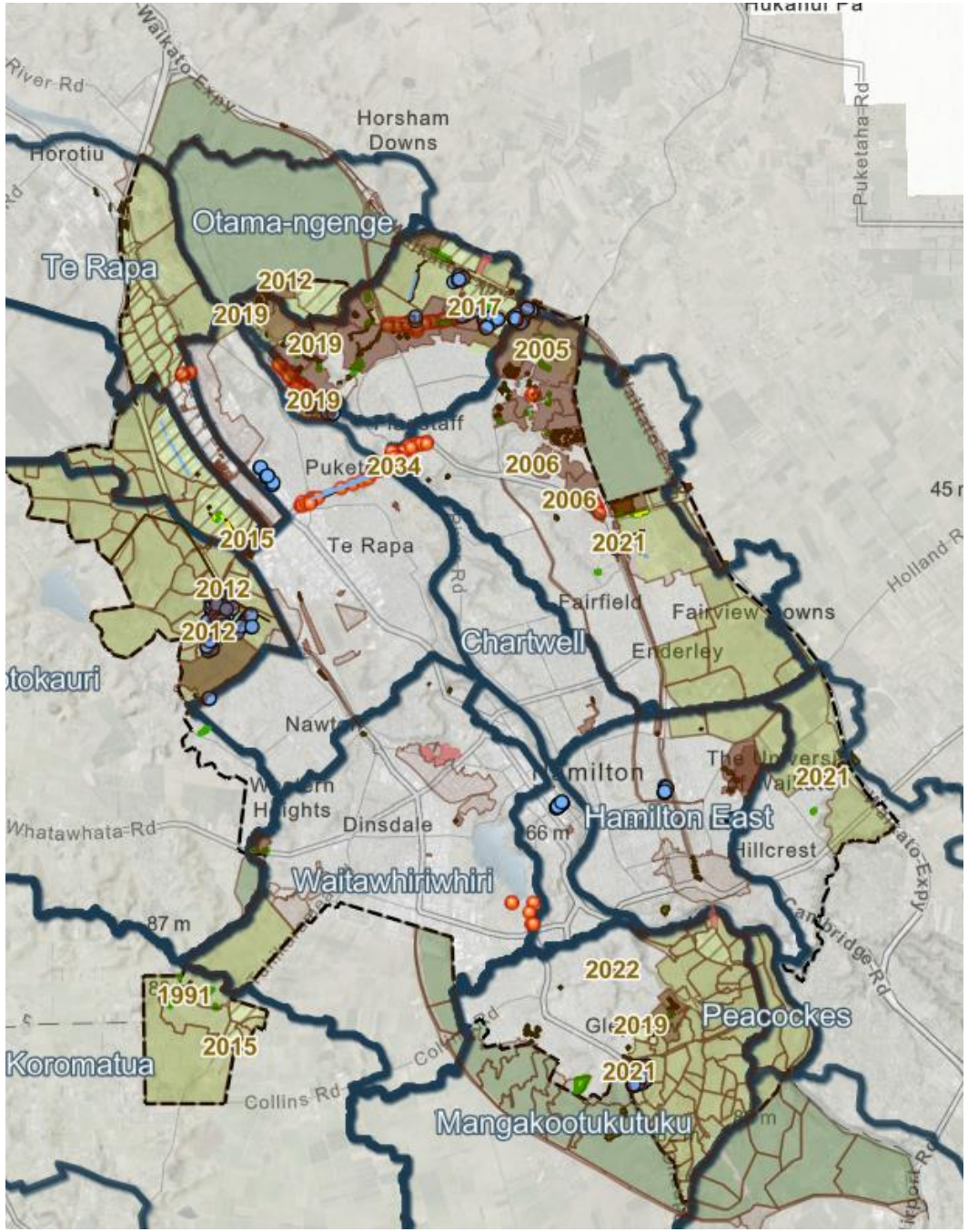
- **Why** require on-lot?
- **How** do we require on-lot?
- **What** do we require?
- **What** is happening in the real world...audits and key findings.

Why on-lot?

- To protect our freshwater bodies, and to give life to Te Mana o Te Wai & Te Ture Whaimana.
- Water sensitive design encourages management close to the source.
- It's been happening for decades, soakage has evolved to reuse, bioretention, permeable paving and more.

More practically...

- We are running out of public space
- 70% of Hamiltons growth is predicted within the existing city, where there are little to no management devices.

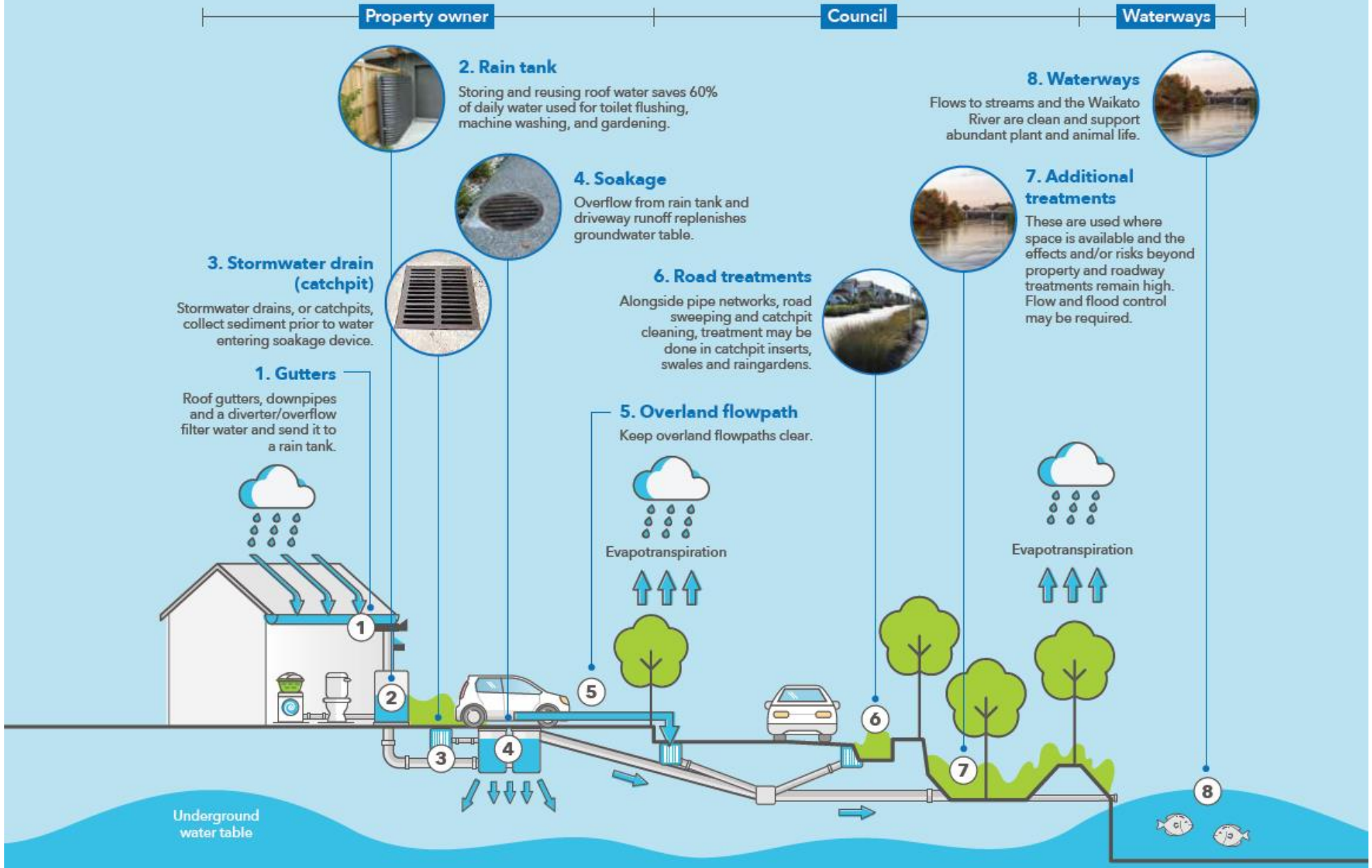


How: District Plan

- A District Plan rule requiring on-lot stormwater management took effect from 2014.
- Details of device options are found within the ‘Three Waters Management Practice Notes’ on the Council website.
- Plan Change 12 proposes to strengthen the rule to 10mm retention, specifically through reuse and soakage.

Residential stormwater management in Hamilton

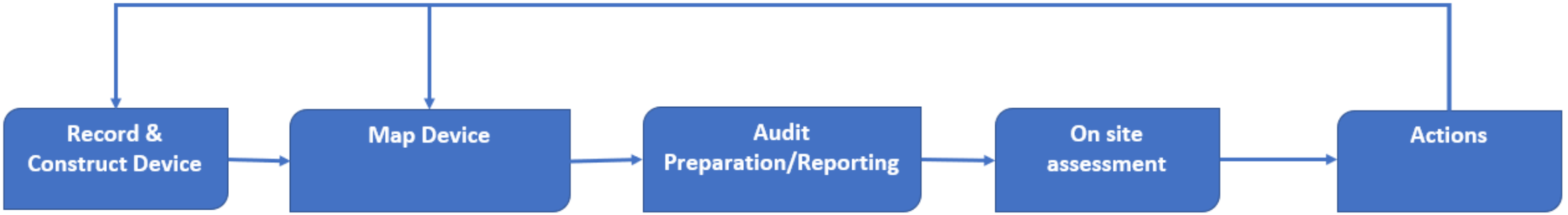
Rain tank and soakage



What: On-Lot Audit Process

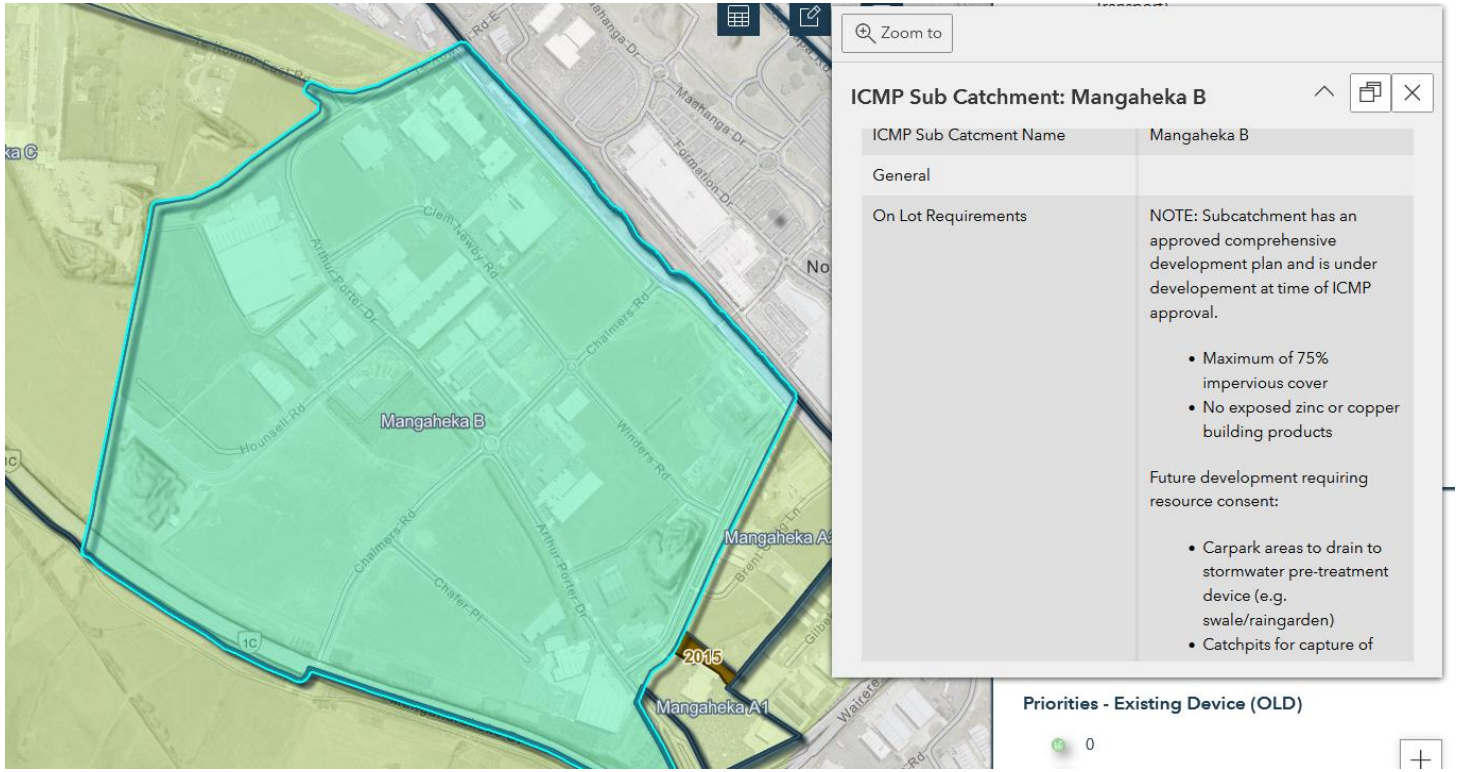
- The on-lot auditing process is to ensure that the intended water quality and quantity outcomes are realised over the lifecycle of private assets.
- The audit provides assurance to Waikato Regional Council (WRC) that these private assets are providing environmental protection in accordance with comprehensive stormwater discharge consent (CSDC) conditions.
- Chance to educate home-owners and occupiers about their assets.
- The project team included members from Councils City Waters, Information Services (Authority and GIS), Planning Guidance, Development Engineers and Building teams and external consultants Morphum.

Five Key Steps



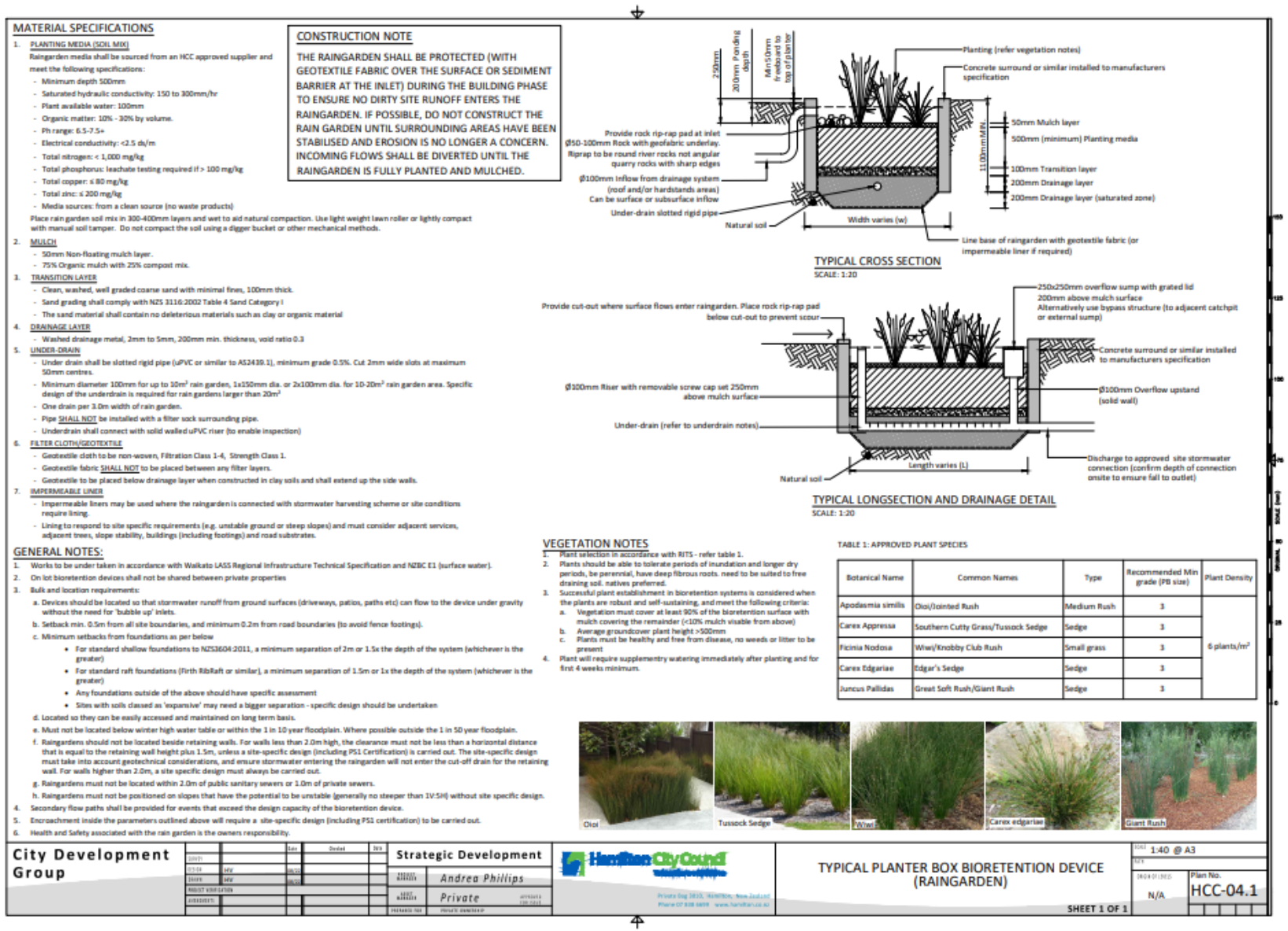
Record & Construct Device

- A Stormwater Requirements GIS layer details any specific on-lot requirements at a catchment scale, usually informed through the development of Integrated Catchment Management Plans (ICMPs).
- HCC planners require and record a Stormwater Device on an Authority checklist as new building consents are received.
- Building oversees technical detail and construction.



Construction

- Building supported a workshop with contractors. Good turn out and willingness to learn.
- Standard design asked for, so requirements are 'fair'
- Standard design drawings developed and available online to help reduce engineering costs



MATERIAL SPECIFICATIONS

1. PLANTING MEDIA (SOIL MIX)

Raingarden media shall be sourced from an HCC approved supplier and meet the following specifications:

- Minimum depth 500mm
- Saturated hydraulic conductivity: 150 to 300mm/hr
- Plant available water: 100mm
- Organic matter: 10% - 30% by volume.
- Ph range: 6.5-7.5+
- Electrical conductivity: <2.5 ds/m
- Total nitrogen: < 1,000 mg/kg
- Total phosphorus: leachate testing required if > 100 mg/kg
- Total copper: ≤ 80 mg/kg
- Total zinc: ≤ 200 mg/kg
- Media sources: from a clean source (no waste products)

Place rain garden soil mix in 300-400mm layers and wet to aid natural compaction. Use light weight lawn roller or lightly compact with manual soil tamper. Do not compact the soil using a digger bucket or other mechanical methods.

2. MULCH
   - 50mm Non-floating mulch layer.
   - 75% Organic mulch with 25% compost mix.
3. TRANSITION LAYER
   - Clean, washed, well graded coarse sand with minimal fines, 100mm thick.
   - Sand grading shall comply with NZS 3116:2002 Table 4 Sand Category I
   - The sand material shall contain no deleterious materials such as clay or organic material
4. DRAINAGE LAYER
   - Washed drainage metal, 2mm to 5mm, 200mm min. thickness, void ratio 0.3
5. UNDER-DRAIN
   - Under drain shall be slotted rigid pipe (uPVC or similar to AS2439.1), minimum grade 0.5%. Cut 2mm wide slots at maximum 50mm centres.
   - Minimum diameter 100mm for up to 10m² rain garden, 1x150mm dia. or 2x100mm dia. for 10-20m² rain garden area. Specific design of the underdrain is required for rain gardens larger than 20m²
   - One drain per 3.0m width of rain garden.
   - Pipe SHALL NOT be installed with a filter sock surrounding pipe.
   - Underdrain shall connect with solid walled uPVC riser (to enable inspection)
6. FILTER CLOTH/GEOTEXTILE
   - Geotextile cloth to be non-woven, Filtration Class 1-4, Strength Class 1.
   - Geotextile fabric SHALL NOT to be placed between any filter layers.
   - Geotextile to be placed below drainage layer when constructed in clay soils and shall extend up the side walls.
7. IMPERMEABLE LINER
   - Impermeable liners may be used where the raingarden is connected with stormwater harvesting scheme or site conditions require lining.
   - Lining to respond to site specific requirements (e.g. unstable ground or steep slopes) and must consider adjacent services, adjacent trees, slope stability, buildings (including footings) and road substrates.

CONSTRUCTION NOTE

THE RAINGARDEN SHALL BE PROTECTED (WITH GEOTEXTILE FABRIC OVER THE SURFACE OR SEDIMENT BARRIER AT THE INLET) DURING THE BUILDING PHASE TO ENSURE NO DIRTY SITE RUNOFF ENTERS THE RAINGARDEN. IF POSSIBLE, DO NOT CONSTRUCT THE RAIN GARDEN UNTIL SURROUNDING AREAS HAVE BEEN STABILISED AND EROSION IS NO LONGER A CONCERN. INCOMING FLOWS SHALL BE DIVERTED UNTIL THE RAINGARDEN IS FULLY PLANTED AND MULCHED.

TYPICAL CROSS SECTION
SCALE: 1:20

TYPICAL LONGSECTION AND DRAINAGE DETAIL
SCALE: 1:20

GENERAL NOTES:

1. Works to be under taken in accordance with Waikato LASS Regional Infrastructure Technical Specification and NZBC E1 (surface water).
2. On lot bioretention devices shall not be shared between private properties
3. Bulk and location requirements:
   a. Devices should be located so that stormwater runoff from ground surfaces (driveways, patios, paths etc) can flow to the device under gravity without the need for 'bubble up' inlets.
   b. Setback min. 0.5m from all site boundaries, and minimum 0.2m from road boundaries (to avoid fence footings).
   c. Minimum setbacks from foundations as per below
      - For standard shallow foundations to NZS3604:2011, a minimum separation of 2m or 1.5x the depth of the system (whichever is the greater)
      - For standard raft foundations (Firth RibRaft or similar), a minimum separation of 1.5m or 1x the depth of the system (whichever is the greater)
      - Any foundations outside of the above should have specific assessment
      - Sites with soils classed as 'expansive' may need a bigger separation - specific design should be undertaken
   d. Located so they can be easily accessed and maintained on long term basis.
   e. Must not be located below winter high water table or within the 1 in 10 year floodplain. Where possible outside the 1 in 50 year floodplain.
   f. Raingardens should not be located beside retaining walls. For walls less than 2.0m high, the clearance must not be less than a horizontal distance that is equal to the retaining wall height plus 1.5m, unless a site-specific design (including PS1 Certification) is carried out. The site-specific design must take into account geotechnical considerations, and ensure stormwater entering the raingarden will not enter the cut-off drain for the retaining wall. For walls higher than 2.0m, a site specific design must always be carried out.
   g. Raingardens must not be located within 2.0m of public sanitary sewers or 1.0m of private sewers.
   h. Raingardens must not be positioned on slopes that have the potential to be unstable (generally no steeper than 1V:5H) without site specific design.
4. Secondary flow paths shall be provided for events that exceed the design capacity of the bioretention device.
5. Encroachment inside the parameters outlined above will require a site-specific design (including PS1 certification) to be carried out.
6. Health and Safety associated with the rain garden is the owners responsibility.

VEGETATION NOTES

1. Plant selection in accordance with RITS - refer table 1.
2. Plants should be able to tolerate periods of inundation and longer dry periods, be perennial, have deep fibrous roots. need to be suited to free draining soil. natives preferred.
3. Successful plant establishment in bioretention systems is considered when the plants are robust and self-sustaining, and meet the following criteria:
   a. Vegetation must cover at least 90% of the bioretention surface with mulch covering the remainder (<10% mulch visable from above)
   b. Average groundcover plant height >500mm
   c. Plants must be healthy and free from disease, no weeds or litter to be present
4. Plant will require supplementry watering immediately after planting and for first 4 weeks minimum.

TABLE 1: APPROVED PLANT SPECIES

Botanical Name	Common Names	Type	Recommended Min grade (PB size)	Plant Density
Apodasmia similis	Oioi/Jointed Rush	Medium Rush	1	6 plants/m²
Carex Appressa	Southern Cutty Grass/Tussock Sedge	Sedge	1	
Ficinia Nodosa	Wiwi/Knobby Club Rush	Small grass	1	
Carex Edgariae	Edgar's Sedge	Sedge	1	
Juncus Pallidas	Great Soft Rush/Giant Rush	Sedge	1	

City Development Group

Strategic Development

Andrea Phillips

Private

Hamilton City Council

TYPICAL PLANTER BOX BIORETENTION DEVICE (RAINGARDEN)

SHEET 1 OF 1

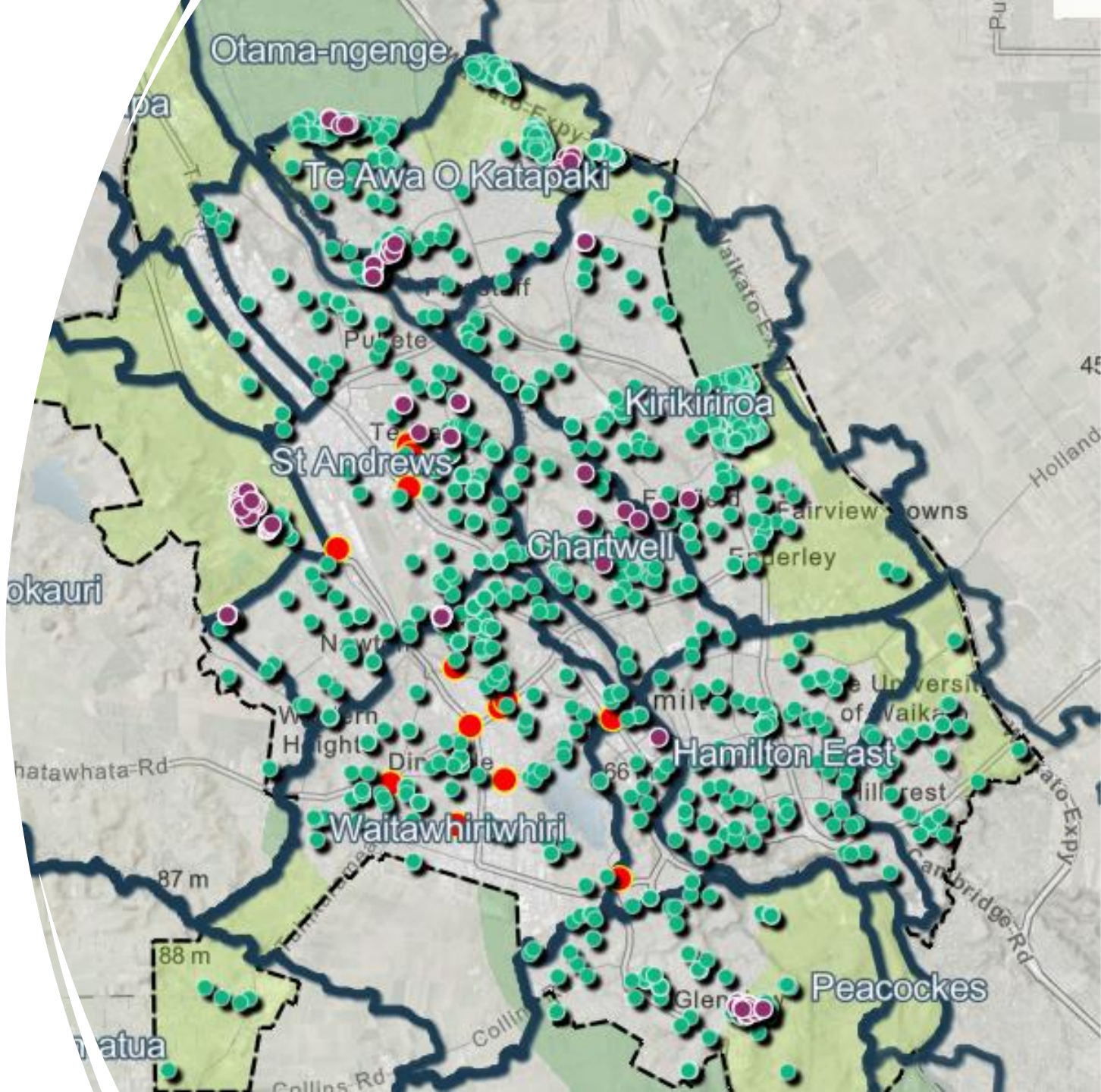
1:40 @ A3

N/A

Plan No. HCC-04.1

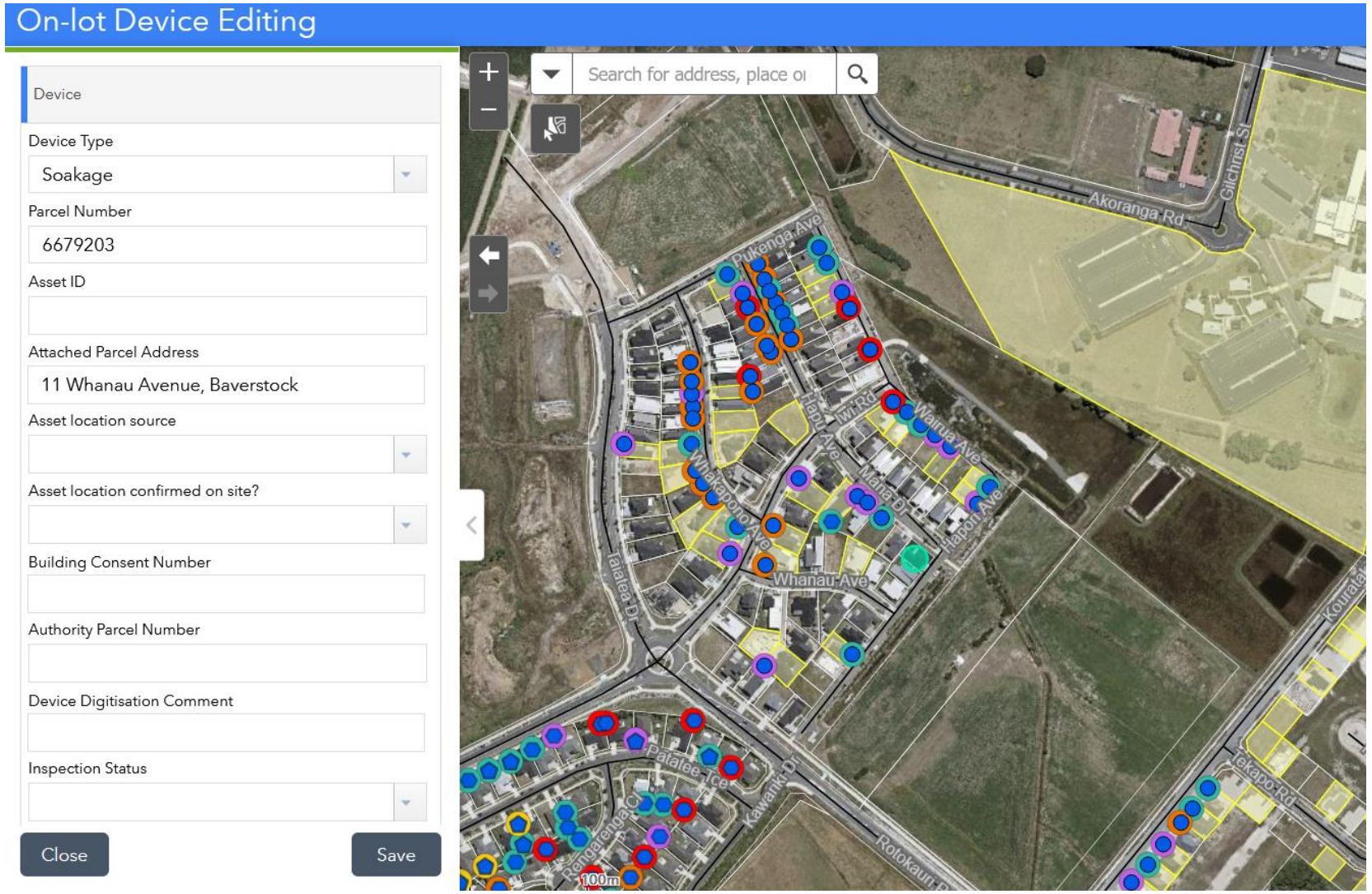
Assets added & mapped

- 2, 649 assets are currently mapped from our Building Consent information since 2019.
- Roughly an increase of 1,000 over the last 2 years.
- Also recording high-risk stormwater audits and inspection outcomes.



Device Editing

- A separate On-Lot Device Editing app was built using Experience Builder
- The Editing app allows users to analyse and update the on-lot data in detail, prior to preparing for the annual audit



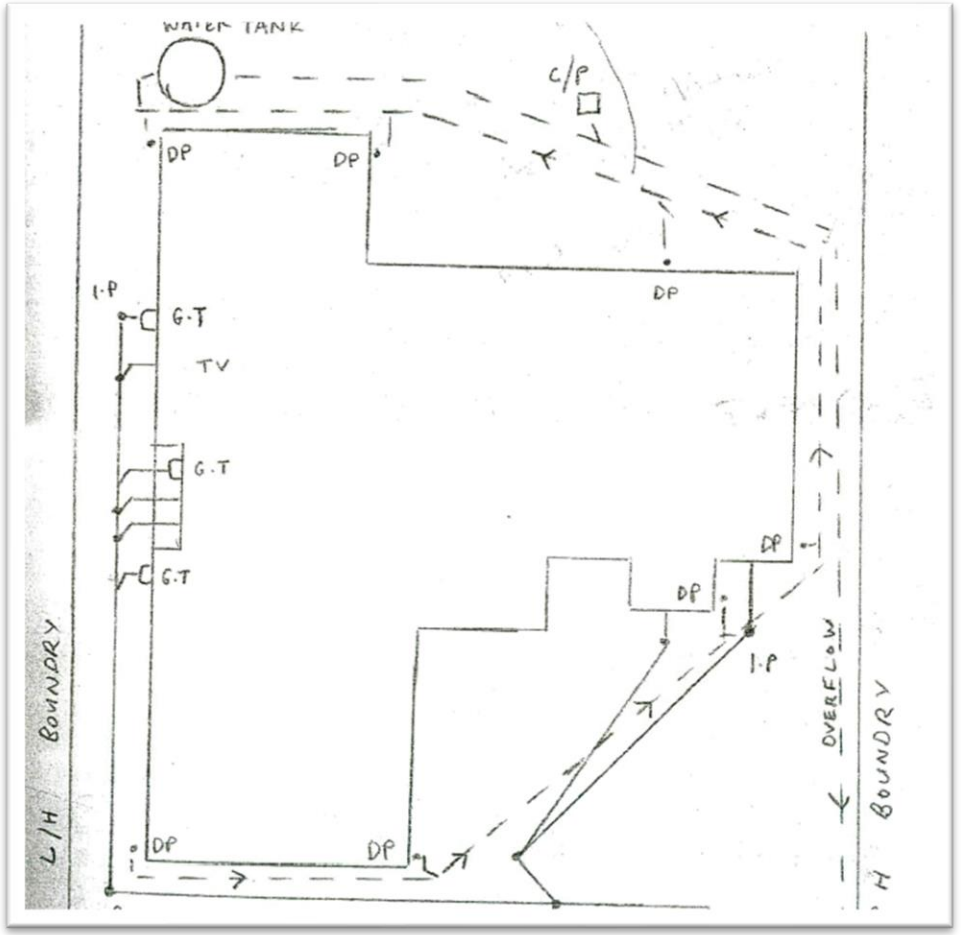
Audit Preparation

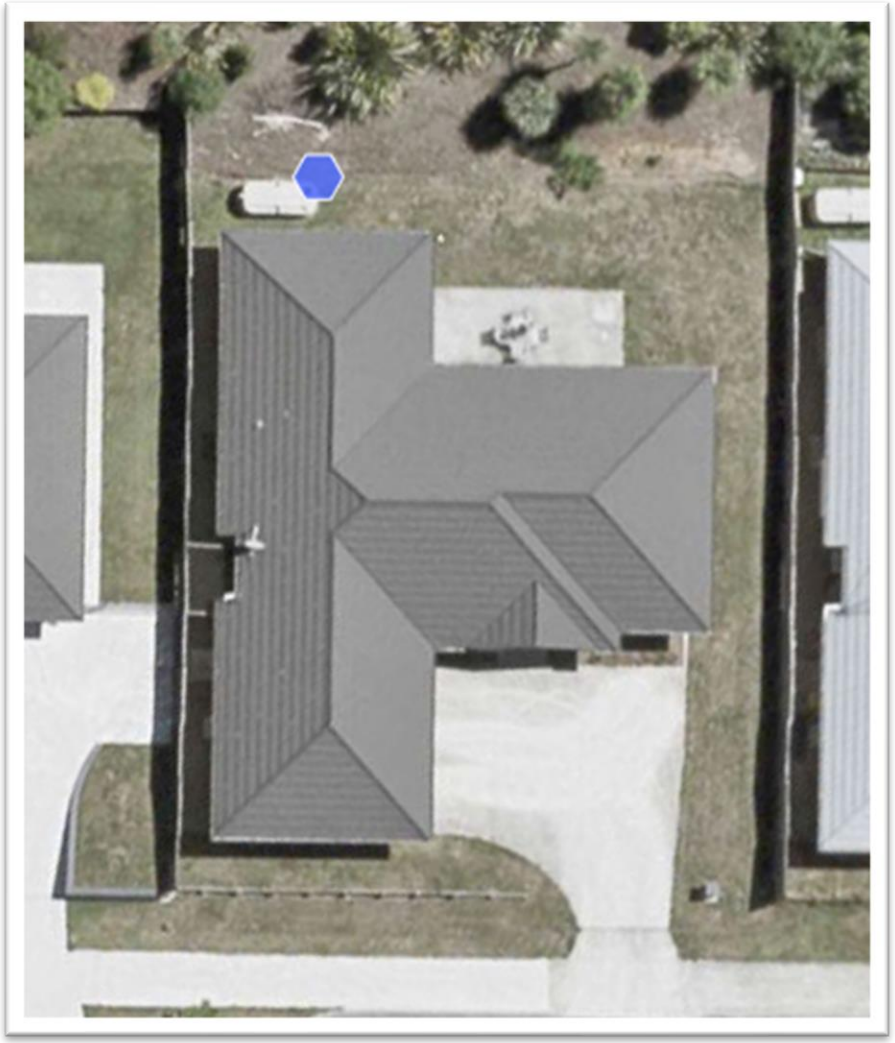
- An annual list of properties to assess is prepared by taking a selection of the devices mapped out of Authority.
- Selecting properties for each audit has focused on assessing clusters of assets within neighbourhoods, as well as revisiting properties to be reassessed

Audit Preparation

- As-built plans are sourced to pinpoint on the GIS map the exact (or expected) location of each asset within the property, along with any additional detail provided such as size and asset type.

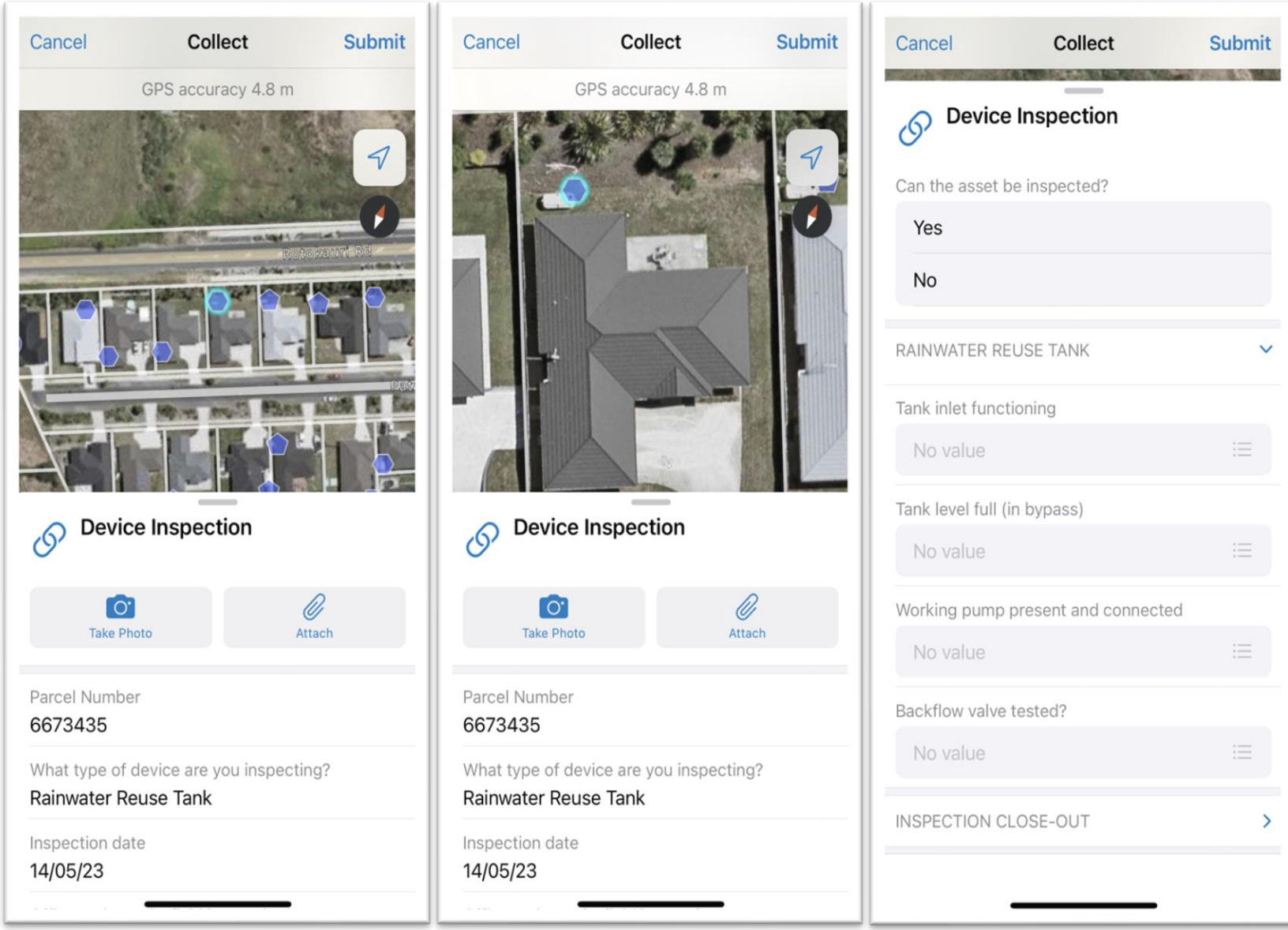
- All available information, including a copy of the as-built is made available to the field assessor



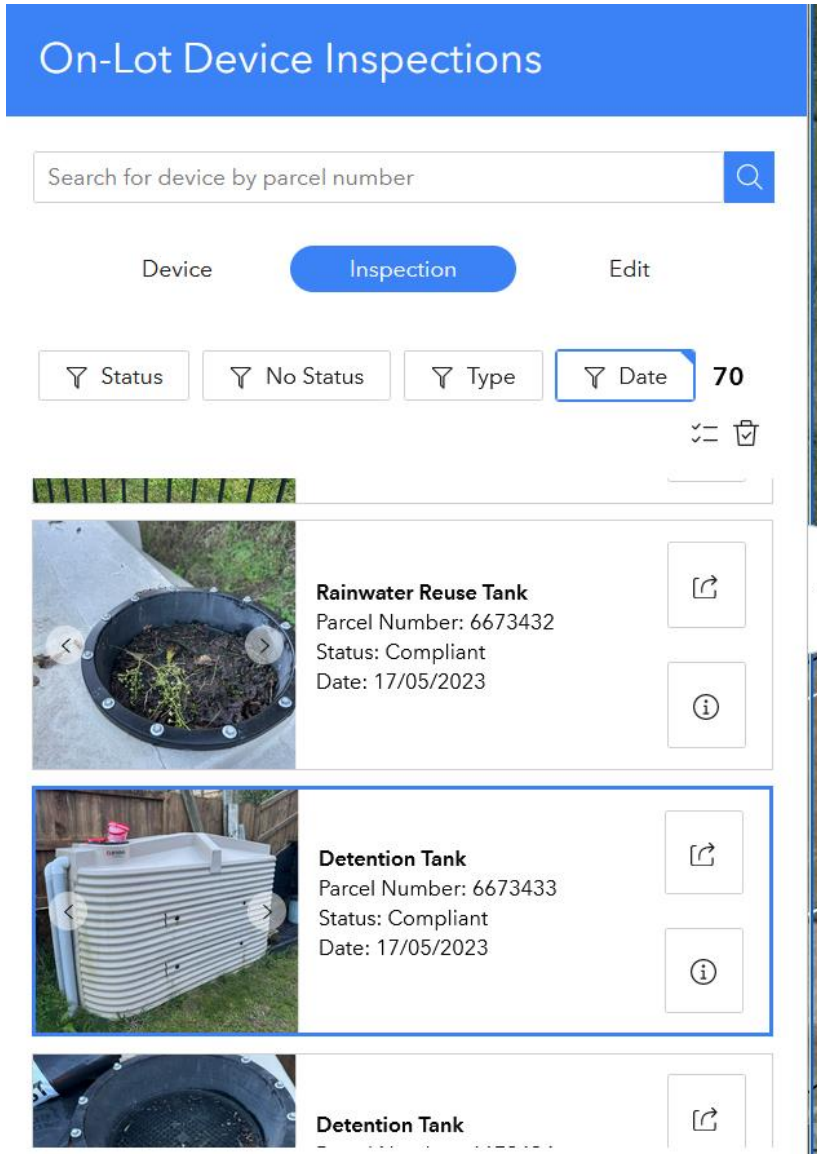


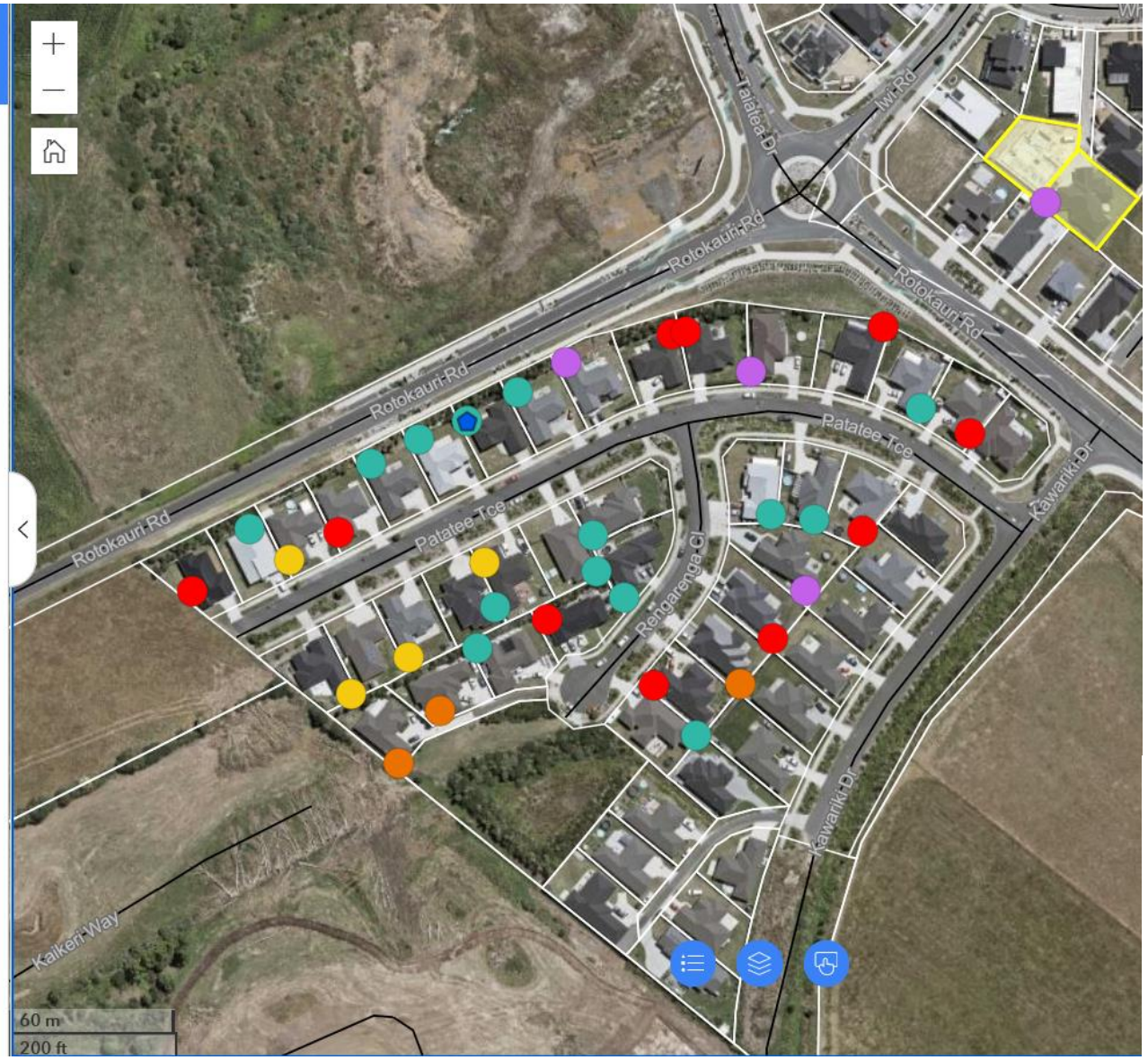
On site Assessment

- On site, auditors seek to gain access to each property on the assessment list
- The audit is undertaken 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.



Reporting/Actions





Reporting/Actions

On-Lot Device Inspections

Search for device by parcel number

Device | Inspection | Edit

< 6673433

Detention Tank

Tank inlet functioning

Yes

Tank level full (in bypass)

Yes

Sediment build up in base of tank?

No

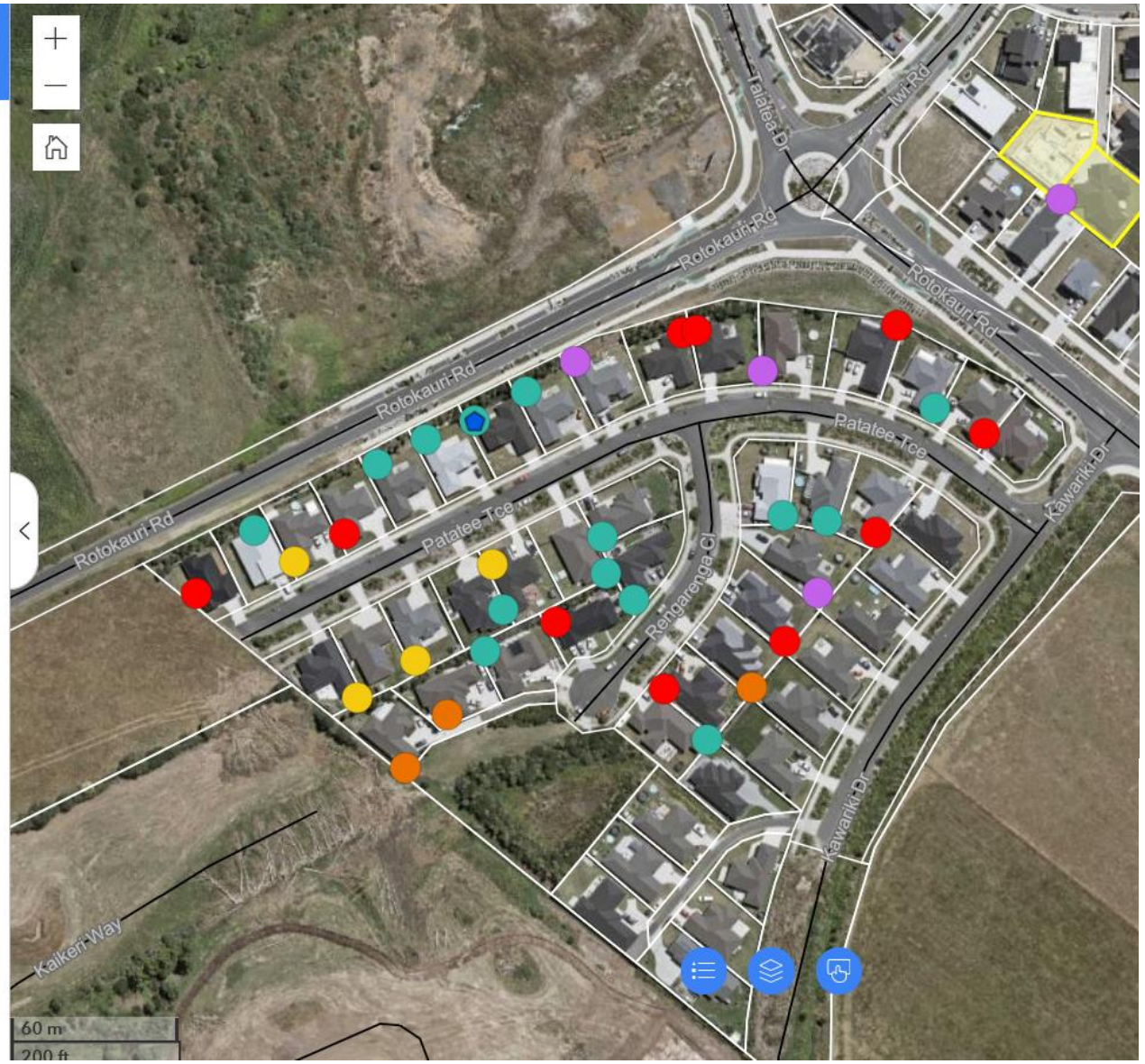
Outlet orifice operational?

No

Reason why outlet orifice not operational?

No outlet

Update | Delete



Inspected Devices

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

Letters to Residents

INSPECTION OF YOUR STORMWATER RAINGARDEN

Our stormwater system aims to minimise the impact of rainfall events on people, property, and our environment – and reduce the impacts these events have on our waterways. Hamilton's stormwater system includes private stormwater devices that help to manage increased runoff from residential properties.

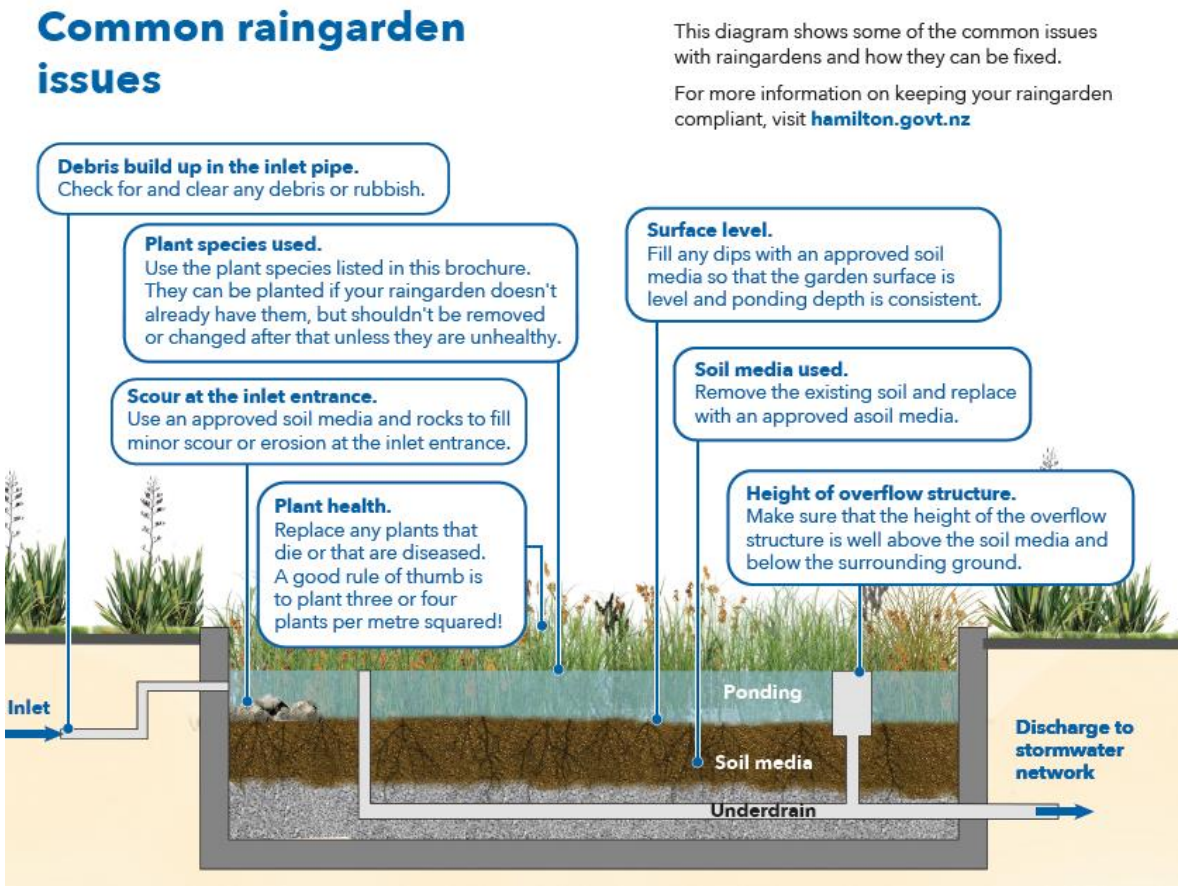
As part of a Hamilton City Council pilot programme, we visited 5 Whakapono Avenue earlier this year to assess the raingarden that has been identified on your property.

During our visit we found the following issues with the raingarden:

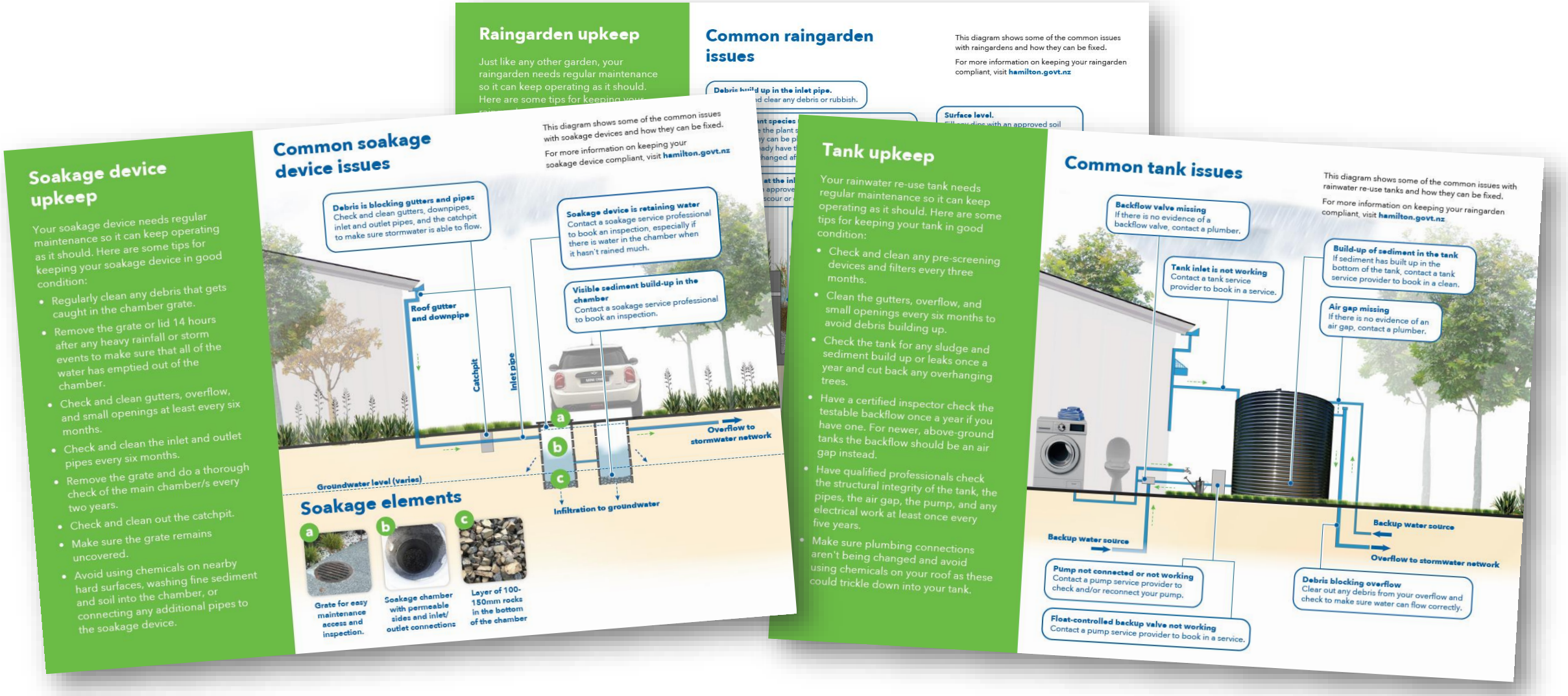
- Incorrect plant selection
- Not enough plants
- The media (soil) isn't level across the whole rain garden
- Wrong media has been used
- Height of the overflow is too low

As this is a pilot programme, we will not be taking any action. However, some advice for fixing these issues can be found in the enclosed pamphlet.

We ask that you keep this stormwater device regularly maintained so that it can continue to function well. This protects the wellbeing of our waterways, so that they can be enjoyed by our communities now and in the future.



Educational Brochures



Pilot Study

- 63 devices were audited in mid-2022 over the course of three days.
- 100 devices are being audited now.

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
Total					63

RainGardens

- Raingardens were the most complicated assets both from an assessment and a maintenance perspective.
- Residents had limited understanding of the purpose
- Key scoring criteria included:
  - State of vegetation (Good, Fair, Poor) was determined by:
    - Were the correct plants used?
    - Planting Density?
  - Was the correct media used, and was it level?
  - Were the inlets and outlets functioning?

Soakage

- 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 were unable to be assessed due to the lack of access chambers for any of the assets.
- Most residents had no idea that there was a soakage device within their property.
- Findings have been conveyed to HCC's building officers to reiterate to use the new design.

Detention & Retention Tanks

- The nine tanks that could be assessed in the pilot study, were all compliant.
- Good level of pride from residents with working tanks- felt like they were “doing their bit” for the environment
- Five tanks were unable to be assessed as they were buried and didn’t have visible access points
- 33 tanks have been assessed in May 2023, with only 4 unable to be assessed (findings still pending)
- 3 tanks had no working pumps

Key Audit Learnings

- Assess all assets in a neighbourhood rather than spread across the city and have as much information as possible on-hand while on site (i.e. as-built plans).
- 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. Clear communication through the course of the project is key:
  - *Initial letter to resident*
  - *Calling card*
  - *Summary Letter*
  - *Educational Pamphlets*
- Maintenance access is critical
- There is a lot of pride from residents who understand what they have and the role their asset plays

Conclusions

- On-lot stormwater management is necessary, and in some cases, will be the only protection before our watercourses.
- Good consistent design and maintenance access is key.
- Education and audits are necessary to ensure the device functions as needed into the future.
- Connecting people to urban stormwater is an important step to creating community understanding and collaboratively achieving restored watercourses.