

Inspection of Stormwater Treatment Devices on Non- Industrial Private Lands

Comprehensive Stormwater Network Discharge Consent (CSNDC), Schedule 4J

Christchurch City Council

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Report: Schedule 4J Inspection of Stormwater Treatment Devices on Non-Industrial Private Lands

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Executive Summary

Under the Comprehensive Stormwater Network Discharge Consent (CSNDC) Schedule 4J – source control investigations, Christchurch City Council (Council) is required to develop a program for the operational inspection of a sample of private stormwater treatment and/or retention devices on non-industrial sites (such as commercial business complexes, rest homes, residential homes and multi-apartment buildings, education centers and so forth) for the purposes of ensuring proper function and maintenance. In 2022-2023, 23 representative stormwater treatment devices across the different catchments were inspected. It was revealed that only two of them were found to be non-compliant during the calendar year 2023. Two devices were exempted from assessment due to a building being demolished, and thus not requiring a device. Overall, 90% of the inspected devices complied with the relevant regulations. Details of the inspection sites and the type of inspected devices can be found in Table 3.

The CSNDC requires work under this condition to be a long-term project. A representative device from the various catchments was inspected as required by the manufacturer’s guidelines. The internal database and workflow have been established to record the inspections and maintenance reports and to track down the devices for future follow-up. The recommendations have been made to set up a process for non-compliant reporting, integrating approved stormwater treatment devices in the council’s mainstream legal documents such as the Land Information Memorandum (LIM) to keep track of its ownership and regular maintenance. While it is not currently mandatory under the CSNDC, it is anticipated that the council’s long-term objectives would greatly benefit from the development of an operational and maintenance guidelines manual and educational outreach program to inform private property owners about the importance of maintaining stormwater treatment devices.

1. Introduction

The Comprehensive Stormwater Network Discharge Consent (CSNDC), CRC231955 was granted to the Christchurch City Council on 20 December 2019. The consent defines the conditions under which the council may discharge Stormwater into the territory’s water bodies, into the land, and to the coast. The CSNDC includes a requirement to develop an ongoing programme for the operational inspection of a sample of private stormwater treatment and/or retention devices on non-industrial sites for the purposes of ensuring proper function and maintenance. The requirements of the programme are set out in Schedule 4J and have a specified timeline to instigate the project:

The primary objective of this project is to develop an ongoing program to ensure the proper functioning of an installed stormwater device in non-industrial private lands. The secondary objectives of the programme are:

- a) To establish a process that will involve the development of a program.
- b) To access the current status of representative samples of approved stormwater treatment devices on non-industrial private lands
- c) To understand how well they are performing since installations and report if there are any non-compliant.

Table 1 Description of the project and the timeline

Description	Action Start Date	Action Completion Date
Stormwater treatment devices on non-industrial private lands Schedule:4j Develop a programme for the operational inspection of a retention devices on non-industrial sites for the purposes of inspection and maintenance	Within 2 years of the commencement of the resource consent 19 December 2021	ongoing

2. Background

2.1. Project Description

The scope of work was prepared by the council in 2021 and peer-reviewed by the review panel to comply with CSNDC requirements and to assess what processes, strategies, and technical inputs are required to develop a programme and to implement it as a long-term project. The scoping document highlighted the existing gaps and helped to develop a framework to meet both the requirements of the CSNDC as well as the council’s internal requirements for a better understanding of the performance of council approved stormwater treatment devices on non-industrial private land (such as commercial business complexes, rest homes, residential homes and multi-apartment buildings, education centers and so forth). Under Sections 23 and 25 of the council’s Stormwater and Land Drainage Bylaw 2022, the occupier(s) of any property with a private stormwater system must ensure that it is maintained in good

operating conditions and allows for the free flow of stormwater. The customer owns and is responsible for all repairs and associated costs with regard to the private stormwater drains within the property, right up to the point of discharge. Conditions could include providing onsite rainwater storage to avoid increasing flooding downstream, or a treatment system to remove contaminants from stormwater ([Stormwater connections and discharge approval](#)). Below are the acceptable stormwater treatment options the council has approved.

The acceptable Treatment - Water Quality options are:

- A rain garden or tree pit designed to Council's Rain Garden and/or Tree Pit Design Criteria
- Soil adsorption or sedimentation basin designed to capture the runoff from the first 25 mm of rainfall
- A vegetated swale designed in general accordance with Auckland Council's TP10 to treat the runoff from a 5 mm/hr intensity storm
- One of the following proprietary devices is designed to treat the runoff from a 5 mm/hr intensity storm:
 - Stormwater360 Stormfilter
 - Stormwater360 Filterra
 - Hynds Up-Flo Filter
 - SPEL Bayfilter
 - SPEL Hydrosystem

The acceptable Attenuation- Water Quantity options are:

- Storage
- Balance Tank

2.2. Gaps

The following gaps were identified during a peer-reviewed process.

- The council has obligations under the Stormwater and Land Drainage Bylaw 2022 for the inspection of all privately owned stormwater systems that are designed, constructed, managed, and maintained by the owner, at the owner's expense or by some other arrangement acceptable to the council. Every property owner who breaches this bylaw commits an offence and is liable on summary conviction to a fine not exceeding \$20,000, as set out in the Local Government Act 2002. As such, no plan or process has been developed or set up to capture these maintenance requirements and non-compliant cases as of now by the Council.
- The council does not hold any information on stormwater treatment devices that are not functioning correctly due to poor design, inappropriate construction methodologies, or insufficient maintenance.

- There is very little information on the council website that covers generic consideration, consent and other legal compliance, construction specifications, documentation, monitoring, and technical guidance.
- The council has not established/disseminated any targeted communications with the property owners regarding their responsibilities to maintain these devices at the time when we approved the consent (APPENDIX I) or contacted the property owners regarding their stormwater treatment device maintenance requirements in the past years.

2.3. Assumptions and Limitations

There are a few assumptions and limitations to the existing approved stormwater treatment devices.

- Approximately, 80% of consent applications are received through the Building Consent application process. The consenting team does not have a process in place to capture maintenance requirements under the property’s building warrant of fitness.
- Although there are no maintenance schedules in place, it is believed that all the installed devices are performing well as we have not heard otherwise.
- For smaller private properties (except for larger subdivisions), it is perceived that all the installed devices have followed appropriate design guidelines, methodologies, and legal compliance requirements.

3. Methods

To address the existing gaps and limitations that the council has identified, a high-level project workflow was established that involves four steps: 1) Identification of sites 2) Communication, plan, and processes 3) Collation of inspection and maintenance reports, 4) Data management and record keeping (Figure 1, APPENDIX II). A brief description of operational inspection and maintenance requirements for each device type was developed (APPENDIX III). In the calendar year 2023, 23 stormwater treatment devices (both proprietary and non-proprietary) were selected across the city representing the four catchments (Ōtākaro/ Avon, Ōpāwaho/Heathcote, Pūharakekenui/ Styx, and Coastal).

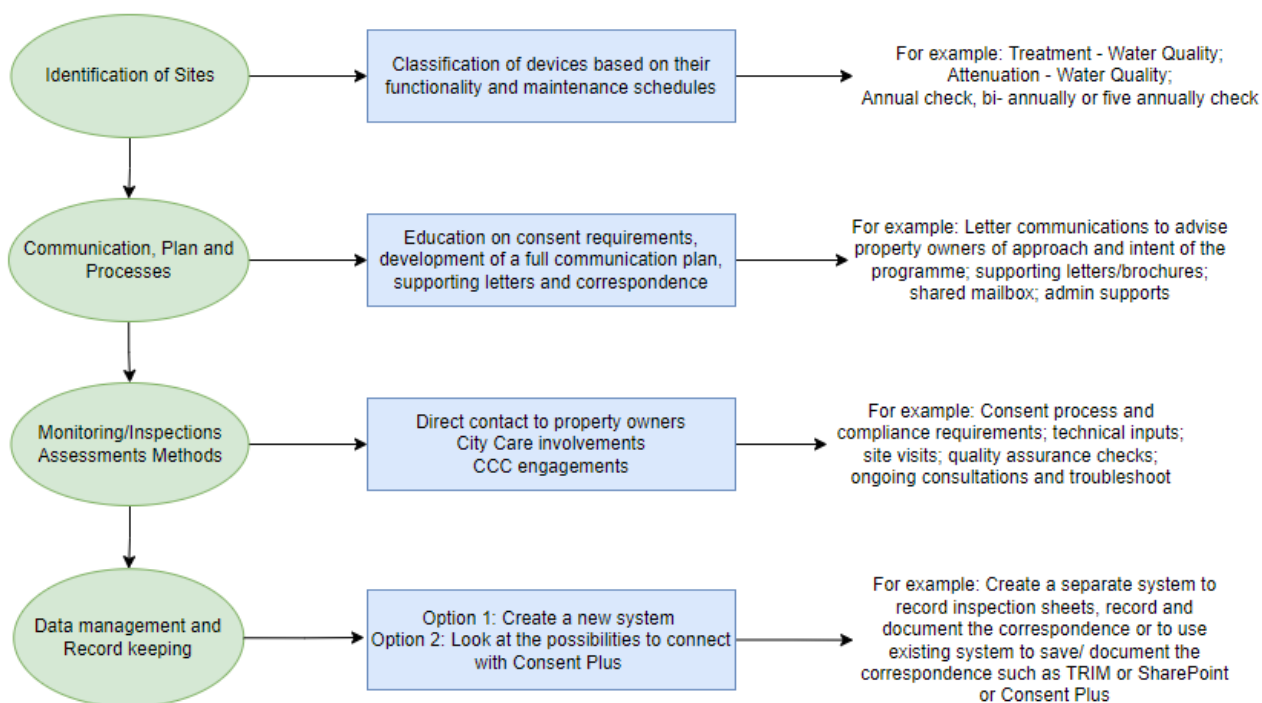


Figure 2 High level Workflow

3.1 List of the devices inspected 2022-2023

Table 2 List of the devices inspected 2022-2023

SN	Site Address	Device Type	Catchment	Property Type	Consent start
1	92 Wilsons Road South, St Martins	Hynds Up-Flow Filter	Ōpāwaho/Heathcote	Commercial	21/07/2011
2	8 Mounter Avenue, Belfast	Hynds Up-Flow Filter	Pūharakekenui/ Styx	Commercial	21/07/2011
3	101/282 Madras Street, Central City	Hynds Up-Flow Filter	Ōtākaro/ Avon	Residential	7/10/2014
4	162 Montreal Street, Central City	Hynds Up-Flow Filter	Ōtākaro/ Avon	Mixed Use	15/06/2015
5	14 Chappie Place, Hornby	Hynds Up-Flow Filter	Ōpāwaho/Heathcote	Commercial	26/07/2013
6	310 Sawyers Arms Road, Harewood,	SW360 Stormfilter	Pūharakekenui/ Styx	Residential	28/08/2014
7	224 Linwood Avenue, Linwood,	SW360 Stormfilter	Coastal	Commercial	23/09/2014
8	54 Harewood Road, Papanui	SW360 Stormfilter	Pūharakekenui/ Styx	Commercial	1/12/2014
9	929 Ferry Road	SW360 Stormfilter	Ōpāwaho/Heathcote	Residential	6/10/2017
10	28 Princess Street, Addington	SW360 Stormfilter	Ōtākaro/ Avon	Commercial	6/10/2017
11	175 Durham Street South, Central City	SW360 Stormfilter	Ōtākaro/ Avon	Mixed Use	23/10/2017
12	109 Clyde Road, Ilam	SW360 Stormfilter	Ōtākaro/ Avon	Specific Purpose	18/12/2017
13	1/19 Nga Mahi Road, Sockburn	Oil & Grit Interceptor	Ōpāwaho/Heathcote	Commercial	6/11/2012
14	346 Halswell Road, Halswell	SW360 Stormfilter	Ōpāwaho/Heathcote	Commercial	29/05/2014
15	389 St Asaph Street, Central City	Oil & Grit Interceptor	Coastal	Mixed Use	3/10/2014
16	210 Penruddock Rise, Westmorland	Swale	Ōpāwaho/Heathcote	Rural Residential	6/03/2013
17	6/57 Stanmore Road, Linwood	Proprietary Filter	Coastal	Residential	16/09/2014
18	346 Mt Pleasant Road, Mt Pleasant,	Detention Tank	Coastal	Residential	3/11/2014
19	392 Moorhouse Avenue, Sydenham	SPEL Hydrosystem	Ōtākaro/ Avon	Commercial	16/04/2018
20	43 Lichfield Street, Central City	SW360 Jellyfish	Ōtākaro/ Avon	Commercial	14/06/2017
21	85 Aldwins Road, Linwood	SW360 Stormfilter	Coastal	Specific Purpose	27/09/2013
22	183 Durham Street, Central City	Rain garden	Mixed use	Commercial	17/10/2017
23	154 Worcester Street, Central City	Rain garden	Avon / Ōtākaro	Commercial	23/06/2015

4. Findings

In 2023, of the 23 representative stormwater treatment devices, it was revealed that only two of them were found to be non-compliant (Table 4). Two devices were exempted from assessment due to a building being demolished, and thus not requiring a device. Overall, 90% of the inspected devices complied with the relevant regulations (Table 2 & Table 4).

The devices under review represented diverse catchments and device types. With 7 devices hailing from the Ōpāwaho/Heathcote catchment, 3 from Pūharakekenui/ Styx, 7 from Ōtākaro/ Avon, and 4 from coastal catchments. This wide distribution included a variety of both proprietary and non-proprietary devices, emphasizing the comprehensive nature of the inspection.

Table 3 Summary of inspection and maintenance of stormwater treatment devices on private lands during 2022-2023

SN	Site Address	Device Type	Inspection Report # TRIM	Date of the Inspection	Summary of the Inspection Report
1	92 Wilsons Road South, St Martins	Hynds Up-Flow Filter	23/1616398	13-Jul-23	Instant Plumbing was engaged to remove trash and debris. Sediment removed. The next inspection is due in January 2024.
2	8 Mounter Avenue, Belfast	Hynds Up-Flow Filter	23/1616924	13-Jul-23	Instant Plumbing was engaged to remove trash and debris. Sediment removed. The next inspection is due in January 2024.
3	101/282 Madras Street, Central City	Hynds Up-Flow Filter	23/1089752	28-Jun-23	Dutton Stormwater was engaged for a full service. The trash was removed, and the cartridge was replaced. 200 kg of the sediment was removed. The date of the next service is due in June 2024.
4	162 Montreal Street, Central City	Hynds Up-Flow Filter	23/1046943	1-Sep-22	HydroVac was engaged for maintenance work. Volume of liquid removed - 750 L, volume of sediment removed - 50mm, number of bags replaced - 8. The date of the next service is in September 2024.
5	14 Chappie Place, Hornby	Hynds Up-Flow Filter	23/1218605	1-Aug-23	HydroVac was engaged for maintenance work. The volume of liquid removed - 150 L, the volume of sediment removed - 50mm, number of bags replaced - 8. The date of the next service is in September 2024.
6	310 Sawyers Arms Road, Harewood	SW360 Stormfilter	23/1091796	26-Jun-23	Sumps were vacuumed, old media bags removed, new media bags installed, and all components for integrity were checked. Date of next service - November 2024.
7	224 Linwood Avenue, Linwood	SW360 Stormfilter	23/1087565	23-Jan-23	Cartridges replaced
8	54 Harewood Road, Papanui	SW360 Stormfilter	23/1392697	15-Aug-23	Stormwater 360 was engaged for full maintenance work. Trash and debris removed, sediment removed, cartridges replaced. The Stormfiler is in good condition.
9	929 Ferry Road	SW360 Stormfilter	23/869265	18-Apr-23	Dutton Stormwater was engaged for a full service. Trash removed, sediment removed - 650 kg, cartridges replaced.
10	28 Princess Street, Addington	SW360 Stormfilter	23/1092070	28-Jun-23	HydroVac South Island was engaged for a full inspection. Trash and debris removed, sediment removed, cartridges replaced. Fully serviced.

SN	Site Address	Device Type	Inspection Report # TRIM	Date of the Inspection	Summary of the Inspection Report
11	175 Durham Street South, Central City	SW360 Stormfilter	23/1090796	19-Oct-22	HydroVac South Island was engaged for a full inspection. Trash and debris removed, sediment removed, cartridges replaced. Minor structural repairs. Fully serviced.
12	109 Clyde Road	SW360 Stormfilter	23/1626814	2-Oct-23	Dutton Stormwater was engaged for a full service. Trash removed, sediment removed - 180 kg, cartridges replaced. Date of next service is due in 1/10/2024.
13	1/19 Nga Mahi Road, Sockburn	Oil & Grit Interceptor	23/864397	12-Jan-23	Trash and debris were removed, and minor structural repairs completed.
14	346 Halswell Road	SW360 Stormfilter	23/1141591	13-Jul-23	Trash and debris removed- minimal, sediment removed. Six monthly service.
15	389 St Asaph Street, Central City	Oil & Grit Interceptor	23/1810741	17-Jul-23	Vacuumed oil from the surface and dewatered the clean water. Vacuumed all the silt from the bottom of the interceptor and disposed of at an approved disposal facility.
16	210 Penruddock Rise, Westmorland	Swale	23/1631334	-	The property was a bare piece of land sold to the owner 2 years ago as Lot 107.
17	346 Mt Pleasant Road, Mt Pleasant	Detention Tank	23/1539429	1-Mar-23	CCTV check of all stormwater pipework, water blasted tank, and inspected system. All working as designed. Next maintenance date - 01/03/2028
18	392 Moorhouse Avenue	SPEL Hydrosystem	23/871011	20-Apr-23	The volume of liquid removed - 1200 L, the weight of waste removed - 120 kg, outlet cleaning and draining - completed. The device is in good condition and has been vacuumed clean.
19	43 Lichfield Street	SW360 Jellyfish	23/1219305	24-Jul-23	Draindown cartridge externally rinsed and installed - completed, Hi-Flo Cartridge externally rinsed and installed, sediment depth - 100mm, cartridge lids installed. The jellyfish chamber was in good condition but was quite dirty.
20	85 Aldwins Road	SW360 Stormfilter	23/1926338	9-Oct-2023	Building demolished – device decommissioned.
21	183 Durham Street	Rain garden	23/1925336	22- Nov -23	Report to be received on 24 Nov 2023.

SN	Site Address	Device Type	Inspection Report # TRIM	Date of the Inspection	Summary of the Inspection Report
22	6/57 Stanmore Road	Proprietary Filter	16/09/2014	6-Sep-23	Device not found in the property.
23	154 Worcester Street	Rain Garden	23/1925336	22-Nov- 23	The raingardens were cleaned out, cleared the debris and inspected drainage and confirmed that it is functionally well.

Table 4 List of devices that need further investigation during 2022-2023

S.N.	Site Address	Device Type	Property Type	Consent Start Date	Inspection Date	Reasons for the further investigation
1.	183 Durham Street	Rain garden	Mixed use	2013	2023	Waiting for a report. The inspection work is scheduled for 24 Nov 2023.
2.	6/57 Stanmore Road	Proprietary Filter	Coastal	2014	2023	The device was not found in the property. Ongoing investigation with the consenting team.

5. Conclusion and Recommendations

Most of the devices inspected were approved/constructed prior to 2015. Out of the 23 devices inspected, 90% of the devices were found in good functional condition whereas the remaining 10% (N=2) need further follow up and investigations. Further to improve the outcomes, the council recommended to:

1. Develop operational and maintenance guidelines manual

While it is not currently mandatory under the CSNDC, it is anticipated that the council's long-term objectives would greatly benefit from the development of an operational and maintenance guidelines that include recommended maintenance procedures, and performance standards.

The manual is expected to provide advice on whom to engage for an inspection, how to overcome operational and maintenance issues, logbooks to record maintenance work and maintenance schedules to prolong the life and performance of each device that the council approved.

2. Educate device owners

- Integrate an educational outreach program with other CSNDC community partnership programs to inform private property owners about the importance of maintaining stormwater treatment devices.
- Provide training sessions, workshop, and informational materials to help owners understand their responsibilities.

3. Support documentation at approval

Along with the approval for installation, plans should include information on the device's design, intended maintenance schedule, and estimated lifecycle costs.

4. Process set up for non-compliant reporting

Addressing non-compliant reporting and enforcing actions for privately owned stormwater treatment

devices is essential to ensure the effectiveness of the inspection program. Currently, there is no existing process to address non-compliant reporting. To maintain the integrity of the inspection program, an enforcement actions or process should be developed which align with the Stormwater and Land Drainage Bylaws 2022.

5. Integrating with the council’s mainstream database

- Integration of the inspection and maintenance report in the council database (e.g. Consent Plus) to schedule annual maintenance plans for the devices that are captured through the CSNDC programme.
- Documentation of stormwater treatment devices in the council’s mainstream report such as the LIM to keep track of required stormwater treatment devices at the property in relation to changes to ownership.

6. APPENDICES

APPENDIX I Classification of the council approved stormwater treatment devices based on functional types – 2022-2023

Stormwater Treatment Device Category	Stormwater Device Type	Total Number
Treatment - Water Quality	Balance Tank	1
Treatment - Water Quality	Hynds Up-Flo Filter	49
Treatment - Water Quality	Oil & Grit	69
Treatment - Water Quality	Amalgam Separator	1
Treatment - Water Quality	Passive Grease Trap	4
Treatment - Water Quality	Hair Trap	3
Attenuation - Water Quantity	Rain Garden	4
Treatment - Water Quality	Rain Garden	60
Treatment - Water Quality	Soil Absorption or Sedimentation Basin	33
Treatment - Water Quality	SPEL Bayfilter	1
Treatment - Water Quality	SPEL Hydrosystem	40
Treatment - Water Quality	SPEL Spelfilter	1
Attenuation - Water Quantity	Storage	1230
Treatment - Water Quality	SW360 Jellyfish	20
Treatment - Water Quality	SW360 Stormfilter	190
Treatment - Water Quality	Swale	73
Treatment - Water Quality	Other	68
Attenuation - Water Quantity	Soak Pit	210
Total		2,057

APPENDIX II Workflow: A detailed outline of scope, methodology, deliverables, and actions

Scope	Methodology
Identification of sites	Desktop analysis using previous data gathered <ul style="list-style-type: none"> - Selection of 23 Stormwater treatment devices (representative sample which covers both quantity and quality types as well as land use (residential, commercial, mixed,) and catchment types (Ōpāwaho/Heathcote catchment, Pūharakekenui/ Styx, Ōtākaro/ Avon and coastal).
Communications plan and process	Full communication plan was developed and agreed <ul style="list-style-type: none"> - Supporting letters (drafted) for the property owners - Set up the shared mailbox
Monitoring/Inspection and assessments methods	Inspection-assessment method to be agreed and documented <ul style="list-style-type: none"> - Establish communication with the property owners - Set up an appointment for an inspection
Data management and record-keeping	Setting up a system to accommodate/document all records, checks/inspections sheets such as SharePoint or TRIM <ul style="list-style-type: none"> - Collate additional information as required to support the report such as maintenance sheet
Preparation of final report	Write a summary report <ul style="list-style-type: none"> - Produce a summary report as required by CSNDC condition 4J - Submit a final report

APPENDIX III Operational inspection and maintenance requirement for each device type

Name of the device	Frequency of inspection and maintenance
Hynds 'Up Flo' Filter	<p>Inspection - Regularly during the first year of installation, every six months after the first year of installation</p> <p>Floatables Removal - Twice per year or as needed, or following a spill in the drainage area</p> <p>Sediment Removal - Twice per year or as needed, or following a spill in the drainage area</p> <p>Media Pack Replacement - Once per year or as needed, or following a spill in the drainage area</p> <p>The council requires documentation of any replacement based on the manufacturer's recommendations to demonstrate compliance.</p>
SPEL Bayfilter	<p>Standard Inspection- Standard inspections are conducted at regular four months intervals.</p> <p>General Cleaning- After the standard inspection, trigger measures will identify if general cleaning is required, for example, if a build-up of debris/pollutants within the vault is greater than 150 mm or there is an accumulation of debris on the outlet chamber of the SPELFilter Vault.</p> <p>Undertake additional inspections after large storm events, tidal or flooding impacts at the request of the owner.</p> <p>Cartridge Replacement- The life of SPELFilter is between 5-7years (guaranteed 5 years).</p> <p>The council requires documentation of Cartridge Replacement based on the manufacturer's recommendations to demonstrate compliance.</p>
SPEL Hydrosystem	To be determined.
SW360 Jellyfish	<p>Inspection- Twice during the first year of operation, inspection frequency based on the maintenance plan developed in the first year</p> <p>Maintenance- Generally, a minimum of once per annum cleaning frequency, filter cartridge cleaning, re-commissioning, or replacement every 12 months or when the automatic backwash feature no longer functions due to cartridge saturation with sediment; whichever occurs first</p> <p>The council requires documentation of cartridge replacement based on the manufacturer's recommendations to demonstrate compliance.</p>
SW360 Stormfilter	<p>Inspection- At least one scheduled inspection should take place per year.</p> <p>Maintenance- Based on the results of inspection (the average maintenance lifecycle is approximately 1-3 years). Inspect after major storms.</p> <p>Note: Once an understanding of site characteristics has been established, maintenance may not be needed for one to three years, but inspection is warranted and recommended annually.</p> <p>The council requires documentation of Cartridge Replacement based on the manufacturer's recommendations to demonstrate compliance.</p>

Name of the device	Frequency of inspection and maintenance
Rain Garden	<p>Major maintenance:</p> <ul style="list-style-type: none"> • Removal and disposal of sediments every 20 years • Complete replanting every 20 years • Major maintenance of drainage system e.g. replacement of parts every 10 years <p>Inspection</p> <p>Filter Media- should be inspected three monthly or after a rain.</p> <p>The horticultural- aspect should be inspected three monthly or as desired for aesthetics.</p> <p>Drainage- annually</p> <p>The council requires documentation of the replacement of any parts based on the manufacturer’s recommendations to demonstrate compliance.</p>
Swale	Annually - inspect once per year
Soak Pit	<p>Soak holes should be cleaned annually where there is a sediment trap/sump chamber or catch-pit manhole.</p> <p>Rock-filled soak-pits as per the NZBC cannot be cleaned annually and will instead need to be monitored for performance and re-built as and when required.</p>
Soil absorption or sedimentation basin	Sediment removal is only required approx. every 5 years (triggers when sediment accumulates to half the basin depth, determined from regular monitoring of sediment depth with a measuring post during maintenance visits).
Oil and Grit Interceptor system	Inspection: During the first year of operation, a Hynds Oil and Grit Interceptor system should be inspected monthly or bimonthly to determine the frequency of maintenance.
Storage tanks	<p>Inspection: At least annually, clean out and make any repairs as necessary.</p> <p>Maintenance: Water supply pumps and associated electrical work and replacements of the filters should be undertaken as per the manufacturer’s requirements.</p> <p>The council requires documentation of the replacement of any parts based on the manufacturer’s recommendations to demonstrate compliance.</p>