Auckland Wastewater Network

Section 1

Annual Performance Report

1 July 2018 to 30 June 2019

Final Draft

30 September 2019

Watercare
An Auckland Council Organisation

FOREWORD

At Watercare, we know our communities feel passionate about the health of their local waterways and beaches. We do too.

That is why we respond quickly when overflows are reported to us. It is also why we are investing billions of dollars in wastewater infrastructure over the next 10 years.

Our communities also have an important role to play in protecting the natural environment. We are working to educate them about how their actions can cause overflows. Aucklanders are now more aware of the consequences of pouring fat down their sinks and flushing rubbish down their toilets. We are also working with communities to identify properties with ageing or incorrectly installed drainage that allows stormwater into our network.

We want our communities to be proud of where they live, to enjoy the outdoors and to flourish. And we hope that by challenging ourselves to reduce the frequency and volume of overflows through a collaborative process of continuous improvement; we will contribute to their wellbeing.

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1 INTRODUCTION

Watercare provides wastewater services to Auckland, New Zealand; from Te Hana in the North of the region to Waiuku in the South.

This Annual Performance Report (APR) is required under Condition 57 of Watercare's Auckland Wastewater Network Comprehensive Discharge Permit (Network Discharge Consent, or NDC), granted on 17 June 2014:

"*The Consent Holder shall provide an Annual Wastewater Network Performance Report to the Manager on 30 September of each year. This report shall provide the information specified in the Template for the Annual Network Performance Report (Attachment 9), and include the annually updated version of Attachment 2.***"**

This is the fifth report submitted for this consent, and this report provides a summary of the overflows that occurred during the period 1 July 2018 to 30 June 2019, as well as a brief overview of works undertaken in each geographical catchment area.

1.1 Strategic Management Areas

To enable a structured management approach and prioritisation of expenditure based on risk to assets and the environment, Watercare has characterised the network in terms of Strategic Management Areas (SMAs). A SMA is defined as the geographic area serviced by a network that conveys wastewater flows to a wastewater treatment plant (WWTP).

This report covers 14 SMAs, which are listed in Table 1. Three of the SMAs are very large and have been further divided into geographic catchments [SMA 7 – Hibiscus Coast, SMA 8 – Rosedale (North Shore) and SMA 9 – Mangere (Metropolitan Auckland)]. The list of geographic catchments is shown in Table 2. There has been no change to the Strategic Management Areas.

Table 1: Strategic Management Areas

Number	Name	WWTP
SMA 1	Wellsford	Wellsford
SMA 2	Omaha	Omaha
SMA 3	Warkworth	Warkworth
SMA 4	Snells Beach/ Algies Bay	Snells Beach/ Algies Bay
SMA 5	Waiwera	Waiwera
SMA 6	Helensville	Helensville
SMA 7	Hibiscus Coast	Army Bay
SMA 8	Rosedale (North Shore)	Rosedale
SMA 9	Mangere (Metropolitan Auckland)	Mangere
SMA 10	Oneroa	Owhanake
SMA 11	Beachlands-Maraetai	Beachlands-Maraetai
SMA 12	Clarks Beach	Clarks Beach
SMA 13	Waiuku	Waiuku
SMA 14	Pukekohe	Pukekohe

Table 2: Geographic Catchments

SMA 7: Hibiscus Coast (Army Bay WWTP)
Catchment 7 – Orewa
Catchment 8 – Weiti
Catchment 9 – Whangaparaoa
SMA 8: North Shore (Rosedale WWTP)
Catchment 10 – Long Bay
Catchment 11 – East Coast Bays
Catchment 12 – Devonport-Takapuna
Catchment 13 – Shoal Bay
Catchment 14 – Upper Harbour North
Catchment 15 – Upper Harbour South
SMA 9: Auckland (Mangere WWTP)
Catchment 16 – Upper Harbour West
Catchment 17 – Henderson Creek
Catchment 18 – Whau River

Catchment 19 – Laingholm
Catchment 20 – Cox's Bay
Catchment 21 – Central Auckland (CBD)
Catchment 22 – Hobson Bay
Catchment 23 – Onehunga
Catchment 24 – Mangere
Catchment 25 – Lower Tamaki River
Catchment 26 – Upper Tamaki River
Catchment 27 – Cockle Bay
Catchment 28 – Puhinui
Catchment 29 – Pahurehure Inlet
Catchment 35 – Kumeu-Huapai-Riverhead
Catchment 36 – Western Isthmus (Central Interceptor)

1.2 Document structure

This report provides a summary of information on the performance of Watercare's wastewater network in terms of the actual recorded and reported overflows that occurred over the reporting period. It also provides comparisons to previous year's data, updates on the progress of various network improvement projects, and other measures aimed at improving network performance.

Section One of this report provides contextual information about wastewater networks, overflows and other network management matters. It also expands upon the terms, definitions and data sources for this report, with summaries of regional trends of wastewater network performance.

Section Two documents network performance for each Strategic Management Area at the geographic catchment level.

Section Three addresses various aspects of wastewater network management that are not confined to specific geographic locations. This section includes all appendices and flushing programmes.

Specifically, this report provides information on:

- Wastewater overflows from Watercare's wastewater network, both during times of dry weather and wet weather flows.
    - Type 1 (pump stations) and Type 2 (Engineered Overflow Point) overflows, identified through telemetry
    - Uncontrolled overflows, typically reported through customer contact
- The capital and operational improvement projects undertaken by Watercare to improve network performance with investigations and planning studies.
- Watercare's Inflow and Infiltration Programme (I&I), additions to the network and the nature of public information made available by Watercare.

The report also includes compliance reporting for other discharge consents held by Watercare to highlight the integrated and connected nature of the wastewater network. These are:

(1) R/REG/2013/3743 (overflows to land and water) – Auckland wastewater network (NDC)
(2) R/REG/2013/3755 (overflows to the coastal marine area) - Auckland wastewater network (NDC)
(3) R/REG/2013/3763 (overflows to land and water) - Central Interceptor Catchment (NDC-CI)
(4) R/REG/2013/3764 (overflows to the coastal marine area) - Central Interceptor Catchment (NDC-CI)
(5) COA-63609 (overflows to the coastal marine area) - Weranui Pump Station, Weranui Road, Waiwera
(6) REG-63613 (overflows to land and water) - Springs Road Pump Station, Springs Road, Parakai
(7) REG-63614 (overflows to land and water) - Outfall Pump Station, Kaipara Coast Highway, Helensville
(8) 31584 (overflows to land and water) - Catchment draining to the Hingaia Pump Station, 158 Park Estate Road, Papakura.
(9) 39084 (overflows to land and water) - Whenuapai Pumping Station, 167 Brigham's Creek Road, Whenuapai
(10) 39087 (overflows to land and water) - Massey North Pumping Station, 97B Fred Taylor Drive, Whenuapai

(11) 48840 (overflows to the Coastal Marine Area) – 562 Oruarangi Road, Mangere, Auckland.

The NDC and NDC-Central Interceptor Consents (1 to 4 above) are distinguished only by the overflow target that has to be met under the terms of the consent. Catchment 36 (Western Isthmus) is dominated by a combined network, and a significant network improvement project (the Central Interceptor) is planned. As such, the overflow target is framed in terms of volume reduction, rather than frequency of overflows.

Consents 5 to 10 above cover individual pump stations that are currently located on rural zoned land. Under the regulatory framework that was in force when the NDC application was submitted, these overflow points had to be addressed separately. Consent conditions of Consents 5 to 7 are the same as the NDC, and less rigorous than the NDC for Consents 8 to 10.

2 OVERVIEW

2.1 Background

The primary purpose of a wastewater network is to transport the untreated wastewater generated by residential, commercial and industrial properties to a wastewater treatment plant (WWTP). These flows comprise of:

- Dry Weather Flow (DWF) is a combination of domestic, commercial and industrial loads. Dry Weather Flows also include groundwater infiltration (GWI); water entering the network from the groundwater table.
- Rainfall Derived Inflow and Infiltration (RDII) is rainfall which enters the wastewater network from cracked pipes or illegal private stormwater pipes connected to the wastewater system.

The wastewater network has been designed to overflow at engineered overflow points (EOPs) during wet weather events in order to minimise the risk of wastewater spilling onto private homes and property; jeopardising public health. This is a common approach taken by many international water utilities.

2.2 Drainage types

There are two key drainage types within the Auckland region - combined networks, found in the older areas of metropolitan Auckland, and separated networks.

2.2.1 Combined networks

The combined networks are designed to collect both wastewater and stormwater flows in a single pipe in defined combined areas. Combined networks are designed to overflow during rainfall events, when capacity is restricted due to increased stormwater flows.

To ensure that these overflows occur in a controlled manner, rather than on private properties and buildings, dedicated Type 2 Engineered Overflow Points (EOPs) were constructed at points along the network, which discharge through a piped system to the local receiving environment.

The Mangere SMA is the only area within the network which remains combined, encompassing parts of the Western Isthmus (Central Interceptor), Cox's Bay, CBD and Hobson Bay geographic catchments. All other SMAs were developed as separated systems as are all new developments.

2.2.2 Separate networks

Separate networks are designed to receive dry weather flows and some wet weather flows. The influence from wet weather flow results from:

- Inflow - where water enters the separated wastewater system through wrongful or illegally connected downpipes from roofs, overland flow, flooded manholes and/or low-lying gully traps on private property.
- Infiltration - where surface and groundwater that is above the pipe level enters the wastewater system through cracked or disjointed pipes. This occurs in both public and private wastewater pipes.

Separate wastewater systems also have engineered overflow structures at pump stations (Type 1 EOPs) and within the network (Type 2 EOPs), to provide a relief point where lack of capacity could otherwise result in uncontrolled overflows at a private property, and/or to spill

preferentially in locations with lower risks to public health and the environment.

2.3 Watercare's response to overflows

Management of wastewater overflows is undertaken in two ways:

- Immediate response in accordance with the Wastewater Overflow Regional Response Manual, as outlined below.
- Investigation and remediation: overflow incidents are recorded and reported in accordance with the procedures set out in the Wastewater Overflow Regional Response Manual. Through this process, Watercare determines whether preventative measures can be undertaken.

2.3.1 Immediate response

Watercare has in place an agreed protocol with Auckland Council for responding to and reporting on wastewater overflows. The Wastewater Overflow Regional Response Manual, developed in conjunction with the Pollution Response and Licencing and Compliance Teams, was signed in 2014.

Overflows are categorised according to risks, as identified below:

- Level 1: No discharge to a water course and the overflow is contained onsite, with limited public health risks. Escalation to Auckland Council is not required.
- Level 2: Wastewater enters a watercourse but ammonia is less than 3ppm, 100m downstream. Auckland Council is notified of Level 2 incidents via phone.
- Level 3: Wastewater enters a watercourse and ammonia is greater than 3ppm, 100m downstream. Both Auckland Council and the Auckland Regional Public Health Service are notified of these overflows, with the follow up incident reporting issued within 10 working days.
- Level 4: Significant overflow to a watercourse.
- Level 5: Catastrophic event or civil defence state of emergency.

Ammonia testing was adopted as a tool to indicate the presence of sewage contamination, along with other visual and odour indicators. Ammonia sampling is undertaken when health and safety is not compromised and the water course is accessible. Where possible, ammonia samples are taken at point of entry, 5m downstream and 100m downstream.

Ammonia results are reported in the wastewater overflow incident assessment forms which are issued to Auckland Council within 10 working days for Level 3 and above incidents.

Where ammonia is greater than 6ppm, further sampling may be undertaken to confirm repairs have been completed and no further action is required. Watercare provides these results in the 2017-2018 Annual Report. Further sampling may also be undertaken by the Auckland Council Environmental Health Officer if required.

2.3.2 Investigation and remediation

The investigation into repeat Dry Weather Overflows (DWOs) may identify a systemic network asset or maintenance issue. A repeat DWO is defined as one which occurs twice or more over a 12 month period; Watercare is tracking these repeat overflows which are not resolved within the reporting year, and prioritising investigations into issues with three or more spills over a rolling 24 month period.

Repeat overflows can be the result of:

- Pipe deterioration, root intrusion, blockages from foreign objects, and lack of capacity.
- The same incident being logged under separate Service Requests (customer calls).

- A fault being incompletely rectified, and requiring a follow up visit to resolve the issue.
- Third party damage.

Watercare investigates the cause of repeat overflows and initiates appropriate remedial actions as required. Remedial action may include additional sewer cleaning, removal of temporary obstructions, asset renewal, public education or other site specific actions.

Where the cause of the repeat overflows is clearly attributable to I&I, rather than a partial blockage or other maintenance issues, Watercare has three options:

- Network improvements and upgrades to eliminate the overflow, or
- Create an EOP to divert the overflow into an adjacent waterway or stormwater pipe (subject to agreement from the asset owner). This is a short-term solution to ensure that direct human contact with the overflow can be avoided by providing an alternative discharge location and adequate dilution; and/or
- Commence I&I investigation and remediation/enforcement by Auckland Council.

2.3.3 Improvement works programme

As a requirement of the NDC, the Wastewater Network Strategy sets out a Wastewater Network Improvement Programme to address wet weather overflows, this is developed and refreshed on a six-yearly basis. The first Wastewater Network Strategy Plan was delivered in June 2017. The Wastewater Network Improvement Works Programme sets out how growth will be serviced, and how wastewater network performance will be improved over the next six-yearly planning period, as well as how works will be prioritised.

A full summary of the proposed improvement works scheduled to be undertaken within the current year; as well as the next year is included in each catchment in Section One.

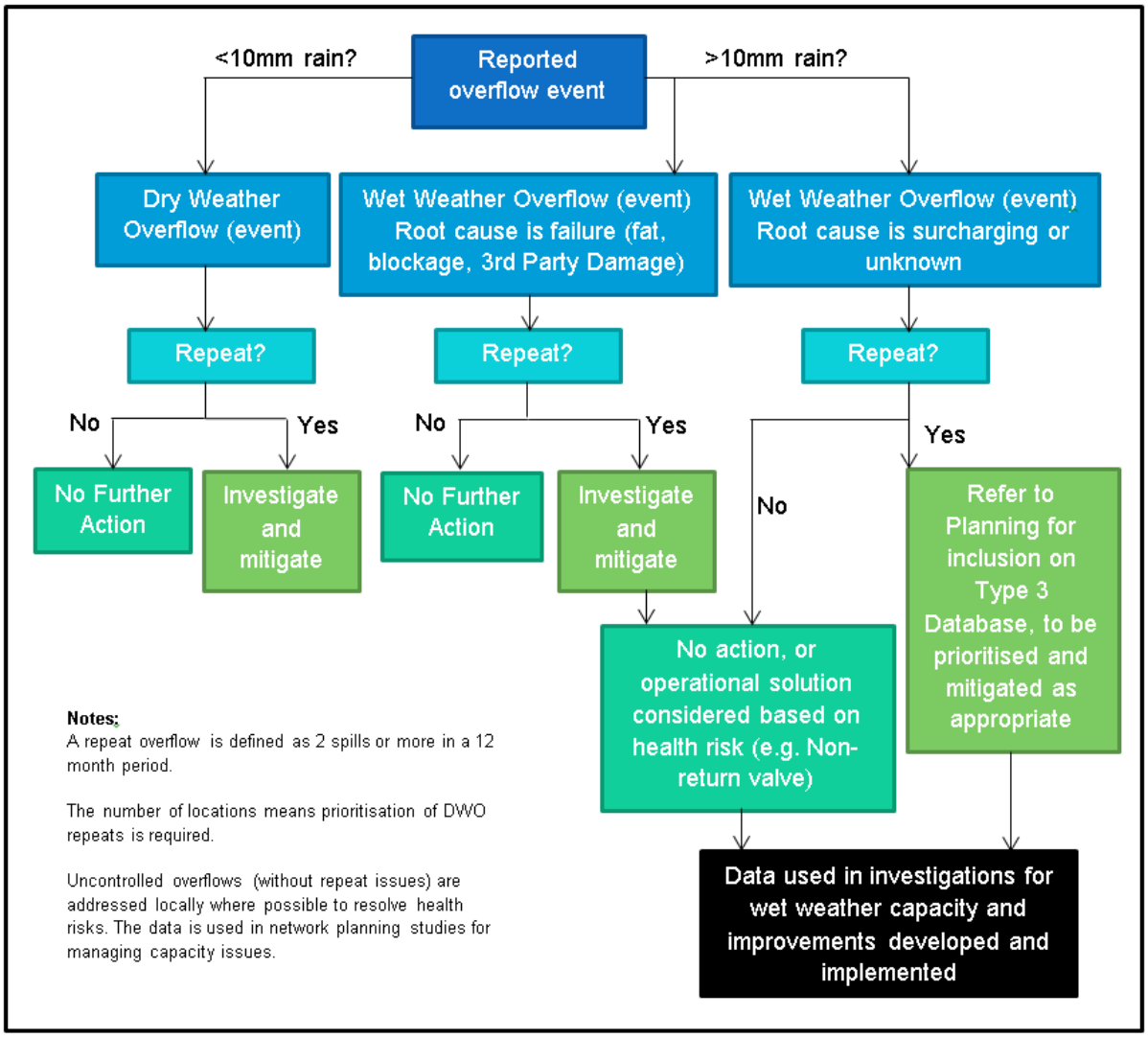
As well as developing new assets, Watercare is undertaking an Inflow & Infiltration programme that will identify sources of stormwater entering wastewater networks, including those from private property.

Work is being undertaken to educate the public on the causes of overflows and actions private property owners can take to reduce the frequency and volume of overflows. This is readily available on the Watercare website, and Watercare's customer newsletters include valuable information on how customers' actions can help to reduce the risk of overflows. For example, the Winter 2017 edition of the customer newsletter 'Tapped In' included a graphic covering information on the correct way to dispose of fat, and how the public affect the wastewater network. The newsletter was shared with media and gained coverage in national and local publications.

3 REPORTING AND DATA

3.1 Wastewater overflow reporting

Overflows from a wastewater network are distinguished on the basis of their primary cause as **Dry weather overflows** (DWOs) or **Wet weather overflows** (WWOs). Wastewater overflow reporting processes are outlined below.



A summary of repeat overflows is provided in Section Two in each catchment, with details of all reported incidents in Appendix 3.

3.1.1 Dry weather overflows

DWOs normally occur as the result of blockages, breakages or system breakdown such as a power failure at a pump station. Because dry weather overflows occur as the result of an unforeseen occurrence, they are by definition unpredictable and can happen anywhere in the system. These can occur on 'dry' or 'wet' days.

DWOs are classified in terms of severity of effects, with a Level 1 incident (spill) being minor and able to be contained and cleaned up. Level 5 incidents are classified as catastrophic, constituting a civil defence emergency. This can be found in the Definitions Chapter of Section Three.

Type 1 EOPs – Pump station overflows

Overflow events at Type 1 EOPs (pump stations and storage tanks) are detected by telemetry devices. Watercare's maintenance contractors receive notification of alarms and respond immediately, with high level alarms providing early warnings prior to the overflow occurring. Pump station alarms can also be the result of a localised or general power failure.

The majority of pump stations have a minimum of 4 hours' storage to allow maintenance contractors to respond to failures without discharging to the environment. In some instances of widespread system failure, this cannot be achieved at all locations.

Type 2 EOPs – Network relief overflows

Dry weather overflows from Type 2 EOPs are typically notified by members of the public or network maintenance staff.

Reported incidents - Uncontrolled spills

DWOs from manholes are reported to Watercare by members of the public or network maintenance staff.

DWO information reported on includes the following:

Identification Details:	
Date	The date on which the overflow was notified.
Compkey / Asset ID	This is the unique code used to identify the asset in Watercare's asset database.
Facility	Wastewater overflows normally occur at three types of facilities: Type 1 - Pump stations (or the storage tanks associated with pump stations); Type 2 - Engineered structures in the network of pipes that are purpose built to let wastewater overflow, usually to the stormwater system; Uncontrolled spills – Manholes and gully traps. DWOs normally discharge from manholes.
Address	The street address at or closest to the overflow location.
Overflow Characteristics:	
Incident level	The incident level is determined by the Watercare incident controller in accordance with the procedures set out in the *Wastewater Overflow Regional Response Manual* (Auckland Council and Watercare, 2013): Level 1 – Spill Level 2 – Minor Overflow Level 3 – Significant Overflow Level 4 – Major Overflow Level 5 – Catastrophe
Start Time	The time at which the overflow was reported to Watercare (24 hour clock).
End Time	The time at which the job was closed off on the reporting system (24 hour clock).

Overflow Characteristics:	
Job Duration (minutes)	Length of time to resolve the job. Type 2 and uncontrolled DWOs are calculated based upon the time the call was logged to when the job was completed, inclusive of containment / unblocking and clean up, and closed on the system. This can result in large durations and does not reflect the period of the actual overflow. Type 1 DWOs spill durations are based on the telemetered data.
Cause	The causes of DWOs are generally well established as one of the following: • Roots • Fat • Foreign Object • Third party damage • Silts • Rubbish • Surcharging • Broken pipe • Unknown Where a contributing factor isn't identified "Unknown" is logged.
Rainfall	The daily rainfall in the general area. This is not always able to account for localised rainfall events. This also does not always account for incidents identified or occurring after days of heavy rain.
Repeat Overflow	A repeat overflow is one that occurs more than once at the same location within a 12 month period. This may indicate a network issue which requires further investigation. This is reported as a YES or NO.
Overflow Management:	
Receiving Environment	For Level 1 overflow incidents, the receiving environment is always 'Land'. Level 2 and above incidents are those where the overflow has entered a water body, either directly or via the stormwater system. In these cases, the receiving environment is 'Water'.
Public Health Risk	A public health risk potentially only applies in incidents of Level 2 and above, where wastewater isn't contained onsite. This is reported as YES or NO.
Ecological Risk	An ecological health risk potentially only applies in incidents of Level 2 and above. Where wastewater isn't contained onsite. This is reported as YES or NO.
Monitoring	Monitoring refers to monitoring of the overflow, meaning that in some instances the overflow location will be re-visited to ensure that the overflow has ceased and been responded to in accordance with established procedure. Under the terms of the *Wastewater Overflow Regional Response Manual,* Watercare does not carry out environmental monitoring other than the assessment of ammonia levels through the use of a handheld device (see below).
Monitoring Location	The monitoring location is the same as the overflow location.
Ammonia Result (100 m downstream)	For Level 2 and above incidents where the overflow has entered a water body, the incident controller will assess ammonia levels through the use of a handheld device to determine the incident level.
Containment	This is reported as YES or NO. Level 1 incidents are always contained and cleaned up. Containment for Level 2 and above incidents may not be possible or appropriate, depending on the circumstances.
Repeat Overflow Prevention Measures	If the overflow is a repeat overflow, Watercare will investigate options to address this.

3.1.2 Wet weather overflows

WWOs typically occur at EOPs designed for this purpose. As outlined above, there are two types of EOPs:

- Type 1 EOPs are overflow structures (with telemetry) associated with a pump station.
- Type 2 EOPs, also referred to as network relief points, can be found anywhere on the network, and are most common in the combined (or formerly combined) network. Watercare has telemetry devices at very few Type 2 EOPs; accordingly, any data provided is not representative of the overall network system performance. It is also noted that combined sewers were designed to overflow frequently.

Occasionally, wastewater may also overflow at uncontrolled locations when a lack of hydraulic capacity in wet weather causes the wastewater system in an area to surcharge. These are termed Type 3 locations, and are identified through analysis of the overflow data and catchment studies.

WWO information reported on includes the following:

Identification Details:	
EOP ID	This is the unique code used to identify the Engineered Overflow Point in Watercare's EOP database.
Asset ID	This is the unique code used to identify the asset associated with the EOP in Watercare's asset database.
Facility	The name of the pump station or storage tank associated with the EOP.
Address	The street address at or closest to the EOP location.
Receiving Environment	The name of the receiving environment into which the discharge occurs. Because the Engineered Overflow Point is a permanent structure, this information is available from Watercare's EOP database (Schedule of EOPs in Appendix 1).
Overflow Event Characteristics:	
Date	The date on which the overflow occurred.
Start Time	The time at which the overflow was recorded by telemetry (24 hour clock).
End Time	The time at which the overflow ceased (24 hour clock).
Duration (mins)	The length of time over which the overflow occurred. Note this can be less than the start and end time of the overflow, as a WWO event is categorised by being separated by 24 hours, but the spill duration can be significantly less.
Rainfall	The daily rainfall in the general area. This is not always able to account for localised rainfall events.
Engineered Overflow Point Characteristics:	
Number of overflows	The total number of overflows that occurred at the EOP over the reporting period.
Public Health Risk	This is reported as YES or NO and is dependent on the classification and public health risk profile of the receiving environment. For example, if a receiving environment is categorised as a Class 1 recreational receiving environment (such as a swimming beach), a public health risk is deemed to exist.

Engineered Overflow Point Characteristics:	
Ecological Risk	This is reported as YES or NO and is dependent on the classification and ecological risk profile of the receiving environment. For example, if a receiving environment is categorised as a Class 1 ecological receiving environment (such as a stream with high water quality), an ecological risk is deemed to exist.
Improvement Works	This is information about any works that may be in progress or planned that are expected to reduce wet weather overflows at this location.

3.2 Inflow and Infiltration programme reporting

Conditions 47 to 49 of the NDC address the management and control of I&I:

47. The Consent Holder shall establish an ongoing programme to investigate the extent of I&I within the wastewater network, and identify where specific I&I remedial works are likely to reduce wastewater overflows.

48. The Consent Holder shall undertake specific I&I remedial works identified through the wastewater network I&I programme required under condition 47 within two years of the specific remedial works being identified.

49. The Annual Network Performance Report required under condition 57 shall include reporting on the wastewater network I&I programme, and any specific remedial works.

Since local government amalgamation in 2010, Watercare has undertaken local I&I investigations, and these are noted in Section Two of this report.

3.3 Erosion protection / Control reporting

Rule 5.5.10 (vi) (2) of the Air, Land and Water Plan requires that erosion control is provided for all outfall structures that may cause scour or erosion. Watercare routinely provides erosion protection for the structures it owns, including those in the combined wastewater network. In some cases wastewater overflows discharge to Auckland Council's stormwater network, being the most practical option. Wastewater is a small component of the combined flows within the stormwater network.

3.4 Improvement works programme reporting

Watercare's NDC application included information about planned wastewater network improvement projects aimed at reducing wastewater overflows. Such projects also include specific investigation, planning, and modelling projects, as these are an integral part and necessary precursor of any large-scale capital projects. This Annual Performance Report outlines the progress of the projects identified, as well as noting any new projects that have been committed to during the reporting year. This information is provided in Section Two for each catchment.

3.5 Schedule of Engineered Overflow Points

Condition 56 of the NDC requires the annual revision of Watercare's Schedule of EOPs:

1. The Consent Holder shall, on an annual basis, update the Schedule of Engineered overflow points (Attachment 2) to identify the following:
   a. Any further engineered overflow points identified by the Consent Holder within the existing network not already listed in Attachment 2. Once identified, these further engineered overflow points become subject to this consent;

b. *Any engineered overflow points that have been decommissioned and are no longer subject to this consent and are therefore to be deleted;*
c. *Any new engineered overflow points within the existing network authorised under conditions 24, 26 or 27;*
d. *Any new engineered overflow points within a future network authorised under conditions 30 or 31.*
e. *Any engineered overflow points previously authorised by another consent that has been included in this comprehensive discharge permit.*

The updated Schedule of EOPs, current as of June 2018, is provided in Appendix 1.

4 SUMMARY

4.1 Reported incidents

The 2018-19 period had more reported wastewater overflow incidents and more Dry Weather Overflow events (Level 3 and above) when compared to the 2017-18 reporting period.

The below table summarises the key indicators of wastewater network performance over the last four reporting years. A breakdown of the reporting measures is appended for clarity.

Category	2014/15	2015/16	2016/17	2017/18	2018/19
Reported incidents	3,396	4,520	4,813	3,979	4,246
Number of DWO incidents Level 3 and above	36	43	51	52	76

Please note that the pipe length data supplied in 2018/19 APR may have changed due to data cleansing and change of the network over time.

Analysis of overflow data has identified fat, root intrusion and rubbish as the main causes of blockages and overflows, with 2016-17 having a larger portion caused by surcharging as a result of the extremely wet year. Rags were added as a notable cause of overflows due to the increasing presence of wipes and other non-degradable materials in the wastewater network.

Ongoing planned maintenance activities such as CCTV survey, root cutting and flushing continue as measures to reduce overflow events. Such maintenance also includes investigating, analysing and implementing measures to reduce the frequency of repeat uncontrolled overflows.

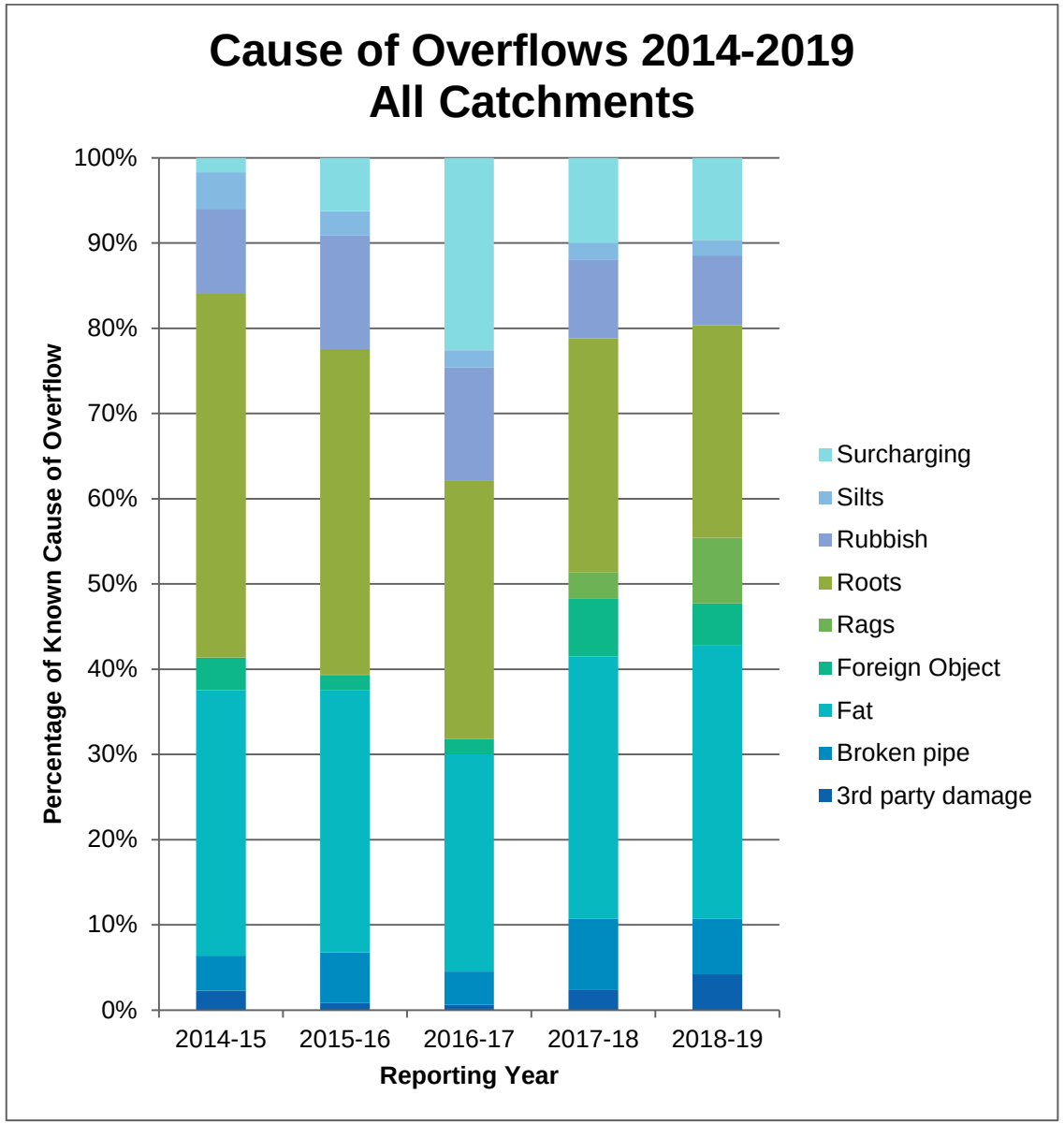
An education and awareness programme has been implemented and is made available to our customers via printed media attached to bills, as well as being on the Watercare website. Targeted programmes around disposal of fat and wet wipes continue.

4.1.1 Trend analysis across catchments

The table below shows the total network and transmission pipe length (km) and total reported incidents of uncontrolled overflows across all catchments from 2014-2019.

Geographic Catchment	2014-15			2015-16			2016-17			2017-18			2018-19		
	Total Pipe Length (km)	Reported Incidents	Ratio	Total Pipe Length (km)	Reported Incidents	Ratio	Total Pipe Length (km)	Reported Incidents	Ratio	Total Pipe Length (km)	Reported Incidents	Ratio	Total Pipe Length (km)	Reported Incidents	Ratio
1. Wellsford	26	10	0.39	26	18	0.69	27	12	0.45	29	11	0.38	29	9	0.31
2. Omaha	44	19	0.43	45	13	0.29	47	18	0.39	55	10	0.18	55	18	0.33
3. Warkworth	47	8	0.17	48	29	0.60	50	21	0.42	59	20	0.34	61	22	0.36
4. Snells Beach-Algies Bay	53	10	0.19	55	15	0.27	56	10	0.18	64	17	0.26	64	8	0.13
5. Waiwera	3	1	0.33	3	3	0.99	3	0	0	4	2	0.48	4	1	0.24
6. Helensville	30	11	0.36	30	14	0.46	31	29	0.95	36	14	0.39	36	24	0.66
7. HBC-Orewa	132	38	0.29	147	60	0.41	155	50	0.32	187	39	0.21	191	42	0.22
8. HBC-Weiti	39	8	0.21	39	14	0.36	39	16	0.41	45	20	0.44	46	24	0.52
9. HBC-Whangaparaoa	270	99	0.37	274	95	0.35	276	100	0.36	318	89	0.28	322	88	0.27
10. Long Bay	61	13	0.23	63	28	0.47	65	30	0.46	81	24	0.31	81	33	0.41
11. East Coast Bays	489	372	0.82	489	353	0.78	489	350	0.72	597	349	0.62	561	331	0.59
12. Devonport-Takapuna	38	38	1.09	38	22	0.63	38	26	0.68	48	11	0.25	45	26	0.58
13. Shoal Bay	277	151	0.60	277	214	0.84	277	204	0.74	338	182	0.58	315	204	0.65
14. Upper Harbour North	302	90	0.33	307	95	0.34	311	109	0.35	368	106	0.31	345	146	0.42
15. Upper Harbour South	219	108	0.53	219	147	0.72	220	139	0.63	260	110	0.45	244	144	0.59
16. Upper Harbour West	74	8	0.12	80	19	0.25	112	25	0.22	117	28	0.25	117	35	0.30
17. Henderson Creek	727	344	0.50	730	459	0.66	732	445	0.61	893	316	0.37	866	366	0.42
18. Whau River	349	365	1.11	349	304	0.92	349	260	0.75	405	199	0.52	387	228	0.59
19. Laingholm	103	22	0.22	103	45	0.45	104	42	0.41	125	42	0.35	120	52	0.43
20. Cox's Bay	96	51	0.57	96	67	0.75	96	70	0.73	97	55	0.61	90	76	0.84
21. Central Auckland (CBD)	116	56	0.52	116	106	0.99	117	101	0.87	120	72	0.65	111	86	0.78
22. Hobson Bay	429	211	0.52	431	325	0.80	432	348	0.81	436	329	0.80	412	301	0.73

Geographic Catchment	2014-15			2015-16			2016-17			2017-18			2018-19		
	Total Pipe Length (km)	Reported Incidents	Ratio	Total Pipe Length (km)	Reported Incidents	Ratio	Total Pipe Length (km)	Reported Incidents	Ratio	Total Pipe Length (km)	Reported Incidents	Ratio	Total Pipe Length (km)	Reported Incidents	Ratio
23. Onehunga	254	99	0.42	254	173	0.73	255	184	0.72	258	131	0.54	242	159	0.66
24. Mangere	304	158	0.58	305	217	0.79	307	212	0.69	354	143	0.44	325	171	0.53
25. Lower Tamaki River	303	236	0.82	304	212	0.73	307	288	0.94	327	216	0.69	314	218	0.69
26. Upper Tamaki River	1035	534	0.55	1039	557	0.57	1061	687	0.65	1248	568	0.48	1203	536	0.45
27. Cockle Bay	104	61	0.61	104	35	0.35	104	53	0.51	123	44	0.37	119	45	0.38
28. Puhinui	372	176	0.51	368	218	0.63	375	233	0.62	446	193	0.46	427	184	0.43
29. Pahurehure Inlet	548	164	0.32	558	149	0.28	565	179	0.32	626	151	0.25	608	178	0.29
30. Oneroa	3	0	0.00	3	0	0.00	3	1	0.32	3	0	0.00	3	0	0.00
31. Beachlands-Maraetai	70	23	0.33	73	13	0.18	78	18	0.23	89	16	0.18	92	16	0.17
32. Clarks Beach	15	4	0.26	15	4	0.26	16	8	0.51	16	3	0.19	16	9	0.56
33. Waiuku	59	17	0.29	59	24	0.41	59	15	0.25	59	29	0.49	59	21	0.35
34. Pukekohe	152	62	0.41	153	70	0.46	168	114	0.68	164	86	0.53	167	61	0.36
35. Kumeu/Huapai/Riverhead	47	2	0.04	53	14	0.27	59	14	0.24	71	6	0.08	76	16	0.21
36. Western Isthmus	617	238	0.41	618	395	0.68	619	402	0.65	625	348	0.59	589	368	0.63
Average across catchments	217	106	0.43	219	126	0.54	222	134	1	253	111	0.40	243	118	0.45
Total across catchments	7810	3807		7871	4526		8001	4813		9092	3979		8740	4246	


Cause of Overflows 2014-2019
All Catchments
Percentage of Known Cause of Overflow
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2014-15
2015-16
2016-17
2017-18
2018-19
Reporting Year
Surcharging
Silts
Rubbish
Roots
Rags
Foreign Object
Fat
Broken pipe
3rd party damage

4.2 Wet weather overflows

The table below shows the Type 1 EOPs (Pump Stations) network performance statistics for the last three reporting years. In contrast with dry-weather incidents (refer section 4.1), and likely driven by less rainfall than usual between January and June 2019, there were fewer wet weather overflows in 2018/19 than the previous reporting year. This table also shows the updated identification of Type 3 overflows. Type 2 (network relief) EOPs are not included in this summary, as these are typically not monitored.

Watercare has introduced a number of new reporting systems to ensure continual validation of discharges in the telemetered overflow network and uncontrolled overflows. This is resulting in an improved identification of issue locations, which is reflected in the increase in identified Type 3 locations.

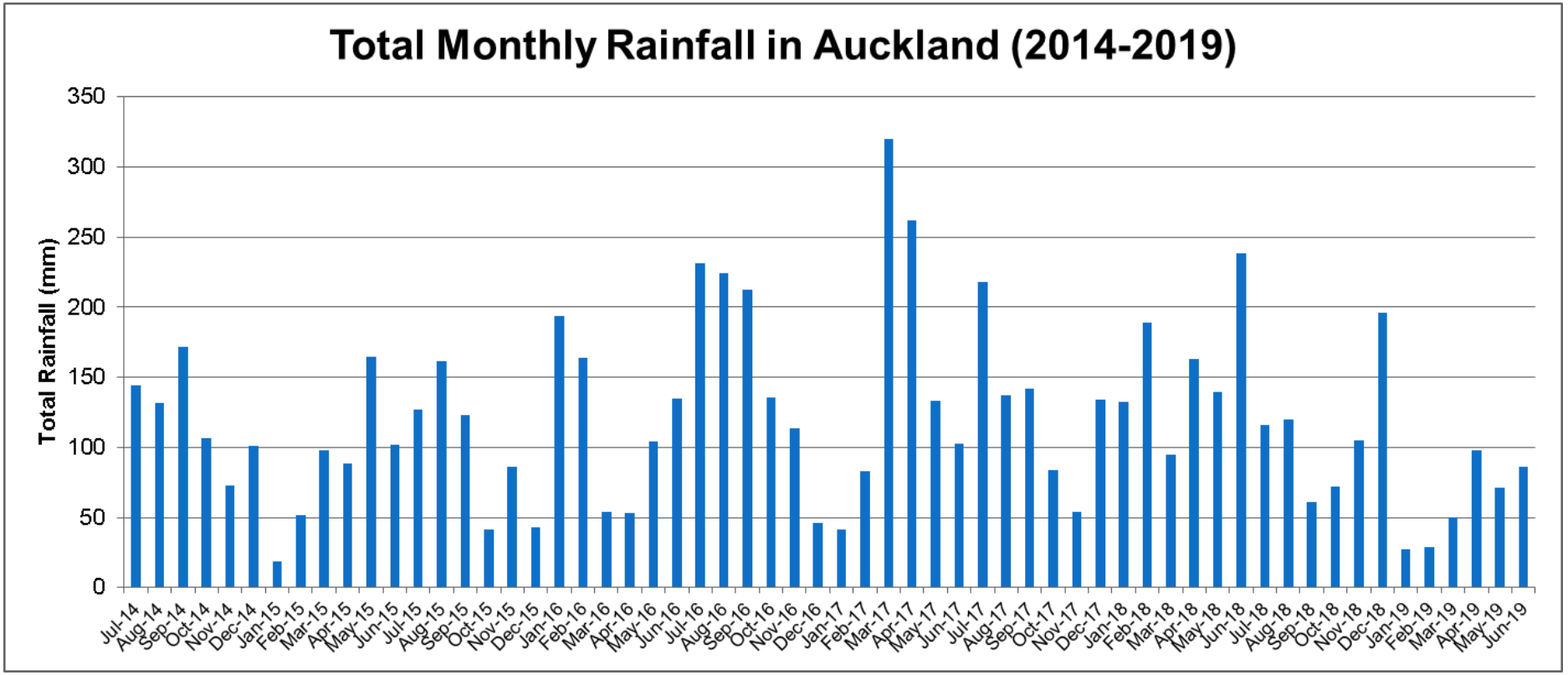
	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Number of Type 1 EOPs compliant with two spills/year*	n/a	375	371	366	374
Number of Type 1 EOPs exceeding two spills / year*	n/a	14	32	38	30
Number of Type 3 locations on register	29	35	56	52	46
Number of new Type 3 locations identified	-	9	24	2	0
Number of Type 3 locations resolved with project	-	1	3	6	10
Number of Type 3 locations mitigated (new EOP)	-	2	0	6	1

*This is based on a rolling average of 4 years of data only.

For further information on Type 3 locations, refer to Chapter 3 of Section 3, “Remediation of Uncontrolled Overflows”.

4.2.1 Rainfall data for during reporting periods

The graph below shows the monthly total of rainfall (mm), averaged from key rain gauges across Auckland from reporting periods 1/07/2014 –30/06/2019. The increase in rain during March and April of 2017 was due to high rainfall during the Tasman Tempest and following excessive storm events.

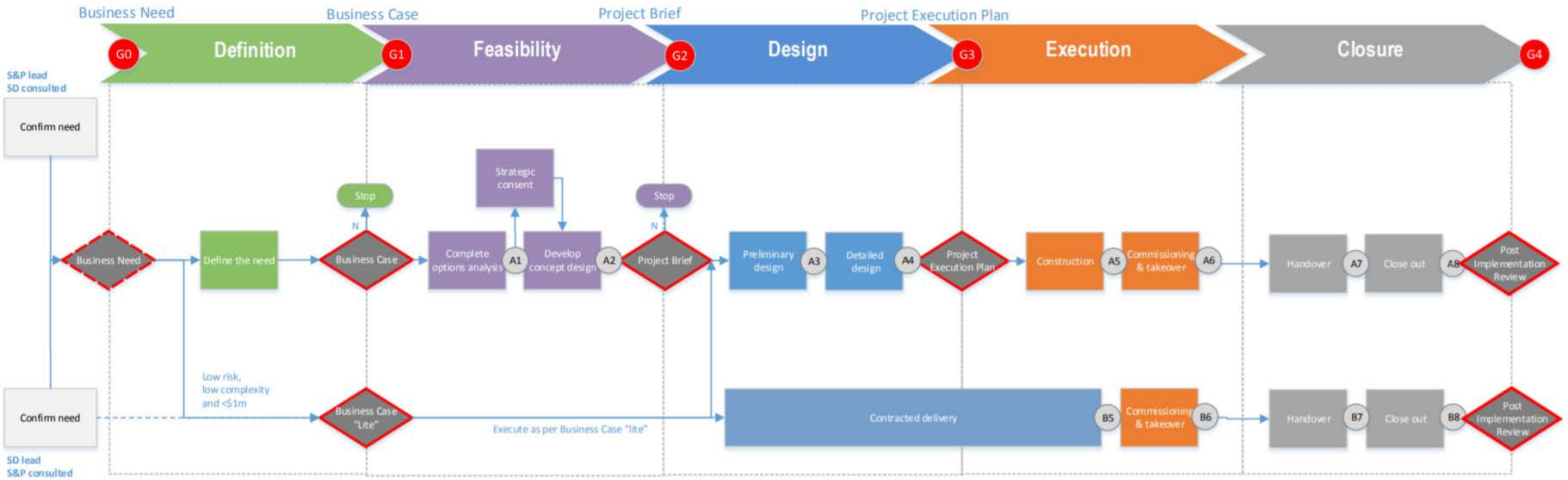


4.3 Improvement works programme

The table overleaf summarises the improvement works completed over the 2018/19 reporting year, as well as an update on significant network improvement works projects which have progressed this reporting year. This summary is limited to major works, with more detailed information on all improvements undertaken and planned for the next reporting year available in the catchment summaries.

The level of certainty in terms of scope, programme, costs and outcomes achieved for each project depends upon the stage of project development. The project stages are outlined in the figure below (Overview of the Project Management Framework). Projects in the Feasibility stage have the most uncertainty associated with them and accordingly have the highest risk of delays or scope changes. These risks decrease as the project progresses through the design and project execution stages. The proposed improvement works programme is therefore subject to change.

Overview of the Project Management Framework



Status	Project Name	Current Stage	Reason for Project	Anticipated Outcome	Timeframe (to project completion)	Catchment(s)
Underway	Alma WWPS Catchment Diversion (Formerly Forrest Hill Wastewater Catchment Diversion)	Options analysis (Feasibility)	Provide 1,100m of 310mm rising main, 60l/s pump station, 350m of 250/335mm rising main and 600m of 300/375/525mm gravity sewer	Improvement of the network, will address wet weather overflows at Alma St WWPS, and known Type 3 overflows within Forrest Hill catchment and cater for growth within Milford and Takapuna	2022-2024	East Coast Bays
Complete	Aotea Square Suspended Sewer Replacement	Closure	Like for like replacement of the 300mm suspended sewer due to poor condition of the existing pipeline		2019-2020	CBD
Closure	Army Bay WWTP outfall	Closure	Required to provide an alternative outfall for use during wet weather events	Will provide for growth and allow network restrictions related to WWTP constraints to be removed from trunk pump stations, reducing the risk of spills	2015-2019	Orewa, Weiti, Whangaparaoa
Underway	Army Bay WWTP Upgrade	Studies and investigations	Army Bay WWTP capacity increase to meet growth.	Cater for growth in the HBC, Whangaparaoa catchments	2020-2025	Orewa/Whangaparaoa
Underway	Central Interceptor – main works and link sewers	Project Execution	This project, as well as addressing numerous wet weather overflows, will also address the risk of failure of the Manukau siphon, and also provide for urban growth. To address growth, level of service, and asset condition risks	The Central Interceptor will have multiple and widespread benefits through immediate improvements in wet weather overflow frequency and enabling upgrades for growth and level of service upgrades through the isthmus	2017-2025	Multiple (Whau River, Western Isthmus, Cox's Bay, CBD, Onehunga)
Underway	Drury South Trunk Sewer Development	Concept Design	130l/s package pump station and 1,110m3 storage, approximately 1.5km of 450mm gravity sewer and dual rising main approximately 1km.	Provide additional wastewater capacity in Drury South	2019-2020	Pahurehure Inlet

Status	Project Name	Current Stage	Reason for Project	Anticipated Outcome	Timeframe (to project completion)	Catchment(s)
Underway	Drury West Trunk Sewer Development	Project Execution	Provide wastewater service to the Bremner Road/Auranga development and Drury West	Provide additional wastewater capacity in Drury West	2017-2018	Pahurehure Inlet
Underway	East Coast Bays branch sewer upgrade	Project Execution	Wet weather overflows in existing and future scenarios, and assets in poor condition	Reduces overflow volume/ frequency and allows for growth	2015-2021	East Coast Bays
Complete	Franklin Road, Collingwood Street Targeted Wastewater Separation	Closure	This area is combined and the existing network is in poor condition. Separation will reduce the flows to the EOPs. The network will also be rehabilitated to ensure low I&I in future	The proposal will provide for growth, remove two EOPs (185 and 182) and significantly reduce wet weather overflows from EOP 183	2018	CBD
Complete	Fred Thomas Drive WWPS and storage tank	Closure	Project will address performance and reliability at EOP 852. This project will enable projects (Northboro WWPS upgrade and others) to commence	Will reduce overflow frequency at EOP852 and enable future growth and future projects in upstream catchment to address performance at EOP860	2017	Devonport / Takapuna, Shoal Bay
Underway	Glendowie Branch Sewer Upgrade	Project Execution	Overflows from the Point England pump station, and network overflows exceed two spills per year and this is predicted to increase over time as a result of growth in catchment	Reduced frequency of wet weather overflows at EOPs 188, 189, and 681	2012-2020	Lower Tamaki River, Upper Tamaki River
Underway	Hackett Street EOP - New Access Shaft	Design	New Access Shaft to be installed	To remove access and safety issues	2019-2020	CBD
Complete	Henderson Valley Road Diversion	Closure	Repeat wet weather overflow area due to capacity restraints	Diversion of network to a separate line with capacity to handle wet weather flow. This will reduce the frequency of overflows.	2018	Henderson Creek
Underway	Hingaia WWPS and Storage Upgrade	Design	Major greenfield growth is projected in the Southern region, with significant development progressing the short term in the Hingaia area which needs to be serviced	Provide capacity for immediate growth without increasing wet weather overflows	Before 2022	Pahurehure Inlet

Status	Project Name	Current Stage	Reason for Project	Anticipated Outcome	Timeframe (to project completion)	Catchment(s)
Underway	Howick Diversion/Catchment Upgrades and Manukau North local wastewater network improvements	Studies and Investigations	Several overflows from the Howick catchment currently exceed two spills per year from both controlled and uncontrolled locations. This will increase with predicted growth	Expected to reduce overflows in this catchment to less than two per year for current and future flows.	2021-2025	Upper Tamaki River
Underway	Lawsons Creek Branch Sewer Duplication	Project Execution	Lawsons Creek Branch Sewer duplication to cater for growth in West Harbour	Reduces overflow volume/ frequency and allows for growth	2017-2020	Henderson Creek
Underway	Manukau West upgrades	Variable	Known Type 3 issue locations were identified under this study. A large suite of isolated upgrades were identified to be progressively implemented	Address Type 3 overflows S1 to S5 inclusive) for current and future flows	2017-2025	Mangere, Upper Tamaki River
Complete	Massey and Swanson siphon upgrades	Closure	These are critical assets with a high risk of failure, and require additional capacity to address growth and levels of service	Will reduce risk of asset failure and address Type 3 overflows	2012-2019	Henderson Creek
Underway	Network improvements – Mellons Bay	Option analysis (Feasibility)	Type 3 overflows have been identified in this location	Along with I&I remediation, network changes to mitigate wet weather overflows	2019-2022	Cockle Bay
Complete	New gravity sewerage in Wynyard Quarter	Design and Execution	The sewers are in poor condition, with high I&I and tidal ingress. Flat grades have also resulted in operational issues	Reduced overflow frequency and volume at EOP659, and reduced risk of uncontrolled spills from the network	2019-2022	CBD
Underway	North Shore Transmission Control Upgrade	Project Execution	Upgrade of electrical and control systems of 20 wastewater Transmission sites	Reduction of uncontrolled wet weather overflows from MH10 Chatswood Branch Sewer and EOP 830 at MH1 Northcote Point Branch Sewer	2017-2019	Rosedale SMA8
Complete	Northcote Branch Sewer (DSNCT) Upgrade Works (formerly TS8)	Closure	Required to maintain service delivery and to reduce the risk of failure	Will provide for growth in the contributing wastewater catchments and allow for an improved level of service	2011-2020	Shoal Bay
Underway	Northcote-Chatswood Wastewater Network Upgrades (Chelsea Pump Station)	Option analysis (Feasibility)	Provide 60l/s pump station, 900m of 315mm rising main and 700m of 450mm gravity sewer	Increase capacity and reduce uncontrolled overflows	2020-2023	Shoal Bay

Status	Project Name	Current Stage	Reason for Project	Anticipated Outcome	Timeframe (to project completion)	Catchment(s)
Underway	Northern Interceptor - Stage 1	Project Execution	To allow wastewater flows to be diverted from the Northern Strategic Growth Area (NorSGA) and South Rodney (Kumeu / Huapai/Riverhead) to the Rosedale wastewater treatment plant. This balances flows at the treatment plants and provides additional capacity to the Western Interceptor	This project is required to service greenfield growth and avoid capacity-related dry weather overflows. Will reduce the load on the Western Interceptor and also reduce Type 3 overflows S20, S21 and S24	2012-2021	Upper Harbour West, Kumeu/Huapai/Riverhead, Henderson Creek, Whau River
Underway	Okahu Bay Separation (Healthy Waters led) and WW upgrades	Design	To address wet weather overflows in the partially combined areas. Also includes additional wastewater upgrades required to ensure level of service outcomes are met	Is expected to reduce high overflow frequencies at EOPs 448, 453, 455, 456,457 and 696	2020	Hobson Bay
Complete	Oliver St WWPS catchment diversion	Closure	The Oliver St WWPS is undersized for the current contributing catchment, resulting in frequency wet weather overflows	Reduction in overflows from EOP 701	2015-2018	Western Isthmus (CI) catchment
Underway	Otara Catchment Capacity Upgrades	Design	Overflows from the Otara catchment currently exceed two spills per year from both controlled and uncontrolled locations	Expected to reduce overflows in Otara and address Type 3 overflows for current and future populations	2015-2023	Upper Tamaki River
Complete	Pakuranga pipe work replacement PS28	Closure	Upgrade of aging pipework at WWPS DPS028	Reduction of discharges of wastewater to the environment	2011-2017	Upper Tamaki River
Underway	Picton St, Anglesea St, Hepburn St, Collingwood Rd Separation and Sewer Rehabilitation	Optional analysis (Feasibility)	This area is combined and the existing network is in poor condition. Separation will reduce flows to the downstream EOPs. The network will also be rehabilitated to ensure low I&I in future	Will reduce the frequency of overflow EOP 183	2015-2020	CBD
Underway	Pukekohe Options Analysis	Options Analysis (Feasibility)	Solve capacity issues at Franklin PS and downstream of Jutland PS as well as to develop an understanding of works needed to convey flows from future growth (developer driven/Watercare requirements)	Improvement of the network, will address wet weather capacity issues at Franklin PS and increase capacity downstream of Jutland Road PS discharge. Understand future requirements to cater for growth within Pukekohe	2019-2023	Pukekohe
Complete	Pukekohe trunk sewer upgrade	Closure	Required in order to provide additional conveyance capacity to cater for the planned growth	Will improve the level of wastewater overflow performance and provide for growth	2013-2017	Pukekohe

Status	Project Name	Current Stage	Reason for Project	Anticipated Outcome	Timeframe (to project completion)	Catchment(s)
Complete	Pump station and rising main to service Wynyard Quarter	Closure	The capacity of the existing wastewater system servicing Wynyard Quarter is insufficient to cater for the proposed change in land use and associated growth	The new pump station will divert flows currently going to EOP 659, reducing overflows at that location and providing for growth	2014-2018	CBD
Underway	Queen St Diversion Sewer	Options Assessment	To address growth in the CBD area and the risk of aging assets in poor condition	Proposed to addressed asset risk and frequent discharges at EOP128	By 2025	CBD
Underway	Red Hills Wastewater Upgrade	Project Execution	Installation of transmission sewer and pump station to service growth	Ready for development by 2022-2026 with bulk wastewater services	2017-2020	Henderson Creek
Underway	Sidmouth WWPS upgrade	Project Execution	Wet weather overflows in existing and future scenarios, and assets in poor condition	Reduces overflow volume/ frequency for OF 854, OF855 and uncontrolled overflows and allows for growth	2012-2022	East Coast Bays
Underway	Tamaki redevelopment catchment upgrades	Options Assessment	There are known high frequency and volume EOPs in this catchment, and high growth with the proposed HNZ redevelopment	The preferred suite and timing of upgrades for this catchment to achieve reduced frequency of wet weather overflows at multiple EOPs and optimising the performance of the Glendowie branch sewer upgrade	2017-2024	Lower Tamaki River, Upper Tamaki River
Complete	Upper Glen Eden storage tank and branch sewer upgrade	Closure	Glen Eden branch sewer has insufficient capacity to convey flows during wet weather and has limited capacity for future growth	Reduction in volume and frequency of wet weather overflows, addresses numerous Type 3 overflows	2018	Henderson Creek
Underway	Wairau pump station (DPWAU) upgrades	Design	Reduce overflow frequency and risk to public health and environment, reduce risk of asset failure	Reduces overflow volume/ frequency for OF 951 and allows for growth and future improvements in multiple catchment	2022-2024	East Coast Bays, Devonport / Takapuna, Shoal Bay
Underway	Wairau pump station rising main upgrades	Project execution	Rising main failed and requires replacement. Will be upsized to increase capacity	Reduces risk of uncontrolled discharges due to asset failure	2017-2018	East Coast Bays, Devonport / Takapuna, Shoal Bay
Underway	Waiwera Diversion to Hatsfield	Design	Provide a 20l/s pump station, 2,100m of 180mm rising main and 2,500 of 250mm gravity sewer	Cater to growth in the area	2019-2022	Waiwera
Underway	Warkworth Growth Servicing	Options analysis (Feasibility)	Connection from Development, conveyance from Warkworth to Snells Beach	To cater for population growth	2020-2023	Warkworth

Status	Project Name	Current Stage	Reason for Project	Anticipated Outcome	Timeframe (to project completion)	Catchment(s)
Underway	Warkworth to Snells Transfer Pipeline	Design	Installation of a new conveyance sewer from Warkworth to Snells Wastewater Treatment Plant, including intermediate pump station	To cater for population growth	2017-2021	Warkworth
Underway	Wastewater Main Renewals and Lining Programme	Project Execution	Network wastewater pipe renewal at 38 sites	Upgraded network pipe condition	2015-2018	Albert-Eden, Devonport-Takapuna, Franklin, Great Barrier, Henderson-Massey, Hibiscus and Bays, Howick, Kaipatiki, Mangere-Otahuhu, Manurewa, Maungakiekie-Tamaki, Orakei, Otara-Papatoetoe, Papakura, Puketapapa, Rodney, Upper Harbour, Waiheke, Waitakere Ranges, Waitemata, Whau
Underway	Wastewater Transmission and Pump Station Renewal Programme	Project Execution	A programme of wastewater renewals including sewer relining, pump station internal pipework upgrades, switchboard upgrades, pipe bridge upgrades, and rising main upgrades	Upgraded network condition	On-going	Various Areas
Underway	Waterview Glade EOP Reinstatement and SMH Stabilisation	Design + Execution			2019-2020	Western Isthmus (Central Interceptor)
Underway	Western Isthmus Water Quality Improvement Programme - Avondale/Whau Wastewater Catchment Improvements	Studies and investigations	Programme of work to enable growth and reduce wet weather overflows	Reduces overflow volume/ frequency and allows for growth	2018-2023	Whau River, Western Isthmus (Central Interceptor)

Status	Project Name	Current Stage	Reason for Project	Anticipated Outcome	Timeframe (to project completion)	Catchment(s)
Underway	Western Isthmus Water Quality Improvement Programme - Grey Lynn Catchment Improvements	Studies and investigations	Programme of work to enable growth and reduce wet weather overflows	Reduces overflow volume/ frequency and allows for growth	2019-2026	Cox's Bay
Underway	Grey Lynn Wastewater Tunnel - Central Interceptor	Design	A new 4.5m (initial estimate only) diameter tunnel 1.6km long	Increased capacity and reduction in wet weather overflows at EOPs 244 and 246, and to facilitate future improvements in Grey Lynn catchment	Alignment with Central Interceptor	Western Isthmus (Central Interceptor)
Underway	Western Isthmus Water Quality Improvement Programme - St Marys Bay Wastewater Catchment Improvements	Execution	Programme of work to enable growth and reduce wet weather overflows	Reduces overflow volume/ frequency and allows for growth	2018-2023	CBD
Underway	Western Isthmus Water Quality Improvement Programme - Waterview North and South separation	Design / Option analysis (Feasibility) /	To address wet weather overflows in the partially combined areas. May require additional wastewater upgrades to ensure level of service outcomes are required	Is expected to reduce high overflow frequencies at EOPs 559, 561, 562, 566, 568, 568	2015-2023	Western Isthmus (CI) catchment
Underway	Western Isthmus Water Quality Improvement Programme - Herne Bay Wastewater Catchment Improvements	Studies and investigations	Programme of work to enable growth and reduce wet weather overflows	Reduces overflow volume/ frequency and allows for growth	2019-2026	Cox's Bay

Status	Project Name	Current Stage	Reason for Project	Anticipated Outcome	Timeframe (to project completion)	Catchment(s)
Underway	Whenuapai and Redhills Wastewater Scheme (Housing Infrastructure Fund)	Design	320L/s pump station located on Brigham Creek Road; 500mm diameter rising main 2km in length; 1,800mm diameter, 1km long gravity pipeline to link under SH18 linking into the Northern Interceptor, 1km in length; 2,100mm diameter tunnel, 2.8km in length, between Westgate and Hobsonville. The alignment of the tunnel is alongside SH18 and forms part of the Northern Interceptor Scheme, which transfers conveying wastewater to the Rosedale WWTP. 315mm diameter rising main, 1.1km in length, to divert flow from Kumeu, Huapai, Riverhead and the existing Whenuapai township to the new pump station on Brigham Creek Road.	Ultimately the provision of trunk servicing capacity for north-west FUZ area - distinct from Northern interceptor	Before 2022	Upper Harbour West, Kumeu/Huapai/Riverhead

The following planning and modelling studies and investigations are also currently underway:

- Army Bay SMA wastewater model update and calibration (Orewa, Weiti, Whangaparaoa)
- Grey Lynn wastewater model update and calibration (Cox's Bay)
- Meola Reef wastewater model update and calibration (Cox's Bay, Western Isthmus)
- Oakley wastewater model update and calibration (Western Isthmus)
- Branch 1 and 2 wastewater model update and calibration (Hobson)
- Otara catchment option assessment (Upper Tamaki River)

Another key strand of Watercare's network improvement works includes regional renewals programmes. Renewal and replacement of assets can reduce wet weather overflows through reduction of I&I and through opportunistic upgrades where appropriate. Importantly, such works reduce the risk of Dry Weather Overflows as a result of asset failure.