THAMES COROMANDEL DISTRICT COUNCIL

ANNUAL REPORT

Comprehensive Stormwater Discharge Consents 2018 - 2020

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Introduction

Thames-Coromandel District Council holds eight Comprehensive Stormwater Discharge Consents:

- Thames Urban Area (Consent 122521)
- Pauanui Urban Area (Consent 105661)
- Coromandel Urban Area (Consent 105663)
- Tairua Urban Area (Consent 105664)
- Whitianga Urban Area (Consent 105665)
- Onemana Urban Area (Consent 105666)
- Whangamata Urban Area (Consent 105667)
- Thames Coast Urban Area (Consent 105668)

Condition 6 of each individual consent requires an Annual Report for the year ending 30th June by 30th September each year. The 2018-2019 Annual Report was not submitted and, as agreed with Waikato Regional Council, is included in this report which also includes the 2019-2020 Annual Report.

The numbering convention of this report aligns with the requirements of the Consent condition.

a) Summary of Procedures, Initiatives, and Implementation Methods

i. 2018-2019

Operational Procedures

Operational procedures are within each of the Operations and Maintenance Contracts. A new Roading Operations and Maintenance Contract came into effect in April 2019, bringing with it, new operational procedures. These procedures are outlined in Section f) of the Stormwater Management Plan.

Management Initiatives

There were no Management Initiatives implemented during the 2018-2019 financial year.

Implementation Methods

Not applicable for 2018-2019.

ii. 2019-2020

Operational Procedures

Operational procedures are within each of the Operations and Maintenance Contracts and are outlined in Section f) of the Stormwater Management Plan.

Management Initiatives

There were no Management Initiatives implemented during the 2019-2020 financial year.

Implementation Methods

Not applicable for 2019-2020.

iii. To be Implemented

Section h) contains a prioritised list of Actions and Management Initiatives for the 2020-2021 financial year.

b) Stormwater Infrastructure Works

i. 2018-2019

Major Works

- Sarah Avenue Stormwater Improvements – Installation of high capacity inlet structures, 1200 mm diameter culverts, and headwalls with flap gates.
- Whitianga Main Street Upgrade – Replacement of existing roading assets.

Developing Catchments

The current Catchment Management Plans are silent in terms of Developing Catchments. These are in the process of being completely re-written.

ii. 2019-2020

Major Works

- Williamson Park Stormwater Improvements – Installation of 1050 mm diameter culverts to increase the capacity and efficiency of the existing pipe network. This network discharges into the Williamson Park pond which is a treatment device.
- Coromandel Main Street Upgrade – Replacement of existing with upgraded pipes and installation of a stormwater treatment device to collect gross pollutants down to 5 mm.

Developing Catchments

The current Catchment Management Plans are silent in terms of Developing Catchments. These are in the process of being completely rewritten.

Proposed Infrastructure Works

- Port Road Stormwater Improvements – Replacement of the existing pipes and the installation of a stormwater treatment device to collect gross pollutants down to 5 mm.

c) Monitoring Summary

The current stormwater monitoring programme prepared by KTB Planning has identified 15 sites across the Peninsula to form the stormwater monitoring programme. Thirteen of the sites have been selected to ensure monitoring is focussed on high risk catchments and / or catchments that contain high risk activities. The other two sites have been selected at or near discharges from medium to low density residential areas to use as control sites.

The framework developed for the stormwater monitoring programme is based on carrying out the following assessments of the receiving environment at stormwater outlets:

- Visual inspection
- Sediment quality
- Ecosystem health.

The framework requires the visual inspection to be carried out during January and May every year, with the sediment quality and ecosystem health assessment scheduled four-yearly (beginning in 2014) during January / February.

The following is a summary of the latest assessments.

i. Visual Monitoring Results

2018-2019

No visual inspection was carried out in 2019.

2019-2020

The twice-yearly visual inspection was carried out during February and June of 2020. The report notes an overall improvement compared to previous inspections.

Sites with points to note from the inspections:

- Site 2, Sealey Street, Thames: improvement was noted in the February inspection with the channel being clear of sediment after the fitting of WaStop check valves that create a pulsed discharge during low flow periods. This was seen again during the June inspection.
- Site 5, Sheppard Avenue, Pauanui: bank on true RHS of pipe is eroding – four pipes were visible during February inspection, with six visible during the June inspection.
- Site 6, Whangarahi Stream, Wharf Road, Coromandel: minor scouring under the outlet noted after heavy rainfall event during June inspection [Note: the outfall discharges approximately 1 metre above the riverbed so some scouring is always present].
- Site 9, Moewai Road North, Whitianga: maintenance of drain noted around discharge points during June inspection.
- Site 13, Lindsey Road, Whangamata: ponding downstream of outfall due to build-up of material in channel noted during February inspection. Channel cleared by time of June inspection, but ponding remained.

Based on the observations provided in the report, it is recommended the erosion at the Sheppard Avenue, Pauanui outfall be further investigated to determine if action is required to stabilise the outlet.

The visual monitoring report is included as Appendix 6.

ii. Sediment Sampling Results

The four-yearly sediment sampling was carried out during February 2018. Samples were collected by Veolia staff and sent to R J Hill Laboratories Limited, Hamilton for analysis.

Analysis of the 2018 results suggests little change from the 2014 results.

Hydrocarbon results are only marginally changed in all sites with none of the sites exceeding the ISQG-High value for hydrocarbons and only a minor number at or above the ISQG-Low value (e.g. site 4, Fergusson Drive control site, Thames).

In terms of the metal analysis, significant changes are evident in Whangamata where sites previously recorded with values above ISQG-Low have returned results below the threshold. This is particularly the case for site 12, Aicken Road, Whangamata where values for recoverable lead and zinc are now below the ISQG-Low value, whereas in 2014 they were above. All sites in Thames other than site 3, Burke Street, demonstrate levels for arsenic between the ISQG-Low and ISQG-High values. Burke Street has an elevated arsenic level which is not unexpected given the site is the outfall for the Moanataiari Stream which drains the former epicentre for gold mining in Thames. Burke Street also demonstrates elevated levels of copper while all sites other than the Fergusson Drive control site demonstrate slightly elevated levels for recoverable nickel and lead. The one site in Coromandel (site 6) has levels for arsenic above the ISQG-Low value and this was also the case in 2014.

The laboratory report and a summary spreadsheet are included as Appendix 7.

iii. Ecological Assessment

The four-yearly ecological assessment was carried out during January 2018. The site surveys and assessment were conducted by Kessels Ecology Limited.

Analysis of the 2018 assessment suggests little change from the 2014 assessment.

Sites with points to note from the assessment:

- Site 2, Sealey Street, Thames: noted as being physically different from the 2014 survey in that the channel was clear of mud build up and debris, confirming the February 2020 visual inspection assessment.
- Site 4, Fergusson Street, Thames (control site): outlet structure was buried in sand so could not be sampled
- Site 5, Sheppard Avenue, Pauanui: bivalve shellfish not detected when had been during 2014 survey.
- Site 8, Marina Hardstand, Whitianga: fewer fauna species noted compared to 2014 survey.
- Site 9, Moewai Road North, Whitianga: water level in the drain was exceptionally low and there were slightly fewer invertebrate groups found compared with 2014. Site had changed dramatically since 2014 survey with vegetation overhanging stream channel having been removed.
- Site 10, Casement Road drain, Whangamata: similar to 2014 survey except fewer invertebrate species observed.
- Site 13, Lindsey Road, Whangamata: noted banks are eroding but unclear if due to active erosion or high rainfall event.

The surveys were carried out over two days and took place five days after a major storm event, in line with the recommendations of the 2014 report ('…future sampling should take place after at least 10-50 mm of rainfall, so that any ecological effects of stormwater discharge would be more obvious'). However, the 2018 assessment noted that, due to the catchments being 'flashy', discharges had already returned to low flow and, therefore, the effects of discharge are likely only present during actual rainfall events. On this basis, the 2018 report concludes it is not necessary to conduct surveys following rainfall events.

The report notes that it remains difficult to separate the ecological effects of stormwater discharge from the influence of tide and local habitat variation, however discharge effects appear to be minor. No effects of stormwater discharge on aquatic plants is evident. Macroinvertebrate presence is highly variable but is likely a reflection on the diversity present in the wider area or habitat available at the site, rather than the impacts of stormwater discharge. The report does note:

'Only severe changes in benthic fauna would be likely to be detected using the current survey technique.'

This seems to suggest another approach to carrying out ecological assessments may be required. TCDC has prepared a Draft Request for Proposal (see Appendix 9) with the intention to engage Tonkin + Taylor (or other suitably experienced consultant, should Tonkin + Taylor's offer be unacceptable) to develop a revised stormwater monitoring programme. This will be developed in consultation with, among others, Waikato Regional Council, as required by Condition 4 of the Comprehensive Stormwater Discharge Consents.

The ecological assessment report is included as Appendix 8.

d) Non-Routine Contaminant Discharge Incidents

i. 2018-2019

During the 2018-2019 year there were seven reports of pollution (see Stormwater Complaints in Appendix 2. Of these, two were non-routine contaminant discharge incidents:

- In October 2018 a bylaws officer noted a mix of oil and water in the drain outside an automotive business in Thames. This was assigned to a member of the water services team who is no longer employed by TCDC. There are no notes to identify the action taken. In March 2020 the Infrastructure Engineering Intern was asked to randomly visit this site and take photos to identify if there was any current issue. This was interrupted by COVID-19 lockdown and was picked up again in September 2020. Photos have indicated that a small amount of oil appears to be present in the catchpit. Veolia Water were issued with a request for service on 9 September to CCTV from the catchpit upstream to positively identify the source of the oil and downstream to determine if it is entering a receiving environment. The CCTV footage did not demonstrate any oil either upstream or downstream of the catchpit. The TCDC Field Representative for this area visited the business on 9 September 2020. The owners of the business were very receptive to the information provided by the Field Representative to aid them in improving their practices to prevent any oil and / or contaminants entering the stormwater system.
- In April 2019 a member of the public advised a concrete truck had washed down in the gutter on a residential street in Thames. It was determined concrete had entered stormwater drains and into a creek. Waikato Regional Council was involved in this incident.

ii. 2019-2020

There were no reports of pollution / non-routine contaminant discharges during the 2019-2020 year.

The issue with the October 2018 complaint has highlighted that the current standard operating procedures in the Stormwater Management Plan are insufficient to provide a clear understanding of how to proceed with a non-routine contaminant discharge incident and the amending of these procedures is required as a priority. Within Council, a multi-department response is required, and procedures will be developed to clarify roles (see Section h).

e) Summary of Level of Compliance with Conditions of Consent

The summary of the level of compliance with the conditions of this consent can be found in Appendix 1. The summary covers both the 2018/2019 and 2019/2020 periods.

f) Summary of Formal Complaints

The summary of formal complaints for 2018-2019 is found in Appendix 2. The summary of formal complaints for 2019-2020 is found in Appendix 3.

g) Updated Catchment Drawings

There have been no new stormwater diversion and discharge activities which have been certified as authorised by Waikato Regional Council in accordance with Schedule A, Condition 4 in the last two years. The updated Stormwater Management Plan includes catchment drawings updated to reflect subdivisions created since consents were issued in 2011.

h) Summary of Actions / Management Measures to be Implemented

The following actions / measures are planned to be implemented over the 2020/2021 year:

Action	Condition(s)	Priority
Commence re-write Catchment Management Plans	SA25	1
Update SOPs for managing non-routine contaminant discharge events (including potential for entering into MOU with WRC)	SA21	2
Stormwater Education brochure for businesses to be created (including at-source stormwater management measures)	SA23b	3
Internal education session to be run for members of asset management teams, building team, associated services, and their contractors on the requirements of the CSDCs	SA5	4
Create procedures to clarify roles regarding inspections and audits	SA23b	5
Guidance to be sought from Council on the enactment of a district-wide Stormwater Bylaw	SA22 / SA23f / SA30n	6
Guidance to be sought from Council on the enactment of a district-wide Trade Waste Bylaw	SA23b / SA30g	7
Formalise connection application procedure	SA22	8

The following actions / measures are planned to be implemented over the 2021/2022 year:

Action	Condition(s)	Priority
Stormwater Education brochure to be created to be sent out with rates notices in August 2021 (next rates notice that goes to all ratepayers)	SA5	1
Stormwater management device operations and maintenance documentation to be updated and incorporated into appropriate Operations and Maintenance Contract(s)	SA9 / SA18	2
Review Stormwater section of Code of Practice for Subdivision and Development and commence consultation process.	SA22 / SA28 / SA30n / SA30o	3
Reference WRCs Waikato Stormwater Management Guideline (TR2020/07) in updated Code of Practice (in conjunction with the above Code of Practice review)	SA30n	4
Finalise Stream Channel Maintenance Guidelines following feedback from WRC	SA30j	5
Complete re-write Catchment Management Plans	SA25	6
Write protocol for managing illicit wastewater connections when discovered	SA19	7

i) Other Relevant Matters

i. Identification of changes to stormwater networks since commencement of consents

The identification of changes to stormwater networks since the commencement of the comprehensive discharge consents can be found in Appendix 4.

ii. New stormwater activities in urbanised catchments

The information regarding stormwater activities in urbanised catchments since the commencement of the comprehensive discharge consents can be found in Appendix 5.

iii. Monitoring Programme Results

- Visual Inspections (required bi-annually) - carried out by Veolia in 2020, are located in Appendix 6.
- Sediment Sampling (required four yearly) - carried out by Veolia and analysed by Hills Laboratories in 2018 are located in Appendix 7.
- Ecological Assessment (required four yearly) - carried out by Kessel's Ecology in 2018, is located in Appendix 8.

iv. 2017/2018 Compliance Report Actions

Action	Update
Schedule A, Condition 2	See Appendix 4
Schedule A, Condition 4(a) and 4 (b)	See Appendix 5
Schedule A, Condition 22	See Stormwater Management Plan Section hiii)
Schedule A, Condition 23	See Stormwater Management Plan Section m)
Schedule A, Condition 28	See Stormwater Management Plan o)
Schedule A, Condition 29	See Stormwater Management Plan Appendix F
Schedule A, Condition 30	Stormwater Management Plan updated and submitted in conjunction with this Annual Report
Condition 4	• Monitoring Results: See Section c) and Appendices 6 - 8 • Draft Request for Proposal, including requirement for liaison with WRC created. To be issued to Tonkin + Taylor for a quote (see Appendix 9)
Condition 6	This Annual report, incorporating 2018/2019 and 2019/2020

Appendix 1: Summary of Level of Compliance

Each of the individual Comprehensive Stormwater Discharge Consents has Conditions as follows:

1) Schedule A
2) Stormwater diversion and discharge activities
3) Scope of the stormwater diversion and discharge activities authorised
4) Monitoring Programme (a – i)
5) Monitoring Results
6) Annual Report (a – i)

The first three are covered by other conditions within Schedule A (SA) and are therefore not reported on individually below. The Compliance columns incorporate a traffic light system as described below. Commentary is provided where required for clarification. Within Schedule A, the following conditions are statements and are covered by other condition(s), or are administrative and therefore not reported on individually below:

1) Design, structural integrity and maintenance of the stormwater network
2) Changes to the stormwater network
3) Best Practicable Option
20) Routine contaminant discharges into the stormwater network
32) Consent Holder's Representative
33) Review Clause
34) Administrative charges

Compliance for the following Conditions within Schedule A are "determined through the establishment and implementation of best practicable stormwater management measures that are adopted by, and implemented through, the Stormwater Management Plan required by Condition 30 of this consent" (Advice Note) and are therefore not reported on individually below:

6) Adverse stormwater quantity effects
11) Floatable contaminants
12) Suspended solids
13) Hazardous substances
14) Micro-organisms
15) Adverse effects on aquatic ecosystems

Historically, the difficulties in achieving compliance have been due to constraints on resources, staff turnover, and budget. In the latter part of the 2019-2020 year, when constraints eased, progress was complicated by COVID-19.

#	Condition	Compliance 2018/2019	Commentary	Compliance 2019/2020	Commentary
4	Monitoring Programme		Due to be updated 2016. Update yet to occur		See 2018/2019 Commentary
5	Monitoring Results		Results of visual inspections not provided by Contractor.		See Appendices 6-8
6	Annual Report		Annual report not submitted.		
SA4	Technical Certification		Technical certification has not been sought for new stormwater activities		This process has been carried out retrospectively and is submitted to WRC for technical certification See Appendix 4 and 5
SA5	Asset Management Activities		Departments with stormwater responsibilities (3Waters, Roading, and Parks & Reserves) are familiar with consent conditions. No evidence of solid waste and building team education		See Section h)
SA7	Addressing Adverse Stormwater Quantity Effects		No adverse quantity effects have been reported.		See 2018/2019 Commentary
SA8	Fish Passage		Reviewed as part of Ecological Monitoring required by Monitoring Programme.		See 2018/2019 Commentary
SA9	Stormwater Management Devices (Control Volume and / or peak rates of discharge)		Not all stormwater management devices have maintenance schedules within the respective contracts		See Section h)
SA10	Stream Channel Works		See Section 4.5 of Stormwater Management Plan November 2013		See Section j) Stormwater Management Plan 2020
SA16	Street and Stormwater catchpit cleaning operations		See Section f) Stormwater Management Plan 2020		See Section f) Stormwater Management Plan 2020
SA17	Stormwater Catchpits		TCDC's view is existing catchpits are capable of retaining the majority of gross pollutants. Floating contaminants are considered during capital works projects		See 2018/2019 Commentary
SA18	Stormwater Management Devices (treat contaminated stormwater)		Not all stormwater management devices have maintenance schedules within respective contracts		See Section h)

#	Condition	Compliance 2018/2019	Commentary	Compliance 2019/2020	Commentary
SA19	Illicit wastewater connections		No specific investigations carried out, however no reports of potential issues during this period		See 2018/2019 Commentary. Protocol to be written see Section h)
SA21	Non-routine contaminant discharges to/from the stormwater network		See Appendix D of Stormwater Management Plan dated November 2013. See Stormwater Complaints 2018-2019 Appendix 2.		See 2018/2019 Commentary.
SA22	New or replacement connections to the stormwater network		No stormwater bylaw		See Section hiii) of the Stormwater Management Plan. No stormwater bylaw see Section h)
SA23	Stormwater Quality Improvement Programme		Overdue for Update		See Stormwater Management Plan Section m)
SA24	Complaints Register		Complaints Register collated live in Pathway. See summary Appendix 2		See summary Appendix 3
SA25	Catchment Management Plans		There are approved catchment management plans, however they don't contain all requirements		See 2018/2019 Commentary. Catchment Management Plans are in the process of being re-written
SA26	Implementation of Catchment Management Plans		The only requirement within the Catchment Management Plans that are able to be implemented is monitoring (see Condition 5)		The only requirement within the Catchment Management Plans that is able to be implemented is monitoring (see Condition 5)
SA27	Waikato Regional Council guidelines for sustainable subdivision development		The concepts within the document are promoted however the document itself is not referred to (and is now out of date).		See 2018/2019 Commentary.
SA28	Low Impact Urban Design measures and stormwater management devices		Council have promoted hydraulic neutrality as a LIUD measure.		See 2018/2019 Commentary.
SA29	Register of stormwater management devices		Stormwater Management Devices recorded on GIS; however, this does not include all information required.		See 2018/2019 Commentary. See Appendix E Stormwater Management Plan 2020
SA30	Stormwater Management Plan		Stormwater Management Plan was due to be updated in 2017		Stormwater Management Plan was due to be updated in 2017
SA31	Implementation of the Stormwater Management Plan		Stormwater Management plan partly implemented		See 2018/2019 Commentary. Updated Stormwater Management Plan 2020 submitted in conjunction with this Annual Report

Appendix 2: Stormwater Complaints Summary 2018-2019

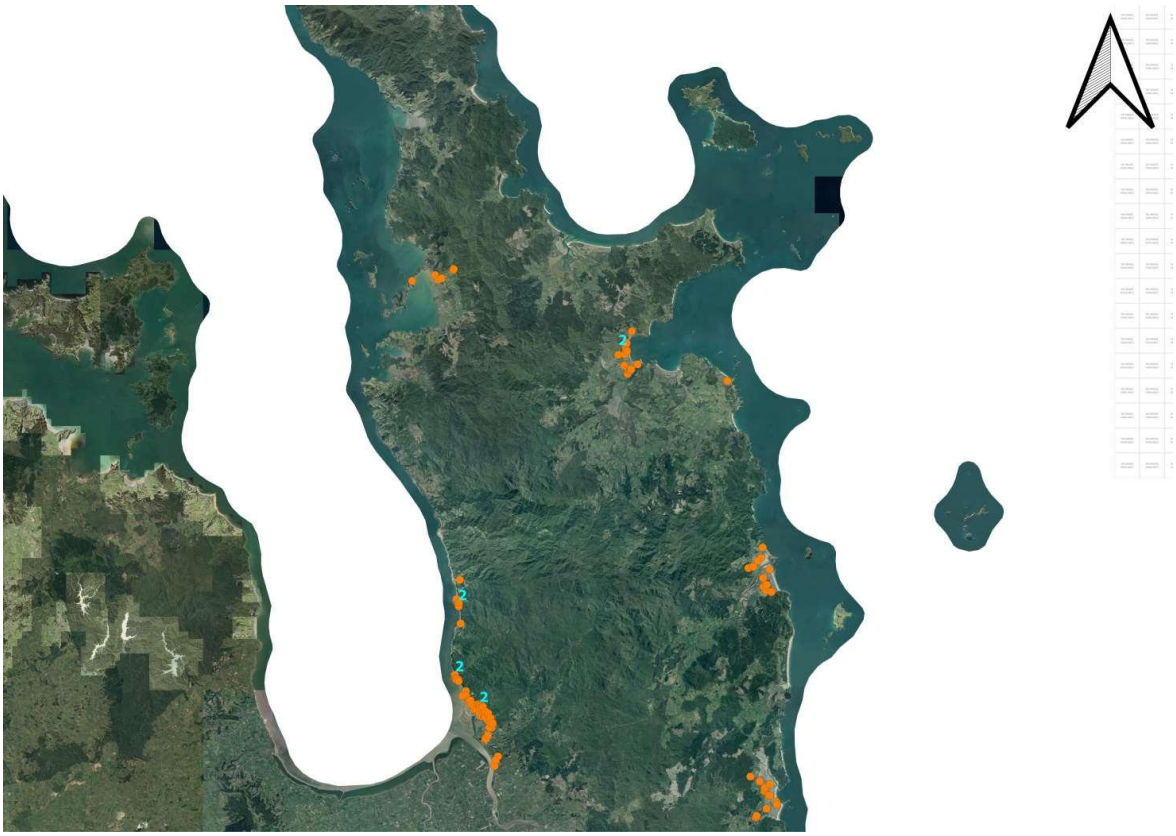
Section 24 of Schedule A (General Conditions of Comprehensive Stormwater Discharge Consents) requires all formal complaints received about the stormwater diversion and discharge activities authorised by these consents to be held in a register. Thames-Coromandel District Council's system for recording all complaints, notifications, and requests is the Request for Service (RFS) module in Pathway. The report below includes all requests for service that come to Council regarding Stormwater even though not all are formal complaints.

During the 2018-2019 year there were a total of 107 requests for service relating to stormwater within the Thames-Coromandel District Council urban areas serviced by Comprehensive Stormwater Discharge Consents.

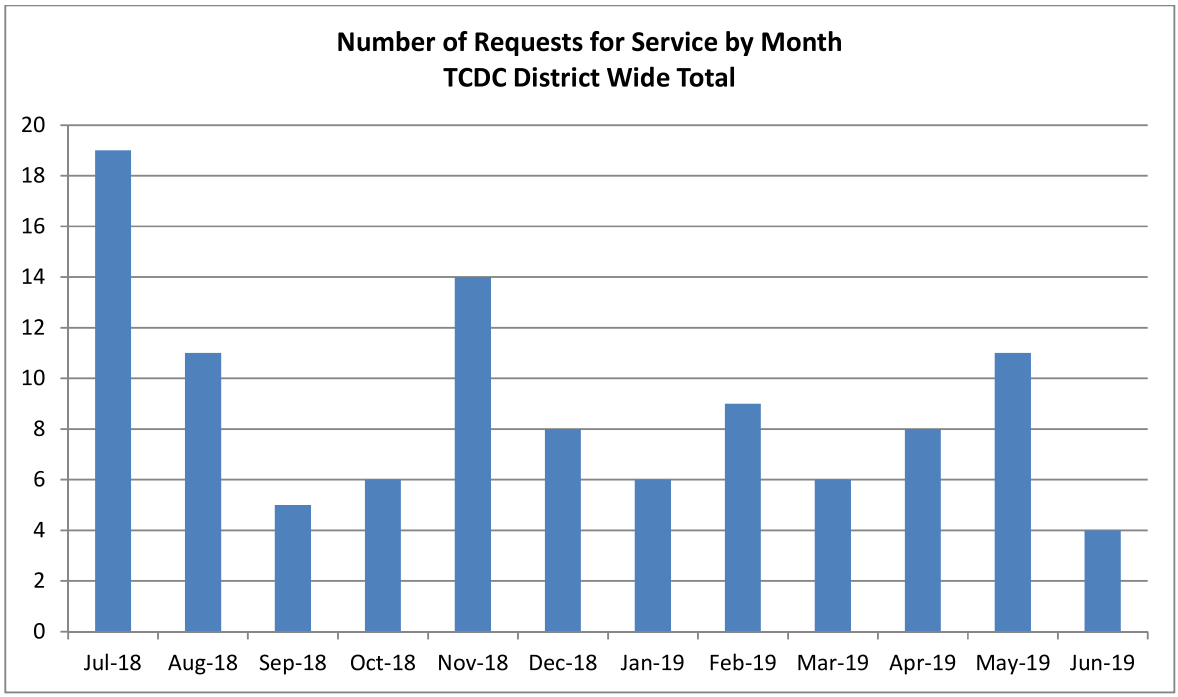
Requests are categorised as follows:

- Clear Stormwater Asset Request 42
- Stormwater Asset Leak 4
- Pollution Report 7
- Ponding / Flooding Private Land 11
- Ponding / Flooding Public Land 9
- Stormwater Asset Issue (e.g. manhole cover displaced, request to cover open drain) 33
- Third Party Damage 1

The location of all requests is shown in the map below.



The largest number of requests for service District Wide was received in July 2018 which coincided with a major storm event in the area.


Number of Requests for Service by Month
TCDC District Wide Total
20
18
16
14
12
10
8
6
4
2
0
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19

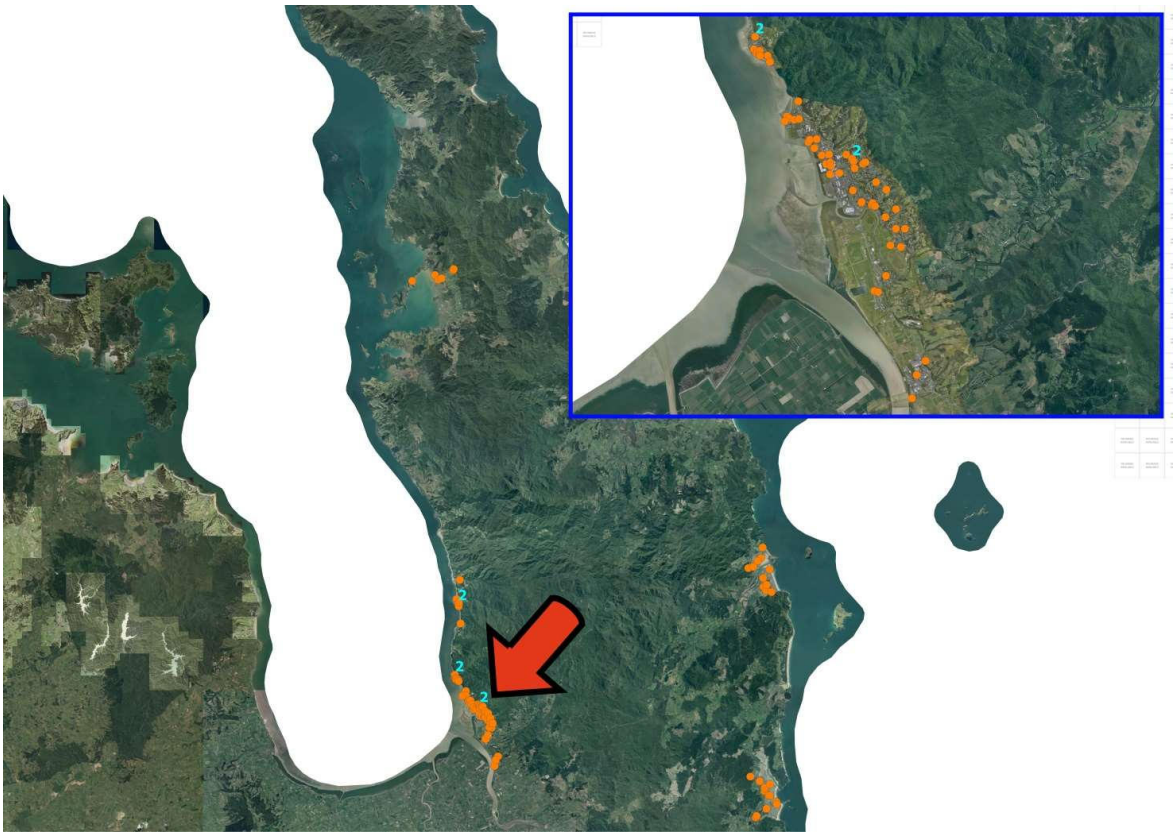
Comprehensive Stormwater Discharge Consent 122521 – Thames Urban Area

During the 2018-2019 year there were a total of 56 requests for service relating to stormwater within the Thames urban area.

Requests are categorised as follows:

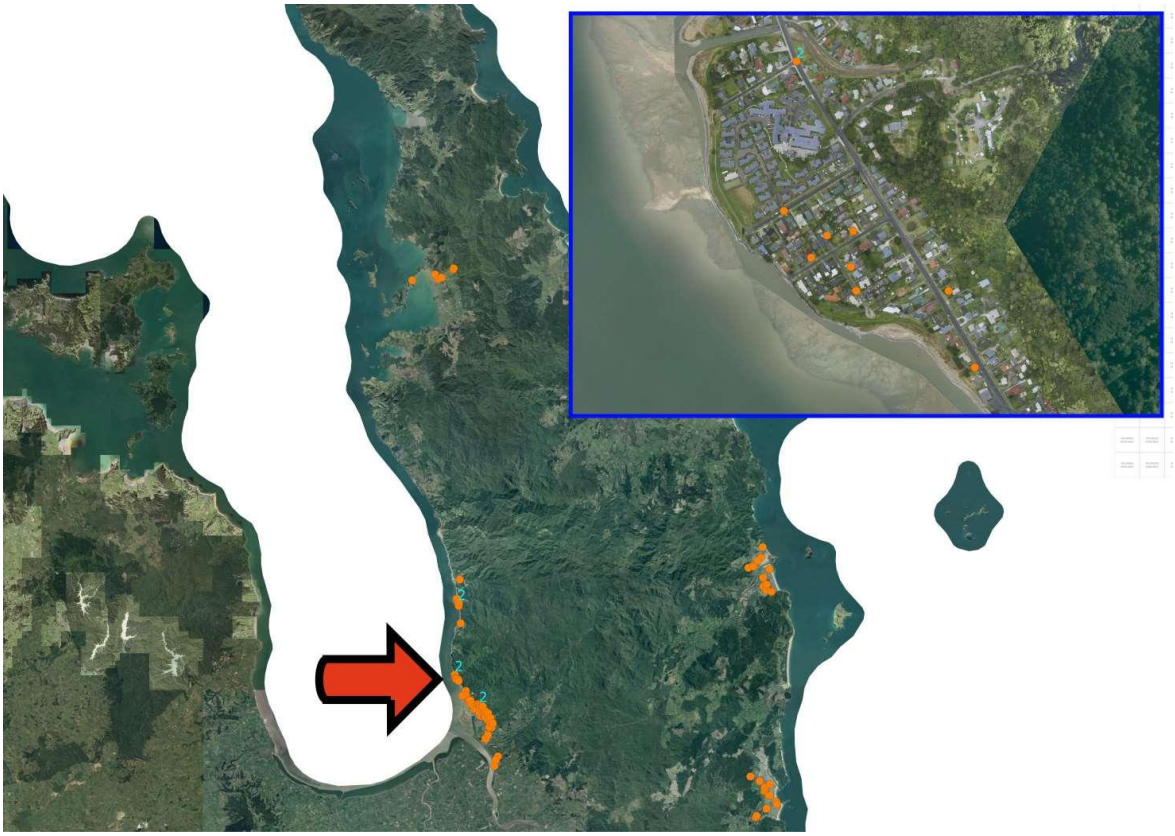
• Clear Stormwater Asset Request	20
• Stormwater Asset Leak	3
• Pollution Report	3
• Ponding / Flooding Private Land	5
• Ponding / Flooding Public Land	5
• Stormwater Asset Issue	19
• Third Party Damage	1

The location of each request for service is shown in the maps below.



The maps below show the spread of requests for service in the four catchment areas that the bulk of requests were received. The maps identify that the requests are spread throughout each catchment and do not demonstrate any particular area of concern.

Tararu



There were two requests from the same address during this period, however they related to separate assets. The first refers to a stormwater outlet on the sand just down from the ratepayer's address (Asset ID 303395) where a child could climb into the exit point with overflow flap. A splitter bar to halve the hole size was made and installed. The second related to storm damage to a stormwater pipe (Asset ID 407052) in October 2018. Permanent repairs were completed early November.

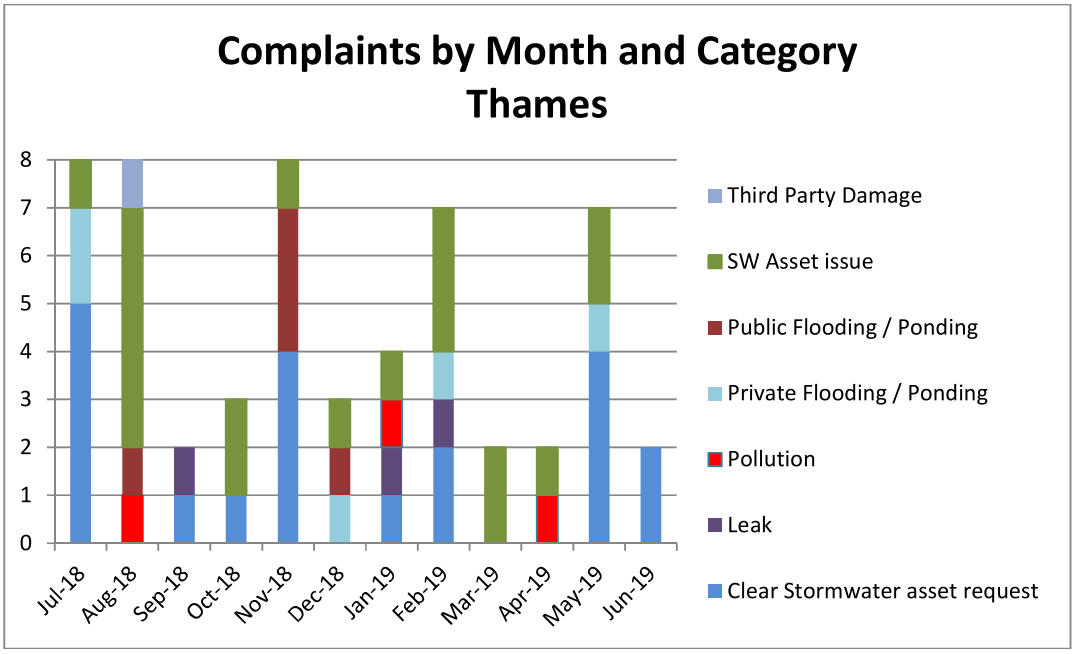
Thames North

Thames Central

The two requests at the same address (414B Sandes Street) both relate to the ratepayer requesting a stormwater pipe to be installed alongside his property. This has been added to the Capital Projects list for consideration and budget.

Thames South

The graph below outlines the categories of stormwater requests for service by month for the Thames urban area throughout the 2018-2019 year.



Comprehensive Stormwater Discharge Consent 105661 – Pauanui

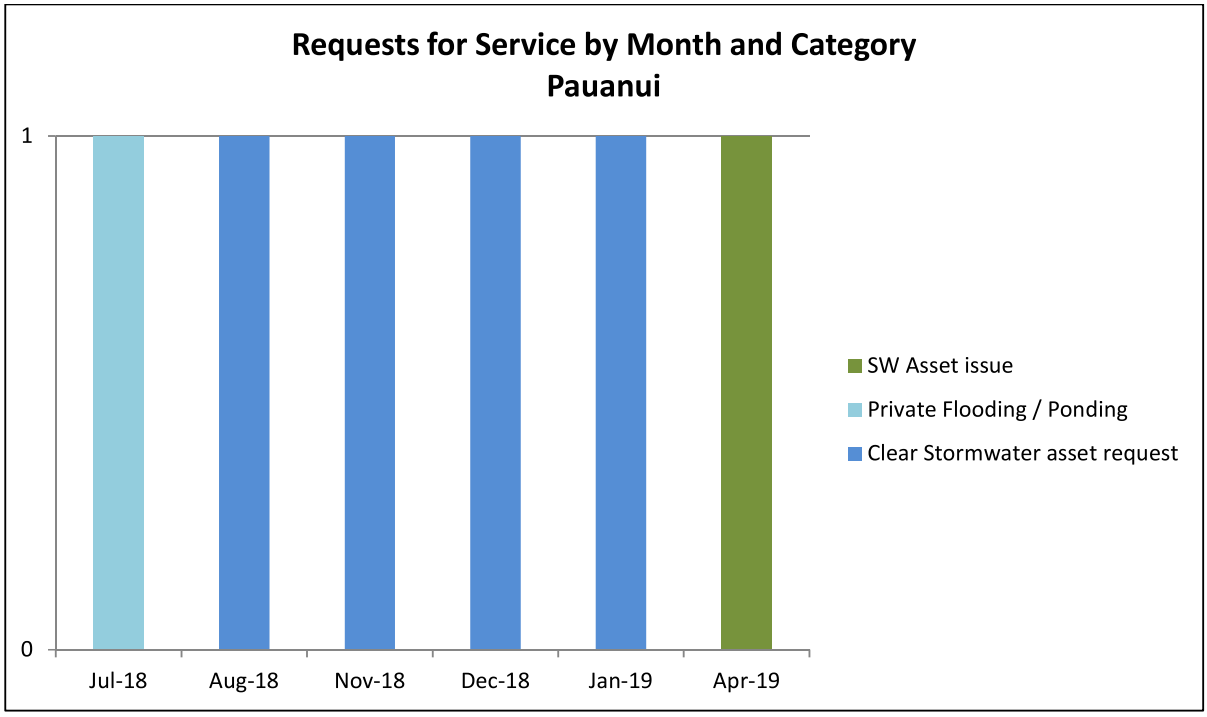
During the 2018-2019 year there were a total of six requests for service relating to stormwater within the Pauanui urban area.

Requests are categorised as follows:

- Clear Stormwater Asset Request 4
- Ponding / Flooding Private Land 1
- Stormwater Asset Issue 1

The location of all requests is shown in the map below. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.

The graph below outlines the categories of stormwater requests for service by month for the Pauanui urban area throughout the 2018-2019 year.



Comprehensive Stormwater Discharge Consent 105663 – Coromandel

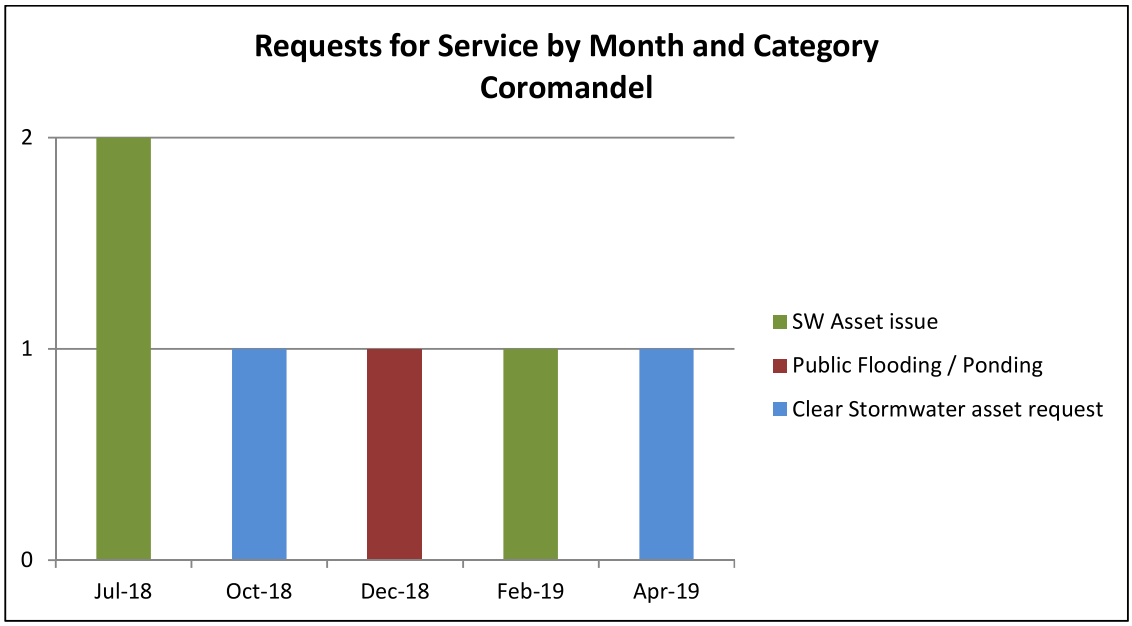
During the 2018-2019 year there were a total of six requests for service relating to stormwater within the Coromandel urban area.

Requests are categorised as follows:

- Clear Stormwater Asset Request 2
- Ponding / Flooding Public Land 1
- Stormwater Asset Issue 3

The location of all requests for service is shown in the map below. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.

The graph below outlines the categories of stormwater requests for service by month for the Coromandel urban area throughout the 2018-2019 year.



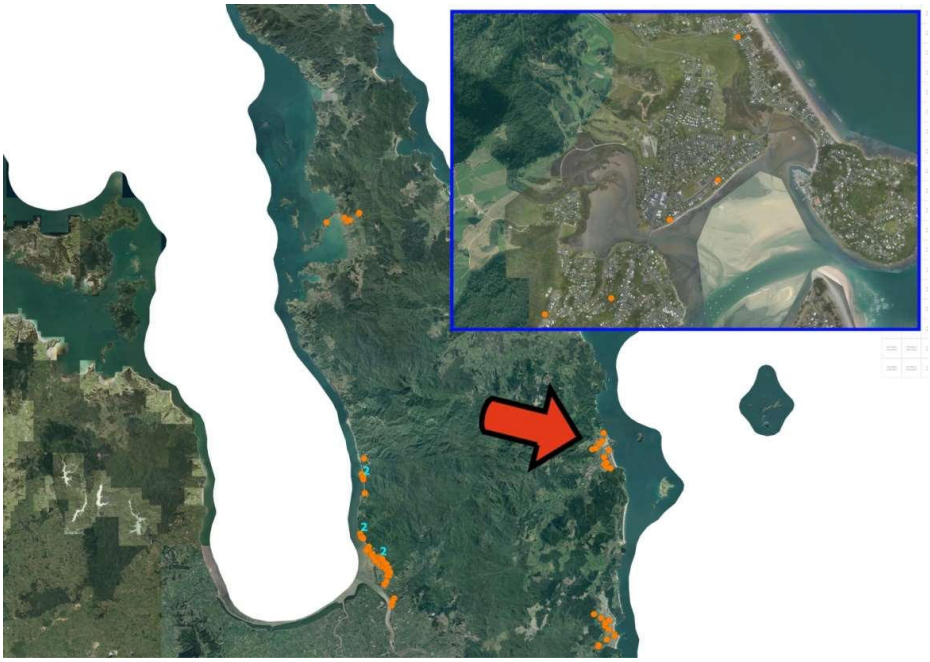
Comprehensive Stormwater Discharge Consent 105664 – Tairua

During the 2018-2019 year there were a total of five requests for service relating to stormwater within the Tairua urban area.

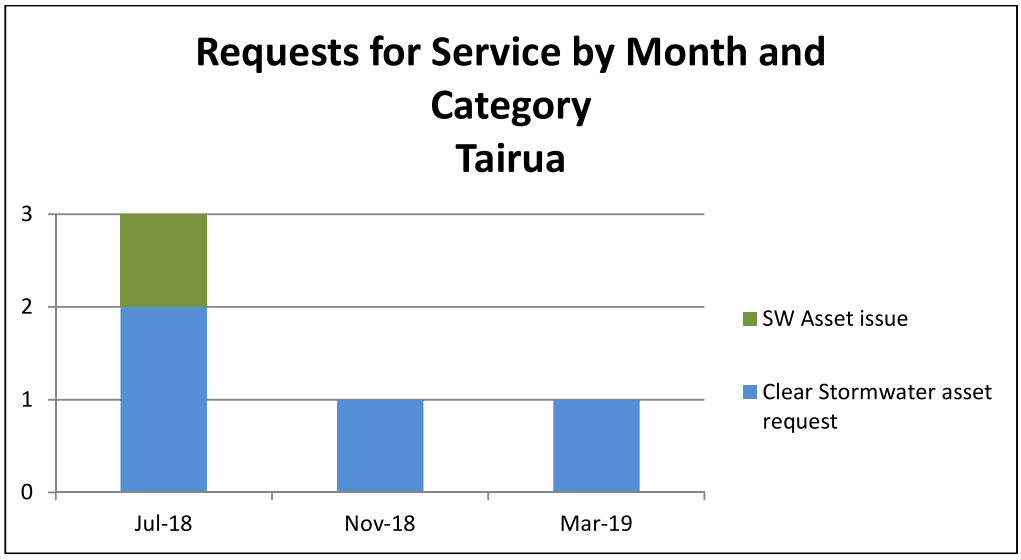
Requests are categorised as follows:

- Clear Stormwater Asset Request 4
- Stormwater Asset Issue 1

The location of all requests for service is shown in the map below. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.



The graph below outlines the categories of stormwater requests for service by month for the Tairua urban area throughout the 2018-2019 year.



Comprehensive Stormwater Discharge Consent 105665 – Whitianga

During the 2018-2019 year there were a total of 16 requests for service relating to stormwater within the Whitianga urban area.

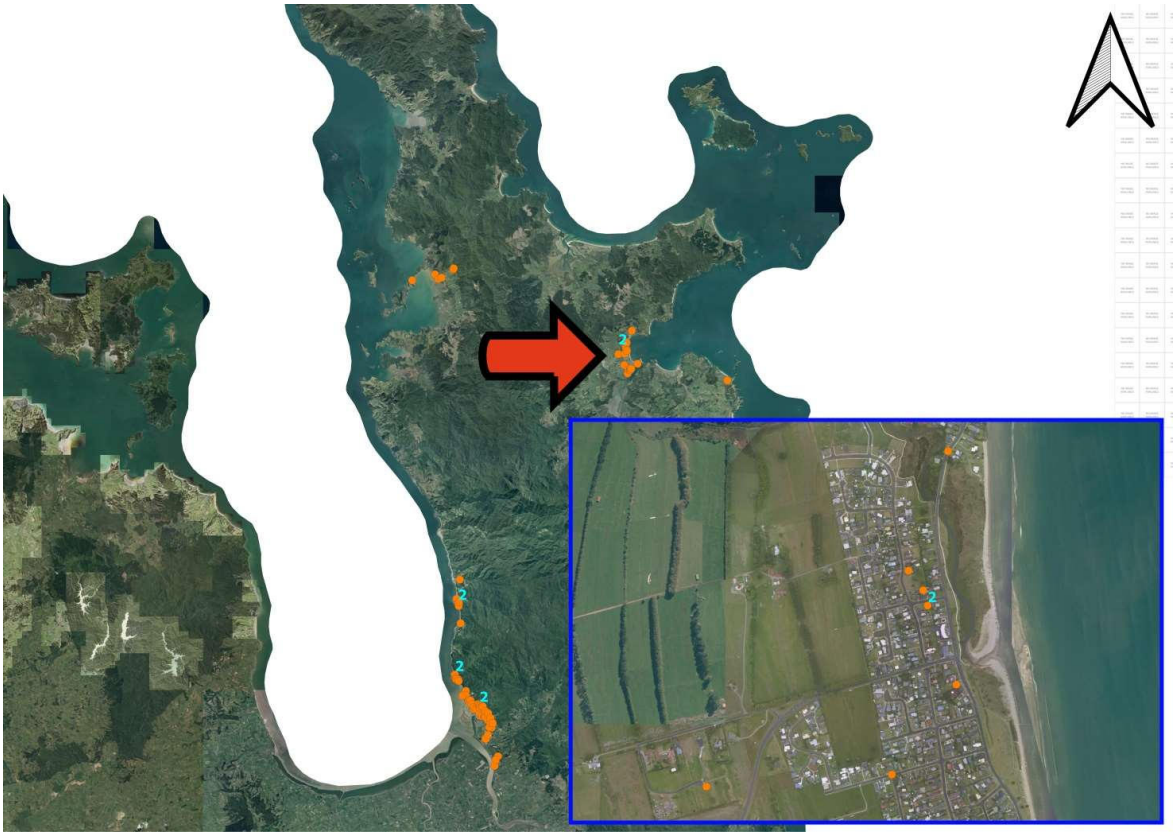
Requests are categorised as follows:

- Clear Stormwater Asset Request 5
- Stormwater Asset Leak 1
- Pollution Report 3
- Ponding / Flooding Private Land 1
- Ponding / Flooding Public Land 2
- Stormwater Asset Issue 4

The location of all Whitianga urban area requests are shown in the map below.

The maps below show the spread of requests in the two catchment areas that the bulk of requests were received. The maps identify that the requests are spread throughout each catchment and do not demonstrate any particular area of concern.

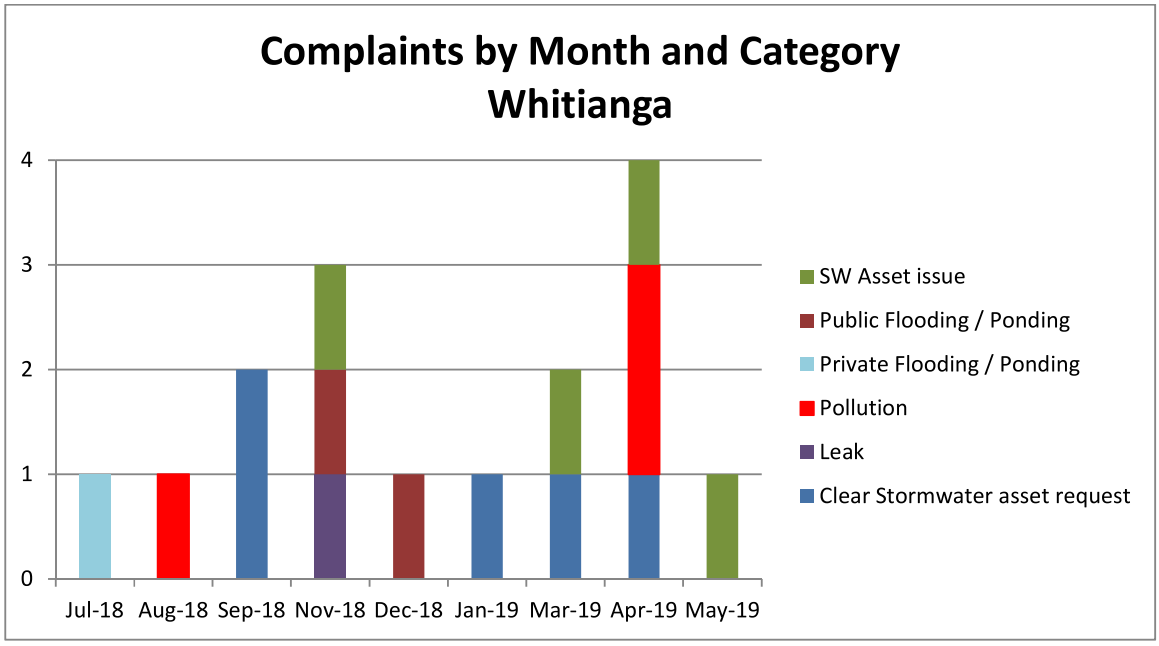
Buffalo Beach Foreshore



The only address at which there was more than one request was 4 Marlin Street, Whitianga. The customer purchased this property and requested an open drain at the back of the property be covered due to safety concerns. The initial request was in March 2019 and he was advised it would be put on the list to pipe. A second request was received in May 2019 and the drain was piped in July 2019.

Central Whitianga

The graph below outlines the categories of stormwater requests by month for the Whitianga urban area throughout the 2018-2019 year.



Comprehensive Stormwater Discharge Consent 105666 – Onemana

During the 2018-2019 year there were no stormwater requests for service in the area serviced by the Onemana Comprehensive Stormwater Discharge Consent.

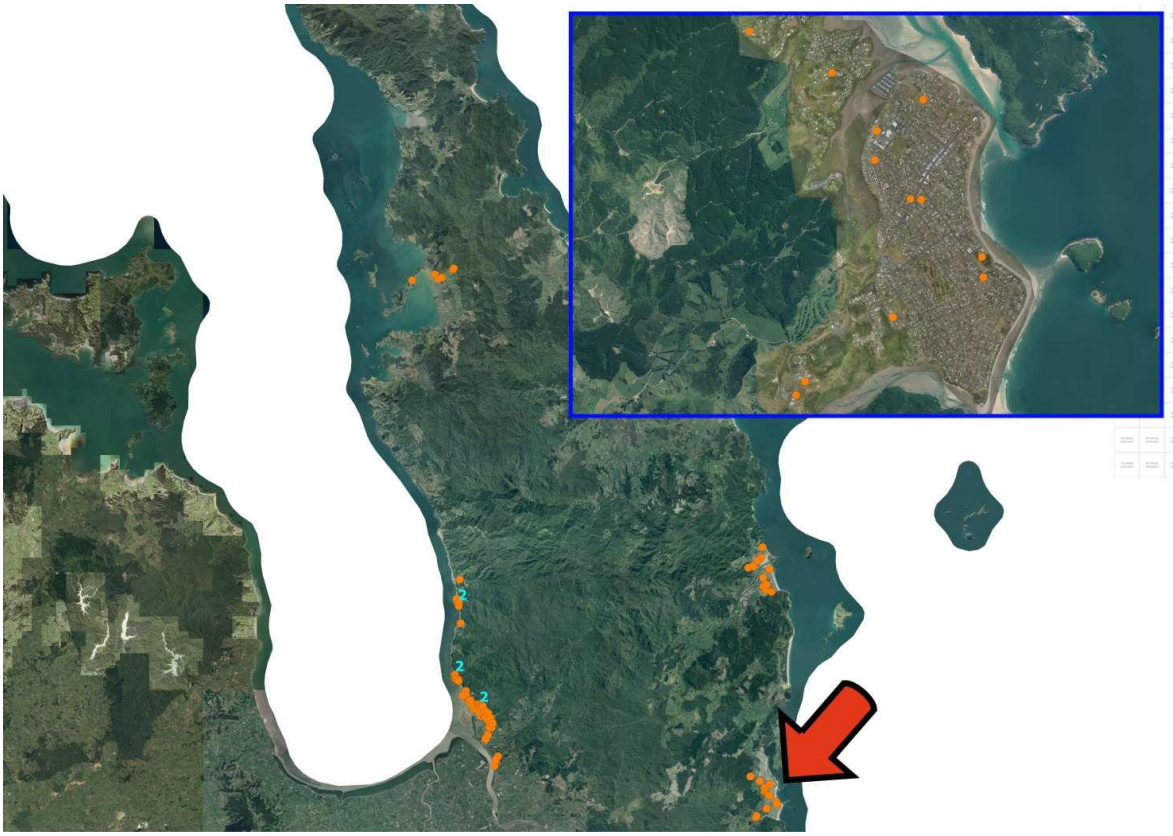
Comprehensive Stormwater Discharge Consent 105667 – Whangamata

During the 2018-2019 year there were a total of 12 requests for service relating to stormwater within the Whangamata urban area.

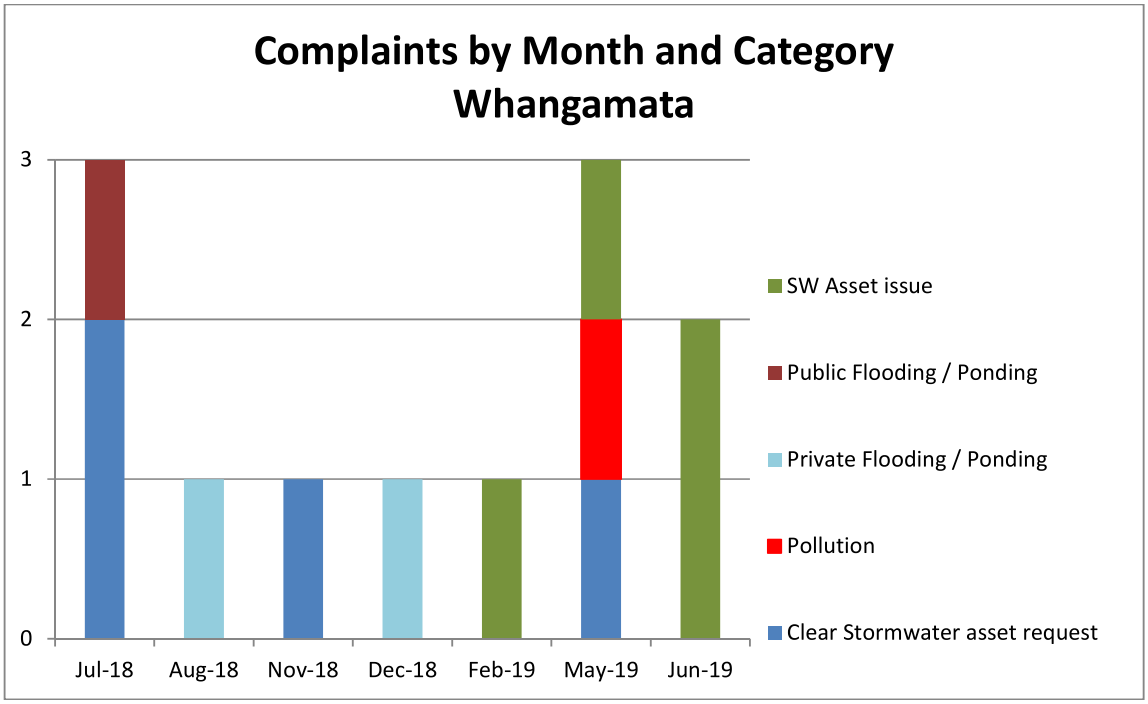
Requests are categorised as follows:

- Clear Stormwater Asset Request 4
- Pollution Report 1
- Ponding / Flooding Private Land 2
- Ponding / Flooding Public Land 1
- Stormwater Asset Issue 4

The location of all requests is shown in the map below. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.



The graph below outlines the categories of stormwater requests by month for the Whangamata urban area throughout the 2018-2019 year.



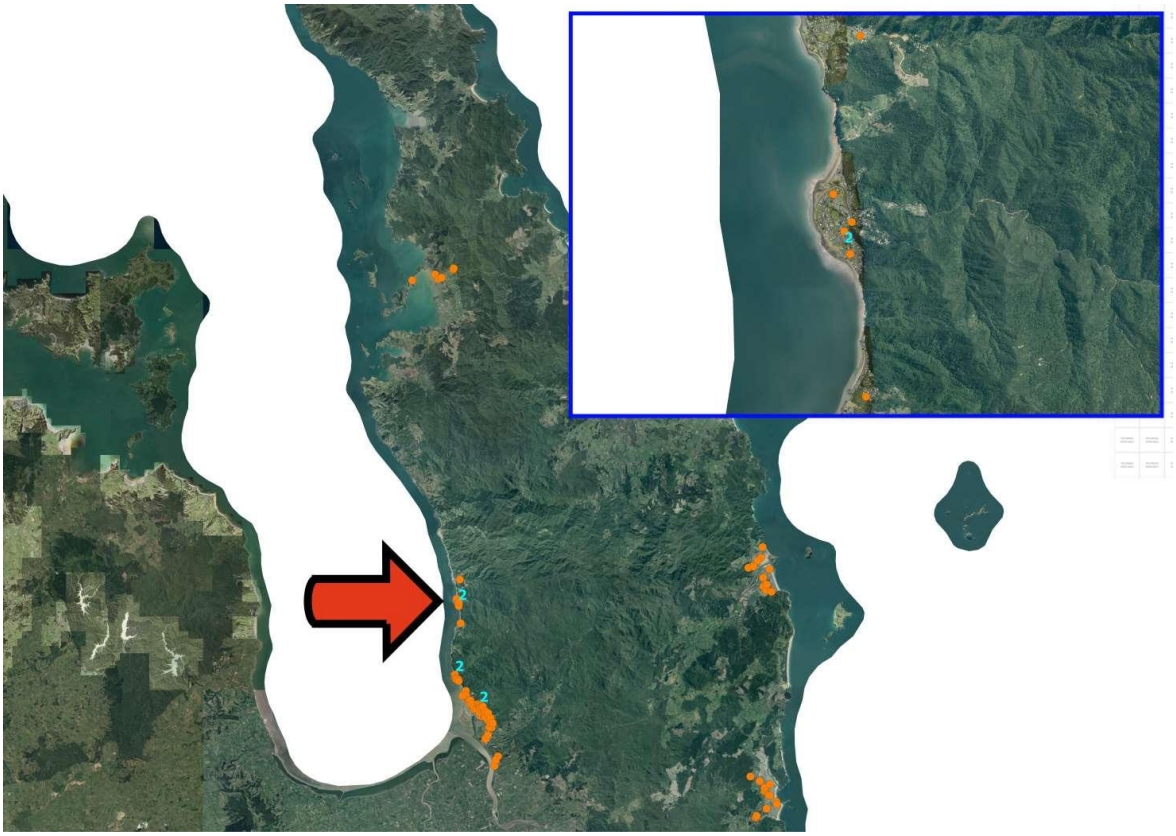
Comprehensive Stormwater Discharge Consent 105668 – Thames Coast

During the 2018-2019 year there were a total of six requests for service relating to stormwater within the Thames Coast urban area.

Requests are categorised as follows:

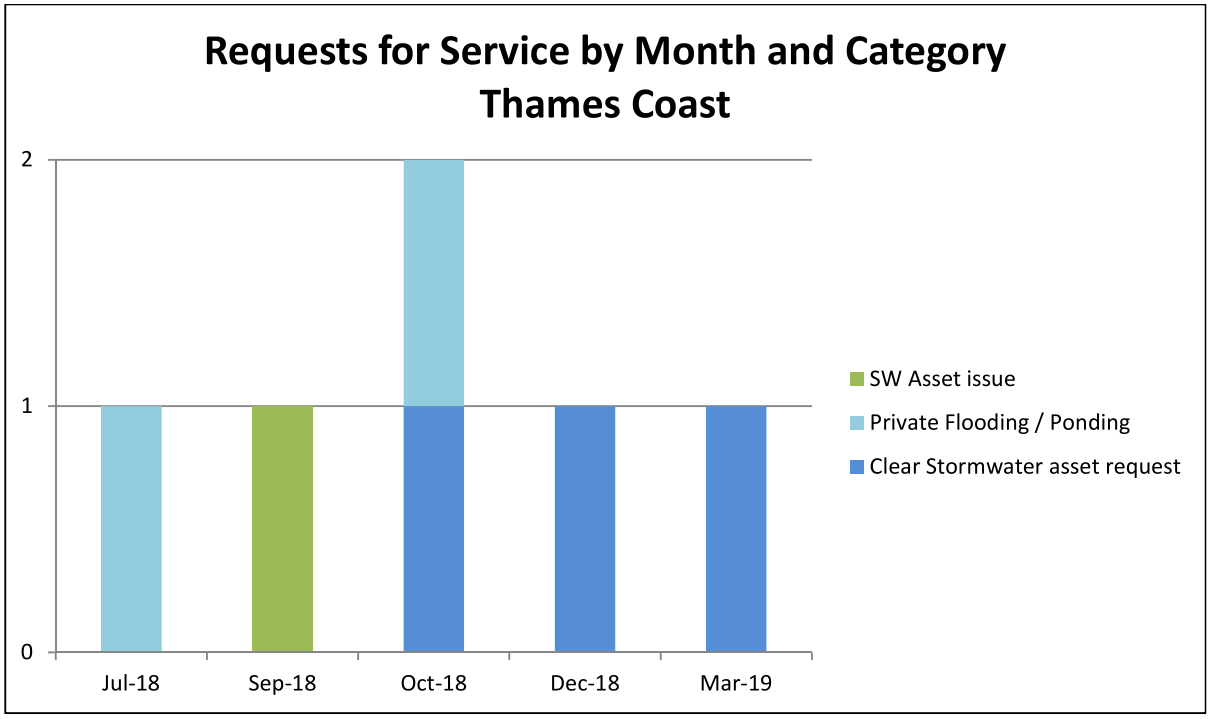
- Clear Stormwater Asset Request 3
- Ponding / Flooding Private Land 2
- Stormwater Asset Issue 1

The location of all requests is shown in the map below. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.



There were two requests to clear a stormwater asset in Tatahi Street, Te Puru. The first request, in December 2018 resulted in this asset being added to a monthly clearing schedule. The second, in March 2019, was as the result of concerns by the resident regarding a fence installed by a neighbour and how this would affect the drain. As this asset is monitored monthly, Veolia were keeping a close eye to ensure the fence does not affect stormwater.

The graph below outlines the categories of stormwater requests for service by month for the Thames Coast urban area throughout the 2018-2019 year.



Appendix 3: Stormwater Complaints Summary 2019-2020

Section 24 of Schedule A (General Conditions of Comprehensive Stormwater Discharge Consents) requires all formal complaints received about the stormwater diversion and discharge activities authorised by these consents to be held in a register. Thames-Coromandel District Council's system for recording all complaints, notifications, and requests is Pathway. The report below includes all requests for service that come to Council regarding Stormwater even though not all are formal complaints.

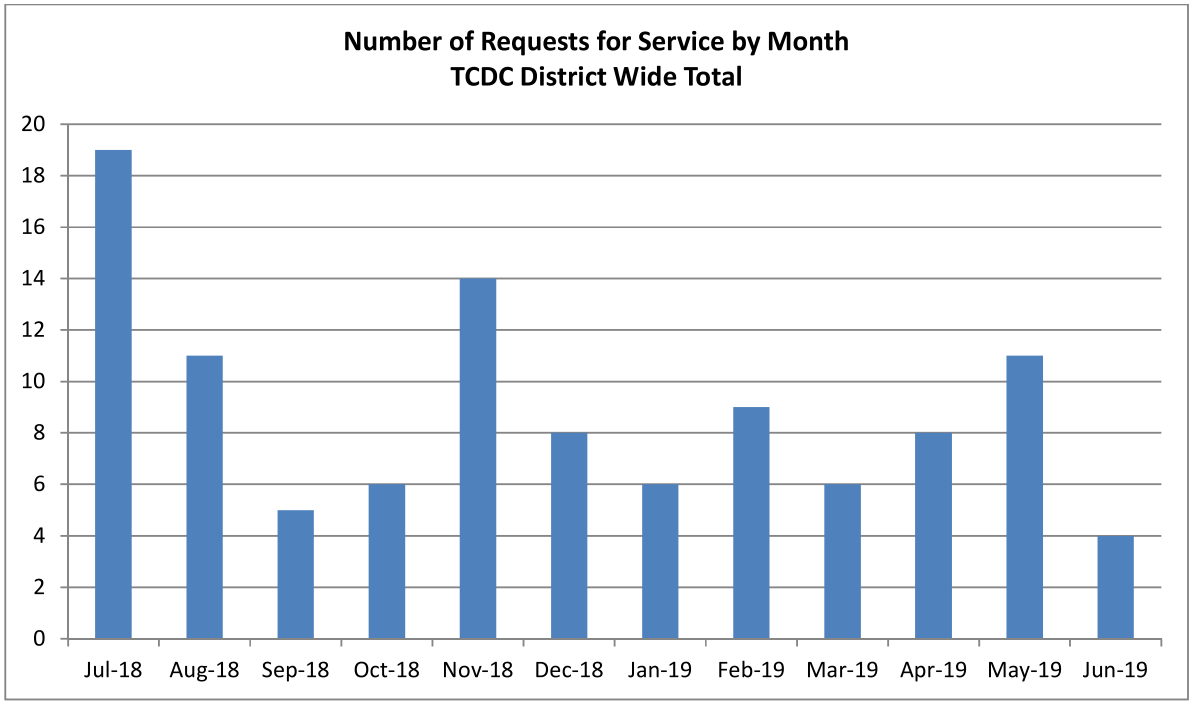
During the 2019-2020 year there were a total of 88 requests for service relating to stormwater within the Thames-Coromandel District Council urban areas serviced by Comprehensive Stormwater Discharge Consents. This is a reduction of 19 from 2018-2019. There were no reports of pollution or third party damage in the 2019-2020 year.

Requests are categorised as follows:

- Clear Stormwater Asset Request 48
- Stormwater Asset Leak 1
- Ponding / Flooding Private Land 6
- Ponding / Flooding Public Land 13
- Stormwater Asset Issue (e.g. manhole cover displaced, request to cover open drain) 20

The location of all requests is shown in the map below.

The largest number of requests for service District Wide was received in October 2019 and July 2020 which coincided with major storm events in the area.



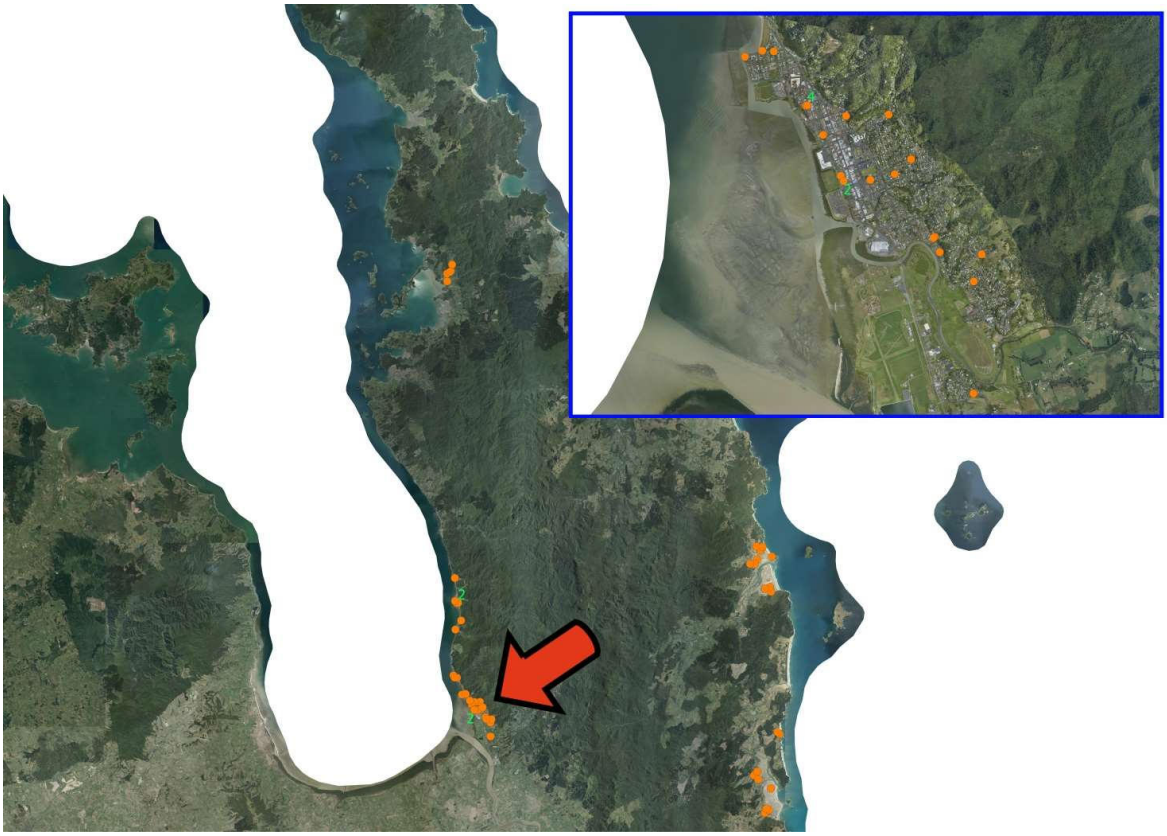
Comprehensive Stormwater Discharge Consent 122521 – Thames Urban Area

During the 2019-2020 year there were a total of 26 requests for service relating to stormwater within the Thames urban area. This is a reduction of 30 from 2018-2019.

Requests are categorised as follows:

- Clear Stormwater Asset Request 6
- Ponding / Flooding Private Land 4
- Ponding / Flooding Public Land 6
- Stormwater Asset Issue 10

The location of each request for service is shown in the maps below.

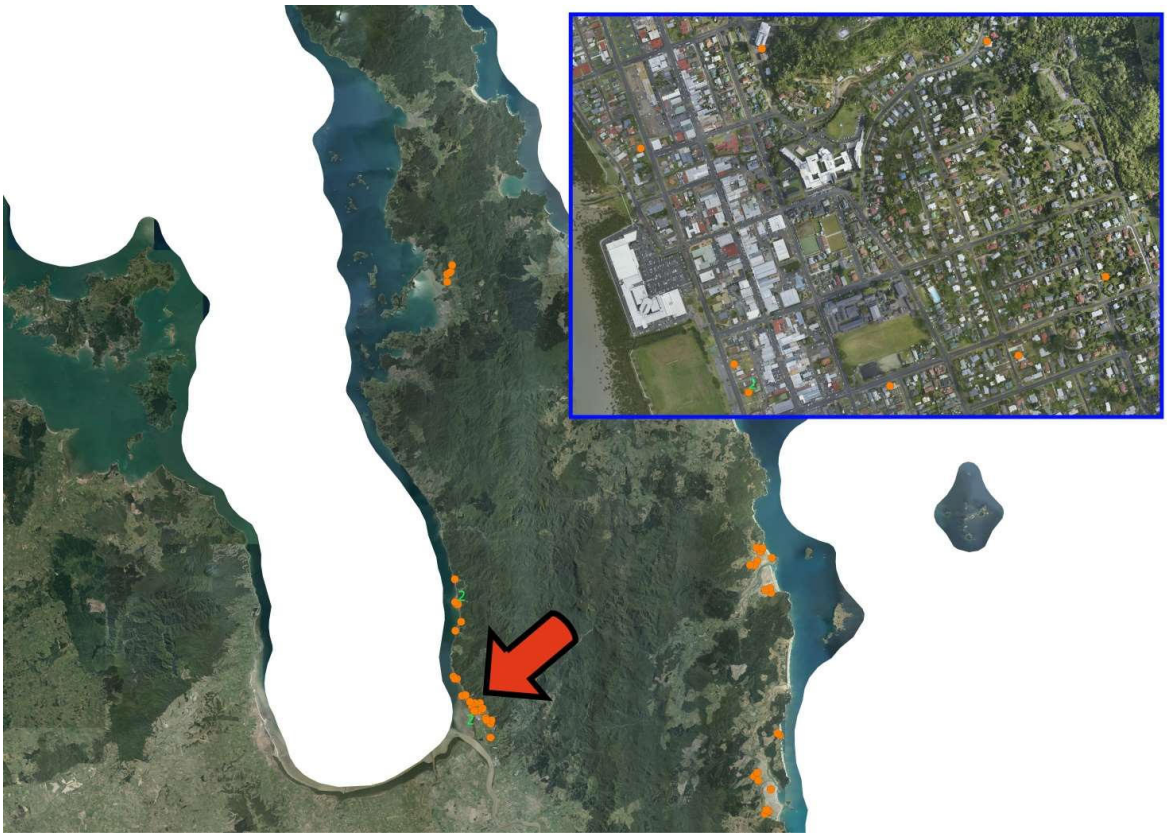


The maps below include an inset that shows the spread of requests for service in the four catchment areas that the bulk of requests were received.

Thames South

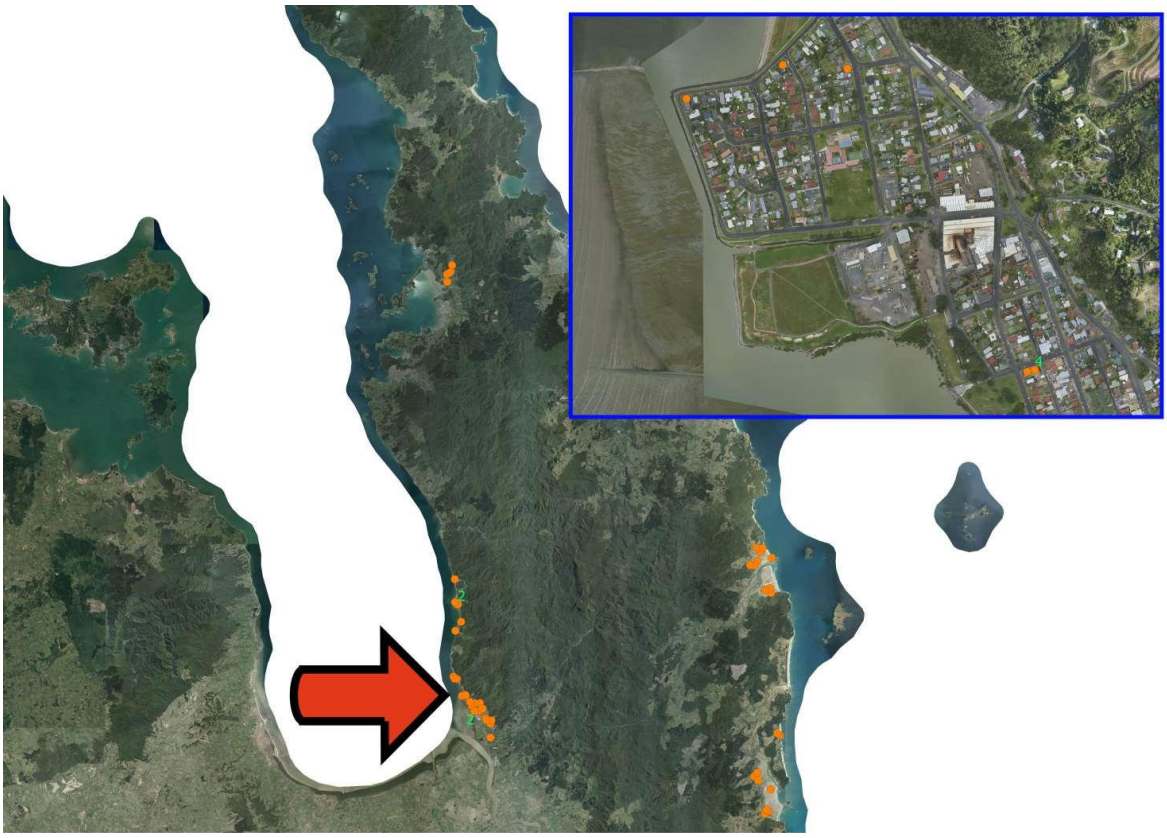
There were two requests in Parawai Road during this period, as indicated at the top of the inset map; however they are related to different assets. The first was a request for a stormwater pipe to be cleared in July 2019 (Asset 450,166) and the second was a request for a stormwater wing wall inlet (Asset 553,953) to be cleared following a storm event in June 2020. Both assets are on private property.

Thames Central



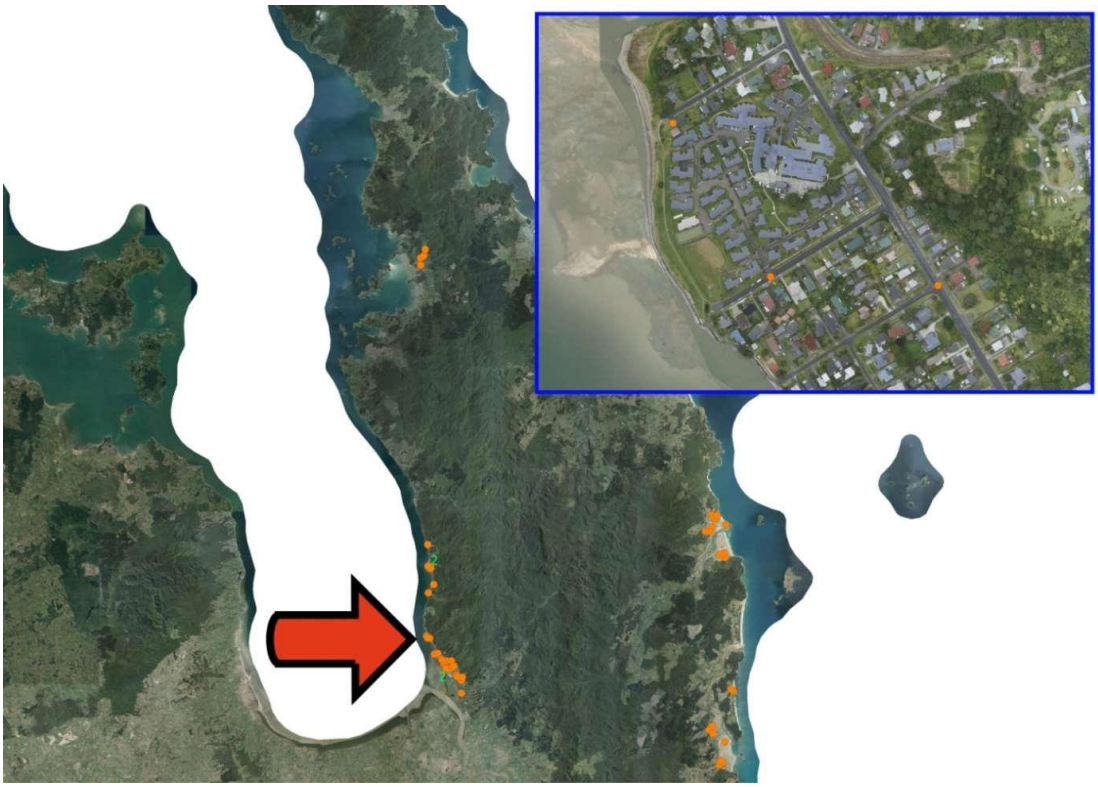
There were two requests from one address during the 2019-2020 year. The first was for a grate to be placed over a stormwater open drain (Asset ID 450,041) in March 2020. This will be considered as part of the renewals process. The second request was for the same open drains to be cleared in July 2020 following a storm event.

Thames North

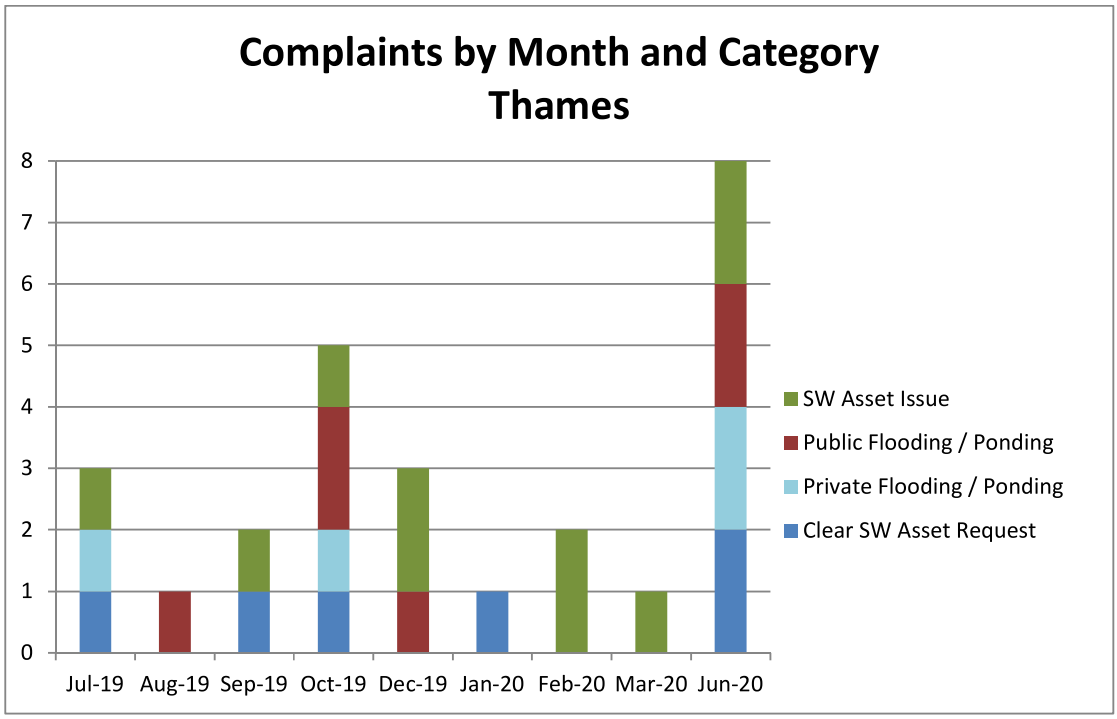


Four complaints of flooding were received from an address in Albert Street, Thames during the 2019-2020 year. An issue has been identified and funding requested to carry out an amendment to the stormwater network to rectify this issue. In the meantime, regular clearing of these assets is undertaken by Veolia.

Tararu



The graph below outlines the categories of stormwater requests for service by month for the Thames urban area throughout the 2019-2020 year. Major storm events in June 2020 led to a significant increase in requests.



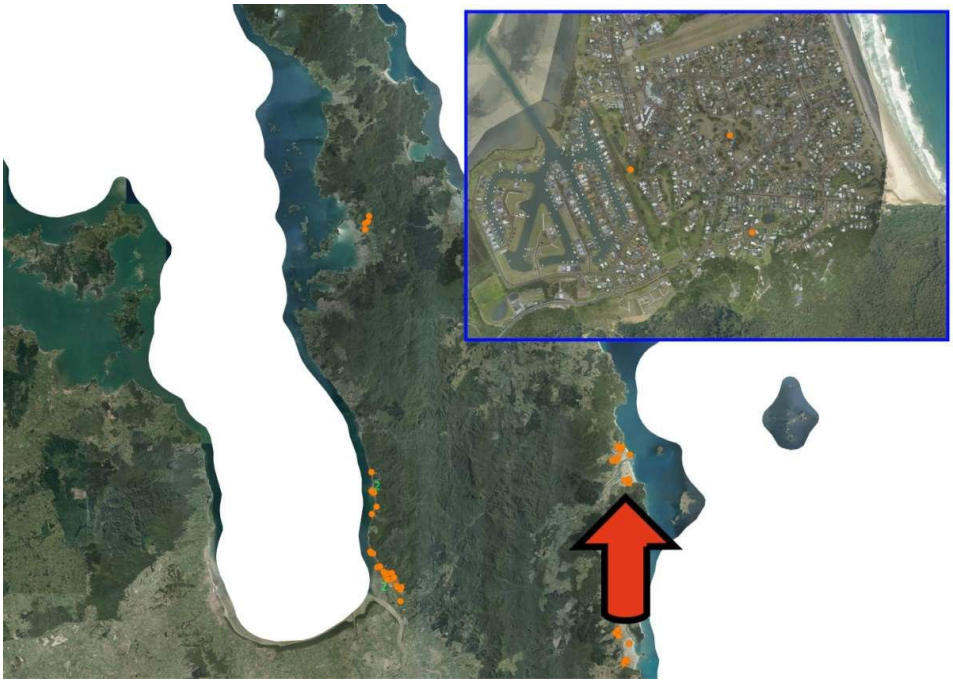
Comprehensive Stormwater Discharge Consent 105661 – Pauanui

During the 2019-2020 year there were a total of three requests for service relating to stormwater within the Pauanui urban area. This is a reduction of three from the 2018-2019 year.

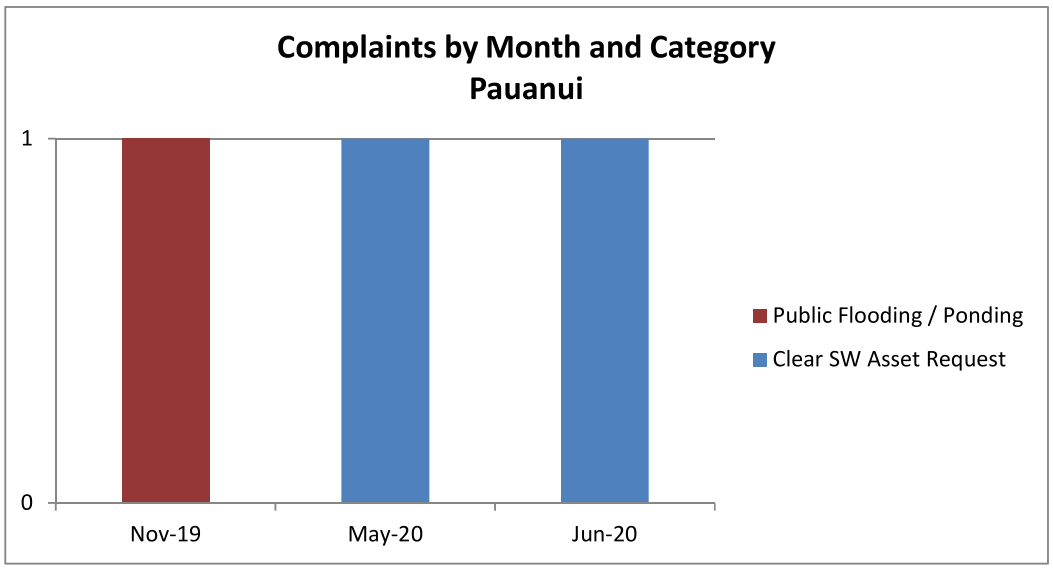
Requests are categorised as follows:

- Clear Stormwater Asset Request 2
- Ponding / Flooding Public Land 1

The location of all requests is shown in the map below. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.



The graph below outlines the categories of stormwater requests for service by month for the Pauanui urban area throughout the 2019-2020 year.

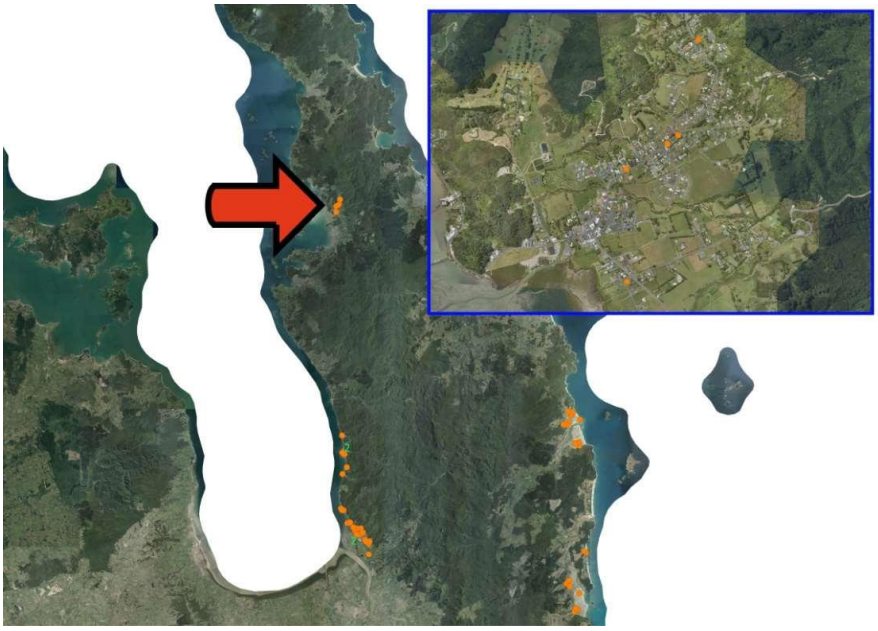


During the 2019-2020 year there were a total of five requests for service relating to stormwater within the Coromandel urban area. This is a reduction of one from 2018-2019.

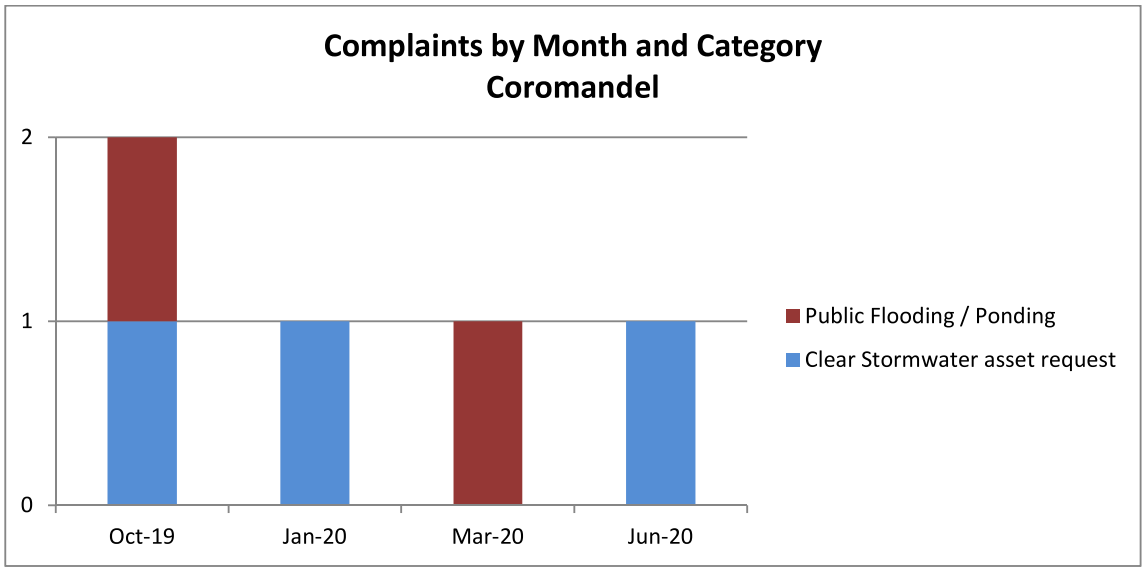
Requests are categorised as follows:

- Clear Stormwater Asset Request 3
- Ponding / Flooding Public Land 2

The location of all requests for service is shown in the map below. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.



The graph below outlines the categories of stormwater requests for service by month for the Coromandel urban area throughout the 2019-2020 year.



Comprehensive Stormwater Discharge Consent 105664 – Tairua

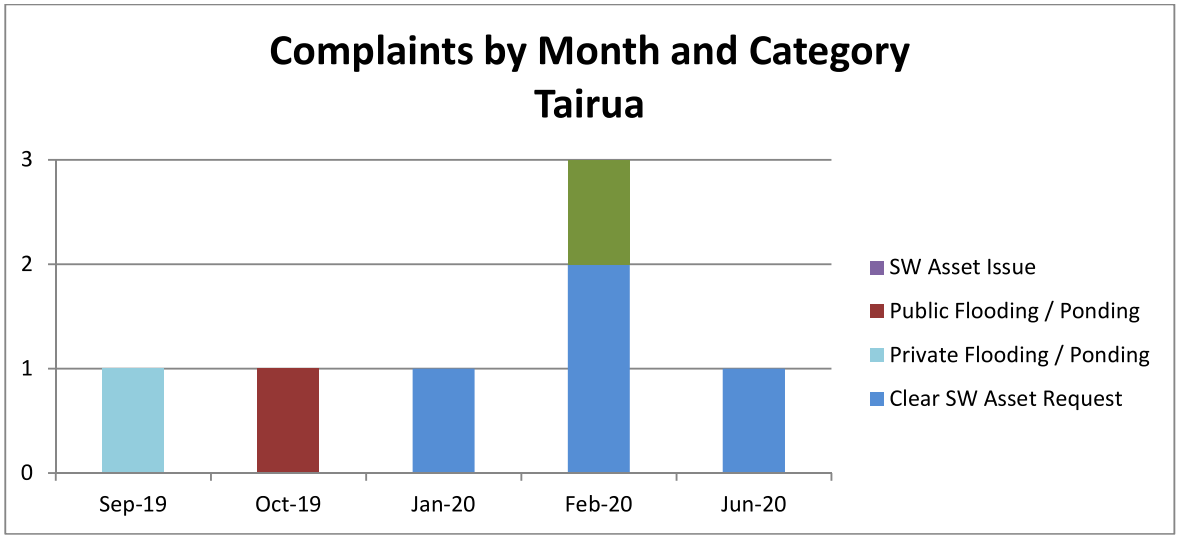
During the 2019-2020 year there were a total of seven requests for service relating to stormwater within the Tairua urban area. This is an increase of two from 2018-2019.

Requests are categorised as follows:

- Clear Stormwater Asset Request 4
- Ponding / Flooding Private Land 1
- Ponding / Flooding Public Land 1
- Stormwater Asset Issue 1

The location of all requests for service is shown in the map below. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.

The graph below outlines the categories of stormwater requests for service by month for the Tairua urban area throughout the 2019-2020 year.



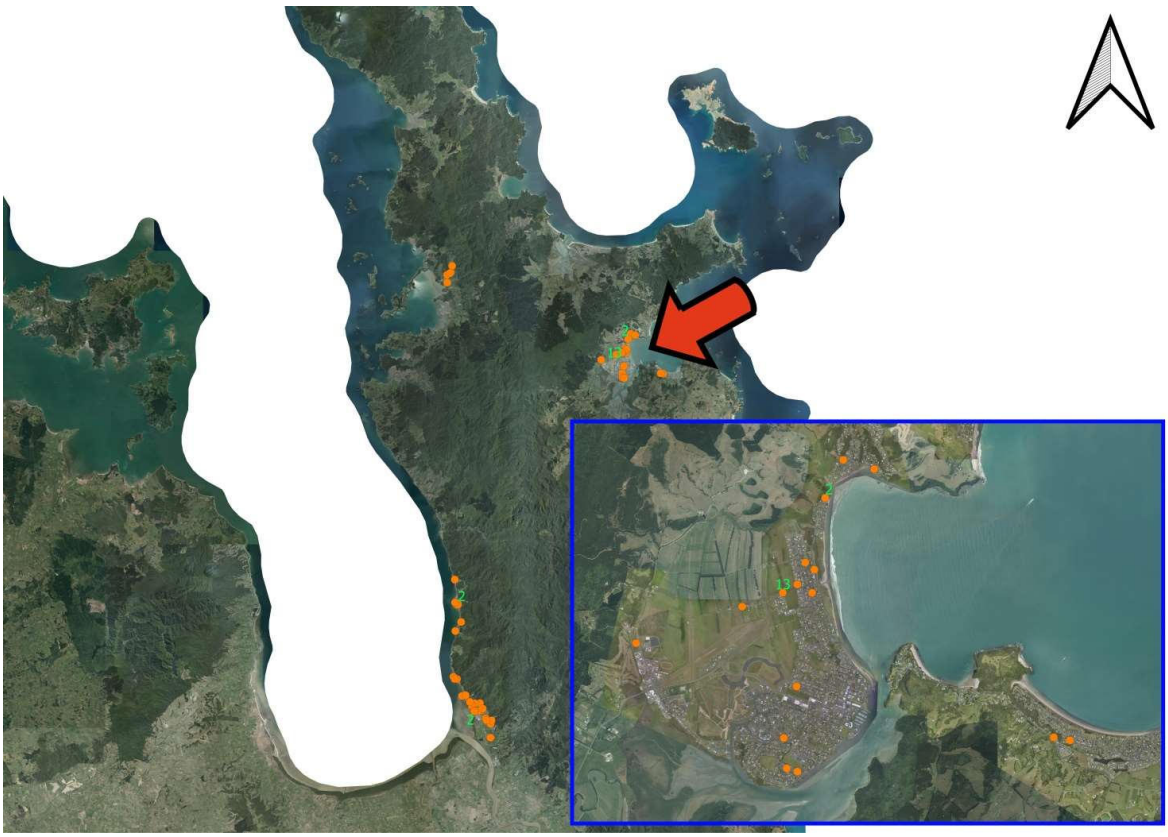
Comprehensive Stormwater Discharge Consent 105665 – Whitianga

During the 2019-2020 year there were a total of 16 requests for service relating to stormwater within the Whitianga urban area. This is an increase of 13 from 2018-2019. There were 13 requests for the clearing of the mouth of Taputapuatea Stream (see Buffalo Beach Foreshore catchment). The severe drought conditions experienced over the summer period contributed to the low flow of the creek leading to increased sand build up tidally. This led to increased requests from local residents to keep the stream mouth clear.

Requests are categorised as follows:

- Clear Stormwater Asset Request 22
- Stormwater Asset Leak 1
- Ponding / Flooding Public Land 1
- Stormwater Asset Issue 5

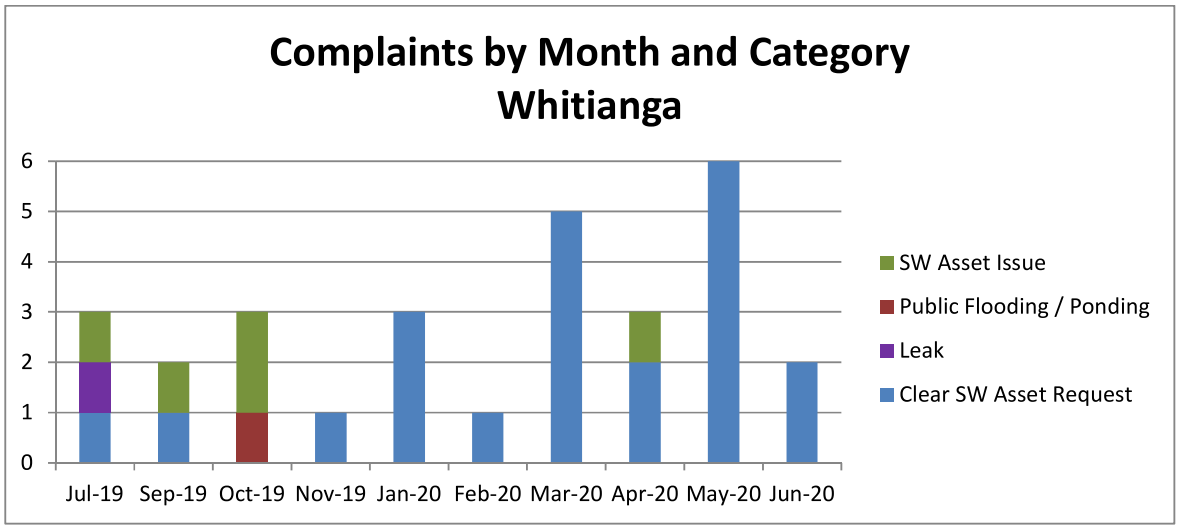
The location of all Whitianga urban area requests are shown in the map below.



The map below shows the spread of requests in the catchment area that the bulk of requests were received. With the exception of the requests to clear the mouth of the Taputapuatea Stream, the map identifies that the requests are spread throughout each catchment and do not demonstrate any particular area of concern.

Buffalo Beach Foreshore

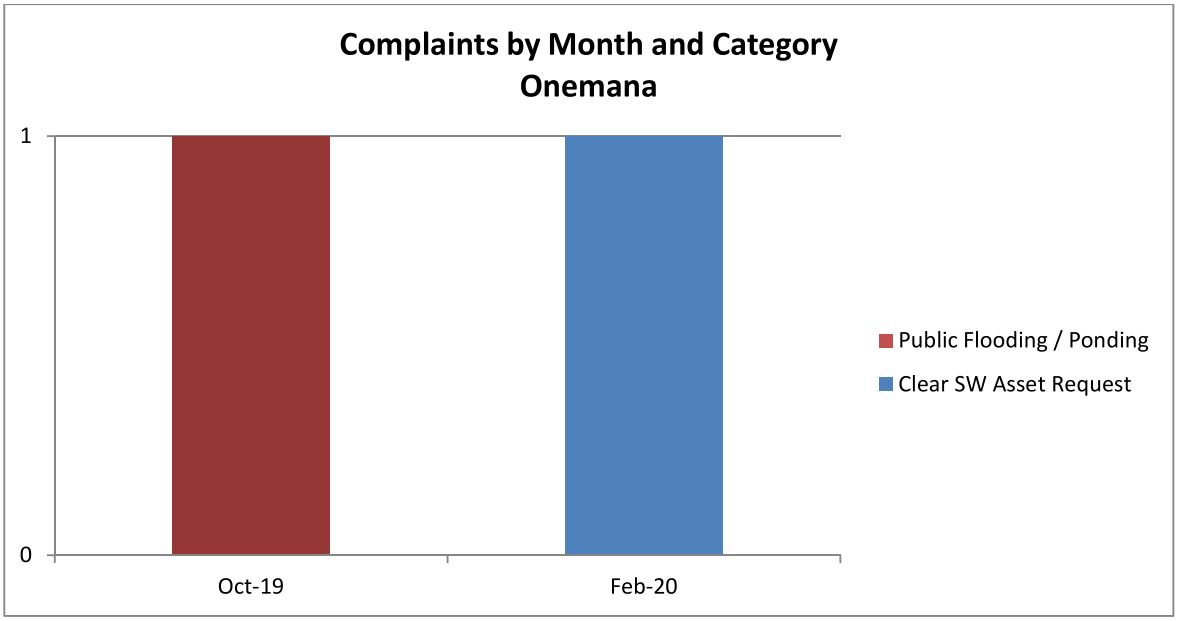
The graph below outlines the categories of stormwater requests by month for the Whitianga urban area throughout the 2019-2020 year.



Comprehensive Stormwater Discharge Consent 105666 – Onemana

During the 2019-2020 year there were a total of two requests for service relating to stormwater within the Onemana urban area. This is an increase of two from 2018-2019. The map identifies that the requests are spread throughout the urban area and do not demonstrate any particular area of concern.

The graph below outlines the categories of stormwater requests by month for the Onemana urban area throughout the 2019-2020 year.



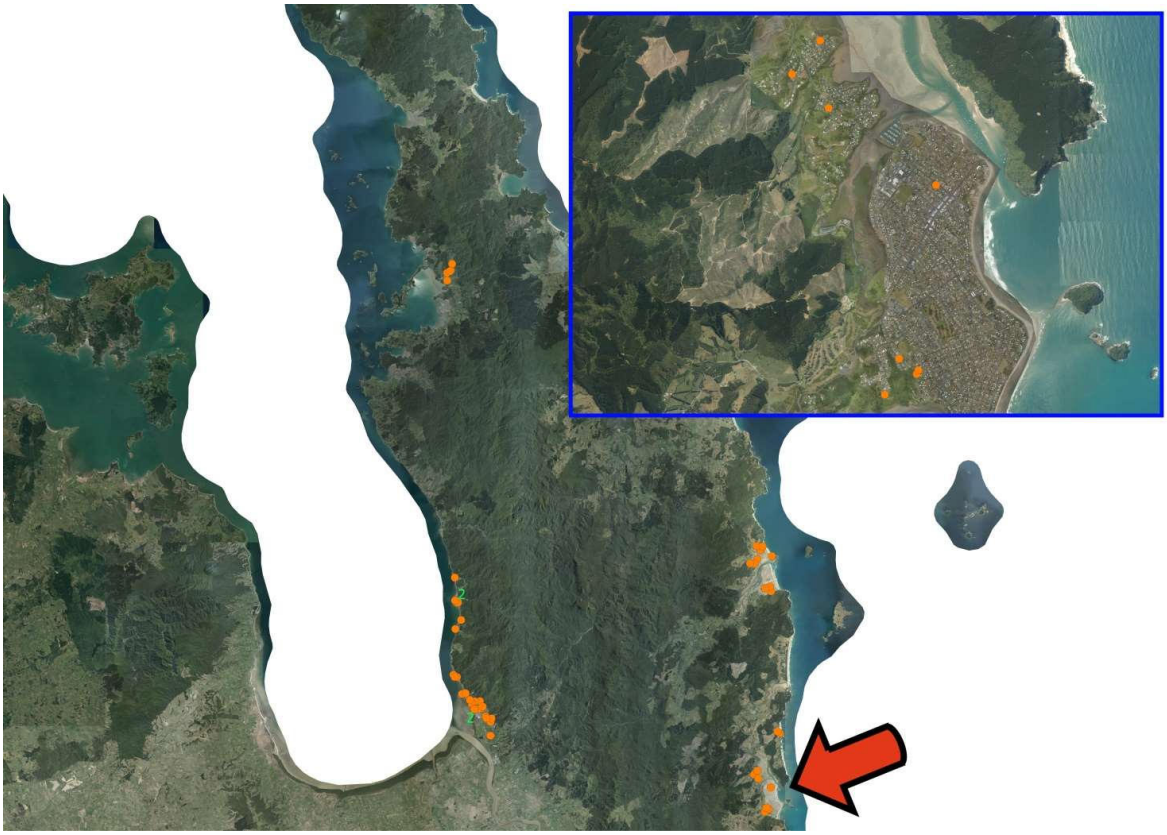
Comprehensive Stormwater Discharge Consent 105667 – Whangamata

During the 2019-2020 year there were a total of eight requests for service relating to stormwater within the Whangamata urban area. This is a reduction of four from 2018-2019

Requests are categorised as follows:

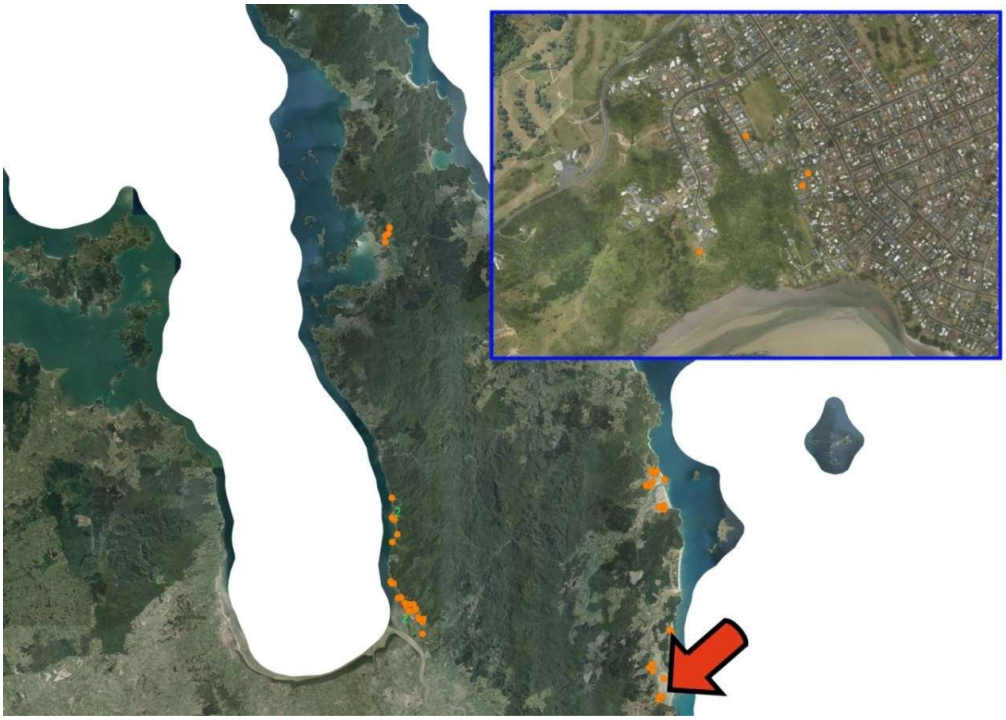
- Clear Stormwater Asset Request 5
- Stormwater Asset Issue 3

The location of all requests is shown in the map below.

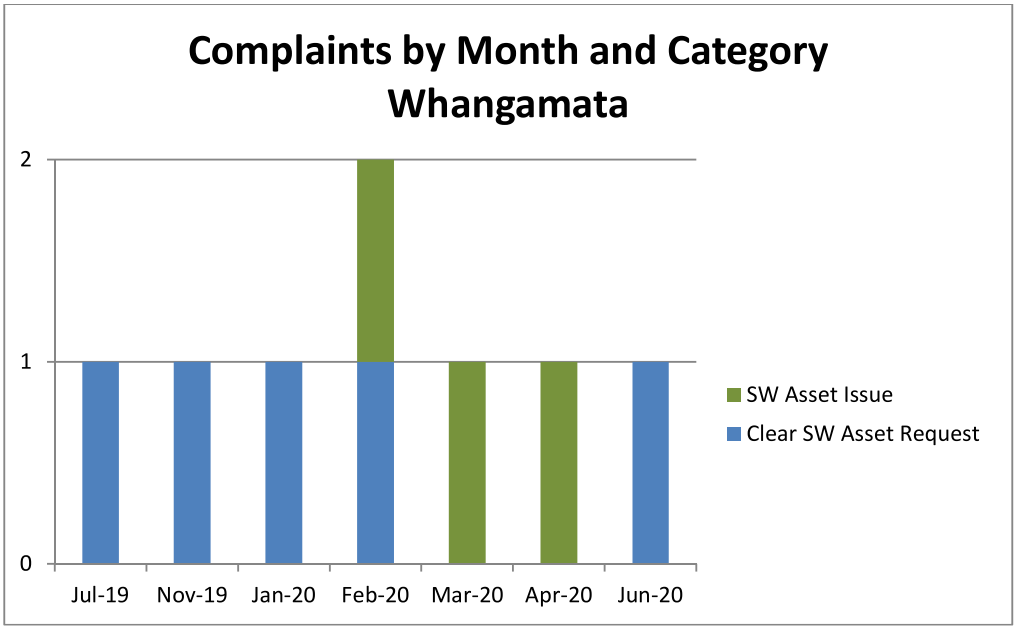


The map below shows the spread of requests in the catchment area that the bulk of requests were received.

Whangamata South



The graph below outlines the categories of stormwater requests by month for the Whangamata urban area throughout the 2019-2020 year.



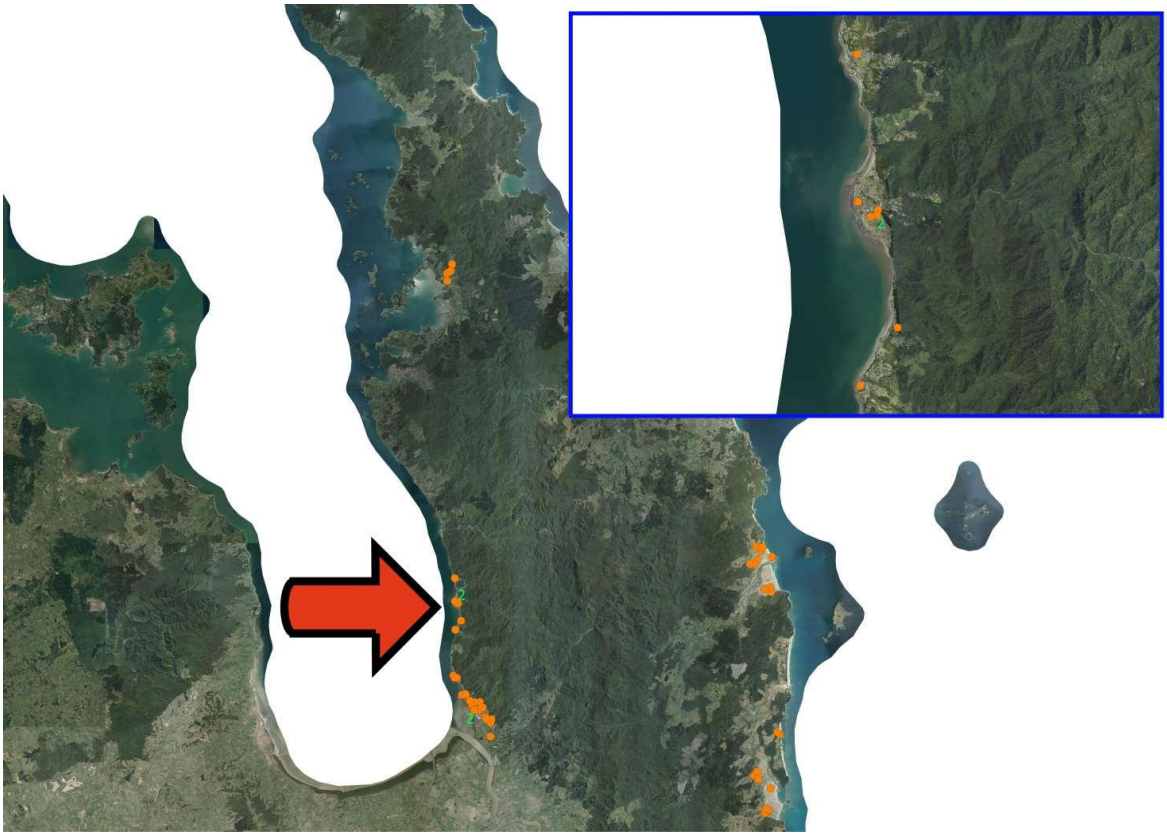
Comprehensive Stormwater Discharge Consent 105668 – Thames Coast

During the 2018-2019 year there were a total of eight requests for service relating to stormwater within the Thames Coast urban area. This is an increase of two from 2018-2019

Requests are categorised as follows:

- Clear Stormwater Asset Request 5
- Ponding / Flooding Private Land 1
- Ponding / Flooding Public Land 1
- Stormwater Asset Issue 1

The location of all requests is shown in the map below.

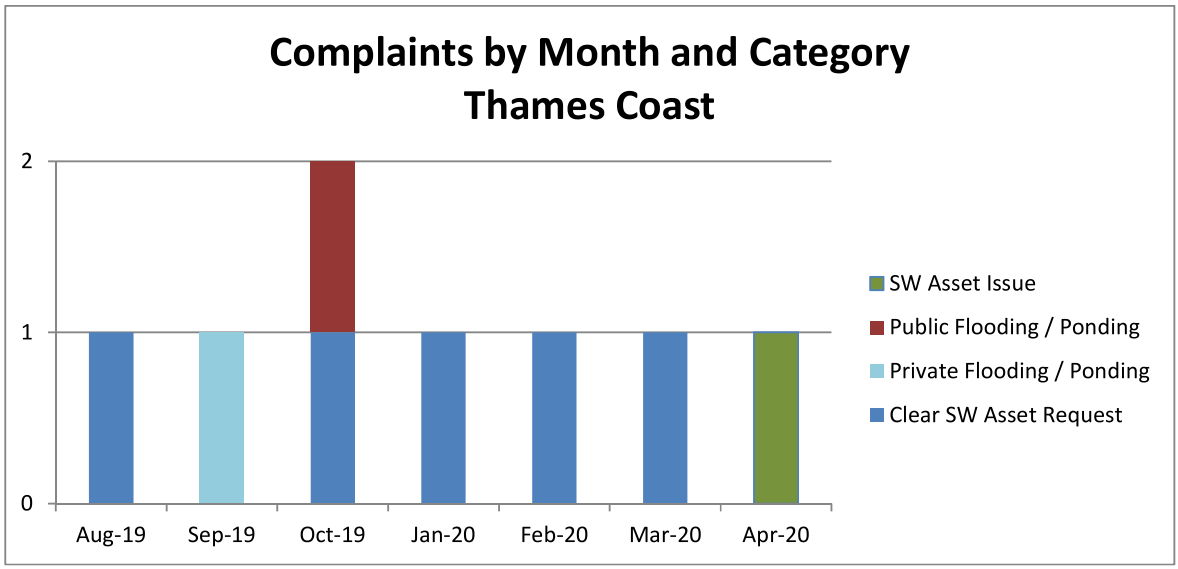


The map below includes an inset that shows the spread of requests for service in the Te Puru, the catchment area that the bulk of requests were received.

Te Puru

There were two requests for one address in Tatahi Street, Te Puru for the same stormwater open drain (Asset ID 450433). The first was requesting the drain be in August 2019 and the second to request the drain be sprayed in March 2020.

The graph below outlines the categories of stormwater requests for service by month for the Thames Coast urban area throughout the 2019-2020 year.



Appendix 4: Changes to Stormwater Network

The following sections identify all changes to the stormwater network since the commencement of consents which have potentially increased the scale or intensity of the actual and / or potential adverse effects of the authorised activities on the environment as required by Schedule A, Condition 2. Only those subdivisions that are > 1 hectare are included. The subdivisions are listed by Consent and from oldest (approved subdivision) to the most recent. All calculations are rounded to two decimal places.

The results of the calculations provide a reasonable estimate of the change in runoff pre and post-development. Due to the requirement for hydraulic neutrality for new buildings, up to 35% of the land area will be subject to pre-development flows up to a 1 in 10-year, 10-minute, rainfall event. It can be assumed that 50% of this flow will go to ground soakage and therefore there is no increase in the scale or intensity of the discharge to the stormwater system, thus mitigating actual and / or potential adverse effects of the authorised activities on the environment.

There have been no changes to the stormwater network > 1 hectare since 2011 in the Onemana Urban Area (Consent 105666) or Thames Coast Urban Area (105668).

					Pre-Development				Post-Development				Flow Increase
Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	(m3/s)
Thames Urban Area Total Development	2011-2020	11.40	18	3.04	0.94	1.56	349.20	10.28	1.57	2.34	349.20	11.40	0.63
Pauanui Urban Area Total Development	2011-2020	3.11	42.00	0.22	0.30	1.05	293.40	3.11	0.46	1.63	293.40	3.11	0.16
Coromandel Urban Area Total Development	2011-2020	1.30	14	0.09	0.12	0.35	96	1.30	0.19	0.54	96	1.30	0.07
Tairua Urban Area Total Development	2011-2020	10.02	28	0.36	0.94	0.35	96.6	10.02	1.46	0.54	96.6	10.02	0.52
Whitianga Urban Area Total Development	2011-2020	57.98	231	0.69	5.40	1.40	379.80	57.98	8.37	2.17	379.80	57.98	2.97
Whangamata Urban Area Total Development	2011-2020	30.44	78	6.44	2.88	1.40	388.20	30.44	3.55	1.95	388.20	30.44	0.68
Thames-Coromandel District Council Total Development	**2011-2020**	**114.25**	**411**	**10.84**	**10.57**	**6.11**	**1603.20**	**113.13**	**15.60**	**9.18**	**1603.20**	**114.25**	**5.03**

i. Thames Urban Area (Consent 122521)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	(m3/s)
Thames Urban Area Total Development	2011-2020	11.40	18	3.04	0.94	1.56	349.20	10.28	1.57	2.34	349.20	11.40	0.63

1 Kopu Road, Kopu (2011-2012)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	(m3/s)
1 Kopu Road, Kopu	2011-2012	1.66	5	0.33	0.21	0.51	87.6	1.66	0.29	0.72	87.6	1.66	0.08

Pre-Development

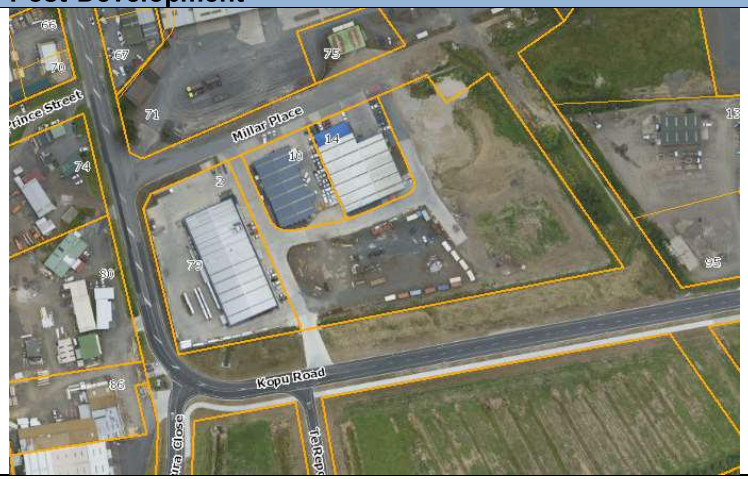
Post-Development

79 Kopu Road, SH25, Kopu (2013-2014)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
79 Kopu Road, SH25 Kopu	2013-2014	2.56	7	0.37	0.22	0.35	87.6	2.56	0.34	0.54	87.6	2.56	0.12

Pre-Development

Post-Development



130 and 134 Te Arapipi Road, Thames (2014-2015)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
130 & 134 Te Arapipi Road, Thames	2014-2015	6.05	5	1.21	0.52	0.35	87.6	6.05	0.80	0.54	87.6	6.05	0.28

Pre-Development

Post-Development

366 Ngati Maru Highway, SH25, Thames (2017-2018)

This subdivision is a light industrial development on the outskirts of Thames.

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	(m3/s)
366 Ngati Maru Highway, SH25, Thames	2017-2018	1.13	1	1.13	0.00	0.35	86.4	0.00	0.15	0.54	86.4	1.13	0.15

Pre-Development	Post-Development
	

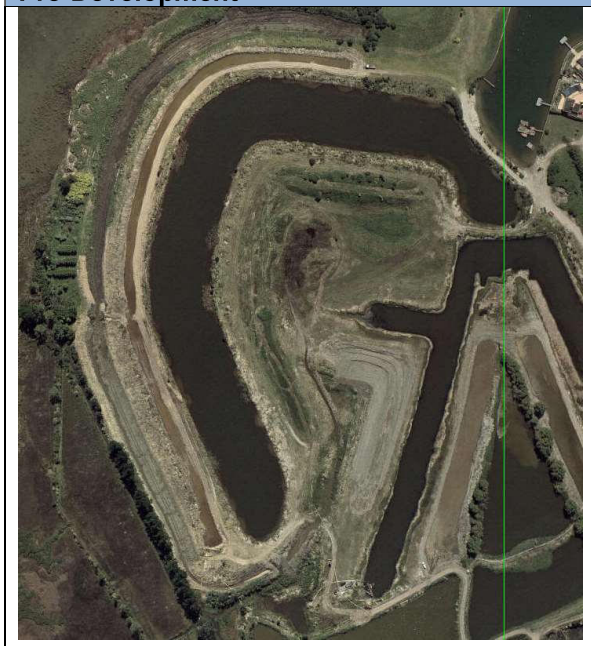
ii. Pauanui Urban Area (Consent 105661)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
Pauanui Urban Area Total Development	2011-2020	3.11	42	0.22	0.30	1.05	293.40	3.11	0.46	1.63	293.40	3.11	0.16

Motu Hei, Pauanui (2015-2016)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
Motu Hei, Pauanui	2015-2016	0.75	12	0.06	0.07	0.35	97.2	0.75	0.11	0.54	97.2	0.75	0.04

Pre-Development



Post-Development

Pauanui Nine, 1201 Hikuai Settlement Road, Pauanui (2017-2018)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
1201 Hikuai Settlement Road, Pauanui	2017-2018	1.22	16	0.08	0.12	0.35	98.4	1.22	0.18	0.54	98.4	1.22	0.06

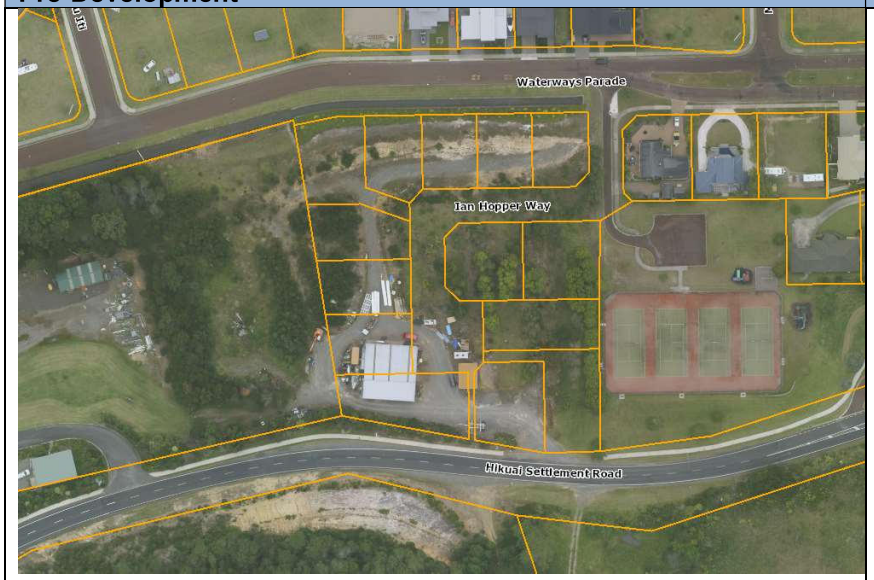
Pre-Development

Post-Development

Pauanui Waterways – The Terraces (2019-2020)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
Pauanui Waterways - The Terraces	2019-2020	1.14	14	0.08	0.11	0.35	97.8	1.14	0.17	0.54	97.8	1.14	0.06

Pre-Development



Post-Development

iii. Coromandel Urban Area (Consent 105663)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
Coromandel Urban Area Total Development	2011-2020	1.30	14	0.09	0.12	0.35	96.00	1.30	0.19	0.54	96.00	1.30	0.07

1 Albert Street, Coromandel (2016-2017)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
1 Albert Street, Coromandel	2016-2017	1.30	14	0.09	0.12	0.35	96	1.30	0.19	0.54	96	1.30	0.07

Pre-Development

Post-Development

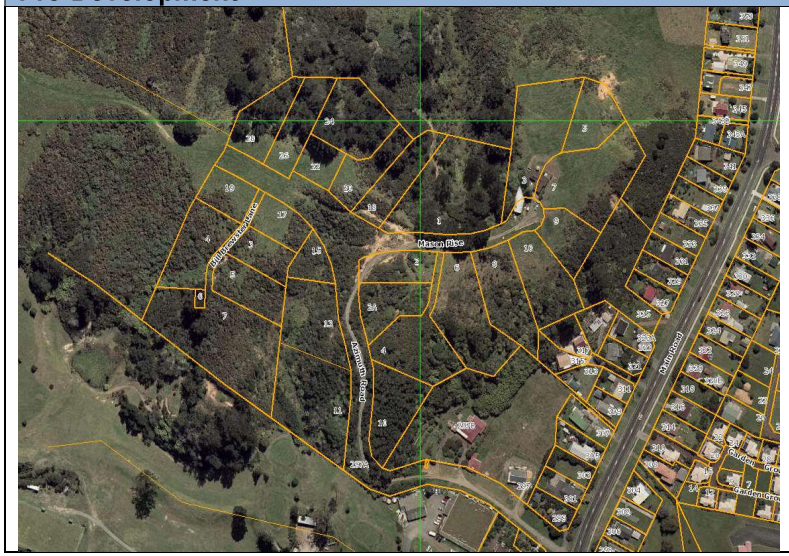
iv. Tairua Urban Area (Consent 105664)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
Tairua Urban Area Total Development	2011-2020	10.02	28	0.36	0.94	0.35	96.60	10.02	1.46	0.54	96.60	10.02	0.52

Azimuth Estates, 297C Main Road, SH25, Tairua (2016-2017)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
297C Main Road, SH25 Tairua	2016-2017	10.02	28	0.36	0.94	0.35	96.60	10.02	1.46	0.54	96.60	10.02	0.52

Pre-Development



Post-Development

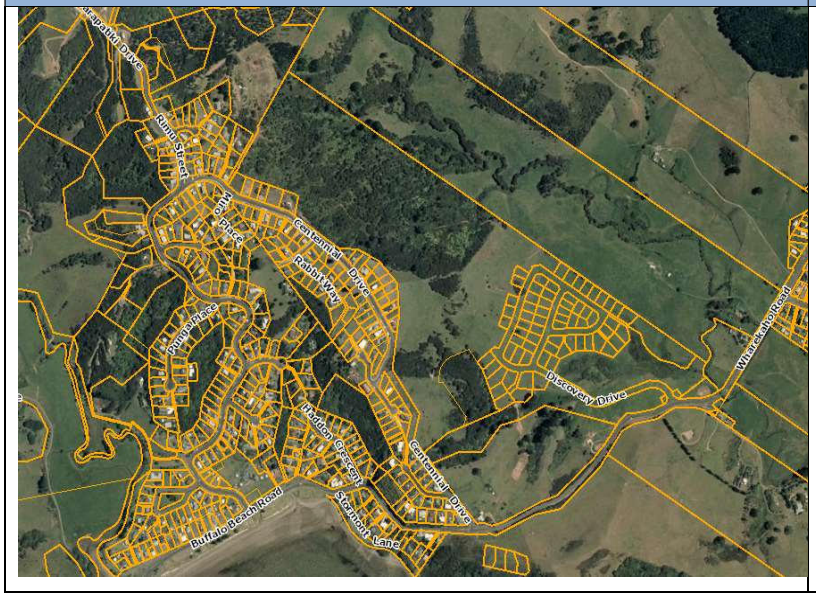
v. Whitianga Urban Area (Consent 105665)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
Whitianga Urban Area Total Development	2011-2020	57.98	231	0.69	5.40	1.40	379.80	57.98	8.37	2.17	379.80	57.98	2.97

Whitianga Waterways developments have not been included in this commentary as the discharge consent is held by Whitianga Waterways Ltd and does not form part of the Thames-Coromandel District Council Comprehensive Stormwater Discharge Consents.

15 Wharekaho Road, Wharekaho (2014-2015)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	(m3/s)
15 Wharekaho Road, Wharekaho	2014-2015	46.78	111	0.42	4.37	0.35	96	46.78	6.77	0.54	96	46.78	2.40

Pre-Development	Post-Development
	

Pacific Estates, Cook Drive, Whitianga (2014-2015)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
Pacific Estates, Cook Drive, Whitianga	2014-2015	6.49	63	0.10	0.60	0.35	95.4	6.49	0.93	0.54	95.4	6.49	0.33

Pre-Development

Post-Development

8 Park Lane, Whitianga (2017-2018)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
8 Park Lane, Whitianga	2017-2018	1.23	15	0.08	0.11	0.35	94.2	1.23	0.18	0.54	94.2	1.23	0.06

Pre-Development	Post-Development
	

The Palms, 104A Cook Drive, Whitianga (2017-2018)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
104A Cook Drive, Whitianga	2017-2018	3.47	42	0.08	0.32	0.35	94.2	3.47	0.49	0.54	94.2	3.47	0.18

Pre-Development	Post-Development
	

vi. Whangamata Urban Area (Consent 105667)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
Whangamata Urban Area Total Development	2011-2020	30.44	78	6.44	2.88	1.40	388.20	30.44	3.55	1.95	388.20	30.44	0.68

207 Port Road, Whangamata (2011-2012)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
207 Port Road, Whangamata	2011-2012	2.04	38	0.05	0.19	0.35	96.6	2.04	0.30	0.54	96.6	2.04	0.11

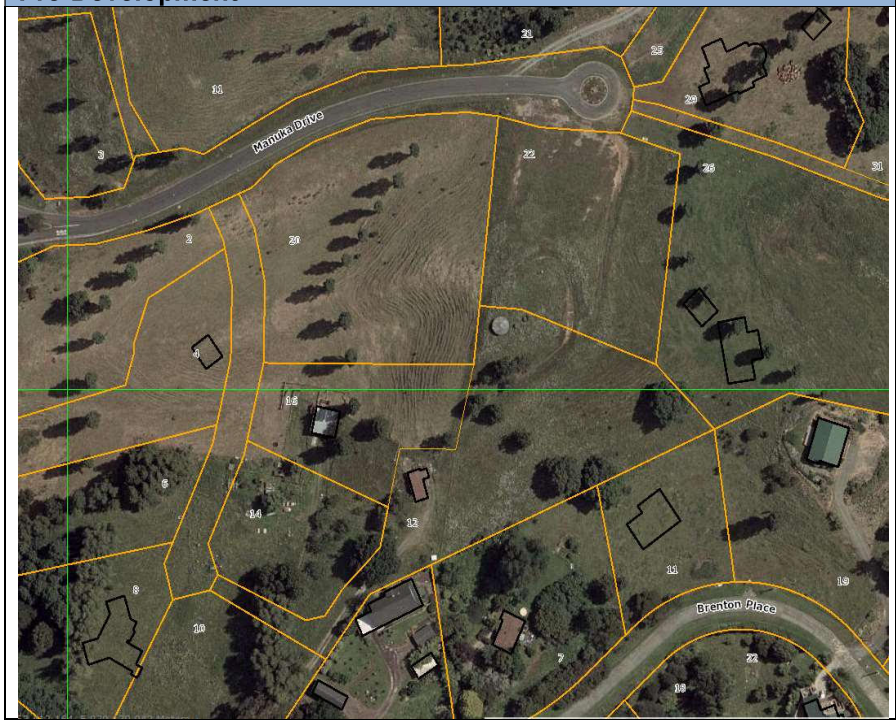
Pre-Development

Post-Development

12 Manuka Drive, Whangamata

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
12 Manuka Drive, Whangamata	2015-2016	1.79	4	0.45	0.17	0.35	97.2	1.79	0.22	0.46	97.2	1.79	0.05

Pre-Development



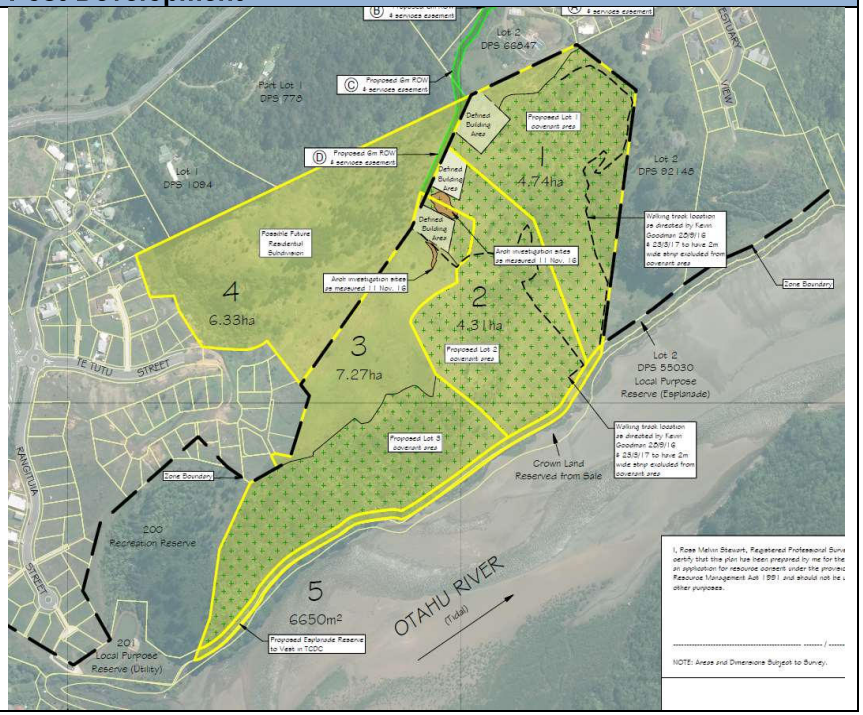
Post-Development

137 Te Tutu Street, Whangamata

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	(m3/s)
137 Te Tutu Street, Whangamata	2016-2017	23.33	4	5.83	2.20	0.35	97.2	23.33	2.55	0.41	97.2	23.33	0.35

Pre-Development

Post-Development



Kotuku, 2752 SH25, Whangamata (2016-2017)

Address	Year	Gross Area (ha)	No. of Lots	Average lot Size (ha)	Pre-Development				Post-Development				Flow Increase (m3/s)
					Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	Q=CIA/360 (m3/s)	C (coefficient)	I (mm/hr)	A (ha)	
2752 SH25, Whangamata	2016-2017	3.27	32	0.10	0.31	0.35	97.2	3.27	0.48	0.54	97.2	3.27	0.17

Pre-Development

Post-Development

Appendix 5: New Stormwater Activities in Urbanised Catchments

The subdivisions outlined in Appendix 4 have been assessed against the following conditions:

Condition Number	Condition Summary	Commentary
Schedule A, Condition 3	The Consent Holder shall seek to implement the best practicable option to avoid, remedy or mitigate the actual and potential adverse effects of the stormwater diversion and discharge activities authorised by this consent on the environment	See individual subdivision below
Schedule A, Condition 4(b)	For new stormwater diversion and discharge activities established in urbanised catchments - the new activities do not increase peak discharge rates to, or flow volumes in, stormwater receiving water bodies above those that would occur at the time of granting this consent, unless it is demonstrated that there are no additional adverse effects on the environment or downstream properties as a result of such increase	See Appendix 4
Schedule A, Condition 4(c)	For new stormwater diversion and discharge activities established in developing catchments - the new activities are consistent with Catchment Management Plans which have been prepared in accordance with Condition 25 of this consent, prior to the establishment of new activities within these catchments	No subdivision has been approved during this period within a developing catchment
Schedule A, Condition 17	All stormwater catchpits which connect to the stormwater network shall be capable of capturing and retaining the majority of gross pollutants. New, replacement and / or upgraded stormwater catchpits shall, when constructed, be further capable of capturing and retaining the majority of floatable contaminants such as oil and grease, unless any discharges of floatable contaminants from the catchpits to the receiving environment would have no more than negligible adverse effects	All stormwater catchpits have a sump which is capable of capturing and retaining the majority of heavy gross pollutants. Historically, catchpits have not been required to capture and retain floatable contaminants
Schedule A, Condition 22	When assessing applications and engineering approvals for new or replacement connections to the stormwater network, the Consent Holder shall, to the extent that it lawfully can, ensure that stormwater management devices are required and / or in place to avoid as far as practicable and otherwise minimise routine contaminant discharges to the stormwater network.	See individual subdivision below
Schedule A, Condition 26	The Consent Holder shall coordinate and oversee the implementation of approved Catchment Management Plans as required by Condition 4(c) of this consent, and shall ensure as far as practicable, that all relevant stormwater management devices are constructed and operational prior to the development of impervious surfaces within developing catchments.	No subdivision has been approved during this period within a developing catchment

Condition Number	Condition Summary	Commentary
Schedule A, Condition 27	For all new stormwater diversion and discharge activities in developing catchments, the Consent Holder shall promote consideration of the Waikato Regional Council publication titled 'Sustainable Subdivision Development - An Environment Waikato Perspective' (WRC, 2006), or any other technical publication approved in advance by the Waikato Regional Council in a technical certification capacity	No subdivision has been approved during this period within a developing catchment
Schedule A, Condition 28	…the Consent Holder shall promote the implementation of Low Impact Urban Design measures and stormwater management devices in all reticulated catchments, to avoid as far as practicable and otherwise minimise the actual and potential adverse effects of the stormwater diversion and discharge activities authorised by this consent on the environment	Until 2019, hydraulic neutrality had been the only low impact urban design measure / stormwater management device required by TCDC. Regional Council consents were seen to be the tool to add additional LIUD measures and stormwater management devices. Commentary in individual subdivisions is included where any additional measures have been implemented.
Schedule A, Condition 29	As the Consent Holder and / or private developers progressively construct new stormwater management devices that become part of the stormwater network, the Consent Holder shall maintain a register of these devices in the Stormwater Management Plan required by Condition 30 of this Consent, including details of their location, catchment area, operational procedures and maintenance requirements.	Refer to Stormwater Management Plan Appendix F.

i. Thames Urban Area (Consent 122521)

1 Kopu Road, Kopu (2011-2012)

This commercial subdivision currently includes a Bus Depot, Hire Company, Hotel, and Power Company Depot.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4. A flood assessment was undertaken, not only to determine appropriate floor levels, but to prevent the loss of existing flood ponding area.
Schedule A, Condition 22	The only stormwater management device required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks which discharge to an open drain network maintained by the Water Services Operations and Maintenance Contractor. The bus depot has a dedicated bus wash station with approval to discharge to TCDC's wastewater system. The lowering of the bus park area was required to compensate for the development flood ponding ability.

79 Kopu Road, SH25, Kopu (2013-2014)

This commercial subdivision currently includes two hardware retailers, a national freight depot, and an industrial warehouse and office.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4. A flood assessment was undertaken, not only to determine appropriate floor levels, but to prevent the loss of existing flood ponding area.
Schedule A, Condition 22	The only stormwater management device required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks

130 and 134 Te Arapipi Road, Thames (2014-2015)

This is a rural residential subdivision (low density) that disposes stormwater onsite with overflow to natural watercourse. This development is not serviced by public wastewater reticulation, therefore on-site treatment and disposal is required.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4.
Schedule A, Condition 22	The only stormwater management device required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks
Schedule A, Condition 28	These large residential lots rely on secondary flow through grass and vegetation.

366 Ngati Maru Highway, SH25, Thames (2017-2018)

This light industrial development currently has two tenants, an administration office, and the Department of Conservation.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4.
Schedule A, Condition 22	The only stormwater management device required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks

ii. Pauanui Urban Area (Consent 105661)

Motu Hei, Pauanui (2015-2016)

This subdivision is a stage of the Pauanui Waterways. It is a medium density residential development with stormwater discharges being to soakage and overflows to a man-made canal system.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4.
Schedule A, Condition 22	The only stormwater management device required for this subdivision was hydraulic neutrality which, in this case, was in the form of on-site soakage
Schedule A, Condition 28	The road system primary stormwater management device is swales discharging to a man-made canal system.

Pauanui Nine, 1201 Hikuai Settlement Road, Pauanui (2017-2018)

This is a medium density residential development located on naturally sloping land that has been shaped to provide flat building sites.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4.
Schedule A, Condition 22	The only stormwater management device required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks
Schedule A, Condition 28	The developer has instigated the installation of on-site, below ground, storage cells with stormwater being re-used as a non-potable supply for each property.

Pauanui Waterways – The Terraces (2019-2020)

This is a medium density residential development built on a filled site.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4.
Schedule A, Condition 22	In addition to hydraulic neutrality (in the form of detention tanks) of the individual sites, a Hynds upflow filter stormwater device (located outside 1 Ian Hopper Way) that discharges to TCDC open drain system was a requirement of the TCDC resource consent.

iii. Coromandel Urban Area (Consent 105663)

1 Albert Street, Coromandel (2016-2017)

This subdivision is a medium density residential development.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality designed to 80% pre-development flows for a 1 in 100-year rainfall event (as required by WRC).
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks.
Schedule A, Condition 28	The WRC Resource Consent required the installation of two Gravel Filled Stormwater Attenuation Basins as a stormwater management device prior to discharge to the Karaka Stream.

iv. Tairua Urban Area (Consent 105664)

Azimuth Estates, 297C Main Road, SH25, Tairua (2016-2017)

This is a medium density residential subdivision

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	TCDC required hydraulic neutrality which, in this case, was in the form of detention tanks and a detention pond at the low point of the development as stormwater management devices for this development.
Schedule A, Condition 28	WRC consent required individual properties to construct a 25,000-litre water tank for primary water supply to each lot, with overflow from these tanks directed to on-site detention at 80% pre-development greenfield rate with overflow to the road. The reticulation is discharged to either existing reticulation in main Road, or to a new stormwater detention pond at the lower site of the development

v. Whitianga Urban Area (Consent 105665)

15 Wharekaho Road, Wharekaho (2014-2015)

A medium density residential subdivision with areas of reserve.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks.
Schedule A, Condition 28	WRC consent required stormwater discharge from the development to a detention pond that discharges into a natural wetland that discharges to the Tohetea Stream that ultimately discharges onto the south end of Wharekaho Beach.

Pacific Estates, Cook Drive, Whitianga (2014-2015)

A medium density, residential subdivision.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks and / or on-site soakage with overflow to the road.
Schedule A, Condition 28	WRC consent required stormwater discharge from the development to a constructed wetland that discharges to the Taputapuatea Stream that ultimately discharges to Buffalo Beach.

8 Park Lane, Whitianga (2017-2018)

A medium density, residential subdivision.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks and / or on-site soakage with overflow to the road.

The Palms, 104A Cook Drive, Whitianga (2017-2018)

A medium density, residential subdivision.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of detention tanks with overflow to roadside swales discharging to TCDC owned reticulation.

vi. Whangamata Urban Area (Consent 105667)

207 Port Road, Whangamata (2011-2012)

A medium density, residential subdivision with excellent soakage.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of soakage and / or on-site detention tanks.

12 Manuka Drive, Whangamata

A medium – low density residential subdivision.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of on-site detention tanks.

137 Te Tutu Street, Whangamata

A rural, residential subdivision.

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of on-site detention tanks.

Kotuku, 2752 SH25, Whangamata (2016-2017)

A medium density, residential subdivision

Condition	Commentary
Schedule A, Condition 3	A condition of this consent required hydraulic neutrality as described in Appendix 4
Schedule A, Condition 22	The only stormwater management device TCDC required for this subdivision was hydraulic neutrality which, in this case, was in the form of on-site detention tanks.
Schedule A, Condition 28	WRC consent required stormwater discharge from the development detention pond which discharges to the Whangamata estuary. Road stormwater is managed by way of rain gardens to the detention pond.

Appendix 6: Visual Monitoring Results

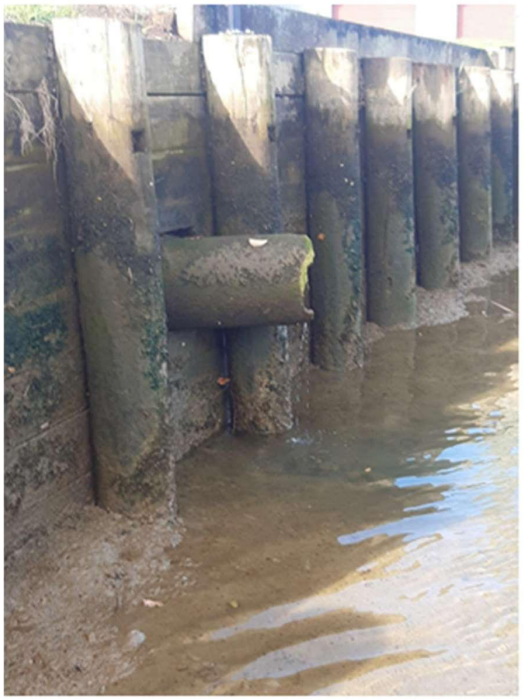
Sites are in an improved condition to those recorded in previous reports. Conspicuous changes are evident for the outlets in Thames at Shortland wharf and Sealey Street. The monitored site at Shepard Avenue in Pauanui is manifesting erosion of the embankment on the eastern side of the outlet structure.

Ref 01	February 2020, Shortland Wharf, Thames	June 2020 Shortland Wharf, Thames
	SW outlet has been redeveloped in 2018 and the outlet channel broaden and cleared of mangroves 	Channel remains well defined and clear of vegetation although silt build up is evident 

Ref 02	February 2020, Sealey Street, Thames	June 2020, Sealey Street, Thames
	Modifications made to the outfall SW pipes include the fitting of 3 WA stops. The benefit has been a regular pulse of water to the channel as the water pressure reaches the level required to activate the device	The channel capacity has not diminished over 6 months and silt build up is restricted to the channel extremities
		

Ref 03	February 2020, Burke Street Outfall	June 2020, Burke Street Outfall
	Channel is maintained by WRC. Light layer of silt on apron of outfall structure 	Channel remains clear with recent flows removing the silt layer on the RHS 
Ref 04	No visual inspection required	

Ref 05	February 2020, Shepard Avenue, Pauanui	June 2020, Shepard Avenue, Pauanui
	Downstream of outlet is stable Embankment to LHS is eroding 4 pipe lengths visible 	Continued loss of embankment to the LHS of the outlet. 6 pipe lengths now visible 

Ref 06	February 2020, Coromandel outfall to Whangarahi Stream	June 2020 Coromandel outfall to Whangarahi Stream
	Silt layer has developed with absence of strong stream flows. Recent work in the CBD has replaced a portion of the upstream SW reticulation improving system performance. 	Site after a heavy rainfall event identifies minor scour under outlet Site conditions remain similar. 

Ref 07	February 2020, Marquet Place Tairua	June 2020, Marquet Place Tairua
	Outlet is stable with a thin layer of silt downstream of outlet 	Silt material downstream of outlet removed by flow otherwise unchanged. 

Ref 08	February 2020, Whitianga Marina	June 2020, Whitianga Marina
	Area well maintained and clear of debris 	Outlet continues to function well 

Ref 09	February 2020, Moewai road Whitianga	June 2020, Moewai road drain
	Downstream drain remains tidal. 	Drain has received maintenance work. 

Ref 10	February 2020, Casement Road Whangamata	June 2020 Casement Road, Whangamata
	Site stable 	Bottom outlet pipe partially submerged at all tide levels. Channel requires minor cleaning 

Ref 11	February 2020, Hetherington Road Whangamata	June 2020, Hetherington Road Whangamata
	Stable site 	Site remains unchanged 

Ref 12	February 2020, Aicken Road Whangamata	June 2020, Aicken Road Whangamata
	Outlet to drain. Drain requires vegetation control	Vegetation control completed
		

Ref 13	February 2020, Lindsey Road Whangamata	June 2020, Lindsey Road Whangamata
	Site clear and stable. Ponding due to aggregation of material in channel downstream of outlet 	Site remains as recorded in February. Channel since cleaned but ponding remains 

Ref 14	February 2020, Kotuku street Whangamata	June 2020, Kotuku street Whangamata
	Site remains unchanged from the previous inspection. Small ponding area in front of splash area 	Site is unchanged. Area to the RHS middle of image is the reference site for sediment and ecological studies 
Ref 15	No visual inspection required.	

Appendix 7: Sediment Sampling Results

2018 Sediment Sampling Monitoring Results and comparison against ANZECC 2000 Interim Sediment Quality Guidelines (ISQG)

	Monitoring Location		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Individual Tests	**ISQG Low**	**ISQG High**	Thames 26/2/18	Thames 26/2/18	Thames 26/2/18	Thames 26/2/18	Pauanui 27/2/18	Coro 28/2/18	Tairua 27/2/18	Whiti 28/2/18	Whiti 28/2/18	Whanga 28/2/18	Whanga 28/2/18	Whanga 28/2/18	Whanga 28/2/18	Whanga 28/2/18	Whanga 28/2/18
Environmental Solids	-	-															
Total Recoverable Digestion	-	-															
Total Organic Carbon (g/100g dry wt)	-	-	1.71	1.35	5.1	0.66	0.16	1.45	0.81	0.71	0.38	0.41	14.8	0.31	1.35	0.85	0.39
Dry Matter (Env) (g/100g as rcvd)	-	-	72	48	32	58	69	50	69	63	60	58	54	84	59	60	64
Heavy Metals (mg/kg dry wt)																	
Total Recoverable Arsenic	20	70	16.3	53	970	24	4.3	37	3.5	16.6	11.4	4.2	15.4	6.9	3.0	7.1	8.5
Total Recoverable Cadmium	1.5	10	0.195	0.169	0.33	0.111	0.015	0.073	0.082	0.050	0.111	<0.010	0.143	0.066	0.051	0.017	0.016
Total Recoverable Chromium	80	370	26	21	34	15.1	5.2	21	7.1	12.8	11.5	5.6	19.8	11.5	5.9	5.5	9.7
Total Recoverable Copper	65	270	34	33	86	23	0.8	43	12.3	13.7	29	1.6	47	11.6	3.4	1.8	1.0
Total Recoverable Lead	50	220	55	65	80	23	25	41	7.6	10.2	14.4	4.7	22	9.1	10.1	3.4	3.6
Total Recoverable Nickel	21	52	13.3	9.4	22	5.7	1.3	8.1	5.7	3.9	4.9	1.3	6.1	6.2	2.1	1.5	1.7
Total Recoverable Zinc	200	410	400	390	270	94	14	103	161	106	85	25	196	94	26	31	16.6

Between ISQG-Low and ISQG-High

Above ISQG-High

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Certificate of Analysis

Client:	Veolia Water Services (ANZ) Pty Limited	**Lab No:**	1936071 SPv1
Contact:	Cliff Olsen	**Date Received:**	02-Mar-2018
	C/- Veolia Water Services (ANZ) Pty Limited	**Date Reported:**	22-Mar-2018
	PO Box 72243	**Quote No:**	56713
	Papakura 2244	**Order No:**	PO137187
		Client Reference:	
		Submitted By:	Cliff Olsen

Sample Type: Sediment

Sample Name:		Burke Street Thames 26-Feb-2018 12:50 pm	Thames Marina 26-Feb-2018 12:15 pm	Fergusson Drive (Control Site) 26-Feb-2018 12:40 pm	Sealey Street Thames 26-Feb-2018 12:25 pm	Margnet Place Tairua 27-Feb-2018 10:35 am
Lab Number:		1936071.1	1936071.2	1936071.3	1936071.4	1936071.5
Individual Tests						
Dry Matter	g/100g as rcvd	32	72	58	48	69
Total Organic Carbon*	g/100g dry wt	5.1	1.71	0.66	1.35	0.81
Heavy metal, trace level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	970	16.3	24	53	3.5
Total Recoverable Cadmium	mg/kg dry wt	0.33	0.195	0.111	0.169	0.082
Total Recoverable Chromium	mg/kg dry wt	34	26	15.1	21	7.1
Total Recoverable Copper	mg/kg dry wt	86	34	23	33	12.3
Total Recoverable Lead	mg/kg dry wt	80	55	23	65	7.6
Total Recoverable Nickel	mg/kg dry wt	22	13.3	5.7	9.4	5.7
Total Recoverable Zinc	mg/kg dry wt	270	400	94	390	161
Polycyclic Aromatic Hydrocarbons Trace in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.005	< 0.002	0.003	< 0.003	< 0.003
2-Methylnaphthalene	mg/kg dry wt	< 0.005	< 0.002	0.003	< 0.003	< 0.003
Acenaphthene	mg/kg dry wt	0.005	< 0.002	< 0.003	0.003	< 0.003
Acenaphthylene	mg/kg dry wt	0.012	0.018	0.022	0.021	< 0.003
Anthracene	mg/kg dry wt	0.019	0.024	0.049	0.035	< 0.003
Benzo[a]anthracene	mg/kg dry wt	0.129	0.22	0.20	0.31	< 0.003
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.164	0.25	0.21	0.36	0.004
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.196	0.28	0.23	0.40	0.006
Benzo[e]pyrene	mg/kg dry wt	0.112	0.152	0.123	0.21	0.006
Benzo[g,h,i]perylene	mg/kg dry wt	0.120	0.140	0.120	0.20	0.011
Benzo[k]fluoranthene	mg/kg dry wt	0.068	0.101	0.091	0.147	< 0.003
Chrysene	mg/kg dry wt	0.112	0.177	0.164	0.26	0.004
Dibenzo[a,h]anthracene	mg/kg dry wt	0.020	0.029	0.021	0.042	< 0.003
Fluoranthene	mg/kg dry wt	0.24	0.36	0.42	0.41	0.004
Fluorene	mg/kg dry wt	< 0.005	0.003	0.004	0.004	< 0.003
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.119	0.165	0.129	0.24	< 0.003
Naphthalene	mg/kg dry wt	< 0.03	< 0.010	< 0.013	< 0.015	< 0.011
Perylene	mg/kg dry wt	0.039	0.051	0.050	0.080	< 0.003
Phenanthrene	mg/kg dry wt	0.071	0.081	0.20	0.094	< 0.003
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	0.24	0.36	0.30	0.52	< 0.005
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	0.24	0.36	0.30	0.52	< 0.006
Pyrene	mg/kg dry wt	0.26	0.39	0.43	0.45	0.012

IANZ ACCREDITED LABORATORY

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

Sample Type: Sediment						
Sample Name:		Sheppards Ave Pauanui 27-Feb-2018 11:25 am	Aicken Road Whangamata 28-Feb-2018 2:00 pm	Hetherington Road Whangamata 28-Feb-2018 1:40 pm	Lindsay Road Whangamata 28-Feb-2018 2:05 pm	Casement Road Whangamata 28-Feb-2018 1:45 pm
Lab Number:		1936071.6	1936071.7	1936071.8	1936071.9	1936071.10
Individual Tests						
Dry Matter	g/100g as rcvd	69	84	54	59	58
Total Organic Carbon*	g/100g dry wt	0.16	0.31	14.8	1.35	0.41
Heavy metal, trace level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	4.3	6.9	15.4	3.0	4.2
Total Recoverable Cadmium	mg/kg dry wt	0.015	0.066	0.143	0.051	< 0.010
Total Recoverable Chromium	mg/kg dry wt	5.2	11.5	19.8	5.9	5.6
Total Recoverable Copper	mg/kg dry wt	0.8	11.6	47	3.4	1.6
Total Recoverable Lead	mg/kg dry wt	2.5	9.1	22	10.1	4.7
Total Recoverable Nickel	mg/kg dry wt	1.3	6.2	6.1	2.1	1.3
Total Recoverable Zinc	mg/kg dry wt	14.0	94	196	26	25
Polycyclic Aromatic Hydrocarbons Trace in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.003	< 0.002	< 0.003	< 0.003	< 0.003
2-Methylnaphthalene	mg/kg dry wt	< 0.003	< 0.002	< 0.003	< 0.003	< 0.003
Acenaphthene	mg/kg dry wt	< 0.003	< 0.002	< 0.003	< 0.003	< 0.003
Acenaphthylene	mg/kg dry wt	< 0.003	< 0.002	< 0.003	< 0.003	< 0.003
Anthracene	mg/kg dry wt	< 0.003	0.003	0.005	< 0.003	< 0.003
Benzo[a]anthracene	mg/kg dry wt	< 0.003	0.028	0.008	0.013	< 0.003
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.003	0.029	0.016	0.019	< 0.003
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.003	0.038	0.024	0.023	< 0.003
Benzo[e]pyrene	mg/kg dry wt	< 0.003	0.018	0.024	0.011	< 0.003
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.003	0.018	0.036	0.012	< 0.003
Benzo[k]fluoranthene	mg/kg dry wt	< 0.003	0.014	0.004	0.007	< 0.003
Chrysene	mg/kg dry wt	< 0.003	0.023	0.015	0.010	< 0.003
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.003	0.002	< 0.003	< 0.003	< 0.003
Fluoranthene	mg/kg dry wt	< 0.003	0.053	0.029	0.026	< 0.003
Fluorene	mg/kg dry wt	< 0.003	< 0.002	< 0.003	< 0.003	< 0.003
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.003	0.019	0.012	0.011	< 0.003
Naphthalene	mg/kg dry wt	< 0.011	< 0.010	< 0.014	< 0.012	< 0.013
Perylene	mg/kg dry wt	< 0.003	0.007	0.003	0.007	< 0.003
Phenanthrene	mg/kg dry wt	< 0.003	0.005	0.016	< 0.003	< 0.003
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.005	0.042	0.021	0.025	< 0.006
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.006	0.041	0.021	0.024	< 0.007
Pyrene	mg/kg dry wt	< 0.003	0.057	0.047	0.026	0.003

Sample Name:		Otahu Estuary (Control Site) 28-Feb-2018 1:30 pm	Kotuku Street Whangamata 28-Feb-2018 1:20 pm	Marina Hardstand Whitianga 28-Feb-2018 11:30 am	Moewai Drive Whitianga 28-Feb-2018 11:50 am	Wharf Road Coromandel 28-Feb-2018 10:25 am
Lab Number:		1936071.11	1936071.12	1936071.13	1936071.14	1936071.15
Individual Tests						
Dry Matter	g/100g as rcvd	64	60	63	60	50
Total Organic Carbon*	g/100g dry wt	0.39	0.85	0.71	0.38	1.45
Heavy metal, trace level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	8.5	7.1	16.6	11.4	37
Total Recoverable Cadmium	mg/kg dry wt	0.016	0.017	0.050	0.111	0.073
Total Recoverable Chromium	mg/kg dry wt	9.7	5.5	12.8	11.5	21
Total Recoverable Copper	mg/kg dry wt	1.0	1.8	13.7	29	43
Total Recoverable Lead	mg/kg dry wt	3.6	3.4	10.2	14.4	41
Total Recoverable Nickel	mg/kg dry wt	1.7	1.5	3.9	4.9	8.1
Total Recoverable Zinc	mg/kg dry wt	16.6	31	106	85	103

Sample Type: Sediment						
Sample Name:		Otahu Estuary (Control Site) 28-Feb-2018 1:30 pm	Kotuku Street Whangamata 28-Feb-2018 1:20 pm	Marina Hardstand Whitianga 28-Feb-2018 11:30 am	Moewai Drive Whitianga 28-Feb-2018 11:50 am	Wharf Road Coromandel 28-Feb-2018 10:25 am
Lab Number:		1936071.11	1936071.12	1936071.13	1936071.14	1936071.15
Polycyclic Aromatic Hydrocarbons Trace in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
2-Methylnaphthalene	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Acenaphthene	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Acenaphthylene	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Anthracene	mg/kg dry wt	< 0.003	< 0.003	< 0.003	0.007	< 0.003
Benzo[a]anthracene	mg/kg dry wt	< 0.003	< 0.003	0.016	0.031	0.022
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.003	< 0.003	0.027	0.042	0.028
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.003	< 0.003	0.036	0.047	0.032
Benzo[e]pyrene	mg/kg dry wt	< 0.003	< 0.003	0.023	0.029	0.016
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.003	< 0.003	0.025	0.031	0.015
Benzo[k]fluoranthene	mg/kg dry wt	< 0.003	< 0.003	0.011	0.015	0.010
Chrysene	mg/kg dry wt	< 0.003	< 0.003	0.016	0.025	0.016
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.003	< 0.003	0.003	0.003	< 0.003
Fluoranthene	mg/kg dry wt	< 0.003	< 0.003	0.029	0.065	0.033
Fluorene	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.003	< 0.003	0.019	0.026	0.015
Naphthalene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.015
Perylene	mg/kg dry wt	< 0.003	< 0.003	0.007	0.009	0.006
Phenanthrene	mg/kg dry wt	< 0.003	< 0.003	0.007	0.025	0.004
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.006	< 0.006	0.039	0.059	0.039
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.006	< 0.006	0.039	0.058	0.038
Pyrene	mg/kg dry wt	< 0.003	< 0.003	0.034	0.073	0.036

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Sediment			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-15
Heavy metal, trace level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, trace level.	0.010 - 0.4 mg/kg dry wt	1-15
Polycyclic Aromatic Hydrocarbons Trace in Soil	Sonication extraction, SPE cleanup, GC-MS SIM analysis US EPA 8270C. Tested on as received sample [KBIs:5784,4273,2695]	0.002 - 0.010 mg/kg dry wt	1-15
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-15
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-15
Total Organic Carbon*	Acid pretreatment to remove carbonates present followed by Catalytic Combustion (900°C, O2), separation, Thermal Conductivity Detector [Elementar Analyser].	0.05 g/100g dry wt	1-15

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental

THAMES COROMANDEL DISTRICT COUNCIL

VEOLIA WATER

Stormwater Monitoring Programme:

Ecological Assessment
Thames-Coromandel Urban Areas
2018

Kessels Ecology
survey, assessment, restoration

Table of Contents

Prepared by: Stella McQue

Reviewed by: Brenda Bart

Version: 1704

PWF ref: VW.005

Executive Summary

As part of their Comprehensive Stormwater Discharge Consents, Thames-Coromandel District Council and Veolia Water are required to carry out a monitoring programme of stormwater outlets, including an ecological assessment throughout the region every four years. Kessels Ecology was contracted to carry out the ecological assessment in 2018. The survey sites include 13 stormwater outlets around the Coromandel area, as well as two control sites where no stormwater is discharged. Most sites are situated in, or near, harbours, with one site (Site 9) in a freshwater stream.

The purpose of this study is to determine the general ecological health of the stormwater discharge receiving environment and assess general effects of stormwater discharge.

This report should be read in conjunction with a report on sediment contaminant concentrations which has been produced by Veolia Water.

In line with the recommendations of the 2014 report, the 2018 sampling took place 5 days after a major storm event, so that any ecological effects of stormwater discharge would be more obvious.

The general approach for the surveys is based on in-situ visual observation of three key biological indicators of ecological health. These three indicators are as follows:

- Aquatic plant growth composition and percentage cover;
- Benthic macroinvertebrate diversity and distribution; and
- Identification of potential native freshwater fish habitat and potential barriers to fish migrations.

Macroinvertebrate presence was highly variable. The fauna at each site probably reflected the diversity present in the wider estuary or the habitat available at the site, rather than the impacts of stormwater. In these mainly estuarine habitats, the invertebrate fauna is greatly dependent on the substrate and exposure to water currents, e.g. whether the site is muddy and sheltered or sandy/rocky and exposed. Only severe changes in benthic fauna would be likely to be detected using the current survey technique.

No effects of the stormwater discharges on aquatic plants were evident at the time of sampling. Few sites had aquatic plants present, partly due to the tidal fluctuations and habitat types at most sites being less suitable for plants. Mangroves and green filamentous algae were present at 2 sites each.

The stormwater discharges appears to have little impact on the ecology of the receiving environments, however these effects remain difficult to separate from the influence of tide and local habitat variation.

1 Introduction

As part of their Comprehensive Stormwater Discharge Consents, Thames-Coromandel District Council and Veolia Water are required to carry out a monitoring programme of stormwater outlets, including an ecological assessment. Kessels Ecology was contracted to carry out this assessment in 2018. The survey sites include 13 stormwater outlets around the Coromandel area, as well as two control sites where no stormwater is discharged. Most sites are situated in, or near, harbours, with one site (Site 9) in a freshwater stream.

The purpose of this study is to determine the general ecological health of the stormwater discharge areas and assess general effects of stormwater discharge. Monitoring is undertaken every four years.

This report should be read in conjunction with a report on sediment contaminant concentrations which has been produced by Veolia Water.

In line with the recommendations of the 2014 report (Price and Catlin 2014), the 2018 sampling took place 5 days after a major storm event, so that any ecological effects of stormwater discharge would be more obvious.

2 Methods

2.1.1 General Approach

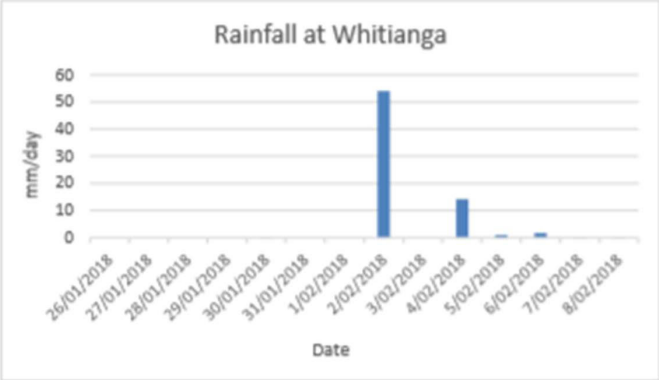
The general approach for the surveys is based on the visual observation of three key biological indicators of ecological health, as well as physicochemical water parameters. The three indicators are as follows:

- Aquatic plant growth composition and percentage cover;
- Benthic macroinvertebrate diversity and distribution; and
- Identification of potential native freshwater fish habitat and potential barriers to fish migrations.

2.1.2 Survey Sites

Fifteen sample sites were sampled within Coromandel and nearby communities or immediately upstream of most of the urban areas. Sites were investigated on the 10th and 11th of January 2018. The survey was undertaken after a storm event which resulted in heavy rainfall across the Coromandel on January 5 (Table 1).

Table 2: Example of rainfall patterns in the Coromandel over the two weeks prior to the 2018 survey.



Coordinates of the sample sites are given in Table 2. The sites are as follows (site descriptions from Baldwin 2013):

Site 1: Thames Marina. High risk catchment with commercial and industrial activities, making it susceptible to the build-up of contaminants in the sediments. Outlet flows into an area of mangroves.

Site 2: Sealey St South of Goldfields shopping centre – Thames. High risk catchment with commercial activities. Close to SH25. Outlet flows into a narrow channel which flows into the harbour.

Site 3: Burke St outlet – Thames. High risk catchment with commercial and industrial activities and close to SH25.

Site 4: **Control site**. Fergusson Dr – Moanatairi, away from stormwater outlets - Thames. Residential catchment associated with historical mine catchments. A floodgate controls stormwater flow at this site.

Site 5: Sheppard Avenue, Pāuanui harbour – Pāuanui. High risk catchment, stormwater flows directly into the estuary.

Site 6: Wharf Road, Whangarahi Stream – Coromandel. High risk catchment which encompasses most of the CBD.

Site 7: Marquet Place, Tairua harbour – Tairua. High risk catchment which envelops most of the CBD. Stormwater outlet flows directly into the harbour.

Site 8: Marina Hardstand – Whitianga. High risk catchment which envelops most of the CBD. The stormwater outlet flows into the marina where channels have been constructed.

Site 9: Moewai Road North, drain outlets – Whitianga. High risk catchment with commercial and industrial activities. SH25 is also close. The stormwater outlet at this site flows into a freshwater stream.

Site 10: Casement Rd drain Moana Anu Anu River – Whangamatā. High risk catchment with commercial and industrial activities. At this site the stormwater outlet flows into a short channel which then flows into the harbor.

Site 11: Hetherington Rd, south of marina – Whangamatā. High risk catchment with commercial and industrial activities. The stormwater outlet flows directly into the harbor.

Site 12: Aicken Rd – Whangamatā. High risk catchment with commercial and industrial activities. The outlet flows into a short channel which flows into the harbor.

Site 13: Lindsay Rd – Whangamatā. High risk catchment with commercial and industrial activities. Similar to sites 10 and 12, the stormwater outlet flows into a channel and then into the harbour.

Site 14: Kotuku St SW outfall, Otahu Estuary Kotuku Street – Whangamatā. This site is considered to be in a low risk residential area. The stormwater outlet flows into a raised concrete pond within the tidal zone of the estuary.

Site 15: Control site, Otahu estuary, away from SW outlets – Whangamatā. The site is situated in a residential catchment. As it is a control site, there is no stormwater outlet present.

Table 2: Coordinates (decimal degrees) for the stormwater stream sampling sites, February 2018.

Site	Location	Easting	Northing
1	Thames	175.324259	-37.84802
2	Thames	175.322644	-37.82414
3	Thames	175.315976	-37.75009
4	Thames (Control)	175.314992	-37.73042
5	Pāuanui	175.511939	-37.1264
6	Coromandel	175.294266	-36.453979
7	Tairua	175.504958	-37.0508
8	Whitianga	175.422053	-36.501537
9	Whitianga	175.402005	-36.495468
10	Whangamatā	175.515725	-37.12133
11	Whangamatā	175.515860	-37.115899
12	Whangamatā	175.515398	-37.12400
13	Whangamatā	175.515222	-37.12768
14	Whangamatā	175.522067	-37.133112
15	Whangamatā (Control)	175.522529	-37.133356

2.1.3 Aquatic Macroinvertebrates

Where possible, aquatic macroinvertebrate samples were collected in accordance with Environment Waikato's regional guidelines (Collier and Kelly 2005), which are based on protocols developed for the Ministry for the Environment by Stark et al. (2001). However, due to the estuarine habitat present at most sites, and the extremely low flow from the pipes at most sites, this method was not always appropriate as it was designed for freshwater streams. At estuarine sites, a thorough search was carried out for fauna species in the water, on the sediment surface and under rocks and logs etc. Samples were assessed for presence or absence of taxa and particularly abundant taxa were noted.

3 Results & Discussion

3.1 Site Descriptions

3.1.1 Site 1: Thames Marina

The outlet flows into a short channel then into the estuary. The channel banks are moderately steep with a narrowly incised channel. The marine mud substrate was deep, with some gravel in the base and no woody debris. Flow through the culvert was very low at the time of sampling.

Mangrove seedlings present at the 2014 survey have established and were 0.5-1 m tall. Tunnelling mud crab (*Austrohelice crassa*) burrows were abundant over all surfaces of the channel. Rock oysters (*Saccostrea glomerata*), mud snail (*Potamopyrgus* sp.) and whelks (*Cominella*) were abundant. One mudflat snail (*Amphibola crenata*) was also found. Fish access into the culvert was not impeded, but is tide dependent. Oligochaete worms and Tanypod fly larvae were present in the 2014 survey, but were not observed in 2018.

Photo 1. Site 1: Thames Marina.

3.1.2 Site 2: Sealey St- Thames

The outlet flows into a 100 m long, mangrove-lined channel then into the estuary. The substrate was gravel, sand and rocks, leading into deeper marine muds. No woody debris or aquatic plants were present and minimal organic matter or leaf litter. Flow through the culvert was low at the time of sampling.

The tunnelling mud crab burrows and mud snails were abundant, other fauna include estuarine mudflat snail, oligochaetes, chironomid non-biting midge larvae, and the pest fish *Gambusia affinis*. Fish access into the culvert was blocked due to the metal cones fixed into the culvert openings.

This site was physically very different to 2014. Built-up mud and debris present on the culvert apron at the previous survey have been removed or washed out, and metal cones had been fitted to the culvert openings.

Photo 2. Site 2: Sealey St, Thames.

3.1.3 Site 3: Burke St outlet – Thames

The outlet flows into a long tidal channel then into the estuary. The channel was wide and flat-bottomed; iron flocculates were conspicuous in the shallow water channels. The substrate was deep tidal mud with mangrove seedlings. Flow through the culvert was low at the time of sampling.

Tunnelling mud crab burrows and mud snail and tubificid oligochaete worms were abundant; and chironomid non-biting midge larvae were also present. Fish access was unimpeded.

Observations at this site were similar to the 2014 survey.

Photo 3. Site 3: Burke St outlet, Thames.

3.1.4 Site 4: Control site, Fergusson Dr – Thames

This stormwater outlet is controlled by a tide gate which opens directly onto the beach. At the time of survey, the concrete structure was buried in sand, almost to the top of the structure, possibly by the recent storm event, and could not be surveyed.

Photo 4. Site 4: Fergusson Dr, Thames in 2018 (left) and 2014 (right).

3.1.5 Site 5: Sheppard Avenue, Pāuanui harbour – Pāuanui

This outlet flows directly into the estuary. The culvert is constructed from several interlinked concrete pipes, the outer of which was coming loose. There was no flow from the culvert at the time of sampling. The substrate was sand with many empty marine shells.

No aquatic plants were present, and the inside of the pipe was lined with rock oysters (*Saccostrea glomerata*). Other fauna species present included; shrimp which were abundant as well as mudflat snail and spire shells (*Zeacumantus* sp.). Fish access was unimpeded.

Compared with the 2014 survey, observations at this site were very similar, excepting that bivalve shellfish (i.e. cockle (*Austrovenus stutchburyi*) and pipi (*Paphies australis*) were not detected.

Photo 5. Site 5: Sheppard Ave, Pāuanui.

3.1.6 Site 6: Wharf Road, Whangarahi Stream – Coromandel

This outlet pipe is set in a retaining wall 1 m above the mud in a tidal section of the Whangarahi Stream. the top of the culvert pipe is submerged at high tide, which would allow fish access. The substrate was tidal mud with embedded cobbles and there was no flow through the culvert at the time of sampling.

No aquatic plants were present. Tunnelling mud crab burrows and mud snails were abundant during the survey, and shrimp and amphipods were present.

Observations at this site were similar to the 2014 survey.

Photo 6. Site 6: Wharf Rd, Coromandel.

3.1.7 Site 7: Marquet Place, Tairua harbour – Tairua

The outlet flows directly into the harbour. The substrate was rocks, concrete blocks, sand and marine mud. Several *Juncus* reeds were present on the edge of the banks and no aquatic plants were present. There was no or very low flow from the culvert, so the water chemistry measurements reflect tidal water at the mouth of the culvert.

Common fauna species observed were shrimp, estuarine triplefin (*Grahamina nigripenne*), tunnelling mud crab, mudflat snail, spotted whelk (*Cominella maculosa*), mud whelk (*Cominela glandiformis*) and top shell (*Diloma* sp.). Fish access is unimpeded, except possibly by the lip of the culvert apron at low tide

Observations at this site were similar to the 2014 survey.

Photo 7. Site 7: Marquet Place, Tairua Harbour.

3.1.8 Site 8: Marina hardstand – Whitianga

The outlet flows into the marina over a concrete weir only during times of high flows and high tides. Within the metal-grilled chamber, water flows out of a large culvert and diverts into a smaller culvert. The channel beyond the structure is lined with riprap which was embedded in sand. There was no flow of water from the culvert to the channel during the survey.

There were no aquatic plants present. Topshell snails (*Nerita* sp.) were clustered near the concrete block and mud whelks were also present. There was no fish access at this location. Bullies (*Gobiomorphus* sp.), a

common fish species, were abundant within the chamber. This fish species has an estuarine larval stage, and are likely entering from

Fewer fauna species were observed during this survey than in 2014.

Photo 8. Site 8: Marina hardstand, Whitianga.

3.1.9 Site 9: Moewai Road North– Whitianga.

The outlet flows into a freshwater stream. The stream was lined with rank grasses, *Convolvulus*, blackberry (*Rubus fruticosus*) and other low weeds on the true left bank, and pine (*Pinus sp.*), flax (*Phormium tenax*), tutu (*Coriaria arborea*) and reeds on the true right bank. The streambed was mostly clear of vegetation, with water pepper (*Persicaria hydropiper*) along the edge of the banks, and leaf litter and woody debris present in the stream. The water level in the stream was exceptionally low, with 40-50% of the substrate exposed. The water was slightly milky and algal mats were growing on the substrate. Water flowing from the outlet was clear and contained large amounts of iron flocculate.

A large longfin eel (*Anguilla dieffenbachii*) was hiding amongst detritus beside the culvert outlet. Mud snails and chironomid non-biting midge larvae were abundant; also present were oligochaete worms and a caddisfly larva (Hydroptilidae). Fish access was unimpeded at high water levels but could be impeded at low water levels by a slight drop at the mouth of the culvert.

Compared with the 2014 survey, the site has changed dramatically. In 2014, the stream channel was overgrown and partly obscured by weeds and rank grasses. Slightly fewer invertebrate groups were found in 2018 compared to 2014.

Photo 9. Site 9: Moewai Rd, Whitianga.

3.1.10 Site 10: Casement Rd drain, Moana Anu Anu River – Whangamatā

The outlet flows into a long, wide channel which then flows into the harbour. The substrate wa predominantly sand with fine gravel with some mud. The flow was very low, with plenty of built-up surfac scum and green filamentous algae.

No aquatic plants or mangroves were present at the site, weedy terrestrial vegetation along the bank provided some stream shade and cover in places. Mud snails were especially abundant. there were als non-biting chironomid midge larvae and burrows from tunnelling mud crabs.

The site was similar to the 2014 survey, however fewer invertebrate species were observed.

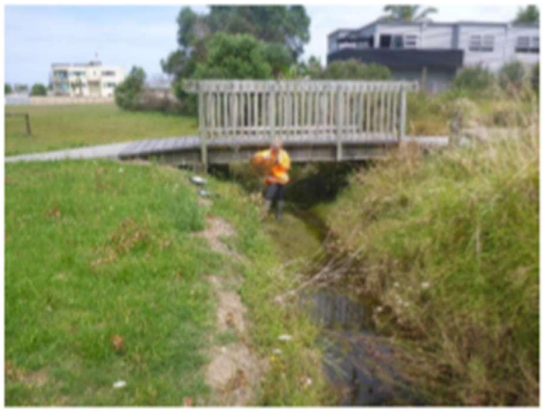


Photo 10. Site 10: Casement Rd, Whangamatā.

3.1.11 Site 11: Hetherington Rd – Whangamatā.

This outlet flows into a small saltmarsh on the edge of the harbour, although there was no flow at the tim of the survey. The sediment around the outlet was dry, soft sand and soil, densely vegetated with (*Juncu* sp.), and glasswort (*Salicornia quinqueflora*), oioi (*Apodasmia similis*), and the creeper (*Samolus* sp.). N aquatic plants were present at the site. Tunnelling mud crab burrows were present but no other fauna wer observed and there was no fish access to the culvert pipe.

Observations at this site were similar to the 2014 survey.

Photo 11. Site 11: Hetherington Rd, Whangamatā.

3.1.12 Site 12: Aicken Rd – Whangamatā.

This outlet flows into a short channel then enters the estuary. Water was flowing at a very low rate from the submerged pipe. The substrate was gravel and sand, with iron flocs and oily scum from iron bacteria were present. The banks of the channel were eroding, either actively or as the result of a very large rainfall event. There were no aquatic plants present.

There were a few mud snails, chironomid non-biting midge larvae and oligochaete worms present and fish access was unimpeded.

Observations at this site were similar to the 2014 survey.

Photo 12. Site 12: Aicken Rd, Whangamatā.

3.1.13 Site 13: Lindsay Rd – Whangamatā

This outlet flows into large scour pool, then a short channel and finally enters the estuary. Four pipes exit into the pool. The banks of the channel were eroding, either actively or as the result of a very large rainfall event. The substrate was gravel with a light covering of sediment, leaf litter and filamentous algae. Iron flocs and an oily scum from iron bacteria were present.

Shrimp and mud snail were abundant. Fish were observed in the pool – estuarine triplefins (*Forsterygion nigripenne*) were abundant and a 15 cm mullet (*Mudgil* sp.) was present. There were no aquatic plants and there was fish access into the lower outlets.

Observations at this site were similar to the 2014 survey.

Photo 13. Site 13: Lindsay Rd, Whangamatā.

3.1.14 Site 14: Kotuku St – Whangamatā.

This outlet flows into a raised concrete trough, which overflows into the estuary. The substrate was sand and gravel with gabion bank armouring and iron floc was present.

Cat's eye snails (*Lunella smaragda*) were abundant. Other species included shrimp, rock oyster (*Saccostrea glomerata*), limpet (Lottidae), oligochaete worms, amphipods, estuarine mud snail and whelk. No aquatic plants were present and fish access was not impeded.

Observations at this site were similar to the 2014 survey.

Photo 14. Site 14: Kotuku St, Whangamatā.

3.1.15 Site 15: Control site, Otahu estuary – Whangamatā.

Site 15 is the estuary control site, with no stormwater outlet present. The substrate at this site was sandy. Fauna present included tunnelling mud crab, little black mussel (*Xenostrobus neozelanicus*), whelk, amphipods, isopods, mudflat topshell (*Diloma* sp.), cat's eye snail and shrimp. The estuarine triplefin fish (*Forsterygion nigripenne*) was common. No aquatic plants were present.

Photo 15. Site 15: Otahu Estuary, Whangamatā.

3.2 Aquatic Macroinvertebrates

Aquatic macroinvertebrate communities were highly variable between sampling sites, potentially related to tidal fluctuations in water level and salt water, as well as the substrate site and level of disturbance at each site. The most widespread and generally abundant species were tunnelling mud crab and mud snail, found at eight sites each. Marine and estuarine molluscs were present at 12 of the 15 sites.

Sites 14 and 15 had seven fauna species present, followed by sites 1, 2, 5, and 7 having five species each. Sites 14 and 15 were close to each other, as were sites 1 and 2, and site 5 and 7. Each pair of neighbouring sites shared at least half of its species. This may indicate that the number of species at any one site is directly related to the number of species in the wider estuary, while the type of species present at a site may depend on local habitat conditions.

Sites 10, 11, 12 and 13 had very few fauna species. These sites also had the highest water temperatures, lowest water velocities and visually the water appeared stagnant.

Diversity and abundance of invertebrates was likely affected by the warm conditions and low freshwater flow at the time of sampling, with only tolerant species able to survive in the shallow water habitats near the outlets.

3.3 Aquatic Plants

Aquatic plant cover was low or absent at the stormwater outlets. Sites 1 and 3 had small mangrove plants or seedlings present. Some sites had occasional loose mangrove seeds but these were not rooted, and the sandy substrate at most of these sites means that mangroves are unlikely to establish. Green filamentous algae was present at Sites 10 and 13; large amounts of such algae can signal nutrient enrichment.

3.4 Fish Habitat and Passage

Five species of fish were observed at six of the sampling sites. The estuarine triplefin was seen at sites 7, 13 and 15. The euryhaline mullet was observed at site 13, and the freshwater bully and longfin eel were seen at sites 8 and 9 respectively. Gambusia, an introduced pest species, were seen at site 2.

As most sites surveyed were estuarine, the culverts would be freely accessible to fish at high tide. Few of the sites The areas around most outlets had little cover or habitat (i.e. aquatic plants, woody debris, stones or other structures) and would not be expected to provide more than occasional habitat for

fish. Fish would likely vacate the small tidal channels at low tide during periods of low dissolved oxygen, high temperatures and low water levels.

4 Conclusions

Ecological effects of the stormwater discharges remain difficult to separate from the influence of tide and local habitat variation, however they appear to be minor.

Macroinvertebrate presence was highly variable. The fauna at each site probably reflected the diversity present in the wider estuary or the habitat available at the site, rather than the impacts of stormwater. In these mainly estuarine habitats, the invertebrate fauna is greatly dependent on the substrate and exposure to water currents, e.g. whether the site is muddy and sheltered or sandy/rocky and exposed. Only severe changes in benthic fauna would be likely to be detected using the current survey technique.

No effects of the stormwater discharges on aquatic plants were evident at the time of sampling. Aquatic plant coverage was low at the time of sampling, partly due to the tidal fluctuations and habitat types at most sites being less suitable for plants. Mangroves and green filamentous algae were present at 2 sites each.

The 2014 survey report recommended that future sampling should take place after at least 10-50 mm of rainfall, so that any ecological effects of stormwater discharge would be more obvious (Price and Catlin, 2014). The 2018 surveys took place five days after a major storm event; however, the stormwater discharges had returned to low flow, indicating that the sites are flashy and the effects of stormwater discharge are likely only present during the actual rainfall events. Therefore, this stipulation to conduct surveys following rainfall is unnecessary for future surveys.

5 References & Bibliography

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Appendix 9: Draft Request for Proposal – Stormwater Monitoring Programme

Introduction

Thames-Coromandel District Council (TCDC) obtained comprehensive stormwater discharge consents (CSDC's) for eight urban areas within the district from Waikato Regional Council (WRC) in 2011. The WRC resource consent reference and urban area these consents relate to are as listed in

Table *1* and shown spatially in the map referenced as Figure 1.

Table 1 - CSDC List

CSDC – Consent Number	Urban Area
122521	Thames
105661	Pauanui
105663	Coromandel
105664	Tairua
105665	Whitianga
105666	Onemana
105667	Whangamata
105668	Thames Coast

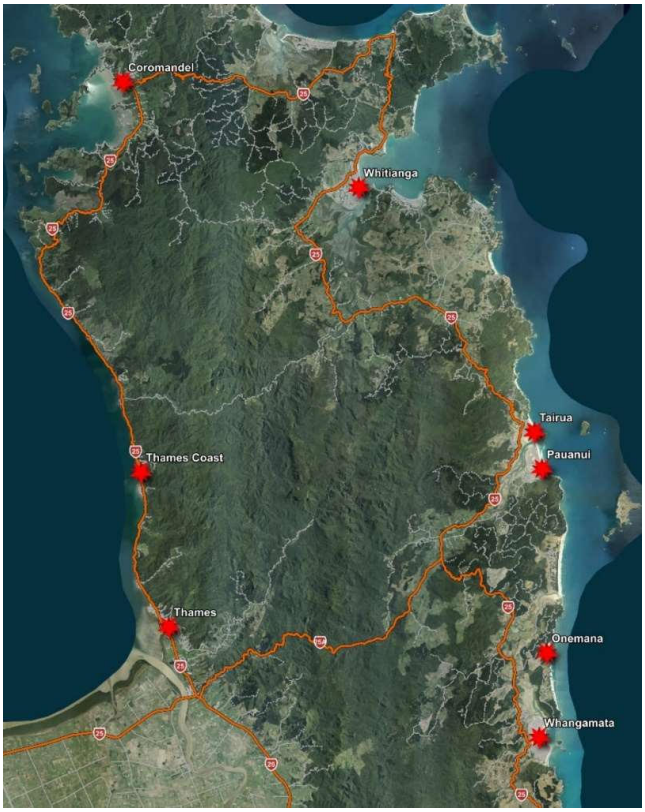

Figure 1 - CSDC Locations

Consent condition 4 of the each of the above consents requires TCDC to prepare a monitoring programme that will achieve the following objectives:

Monitoring Programme

4) The Consent Holder shall retain appropriately qualified and experienced persons to prepare a Monitoring Programme. The objectives of the Monitoring Programme are to:

- Investigate the actual and potential adverse effects of municipal stormwater diversion and discharge activities on the environment;
- Provide information to refine Best Practicable Option stormwater management measures that assist the Consent Holder in avoiding, remedying or mitigating actual and potential adverse effects on the environment;
- Assess the performance of utilised stormwater management devices to determine their overall effectiveness in managing and/or treating stormwater, and to guide the best practicable application of these devices in respective catchments;
- Provide guidance on the ongoing and necessary changes to the Stormwater Management Plan to address any shortcomings with the operational procedures, management initiatives and implementation measures adopted by the Stormwater Management Plan;
- Review the level of subdivision and development that is occurring in developing catchments, relative to the land use assumptions underlying the integrated catchment management approaches adopted by approved Catchment Management Plans;
- Determine overall compliance with the conditions of this consent.

As a minimum, the Monitoring Programme shall include:

a) Monitoring to identify any adverse stormwater quantity and quality effects on aquatic ecosys shall include stormwater receiving water body monitoring at targeted locations, and is likely to one or more of the following activities:

   i) Visual assessments of general habitat quality and sensitivity to stormwater inputs,
   ii) Sediment quality sampling and analyses of key stormwater contaminants and characteristics that aid data interpretation, and
   iii) Biological sampling and analyses of macroinvertebrate communities and fish populations

b) Monitoring to identify any visual signs of contaminants in stormwater (conspicuous oil or gre scums or foams, floatable suspended materials, conspicuous change in colour or visual clarity

c) Monitoring to identify any adverse scour, erosion and sediment deposition on land, propert beds of stormwater receiving water bodies;

d) Monitoring to identify any adverse flooding of land, property and stormwater receiving wate

e) Monitoring to identify any stormwater management structures that are impeding the upst downstream movement of fish;

f) Monitoring to determine the performance of utilised stormwater management devices in and/or treating stormwater;

g) Monitoring to gauge the level of subdivision and development that is occurring in d catchments, relative to the land use assumptions underlying the integrated catchment mar approaches adopted by approved Catchment Management Plans;

h) Monitoring to ensure that all stormwater management devices are maintained in good working order, and providing best practicable stormwater management and/or treatment efficiency at all times;

i) Monitoring to determine best practicable street and stormwater catchpit cleaning operations to minimise the volume of stormwater contaminants entering the stormwater network and discharging to the receiving environment.

The Monitoring Programme shall be to a standard acceptable to the Waikato Regional Council and shall be submitted to the Waikato Regional Council for written approval in a technical certification capacity, by 31st March 2012 or such later date that may be approved in writing by the Waikato Regional Council in a technical certification capacity. Thereafter, the Monitoring Programme shall be reviewed, updated and submitted to the Waikato Regional Council for approval in a technical certification capacity, by 31st March every third year. The Waikato Regional Council will review and may alter the Monitoring Programme (in scale and/or method and/or location) after having had regard to the consistency and significance of the monitoring data collected, or any other information relating to the stormwater diversion and discharge activities authorised by this consent.

This request for proposal (RFP) sets out TCDC's requirements for a comprehensive review and update of the stormwater monitoring programme to ensure Council's monitoring obligations under the CSDC resource consents continue to be met.

Scope of Work

1. Review the existing CSDC Monitoring Programme and the results of the monitoring data which have been collected to date

2. Carry out a review and update of the current stormwater monitoring programme in accordance with the requirements of condition 4 of TCDC's CSDC's
3. Consultation and liaison with TCDC staff and contractors
4. Review of best practice for urban stormwater monitoring for the Thames-Coromandel District context, taking into consideration available codes of practice, guidelines, regulations etc
5. Liaise with Waikato Regional Council as required to ensure an acceptable updated monitoring programme is provided
6. Update the Monitoring Programme as required based on the review and development as above, this will be done in consultation / liaison with TCDC staff
7. Submit a draft version of the review and updated Monitoring Programme to TCDC for comment
8. Submit the final version of the review and updated Monitoring Programme to WRC for approval as per Condition 4.

Deliverables

1. A completed Stormwater Monitoring Programme (including all appendices and a list of referenced documents) approved by WRC.

Information Provided

1. Current Stormwater Monitoring Programme document in PDF format
2. Monitoring results collected and available to date – generally PDF format
3. Current draft revision of Stormwater Management Plan
4. GIS datasets as necessary and available (supply agreement to be completed by consultant and approved for supply by TCDC IT Governance)
5. Other information as requested and available.

Programme

A completed draft revised monitoring programme shall be provided to TCDC by XXX.

The final revised monitoring programme shall be submitted to WRC and provided to TCDC by XXX.

Client Representative

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