WAIMAKARIRI
DISTRICT COUNCIL

Utilities and Roading Committee

Agenda

Tuesday 12 December 2017

4.00pm

Waimakariri District Council Chambers
215 High Street
Rangiora

Members:

Cr Sandra Stewart (Chairperson)
Cr Robbie Brine
Deputy Mayor Kevin Felstead
Cr John Meyer
Cr Paul Williams
Mayor David Ayers (ex officio)

The Chairman and Members
WAIMAKARIRI DISTRICT COUNCIL

A Meeting of the **UTILITIES AND ROADING COMMITTEE** will be held in the **COUNCIL CHAMBERS, 215 HIGH STREET, RANGIORA** on **TUESDAY 12 DECEMBER 2017** to commence at **4.00pm**.

Adrienne Smith
Committee Advisor

Recommendations in reports are not to be construed as Council policy until adopted by the Council

BUSINESS

Page No

1 APOLOGIES

2 CONFLICTS OF INTEREST

Conflicts of interest (if any) to be reported for minuting.

3 CONFIRMATION OF MINUTES

3.1 Minutes of a meeting of the Utilities and Roading Committee held on Tuesday 15 August 2017

9 - 15

RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Confirms,** as a true and correct record, the minutes of a meeting of the Utilities and Roading Committee held on Tuesday 15 August 2017.

4 MATTERS ARISING

5 PRESENTATION

6 REPORTS

6.1 Garrymere Water Supply Source Upgrade – Request to Consult with community regarding options to meet Drinking Water Standards for New Zealand – Sean de Roo (Project Coordinator) and Colin Roxburgh (Water Asset Manager)

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RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 171128128873.

(b) **Approves** staff to begin the community consultation process with the Garrymere community on the basis of the four options presented as being viable (Options A, B, C and D). The community consultation would involve the distribution of an information pamphlet followed by a public meeting.

(c) **Recommends** to the Council that it consider funding options for the scheme upgrade as part of the Draft Long Term Plan that could include partial funding from other water supply schemes, or the general rate.

(d) **Notes** that the options of point of entry treatment, connecting to the Ashley water supply scheme and not upgrading were considered but are not considered to be viable either due to high cost, not complying with the DWSNZ, or both.

(e) **Notes** that this process has been recommended by the Rangiora-Ashley Community Board, subject to staff investigating the option of point of entry treatment further which has now been completed (refer to report 171025115123).

(f) **Notes** that following the community consultation, staff will report back to the Community Board to provide a summary of the feedback received and to seek endorsement of the recommended option prior to staff reporting back to Council.

6.2 Utilities and Roading Activity Management Plans 2018 – Gerard Cleary (Manager Utilities and Roading) and Simon Collin (Infrastructure Strategy Manager)

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RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report N° 171122126970.

(b) **Notes** the following draft 2018 Activity Management Plans for Roading, Water, Wastewater, Drainage, Stockwater, and Solid Waste which are works in progress, with completion programmed before the January LTP Budget Meetings.

i. Introduction, IFR-02-01, TRIM 170724076981

ii. Roading AMP, IFR-02-02.04

(b) Scheme / Document Reference	TRIM Number
Section 1 Executive Summary Waimakariri Transport AMP 2018	170321027383
Section 2 Introduction Waimakariri Transport AMP 2018	170321027382
Section 3 Levels Of Service Waimakariri Transport AMP 2018	170321027378
Section 4 Future Demand Waimakariri Transport AMP 2018	170321027379
Section 5 Risk Management Waimakariri Transport AMP 2018	170321027377
Section 6 Life Cycle Management Plan Waimakariri Transport AMP 2018	170321027282
Section 7 Financial Summary Waimakariri Transport AMP 2018	170321027375
Section 8 Asset Management Practices Waimakariri Transport AMP 2018	170321027374
Section 9 Plan Improvement And Monitoring Waimakariri Transport AMP 2018	170321027381
Section 10 Appendices Waimakariri Transport AMP 2018	170321027373
Appendix A Glossary of Terms Waimakariri Transport AMP 2018	170321027372
Appendix B 2018 Draft Strategic Business Case	171025115475
Appendix C Level Of Services Waimakariri Transport AMP 2018	170321027288
Appendix D 2018 Roading Valuation Report Waimakariri Transport AMP 2018	171201130750
Appendix E Capital Works Forward Works Programme Waimakariri Transport AMP 2018	170321027277

i. Water Supply AMP, IFR-02-03

Scheme / Document Reference	TRIM Number
Water Supply AMP Overview Document 2018	170822090191
Rangiora Water Supply Scheme AMP 2018	161116117739
Kaiapoi (including Pines/ Kairaki) AMP 2018	161116117709
Pegasus/Woodend Water Supply Scheme AMP 2018	161116117732
Oxford Urban Scheme AMP 2018	161116117758
Oxford Rural No. 2 Water Supply AMP 2018	161116117731
Oxford Rural No. 1 Water Supply Scheme AMP 2018	161116117729
Waikuku Beach Water Supply Scheme AMP 2018	161116117719
Cust Water Supply Scheme AMP 2018	161116117722
Mandeville/Fernside Water Supply Scheme AMP 2018	161116117727
Summerhill Water Supply Scheme AMP 2018	161116117718

Ohoka Water Supply Scheme AMP 2018	161116117711
Poyntz Road Water Supply Scheme AMP 2018	161116117736
West Eyreton Water Supply Scheme AMP 2018	161116117741
Garrymere Water Supply Scheme AMP 2018	161116117714

ii. Wastewater AMP, IFR-02-04

Scheme / Document Reference	TRIM Number
Wastewater AMP Overview Document 2018	161116117659
Eastern District's Wastewater Scheme AMP 2018	161116117662
Rangiora Wastewater Scheme AMP 2018	161116117667
Kaiapoi Wastewater Scheme AMP 2018	161116117680
Woodend Wastewater Scheme AMP 2018	161116117668
Pegasus Wastewater Scheme AMP 2018	161116117672
Waikuku Beach Wastewater Scheme AMP 2018	161116117664
Mandeville Wastewater Scheme AMP 2018	161116117675
Pines/Kairaki Wastewater Scheme AMP 2018	161116117670
Tuahiwi Wastewater Scheme AMP 2018	161116117666
Woodend Beach Wastewater Scheme AMP 2018	161116117669
Oxford Wastewater Scheme AMP 2018	161116117674
Loburn Lea Wastewater Scheme AMP 2018	161116117678
Fernside Wastewater Scheme AMP 2018	161116117682

iii. Drainage AMP, IFR-02-05

Scheme / Document Reference	TRIM Number
Drainage AMP Overview Document 2018	161116117610
Coastal urban Drainage Scheme AMP 2018	161116117569
Pegasus Urban Drainage Scheme AMP 2018	161116117571
Oxford Rural Drainage Scheme AMP 2018	161116117572
Ohoka Rural Drainage Scheme AMP 2018	161116117575
Loburn Lea Rural Drainage Scheme AMP 2018	161116117576
Kaiapoi Urban Drainage Scheme AMP 2018	161116117578
Coastal Rural Drainage Scheme AMP 2018	161116117581

Clarkville Rural Drainage Scheme AMP 2018	161116117585
Oxford Urban Drainage Scheme AMP 2018	161116117589
Cust Rural Drainage Scheme AMP 2018	161116117591
Rangiora Urban Drainage Scheme AMP 2018	161116117592
Central Rural Drainage Scheme AMP 2018	161116117602

iv. Stockwater AMP, IFR-02-06

Scheme / Document Reference	TRIM Number
Stock Water Race AMP 2018	161115117090

v. Solid Waste AMP, IFR-02-07

Scheme / Document Reference	TRIM Number
Solid Waste AMP November 2018	171129129620

(c) **Notes** that the levels of service provided for are reflected in the draft budgets for the Long Term Plan (LTP).

(d) **Notes** that the suite of draft utilities and roading Activity Management Plans will be reported to Council at the January 2018 LTP Budget Meetings for adoption

(e) **Circulates** a copy of this report to all boards for their information.

6.3 <u>Ocean Outfall – 2016-2017 Compliance Review – Chris Parton (Wastewater Asset Manager)</u>

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RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No.170928105223.

(b) **Notes** that the Ocean Outfall adhered to consent conditions for the year 2016-2017 apart from a minor non-compliance issue for not properly sampling for metals.

(c) **Notes** that the upgrades at the Woodend and Rangiora wastewater treatment plants will provide increased treatment at these two plants.

(d) **Circulates** this report to Council for their information.

7 REPORTS/MEMOS FOR INFORMATION ONLY

7.1 Kaiapoi Tanker Filling Point – Colin Roxburgh (Water Asset Manager)
(*copy of report no. 171102118733 attached, to the Kaiapoi-Tuahiwi Community Board meeting of 20 November 2017)*

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7.2 Variation to Contract 16-49 to lay a new water main along Cass Street and Feldwick Drive –Gary Boot (Senior Engineering Advisor)
(copy of memo no. 171129129663 attached)

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RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** Items 7.1 and 7.2 for information.

8 PORTFOLIO UPDATES

8.1 Roading – Councillor John Meyer

8.2 Drainage and Stockwater – Councillor Sandra Stewart

8.3 Utilities (Water Supplies and Sewer) – Cr Paul Williams

8.4 Solid Waste– Cr Robbie Brine

9 MATTERS TO BE CONSIDERED WITH THE PUBLIC EXCLUDED

Section 48, Local Government Official Information and Meetings Act 1987

RECOMMENDATION

THAT the public be excluded from the following parts of the proceedings of this meeting.

The general subject of each matter to be considered while the public is excluded, the reason for passing this resolution in relation to each matter and the specific grounds under section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution, are as follows:

Item N°	Minutes/Report of:	General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under section 48(1) for the passing of this resolution
9.1	Minutes of the public excluded portion of a meeting of the Utilities and Roading Committee 15 August 2017	Confirmation of Minutes	Good reason to withhold exists under Section 7	Section 48(1)(a)

This resolution is made in reliance on section 48(1)(a) of the Local Government Official Information and Meetings Act 1987, and the particular interest or interests protected by Section 6 or Section 7 of that Act which would be prejudiced by the

holding of the whole or relevant part of the proceedings of the meeting in public are as follows:

Item Nº	Reason for protection of interests	Ref NZS 9202:2003 Appendix A
9.1	Protection of privacy of natural persons To carry out commercial activities without prejudice	A2(a) A2(b)ii

10 QUESTIONS

11 URGENT GENERAL BUSINESS

WAIMAKARIRI DISTRICT COUNCIL

MINUTES OF THE MEETING OF THE UTILITIES AND ROADING COMMITTEE HELD IN THE COUNCIL CHAMBERS, 215 HIGH STREET, RANGIORA ON TUESDAY 15 AUGUST 2017 AT 4.00PM

PRESENT

Councillor R Brine (Chairperson), Mayor D Ayers, Deputy Mayor K Felstead, Councillors J Meyer, S Stewart and P Williams.

IN ATTENDANCE

Councillors D Gordon, W Doody (late arriving)
Messrs J Palmer, (Chief Executive), G Cleary (Manager Utilities and Roading), K Simpson (3 Waters Manager), C Roxburgh (Water Asset Manager), Mrs K Waghorn (Solid Waste Asset Manager), Ms J Fraser (Utilities Planner), O Davies (Drainage Asset Manager) and A Smith (Committee Advisor)

1 APOLOGIES

An apology from Councillor Brine for early departure at 5.30pm was received and sustained. The meeting subsequently finished before this time.

2 CONFLICTS OF INTEREST

No conflicts of interest were noted.

3 CONFIRMATION OF MINUTES

3.1 Minutes of a meeting of the Utilities and Roading Committee held on Tuesday 20 June 2017

Moved Deputy Mayor Felstead seconded Councillor Meyer

THAT the Utilities and Roading Committee:

(a) **Confirms,** as a true and correct record, the minutes of a meeting of the Utilities and Roading Committee held on Tuesday 20 June 2017.

CARRIED

4 MATTERS ARISING

There were no matters arising.

5 PRESENTATION

There were no presentations.

6 REPORTS

6.1 Water Conservation Strategy Implementation Summary for 2016/17 – Colin Roxburgh (Water Asset Manager)

Colin Roxburgh presented this report to provide an annual update to the committee on the implementation of the Council's Water Conservation Strategy

Following assessment of the average leakage figure district-wide, this figure equated to water loss of 18% of the water supplied to the network. This is less than the mandatory performance measure target of 22%. Some schemes didn't meet the target which is where the Council will focus its work over the next few years. It has been found to be challenging actually measuring the leakage on some restricted schemes. It is planned to find a better way to measure estimated leakage on these schemes.

Water conservation education is an important part of the process and as part of the Community Awareness Programme in the 2016/17 year, there has been school education programmes to raise awareness of water conservation issues. 88 classroom sessions were held in schools and pre-schools in the 2016/17 year. There has also been participation in the SMART watering programme, which promotes smarter use of water throughout the region.

There is further investigations to be undertaken into the use of water metering. For several years there has been water use data being collected at approx. 114 sites, which were selected as potential high users, industrial and commercial sites. A report will come back to the Council with information from this investigation, as to whether there could be any rating for water use on this type of property. It was noted that previous Councils have not favoured having water metering, but it could be something that could be considered in future on a targeted property basis.

Mayor Ayers enquired on the benefits of having a desk top exercise to get an indication of what resources would be required for the introduction of water metering in the district and how much planning would be involved. Knowing what likely costs involved would be helpful. Colin said there was work started in 2010 on this, but further work would be undertaken to provide more current information and this will be reported back to the committee.

Deputy Mayor Felstead asked if there was information available from other neighbouring districts to compare the percentage figures of average water leakage of total water used across the district. Colin advised it is a mandatory performance measure that all Councils must report on. Staff will source the information from neighbouring authorities and provide it back to the committee.

Councillor Stewart expressed concern with the reported leakages and water losses in the water schemes across the district, highlighting the 91% leakage recorded at Summerhill Water Supply, stating this is totally unacceptable. It was asked what timeframe is suggested for getting this percentage down? Colin replied that this scheme is one of the schemes where a better way of measuring the leakage was needed and is being investigated. If there was instances of illegal connections to a water supply scheme, this would be reported as water leakage, because this is water that is going out that the Council can't account for. The district wide figure of 18% does sound high, with a lot of water lost, but in terms of comparing this Council's with others nationally, this is about middle of the range of percentages.

Moved Councillor Williams seconded Deputy Mayor Felstead

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 170803082745.

(b) **Notes** the progress on the implementation of the Water Conservation, including the active leak detection and analysis work, Community Awareness Programme and investigations in water metering as documented in this report.

(c) **Notes** that Council is meeting its mandatory performance measure target set by the Department of Internal Affairs of achieving leakage of less than 22% of total water used, achieving an actual assessed leakage value of 18% across the district's public water supply schemes.

(d) **Circulates** this report to the Community Boards for their information.

CARRIED

Deputy Mayor Felstead said there is obviously room for improvement but also understands that it is hard to source the leaks.

Councillor Stewart suggested that water metering needs to be considered by the Council and looks forward to the report coming back to the committee with information on this and the costs involved for updating the technology required.

6.2 Update on Cam River Enhancement Project – Janet Fraser (Utility Planner) and Owen Davies (Drainage Asset Manager)

Janet Fraser and Owen Davies presented this report with the annual update on the status of the Cam River Enhancement Project. The $100,000 of the fund already allocated has gone to Environment Canterbury and they will be bringing information back to the Cam River Enhancement subcommittee on Thursday. This is for planned works within Tuahiwi Stream and around the springs and headwaters of South Brook in the Fernside area.

Councillor Stewart questioned the information coming from Ecan and whether this already approved funding may need to be reviewed. Owen Davies replied that Council staff are working closely with Ecan staff, aligning any planned work with the recommendations in the Henry Hudson report and what Ecan proposes is acceptable to the sub-committee. There will be an opportunity to discuss this work at the next meeting of the Subcommittee on the 24 August, and to possibly adjust any funding to align that with what Henry has in his report.

Moved Councillor Meyer seconded Councillor Brine

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 170803082835.

(b) **Notes** the Cam River Enhancement Fund has a value of $208,437 as at 3 August 2017.

(c) **Notes** $100,000 has already been allocated to projects in the Tuahiwi Stream and in Fernside, but has yet to be spent.

(d) **Notes** that staff will bring a report to the October meeting of the Utilities and Roading Committee detailing how the remainder of the budget will be allocated, following the Cam River Enhancement Fund Subcommittee meeting on 24 August 2017.

(e) **Circulates** this report and its attachments to the Kaiapoi-Tuahiwi, Rangiora-Ashley and Woodend-Sefton Community Boards.

CARRIED

Councillor Meyer is pleased to see this matter move forward and looks forward to improvements in the Tuahiwi Stream.

Councillor Stewart endorses the comments of Councillor Meyer and welcomes the adoption of the report from Henry Hudson. Councillor Stewart hopes that all authorities are working down the same path to achieve the same objectives and would be disappointed if other authorities don't work to implement improvements as in Henry Hudson's report.

Councillor Brine noted the Tuahiwi Stream is a very important waterway, and noted the work that has already been undertaken by farmers along this stretch of water. There are improvements being made. It is good to see the fund being available to progress work and to make a difference. Councillor Brine believes there is now a much greater awareness of water ways and what goes in the waterways.

Councillor Meyer is very confident that the improvements to the waterways will be measurable.

7 REPORT FOR INFORMATION ONLY FROM KAIAPOI-TUAHIWI COMMUNITY BOARD MEETING OF 19 JUNE 2017

7.1 Approval to Install Intersection Controls in Rich Street at Raven Quay – Ken Stevenson (Roading Manager)

Moved Deputy Mayor Felstead Seconded Councillor Williams

THAT the report be received for information.

CARRIED

8 PORTFOLIO UPDATES

8.1 Roading – Councillor John Meyer

Regarding the switching on the traffic lights at Southbrook – Councillor Meyer noted that he had had discussions with residents who live in the vicinity of the intersection relayed positive comments from these residents.

8.2 Drainage and Stockwater – Councillor Sandra Stewart

There has been a full round of drainage advisory groups in June/July. At the recent meeting of the Water Race Advisory Group on 20 July, there was discussion on the use of race system to do a stream augmentation trial – inputting water upstream from Silverstream to supplement water flow. Councillor Stewart suggested that this Council staff need to be more aware of this trial.

Councillor Stewart noted the erosion of the banks of the stream at the corner of Flaxton Road, with pressure from the road and the run off from the industrial sites. The Council needs to show a lead to have some barriers, planting or something to stop the roadside slipping into the stream. looks forward to seeing a report back from staff on what plans are in place.

8.3 Utilities (Water Supplies and Sewer) – Cr Paul Williams

In the wake of recent announcements of some water schemes in Hurunui to be chlorinated, the Hurunui District Council has been asked to advise if they have any plans to upgrade the Ashley Rural Water scheme to comply with Drinking Water Standards of New Zealand. The Ashley Rural Water Scheme currently has MIOX, which is an equivalent of chlorination.

8.4 Solid Waste– Cr Robbie Brine

Robbie advised, there has been approximately 3,000 submissions received in response to the public consultation on the Waste Management Minimisation Plan. Of these, currently 35 submitters have indicated they wish to speak to their submissions.

At this time, Gerard Cleary took the opportunity to introduce Chris Parton, who has recently been appointed to the Council in the role of Wastewater Asset Manager. The Chairperson welcomed Chris to the Council and wished him an enjoyable association with the Council and this Committee..

9 MATTERS TO BE CONSIDERED WITH THE PUBLIC EXCLUDED

Section 48, Local Government Official Information and Meetings Act 1987

Moved Councillor Brine seconded Councillor Meyer

THAT the public be excluded from the following parts of the proceedings of this meeting.

The general subject of each matter to be considered while the public is excluded, the reason for passing this resolution in relation to each matter and the specific grounds under section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution, are as follows:

Item Nº	Minutes/Report of:	General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under section 48(1) for the passing of this resolution
9.1	Minutes of the public excluded portion of a meeting of the Utilities and Roading Committee 20 June 2017	Confirmation of Minutes	Good reason to withhold exists under Section 7	Section 48(1)(a)
9.2	Report of Kitty Waghorn (Solid Waste Asset Manager)	Renewal of Waste Receipt Agreement with Transwaste Canterbury	Good reason to withhold exists under Section 7	Section 48(1)(a)

This resolution is made in reliance on section 48(1)(a) of the Local Government Official Information and Meetings Act 1987, and the particular interest or interests protected by Section 6 or Section 7 of that Act which would be prejudiced by the holding of the whole or relevant part of the proceedings of the meeting in public are as follows:

Item Nº	Reason for protection of interests	Ref NZS 9202:2003 Appendix A
9.1 and 9.2	Protection of privacy of natural persons To carry out commercial activities without prejudice	A2(a) A2(b)ii

CARRIED

Resolution to Resume Open Meeting

Moved Councillor Brine seconded Councillor Meyer

THAT open meeting resumes and that the resolution(s) made with the public excluded be made public.

CARRIED

9.2 Renewal of Waste Receipt Agreement with Transwaste Canterbury – Kitty Waghorn (Solid Waste Asset Manager)

Moved Deputy Mayor Felstead seconded Councillor Williams

THAT the Utilities and Roading Committee:

(e) **Receives** report No. 170728079952.

(f) **Approves** the renewal of the General Waste Receipt Agreement between the Waimakariri District Council and Transwaste Canterbury Ltd for a further three year term, to 30 June 2020.

(g) **Delegates** authority to the Chief Executive to sign the General Waste Receipt Agreement on behalf of the Council.

CARRIED

Open meeting

10 QUESTIONS

There were no questions.

11 URGENT GENERAL BUSINESS

There was no urgent general business.

12 NEXT MEETING

The next scheduled meeting of the Utilities and Roading Committee is Tuesday 17 October 2017.

There being no further business, the meeting closed at 4.55pm

CONFIRMED

_____
Chairperson

_____
Date

BRIEFING

At the conclusion of the meeting, staff gave an overview of the preparation and response to the storm event on the 21 July from a 3 Waters perspective, including outlining areas that will require further investigation and potentially upgrading works.

WAIMAKARIRI DISTRICT COUNCIL

REPORT

FILE NO and TRIM NO:	CON201673 / 171128128873
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	12th December 2017
FROM:	Sean de Roo, Project Coordinator Colin Roxburgh, Water asset Manager
SUBJECT:	Garrymere Water Supply Source Upgrade – Request to consult with community regarding options to meet Drinking Water Standards for New Zealand
SIGNED BY: **(for Reports to Council or Committees)**	Department Manager / Chief Executive

1. SUMMARY

1.1. The purpose of this report two-fold:

1. To update the Utilities and Roading Committee on the options for upgrading and funding the upgrade of the Garrymere water supply scheme to achieve compliance with the Drinking Water Standards for New Zealand (DWSNZ).

2. To seek endorsement from the Utilities and Roading Committee for the proposed basis of consulting the Garrymere community on the upgrade options, including funding and rating impacts of each option. Following the consultation process staff will recommend an option to Council to upgrade the Garrymere water supply scheme.

1.2. The following options were considered to upgrade the Garrymere water supply scheme to achieve compliance with the DWSNZ:

1.2.1. Option A - Treatment of Existing Source.

The option of treating the existing source has been investigated by Opus International Consultants Ltd and is deemed to be viable through the installation of a pre-filtration system followed by ultra violet (UV) disinfection. The estimated capital cost for this option is $390,000.

1.2.2. Option B – Drill New Well at Garrymere.

This option would involve drilling and developing a new deep well up to 300m deep within the Council easement at 70 Garrymere Road, close to the existing Garrymere headworks to find a secure water source with adequate capacity for the scheme. This option is deemed to have a high risk that the well may be unsuccessful with the deepest wells in the area being no more than 80m deep and all yielding less than the required capacity for the scheme. The capital cost estimate for this option is $880,000.

1.2.3. Option C – Connect to Summerhill Water Supply

This option would involve connecting into the Summerhill water supply scheme from the existing pipe at the old Summerhill intake at the Ashely River. This intake

is located at the end of Campions Road to the western end of the Garrymere scheme. Approximately 2.9km of pipe would be required to be installed. This work will involve two river crossings; one across the Ashley River and one across the Garrymere River. This would also include additional upgrade works at the West Eyerton water supply headworks and within the Summerhill scheme to cater for the additional demand. This results in this option being the highest cost option, with an estimated capital cost of $1,800,000.

1.2.4. Option D – Connect to Summerhill Water Supply and Decrease Allocated Demand

This option is similar to Option C in that it also involves a connection into the Summerhill scheme from the existing pipe at the old intake. This option is different to Option C however in that, in order to minimise capacity upgrades within the West Eyreton and Summerhill schemes, it would involve measures to decrease demand within the Garrymere scheme. This would be achieved by changing the semi-restricted (13 litres per minute) connections to 3 unit (2 litres/min) restricted connections with a tank and pump to decrease the scheme demand. This would decrease the required capacity cost within the West Eyreton and Summerhill schemes for capacity upgrades, but would add some additional capital cost to install the private tanks and pumps in order to convert the existing semi-restricted connections to full restricted connections. This option has an estimated capital cost of $1,049,000.

1.3. The following additional options were initially considered but discounted due to not achieving compliance with the DWSNZ:

1.3.1. Option E – Onsite Treatment as per Schedule 12 DWSNZ, Rural Agricultural Drinking Water Supplies.

There is a section in the DWSNZ in which Rural Agricultural Drinking Water Supplies (RADWS) are defined, and which allows alternative treatment systems (such as individual 'point of entry' treatment systems) to be considered. The Garrymere scheme however does not meet the criteria for defining a Rural Agricultural Drinking Water Supply, and therefore this option was discounted. In order to qualify for a Rural Agricultural Drinking Water Supply, it must be able to be demonstrated that 75% of water on the scheme is used for agricultural purposes. Garrymere does not meet these requirements in terms of the proportion of demand for agricultural use.

Following a request from the Rangiora-Ashley Community Board, further work was carried out on this option. This included the likely cost to implement point of entry treatment, if it could be proved that this supply would meet the criteria for a RADWS (despite earlier work indicating that it would not meet this criteria). This cost analysis showed that this would be cost prohibitive to implement relative to the centralised treatment option.

1.3.2. Option F – Connecting to the Ashley Water Supply Scheme

The option of connecting the Garrymere scheme to the Ashley water supply scheme was considered initially but discounted due both to the significant cost of at least $1,200,000 and the Ashley scheme currently not meeting the DWSNZ.

1.3.3. Option G – Do Nothing.

This option of not upgrading the scheme was discounted due to the current scheme being uncompliant with the DWSNZ as it only treats for bacteria through chlorination but does not treat protozoa. There is a legislative requirement for Council to take all practicable steps to comply with the DWSNZ under the Health Act, so not complying is not an option that can be considered.

1.4. It is recommended that Council consult with the community on all viable options to the (Options A, B, C and D). It is proposed that the community be provided information on these options and be asked to provide feedback and indicate their preferred option.

1.5. The rating impact of all the options considered is summarised on the table below. Also shown are the existing rates as a basis for comparison:

Table 1: Proposed rating impact of all options

Option	Capital Cost	Projected Rate for 2-unit Property for 2019/20	Projected Rate for 19-unit property for 2019/20
Existing Rates (17/18)	NA	$1,272	$1,803
A – Treat Existing	$387,490	$2,602	$3,689
B – Drill Well	$878,724	$2,813	$3,988
C – Connect to Summerhill	$1,812,304	$4,819	$6,831
D – Connect to Summerhill and Convert Semi-Restricted Connections	$1,048,901	$3,384	$3,579 *

**this rate is for connections that are currently 19 unit connections that would be converted to 3 unit connections under this option.*

1.6. It is acknowledged that all options would represent a significant rating increase for the Garrymere scheme members. It is recommended that Council consider alternative ways to fund this upgrade such as capping the rates and funding the excess costs not covered by the scheme either across all other water schemes, or across the general rate. This could be considered and consulted on as part of the Draft Long Term Plan.

Attachments:

i. Maps showing extent of works for option C and D
ii. Analysis of Point of Entry Treatment Option.
iii. Draft Consultation material (TRIM reference 171130130510)
iv. Opus concept design report for treatment option (TRIM reference 171026115522)
v. Southern Geophysical report on drilling option (TRIM reference 171026115523).

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 171128128873.

(b) **Approves** staff to begin the community consultation process with the Garrymere community on the basis of the four options presented as being viable (Options A, B, C and D). The community consultation would involve the distribution of an information pamphlet followed by a public meeting.

(c) **Recommends** to the Council that it consider funding options for the scheme upgrade as part of the Draft Long Term Plan that could include partial funding from other water supply schemes, or the general rate.

(d) **Notes** that the options of point of entry treatment, connecting to the Ashley water supply scheme and not upgrading were considered but are not considered to be viable either due to high cost, not complying with the DWSNZ, or both.

(e) **Notes** that this process has been recommended by the Rangiora-Ashley Community Board, subject to staff investigating the option of point of entry treatment further which has now been completed (refer to report 171025115123).

(f) **Notes** that following the community consultation, staff will report back to the Community Board to provide a summary of the feedback received and to seek endorsement of the recommended option prior to staff reporting back to Council.

3. ISSUES AND OPTIONS

Background

3.1. The Garrymere Water Supply Scheme has been identified for a proposed upgrade to be completed by June 2019 to provide a source that meets the water quality requirements of the Drinking Water Standards for New Zealand (DWSNZ). This upgrade was identified as part of the 2015-25 Long Term Plan and was also identified as part of the Garrymere Public Health Risk Management Plan (PHRMP) in 2013. PHRMPs are now referred to as Water Safety Plans (WSPs) and are required under the Health Act in order to either demonstrate how compliance with the DWSNZ is achieved, or where it is not achieved to demonstrate the plan for how it will be achieved. At the time this document was produced it was indicated that this source upgrade project would be completed in 2017.

3.2. The Garrymere water supply scheme is supplied by a well within the headworks site on private property at 70 Garrymere Road which is secured by an easement. The well is 30m deep and has multiple screens with the shallowest screen starting at just 2.5m below ground level. The existing well is consented to take no more water than 389 cubic meters of water per day with enough capacity within the well to carter for the next projected 50 year's worth of growth within the scheme.

3.3. At present, the raw water is disinfected with chlorine before exiting the headworks and entering the supply. This treatment system does achieve bacterial compliance with the DWSNZ but provides little or no protection against protozoa contaminants such as giardia and cryptosporidium, and therefore does not comply with the protozoal requirements of the DWSNZ. Bacterial contamination (e. coli) has been found in the raw source water in the past, which indicates that the source is influenced by activities on the ground surface due to being a shallow unsecure bore.

3.4. The lack of protection against protozoa contaminants, and the shallow unsecure nature of the source means that it does not comply with the DWSNZ, and presents a public health risk.

Options

3.5. The following options were considered to upgrade the Garrymere water supply scheme to achieve compliance with the DWSNZ:

3.6. **Option A - Treatment of existing source.**

3.6.1. The option of treating the existing source has been investigated by Opus International Consultants Ltd and is deemed to be viable through the installation of a pre-filtration system followed by ultra violet (UV) disinfection. The estimated capital cost for this option is $390,000.

3.6.2. The advantages and disadvantages of this option are summarised below:

3.6.3. Advantages:

- Lowest capital cost option.
- Can be completed within existing capital budget provisions.
- All works can be completed within the headwork's compound (no need to obtain additional land).

3.6.4. Disadvantages:

- High operating cost.
- Additional operator input including more monitoring and sampling.
- As treatment is relied upon for compliance, there is a potential risk of something operationally going wrong with the treatment system causing temporary non-compliance until resolved.
- There will be no back up well with this option (although this may be able to be added at a future date for relatively low cost).
- The shallow well means there is a risk that if a high concentration of contaminants are discharged close to the well this may exceed the treatment capabilities of the treatment system (in particular for chemical contaminants).

3.7. **Option B – Drill new well at Garrymere.**

3.7.1. This option would involve drilling and developing a new deep well up to 300m deep within the Council easement at 70 Garrymere Road, close to the existing Garrymere headworks to find a secure water source with adequate capacity for the scheme. This option is deemed to have a high risk that the well may be unsuccessful with the deepest wells in the area being no more than 80m deep and all yielding less than the required capacity for the scheme. The capital cost estimate for this option is $880,000.

3.7.2. The estimated required depth for the well of 300m is based on advice obtained from Southern Geophysical Ltd. They have advised that in order to strike the type of material that may result in a sufficiently high yielding well, drilling down to the Kowhai Formation would be required. This is the hydrological basement of North Canterbury and is approximately 300m deep. There is still no guarantee that a suitable source would be found at this depth as there are no existing wells in the area known to exist at this depth.

3.7.3. The advantages and disadvantages of this option are summarised below:

3.7.4. Advantages:

- Second lowest rating impact option.
- Low operational costs.
- All works can be completed within the headwork's compound (no need to obtain additional land)
- Assuming well is successful, no reliance on successful operation of a treatment system to achieve compliance (less chance of ‘operator error’).
- Additional resilience with the existing source providing an emergency back-up well.

3.7.5. Disadvantages:

- Risk that sufficient source may not be found. The only moderate depth wells within the area (approx. 60 – 80m deep) are yielding less than 1 l/s with the scheme needing at least 6 l/s. This is due to low porosity at these depths.
- High cost to determine whether a suitable source could be found in a deep well, and if this well is unsuccessful this would be a high sunk cost.
- No treatment of protozoa so a minor risk of a bore thought to be secure becoming non-secure in the future and requiring treatment.

3.8. **Option C – Connect to Summerhill Water Supply**

3.8.1. This option would involve connecting the Garrymere scheme into the Summerhill water supply scheme from the existing pipe at the old Summerhill intake at the

Ashely River. This intake is located at the end of Campions Road to the western end of the Garrymere scheme. Approximately 2.9km of pipe would be required to be installed. This work would involve two river crossings; one across the Ashley River and one across the Garrymere River. This would also include additional upgrade works at the West Eyerton water supply headworks and within the Summerhill scheme to cater for the additional demand. This results in this option being the highest cost option, with an estimated capital cost of $1,800,000.

3.8.2. Advantages

- Connecting into scheme that already complies with the DWSNZ means there is low risk of the option being unsuccessful.
- A larger rating base to fund future upgrades at the source.
- Additional resilience with the existing source providing an emergency back-up well.

3.8.3. Disadvantages

- Risk of loss of supply due to the new pipeline under the Ashley River or the Garrymere River getting washed out.
- Additional operational works to maintain another Booster Station on the Summerhill scheme.
- No treatment of protozoa so a minor risk of a bore thought to be secure becoming non-secure in the future and requiring treatment.
- Joining Garrymere to Summerhill will fast track future growth works within the Summerhill reticulation and at the West Eyreton headworks.
- This option would rely on the old intake line from the old Summerhill intake as part of the connection between the schemes. The condition of this pipe (1990 PVC) would need to be assessed and confirmed as suitable prior to confirming the viability of this option (it is unlikely to be an issue based on its age, but would require confirmation as it has not been in service for some time).
- This has the highest operational due to pump upgrades, pipework, river crossings and the new booster pump station being required.

3.9. **Option D – Connect to Summerhill Water Supply and decrease allocated demand**

3.9.1. This option is similar to Option C in that it also involves a connection into the Summerhill scheme from the existing pipe at the old intake. This option is different to Option C however in that, in order to minimise capacity upgrades within the West Eyreton and Summerhill schemes, it would involve measures to decrease demand within the Garrymere scheme. This would be achieved by changing the semi-restricted (13 litres per minute) connections to 3 unit (2 litres/min) restricted connections with a tank and pump to decrease the scheme demand. This would decrease the required capacity cost within the West Eyreton and Summerhill schemes for capacity upgrades, but would add some additional capital cost to install the private tanks and pumps in order to convert the existing semi-restricted connections to full restricted connections. This option has an estimated capital cost of $1,049,000.

3.9.2. The advantages and disadvantages of this option are the same as for Option C, with the following additions:

3.9.3. Advantages:

- This option has a decrease in operational costs due to the existing headwork becoming a back-up site (as water would be pumped directly from the Summerhill scheme into the Garrymere reticulation).

3.9.4. Disadvantages:

- Potential complications due to carrying out works on private property to install tanks and pumps to reduce semi-restricted connections to fully restricted 3 unit connections.
- There may be some residents who utilise their existing 19 unit connections to its full extent and so may not support a reduction in their allocation.

3.10. In addition to the four options outline above, several other options were considered but deemed not to be viable due to not achieving compliance with the DWSNZ.

3.11. **Option E – Individual Onsite Treatment as per Schedule 12 DWSNZ, Rural Agricultural Drinking Water Supplies**

3.11.1. There is a section in the DWSNZ in which Rural Agricultural Drinking Water Supplies (RADWS) are defined, and which allows alternative treatment systems (such as individual on-site 'point of entry' treatment systems) to be considered. In order to qualify as a Rural Agricultural Drinking Water Supply, it must be able to be demonstrated that 75% of water on the scheme is used for agricultural purposes.

3.11.2. Following feedback from the Rangiora-Ashley Community Board, it was learnt that the Hurunui District Council is currently investigating whether any of their supplies met the criteria for a RAWDS. Three methods to calculate the proportion of domestic and agricultural flow were being used by Hurunui. In addition to this staff developed an alternative method that was also used. The Garrymere scheme was assessed against all four of these potential methods for calculating the proportion of domestic and agricultural water use, to determine whether it could comply as a RADWS. These four methods are described below:

1. In the Ministry of Health 'Rural Agricultural Drinking-water Supply Guideline (2015) document, it is stated that if the amount of domestic use is not known or measured, it can be assumed that 2,500 litres per dwelling house per day is used for domestic purposes. Anything over and above this can then be assumed to be for agricultural purposes.
2. Assume that the standard minimum allocation for a scheme is that required for domestic purposes, and that anything over and above this is water used for agricultural purposes. In the Waimakariri District the minimum allocation is 2,000 litres per dwelling house per day.
3. Use average human consumption figures (derived by the Ministry of Health) as the basis of calculating the amount of domestic use, and assume everything over and above this is agricultural use. This equates to 936 litres per property per day for domestic use (385 L/person/day and 2.43 residents per property).
4. Assume that the Fernside water supply scheme represents a typical scheme in which water is consumed for domestic purposes rather than agricultural purposes. Therefore, assume that Fernside's average daily flow represents typical domestic use for a rural property within the Waimakariri district, and therefore any flow used by Garrymere over and above that used by Fernside represents agricultural use.

Table 2: Analysis of Proportion of Domestic Use on Garrymere Scheme

Option	Domestic Use (L/property/day)	Min Total Daily Demand in order to meet RADWS Requirements	Actual Garrymere ADF	Assessed Percentage of Domestic Use (note max 25% in order to comply as a RADWS)	Criteria Met
1 - Using MoH Figures from RADWS Guidelines of 2500 L /conn/day domestic use	2500	10000	3461	72%	NO
2 - Assume minimum allocation of 2000L per property per day for domestic use	2000	8000	3461	58%	NO
3 - Average Human Consumption Figure (derived by Hurunui)	936	3742	3461	27%	NO
4 - Assuming Fernside ADF Represents 100% Domestic Use	1,563	6252	3461	45%	NO

3.11.3. As is demonstrated above, all of the methods used to calculate the amount of domestic use on the Garrymere scheme (and subsequently the proportion of agricultural use) show that the scheme does not meet the criteria of having a minimum of 75% agricultural use.

3.11.4. It is noted that the third method proposed (using average human consumption of 385L per person per day) to determine the proportion of domestic and agricultural use would require some further justification to drinking water assessors before it could be accepted. So while it is close to meeting the criteria for showing the proportion of agricultural use required for a RADWS, it would not necessarily be able to be accepted without further justification, even if it did demonstrate 25% (or less) domestic use rather than 27%.

3.11.5. The following other issues have been identified with implementing a point of entry treatment system:

- Staff would have to enter private property to carry out maintenance activities on individual treatment units and take water samples. This would mean that treatment systems would have to either be located outside of dwellings, or that operators would have to be given access into private dwellings.
- There would be a lower level of control of the treatment systems (i.e. it would not be practicable to generate alarms to operators from faults within the systems).
- There would be less certainty regarding the compliance of the system going forward, even if compliance could be achieved initially. This would be affected by:
    - The Havelock North Drinking Water Inquiry which is likely to result in changes to the current Drinking Water Standards. There would be a risk that point of entry treatment under the criteria for RADWS may change as a result of this.
    - The use of the scheme may change over time as development occurs. This is more likely to increase the proportion of domestic use and decrease the proportion of agricultural use (i.e. even if 25% domestic use could be proven now, future developments may increase this proportion).
- As individual filters block up over time, pressure in households would reduce. This would introduce a risk that residents may bypass their

individual treatment systems if they become frustrated with their performance.

3.11.6. Therefore, the following conclusions can be drawn regarding point of entry treatment systems for Garrymere:

- Assessments have shown that Garrymere would not meet the criteria for a RADWS, therefore Section 12 of the DWSNZ does not apply to the scheme, and a point of entry treatment style solution would not comply with the DWSNZ.
- If point of entry were able to be implemented, there would be a lower level of safety for this type of treatment system as well as issues with operators entering private property, and there would be a risk that this type of system may not be accepted as compliant in the long term.
- The overall cost of this system would be higher than the full scale treatment option (Option A), and would offer no benefits over this type of system (refer Section 5 for further detail on cost).

3.11.7. Based on the above, it is not recommended that point of entry treatment be presented as a viable option as part of the community consultation for this project. It has however been noted in the draft consultation material that staff considered this option as part of the assessment.

3.12. **Option F – Connecting to the Ashley Water Supply Scheme**

3.12.1. The option of connecting the Garrymere scheme to the Ashley water supply scheme was considered initially but discounted due both to the significant cost of at least $1,200,000 and the Ashley scheme currently not meeting the DWSNZ.

3.12.2. At a minimum this would require the construction of a booster pump station, and approximately 6.5km of main to connect. This alone would require a capital cost of approximately $1.2m. This cost would be higher still if hydraulic analysis within the Ashley scheme (that has not been carried out) indicated that there would be further upgrades within the Ashley scheme, or if there were development contributions that may be required to be paid in order to connect. Further to the above, the Ashley scheme at present does not comply with the DWSNZ.

3.13. **Option G – Do nothing.**

3.13.1. The option of not upgrading the scheme was discounted due to the current scheme being uncompliant with the DWSNZ as it only treats for bacteria through chlorination but does not treat protozoa (therefore not meeting the protozoal requirements of the DWSNZ). There is a legislative requirement for Council to comply with the DWSNZ under the Health Act, so not complying is not an option that can be considered.

<u>Proposed Way Forward</u>

3.14. It is proposed that the project be progressed according to the timetable below:

Table 2: Proposed project plan

Item	Description	Complete by	Agenda by
1	Rangiora Ashley Community Board provide recommendation to Utilities and Roading Committee to proceed with community consultation, and provide feedback on draft consultation material.	8th November 17	27th October 17
2	Draft consultation material updated (based on RACB feedback).	24th November 17	
3	Approval from U&R Committee to consult community on recommended upgrade options	12th December 17	1st December 17
4	Consultation commences (1 month period)	20th January 18	
5	Public meeting	February 2018	
6	Consultation closes	20th February 2018	
10	Staff report to RACB with results of community consultation and to seek endorsement of recommended upgrade option	14 March 2018	2 March 2018
11	Staff report to Council to seek endorsement to proceed with recommended upgrade option	3 April 2018	29 March 18
12	Design	April 2018	July 2018
13	Tender	August 2018	September 2018
14	Construction	October 2018	January 2019

3.15. The Management Team has reviewed this report and supports the recommendations.

4. COMMUNITY VIEWS

4.1. Report 171025115123[v2] was presented to the Rangiora-Ashley Community Board on the 8th of November 2017. The Board recommended to the Utilities and Roading Committee that community consultation be carried out in accordance with the procedure outlined in this report, subject to further investigation being carried out on Option E which has now been completed.

4.2. It is recommended that community consultation take place in the form of an information pamphlet being distributed to each property owner outlining the issues with the existing supply, the options to upgrade the source and the cost and rating implications. Following that, a public meeting would be held to address any questions or concerns from the public.

4.3. Following the community consultation above Council staff will report back to the Rangiora Ashley Community Board with the results, to seek guidance on the pathway forward.

4.4. It is noted that if either Option C or D (join with Summerhill) were favoured by the Garrymere community and/or the Community Board, wider consultation would be required with the Summerhill and West Eyreton scheme members, as well as the relevant water supply advisory boards and community boards representing those areas. This wider consultation is not proposed to be undertaken at this stage, as the rating implications of these options indicate that they are unlikely to be favoured by the Garrymere community.

4.5. Option E (private on-site treatment systems is included in the consultation material, but it is noted that this is not considered to be a viable option.

4.6. A letter has been sent to the relevant water supply advisory group members (West Eyreton and Summerhill) to inform them of the upcoming consultation on the Garrymere scheme. This letter states that in the unlikely event that the option of joining with the Summerhill community is favoured wider consultation will be undertaken with these advisory groups and the communities that they represent.

5. FINANCIAL IMPLICATIONS AND RISKS

5.1. A total budget of $500,000 has been allocated, as part of the Council 2017/18 Annual Plan to fund the proposed source upgrade.

5.2. This budget forms a multiyear project. With $50,000 already allocated to the previous financial year (2016/17) which funded investigation works to determine viable options, $250,000 allocated to this financial year (2017/18) to fund consultation, design, tender and commencement of construction works and $200,000 allocated to the 2018/19 financial year to fund the completion of the construction works.

5.3. The total expenditure to date is approximately $28,000 spent on investigation works.

5.4. It is noted that of the options considered, only the treatment option (Option A) could be completed within the current allocated budget. If one of the other options is preferred, staff would require that Council allocate additional funding.

5.5. The budget this has been proposed as part of the Draft 2018-28 Long Term Plan (LTP) is based on the capital and operating costs associated with the treatment option, as this is seen as the most likely option to proceed at this stage. The confirmation of the preferred option will take place in April 2018, prior to the final adoption of the 2018-28 Long Term Plan, so this would provide the opportunity to amend the budget if necessary prior to the adoption of the LTP.

5.6. The capital cost and projected rating impact of all viable options considered are summarised on the table below.

Table 3: Preliminary Assessment of Rating Impact to Garrymere Water Supply Scheme

	Option	A - TREATMENT		B – DRILL WELL		C – CONNECT TO SUMMERHILL		D – CONNECT TO SUMMERHILL AND REDUCE DEMAND	
	Capital Cost	**$387,490**		**$878,724**		**$1,812,304**		**$1,048,901**	
	Change in Operational Cost (2018/19 year)	**$29,440**		**$1,817**		**$31,970**		**-$3,450**	
Rating Implications	**Existing Rates**	**Increase in Rates**	**New Rate**	**Increase in Rates**	**New Rate**	**Increase in Rates**	**New Rate**	**Increase in Rates**	**New Rate**
Fixed rate ($/conn/year)	$1,270	$1,204	$2,475	$1,405	$2,674	$3,427	$4,697	$1,723	$2,993
Variable Rate ($/unit/year)	$33	$31	$64	$36	$69	$89	$121	$162	$195
Rate Impact based on different allocations of units currently on the scheme	**Existing Rates ($/year)**	**Increase in Rates ($/year)**	**New Rate ($/year)**	**Increase in Rates ($/year)**	**New Rate ($/year)**	**Increase in Rates ($/year)**	**New Rate ($/year)**	**Increase in Rates** (note under this option 19 unit connection is changed to 3 units)	**New Rate** (note under this option 19 unit connection is changed to 3 units)
19 units (24 properties)	$1,893	$1,796	$3,689	$2,094	$3,988	$4,937	$6,831	$2,210	
38 units (1 property)	$2,517	$2,387	$4,904	$2,784	$5,301	$6,563	$9,080	$7,895	$10,412
4 units (1 property)	$1,401	$1,329	$2,730	$1,550	$2,951	$3,654	$5,055	$2,373	$3,774
3 units (1 property)	$1,368	$1,298	$2,666	$1,514	$2,882	$3,568	$4,937	$2,210	$3,579
2 units (14 properties)	$1,336	$1,267	$2,602	$1,477	$2,813	$3,483	$4,819	$2,048	$3,384

5.7. It is noted that on schemes such as Garrymere with 'fixed-variable' rating charges (i.e. a fixed 'per connection' rate as well as a variable 'per unit' cost), the fixed charges cover 75% of total costs against the scheme, while the variable charges cover the remaining 25% of costs against the scheme. This has the result that as the number of units that a property has increases, the rates do not increase directly proportionally to the additional volume of water being supplied, which is evident in the table above.

5.8. It is noted that for Options C and D which involve connecting to the Summerhill water supply scheme, it has been assumed that the schemes would remain financially separate following the physical joining. The rates presented above are based on Garrymere paying the proportional share of the operating costs on the Summerhill and West Eyreton schemes to provide water to the Garrymere scheme. Therefore, any rating impact to the Summerhill and West Eyreton scheme would be minor (less than $5 per connection per year). This would be a similar system to the Summerhill and West Eyerton schemes presently, which are both sourced from West Eyreton.

5.9. There is a financial risk to the community if Option B (drill new well at the Garrymere headworks) is the preferred option. This is due to the possibility that a well is drilled to a depth of approximately 300m and a source either of insufficient quantity or quality is found. This has financial risk of approximately $400,000 (the potential cost to drill to this depth). If this scenario eventuated the community would be required to cover this cost in addition to the cost to proceed with one of the alternative options.

5.10. Option A (treatment of the existing source) is indicated as being the most likely option to be preferred following the community consultation. This is based on being the lowest risk option and being projected as having the lowest impact on rates to the community.

5.11. While it is not assessed as being viable in terms of the proportion of agricultural flow to be assessed as a RADWS, a cost analysis has been carried out on Option E (Point of Entry Treatment). This has shown a per property rating increase of approximately $3,500 per property which is significantly higher than the centralised treatment option as well as presenting a lower level of safety for the scheme. A breakdown of this cost assessment is given in Attachment ii.

Alternative Funding Option

5.12. It is noted that all potential options to achieve the required upgrade for the Garrymere water supply scheme would result in a significant rate increase for the Garrymere scheme members. Given the significant cost of all feasible options, and the low number of residents to fund this upgrade the significant rating impact is unavoidable with the current rating structure in which each scheme recovers all costs associated with that scheme.

5.13. It is also noted that prior to the proposed upgrade, the Garrymere scheme already has the highest water rates in the district at $1,272 per 2 unit connection and $1,803 per 19 unit connection.

5.14. An alternative option that could be considered would be to cap water rates at the existing Garrymere rate. Any costs for schemes whose rates exceed these rates (including allowance for inflation) could then be spread one of two ways:

5.14.1. The excess costs over and above the capped limit could be applied across all other water schemes on a per connection basis.

5.14.2. The excess costs over and above the capped limited could be applied across all properties within the district as part of the general rate.

5.15. The two schemes that it is forecast that this capping would apply to would be the Garrymere scheme (as discussed above) and the Poyntzs Road scheme. The projected rates for the Garrymere and Poyntzs Road schemes and the effect that capping would have are summarised in the table below:

Scheme	2017/18		2018/19		2019/20	
	2 unit	19 unit	2 unit	19 unit	2 unit	19 unit
Garrymere (no capping)	1,272	1,803	2,082	2,946	2,582	3,654
Poyntzs (no capping)	573	1,083	758	1,499	1,601	3,046
Potential capped rate	1,272	1,803	1,306	1,852	1,342	1,902
Option 1 - Impact on Water Rate (per connection)	-		2.10		6.20	
Option 2 – Impact on General Rate (per property)	-		1.60		4.80	

5.16. It is recommended that the Utilities and Roading Committee consider the above options if it is considered that the rating increases projected will not be affordable or acceptable to the existing scheme members. The Committee could make a recommendation to the Council for it to consider as part of the Draft Long Term Plan.

5.17. This option is not a proposal to create a district wide water rate. It is an option that Council could consider to help fund the final two water supply upgrades in the district to achieve compliance with the DWSNZ.

6. CONTEXT

6.1. Policy

This matter is not a matter of significance in terms of the Council's Significance Policy.

6.2. Legislation

The Health (Drinking Water) Amendment Act is relevant in this matter.

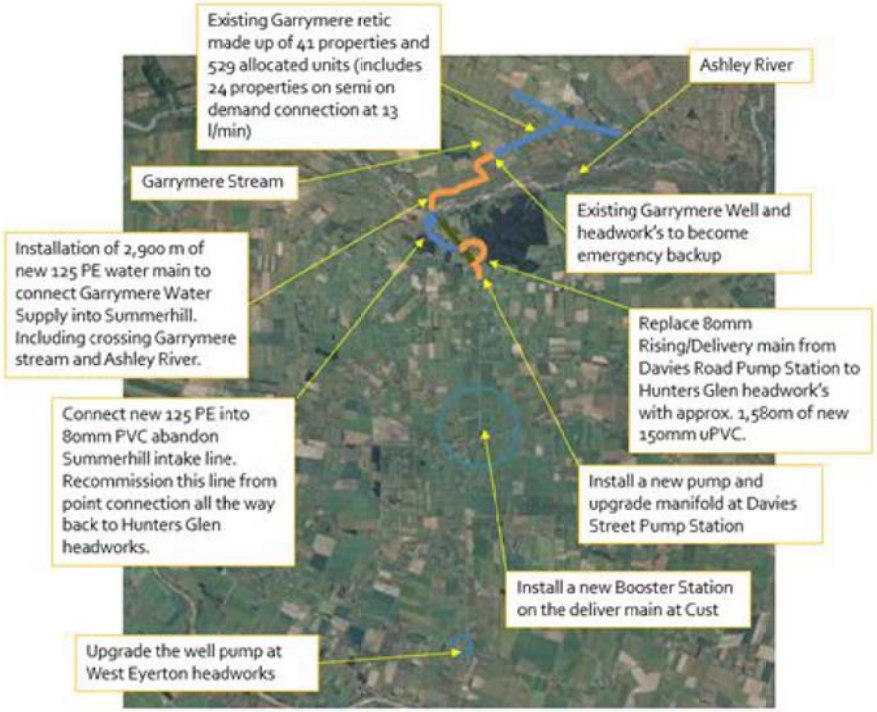
6.3. Community Outcomes

This project is related to the following community outcomes:

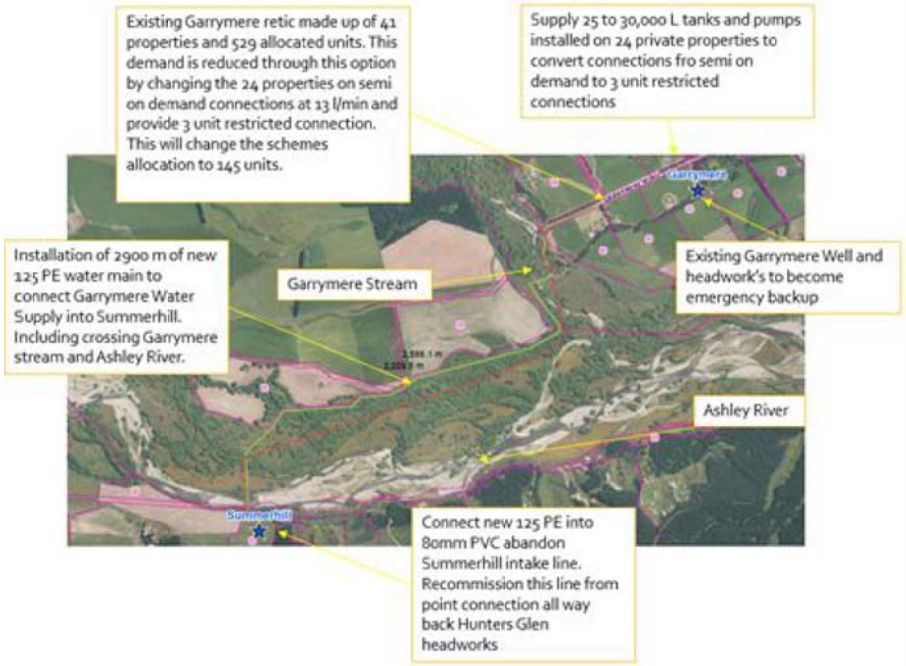
- There is sufficient clean water to meet the needs of communities and ecosystems.
- Core utility services are provided in a timely, sustainable and affordable manner.

Attachment i.

Option C - Connect to Summerhill Water Supply



Option D – Connect to Summerhill Water Supply and decrease



Attachment ii: - Point of Entry Cost Analysis

Table 3: Summary of Additional Costs for Point of Entry Treatment (over and above existing rates)

	Rate	Unit	Quantity	Cost	Notes
Supply of 50% Pro 10 38L/m UV Unit (cottage) and 50% Pro 20 (small house)	3235	Each	41	132,635	Assume 13L/m properties can use the smallest unit, other properties the next size up
Comms centre (visual display of intensity, hours etc)	1000	Each	41	41,000	Filtec recommendation for monitoring purposes
Filter Array (twin set)	530	Each	41	21,730	Filtec recommendation
Upgraded Pump From Tank (to allow for additional 200 - 400kPa headloss)	500	Each	41	20,500	Estimate by me
Installation	750	Each	41	30,750	Estimate by me (Filtec estimate $200 - $2,500 depending on complexity of situation)
Total Capital				246,615	
Contingency			0%	-	Set contingency at 0% as RRP above which may come down by 15 - 30% for bulk purchase which effectively cancels out contingency.
Professional Fees			15%	36,992.25	
Expenditure to Date				28,000	
Total Estimated Budget Requirement				311,607	
Repayments on Loan				$22,109	
Annual Depreciation	20	year life (average)		15,580	
Operations	Rate	Unit	Quantity	Cost	
Replacement Bulbs (annual cost)	175	per property per year	41	7,175	
Replacement Sensors (annual cost)	312	per property per year	41	12,792	Filtec estiamte of $520 every 20 monhts.
Replacement Filters	880	per property per year	41	36,080	Filtec estimate of $55 per filter, with larger micron filter replaced monthly and smaller micron filter replaced quarterly (consistent with assumptions for full scale plant).
Labour (operations and maintenace)	195	per property per year	41	7,995	Assumes 1 hour per year for bulb and sensor, and 0.5 hour each filter change
Labour (sampling)	195	per property per year	41	7,995	Assumes each property every 2 months, 0.5 hours per property to check UV compliance (alarms) and take sample.
Electricity	413	per property per year	41	16,913	Filtec estimate of $275 for small house to $550 for large
Sub-total: Annual Operation, Maintenance and Sampling				88,950	
Total Annual Costs (excl. GST)				126,639	
Total Annual Costs (incl. GST)				145,635	
Annual Cost per Property (incl. GST)				3,552	

GARRYMERE WATER SUPPLY SCHEME – SOURCE UPGRADE

The Garrymere Water Supply Scheme requires an upgrade to comply with New Zealand Drinking Water Standards.

We have identified four possible solutions and would like to get your feedback around which option your household prefers.

What's the issue?

The existing Garrymere supply draws water from a shallow bore. The water supply is chlorinated but this is not a sufficient treatment system to remove all potential contaminants such as protozoa. Protozoa are organisms such as giardia that can be harmful to humans.

Because of this, the water supply does not comply with Drinking Water Standards for New Zealand (DWSNZ) and must be upgraded in order for Council to meet its requirements under the Health Act. It is noted that not upgrading the scheme is not an option that Council can consider.

What are the options?

There are four options for providing good quality water to the existing Garrymere community that will meet the requirements of the DWSNZ. A fifth option is also discussed that was considered but assessed as not being viable.

Option A – Treatment of Existing Source.

This option involves the additional treatment of the existing shallow well through the installation of a pre-filtration system, followed by ultra violet (UV) disinfection. This will further treat any potential contaminants that survive the current chlorine treatment.

Option B – Drill new well at Garrymere.

In this option, we would drill and develop a new deep well up to 300m deep within the Council easement at 70 Garrymere Road, close to the existing Garrymere headworks. The aim would be to find a secure water source with adequate capacity for the scheme. This option has a high risk that the new well may be unsuccessful. The deepest wells currently in the area are no more than 80m deep and yield less than the required capacity for the scheme.

Option C – Connect to Summerhill Water Supply.

This option would involve connecting the Garrymere scheme into the Summerhill water supply scheme from the existing pipe at the old Summerhill intake at the Ashley River. Construction would involve two river crossings; one across the Ashley River and one across the Garrymere River and require approximately 2.9km of pipe. This would also include additional upgrade works at the West Eyreton water supply headworks and within the Summerhill scheme to cater for the additional demand.

Option D – Connect to Summerhill Water Supply and decrease allocated demand

This option is similar to Option C in that it involves a connection into the Summerhill scheme from the existing pipe at the old intake at the Ashley River. However, in order to minimise capacity upgrades within the West Eyreton and Summerhill schemes, demand would need to be decreased within the Garrymere scheme. This would be achieved by changing the semi-restricted (13 litres per minute) connections to 3 unit

(2 litres per minute) restricted connections. This would decrease the costs within the West Eyreton and Summerhill schemes for capacity upgrades, this will include the install of tanks and pumps on these properties in order to convert the existing semi-restricted connections to fully-restricted connections

Option E – Private Treatment Systems

The Drinking Water Standards for New Zealand allow for private on-site treatment systems to be implemented, where a scheme can be classified as a Rural Agricultural Drinking Water Supply (RADWS). In order for a scheme to be classified as a RADWS it must be able to be demonstrated that a minimum of 75% of water used on the scheme is for agricultural purposes, with the remaining 25% for domestic use. Staff have assessed Garrymere and have concluded that the scheme does not meet this criteria. For this reason the use of private treatment systems is not considered to be a viable option to comply with the Drinking Water Standards. It is noted that staff could not find any examples of schemes in New Zealand that have been classified as a RADWS.

How much will it cost?

	Option	**A - TREATMENT**		**B – DRILL WELL**		**C – CONNECT TO SUMMERHILL**		**D – CONNECT TO SUMMERHILL AND REDUCE DEMAND**	
	Capital Cost	**$387,490**		**$878,724**		**$1,812,304**		**$1,048,901**	
	Operational Cost (2018/19 year)	**$29,440**		**$1,817**		**$31,970**		**-$3,450**	
Rate Impact by Number of Units	**Existing Rates**	**Increase in Rates**	**New Rate**	**Increase in Rates**	**New Rate**	**Increase in Rates**	**New Rate**	**Increase in Rates**	**New Rate**
19 units (24 properties)	$1,893	$1,796	$3,689	$2,094	$3,988	$4,937	$6,831	** note assumed all 19 unit connections converted to 3 unit connections.*	
38 units (1 property)	$2,517	$2,387	$4,904	$2,784	$5,301	$6,563	$9,080	$7,895	$10,412
4 units (1 property)	$1,401	$1,329	$2,730	$1,550	$2,951	$3,654	$5,055	$2,373	$3,774
3 units (1 property)	$1,368	$1,298	$2,666	$1,514	$2,882	$3,568	$4,937	$2,210	$3,579
2 units (14 properties)	$1,336	$1,267	$2,602	$1,477	$2,813	$3,483	$4,819	$2,048	$3,384

The additional cost for the proposed upgrade will be recovered through your water rate. The rates in the table above show how much you would pay for each of the options.

For example - Bob Jones has a property with a 19 unit connection *(19,000 litres per day allocation)*, he currently pays $1,893 for his water rate.

Under **Option A - Treatment**, the new water rate for Bob's property would be $3,689, an increase of $1,796.

In comparison, if **Option B - Drill Well** was the preferred option, Bob's new water rate would be $3,988, an increase of $2,094.

The costs presented above are based on our best estimates for the infrastructure and operating costs required for each option. The final rates will be based on actual costs of the project, and may differ from those presented above.

What are the risks?

There are two main risks associated with the options being considered.

- If **Option B – Drill Well** is adopted, the well may not be successful in striking a water source of the required quality and capacity. If this were the case, the scheme would have to not only cover the costs of the unsuccessful well, but also the costs of one of the alternative options.
- **All options**: Construction costs may be higher than the Council has estimated, which would increase the impact on rates. This risk is arguably higher for Option C and D (connecting to the Summerhill water supply scheme) as these two options involve a substantially greater amount of capital expenditure.

How will the Council decide?

Feedback from the community will be collated and presented to Council along with a report from council staff on the various options. After carefully considering the feedback from the community, Council will choose an option to proceed with. We will notify you once the decision has been made, which is expected to be in April 2018.

Public Information Meeting

You can find out more and ask questions at our public information meeting at the Loburn Domain Pavilion on Thursday 1 February, 7-9pm **MEETING DATE AND TIME TO BE CONFIRMED*

What now?

Tick which option you prefer and return this form to the Council no later than Thursday 8 February 2018.

Option A – Treatment of Existing Source

Option B – Drill new well at Garrymere

Option C – Connect to Summerhill Water Supply

Option D – Connect to Summerhill Water Supply and decrease allocated demand

You can also give us your feedback online - waimakariri.govt.nz/letstalk.

If you have any questions, or if you would like further information, phone 0800 965 468 or email your feedback to records@wmk.govt.nz

Make sure your feedback reaches us by Thursday 8 February 2018.

Formatted feedback form to be used below.

Garrymere Water Supply Source Upgrade – Feedback

Name:_____

Address:_____

_____

_____

Telephone: _____

Email: _____

For the upgrade of the community on the Garrymere water supply, please indicate your preferred option:

- ☐ Option A – Treatment of Existing Source.
- ☐ Option B – Drill new well at Garrymere.
- ☐ Option C – Connect to Summerhill Water Supply.
- ☐ Option D – Connect to Summerhill Water Supply and decrease allocated demand

Comments:

Options Report

Garrymere Water Supply – Headworks Source Upgrade

OPUS

Options Report

Garrymere Water Supply - Headworks Source Upgrade

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Date: 31 January 2017
Reference: 6-CO036.00
Status: Draft

Contents

Executive Summary

Opus International Consultants were engaged by Waimakariri District Council (WDC) to investigate options to upgrade the existing Garrymere water supply headworks, situated in the North Canterbury community of Okuku. The 30 metre deep bore is not secure and chlorination only is currently provided, therefore the upgrade is required in order to fully comply with the New Zealand Drinking Water Standards 2005 (Revised 2008) (DWSNZ).

As the Garrymere water supply provides water to only 103 people the scheme qualifies as a Small Drinking Water Supply under the New Zealand Drinking Water Standards, which allows alternative compliance criteria to meet the DWSNZ. The treatment options under Section 10 of the DWSNZ for Small drinking water supply are:

- Option 1: Microfiltration (≤1 µm absolute) followed by chlorine disinfection.
- Option 2: Microfiltration (≤5 µm nominal) followed by UV disinfection.

From a water treatment process viewpoint the elevated and varying turbidity levels in the bore water are the factors that govern the optimum treatment system. These necessitate additional filtration ahead of the cartridge filtration which is a component of the treatment stream required for compliance. Prevention of the blocking of the cartridge filters is important. Also the use of a coagulating chemical for filtration is to be avoided because of dosing and backwashing disposal issues.

The preferred option for the Garrymere water supply upgrade, on a treatment process basis, is Option 2C which comprises 25 µm cartridge filtration followed by 5 µm cartridge filtration followed by UV disinfection.

Process flow diagrams, storage layouts, and headworks layouts for each option, were produced. In addition, 25 year NPV analyses were undertaken and these showed that Option 2C, microfiltration using 25 µm and 5 µm cartridge filters ahead of low pressure lamp UV disinfection, was the most economic option.

It is recommended that the Garrymere Water Supply Source Headworks be upgraded using Option 2C, microfiltration with 25 µm and 5 µm cartridge filters ahead of low pressure lamp UV disinfection, at a capital cost of $188,000.

1 Introduction

Opus International Consultants were engaged by Waimakariri District Council (WDC) to investigate options to upgrade the existing Garrymere water supply headworks, situated in the North Canterbury community of Okuku. The upgrade is required in order to comply with the New Zealand Drinking Water Standards 2005 (Revised 2008) (DWSNZ).

This report discusses the proposed options for treatment and the treatment plant, including the associated costs. It builds on the following previous reports:

- Garrymere Water Supply System Assessment, 2013;
- Garrymere Water Supply Scheme Activity Management Plan, 2015; and
- Garrymere Water Supply Public Health Risk Management Plan, 2013.

2 Okuku Community

The Garrymere Headworks are located on Garrymere Road in Okuku, North Canterbury, which is approximately 50 kilometres north-west of Christchurch (see Figure 1). The community has a current population of 103 residents and is mainly farmland.

Figure 1: Okuku Location Plan

3 Garrymere Drinking-Water Supply

As outlined in the *"Garrymere Water Supply System Assessment, November 2013"* report, the Garrymere water supply sources its drinking-water from the well located at 70 Garrymere Road, in the vicinity of the headworks. The well is 30 metres deep and is not secure.

No reservoir exists for storage. A pump is present at the well, installed in 2009. There are also two surface pumps at the headworks for pumping to the reticulation.

The current consent for taking groundwater from the wells, which is valid until April 2032, states that a maximum rate of 4.5 L/s is permitted, not exceeding 389 m^3/day.

4 Water Supply Demand

The WDC Garrymere Water Supply Scheme Activity Management Plan (AMP) projections allow for 14% growth on the Garrymere scheme, despite a 0% demand increase. However, a 10% growth has been recommended by the WDC Water Asset Manager to allow for future developments that are not anticipated in the AMP projections. The existing and future water supply parameters given in the design brief are shown in Table 1 below.

Table 1: Water Supply Parameters

Parameter	Existing		Future	
Connections	41		62	
Average Daily Flow	134 m^3/day	1.6 L/s	147 m^3/day	1.7 L/s
Peak Daily Flow	245 m^3/day	2.9 L/s	270 m^3/day	3.1 L/s
Peak Hourly Flow	654 m^3/day	7.6 L/s	710 m^3/day	8.2 L/s

Of the existing 41 connections, 24 connections are semi restricted and 17 are fully restricted.

It has since been agreed that the Peak Daily Flow should be 389 m^3/day (4.5 L/s) for the treatment of the water, as this is the maximum consented abstraction rate. This report provides costs and cost comparisons for the maximum abstraction rate flow only as the cost difference for water treatment between the existing demand and the maximum abstraction demand is minimal.

5 Existing Water Quality

The results of raw water quality analyses of the Garrymere well carried out in 2013, and more recently, show a groundwater of reasonable quality, but with elevated and varying turbidity levels. Table 2 below outlines the guideline values in the DWSNZ for water quality to compare with the 2013 and more recent test results.

Table 2: Water Quality Values

Parameter	DWSNZ Guideline	Garrymere Well
Colour	10 TCU	<10
Iron	0.2 mg/L	0.019 mg/L
Manganese	0.04 mg/L	< 0.005 mg/L
Nitrate Nitrogen	10 mg/L	0.12 mg/L
UV Transmittance	Validated UV reactor %, but >80% minimum	93% - 98%

Results from control monitoring of the headworks between March 2013 and July 2016 for pH and Turbidity show the following:

pH Analysis Results

The pH has ranged from 6.3 to 7.9 with an average value of 7.1. As the water has an alkalinity of around 43 mg/l the average free carbon dioxide levels are around 9 mg/l. This shows that the water

will be corrosive, a fact recognised by the issuing of two plumbosolvency public health warnings each year. These warnings ensure compliance with the DWSNZ.

Turbidity Results

For the turbidity samples collected from the headworks from 2013 to 2017, the turbidity has ranged from 0.0 NTU to 23.9 NTU. Readings exceeding 1 NTU have occurred frequently. As the bore is 1 kilometre from the nearest river the bore water is possibly being affected from the surrounding ground. Attention to the bore head may improve the turbidity levels. The stock-proof fence has already been extended to provide sufficient clearance and a concrete apron sloping away from the bore casing should also constructed.

There are no Priority 2 determinands assigned to the Garrymere well water.

6 Treatment Options

The Garrymere bore is 30 m deep and is screened over five intervals between 2.5 m and 28 m. As there are two screens in the first 10 m depth a 3-Log protozoal treatment only for DWSNZ compliance is not permissible. Treatment using UV disinfection only is therefore not a possible option. The protozoal treatment required would be at least 4 Log credits and possibly 5 Log credits, and more extensive treatment is required.

However, as the Garrymere Water Supply provides water to only 103 people, the scheme qualifies as a Small Drinking Water Supply under the New Zealand Drinking Water Standards. This allows alternative compliance criteria to meet the DWSNZ. This will reduce the treatment costs and this approach has therefore been used to assess suitable treatment options and determine costs.

The applicable catchment type in Table 10.1 from section 10 of the DWSNZ is "Unprotected catchment with septic tanks and/or sewage discharges from human habitations and/or intensive livestock operations harbouring gatherings of pre-weaned and juvenile stock, *eg non-secure bore water drawn from a depth of less than 10 m, or a spring, lake or reservoir, stream or river.*"

The minimum microbial treatment requirements for such a catchment are bacterial and 4-Log protozoal treatment provided by:

Either:

Option 1 Microfiltration (≤1 µm absolute) followed by chlorine disinfection

Or:

Option 2 Microfiltration (≤5 µm nominal) followed by UV disinfection

6.1 Option 1

The process flow diagram for this option is shown on Sheet C01 in Appendix A. With the elevated and varying turbidity levels in the bore water, it will be necessary to have filtration ahead of the 1 µm cartridge filtration in order to avoid excessive operating costs from replacement of blocked cartridges. Direct filtration is proposed, with a flocculation tank and a pressure sand filter. A filtration rate of 8 m/h is proposed.

A minimum chlorine contact time of 30 minutes without short-circuiting is required. The maximum flow rate is 16.5 m^3/h and 30 minutes contact requires a volume of 8.3 m^3/h. However, as a tank with a normal pipe inlet and outlet has a T_{10}/T ratio of only 0.1[1] then the actual required volume is to be greater than 83 m^3. Three additional tanks, each of 30m^3 capacity would be required. To minimise costs the number of tanks could be reduced to two, if the nearest consumers are on a fully restricted supply, recognising that 17 of the 41 connections are fully restricted and thus will have on-site storage.

There are disadvantages associated with this option. First, a coagulating chemical needs to be used. In addition to the cost is the issue of matching the dose rate to the level of turbidity. This would require considerable manual input for a start until a dosing algorithm could be developed and run automatically. There is also the risk of cartridge blockage (with expensive replacement) if a dosing-turbidity mismatch occurred. Secondly the pressure filter also needs to be backwashed on a regular

[1] "Improving Clearwell Design for CT Compliance", AWWA Research Foundation, 1999.

basis. This would require on-site treatment, or storage and regular removal, because of the location of the treatment plant. Both handling options would be expensive.

6.2 Option 2

The elevated and varying turbidity levels in the bore water also affect this treatment option. To protect the 5 µm cartridge from rapid blockage additional filtration ahead of the cartridge would be provided. This could be done in three ways.

As above, a flocculation tank and pressure filter are proposed. The pressure filter could be of a smaller diameter as a much greater filtration rate could be used (20 m/h) because the turbidity only has to be reduced to 1 NTU for the subsequent UV disinfection. Alternatively the flocculation tank could be removed and the large pressure filter used at the reduced filtration rate of 8 m/h. Both of these methods suffer from the same disadvantages mentioned above of a coagulating chemical being required with its consequent dosing and backwashing disposal issues.

The third method is to use a 25 µm cartridge to provide filtration ahead of the 5 µm cartridge. This would remove most of the turbidity from the bore water and allow the 5 µm cartridge to attain a reasonable length of operation without blocking up. There are no dosing or backwashing issues as the cartridges are disposed of when they are no longer capable of filtering.

Therefore there are three alternatives for option 2 as follows:

- Option 2A: Direction filtration using a flocculation tank and small diameter filter + microfiltration (1 µm cartridge) + UV disinfection.
- Option 2B: Direct filtration using a large diameter filter + microfiltration (5 µm cartridge) + UV disinfection.
- Option 2C: Microfiltration (25 µm cartridge) + microfiltration (5 µm cartridge) + UV disinfection.

As chlorine is not necessary in Option 2 for disinfection, there is no need for the additional tanks which are required for Option 1 to provide chlorine contact time. The chlorine dosing for the Option 2 alternatives is only to provide a chlorine residual in the reticulation.

6.3 Drawing Layouts

The layouts for the proposed headworks upgrade are shown on the drawings enclosed in Appendix A, and are based on a design flow of 4.5 L/s which is the agreed Peak Daily Flow.

- Sheet C01 shows the process flow diagrams for the DWSNZ section 10 applicable treatments.
- Sheet C02 shows the storage layouts for the two DWSNZ section 10 options. Additional pipework to hydraulically balance flows through the tanks has been provided.

Sheet C11 outlines the proposed headworks layout for Option 1, the microfiltration + chlorine disinfection option. This option requires an additional two 30m^3 storage tanks for chlorine contact as mentioned above, if on-site storage requirements are met for the closest consumers. Otherwise three 30m^3 storage tanks will be needed.

Sheets C21, C22 and C23 outlines the proposed headworks layouts for Option 2, the microfiltration + UV disinfection options. For these layouts, the Wedeco Spektron 30e low pressure lamp UV system has been displayed and uses the two existing 23 m^3 storage tanks.

The existing pipes as noted on the as-builts are DN50 pipes. An increase in flow requires the pipes to increase in size to DN65 pipes. In addition to this, the Wedeco Spektron 30e UV system requires a DN80 connection and the CUNO cartridge filtration requires a DN100 connection.

Valves are included ahead of the cartridge filters and UV systems to provide isolation when maintenance is required. A flow meter is proposed after treatment for treatment compliance. A Krohne Waterflux electromagnetic flow meter has been proposed as this meter does not require specific distances upstream and downstream for measurement accuracy. As minimum pipe lengths do not have to be used, a smaller building extension can be utilised.

In both options, the existing headworks building remains. There is very limited space in the existing treatment rooms therefore a new building extension is required for all options presented.

6.3.1 Building Extension

The building extension is proposed as a timber framed, profiled steel clad building, with internal plywood lining. This is considered suitable in the location and will minimise cost.

All options have single door access.

Table 3 below outlines the approximate building areas for the new building.

Table 3: Proposed Building Area Requirements

Option	Description	Area (m^2)
1	Microfiltration + chlorine disinfection	11.0
2A	Microfiltration + UV disinfection	15.0
2B	Microfiltration + UV disinfection	16.5
2C	Microfiltration + UV disinfection	13.0

The microfiltration + chlorine disinfection option has a smaller area than the microfiltration + UV disinfection options, as more plant can be situated outside the building. It should be noted that an alternative low pressure lamp UV system for Option 2 is the Trojan Telos 120i. This system will require a building area of up to 22.0 m^2

Sheet C31 (Appendix A) shows the comparison of the two UV systems for Option 2C.

7 Preferred Option for Garrymere Headworks Source Upgrade

From a water treatment process viewpoint the elevated and varying turbidity levels in the bore water are the factors that govern the optimum treatment system. These necessitate additional filtration ahead of the cartridge filtration which is a component of the treatment stream required for compliance. As prevention of the blocking of 1 µm cartridges requires greater treatment than for 5 µm cartridges then the options for microfiltration followed by UV disinfection are favoured over the Microfiltration followed by Chlorine disinfection option.

Of the microfiltration followed by UV disinfection options, those which employ sand filtration suffer from the disadvantages mention above of a coagulating chemical being required with its consequent

dosing and backwashing disposal issues. Thus the preferred option for the Garrymere water supply upgrade, on a treatment process basis, is Option 2C which comprises 25 µm cartridge filtration followed by 5 µm cartridge filtration followed by UV disinfection.

Due to the small scale of the Garrymere water supply and the quantity of storage available, standby equipment is not justified and thus only single units are proposed for the UV reactor and the cartridge filtration housings.

8 Upgrade Costs

Table 4 shows the capital costs for Options 1 and 2C. All costs exclude GST.

Table 4: Capital Costs

Item	1 - Microfiltration + Chlorine Disinfection ($)	2C - Microfiltration + UV Disinfection ($)
Civils	15,000	15,000
Building	13,500	17,500
Pumping storage	2,000	2,000
Pumps & piping	21,000	16,000
Direct filtration	57,500	-
Cartridge filtration	20,000	25,000
UV disinfection	-	34,500
Electrical / Controls/SCADA	85,000	75,000
Chlorination	20,500	Use existing
Test & Commission	3,000	3,000
TOTAL	**237,500**	**188,000**

Annual Operating costs are shown in Table 5. All costs exclude GST.

Table 5: Operating Costs

	1 - Microfiltration + Chlorine Disinfection	2C - Microfiltration + UV Disinfection
Opex Total	$78,500	$37,800

The operating costs do not include the existing plant operating costs (chlorination, soda ash dosing, and pumping power), which do not affect comparisons.

9 NPV Analysis

A Net Present Value (NPV) analysis was undertaken to determine the whole of life costs for each option over a 25 year period.

Capital costs were determined for each item of plant, as well as costs associated with installation; electrical/controls/SCADA; siteworks and building foundation; building extension; and testing and commissioning of the plant.

Operational costs were determined including power costs; replacement costs for UV lamps, cartridge filters and filter media; coagulant costs and labour costs. Labour costs for options 1, 2A and 2B are based on an operator being on-site two days a week due to ensure the coagulant is dosed correctly. The labour cost for Option 2C is based on an operator being on-site once a week during summer months and once a fortnight during winter months, as per the current arrangement.

The whole of life costs for each option are outlined in Table 6.

Table 6: Whole of Life Costs

Option	Description	Whole of Life Cost (25 year NPV)
1	Microfiltration + Chlorine Disinfection	$1,475,900
2A	Microfiltration + UV Disinfection	$1,428,400
2B	Microfiltration + UV Disinfection	$1,430,900
2C	Microfiltration + UV Disinfection (Wedeco)	$864,100

An alternative UV system was also analysed for Option 2C, using the Trojan Telos 120i low pressure lamp system. This option was analysed as the building area would be larger than that of the Wedeco Spektron 30e 2C option.

2C	Microfiltration + UV Disinfection (Trojan)	$875,400

The option with the lowest whole of life cost over 25 years is Option 2C using the Wedeco Spektron 30e UV system, while the highest cost is Option 1 – using chlorine disinfection.

10 Recommendation

It is recommended that the Garrymere Water Supply Source Headworks be upgraded using Option 2C, microfiltration with 25 µm and 5 µm cartridge filters ahead of low pressure lamp UV disinfection, at a capital cost of $188,000.

Appendix A – Drawing Layouts

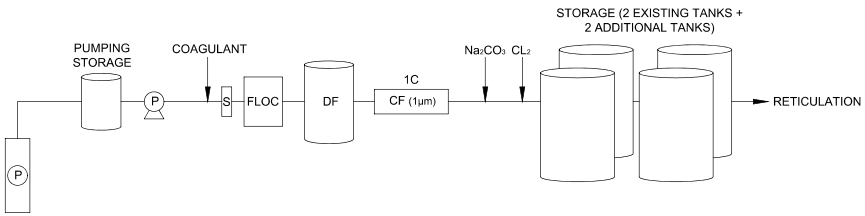
SHEET	DESCRIPTION	REVISION
C01	PROCESS FLOW DIAGRAMS	A
C02	STORAGE LAYOUTS	A
HEADWORKS LAYOUTS		
C11	OPTION 1	A
C21	OPTION 2A	A
C22	OPTION 2B	A
C23	OPTION 2C	A
C31	OPTION 2C ALTERNATIVE SYSTEM LAYOUTS	A

WAIMAKARIRI DISTRICT COUNCIL GARRYMERE ROAD, OKUKU HEADWORKS SOURCE UPGRADE

CONCEPT

Project No: 6-CO036.00

Date: 27/01/2017



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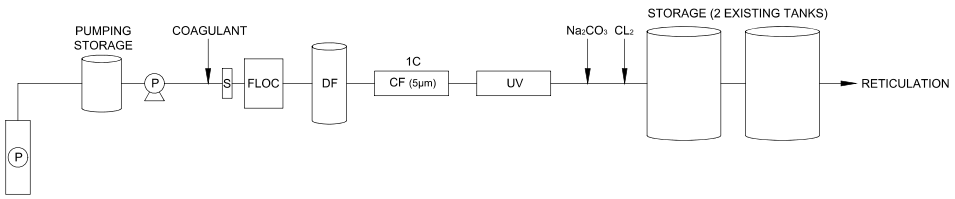

2A MICROFILTRATION + UV DISINFECTION
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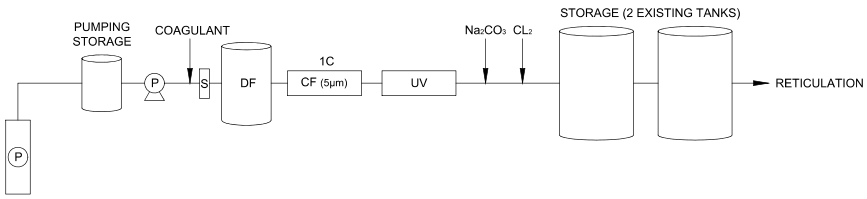

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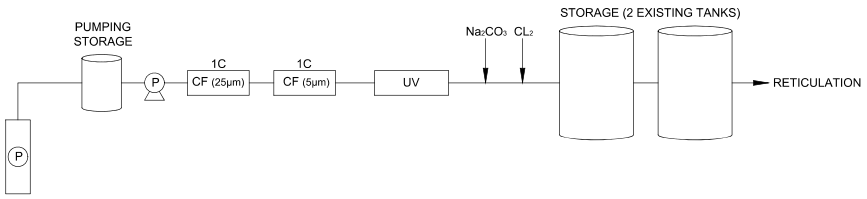

2C MICROFILTRATION + UV DISINFECTION
NTS

KEY

S	STATIC MIXING PLATE	1C	ONE CARTRIDGE HOUSING
		P	PUMP
FLOC	FLOCCULATION CHAMBER	UV	UV DISINFECTION
		Na_2CO_3	SODA ASH DOSING
DF	DIRECT FILTRATION	CL_2	CHLORINE DOSING
CF	CARTRIDGE FILTRATION		

CONCEPT

Revision	Amendment	Approved	Revision Date

WAIMAKARIRI DISTRICT COUNCIL

OPUS
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Dunedin 9016
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Designed	Approved	Approved Date
M PETRIE	M PETRIE	27/01/2017
Drawn	Scales	
M CROSSEN	NTS	

Project
WAIMAKARIRI DISTRICT COUNCIL
GARRYMERE ROAD, OKUKU
HEADWORKS SOURCE UPGRADE

Sheet
TREATMENT OPTIONS
PROCESS FLOW DIAGRAMS

Project No.	Sheet No.	Revision
6-CO036.00	C01	A

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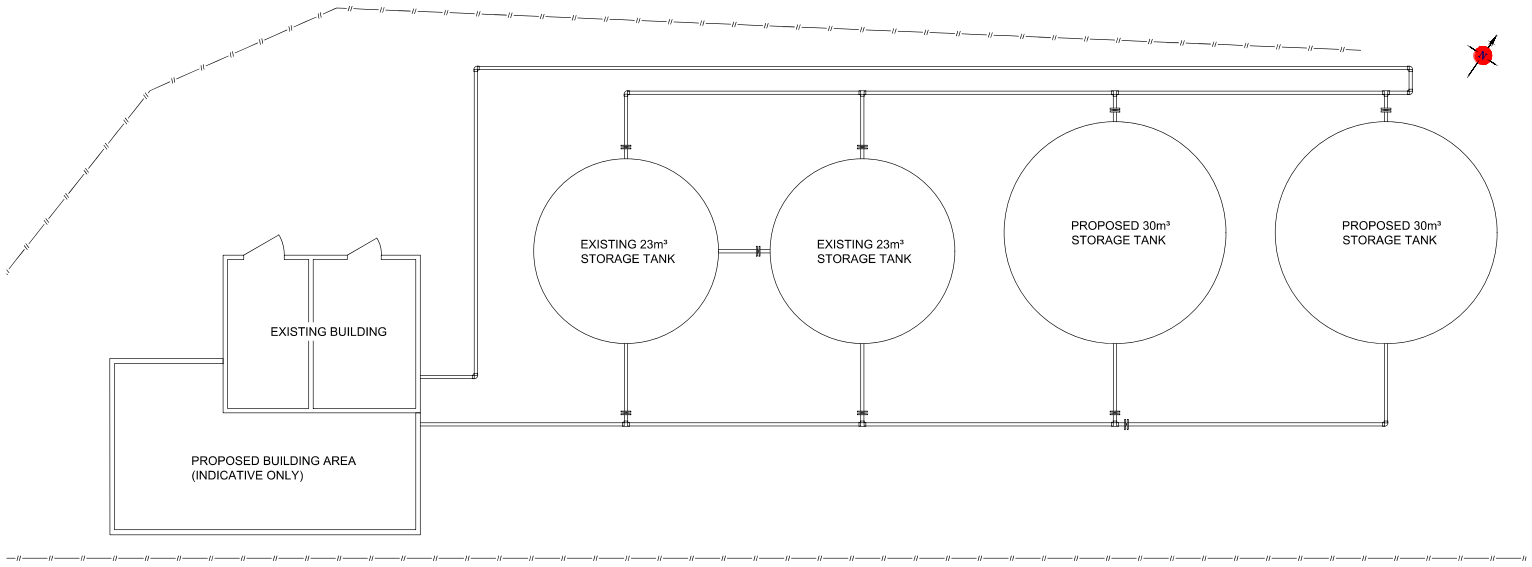

1 MICROFILTRATION + CHLORINE DISINFECTION
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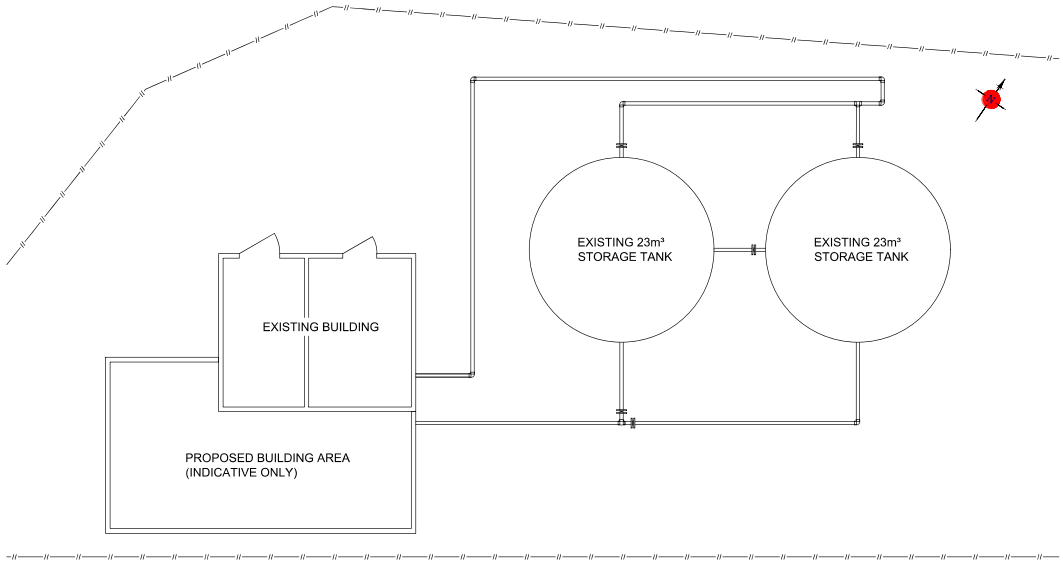

2 MICROFILTRATION + UV DISINFECTION
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KEY

EXISTING FENCELINE

CONCEPT

Revision	Amendment	Approved	Revision Date

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Designed	Approved	Approved Date
M PETRIE	M PETRIE	27/01/2017
Drawn	Scales	
M CROSSEN	1:100 (A3)	

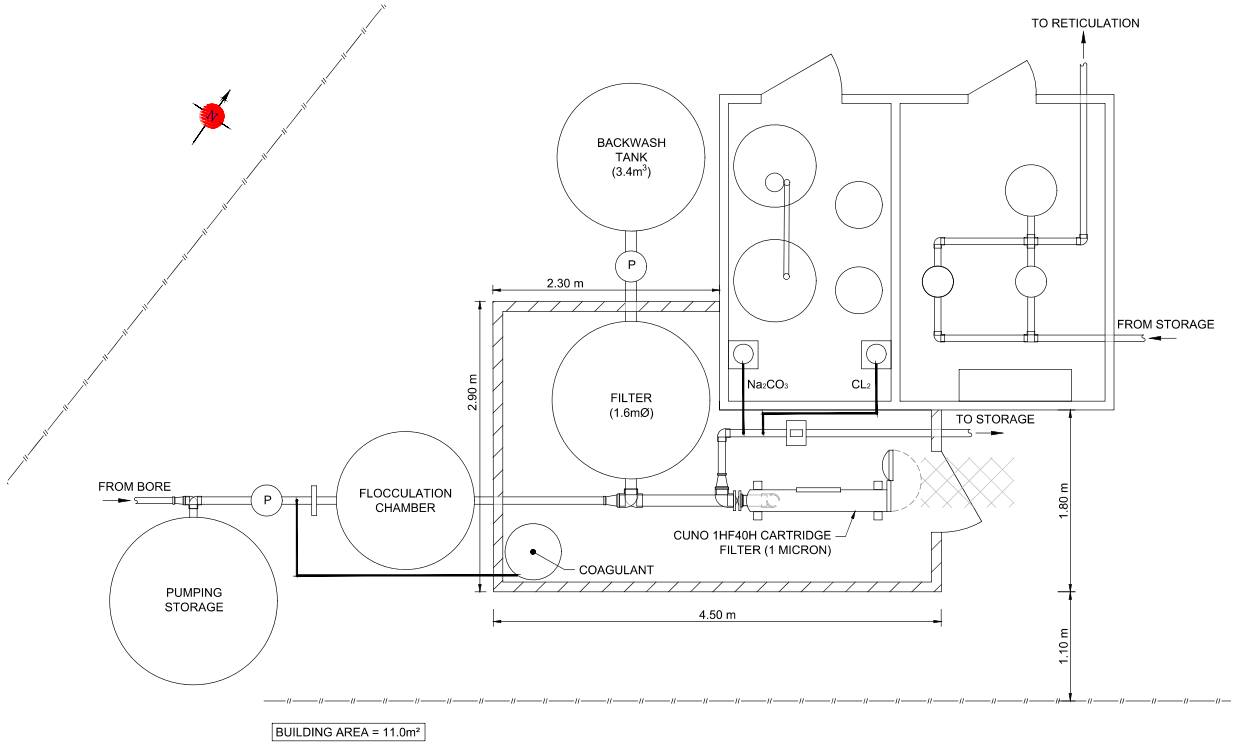
Project
WAIMAKARIRI DISTRICT COUNCIL
GARRYMERE ROAD, OKUKU
HEADWORKS SOURCE UPGRADE

Sheet
TREATMENT OPTIONS
STORAGE LAYOUTS

Project No.	Sheet No.	Revision
6-CO036.00	C02	A

1:50 @ A1
1:100 @ A3
0 1 2 3 4 5 m

Original Sheet Size A1 [841x594] Plot Date 2017-01-31 at 3:33:59 p.m. Path G:\Waimakariri DC\6-CO036.00 Garrymere Water Supply - Headworks Source Upgrade\drawings\(C) Civil\AutoCad\6-CO036.00_C01-02_C11_C21-23_C31.dwg C02(A)



1 MICROFILTRATION + CHLORINE DISINFECTION
Scale: 1:50 (A3)

KEY

P	PUMP
	FLOW METER
	VALVE
	PROPOSED BUILDING
	CLEARANCE
—//—	EXISTING FENCE
Na_2CO_3	SODA ASH DOSING
CL_2	CHLORINE DOSING
UV CC	UV CONTROL CABINET

NOTE: DIMENSIONS APPROXIMATE ONLY

CONCEPT

Revision	Amendment	Approved	Revision Date

WAIMAKARIRI DISTRICT COUNCIL

OPUS
Dunedin Office
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Private Bag 1913
Dunedin 9016
New Zealand

Designed	Approved	Approved Date
M PETRIE	M PETRIE	27/01/2017
Drawn	Scales	
M CROSSEN	1:50 (A3)	

Project
WAIMAKARIRI DISTRICT COUNCIL
GARRYMERE ROAD, OKUKU
HEADWORKS SOURCE UPGRADE

Sheet
HEADWORKS LAYOUTS
OPTION 1

Project No.	Sheet No.	Revision
6-CO036.00	C11	A

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1:50 @ A3
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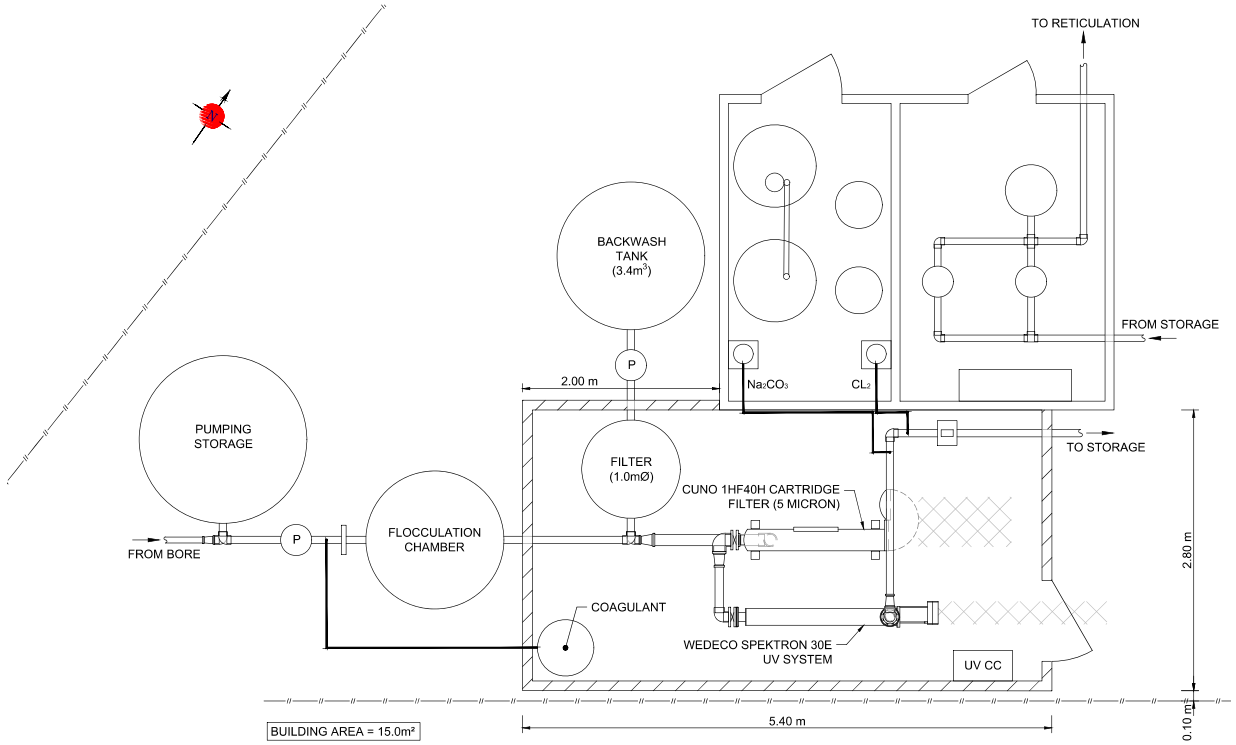
Original Sheet Size A1 [841x594] Plot Date 2017-01-31 at 3:34:03 p.m. Path G:\Waimakariri DC\6-CO036.00 Garrymere Water Supply - Headworks Source Upgrade\drawings\(C) Civil\AutoCad\6-CO036.00_C01-02_C11_C21-23_C31.dwg C11(A)



2A MICROFILTRATION + UV DISINFECTION
Scale: 1:50 (A3)

KEY

P	PUMP
	FLOW METER
	VALVE
	PROPOSED BUILDING
	CLEARANCE
	EXISTING FENCE
Na_2CO_3	SODA ASH DOSING
CL_2	CHLORINE DOSING
UV CC	UV CONTROL CABINET

NOTE: DIMENSIONS APPROXIMATE ONLY

CONCEPT

Revision	Amendment	Approved	Revision Date

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Designed	Approved	Approved Date
M PETRIE	M PETRIE	27/01/2017
Drawn	Scales	
M CROSSEN	1:50 (A3)	

Project
WAIMAKARIRI DISTRICT COUNCIL
GARRYMERE ROAD, OKUKU
HEADWORKS SOURCE UPGRADE

Sheet
HEADWORKS LAYOUTS
OPTION 2A

Project No.	Sheet No.	Revision
6-CO036.00	C21	A

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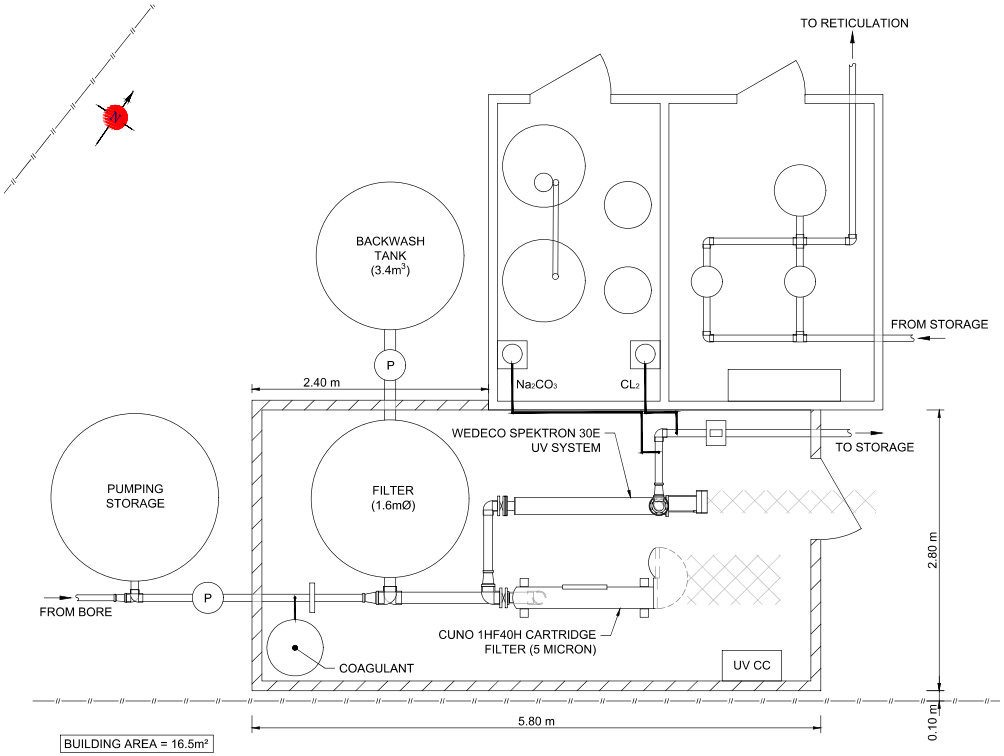
1:50 @ A3
0 400 800 1200 1600 2000 2400 mm

Original Sheet Size A1 [841x594] Plot Date 2017-01-31 at 3:34:08 p.m. Path G:\Waimakariri DC\6-CO036.00 Garrymere Water Supply - Headworks Source Upgrade\drawings\(C) Civil\AutoCad\6-CO036.00_C01-02_C11_C21-23_C31.dwg C21(A)



2B MICROFILTRATION + UV DISINFECTION
Scale: 1:50 (A3)

KEY

P	PUMP
	FLOW METER
	VALVE
	PROPOSED BUILDING
	CLEARANCE
	EXISTING FENCE
Na_2CO_3	SODA ASH DOSING
CL_2	CHLORINE DOSING
UV CC	UV CONTROL CABINET

NOTE: DIMENSIONS APPROXIMATE ONLY

1:25 @ A1
1:50 @ A3
0 400 800 1200 1600 2000 2400 mm

CONCEPT

Revision	Amendment	Approved	Revision Date

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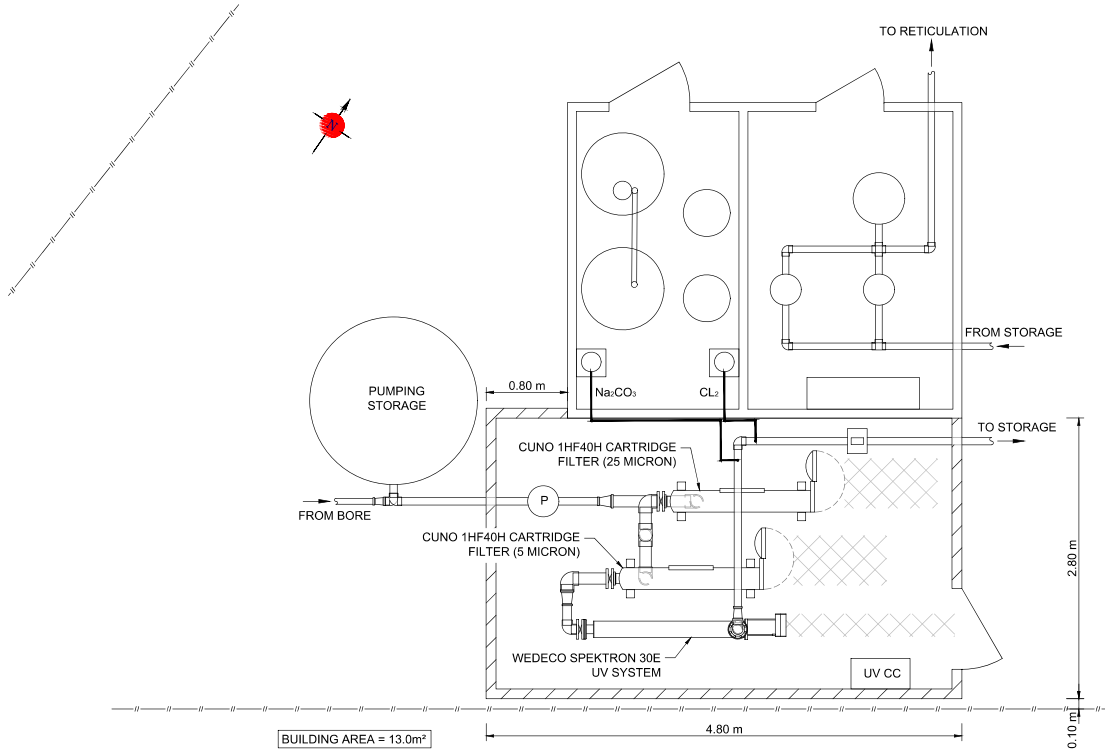
M PETRIE	M PETRIE	27/01/2017
Drawn	Scales	
M CROSSEN	1:50 (A3)	

Project
WAIMAKARIRI DISTRICT COUNCIL
GARRYMERE ROAD, OKUKU
HEADWORKS SOURCE UPGRADE

Sheet
HEADWORKS LAYOUTS
OPTION 2B

Project No.	Sheet No.	Revision
6-CO036.00	C22	A

Original Sheet Size A1 [841x594] Plot Date 2017-01-31 at 3:34:12 p.m. Path G:\Waimakariri DC\6-CO036.00 Garrymere Water Supply - Headworks Source Upgrade\drawings\(C) Civil\AutoCad\6-CO036.00_C01-02_C11_C21-23_C31.dwg C22(A)



2C MICROFILTRATION + UV DISINFECTION
Scale: 1:50 (A3)

KEY

P	PUMPING
	FLOW METER
	VALVE
	PROPOSED BUILDING
	CLEARANCE
	EXISTING FENCE
Na_2CO_3	SODA ASH DOSING
CL_2	CHLORINE DOSING
UV CC	UV CONTROL CABINET

NOTE: DIMENSIONS APPROXIMATE ONLY

CONCEPT

Revision	Amendment	Approved	Revision Date

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Designed	Approved	Approved Date
M PETRIE	M PETRIE	27/01/2017
Drawn	Scales	
M CROSSEN	1:50 (A3)	

Project
WAIMAKARIRI DISTRICT COUNCIL
GARRYMERE ROAD, OKUKU
HEADWORKS SOURCE UPGRADE

Sheet
HEADWORKS LAYOUTS
OPTION 2C

Project No.	Sheet No.	Revision
6-CO036.00	C23	A

1:25 @ A1
1:50 @ A3
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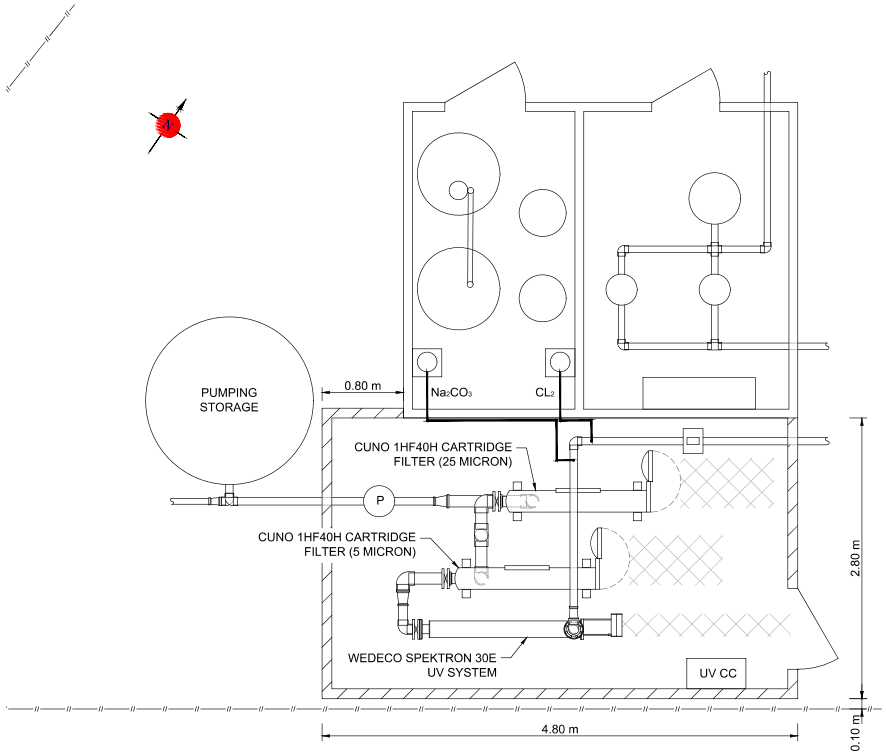
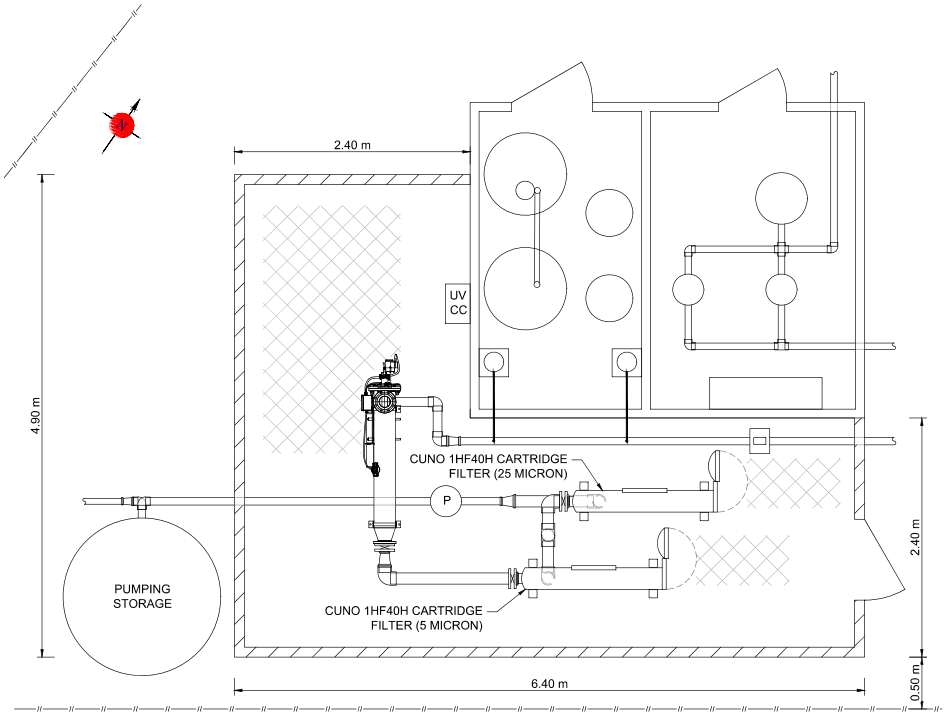
Original Sheet Size A1 [841x594] Plot Date 2017-01-31 at 3:34:16 p.m. Path G:\Waimakariri DC\6-CO036.00 Garrymere Water Supply - Headworks Source Upgrade\drawings\(C) Civil\AutoCad\6-CO036.00_C01-02_C11_C21-23_C31.dwg C23(A)



BUILDING AREA = 13.0m²

2C WEDECO SPEKTRON 30E UV SYSTEM
Scale: 1:50 (A3)



BUILDING AREA = 22.0m²

2C TROJAN TELOS 120I UV SYSTEM
Scale: 1:50 (A3)

KEY

P	PUMP
	FLOW METER
	VALVE
	PROPOSED BUILDING
	CLEARANCE
	EXISTING FENCE
Na_2CO_3	SODA ASH DOSING
CL_2	CHLORINE DOSING
UV CC	UV CONTROL CABINET

NOTE: DIMENSIONS APPROXIMATE ONLY

1:25 @ A1
1:50 @ A3
0 400 800 1200 1600 2000 2400 mm

CONCEPT

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Designed	Approved	Approved Date
M PETRIE	M PETRIE	27/01/2017
Drawn	Scales	
M CROSSEN	1:50 (A3)	

Project
WAIMAKARIRI DISTRICT COUNCIL
GARRYMERE ROAD, OKUKU
HEADWORKS SOURCE UPGRADE

Sheet
HEADWORKS LAYOUTS
OPTION 2C - ALTERNATIVE SYSTEM LAYOUTS

Project No.	Sheet No.	Revision
6-CO036.00	C31	A

Original Sheet Size A1 [841x594] Plot Date 2017-01-31 at 3:34:24 p.m. Path G:\Waimakariri DC\6-CO036.00 Garrymere Water Supply - Headworks Source Upgrade\drawings\(C) Civil\AutoCad\6-CO036.00_C01-02_C11_C21-23_C31.dwg C31(A)

Appendix B – NPV

BUDGET COSTS ESTIMATE

Option 1: Microfiltration (1 micron) + Chlorine Disinfection

Cost of Capital	6.50%
General Inflation	2.50%
Annual Power Cost	$5,904

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Cartridge Replacement Schedule		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Filter Media Replacement Schedule											1										1					
CAPEX & Renewals	$237,697																									
All Power Consumption ($/yr)		$ 6,052	$ 6,203	$ 6,358	$ 6,517	$ 6,680	$ 6,847	$ 7,018	$ 7,194	$ 7,374	$ 7,558	$ 7,747	$ 7,941	$ 8,139	$ 8,343	$ 8,551	$ 8,765	$ 8,984	$ 9,209	$ 9,439	$ 9,675	$ 9,917	$ 10,165	$ 10,419	$ 10,679	$ 10,946
Cartridge Replacement		$ 5,535	$ 5,673	$ 5,815	$ 5,961	$ 6,110	$ 6,262	$ 6,419	$ 6,579	$ 6,744	$ 6,912	$ 7,085	$ 7,262	$ 7,444	$ 7,630	$ 7,821	$ 8,016	$ 8,217	$ 8,422	$ 8,633	$ 8,849	$ 9,070	$ 9,296	$ 9,529	$ 9,767	$ 10,011
Filter Media Replacement		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,024	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,311	$ -	$ -	$ -	$ -	$ -
Coagulant Replacement		$ 533	$ 547	$ 560	$ 574	$ 589	$ 603	$ 618	$ 634	$ 650	$ 666	$ 683	$ 700	$ 717	$ 735	$ 753	$ 772	$ 792	$ 811	$ 832	$ 852	$ 874	$ 896	$ 918	$ 941	$ 964
Labour		$ 68,224	$ 69,930	$ 71,678	$ 73,470	$ 75,307	$ 77,189	$ 79,119	$ 81,097	$ 83,124	$ 85,202	$ 87,332	$ 89,516	$ 91,754	$ 94,048	$ 96,399	$ 98,809	$ 101,279	$ 103,811	$ 106,406	$ 109,066	$ 111,793	$ 114,588	$ 117,452	$ 120,389	$ 123,399
Total																										
CAPEX Total	$237,697																									
OPEX Total		$ 80,344	$ 82,353	$ 84,411	$ 86,522	$ 88,685	$ 90,902	$ 93,174	$ 95,504	$ 97,891	$ 101,363	$ 102,847	$ 105,418	$ 108,054	$ 110,755	$ 113,524	$ 116,362	$ 119,271	$ 122,253	$ 125,309	$ 129,753	$ 131,653	$ 134,944	$ 138,318	$ 141,776	$ 145,320
Annual Cost - PV		$ 75,440	$ 72,607	$ 69,880	$ 67,255	$ 64,729	$ 62,298	$ 59,958	$ 57,706	$ 55,539	$ 53,999	$ 51,445	$ 49,513	$ 47,654	$ 45,864	$ 44,141	$ 42,483	$ 40,888	$ 39,352	$ 37,874	$ 36,823	$ 35,082	$ 33,765	$ 32,497	$ 31,276	$ 30,101
Whole of Life - PV	**$1,475,867**																									
Whole of Life - No CAPEX	**$1,238,171**																									

BUDGET COSTS ESTIMATE

Option 2A: Direct Filtration (Small Diameter) + Microfiltration (5 micron) + UV Disinfection

Cost of Capital	6.50%
General Inflation	2.50%
Annual Power Cost	$6,833

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
UV Lamp Replacement Schedule			1		1	1		1	1		1		1	1		1	1		1		1	1		1	1	
Cartridge Replacement Schedule		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Filter Media Replacement Schedule											1										1					
CAPEX & Renewals	$227,830																									
All Power Consumption ($/yr)		$ 7,004	$ 7,179	$ 7,358	$ 7,542	$ 7,731	$ 7,924	$ 8,122	$ 8,325	$ 8,533	$ 8,747	$ 8,965	$ 9,189	$ 9,419	$ 9,655	$ 9,896	$ 10,143	$ 10,397	$ 10,657	$ 10,923	$ 11,196	$ 11,476	$ 11,763	$ 12,057	$ 12,359	$ 12,668
UV Lamp Replacement		$ -	$ 563	$ -	$ 592	$ 606	$ -	$ 637	$ 653	$ -	$ 686	$ -	$ 721	$ 739	$ -	$ 776	$ 796	$ -	$ 836	$ -	$ 878	$ 900	$ -	$ 946	$ 969	$ -
Cartridge Replacement		$ 1,845	$ 1,891	$ 1,938	$ 1,987	$ 2,037	$ 2,087	$ 2,140	$ 2,193	$ 2,248	$ 2,304	$ 2,362	$ 2,421	$ 2,481	$ 2,543	$ 2,607	$ 2,672	$ 2,739	$ 2,807	$ 2,878	$ 2,950	$ 3,023	$ 3,099	$ 3,176	$ 3,256	$ 3,337
Filter Media Replacement		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 512	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 655	$ -	$ -	$ -	$ -	$ -
Coagulant Replacement		$ 533	$ 547	$ 560	$ 574	$ 589	$ 603	$ 618	$ 634	$ 650	$ 666	$ 683	$ 700	$ 717	$ 735	$ 753	$ 772	$ 792	$ 811	$ 832	$ 852	$ 874	$ 896	$ 918	$ 941	$ 964
Labour		$ 68,224	$ 69,930	$ 71,678	$ 73,470	$ 75,307	$ 77,189	$ 79,119	$ 81,097	$ 83,124	$ 85,202	$ 87,332	$ 89,516	$ 91,754	$ 94,048	$ 96,399	$ 98,809	$ 101,279	$ 103,811	$ 106,406	$ 109,066	$ 111,793	$ 114,588	$ 117,452	$ 120,389	$ 123,399
Total																										
CAPEX Total	$227,830																									
OPEX Total		$ 77,606	$ 80,109	$ 81,535	$ 84,165	$ 86,269	$ 87,804	$ 90,636	$ 92,902	$ 94,555	$ 98,117	$ 99,342	$ 102,546	$ 105,110	$ 106,980	$ 110,431	$ 113,192	$ 115,206	$ 118,922	$ 121,039	$ 125,598	$ 128,066	$ 130,345	$ 134,550	$ 137,914	$ 140,368
Annual Cost - PV		$ 72,869	$ 70,629	$ 67,498	$ 65,423	$ 62,966	$ 60,175	$ 58,325	$ 56,134	$ 53,646	$ 52,270	$ 49,692	$ 48,164	$ 46,355	$ 44,301	$ 42,939	$ 41,326	$ 39,494	$ 38,280	$ 36,583	$ 35,644	$ 34,127	$ 32,614	$ 31,611	$ 30,424	$ 29,075
Whole of Life - PV	**$1,428,395**																									
Whole of Life - No CAPEX	**$1,200,565**																									

BUDGET COSTS ESTIMATE

Option 2B: Direct Filtration (Large Diameter) + Microfiltration (5 micron) + UV Disinfection

Cost of Capital	6.50%
General Inflation	2.50%
Annual Power Cost	$6,185

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
UV Lamp Replacement Schedule			1		1	1		1	1		1		1	1		1	1		1		1	1		1	1	
Cartridge Replacement Schedule		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Filter Media Replacement Schedule											1										1					
CAPEX & Renewals	$240,105																									
All Power Consumption ($/yr)		$ 6,339	$ 6,498	$ 6,660	$ 6,827	$ 6,997	$ 7,172	$ 7,351	$ 7,535	$ 7,724	$ 7,917	$ 8,115	$ 8,318	$ 8,525	$ 8,739	$ 8,957	$ 9,181	$ 9,411	$ 9,646	$ 9,887	$ 10,134	$ 10,387	$ 10,647	$ 10,913	$ 11,186	$ 11,466
UV Lamp Replacement		$ -	$ 563	$ -	$ 592	$ 606	$ -	$ 637	$ 653	$ -	$ 686	$ -	$ 721	$ 739	$ -	$ 776	$ 796	$ -	$ 836	$ -	$ 878	$ 900	$ -	$ 946	$ 969	$ -
Cartridge Replacement		$ 1,845	$ 1,891	$ 1,938	$ 1,987	$ 2,037	$ 2,087	$ 2,140	$ 2,193	$ 2,248	$ 2,304	$ 2,362	$ 2,421	$ 2,481	$ 2,543	$ 2,607	$ 2,672	$ 2,739	$ 2,807	$ 2,878	$ 2,950	$ 3,023	$ 3,099	$ 3,176	$ 3,256	$ 3,337
Filter Media Replacement		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,024	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,311	$ -	$ -	$ -	$ -	$ -
Coagulant Replacement		$ 533	$ 547	$ 560	$ 574	$ 589	$ 603	$ 618	$ 634	$ 650	$ 666	$ 683	$ 700	$ 717	$ 735	$ 753	$ 772	$ 792	$ 811	$ 832	$ 852	$ 874	$ 896	$ 918	$ 941	$ 964
Labour		$ 68,224	$ 69,930	$ 71,678	$ 73,470	$ 75,307	$ 77,189	$ 79,119	$ 81,097	$ 83,124	$ 85,202	$ 87,332	$ 89,516	$ 91,754	$ 94,048	$ 96,399	$ 98,809	$ 101,279	$ 103,811	$ 106,406	$ 109,066	$ 111,793	$ 114,588	$ 117,452	$ 120,389	$ 123,399
Total																										
CAPEX Total	$240,105																									
OPEX Total		$ 76,941	$ 79,428	$ 80,837	$ 83,449	$ 85,535	$ 87,052	$ 89,866	$ 92,112	$ 93,746	$ 97,799	$ 98,491	$ 101,675	$ 104,216	$ 106,065	$ 109,492	$ 112,230	$ 114,220	$ 117,911	$ 120,002	$ 125,192	$ 126,978	$ 129,229	$ 133,406	$ 136,741	$ 139,166
Annual Cost - PV		$ 72,245	$ 70,028	$ 66,920	$ 64,867	$ 62,431	$ 59,660	$ 57,829	$ 55,657	$ 53,187	$ 52,100	$ 49,267	$ 47,755	$ 45,961	$ 43,921	$ 42,574	$ 40,975	$ 39,156	$ 37,954	$ 36,270	$ 35,529	$ 33,837	$ 32,335	$ 31,343	$ 30,165	$ 28,827
Whole of Life - PV	**$1,430,897**																									
Whole of Life - No CAPEX	**$1,190,792**																									

BUDGET COSTS ESTIMATE

Option 2C: Microfiltration (25 micron) + Microfiltration (5 micron) + UV Disinfection

Cost of Capital	6.50%
General Inflation	2.50%
Annual Power Cost	$5,309

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
UV Lamp Replacement Schedule			1		1	1		1	1		1		1	1		1	1		1		1	1		1	1	
Cartridge Replacement Schedule (25 micron)		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Cartridge Replacement Schedule (5 micron)		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
CAPEX & Renewals	$187,585																									
All Power Consumption ($/yr)		$ 5,441	$ 5,577	$ 5,717	$ 5,860	$ 6,006	$ 6,156	$ 6,310	$ 6,468	$ 6,630	$ 6,795	$ 6,965	$ 7,139	$ 7,318	$ 7,501	$ 7,688	$ 7,881	$ 8,078	$ 8,280	$ 8,487	$ 8,699	$ 8,916	$ 9,139	$ 9,368	$ 9,602	$ 9,842
UV Lamp Replacement		$ -	$ 563	$ -	$ 592	$ 606	$ -	$ 637	$ 653	$ -	$ 686	$ -	$ 721	$ 739	$ -	$ 776	$ 796	$ -	$ 836	$ -	$ 878	$ 900	$ -	$ 946	$ 969	$ -
Cartridge Replacement (25 micron)		$ 5,535	$ 11,347	$ 11,630	$ 11,921	$ 12,219	$ 12,525	$ 12,838	$ 13,159	$ 13,488	$ 13,825	$ 14,171	$ 14,525	$ 14,888	$ 15,260	$ 15,642	$ 16,033	$ 16,433	$ 16,844	$ 17,265	$ 17,697	$ 18,139	$ 18,593	$ 19,058	$ 19,534	$ 20,023
Cartridge Replacement (5 micron)		$ 1,845	$ 1,891	$ 1,938	$ 1,987	$ 2,037	$ 2,087	$ 2,140	$ 2,193	$ 2,248	$ 2,304	$ 2,362	$ 2,421	$ 2,481	$ 2,543	$ 2,607	$ 2,672	$ 2,739	$ 2,807	$ 2,878	$ 2,950	$ 3,023	$ 3,099	$ 3,176	$ 3,256	$ 3,337
Labour		$ 25,584	$ 26,224	$ 26,879	$ 27,551	$ 28,240	$ 28,946	$ 29,670	$ 30,411	$ 31,172	$ 31,951	$ 32,750	$ 33,568	$ 34,408	$ 35,268	$ 36,150	$ 37,053	$ 37,980	$ 38,929	$ 39,902	$ 40,900	$ 41,922	$ 42,970	$ 44,045	$ 45,146	$ 46,274
Total																										
CAPEX Total	$187,585																									
OPEX Total		$ 38,405	$ 45,602	$ 46,165	$ 47,911	$ 49,108	$ 49,714	$ 51,594	$ 52,884	$ 53,537	$ 55,562	$ 56,247	$ 58,374	$ 59,834	$ 60,572	$ 62,863	$ 64,434	$ 65,230	$ 67,696	$ 68,532	$ 71,123	$ 72,902	$ 73,801	$ 76,592	$ 78,507	$ 79,476
Annual Cost - PV		$ 36,061	$ 40,205	$ 38,217	$ 37,242	$ 35,843	$ 34,071	$ 33,201	$ 31,954	$ 30,374	$ 29,599	$ 28,136	$ 27,417	$ 26,388	$ 25,083	$ 24,443	$ 23,525	$ 22,362	$ 21,791	$ 20,713	$ 20,185	$ 19,427	$ 18,466	$ 17,995	$ 17,319	$ 16,462
Whole of Life - PV	**$864,064**																									
Whole of Life - No CAPEX	**$676,479**																									

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Colin Roxburgh
Water Asset Manager
Waimakariri District Council
Private Bag 1005
Rangiora 7440

Geophysical Consultancy Report: Waimakariri District Council Water Resources

SGL Reference No. 1406

CONFIDENTIAL

Overview:

Southern Geophysical Limited (SGL) was engaged by the Waimakariri District Council (WDC) to compile existing geophysical and geological information that could be useful for water resource planning (Figure 1). The first site is east of View Hill, on McPhedrons Road, between the Raineys Road and Watsons Reserve Road intersection. The second site is at Garrymere Road, near the confluence of the Garry River and the Ashley River. Several PhD and MSc thesis dissertations have been written on the geology of the area. In addition, the surface geology and regional geologic structures have been mapped by Geologic and Nuclear Sciences (GNS) and other academic groups. There are also third party reports provided by the WDC, and numerous borehole well logs from the Environment Canterbury (ECAN) database.

Figure 1 Location of sites in Canterbury, New Zealand

Garrymere Road

The area north of the Ashley River and east of the Okuku River is geological controlled by the East-West striking Ashley and Loburn Fault systems (Jongens et al 2012; Mahon 2015). The Ashley Fault trace passes through Garrymere Road, parallel to the Loburn Fault trace which is approximately 1.5 km north (Map 1). Fault movement on both faults is considered to be transpressional dextral strike-slip (Mahon 2015). East of the Okuku River, the Ashley Fault is south-side down, and the Loburn Fault is north-side down (Jongens et al 2012). This has created a low relief topographic high between the two faults. The fault structure west of the Okuku River and east of the Makerikeri River is not well constrained, and the relationship between the Ashley-Loburn Faults and the Cust Anticline structure is not well defined (Mahon 2015). There are several seismic reflection survey lines, acquired near Garrymere Road by Indo-Pacific Energy Ltd in 1999. While these were designed for petroleum prospects and do not image the near surface (<300 m depth) in detail, they do show the overall geology and fault structures underlying the site (Figure 2) (Jongens et al 2012, Mahon 2015).

At Garrymere Road, Quaternary river deposits form the surficial geologic unit (Forsyth et al 2006) (Map 1). The clay and silt in the Pliocene Kowai Formation prevent water from flowing easily through it, and the Kowai Formation is effectively the hydrologic basement in North Canterbury. Most of the wells in the area appear to be drawing water from sandy or clean gravel lenses (aquifers) bounded above and below by claybound gravels or clay layers (aquitards) (Clemence 2017). See Figure 3 for a description of the soil types in North Canterbury. Many of these aquifers are likely to be discrete, buried paleo-channels, with a

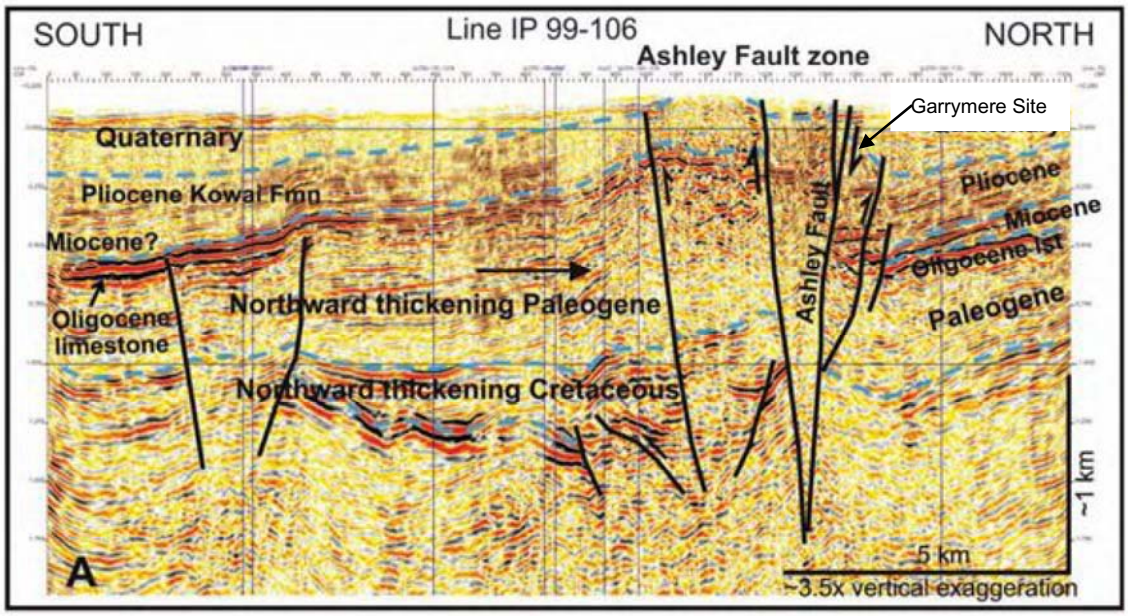

Figure 2 Indo-Pacific Energy Ltd Seismic Line IP99-106 (Jongens et al 2012).

thin lens like character. Water movement in the Quaternary gravels is also likely to be controlled by the dip of the Kowai surface and by tectonic deformation of the Quaternary sediments.

The objective of any new geophysical investigations at Garrymere Road should be to firstly identify the depth and structure of the Kowai Formation, which is likely to be the maximum depth of extractable water resources (hydrological basement). Based on the results of other surveys undertaken in the area, the maximum depth is expected to be 300 m deep, but the dip direction and overall structure of the surface is unknown. Secondly, the survey should be designed to image sub surface aquifer geometry across the site, with the aim of locating a number of possible targets for drilling, such as paleochannels and aquifers.

Figure 3 Soil types in North Canterbury and their water bearing properties (Finnemore 2004).

McPhedrons Road:

The council has indicated three potential drilling sites along McPhedrons Road, between the intersections of Raineys Road and Watsons Reserve Road. The overall geology and known hydrology of the area has already been well summarised in a third party report (PDP, 2016). In addition, several postgraduate (PhD and MSc) thesis and papers have been written on the general area (i.e. Mahon, 2015; Sewell 1988), and there are a number of shallow seismic reflection lines nearby (Map 2). The potential drilling sites are likely on the upthrown (southeast) side of the View Hill Fault system, with basement rock dipping southeast. The hydrological basement in the area is most likely the surface of the Kowai Formation.

The primary benefit of any further geophysical survey would be to add geological context to the water investigations, including depth to the Kowai Formation, the depth to the Palaeocene volcanics, and the dip and overall structure of the Quaternary gravel formations.

Recommendations:

Shallow seismic reflection is the recommended method for identifying buried channels and aquifer structures in the Quaternary gravels above the Kowai Formation or in the upper Kowai Formation, and for imaging near-surface (< 500 m) geological structure. The method uses reflected seismic waves to image the subsurface, and is commonly used in oil and gas exploration for imaging deep geological structures and lithology.

At Garrymere, there are existing seismic lines which image deep geological structures in good detail. These lines, however, were not designed to image the very near surface (<300 m) in detail, and the structure of the Quaternary gravels is therefore poorly constrained. It may be useful to conduct some new surveys across the proposed well site, designed to image the near-surface in greater detail. Some possible lines have been marked on Map 1.

The site at McPhedrons Road is lacking in geological context. While there are numerous bores in the area, none of them penetrated through to bedrock (Palaeocene volcanic deposits) and some have not been logged in detail. There are regional seismic surveys, but none of these are close enough to provide context. The main benefit of seismic work at the site would be to add geological context to the groundwater bores, including depth to basement rock, dip of the quaternary sediments, and the location of paleochannels where present.

For more information:

Please contact us at any time for further information or for hard copies of the resources referenced in this report.

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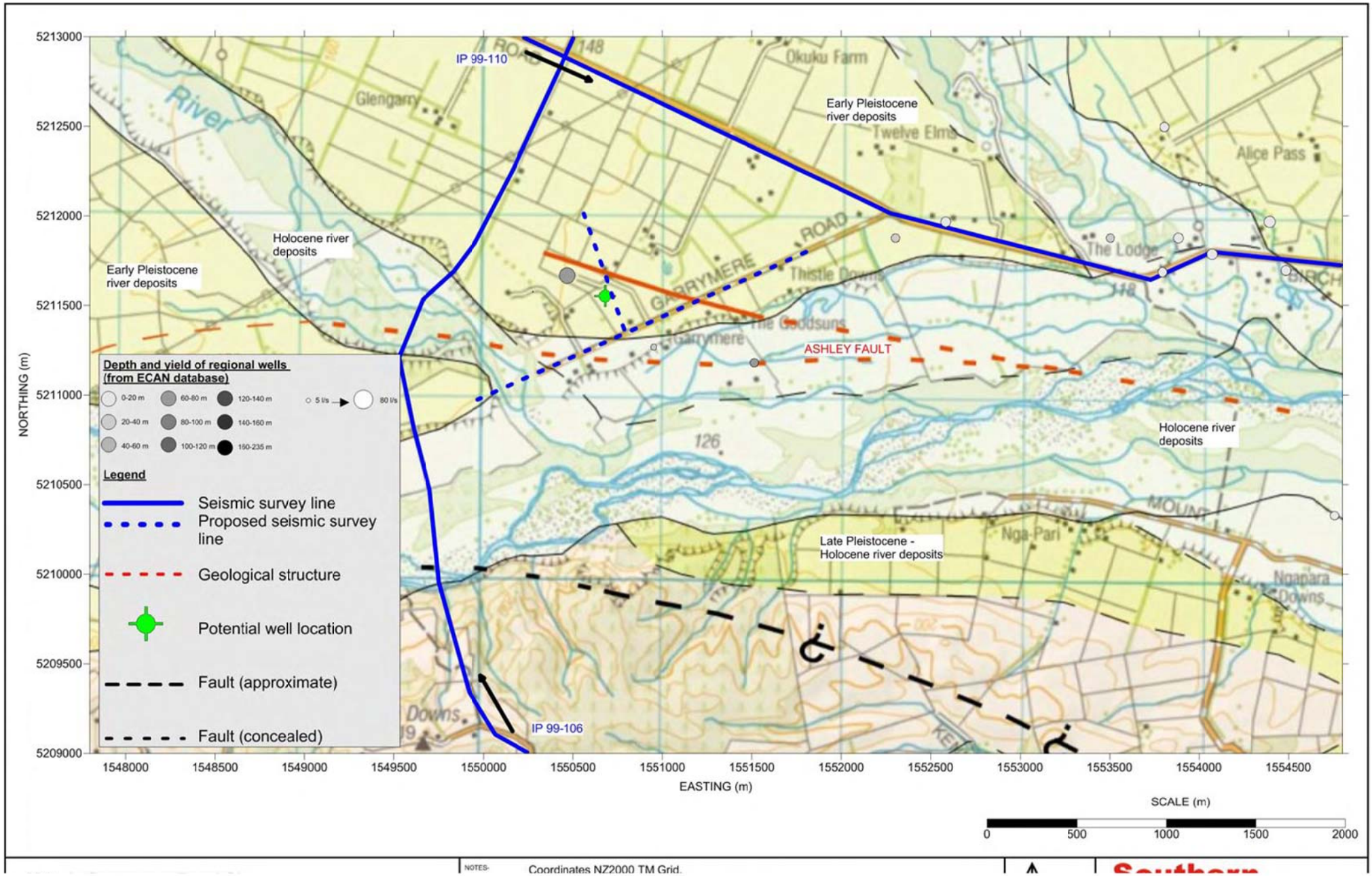
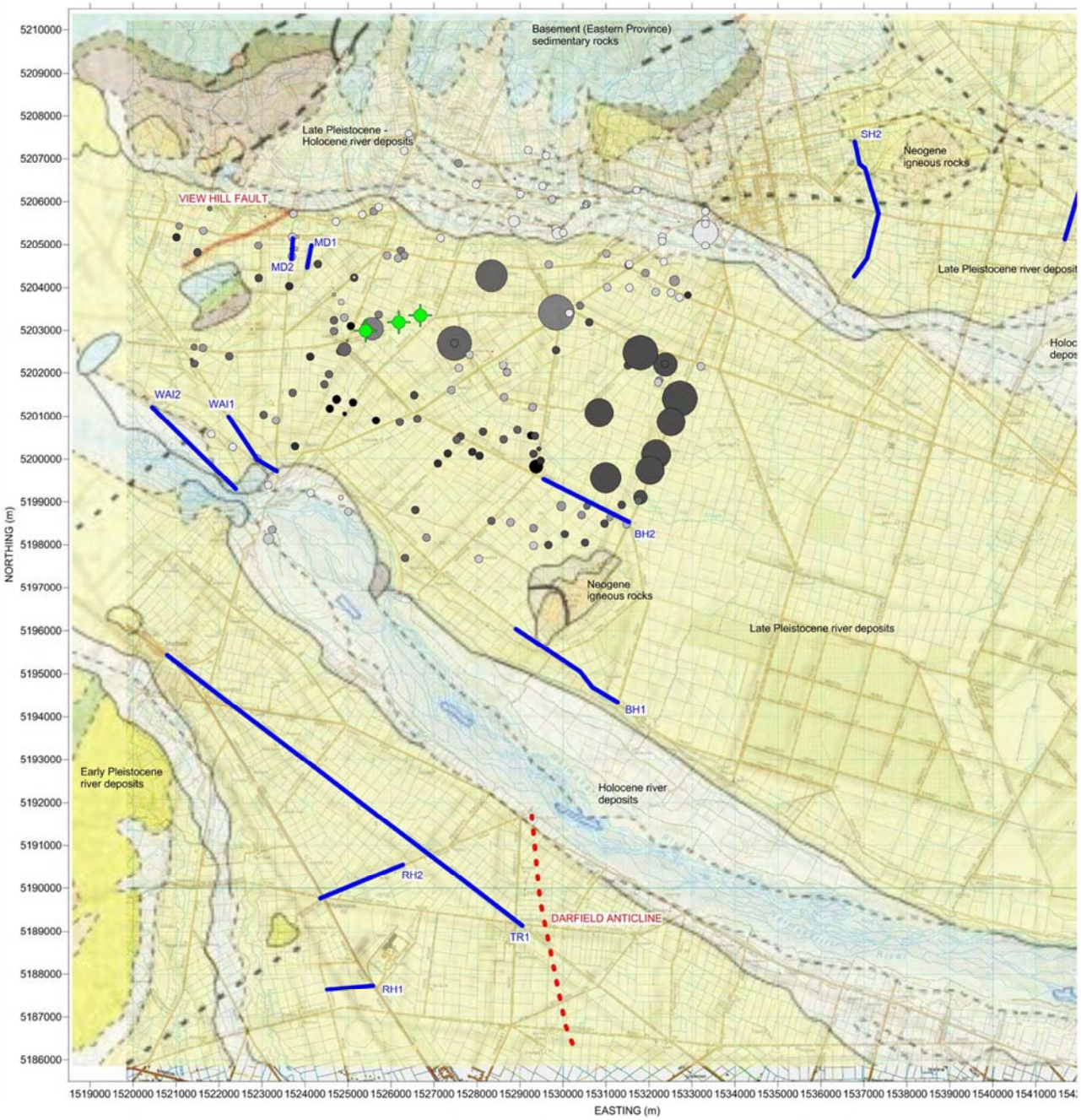
Non-invasive geophysical testing has limitations and is not a complete source of testing. Often there is a need to couple non-invasive methods with invasive testing methods, such as drilling, especially in cases where the non-invasive testing indicates anomalies.

This document has been prepared for the particular purpose outlined in the project proposal and no responsibility is accepted for the use of this document, in whole or in part, in other contexts or for any other purpose. Southern Geophysical Ltd did not perform a complete assessment of all possible conditions or circumstances that may exist at the site. Conditions may exist which were undetectable given the limited nature of the enquiry Southern Geophysical Ltd was retained to undertake with respect to the site. Variations in conditions often occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account. Accordingly, additional studies and actions may be required by the client.

We collected our data and based our report on information which was collected at a specific point in time. The passage of time affects the information and assessment provided by Southern Geophysical Ltd. It is understood that the services provided allowed Southern Geophysical Ltd to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes for whatever reason. Where data is supplied by the client or other sources, including where previous site investigation data have been used, it has been assumed that the information is correct. No responsibility is accepted by Southern Geophysical Ltd for incomplete or inaccurate data supplied by others. This document is provided for sole use by the client and is confidential to that client and its professional advisers. No responsibility whatsoever for the contents of this document will be accepted to any person other than the client. Any use which a third party makes of this document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Southern Geophysical Ltd accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.


IP 99-110
IP 99-106
Early Pleistocene river deposits
Holocene river deposits
Early Pleistocene river deposits
Holocene river deposits
Late Pleistocene - Holocene river deposits
ASHLEY FAULT
Depth and yield of regional wells (from ECAN database)
0-20 m
20-40 m
40-60 m
60-80 m
80-100 m
100-120 m
120-140 m
140-160 m
150-235 m
5 l/s
80 l/s
Legend
Seismic survey line
Proposed seismic survey line
Geological structure
Potential well location
Fault (approximate)
Fault (concealed)
NORTHING (m)
EASTING (m)
SCALE (m)
0
500
1000
1500
2000
Coordinates NZ2000 TM Grid.



Legend

- Seismic survey line
- Geological structures
- Potential well location
- Fault (approximate)
- Fault (concealed)

Depth and yield of regional wells (from ECAN database)

0-20 m, 20-40 m, 40-60 m, 60-80 m, 80-100 m, 100-120 m, 120-140 m, 140-160 m, 160-235 m

5 l/s → 80 l/s

Circles indicate depth (by circle colour) and max well yield (l/s) (by circle size)

SCALE (m) 0 1000 2000 3000 4000

Map 2: McPhedrons Road Site

Waimakariri, Canterbury

NOTES- Coordinates NZ2000 TM Grid.
NZ Topo50 maps sourced from LINZ, Crown Copyright ©

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WAIMAKARIRI DISTRICT COUNCIL

REPORT

FILE NO:	171122126970/ IFR-02
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	12 December 2017
FROM:	Gerard Cleary, Manager Utilities and Roading, and Simon Collin. Infrastructure Strategy Manager
SUBJECT:	Utilities and Roading Activity Management Plans 2018

SIGNED BY:
(for Reports to Council or Committees)

Department Manager

Chief Executive

1. SUMMARY

1.1. The purpose of this report is to present to the Committee the draft 2018 Roading, Water Supply, Wastewater, Drainage, Stock Water and Solid Waste Activity Management Plans, noting their role as supporting documents to the draft 2018-28 LTP.

1.2. These are revisions of the Activity Management Plans that were adopted by the Council in 2015.

1.3. The draft Activity Management Plans (AMP's) will be used to inform the Council's draft 2018–2028 Long Term Plan (LTP). The Activity Management Plans will be subsequently updated to reflect changes resulting from the approved LTP so that the final AMP's align with the LTP.

Attachments:

i. Introductory Chapter for the Utilities and Roading Activity Management Plans (170724076981)

ii. Utilities and Roading Activity Management Plans (available in electronic format in the folders shown)

- Roading AMP, IFR-02-02.04
- Water Supply AMP, IFR-02-03
- Wastewater AMP, IFR-02-04
- Drainage AMP, IFR-02-05
- Stockwater AMP, IFR-02-06
- Solid Waste AMP, IFR-02-07

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report N° 171122126970.

(b) **Notes** the following draft 2018 Activity Management Plans for Roading, Water, Wastewater, Drainage, Stockwater, and Solid Waste which are works in progress, with completion programmed before the January LTP Budget Meetings.

i. **Introduction, IFR-02-01,** TRIM 170724076981

ii. **Roading AMP, IFR-02-02.04**

2. Scheme / Document Reference	TRIM Number
Section 1 Executive Summary Waimakariri Transport AMP 2018	170321027383
Section 2 Introduction Waimakariri Transport AMP 2018	170321027382
Section 3 Levels Of Service Waimakariri Transport AMP 2018	170321027378
Section 4 Future Demand Waimakariri Transport AMP 2018	170321027379
Section 5 Risk Management Waimakariri Transport AMP 2018	170321027377
Section 6 Life Cycle Management Plan Waimakariri Transport AMP 2018	170321027282
Section 7 Financial Summary Waimakariri Transport AMP 2018	170321027375
Section 8 Asset Management Practices Waimakariri Transport AMP 2018	170321027374
Section 9 Plan Improvement And Monitoring Waimakariri Transport AMP 2018	170321027381
Section 10 Appendices Waimakariri Transport AMP 2018	170321027373
Appendix A Glossary of Terms Waimakariri Transport AMP 2018	170321027372
Appendix B 2018 Draft Strategic Business Case	171025115475
Appendix C Level Of Services Waimakariri Transport AMP 2018	170321027288
Appendix D 2018 Roading Valuation Report Waimakariri Transport AMP 2018	171201130750
Appendix E Capital Works Forward Works Programme Waimakariri Transport AMP 2018	170321027277

i. **Water Supply AMP, IFR-02-03**

Scheme / Document Reference	TRIM Number
Water Supply AMP Overview Document 2018	170822090191

Rangiora Water Supply Scheme AMP 2018	161116117739
Kaiapoi (including Pines/ Kairaki) AMP 2018	161116117709
Pegasus/Woodend Water Supply Scheme AMP 2018	161116117732
Oxford Urban Scheme AMP 2018	161116117758
Oxford Rural No. 2 Water Supply AMP 2018	161116117731
Oxford Rural No. 1 Water Supply Scheme AMP 2018	161116117729
Waikuku Beach Water Supply Scheme AMP 2018	161116117719
Cust Water Supply Scheme AMP 2018	161116117722
Mandeville/Fernside Water Supply Scheme AMP 2018	161116117727
Summerhill Water Supply Scheme AMP 2018	161116117718
Ohoka Water Supply Scheme AMP 2018	161116117711
Poyntz Road Water Supply Scheme AMP 2018	161116117736
West Eyreton Water Supply Scheme AMP 2018	161116117741
Garrymere Water Supply Scheme AMP 2018	161116117714

ii. Wastewater AMP, IFR-02-04

Scheme / Document Reference	TRIM Number
Wastewater AMP Overview Document 2018	161116117659
Eastern District's Wastewater Scheme AMP 2018	161116117662
Rangiora Wastewater Scheme AMP 2018	161116117667
Kaiapoi Wastewater Scheme AMP 2018	161116117680
Woodend Wastewater Scheme AMP 2018	161116117668
Pegasus Wastewater Scheme AMP 2018	161116117672
Waikuku Beach Wastewater Scheme AMP 2018	161116117664
Mandeville Wastewater Scheme AMP 2018	161116117675
Pines/Kairaki Wastewater Scheme AMP 2018	161116117670
Tuahiwi Wastewater Scheme AMP 2018	161116117666
Woodend Beach Wastewater Scheme AMP 2018	161116117669
Oxford Wastewater Scheme AMP 2018	161116117674
Loburn Lea Wastewater Scheme AMP 2018	161116117678
Fernside Wastewater Scheme AMP 2018	161116117682

iii. Drainage AMP, IFR-02-05

Scheme / Document Reference	TRIM Number
Drainage AMP Overview Document 2018	161116117610
Coastal urban Drainage Scheme AMP 2018	161116117569
Pegasus Urban Drainage Scheme AMP 2018	161116117571
Oxford Rural Drainage Scheme AMP 2018	161116117572
Ohoka Rural Drainage Scheme AMP 2018	161116117575
Loburn Lea Rural Drainage Scheme AMP 2018	161116117576
Kaiapoi Urban Drainage Scheme AMP 2018	161116117578
Coastal Rural Drainage Scheme AMP 2018	161116117581
Clarkville Rural Drainage Scheme AMP 2018	161116117585
Oxford Urban Drainage Scheme AMP 2018	161116117589
Cust Rural Drainage Scheme AMP 2018	161116117591
Rangiora Urban Drainage Scheme AMP 2018	161116117592
Central Rural Drainage Scheme AMP 2018	161116117602

iv. Stockwater AMP, IFR-02-06

Scheme / Document Reference	TRIM Number
Stock Water Race AMP 2018	161115117090

v. Solid Waste AMP, IFR-02-07

Scheme / Document Reference	TRIM Number
Solid Waste AMP November 2018	171129129620

(c) **Notes** that the levels of service provided for are reflected in the draft budgets for the Long Term Plan (LTP).

(d) **Notes** that the suite of draft utilities and roading Activity Management Plans will be reported to Council at the January 2018 LTP Budget Meetings for adoption

(e) **Circulates** a copy of this report to all boards for their information.

3. ISSUES AND OPTIONS

3.1. Activity Management Plans

3.2. The Utilities and Roading Activity Management Plans cover the following activities:

- Roading
- Water Supply
- Wastewater
- Drainage
- Stockwater
- Solid Waste

3.3. Activity Management Plans (AMPs) are important documents that state how the Council will manage its assets and activities in the future. They provide the supporting information for the LTP and 30 Year Infrastructure Strategy. The plans outline the significant issues associated with the activities and assets. The plans summarise the various components of the schemes and identify future funding requirements and upgrades to maintain levels of service and manage growth.

3.4. For each activity there are a number of key aspects that the plans cover, these include:

- Desired & Actual Levels of Service
- Asset Condition
- Capacity & Performance
- Risks
- Disaster resilience
- Growth predictions

3.5. The AMPs cover future works and financial projections which include:

- Operations and maintenance
- Renewals programmes
- New capital works for growth and Levels of Service
- Financial projections

3.6. The documents also include improvement plans that summarise the future improvements the Council proposes to carry out as part of the ongoing asset management process.

3.7. Document Hierarchy

3.8. The Roading, Solid Waste and Stockwater AMPs are stand-alone documents that (including appendices) provide a complete picture of the activity, its assets and how they are managed.

3.9. For 3 Waters with the numerous different water, wastewater and drainage schemes, the AMPs have been structured so that two documents need to be referenced to get a complete picture for each scheme. These are the Overview document relevant to the activity and the scheme specific AMP.

3.10. Each of the Water Supply, Wastewater and Drainage activities has an Overview AMP. This document describes the processes and asset management practices that are common to all schemes for that activity. It includes high level scheme descriptions, and a district wide view of levels of service, asset condition, risk, growth and financial projections etc. It also contains an executive summary which is used as the basis for relevant text in the 30 year Infrastructure Strategy.

3.11. The individual scheme AMPs contain all the detail specific to each scheme, but need to read in conjunction with the Overview documents.

3.12. 2018 Revision – General Comments

3.12.1. In 2005 the Waimakariri District Council adopted Activity Management Plans (AMPs) for Utilities and Roading that were substantially different and improved from previous plans. These documents were subject to extensive public consultation particularly in terms of levels of service.

3.12.2. The 2009, 2012, and 2015 revisions have not had substantial changes in terms of level of service. See Section 4 for ways in which levels of service have been tested with the public over these periods.

3.12.3. Each of the updated AMPs across all the activities reference a number of data and process improvements and additional assessments that have been undertaken since the 2005 versions. The plans therefore incorporate a number of content changes.

3.12.4. The technical work that supports the 2018 AMPs was carried out in advance of the preparation of the 30 Year Infrastructure Strategy (IS), which has allowed stronger linkages between the AMP's and the IS.

3.12.5. Some of the projections in the AMP's are prepared in context of the 30 year outlook taken within the Infrastructure Strategy, but others take a 50 year view, while the renewals projections are pushed out to 150 years to properly account for the long life cycle of many of the infrastructural assets.

3.12.6. Population projections, on which infrastructure planning is based, have been updated to align with the adopted corporate population projection WDC Scenario Township Projections 2018-2048

3.12.7. The 2018 3 waters AMPs have been updated to reflect new higher growth projections, improved asset data, latest condition ratings and new and revised plans and strategies. They include revisions resulting from ongoing improvement to the asset criticality and renewals models. The results and recommendations from this work are presented in a spatial format within the documents.

3.13. 2018 Revision – Roading AMPs

3.13.1. The 2018 Roading AMP process incorporated the Treasury's Better Business Case Approach, including developing a Strategic Business Case, and utilising Investment Logic Mapping (ILM) Workshops.

3.13.2. Key roading issues identified through the ILM process included congestion, road safety, and potential impact on maintenance due to changing land use. These have been the primary driver behind the Capital Projects planned for the 2018-28 LTP period.

3.13.3. Scenario testing of future roading rehabilitation and resurfacing options were tested through DTIMS, a modelling programme. The outcomes and recommendations were found to be in line with those proposed by staff. This gives both Council and NZTA confidence that forward works planning is on target and not over or under-committed

3.13.4. The Road Efficiency Group (REG), a task force set up by government to get more value for money within the roading activity, instigated the One Network

Road Classification, a national hierarchy designed to achieve consistency in customer outcomes across the country, and this hierarchy was incorporated into the AMP.

3.13.5. Key roading projects completed include:

- Southbrook/South Belt Traffic Signals
- Mitre 10/Pak N' Save Traffic Signals
- High St Upgrade
- Kaiapoi Town Centre
- New Arterial Rd West Kaiapoi

3.13.6. Data improvement continues to be a focus for the next roading AMP, along with improvements to performance monitoring to allow better calibration of actual performance against customer wants and needs

3.14. 2018 Revision – 3 Waters AMPs

3.15. Levels of Service

3.15.1. A review of the levels of service has been carried out for the 2018 AMPs, and minor changes made to align with our ability to measure performance, to reflect external influences, and to clarify some of the wording. The changes are detailed in each of the Overview documents, together with the reasons for the changes

3.15.2. The primary level of service driver for water supplies continues to be meeting the Drinking Water Standards, with all WDC managed schemes expected to be compliant by end of FY 2018/19. However the standards are likely to change within the term of the 2018 AMPs, following the completion of the stage 2 Havelock North enquiry report.

3.15.3. The main wastewater level of service issue is Kaiapoi overflows in wet weather. An update of the hydraulic model is underway, and detailed planning to resolve the issues will be carried out in 2018. "Placeholder" budget provision has been made, pending development of preferred concept solutions.

3.15.4. While improvements have recently been made to the Kaiapoi stormwater drainage system, further assessments are planned for parts of the catchment, as it is thought that levels of service are not being met in some areas

3.15.5. Council is required by the Land and Water Regional Plan to apply for discharge consents for its stormwater network. The ultimate effect, and timeframe and cost to comply is largely unknown at this point. However it is likely that it will quite costly. Some budgetary provision has been included at the end of the 10 year LTP period, for the urban drainage schemes, but this may need to be increased considerably at the next LTP.

3.16. Asset Renewals

3.16.1. Progress has been made on the asset criticality model, which is used to provide an input to the renewals model. Drainage assets have now been included in the reticulation criticality assessment for the first time. Criticality assessments of above ground assets (headworks, pump stations, reservoirs etc) will be able to be carried out for the next AMP reviews.

3.16.2. Renewals estimates are aligned to the most recent infrastructure asset valuation (peer reviewed) completed in August 2017. The renewals model and the linked funding model have been improved and are now able to show the long term level of funding necessary to ensure that each scheme will have sufficient future budget provision to replace assets at the end of their life. The model has been used for drainage reticulation assets in this review.

3.17. Asset Condition

3.17.1. A targeted CCTV programme of pipe inspections for drainage pipes has been implemented, which will provide currently lacking asset condition information, and assist with improved maintenance.

3.17.2. The CCTV programme for sewer pipes is ongoing and will result in pipes being inspected on an approximately 20 year cycle. Pipes are prioritised based on criticality and age.

3.17.3. For water supply, a record of pipe bursts has been used as a proxy for asset condition assessment, but an inspection programme is planned for development during the coming three years.

3.17.4. An asset inspection programme for above ground facilities is also included in the improvement plan for the 2018-2021 period

3.18. Risk

3.18.1. The suite of risk assessments carried out for the 2015 AMP reviews was not updated for the 2018 AMP reviews. There is considerable overlap between the 2009 Disaster Resilience Assessment and the Operational Risk Assessment, the methodology for which is also in need of a review. A comprehensive review of methodologies, with a view to integrating and updating these assessments is noted as an improvement project.

3.19. Key Projects/Issues

3.19.1. Completion of the Rangiora wastewater treatment plant (WWTP) upgrade. Note a second aeration basin is planned for construction 2026-2028. Similarly new wetland cells are planned for Woodend WWTP in 2026/27.

3.19.2. Continuation of the Rangiora network upgrade (stages 5-9), and detailed planning of a Kaiapoi network upgrade to meet levels of service.

3.19.3. Completing connection of the Woodend and Pegasus water supply schemes

3.19.4. Completion of the remaining water supply source upgrades to ensure compliance with the New Zealand Drinking water standards. There are expected to be financial challenges with the affordability of some of this work for the smaller schemes, Ohoka, Garrymere and Poyntzs Road.

3.19.5. Ongoing flood mitigation works, both the flood response works, and works funded within the district drainage schemes. Kaiapoi being the main focus going forward.

3.19.6. Increased renewals costs. The updated risk based model, together with the latest valuations has resulted in an overall increase in the expected renewals programme, required to ensure continued reliable delivery of levels of service.

Some adjustments have been made in the short term programme to mitigate the effect of these increases.

3.19.7. The unknown long term cost and timing for compliance, of the urban stormwater discharge consents required under the Land and water regional Plan.

3.20. 2018 Revision – Solid Waste

3.20.1. A waste assessment and review of the Waste Management Plan was undertaken in 2016/17, a draft Waste Management & Minimisation Plan prepared, and consulted upon. It includes proposals for additional kerbside collection services, but it cannot be finalised until the 2018/28 LTP has been completed.

3.20.2. Irrespective of the outcome of the LTP on the final kerbside services to be offered, the collections contract and contract for management of the Southbrook and Oxford Transfer stations are to be put out for tender during 2018, in preparation for a new contract term starting July 2019

3.21. Level of Optimisation

3.22. The Introductory Chapter describes the optimisation process that is used on Utilities and Roading projects. It outlines some of the processes that are used to ensure that expenditure is optimised and discusses the different levels of optimisation that are applied to various projects.

3.23. Differing levels of optimisation are applied to projects, depending on a number of factors, including the relative value (or effect on ratepayers) of a project, the risks, the degree of public interest, and when the works are planned.

3.24. Management Team Review

3.25. The Management Team has reviewed this report and supports the recommendations.

4. COMMUNITY VIEWS

4.1. The level of service component of the Activity Management Plans was consulted upon comprehensively as part of the 2005 review. While a comprehensive public review has not been carried out since then, levels of service are tested with the public regularly in the following ways:

4.1.1. Customer surveys, e.g. stockwater survey

4.1.2. Monitoring service requests

4.1.3. The LTP and Annual Plan process

4.1.4. Specific engagement when significant LOS changes are proposed, e.g. kerbside collection services

4.1.5. In addition to the above, additional engagement was carried out with key stakeholders to seek feedback on key strategic issues affecting the roading network.

4.2. 3 Waters are planning to develop 3 Waters strategies during the first three years of the 2018-28 LTP. This will provide an opportunity for engagement with the community on future levels of service

4.3. For the 2018 AMPs a staff review of the 3 Waters levels of service has resulted in minor changes to clarify the intent of the performance measures and test the suitability of the targets. Only minor changes have been made as a result of the review, and these are detailed in the Overview documents.

4.4. The community outcomes in Council's Long Term Plan (LTP) are a significant input into the Activity Management Plans. These were consulted on as part of the Long Term Plan. The major outputs from the Activity Management Plans are via the Long Term Plan as capital works and operational budgets, together with a number of ongoing internal process and data management improvements.

4.5. The Waste Management & Minimisation Plan (WMMP) public consultation was undertaken via a Special Consultative Procedure. The community has a further opportunity to provide feedback on the additional kerbside services proposed in the WMMP via the LTP process.

4.6. After approval by the Council the Activity Management Plans, amended as a result of any changes made during this meeting, and from any changes that arise from the LTP process, will be placed on the Council's website. Some maps which are currently only in draft form (e.g serviced area maps) will also be finalised prior to publication on the website

5. FINANCIAL IMPLICATIONS AND RISKS

5.1. Activity Management Plans are a core part of the Council's business and provide the key financial inputs into the LTP. These documents demonstrate that the Council is managing its assets and activities appropriately.

5.2. The planned update of the Risk Assessment and Disaster Resilience assessment together with the risk based renewals process, will provide a significant improvement to the resilience of the Council's infrastructure over time.

5.3. The financial implications of the Activity Management Plans have been reflected in the draft budgets put forward for the LTP.

5.4. In some instances activity specific rates for some small schemes will rise quite sharply, driven by work needed to meet legislative standards. For example rates for Garrymere water supply (Drinking Water Standards) and Fernside wastewater (consent conditions).

5.5. In 2016 a Council Working Party comprehensively considered options for changing 3 Waters rating structures across the district. One objective of the study was to consider ways of easing the projected high rates increases for some small schemes. Council resolved to include this issue in the draft 2021/31 LTP. It also requested that staff bring a recommendation to Council in January 2018 to include a $6 per property flood rate in the draft 2018/2028. This has been included in the draft drainage budgets.

5.6. Initial indications from NZTA indicate support for the proposed programme of subsidised work, however the final allocation will not be known until mid-2018.

5.7. An inappropriate level of activity management would have significant financial and risk implications for the Council.

5.8. A peer review of the Activity Management Plans has been programmed. Any recommended improvements to meet statutory, OAG and good practice requirements, will be incorporated in the final version placed on the Council's website.

6. CONTEXT

6.1. Activity Management Plans are required for compliance with requirements of the *Local Government Act* 2002 Schedule 10.

6.2. Some of the key outcomes that the Utilities and Roading Activity Management Plans contribute to are as follows:

- There is a safe environment for all
- Transport is accessible, convenient, reliable, affordable and sustainable
- There is sufficient clean water to meet the needs of communities and ecosystems
- Core utility services are provided in a timely, sustainable and affordable manner

Gerard Cleary

Manager Utilities and Roading

Simon Collin

Infrastructure Strategy Manager

WAIMAKARIRI
DISTRICT COUNCIL

Utilities & Roading

Activity Management Plan

2018

Introduction Chapter

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1. INTRODUCTION

This is the introductory chapter to the Waimakariri district council utilities & roading (U &R) activity management plans (amps). The council's activity management plans are key strategic documents that describe all aspects of the management of assets and services for an activity (including technical and financial) over the lifecycle of the asset in the most cost-effective manner to provide a specified level of service.

The specific activities covered by the u&r amps are:

- Roading
- Water
- Sewer
- Drainage
- Stockwater
- Solid Waste

The chapter provides an overview of the activities and asset management practices and processes that are common to all of the activities.

2. DOCUMENT HEIRARCHY

The Roading, Solid Waste and Stockwater AMPs are stand-alone documents that (including appendices) provide a complete picture of the activity, its assets and how they are managed.

With the Council managing numerous different water and wastewater schemes, the AMPs have been structured so that two documents need to be referenced to get a complete picture for each scheme.

There are three Overview documents, one each for Water Supply, Wastewater and Drainage. They describe the processes and asset management practices that are common to all schemes, and include high level scheme descriptions, and a district wide view of levels of service, asset condition, risk, growth projections etc.

The individual scheme AMPs contain all the detail specific to each scheme, but need to read in conjunction with the Overview documents.

3. DESCRIPTION OF ACTIVITIES

Roading

The Roading Activity Management Plan covers all of the roading and transport activities in the Waimakariri District. The assets include approximately 970. km of sealed roads, 575 km of unsealed roads, 329 km of footpaths, 9 km of off road cycle ways, 292 bridges, along with signs, streetlights, and passenger transport infrastructure to support the public passenger transport system. Almost all urban roads and 56% of rural roads are sealed.

The roading activity provides people with access to employment, services, education, and recreation, as well as providing for the movement of goods to support a thriving economy. The road corridor also provides access for critical services such as power, telecommunications, water supply and waste disposal. The Council considers that the provision of an effective and efficient roading and transportation system is a key component to meeting Waimakariri Community Outcomes, and in meeting the Council goal of providing high quality living and productive environments.

Key strategies driving this activity are the New Zealand Transport Strategy, the Government Policy Statement on Transport, Safer Journeys Strategy, the Regional Land Transport Plan, and the Greater Christchurch Urban Development Strategy. The key pieces of legislation governing this activity are the Local Government Act, the Land Transport Management Act, and the Resource Management Act.

Water Supply

The water supply activity involves the management, operation and maintenance of the District's water supplies in a way that protects and enhances the health and well-being of the community and minimises the effect on the environment.

The Council considers the supply of potable water to the community to be an essential service. The Council elects to perform this function in order to ensure that the community receives an affordable, safe and reliable supply. This ensures the public health of the community is protected and the impacts on the environment are minimised.

The water supply activity includes the operation of seven on-demand, three semi-restricted and five fully restricted water supplies. Between them these schemes supply water to 73% of the properties in the district.

The key pieces of legislation governing this activity are the Health (Drinking Water) Amendment Act, the Local Government Act, and the Resource Management Act.

Wastewater

The wastewater activity involves the management, operation and maintenance of the District's wastewater schemes so that sewage is collected, conveyed, treated, and disposed of in a way that protects and enhances the health and well-being of the community and minimises the effect on the environment.

The Council considers the provision of a public sewer system to the community to be an essential service. The Council elects to perform this function in order to ensure that the community receives an affordable, safe and reliable service. This ensures the public health of the community is protected and the impacts on the environment are minimised.

The wastewater activity includes the Eastern District Wastewater Scheme (serving 9 distinct communities) plus three smaller, separate schemes elsewhere in the district. The schemes collectively provide a wastewater service to 60% of the properties in the district.

The key pieces of legislation governing this activity are the Local Government Act and the Resource Management Act.

Drainage

The drainage activity involves the management, operation and maintenance of the District's drainage schemes within urban and selected rural areas of the Waimakariri District. The level of service in rural areas is largely restricted to maintaining the network of open drains.

The Council considers the carrying out of this work to be an essential service. The Council elects to perform this function to provide public safety, protect property and drain excess water from roads, and minimise adverse effects on the receiving environment.

There are seven rural drainage areas and five urban areas, but only 10% of the District is covered by a drainage area.

Drainage activities have reference to a number Acts but principally are concerned with the Land Drainage Act, the Local Government Act and the Resource Management Act, and various Regional Council documents.

Stock Water

The stock water race activity involves the management, operation and maintenance of the network of water races that delivers stock drinking water to approximately 44,000 hectares of land. The area supplied lies between the Waimakariri and Ashley rivers, and east of Burnt Hill and Oxford and west of Rangiora and Eyreton.

The Council carries out this activity to enable livestock farming on dry land.

The Irrigation scheme is owned by Waimakariri Irrigation Limited (WIL), although the races are owned by WDC. Both the stock water as well as the irrigation water system is managed by WIL. WIL is officially appointed as the Council's Agent for the management of the stock water races.

No specific legislation relates to the stock water race activity

Solid Waste

The Solid Waste activity involves the collection, transport, treatment, and disposal of solid and hazardous waste in a way that protects and enhances the health and well-being of the community and minimises the effect on the environment.

The Council provides a refuse and recycling collection service, refuse disposal facilities and hazardous waste and recycling facilities to help maintain the quality of life in the district and protect the environment.

The activity includes collection services to approximately 77% of District properties, the operation of two waste transfer/drop off facilities, the operation of a cleanfill, closed landfill aftercare, and a range of waste minimisation and education activities.

Strategies driving the Solid Waste activity are outlined in the Waste Management & Minimisation Plan (2017), the New Zealand Waste Strategy, and the Canterbury Hazardous Waste Management Strategy.

The key pieces of legislation governing this activity are the Waste Minimisation Act, the Local Government Act, and the Resource Management Act.

4. AMP PLANNING FRAMEWORK

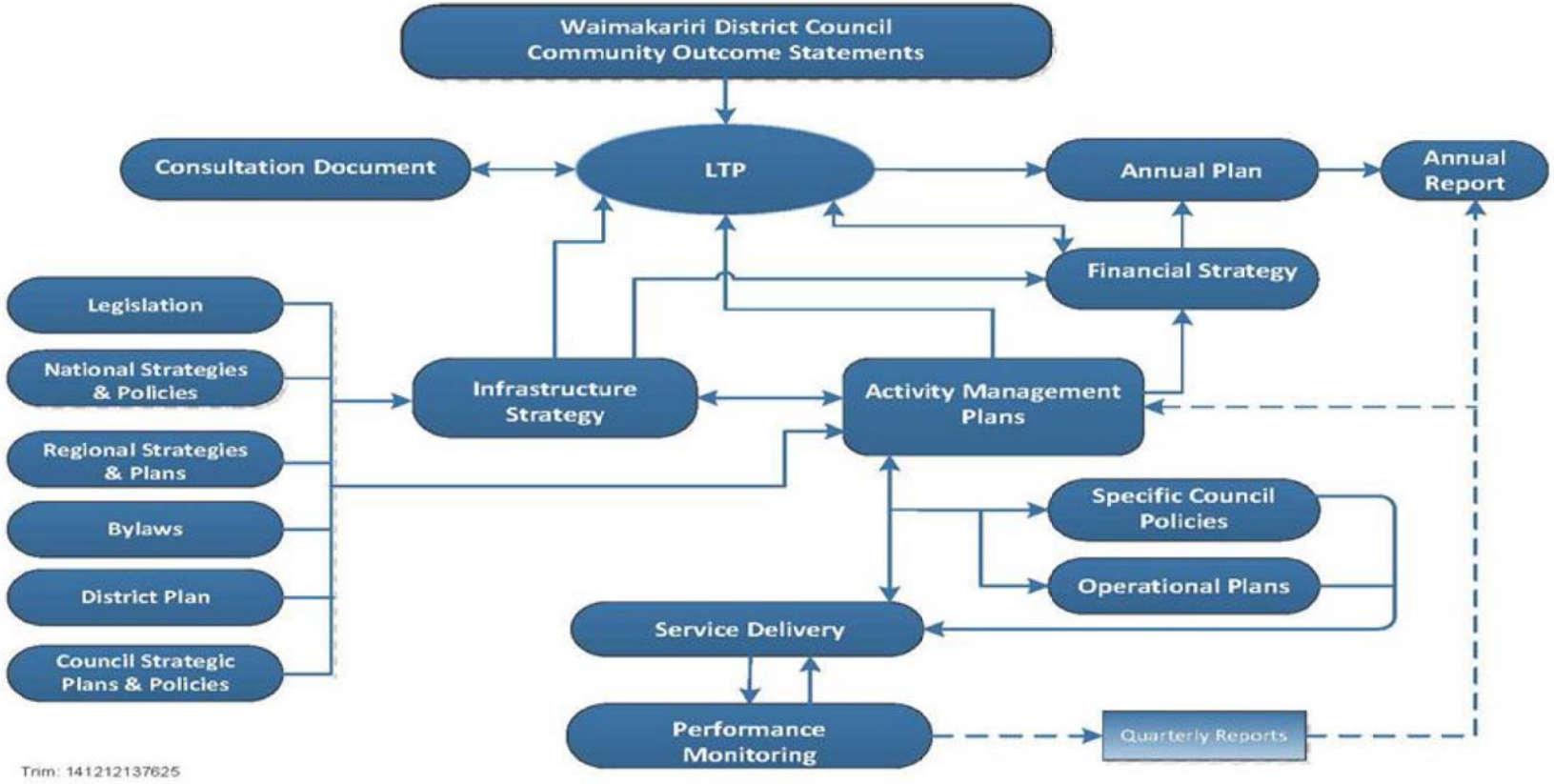
The purpose of the Activity Management Plans (AMP) is to meet the required level of service, in the most cost effective manner, through the management of assets for present and future customers. Good asset management is about achieving best value through the right balance between cost, risk and performance.

There are a number of processes and documents that feed into the AMPs. The AMPs are critical documents that output as works and services via the LTP.

The strategic view for the infrastructural assets is provided via the Infrastructure Strategy, which considers the long term view (100+ yrs), and the amalgamated effect of the Utilities and Roading Activity Management Plans, as well from non-infrastructural assets such as the Council's property portfolio. It identifies significant infrastructure issues that will need addressing, and identifies the principal options for managing those issues and the implications of those options.

The diagram below shows the various inputs and outputs for the Roading, Water, Wastewater, Drainage, Stock Water and Solid Waste activities.

Figure 1: Activity Management Planning Framework



5. LINKS TO COMMUNITY OUTCOMES

The AMPs describe the assets and services that contribute to the community's outcomes. The outcomes are the aspirations of the District's communities that show the kind of environment and lifestyle which people are seeking in the future.

The outcomes were developed by residents of the Waimakariri District, for the people who live here, through a widespread consultation process that was facilitated by the Council. Further information about the outcomes and about how the Council's services and activities contribute to these outcomes is detailed in the Council's Ten Year Plan 2018-2028.

Some of the key outcomes that the Council's services contribute to are noted as follows:

- There is a safe environment for all
- Transport is accessible, convenient, reliable, and sustainable
- There is a healthy and sustainable environment for all
- Core utility services are provided in a timely and sustainable manner

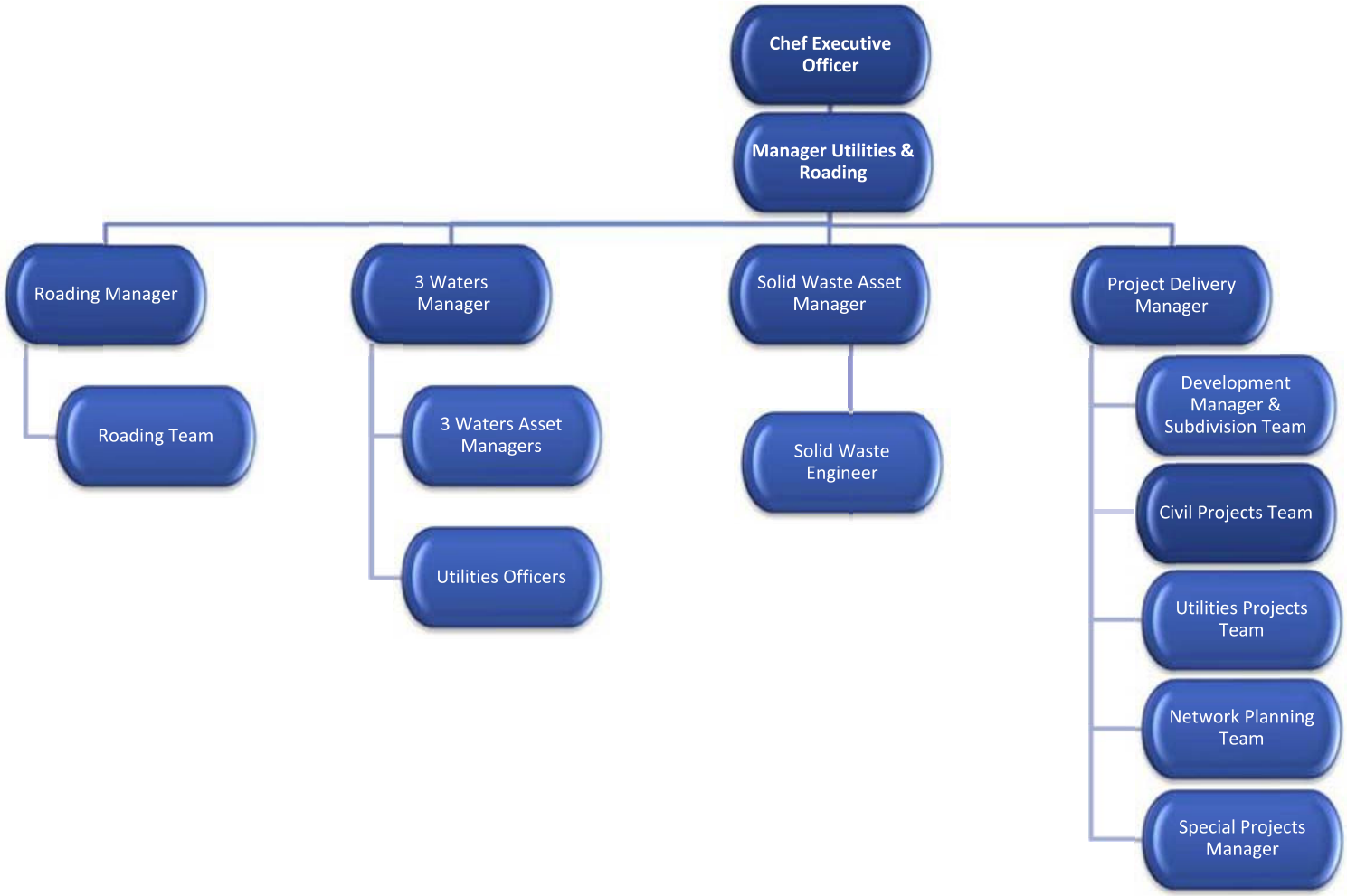
The Council's services progress the achievement of these outcomes by providing service levels that maintain community safety and public health, promote customer value for money and service efficiency, whilst protecting and enhancing the environment. These services provide the infrastructure that supports business development, population growth and healthy active lifestyles for residents.

6. ORGANISATIONAL CONTEXT

The Manager Utilities and Roading is responsible for developing, managing and maintaining Council infrastructural assets in accordance with sustainable asset management principals and plans.

The structure on the following page shows how the various responsibilities are delegated within the Utilities and Roading Department.

Figure 2:


Chef Executive Officer
Manager Utilities & Roading
Roading Manager
Roading Team
3 Waters Manager
3 Waters Asset Managers
Utilities Officers
Solid Waste Asset Manager
Solid Waste Engineer
Project Delivery Manager
Development Manager & Subdivision Team
Civil Projects Team
Utilities Projects Team
Network Planning Team
Special Projects Manager

7. ASSET MANAGEMENT MATURITY FOR UTILITIES AND ROADING

The purpose of this section is to outline the process to determine the appropriate level of asset management to be adopted for the U&R activities.

The Council is replacing the legacy activity level based AM complexity assessment with the more updated Asset Management Maturity Assessment.

The AM Maturity Assessment methodology was developed by the NZ Treasury and National Infrastructure Unit in 2011 to help asset owners identify current and appropriate (target) levels of AM practice.

The assessment recognises that appropriate levels of AM practice can differ between AM practice areas and activities within an organisation.

The structured methodology considers 17 elements of AM practice for each activity and requires an assessment of current Asset Management practices against 5 defined levels of maturity:

- Aware
- Minimum
- Core
- Intermediate
- Advanced

The methodology also requires consideration, for each of the 17 elements, as to what level of maturity it is appropriate to try and achieve.

An AM Maturity Assessment has been carried out for the 3 Waters and Roading activity areas. For Roading the maturity level descriptions, outcome of the assessment, and the targets, are shown in section 8 (Asset management Practices) of the Roading AMP. For 3 Waters the descriptions, outcomes, and targets are detailed in the Overview documents for each activity.

Outputs from regular maturity assessments will be used to focus improvement plan actions and update the AM Policy.

The existing 3-level AM complexity assessments will remain valid for the Stockwater and Solid Waste activities until an AM Maturity Assessment has been completed. For both of these activities Core has been assessed as the appropriate level of complexity to target in the 2015 AMP updates.

The characteristics of Core asset management are:

- Takes a lifecycle approach
- Is based on the best current information
- Includes a simple risk assessment
- Adopts existing levels of service
- Contrasts existing management with opportunities for improvement.
- Prioritises capital works
- Produces long term budgets for maintenance, rehabilitation and replacement.
- Provides performance measures for monitoring implementation

8. SUSTAINABILITY

The Council's approach to sustainability involves taking account of the needs of people and communities now, the reasonably foreseeable needs of future generations, and the need to maintain and enhance the quality of the environment.

This view, including the increasing public expectation for improving environmental outcomes is accommodated through the AMP and LTP review process. Budgets (long and short term) that estimate the costs of changing levels of service expectations are part of the AMP review process, and these are an input into the LTP budgets which then become available for public feedback.

Sustainability is in any case an integral part of asset management. Its primary purpose is to maintain (and replace when necessary) infrastructural assets so as to ensure that a level of service that has been agreed with the community continues to be provided at least cost.

Economic sustainability is necessary for achieving intergenerational equity. By considering the whole lifecycle costs of assets and activities future costs and rates are projected. The value and life expectancy of all assets are determined and used to value annual depreciation. Depreciation is collected annually via rates which ensures that sufficient funding is available in the future to enable replacement of assets at the end of their useful lives. This mechanism ensures that current ratepayers are funding their portion of the use of an asset.

Details of the actions and approaches taken from a sustainability perspective for the different utility and roading activities, are set out in the Overview documents for water supply, wastewater and drainage, and in the individual AMPs, where appropriate, for roading, and solid waste.

Sustainability under the Treaty of Waitangi

The Council has a good working relationship with Te Ngai Tuahuriri Runanga which is sustained on a regular monthly basis with meetings with the Runanga at which any significant activities or issues are discussed.

The relationship between the Council and the Runanga is guided by a Memorandum of Understanding.

A good working relationship between the Council and the Runanga helps ensure that decisions of significance to Maori are made in a mutually agreed way following the principles of sustainability.

9. HOW DO WE REACH OPTIMAL DECISIONS?

Optimised Decision Making

This section outlines the Council's approach to optimised decision making, in particular relating to capital works expenditure. It outlines some of the processes the Council goes through to ensure that expenditure is optimised and defines the different levels of optimisation that are applied to various projects. Council is working towards applying optimised decision making processes to operational and maintenance expenditure, but its systems and data capture processes are not yet robust enough to enable this.

Definition

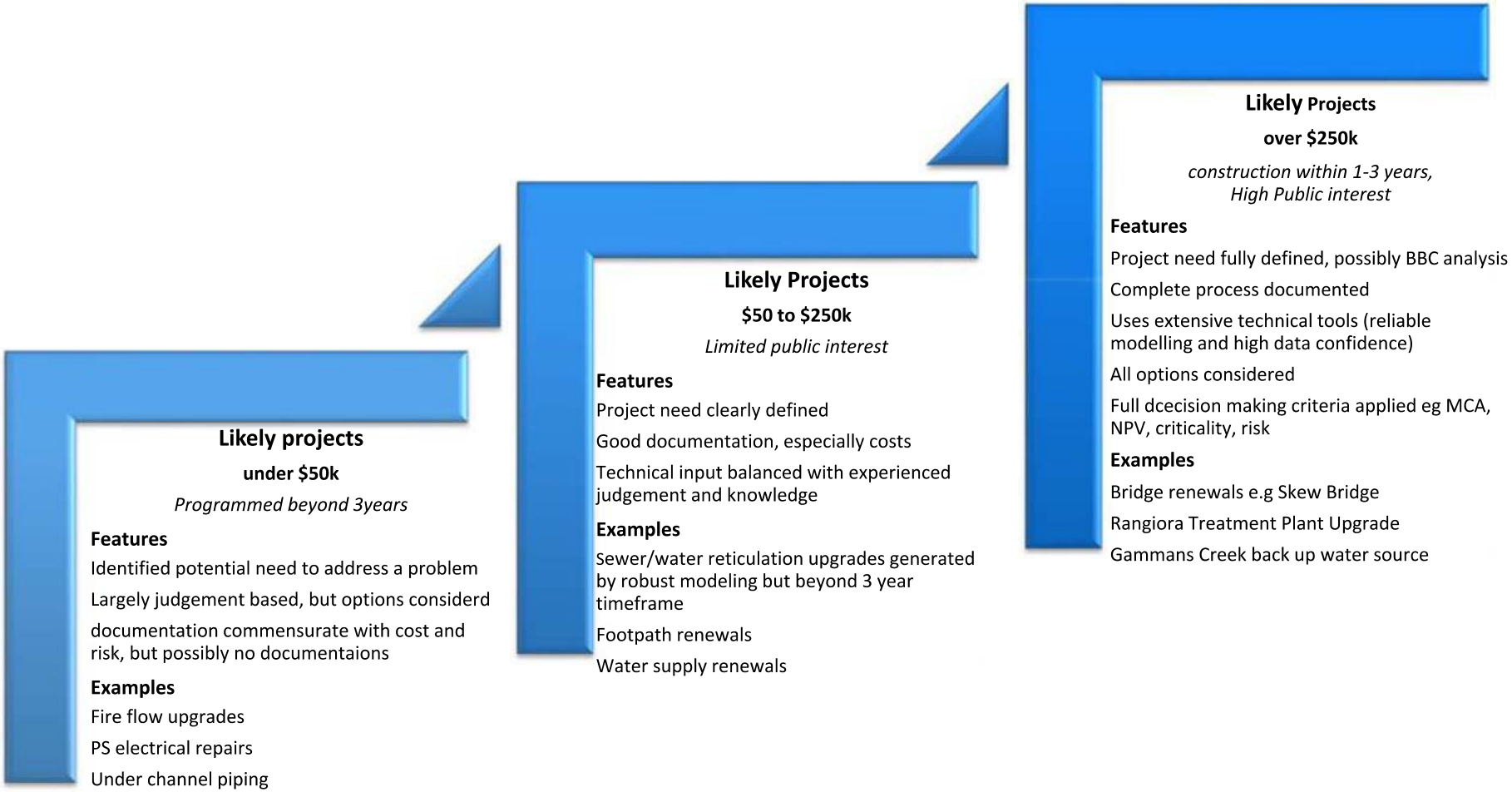
For the purposes of this plan we have defined optimised decision making as a process for considering and prioritising all options to rectify performance failures of assets. The process encompasses NPV analysis and risk assessment.

The Council applies differing levels of optimisation to projects, depending on a number of factors, including the relative value (or effect on ratepayers) of a project, the risks, the degree of public interest, and when the works are planned to be built.

The range of assessments Council uses in its decision making are listed below, but not all criteria are used for all decisions. The table on the following page shows the structure of Council's tiered decision making process.

a) Current and desired level of service
b) Legislative requirements
c) Growth projections
d) Disaster resilience
e) Lifecycle cost
f) Impact on rates (short and long term)
g) Likely effectiveness of the solution
h) Environmental impact
i) Ease of consenting
j) Risks (including reliability of costs)
k) Political and Public considerations (including public consultation)

Figure 3: Tiered Approach to Optimised Decision Making



10. PROJECT DEVELOPMENT AND APPROVAL

Public Engagement

Capital projects are developed in order to meet the needs of growth, renewal, or levels of service (LOS).

While LOS for each activity have not changed substantially since 2005, they are reviewed and updated as part of the three yearly AMP review process. Projects that are needed to ensure LOS are met are subsequently identified, and then included in long term capital and operational budgets. The key LOS and accompanying budgets form part of the LTP, which goes out for public consultation.

There is also a need to engage with the public on specific services and issues outside of the LTP process.

A recent example of this was the planned amalgamation of the Woodend and Pegasus water supply schemes. An extensive public engagement programme was carried out to ensure that the views of both communities was understood. It included advertising, specific mail outs to affected property owners and public meetings, and resulted in 73% of the combined communities in favour of joining the supplies.

Financial Approval

The Council operates a thorough and robust approval process. The delegations from the Council to the Chief Executive are clearly defined in the Councils delegations Manual. These delegations also define the limits of authority for Department and Unit Managers.

Overall the Ten Year Plan (LTP) is the major vehicle for approval of expenditure. This document is revised and approved by Council every three years. Each other year the Annual Plan is the process whereby the Council approves the following year's expenditure.

Prior to inclusion in the Annual Plan or the Ten Year Plan, each substantial project will normally have been subject to approval by the Council's Utilities and Roading (U&R) Committee. The U&R committee will be briefed by Council staff on major issues and projects and they will make major decisions on these issues. Any projects that then require operational or capital expenditure will be recommended by the Utilities and Roading Committee for adoption by the Council in the next Annual Plan or Ten Year Plan.

Major Project Consultation

There are specific projects within each activity that have been or will be subject to major consultation and approval exercises. Examples of these are:

- Planned upgrades to the Oxford rural and Ohoka water supplies
- Waste Management & Minimisation Plan 2017 Review
- West Kaiapoi new arterial road
- Central Rangiora gravity trunk wastewater upgrade
- Woodend and Pegasus water supply treatment amalgamation
- Obtaining urban stormwater network discharge consents (required by 2018)
- Kaiapoi River Rehabilitation Works
- Garrymere Water Source

11. AMP REVIEW AND AUDIT PROCESS

Since the previous 2015 AMP reviews, Council has developed an Asset Management Policy which has been approved by the Management Team. An Asset Management Steering Group has also been set up, with representatives from all relevant Council departments included. The Steering Group objectives are:

- To coordinate a more consistent approach to asset management practice across Council departments.
- To support the application of the Asset Management Policy.
- To support continuous improvement of asset management practice.

The Steering group has produced 4 Advice Notes that cover the basics of asset management planning, generic definitions, a style guide and a comprehensive contents schedule. It is anticipated that this will assist with the consistency of approach to asset management.

The 2015 Utilities and Roading AMPs were externally peer reviewed by AECOM, but the timeframe to publishing was too short to enable incorporation of all suggested improvements. The recommendations from that peer review have been incorporated in this review where still relevant. In addition Brian Smith from Brian Smith Advisory Services was engaged to provide advice on the structure and content of the 2015 3 Waters AMPs prior to the commencement of the 2017 AMP revision.

For the water supply, wastewater, drainage and stockwater sections, the documents have been updated by the Council's Project Delivery Unit, and the Infrastructure Strategy Manager, with the assistance from the respective asset managers and the 3 Waters Manager. The Roading Activity Management Plan was prepared by the Roading Asset Planning Engineer and reviewed by the Roading Manager. The Solid Waste Activity Management Plan was prepared by the Solid Waste Asset Manager. These documents were then reviewed by the Manager Utilities and Roading.

The draft 2017 AMP's are to be peer reviewed by Infrastructure Associates. They will peer review the Introductory Chapter, the 3 Waters Overview documents, the Roading AMP and a representative sampling of the 3 Waters AMP's.

The construction rates used to derive the 2017 valuations of Council assets, are also used as the basis for the capital project estimates which form one of the more significant outputs from the AMP revision.

For the 3 Waters and Solid Waste valuations Brian Smith provided advice on the valuations methodology, prior to the work being undertaken, and the finished valuation was peer reviewed and certified by John Vessey (Technical Principal Asset Valuation) of Opus International Consultants Ltd to ensure accuracy and follow the international accounting standards requirements.

The Roading valuations that were revised in 2017 were prepared by MWH and externally peer reviewed, and were then reviewed by the Roading Manager.

Under the Local Government Act 2002 Audit New Zealand are required to Audit the Long Term Plan. This includes the underlying asset management plans. This year audit New Zealand took an overview level audit of selected Water Supply Activity Management Plans, the Roading AMP, and also audited the 2017 valuations.

12. EARTHQUAKES

Roading

The impact of the earthquakes has been taken into account in developing the AMP. This includes the impact of the red zoning on assets servicing those areas and the impact of the relocation of people to the new growth areas.

Three Waters

Most repairs to wastewater, water supply and drainage infrastructure damaged by the 2010/11 earthquake series are now complete. Any legacy issues which remain have been taken into account in the review of the AMP, and any projects identified to build resilience to any future earthquakes have been included in the revised AMPs as business-as-usual projects.

With the overall planning for the infrastructure within the Kaiapoi Regeneration areas (formerly known as Residential Red Zones) now complete, it has been possible to clarify the final form of the services in this area. Completion of the water and wastewater infrastructure reconfiguration in this area is programmed to be complete by the end of the 2017/18 year, and the final storm water works are expected to be completed the following year in conjunction with some other regeneration area projects.

Solid Waste

The effect on the Council's solid waste infrastructure of the Canterbury Earthquakes is now negligible.

13. LOOKING FORWARD

As for the 2015 documents, the 2017 suite of AMPs are part of a process of continuing effort to improve Utilities and Roading AMPs. A component of the AMP review process is to identify shortcomings in processes and practices and scope out projects that will help to fill the gaps. Improvement Plans are an integral part of asset management and have been produced for all of the 2017 Utilities and Roading AMPs. In the case of 3 waters AMPs one combined Improvement Plan was developed that covered all of the individual AMPs, with projects that affect or are specific to individual AMP's covered in each scheme AMP.

Progress has been steady on some of these projects, while for others progress has been slow, or stalled.

For 3 Waters, the projects that are expected will provide the most significant benefit, are linked to the implementation of a well specified Asset Management System. This will include the ability to load asset data in the field through mobile devices, and an integrated works management system that will enable the linking of repair work directly to assets. It is anticipated that these systems will allow a steady improvement to be made in Council's confidence in its 3 Waters asset data, particularly regarding underground network assets. Current confidence is mixed, and will improve (for example via the CCTV programme of the sewer network), but is in need of a boost in some other areas, e.g water supply network pipe condition.

It is expected that good progress will be made on implementation of these new systems during the three year period before the next AMP revisions.

For Roading, work will continue on identified shortcomings in the data, including condition rating, where appropriate, of drainage data. There will also be greater linkage of information gathered from contractor data (i.e. from RAMM Contractor) to feed into the overall picture of the network performance. It is also planned to make much greater use of spatial representation of data, both for coordination with other Utilities, such as 3 Waters, and for better analysis of influences on network condition.

For Solid Waste, work will continue on identified shortcomings in the data, including asset valuation at component level, condition rating, criticality assessment, facility capacity and risk assessment. Current confidence is low, and will improve with this planned work.

14. APPENDIX A - List of AMP documents and their TRIM reference Numbers

Roading

Section/Appendix	Scheme / Document Reference	TRIM Number
Section 1	Executive Summary Waimakariri Transport AMP 2018	170321027383
Section 1	Introduction Waimakariri Transport AMP 2018	170321027382
Section 3	Levels Of Service Waimakariri Transport AMP 2018	170321027378
Section 4	Future Demand Waimakariri Transport AMP 2018	170321027379
Section 5	Risk Management Waimakariri Transport AMP 2018	170321027377
Section 6	Life Cycle Management Plan Waimakariri Transport AMP 2018	170321027282
Section 7	Financial Summary Waimakariri Transport AMP 2018	170321027375
Section 8	Asset Management Practices Waimakariri Transport AMP 2018	170321027374
Section 9	Plan Improvement And Monitoring Waimakariri Transport AMP 2018	170321027381
Section 10	Appendices Waimakariri Transport AMP 2018	170321027373
Appendix A	Glossary of Terms Waimakariri Transport AMP 2018	170321027372
Appendix B	Strategic Business Case Waimakariri Transport AMP 2018	171025115475
Appendix C	Maintenance Contract Level Of Services Waimakariri Transport AMP 2018	150630103986
Appendix D	Roading Valuation Report Waimakariri Transport AMP 2018	171201130750
Appendix E	Risk Management Waimakariri Transport AMP 2018	171205131856

Water Supply

Scheme / Document Reference	TRIM Number

Water Supply AMP Overview Document 2018	170822090191
Rangiora Water Supply Scheme AMP 2018	161116117739
Kaiapoi (including Pines/ Kairaki) AMP 2018	161116117709
Pegasus/Woodend Water Supply Scheme AMP 2018	161116117732
Oxford Urban Scheme AMP 2018	161116117758
Oxford Rural No. 2 Water Supply AMP 2018	161116117731
Oxford Rural No. 1 Water Supply Scheme AMP 2018	161116117729
Waikuku Beach Water Supply Scheme AMP 2018	161116117719
Cust Water Supply Scheme AMP 2018	161116117722
Mandeville/Fernside Water Supply Scheme AMP 2018	161116117727
Summerhill Water Supply Scheme AMP 2018	161116117718
Ohoka Water Supply Scheme AMP 2018	161116117711
Poyntz Road Water Supply Scheme AMP 2018	161116117736
West Eyreton Water Supply Scheme AMP 2018	161116117741
Garrymere Water Supply Scheme AMP 2018	161116117714

Wastewater

Scheme / Document Reference	TRIM Number
Wastewater AMP Overview Document 2018	161116117659
Eastern District's Wastewater Scheme AMP 2018	161116117662
Rangiora Wastewater Scheme AMP 2018	161116117667
Kaiapoi Wastewater Scheme AMP 2018	161116117680
Woodend Wastewater Scheme AMP 2018	161116117668
Pegasus Wastewater Scheme AMP 2018	161116117672
Waikuku Beach Wastewater Scheme AMP 2018	161116117664
Mandeville Wastewater Scheme AMP 2018	161116117675
Pines/Kairaki Wastewater Scheme AMP 2018	161116117670
Tuahiwi Wastewater Scheme AMP 2018	161116117666
Woodend Beach Wastewater Scheme AMP 2018	161116117669
Oxford Wastewater Scheme AMP 2018	161116117674
Loburn Lea Wastewater Scheme AMP 2018	161116117678
Fernside Wastewater Scheme AMP 2018	161116117682

Drainage

Scheme / Document Reference	TRIM Number
Drainage AMP Overview Document 2018	161116117610
Coastal urban Drainage Scheme AMP 2018	161116117569
Pegasus Urban Drainage Scheme AMP 2018	161116117571
Oxford Rural Drainage Scheme AMP 2018	161116117572
Ohoka Rural Drainage Scheme AMP 2018	161116117575
Loburn Lea Rural Drainage Scheme AMP 2018	161116117576
Kaiapoi Urban Drainage Scheme AMP 2018	161116117578
Coastal Rural Drainage Scheme AMP 2018	161116117581
Clarkville Rural Drainage Scheme AMP 2018	161116117585
Oxford Urban Drainage Scheme AMP 2018	161116117589
Cust Rural Drainage Scheme AMP 2018	161116117591
Rangiora Urban Drainage Scheme AMP 2018	161116117592
Central Rural Drainage Scheme AMP 2018	161116117602

Stock Water

Scheme / Document Reference	TRIM Number
Stock Water Race AMP 2018	161115117090

Solid Waste

Scheme / Document Reference	TRIM Number
Solid Waste AMP 2018	171129129620

WAIMAKARIRI DISTRICT COUNCIL

REPORT

FILE NO and TRIM NO:	SEW-03-18-03-02 / 170928105223
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	17th October 2017
FROM:	Chris Parton, Wastewater Asset Manager
SUBJECT:	Ocean Outfall – 2016-2017 Compliance Review
SIGNED BY: **(for Reports to Council or Committees)**	Department Manager / Chief Executive

1. SUMMARY

1.1. The purpose of this report is to update the Utilities and Roading Committee on the operation of the Ocean Outfall for the 2016-2017 reporting year. The Eastern District Sewer Scheme Ocean Outfall operates under resource consent CRC041162.2. Consent compliance for monitoring data of this nature is determined on two levels:

- Has the frequency of monitoring met the consent requirements?
- Does the monitoring data comply with any numerical limits specified in the consent conditions?

1.2. Many of the parameters sampled have no numerical compliance limits, so compliance for these parameters is assessed on sampling frequency alone.

1.3. With two exceptions, the required sampling frequency was met for the 2016-2017 reporting year. The first exception where the sampling frequency was not met was the 2nd of two six-monthly tests for metals and metalloids. This oversight was due to a misinterpretation by the testing laboratory of the required tests. Council staff have reviewed the procedure for requesting and labelling tests to minimize the possibility of this oversight occurring on future tests.

1.4. The second exception where sampling frequency was not met is monthly sampling for total nitrogen and total phosphorus. In one instance samples were not collected, and in another instance samples were collected but not analysed. An incorrect test request form was provided to the laboratory by Council staff so not all required parameters were analysed. Council staff have reviewed the procedure for requesting and labelling tests to minimize the possibility of this oversight occurring on future tests.

1.5. Where they exist, numerical limits set forth in the consent were met for all conditions of the consent.

1.6. The following items represent an overall summary of consent compliance for the Ocean Outfall:

- Laboratory and field-measured pH in 2016/17 was comparable with that measured in 2015/16.
- Median dissolved oxygen (DO) concentrations were higher in 2016/17; however, DO concentrations were low for a sustained period between October and November 2016.

- There were no exceedances of the consent limit for total suspended solids (TSS) (200 g/m³) over the 2016/17 monitoring period.
- A single sample collected on 8 November 2016 exceeded the consent limit for five-day biochemical oxygen demand (BOD_5) (25 g O_2/m^3); however, this is permitted under Condition 11, which requires no more than 16 values to exceed the consent limit within each 26 week period.
- Ammoniacal-N concentrations exceeded the consent limit of 27 g/m³ on eight occasions during the 2016/17 monitoring period; however, this is permitted under Condition 11, which requires no more than 16 values to exceed the consent limit within each 26 week period.
- There were no exceedances of the consent limits for faecal coliforms over the 2016/17 monitoring period.
- The high consent limit for enterococci (1,500 cfu/100 mL) was exceeded on two occasions, by samples collected on 10 January 2017 and 18 April 2017. However, this is permitted under Condition 12, which requires no more than six values from eight consecutive samples to exceed the consent limit.
- Samples for metals and metalloids from only a single sampling round in July 2017 (i.e., beyond the monitoring period) was tested for the 2016/17 period and this is a minor non-compliance. The results were similar to previous monitoring periods.
- All organochlorine pesticide, PCB and PAH results were below their respective method detection limits.

Attachments

1 – Resource Consent CRC041162.2

2 – Report from Golder Associates

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No.170928105223.

(b) **Notes** that the Ocean Outfall adhered to consent conditions for the year 2016-2017 apart from a minor non-compliance issue for not properly sampling for metals.

(c) **Notes** that the upgrades at the Woodend and Rangiora wastewater treatment plants will provide increased treatment at these two plants.

(d) **Circulates** this report to Council for their information.

3. ISSUES AND OPTIONS

3.1. Background

3.1.1. The purpose of this report is to update the Utilities and Roading Committee on the operation of the Ocean Outfall for the 2016-2017 monitoring year (the year). The treatment facilities at the Rangiora, Kaiapoi, Woodend and Waikuku Beach wastewater treatment plants (WWTP's) discharge into a pipeline, the Ocean Outfall line, that discharges into Pegasus Bay between Pines/Karaiki Beach and Woodend Beach. These treatment plants and the Ocean Outfall line comprise the Eastern Districts Sewer Scheme (EDSS). A schematic diagram of the EDSS is included on the following page. The EDSS operates under a number of resource consents from Canterbury Regional Council. The focus of this report is CRC041162.2, the consent that authorises the discharge of treated effluent into the coastal marine environment from the Ocean Outfall. A copy of the consent is provided in attachment 1.

3.2. Condition 2 – Discharge Volume and Rate

Discharge volumes and instantaneous discharge rate to the Ocean Outfall are recorded by a supervisory control and data acquisition (SCADA) system. Figures 2 & 3 in the Golder Associates report depict the annual measures of these metrics. There were no exceedances of either the discharge volume limit or the instantaneous discharge volume for the year.

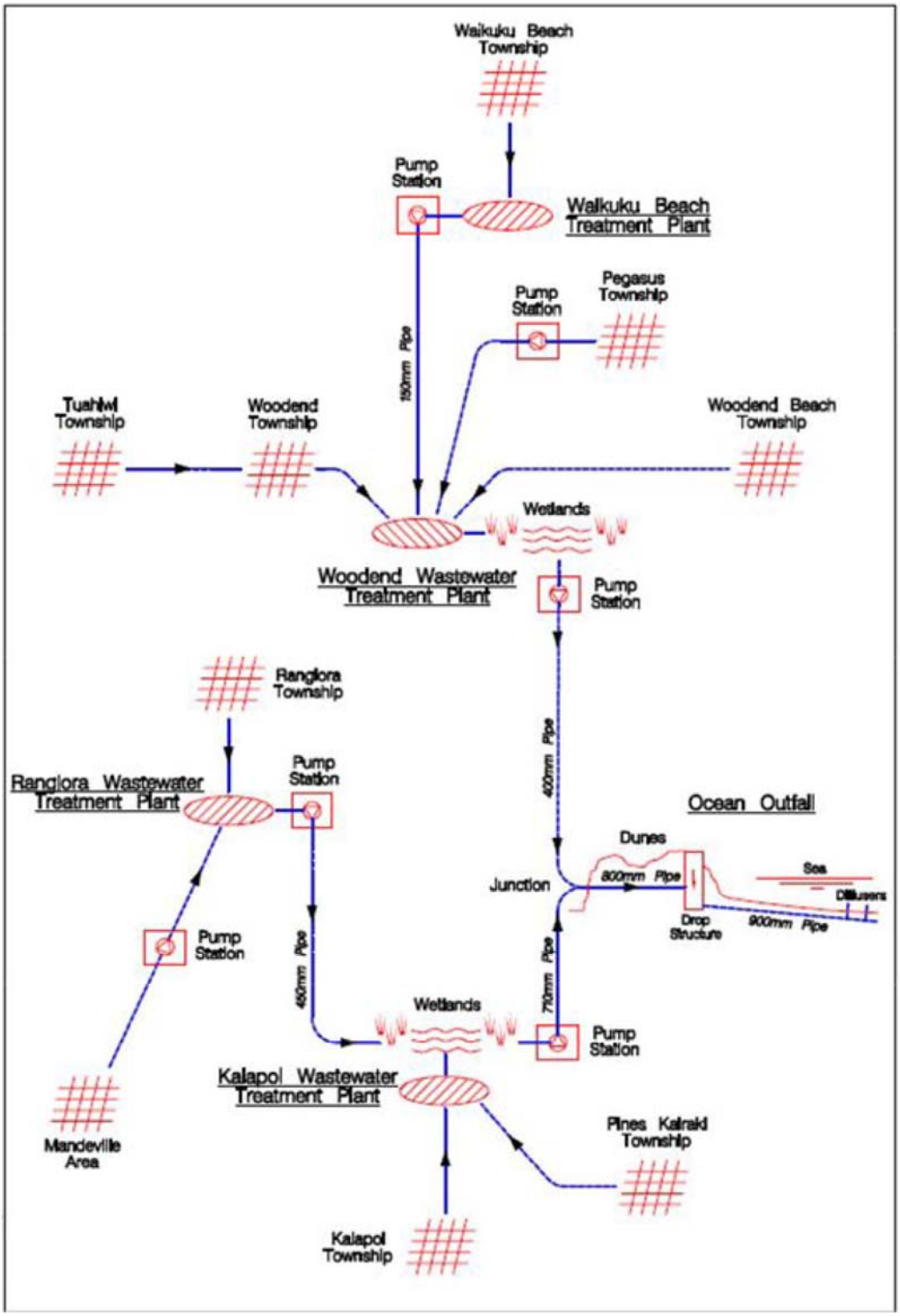


Figure 1: Eastern District Sewer Scheme Schematic

3.3. Ocean Outfall Pipeline Effluent Water Quality

Six areas describing the quality of wastewater effluent from the Ocean Outfall are sampled and tested based on the schedule for each area as specified in the consent. Those areas are:

- Physiochemical
- Five-day biochemical oxygen demand (BOD_5)
- Nutrients
- Microbiological quality
- Metals and metalloids
- Human pathogens
- Pesticides, PCBs, and PAHs

Testing results for each area are described in more detail in the following sections.

3.3.1 Physiochemical

pH

Laboratory and field measured pH in 2016/17 were comparable with that seen in the previous monitoring period, however the increase in pH seen over summer was greater and much more pronounced, with a larger increase over a greater period of time. Figure 4 in the Golder Associates report depicts the annual results for pH. As identified in previous reports (e.g. Golder 2015, Golder 2016), field measured pH was more variable than that measured in the lab, and this is likely attributable to changes in temperature, equipment and calibration. There is no consent limit for pH.

Dissolved Oxygen

DO concentrations were higher during the current monitoring period compared to last year's data, with concentrations in 2016/17 displaying a greater range with less seasonal variation than previous years. This highlights the effectiveness of the four 22 kW aerators that were installed at the Kaiapoi WWTP after the 2015/16 monitoring period and eliminated the drop in DO concentration often seen over summer as water temperatures increase. There is no consent limit for DO.

As shown in the figure 5 of the Golder Associates report, DO concentrations were low for a sustained period between September and November 2016. Although the new cage aerators had been installed and where running at that time, smaller 'bubbler' type aerators were not operational due to fan and bearing failures. This coincided with an algae bloom development, which led to the reduction of DO.

Temperature

Temperature data showed typical seasonal variation. During the 2016/17 monitoring period, the lowest temperature (4.1 °C) was recorded in July 2016, while the highest temperature (19.9 °C) was recorded in February 2016. There is no consent limit for temperature. Figure 6 of the Golder Associates shows the annual temperature data.

Total Suspended Solids

Figure 7 of the Golder Associates report shows the annual data for TSS. There was no exceedance of the consent limit for TSS (200 g/m³) over the 2016/17 monitoring period. Therefore, full compliance was achieved for Condition 11 of the resource consent. In general, TSS concentrations displayed greater variability compared with the previous monitoring period and had a greater range of results than in 2015/16. A strong increase to up to 180 g/m3 occurred in January

2017 after which the TSS fell to concentrations between 20 and 80 g/m3, similar as recorded in previous years. The high TSS was caused by an algae bloom due to the high seasonal temperatures at that time.

3.4. Biochemical Oxygen Demand

Five day biochemical oxygen demand (BOD_5) results for the year were similar to those recorded during the 2015/16 monitoring period, ranging from 8 g O_2/m^3 to 67 g O_2/m^3. Consistent with previous monitoring periods, soluble BOD_5 comprised between 11% and 21 % (interquartile range) of the total BOD_5 during the 2016/17 monitoring period. One of the soluble BOD_5 results was above the consent limit of 25 g O_2/m^3 (Figure 9); however, this exceedance did not result in a breach of Condition 11, which allows up to 16 exceedances in each 26-week period of the current monitoring period. There is no consent limit for BOD_5, only for soluble BOD_5. Figures 8 and 9 of the Golder Associates report show the annual data for BOD_5 and soluble BOD_5.

3.5. Nutrients

Condition 9 requires dissolved inorganic nitrogen (DIN[1]), ammoniacal-N and dissolved reactive phosphorus (DRP) to be measured weekly. Total nitrogen (TN) and total phosphorus (TP) are required to be measured monthly. The frequency of monitoring prescribed by Condition 9 was met in full for the parameters sampled weekly; however, TN and TP samples were not collected in January 2017 and, although samples were collected, they were not analysed in May 2017. An incorrect test request form was provided to the laboratory by WDC staff and not all required parameters were analysed. WDC will review their quality control procedure to ensure that the required parameters are tested in the future. Figures 9-14 in the Golder Associates report show the annual data for nitrogen and phosphorus.

Nitrogen

DIN in the discharge is primarily made up of ammoniacal-N. With the exception of 12 uncharacteristically high results across the final eight months of the year, ammoniacal-N concentrations followed a similar seasonal pattern to the 2015/16 monitoring period. Ammoniacal-N concentrations exceeded the consent limit of 27 g/m³ on eight occasions during the 2016/17 monitoring period. Condition 11 of the consent allows up to 16 exceedances in each 26-week period of the current monitoring period; therefore, these exceedances did not result in a breach of of the consent. There is no consent limit for DIN.

TN concentrations over the 2016/17 monitoring period, which ranged from 7.9 g/m³ to 36 g/m³, were similar to those recorded during the 2015/16 monitoring period. There is no consent limit for TN.

Phosphorus

The monitoring results for total phosphorus (TP) and dissolved reactive phosphorous (DRP) indicate less phosphorus was present than in the previous year and may be receding. DRP concentrations appear to be influenced by seasonal variations, with somewhat higher concentrations of both parameters occurring during the winter and spring months. Most of the phosphorus was present in the dissolved form (DRP). There are no consent limits for DRP or TP.

3.6. Microbiological Quality

Faecal Coliforms

[1] DIN comprises nitrate-N, nitrite-N and ammoniacal-N

Faecal coliform numbers were below relevant seasonal consent limits over the entire 2016/17 monitoring period; therefore, full compliance with Condition 12 was achieved for faecal coliforms. Figure 15 in the Golder Associates report shows the annual data for faecal coliforms.

Enterococci

Two samples, collected on 10 January 2017 and 18 April 2017 exceeded the high limit specified in the consent. The resource consent allows for two out of eight consecutive samples to exceed the high limit. Therefore, full compliance with Condition 12 was achieved for enterococci.

Elevated levels of enterococci caused minor non-compliances in 2013 and 2015. To better understand the cause of these elevated levels, Council has undertaken a number of studies with subject matter experts. The most recent study, commissioned in February 2016, is being performed by ESR and includes three distinct phases:

- Determine the travel time for wastewater from the Kaiapoi and Woodend wastewater treatment plants to the Ocean Outfall,
- Sampling and comparison of levels of faecal indicator bacteria downstream of ultraviolet (UV) treatment at Kaiapoi and Woodend wastewater treatment plants, and
- Once elevated levels of faecal indicator bacteria are found, use pulsed-field gel electrophoresis (PFGE) to determine the source of enterococci as being either from the wastewater treatment plants or inside the pipelines downstream from the Woodend and Kaiapoi treatment plants.

To date, elevated levels of faecal indicator bacteria have not been found, so only phase 1 of this study has been completed. During the summer months of 2017 and 2018, sampling by ESR will continue to determine the source of the enterococci. Figure 16 in the Golder Associates report shows annual data for enterococci.

Escherichia coli (E. coli)

There is no consent limit for E. coli, but numbers recorded were similar to faecal coliform numbers. These results indicate the majority of faecal coliforms recorded were likely to have been E. coli. Figure 17 in the Golder Associates shows annual data for E Coli.

3.7. Human Pathogens

Human enterovirus, adenovirus, Campylobacter and Salmonella spp. are required to be sampled annually. The human pathogen sampling requirements of Condition 9(d) were met in full in March 2017. Human enterovirus and adenovirus were below their respective MDL during the 2016/17 monitoring period. Campylobacter was detected in the sample collected in March 2017 but was not tested in the previous three years; therefore, it is not known if this is a one-time occurrence. Future testing will provide more information about possibly emerging trends. Salmonella spp. were not detected during the 2016/17 monitoring period. There are no consent limits for human pathogens.

3.8. Metals and Metalloids

Metals and metalloids are required to be sampled six-monthly. The samples were taken by WDC; however, the laboratory did not test the samples for metals and metalloids during the 2016/17 monitoring period. This was due to a misinterpretation of sample labelling, resulting in the incorrect suite of parameters being tested. Further investigations and procedural reviews are being conducted to ensure this error does not occur again. Once the error was identified, an additional sample was collected and analysed on 15 August 2017. This date is outside of the 2016/17

monitoring period but is being considered to represent the second sampling requirement of the period.

Total metal and metalloid concentrations of the one sample analysed for the 2016/17 monitoring period were comparable to results from previous years. The laboratory detection limits during previous monitoring periods were the same for the current monitoring period, with the concentration of Total Cadmium being below its respective detection limit.

There are no consent limits for any trace metals and metalloids. Figure 18 shows annual results for metals and metalloids.

3.9. Organochlorine pesticides, PCBs and PAHs

The annual monitoring for organochloride pesticides, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) was undertaken in March 2017. All results were below their respective method detection limits. There are no limits for organochloride pesticides, PCBs and PAHs, specified in the resource consent.

3.10. Condition 13 – Woodend Beach, The Pines Beach and Waimakariri River Mouth

Condition 13 of CRC041162.2 requires weekly monitoring for faecal coliforms and enterococci at Woodend Beach and The Pines Beach. Woodend Beach is located to the north of the Ocean Outfall and The Pines Beach to the south. Both locations are north of the Waimakariri River mouth. The frequency of monitoring during the 2016/17 period at Woodend Beach and The Pines Beach complied with these requirements.

Median numbers of faecal coliforms were highest at the Waimakariri River Mouth in all monitoring periods reported to date. These results could be due to a number of factors that differentiate the river mouth from Woodend and The Pines Beach (e.g., lowland tributaries such as the Styx River and Kaiapoi River entering near the Waimakariri River mouth, birdlife from Brooklands Lagoon, and the short survival rate of faecal coliforms in marine waters).

Median numbers of faecal coliforms recorded at Woodend, The Pines Beach and at the Waimakairi River Mouth in 2016/17 were similar to those reported in 2015/16.

Median numbers of enterococci recorded at Woodend, The Pines Beach and at the Waimakairi River Mouth showed a slight increase from the 2015/16 results.

Compliance with the monitoring requirements of Condition 13 for sampling at Woodend Beach and The Pines Beach was met in full during the 2016/17 monitoring period.

Figure 19 in the Golder Associates report shows results for microbiological monitoring at these three sites over the year.

3.11. Visual Observations

As required by Condition 14, WDC make visual observations at each sampling site to assess the presence of conspicuous oil or grease films, scums or foams or floatable materials. Wind speed and direction are also recorded and are available on request.

During the 2016/17 period, no conspicuous oil or grease films, scums or foams, or floatable materials were noted at either Woodend Beach or The Pines Beach on any of the weekly site visits during the monitoring period.

3.12. Water Quality, Surface Sediments and Benthic Infauna

Conditions 15 through 26 require that the Council survey for water quality, surface sediments, and benthic infauna in the vicinity of the Ocean Outfall discharge. The appropriate sampling was conducted over the course of the year, and compliance with all conditions was achieved.

3.13. Complaints

As required by condition 30 of the consent, the Council maintains a record of complaints received in relation to the Ocean Outfall. No complaints regarding the Ocean Outfall or the treatment plants on the EDSS were received during the year.

3.14. Summary

All requirements of conditions 9 – 12 were met with the exception of missing metals and metalloid sampling data from the second test for the year and two instances related to the sampling of total nitrogen and total phosphorus from Ocean Outfall pipeline effluent. The key results for the 2016/17 outfall monitoring programme were:

- Laboratory and field-measured pH in 2016/17 was comparable with that measured in 2015/16.
- Median DO concentrations were higher in 2016/17; however, DO concentrations were low for a sustained period between October and November 2016.
- There were no exceedances of the consent limit for TSS (200 g/m³) over the 2016/17 monitoring period.
- A single sample collected on 8 November 2016 exceeded the consent limit for SBOD (25 g O_2/m^3); however, this is permitted under Condition 11, which requires no more than 16 values to exceed the consent limit within each 26 week period.
- Ammoniacal-N concentrations exceeded the consent limit of 27 g/m³ on eight occasions during the 2016/17 monitoring period; however, this is permitted under Condition 11, which requires no more than 16 values to exceed the consent limit within each 26 week period.
- There were no exceedances of the consent limits for faecal coliforms over the 2016/17 monitoring period.
- The high consent limit for enterococci (1,500 cfu/100 mL) was exceeded on two occasions by samples collected on 10 January 2017 and 18 April 2017; however, this is permitted under Condition 12, which allows no more than two values from eight consecutive samples to exceed the consent limit.
- All organochlorine pesticide, PCB and PAH results were below their respective method detection limits.

The upgrades at the Rangiora and Woodend WWTPs will improve the treatment at each plants. Additionally, planned improvements to the wetland cells at Woodend and Kaiapoi WWTPs will provide increased removal of TSS, TN, and TP from plant effluent.

4. COMMUNITY VIEWS

4.1. The community have not been specifically consulted as part of this work.

4.2. Staff will present the results of the 2016-17 compliance report to the Ngai Tuahuriri Rununga. Additionally, staff will consult the Iwi Management Plan and will also work to implement cultural monitoring as part of its resource consent for the Ocean Outfall.

4.3. There has been an interest in the community regarding the presence of sea foam along the beach in the vicinity of the ocean outfall; as part of the consent from Environment Canterbury, the beach in this area is visited on a routine and frequent basis by Council staff to both sample ocean water in this vicinity and perform visual inspections for the presence of sea foam. Local residents have been asked to inform Council if and when sea foam is present. To date no sea foam has been found in the vicinity of the ocean outfall; however, monitoring of the beach in the vicinity of the Ocean Outfall will continue so that testing can be undertaken if sea foam does occur.

5. FINANCIAL IMPLICATIONS AND RISKS

5.1. There are no financial implications or risks with regard to current testing requirements of the consent. If testing requirements change or Council chooses to increase testing frequency or adopt additional testing parameters, then there will be associated costs associated with those changes.

6. CONTEXT

6.1. Policy

This matter is not a matter of significance in terms of the Council's Significance Policy.

6.2. Legislation

This project is not covered by specific legislation.

6.3. Community Outcomes

This project is consistent with the following community outcome of:

- There is a safe environment for all, and
- Core utility services are provided in a timely, sustainable, and affordable manner.

Attachment 1

CRC 041162.2

Consent Summary

RecordNo **CRC041162.2**

Type Consent
Souce Change Conds

PermitType Coastal Permit

FileNo CO6C/22000

ClientID 40544 ***ClientName*** Waimakariri District Council

To To discharge treated sewage effluent into the coastal marine area from a sub aqueous ocean outfall.

Location Waimakariri Eastern District Sewerage Scheme, RANGIORA, KAIAPOI, WAIKUKU BEACH, WOODEND, WOODEND BEACH

Status Current

Events

27/Apr/2006	Given Effect To
12/Mar/2009	Change in Conditions takes effect
13/Jul/2009	Lapse Date if not Given Effect To
12/Jul/2039	Consent Expires

Subject to the following conditions:

1) The ocean outfall discharge will be located approximately 1.5 kilometres offshore, at or about map reference NZMS 260 M35:880-602.

2) The discharge shall not exceed a rate of 660 litres per second or 57,000 cubic metres per day.

3) The diffuser shall be designed to achieve a minimum initial dilution of 75 times.

4) The consent holder shall maintain the discharge pipes and the associated facilities in good condition and in accordance with appropriate and accepted best engineering practice.

5) The consent holder shall maintain a continuous record of the flow discharged into Pegasus Bay. Such records shall be retained by the consent holder and be made available to the Canterbury Regional Council upon request.

6) Prior to commissioning of the outfall, the consent holder shall construct: A UV disinfection facility on the outlet from the Woodend Sewage Treatment Plant with the capacity to treat peak wet weather flows.A UV disinfection facility on the outlet from the Kaiapoi Sewage Treatment Plant wetlands, utilising the existing UV disinfection equipment.Additional channels and physical structures at the outlet from the Kaiapoi Sewage Treatment Plant for additional UV plant capacity to treat peak wet weather flows from Rangiora and Kaiapoi.

7) The consent holder shall operate the UV disinfection plants as is required to ensure compliance with Condition (12).

8) Should the standards in Condition (12) not be met, the consent holder shall install the necessary UV disinfection equipment required to treat peak wet weather flows from Rangiora and Kaiapoi.

9) A single grab sample shall be taken from the ocean outfall pipeline at the frequencies noted in this condition and the same shall be analysed for the identified contaminants at the frequencies noted for each contaminant. Report schedules shall be prepared recording the results of such analyses. Grab sample locations and the times at which the grab samples are taken shall be recorded and included in the reporting schedules. The consent holder shall retain the reporting schedules.(a)Weekly:(i)pH -reported as pH units(ii)Dissolved oxygen - reported as % saturation(iii)Temperature - reported as ° C(iv)Five-day biochemical oxygen demand - reported as g O/m3(v)Filtered five-day biochemical oxygen demand - reported as g O/m3(vi)Total suspended solids - reported as g/m3(vii)Dissolved inorganic nitrogen - reported as g N/m3(viii)Ammoniacal nitrogen - reported as g N/m3(ix)Dissolved reactive phosphorus - reported as g P/m3(x)Faecal coliforms - reported as no./100m(xi)Enterococci - reported as no./100ml(xii)Escherichia coli - reported as no./100ml.In addition, the above parameters, with the exception of inorganic nitrogen and phosphorus (vii and ix), shall be monitored every three months in the effluent being discharged from each of the contributing sewage treatment plants at Rangiora, Kaiapoi, Woodend and Waikuku Beach.(b)Monthly:(i)Total phosphorus - reported as g P/m3(ii)Total nitrogen - reported as g N/m3.(c)Three Monthly for the first five years and then six monthly thereafter:(i)Arsenic - reported as g/m3(ii)Cadmium - reported as g/m3(iii)Chromium - reported as g/m3(iv)Copper - reported as g/m3(v)Lead - reported as g/m3(vi)Nickel - reported as g/m3(vii)Zinc - reported as g/m3(viii)Mercury - reported as g/m3.All metal analysis shall be for total metals only.(d)Three Monthly for the first two years and then annually thereafter: (i)Human Enterovirus. (no./10L)(ii)Human Adenovirus. (no./10L).(e)Annually:(i)Thermophilic campylobacter spp (cfu/L)(ii)Salmonella spp (no./L)(iii)Organo chlorine pesticides - reported as g/m3(iv)Polychlorinated biphenyls - reported as g/m3(v)Polycyclic aromatic hydrocarbons - reported as g/m3.

10) The results of all analyses required by Condition (9) shall be provided to the Canterbury Regional Council within 10 working days of receipt of each completed analysis.

11) Based on the weekly sampling required by Condition (9) of this consent, and taken over each 26 week period commencing on the 1st of May, and the 1st of November of each year during the term of this consent, no more than 16 values in each 26 week period shall exceed the following standards for each of the named contaminants:Contaminant Unit StandardBOD5 (filtered) 25 [gram per cubic metre]Total Suspended Solids 200 [grams per cubic metre]Ammoniacal Nitrogen27 [grams per cubic metre]

12) Based on the weekly sampling required by Condition (9) of this consent, over each Summer period (November – February inclusive) and over each Winter period (March – October inclusive), no more than six values from eight consecutive samples, shall exceed the following standard values and no more than two values from eight consecutive samples, shall exceed the higher value for enterococci and faecal coliforms.Contaminant Unit Standard Value Higher Value Summer Winter Summer WinterEnterococci No./100ml 500 500 1,500 1,500Faecal Coliforms No./100ml 1,000 9,000 5,000 20,000

13) Water quality at Woodend Beach and Pines Beach shall be monitored at not less than weekly intervals as follows:For faecal coliforms and enterococci, and the monitoring shall be for a period of two years after commissioning of the outfall, total nitrogen and total phosphorus, reported as g N/m3 g P/m3 and salinity. The monitoring shall be undertaken using sampling and testing methods approved by the Canterbury Regional Council.as soon as practical after the second anniversary of the commissioning of the ocean outfall, the consent authority shall review the results of testing for total nitrogen, total phosphorus and salinity. If the results of that testing show that the operation of this consent has caused a significant adverse effect on the ocean environment then the monitoring shall continue until such time as that effect has been avoided, remedied or mitigated.

14) The consent holder shall make observations at each beach water quality sampling location to assess the presence of conspicuous oil or grease films, scums or foams or floatable materials and observations of wind speed and direction. The observations shall be recorded and a summary of the observations made available to Canterbury Regional Council.

WATER QUALITY

15) The consent holder shall monitor the water quality of the discharge plume at sites located: immediately adjacent to (zero to 25 metres), 100, 200, 500 and 1000 metres distance from the centre point of the diffuser, in accordance with Conditions (15) to (18) of this consent. For the purpose of these conditions:The direction of the discharge plume shall be determined by using a trackable drogue(s), or equivalent drifter(s), at the time of monitoring.Water quality monitoring shall commence on the first third of a rising or falling tide.As far as practicable, surface samples shall be collected as the drogue(s) or drifter(s) crosses each of the above mentioned sites.

16) Water quality monitoring shall be undertaken during February or March, at the following intervals:Three and five years following commissioning of the ocean outfall; and Every five years thereafter for the duration of the consent.

17) Monitoring information to be recorded at each of the sites specified in Condition (15) shall include:The geographical position of each site and the time of sampling;Visual observations for scums, foams and other floatable material;Dissolved oxygen (% saturation);Temperature (degrees Celsius); andSalinity (physical salinity units, psu).

18) Water quality samples shall be collected at each site, and analysed for the following parameters:Water quality parameterUnitsTotal suspended solidsGrams per cubic metreTotal nitrogen (TN) Milligrams per cubic metreAmmoniacal nitrogen (NH4-N) Milligrams per cubic metreNitrate (NO3) Milligrams per cubic metreTotal phosphorus (TP) Milligrams per cubic metreDissolved reactive phosphorus (DRP)Milligrams per cubic metreFaecal coliforms Number per 100 millilitresEnterococciNumber per 100 millilitres

SEDIMENT QUALITY

19) The consent holder shall monitor seabed sediment quality of the receiving environment below the general position of the discharge plume, in accordance with Conditions (19) to (23). The seabed sediment sampling shall occur at fixed locations along the long axis of the discharge plume that is oriented generally north-south and parallel to the shoreline. The sampling locations shall therefore be:At sites immediately adjacent to (zero to 25 metres), and 100, 250, 500 and 1000 metres from the centre point of the diffuser in a northerly direction, andAt sites 100, 250, 500 and 1000 metres from the centre point of the diffuser in a southerly direction.

20) Sediment quality monitoring shall be undertaken during February or March, at the following intervals:Three and five years following commissioning of the outfall; and Every five years thereafter for the duration of the consent.

21) At each site specified in Condition (19), three replicate sediment cores shall be collected. For the purpose of processing, each core collected shall be 130 millimetres in diameter and at least 100 millimetres in depth.

22) Sediment quality parameters to be recorded for all representative cores collected at each site specified in Condition (19) shall include:General description, including texture, colour, occurrence of man-made or terrestrial objects based on visual assessment, and photographic record of each core;Odour; andApparent redox potential discontinuity layer (visual assessment only).

23) Sediment quality samples collected at each site shall be analysed for the following physicochemical parameters:Sediment physicochemical parameterUnitsSediment grain sizePercentage (%) dry weight as gravel, sand, and mud, using the Udden-Wentworth grain size classification Total organic carbon (TOC)Percentage (%) dry weightNutrient contentTotal nitrogen (TN) Milligrams per kilogram N dry weightTotal phosphorus (TP)Milligrams per kilogram P dry weightMetal contentArsenicMilligrams per kilogram dry weightCadmiumMilligrams per kilogram dry weightChromiumMilligrams per kilogram dry weightCopperMilligrams per kilogram dry weightLeadMilligrams per kilogram dry weightMercury Milligrams per kilogram dry weightNickelMilligrams per kilogram dry weightZincMilligrams per kilogram dry weightFor the purpose of these analyses, samples shall be processed as follows:Only the top 20 millimetres of any core shall be used for physicochemical analyses;Three sediment cores collected at each site may be combined to form a single composite sample for analysis of metal content;Three sediment cores (or representative parts thereof) shall be analysed as individual replicates for sediment grain size; total organic carbon and nutrient content.

MONITORING OF BENTHIC INFAUNA

24) The consent holder shall monitor the benthic infauna of the receiving environment in accordance with Conditions (24) and (25), and: At the same sites as specified for sediment quality monitoring in Condition (19).Monitoring shall be undertaken during February or March, at the following intervals:Three and five years following commissioning of the outfall; and Every five years thereafter for the duration of the consent.

25) Five replicate infauna cores shall be collected from each site. For the purpose of processing, Each core shall be 130 millimetres in diameter and at least 100 millimetres in depth;Each core shall be sieved using a 0.5 millimetre sized mesh, and preserved; and Infauna collected shall be counted and identified to the lowest practical taxonomic level.

26) Only suitably qualified expert(s) in environmental monitoring shall:Supervise the monitoring of water quality, sediment quality and benthic infauna of the receiving environment, as specified under Conditions (15) to (25) of this consent; andUndertake data analysis, interpretation, and reporting of monitoring results collected under Conditions (15) to (25) of this consent, as required in accordance with Condition (32)(a), (b) and (c) of this consent.

27) The consent holder shall collect and analyse water and wastewater samples required under these consent conditions in accordance with "Standard Methods for the Examination of Water and Wastewater" prepared and published by the American Public Health Association, the American Waterworks Association and the Water Environment Federation - the current edition - or any other suitable methodology acceptable to the Canterbury Regional Council. Viruses and micro-organisms shall be tested and analysed using methods acceptable to the Canterbury Regional Council.

28) The laboratory carrying out analyses required under this consent shall be accredited for those analyses to a standard equivalent to NZS/ISO/IEC/ 17025.

29) The consent holder shall make available to the Canterbury Regional Council, all records kept in relation to the discharge, the operation of the ocean outfall, and the sampling, testing, monitoring and analyses required by these conditions.

30) The consent holder shall maintain and keep a complaint register for all aspects of all operations in relation to the discharge into the ocean. The register shall detail the date, time and type of complaint, cause of the complaint, and action taken by the Consent Holder in response to the complaint. The register shall be available to the Canterbury Regional Council at all reasonable times.

31) In the event of any known breach of compliance of the conditions of this consent the consent holder shall notify the Canterbury Regional Council within 48 hours of the breach being detected. Within five days of any known breach, the Consent Holder shall provide written notification to the Canterbury Regional Council, which explains the cause of the breach and if the cause was within the control of the consent holder, steps which were taken to remedy the breach and steps which will be taken to prevent any future occurrence of the breach.

32) The Consent holder shall provide the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, with an annual monitoring report by 31 August each year. The monitoring report shall include a summary of the analyses and records collected up to the end of June of the same year, in accordance with the conditions of this consent, and as a minimum shall: Summarise all the data collected as required under the conditions of this consent, including graphical presentation and statistical summations of monitoring data, and analyse the information in terms of compliance with this consent. Highlight and discuss any important environmental trends in the results. Compare results obtained over the reporting period with the results obtained from previous reporting periods, including monitoring results collected under related consents CRC041162 and CRC041162.1. Report and discuss any operational difficulties, changes or improvements undertaken to the sewage treatment plants or process, which would result in a notable variation of water quality or volume discharged. List any maintenance works needed, proposed or undertaken to ensure compliance with the conditions of the consent. Report and discuss any complaints received regarding the discharge into the ocean and any action taken by the consent holder to address the complaint.

33) The Canterbury Regional Council may once per year, on any of the last five working days of May or November in each year, serve notice of its intention to review the conditions of the consent for the purpose of:dealing with any adverse effect on the environment which may arise from the exercise of this consent, which was not foreseen at the time of its grant and which is therefore more appropriate to deal with at a later stage; orrequiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment resulting from the discharge; orreviewing the contaminant limits and monitoring provisions in these conditions if it is appropriate to do so.

34) (a)The consent holder shall use its best endeavors to establish and maintain a Submitters Group and provide reasonable organisational and administrative support for such a group for the duration of this consent.(b)In establishing such a group, the consent holder shall invite a representative of each submitter to the resource consent application CRC041162.1 to be a member of the Submitters Group and to meet at least once per year.(c)The consent holder shall liaise with the Submitters Group and ensure as a minimum that:The results of the monitoring required by this consent are reviewed at least annuallyWhere there are no concerns about the results, it is recorded that the Submitters Group is satisfied with the monitoring results.Where results indicate a possible adverse effect, further testing is undertaken and the results of such additional testing is forwarded to the Submitters GroupWhen required, a suitably qualified independent expert is to provide advice and guidance to the Submitters Group on what, if any, further monitoring or action should be taken.

35) The consent holder shall provide the Canterbury Regional Council and any member of the Submitter's Group at their request:(a)the results of all analyses required by Condition (9) within 10 working days of receipt of each completed analysis, and(b)the annual monitoring report required under Condition 32 within two months of the 30th June in each year during the term of this consent.

August 2017

WAIMAKARIRI DISTRICT COUNCIL

Eastern Districts Sewer Scheme – Annual Compliance Monitoring Report 2016 – 2017

Submitted to:
Waimakariri District Council
Canterbury Regional Council

REPORT

Report Number: 1478107201_7410-011-R-Rev0

Golder Associates

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FIGURES

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List of Abbreviations and Units

ammoniacal-N	ammoniacal nitrogen
BOD_5	five-day biochemical oxygen demand
°C	degrees Celsius
cfu/100 mL	colony forming units per 100 millilitres
CRC	Canterbury Regional Council
DIN	dissolved inorganic nitrogen
DO	dissolved oxygen
DRP	dissolved reactive phosphorus
EDSS	Eastern Districts Sewer Scheme
EDS	Eastern Districts Sewer
E. coli	*Escherichia coli*
ESR	Institute of Environmental Science and Research
Golder	Golder Associates (NZ) Limited
g/m^3	grams per cubic metre
iu	infectious units
km	kilometre
LOESS	local polynomial regression fitting
L/s	litres per second
MDL	method detection limit
m	metres
mL	millilitre
m^3	cubic metres
m^3/day	cubic metres per day
N	number of samples
nitrate-N	nitrate nitrogen
NIWA	National Institute of Water and Atmospheric Research
PCB	polychlorinated biphenyls
PAH	polycyclic aromatic hydrocarbons
pfu	plaque forming units
SCADA	supervisory control and data acquisition
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
UV	ultraviolet
WDC	Waimakariri District Council
WWTP	wastewater treatment plant

1.0 INTRODUCTION

1.1 Background

Waimakariri District Council (WDC) operates wastewater treatment plants (WWTPs) at Rangiora, Kaiapoi, Woodend and Waikuku Beach, all north of Christchurch. In 2006, the treatment facilities at each WWTP were upgraded, with the flows from these four locations combined for discharge to the coastal marine environment via an ocean outfall located in Pegasus Bay. The upgraded system and ocean outfall, shown in Figure 1, is known as the Eastern District Sewer Scheme (EDSS).

The EDSS operates under a number of resource consents from Canterbury Regional Council (CRC), which are listed in Table 1 along with their respective reporting requirements.

Table 1: Eastern District Sewer Scheme resource consents.

Consent	Activity	Reporting
CRC041162.2	To discharge treated sewage effluent into the coastal marine area from a sub-aqueous ocean outfall	Refer to Section 2.0 of this report
CRC041049	To discharge treated sewage effluent to the infiltration wetland and to groundwater via seepage at the Kaiapoi WWTP	Refer to Section 3.0 of this report
CRC168391	To discharge treated sewage effluent via seepage onto land (Woodend)	Refer to Section 4.0 of this report
CRC145027	To discharge dewatered sludge removed from a wastewater pond to land (Rangiora)	Refer to Section 5.0 of this report
CRC031724	To discharge groundwater from subsoil drains into the marine area of Jockey Baker Creek	No reporting required
CRC168388	To discharge contaminants to air (Woodend)	No reporting required
CRC060424.1	To use land for storing, treating and discharging human effluent (Woodend)	No reporting required
CRC950610	To discharge contaminants to air (Kaiapoi)	No reporting required
CRC962560	To discharge contaminants to air (Waikuku)	No reporting required
CRC030917	To discharge contaminants, via seepage, from Rangiora STP to land.	No reporting required
CRC041163	For the erection, placement and maintenance of an ocean outfall pipeline and temporary structures, including a trestle structure and sheet piling for the purpose of constructing an ocean outfall, within the coastal marine area	No reporting required
CRC154176	To discharge contaminants to land (Kaiapoi)	No reporting required
CRC168390	To use land for storing, treating and discharging human effluent (Woodend)	No reporting required
CRC173124	To discharge contaminants (odour) to air (Rangiora)	No reporting required

1.2 Report Scope

The purpose of this report is to fulfil the reporting requirements of consents CRC041162.2, CRC041049, CRC168391 and CRC145027, which require an annual monitoring report to be submitted to CRC. The reports are required to be submitted variously between 31 July and 31 August each year. However, a report due date of 31 August for all four resource consents has been agreed between WDC and CRC. This report fulfils the reporting requirements of these resource consents. Consents CRC041162.2, CRC041049, CRC168391 and CRC145027 are provided in Appendices A to D, respectively.

Fig01_EasternSewerage_GRA - Shortcut

Figure 1: Eastern Districts Sewer Scheme.

2.0 CRC041162.2 – DISCHARGE FROM OCEAN OUTFALL

2.1 Overview

Consent compliance for the period 1 May 2016 through 30 June 2017 ('the monitoring period') has been assessed by Golder Associates (NZ) Limited (Golder) using monitoring data provided by WDC. The 14-month extended monitoring period allows assessment of discharge quality over two 26-week periods commencing 1 May and 1 November each year, as specified by CRC041162.2. The report includes a comparison with data reported in the previous monitoring periods reported under the EDSS resource consents (Golder 2013a, 2013b, 2014a, 2014b, 2015, 2016).

2.2 Condition 2 – Discharge Volume and Rate

Condition 2 states:

> *"The discharge shall not exceed a rate of 660 litres per second or 57,000 cubic metres per day."*

Discharge volumes to the ocean outfall were recorded by a supervisory control and data acquisition (SCADA) system, which transmits via a broadband connection to an InTouch data visualisation system. This system is more reliable than the radiolink previously used to download outflow data. The meter is still read manually on at least a monthly basis to provide a backup data record in the event the SCADA system fails.

Daily discharge volumes for the 2015/16 period are plotted in Figure 2. Daily discharge volume data is missing for both the Woodend EDS and Kaiapoi EDS from 1 – 3 May 2016 and 10 June 2016, while daily discharge data is also missing from the Woodend EDS on 11 – 12 May 2016 and the Kaiapoi EDS on 15 – 16 April 2017.

The maximum daily instantaneous discharge rates for the 2016/17 monitoring period are illustrated in Figure 3. Instantaneous discharge rates are missing from both the Woodend EDS and Kaiapoi EDS for a number of increments on a number of occasions. Significant periods where data is missing from both locations occurred on 28 July 2016, 8 February 2017, 7 April 2017 and 24 – 25 March 2017. Daily discharge and daily maximum instantaneous discharge rates data are summarised in Table 2.

Table 2: Summary statistics for discharge volumes to ocean outfall from May 2016 to June 2017.

Statistic	Discharge volume (m^3/day)	Instantaneous discharge rate (L/s)
Minimum	0	39
5th percentile	6,528	288
Median	9,674	315
95th percentile	14,576	364
Maximum	27,201	452

The missing data is caused by outages or other issues with the SCADA system that result in no data being logged for those times. This can be caused by temporary communications outages, network outages or failure of the monitoring control systems on site.

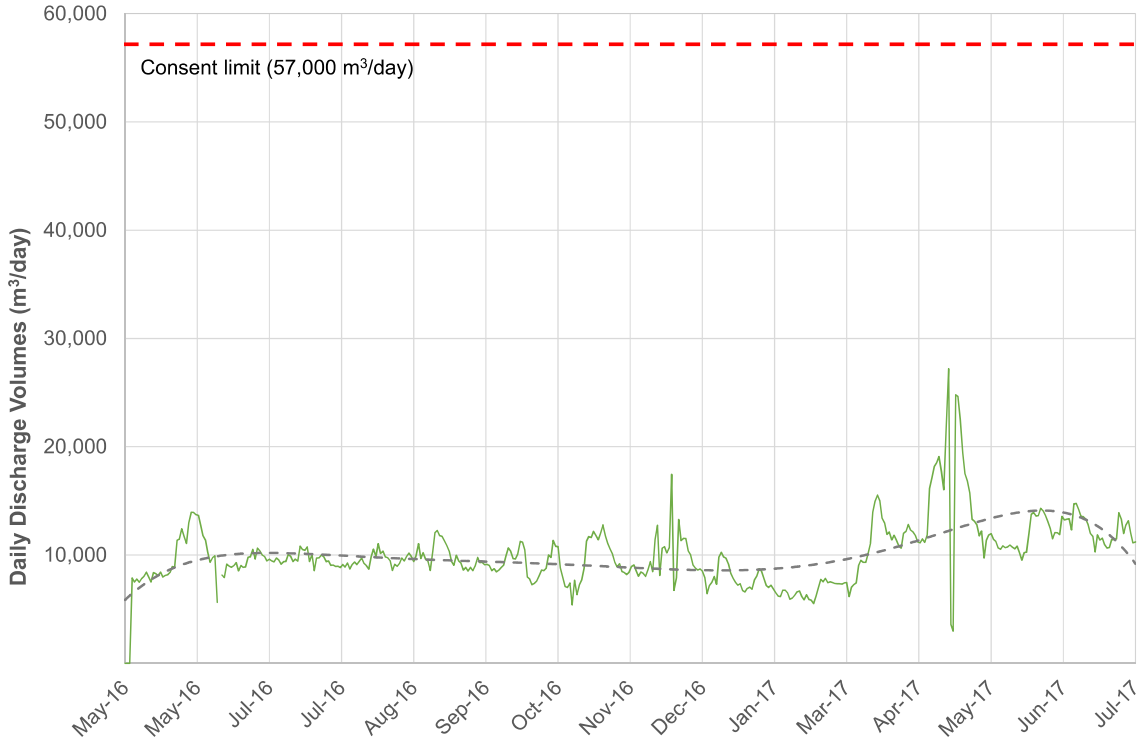

Figure 2: Daily discharge volumes to ocean outfall between May 2016 and June 2017.

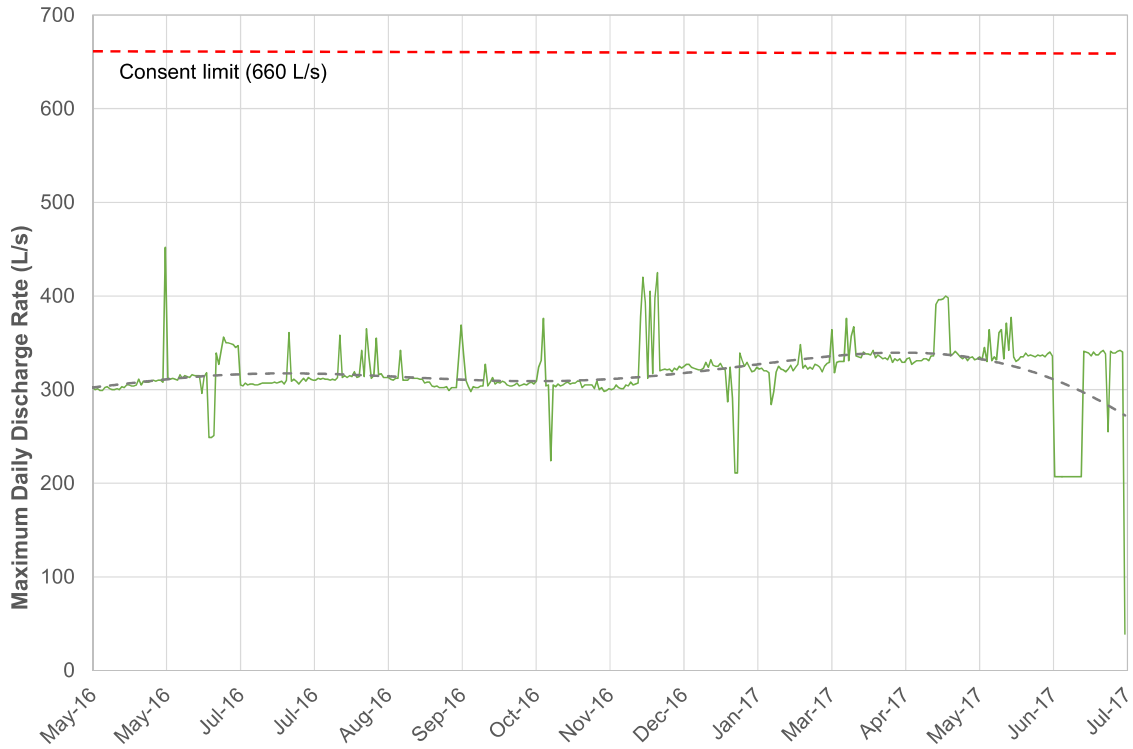

Figure 3: Maximum instantaneous daily discharge rate to ocean outfall between May 2016 and June 2017.

The data is graphed in Figure 2 and Figure 3. A 6th order polynomial regression line is fitted through the data to indicate the general trend. The graphs indicate that the daily and instantaneous discharge volumes remained consistently below the respective limits of 57,000 m^3/day and 660 L/s during the 2016/17 monitoring period. Overall, compliance with Condition 2 was met in full.

2.3 Conditions 9 – 12: Ocean Outfall Pipeline Discharge Quality

2.3.1 Overview of monitoring and compliance requirements

Condition 9 states the following:

> *"A single grab sample shall be taken from the ocean outfall pipeline at the frequencies noted in this condition and the same shall be analysed for the identified contaminants at the frequencies noted for each contaminant. Report schedules shall be prepared recording the results of such analyses. Grab sample locations and the times at which the grab samples are taken shall be recorded and included in the reporting schedules. The consent holder shall retain the reporting schedules.*
>
> *(a) Weekly*
>
> *i. pH -reported as pH units*
> *ii. Dissolved oxygen - reported as % saturation*
> *iii. Temperature - reported as °C*
> *iv. Five-day biochemical oxygen demand - reported as g O/m^3*
> *v. Filtered five-day biochemical oxygen demand - reported as g O/m^3*
> *vi. Total suspended solids - reported as g/m^3*
> *vii. Dissolved inorganic nitrogen - reported as g N/m^3*
> *viii. Ammoniacal nitrogen - reported as g N/m^3*
> *ix. Dissolved reactive phosphorus - reported as g P/m^3*
> *x. Faecal coliforms - reported as no./100ml*
> *xi. Enterococci - reported as no./100ml*
> *xii. Escherichia coli - reported as no./100ml.*
>
> *(b) Monthly*
>
> *i. Total phosphorus - reported as g P/m^3*
> *ii. Total nitrogen - reported as g N/m^3.*
>
> *(c) Three Monthly for the first two years and then six monthly thereafter*
>
> *i. Arsenic - reported as g/m^3*
> *ii. Cadmium - reported as g/m^3*
> *iii. Chromium - reported as g/m^3*
> *iv. Copper - reported as g/m^3*
> *v. Lead - reported as g/m^3*
> *vi. Nickel - reported as g/m^3*
> *vii. Zinc - reported as g/m^3*
> *viii. Mercury - reported as g/m^3.*
>
> *All metal analysis shall be for total metals only.*
>
> *(d) Three Monthly for the first two years and then annually thereafter*
>
> *i. Human Enterovirus. (no./10l)*
> *ii. Human Adenovirus. (no./10l).*
>
> *(e) Annually*
>
> *i. Thermophilic campylobacter spp (cfu/l)*
> *ii. Salmonella spp (no./l)*
> *iii. Organo chlorine pesticides - reported as g/m^3*

iv. Polychlorinated biphenyls - reported as g/m^3
v. Polycyclic aromatic hydrocarbons - reported as g/m^3."

The initial two-year monitoring period began in May 2006 and concluded in April 2008. Since then, metals have been analysed at six monthly intervals, with viral and bacterial monitoring completed annually, in line with Condition 9 above.

Condition 11 requires that monitoring results for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS) and ammoniacal nitrogen (ammoniacal-N) are compared with the following limits:

> *"Based on the weekly sampling required by Condition (9) of this consent, and taken over each 26 week period commencing on the 1st of May, and the 1st of November of each year during the term of this consent, no more than 16 values in each 26 week period shall exceed the following standards for each of the named contaminants [Table 3]:"*

Table 3: Condition 11 limits of resource consent CRC041162.2.

Contaminant	Unit	Standard
BOD_5 (filtered)	*g/m³*	*25*
Total suspended solids	*g/m³*	*200*
Ammoniacal nitrogen	*g/m³*	*27*

Condition 12 requires that faecal indicator bacteria monitoring results are compared with prescribed limits:

> *"Based on the weekly sampling required by Condition (9) of this consent, over each Summer period (November - February inclusive) and over each Winter period (March - October inclusive), no more than six values from eight consecutive samples, shall exceed the following standard values and no more than two values from eight consecutive samples, shall exceed the higher value for enterococci and faecal coliforms [*Table 4*]."*

Table 4: Condition 12 limits of resource consent CRC041162.2.

Contaminant	Unit	Standard value		Higher value	
		Summer	***Winter***	***Summer***	***Winter***
Enterococci	*No./100mL*	*500*	*500*	*1,500*	*1,500*
Faecal coliforms	*No./100mL*	*1,000*	*9,000*	*5,000*	*20,000*

2.3.2 Physicochemical

The results of weekly physicochemical monitoring between May 2016 and June 2017 are summarised in Table 5 alongside results from the previous monitoring period. These results are discussed by parameter below. Physiochemical monitoring requirements (i.e., weekly monitoring) were met in full during the 2016/17 period. DO (percent saturation and concentrations) were also continuously measured by several probes at Kaiapoi, Rangiora and Woodend and recorded by the WDC's SCADA system. Manual readings were taken weekly as a back-up.

To allow for graphical representation of all parameters, parameters that recorded concentrations less than their respective method detection limits (MDL[1]) were given a nominal concentration of MDL/2 (i.e., half the MDL concentration) (Chapman 1992).

[1] MDL: method detection limit, which is the lowest concentration that a given parameter can be detected during the laboratory analysis. This can vary over time due to changes to laboratory analysis techniques.

Table 5: Physicochemical water quality in the ocean outfall discharge.

Parameter	May 2016 to June 2017			May 2015 to June 2016			Consent limit
	N	Median	Range	N	Median	Range	
Laboratory pH (unitless)	61	8.1	7.8 – 9.5	61	8.0	7.5 – 9.0	-
Field pH (unitless)	61	8.0	7.5 – 9.7	61	7.9	7.6 – 9.0	-
DO (g/m^3)	61	5.1	0.2 – 8.9	61	3.6	0.2 – 6.8	-
Temperature (°C)	61	14.1	4.1 – 19.9	61	11.0	3.2 – 22.5	-
TSS (g/m^3)	61	61.0	12.0 – 178.0	61	59.0	14.0 – 124.0	200*

Note: * No more than 16 values to exceed the consent limit in the 26-week period beginning 1 May and 1 November. N: number of samples. DO (% saturation) is measured continuously by probes and recorded by the SCADA system, however results are not presented here.

pH

Laboratory and field measured pH in 2016/17 were comparable with that seen in the previous monitoring period, however the increase in pH seen over summer was greater and much more pronounced, with a larger increase over a greater period of time (Figure 4). As identified in previous reports (e.g. Golder 2015, Golder 2016), field measured pH was more variable than that measured in the lab, and this is likely attributable to changes in temperature, equipment and calibration. There is no consent limit for pH.

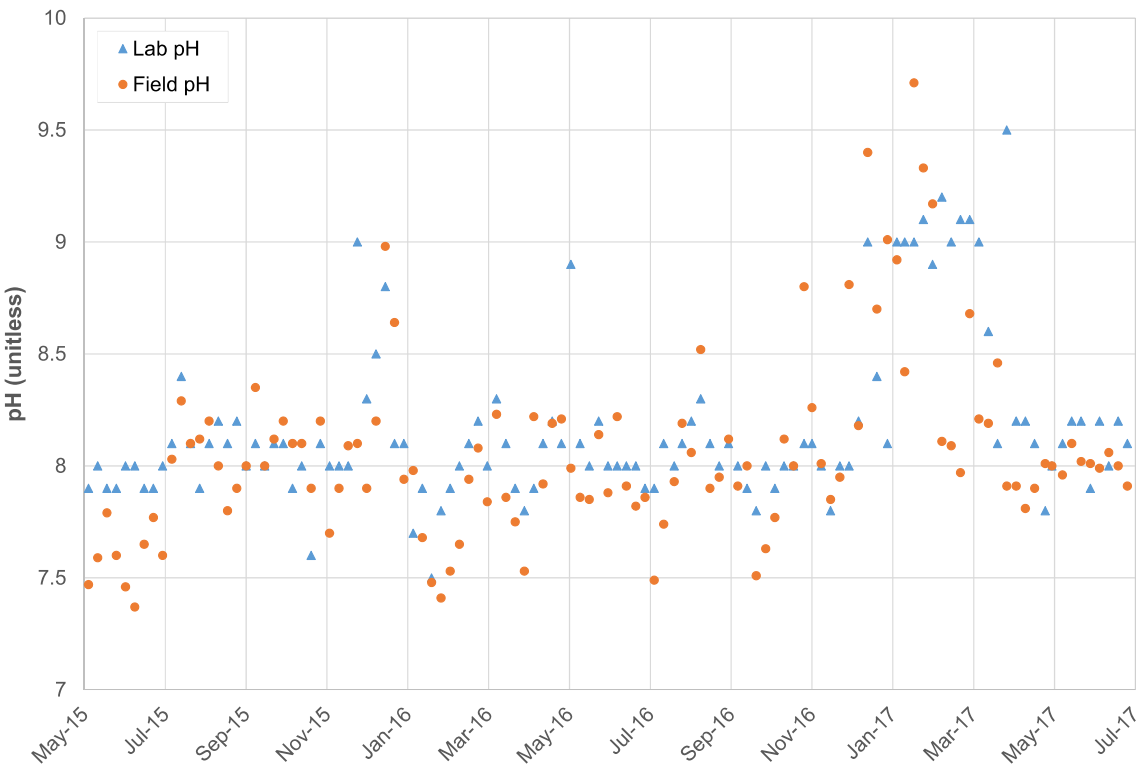

Figure 4: pH of the ocean outfall discharge between May 2015 and June 2017.

Dissolved oxygen

DO concentrations were higher during the current monitoring period compared to last year's data, with concentrations in 2016/17 displaying a greater range with less seasonal variation than previous years (Figure 5). This highlights the effectiveness of the four 22 kW aerators that were installed after the 2015/16 monitoring period and eliminated the drop in DO concentration often seen over summer as water temperatures increase (Figure 6). There is no consent limit for DO.

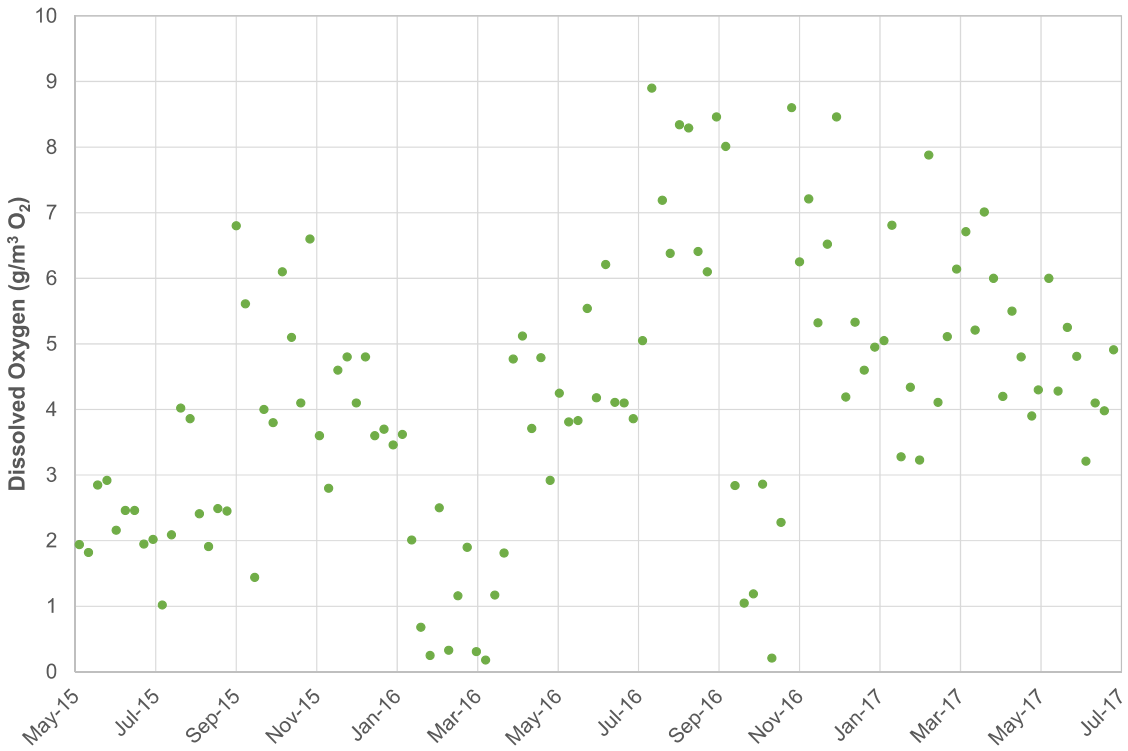

Figure 5: Dissolved oxygen concentrations in the ocean outfall discharge between May 2015 and June 2017.

DO concentrations were low for a sustained period between September and November 2016. Although the new cage aerators had been installed and where running at that time, smaller 'bubbler' type aerators were not operational due to fan and bearing failures. This coincided with an algae bloom development, which led to the reduction of DO.

Temperature

Temperature data showed typical seasonal variation (Figure 6). During the 2016/17 monitoring period, the lowest temperature (4.1 °C) was recorded in July 2016, while the highest temperature (19.9 °C) was recorded in February 2016. There is no consent limit for temperature.

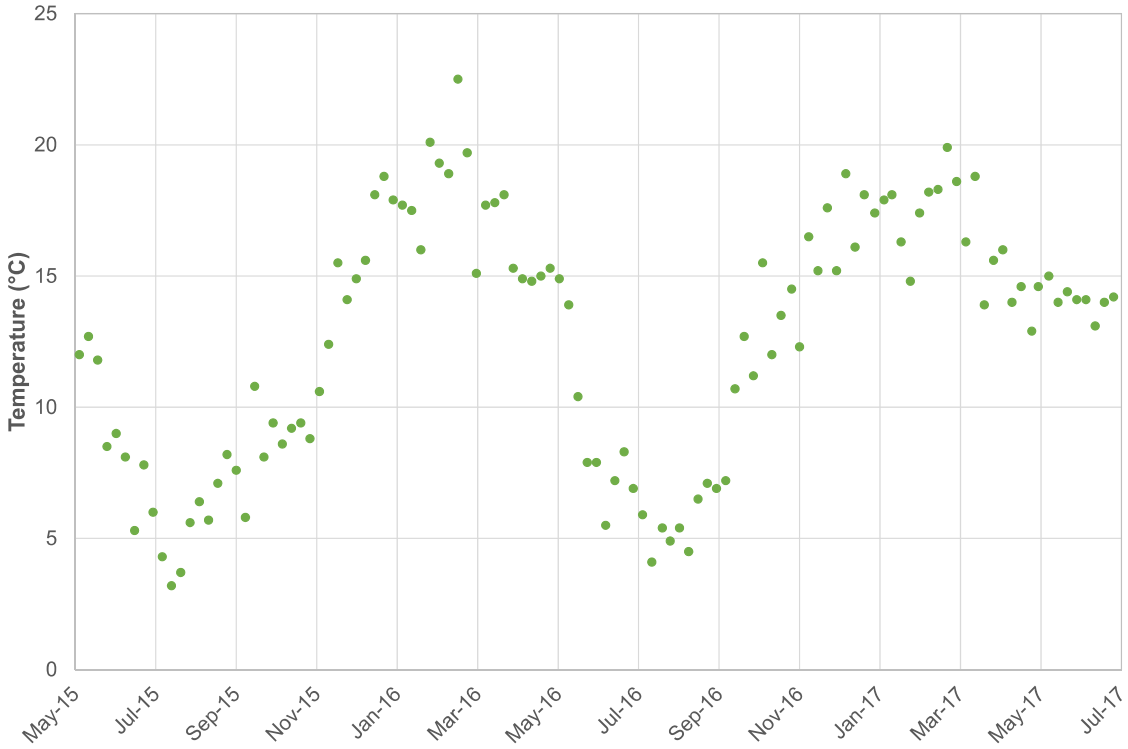

Figure 6: Temperature of the ocean outfall discharge between May 2015 and June 2017.

Total suspended solids

There was no exceedance of the consent limit for TSS (200 g/m³) over the 2016/17 monitoring period (Figure 7). Therefore, full compliance was achieved for Condition 11 of the resource consent, which allows up to 16 exceedances in each 26-week period of the current monitoring period. In general, TSS concentrations displayed greater variability compared with the previous monitoring period and had a greater range of results than in 2015/16. A strong increase to up to 180 g/m^3 occurred in January 2017 after which the TSS fell to concentrations between 20 and 80 g/m^3, similar as recorded in previous years. The high TSS was caused by an algae bloom due to the high seasonal temperatures at that time.

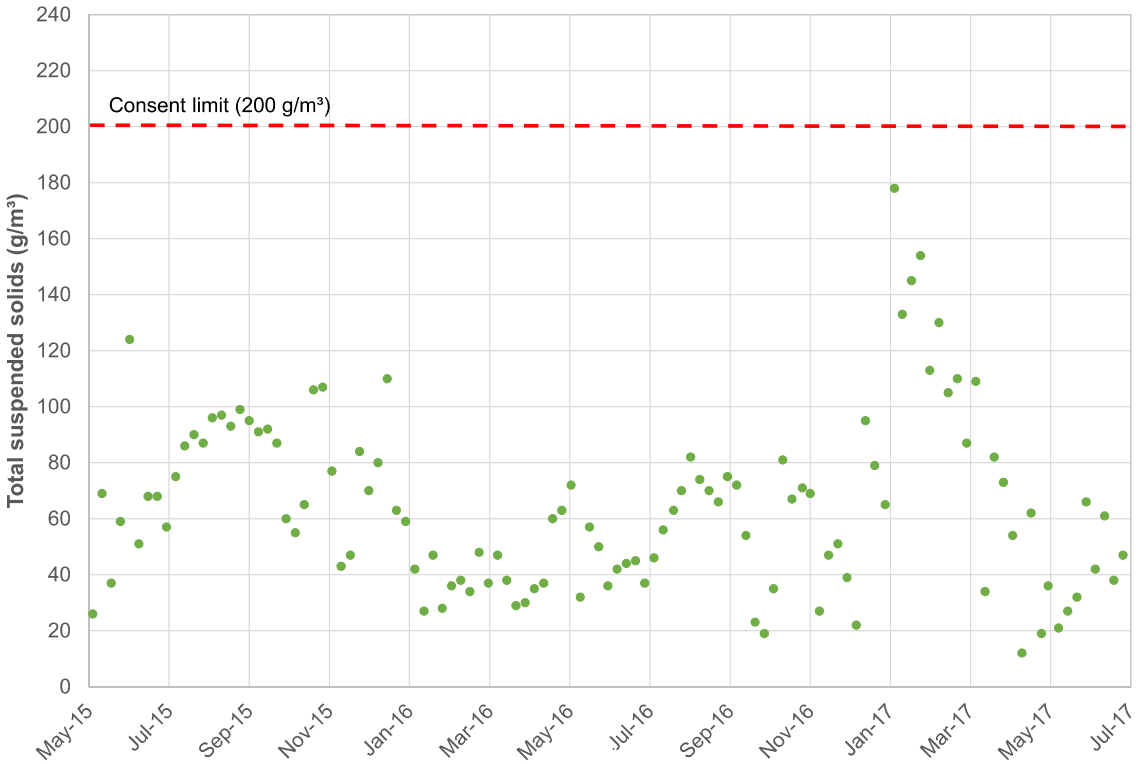

Figure 7: Total suspended solids in the ocean outfall discharge between May 2015 and June 2017.

2.3.3 Biochemical oxygen demand

BOD_5 results for the 2016/17 were similar to those recorded during the 2015/16 monitoring period (Figure 8), ranging from 8 g O_2/m^3 to 67 g O_2/m^3. Consistent with previous monitoring periods, soluble BOD_5 comprised approximately 11 % to 21 % (interquartile range) of the total BOD_5 during the 2016/17 monitoring period. One of the soluble BOD_5 results was above the consent limit of 25 g O_2/m^3 (Figure 9), however this exceedance did not result in a breach of Condition 11, which allows up to 16 exceedances in each 26-week period of the current monitoring period. There is no consent limit for BOD_5. A summary of the BOD of the ocean outfall discharge is provided in Table 6.

Table 6: Biochemical oxygen demand (g O_2/m^3) in the ocean outfall discharge.

Species	May 2016 to June 2017			May 2015 to June 2016			Consent limit
	N	Median	Range	N	Median	Range	
BOD_5 (g O_2/m^3)	61	27	8 - 67	61	26	8 – 69	-
Soluble BOD_5 (g O_2/m^3)	61	5	1 - 60	61	5	<2 – 12	25*

Note: * No more than 16 values to exceed limit in the 26-week period beginning 1 May and 1 November. N: number of samples.

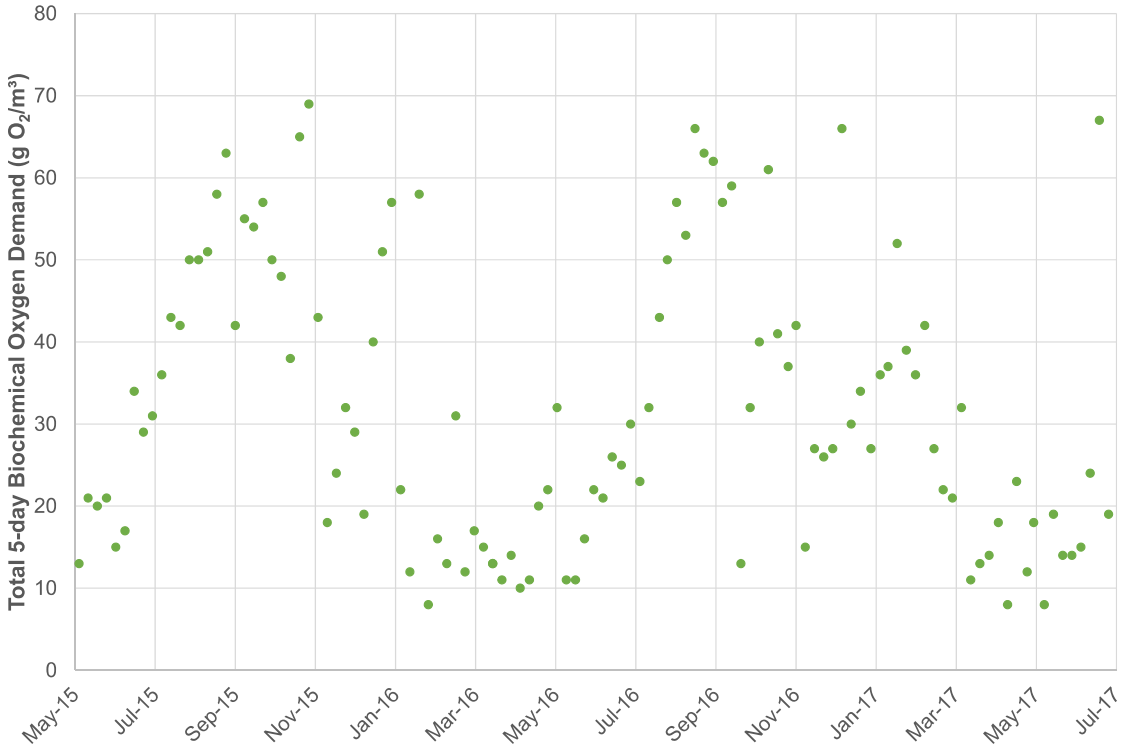

Figure 8: Five-day biochemical oxygen demand of the ocean outfall discharge between May 2015 and June 2017.

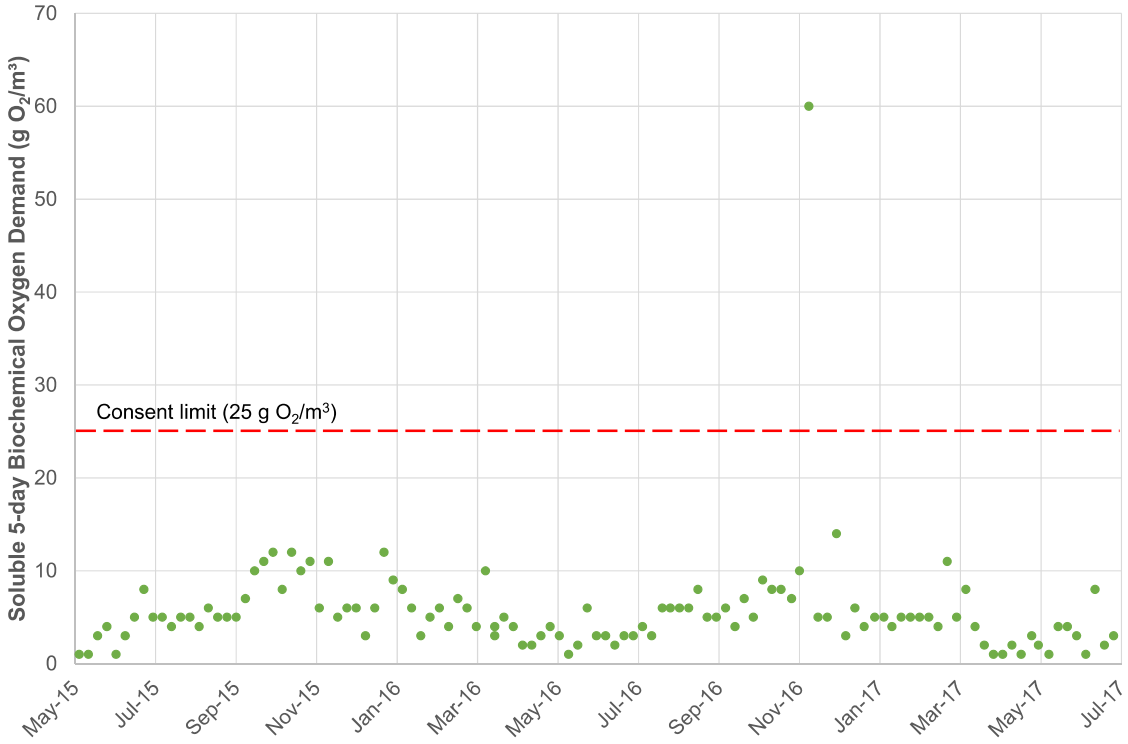

Figure 9: Soluble five-day biochemical oxygen demand of the ocean outfall discharge from May 2015 to June 2017.

2.3.4 Nutrients

Condition 9 requires dissolved inorganic nitrogen (DIN[2]), ammoniacal-N and dissolved reactive phosphorus (DRP) to be measured weekly. Total nitrogen (TN) and total phosphorus (TP) are required to be measured monthly. The frequency of monitoring prescribed by Condition 9 was met in full for the parameters sampled weekly, however TN and TP samples were not collected in January 2017 and, although samples were collected, they were not analysed in May 2017. An incorrect test request form was provided to the laboratory by WDC staff and not all required parameters were analysed. WDC will review their quality control procedure to ensure that the required parameters are tested in the future.

TN and TP were previously measured on a weekly basis, however during the 2016/17 monitoring period the monitoring schedule directly reflected the consent requirement of monthly sampling. A summary of nutrient concentrations in the ocean outfall discharge are shown in Table 7, along with the consent limit for ammoniacal-N.

Table 7: Nutrient concentrations (g/m³) in the ocean outfall discharge.

Species	May 2016 to June 2017			May 2015 to June 2016			Consent limit
	N	Median	Range	N	Median	Range	
Dissolved inorganic nitrogen	61	12.1	0.4 – 37	61	10.4	0.8 – 25	-
Ammoniacal-N	61	11.3	0.4 – 37	61	9.9	0.8 – 25	27*
Total nitrogen	14	16.4	7.9 – 36	56	16.5	8.1 – 39	-
Dissolved reactive phosphorus	61	4.3	1.7 – 10.3	61	5.3	2.0 – 10	-
Total phosphorus	14	5.4	3.7 – 8.1	56	6.6	3.2 – 11	-

Note: * No more than 16 values to exceed limit in the 26-week period beginning 1 May and 1 November. N: number of samples.

DIN in the discharge is shown in Figure 10 and is primarily made up of ammoniacal-N. As shown in Figure 11, with the exception of 12 uncharacteristically high results across the final eight months of the monitoring period, ammoniacal-N (and as such, DIN) concentrations followed a similar seasonal pattern to the 2015/16 monitoring period. Ammoniacal-N concentrations exceeded the consent limit of 27 g/m³ on eight occasions during the 2016/17 monitoring period (Figure 11). However, this exceedance did not result in a breach of Condition 11, which allows up to 16 exceedances in each 26-week period of the current monitoring period. There is no consent limit for DIN.

[2] DIN comprises nitrate-N, nitrite-N and ammoniacal-N

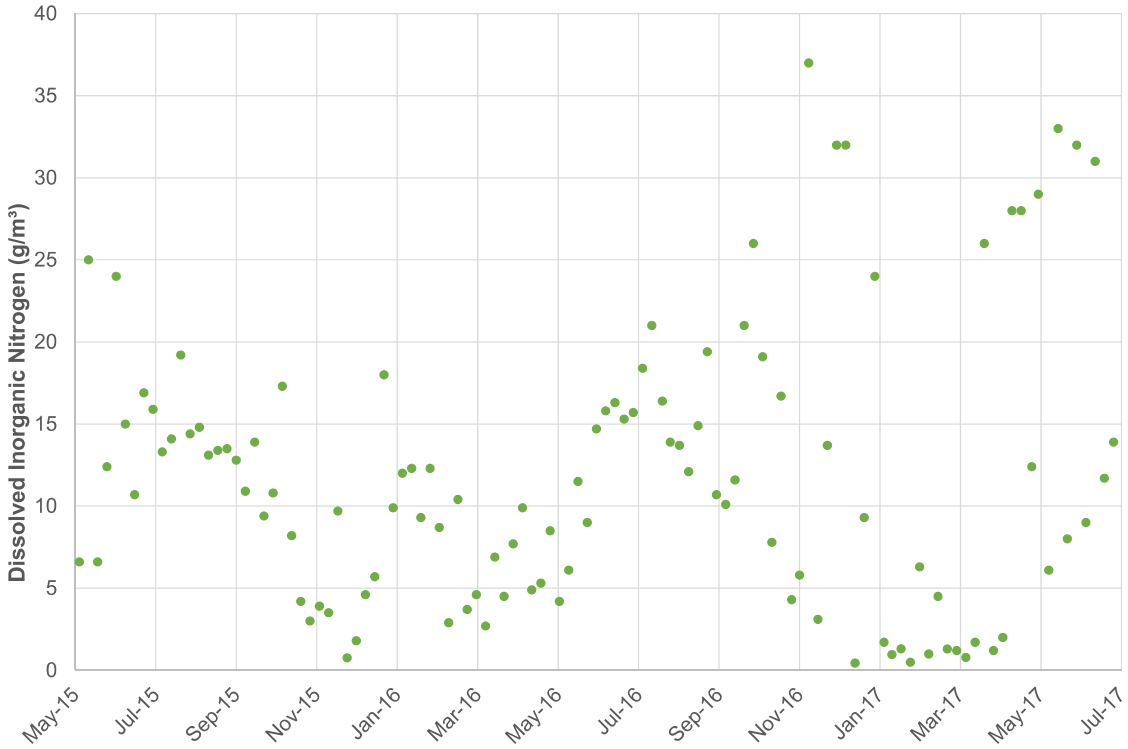

Figure 10: Dissolved inorganic nitrogen concentrations in ocean outfall discharge between May 2015 and June 2017.

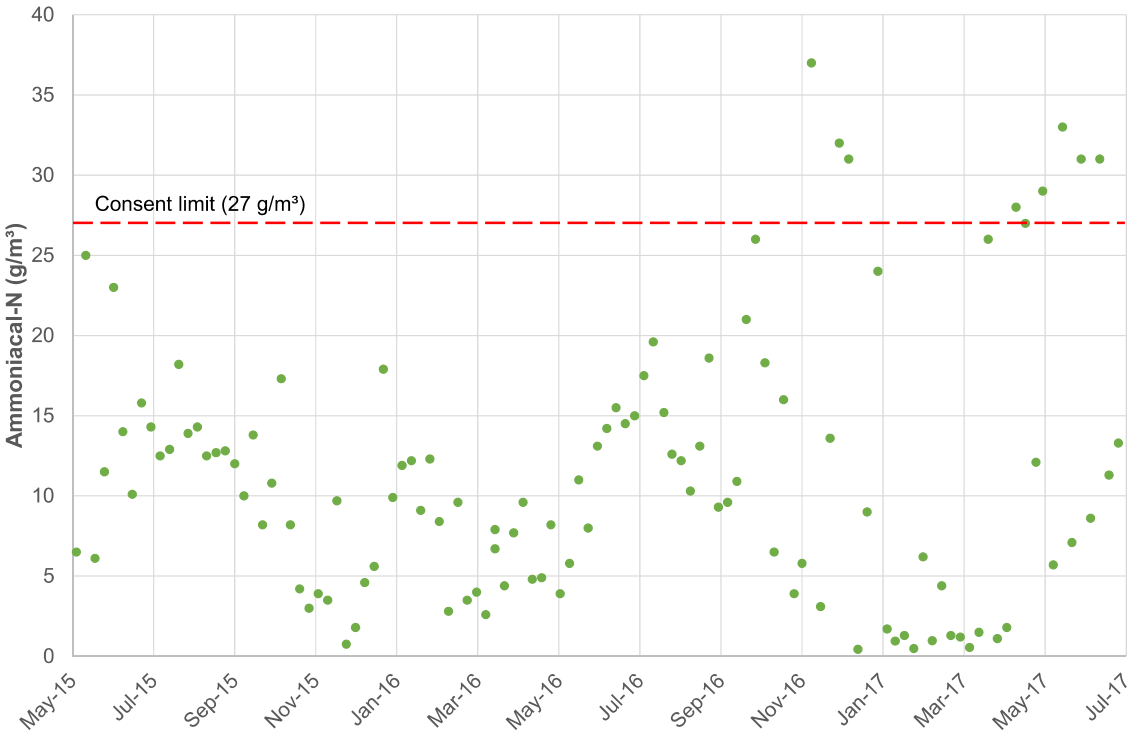

Figure 11: Ammoniacal-N concentrations in the ocean outfall discharge between May 2015 and June 2017.

TN concentrations over the 2016/17 monitoring period, which ranged from 7.9 g/m³ to 36 g/m³, were similar to those recorded during the 2015/16 monitoring period (Figure 12). There is no consent limit for TN.

The monitoring results for total phosphorus (TP) and dissolved reactive phosphorous (DRP) are shown in Figure 13 and Figure 14. DRP concentrations appear to be influenced by seasonal variations, with somewhat higher concentrations of both parameters occurring during the winter and spring months. Most of the phosphorus was present in the dissolved form (DRP). There are no consent limits for DRP or TP.

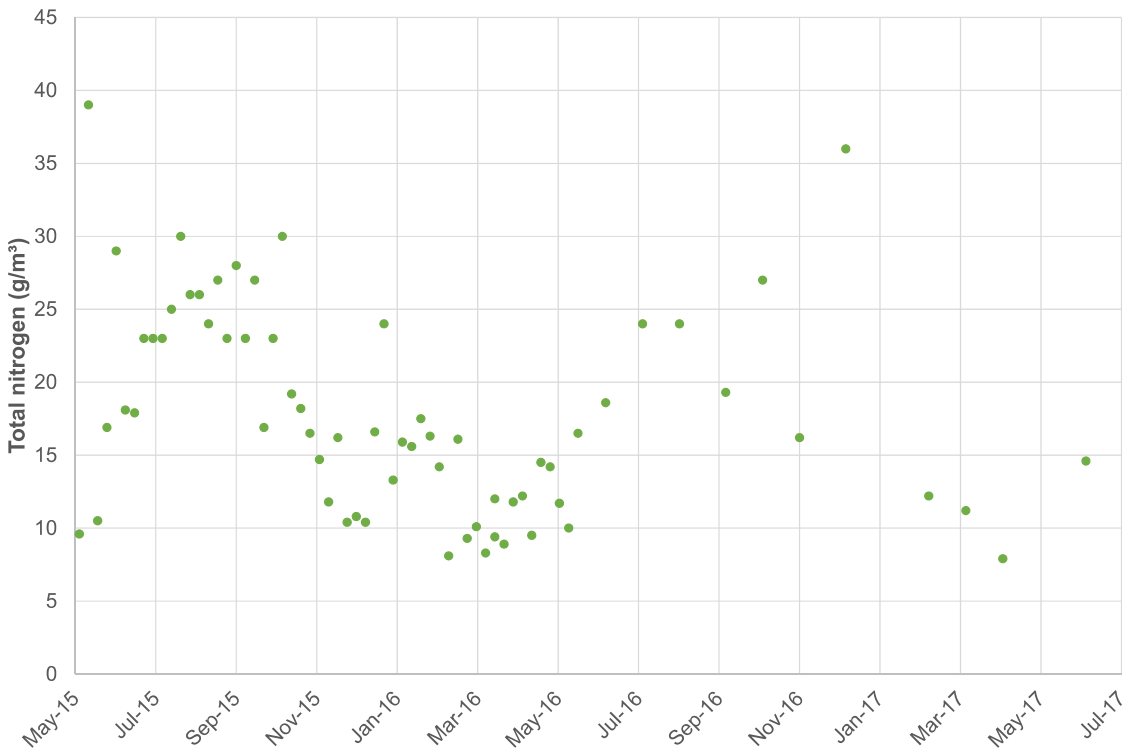

Figure 12: Total nitrogen concentrations in ocean outfall discharge between May 2015 and June 2017.

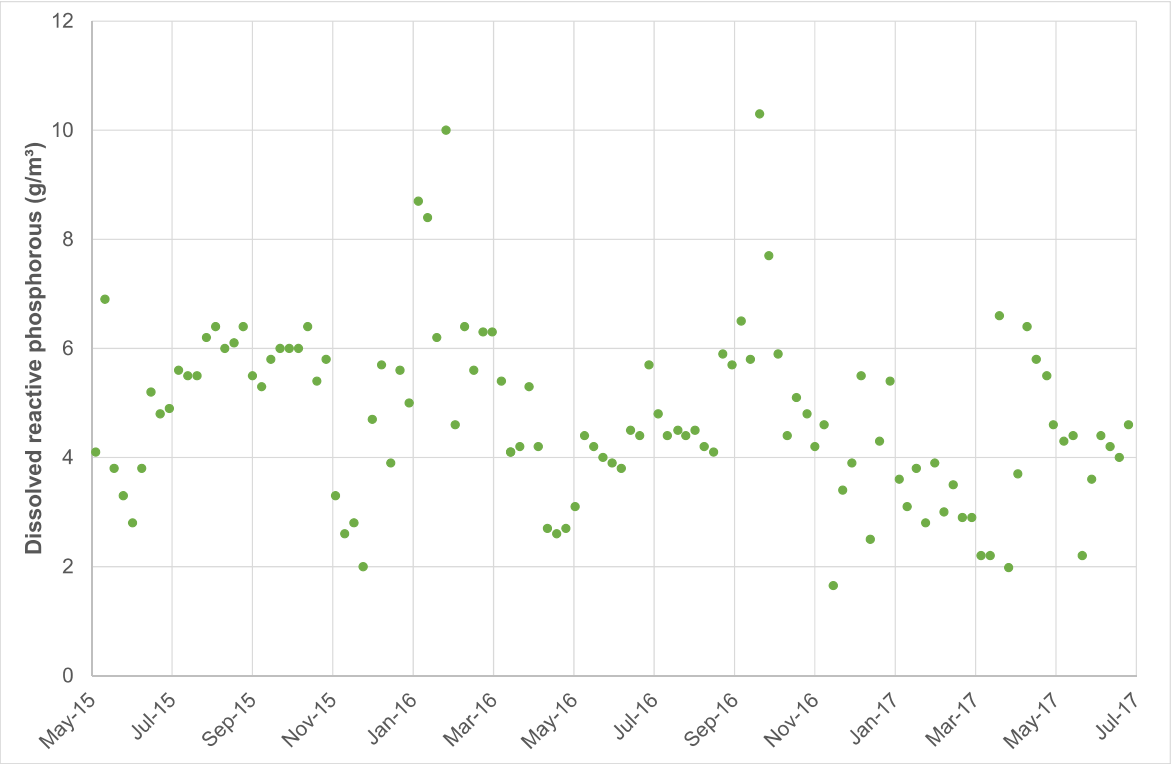

Figure 13: Dissolved reactive phosphorus concentrations in the ocean outfall discharge from May 2015 to June 2017.

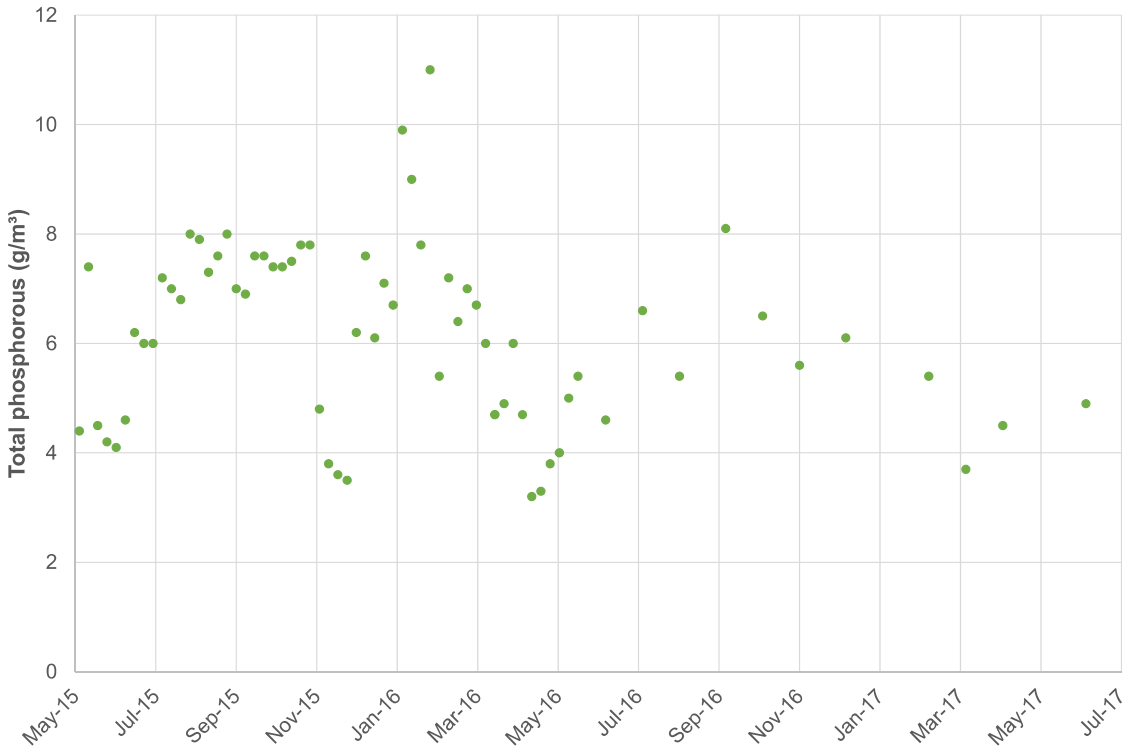

Figure 14: Total phosphorus concentrations in ocean outfall discharge between May 2015 and June 2017.

2.3.5 Microbiological quality

Faecal indicator bacteria

The Woodend and Kaiapoi WWTPs have ultraviolet (UV) disinfection systems to reduce bacterial numbers in the discharge. During the 2016/17 monitoring period the UV system was in continuous operation at both Woodend and Kaiapoi WWTPs.

Consent CRC041162.2 specifies weekly monitoring of three faecal indicator bacteria:

- Faecal coliforms
- Enterococci
- *Escherichia coli* (*E. coli*)

The faecal indicator monitoring data for 2016/17 are summarised in Table 8. The data is plotted alongside data from the previous monitoring period and relevant consent limits in Figure 15, Figure 16 and Figure 17. The sampling frequency for faecal indicator bacteria during the current monitoring period complied with the requirements of Condition 9.

Faecal coliform numbers were below relevant seasonal consent limits over the entire 2016/17 monitoring period (Figure 15), hence full compliance with Condition 12 was achieved for faecal coliforms.

Table 8: Faecal indicator bacteria in the ocean outfall discharge (cfu/100 mL).

Indicator	May 2016 to June 2017			May 2015 to June 2016			Consent limits*	
	N	Median	Range	N	Median	Range	Standard	High
Faecal coliforms (summer)	18	80	10 - 180	17	30	4 – 124,000	1,000	5,000
Faecal coliforms (winter)	43	20	<5 - 520	43	40	<5 – 1,800	9,000	20,000
Enterococci	61	20	5 – 5,200	61	10	<1 – >24,200	500	1,500
E. coli	61	30	<5 - 390	61	30	<5 – 950	-	-

Note: * For each period (summer: November–February; winter: March–October) no more than six out of eight consecutive samples may exceed the 'standard' value and no more than two out of eight consecutive samples may exceed the 'high' value. N: number of samples.

Enterococci numbers in a wastewater discharge of this type are typically lower than faecal coliform or *E. coli* numbers, which are more likely to include non-human derived faecal indicator bacteria as well as human-derived sources (MfE 2003). Consent limits for enterococci do not vary between seasons as they do for faecal coliforms, although there is still a standard (500 cfu/100 mL) and high (1,500 cfu/100 mL) limit.

Two samples, collected on 10 January 2017 (5,200 cfu/100mL) and 18 April 2017 (1,900 cfu/100 mL) exceeded the high limit (1,500 cfu/100 mL) (Figure 16). The resource consent allows for two out of eight consecutive samples to exceed the high limit. Therefore, full compliance with Condition 12 was achieved for enterococci.

There is no consent limit for *E. coli,* but numbers recorded were similar to faecal coliform numbers (Figure 17). These results indicate the majority of faecal coliforms recorded were likely to have been *E. coli*.

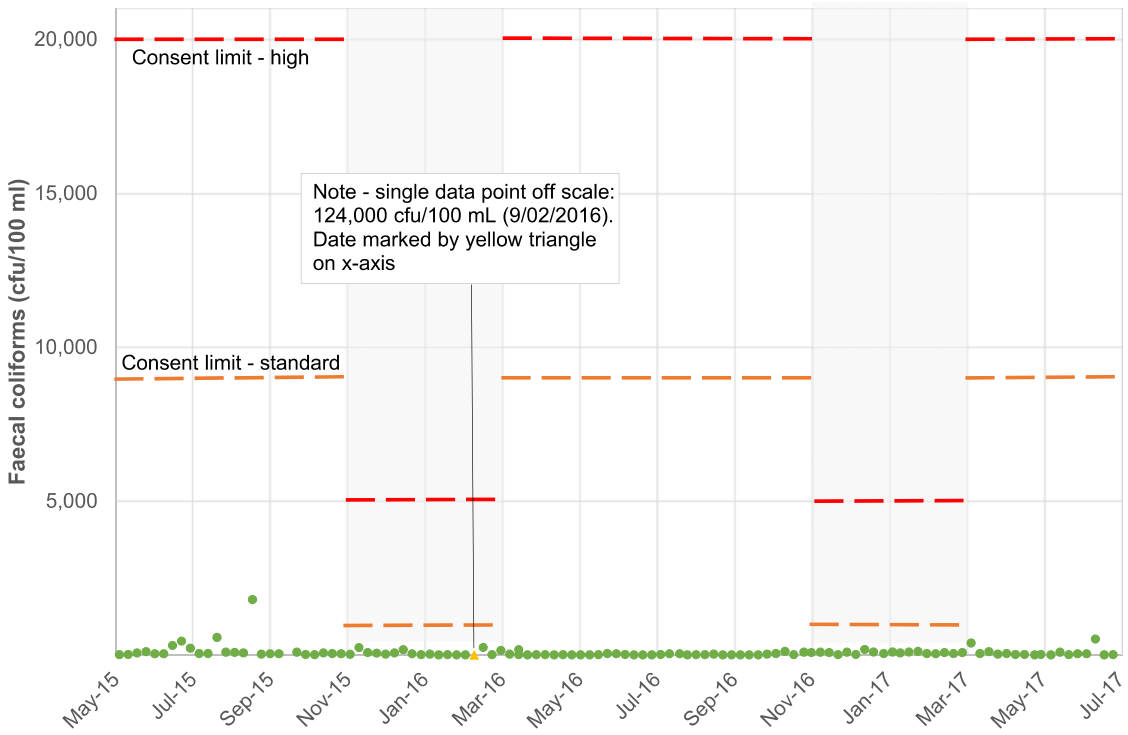

Figure 15: Faecal coliforms in ocean outfall discharge between May 2015 and June 2017.

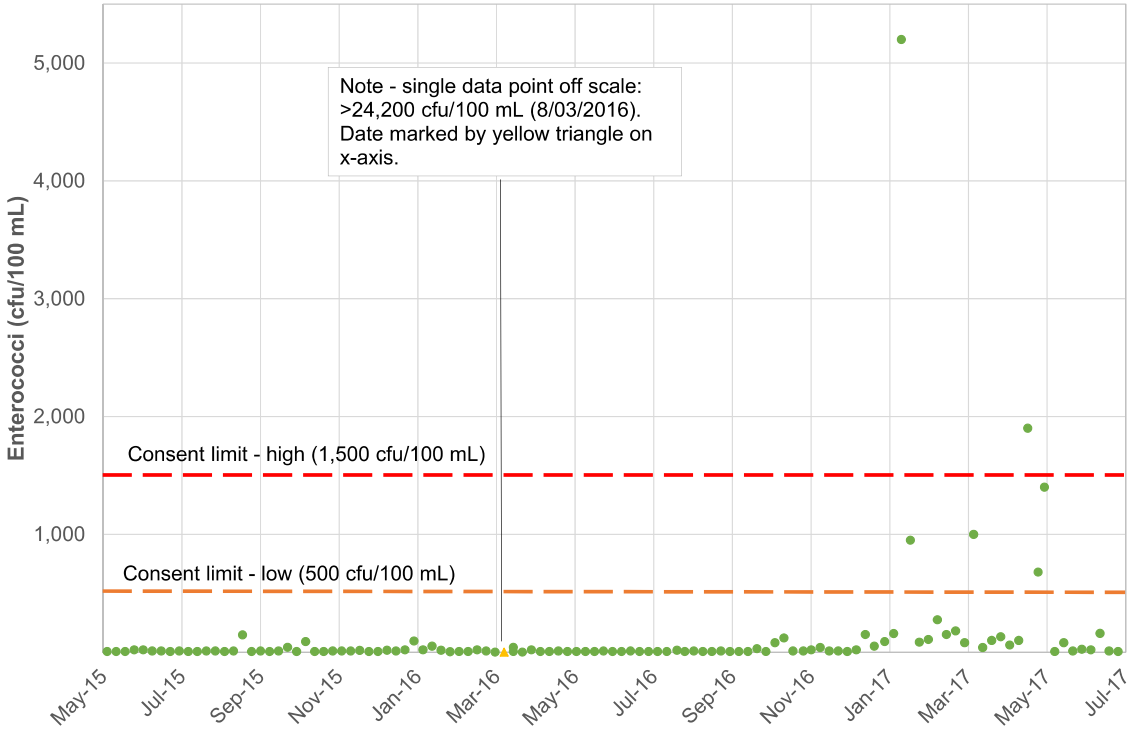

Figure 16: Enterococci in ocean outfall discharge between May 2015 and June 2017.

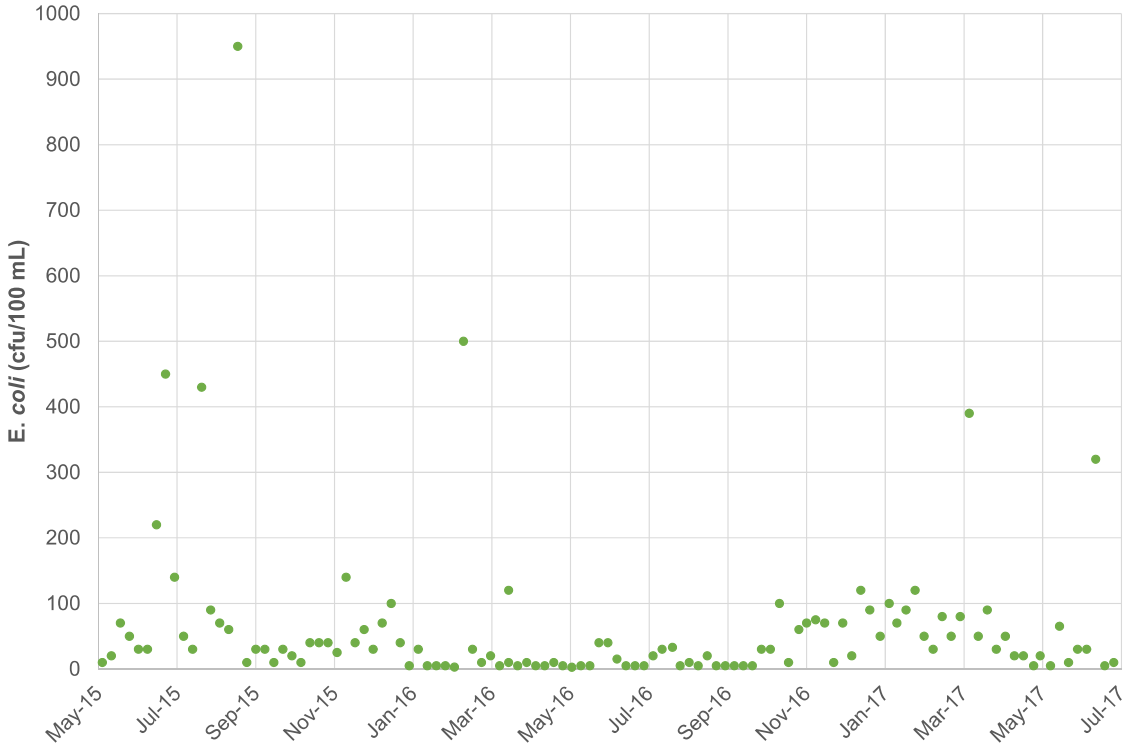

Figure 17: Escherichia coli in ocean outfall discharge between May 2015 and June 2017.

Human pathogens

The results for the 2016/17 human pathogen tests are shown in Table 9, alongside results from the previous monitoring periods. Human enterovirus, adenovirus, *Campylobacter* and *Salmonella spp*. are required to be sampled annually, as the three-monthly sampling was only required for the first two years.

The human pathogen sampling requirements of Condition 9(d) were met in full in March 2017. Human enterovirus and adenovirus were below their respective MDL during the 2016/17 monitoring period. *Campylobacter* was detected in the sample collected in March 2017 and was not isolated (i.e., not tested) in the previous three years. *Salmonella spp*. were not detected during the 2016/17 monitoring period. There are no consent limits for human pathogens.

Table 9: Human pathogens in ocean outfall discharge.

Pathogen	March 2017	March 2016	2015*	March 2014
Human enterovirus (pfu/10 L)	<10	<10	Not isolated	Not isolated
Human adenovirus (iu/10 L)	<10	<10	Not isolated	66
Campylobacter	Detected	Not isolated	Not isolated	Not isolated
Salmonella spp. (/500 mL)	Not detected	Not isolated	Not isolated	Not isolated

Note: Units: pfu = plaque forming units; iu = infectious units. * Pathogen monitoring during 2015 occurred over various dates.

2.3.6 Metals and metalloids

Total metal and metalloid concentrations since May 2014 are shown in Figure 18. These metals and metalloids are required to be sampled six-monthly. The samples were taken by WDC, however the laboratory did not test the samples for metals and metalloids during the 2016/17 monitoring period. This was

due to a misinterpretation of sample labelling, resulting in the incorrect suite parameters being tested. Further investigations and procedure reviews are being conducted to ensure this error does not occur again (Jackie Hunter, Hill Labs, pers. comm.). Once the error was identified, an additional sample was collected and analysed on 15 August 2017. This date is outside of the 2016/17 monitoring period, however is being considered to represent the second sampling requirement of the period.

Total metal and metalloid concentrations of the one sample analysed for the 2016/17 monitoring period were comparable to results from previous years. The laboratory detection limits during previous monitoring periods were the same for the current monitoring period, with the concentration of Total Cadmium being below its respective detection limit (value graphed as MDL/2).

There are no consent limits for any trace metals and metalloids.

2.3.7 Organochlorine pesticides, PCBs and PAHs

The annual monitoring for organochloride pesticides, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) was undertaken in March 2017. The full results are presented in Appendix E. All results were below their respective method detection limits, although these detection limits varies between parameters.

There are no limits for organochloride pesticides, PCBs and PAHs, specified in the resource consent.

2.3.8 Summary

Overall, all requirements of conditions 9 – 12 were largely met with the exception of some missing metals and metalloids data. The key results for the 2016/17 outfall monitoring programme were:

- Laboratory and field-measured pH in 2016/17 was comparable with that measured in 2015/16.
- Median DO concentrations were higher in 2016/17; however, DO concentrations were low for a sustained period between October and November 2016.
- There were no exceedances of the consent limit for TSS (200 g/m³) over the 2016/17 monitoring period.
- A single sample collected on 8 November 2016 exceeded the consent limit for SBOD (25 g O_2/m^3). However, this is permitted under Condition 11, which requires no more than 16 values to exceed the consent limit within each 26 week period.
- Ammoniacal-N concentrations exceeded the consent limit of 27 g/m³ on eight occasions during the 2016/17 monitoring period, however this is permitted under Condition 11, which requires no more than 16 values to exceed the consent limit within each 26 week period.
- There were no exceedances of the consent limits for faecal coliforms over the 2016/17 monitoring period.
- The high consent limit for enterococci (1,500 cfu/100 mL) was exceeded on two occasions, by samples collected on 10 January 2017 and 18 April 2017. However, this is permitted under Condition 12, which requires no more than six values from eight consecutive samples to exceed the consent limit.
- Samples from only a single sampling round in July 2017 (i.e., beyond the monitoring period) was tested for the 2016/17 period and this is a minor non-compliance. The results were similar to previous monitoring periods.
- All organochlorine pesticide, PCB and PAH results were below their respective method detection limits.

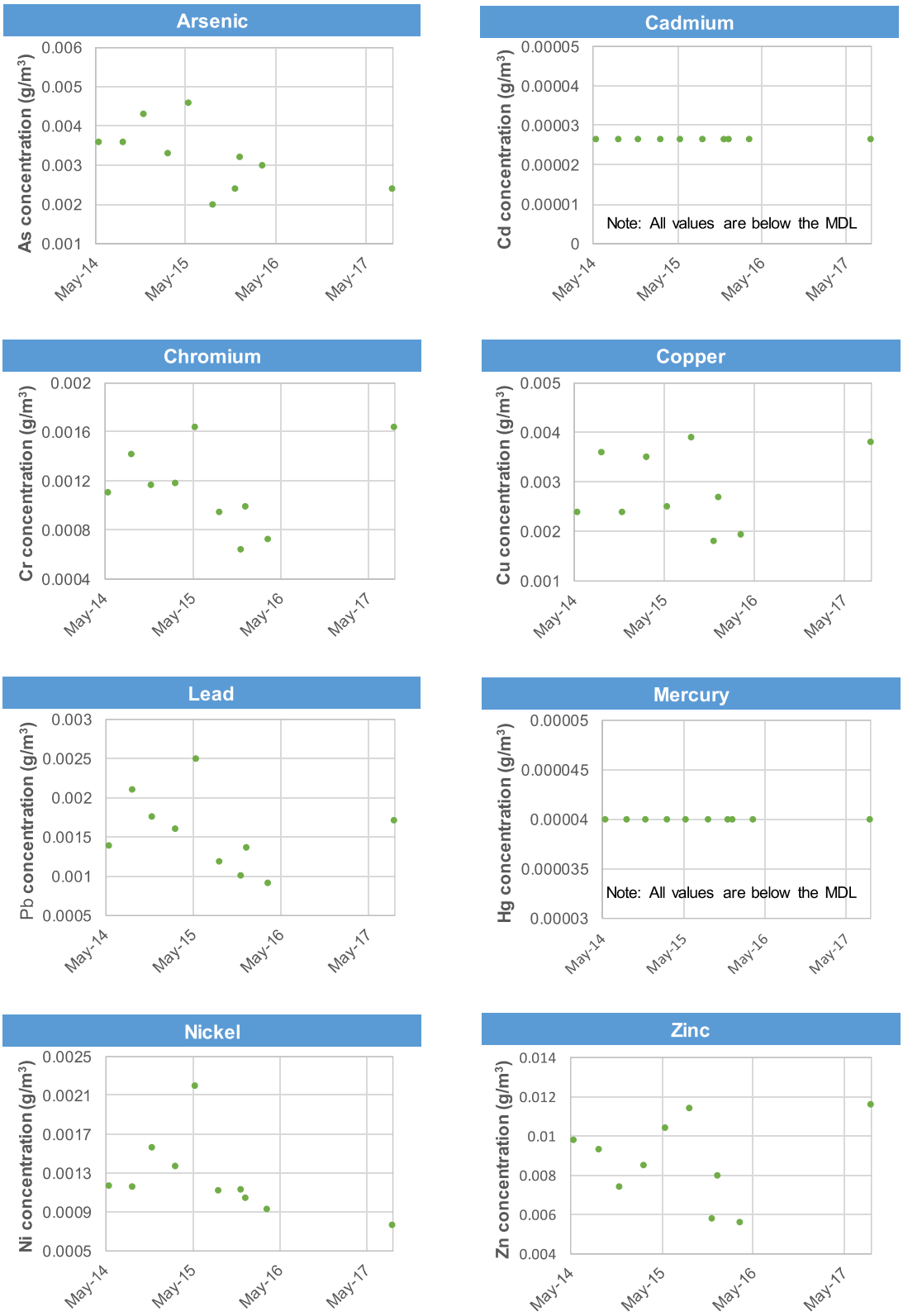

Figure 18: Trace metals and metalloids in ocean outfall discharge between May 2014 and June 2017.

2.4 Condition 13 – Woodend Beach, The Pines Beach and Waimakariri River Mouth

2.4.1 Monitoring requirements

Condition 13 of CRC041162.2 requires weekly monitoring for faecal coliforms and enterococci at Woodend Beach and The Pines Beach. Woodend Beach is located to the north of the ocean outfall and The Pines Beach to the south. Both locations are north of the Waimakariri River mouth, as shown in Figure 1. The frequency of monitoring during the 2016/17 period at Woodend Beach and The Pines Beach complied with these requirements. TN, TP and salinity monitoring are no longer required under Condition 13, as the two-year monitoring period is now complete, and not undertaken in the 2016/17 monitoring period.

2.4.2 Microbiological monitoring results

In addition to the weekly monitoring at Woodend Beach and The Pines Beach, WDC also sample at the Waimakariri River Mouth (generally on a weekly basis as per Woodend Beach and The Pines Beach). The microbiological data measured at each site are shown in Figure 19 and Figure 20, and summarised in Table 10.

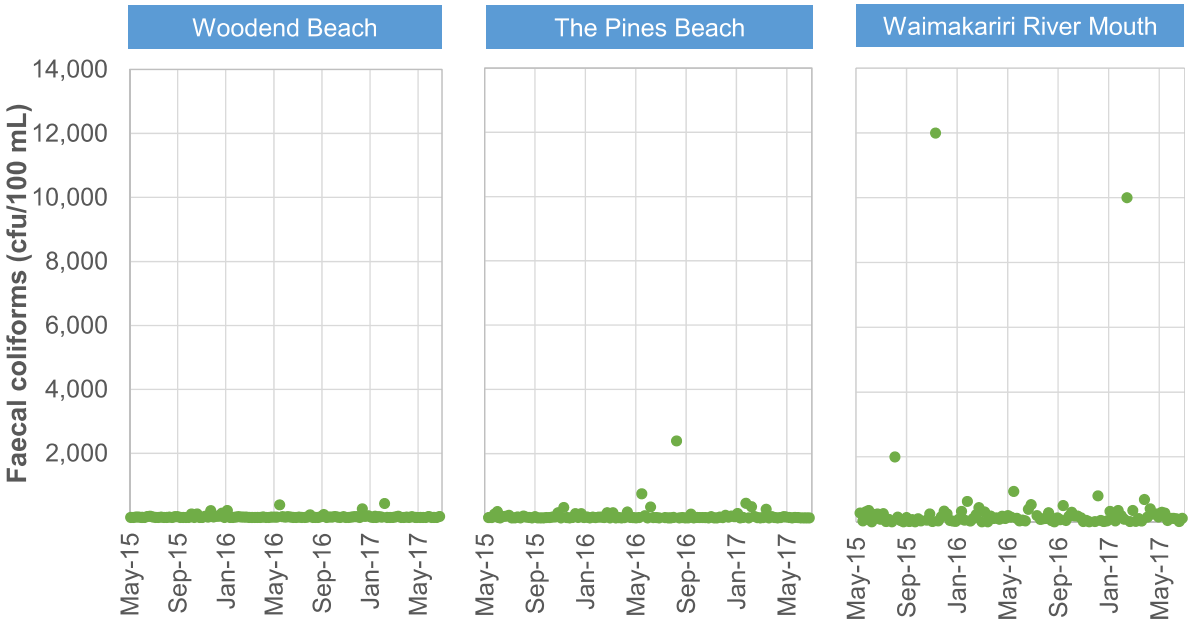

Figure 19: Faecal coliforms at Woodend Beach, The Pines Beach and Waimakariri River Mouth between May 2015 and June 2017.

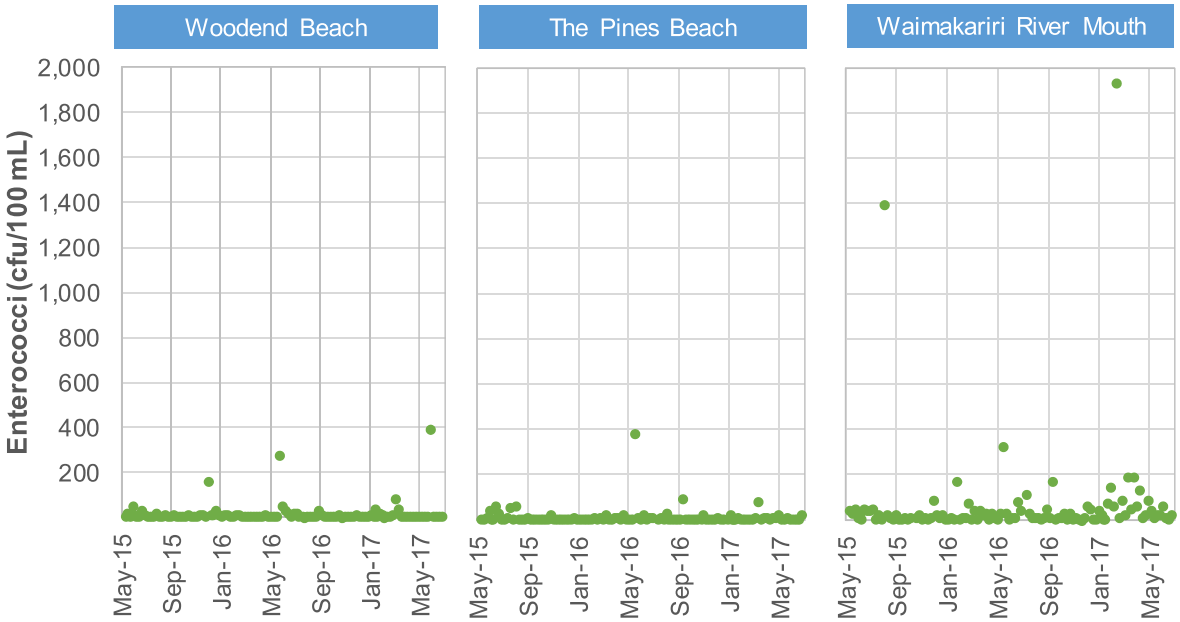

Figure 20: Enterococci at Woodend Beach, The Pines Beach and Waimakariri River Mouth between May 2015 and June 2017.

Table 10: Microbiological monitoring results for Woodend Beach, The Pines Beach and Waimakariri River Mouth between May 2016 and June 2017.

Indicator	Woodend Beach		The Pines Beach		Waimakariri River Mouth	
	N	Median (range)	N	Median (range)	N	Median (range)
Faecal coliforms (cfu/100 ml)	61	7 (<1 – 440)	60	9 (<1 – 2,400)	59	110 (2 – 10,000)
Enterococci (cfu/100 ml)	61	20 (<10 – 393)	61	<10 (<10 – 384)	60	20 (<10 – 1,935)

Note: N: number of samples.

Median numbers of faecal coliforms were highest at the Waimakariri River Mouth in all monitoring periods reported to date (Figure 19). These results could be due to a number of factors that differentiate the river mouth from Woodend and The Pines Beach (e.g., lowland tributaries [Styx River and Kaiapoi River] entering near the mouth, birdlife from Brooklands Lagoon and the short survival rate of faecal coliforms in marine waters).

Median numbers of faecal coliforms recorded at Woodend, The Pines Beach and at the Waimakairi River Mouth in 2016/17 were similar to those reported in 2015/16.

Median numbers of enterococci recorded at Woodend, The Pines Beach and at the Waimakairi River Mouth (Figure 20) showed a slight increase from the 2015/16 results.

2.4.3 Compliance summary – beaches

Compliance with the monitoring requirements of Condition 13 for sampling at Woodend Beach and The Pines Beach was met in full during the 2016/17 monitoring period.

2.5 Condition 14 – Visual Observations

As required by Condition 14, WDC make visual observations at each sampling site to assess the presence of conspicuous oil or grease films, scums or foams or floatable materials. Wind speed and direction were also recorded and are available on request.

During the 2016/17 period, no conspicuous oil or grease films, scums or foams, or floatable materials were noted at either Woodend Beach or The Pines Beach on any of the weekly site visits during the monitoring period.

The investigations and faecal source tracking testing requested by the community and Councillors and mentioned in the 2015/16 monitoring and compliance report (Golder 2016) is still being conducted by ESR.

2.6 Conditions 15 to 26 - Water Quality, Surface Sediments and Benthic Infauna

WDC was granted a change of conditions, effective from 12 March 2009, relating to the sampling of mixing zone water quality, sediments and benthic infauna. Sampling is required after three years following commissioning of the ocean outfall and at five yearly intervals thereafter. Water quality, surface sediments and benthic infauna sampling was required during the 2016/17 monitoring period and sampling methodology, results and interpretation are provided in the attached report (Appendix F) prepared by the National Institute of Water and Atmospheric Research (NIWA) (Brown 2017).

2.6.1 Water Quality

Brown (2017) has reported that a plume was visible at the surface, however no foam, scum or floating material was observed. There was no indication of elevated concentrations of nutrients due to discharges from the ocean outfall diffuser, with concentrations variable in all directions irrespective of distance from the diffuser. During the last water quality survey conducted, Handley et al. (2012) reported that concentrations of all variables decreased with increased distance from the diffuser, before returning to background levels between 200-500 m from the diffuser. This was similar to the previous survey (conducted in 2012) and may indicate that greater mixing has been occurring at the ocean outfall discharge in the previous five years than prior.

Overall, compliance with the requirements of Conditions 15-18 were met.

2.6.2 Surface Sediments

Brown (2017) has reported that sediments collected as part of the fifth post-construction survey comprised of mainly dark grey muddy sand overlain with a fine-grained mud layer of variable thickness, with no significant quantities of material that might be of terrestrial origin present. No material of human origin, nor any strong sulphide odour were detected. Samples analysed for trace metals indicated that levels were not elevated at any of the sampling stations and were below trigger levels identified in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000). Nitrogen and carbon levels did appear to be slightly elevated at the sample site 250 m north of the diffuser where there was a high proportion of fine grained sediments. The link between slightly elevated nitrogen and carbon levels and a higher proportion of fine grained sediments has been noted in previous surveys (Brown et al. 2008, Handley et al. 2012).

Overall, compliance with Conditions 19-23 were met.

2.6.3 Benthic Infauna

As reported by Brown (2017), the infaunal grabs collected as part of the survey sampled 74 taxa, with no clear patterns in the number of taxa or number of individuals at different distances in different directions from the diffuser being reported. In the non-metric multidimensional scaling (n-MDS) plot of infauna sampled in 2017, the samples collected at the diffuser and sampling stations 100 m to the north and south of the diffuser lie in close proximity. This indicates some similarity among these infaunal assemblages relative to the other stations. Results of the PERMANOVA analyses conducted using data from all previous post-construction

surveys show that there were significant changes to the infaunal assemblage between years and distance from the diffuser with orientation. The Year x Distance interaction was also significant, indicating that in either direction the variation among sites at varying distances from the diffuser was not consistent among years (Brown 2017).

Overall, compliance with Conditions 23-26 were met.

2.7 Condition 30 – Complaints

Condition 30 states the following:

> *"The consent holder shall maintain and keep a complaints register for all aspects of all operations in relation to the discharge into the ocean. The register shall detail the date, time and type of complaint, cause of the complaint, and action taken by the Consent Holder in response to the complaint. The register shall be available to the Canterbury Regional Council at all reasonable times."*

WDC maintains a complaints register in accordance with the requirements of Condition 30. WDC confirmed to Golder that no complaints related to the ocean outfall or WWTPs on the EDSS were received during the 2016/17 monitoring period.

2.8 WWTP Operations, Maintenance and Major Shutdowns

WDC has provided an update on operations, maintenance and major shutdowns for the monitoring period. For most of the 2016/17 monitoring period, the ocean outfall has operated as normal, with no issues reported. The only shut-downs to occur were to allow divers to conduct an annual inspection of the diffusers.

2.9 Summary of Compliance – CRC041162.2

Table 11: Summary of compliance for 2016/17 for consent CRC041162.2.

Consent condition	Description	Compliance
Condition 2	Discharge volume and rate	Full compliance
Condition 9	Ocean outfall discharge quality	9(a) Full compliance 9(b) Compliant for 10 of 14 months for both parameters 9(c) Partial compliance; only one sample collected 9(d) Full compliance 9(e) Full compliance
Condition 11	Discharge BOD_5, TSS, ammoniacal-N limits	Full compliance
Condition 12	Discharge microbiological limits	Full compliance
Condition 13	Woodend Beach and The Pines Beach	Full compliance
Condition 14	Visual observations	Full compliance
Condition 15 – 26	Water quality, surface sediments and benthic infauna	Full compliance
Condition 30	Complaints	Full compliance

3.0 CRC041049 – DISCHARGE FROM KAIAPOI WWTP

3.1 Condition 2 – Groundwater Quality Monitoring

Condition 2 states the following:

> *"The consent holder shall monitor on-site bores 1, 2, and 3 and two new monitoring bores within 200 metres of the site, on a monthly basis for a period of up to two years after the introduction of Rangiora effluent into the wetland, thereafter at three monthly intervals. Samples from the monitoring shall be analysed for faecal coliforms,* E. coli*, nitrate-nitrogen and ammoniacal-nitrogen."*

The locations of the groundwater quality monitoring bores are shown in Figure 21. The regional groundwater flow is assumed to be towards the east in the direction of the coast. Bore 1 (labelled as WDC1) and Bore A are considered 'control' bores as they are located up-gradient of the WWTP, whereas bores 2, 3 (labelled as WDC2 and WDC3, respectively) and B are 'effects' bores as they are down-gradient from the WWTP. Effects of the WWTP may be evident in groundwater quality through a comparison of the 'control' bores with the down-gradient bores' water quality.

Figure 21: Location of Kaiapoi monitoring bores.

Although the two-year period of monthly sampling required by Condition 2 was met as of February 2008, monthly sampling continued until February 2010 when three-monthly sampling commenced. Four samples were collected during the 2016/17 monitoring period. Therefore, the three-monthly sampling requirement was met.

3.2 Groundwater Monitoring Results

3.2.1 Nutrients

Nutrient concentrations in the five bores for the 2016/17 monitoring period are shown in Table 12. Nitrate nitrogen (nitrate-N) data are plotted in Figure 22 and ammoniacal-N data are plotted in Figure 23. The laboratory's minimum detection limit for nitrate-N in 2016/17 varied from 0.002 to 0.02 g/m³. The detection limit in 2015/16 was 0.002 g/m³.

Similar to the previous monitoring period, the highest nitrate-N concentration during the 2016/17 monitoring period was recorded in Bore B in July 2016 (2.3 g/m³) (Figure 22). Nitrate-N concentrations recorded from the remaining two down-gradient bores (WDC2 and WDC3) were either low or below detection limits. Aside from a sample collected from Bore A in April 2017, all results from the two up-gradient (WDC1 and Bore A) bores were below detection. There was no clear trend evident in nitrate-N concentrations at any site during the 2016/17 monitoring period.

Ammoniacal-N concentrations were below detection limits in the up-gradient bores. High concentrations are measured in the down-gradient bores. Ammoniacal-N concentrations were generally highest in Bore WDC3. Results from the 2016/17 monitoring period are consistent with previous monitoring (Figure 23), and indicate that the WWTP discharge is influencing groundwater quality down-gradient of the WWTP. Ammoniacal-N concentrations did however appear to decrease at Bore WDC2 over the 2016/17.

Table 12: Nitrate-N and ammoniacal-N concentrations in Kaiapoi WWTP groundwater monitoring bores.

Bore	Nitrate-nitrogen (g/m³)				Ammoniacal-nitrogen (g/m³)			
	Jul 16	Oct 16	Jan 17	Apr 17	Jul 16	Oct 16	Jan 17	Apr 17
WDC1 (control)	<0.002	<0.002	<0.002	<0.002	<0.010	0.014	0.015	0.014
A (control)	<0.002	<0.002	<0.002	0.003	0.128	0.110	0.103	0.041
WDC2 (effect)	<0.002	<0.002	<0.02	0.157	9.0	8.0	8.1	2.7
WDC3 (effect)	<0.002	0.004	<0.002	0.21	5.9	10.3	16.4	5.5
B (effect)	2.3	0.005	<0.02	0.014	7.1	6.9	7.0	3.1

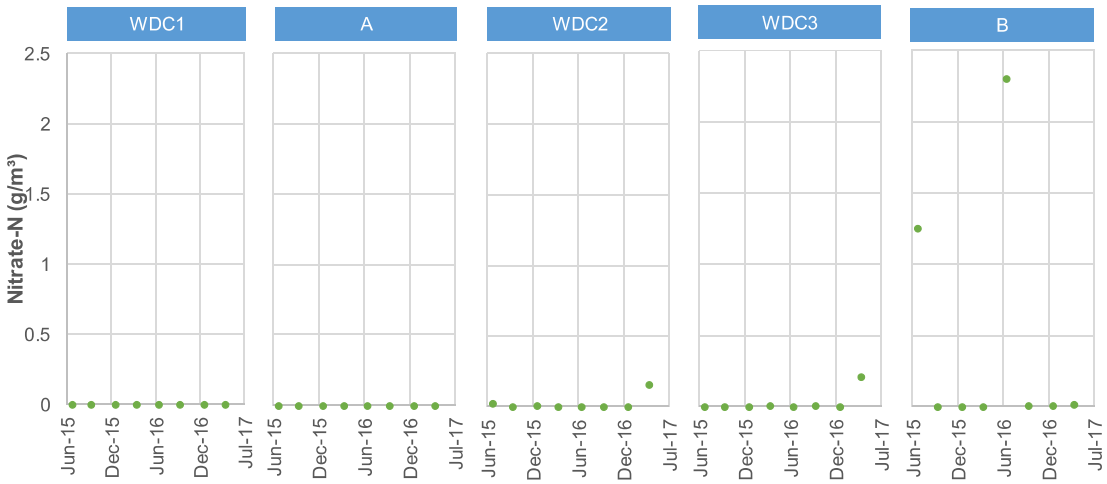

Figure 22: Nitrate-N concentrations in Kaiapoi WWTP monitoring bores between May 2015 and June 2017.

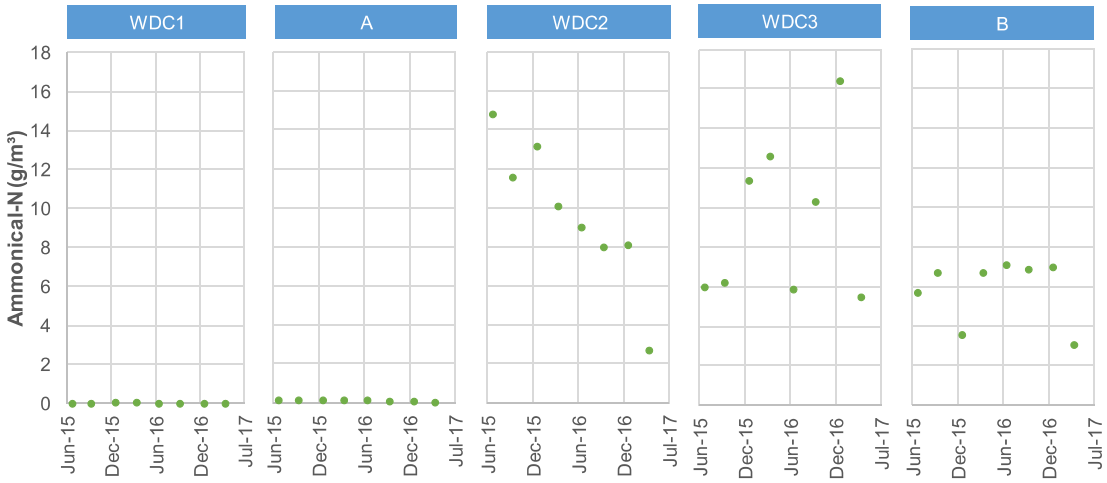

Figure 23: Ammoniacal-N concentrations in Kaiapoi WWTP monitoring bores between May 2015 and June 2017.

3.2.2 Faecal indicator bacteria

E. coli and faecal coliform numbers measured during sampling in 2016/17 are tabulated in Table 13 and shown on Figure 24 and Figure 25, respectively. *E. coli* and faecal coliform concentrations recorded in 2015/16 are also shown for comparison.

All samples for both E.*coli* and faecal coliforms from the up-gradient bores (WDC1 and Bore A) were below detection limits, along with Bore WDC2 downgradient of the WWTP. High E.*coli* and faecal coliform levels were recorded in Bore WDC3 and Bore B in July 2016 and January 2017, but were below detection limits in October 2016 and April 2017. The highest recorded numbers of *E. coli* (190 cfu/100 mL) and faecal coliforms (230 cfu/100 mL) in 2016/17 were recorded from Bore B in July 2016.

Table 13: *Escherichia coli* and faecal coliforms in Kaiapoi WWTP groundwater monitoring bores.

Bore	*Escherichia coli* (cfu/100 mL)				Faecal coliforms (cfu/100 mL)			
	Jul 16	Oct 16	Jan 17	Apr 17	Jul 16	Oct 16	Jan 17	Apr 17
WDC1	<1	<1	<1	<1	<1	<1	<1	<1
A	<1	<1	<1	<1	<1	<1	<1	<1
WDC2	<1	<1	<1	<1	<1	<1	<1	<1
WDC3	40	<1	100	<1	40	<1	100	<1
B	190	<1	<1	3	230	<1	<1	3

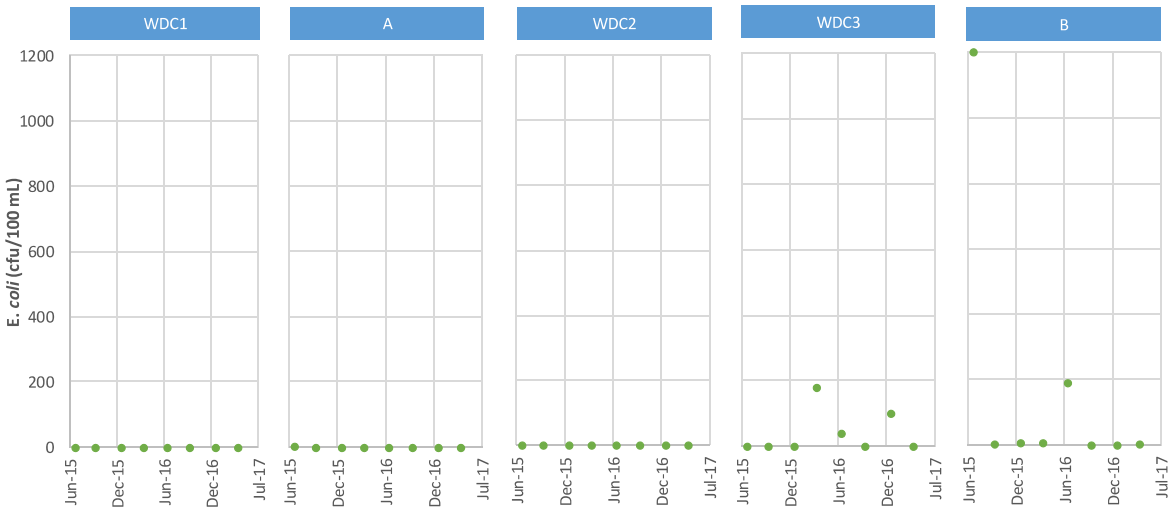

Figure 24: Escherichia coli in Kaiapoi WWTP monitoring bores between May 2015 and June 2017.

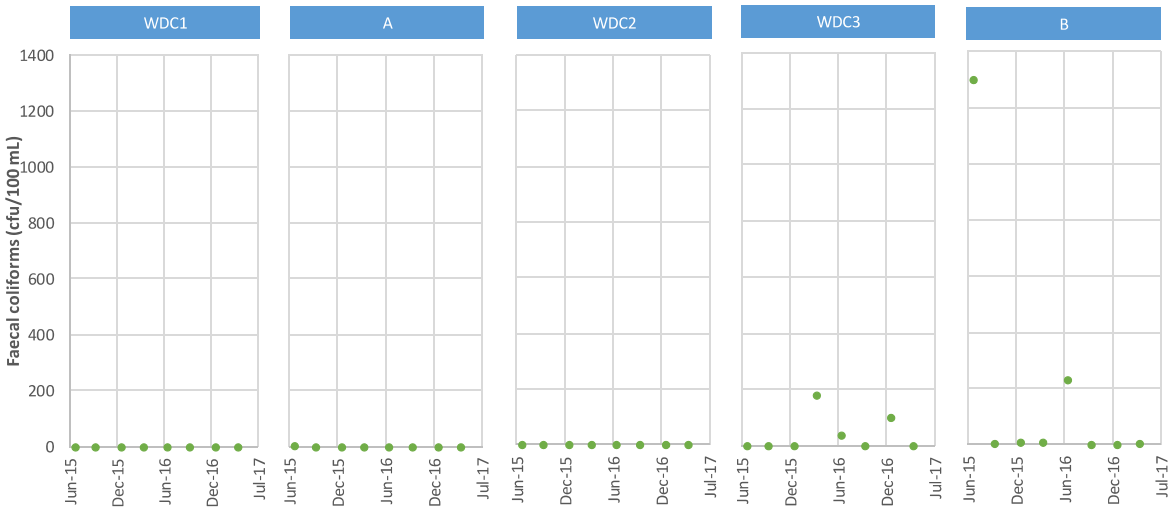

Figure 25: Faecal coliforms in Kaiapoi WWTP monitoring bores between May 2015 and June 2017.

3.3 Condition 6 – Operations and Reporting

Major works carried out at the Kaiapoi WWTP during the 2016/17 monitoring period included desludging of the aeration basin (Figure 26). Approximately 1,834 dry tonnes of material were removed from the basin, a significant amount of which appeared to be liquefaction material that entered the WWTP from the various pumping stations around Kaiapoi. This desludging will allow for greater holding capacity within the aeration basin. No further works were completed during the 2016/17 monitoring period.

Figure 26: Desludging of aeration basin at Kaiapoi WWTP.

The occurrence of avian botulism that occurred in the 2013/14 and 2014/15 periods did not occur to any notable degree in the 2016/17 monitoring period.

3.4 Summary of Compliance – CRC041049

WDC has complied with the monitoring and reporting requirements of resource consent CRC041049 (Table 14). Groundwater monitoring of five bores in the vicinity of Kaiapoi WWTP in 2016/17 indicated that the WWTP influences groundwater quality downgradient, similar to that identified in previous monitoring periods.

Apart from a single high nitrate-N concentration recorded from Bore B in July 2016, nitrate-N concentrations recorded over the 2016/17 monitoring period were generally low and showed no clear pattern or trends. Ammoniacal-N concentrations were below detection limit in the up-gradient bores (WDC1 and Bore A) and high concentrations were observed in the down-gradient bores, indicating downgradient groundwater quality is influenced by the WWTP. Numbers of *E. coli* and faecal coliforms were below detection limit in the up-gradient bores, and showed variability with occasional elevated numbers occurring down-gradient of the WWTP in bores B and WDC3.

Table 14: Summary of compliance for 2016/17 for consent CRC041049.

Consent condition	Description	Compliance
Condition 2	Groundwater monitoring	Full compliance
Condition 6	Annual reporting	Full compliance

4.0 CRC168391 – FROM WOODEND WASTEWATER TREATMENT PLANT

4.1 Overview

The Woodend WWTP is located approximately 23 km north of Christchurch (Figure 27) and receives wastewater from Woodend, Waikuku Beach, Pegasus, Tuahiwi and Woodend Beach. The WWTP consists of an inlet screen, two aeration basins, settling pond and a wetland. Treated wastewater passes through an ultraviolet (UV) disinfection system before being pumped to the ocean outfall between The Pines Beach and Woodend Beach, north of the Waimakariri River mouth.

Figure 27: Location of Woodend WWTP and groundwater monitoring sites.

Resource consent compliance for the period 1 July 2016 to 30 June 2017 (the monitoring period) has been assessed using monitoring data provided by WDC. WDC undertakes additional monitoring at the WWTP which, although not required by the consent, is included in this report where relevant.

4.2 Conditions 5 – 6: Seepage

4.2.1 Record keeping for daily volumes

The resource consent requires WDC to keep records of daily volumes received by the Woodend WWTP and daily volumes discharged to the ocean outfall. As shown in Figure 28, the Woodend WWTP receives influent wastewater from five wastewater pump stations. These are:

- Gladstone Road pump station (Petries Road is non-operational).
- Woodend Beach pump station.
- Waikuku Beach WWTP.
- Pegasus Main Street pump station.
- Mary Ellen Street pump station.

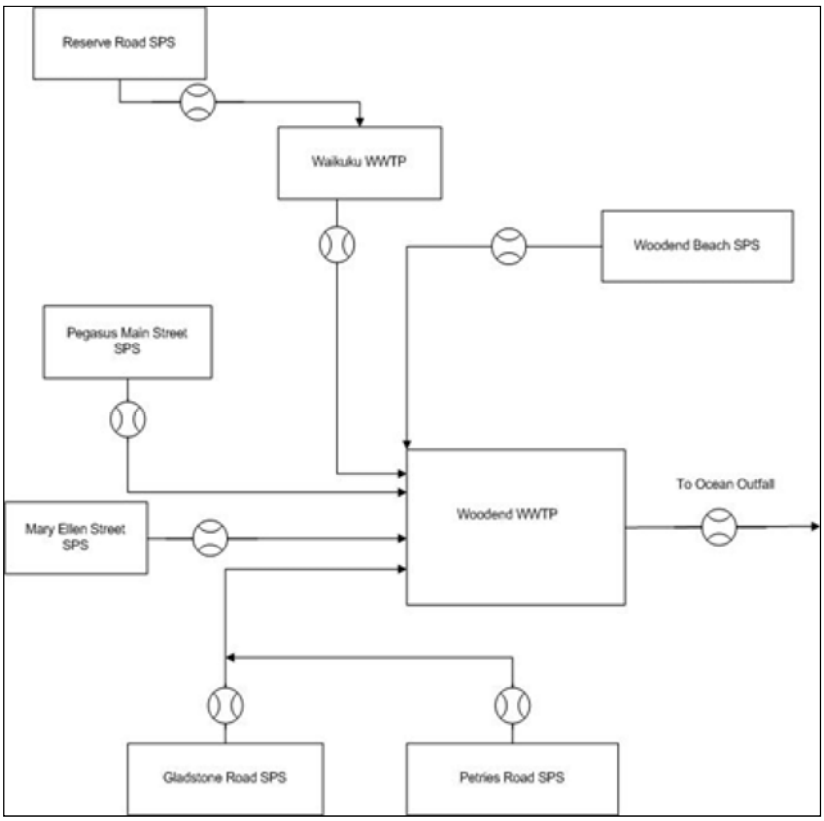

Figure 28: Schematic Woodend sewer network. Image provided by WDC.

Inflow records from the electromagnetic flow meters at Gladstone Road, Woodend Beach, Waikuku Beach WWTP and Pegasus Town for the period 1 May 2016 to 30 June 2017 were recorded by a telemetered SCADA system. These volumes are presented as the combined daily inflow volumes in Figure 29. Rainfall data from the Woodend, Gladstone weather station for the corresponding period is also presented on the same figure for comparison. During the monitoring period, the median daily inflow volume to the Woodend WWTP was 1,339 m^3/day and the median daily outflow was 1,436 m^3/day.

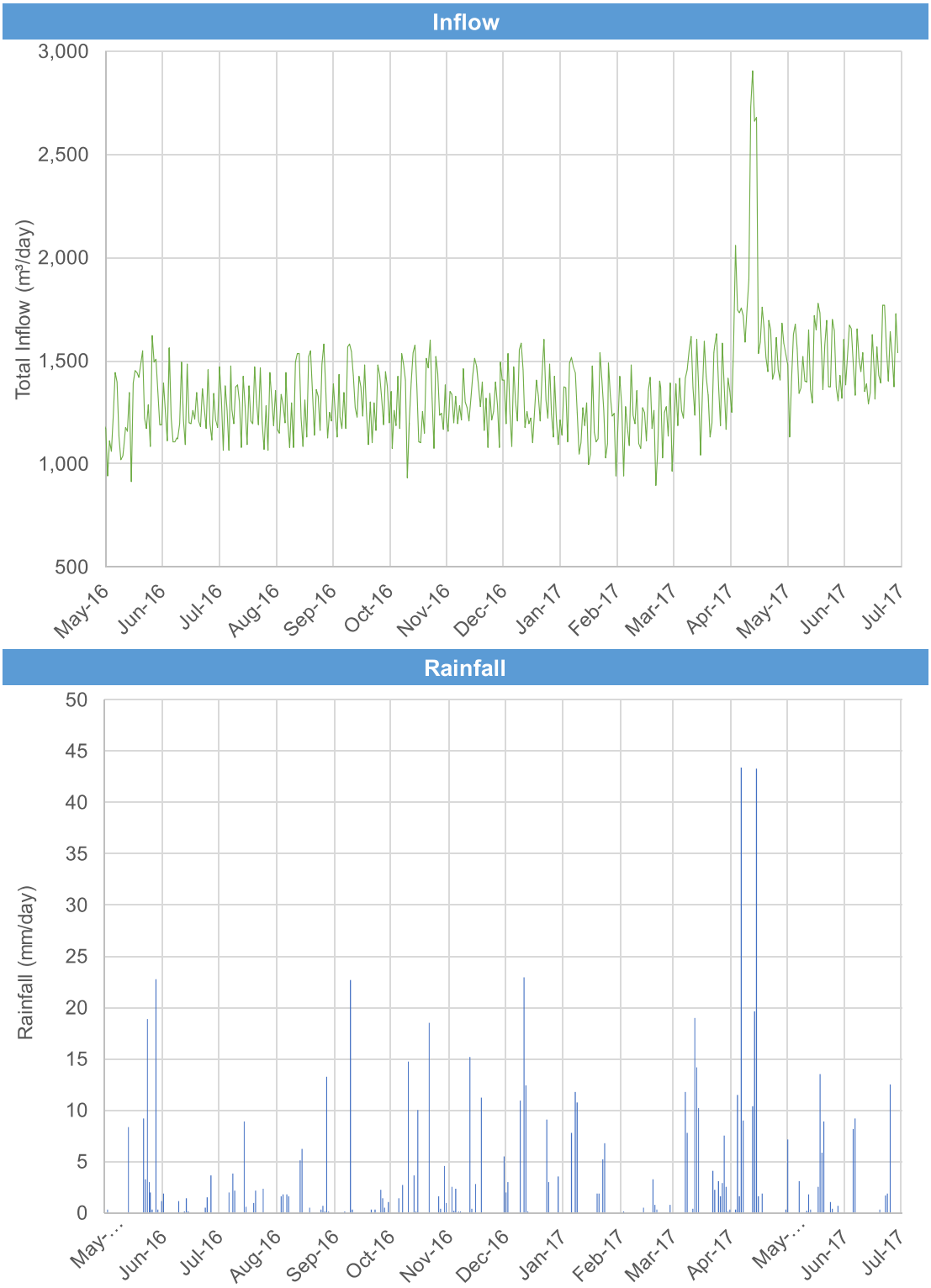

Figure 29: Daily inflow volumes July 2016 – June 2017 plotted with rainfall at Woodend (rainfall data sourced from NIWA CliFlo Database (NIWA 2017)).

Outflow data is measured by an electromagnetic flow meter and logged via a SCADA system. Flows from Woodend WWTP to the ocean outfall for the 2016/17 monitoring period are shown in Figure 30. It should be noted that Woodend WWTP outflow data is missing from 1 to 3 May and 9 to 11 June 2016 due to an outage with the SCADA system. Raw data records for daily inflow and outflow volumes to the ocean outfall for the monitoring period are included in Appendix G.

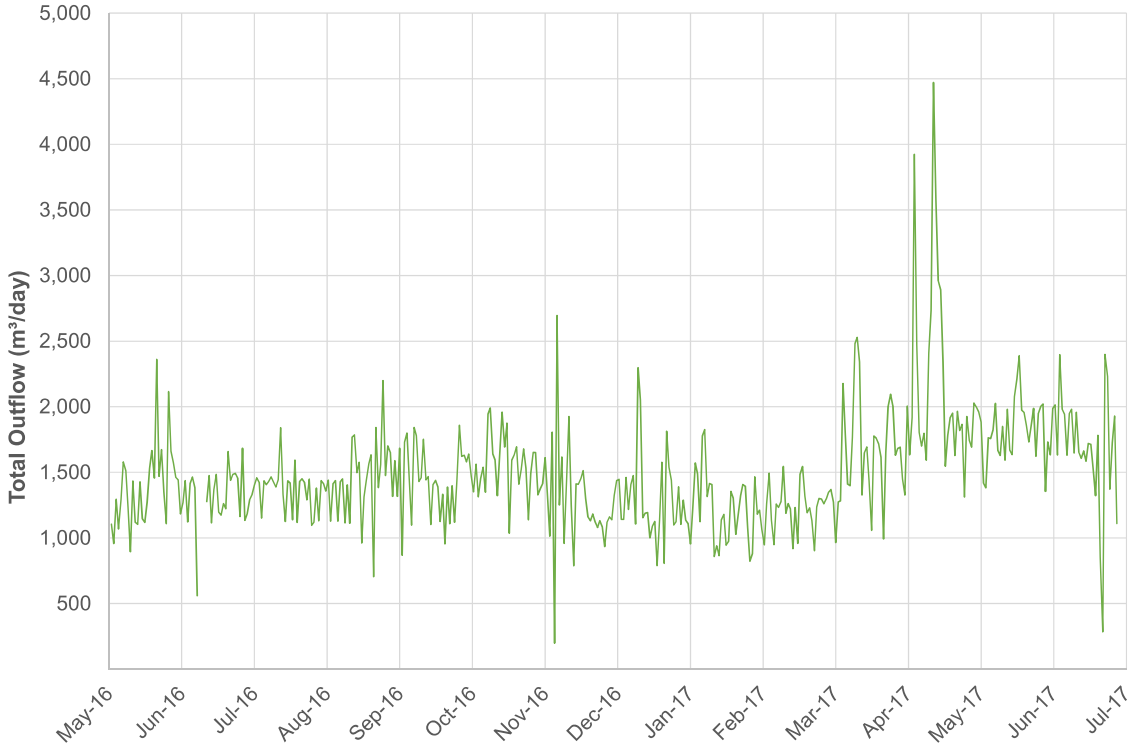

Figure 30: Daily outflow volumes from Woodend WWTP to the ocean outfall May 2016 – June 2017.

4.2.2 Daily seepage discharge volumes

The resource consent states that the volume of treated wastewater discharged via seepage should be calculated by subtracting the volume of wastewater discharged to the ocean outfall from the volume of wastewater received at the WWTP. Calculated seepage volumes for the monitoring period are shown in Figure 31. Please note seepage values have not been calculated when either inflow or outflow data are missing. The prescribed method for calculating the discharge via seepage does not account for:

- Pond/wetland attenuation and fluctuating water levels.
- Rainfall.
- Evaporation from pond/wetland water surfaces and evapotranspiration from wetland plants.

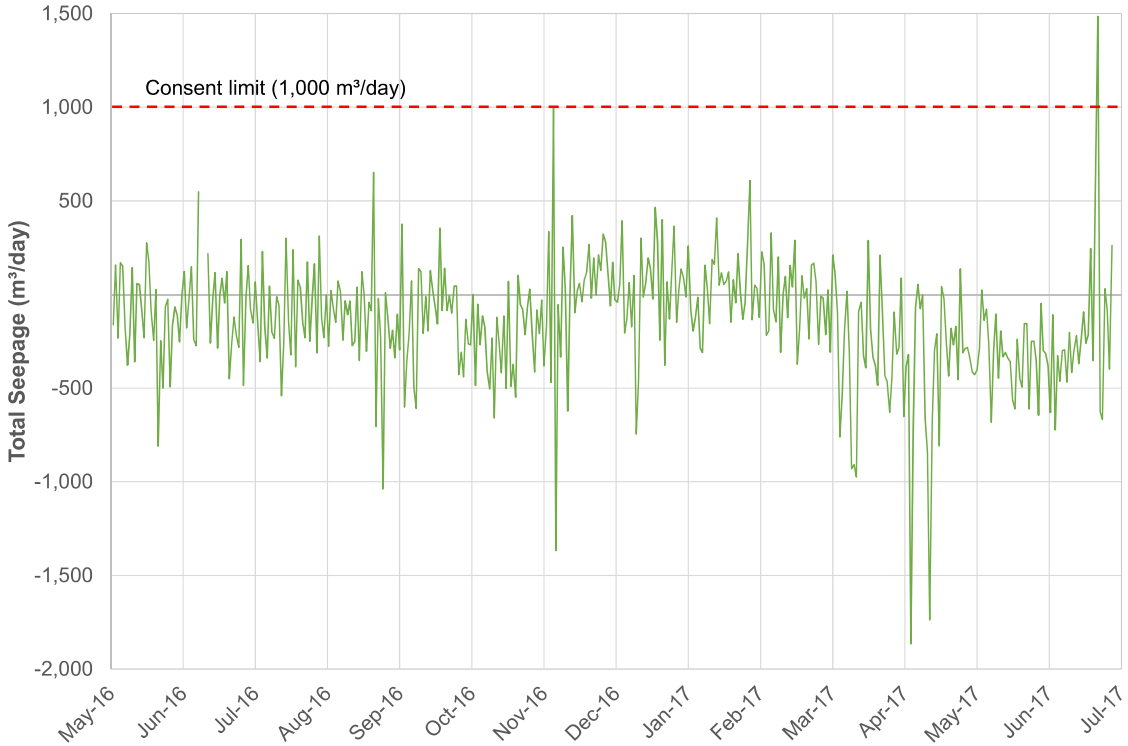

Figure 31: Calculated daily seepage volumes May 2016 – June 2017.

Condition 5 states that "*the volume of treated effluent discharged to land via seepage shall not exceed 1000 cubic metres per day*." The data implies that over the 2016/17 monitoring period WDC has generally complied with the daily seepage volume consent limit of 1,000 m^3/day. However, the calculated daily seepage volumes between 1 May 2016 and 30 June 2017 were above the consent limit of 1,000 m^3/day on two occasions. The exceedance events are as follows:

1) 6 November 2016: 1,003 m^3/day.

2) 24 June 2017: 1,485 m^3/day.

The calculated exceedances were due to very low outflow (<300 m^3/day) shown in Figure 29. Two separate occasions when the 1,000 m^3/day seepage limit (Condition 5) appeared to have been exceeded (6 November 2016 and 24 June 2017) was due to cessation of outflows while maintenance works were being undertaken on the ocean outfall and shouldn't be construed as true exceedances.

The data indicates that on average over the 2016/17 monitoring period WDC has complied with the daily seepage volume consent limit of 1,000 m^3/day.

4.3 Conditions 9 to 11 - Groundwater Monitoring

4.3.1 Monitoring requirements

Condition 9 of the resource consent requires two monitoring bores (south-east and west) to be sampled at three-monthly intervals. The south-east bore is located down-gradient of the WWTP and the west bore is located up-gradient (Figure 27 above). In the 2016/17 monitoring period WDC sampled the bores in July

2016, October 2016, January 2017 and April 2017. A copy of the groundwater quality analytical data for the monitoring period is provided in Appendix H.

In accordance with the Groundwater Monitoring Plan (WDC 2008), which is required under Condition 15, WDC began monitoring two domestic bores in February 2007, located on the Robinson and McKenzie properties directly to the west (up-gradient) of the WWTP (shown in Figure 27 above). Although the bores on these properties are consented for domestic water supply, both properties have an alternative water source supplied by WDC where they now receive a restricted water supply (2 m^3/day) from the Woodend water supply.

4.3.2 Depth to groundwater

Depth to groundwater was measured in the south-east and west bores on four occasions, as required, during the 2016/17 monitoring period (Table 15). Therefore, compliance with Condition 10 was met in full.

The median depth to groundwater has increased continually since the 2013/14 monitoring period. This is likely attributable to the drier than usual conditions experienced in the Canterbury region during this period, which has resulted in lower groundwater levels (through reduced recharge) (CRC 2016).

4.3.3 Groundwater quality

Groundwater samples were collected and analysed for nitrate-N, ammoniacal-N and faecal coliforms, as per Condition 11. The results are shown in Figures 31 to 33 and summarised in Table 15, alongside results from previous monitoring periods. There are no consent limits for these parameters.

Median ammoniacal-N concentrations (and the range of values returned) have increased in both the down-gradient (south-east) bore and one up-gradient (west) bore compared with last year's data, however the magnitude of this increase was greatest in the down-gradient bore (Figure 32). Ammoniacal-N concentrations in the up-gradient bores McKenzie and Robinson remained comparable to previous years and much lower than the other two bores. The results suggest the Woodend WWTP is likely to have contributed to an increase in ammoniacal-N concentrations in down-gradient groundwater, although a source other than the WWTP may have caused the high levels of ammoniacal-N in the West bore, which is located up-gradient from the WWTP.

Nitrate-N concentrations recorded in the last five years in the down-gradient bore (South-east) displayed a decreasing trend in contrast to that shown by ammoniacal-N concentrations (Figure 33). The nitrate-N concentrations have been comparable to the low concentrations (i.e., less than 0.2 g/m^3) recorded in the up-gradient bores in the last three years.

Faecal coliforms were not detected during the 2016/17 monitoring period in any of the monitoring bores (Figure 34). Faecal coliforms have previously been recorded above detection limit in the down-gradient south-east bore.

Table 15: Groundwater quality monitoring at Woodend WWTP from 2011 to 2016.

Bore	Monitoring period	Static level (m)			Ammoniacal-N (g/m³)			Nitrate-N (g/m³)			Faecal coliforms (cfu/100 mL)		
		N	Median	Range	N	Median	Range	N	Median	Range	N	Median	Range
McKenzie (up-gradient)	2016 - 2017	0	nm	nm	4	0.01	<0.01 – 0.033	4	<0.002	<0.002[1]		<1	<1[1]
	2015 – 2016	0	nm	nm	4	0.016	0.012 – 0.018	4	0.003	<0.002 – 0.004	4	<1	<1[1]
	2014 – 2015	0	nm	nm	4	0.016	0.014 – 0.02	4	<0.02	<0.02[1]	4	<1	<1[1]
	2013 – 2014	0	nm	nm	4	0.019	0.015 – 0.023	4	0.005	<0.004 – 0.014	4	<1	<1[1]
	2012 – 2013	0	nm	nm	3	<0.01	<0.01 – 0.021	3	<0.002	<0.002 – 0.007	3	<1	<1[1]
Robinsons (up-gradient)	2016 - 2017	0	nm	nm	4	0.02	0.013 – 0.024	4	0.004	<0.002 – <0.02		<1	<1[1]
	2015 – 2016	0	nm	nm	4	<0.01	<0.01 – 0.07	4	<0.002	<0.002[1]	4	<1	<1[1]
	2014 – 2015	0	nm	nm	4	<0.01	<0.01 – 0.021	4	<0.002	<0.002[1]	4	<1	<1[1]
	2013 – 2014	0	nm	nm	4	0.011	<0.01 – 0.018	4	0.003	<0.002 – <0.01	4	<1	<1[1]
	2012 – 2013	0	nm	nm	3	0.016	0.013 – 0.018	3	<0.002	<0.002[1]	3	<1	<1[1]
West (up-gradient)	2016 - 2017	4	4	4[1]	4	0.88	0.74 – 1.2	4	0.003	<0.002 – 0.007		<1	<1[1]
	2015 – 2016	2	3.6	3.2 – 4	4	0.85	0.74 – 0.97	4	<0.002	<0.002 – 0.004	4	<1	<1[1]
	2014 – 2015	4	3.2	1.8 – 3.8	4	0.55	0.44 – 0.61	4	<0.02	<0.02 – 0.023	4	<1	<1[1]
	2013 – 2014	4	2.6	2.0 – 3	4	<0.01	<0.01 – 0.51	4	0.18	0.024 – 0.33	4	<1	<1[1]
	2012 – 2013	2	3.9	3.8 – 3.9	3	0.78	0.77 – 0.8	3	<0.02	<0.002 – 0.064	3	<1	<1[1]
South-east (down-gradient)	2016 - 2017	4	3.1	3 – 3.3	4	2.75	2.4 – 3.6	4	<0.011	<0.002 - <0.02[1]		<1	<1[1]
	2015 – 2016	2	3.1	3 – 3.2	4	2.4	1.3 – 2.6	4	0.013	<0.002 – 0.57	4	<1	<1[1]
	2014 – 2015	4	2.7	2.1 – 3.1	4	<0.01	<0.01 – 1	4	9.8	<0.4 – 10.6	4	<1	<1 – 4
	2013 – 2014	4	2.4	2.2 – 2.6	4	<0.01	<0.01 – 0.021	4	13	8.1 – 14	4	<1	<1[1]
	2012 – 2013	2	3	2.7 – 3.2	3	<0.01	<0.01 – 0.76	3	26	2.5 – 27	3	<10	<1 – 20

Notes: N: number of samples. nm: not measured. [1] All results were below MDL.

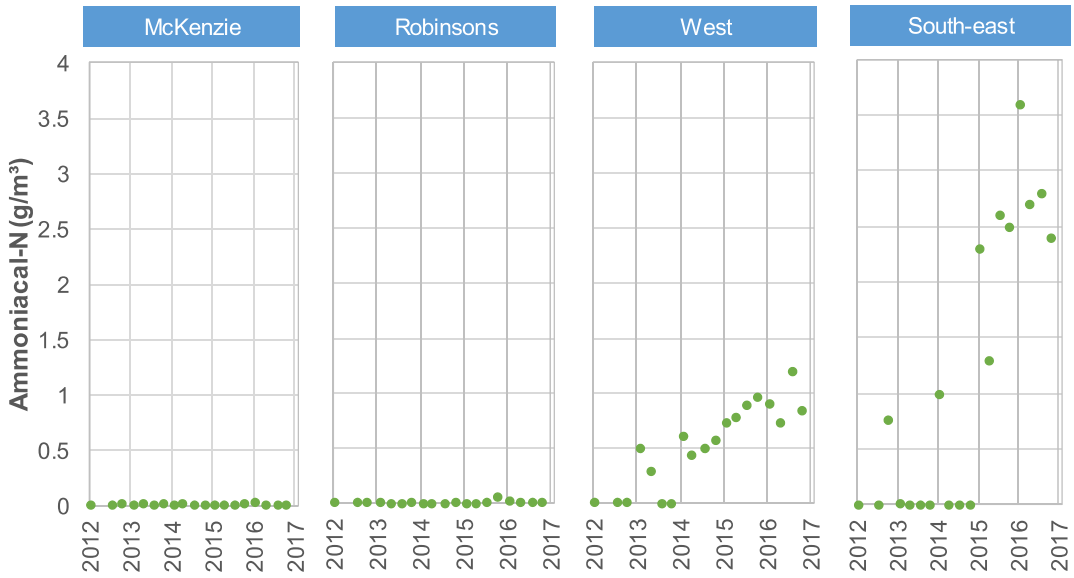

Figure 32: Ammoniacal-N concentration in groundwater monitoring bores from July 2012 – June 2017.

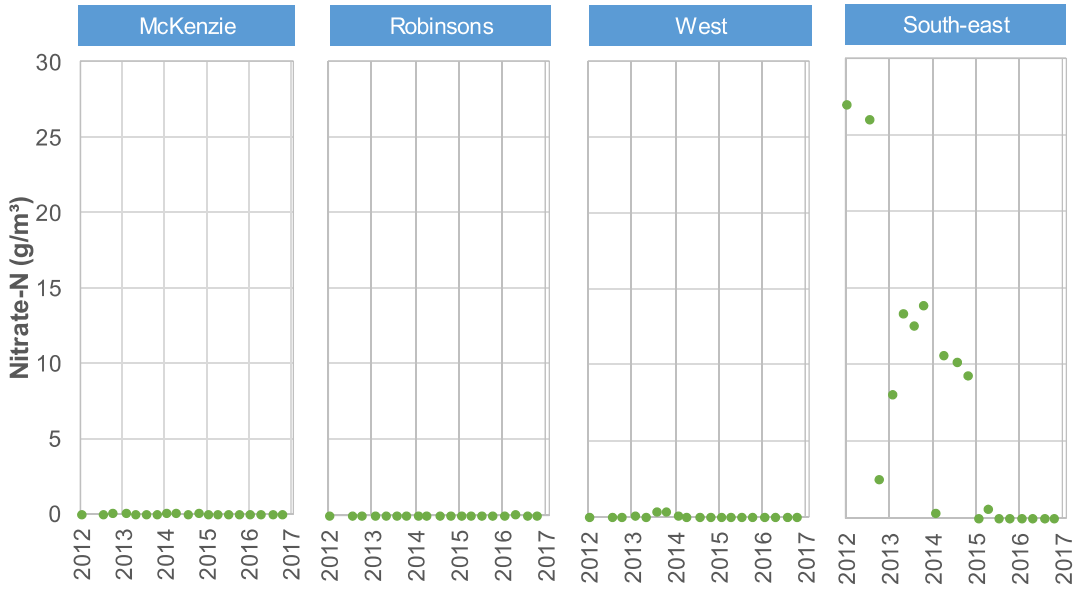

Figure 33: Nitrate-N concentration in groundwater monitoring bores from July 2012 – June 2017.

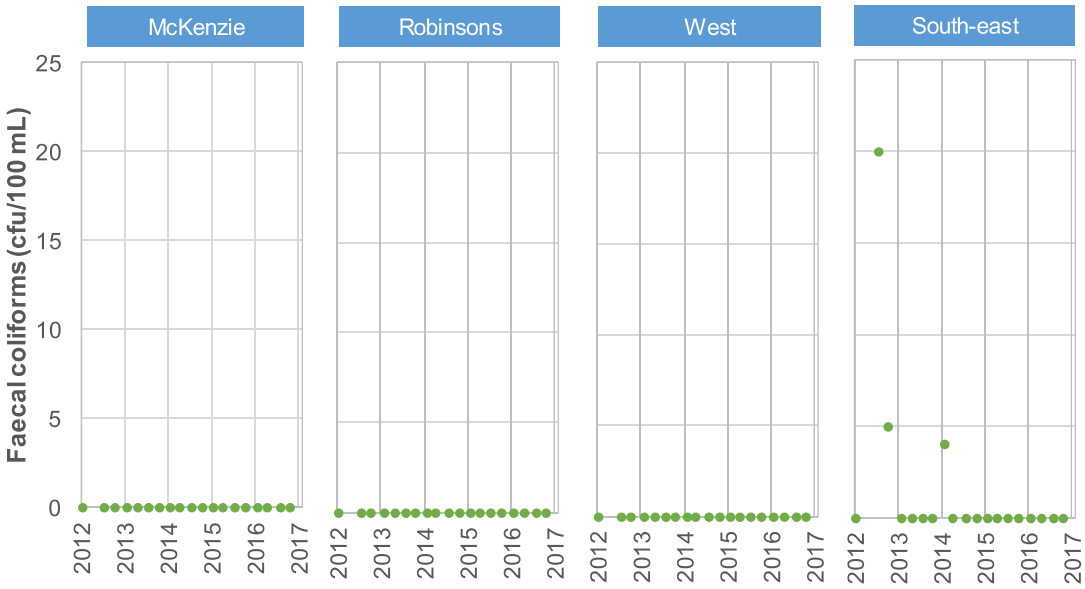

Figure 34: Faecal coliforms numbers in groundwater monitoring bores from July 2012 – June 2017.

4.4 Operations and Maintenance

During the 2016/17 monitoring period, the Woodend WWTP expansion project was completed. This involved the construction of a new aeration basin and settling pond, doubling the front-end treatment capacity of the Woodend WWTP (Figure 35). No additional works were completed on-site during the 2016/17 monitoring period (Robert Frizzell, WDC, pers. comm.).

Figure 35: New aeration basin and settling pond at Woodend WWTP.

4.5 Summary of Compliance – CRC168391

Record keeping of wastewater volumes complied with the requirements of the resource consent and enabled seepage volumes to be calculated. Seepage volumes for the 2016/17 monitoring period met the requirements of Conditions 5 and 6. Two separate occasions when the 1,000 m^3/day seepage limit (Condition 5) appeared to have been exceeded (6 November 2016 and 24 June 2017) was due to cessation of outflows while maintenance works were being undertaken on the ocean outfall and shouldn't be construed as true exceedances.

Groundwater monitoring records for 2016/17 were complete, with groundwater levels (at the two bores where it is possible to take readings; some of the well heads are sealed) and water quality samples being collected on four occasions. Therefore, the requirements of Conditions 9, 10 and 11 were met in full.

The groundwater monitoring undertaken in 2016/17 indicates that:

- Depth to groundwater has continued to increase year-on-year from the two previous monitoring periods.
- Ammoniacal-N concentrations in groundwater down-gradient of the Woodend WWTP was higher than that measured from the up-gradient bores; however, ammoniacal-N concentrations have been continually increasing in the up-gradient West bore and this may relate to another source than the Woodend WWTP. The Woodend WWTP is a likely contributor to elevated ammoniacal-N concentrations in down-gradient groundwater.
- Nitrate-N concentrations in the down-gradient bore (south-east) was comparable to the previous monitoring period and was similar to (or lower than) the concentrations recorded from the up-gradient bores. Therefore, Woodend WWTP appears to be having a negligible effect on nitrate-N concentrations in groundwater down-gradient of the WWTP.
- There is no detectable evidence of faecal contamination of groundwater attributable to the Woodend WWTP.

Overall, WDC has achieved compliance with the conditions of resource consent CRC168391.

5.0 CRC145027 – DESLUDGING AT RANGIORA WASTEWATER TREATMENT PLANT

5.1 Monitoring and Reporting Requirements

Resource consent CRC145027 was granted in October 2014 to permit the discharge of dewatered sludge removed from wastewater pond 1A at the Rangiora WWTP to land. Sludge is suction dredged, then piped via a closed system to geotextile bags for storage and dewatering.

The monitoring requirements are set out in Conditions 16 and 17:

Condition 16

"On completion of the pond dredging operation and commencement of the dewatering phase, the consent shall either:

a) Sampling the drainage water from the dewatering/dewatered sludge at six monthly intervals for the following parameters:
Arsenic
Copper
Cadmium
Chromium
Lead
Mercury
Nickel
Zinc, with all metals in the soluble form; and
Total Nitrogen
Ammoniacal Nitrogen
Dissolved Reactive Phosphorus; or

b) A subsequent sampling regime and timeframe that has received written approval from the Chief Executive of the Canterbury Regional Council or delegate shall be undertaken."

Condition 17

"The consent holder shall either:

a) Monitor the downstream monitoring bore M35/9177 at six monthly intervals (generally September and April) for the following parameters:
pH
Ammoniacal Nitrogen
Total Nitrogen
Metals (Zinc, Copper and Arsenic in the soluble form); or

b) A subsequent sampling regime and timeframe that has received written approval from the Chief Executive of the Canterbury Regional Council or delegate shall be undertaken."

The reporting requirements are set out in Condition 20 and state that the annual report is to include the following details:

- The discharge point of drainage water.
- Findings of the three monthly inspections of the liner, bund and drainage.
- Results of laboratory analyses undertaken in the previous 12 month period.
- Details of any spills.

5.2 Monitoring Results

5.2.1 Drainage water discharge point

All discharge from the discharge chamber is currently pumped back into pond 1A at the Rangiora WWTP (Robert Frizzell, WDC, pers. comm.).

5.2.2 Three monthly inspections

Inspections of the sludge pond are done on a weekly basis, which is more regular than the three-monthly frequency required by the resource consent. There have been no reports of any issues associated with the liner, pump, bund or drainage from the sludge pond during the 2016/17 monitoring period.

5.2.3 Laboratory analyses

Samples from the sludge pond pump chamber were collected on 16 August 2016 and 16 February 2017 and analysed by Hill Laboratories, with results shown in Table 16 and compared with the trigger values appended to the resource consent. Condition 16 of the resource consent requires two samples to be collected annually, at six monthly intervals, thus compliance with the monitoring requirements of Condition 16 was met during the 2016/17 monitoring period. Three of the four parameters with associated consent trigger values (i.e., arsenic, nickel and TN) recorded concentrations below their respective trigger values. The concentration for ammoniacal-N was above the trigger value (30 g/m^3) on both sampling occasions, however the limit did not apply at the time as the pH in monitoring bore M35/9177 was below the trigger application level (pH 8).

Table 16: Dewatering sample results and comparison with trigger values.

Parameter	16 February 2017	3 August 2016	Trigger value
Arsenic (g/m^3)	<0.02	<0.02	0.2
Cadmium (g/m^3)	0.0104	0.0179	-
Chromium (g/m^3)	<0.01	<0.01	-
Copper (g/m^3)	0.22	0.52	-
Lead (g/m^3)	0.003	<0.002	-
Mercury (g/m^3)	<0.002	<0.002	-
Nickel (g/m^3)	0.093	0.173	1.6
Zinc (g/m^3)	7.9	19.1	-
Total nitrogen(g/m^3)	59	70	224
Ammoniacal-N (g/m^3)	44	38	30*
Dissolved reactive phosphorus (g/m^3)	0.069	0.70	-

Note: All metals in soluble form. * Only applies if groundwater in bore M35/9177 exceeds pH 8.

Groundwater samples were collected from Bore M35/9177 on 3 August 2016 and 16 February 2017, with both samples being analysed by Hill Laboratories. Condition 17 of the resource consent requires two samples to be collected annually, at six monthly intervals. Therefore, compliance with the requirements of Condition 17 were met in full during the 2016/17 monitoring period.

The results are shown in Table 17, and compared with 80 % of the relevant maximum allowable value reported in the New Zealand Drinking-Water Standards (NZDWS) (MoH 2008). Condition 14 states that should subsequent groundwater monitoring under Condition 17 show an upward trend extending over four consecutive sampling events, or a trigger level reaches 80 % of the relevant MAV, then the discharge of dewatering water to land must cease and be returned to the treatment pond. All parameters recorded concentrations less than their respective 80 % of MAV (where applicable), while pH was within the recommended range (MoH 2008). The only trend evident was the continued decrease in TN concentrations.

It is noted that WDC is not yet discharging to land yet so groundwater quality will not be affected by the sludge pond.

Table 17: Groundwater monitoring results for Bore M35/9177.

Parameter	16 February 2017	3 August 2016	23 February 2016	13 August 2015	80% of MAV[1]
pH (unitless)	7.1	7.3	7.2	7.2	7.0 – 8.5[2]
Total nitrogen (g/m³)	0.71	0.79	0.88	0.91	-
Ammoniacal-N (g/m³)	<0.01	<0.01	<0.01	<0.01	1.2
Soluble arsenic (g/m³)	<0.001	<0.001	<0.001	<0.001	0.008
Soluble copper (g/m³)	<0.0005	<0.0005	<0.0005	<0.0005	1.6
Soluble zinc (g/m³)	<0.001	<0.001	<0.001	<0.001	1.2

Note: [1] Maximum Allowable Value as defined in New Zealand Drinking-Water Standards (MoH 2008); [2] 7.0 – 8.5 is the preferred pH range for drinking water aesthetics.

5.2.4 Spills

There were no spills during the 2016/17 monitoring period (Robert Frizzell, WDC, pers. comm.).

5.3 Summary of Compliance – CRC145027

The monitoring and sampling results completed during the 2016/17 monitoring period fully comply with Conditions 16 and 17.

6.0 LIMITATIONS

Your attention is drawn to the document, 'Report Limitations', as attached in Appendix I. The statements presented in that document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks to which this report relates which are associated with this project. The document is not intended to exclude or otherwise limit the obligations necessarily imposed by law on Golder Associates (NZ) Limited, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

7.0 REFERENCES

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Report Signature Page

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APPENDIX A

CRC041162.2 – Ocean Outfall

APPENDIX B

CRC041049 – Kaiapoi Wastewater Treatment Plant

APPENDIX C

CRC168391 – Woodend Wastewater Treatment Plant

APPENDIX D

CRC145027 – Rangiora Sludge Pond

APPENDIX E

Ocean Outfall Discharge Monitoring Results – Organochlorine pesticides, PCBs and PAHs

APPENDIX F

NIWA Ocean Outfall Fifth Post-Construction Survey

APPENDIX G

Woodend Wastewater Treatment Plant – Daily Influent and Effluent Records

APPENDIX H

Woodend Wastewater Treatment Plant – Groundwater Quality Data

APPENDIX I

Report Limitations

Report Limitations

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WAIMAKARIRI DISTRICT COUNCIL

REPORT

FILE NO and TRIM NO:	WAT-05-02-03 / 171102118733
REPORT TO:	Kaiapoi-Tuahiwi Community Board
DATE OF MEETING:	20 November 2017
FROM:	Colin Roxburgh, Water Asset Manager
SUBJECT:	Kaiapoi Tanker Filling Points
SIGNED BY: **(for Reports to Council or Committees)**	Department Manager / Chief Executive

1. SUMMARY

1.1. The purpose of this report is to gain the Kaiapoi-Tuahiwi Community Board's feedback on the options for the location and/or upgrades to the tanker filling points in Kaiapoi.

1.2. Tanker filling points have been installed throughout the district to provide contractors with approved points to fill water tankers from, that are safe in terms of the public, the contractors and also the public water supplies.

1.3. While the tanker filling points in the large part have been a success in reducing the number of complaints regarding contractors filling from hydrants throughout the district, the two tanker points in Kaiapoi have had some issues identified:

1.3.1. Adderley Terrace tanker filling point:

This filling point is located on Adderley Terrace near the Annaliese Haven Resthome. This site was selected due to the proximity to development areas to the south-west of Kaiapoi, and to take advantage of the area of land for vehicles to pull over away from the main road.

1.3.2. The issues that have been identified are that the spilt water does not drain away from the site, which creates a muddy area surrounding the point, and the traffic hazard that has been identified predominantly due to retirement village residents and visitors using the road as a footpath which creates a risk of a clash with the water tankers.

1.3.3. Williams Street tanker filling point by Kaiapoi Lakes:

This filling point location was selected due to its proximity to development areas in the north Kaiapoi area, and to take advantage of the existing area of land for vehicles to pull over away from the main carriageway. The key issue identified with this site is that aesthetically it detracts form the amenity value of the area, in particular given the scenic outlook over the lakes at this point.

1.4. Solutions to the issues identified at both sites have been considered and are discussed below.

Adderley Terrace Site (South West Kaiapoi)

1.5. A range of options of been considered for the Adderley Terrace site in terms of either upgrading the existing site, or relocating this filling point to an alternative location.

1.6. None of the options identified were considered to achieve all the desired criteria for a new site. It is noted that the level of development in the part of Kaiapoi that this tanker filling point is serving is reducing. Therefore it is proposed that:

1.6.1. The tanker filling point be shut down as an interim step. The timing of this will be discussed with developers in the area prior to confirming an exact date.

1.6.2. Staff will continue to investigate alternative options and will report back to the board prior to making a long term decision.

Williams Street Site (North Kaiapoi)

1.7. The recommendation for the Williams Street site is to improve the amenity value of this site through the use of native plantings surrounding the backflow preventer cage that is the key visible element of this site. It is proposed that if this can be screened with planting the issue identified will be sufficiently mitigated.

1.8. Relocation of this site was considered by not deemed appropriate due to the high cost, the lack of alternatives available, and the suitability of the proposed solution to the issue.

2. RECOMMENDATION

THAT the Kaiapoi-Tuahiwi Community Board:

(a) **Receives** report No. 171102118733.

(b) **Endorses** staff to work towards shutting down the Adderley Terrace tanker filling point, with the timing of this to be discussed with developers currently working in the area.

(c) **Notes** that staff will continue to investigate alternative options for a tanker filling point to serve the future development areas in south-west Kaiapoi and report back to the Board at a later date with a recommendation.

(d) **Endorses** the use of screen planting at the Williams Street site to address the aesthetic issues noted with this site.

(e) **Circulates** this report to the Utilities and Roading Committee for their information.

3. ISSUES AND OPTIONS

3.1. Tanker filling points have been installed throughout the district to provide contractors with approved points to fill water tankers from, that are safe in terms of the public, the contractors and also the public water supplies.

3.2. Prior to the installation of the dedicated tanker filling points, water tankers that require water for construction would fill from potentially any hydrant throughout the district. This had the following issues:

3.2.1. It would result in complaints from residents due to the nuisance caused by the filing of tankers in residential areas.

3.2.2. It could create traffic hazards due to the tankers stopping to fill within the live traffic lane at times. There was in particular one ‘near miss’ incident in which a moving vehicle came close to striking the operator filling their tanker from a hydrant.

3.2.3. A risk was introduced to the public water supplies as not all contractors would use the correct backflow prevention devices, therefore there was a risk of backflow of contaminants from the tankers into the public water supply.

3.3. While the tanker filling points installed throughout the district have in the large part been a success in addressing the above issues, the two tanker points in Kaiapoi have had some issues identified. The location of the two sites, the growth areas (that drive demand for these filling points), and potential alternative locations for the Adderley Terrace site are summarised on the figure below:

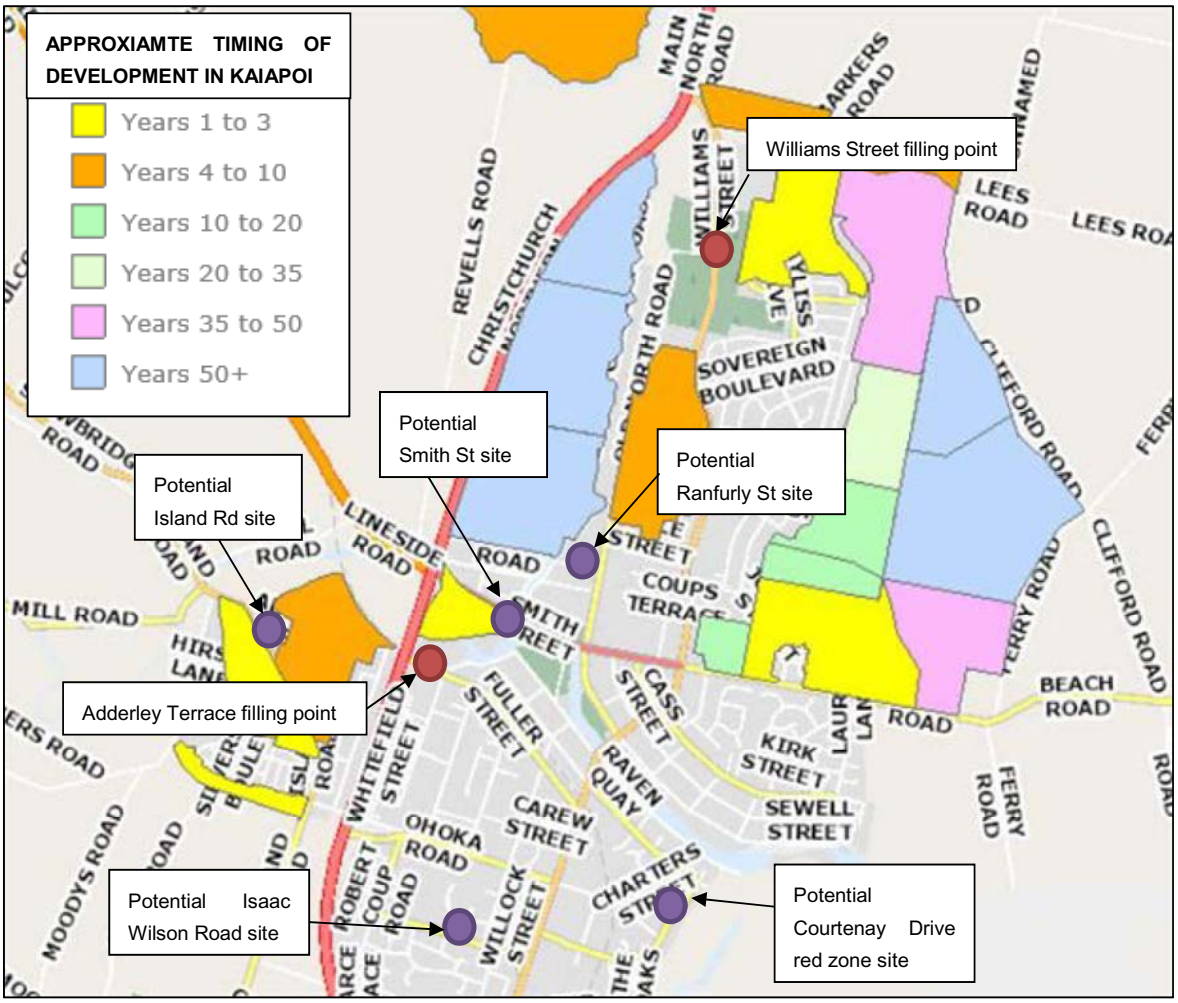

Figure 1: Kaiapoi Development Areas (2014) and Potential Tanker Filling Point Sites.

3.4. It is noted that the growth areas depicted by the shading in Figure 1 above were generated in 2014. While this figure is not completely up to date, it gives an indication of the areas that are required to be served by the tanker filling points.

3.5. Options to mitigate the issues at the two existing sites are covered in the following sections of this report. This includes those options depicted above to relocate the Adderley Terrace site, as well as options to mitigate the issues identified at the Williams Street site.

<u>Adderley Terrace tanker filling point Options</u>

3.6. This filling point is located on Adderley Terrace near the Annaliese Haven Resthome. This site was selected due to the proximity to development areas to the south-west of Kaiapoi, and to take advantage of the area of land for vehicles to pull over away from the main road.

3.7. The issues that have been identified are that the spilt water does not drain away from the site, which creates a muddy area surrounding the point, and the traffic hazard that has identified predominantly due to retirement village residents and visitors using the road as a footpath which creates a risk of a clash with the water tankers.

Figure 2: Location of Adderley Terrace Tanker Filling Point

Figure 3: Adderley Terrace Filling Point - note water not draining from site

Figure 4: Adderley Terrace - area where trucks pull away from site

Figure 5: Footpath adjacent to Adderley Terrace site

3.8. A range of options of been considered for the Adderley Terrace site in terms of either upgrading the existing site, or relocating this filling point to an alternative location. The key criteria used in identifying potential sites are below:

- Must be accessible to contractors working in west Kaiapoi area, preferably south of the Kaiapoi river.
- The impact / drainage of water spilt during the filling of tankers must be able to be managed.
- It must not create a hazard for other road users (i.e. tankers shall be able to pull away from main traffic flow).

- Public impact must be considered, with the impact on residential areas or other community activities minimised.

- Cost.

3.9. Five options have been considered for a potential location to best satisfy the criteria identified above.

3.9.1. Upgrade Existing Site on Adderley Terrace

This option involves retaining the existing site, but making improvements to address the issue with the water ponding at the site, and relocating the area that the tankers pull over to fill up. The works proposed would include:

- Installation of kerb and channel to prevent runoff going onto grass verge, and also to ensure tankers stay within sealed asphalt area.
- Relocation of footpath around new pull over area.
- Relocation of fire hydrant for tankers to fill from (but retain existing location of backflow prevention cage).

The proposed upgrades are shown below:

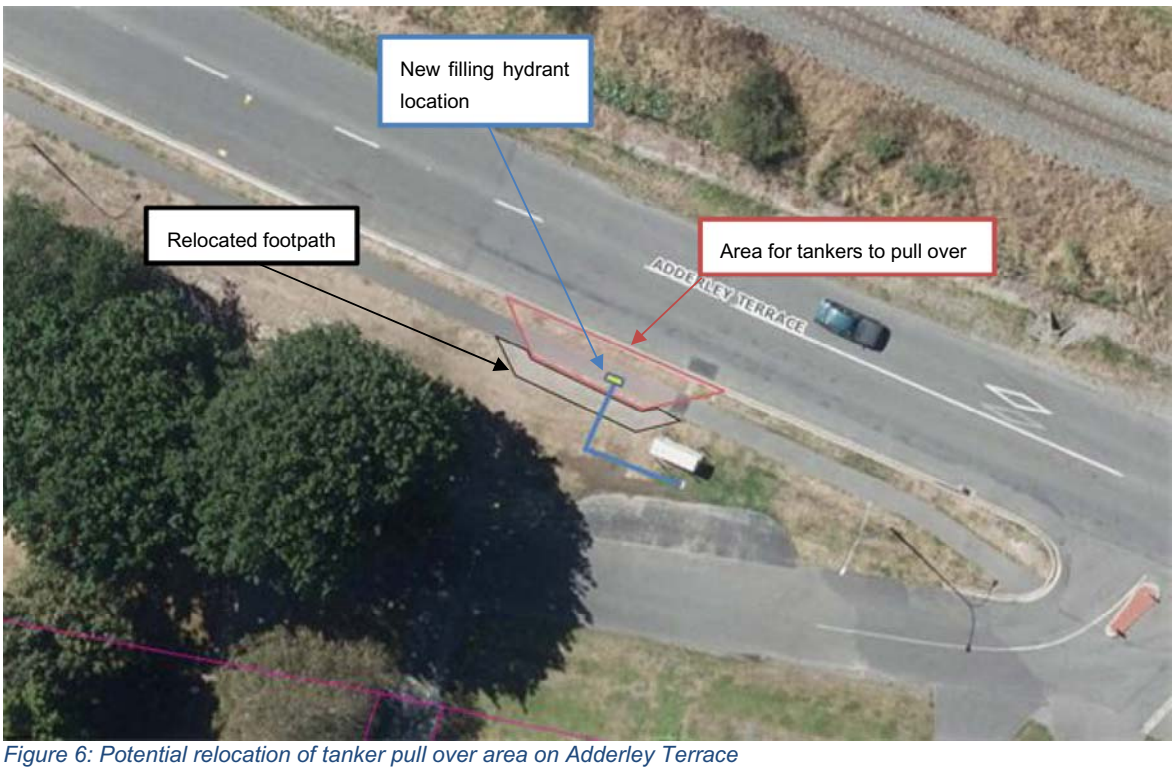

Figure 6: Potential relocation of tanker pull over area on Adderley Terrace

It is envisioned that the above works would address the issues regarding the drainage of spilt water by constructing new kerb and channel that could be tied into the existing drainage system. The issues regarding tankers driving through the area utilised by residents and visitors for parking and walking would be mitigated by relocating the area that tankers park away from this area. It is acknowledged that this option would not completely remove the activity of tankers filling from this area so may not be fully supported by the local residents, however it would mitigate the issues that have been raised.

The advantages and disadvantages of the above option are:

- Greater separation between where tankers pull over and residential and retirement village area.
- Tankers are pulling over closer to a main road (rather than off the main road).
- Cost of relocation is minimised relative to other options as backflow preventor cage location is retained.

3.10. Smith Street

An alternative site considered is on Smith Street close to Hakarau Road. This site has the following key advantages and disadvanges:

- Located away from live traffic lane (minimal risk with road traffic).
- Existing gravel area that could be used for turning vehicles.
- Located away from residential area.
- Adjacent to stormwater basin meaning easy discharge of runoff from site.
- There is an existing water main in a convenient location that could be utilised (this was installed previously for developers in this area to utilise).
- This site is not ideal in terms of location being north of the Kaiapoi river (rather than south).
- This area is used by some parents and caregivers to pick and and drop off school children at Kaiapoi Borough School (which is accessed by a footbridge over the Kaiapoi River). This has the potential for some conflict between the tankers and school children / school traffic at certain times of the day.

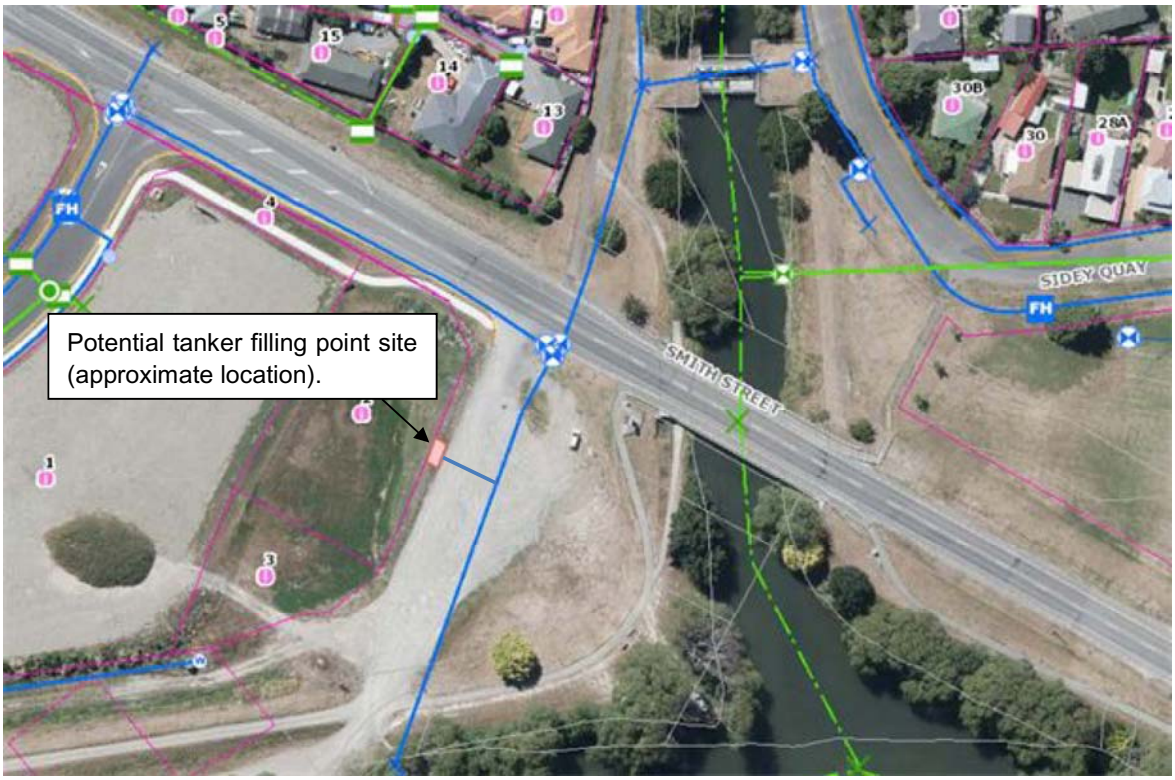

Figure 7: Potential Smith Street site

Figure 8: Photo of potential Smith Street site, showing extent of carparking in area.

3.11. Island Road (near Streamside Terrace intersection)

A site on Island Road is being considered in between the cemetery and a recreation reserve, near the Streamside Terrace intersection. The key advantages / disadvantages with this site are listed below:

- There is adequate grass berm available to construct a zone for tankers to pull over.
- There is some separation between this site and residential housing (with immediately adjacent land being a cemetery and a recreation reserve.
- Ideal location for development areas in South-West Kaiapoi.
- While the recreation reserve does mean there is potential for members of the public to be close to this site, the nature of the reserve area means there is unlikely to be a large amount of people concentrated in this area.
- The cost will be higher than other options considered due to the need to extend the reticulation beneath the existing road to reach this point.

It is also noted that a superior location within this vicinity has also been identified at the intersection of Island Road and Adderley Terrace. This site has adequate existing area that could be utilised for tankers to pull over, however at present water mains do not extend this far. Therefore, if this site was to be used, the water reticulation would need to be extended to this point which would add cost to this option. Both potential sites are shown on the figure below.

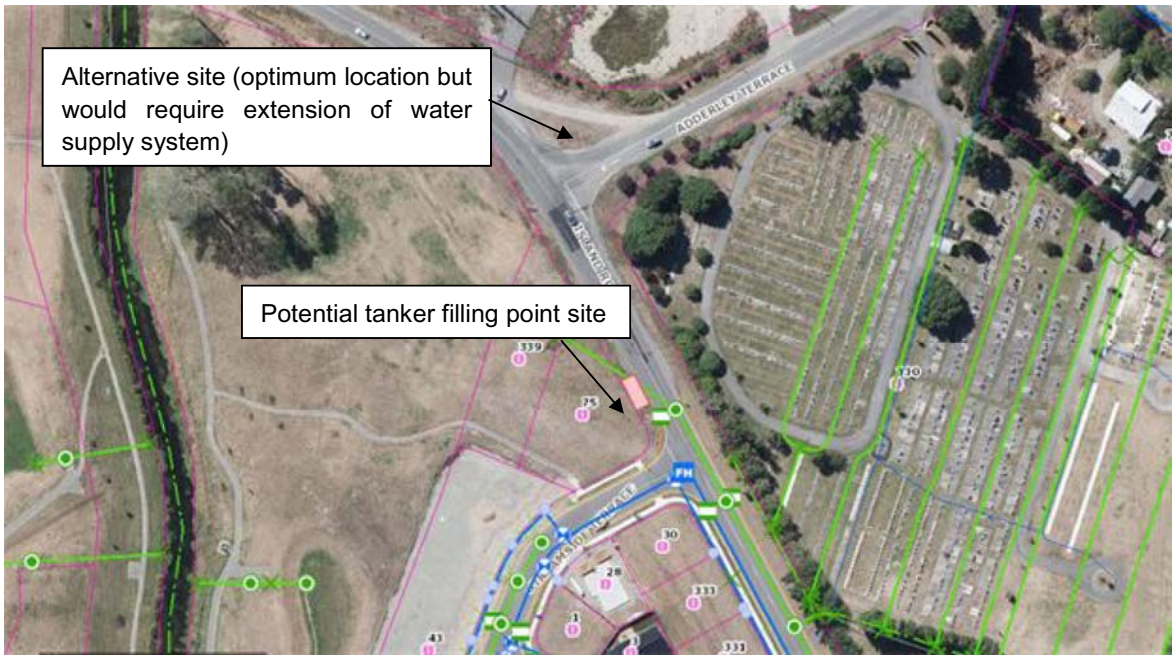

Figure 9: Potential Island Road Site

Figure 10: Potential Island Road site photo

3.12. Ranfurly Street (near Walker Street intersection).

A site on Ranfurly Street was considered in between an industrial area and reserve land. This site has the following advantages and disadvantages:

- Not ideal location for South-West Kaiapoi development areas.
- Impact on residential housing minimised due to location between industrial land and reserve land.
- Potential impact on early childhood centre and playground to the north of site.

Figure 11: Potential Ranfurly Street Site

3.13. Island Wilson Road (near Parnham Lane)

A site was considered on Isaac Wilson Road near Parnham Lane. The key advantage of this site is that one site of the road has a cemetery so impact on residents on this side of the road is minimised.

The other key advantages and disadvantages are summarised below:

- Some potential impact on residents on south side of Isaac Wilson Road.
- Reasonable access to South-West Kaiapoi.
- Foot traffic on footpath on north side of Isaac Wilson Road will be impacted / need to be managed as part of design.

Figure 12: Potential Parnham Lane site

3.14. Red Zone Area on Courtenay Drive

An area within the Courtenay Drive red zone was considered, primarily due to the lack of residential housing. This site has the following advantages / disadvantages:

- Lack of immediate impact on residential housing.
- Potential impact on houses on the non-red zone parts of Courtenay Drive with tankers driving past their properties (potentially shaking houses).
- Site is north of Williams Street, so would require traffic to cross Williams Street to access South-West Kaiapoi area.

3.15. The options considered are summarised in the table below:

Table 1: Options Summery Table for West / South Kaiapoi Tanker Filling Point Location

Site	Proximity to South-West Kaiapoi	Drainage for spilt water	Traffic Hazard with other vehicles	Public impact	Cost Estimate
Do nothing	Very good	Issues with ponded water	Minor (away from main road)	Issues with retirement village users	-
Adderley Terrace – relocate area for tankers to pull over	Very good	Can tie in with existing system	Moderate	Issues with retirement village users mitigated to some degree	27,000
Smith Street	Average (north of river)	Close access to stormwater basin	Minor (away from main road)	No residents in close proximity but this area is used as a drop off zone for school children	15,000
Island Road (near Streamside Tce intersection)	Very good	Can tie in with road drainage system	Moderate (improvement works required to construct area to pull over)	Minimal (between un-used Council land and cemetery)	45,000
Island Road (at Adderley Terrace intersection)	Very good	No formal drainage system in this area.	Minor (existing area where tankers can pull over).	Minimal (between un-used Council land and cemetery)	67,000
Ranfurly Street	Average (north of river)	Can either tie in with existing stormwater system or drain to grass (not ideal).	Moderate (improvement works required to construct area to pull over)	Can be situated away from housing but relatively close proximity to pre-school / playground	29,000
Isaac Wilson Road	Good	Can tie in with road drainage system	Moderate (improvement works required to construct area to pull over)	Potential issues due to proximity of residential housing.	40,000
Courtenay Drive Red Zone	Average (east of Williams Street	Can be managed within new road design.	Minimal immediate impact (due to low use of road) but potential wider impact to access site.	Potential impact on houses on edge of red zone.	40,000

3.16. Based on the above analysis, there is not one site that clearly satisfies all the criteria for a tanker filling point site. It is noted that the level of development in the south-west part of Kaiapoi is declining at present, and therefore the demand for a site in this area is expected

to decline in the coming months. Based on this, the following steps are proposed to address the issues with the Adderley Terrace site:

3.16.1. The Adderley Terrace tanker filling point be shut down as an interim step. The timing of this will be discussed with developers in the area prior to confirming an exact date.

3.16.2. Staff will continue to investigate alternative options and will report back to the board prior to making a long term decision.

3.16.3. One alternative that will be considered as a long term solution will be a developer in the south-west Kaiapoi area incorporating the installation of a filling point as part of their development. This would potentially be of benefit to them during their construction, and would be of benefit to Council as well if this were to be vested to Council. In this scenario the equipment on Adderley Terrace could be re-purposed.

3.17. Williams Street tanker filling point by Kaiapoi Lakes:

This Williams Street site is the second tanker filling point site within Kaiapoi. This site is situated to serve the northern Kaiapoi area. The expected development areas within Kaiapoi are shown on the map below:

The Williams Street site has the advantages that it is ideally situated to serve the Northern Kaiapoi area, and there is an area on the side of the road that is designed for vehicles to pull over.

The key issue identified with this site is that aesthetically it detracts from the amenity value of the area, in particular given the scenic outlook over the lakes at this point. Given the cost associated with relocating this site, and the lack of superior alternatives, the recommendation to address the aesthetic issues is to plant vegetation to tie in with the surrounding landscape to screen the view of the filling point. Other measures that could be considered would include painting of the cage to an alternative colour.

The following sketch has been produced to illustrate the potential impact of plantings and painting at the Williams Street site:

Figure 13: Existing Williams Street site

Figure 14: Potential view of Williams Street site following plantings and painting of cage.

3.18. The Management Team has reviewed this report and supports the recommendations.

4. COMMUNITY VIEWS

4.1. A group of residents in the area of the Adderley Terrace site have been in contact with Council to raise their concerns regarding this site. This report has been prepared in response to these concerns.

5. FINANCIAL IMPLICATIONS AND RISKS

5.1. The costs of the various options are summarised on the following tables:

Site	Decommissioning of existing filling points	Installation of filling point at new location	Additional pipe (where connection not directly to existing main).	Roading improvements (asphalt, kerb and channel etc).	Total Construction Estimate	Total Recommended Budget (incl. 30% contingency and professional fees allowance).
Adderley Terrace – relocate area for tankers to pull over	-	-	$5,000	$16,000	21,000	27,000
Smith Street	$4,800	$7,000	-	-	$11,800	$15,000
Island Road (near Streamside Tce intersection)	$4,800	$8,500	$8,100	$13,100	$34,500	$45,000
Island Road (at Adderley Terrace intersection)	$4,800	$8,500	38,100	-	$51,400	$67,000
Ranfurly Street	$4,800	$8,000	-	$9,200	$22,000	$29,000
Isaac Wilson Road	$4,800	$6,600	$4,500	$14,500	$30,400	$40,000
Courtenay Drive Red Zone	$4,800	$6,600	$4,500	$14,500	30,400	$40,000

6. CONTEXT

6.1. Policy

This matter is not a matter of significance in terms of the Council's Significance Policy.

6.2. Legislation

The Health (Drinking Water) Amendment Act is relevant in this matter.

6.3. Community Outcomes

This report is related to the following community outcomes:

- There is a safe environment for all.
- Core utility services are provided in a timely, sustainable, and affordable manner.

WAIMAKARIRI DISTRICT COUNCIL

MEMO

FILE NO:	IRU-17-38 / 171129129663
DATE:	12th December 2017
MEMO TO:	Utilities & Roading Committee
FROM:	Gary Boot, Senior Engineering Advisor
SUBJECT:	Variation to Contract 16-49 to lay a new watermain along Cass Street and Feldwick Drive

The purpose of this memo is to advise the Utilities and Roading Committee that OnGrade Drainage & Excavation Ltd (OnGrade) have been granted a variation to Contract 16-49 to lay a new watermain along Cass St and Feldwick Drive in Kaiapoi.

A new 100mm diameter pipe is required along Cass St (from Meadow St to Feldwick Dr) and along Feldwick Dr (from Cass St to Gray Cr) to service 3 remaining residential properties in the Kaiapoi East Regeneration Area and also to provide water to future facilities in the regeneration area. The location of the proposed pipeline is shown in Figure 1 below.

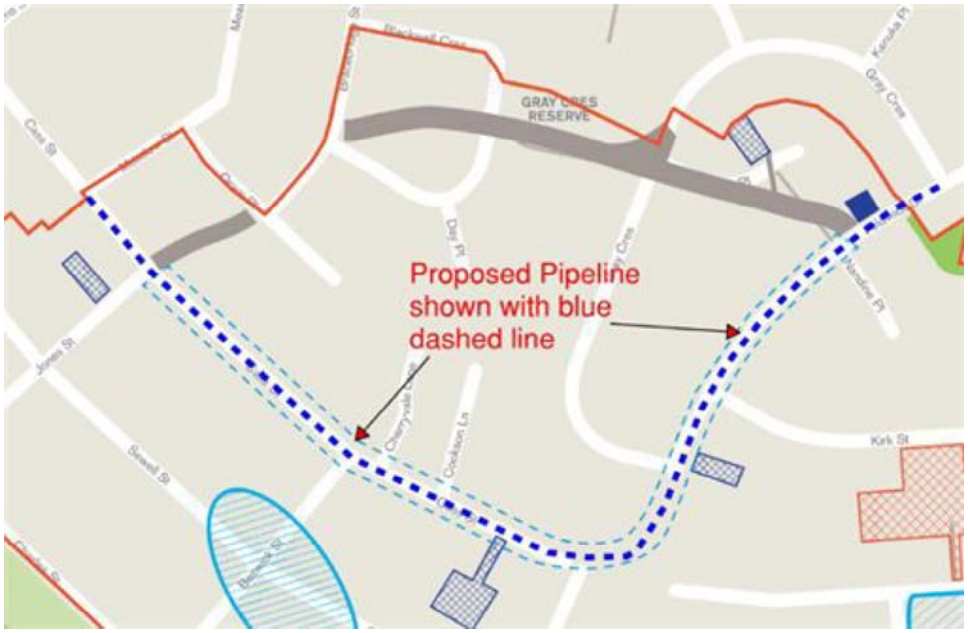

Figure 1 – Location of Proposed 100mm diameter Water Pipeline in Kaiapoi East

The proposed polyethylene pipeline will replace a fragile asbestos–cement (AC) pipeline that extends out into the Regeneration area from a single point in Sewell St.

This work be undertaken as a variation to Contract 16-49 (Kaiapoi East Earthquake Recovery – Water Reticulation). The price provided by OnGrade is $264,650.06 + GST (excluding contingency).

The work was awarded as a variation because OnGrade had won a competitive contract with appropriately scheduled rates, and they were already working in the area and were performing very well.

Gary Boot
Senior Engineering Advisor

WAIMAKARIRI
DISTRICT COUNCIL