Waimakariri District Council

Utilities and Roading Committee

Agenda

Tuesday 16 April 2024
9am

Council Chambers
215 High Street
Rangiora

Members:

Cr Paul Williams (Chairperson)
Cr Robbie Brine
Cr Niki Mealings
Cr Philip Redmond
Cr Joan Ward
Mayor Dan Gordon (ex officio)

WAIMAKARIRI
DISTRICT COUNCIL

AGENDA CONTENTS – UTILITIES AND ROADING COMMITTEE

The Chairperson and Members
UTILITIES AND ROADING COMMITTEE

A MEETING OF THE UTILITIES AND ROADING COMMITTEE WILL BE HELD IN THE COUNCIL CHAMBER, RANGIORA SERVICE CENTRE, 215 HIGH STREET, RANGIORA ON TUESDAY 16 APRIL 2024 AT 9AM.

Sarah Nichols
GOVERNANCE MANAGER

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 the meeting of the Utilities and Roading Committee held on Tuesday 19 March 2024.**

8 – 17

RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Confirms** the circulated Minutes of the meeting of the Utilities and Roading Committee held on 19 March 2024, as a true and accurate record.

3.2 **Matters arising (From Minutes)**

3.3 **Notes of the Workshop of the Utilities and Roading Committee held on Tuesday 19 March 2024.**

18 – 19

RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** the circulated Notes of the Workshop of the Utilities and Roading Committee held on 19 March 2024.

4 DEPUTATION/PRESENTATIONS

Nil.

5 REPORTS

5.1 School Road Drainage Upgrade – J Recker (Stormwater and Waterways Manager) and K Simpson (3 Waters Manager)

20 – 28

RECOMMENDATION

THAT the Utilities and Roading Committee:

THAT the Council:

(a) **Receives** report No. 240314040024.

(b) **Approves** the inclusion of an additional budget for consideration as part of the deliberations on the Long Term Plan, of $126,000 in the 2024/2025 financial year under the Stormwater LOS (PJ 101517.000.5123) budget, for the construction of the School Road Drainage Upgrade, giving a total budget of $541,000.

(c) **Notes** that the estimate for this work (including a 20% project contingency, and all associated fees) is $541,000, while the current budget allowance is $415,000.

(d) **Notes** that the additional budget for 2024/2025 will increase the Coastal Urban Drainage rate by approximately $2.88 or 1.2% per property from 2025/26 onwards.

(e) **Notes** that the overall rating impact on the district is an increase of 0.14%.

(f) **Notes** that a piped solution will improve the level of service in School Road meeting Waimakariri District Council's 1 in 5-year primary system requirement set out in the Engineering Code of Practice.

(g) **Notes** that the secondary flow path will be altered (subject to the approval of the 10 School Road property owner) to flow southwards over the crown of the road away from the east driveway of 10 School Road. This is expected to prevent secondary flow overtopping the driveway in significant storm events meeting Waimakariri District Council's 1 in 50-year secondary system requirement set out in the Engineering Code of Practice.

(h) **Notes** that this upgrading approach is consistent with other drainage improvement works undertaken in the District and does not set a new precedent for other properties who do not meet the level of service set out in the Engineering Code of Practice.

5.2 July 2023 Flood Recovery Progress Update – Kalley Simpson (3 Waters Manager), Joanne McBride (Roading and Transport Manager) and Pat Towse (Flood Team Lead)

29 – 43

RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** Report No. 240404051729.

(b) **Notes** that all 88 investigations have been triaged and scoped, 8 are under investigation, 35 have works being reviewed for approval and 45 are complete.

(c) **Notes** that all 126 maintenance actions have been triaged, 3 are work in progress, 17 have works programmed, and 106 are complete.

(d) **Notes** that the total cost estimate for the flood recovery work is $4.055 million.

(e) **Notes** that the expenditure to date is $2,221,796 and the final forecast expenditure remains at $4.055 million.

(f) **Circulates** this report to all Community Boards for information.

5.3 **3 Waters Climate Change Risk Assessment – Kalley Simpson (3 Waters Manager)**

44 – 147

RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** Report No. 240404052230.

(b) **Notes** that while the majority of 3 Waters assets have low or very low asset risk exposure to climate hazards, about 7% are critical assets that have a high or medium asset risk exposure.

(c) **Notes** that the estimated investment to build resilience into Council's 3 Waters infrastructure is $41.9 million dollars to manage the predicted impacts of climate change which has been included in years 2034/35 to 2043/44.

(d) **Notes** that while budget provisions have been made in the outer year of the Long Term Plan for resilience investment, further work is required to refine these estimates and integrate any works with the future renewals programme.

(e) **Circulates** this report to the Council for information.

6 CORRESPONDENCE

Nil.

7 PORTFOLIO UPDATES

7.1 **Roading – Councillor Philip Redmond**

7.2 **Drainage, Stockwater and Three Waters (Drinking Water, Sewer and Stormwater) – Councillor Paul Williams**

7.3 **Solid Waste– Councillor Robbie Brine**

7.4 **Transport – Mayor Dan Gordon**

8 MATTERS FOR INFORMATION

8.1 **Proposal that the Tuahiwi Footpath be named "Johno's Way" – Dominic Mansbridge (Project Engineer) and Joanne McBride (Roading and Transport Manager)**

(Report No. 240207016698 to the Kaiapoi-Tuahiwi Community Board Meeting 18 March 2024)

148 – 152

RECOMMENDATION

THAT the Utilities and Roading Committee

(a) **Receives** the information in Item 8.1.

9 QUESTIONS UNDER STANDING ORDERS

10 URGENT GENERAL BUSINESS

11 MATTERS TO BE CONSIDERED WITH THE PUBLIC EXCLUDED

In accordance with section 48(1) 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 (or sections 6, 7 or 9 of the Official Information Act 1982, as the case may be), it is moved:

That the public be excluded from the following parts of the proceedings of this meeting:

11.1 Confirmation of Minutes from 19 March 2024.
11.2 Receiving of Briefing Notes from 19 March 2024.
11.3 Report from Management Team Operations 18 March 2024.
11.4 Report from Management Team Operations 25 March 2024.

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.	Subject	Reason for excluding the public	Grounds for excluding the public.
12.1	Confirmation of Minutes from 19 March 2024.	Good reason to withhold exists under section 7	To carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations) LGOIMA Section 7(2)(i).
12.2	Receiving of Briefing Notes 19 March 2024.	Good reason to withhold exists under Section 7	As per Section 7(2)(i) of the Local Government Official Information and Meetings Act 1987, to "enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations)", and that both this report and the recommendations remain Public Excluded owing to the commercial sensitivity of the proposed negotiations.
12.3	Report from Management Team Operations 18 March 2024.	Good reason to withhold exists under Section 7	As per Section 7(2)(i) of the Local Government Official Information and Meetings Act 1987, to "enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations)", and that this report remains Public Excluded owing to the commercial sensitivity of the proposed negotiations, but the recommendations be made publicly available.
12.4	Report from Management Team Operations 25 March 2024.	Good reason to withhold exists under Section 7	As per Section 7(2)(i) of the Local Government Official Information and Meetings Act 1987, "The withholding of the information is necessary to enable any local authority holding the information to carry out, without prejudice or disadvantage, commercial activities", and that the recommendations in this report be made publicly available but that the contents remain public excluded.

CLOSED MEETING

See Public Excluded Agenda (separate document)

OPEN MEETING

NEXT MEETING

The next meeting of the Utilities and Roading Committee will be held on Tuesday 28 May 2024 at 9am.

WAIMAKARIRI DISTRICT COUNCIL

MINUTES OF A MEETING OF THE UTILITIES AND ROADING COMMITTEE HELD IN THE COUNCIL CHAMBER, RANGIORA SERVICE CENTRE, 215 HIGH STREET, RANGIORA ON TUESDAY 19 MARCH 2024, AT 9AM.

PRESENT

Councillors P Williams (Chairperson), R Brine, N Mealings, P Redmond, J Ward, and Mayor D Gordon (arrived 10:15am).

IN ATTENDANCE

Councillors B Cairns and T Fulton.

J Millward (Chief Executive), G Cleary (General Manager Utilities and Roading), K Simpson (3 Waters Manager), J McBride (Roading and Transportation Manager), K Straw (Civil Projects Team Leader) and C Fowler-Jenkins (Governance Support Officer).

1 APOLOGIES

Moved: Councillor Mealings Seconded: Councillor Redmond

THAT an apology for lateness be received and sustained from Mayor Gordon, who arrived at 10:15am.

CARRIED

2 CONFLICTS OF INTEREST

There were no conflicts declared.

3 CONFIRMATION OF MINUTES

3.1 Minutes of the meeting of the Utilities and Roading Committee held on Tuesday, 20 February 2024

Moved: Councillor Redmond Seconded: Councillor Ward

THAT the Utilities and Roading Committee:

(a) **Confirms** the circulated Minutes of the meeting of the Utilities and Roading Committee held on 21 November 2023 as a true and accurate record.

CARRIED

3.2 Notes of the meeting of the Utilities and Roading Committee held on Tuesday, 20 February 2024

Moved: Councillor Mealings Seconded: Councillor Brine

THAT the Utilities and Roading Committee:

(a) **Receives** the circulated notes of the workshop of the Utilities and Roading Committee held on 20 February 2024.

CARRIED

3.3 **Matters Arising (From Minutes)**

Nil.

4 DEPUTATION/PRESENTATIONS

Nil.

5 REPORTS

5.1 **July 2023 Flood Recovery Progress Update –** K Simpson (3 Waters Manager), J McBride (Roading and Transport Manager) and P Towse (Flood Team Lead)

K Simpson provided an update on the ongoing Flood Recovery Work Programme. He noted that the staff had completed approximately 79% of the investigation work and was hoping to have it completed by the end of April 2024. The implementation of maintenance actions was 98% complete. K Simpson highlighted the following in terms of key focus areas:

- Cam River / Ruataniwha - Environment Canterbury (ECan) had completed the maintenance work, including tree felling and vegetation clearance, on the lower Cam River from the Kaiapoi River up to Bramleys Road.
- Tuahiwi area – The Council had completed heavy maintenance work at the Tuahiwi Stream, including trimming vegetation from the banks and removal of sediment from the bed along the main channel of the stream between Church Bush Road to the Cam River. Staff had identified the need to upgrade the diversion drain which ran from the corner of Te Pouapatuki Road and Greens Road out to the Cam River. These works were planned to be undertaken before winter.
- Waikuku Beach – Staff were addressing several smaller projects in this area. Detailed assessment was underway to determine the cause of flooding from the Taranaki Stream, which was higher than expected, although it would take some months to complete. The causeway between Pegasus and the beach had been identified as potentially stopping the use of some of the floodplain within the coastal area.

  G Cleary noted that the catchment area had been extensively investigated as part of the modelling for the Taranaki Stream. The Infrastructure Strategy identified some funding for a major upgrade; however, this was outside the 2024-34 Long Term Plan timeframe. Staff had added the Taranaki Stream to one of the key areas that they would monitor.

Councillor Mealings questioned whether any of the planned stopbank improvement work in the Cam River would be near the Arohatia te Awa planting project. K Simpson noted that the Council was proposing improvements to several sections of the upper Cam River/Ruataniwha stopbank. Two of the sections located upstream from Bramleys Road were currently being programmed for construction and ECan would be undertaking work on two sections downstream. Staff were aware of the stopbank overtop near the motorway bridge. However, there were no immediate upgrades planned in this area.

In response to a further question from Councillor Mealings, K Simpson confirmed that the tender for the proposed work in Wilson Drive, Ohoka, had not yet been awarded.

Councillor Ward enquired if it would be better if ECan made the Ashley River outlet straight into the sea at Waikuku Beach. G Cleary explained that during the July 2023 flood event, the Ashley River breached its banks and carved out a new river mouth, which was a natural occurrence. To ensure that the Ashley River was routed to always flow straight into the sea would be a challenge because you would effectively be constantly trying to defy nature. G Cleary further noted that ECan had identified $15 million in its draft 2024-34 Long Term

Plan for works on the Ashley River. Part of that work would be investigating the Ashley River's capacity. He expected that ECan would identify upgrades to stopbanks and potentially secondary stopbanks requirements. In terms of containing the Ahsley River itself, it would be part of consideration.

In response to a question from Councillor Williams, K Simpson noted that 98% of the required maintenance actions had been identified and passed on to the Council's maintenance contractors. The maintenance contractors were currently very busy working on that package of work. However, he understood that they had more capacity if required. Staff was, therefore, confident that work would be completed before the winter. K Simpson confirmed that there was adequate budget for the works.

Councillor Fulton asked if the assessment of the backflow included the impact of housing growth. K Simpson explained that staff were undertaking modelling as part of the Taranaki Stream work, and ECan was also doing modelling as part of the Cam River Scheme Design. Both of the scenarios would consider the changes with additional development occurring in the catchment areas over the next 20 to 30 years.

Moved: Councillor Mealings Seconded: Councillor Ward

THAT the Utilities and Roading Committee:

(a) **Receives** Report No. 240307035674.

(b) **Notes** that all 86 investigations have been triaged, 11 are currently being scoped, 13 are under investigation, 29 have works being reviewed for approval, and 28 are complete.

(c) **Notes** that all 126 maintenance actions have been triaged, three are work in progress, 21 have works programmed, and 102 are complete.

(d) **Notes** that the total cost estimate for the flood recovery work is $4.055 million.

(e) **Notes** that the expenditure to date is $1,974,998, and the final forecast expenditure remains at $4.055 million.

(f) **Circulates** this report to all Community Boards for information.

CARRIED

6 CORRESPONDENCE

Nil.

7 PORTFOLIO UPDATES

7.1 Roading – Councillor Philip Redmond

- As we head into autumn, some activities were starting to draw to a close, a number of construction projects were progressing well, and two new projects were about to start. Autumn leaf fall was just starting and would become a key area of focus over the next couple of months.
- Staff were continuing to work with the Selwyn District Council on the Waimakariri Gorge Bridge Deck Replacement Project. Fulton Hogan had been awarded the contract. Scaffolding would be installed from 25 March 2024, and night works to replace the deck would begin straight after Easter.
- The resealing and Pavement Rehabilitation Programmes were continuing; however, they would largely be complete by early April 2024.

- The River Road Upgrade Project had been awarded to Stopforth Construction and was commencing this week.
- Higgins Ltd had commenced the Island and Ohoka Roads Intersection upgrade, with the widening areas and preparing for the first kerb pour. The first of the signal pole foundations had been poured.
- The Kerb and Channel Renewal Contract was continuing. Pidgeon Contracting had completed the work on Edward Street and had now moved into Geddis Street.
- The Palmer Street Upgrade contract had been awarded to EDR Contracting. Work started on site in late February 2024 and included kerb and channel renewal, water main, stormwater, and footpath renewals.
- Doubledays Footbridge was currently closed while repairs were being agreed upon and priced. The repairs would be completed before the bridge was reopened to the public, which was expected to take around three weeks.
- Pavement rehabilitation work on Tram Road was now complete. The Council had one failed area in the tie-in between the old and new pavements. Corde identified this early and repaired it very quickly; however, it would be monitored.

  Councillor Williams asked if staff knew what caused the resealing on Tram Road to fail. J McBride noted that she still had to be briefed by Corde, and the Council had yet to establish the cause. If the contractor had to repair it due to workmanship, it was done at the contractor's cost.
- Pavement rehabilitation was also underway on the western end of South Eyre Road, which was the last site to be completed this construction season.
- Resealing had been completed on Ashley Gorge Road and Rangiora Woodend Road.
- The installation of new sewer mains in Rangiora along King Street was continuing. King Street was closed southbound from Blackett to High Streets. Also, the King Street / High Street roundabout was being closed overnight for reconstruction and resurfacing.
- Smith Street remained closed to eastbound traffic between Charles and Cass Streets for the installation of a new water trunk main.
- Remarking the road markings was underway in Rangiora, and the Council would be remarking in Kaiapoi next.
- South Belt would be closed at the Pentecost Road intersection for three weeks while the intersection was upgraded, and the water main was extended through this area. There would be a one-way section from Rowse to Martyn Street. South Belt was expected to reopen to eastbound traffic from Townsend Road after three weeks.
- The RYDA Road Safety Programme was recently delivered to a group of Rangiora High School students and this popular programme was well received. The programme aimed to provide students with the tools and understanding they need to see themselves as active, responsible road citizens.

7.2 **Drainage, Stockwater and Three Waters (Drinking Water, Sewer and Stormwater) – Councillor Paul Williams**

Water:

- The UV treatment installation project continued to progress well. There would be a number of shutdowns over the coming months as works to enable the installation of new pipework to connect up the UV units. The shutdowns were expected to typically last for four to eight hours, and customers would be advised in advance.

Wastewater

- There had been a decrease in the number of bird deaths from Avian Botulism, indicating that the outbreak was over. The numbers were less than in other years when there were outbreaks.

Drainage

- There would be a 2024-34 Long Term Plan drop-in session focussing on the Mandeville Resurgence Channel Upgrade project at 7pm on 11 April 2024, at the Ohoka Domain Pavilion. Letters had been sent to the residents who submitted during the consultation last year, and a letter drop would be undertaken to residents along the route of the Stage 1 works. The purpose is to inform residents of the proposed works and budgets included in the draft LTP.
- The next round of Drainage Advisory Group meetings was currently underway. There was a push to complete drain maintenance works prior to winter.

7.3 Solid Waste– Councillor Robbie Brine

- Kerbside Standardization had been implemented, and to date, the Council appeared to comply with the Ministry for the Environment's requirements by updating its website to itemize the changes and provide links to the relevant pages. Eco Educate staff continued to talk about the changes to groups of residents and to people at supermarkets, aquatic centres, libraries, service centres, some markets, and the Volunteer Expo.
- The Council had postponed the re-starting of kerbside bin audits until after Easter owing to staff being on leave through March 2024.
- Staff would be meeting with Ecogas, the company building the Christchurch City Council's new organics processing plant, in early April 2024. It was anticipated that the plant would be a biodigester for the food scraps, which not only would generate heat and energy, the liquid 'digestate' was a liquid fertilizer. This plant would include a process to shred and dry the woody portion of the organics bins to create a biofuel which could be used in boilers, replacing coal.
- Staff met online with a representative from Tetrapak and Saveboard to ascertain if it would be feasible for the Council to have liquid paperboard carton drop-off boxes in the District. The best product was received when the staff was present to oversee the process. The most contamination was seen at transfer stations where there was sporadic staff oversight of the drop-box. However, staff would continue to investigate various options. Saveboard was used in the manufacturing of building products that were used to line the inside of houses.
- Kaiapoi now had a plastics recycling drop-off at the new Woolworths, which was good to hear.

Councillor Fulton asked what the Council currently did with its wood waste. Councillor Brine noted that it would depend on who was doing the work. If it was taken to the transfer station and applied as green waste, it would be sent to Canterbury Landscapes for composting. G Cleary explained that all organics that were collected at kerbside went to the facility in Bromley and, in future, would go to the energy centre. As part of that process, one of their products would be a wood chip to be used instead of coal. If the Council was removing trees, the waste was managed in an appropriate way depending on the project. A lot of it was chipped and then put to use.

7.4 Transport – Mayor Dan Gordon

Mayor Gordon was not present to provide an update.

8 MATTERS REFERRED FROM THE COMMUNITY BOARDS

8.1 **Kaiapoi North School – Proposed Pedestrian Crossing Improvements –** J McBride (Roading and Transport Manager), K Straw (Civil Projects Team Leader) and S Binder (Senior Transportation Engineer)

K Straw noted that the report was presented to the Kaiapoi-Tuahiwi Community Board in November 2023. The report sought approval for changes to the existing pedestrian crossing and line marking on Williams Street outside Kaiapoi North School. He explained that the school had raised concerns regarding safety, visibility, and speeding past the school, and the community had raised concerns regarding the accessibility to a safe pedestrian crossing of Williams Street. The report referred to two stages of work, one in the current financial year, to address the line markings, speed and safety outside the school. In the next financial year, staff intended to do some work to improve the accessibility of the pedestrian crossing. At this stage, staff was looking at combining the work, carrying over the budget, and doing it all in the next financial year.

Councillor Williams questioned whether the Council could assist in designing a pedestrian crossing that is accessible to users in wheelchairs, prams, mobility scooters, or less mobile residents. K Straw advised that the design had not yet been done. However, the current plan was to install a small retaining wall on the boundary and build the path up; that way, a 1/12 grade could be achieved from the footpath to the edge of the current grade, and a 1.2-metre level platform would be needed before you come to the pedestrian crossing.

Moved: Councillor Redmond Seconded: Councillor Brine

THAT the Utilities and Roading Committee:

(a) **Approves** the design to improve the conspicuity of the pedestrian crossing and reduce vehicle speeds outside the school (Trim 231011161371).

(b) **Approves** the implementation of no-stopping signage outside 227 Williams Street, Kaiapoi (south of the pedestrian crossing) during the hours of 8:00 am to 9:00am and 2:30pm to 3:30pm School Days.

(c) **Approves** the implementation of no-stopping signage outside 231 Williams Street to Sims Road, Kaiapoi (north of the pedestrian crossing) during the hours of 8:00am to 9:00am and 2:30pm to 3:30pm School Days.

(d) **Approves** the installation of 13 meters of no-stopping lines on Williams Street, Kaiapoi, outside 274 Williams Street.

(e) **Approves** the extension of existing no-stopping lines outside 239 Williams Street, Kaiapoi, by 5 meters.

(f) **Approves** the extension of existing no-stopping lines outside 229 Williams Street, Kaiapoi, by 3 meters.

(g) **Notes** that the installation of no-stopping lines as per recommendation (e) is due to the road shoulder camber being unacceptable for roadside parking that results in motor vehicles being unable to access the road shoulder and, therefore, parking within the adjacent cycle lane.

(h) **Notes** that the extension of the existing no-stopping lines, as per recommendations (f) and (g), involves adjusting the parking bay length to ensure it accommodates full car lengths. This avoids excess space that may encourage vehicles to squeeze into left-over space, which may result in encroachment into the no-parking area and obstruct visibility to the crossing.

(g) **Notes** that a budget has been allocated in the Minor Safety Improvements Programme for this project in the current financial year, as it is a carryover project from the 2022/23 financial year.

(h) **Notes** that the Utilities and Roading Committee approved this project as part of an overall programme of minor safety improvements on 19 July 2022.

(i) **Notes** that the steps to the pedestrian crossing will remain following the works and that this will be added to the future minor improvement programme for 2024/25 financial year.

CARRIED

Councillor Redmond commented that the proposed changes to the existing pedestrian crossing and line marking on Williams Street were discussed at the Kaiapoi-Tuahiwi Community Board meeting, and they were unanimous on the final decision. He noted that there had been some chatter on social media about the pedestrian crossing outside Kaiapoi North School and concerns from the school. These proposed works were intended to make the corner much safer.

8.2 **Approval to Install No Stopping Restrictions associated with Pedestrian Refuge Islands –** K Straw (Civil Projects Team Leader) and J McBride (Roading and Transportation Manager)

K Straw explained that approval was being sought for the approval for the installation of three pedestrian refuge islands and the associated no-stopping lines. He clarified that the two Ivory Street refuge islands had already been priced at $34,000, and the West Belt refuge island was priced at $19,000, which excluded the cost of the proposed build-out. The matter was extensively debated at the Rangiora-Ashley Community Board meeting held on 13 March 2024, with members suggesting that staff develop a policy framework to guide any future installation of pedestrian refuge islands.

K Straw noted that the proposed sites were:

- On Ivory Street, immediately north of Thorne Place outside the Bainswood Rest Home, some of the Community Board members were concerned about the short distance between the proposed refuge island and the existing refuge island on Buckham Street, which was approximately 150 meters apart.
- On Ivory Street, north of Doggett Place, outside the Kentucky Fried Chicken (KFC), the Community Board raised concerns that the location would negatively impact the traffic flow on Ivory Street. Also, the proposed refuse island could potentially place pedestrians in danger due to conflicts with turning traffic. There was a suggestion from the Community Board that it may be better to signalize the Queen Street intersection rather than install a pedestrian refuge.
- On West Belt, mid-block, between Milesbrook Close and Harrod Place, some Community Board members questioned whether the facility was needed. However, following the concerns raised by the Community Board in February 2024, staff engaged WSP to provide an independent technical report on the proposed locations and suitability, which was included in the report.

In response to a question raised by Councillor Redmond, K Straw confirmed that the Council currently did not have a policy pertaining to pedestrian refuges. However, the Council was receiving many requests for the installation of pedestrian refuges and tried to prioritise them.

Councillor Redmond further asked where the requests originated. J McBride explained that some were received via service requests for safe pedestrian crossings. If the Council became aware of any injuries to a pedestrian, they would record it in the Deficiency Database and investigate the options for ensuring safe pedestrian crossings. In terms of

West Belt, there were no crossing facilities for the entirety of the road.

Councillor Redmond enquired if the Council had data on the number of pedestrians or mobility scooter operators who wanted to cross the roads at these points. J McBride noted that staff had not done specific surveys. However, they investigated what pedestrian facilities were available in these areas. On West Belt, there was a street-to-street walkway adjacent, which encouraged pedestrians. Hence, staff tried to locate the pedestrian refuge island as close to the street-to-street walkway as possible. On Ivory Street, there were no pedestrian facilities between Queen and Alfred Streets, and pedestrians were crossing backwards and forwards to KFC and the Produce Market.

Councillor Ward noted that this matter had been widely discussed at the March 2024 Rangiora-Ashley Community Board meeting. She asked if the Community Board supported the recommendation. J McBride confirmed that the board passed all the recommendations.

Councillor Williams noted that the pedestrian refuge island outside Auto Tech was removed because it was close to businesses, and motorists could not turn in properly. He asked what the difference was between that refuge island and the one proposed outside KFC. J McBride explained that staff had done extensive work on the location of the proposed refuge island to ensure the necessary turning curves and that truck access to the Produce Market was not negatively impacted. Staff had spoken with the Produce Market, and they were very supportive of the proposal.

Moved: Councillor Ward Seconded: Councillor Brine

THAT the Utilities and Roading Committee:

(a) **Approves** the installation of no-stopping restrictions at the following locations to install a pedestrian refuge on West Belt, mid-block between Milesbrook Close and Harrod Place:

i. Outside No. 55 West Belt (approximately 30m long)

(b) **Approves** the installation of a 10-meter kerb build-out in front of No. 48 West Belt.

(c) **Approves** the installation of no-stopping restrictions at the following locations to install a pedestrian refuge on Ivory Street immediately north of Thorne Place:

i. Outside No. 34 Ivory Street (approximately 30m long)
ii. Outside No. 29 and 35 Ivory Street (approximately 40m long)

(d) **Notes** that to retain two on-street parking spaces outside No. 48 West Belt, the proposed refuge island has been offset to the west, and a kerb buildout is proposed on the eastern side of West Belt.

(e) **Notes** that there is a pedestrian refuge island proposed for Ivory Street, immediately north of the Doggett Place intersection. However, there is already no stopping restriction through this length, and therefore, no changes to the parking are required at this location.

CARRIED
3/2

A Division was called:

For: 3 Councillors Brine, Mealings and Ward.
Against: 2 Councillors Redmond and Williams.

Councillor Ward appreciated that the staff had listened to all the residents and business owners. She thoroughly approved of the conclusions the staff had reached. She commented that it was not safe to try to cross Ivory Street, and the proposed pedestrian refuge islands would provide some protection for pedestrians.

Councillor Brine commented that the matter led to a very contentious discussion at the Rangiora-Ashley Community Board meeting. Hence, the recommendations were considered in sections after three divisions were called motion passed.

Councillor Redmond supported the suggestion of developing a policy for the installation of pedestrian refuge islands. He noted that pedestrians had a choice where they wished to cross the road; however, businesses and property owners did not, as they were in fixed locations. Councillor Redmond was concerned that some of the proposed refuge islands would have a significant negative impact on residents, and he, therefore, did not support the motion.

Councillor Mealings noted that the motion was well-traversed and discussed at the Community Board level. She also noted that she had been approached by residents on West Belt requesting safe pedestrian crossings. West Belt was a wide, busy road with no place for pedestrians to cross safely. She, therefore, believed that the pedestrian refuge island would be a welcome addition. Regarding Ivory Street, she had faith that the staff had thoroughly investigated the placement of the refuge islands, and the Council was required to obtain a safety audit. Hence, Councillor Mealings supported the motion.

Councillor Williams did not support the motion because the West Belt residents consulted about the pedestrian refuge island did not support the project. He could not understand why residents from the Bainswood Rest Home would wish to cross Ivory Street at the proposed location, as there were already two refuge islands there, one on each side of Countdown. Councillor Williams commented that pedestrian refuge islands were disrupting traffic and leading to accidents. He thought that the Council would be worsening the situation, particularly with the proposed refuge island outside the KFC and Produce Market. This part of Ivory Street delt with a high volume of traffic, including trucks turning in and out of the Produce Market. Installing a refuge island in this location would cause a backup of traffic along Ivory Street.

In her right of reply, Councillor Ward stressed that the pedestrian refuge islands were necessary, and their proposed locations had been well thought out. Many people with limited mobility who lived at the Bainswood Rest Home wanted to be able to safely access Rangiora. She also believed the proposed refuge island outside KFC was necessary as it ensured safe passage in the middle of the road.

9 QUESTIONS UNDER STANDING ORDERS

Nil.

10 URGENT GENERAL BUSINESS

Nil.

11 MATTERS TO BE CONSIDERED WITH THE PUBLIC EXCLUDED

In accordance with section 48(1) 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 (or sections 6, 7 or 9 of the Official Information Act 1982, as the case may be), it was moved:

Moved: Councillor Williams Seconded: Councillor Mealings

That the public be excluded from the following parts of the proceedings of this meeting:

11.1 Confirmation of Minutes from 20 February 2024.
11.2 Report from Management Team Operations 26 February 2024.

The general subject of each matter to be considered while the public was 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 were as follows:

Item No.	Subject	Reason for excluding the public	Grounds for excluding the public.
12.1	Confirmation of Minutes from 20 February 2024	Good reason to withhold exists under section 7	To carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations) LGOIMA Section 7(2)(i).
12.2	Report from Management Team Operations 26 February 2024	Good reason to withhold exists under Section 7	As per Section 7(h) of the Local Government Official Information and Meetings Act; "enable any local authority holding the information to carry out, without prejudice or disadvantage, commercial activities".

CARRIED

CLOSED MEETING

The public excluded portion of the meeting commenced at 10:11am to 10:13am.

OPEN MEETING

NEXT MEETING

The next meeting of the Utilities and Roading Committee will be held on Tuesday 16 April 2024 at 9am.

THERE BEING NO FURTHER BUSINESS THE MEETING CONCLUDED AT 11.24AM.

CONFIRMED

_____

Chairperson

_____

Date

NOTES OF A WORKSHOP OF THE UTILITIES AND ROADING COMMITTEE HELD IN THE COUNCIL CHAMBERS, HIGH STREET, RANGIORA ON TUESDAY, 19 MARCH 2024, COMMENCING AT 10.13 AM.

PRESENT

Councillors P Williams (Chairperson), R Brine, N Mealings, P Redmond, J Ward and Mayor D Gordon (arrived 10:15am).

IN ATTENDANCE

Councillors B Cairns and T Fulton.

J Millward (Chief Executive), G Cleary (General Manager Utilities and Roading), K Simpson (3 Waters Manager), J McBride (Roading and Transportation Manager), K Straw (Civil Projects Team Leader) and C Fowler-Jenkins (Governance Support Officer).

APOLOGIES

Moved: Councillor Mealings Seconded: Councillor Redmond

THAT an apology for lateness be received and sustained from Mayor Gordon who arrived at 10:15am.

CARRIED

1. Strategic Options for Oxford Wastewater Scheme

Presenter(s) Caroline Fahey (Water and Wastewater Asset Manager) and Kalley Simpson (3 Waters Manager)

Trim ref: 240320044065.

Questions/ Issues/ Observations:

- Have staff contemplated combining with the Eastern District Sewerage System?

  This was anticipated to be an issue for the Council's 2027-37 Long Term Plan. Staff had signalled that the Council would need to consider how to fund the project, whether that should be on a scheme-by-scheme basis or whether the Council would need to investigate the possibility of a district-wide wastewater rating.

- How real were the concerns from the Rūnanga about the pipe across the Eyre River?

  Staff had consulted Mahaanui Kurataiao Ltd (MKL), who advised that the Rūnanga strongly opposed the pipeline across the Eyre River from a cultural perspective. They were likely to oppose the consent for renewal on the same basis. However, if the Council continued to treat in Oxford, the Rūnanga had signalled that they would prefer the Council to do so on the north side of the Eyre River and not cross the river. The Iwi Management Plan had called out both Waimakariri District and Christchurch City Councils' ocean outfalls as not being supported in the long term. The preference of the Rūnanga was land-based disposal. From a technical point of view, it would be extremely challenging to try and find suitable land for land-based disposal in the Waimakariri District, particularly on the eastern side of the district, without impacting groundwater.

- Considering the Rūnanga's concerns, had the Council ever considered buying land on the other side of the Eyre River close to the treatment plant?

  The Council was beginning to investigate this. Once staff received feedback from MKL, they started investigating viable disposal areas on the north side of the Eyre River.

- The Council planned to review its Rating Schemes after the next local government election. One option was potentially to examine Oxford because its sewer rate was very high.

  It made sense that the new Council that would be responsible for the 2027-37 Long Term Plan should head the review of the Rating Schemes.

- How was the Mandeville area's wastewater dealt with currently?

  The Mandeville urban area was reticulated, and the rural areas were not; therefore, they were on septic tank systems.

- Based on 2020 statistics, Oxford's population was nearly 2,200 and Cust at 426. Whereas Mandeville was currently approximately 3,680. The socialisation of the cost would be more beneficial population-wise to come straight through to Kaiapoi.

  Staff were currently only investigating high-level options. There was potential for Mandeville to be piped up to the Cust Oxford to Rangiora line as well. Staff could investigate various different combinations.

- Was staff anticipating growth in Cust, as there was nothing major included in the District Plan?

  The Council had allowed for background growth that occurred. In Cust, there are currently just over 100 properties, and over the 50-year period, that effectively increased up to 340 connections.

- Would it not make sense for the Council to also provide potable water while constructing a major pipeline. Because if Oxford was expected to double in size over the next 50 years, its drinking water supply would not be adequate.

  The Council needed to examine the resilience of all of its water supplies. It had rationalised its water supplies over the years and was now down to 11.

- In the early 2000s, the Council brought 253 hectares of land for on-land disposal. Had staff reviewed the technical data to understand why the Council decided against land disposal and went with ocean outfall?

  When staff looked at the best solution for the eastern districts in the early 2000s, they effectively weighed up land disposal and discharge to sea. Based on what was best at the time from a consenting and environmental perspective, the decision was made to go with an ocean outfall. Since then, the Iwi Management Plan came into effect, which set out not only opposition to the Waimakariri and Christchurch City Council's ocean outfall but seemly to discharge out to sea in general. The staff took the opportunity to start liaising with the Rūnanga regarding what would be acceptable in terms of the treatment standard to enable discharge to the sea to occur. This was similar to the Oxford land disposal site; while on the surface, the Council would expect that the Rūnanga would support on-land disposal, they were not supporting crossing the Eyre River and the irrigation field in a location was prone to surface flooding in an extreme event.

- The Rūnanga representative on the Working Party that supported the purchase of that land opposed on-land disposal. Consistency as far as decision making would be advisable.

  Staff had not specifically considered that assessment as part of this project; however, it would have been wise for staff to do so. The Eastern District Assessment was certain to provide some helpful information and help staff understand the decision-making and issues.

THERE BEING NO FURTHER BUSINESS THE WORKSHOP CONCLUDED AT 11.10AM.

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	DRA-20-25-08 / 240314040024
REPORT TO:	UTILITIES & ROADING COMMITTEE
DATE OF MEETING:	16 April 2024
FROM:	Jason Recker – Stormwater & Waterways Manager Kalley Simpson – 3 Waters Manager
SUBJECT:	School Road Drainage Upgrade
SIGNED BY: **(for Reports to Council, Committees or Boards)**	Department Manager / Chief Executive

1. SUMMARY

1.1 This report is to:

a) Provide further information to Council regarding properties in a similar situation to that of 10 School Road.

b) Seek approval of additional budget of $126,000 for the pipework upgrades and driveway alterations for 24/25 financial year as part of the LTP deliberations.

1.2 Council Staff presented the “School Road Drainage Upgrade” report (TRIM 230324041614) to the Woodend-Sefton Community Board at the 4 December 2023 meeting. The report outlined the progress of the investigation work for the School Road drainage upgrades and requested approval for the proposed solution to address the flooding issues at 10 School Road, Woodend.

1.3 The Woodend-Sefton Community Board requested that a recommendation be added to the previous Council report to consider the precedent that may be set for other properties who do not meet the one in five-year level of service.

1.4 Council Staff presented the “School Road Drainage Upgrade” report (TRIM 230324041614) to Council at the 5 December 2023 meeting. Council requested that the report be tabled until further information on affected properties had been investigated and that this matter be considered as part of the 2024/34 Long Term Plan process for a decision to be made.

1.5 In response to the Council's request, staff conducted a search for properties with similar characteristics and identified one at 7 Aldersgate Street in Kaiapoi. This property, like the one on School Road, features a below-ground garage with liveable floors and lacks stormwater pipework in the street, necessitating a potential upgrade to meet engineering standards. Unlike the situation at School Road, however, there is no history of drainage-related service requests or flooding issues at 7 Aldersgate Street.

1.6 Council is responsible for investigating flooding-related service requests to assess potential deficiencies in our stormwater network. The stormwater network serves as a vital defence mechanism, safeguarding individuals, properties, and infrastructure from

the damaging effects of flooding. It consists of a primary drainage system of pipes and waterways and detention areas and a secondary system that takes use of roadways, open channels, controlled flood plains, natural ponding areas and flow paths.

1.7 The proposed solution for School Road represents a significant improvement towards enhancing flood resilience, offering a 1 in 5-year primary network stormwater level of service. Additionally, it improves the capacity of secondary flow paths, mitigating potential flood risks of private property.

2. RECOMMENDATION

THAT the Utilities & Roading Committee recommends:

THAT the Council:

(a) **Receives** report No. 240314040024.

(b) **Approves** the inclusion of an additional budget for consideration as part of the deliberations on the Long Term Plan, of $126,000 in the 2024/2025 financial year under the Stormwater LOS (PJ 101517.000.5123) budget, for the construction of the School Road Drainage Upgrade, giving a total budget of $541,000.

(c) **Notes** that the estimate for this work (including a 20% project contingency, and all associated fees) is $541,000, while the current budget allowance is $415,000.

(d) **Notes** that the additional budget for 2024/2025 will increase the Coastal Urban Drainage rate by approximately $2.88 or 1.2% per property from 2025/26 onwards.

(e) **Notes** that the overall rating impact on the district is an increase of 0.14%.

(f) **Notes** that a piped solution will improve the level of service in School Road meeting Waimakariri District Council's 1 in 5-year primary system requirement set out in the Engineering Code of Practice.

(g) **Notes** that the secondary flow path will be altered (subject to the approval of the 10 School Road property owner) to flow southwards over the crown of the road away from the east driveway of 10 School Road. This is expected to prevent secondary flow overtopping the driveway in significant storm events meeting Waimakariri District Council's 1 in 50-year secondary system requirement set out in the Engineering Code of Practice.

(h) **Notes** that this upgrading approach is consistent with other drainage improvement works undertaken in the District and does not set a new precedent for other properties who do not meet the level of service set out in the Engineering Code of Practice.

3. BACKGROUND

3.1 The need for an upgrade was identified following flooding of the property at 10 School Road in the 1 June 2019 flood event. This event was a short duration and high intensity event, with a return period in excess of the 1 in 100-year (1% AEP) event.

3.2 The existing primary network in this area is not meeting the desired 1 in 5-year return period (20% AEP) level of service, and the house is lower than the road reserve. This results in flooding of the roadway, and in extreme events (such as 1 June 2019), into the lower section of the house.

3.3 A DN375 and DN300 main is proposed from the corner of School Road / Main North Road to outside 12 School Road. A high-capacity sump is to be installed outside 12 School Road.

3.4 Driveway alterations are proposed to increase the crest height to improve the secondary flow path capacity and divert flow southwards over the crown of the road before overtopping the east driveway entrance to 10 School Road.

3.5 While the primary beneficiary of the work is the 10 School Road resident, the remainder of the street will benefit from the improved primary drainage network.

3.6 It is proposed to tender this contract this year and construct in the 2024/2025 financial year.

3.7 Council Staff presented the “School Road Drainage Upgrade” report (TRIM 230324041614) to the Woodend-Sefton Community Board at the 4 December 2023 meeting. The report outlined the progress of the investigation work for the School Road drainage upgrades and requested approval for the proposed solution to address the flooding issues at 10 School Road, Woodend.

3.8 The Woodend-Sefton Community Board requested that a recommendation be added to the Council report to consider the precedent that may be set for other properties who do not meet the one in five-year level of service.

3.9 Council Staff presented the “School Road Drainage Upgrade” report (TRIM 230324041614) to Council at the 5 December 2023 meeting. Council requested that the report be tabled until further information on affected properties had been investigated and that this matter be considered as part of the 2024/34 Long Term Plan process for a decision to be made then.

4. ISSUES AND OPTIONS

4.1. As per the Council's request, Council staff conducted a search for properties in similar situations. Our property search process involved internal discussions with long standing staff members who have extensive knowledge of property and road flooding issues within the district. Through those discussions we identified one property at 7 Aldersgate Street in Kaiapoi (refer to Figure 1).

4.2. This property features a below-ground garage with liveable floors. However, Adlers Street currently lacks stormwater pipework, theoretically this would require an upgrade to meet Council engineering code of practice standards.

4.3. In contrast to the property at 10 School Road, there is no history of drainage-related service requests at 7 Aldersgate Street. However, historical information provided by staff indicates that there have been requests for sandbags, signalling localised concerns regarding potential flooding or water ingress. Nevertheless, beyond these requests, no further concerns or information have been conveyed to the council. Should service requests arise in the future, Council staff would assess the need for drainage improvement works in the area and determine whether a project is warranted similar to that of 10 School Road.

Figure 1 - 7 Aldersgate Street in Kaiapoi

4.4. Over the years Council has implemented improvement projects based on flood related drainage service requests. Service requests are an important indicator where our stormwater network is deficient and requires attention. One example of this would be 69 Raven Quay in Kaiapoi.

4.5. The property owners at 69 Raven Quay have submitted several flooding-related drainage service requests. Situated in a low-lying area near the Dudley Drain Stormwater Pumping Station, the property experienced flooding during a storm event on June 1, 2019.

4.6. In response, Council implemented a first phase of works that was completed in early 2020, which involved repairing a damaged stormwater pipe, upgrading an existing sump, and constructing a secondary overland flow path from the cul-de-sac of Raven Quay to Rich Street (TRIM 191216177771).

4.7. Hydraulic analysis revealed that the existing primary flow infrastructure along Raven Quay lacked sufficient capacity, prompting phase 2 of works. These works included the construction of a new stormwater pipe to convey the flow associated with a 20% annual exceedance probability (AEP) storm event, complying with WDC's Engineering Code of Practice design requirements (refer to Figure 2). These works were completed in 2021.

Figure 2 - Raven Quay Stormwater Works Phase 2

4.8. In summary, Council is responsible for investigating flooding-related service requests to assess potential deficiencies in our stormwater network. The stormwater network serves as a vital defence mechanism, safeguarding individuals, properties, and infrastructure from the damaging effects of flooding. It consists of a primary drainage system of pipes and waterways and detention areas and a secondary system that takes use of roadways, open channels, controlled flood plains, natural ponding areas and flow paths.

4.9. Adhering to the standards outlined in the WDC engineering code of practice, the primary system is designed to handle more frequent rainfall events (20% AEP), while the secondary system is engineered to withstand higher intensity events (2% AEP) and instances of blockages in the primary system.

4.10. The proposed solution represents a significant improvement towards enhancing flood resilience, offering a 1 in 5-year primary network stormwater level of service. Additionally, it improves the capacity of secondary flow paths, mitigating potential flood risks of private property.

4.11. **Council has three options:**

4.12. **Option 1** – Council approves additional budget of $126,000 for the pipework upgrades and driveway alterations for 24/25 financial year as part of the LTP deliberations.

4.13. This is the recommended option for the following reasons:

- Option 1 meets the target level of service requirements, is cost effective, and is supported in principle by the most affected resident.
- Option 1 meets Council's 1 in 5-year primary level of service, increase secondary flow path capacity and divert flow away from the driveway.

4.14. **Option 2** – Council approves additional budget of $54,000 for **only** the pipework upgrades for 24/25 financial year as part of the LTP deliberations.

4.15. This option does meet Council's 1 in 5-year primary level of service for stormwater reticulation, however it is **not** the recommended option for the following reason:

- Secondary flow in large and intense storm events will still enter the property and the landowner may have expectations around works to provide increased secondary flow protection.
- Additionally, it's important to emphasize that while several areas in the district may not currently meet the Council's level of service regarding secondary overland flow, addressing the flooding risks to an individual property in this instance can be achieved at a relatively low cost. By focusing efforts on mitigating these localised issues, we can alleviate the concerns of property owners and enhance overall flood protection within the community.

4.16. **Option 3** – Council declines the approval of any works.

4.17. This is **not** recommended due to the existing system on School Road not meeting Council's 1 in 5-year level of service and there is a known flooding issue. Additionally, the 1 in 50-year secondary flow path from the road reserve is into a habitable building.

4.18. The recommended upgrading approach is consistent with other drainage improvement works undertaken in the District and does not set a new precedent for other properties who do not meet the level of service set out in the Engineering Code of Practice.

4.19. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Mana Whenua

Te Ngāi Tūāhuriri hapū via Mahaanui Kurataiao (MKT) were included in discussions when additional catchment was being added to Woodend Box Drain at 63 Rangiora Woodend Road. As the current design does not go into Box Drain (which feeds into Tuahiwi Stream) and does not alter the current flow path of water in storm events it is understood that the initial concerns raised with the original proposal have been addressed.

5.2. Groups and Organisations

There are groups and organisations likely to be affected by, or to have an interest in the subject matter of this report.

- The landowner at 10 School Road has been informed of the proposal for this project, and is supportive in principle, although staff are still working through gaining approval on some final details.

Council Staff presented the "School Road Drainage Upgrade" report (TRIM 230324041614) to the Woodend-Sefton Community Board at the 4 December 2023 meeting.

5.3. Wider Community

The wider community is not likely to be affected by, or to have an interest in the subject matter of this report.

- There has been no consultation as yet with the wider community on this proposal.
- The local community will be notified of the project works via letter drop, once the concept and budget has been approved and prior to construction starting.

6. OTHER IMPLICATIONS AND RISK MANAGEMENT

6.1. Financial Implications

There are financial implications of the decisions sought by this report.

- The current budgets have the following allocations:
    - School Road Drainage Upgrade - $415,000 (P.J. 101517.000.5123) (construction 2023/2024)

For Option 1 the Engineer's Estimate including professional fees is outlined in Table 1.

Table 1: Option 1 Engineer's Estimate

Committed to Date	Remaining Costs	Amount
2021 / 2022 Design fees		$18,000
August 2022 Mahaanui Kurataiao Report		$2,000
2022 / 2023 Design fees		$39,000

2023 / 2024 Design fees to date		$11,000
	Construction Pipeline	$297,000
	Contingency Pipeline (20%)	$59,000
	Professional Fees Pipeline	$43,000
	Total Pipeline	**$399,000**
	Construction Driveway Alterations	$56,000
	Contingency Driveway Alterations (20%)	$11,000
	Professional Fees Driveway Alterations	$5,000
	Total Driveway Alterations	**$72,000**
	Overall Estimate	**$541,000**

- For Option 2 the Engineers Estimate is $469,000 (excludes or defers driveway alterations).

6.1.1 Taking into consideration, professional fees and the 20% contingency, the following budget amendments are proposed in order to achieve Option 1.

Funding Source	Current Budget	Proposed Budget	Proposed Amendments
101517.000.5123	$415,000.00	$541,000	Seeking an additional $126,000 to 2024/25 financial year

6.1.2 Upon approval of this report, there will likely be adequate budget available to allow the project to proceed without any adverse effect on the project.

6.1.3 If **Option 1** is approved an additional budget of $126,000 will have a rating increase of $2.88 per property (or 1.2%) on the Coastal Urban Drainage account, increasing the average drainage from $235.28 to $238.16 per year. This increase will take effect from the 2026/27 financial year onwards.

6.1.4 If **Option 2** is approved an additional budget of $54,000 will have a rating increase of $1.23 per property (or 0.5%) on the Coastal Urban Drainage account, increasing the average drainage from $235.28 to $236.51 per year. This increase will take effect from the 2026/27 financial year onwards.

6.2. **Sustainability and Climate Change Impacts**

The recommendations in this report do have sustainability and climate change impacts.

The recommendation is to increase the primary drainage level of service to 1 in 5 year and to improve the secondary flow path at the driveway. With heavy rainfall events

predicted to occur more often in the future this will help mitigate flooding at 10 School Road.

6.3. **Community Implication**

The recommended approach would benefit the community by reducing the impact of storm events in the catchment and the risk of private property flooding.

6.4. **Risk Management**

There are risks arising from the adoption/implementation of the recommendations in this report.

- There is a risk in the interim period before an upgrade is implemented that property flooding could occur during significant rainfall events.
- There remains a residual risk following the works of flooding of habitable spaces of 10 School Road in large storm events due to limited freeboard protection and downstream backwater effects. However, the proposed solution will provide a significant improvement to the status quo, and will reduce the risk of flooding to the property.
- The normal risks associated with construction apply and are partially addressed by provision of a 20% overall project contingency within the cost estimates.

6.5. **Health and Safety**

There are health and safety risks arising from the adoption/implementation of the recommendations in this report.

- There will be a Safety in Design process undertaken as part of the detailed design process, to identify and mitigate construction, maintenance and end user risks.
- Contractors Health and Safety methodology and track record will be assessed in the tender evaluations and a site-specific safety plan will be required.

7. CONTEXT

7.1. **Consistency with Policy**

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

7.2. **Authorising Legislation**

- The Local Government Act is relevant in this matter.

7.3. **Consistency with Community Outcomes**

The Council's community outcomes are relevant to the actions arising from recommendations in this report.

- There is a safe environment for all
    - Harm to people from natural and man-made hazards is minimised.
    - Our district has the capacity and resilience to quickly recover from natural disasters and adapt to the effects of climate change.
- Core utility services are provided in a timely and sustainable manner
    - Harm to the environment from sewage and stormwater discharges is minimised.
    - Council sewerage and water supply schemes, and drainage and waste collection services are provided to a high standard

7.4. **Authorising Delegations**

- The Council has the delegation to approval additional budget.

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR INFORMATION

FILE NO and TRIM NO:	RDG-22-04, DRA-16-05 / 240404051729
REPORT TO:	UTILITIES AND ROADING COMMITTEE
DATE OF MEETING:	16 April 2024
AUTHOR(S):	Kalley Simpson, 3 Waters Manager Joanne McBride, Roading and Transport Manager Pat Towse, Flood Team Lead
SUBJECT:	July 2023 Flood Recovery Progress Update
ENDORSED BY: (for Reports to Council, Committees or Boards)	General Manager / Chief Executive

1. SUMMARY

1.1 This report provides a progress update on the July 2023 Flood Recovery work programme, including investigation work and maintenance actions, and provides an overview of the physical works programme recommended by the investigations.

1.2 A total of 351 service requests have been received related to the July 2023 storm event, which have been triaged, grouped and classified into a total of 86 investigations, 126 maintenance actions and 31 customer advice actions[1]. The total number of investigations has increased by 2 to 88 following the previous report to the Utilities & Roading Committee, as maintenance actions in Kaiapoi and Tuahiwi have been changed to an investigation.

1.3 As at 3 April 2024, all investigations have been triaged and processed through the scoping phase, 8 are under investigation, 35 are in the approval stage and 45 have been completed. It is estimated that the Flood Team has completed 90% of the investigation work and still expected that the remaining investigation work will be completed by the end of April 2024.

1.4 A further 126 maintenance actions were also identified from the service requests following the July 2023 event. As at 3 April 2024, all have been started and 3 are work in progress, 17 have been programmed, and 106 have been completed. It is estimated that the Flood Team has completed 98% of the maintenance actions, with the maintenance work either being programmed or completed.

1.5 Work on the following three key focus areas that experience extensive flooding has commenced:

- **Cam River / Ruataniwha** – Environment Canterbury have completed the maintenance work, including tree felling and vegetation clearance, on the lower Cam River from the Kaiapoi River up to Bramleys Road. Work on the upper Cam River above Bramleys Road began in late February and is currently up to Youngs Road. It is expected to complete the maintenance work up to Marsh Road by the end of April 2024. Localised stopbank improvement works to improve the upper Cam River /

[1] Note that the total number of service requests is greater than the number of investigations and maintenance tasks as an investigation or maintenance task can have multiple service requests associated with the work.

Ruataniwha system upstream of Bramleys Road are currently being programmed for construction.

- **Tuahiwi** – Council has completed heavy maintenance work, including trimming of vegetation from the banks and removal of sediment from the bed, along the main channel of the Tuahiwi Stream / Waituere between Church Bush Road to the Cam River, and vegetation clearing works on the Tuahiwi Stream / Waituere between Greens Road and Church Bush Road. Upgrading works on the diversion drain (between Greens Road and the Cam River) is proposed, including upgrading the culvert at the upper end and regrading / widening the middle section above Pa Road. These works are planned to be undertaken before winter.

- **Waikuku Beach** – Detailed assessment is underway to determine the cause of flooding from the Taranaki Stream which was higher than expected, although will take some months to complete. This work will be coordinated with Environment Canterbury and will look at factors such as the operation of the flood gate, upstream development, and the catchment hydrology, including any recharge from the Ashley River.

1.6 There are a total of 24 immediate works projects that are being progressed in the 2023/24 financial year to implement drainage improvements that have been identified as part of the investigation work. It is anticipated that some of this work will carryover into the 2024/25 financial year.

1.7 The total cost of the flood recovery work is $4.055 million, as approved by Council at the October 2023 Council meeting (refer Trim 230921147926). To date $1,974,998 (or approximately 49%) of the work has been completed and the final forecast expenditure remains at $4.055 million. As indicated above, it is anticipated that some of this spend with carryover into the 2024/25 financial year.

Attachments:

i. Flood Recovery July 2023 Event Tracking – As at 3rd April 2024 (Trim 240404051733).

ii. Flood Recovery July 2023 Event Dashboard – As at 3rd April 2024 (Trim 240404051731).

2. RECOMMENDATION

2.1. **THAT** the Utilities and Roading Committee:

a. **Receives** Report No. 240404051729.

b. **Notes** that all 88 investigations have been triaged and scoped, 8 are under investigation, 35 have works being reviewed for approval and 45 are complete;

c. **Notes** that all 126 maintenance actions have been triaged, 3 are work in progress, 17 have works programmed, and 106 are complete;

d. **Notes** that the total cost estimate for the flood recovery work is $4.055 million.

e. **Notes** that the expenditure to date is $2,221,796 and the final forecast expenditure remains at $4.055 million;

f. **Circulates** this report to all Community Boards for information.

3. BACKGROUND

3.1 The district experienced a significant rainfall event over the weekend of 22-24 July 2023, with the coastal area around Woodend receiving approximately 150mm of the rainfall over a 48 hour period.

3.2 A total of 351 service requests related to the July 2023 storm event were received. All service requests have been acknowledged and have been collated, triaged and

categorised. This work has identified that there is a total of 86 investigations and 126 maintenance tasks that need to be undertaken to address the issues raised in the service requests (refer Table 1 below). There are also 31 service requests predominantly related to private drainage issues where advise is required to be provided to the customer.

Table 1 – Classification of Service Requests

Classification		No. SR	Investigations	Maintenance Tasks
Investigations	Recent (July 2022)	82	36	-
	Historical (pre 2022)	54	30	-
	New (July 2023)	25	22	-
Maintenance		159	-	126
Customer Advised		31	-	-
TOTAL[1]		**351**	**88**	**126**

[1] Note that the total number of service requests is greater than the number of investigations and maintenance tasks as an investigation or maintenance task can have multiple service requests associated with the work.

3.3 A Flood Team has been established, predominantly comprising of external resources but with support from internal resources where there is existing project work underway related to the issue. The tracking system, used for the previous Flood Team investigation work, is again being used to ensure that each investigation is tracked through until completion.

3.4 The Flood Team is overseen by a Flood Recovery Project Control Group (PCG), comprised of relevant managers from the Utilities & Roading department. The PCG is updating the tracking spreadsheet fortnightly and reporting formally to the Utilities and Roading Committee monthly.

4. ISSUES AND OPTIONS

Key Focus Areas

4.1. The three key focus areas that experience extensive flooding that will require more detailed assessment, investigation and community and stakeholder are:

- Cam River / Ruataniwha
- Tuahiwi
- Waikuku Beach

4.2. A report Cam River / Ruataniwha was presented to the previous Utilities & Roading Committee meeting in October (refer Trim 231005158212). Immediate maintenance works to remove fallen trees was completed in October. Environment Canterbury have completed the maintenance work, including tree felling and vegetation clearance, on the lower Cam River from the Kaiapoi River up to Bramleys Road. Work on the upper Cam River above Bramleys Road began in late February and is currently up to Youngs Road. It is expected to complete the maintenance work up to Marsh Road by the end of April 2024. Localised stopbank improvement works to improve the upper Cam River / Ruataniwha system upstream of Bramleys Road are currently being programmed for construction. Environment Canterbury have recently completed the re-surveying of the bed and banks of river. This information will feed into the proposed update of the Scheme Plan for the Cam River/ Ruataniwha.

4.3. Council has completed heavy maintenance work, including trimming of vegetation from the banks and removal of sediment from the bed, along the main channel of the Tuahiwi Stream / Waituere between Church Bush Road to the Cam River, and vegetation clearing works on the Tuahiwi Stream / Waituere between Greens Road and Church Bush Road. Upgrading works on the diversion drain (between Greens Road and the Cam River) is proposed, including upgrading the culvert at the upper end and regrading / widening the middle section above Pa Road where the drain is constricted. underway to confirm the extent of works required. These works are planned to be undertaken before winter.

4.4. Modelling works of the Taranaki Stream has commenced as part of the detailed assessment to determine the cause of higher than expected flooding in Waikuku Beach. This work will assess factors such as the operation of the flood gate, upstream development, flood storage within the Tutaepatu Lagoon area and the catchment hydrology, including any recharge from the Ashley River. A meeting with Environment Canterbury has been held as part of scoping the modelling work required.

Progress of Investigations

4.5. All of the 88 investigations have been triaged and process through the scoping phase, 8 are under investigation, 35 are being reviewed and 45 are complete. The current status of these are summarised in the following table.

Table 2 – Progress of Investigations

Phase	Previous Report	Current Status[4]	Change
Triaging	0	0	-
Scoping	11	0	-11
Under investigation (Flood Team)	6	8	+2
Review and approval (Asset Manager)	35	35	-
Maintenance / immediate works programmed[1]	0	0	-
Improvement works proposed[2]	0	0	-
Completed[3]	34	45	+11
Total	**86**	**88**	**+2**

[1] For the current financial year.

[2] Subject to future year budget process.

[3] Investigation complete, actions agreed. works programmed or budgeted, customer/s called back.

[4] As at 3 April 2024.

4.6. The 4 investigations that are still in the scoping phase have been assigned to a Flood Team member and the initial scope has been developed as part of the triaging phase. These remaining investigations are either low priority or related to other investigation work, yet still expected to be completed by the end of April 2024.

4.7. While progress is being made on the 88 investigations, addressing the issues through physical works or changes to maintenance practice (if it is WDC's responsibility) is the outcome that is most sought by the affected residents. The following table provides a summary of the solutions identified by the investigations, which will be updated as the investigations are progressed to completion.

Table 3 – Outcome of Investigations

Implementation Solutions	Previous Report	Current Status	Change
Not yet determined	52	43	-9
Physical Works FY23/24	25	28	+3
Future year capex	4	6	+2
O&M changes	0	0	-
No action/Customer Advice	5	11	+6
Total	86	88	+2

4.8. The current expenditure for investigations is $443,061. The budget for the investigation costs is up to $450,000 drawing from the allocated fund of $600,000 for the Flood Team investigation work.

4.9. There are 35 investigations that have been previously investigated due to past flooding events. The budgets assigned to these investigations (FT04 to NS5) are to cover the costs

associated with investigating the cause of flooding and confirm if the previous programmed works would address the flooding issues observed in the recent July 2023 event.

Progress with Maintenance Actions

4.10. Of the 126 maintenance actions all 126 have now been inspected. The current status of these is summarised in the following table.

Table 4 – Progress with Maintenance Actions

Phase	Previous Report	Current Status[2]	Change
To be started	0	0	-
Work in progress	24	24	-
Completed[1]	102	102	-
Total	**126**	**126**	**-**

[1] Inspection complete, maintenance required programmed, customer/s called back.

[2] As at 3 April 2024.

4.11. The current expenditure for maintenance actions is $144,807. The budget for the maintenance action costs is up to $150,000 drawing from the allocated fund of $600,000 for the Flood Team investigation work.

Progress with Immediate Works

4.12. There are a total of 24 immediate works that are being progressed in the 2023/24 financial year to implement drainage improvements that have been identified as part of the investigation work (refer Table 5 below).

Table 5 – Progress with Immediate Works

Project	Budget	Status
Broadway Ave, Waikuku Beach	$15,000	Complete
10 Beach Crescent, Waikuku Beach	$80,000	Report Review
Rotten Row, Waikuku Beach	$25,000	Investigating
Pegasus Main Street, Pegasus	$50,000	Investigating
Pearson Drain Improvements, Oxford	$330,000	Design
Helmore Street Bund, Rangiora	$75,000	Complete
Main North Road, Kaiapoi	$5,000	Complete
Tram Road, Clarkville	$100,000	Waiting Construction
Edmunds Road, Clarkville	$50,000	Pricing
Revells Road, Tuahiwi	$50,000	Report Review
Greens Road, Tuahiwi	$200,000	Pricing
Woodfields Road, Cust	$150,000	Pricing
South Eyre Road, Eyrewell	$20,000	Report Review
Washington Place, West Eyreton	$50,000	Pricing
Lower Sefton Road, Ashley	$100,000	Report Review
Upper Sefton Road, Ashley	$80,000	Design
North Eyre Road, Eyreton	$15,000	Complete
Poyntzs Road, Cust	$80,000	Design
Wilson Drive, Ohoka	$200,000	Tendered
Bramleys Road, Tuahiwi	$100,000	Waiting Construction
Upper Cam River	$150,000	Pricing
Siena Place, Mandeville	$30,000	Completed
Featherstone Ave, Kairaki	$90,000	Completed
306 Beach Road	$72,000	Waiting Construction

Total	**$2,117,000**	

4.13. It is anticipated that some of this spend will carryover into the 2024/25 financial year, particularly the projects that are still in the investigation or the design phase are at risk. The projects will be reported to the Audit & Risk Committee as part of the quarterly capital works programme report.

Proposed Future Works

4.14. There are 6 investigations that relate proposed future works that have capital works budgets in outer years. The works for Washington Place and Cust Road are currently being designed and will be completed next financial year, while the other projects which relate to improvements in Rangiora, Waikuku Beach and Mandeville are planned for outer years as shown in Table 6 below.

Table 6 – Proposed Future Works

Project	Budget	Construction
Washington Place, West Eyreton	$160,000	23/24 - 24/25
Cust Road, Cust	$300,000	24/25
Percival Street, Rangiora (Sewer)	$550,000	25/26
Belmont Avenue, Rangiora	$480,000	27/28
10 Beach Crescent, Waikuku Beach (Stage 2)	$1,100,000	28/29
Mandeville Resurgence Channel (Stage 1 & 2)	$22,600,000	24/25 - 31/32

Communications

4.15. The communications strategy document has been prepared and endorsed by the Utilities & Roading Committee.

4.16. The website has been updated to deliver the flood response progress to the public based on the progress as at 3rd April 2024.

4.17. A programme of regular communications has been implemented to support the recovery programme. In particular, the following key activities will be undertaken, similar to the previous approach:

- A fortnightly dashboard and detailed tracking sheet published on the website.
- Personal phone calls or emails to submitters when investigations begin to understand the issue, with follow up communications to confirm the outcomes.
- Residents meetings, either street meetings or at community halls, will be held where appropriate. A residents' meeting has already been held in the West Eyreton Hall for the Washington Place flooding issue. Additionally, several street meetings have already been held for the Bramleys Road / Cam River flooding issue, the Threlkelds Road flooding issue and the Tram Road flooding issue.
- Close out emails or communications with submitters as appropriate when each investigation is complete.

Implications for Community Wellbeing

4.18. There are implications on community wellbeing by the issues and options that are the subject matter of this report.

4.19. Safe and reliable Roading and 3 Waters infrastructure is critical for wellbeing. 3 Waters infrastructure includes adequate drinking water, wastewater drainage and stormwater drainage for health and Roading infrastructure is required to provide safe egress and enable residents to access goods and services within the community.

4.20. The Management Team has reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

Mana whenua

5.1. Te Ngāi Tūāhuriri hapū are likely to be affected by or have an interest in the subject matter of this report as it relates to impacts on waterways and rivers. Staff will update the Runanga at the executive meetings and where relevant on specific projects or consents engage with Mahaanui Kurataio Limited.

Groups and Organisations

5.2. A number of the issues in this report cross over with Environment Canterbury (Ecan) in terms of consenting, or in relation to rivers and natural waterways assets and services they maintain. Staff from Ecan and WDC are working to proactively coordinate where necessary.

5.3. There are some drainage related issues that also relate to water races and irrigation races. Where this is the case staff are coordinating with Waimakariri Irrigation Limited.

Wider Community

5.4. The wider community is likely to be affected by, or to have an interest in the subject matter of this report, as the wider community has been impacted by the recent flood event.

6. OTHER IMPLICATIONS AND RISK MANAGEMENT

Financial Implications

6.1. The Council has approved unbudgeted expenditure of up to $4.055 million in the current (2023 / 2024) financial year for emergency and immediate works responding to and recovering from the flooding.

6.2. The updated cost estimate and spend to date for the works associated with recovery from the flood is summarised below with the assessment of the funding source.

Table 7 – Financial Spend Summary

Area	Estimate	Spent to date	Forecast final expenditure
Roading	$1,950,000	$1,275,768	$1,950,000
Stormwater	$230,000	$106,775	$230,000
Land Drainage	$815,000	$24,291	$815,000
Rivers	$300,000	$110,774	$300,000
Wastewater	$160,000	$116,320	$160,000
Flood Response Investigations	$600,000	$587,868	$600,000
TOTAL	**$4,055,000**	**$2,221,796**	**$4,055,000**

6.3. At this stage it is expected that the final expenditure will be within the budget estimate approved by Council in October 2023. It is however anticipated that some of this spend will be carried over into the 2024/25 financial year.

Sustainability and Climate Change Impacts

6.4. The frequency and severity of flood events is likely to increase due to the impacts of climate change.

Risk Management

6.5. There are risks arising from the adoption/implementation of the recommendations in this report.

6.6. A risk-based approach has needed to be adopted around the management of any improvements works. Whole of life cost will be considered when agreeing the extent of works and the residual risk due to further rainfall events.

Health and Safety

6.7. There are health and safety risks arising from the adoption/implementation of the recommendations in this report.

6.8. Physical works will be undertaken to repair flood damage and as per standard process for any physical works, the contractor will be required to provide a Site Specific Health & Safety Plan for approval prior to work commencing on site.

7. CONTEXT

Consistency with Policy

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

Authorising Legislation

7.2. The Land Transport Management Act is the relevant legislation in relation to Roading activities.

Consistency with Community Outcomes

7.3. The Council's community outcomes are relevant to the actions arising from recommendations in this report.

7.4. This report considers the following outcomes:

There is a safe environment for all

- Harm to people from natural and man-made hazards is minimised.
- Our District has the capacity and resilience to quickly recover from natural disasters and adapt to the effects of climate change.
- Crime, injury and harm from road crashes, gambling, and alcohol abuse are minimised.

Transport is accessible, convenient, reliable and sustainable

- The standard of our District's roads is keeping pace with increasing traffic numbers.
- Communities in our District are well linked with each other, and Christchurch is readily accessible by a range of transport modes.

Core utility services are sustainable, resilient, affordable; and provided in a timely manner

- Harm to the environment from sewage and stormwater discharges is minimised.
- Council sewerage and water supply schemes, and drainage and waste collection services are provided to a high standard.
- Waste recycling and re-use of solid waste is encouraged, and residues are managed so that they minimise harm to the environment.

Authorising Delegations

7.5. Relevant staff have delegation to authorise unbudgeted emergency works where needed.

Flood Recovery Tracking April 2024

As at 3 April

Work package	Location	Report status	Investigation Outcome	% Completed
23I-01	228 Marsh Road & 2 Marshall Street, Rangiora	Submitted for Review		75
23I-02	12 & 14 Pascoe Drive, WOODEND	Submitted for Review		75
23I-03	1639 Poyntzs Road, HORRELLVILLE	N/A	Physical Works FY23/24	100
23I-04	138 Edmunds Road & 585 Tram Road, CLARKVILLE	Design Stage	Physical Works FY23/24	100
23I-05	19 B Newnham Street, RANGIORA	Submitted for Review		75
23I-06	165 Raddens Road, OHOKA	Approved	Physical Works FY23/24	100
23I-07	1758 North Eyre Road, EYRETON	N/A	Physical Works FY23/24	100
23I-08	242 Jeffs Drain Road, CLARKVILLE	Submitted for Review		75
23I-09	785 Tram Road, WAIMAKARIRI DISTRICT	Submitted for Review		75
23I-10	489 Woodfields Road, SWANNANOA	Submitted for Review		75
23I-11	97 & 97 A Threlkelds Road, OHOKA,	Submitted for Review		75
23I-12	153,157 & 180 Loburn Terrace Road, LOBURN NORTH	Submitted for Review		75
23I-13	187 Terrace Road, CUST	Submitted for Review		75
23I-14	Waikuku Beach Road / Leggits Road, WAIKUKU BEACH	Submitted for Review		75
23I-15	236 & 269 Swannanoa Road, FERNSIDE	Under Investigation		50
23I-16	196 Loburn Terrace Road, LOBURN NORTH	Submitted for Review		75
23I-17	60 Siena Place, MANDEVILLE	N/A	Physical Works FY23/24	100
23I-18	13 & 26 Collins Drive, WAIKUKU BEACH	Submitted for Review		75
23I-19	79 Park Terrace, WAIKUKU BEACH	Under Investigation		50

23I-20	4, 6 & 8 Waikuku Beach Road, WAIKUKU BEACH & 1/57 Topito Road, TUAHIWI	Submitted for Review		75
23I-21	229 Island Road, KAIAPOI	Submitted for Review		75
23I-22	214 Greigs Road, CLARKVILLE	Submitted for Review		75
23I-23	964 Woodfields Road, CUST	Under Investigation		50
23I-24	102 Topito Road, TUAHIWI	Submitted for Review		75
23I-25	29 Reserve Road, WAIKUKU BEACH	Approved	Future Year CAPEX	100
23I-26	23 & 31 Queens Avenue, WAIKUKU BEACH	Submitted for Review		75
23I-27	3 B Charles Street, RANGIORA	N/A	No Action/ Customer Advised	100
23I-28	793 Browns Road, SWANNANOA	Under Investigation		50
23I-29	152 Ohoka Road, KAIAPOI	N/A	No Action/ Customer Advised	100
23I-30	8 Rowse Street, RANGIORA	Submitted for Review	No Action/ Customer Advised	100
23I-31	102 Eders Road, WOODEND	N/A	No Action/ Customer Advised	100
23I-32	47 Upper Sefton Road, SEFTON	Submitted for Review		75
23I-33	82 & 110 Old North Road, KAIAPOI	Submitted for Review		75
23I-34	198 Sladdens Farm Road, COOPERS CREEK	N/A	Physical Works FY23/24	100
23I-35	69 Old North Road, KAIAPOI	N/A	Physical Works FY23/24	100
23I-36	18 Evans Place, KAIAPOI	N/A	No Action/ Customer Advised	100
23I-37	105 Otaki Street, KAIAPOI	N/A	No Action/ Customer Advised	100
23I-38	2 Alpine Lane (Pvt), KAIAPOI	Under Investigation		50
23I-39	43 Cam Road, KAIAPOI	N/A	Future Year CAPEX	100
23I-40	3 Allin Drive & Kings Avenue, WAIKUKU BEACH	N/A	Physical Works FY23/24	100
23I-41	10 Parkinson Place, WOODEND	Under Investigation		50

23I-42	246 Revells Road, KAIAPOI	Submitted for Review		75
23I-43a	3307 South Eyre Road, EYREWELL	N/A	No Action/ Customer Advised	100
23I-43b	3359 South Eyre Road, EYREWELL	Submitted for Review		75
23I-44	533 Lower Sefton Road, ASHLEY	Submitted for Review		75
23I-45	3 Railway Street, SEFTON	Submitted for Review		75
23I-46	67 & 77 Fairweather Crescent, KAIAPOI	Submitted for Review		75
23I-47	119 Greens Road, TUAHIWI	Submitted for Review		75
23I-48	183 B Tuahiwi Road, TUAHIWI	N/A	No Action/ Customer Advised	100
23I-49	109 Te Pouapatuki Road, WOODEND	Submitted for Review		75
23I-50	1/57 Topito Road, Tuahiwi	Submitted for Review		75
23M-066	127 Mairaki Road, Waimakariri District	Submitted for Review		75
FT04	310 Beach Road, KAIAPOI	N/A	Physical Works FY23/24	100
23M-027 & 23M-081	Fullers Road, Kaiapoi	Submitted for Review		75
FT10	59 Main North Road, KAIAPOI	N/A	Physical Works FY23/24	100
FT17	15 Cridland Street West, KAIAPOI	N/A	Physical Works FY23/24	100
FT24	31 & 35 Broadway Avenue, WAIKUKU BEACH	N/A	Physical Works FY23/24	100
FT25	34 Kiwi Avenue, WAIKUKU BEACH	Submitted for Review		75
FT27	4 Swindells Road	N/A	Physical Works FY23/24	100
FT31	29, 30 & 31 Pegasus Main Street, PEGASUS	Under Investigation		50
FT37	Church Street Reserve, OXFORD	Approved	Physical Works FY23/24	100
FT42	5 & 10 Wilson Drive. OHOKA	N/A	Physical Works FY23/24	100
FT44	1461 Main North Road (Sh1) (Wnd-Amb), WOODEND	N/A	Physical Works FY23/24	100

FT45	6 & 16 Macdonalds Lane, WAIKUKU	Submitted for Review		75
FT46	2, 4, 11, 14 & 28 Stalkers Road and 62 Ferry Road, WOODEND BEACH	N/A	Physical Works FY23/24	100
FT49	1838 & 1840 Cust Road. CUST	N/A	No Action/ Customer Advised	100
FT50	1689 & 1689 B Cust Road, CUST	N/A	Physical Works FY23/24	100
FT56	4123 South Eyre Road, EYREWELL	N/A		100
FT62	56 Featherstone Avenue, KAIRAKI	N/A	Physical Works FY23/24	100
H08	14 Blakeley Place & 13 Belcher Street, KAIAPOI	Submitted for Review		75
H14	1140 & 1170 Woodfields Road and 50 Howsons Road, CUST	N/A	Physical Works FY23/24	100
H16	205 Cones Road / Fawcetts Road & 36 Max Wallace Drive, ASHLEY	N/A	Physical Works FY23/24	100
H18	79 Greens Road, TUAHIWI	Submitted for Review	Physical Works FY23/24	75
H21	28 Belmont Avenue, RANGIORA	Under Investigation		50
H24	32 Wetherfield Lane, MANDEVILLE	N/A	Future Year CAPEX	100
H27	376 Island Road, KAIAPOI	N/A	No Action/ Customer Advised	100
H30	308, 380 & 414 No 10 Road, EYRETON, 1124 & 1126 Tram Road, WAIMAKARIRI DISTRICT, 8 Wetherfield Lane, MANDEVILLE	N/A	No Action/ Customer Advised	100
H32	5 Washington Place, WEST EYRETON & 9 Earlys Road, CUST	N/A	Physical Works FY23/24	100
H41	301, 305 & Tram Road, WAIMAKARIRI DISTRICT	Approved	Physical Works FY23/24	100
N08	15 & 29 Holland Drive, KAIAPOI	Approved	Physical Works FY23/24	100
N13	10 Beach Crescent, WAIKUKU BEACH	Submitted for Review		75
N18	29 & 53 Northside Drive, WAIKUKU BEACH	Submitted for Review	Physical Works FY23/24	100
N19	16 Church Bush Road, TUAHIWI	Approved	Future Year CAPEX	100
N30	150 Bramleys Road, TUAHIWI	N/A	Physical Works FY23/24	100

N32	45 Queens Avenue, WAIKUKU BEACH	Submitted for Review		75
NS1	51 Percival Street, RANGIORA	N/A	Future Year CAPEX	100
NS4	32 Wetherfield Lane, MANDEVILLE (FYI SR is actually for 380 No10 Road)	N/A	Future Year CAPEX	100
NS5	183 B & 255 Tuahiwi Road, TUAHIWI	N/A	Physical Works FY23/24	100

FLOOD RECOVERY FORTNIGHTLY STATUS REPORT
As at Wednesday, 3 April 2024

Fortnightly Report

Introduction
The district experienced a significant rainfall event over the weekend of 22-24 July 2023, with the coastal area around Woodend receiving approximately 150mm of the rainfall over a 48 hour period.

The purpose of this report is to update the Utilities and Roading Committee and Community Boards on the status of the drainage and sewer service requests and further investigations:

Report Format
This report will be prepared fortnightly and will include the following information
- This Dashboard showing:
  - General commentary
  - Dashboard metrics
  - Specific commentary on Key Focus Areas
  - An attached report on all the investigations

General Update
Maintenance Investigations are still holding at 137 investigations completed, with a further 27 to have the work programmed and only 3 investigations that are open, as these are the final investigations to close out.
Investigations have been steadily dropping with 90% of the Investigation work having been completed. We now have 45 investigations completed and 35 investigations being reviewed, leaving 8 under investigation and 0 waiting to be investigated.

Tenders - Greens Road Box Culvert Upgrade
Greens Road Box Culvert upgrade is now our for tender with the works staring in May.
Tender - Wilson Drive
This tender is in the process of being awarded.

Physical Works
With investigations now being completed and out comes found, we are now transitioning to start to deliver the physical works as we have done with Wilson Drive and Greens Road tenders, and the number of project will continue to increase.

Cam River Maintenance Works

Key Metrics

Investigation Phase	As at 7 March	This report
Triaging	0	0
Scoping	11	0
Under investigation	6	8
Submitted for approval	35	35
Investigations completed	34	45
% of work Investigation completed	79%	90%
Total	**86**	**88**

Implementation Solutions	As at 7 March	This report
Not yet determined	52	43
Physical Works FY23/24	25	28
Future year capex	4	6
No action/Customer Advice	5	11
Total	**86**	**88**

Maintenance Actions Phase	As at 7 March	This report
To be started	0	0
Work in progress	3	3
Works programmed	21	17
Completed	102	106
Total	**126**	**126**

Key Focus Areas

Cam River	ECan maintenance work on the Cam River up to Bramleys Road has been completed. ECan have commenced the maintence of Bramleys Road to Marsh Road on the 26 February. Localised stop bank improvement works are underway upstream from Bramleys Road bridge.	**Works Programmed**
Tuahiwi	Maintenance of Tuahiwi Stream from Greens Road to the Cam River, Te Pouapatuki Road drain are complete, with the Greens Road diversion programmed. A survey of the Greens Road diversion has been completed to inform the design for the upgrade of a Greens Road diversion culvert.	**Maintenance Completed/Under Investigation**
Waikuku Beach	A Waikuku modeling study is to be undertaken to determine the cause of flooding which was higher than expected. This work will look at factors such as the operation of the flood gate, upstream development, and the catchment hydrology, including any recharge from the Ashley River.	**Under Investigation**
Swindells Road, Waikuku Beach	Temporary pump tender awarded deliverty expected in 6 weeks. Design of pipework improvments being finalised.	**Works Programmed**
Stalkers Road, Woodend Beach	Construction in progress. Completion planned for late April.	**Tender Let**
Cust Road, Cust	New larger soakpits have been installed, but were overloaded in the July 2023 event. Design for overflow pipe to the lower terrace has commenced.	**Future year capex**
Washington Place, West Eyreton	Design is being finalised. Anticipate tendering in April and construction starting in May.	**Works Programmed**
Featherstone Ave, Kairaki	Issue with inflow and infiltration overloading the sewer. Urgent works to address main issues in campground completed. Additional remedial work on manholes and laterals in Featherstone Ave to be progressed.	**Works Programmed**
Cones Road, Ashley	Tender awarded. Construction programmed to start 15 April 2024.	**Works Programmed**
Resurgence Flow, Mandeville	Council has approved Stage 1 and 2 recommendations to move forward to public LTP consultation. Public consulation drop-in session for LTP will be held on 11 April 2024 to inform LTP decisions.	**Future year capex**
Beach Crescent, Waikuku Beach	Install sumps and pipework to connect existing low points to a new pump chamber in the campground and install a discharge main through to the sand dunes for the discharge from a portable pump. Design is under review.	**Works Programmed**
Tram Road, Clarkville	Upsize 375mm on north side of Tram Road to a 750mm culvert. Design approved and tender documents are being prepared. Landowner discussions underway to confirm construction access.	**Under Investigation**
Upper Sefton Road, Sefton	Investigation report under review. Site meeting to be organised after review of options are complete.	**Under Investigation**

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR INFORMATION

FILE NO and TRIM NO: IFR-04-03 / 240404052230

REPORT TO: UTILITIES AND ROADING COMMITTEE

DATE OF MEETING: 16 April 2024

AUTHOR(S): Kalley Simpson, 3 Waters Manager

SUBJECT: 3 Waters Climate Change Risk Assessment

ENDORSED BY:
(for Reports to Council, Committees or Boards)

General Manager | Chief Executive

1. SUMMARY

1.1 The purpose of this report is to present the findings from the 3 Waters Infrastructure Climate Change Impact Assessment work, which was undertaken as part of the recent update of the Activity Management Plans.

1.2 Climate change will have an impact on our ability to provide 3 Waters services into the future however the scale and extent is unknown. The recent NIWA report prepared for the Waimakariri District, identified likely impacts of more extremes in weather, including increased river flows, more hot days and increases in rainfall intensities.

1.3 To better understand the potential impact on our 3 Waters infrastructure Council engaged Waugh to undertake the 3 Waters Climate Change Risk Assessment work. The outputs were to inform the update of the Activity Management Plans and to feed into the Council's adaptation strategy work.

1.4 The approach taken was to setup a framework that considered the hazard exposure, assigned a risk score based on asset fragility and asset failure impact, and determined the most appropriate adaptation intervention strategy. The adaption intervention strategy considered four discrete approaches of relocate, harden, maintain or accept, depending on the level of exposure. High level cost estimates were developed for the most likely adaptation interventions.

1.5 The results show that flooding has the greatest impact on the 3 Waters infrastructure in our District. The overall exposure to climate hazard by asset criticality and risk level is shown in Table 1 below. This shows that a majority of 3 Waters assets have low or very low asset risk exposure to climate hazards, but about 7% are critical assets (criticality AA or A, that have a high consequence of failure which may extend to significant consequences for community wellbeing) that have a high or medium asset risk exposure.

Table 1 – Climate Hazard Exposure

Criticality	High	Medium	Low	Very low
AA	0.19%	3.92%	5.57%	9.38%
A	0.02%	3.02%	9.67%	4.57%
B	0.10%	2.19%	9.10%	5.12%
C	0.05%	2.96%	15.63%	11.29%
Unknown	0.00%	1.62%	6.23%	9.40%
Total	0.36%	13.71%	46.18%	39.74%

1.1 The estimated investment is $41.9 million dollars to build resilience into Council's 3 Waters infrastructure to manage the impacts of climate change. Placeholder budgets have been provided in outer years of the Long Term Plan (from years 2034/35 to 2043/44), however further work is required to refine these estimates and integrate any works with the future renewals programme.

Attachments:

i. 3 Waters Infrastructure Climate Change Impact Assessment, Waugh Report (Trim 231115183268).

2. RECOMMENDATION

2.1. **THAT** the Utilities and Roading Committee:

a. **Receives** Report No. 240404052230.

b. **Notes** that while the majority of 3 Waters assets have low or very low asset risk exposure to climate hazards, about 7% are critical assets that have a high or medium asset risk exposure;

c. **Notes** that the estimated investment to build resilience into Council's 3 Waters infrastructure is $41.9 million dollars to manage the predicted impacts of climate change which has been included in years 2034/35 to 2043/44;

d. **Notes** that while budget provisions have been made in the outer year of the Long Term Plan for resilience investment, further work is required to refine these estimates and integrate any works with the future renewals programme;

e. **Circulates** this report to the Council for information.

3. BACKGROUND

3.1 Climate change was identified in the 2021 Activity Management Plans as one of the key future challenges impacting the management of 3 Waters infrastructure. It is recognised that climate change will have an impact on our ability to provide 3 Waters services into the future however the scale and extent is unknown.

3.2 In 2022, Council commissioned NIWA to assess the climate change projections specific for the Waimakariri District (refer 220616103176[v2]). The report identified likely impacts of climate change of more extremes in weather, including increased river flows, more hot days and increases in rainfall intensities (refer Figure 1 below).

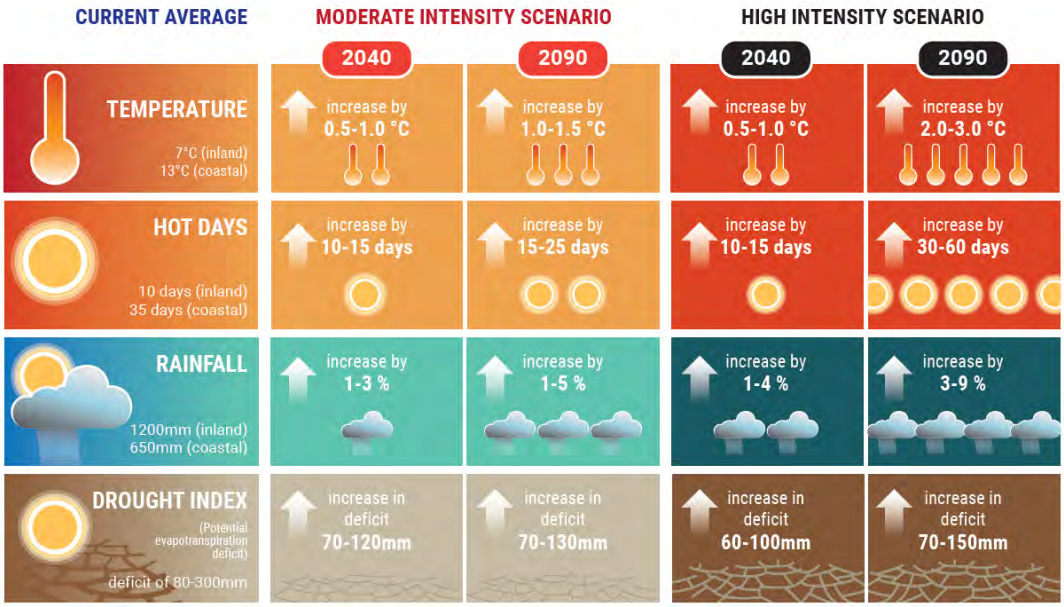

Figure 1 – Waimakariri Climate Change Scenarios

4. ISSUES AND OPTIONS

4.1. To better understand the potential impact on our 3 Waters infrastructure Council engaged Waugh to undertake the 3 Waters Climate Change Risk Assessment work. The scope included assessing water supply, wastewater and urban stormwater assets, however, rural land drainage and stockwater assets were excluded from this initial assessment.

4.2. The approach taken was to setup a framework that considered the hazard exposure, assigned a risk score based on asset fragility and asset failure impact, and determined the most appropriate adaptation intervention strategy.

4.3. Hazard exposure was based on existing data from numerous sources including:

- Eastern South Island Projected regional climate change hazards
- Jacobs Coastal Hazard 2020 Data – 100 year event
- WDC District Flood Modelling – 100 year event
- National groundwater table model
- Eastern Canterbury liquefaction susceptibility

4.4. Asset risk to hazard exposure was assessed based on fragility (i.e.: physical vulnerability of the infrastructure) and the impact of failure (i.e.: consequence). The consequence (refer Table 2 below) was workshopped with Council staff to ensure it generally reflected the anticipated impact.

Table 2 – Climate Change Consequent on 3 Water Infrastructure

Group	Asset Class	Sub Type	Increased Temperature	Increased Dry Days (Wet/Dry Cycle)	Flooding	Coastal Hazards	Snow/Ice Events	Wind
Stormwater	Overland Flow Paths	N/A	Low	Low	Extreme	Moderate	Moderate	Insignificant
	Pipelines	N/A	Low	Moderate	Extreme	High	Moderate	Insignificant
	Pump Stations	N/A	Moderate	Low	Extreme	High	Moderate	High
	Supporting Infrastructure	N/A	Moderate	Low	Low	Insignificant	Moderate	Insignificant
	Treatment, Basins, SMA	N/A	Moderate	Moderate	Extreme	High	Moderate	Insignificant
	Waterways	N/A	Low	Moderate	Extreme	Moderate	Moderate	Insignificant
Wastewater	Coastal Discharge	N/A	Insignificant	Low	Moderate	High	Low	Insignificant
	Land Disposal	Wetlands	Moderate	Moderate	Extreme	High	High	Insignificant
	Land Disposal	Land	Moderate	Moderate	Extreme	High	High	Insignificant
	Overflows	N/A	Insignificant	Moderate	Extreme	Moderate	High	Insignificant
	Pipelines	Gravity	Low	High	Extreme	Moderate	Low	Insignificant
	Pipelines	Pressure	Moderate	High	Extreme	High	Moderate	Insignificant
	Pump Stations	N/A	Moderate	Low	Extreme	High	Moderate	Moderate
	Supporting Infrastructure	N/A	Moderate	Low	Moderate	Moderate	Moderate	Moderate
	Treatment	N/A	Moderate	High	Moderate	High	Low	High
Water Supplies	Demand	N/A	Moderate	Moderate	Low	Insignificant	Low	Moderate
	Groundwater Source	N/A	Moderate	Moderate	Low	Insignificant	Low	Moderate
	Pipelines	Below	Low	High	High	Insignificant	Low	Insignificant
	Pipelines	Above	Moderate	Moderate	Extreme	Low	Low	Moderate
	Pump Stations	N/A	Moderate	Low	Extreme	High	Moderate	High
	Source Infrastructure	N/A	Insignificant	Insignificant	High	Insignificant	Low	Insignificant
	Storage	Source	Moderate	Insignificant	Low	Insignificant	Low	Low
	Storage	Prouduction	Moderate	Insignificant	Low	Insignificant	Insignificant	Insignificant
	Supporting Infrastructure	N/A	Moderate	Low	High	High	Low	Moderate
	Surface Water Source	N/A	High	High	High	Insignificant	Insignificant	Insignificant
	Treatment	N/A	Moderate	Insignificant	Extreme	Moderate	Moderate	Moderate

4.5. The results show that flooding has the greatest impact on the 3 Waters infrastructure in our District.

4.6. The adaption intervention strategy considered four discrete approaches of relocate, harden, maintain or accept, depending on the level of exposure and risk. For assets with a high asset risk the approach was to relocate, for asset with a medium asset risk the approach was to harden, for asset with a low asset risk the approach was to maintain and for asset with a very low asset risk the approach was to accept.

4.7. In order to develop high level cost estimates the level of investment required, it was assumed that relocate approach would be 120% of the replacement value, harden

approach would be 50% of the replacement value, maintain approach would be 0.01% of the replacement value and accept approach would be covered by existing budgets.

4.8. The results summarised in Table 3 below and show that while a majority of 3 Waters assets have low or very low asset risk exposure to climate hazards, about 14% have a high or medium asset risk exposure. About half (7%) of assets that high or medium asset risk exposure are critical assets (criticality AA or A) key to the delivery of water services. These are highly critical assets that have significant consequences for community wellbeing if they fail.

Table 3 – Climate Hazard Asset Risk Exposure

Criticality	High	Medium	Low	Very low
AA	0.19%	3.92%	5.57%	9.38%
A	0.02%	3.02%	9.67%	4.57%
B	0.10%	2.19%	9.10%	5.12%
C	0.05%	2.96%	15.63%	11.29%
Unknown	0.00%	1.62%	6.23%	9.40%
Total	0.36%	13.71%	46.18%	39.74%

4.9. Maps showing the classification of risk for stormwater, wastewater and water supply asset across the District are shown in Figures 7-7, 7-8 and 7-9 of the of 3 Waters Infrastructure Climate Change Impact Assessment report (refer Attachment i, pages 46-62). High risk assets are shown in red and medium risk assets are shown in orange.

4.10. The estimated investment is $41.9 million dollars to build resilience into Council's 3 Waters infrastructure to manage the impacts of climate change. The spread of this investment over stormwater, wastewater and water supply and the different adaptation intervention approaches is shown in Figure 2 below.

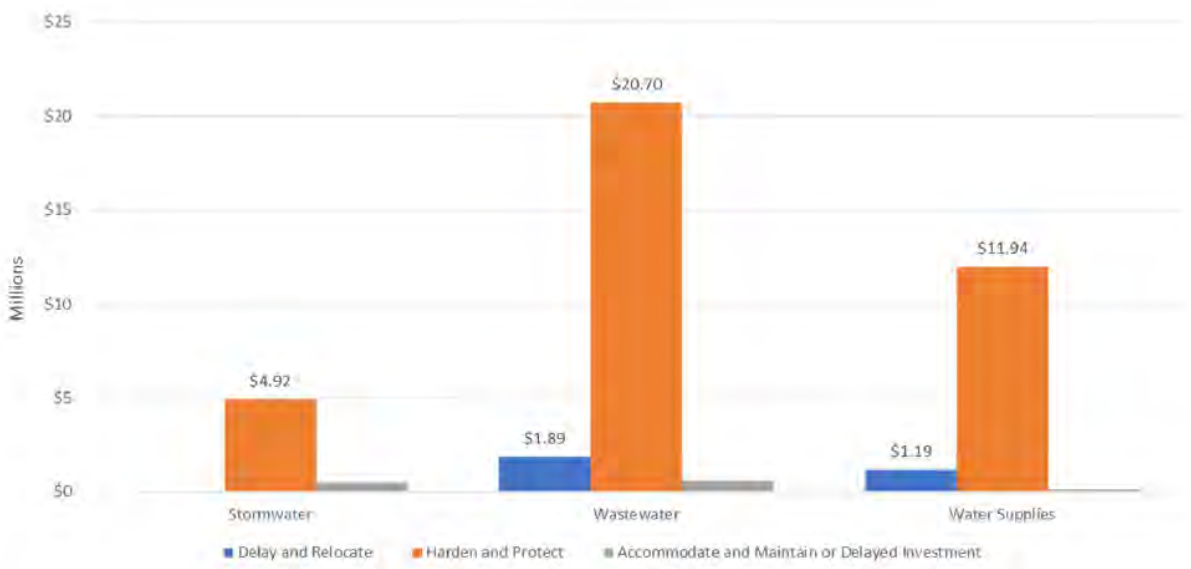

Figure 2 – Investment Required in Criticality AA, A and Part B

4.11. Placeholder budgets have been provided in outer years of the Long Term Plan (from years 2034/35 to 2043/44), however further work is required to refine these estimates and integrate any works with the future renewals programme.

Implications for Community Wellbeing

4.12. There are implications on community wellbeing by the issues and options that are the subject matter of this report. A broad range of direct and indirect climate change impacts have been identified for the District in the 2022 NIWA Technical Report (refer

220616103176[v2]). These have the potential to significantly affect the health and wellbeing of residents.

4.13. Planning for the potential impacts of climate change on 3 Waters infrastructure is important to ensure we can continue to deliver core utility services that are sustainable, resilient, affordable; and provided in a timely manner for the community.

4.14. The Management Team has reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

Mana whenua

5.1. Te Ngāi Tūāhuriri hapū are likely to be affected by and have an interest in the subject matter of this report. Ngāi Tahu and Te Ngāi Tūāhuriri hapū are concerned about the impacts of climate change as changes to the natural environment affect Māori cultural, economic and spiritual wellbeing. This work will feed into the climate change risk assessment work being undertaken at a District level which will assist the Runanga with their climate change planning.

Groups and Organisations

5.2. There are groups and organisations likely to be affected by, or to have an interest in the subject matter of this report. These include groups who support and don't support climate action.

Wider Community

5.3. The wider community is likely to be affected by, or to have an interest in the subject matter of this report. In the 2019 Community Survey over 70% of respondents were either concerned or very concerned about climate change. In the 2022 Customer Satisfaction Survey 38% of respondents were satisfied with Council's response to climate change and 21% were dissatisfied.

6. OTHER IMPLICATIONS AND RISK MANAGEMENT

Financial Implications

6.1. The work undertaken by Waugh, identified the need for about $41.9 million dollars to build resilience into Council's 3 Waters infrastructure to manage the impacts of climate change. While this is a high level assessment, the placeholder budgets shown in Table 4 below have been put in years 10-20 of the Long Term Plan to signal that climate change related work will be required.

Table 4 – Climate Change Placeholder Budgets

Area	Budget Provision (over year 2034/35 to 2043/44)
Water Supply	$13,291,000
Wastewater	$23,190,000
Stormwater	$5,398,000
TOTAL	**$41,879,000**

6.2. As set out in this report, further work is required to refine these estimates and integrate any works with the future renewals programme.

Sustainability and Climate Change Impacts

6.3. The recommendations in this report do have sustainability and/or climate change impacts. This work is the first phase of developing resilience programme for Council's 3 Waters infrastructure and will feed into Council's overall climate change adaptation strategy.

Risk Management

6.4. There are no risks arising from the adoption/implementation of the recommendations in this report.

6.5. A risk-based approach will need to be adopted around the management of any resilience improvements works as part of any climate change adaptation investment.

Health and Safety

6.6. There are no health and safety risks arising from the adoption/implementation of the recommendations in this report.

7. CONTEXT

Consistency with Policy

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

7.2. This work is consistent with objectives of the Council's Climate Change Policy, namely:

- To enhance the Council's preparedness to respond to climate change challenges in an appropriate, co-ordinated, timely, cost-effective, and equitable way.
- To enable the Council to provide transformational leadership that will ensure the longterm wellbeing, sustainability and resilience of the District's communities and businesses.
- To provide for a planned approach to reducing emissions that contribute to climate change, and adapting to its effects on communities and the environment.

Authorising Legislation

7.3. The Local Government Act 2002 is the relevant legislation in relation to managing infrastructure assets, including water supply, wastewater and stormwater activities.

Consistency with Community Outcomes

7.4. The Council's community outcomes are relevant to the actions arising from recommendations in this report. Specifically,

- Climate change challenges are addressed in an appropriate, timely, cost-effective and equitable manner.
- Climate change considerations are incorporated into all infrastructure decision making processes.
- Core utility services are sustainable, resilient, affordable; and provided in a timely manner

Authorising Delegations

7.5. The Utilities & Roading Committee have the delegate authority to receive this report.

Infrastructure Management

Waimakariri District Council

3 Waters Infrastructure
Climate Change Impact Assessment

WAUGH

ideas | analysis | solutions

Quality Record Sheet

Waimakariri District Council

3 Waters Infrastructure
Climate Change Impact Assessment

Issue Information	
Issue Purpose	For Issue
Issue Date	14 November 2023
Version Number	1.2

Authorisation	
Waimakariri District Council	Colin Roxburgh
Prepared By	Hugh Blake-Manson Kurt Hayward
Reviewed By	Assoc. Prof. Theuns Henning Ross Waugh
Date	14 November 2023
Report Number	64-072-1018P

Waugh Infrastructure Management Ltd. Level 2 18 Woollcombe St PO Box 827, Timaru, New Zealand
P +64 3 686 6994 or 0800 4 WAUGH E info@waugh.nz
www.waughinfrastructure.co.nz

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Glossary of Terms

Key term	Definition
Adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2014)
Adaptive capacity	The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences (IPCC, 2014)
Assets	"Things of value", which may be exposed or vulnerable to a hazard or risk. Physical, environmental, cultural or financial/economic element that has tangible, intrinsic or spiritual value (see Taonga) (Ministry for the Environment, 2019)
Baseline (or reference)	Any datum against which change is measured
Cascading effects (of climate change)	The effects that flow on from a primary hazard to compound and affect many systems in a dynamic sequence
Climate	In the usual narrow sense, the average weather. More rigorously, the statistical description of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system (IPCC, 2014)
Climate change	A change in the state of the climate that can be identified (for example, by using statistical tests) by changes or trends in the mean and/or the variability of its properties, and that persists for an extended period, typically decades to centuries. Climate change includes natural internal climate processes or external climate forcings such as variations in solar cycles, volcanic eruptions and persistent changes due to human activity in the composition of the atmosphere or in land use (IPCC, 2014)
Climate projection	The simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions in that they depend on the emission, concentration or radiative forcing scenario used, which is in turn based on assumptions about, for example, future socio-economic and technological developments that may or may not be realised (IPCC, 2014)
Compound hazards and stressors	Combined occurrences of multiple hazards and stressors (that is, cumulative hazards) that will become more significant in the future as adaptation thresholds are reached. For example, in a low-lying coastal area, a persistent wet season (high groundwater, reduced field capacity) could be followed by a coastal storm in the context of sea-level rise, coinciding with intense rainfall, leading to compound flooding impacts (Ministry for the Environment, 2019)
Confidence	A qualitative measure of the validity of a finding, based on the type, amount, quality and consistency of evidence (for example, data, mechanistic understanding, theory, models and expert judgement) and the degree of agreement (Ministry for the Environment, 2019)

Key term	Definition
Consequence	The outcome of an event that may result from a hazard. It can be expressed quantitatively (for example, units of damage or loss, disruption period, monetary value of impacts or environmental effect), semi-quantitatively by category (for example, high, medium or low level of impact) or qualitatively (a description of the impacts) (adapted from Ministry of Civil Defence and Emergency Management, 2019). It is also defined as the outcome of an event affecting objectives (ISO/IEC 27000:2014 and ISO 31000: 2009) (Ministry for the Environment, 2019)
Critical Assets	Assets that have a high consequence of failure which may extend to significant consequences for community wellbeing. Criticality ratings for 3 Waters infrastructure are considered within the context of their local significance
Disaster	Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery (IPCC, 2014)
Driver	An aspect that changes a given system. Drivers can be short term but are mainly long term in their effects. Changes in both the climate system and socio-economic processes, including adaptation and mitigation, are drivers of hazards, exposure and vulnerability, so drivers can be climatic or non-climatic (Ministry for the Environment, 2019)
Emissions	The production and discharge of substances that are potentially radiatively active (that is, absorb and emit radiant energy) in the atmosphere (for example, greenhouse gases, aerosols) (Ministry for the Environment, 2019).
Exposure	The type and number of things that could potentially be affected by a hazard e.g. drinking water affected by organic contaminants. The level of exposure can be dependant on the physical location
Extreme weather events	An event that is rare at a particular place and time of year. Definitions of 'rare' vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (for example, drought or heavy rainfall over a season) (IPCC, 2014)
Financial risk	Risks that involve financial loss to government orgainisations, firms and the community. Financial risks in general relate to markets, credit, liquidity and operations
Fragility	Alternatively referred to as asset vulnerability. Fragility is the quality of an assets which determines how easily it could be broken or damaged during a climatic shock event or due to slow-burning climatic changes
Frequency	The number or rate of occurrences of hazards, usually over a particular period of time (Ministry for the Environment, 2019)

Key term	Definition
Greenhouse gas	The gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by Earth's surface, the atmosphere itself and clouds. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases in Earth's atmosphere
Hazard	The potential occurrence of a natural or human-induced physical event, trend or physical impact that may cause loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (IPCC, 2014). In this report, the term 'hazard' usually refers broadly not only to climate-related physical hazard events (such as floods or heatwaves) but also to evolving trends or their gradual onset physical impacts (IPCC, 2014)
Heatwave	A period of abnormally and uncomfortably hot weather (IPCC, 2014)
Interdependence	Relationship between infrastructure types characterised by one's need for supply from another in order for their service to function
Impacts (or consequences or outcomes)	The effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific time period, and the vulnerability of an exposed society or system. Impacts are also referred to as consequences and outcomes (IPCC, 2014)
Intergovernmental Panel on Climate Change (IPCC)	A scientific and intergovernmental body that works under the authority of the United Nations
Land use	The total of arrangements, activities and inputs undertaken in a certain land cover type (a set of human actions). Also means the social and economic purposes for which land is managed (for example, grazing, timber extraction and conservation). In urban settlements, it is related to land uses within cities and their hinterlands. Urban land use has implications for city management, structure and form and so for energy demand, greenhouse gas emissions and mobility, among other aspects (IPCC, 2014)
Likelihood	The chance of a specific outcome occurring, where this might be estimated probabilistically (IPCC, 2014)
Mitigation	A human intervention to reduce the sources or enhance the sinks of greenhouse gases (IPCC, 2014)
Percentile	A value on a scale of 100 that indicates the percentage of the data set values that is equal to or below it. The percentile is often used to estimate the extremes of a distribution. For example, the 90th (or 10th) percentile may be used to refer to the threshold for the upper (or lower) extremes
Representative concentration pathway (RCP)	A suite of representative future scenarios of additional radiative heat forcing at Earth's surface by 2100 (in Watts per square metre), which is the net change in the balance between incoming solar radiation and outgoing energy radiated back up in the atmosphere. Each RCP can be expressed as a greenhouse gas concentration (not emissions) trajectory adopted by the IPCC for its Fifth Assessment Report (AR5) in 2014 (IPCC, 2014)
Residual risk	The risk that remains (and may continue to rise) in unmanaged form, after risk management measures and adaptation policies have been implemented to adapt to climate change and more frequent hazards, and for which emergency response and additional adaptive capacities must be maintained or limits to adaptation addressed. Policy interventions and adaptation plans will need to reconcile changing residual risks with changing (evolving) societal perceptions of tolerable risk

Key term	Definition
Resilience	The capacity of social, economic and environmental systems to cope with a hazardous event, trend or disturbance by responding or reorganising in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation (IPCC, 2014)
Risk	The potential for consequences where something of value is at stake and where the outcome is uncertain, recognising the diversity of values. Risk is often represented as probability or likelihood of occurrence of hazardous events or trends, multiplied by the impacts if these events or trends occur. The term 'risk' is used to refer to the potential, when the outcome is uncertain, for adverse consequences on lives, livelihoods, health, ecosystems and species, economic, social and cultural assets, services (including environmental services) and infrastructure. Risk results from the interaction of vulnerability, exposure and hazard. To address the evolving impacts of climate change, risk can also be defined as the interplay between hazards, exposure and vulnerability (IPCC, 2014)
Risk assessment	The overall qualitative and/or quantitative process of risk identification, risk analysis and risk evaluation, with multiple entry points for communication and engagement and monitoring and reviews (AS/NZS ISO 31000:2009, Risk Management Standard)
Shock	A sudden, disruptive event with an important and often negative impact
Stress	A long-term, chronic issue with an important and often negative impact
Stressor (climate)	Persistent climatic occurrence (for example, change in pattern of seasonal rainfall) or rate of change or trend in climate variables, such as the mean, extremes or the range (for example, ongoing rise in mean ocean temperature or acidification), which occurs over a period of time (for example, years, decades or centuries), with important effects on the system exposed, increasing vulnerability to climate change (Ministry for the Environment, 2019)
System	A set of things working together as parts of an interconnected network and/or a complex whole
Three waters (3 waters)	Drinking water, wastewater and stormwater
Uncertainty	A state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from imprecision in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour (IPCC, 2014)
Value domain	The NCCRA framework outlines five 'value domains' for assessing risks and opportunities. These value domains represent groups of values, assets and systems that may be at risk from exposure to climate change-related hazards or could benefit from them (opportunities). These value domains are a hybrid of New Zealand Treasury's Living Standards Framework and those used in the National Disaster Resilience Strategy (Ministry of Civil Defence and Emergency Management, 2019; New Zealand Treasury, 2018). The value domains are interconnected and apply at individual, community and national levels. They include tangible and intangible values

Key term	Definition
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC, 2014). Assessing vulnerability is broader than conventional risk assessments, because it includes indirect and intangible consequences on the four wellbeings and considers adaptiveness and adaptive capacity (for example, communities, whānau, hapū and iwi may be resourceful and adaptive but may lack the resources, insurance access and mandate or capacity to adapt) (Ministry for the Environment, 2019)

Glossary of Abbreviations

Abbreviation	Explanation
3 Waters	Councils drinking water, wastewater and stormwater assets which it provides across its District
CDEM 2002	Civil Defence Emergency Management Act 2002
DIA	Department of Internal Affairs (National Transition Unit)
IPCC	Intergovernmental Panel on Climate Change
NIWA	National Institute of Water and Atmospheric Research
RCP	Representative Concentration Pathway
WDC	Waimakariri District Council (Council)
WIML	Waugh Infrastructure Management Ltd

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1.0 EXECUTIVE SUMMARY

Waimakariri District Council provides 3 Waters services (drinking water, wastewater and stormwater) to properties generally located in four townships – Rangiora, Kaiapoi, Oxford and Woodend Pegasus, seven rural villages and some rural areas. Drinking water is supplied to over 80% of the population (50,000 people), providing both a source of sustainment and risk to the community. The 3 Waters assets collectively have a replacement valued at 2022 of $839M with renewals of $149M forecast (2022) over the next 50 years. Some of these assets may be exposure to climate change impacts earlier than their forecast replacement date.

Rivers define the land and its use – the Ashley, Cust, Eyre and Waimakariri provide conduits for river ecology while indirectly providing a source of drinking and directly taking flood flows through the District and ultimately out to sea. The District relies on deep groundwater to provide safe drinking water, treats and discharges wastewater to land and sea, and has a series of stormwater-to-drainage systems that minimise the risk of flooding properties.

Council recognises that climate change will have an impact on its ability to provide 3 Waters services. The likely scale and extent of across the District was not clear, resulting in the commissioning of a 2022 climate change assessment from NIWA. That report identified the likely impacts of climate change within the District are more extremes in weather, including increased river flows, more hot days (above 25 degrees Celsius) and increases in rain fall intensity. Following this, WIML were engaged to look specifically at the scale and extent of climate related exposure, including costs, as a basis for providing an adaptation strategy. An RCP 8.5, mid century (2050) scenario was applied while reporting on areas of focus over the next three years.

Coinciding with this work are several directly aligned work programmes – Council's Climate Adaptation Strategy covering all assets, the provision of climate related budget information to the DIA and the Lifelines vulnerability Proof of Concept programme.

This project's approach was to develop short to medium-term cost estimates of the most likely adaptation interventions for 3 Waters while setting up a framework assessment process that could also be used for other assets. This project has relied predominantly on utilisation of existing data to support the assessments, however some additions to and development of that data were required to contextualise it from a natural hazard risk perspective. Development included:

- An expanded 3 Waters framework to include criteria such as the relative importance of assets from a disaster response and management perspective i.e. engineering lifelines
- Completion of an asset fragility framework. This recognised that asset types and components are not equally vulnerable to the impacts of hazard events. Factors such as design standards, current conditions and material types make a specific asset more or less robust against the impacts of weather events. Asset fragility was rated according to the specific factors applicable to the different asset types
- Completion of an asset failure impacts table. Existing best practice was used and contextualised around the land and assets inside the district. As a result, an understanding of the most likely failure or impacts of natural hazards on infrastructure was obtained e.g. a well-known consequence of flooding is the inundation of the entire wastewater system where surcharge in the adjacent stormwater network occurs
- Provision of adaptation intervention strategies. Following completion of the climate risk assessment process, a series of adaptation options were defined to address risks at an appropriate level. This allowed for a range of options and cost to be applied for specific asset given its overall climate risk

Because this project focuses on providing adaptation strategies for the highest risk assets (criticality AA, A and B (part), there is a high level of confidence in the investment direction though this will ultimately be confirmed at a programme and project level. Longer-term uncertainties will be addressed through long-term adaptation pathways, which were not considered for this initial work.

The outcome of the climate risk assessment process is illustrated in Table 1-1. It shows that 0.31% of the 3 Water asset base has a high climate risk, while 9.13 % is at a medium level.

Table 1-1: Asset Portion by Criticality and Risk Level

Criticality	High	Medium	Low	Very low
AA	0.19%	3.92%	5.57%	9.38%
A	0.02%	3.02%	9.67%	4.57%
B	0.10%	2.19%	9.10%	5.12%
C	0.05%	2.96%	15.63%	11.29%
Unknown	0.00%	1.62%	6.23%	9.40%
Total	0.36%	13.71%	46.18%	39.74%

The expected investment cost and the identified intervention level across the respective waters for Criticality A and AA is provided in Figure 1-1. As expected, the wastewater system requires the most significant investment levels, given this system's particular vulnerability to flood events.

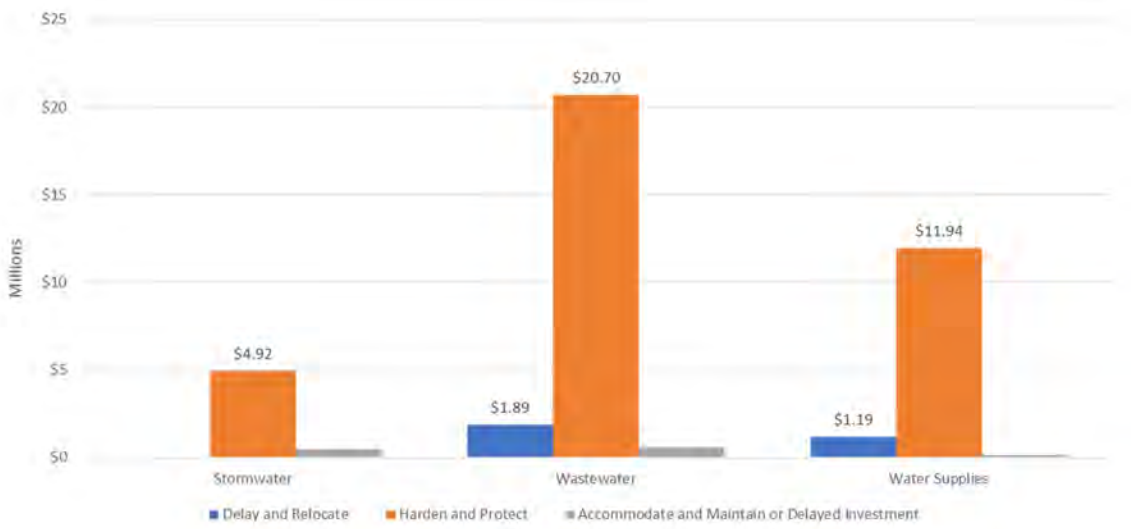

Figure 1-1: Investment Required in Criticality A and AA Assets and Part B

Next Steps

A network level adaptation investment approach was taken for this project. The resilience programme requires further investigation and adaptation design before finalisation. As a consequence, the investment programme provided to Council (and for DIA capital budgets) commences from year 10 onwards - 2034.

Integration of this projects resilience programme and the current maintenance and renewals programme is appropriate. The recommended approach is provided in Table 1-2.

Table 1-2: Integrating the Resilience Programme with Councils Renewals and Maintenance Programme

Asset Programme	Recommended Approach	Cost Implication
Asset identified in the resilience programme and in Councils renewals programme	Assign a higher priority for the assets in the renewals/maintenance programme, plus investigate the most appropriate adaptation design	To be determined on a case-by-case basis. For example, an identified pipe replacement in both programmes has no cost impact

Asset Programme	Recommended Approach	Cost Implication
Asset identified in the resilience programme only	Undertake further and more detailed investigation on the risk these assets are exposed to, determining the most appropriate adaptation strategy and timing. On completion, these works could be prioritised against other projects on the programme	A more detailed cost estimate is required for each asset and will depend on the chosen adaptation strategy
Asset identified in Councils renewal and maintenance programme only	Take a business as usual approach	N/A

Council has also indicated that it is considering extending its climate change assessment to cover other assets. If this occurs, then an assessment of the interdependencies and dependencies between these additional asset groups e.g. facilities, transport and greenspaces and 3 Waters should be undertaken. This would reveal the spatial areas and asset groups with the highest to lowest levels of climate change exposure.

Lifelines work is progressing separately from this programme. Alignment between the two programmes would be appropriate to maximise the benefit for Council and the community.

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2.0 INTRODUCTION

Waimakariri District Council is undertaking a significant programme of work to understand climate change impacts within its boundaries including quantifying Council emissions and plan for the required mitigation.

To support this work and to inform the next three years investment programme (2024-2027), Council commissioned an assessment of climate change impacts on its three waters infrastructure - drinking water supplies, wastewater and stormwater assets (3 Waters). The report content – included below provides details of the data utilised, assumptions made and modelling undertaken to provide an initial investment programme. The investment programme is based on asset significance (a measure of criticality and fragility) and exposure.

In 2022, the National Institute of Water and Atmospheric Research (NIWA) provided an assessment of climate change impacts to Counci- summrised in Figure 2-1. This provided a primary basis for the adaptation response.

Figure 2-1: Waimakariri District Climate Change Impacts

2.1 3 Waters Climate Change Impact Assessment Framework

The 3 Waters Climate Change Impact Assessment Framework (the assessment framework) provides guidance on investment over the next three years (2024-2027), and is based on NIWA data for an RCP 8.5 scenario with impacts projected for mid-century (2031-2050) outcomes.

The assessment framework particularly relies on:

- Data from Council – particularly asset criticality, asset attribute information and replacement value
- Hazard risk data from other sources, including NIWA, coastal exposure (Jacobs) and flood modelling (WDC/DHI Flood Hazard Mapping)

The methodology followed is summarised in Figure 2-2. The risk to the assets was determined in the first instance through the product of hazard occurrence, infrastructure exposure and the asset's vulnerability to failure (fragility). The wider consequences of asset failure were reflected in the criticality rating of the assets.

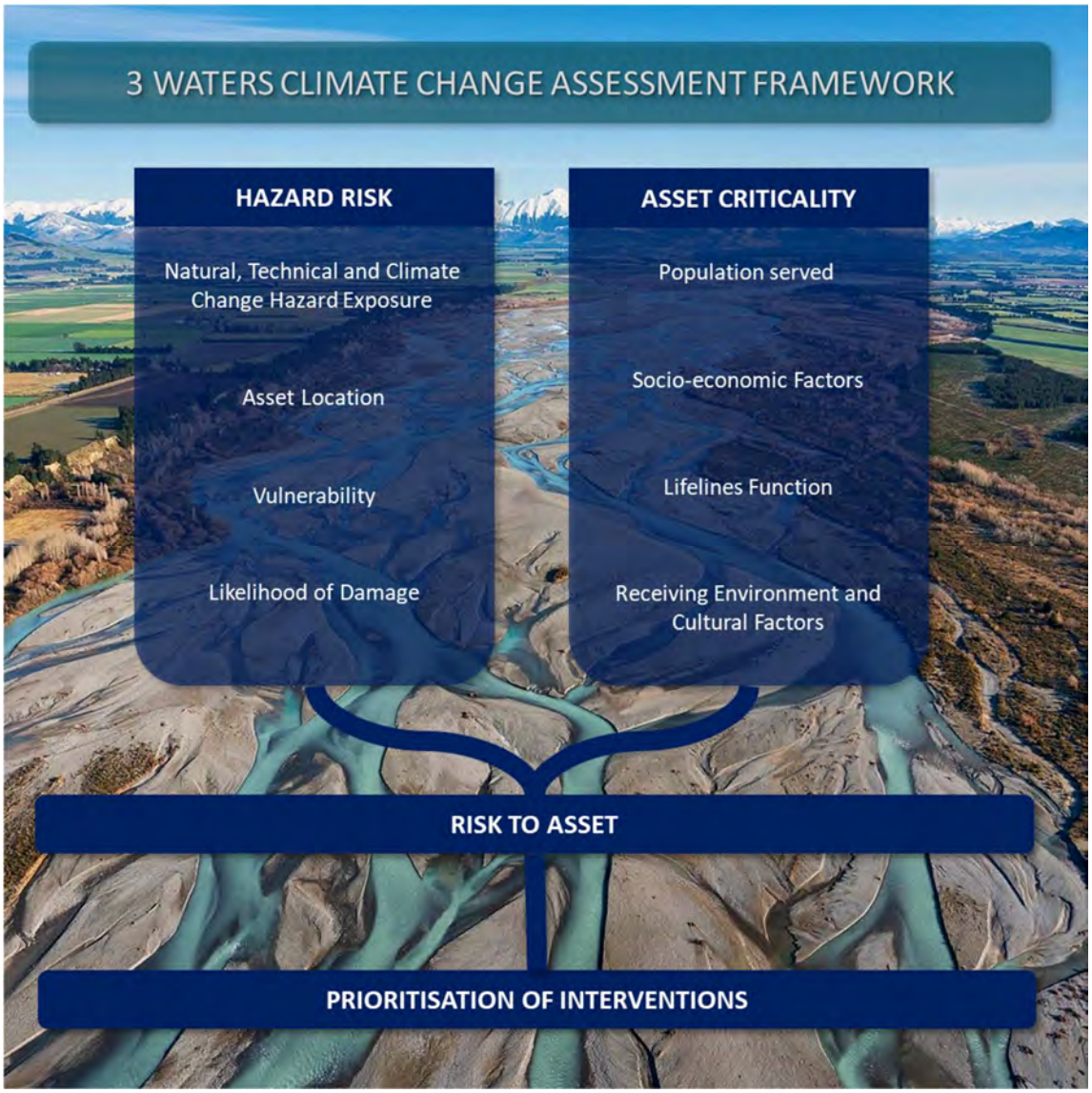

Figure 2-2: 3 Waters Risk Assessment Methodology

2.1.1 Prioritisation Methodology

The risk framework established for this project is based on a risk-based approach, which utilises likelihood and consequence to quantify the risk to an asset.

The assessment methodology - Figure 2-3 takes the following approach stepwise approach:

1. Blue: Climate change likelihood values for each applicable asset e.g. source, pumpstation, treatment are calculated as is the fragility to the climate hazard and likelihood of damage.
2. Green: An asset hazard impact value is determined and spatially mapped
3. Yellow/cream: Risk is calculated
4. Orange: Criticality values are applied limited to AA, A and B (high exposure)
5. Priority: Using the adaptation strategy matrix covering four areas from “re-locate” to “accept” each asset has an associated investment applied in accordance to its risk and criticality

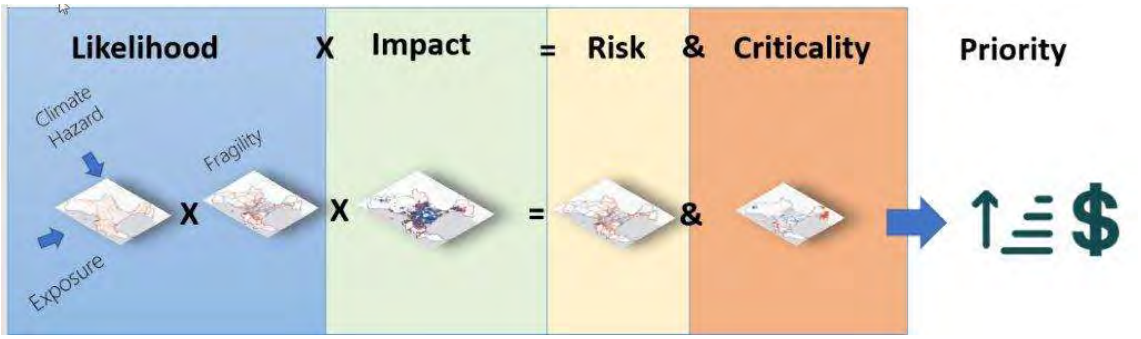

Figure 2-3: Risk Assessment Methodology

Source: National Treasury of South Africa (2023)

2.1.2 3 Waters Assets Covered In this Assessment

The 3 Waters services included in this assessment are provided in Table 2-1, Table 2-2 and outlined for stormwater assets.

Table 2-1: Included Drinking Water Supplies

Main Scheme	Level of Service	Customer Storage	Level of Service
Rangiora	On-Demand	Nil	Major
Kaiapoi	On-Demand	Nil	Major
Woodend-Pegasus	On-Demand	Nil	Major
Oxford Urban - Rural No. 2 *(Oxford Urban)*	On-Demand	Nil	Major
Oxford Urban - Rural No. 2 *(Rural No. 2)*	Restricted	24 hours	Minor
Waikuku Beach	On-Demand	Nil	Major
Cust	On-Demand	Nil	Major
Mandeville-Fernside	Restricted	24 hours	Minor
Oxford Rural No. 1	Restricted	24 hours	Minor
West Eyreton – Summerhill – Poyntzs Rd	Restricted	24 hours	Minor
Ohoka	Restricted & Semi-Restricted	24 hours	Minor
Garrymere	Restricted & Semi-Restricted	24 hours	Minor

Table 2-2: Included Wastewater Supplies

Main Scheme	Level of Service	Treatment Facility	Treatment Method
Eastern District			
Sub Scheme			
Rangiora	Urban gravity	Rangiora WwTP	Aeration Basin Oxidation Ponds
Mandeville	STEP		
Loburn Lea (to Rangiora)	Urban gravity with 4 private pump stations		
Fernside (to Rangiora)	Pressure		
Kaiapoi	Urban gravity and pressure (Beach Grove)	Kaiapoi WwTP	Aeration Basin Oxidation Ponds Wetlands UV Treatment
Pines Kairaki	Urban gravity		
Woodend	Urban gravity	Woodend WwTP	Aeration Basin Oxidation Ponds Wetlands UV Treatment
Pegasus	Urban gravity, EOne, STEP		
Tuahiwi	Pressure		
Woodend Beach	Urban gravity		

Main Scheme	Level of Service	Treatment Facility	Treatment Method
Eastern District			
Waikuku Beach	Urban gravity, EOne	Waikuku WwTP	Oxidation Ponds
Main Scheme	**Level of Service**	**Treatment Facility**	**Treatment Method**
Oxford	Urban Gravity	Oxford WwTP	Activated sludge UV treatment

WDC has 12 drainage schemes with 14 stormwater pumpstations. While the interconnected nature of stormwater and drainage is acknowledged, the priority for this assessment is on the 'urban' stormwater systems inclduing:

- Coastal Urban
- Kaiapoi Urban
- Oxford Urban
- Pegasus Urban
- Rangiora Urban

2.1.3 Exclusions

The scope of this assessment is limited to modelling climate change impacts on Council 3Waters infrastructure - Section 2.1.2. Consideration of cascading impacts, climate finance and insurance arrangements between the 3 Waters infrastructure asset groups are excluded. The inclusion of these aspects in future work would be of benefit to Council, as part of a wider improvement programme.

Other 3 Waters assets and key associated infrastructure excluded from this assessment are provided in Table 2-3. The priority order in which they could be included is suggested with rational.

Table 2-3: Items Excluded from This Assessment

Asset	Priority	Reason
Non-rated rural stormwater/drainage: Central Rural, Clarkville Rural, Cust Rural, Coastal Rural, Cust Rural, Loburn Lea Rural, & Ohoka Rural	**Very high**	Discharges into urban stormwater systems can contribute significant flood volumes (property damage)
Transportation (Local and State Highway), including roading / stormwater drainage infrastructure	**Very high**	Critical to the efficient movement of goods, services (well-being)
Main Power Supply	**Very high**	Key infrastructure interdependencies: Subject to wind, snow and wildfire impact, outages will immediately affect on-demand and gravity systems (no flow, overflows). Earthquakes may also affect main supply reliability.
Stockwater races	**High**	Contributes to economic prosperity through supply to stock and irrigation water to rural properties. Undertake assessment with Waimakariri Irrigation Ltd as these are shared assets.
Private water schemes (≥2 connected properties)	**Low**	Subject to LGA s125-126, unknown number of schemes
Private wastewater schemes (≥2 connected properties)	**Low**	Subject to LGA s125-126, unknown number of schemes
River systems	**Low**	Should be resourced by Regional Council
Ashley Rural Water Supply	**Low**	Assets owned and managed by Hurunui District Council, located in Waimakariri District Council

2.1.3.1 Interdependencies between Asset Types

Through its provision of 3 Waters services, the Council is a lifeline utility under the CDEM 2002. These essential services can impact the ability of other lifeline utilities to ensure critical services are provided and delivered.

An assessment of the interdependencies between 3 Waters and other infrastructure is provided in Table 2-4 and Table 2-5.

Table 2-4: Infrastructure Interdependencies: Impact of Other Lifeline Utilities on 3 Waters

	3 Waters Impacted by Other Infrastructure							
	Power supply	Telecommunications	Pipelines crossing waterways/bridges	Road access	Fuel supply	Water supplies	Wastewater	Stormwater
Water Supplies	*	*	*	*	*			
Wastewater	*	*	*	*	*			*
Stormwater	*	*	*	*	*			

Key

	Significant – operational requirement		Moderate – partial requirement / backup available		Minimal		None

Table 2-5: Infrastructure Interdependencies: Impact of Three Waters on Other Lifeline Utilities

	Other Infrastructure Services Impacted by 3 Waters							
	Power supply	Telecommunications	Pipelines crossing waterways/bridges	Road access	Fuel supply	Water supplies	Wastewater	Stormwater
Water Supplies								
Wastewater								
Stormwater				*				

Note:
* indicates those interdependencies which may be impacted by climate change, causing increased frequency and/or intensity of severe weather events which may result in damage to infrastructure assets.

2.2 Data

2.2.1 Data Sources

The primary data sources utilised in this project are provided below - Table 2-6.

Table 2-6: **Primary Data Sources Utilised**

Reference Outline e.g. Data Source	Source and Data	Purpose
Eastern South Island Projected regional climate change hazards	NIWA, GeoTiffs provided by Jochen Stoll (WDC) August 2022	Provides spatially accessible climate factors projections to determine exposure
Jacobs Natural Hazard 2020 Data	Jacobs, GeoTiffs provided by Jochen Stoll (WDC) January 2023	Backing data and scenarios for District Flooding Modelling to assess the sufficiency
WDC 3 Waters 2022 Valuation Databases	WDC, provided by Chris Bacon February 2023	Links assessed assets to corporately assessed financial records, which assists in determining projected climate adaptation cost
WDC District Flood Modelling	WDC, provided by Chris Bacon November 2022	Provides modelled future flood exposure for risk calculation
WDC 3 Waters Assets GIS Snapshot	WDC, provided by Chris Bacon September 2022	The base dataset to link back to WDC 3 Waters Assets
National Water Table Model	https://doi.org/10.21420/KZ52-NT28, GNS Science, 2018	Provides context for high water tables to assess Design Adequacy in specific asset locations
Eastern Canterbury liquefaction susceptibility	https://opendata.canterburymaps.govt.nz/datasets/a1d1e268681f4f9896b551b26a6e8bbc, Canterbury Maps, 2012	Provides context for ground suitability to assess Design and Material Adequacy in specific asset groupings

2.2.2 NIWA Data - Sources of Uncertainty

The NIWA 2022 data is critical to the investment decisions and adaptation strategy provided in this 3 Waters assessment. It should be recognised that the NIWA data provides the most current, the best resolution information over the Waimakariri area that is currently available. Any improvement in resolution, even if it were possible may not be of significant benefit.

There are three main sources of uncertainty in projections of climate as presented in the underlying NIWA climate change projections. The NIWA report should be referred to for the avoidance of doubt and to provide context.

The main sources of uncertainty are:

1. Actual future emissions levels and rates e.g. RCP's.
2. Level of internal climate variability – natural variations in climate can occur over annual to decadal timescales.
3. Inter-model differences – different models present climate change rates, levels and spatial changes differently.

These uncertainties are reflected in this assessment through :

1. Application of the spatial overlay of climate change modelling to asset locations
2. The scale of climate change projection modelling (4-5.5km resolution).

Because this project focuses on providing adaptation strategies for the highest-risk assets (AA, A and B (part), there is strong confidence in the robustness of the investment programme. Longer-term uncertainties will be addressed through long-term adaptation pathways, which were not considered for this initial work.

2.2.3 Assumptions and Impact

An assessment of assumptions made and their resulting impact is provided in Table 2-7.

Table 2-7: 3 Waters - Assumptions and Impact

Aspect	Assumption	Impact (positive / negative) & level
Asset Points	To uniformly assess assets, they were converted to points. This was considered to be a pragmatic approach for the assessment of long continuous length assets	Positive: Long assets skew the climate change grid location and proximity to liquefaction
Valuation	That the 2022 new replacement value utilised from Councils valuation databases is accurate	Positive: The valuation is recent and has had significant benchmarking by staff and expert industry review before approval. Climate change investment is based on the valuation data. If the asset replacement values aren't reflective of market values, then the climate Change investment may also be out by the same factor. A full review to ensure the scale is still reflective of market values would be required to have higher confidence that the investment projection has accurate base data (not undertaken)
NIWA grid size	NIWA projected information is represented in 5.5km x 4km grids	Negative unknown: Assets are analysed in relation to 22,000,000 m2 blocks. Those assets in close proximity can have different factors as a result of their overlying grid
Unavailable NIWA data	The NIWA climate projections have grid locations that do not resolve into some climate change factors or projections	Negative - unknown: Assets within 500-1000m of the eastern coast have a limited subset of climate projection data and score lower on non-flooding factors
Water Network Capacity	Capacity input to fragility is derived from Demand Capacity in the Council supplied criticality tables - Water Facilities	Negative - minor: It was agreed with Council be based on a criticality factor. Capacity data was not available for non-facility assets (networks). Capacity is inferences and skewed towards critical assets, however many facets of fragility scoring offset this
Wastewater Network Capacity	Capacity input to fragility is derived from Overflow Time and Volume criticality in WDC scored criticality tables for Water Facilities	Negative – minor: It was agreed with Council be based on a criticality factor. Capacity data was not available for non-facility assets. Capacity is inferred from the selected factor and skewed towards critical assets, however many facets of fragility scoring offset any concern
Stormwater Network Capacity	No capacity information was able to be derived from available information. Capacity was not considered for these assets	Negative – unknown: Stormwater facility assets were not assessed against capacity input
Data Quality	The data provided to WIML was up to date, including attribute to provide confidence in results	Negative – unknown: Attributes such as criticality are relied upon for prioritisation or risk calculation. The analysis uses what was provided, so if attributes have been changed or populated after the data was exported, this has not carried through to changing risk outputs
Impact and exposure scale range	Values are 1-5, non-zero values not allowed. Note scaling is detailed in the Appendices	Positive: Ensures consistency of resulting scores across different hazards. Low values may not result in priority actions. Scale is consistent (high=5, low =1)

2.2.4 Data Adjustments

A number of adjustments were made to the data - Table 2-8.

Table 2-8: **Primary Data Sources Utilised**

Data	Adjustment	Reason	Impact on Output (Adaptation Strategy and Investment Value)
Liquefaction proximity	Assets within 100m buffer of the liquefaction assessment zone were flagged with the associated liquefaction risk	Asset proximity to hazard is assessed based on points derived from linear assets that can be shifted outside the extent of the liquefaction assessment	Insignificant: Only 1 asset was flagged with an increase of liquefaction likelihood because of this tweak
Filtering Managing Department	Financial mapping was filtered to exclude certain managing departments	The 3 Waters GIS data provided contained assets managed by other departments	Insignificant: Excluding non 3W departments removes $1.8M from the valuation data. The Northbrook Wetlands SW Reserve, managed by Greenspaces is $1.5M of that value. However, based on the Risk Level, all assets filtered out only net $0.04M of climate Change cost
Asset Type Categorising	The asset type used to determine impacts using the classification and attribute data present (in broad aggregates)	Assets need to resolve to have a climate change impact, and the WDC classification did not directly relate to the impact	Minor: The associated climate impacts within water classes are closely related. The classification within water class is accurate, and the sub-classification has very high confidence from Council data. A misinterpretation of clarification to determine sub-classification is unlikely and the occurrence does not impact the result significantly unless incorrectly flagged as supporting infrastructure
Climate Flood Model Exposure (Jacobs)	The 100 year flooding hazard likelihood was incremented by 1 to suit a 1-5 scale	To be consistent with exposure calculations, a 1-5 scale is required	Insignificant: Asset range is from 1-5 rather than 0-4

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3.0 CLIMATE CHANGE FRAMEWORK

Climate change causes impacts, and responses, including mitigation and adaptation, occur across the four spatial extents of varying control from global through to the area managed by Council (district). The climate change framework is similarly distributed across these levels.

Figure 3-1: Climate Change levels of influence

3.1 Global

Changes to the global climate system are unequivocal. These changes include warming of the atmosphere and ocean, diminishing of ice and snow, sea-level rise, and increases in the concentration of greenhouse gases in the atmosphere. Internationally, we are seeing increasing frequency and severity of extreme weather and climate events. Global impacts are collated and modelled in the International Panel for Climate Change reports, most recently the Intergovernmental Panel on Climate Change (IPCC) Working Group II Impacts, Adaptation and Vulnerability Report 2022 (IPCC, 2022).

New Zealand is supportive of international efforts in Climate Change and has obligations under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement to provide financial, capability building, and technical transfer support for developing countries to meet their climate change goals.

3.2 National - New Zealand

Expected climate change impacts at a national level are summarised and assessed in various national and international reports most notably the National Climate Change Risk Assessment 2022 (Ministry for the Environment, 2022) and the Climate Change Projections based on the IPCC Fifth Assessment (Ministry for the Environment, 2018). National risk assessments are based on Arotakenga Huringa Āhuarangi: A Framework for the National Climate Change Risk Assessment for Aotearoa New Zealand (the NCCRA framework)

New Zealand's first National Adaptation Plan (the Plan) (Ministry for the Environment, 2020) sets out New Zealand's long-term strategy regarding the Government's approach to adaptation. The Plan outlines Government-led strategies, policies and proposals that will help New Zealanders adapt to the changing climate and its effects, and responds to the risks identified in the National Climate Change Risk Assessment (Ministry for the Environment, 2022).

In addition to the requirements under the Local Government Act 2002 and the Resource Management Act 1991, relevant legislation includes:

- Climate Change Response Act 2002. This establishes a legal framework to enable New Zealand to meet its international obligations under the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement
- Climate Change Response (Zero Carbon) Amendment Act 2019. This provides a framework by which New Zealand can develop and implement clear and stable climate change policies

3.3 Regional - Canterbury Regional Council (Environment Canterbury)

In recognition of the future of climate change and the need for urgent action, Environment Canterbury was a signatory to the Local Government Leaders' Climate Change Declaration in 2018. In addition, Environment Canterbury has been progressing in a number of climate change workstreams, including regional working groups and community education. In May 2019, Environment Canterbury became the first council in New Zealand to declare a climate emergency.

Environment Canterbury in 2020 commissioned research from NIWA to model climate impacts for Canterbury region between present day and 2100. This report and data align with the refined reporting of impacts completed for Waimakariri District Council.

Waimakariri District Council is a member of the Canterbury Regional Climate Change Steering Group established in 2019, the Regional Climate Change Working Group that co-ordinates the region's climate change response and reports to the Steering Group and the Regional Natural Hazards Working Group, which also has a role to play in coordinating climate change adaptation efforts. Waimakariri District Council is participating in 'It's Time Canterbury', community engagement and regionally coordinated climate change response planning, led by Environment Canterbury (It's Time Canterbury, 2023).

3.4 District - Waimakariri District Council

In addition to requirements under the relevant legislation, Council has committed to key workstreams relating to better understanding the impacts of Climate Change over the district, supporting regional work, and developing appropriate Council-led adaptation and mitigation responses.

In late 2019 Council adopted a Climate Change Policy to ensure it was able to respond to climate change challenges appropriately and internal sustainable strategies were developed. The Policy outlines six principles and four objectives to support climate change planning and response actions. The adoption of this policy is an acknowledgement of the need for the Council to demonstrate responsible leadership and develop its programme of action to play an appropriate part in ensuring as smooth as practicable transition to a low-emissions future and achieve the Council's vision 'to make Waimakariri a great place to be, in partnership with our communities'.

Ongoing work by Council includes a wider risk assessment on land and infrastructure to determine assets and facilities most at risk. This will include engagement with the community to identify options for reducing this risk. Results will be incorporated as the basis of a Climate Change Adaptation Strategy to be developed by Council. An emissions profile for the District will also be calculated to inform a future emissions reduction plan for Council.

To refine the modelled climate change impact assessment from a regional to district level, Council commissioned NIWA to provide a Climate Change Scenario (NIWA, 2022). The NIWA Climate Change Scenario report and data forms the basis for this 3 Waters Climate Change Impact Assessment. Scenarios, and climate impacts are summarised in Section 4.0.

Coastal impacts of sea level changes are detailed in a Jacobs report commissioned in 2020 (Jacobs, 2020). This report compares anticipated sea level rise with coastal accretion modelled for the Waimakariri coastline. Modelled sea water incursions for mid century have been included in the 3 Waters Climate Change Impact Assessment model.

3.5 Mana Whenua

Te Rūnanga o Ngāi Tahu are influential at a regional and national climate change policy level. They have released their tribal strategy – He Rautaki mō te Huringa o te Āhuarangi: Te Tāhū o te Whāriki, Anchoring the Foundation in 2018 (Te Rūnanga o Ngāi Tahu, 2018). The Strategy provides direction across the whole spectrum of Ngāi Tahu interests, assets and activities.

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4.0 CLIMATE CHANGE IMPACTS

Waimakariri District Council have selected the Representative Concentration Pathway (RCP) of 8.5 in line with the IPCC recommendation that this is the most likely scenario to be experienced. The high-intensity scenario in Figure 4-1 aligns with RCP 8.5.

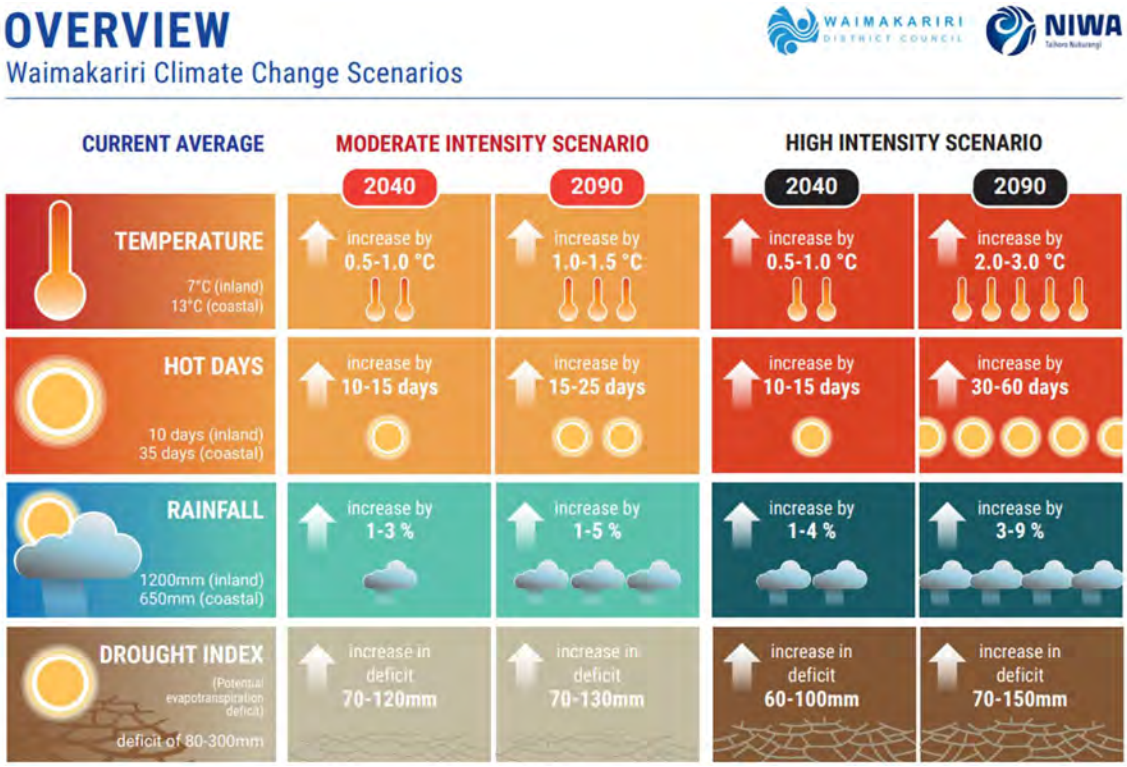

Figure 4-1: Waimakariri District Climate Change Impacts RCP4.5 (Moderate Intensity) and RCP 8.5 (High Intensity)

Source: Waimakariri District Climate Change Scenario: Technical Report Summary, NIWA May 2022.

A summary of both the RCP 4.5. and RCP 8.5 scenarios is provided below. It should be noted that mid-century is considered to be in the 2050's and WIML have referred to this.

- **Warmer air** (uniform changes across the District and seasons): mid-century **mean minimum** air temperature is projected to ***increase by 0.5 °C*** under both GHG concentration scenarios, rising to increases of 0.8 °C (RCP4.5) to 1.6 °C (RCP8.5) by the end of the century. Mid-century **mean maximum** air temperature is projected to increase by 1.0 °C (RCP4.5) to 1.2 °C (RCP8.5), rising to increases of 1.6 °C (RCP4.5) to 3.3 °C (RCP8.5) by the end of the century. Higher elevations within the District are expected to experience the largest increase in maximum air temperatures. Changes will be consistent across seasons
- **More hot days** (days above 25 degrees): average increase 13 (RCP4.5) to ***15 (RCP8.5) days per year*** by mid century, increasing to 20 (RCP4.5) to 44 (RCP8.5) additional days per year by the end of the century - 44 additional hot days would represent a tripling of historical hot days for the District on average. Lees Valley and the western plains could see up to 50 additional hot days
- **Changes in rainfall:** Increases in lower altitude plains and coastal areas of 2.5-2.6% (RCP 4.5) and 3.0-3.4% (RCP 8.5) by mid century and 3.1-4.2% (RCP 4.5) and 7.6-8.2 (RCP8.5) by the end of the century. Minimal change or slight decreases are projected in the high-altitude areas and Lees Valley. Seasonal

variations in rainfall and spatial distribution broadly consistent with the annual change, except spring which has inconsistencies in spatial pattern and the ± change signal

- **More dry days** (<1mm rain): generally slight increases in upper elevations (1-2 additional days) and decreases in coastal and inland plains (4-5 fewer dry days under RCP8.5) by the end of the century. Reductions will occur primarily in summer and autumn (RCP8.5)
- **Increased frequency of rain events:** Approximate increase of 7% per 1 °C of climate warming for extreme rain events, with shorter duration rainfall events (e.g., hourly) increasing by as much as 15% per 1 °C of climate warming. More modelling is required
- **Soil moisture deficit** is calculated based on incoming daily rainfall (mm), outgoing daily potential evapotranspiration (mm), and a fixed available water capacity (the amount of water in the soil 'reservoir' that plants can use). Soil moisture deficit days are days when a moisture deficit occurs, and it is a commonly used indicator of days when plants are water-stressed. Projected to decrease by 2 (RCP8.5) to 5 (RCP4.5) days per year by mid-century and rise by 3 (RCP4.5) to 2 (RCP8.5) days per year by the end of the century. Mid century changes will be consistent across the District, with end of century changes most impacting upper and inland areas. Potential Evapotranspiration Deficit (PED – which characterises the amount of water required for irrigation, or that needs to be replenished by rainfall, to maintain plant growth at levels unimpeded by soil water shortage) is projected to increase across the District regardless of location within the District, GHG concentration scenario, and time period. This is an effective measure of drought intensity and duration. **Increased PED across the entire Waimakariri District suggests the District will likely become more drought prone in the future as temperatures increase and precipitation changes**
- **Frost days:** Mid-century frost days are projected to decrease by 9 (RCP4.5) to 14 (RCP8.5) days per year and by 10 (RCP4.5) to 26 (RCP8.5) days per year by the end of the century (**a more than a twofold reduction in the number of frost days under the high GHG concentration scenario**). Frost days will likely reduce across the District but the largest reductions in total days are projected in the upper high-altitude regions and Lees Valley. Under RCP 4.5 projections suggest that up to 33% of historical frost days may no longer occur in the inland parts of the District
- **Snow days** (reported as days when temperature is below zero and precipitation occurs but snow can occur above these conditions): Snow days will likely decrease substantially (upwards of 20 fewer days per year) across the higher elevation regions of the District. By the end-of century snow days in the mountainous regions could be nearly eliminated. Although this does not relate directly to “snow amount” it is very likely that rising temperatures will decrease snowpack across the mountainous regions of the District
- **Relative humidity:** projected to *decrease* by 0.8% (RCP4.5) to 0.9% (RCP8.5) by mid-century and by 1.1% (RCP4.5) to 2.2% (RCP8.5) by the end of century, with the largest reductions in the Lees Valley region and the higher elevation areas, and generally smaller reductions projected near the coast. Relative humidity will decrease most notably during winter and spring
- **Wind speed:** Mid-century wind speed is projected to increase by approximately 1.8% (RCP4.5) to 2.2% (RCP8.5) and by approximately 2.8% (RCP4.5) to 6.5% (RCP8.5) by end of century. Increases will be greatest in winter in the high elevation regions (up to 16.4%) by the end of the century under a high GHG concertation scenario
- **More extreme:** Regional climate modelling suggests a strengthening of the southern hemisphere storm tracks and increased extreme wind speeds across the South Island. More modelling is required to confirm district effects. Increased flows in the large alpine-fed rivers such as the Waimakariri River and more severe winter flooding events. Wildfire risks are increased by drought conditions and increasing wind. Natural hazard risks such as flooding, erosion/landslides, snow, electrical storms etc
- **Sea level rise, inundation and coastal erosion:** Coastal changes - sea level rise and associated ground water rises, increased frequency and intensity of storm surges and wave impacts, and changes in the dominant direction of waves

5.0 CLIMATE CHANGE IMPACTS ON 3 WATERS INFRASTRUCTURE

5.1 Summary of Impacts on Infrastructure

In the context of this project, wider natural hazard impacts or consequences were reflected in the criticality rating of the infrastructure. The direct impact of the hazards on the infrastructure was determined to understand what adaptation options would be appropriate to improve resilience.

A large part of WDC's built environment, including 3 Waters infrastructure, is located on flood plains, where climate change modelling has identified there is expected to be an increase in climate related events and exposure. Climate change is likely to impact sea levels, ground water levels, rainfall, temperatures and biodiversity within the District, among other things. In particular, rain events significant enough to cause flooding are likely to increase in intensity and frequency, challenging the capacity of existing infrastructure.

General impacts of climate change and particular scenarios are summarised in Table 5-1. These represent a high-level assessment of impacts, and do not represent modelled impacts of climate change on particular assets within the District i.e. it does not consider asset exposure or vulnerability. Specific assessments are provided in Section 7.0 - 7.6.

Table 5-1: 3 Waters Infrastructure - Climate Change Impacts (Examples)

Climate Change Hazard	Impact on 3Waters Infrastructure (Examples)
Changing rain patterns	Less rain in the east will impact on groundwater recharge and foothills-fed rivers such as the Ashley-Rakahuri River
Snow line reduction	The quantity of surface water in rivers and waterways fed by seasonal snowmelt may reduce. There may be a reduction in groundwater levels in some areas where there is a close connection
Warming temperatures	Increased bacterial and protozoa risks in reservoirs and network pipes
	Wastewater odour arise due to suitable conditions for microbe growth
More frequent and severe heavy rain and storm events	Stormwater network capacity is insufficient, flooding occurs more regularly
	Wastewater overflows occur due to infiltration and inflow
Dryer conditions	Groundwater and surface water takes and demands increase
Coastal inundation (sea level rise and surge)	Groundwater levels rise or stay at elevated levels for longer, increasing infiltration and network maintenance (saturated trenches)

5.2 Specific Methodology Elements

The risk assessment methodology provided in Figure 2-3. Specific elements are detailed below, given that these are part of the additional definition work undertaken by WIML.

5.2.1 Fragility (Physical Infrastructure Vulnerability)

Alternatively referred to as asset vulnerability, fragility is the quality of an asset which determines how easily it could be broken or damaged during a climatic shock event or due to slow-burning climatic changes. There are several factors that determine the robustness of infrastructure in relation to withstanding weather events and climate change. Table 5-2 summarises the criteria used for the assessment of the vulnerability of assets.

Fragility criteria and rules are provided in Table 5-2 and Table 5-3. Original criteria can be found in Appendix E.

Table 5-2: Modified Criteria Used for Fragility Rating of Infrastructure

Criteria	Options	Value	Explanation
Suitablity Design, Material, Installation	N/A; Suitable; Not suitable	0; 1; 2	Assessment of the suitability of the asset depending on asset type
Location	N/A; Location adeqaute; Location increases fragility	0; 1; 2	Does the location of asset type present a fragility issue e.g., proximity to waterway
Capacity	N/A; Under Capacity; Close to Capacity	0; 1; 2	Capacity vs Demand ratio (criticality derived)
Condition	N/A; Good; Poor	0; 1; 2	Well assessed asset condition, 4-5 considered poor
Data availability	N/A; Suitable; Not suitable	0; 1; 2	Information available to assess required criteria for fragility

Table 5-3: Asset Fragility Rules

Group	Asset Class	Sub Type	Fragility Assessment Asset Grouping	Fragility Location	Fragility Suitablity Design, Material, Installation	Fragility Capacity	Fragility Condition	Fragility Data Availability
Stormwater	Overland Flow Paths	N/A	Design Only		Hardcode 1 until Data Improves			Always
	Pipelines	N/A	Gravity Assets		Hardcode 1 until Data Improves	Hardcode 1 until Data Improves	Condition Attribute	Always - Exclude Condition
	Pump Stations	N/A	Design Only		Adequate			Always
	Supporting Infrastructure	N/A	Design Only		Hardcode 1 until Data Improves			Always
	Treatment, Basins, SMA	N/A	Treatment		Adequate - assume complies with consents	Criticality Derived		Always
	Waterways	N/A	Design Only		Hardcode 1 until Data Improves			Always
Wastewater	Coastal Discharge	N/A	Design Only		Adequate			Always
	Land Disposal	Wetlands	Design Only		Adequate			Always
	Land Disposal	Land	Design Only		Adequate			Always
	Overflows	N/A	Design Only		Hardcode 1 until Data Improves			Always
	Pipelines	Gravity	Gravity Assets		Hardcode 1 until Data Improves	Hardcode 1 until Data Improves	Condition Attribute	Always
	Pipelines	Pressure	Pressure Assets	50m from waterway	Install >= 2000 is Adequate			Always
	Pump Stations	N/A	Design Only		Hardcode 1 until Data Improves			Always
	Supporting Infrastructure	N/A	Design Only		Adequate			Always
	Treatment	N/A	Treatment		Hardcode 1 until Data Improves	Criticality Derived		Always
Water Supplies	Demand	N/A	Design Only		Adequate - all on planned upgrade programmes			Always
	Groundwater Source	N/A	Design Only		Adequate - all replaced post EQ's			Always
	Pipelines	Below	Pressure Assets	50m from waterway	Install >= 2000 is Adequate			Always
	Pipelines	Above	Pressure Assets	50m from waterway	Install >= 2000 is Adequate			Always
	Pump Stations	N/A	Design Only		Hardcode 1 until Data Improves			Always
	Source Infrastructure	N/A	Design Only		Adequate			Always
	Storage	Source	Design Only		Adequate - all on planned upgrade programmes			Always
	Storage	Prouduction	Design Only		Adequate - all on planned upgrade programmes			Always
	Supporting Infrastructure	N/A	Design Only		Adequate			Always
	Surface Water Source	N/A	Design Only		Adequate			Always
	Treatment	N/A	Treatment		Adequate	Criticality Derived		Always

5.2.2 Consequence

Consequence is a factor of risk, with the likelihood being the additional one. Likelihood data has been obtained from Councils NIWA report. Consequence has been determined with respect to the 3 Waters assets – see Figure 5-1 and Figure 5-2.

		Increased Temperature	Increased Dry Days[1]	Flooding	Coastal Hazards	Snow/Ice Weather Events	Wind
Consequence Applicable to all Climate Change Scenarios							
Water Supplies	Demand	Moderate	Moderate	Low	Insignificant	Low	Moderate
	Groundwater Source	Low	Low	Low	High	Low	Insignificant
	Surface Water Source	High	Low	Extreme	Moderate	Low	Insignificant
	Source Infrastructure	Insignificant	Insignificant	High	Insignificant	Low	Insignificant
	Pump Stations	Moderate	Low	Extreme	High	Moderate	High
	Treatment	Moderate	Insignificant	Extreme	Moderate	Moderate	High
	Pipelines	Low	High	High	High	Low	Moderate
	Storage/Production Water	Moderate	Insignificant	Low	Moderate	Low	Insignificant
	Supporting Infrastructure	Moderate	Low	Low	Insignificant	Moderate	Insignificant
Wastewater	Overflows	Insignificant	Moderate	Extreme	Moderate	High	Insignificant
	Pipelines	Moderate	High	Extreme	High	Moderate	Moderate
	Treatment	Extreme	Moderate	Extreme	High	Moderate	Insignificant
	Pump Stations	Moderate	Low	Extreme	High	Moderate	High
	Land Disposal	High	High	Extreme	High	Low	Insignificant
	Coastal Discharge	Insignificant	Low	Moderate	High	Moderate	Insignificant
	Supporting Infrastructure	Moderate	Low	Moderate	Moderate	Moderate	Insignificant
Stormwater	Pipelines	Low	Moderate	Extreme	High	Moderate	Moderate
	Basins	Moderate	Moderate	Extreme	High	High	Insignificant
	Management Areas	Moderate	Moderate	Extreme	High	High	Insignificant
	Treatment	Moderate	Low	Extreme	High	High	Insignificant
	Pump Stations	Moderate	Low	Extreme	High	Moderate	High
	Waterways	Low	Moderate	Extreme	Moderate	Moderate	Insignificant
	Storage/Production Water						
	Overland Flow Paths	Low	Low	Extreme	Moderate	Moderate	Insignificant
	Supporting Infrastructure	Moderate	Low	Low	Insignificant	Moderate	Insignificant

[1] *Wet/Dry cycle*

Figure 5-1: Initial Consequence Assessment - Climate Change on 3 Waters Infrastructure

The amended consequence assessment followed workshops with Council. In particular – additional division "grain" between assets within each group allows for more detailed breakdown of investment should it be necessary in the future.

Group	Asset Class	Sub Type	Increased Temperature	Increased Dry Days (Wet/Dry Cycle)	Flooding	Coastal Hazards	Snow/Ice Events	Wind
Stormwater	Overland Flow Paths	N/A	Low	Low	Extreme	Moderate	Moderate	Insignificant
	Pipelines	N/A	Low	Moderate	Extreme	High	Moderate	Insignificant
	Pump Stations	N/A	Moderate	Low	Extreme	High	Moderate	High
	Supporting Infrastructure	N/A	Moderate	Low	Low	Insignificant	Moderate	Insignificant
	Treatment, Basins, SMA	N/A	Moderate	Moderate	Extreme	High	Moderate	Insignificant
	Waterways	N/A	Low	Moderate	Extreme	Moderate	Moderate	Insignificant
Wastewater	Coastal Discharge	N/A	Insignificant	Low	Moderate	High	Low	Insignificant
	Land Disposal	Wetlands	Moderate	Moderate	Extreme	High	High	Insignificant
	Land Disposal	Land	Moderate	Moderate	Extreme	High	High	Insignificant
	Overflows	N/A	Insignificant	Moderate	Extreme	Moderate	High	Insignificant
	Pipelines	Gravity	Low	High	Extreme	Moderate	Low	Insignificant
	Pipelines	Pressure	Moderate	High	Extreme	High	Moderate	Insignificant
	Pump Stations	N/A	Moderate	Low	Extreme	High	Moderate	Moderate
	Supporting Infrastructure	N/A	Moderate	Low	Moderate	Moderate	Moderate	Moderate
	Treatment	N/A	Moderate	High	Moderate	High	Low	High
Water Supplies	Demand	N/A	Moderate	Moderate	Low	Insignificant	Low	Moderate
	Groundwater Source	N/A	Moderate	Moderate	Low	Insignificant	Low	Moderate
	Pipelines	Below	Low	High	High	Insignificant	Low	Insignificant
	Pipelines	Above	Moderate	Moderate	Extreme	Low	Low	Moderate
	Pump Stations	N/A	Moderate	Low	Extreme	High	Moderate	High
	Source Infrastructure	N/A	Insignificant	Insignificant	High	Insignificant	Low	Insignificant
	Storage	Source	Moderate	Insignificant	Low	Insignificant	Low	Low
	Storage	Prouduction	Moderate	Insignificant	Low	Insignificant	Insignificant	Insignificant
	Supporting Infrastructure	N/A	Moderate	Low	High	High	Low	Moderate
	Surface Water Source	N/A	High	High	High	Insignificant	Insignificant	Insignificant
	Treatment	N/A	Moderate	Insignificant	Extreme	Moderate	Moderate	Moderate

Figure 5-2: Amended Consequence Assessment - Climate Change on 3 Waters Infrastructure

6.0 3 WATERS ADAPTATION STRATEGY

The adaptation strategy approach taken considered four asset-based response scenarios aligned with risk management categories -
Table 6-1. The 3 Waters asset adaptation approaches can be generally described as:

- Relocation
- Hardening and protection
- Accommodation and maintenance
- Acceptance or abandonment

Table 6-1: Generic Adaptation Strategy Approach

Risk Management Category	Strategic Approach	Retrofit or Rehabilitate Structures to a Higher Standard or Strength	Build New Climate-Resilient Structures
Avoid	Re-locate	Re-locate sensitive facilities or resources from the direct risk	Site in an area with no, or lower, risk from climate impacts
Control	Harden and Protect	Rehabilitate and reinforce Add supportive or protective features Incorporate redundancy	Use more resilient materials, construction methods, or design standards Design for greater capacity or service
Transfer	Accommodate and Maintain	Extend, strengthen, repair or rehabilitate over time Adjust operation and maintenance practices	Design and build to allow for future upgrades, extensions or regular repairs
Accept	Accept or Abandon	Keep as is, accepting a diminished level of service or performance	Construct based on historical climate conditions, accepting possibly diminished level of service or performance

These approaches were tested by Council staff, who considered what this would look like "on the ground". An adaptation strategy approach for water sources, treatment, networks and pumpstations is provided in Appendix F. Asset based actions for the four scenarios are considered against each of the climate hazards e.g. wind, snow, flooding, drought, sea level rise.

In a detailed climate adaptation programme development, every strategic approach is an option for addressing identified resilience improvement needs. At such a detailed level, the option will be selected on the basis of affordability and within a desired risk envelope. For an automated first-cut assessment of the resilience improvements, investment needs to mirror the asset risk score. Therefore infrastructure with high risks score will most likely have a relocation intervention strategy. An intuitive sensibility validation was performed on the outcome to ensure known issues were addressed in a pragmatic manner.

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7.0 3 WATERS ASSESSMENT RESULTS

7.1 Basis for Investment Estimates

The assessment process taken was designed to provide gross investment requirements against each of the four discrete adaptation strategy approaches. Generic and specific examples of how the investment would be practically applied are provided earlier in this report.

The key investment rules applied were:

- All assets with end of typical remaining life greater than or equal to 50 years were included in the dataset. It was agreed with Council that for this assessment, renewal funding for assets within a 50-year renewal period would be considered to cover climate change investment requirements.
- A percentage of the total renewal value for each adaptation strategy option was applied. These are provided in Table 7-1

Table 7-1: 3 Waters Investment Approach

Attribute	Adaptation Strategy Approach			
	Re-locate	Harden/Protect	Accommodate/ Maintain	Accept/ Abandon
% of replacement value applied (%)	120	50	0.01	0
Rational	Asset are replaced at a different location on a "like for like" basis with a cost increase of 20% above the replacement cost to allow for resilience against future climate events	Assets require civil works to minimise risk exposure e.g lifting electrical equipment, bunding	Minor increase in maintenance due to climate related costs e.g. more frequent cleaning	Maintenance funding will cover climate costs, may be a reduction in the Leve of Service

For the purpose of this assessment, each adaption strategy approach has been allocated a risk level Figure 7-10. Using the data obtained including geospatial location, asset attribute data, valuation data, climate risk likelihood (NIWA, flood modelling and fragility Table 5-2) and the respective climate impacts - Figure 5-1 a normalised risk value was calculated for each climate hazard and each asset. The largest risk score was then used to determine the greatest likely risk, and overall climate risk score. This values was then considered within four 25 point band from zero to 100. This allowed for spatial assessment of the assets adaptation strategy.

Table 7-2: Adaptation Strategy, Risk Level and Range

Adaptation Strategy Approach	Risk Level	Risk Level Band	Band Logic
Relocate	High	075-100	Score >= 75
Harden-Protect	Medium	050-075	Score < 75
Accommodate - Maintain	Low	025-050	Score < 50
Accept - Abandon	Very Low	000-025	Score < 25

7.2 Results

This section provides an example of the exposure at a township level is provided. Criticality and investment data across the 3 Waters are provideds along with an example for a township.

7.2.1 3 Waters Asset Exposure

Supplied flood model data has been utilised with asset records to produce an asset exposure product – see Figure 7-1 and Figure 7-2.

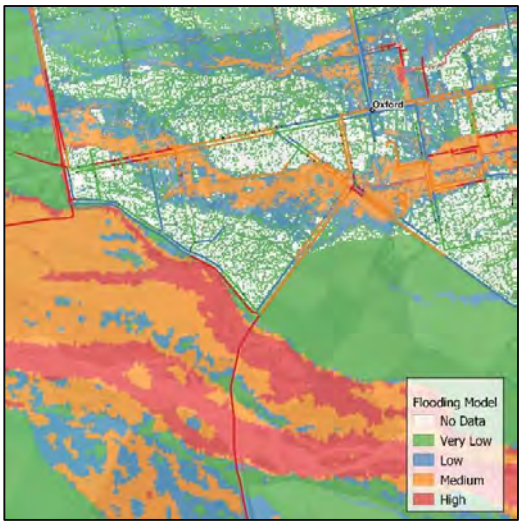


Figure 7-1: Flood hazard – model overlay

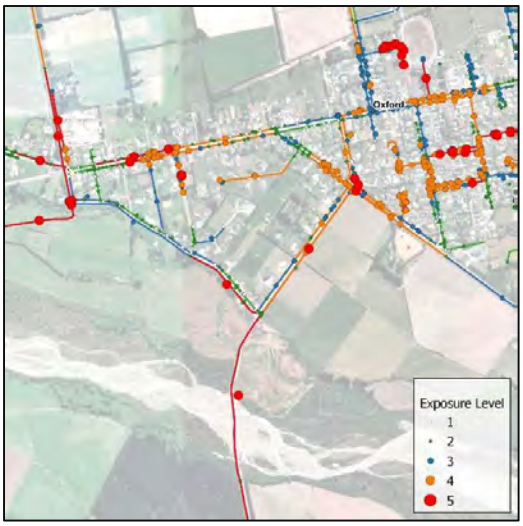


Figure 7-2: Asset exposure to flood hazard

7.2.2 Risk Product

As described, risk is a product of climate hazard, exposure and fragility. The resulting output is described at an asset level – see Figure 7-3, with each accessible asset object e.g., pipe, pump station assigned a final risk score subject to the product. The extent of the assets by criticality and value can then be determined – see Figure 7-4.

Figure 7-3: Final risk scores - example

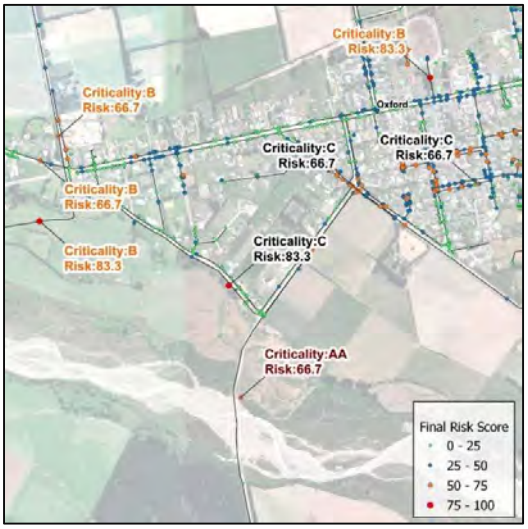


Figure 7-4: Asset criticality and final risk score

7.2.3 3 Waters – Criticality and Investment Requirements

Investment criteria were applied and calculated for each of the 3 Waters by criticality band. While investment values were calculated for all criticality bands, it was agreed that a focus on assets with criticality AA, A and B (part) would be appropriate. A summary of the percentage or value of assets by criticality and risk level is provided in (Table 7-3 to Table 7-6). The initial profiles are provided for context. Referring to the **amended** profiles it should be noted that:

- ca. 0.31% of assets have a high climate risk exposure
- ca. 0.21% of assets have a high climate risk exposure and are the most critical (AA) assets
- ca. 17.25% of assets had missing criticality data (climate risk is still assessed) and cannot currently be prioritized without data improvement or case-by-case scrutiny

The change in risk level values between the initial and amended datasets is a result of changes to consequence and fragility.

Table 7-3: Initial 3 Waters Assets (%) By Criticality Band and Risk Level

Criticality	High	Medium	Low	Very low
AA	0.4%	3.7%	9.6%	3.4%
A	0.4%	3.2%	10.7%	4.6%
B	0.3%	2.2%	9.3%	4.7%
C	0.9%	3.5%	13.0%	12.6%
Unknown	1.5%	3.7%	11.2%	1.0%
Total	3.5%	16.2%	53.8%	26.4%

Table 7-4: Amended 3 Waters Assets (%) By Criticality Band and Risk Level

Criticality	High	Medium	Low	Very low
AA	0.19%	3.92%	5.57%	9.38%
A	0.02%	3.02%	9.67%	4.57%
B	0.10%	2.19%	9.10%	5.12%
C	0.05%	2.96%	15.63%	11.29%
Unknown	0.00%	1.62%	6.23%	9.40%
Total	0.36%	13.71%	46.18%	39.74%

Table 7-5: Initial 3 Waters Asset Value ($M) by Criticality Band and Risk Level

Criticality	High	Medium	Low	Very low
AA	3.7	30.8	79.4	28.2
A	3.7	26.3	88.5	38.2
B	2.2	17.9	76.7	39.1
C	7.2	28.5	106.7	103.4
Unknow	12.5	30.3	92.0	8.5

Table 7-6: Amended 3 Waters Asset Value ($M) by Criticality Band and Risk Level

Criticality	High	Medium	Low	Very low
AA	1.6	32.2	45.8	77.1
A	0.2	24.8	79.5	37.5
B	0.8	18.0	74.7	42.1
C	0.0	24.3	128.4	92.7
Unknown	12.5	13.3	51.2	77.2

For the purpose of DIA capex funding, the investment programme was projected across 20 years. For the period 2024-2034, the initial response is to focus on the maintenance of assets while consideration of more investment-intensive and longer-term responses are developed and refined. Hardening or improvements are determined by planning for and funding asset relocation.

Examples of assets, criticality and investment projections are provided in Figure 7-5 and Figure 7-6

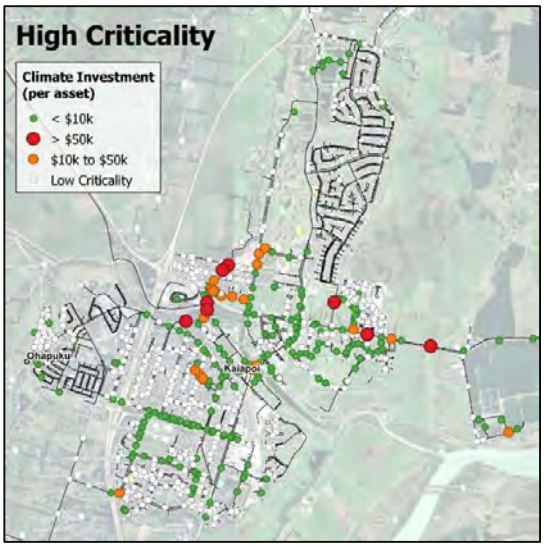


Figure 7-5: High Criticality Assets – Kaiapoi Water

Note. $1.33M of Climate Investment Needed

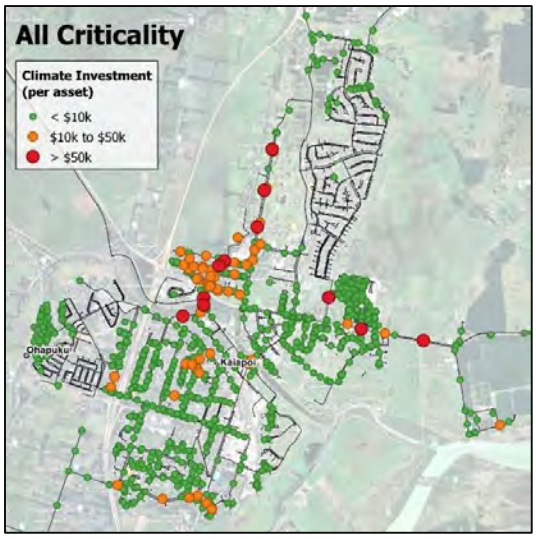


Figure 7-6: All Assets – Kaiapoi Water

Note. $2.85M of Climate Investment Needed

Illustrating the geospatial location of assets in their respective asset classes against their asset climate risk, with associated adaption strategy approaches. It is important to note that:

- This provides Council will the ability to understand where areas of highest risk and investment are likely to be required – particularly where there are denser occurrences of assets at a high risk level
- A more detailed community and infrastructure level would be appropriate. Inclusion of, and assessment with other assets e.g. facilities, transport would provide a richer picture of the adaptation pathway
- It may be impractical to apply the adaption strategy identified in this assessment. For example some stormwater assets have been tagged with a "relocate" approach. Stormwater assets are designed around community facilities, including providing for roadside and property drainage using gravity reticulation. Acceptable strategies may include "harden-protect" where the construction of small local lift pumping stations are provided
- The climate adaption cost is derived from valuation data. As a result, only assets with these criticality ratings and a valuation are shown

Risk has been calculated for all assets, and should asset criticality change, investment decisions can be updated.

Stormwater and wastewater assets have the highest risk scores and therefore most investment-intensive, adaptation strategy linked response. This is because of a number factors:

- These are generally gravity networks and are installed at the lowest points in the community to allow for gravity conveyance – the most energy and environmentally efficient approach at the time of construction
- The predicted increase in flood events extent and frequency exposing and inundating the networks, pump stations and treatment
- Proximity to the coast including in lower-lying areas where groundwater levels may increase and gradually inundate larger areas of the gravity pipe network

Water assets were not identified as having a respective greater extent of high risk assets and are therefore not as investment intensive.

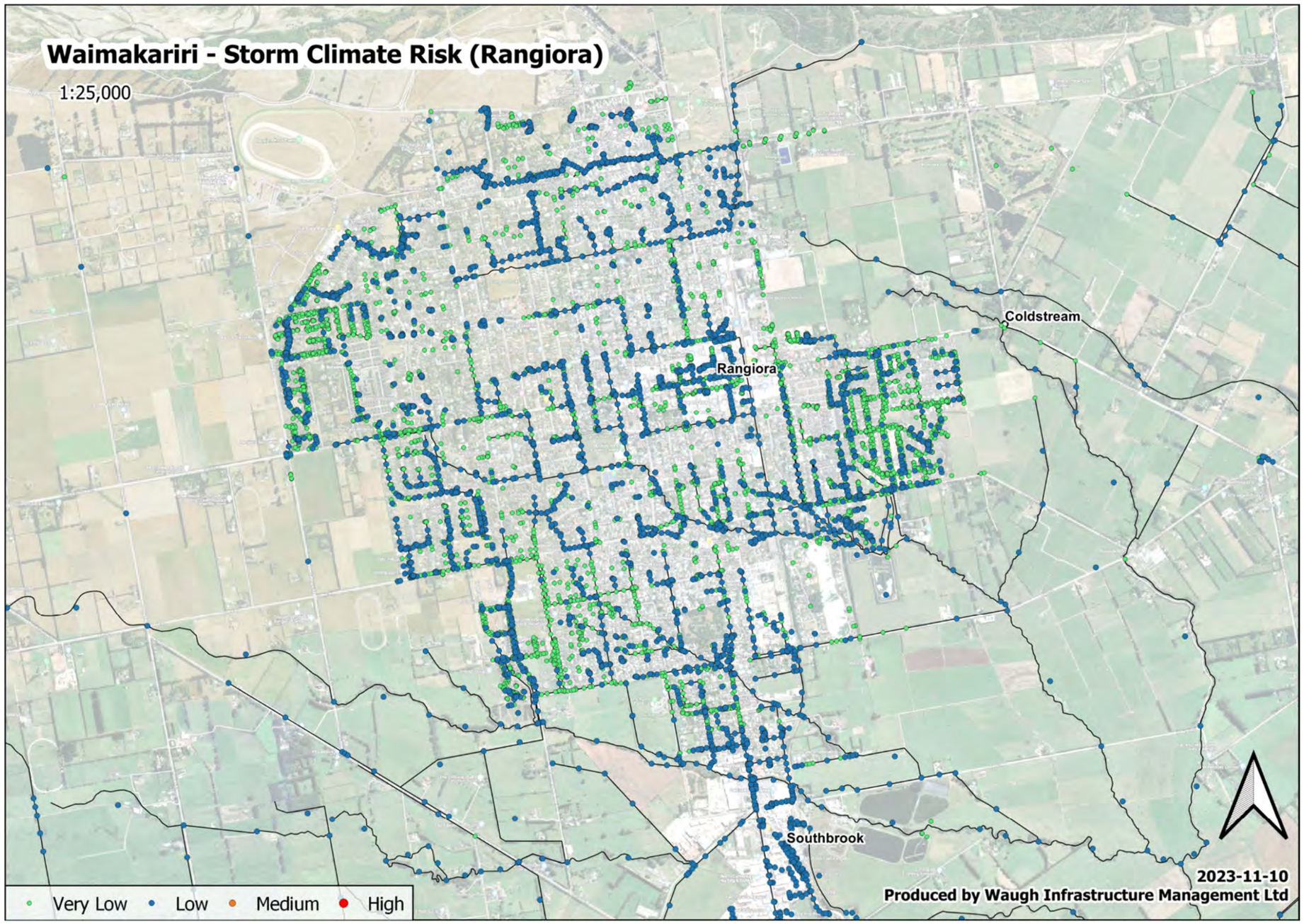
A detailed assessment of the climate hazards and impact on risk is provided in Appendix F.

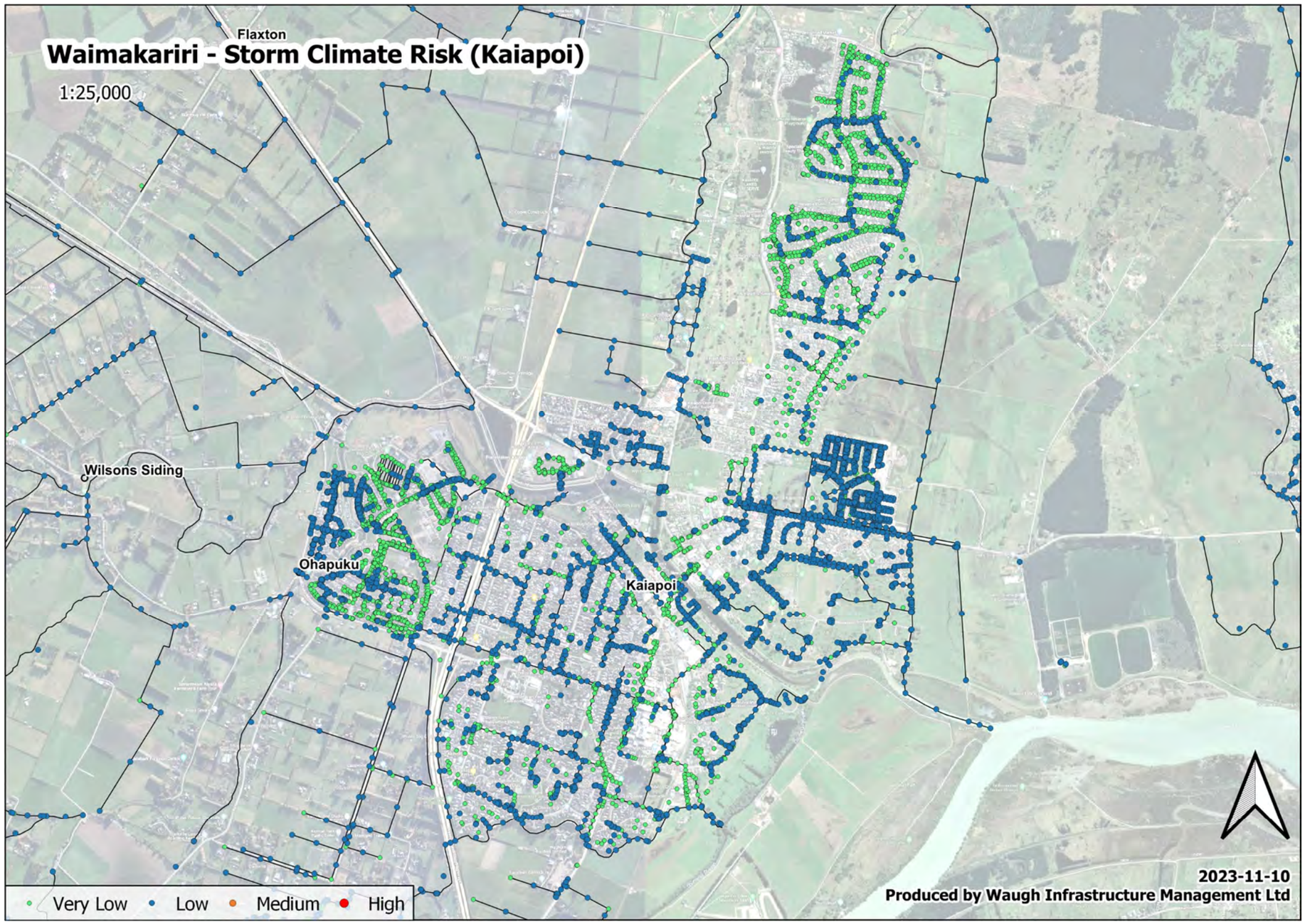
7.3 Climate Risk - breakdown by Water and Scheme

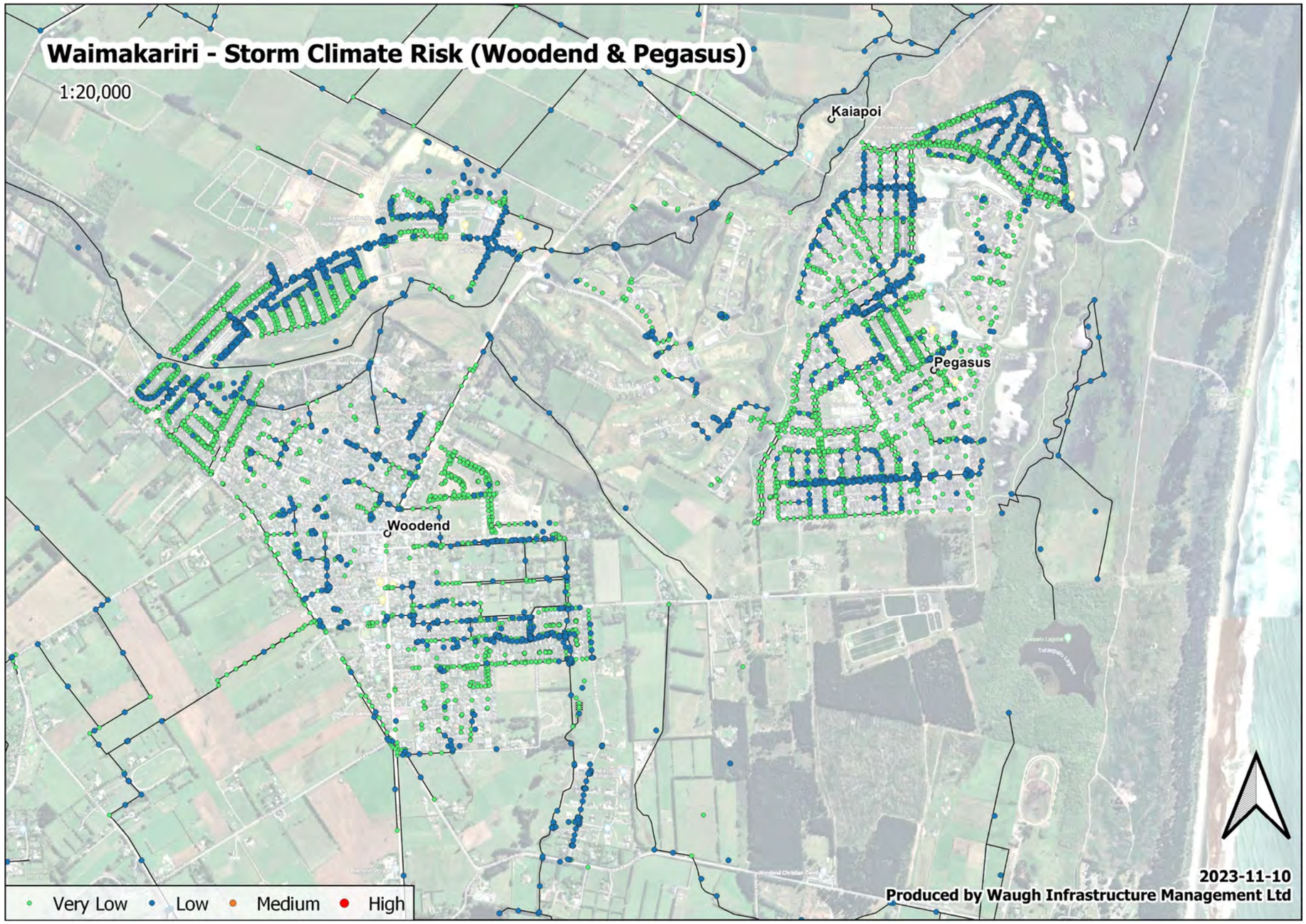
Adaptation response for each township, covering all assets by climate change hazard are provided in the following sections.

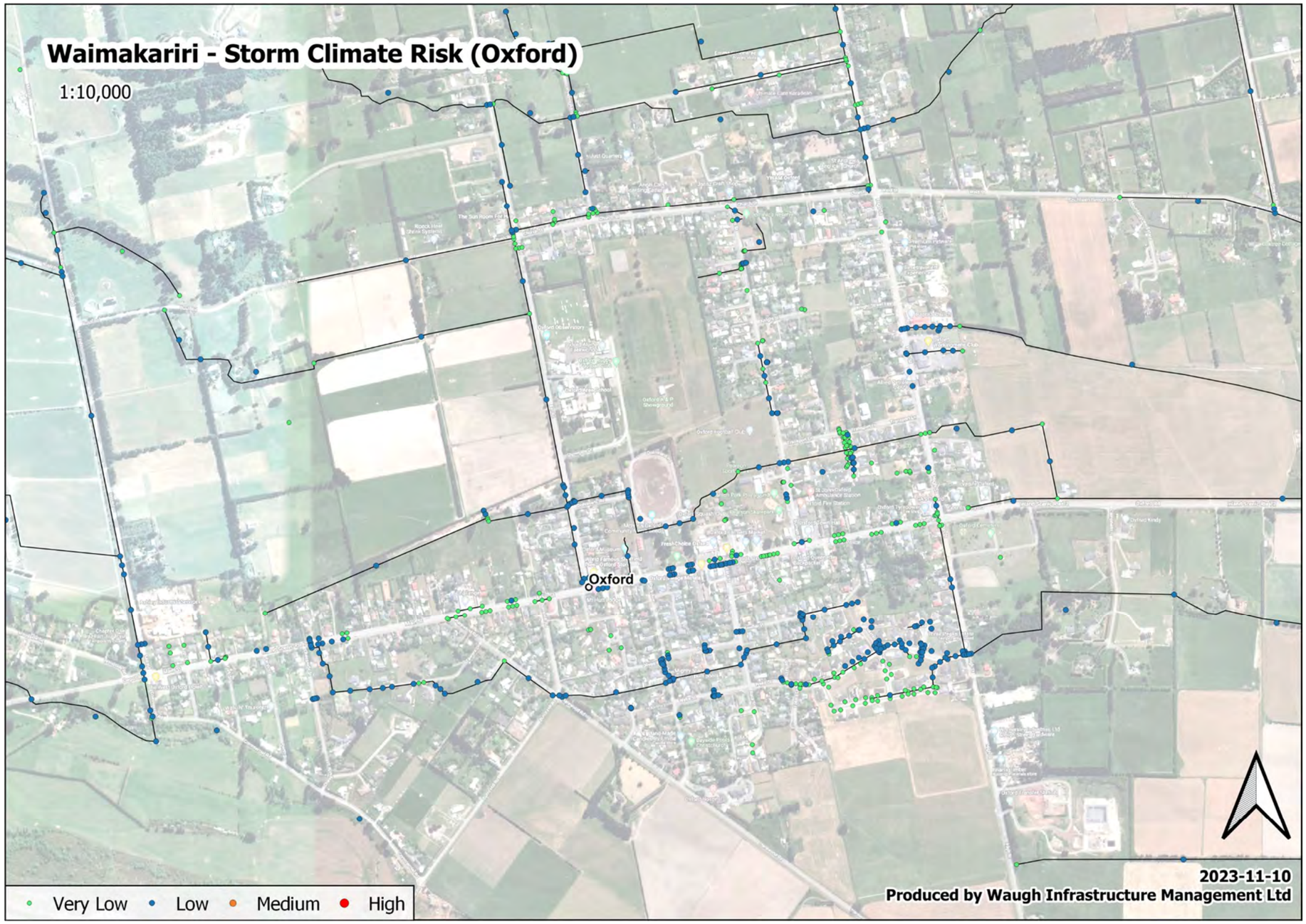
At the end of each group of hazard maps e.g., stormwater hazard, a summary of the scheme/supply and associated risk level (low, medium and high) is provided.

Figure 7-7: Stormwater Assets - Adaptation Response




Waimakariri - Storm Climate Risk (Kaiapoi)
1:25,000
Flaxton
Wilsons Siding
Ohapuku
Kaiapoi
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd


Waimakariri - Storm Climate Risk (Woodend & Pegasus)
1:20,000
Kaiapoi
Pegasus
Woodend
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd


Waimakariri - Storm Climate Risk (Oxford)
1:10,000
Oxford
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd

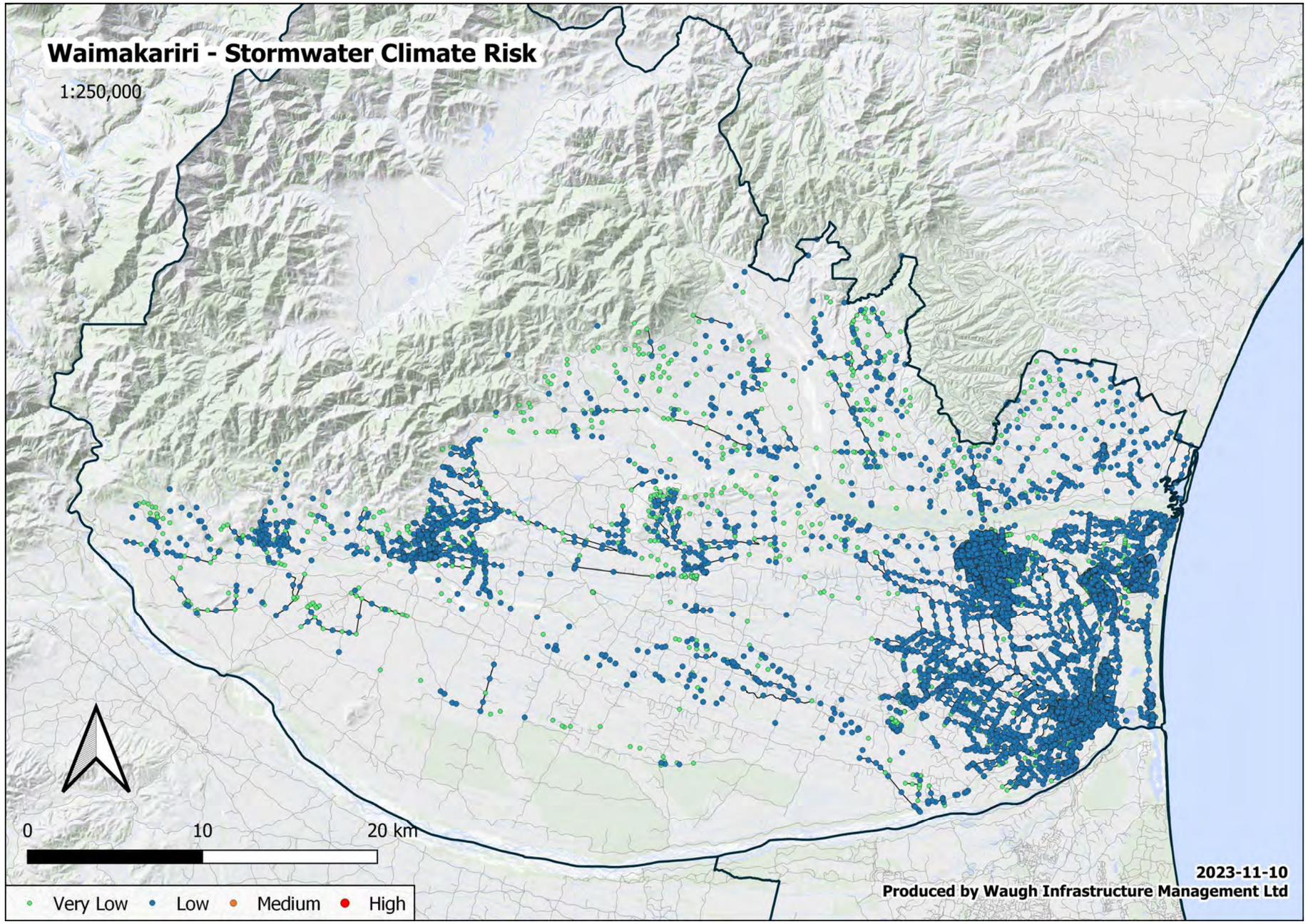
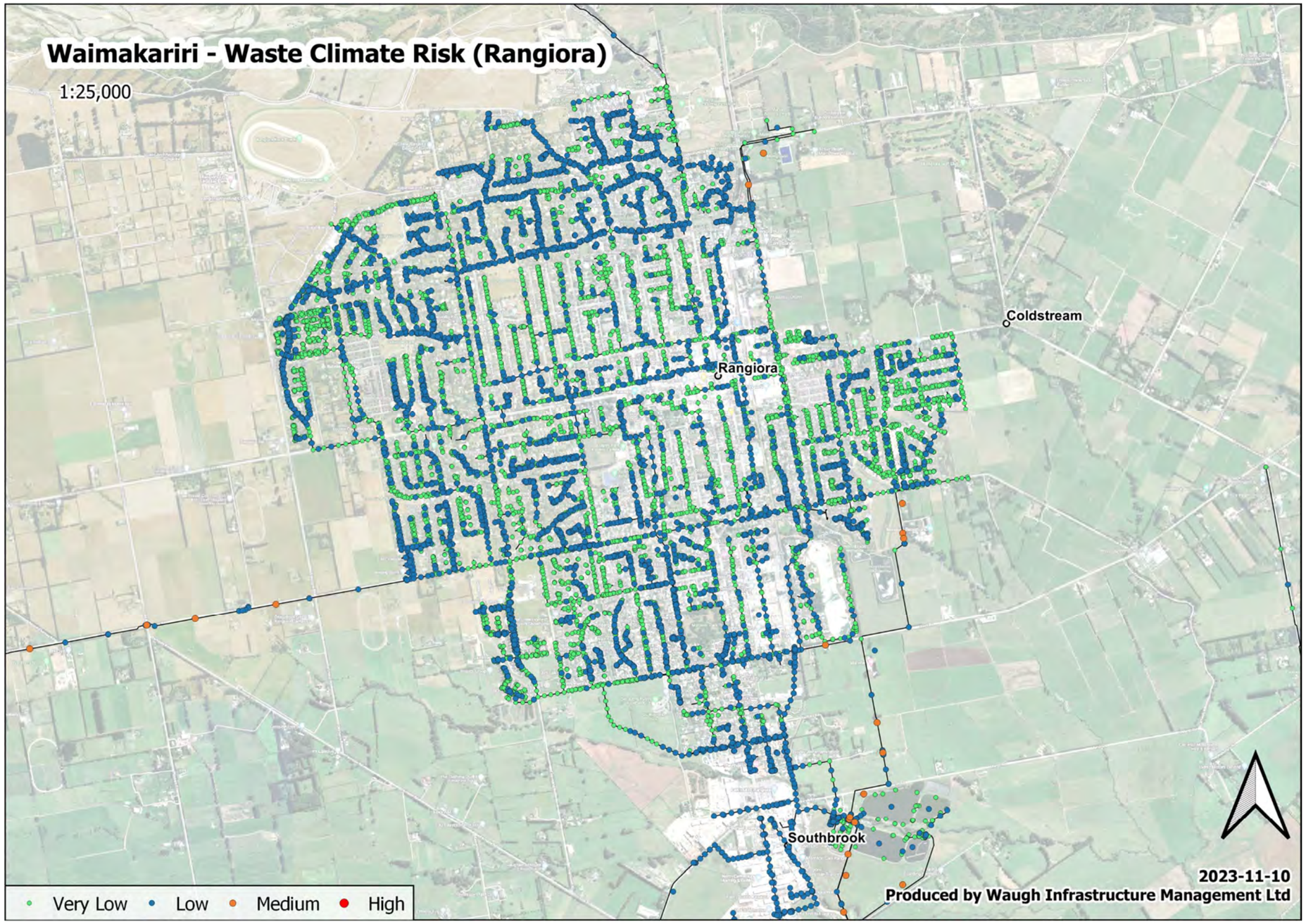
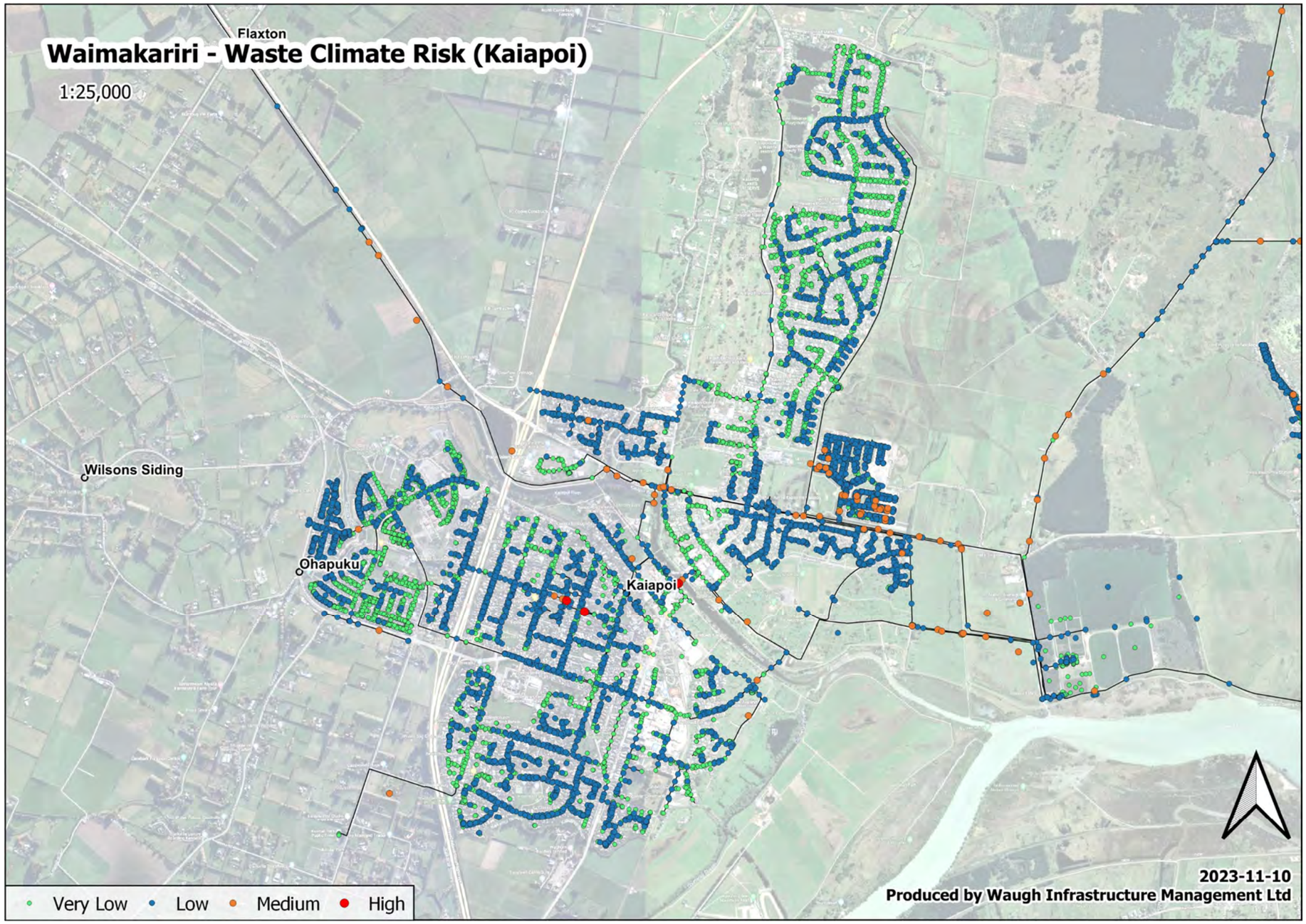

Waimakariri - Stormwater Climate Risk
1:250,000
0
10
20 km
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd

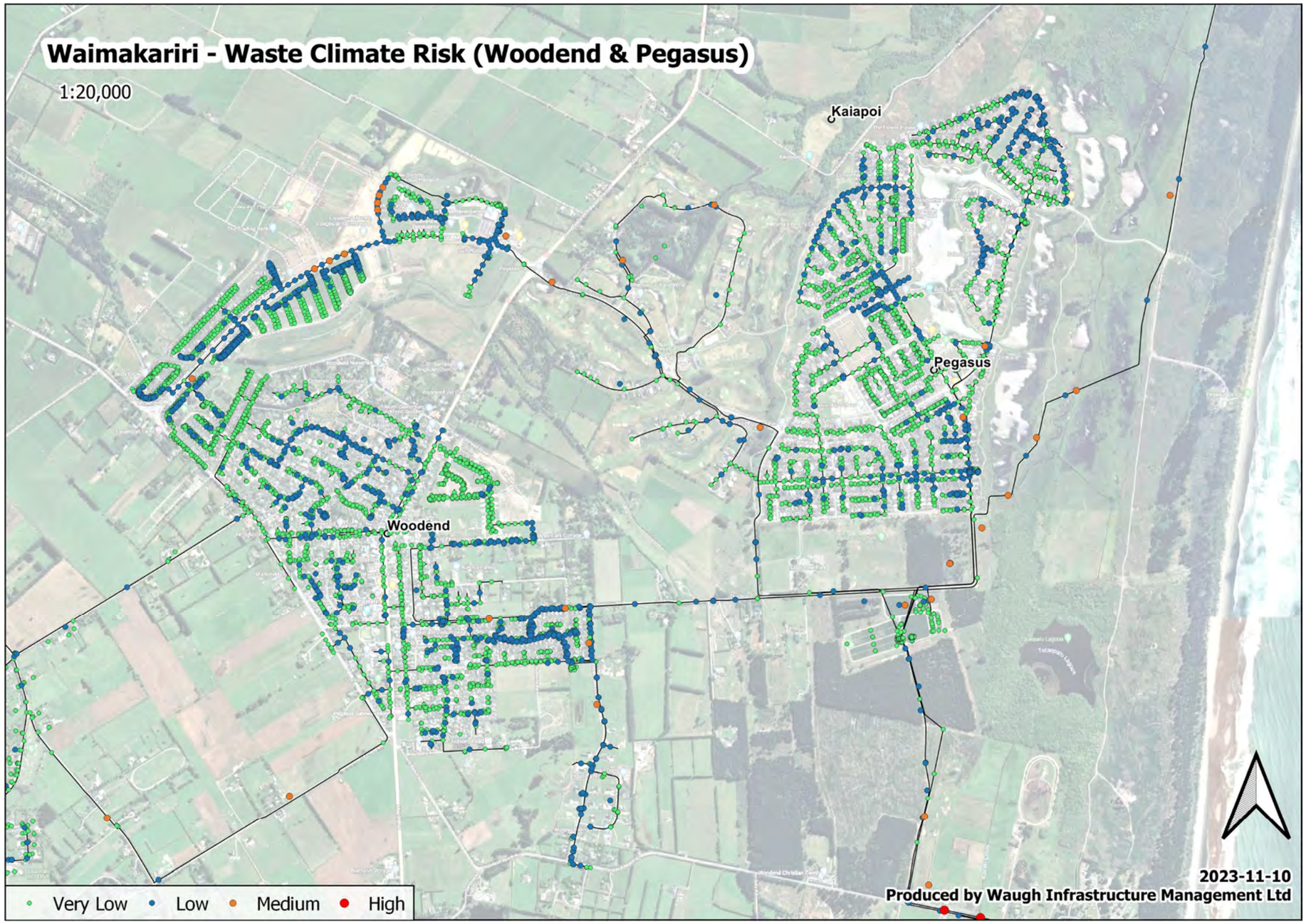
Table 7-7: Stormwater Asset (%) Scheme and Associated Risk Level

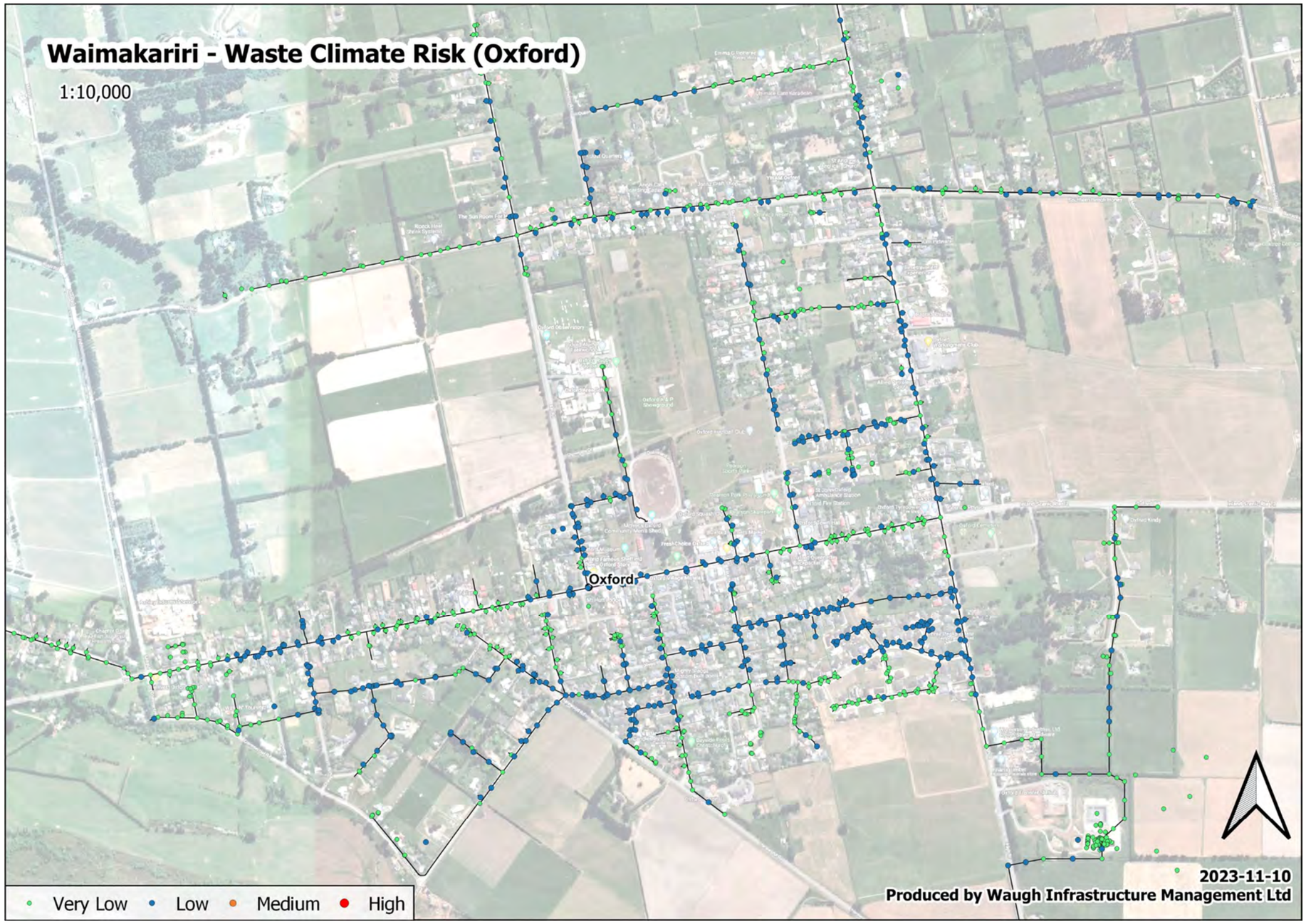
Risk / Scheme	High	Medium	Low	Very Low
D - CENTRAL RURAL		46.60%	47.25%	6.15%
D - CLARKVILLE RURAL		23.44%	75.04%	1.52%
D - COASTAL RURAL		50.74%	41.03%	8.23%
D - CUST RURAL		15.39%	46.01%	38.60%
D - KAIAPOI URBAN		12.67%	50.81%	36.51%
D - LOBURN LEA RURAL		29.30%	59.98%	10.72%
D - OHOKA RURAL		24.85%	68.46%	6.69%
D - OXFORD RURAL		30.31%	56.76%	12.93%
D - OXFORD URBAN		18.72%	55.19%	26.09%
D - PEGASUS URBAN		1.75%	53.18%	45.07%
D - PINES/KAIRAKI COAST URBAN		100.00%	0.00%	0.00%
D - RANGIORA URBAN		13.57%	60.28%	26.15%
D - WAIKUKU BEACH COAST URBAN		74.76%	21.46%	3.78%
D - WOODEND COASTAL URBAN		0.59%	60.47%	38.94%
Green Space		0.00%	0.00%	100.00%
NA - Not Applicable		0.00%	100.00%	0.00%
Grand Total		**12.45%**	**56.19%**	**31.36%**

Figure 7-8: Wastewater Assets - Adaptation Response




Waimakariri - Waste Climate Risk (Kaiapoi)
1:25,000
Flaxton
Wilsons Siding
Ohapuku
Kaiapoi
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd


Waimakariri - Waste Climate Risk (Woodend & Pegasus)
1:20,000
Kaiapoi
Pegasus
Woodend
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd


Waimakariri - Waste Climate Risk (Oxford)
1:10,000
Oxford
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd

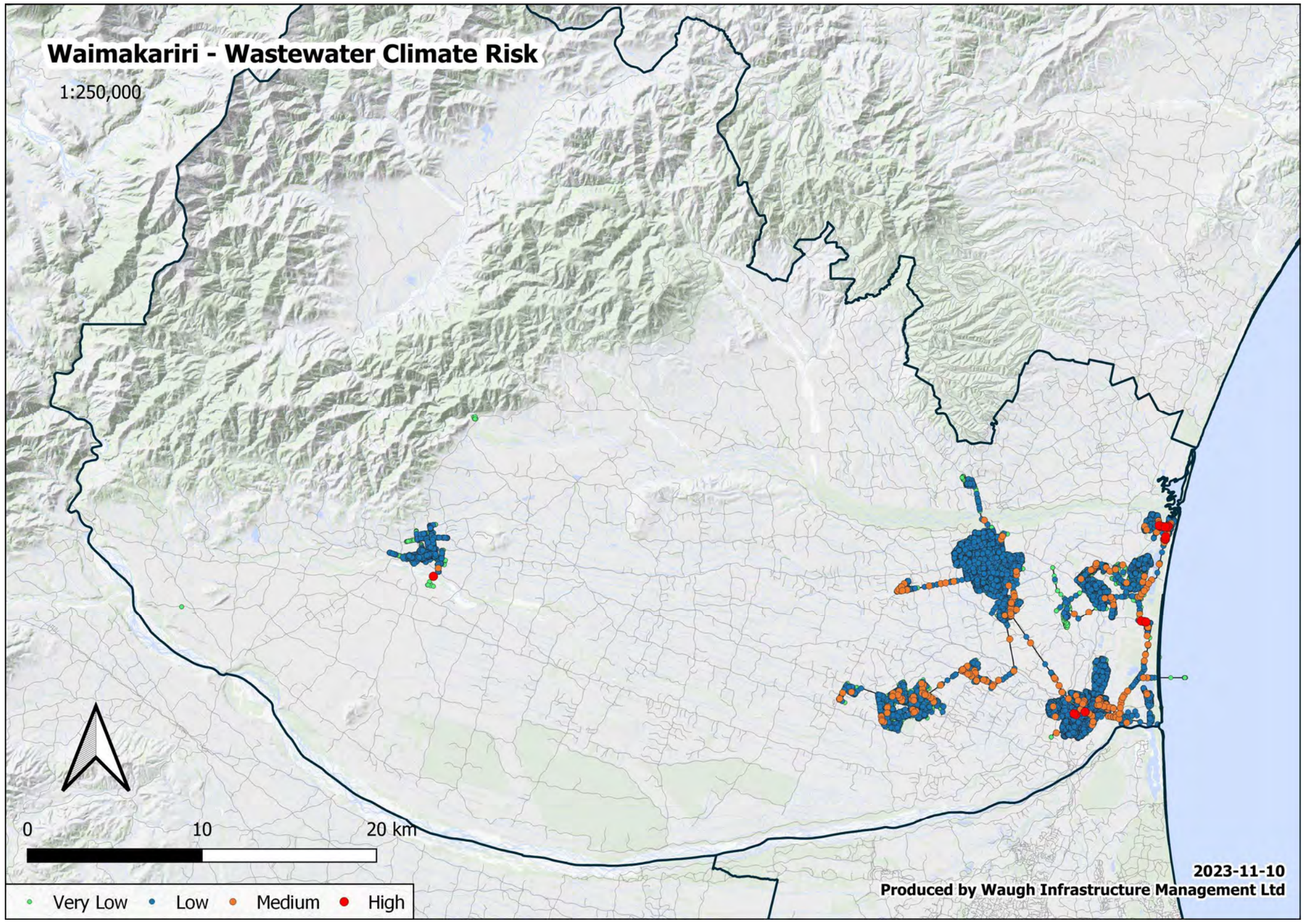
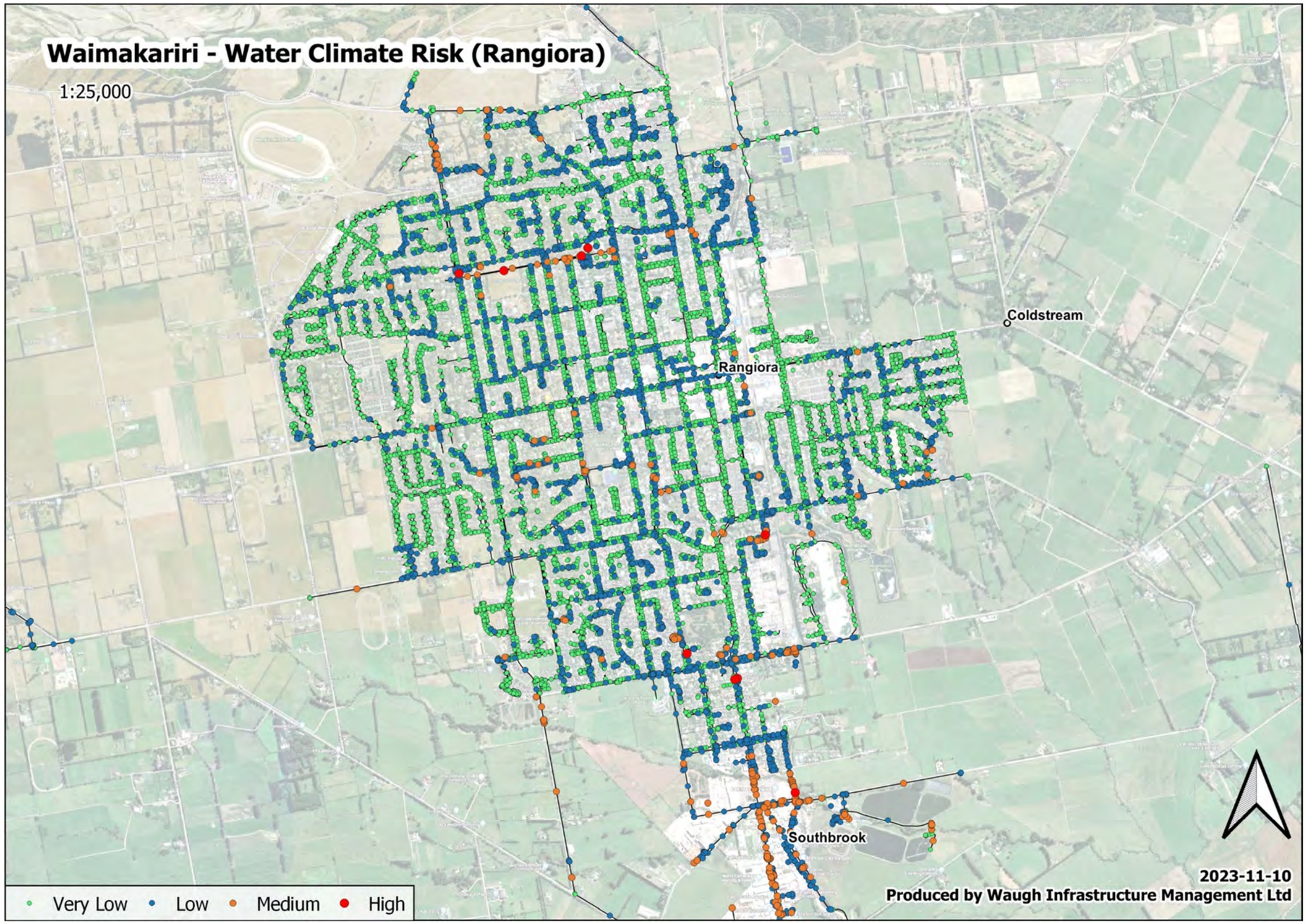
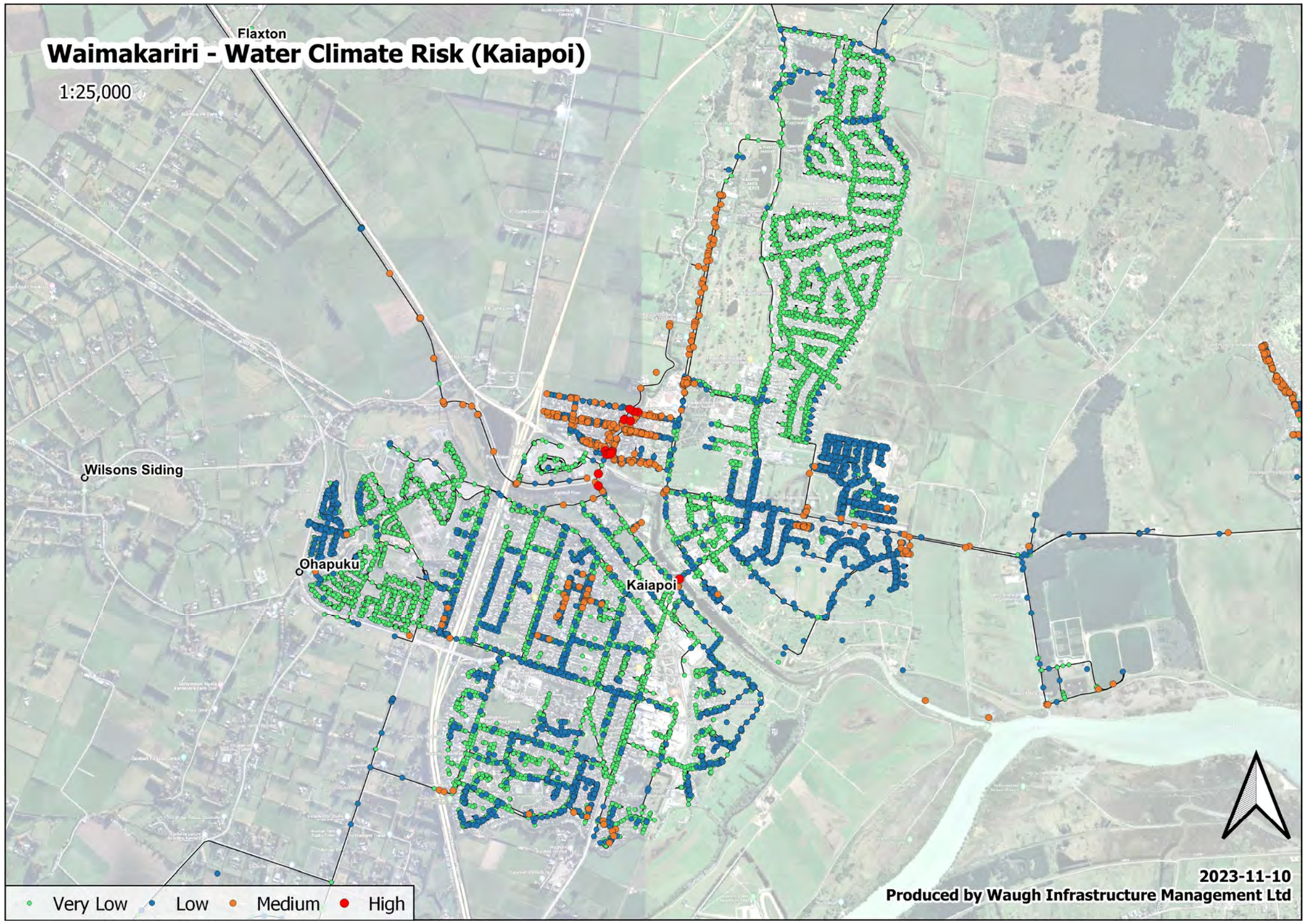

Waimakariri - Wastewater Climate Risk
1:250,000
0
10
20 km
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd

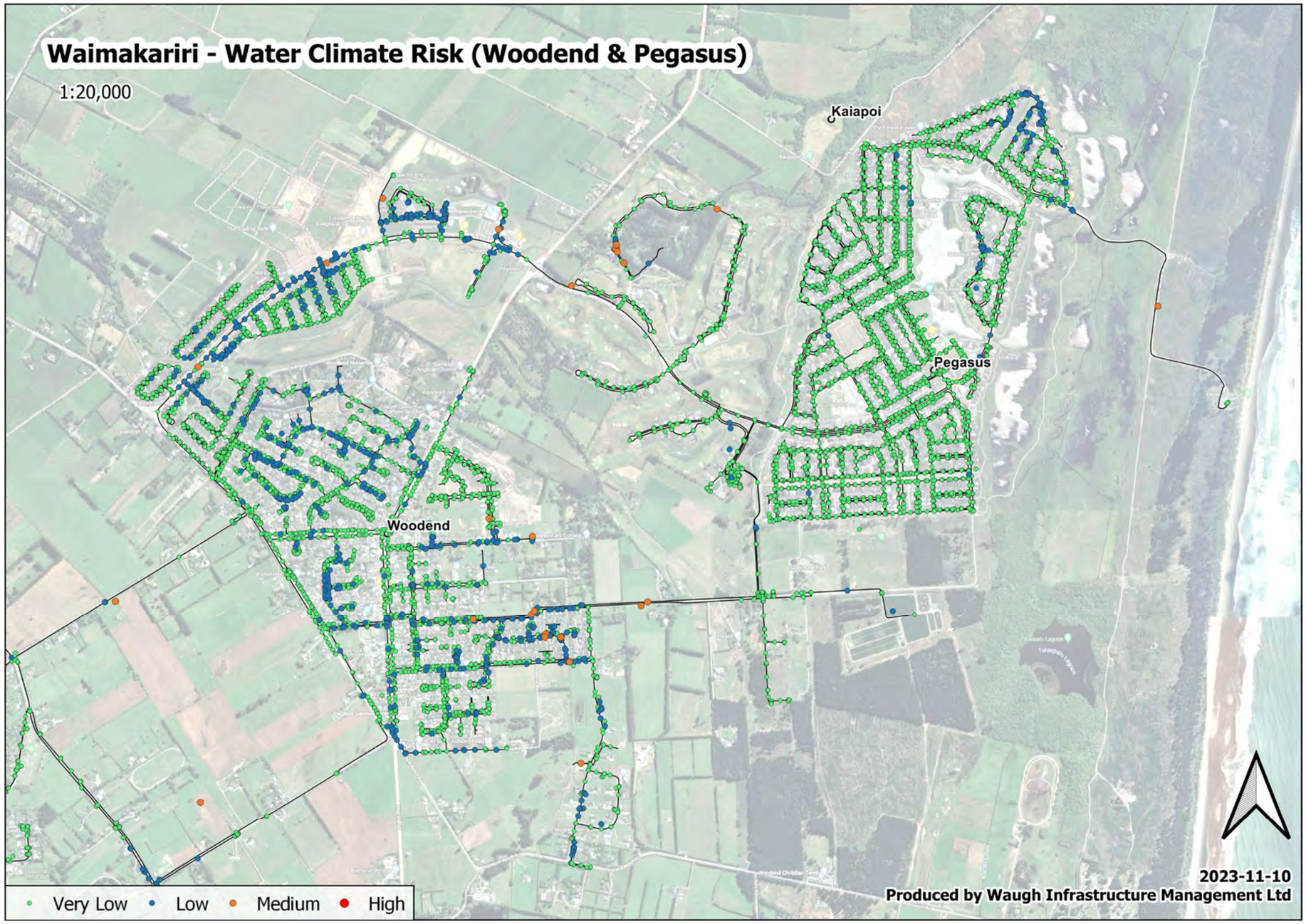
Table 7-8: Wastewater Asset (%) Scheme and Associated Risk Level

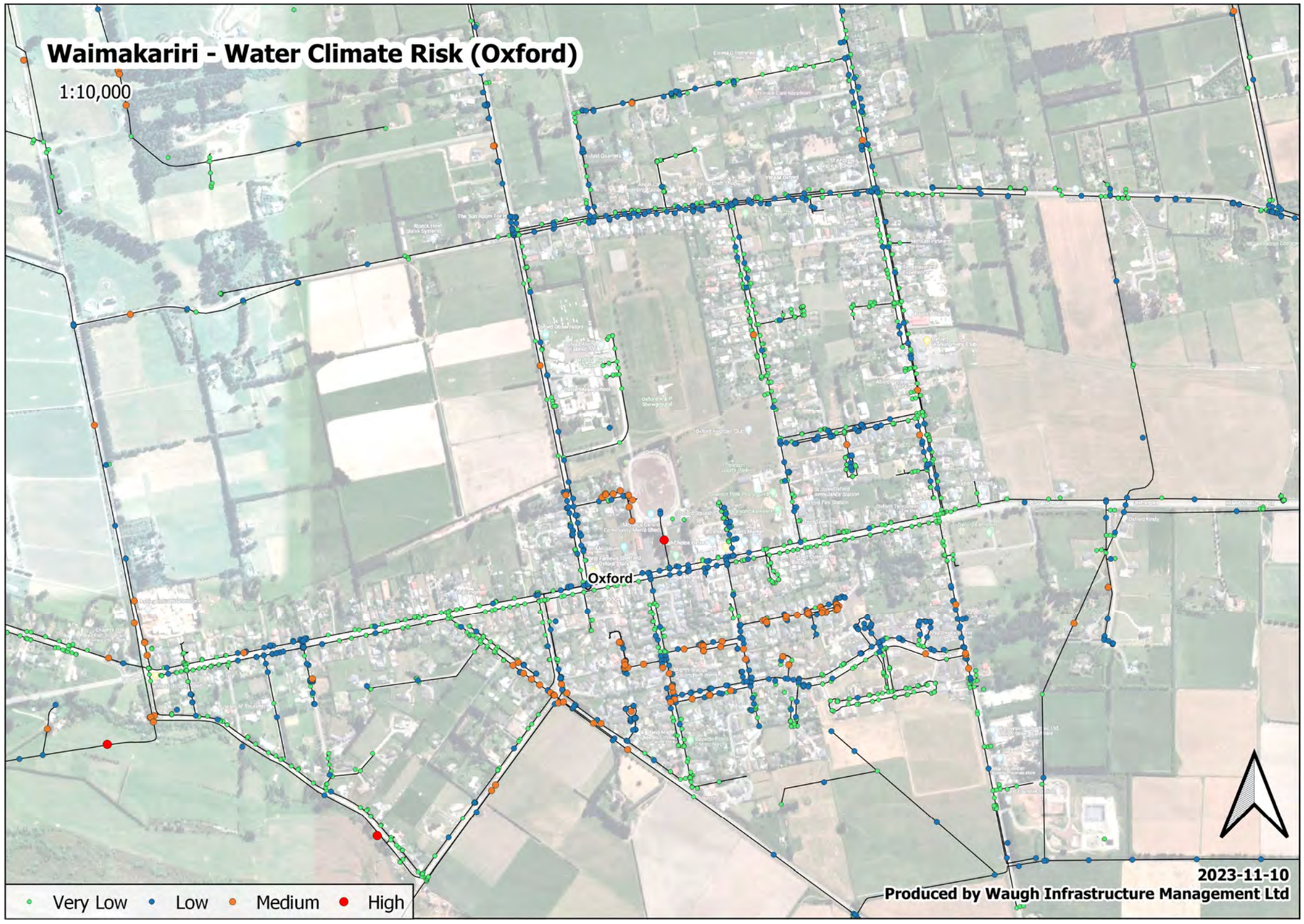
Risk / Scheme	High	Medium	Low	Very Low
D - KAIAPOI URBAN	0.00%	0.00%	0.00%	100.00%
NA - Not Applicable	0.00%	0.00%	0.00%	100.00%
S - KAIAPOI	0.16%	8.08%	54.12%	37.64%
S - LOBURN LEA	0.00%	0.00%	40.11%	59.89%
S - MANDEVILLE	0.00%	36.85%	43.25%	19.89%
S - OCEAN OUTFALL	0.00%	42.30%	7.08%	50.62%
S - OXFORD	4.15%	9.02%	37.99%	48.83%
S - PEGASUS	0.00%	5.06%	35.37%	59.57%
S - PINES/KAIRAKI	0.00%	62.89%	25.54%	11.57%
S - RANGIORA	0.00%	4.62%	52.44%	42.95%
S - TUAHIWI	0.00%	35.96%	28.61%	35.43%
S - WAIKUKU BEACH	2.41%	64.66%	31.86%	1.07%
S - WOODEND	0.00%	5.25%	36.63%	58.12%
S - WOODEND BEACH	9.90%	54.12%	34.88%	1.10%
Grand Total	**0.38%**	**12.55%**	**43.28%**	**43.78%**

Figure 7-9: Water Assets - Adaptation Response




Waimakariri - Water Climate Risk (Kaiapoi)
1:25,000
Flaxton
Wilsons Siding
Ohapuku
Kaiapoi
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd


Waimakariri - Water Climate Risk (Woodend & Pegasus)
1:20,000
Kaiapoi
Pegasus
Woodend
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd


Waimakariri - Water Climate Risk (Oxford)
1:10,000
Oxford
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd

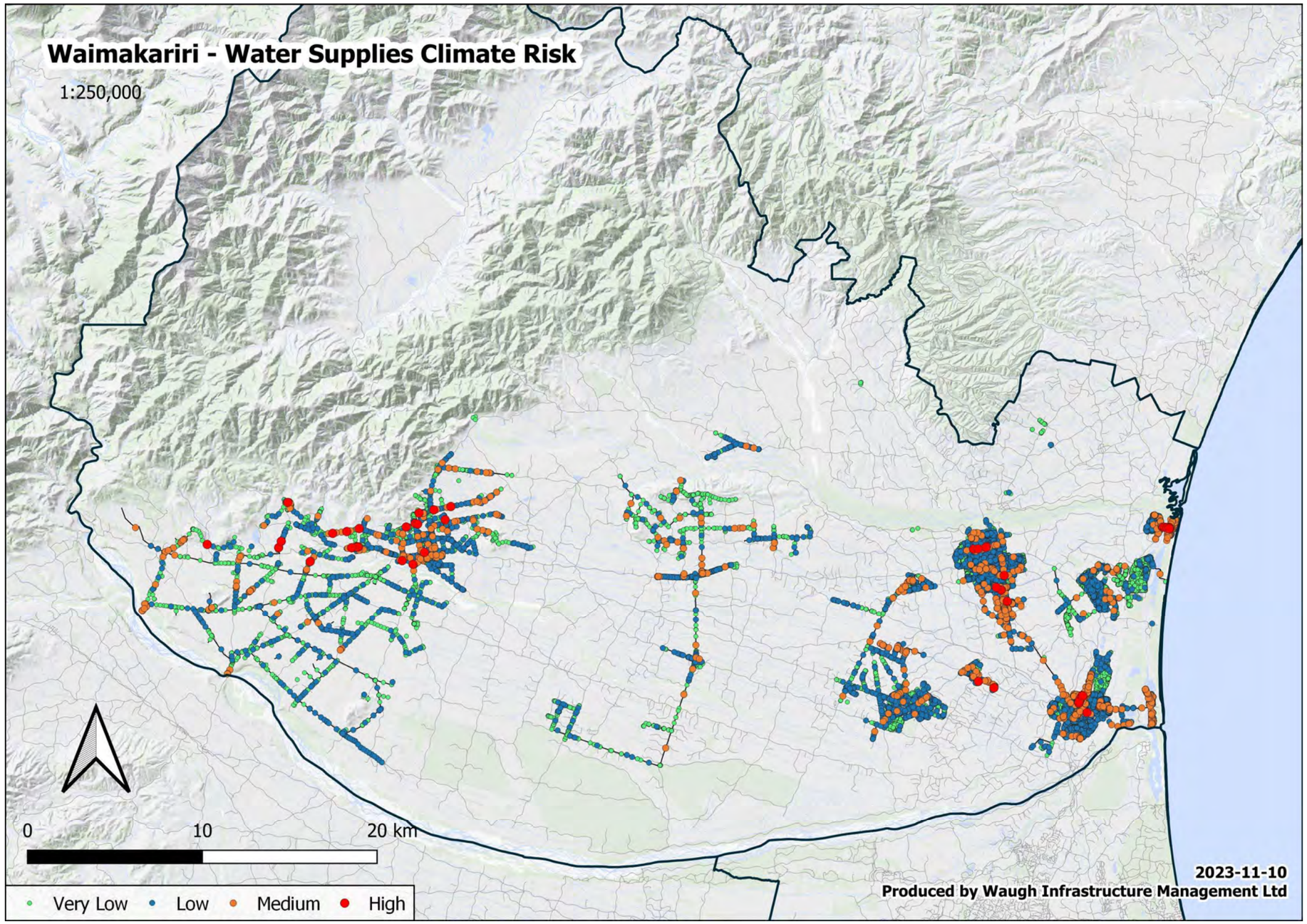

Waimakariri - Water Supplies Climate Risk
1:250,000
0
10
20 km
Very Low
Low
Medium
High
2023-11-10
Produced by Waugh Infrastructure Management Ltd

Table 7-9: Water Asset (%) Scheme and Associated Risk Level

Risk / Scheme	High	Medium	Low	Very Low
W - CUST	0.00%	12.14%	72.74%	15.12%
W - GARRYMERE	0.00%	18.11%	67.01%	14.89%
W - KAIAPOI	0.88%	10.06%	38.97%	50.09%
W - MANDEVILLE	0.00%	21.34%	61.64%	17.02%
W - OHOKA	8.05%	28.39%	53.13%	10.43%
W - OXFORD	0.39%	29.37%	53.51%	16.73%
W - OXFORD NO 1	0.77%	13.88%	58.95%	26.40%
W - OXFORD NO 2	2.71%	33.35%	43.09%	20.86%
W - POYNTZS ROAD	0.00%	19.52%	69.32%	11.16%
W - RANGIORA	0.47%	19.15%	48.19%	32.18%
W - SUMMERHILL	0.00%	43.01%	26.75%	30.24%
W - WAIKUKU BEACH	5.36%	59.85%	33.54%	1.25%
W - WEST EYRETON	0.00%	56.62%	41.21%	2.18%
W - WOODEND	0.00%	6.87%	26.11%	67.02%
Grand Total	**0.63%**	**17.02%**	**42.82%**	**39.53%**

A summary of the investment forecast for 3 Waters assets is provided in Figure 7-10 - Figure 7-12

For the purpose of DIA capex funding, the investment programme was projected across 20 years. For the period 2024-2034, the initial response is to focus on the maintenance of assets while consideration of more investment-intensive and longer-term responses are developed and refined. Hardening or improvements are determined by planning for and funding asset relocation.

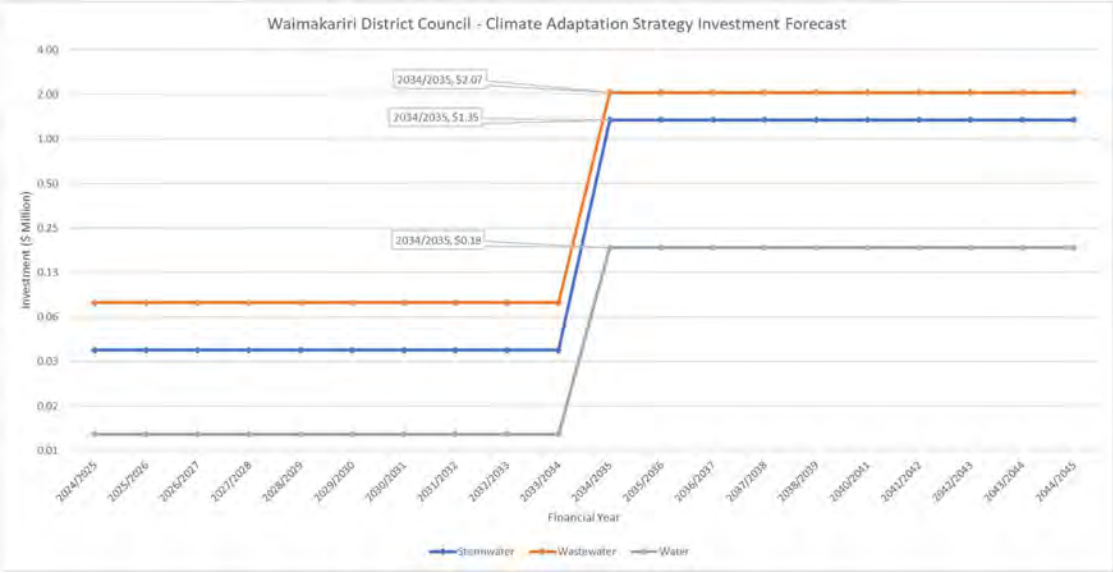


Figure 7-10: Initial Climate Adaptation Strategy Investment Forecast – Waimakariri District Council

The amended 3 Waters climate adaptation strategy investment profile and allocation by drinking water, wastewater and stomwater service is provided in Figure 7-11 and Figure 7-12.

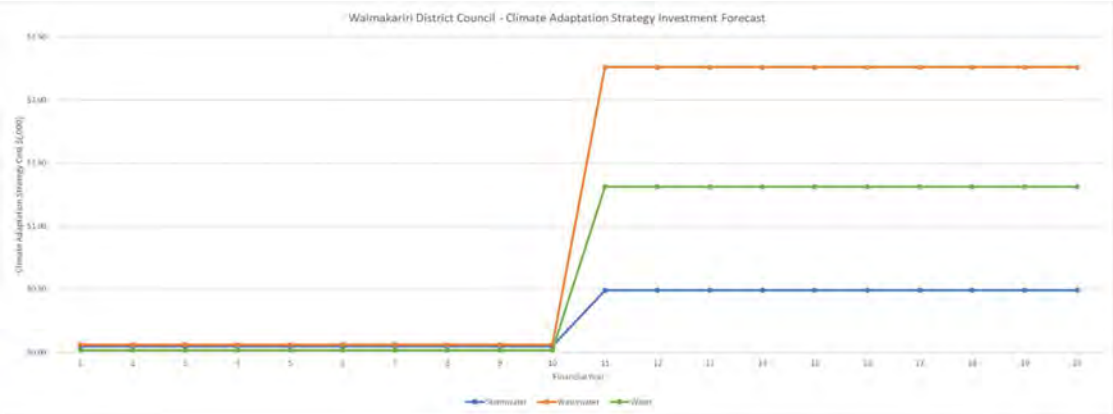


Figure 7-11: Ammended Climate Adaptation Strategy Investment Forecast – Waimakariri District Council

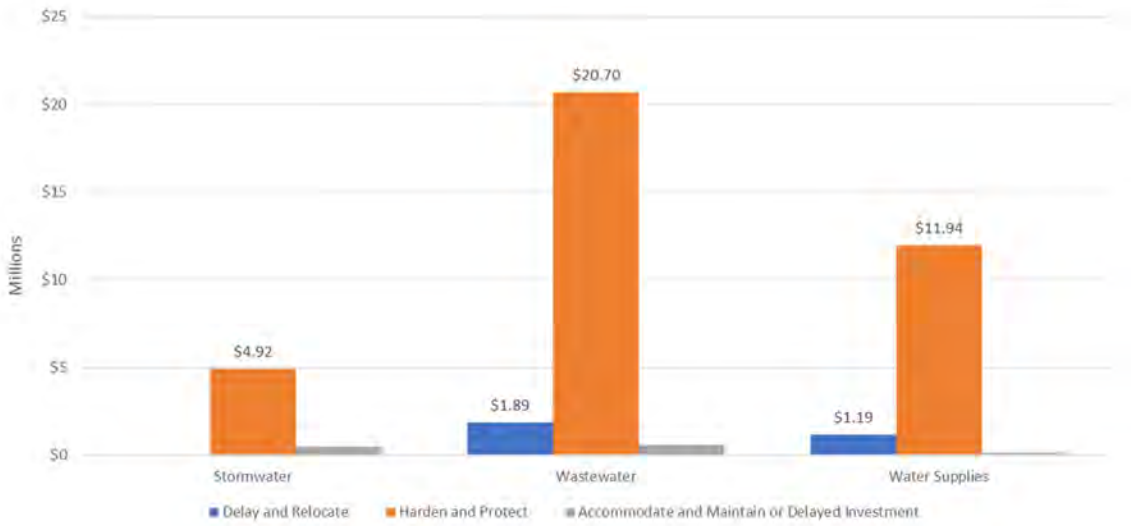


Figure 7-12: Climate investment profile by water service

7.4 Water Supplies

Water service specific climate change costs are presented in Table 7-10. The uplift from the initial assessment is ca $11 M, resulting from changes to the extent of assets exposed to flood hazards.

Table 7-10: Water Specific Climate Change Costs

Asset Type / Criticality	AA	A	B	Grand Total
Pipelines	$2,219,767	$5,973,846	$5,096,300	$13,289,914
Treatment	$32	$1,302		$1,334
Grand Total	**$2,219,800**	**$5,975,149**	**$5,096,300**	**$13,291,248**

The distribution of water supply costs across each criticality level is provided in Figure 7-13

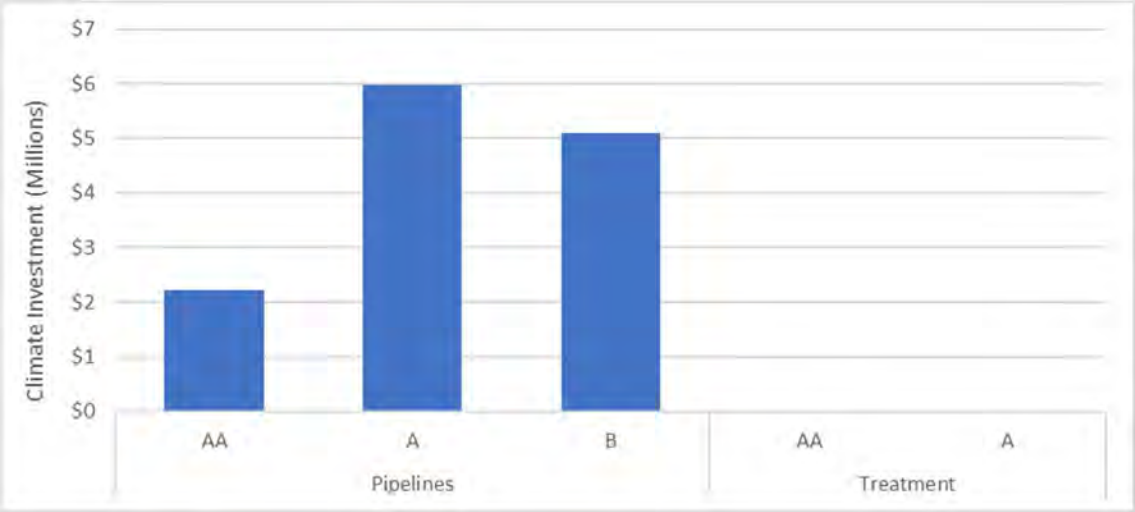


Figure 7-13: Water Supply Projected Climate Change Cost

7.5 Wastewater

Wastewater service specific climate change costs are presented in Table 7-11. The uplift from the initial assessment of ca. $1.4M results from inclusion of asset in flood plain areas within 50m from each identified waterways wetted perimeter boundary .

Table 7-11: Wastewater Specific Climate Change Costs

old

Asset Type / Criticality	AA	A	B	Grand Total
Pipelines	$13,117,284	$4,014,345	$3,698,856	$20,830,484
Pump Stations	$356,168	$582,916	$26,322	$965,406
Grand Total	**$13,473,452**	**$4,597,260**	**$3,725,178**	**$21,795,890**

new

Asset Type / Criticality	AA	A	B	Grand Total
Pipelines	$14,674,138	$4,107,252	$3,851,696	$22,633,086
Pump Stations	$14,733	$266,911	$274,851	$556,494
Grand Total	**$14,688,870**	**$4,374,163**	**$4,126,546**	**$23,189,580**

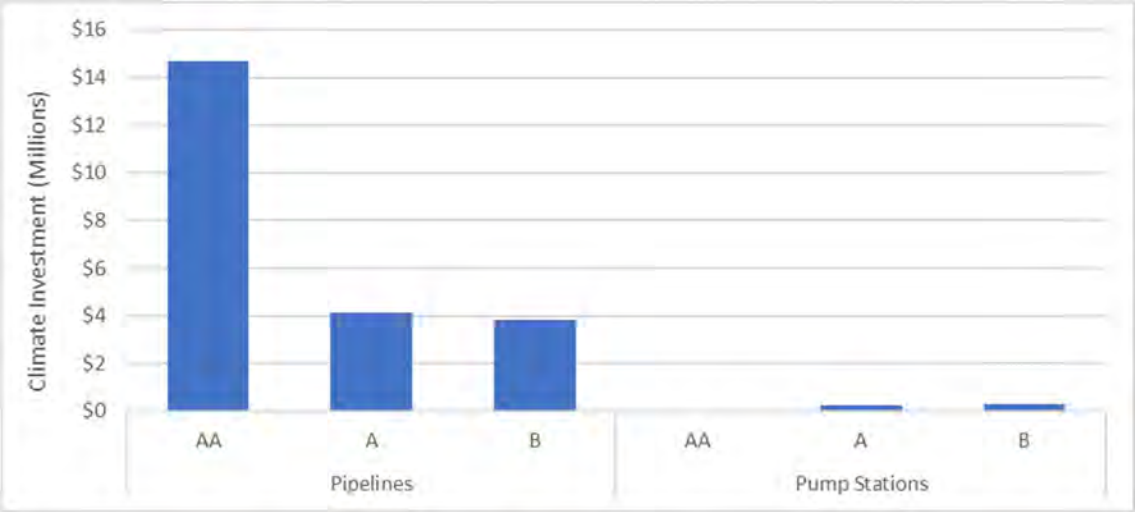


Figure 7-14: Wastewater Projected Climate Change Cost

7.6 Stormwater

Stormwater service specific climate change costs are presented in Table 7-12. There has been a reduction in the extent of stormwater assets exposured to climate change by ca. $6.4M, including a reduction of ca $6.6M criticality "A" assets. This is a result of changes to the consequence level assigned to stormwater pipes.

Table 7-12: Stormwater Specific Climate Change Costs – Initial assessment

Asset Type / Criticality	AA	A	B	Grand Total
Pipelines	$811,449	$9,637,389	$3,572,860	$14,021,698

Table 7-13: Stormwater Specific Climate Change Costs – amended assessment

Asset Type / Criticality	AA	A	B	Grand Total
Pipelines	$1,578,979	$3,048,507	$770,361	$5,397,847

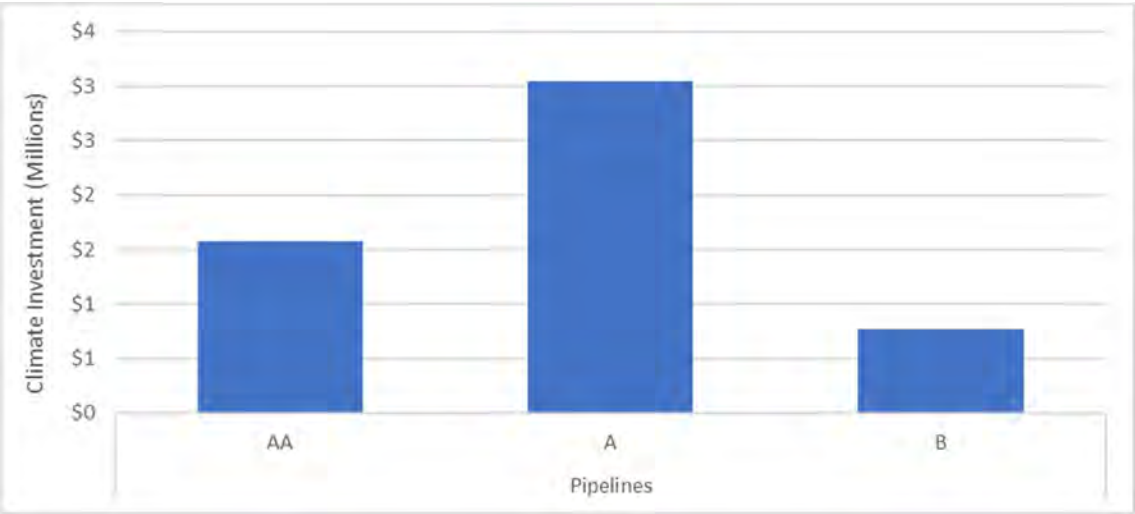


Figure 7-15: Stormwater Projected Climate Change Cost – amended assessment

8.0 RECOMMENDED INVESTMENT AND WORKS PROGRAMME

This project completed an assessment of climate change impacts on its three waters infrastructure - drinking water supplies, wastewater and stormwater assets (3 Waters). The intent was to provide an estimate of likely costs for improving the climate resilience of infrastructure in the short term. An estimate of capital investment has been provided for each criticality class. The approach was at a network level, thus yielding a resilience programme that requires further investigation and adaptation design before finalising it. As a consequence, the investment allocation for DIA was allocated beyond year 10. The following approach is recommended for the integration between the recommended resilience programme from this work and the current maintenance and renewals programme.

Table 8-1: Integrating the Resilience Programme with Renwals and Maintenance Programme

Asset Programme	Recommended Approach	Cost Implication
Asset identified for resilience and current renewals	Assign a higher priority for the renewals/maintenance programme, plus investigate the most appropriate adaptation design	To be determined on a case-by-case basis. For example, an identified pipe replacement in both programmes has no cost impact
Asset identified in resilience programme only	Undertake further and more detailed investigation on the risk to these assets to determine the most appropriate adaptation strategy and timing. On completion, these works could be prioritised against other projects on the programme	A more detailed cost estimate is required for each asset and will depend on the chosen adaptation strategy
Asset identified in renewal and maintenance programme only	Use a business -and-normal-approach	N/A

The investment requirements over the next 20 years, at a network level, are provided in

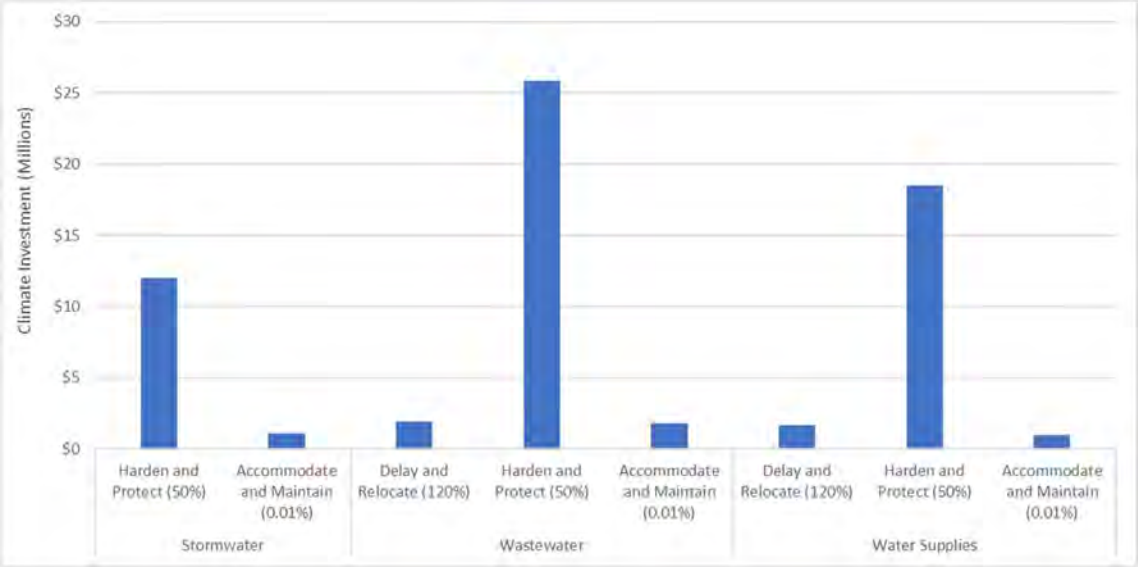


Figure 8-1. Renewal costs are provided for context, with funding already identified.

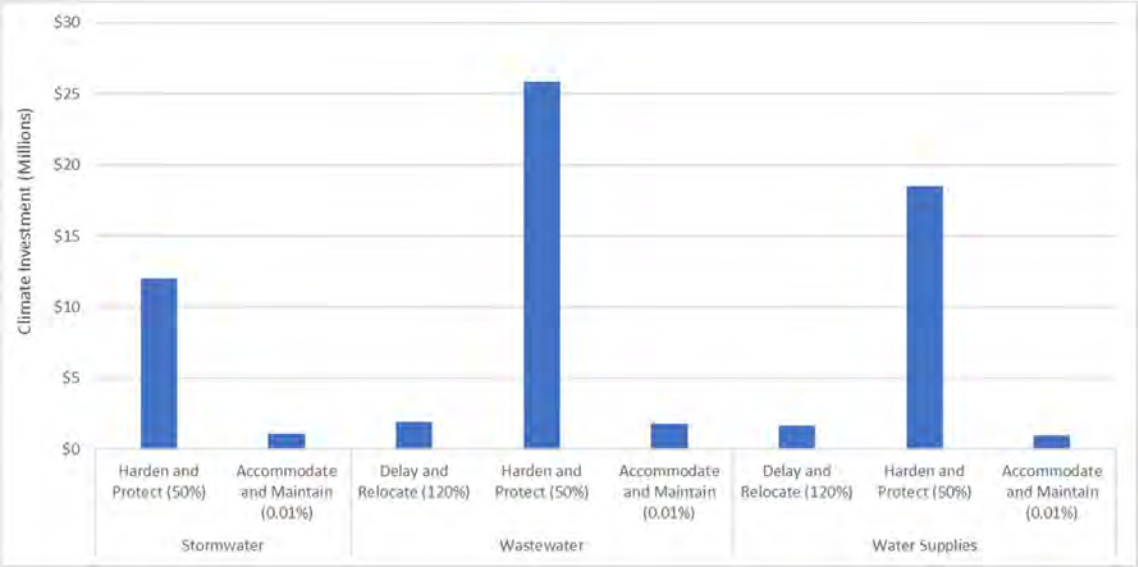


Figure 8-1: Investment by 3 Waters & Adaptation Strategy Approach

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9.0 SUMMARY

An assessment of Councils 3 Waters assets exposure and investment requirements against climate change factors has been undertaken.

NIWA data, provided by Council formed the basis for WIML to produced a framework where asset exposure to various climate change exposure events could be determined. Council instructed that an RCP 8.5 scenario looking out to the modelled mid-century changes be utilised. WIML applied the various factors e.g. increased number of hot days, with a focus on the level of investment required over then next three years (2024-2027).

A risk score was produced which when considered alongside the assets criticality value provided sufficient information to highlight the level of exposure (range of 0-100 in 25 unit blocks).

An adaptation strategy framework with four discrete strategic approaches ie. relocate, harden, maintain, abandon, was applied "over" the assets, and matched against their level of exposure.

In a detailed climate adaptation programme development, every strategic approach is an option for addressing identified resilience improvement needs. At such a detailed level, the option will be selected on the basis of affordability and within a desired risk envelope. For this first-cut assessment of the resilience improvements, investment needs to mirror the asset risk score. Therefore, infrastructure with high risks score will most likely have a relocation intervention strategy. An intuitive sensibility validation was performed on the outcome to ensure known issues were addressed in a pragmatic manner.

Taking the immediate-term investment (2024-2027) approach is intended to support the acceleration of investigation and planning for the band of critical assets selected ie. AA, A and B (part).

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10.0 REFERENCES

IT'S TIME CANTERBURY (2023). https://itstimecanterbury.co.nz/

IPCC (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

IPCC (2014). Summary for policymakers. In: *Climate Change 2014: Impacts, Adaptation. and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press. Retrieved from www.ipcc.ch/srocc/ (28 March 2023)

IPCC (2022) Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844.

JACOBS NEW ZEALAND LIMITED (2020). Phase 2 Coastal Inundation Modelling. Prepared for Waimakariri District Council.

MINISTRY FOR THE ENVIRONMENT (2018). Climate Change Projections for New Zealand: Atmosphere Projections Based on Simulations from the IPCC Fifth Assessment, 2nd Edition. Wellington: Ministry for the Environment.

MINISTRY FOR THE ENVIRONMENT (2019). Arotakenga Huringa Ahuarangi: A Framework for the National Climate Change Risk Assessment for Aotearoa New Zealand. Wellington: Ministry for the Environment.

MINISTRY FOR THE ENVIRONMENT (2020). National Climate Change Risk Assessment for Aotearoa New Zealand: Main report – Arotakenga Tūraru mō te Huringa Āhuarangi o Āotearoa: Pūrongo whakatōpū. Wellington: Ministry for the Environment.

MINISTRY FOR THE ENVIRONMENT (2022). Aotearoa New Zealand's First National Adaptation Plan. Wellington. Ministry for the Environment.

MINISTRY OF CIVIL DEFENCE AND EMERGENCY MANAGEMENT (2019). National Disaster Resilience Strategy. Wellington: Ministry of Civil Defence and Emergency Management.

NATIONAL INSTITUTE OF WATER AND ATMOSPHERIC RESEARCH. (2020). Climate Change Projections for the Canterbury Region. NIWA: Wellington.

NATIONAL INSTITUTE OF WATER AND ATMOSPHERIC RESEARCH. (2022a). Waimakariri District Climate Change Scenario: Technical Report. NIWA: Wellington. Ref: 2022095WN

NATIONAL INSTITUTE OF WATER AND ATMOSPHERIC RESEARCH. (2022b). Waimakariri District Climate Change Scenario: Technical Report Summary. NIWA: Wellington. Ref: 2022095WN

NATIONAL TREASURY SOUTH AFRICA. (2023). ANNEXURE D Climate Resilience Guideline. Cities Infrastructure Delivery and Management System (CIDMS) Toolkit. South Africa.

TE RŪNANGA O NGĀI TAHU (2018). He Rautaki mō te Huringa o te Āhuarangi: Te Tāhū o te Whāriki, Anchoring the Foundation.

WAIMAKARIRI DISTRICT COUNCIL (2019). Waimakariri District Council Climate Change Policy.

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APPENDICES

APPENDIX A – WHO WE ARE

This work was led and delivered by Associate Professor Theuns Henning, Hugh Blake-Manson, Katherine Hill and Kurt Hayward.

Associate Professor Theuns Henning provided guidance and writing for this report. Theuns has 35+ years national and international (including World Bank) experience in Asset and Risk Management Practice and implementation.

Hugh Blake-Manson (Infrastructure Advisor: Waugh Infrastructure Management Ltd), has 30 years experience across Aotearoa | New Zealand's Three Waters (3W) sector. Hugh has worked in local government (Transport, Rivers and 5 Waters Asset Management), delivery of Operations and Maintenance services (City Care Ltd) and consultancy services.

Kurt Hayward (Consultant: Waugh Infrastructure Management Ltd), has 14 years' experience providing advanced solutions and analysis to the Local Government Sector.

Katherine Hill (Consultant: Waugh Infrastructure Management Ltd), has eight years experience within local and central government. Katherine's career progression thus far has encompassed environmental management and planning, project leadership, and policy development with a particular focus on civil defence and emergency management, community resilience and integrated planning.

We are active members of the Te ao Rangahau | Engineering New Zealand (EngNZ), Water New Zealand and The Institute of Public Works Engineering Australasia (IPWEA).

APPENDIX B – DATA SOURCES

Key data sources utilised for this projects are provided in Appendix Table 1:

***Appendix Table 1*: Key Data Sources for WDC 3 Waters Climate Change Assessment**

Reference Outline e.g. Data Source	Source and Data	Purpose
WDC Flood hazard model	WDC/DHI Flood Hazard Mapping	Provides flood extent under AEP events. Overlaid with assets, provides exposure extent
Eastern South Island Projected regional climate change hazards	NIWA, GeoTiffs provided by Jochen Stoll (WDC) August 2022	Provides spatially accessible climate factors projections to determine exposure
Jacobs Natural Hazard 2020 Data	Jacobs, GeoTiffs provided by Jochen Stoll (WDC) January 2023	Backing data and scenarios for District Flooding Modelling to assess sufficiency
WDC 3 Waters 2022 Valuation Databases	WDC, provided by Chris Bacon February 2023	Links assessed assets to corporately assessed financial records which assists determining projected climate adaptation cost
WDC District Flood Modelling	WDC, provided by Chris Bacon November 2022	Provides modelled future flood exposure for risk calculation
WDC 3 Waters Assets GIS Snapshot	WDC, provided by Chris Bacon September 2022	The base dataset to link back to WDC 3 Waters Assets
National Water Table Model	https://doi.org/10.21420/KZ52-NT28, GNS Science, 2018	Provides context for high water tables to assess Design Adequacy in specific asset locations
Eastern Canterbury liquefaction susceptibility	https://opendata.canterburymaps.govt.nz/datasets/a1d1e268681f4f9896b551b26a6e8bbc, Canterbury Maps, 2012	Provides context for ground suitability to assess Design and Material Adequacy in specific asset groupings

APPENDIX C – CRITICALITY FACTORS

Fragility Scoring	Assets are scored against fragility factors and are then snormalised between 1-2 with allowance of lack of data
Flood Model Ocean Exclusion	The flood modelling has boundaries that exclude the ocean from exposure
Climate Adaptation Cost	Climate adaption is deemed to be factored into assets with low remaining life. Climate adaptation cost is determined to be a percentage replacement value of based on resulting adaption strategy

APPENDIX D – CLIMATE CHANGE FACTOR SCORING

To enable modelling, climate change factors extracted from the NIWA report were applied to a five point scale as detailed in the following table.

Appendix Table 2: Climate Change Factor Scoring (1-5)

		1		2		3		4		5	
		Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*
Mean Air Temperature	TempMean 2031-2050 RCP8.5 ANN	0	1	1	1.5	1.5	2	2	2.5	2.5	3
	TempMean 2031-2050 RCP8.5 DJF	0	1	1	1.5	1.5	2	2	2.5	2.5	3
	TempMean 2031-2050 RCP8.5 MAM	0	1	1	1.5	1.5	2	2	2.5	2.5	3
	TempMean 2031-2050 RCP8.5 JJA	0	1	1	1.5	1.5	2	2	2.5	2.5	3
	TempMean 2031-2050 RCP8.5 SON	0	1	1	1.5	1.5	2	2	2.5	2.5	3
Mean Maximum Air Temperature	TempMax 2031-2050 RCP8.5 ANN	0	1	1	1.5	1.5	2	2	2.5	2.5	3
	TempMax 2031-2050 RCP8.5 DJF	0	1	1	1.5	1.5	2	2	2.5	2.5	3
	TempMax 2031-2050 RCP8.5 MAM	0	1	1	1.5	1.5	2	2	2.5	2.5	3
	TempMax 2031-2050 RCP8.5 JJA	0	1	1	1.5	1.5	2	2	2.5	2.5	3
	TempMax 2031-2050 RCP8.5 SON	0	1	1	1.5	1.5	2	2	2.5	2.5	3
Mean Minimum Temperature	TempMin 2031-2050 RCP8.5 ANN	-0.5	0	0	0.5	0.5	1	1	1.5	1.5	2
	TempMin 2031-2050 RCP8.5 DJF	-0.5	0	0	0.5	0.5	1	1	1.5	1.5	2
	TempMin 2031-2050 RCP8.5 MAM	-0.5	0	0	0.5	0.5	1	1	1.5	1.5	2
	TempMin 2031-2050 RCP8.5 JJA	-0.5	0	0	0.5	0.5	1	1	1.5	1.5	2
	TempMin 2031-2050 RCP8.5 SON	-0.5	0	0	0.5	0.5	1	1	1.5	1.5	2
Hot Days	HotDaysT25 2031-2050 RCP8.5 ANN	0	10	10	25	25	35	35	45	45	60
	HotDaysT25 2031-2050 RCP8.5 DJF	0	10	10	25	25	35	35	45	45	60
	HotDaysT25 2031-2050 RCP8.5 MAM	0	10	10	25	25	35	35	45	45	60
	HotDaysT25 2031-2050 RCP8.5 JJA	0	10	10	25	25	35	35	45	45	60
	HotDaysT25 2031-2050 RCP8.5 SON	0	10	10	25	25	35	35	45	45	60
Dry Days	DryDays1mm 2031-2050 RCP8.5 ANN	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	DryDays1mm 2031-2050 RCP8.5 DJF	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	DryDays1mm 2031-2050 RCP8.5 MAM	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	DryDays1mm 2031-2050 RCP8.5 JJA	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	DryDays1mm 2031-2050 RCP8.5 SON	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12

		1		2		3		4		5	
		Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*
Rain Percentage Change	RainPercChange 2031-2050 RCP8.5 ANN	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	RainPercChange 2031-2050 RCP8.5 DJF	0	2	2	6	6	10	10	15	15	18
		0	-2	-2	-6	-6	-10	-10	-15	-15	-18
	RainPercChange 2031-2050 RCP8.5 MAM	0	2	2	6	6	10	10	15	15	18
		0	-2	-2	-6	-6	-10	-10	-15	-15	-18
	RainPercChange 2031-2050 RCP8.5 JJA	0	2	2	6	6	10	10	15	15	18
		0	-2	-2	-6	-6	-10	-10	-15	-15	-18
	RainPercChange 2031-2050 RCP8.5 SON	0	2	2	6	6	10	10	15	15	18
		0	-2	-2	-6	-6	-10	-10	-15	-15	-18
Soil Moisture Deficit Days	SoilMoistureDefDays 2031-2050 RCP8.5 ANN	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	SoilMoistureDefDays 2031-2050 RCP8.5 DJF	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	SoilMoistureDefDays 2031-2050 RCP8.5 MAM	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	SoilMoistureDefDays 2031-2050 RCP8.5 JJA	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
	SoilMoistureDefDays 2031-2050 RCP8.5 SON	0	4	4	6	6	8	8	10	10	12
		0	-4	-4	-6	-6	-8	-8	-10	-10	-12
Annual Change Frost Days	FrostDaysT0 2031-2050 RCP8.5 ANN	-4	-6	-6	-8	-8	-15	-15	-30	-30	-50
	FrostDaysT0 2031-2050 RCP8.5 DJF	-4	-6	-6	-8	-8	-15	-15	-30	-30	-50
	FrostDaysT0 2031-2050 RCP8.5 MAM	-4	-6	-6	-8	-8	-15	-15	-30	-30	-50
	FrostDaysT0 2031-2050 RCP8.5 JJA	-4	-6	-6	-8	-8	-15	-15	-30	-30	-50
	FrostDaysT0 2031-2050 RCP8.5 SON	-4	-6	-6	-8	-8	-15	-15	-30	-30	-50
Potential Evapotranspiration Deficit ANN	PEDAccum 2031-2050 RCP8.5 ANN	0	25	25	50	50	100	100	150	150	200

		1		2		3		4		5	
		Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*
Relative Humidity	RelativeHumidity 2031-2050 RCP8.5 ANN	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
	RelativeHumidity 2031-2050 RCP8.5 DJF	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
	RelativeHumidity 2031-2050 RCP8.5 MAM	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
	RelativeHumidity 2031-2050 RCP8.5 JJA	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
	RelativeHumidity 2031-2050 RCP8.5 SON	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
Annual Change in Average Solar Radiation	SolarRadiation 2031-2050 RCP8.5 ANN	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
	SolarRadiation 2031-2050 RCP8.5 DJF	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
	SolarRadiation 2031-2050 RCP8.5 MAM	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
	SolarRadiation 2031-2050 RCP8.5 JJA	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
	SolarRadiation 2031-2050 RCP8.5 SON	0	1	1	2	2	3	3	4	4	5
		0	-1	-1	-2	-2	-3	-3	-4	-4	-5
Annual Change in Average Wind Speed	WindPercChange 2031-2050 RCP8.5 ANN	-10	0	0	2	2	6	6	8	8	10
	WindPercChange 2031-2050 RCP8.5 DJF	-10	0	0	2	2	6	6	8	8	10
	WindPercChange 2031-2050 RCP8.5 MAM	-10	0	0	2	2	6	6	8	8	10
	WindPercChange 2031-2050 RCP8.5 JJA	-10	0	0	2	2	6	6	8	8	10
	WindPercChange 2031-2050 RCP8.5 SON	-10	0	0	2	2	6	6	8	8	10

APPENDIX E – FRAGILITY SCORING FRAMEWORK

Appendix Table 3: Fragility Scoring Framework

Initial

Criteria	Rating			Example/Criteria
	0	1	2	
Design Standard Adequacy	n/a	Yes	No	Elevation of treatment plants and pump stations
Monitoring	n/a	Yes	No	Operational monitoring where needed
Condition	n/a	Good	Poor	Pipe condition (e.g. wastewater E&I)
Capacity	n/a	Under	Close	Treatment plants and pipes operating capacity
Construction or Material Quality	n/a	Good	Poor	Rigid pipes in expansive soils
Sufficient data is available to assess infrastructure fragility	n/a	Yes	No	Data gaps for fragility rating

Amended (utilised in this report)

Criteria	Options	Value	Explanation
Suitablity Design, Material, Installation	N/A; Suitable; Not suitable	0; 1; 2	Assessment of the suitability of the asset depending on asset type
Location	N/A; Location adeqaute; Location increases fragility	0; 1; 2	Does the location of asset type present a fragility issue e.g., proximity to waterway
Capacity	N/A; Under Capacity; Close to Capacity	0; 1; 2	Capacity vs Demand ratio (criticality derived)
Condition	N/A; Good; Poor	0; 1; 2	Well assessed asset condition, 4-5 considered poor
Data availability	N/A; Suitable; Not suitable	0; 1; 2	Information available to assess required criteria for fragility

APPENDIX F – CLIMATE HAZARDS AND IMPACT ON RISK – DETAILED ASSESSMENT

Dry Days

Appendix Table 4: Stormwater Assets (%) By Criticality Band and Dry Days Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	-	12.07%
A	-	-	-	23.31%
B	-	-	-	7.45%
C	-	-	-	23.31%
Unknown	-	-	-	33.86%
Total	-	-	-	100.00%

Appendix Table 5: Wastewater Assets (%) By Criticality Band and Dry Days Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	-	49.80%
A	-	-	-	14.83%
B	-	-	-	15.17%
C	-	-	-	12.57%
Unknown	-	-	-	7.62%
Total	-	-	-	100.00%

Appendix Table 6: Water Supply Assets (%) By Criticality Band and Dry Days Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	-	10.52%
A	-	-	-	28.33%
B	-	-	-	25.08%
C	-	-	-	33.77%
Unknown	-	-	-	2.29%
Total	-	-	-	100.00%

Flooding (including coastal)

Appendix Table 7: Stormwater Assets (%) By Criticality Band and All Flooding Risk Level

Criticality	High	Medium	Low	Very low
AA	-	11.64%	0.43%	0.00%
A	-	20.05%	3.25%	0.00%
B	-	5.89%	1.56%	0.00%
C	-	22.21%	1.10%	0.00%
Unknown	-	31.93%	1.94%	0.00%
Total	-	91.72%	8.27%	0.00%

Appendix Table 8: Wastewater Assets (%) By Criticality Band and All Flooding Risk Level

Criticality	High	Medium	Low	Very low
AA	4.49%	44.15%	1.16%	0.00%
A	0.58%	13.36%	0.89%	0.00%
B	1.32%	12.67%	1.18%	0.00%
C	0.00%	10.60%	1.98%	0.00%
Unknown	0.00%	6.80%	0.83%	0.00%
Total	6.39%	87.57%	6.04%	0.00%

Appendix Table 9: Water Supply Assets (%) By Criticality Band and All Flooding Risk Level

Criticality	High	Medium	Low	Very low
AA	2.78%	7.46%	0.29%	0.00%
A	0.06%	27.77%	0.50%	0.00%
B	2.79%	21.37%	0.92%	0.00%
C	2.11%	29.02%	2.64%	0.00%
Unknown	0.00%	2.22%	0.07%	0.00%
Total	7.74%	87.84%	4.42%	0.00%

Coastal Flooding

Appendix Table 10: Stormwater Assets (%) By Criticality Band and Coastal Flooding Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	0.29%	11.78%
A	-	-	2.60%	20.71%
B	-	-	1.12%	6.33%
C	-	-	3.32%	19.99%
Unknown	-	-	4.44%	29.42%
Total	-	-	11.77%	88.23%

Appendix Table 11: Wastewater Assets (%) By Criticality Band and Coastal Flooding Risk Level

Criticality	High	Medium	Low	Very low
AA	-	11.89%	8.47%	29.44%
A	-	2.38%	1.85%	10.59%
B	-	2.11%	2.08%	10.99%
C	-	0.00%	1.48%	11.09%
Unknown	-	0.03%	1.18%	6.41%
Total	-	16.41%	15.07%	68.52%

Appendix Table 12: Water Supply Assets (%) By Criticality Band and Coastal Flooding Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	1.72%	8.80%
A	-	-	0.01%	28.32%
B	-	-	0.45%	24.63%
C	-	-	0.65%	33.12%
Unknown	-	-	0.00%	2.29%
Total	-	-	2.83%	97.17%

Snow

Appendix Table 13: Stormwater Assets (%) By Criticality Band and Snow Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	-	12.07%
A	-	-	-	23.31%
B	-	-	-	7.45%
C	-	-	-	23.31%
Unknown	-	-	-	33.86%
Total	-	-	-	100.00%

Appendix Table 14: Wastewater Assets (%) By Criticality Band and Snow Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	3.86%	45.94%
A	-	-	0.25%	14.58%
B	-	-	0.00%	15.17%
C	-	-	0.00%	12.57%
Unknown	-	-	0.00%	7.62%
Total	-	-	4.11%	95.89%

Appendix Table 15: Water Supply Assets (%) By Criticality Band and Snow Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	-	10.52%
A	-	-	-	28.33%
B	-	-	-	25.08%
C	-	-	-	33.77%
Unknown	-	-	-	2.29%
Total	-	-	-	100.00%

Wind

Appendix Table 16: Stormwater Assets (%) By Criticality Band and Wind Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	-	12.07%
A	-	-	-	23.31%
B	-	-	-	7.45%
C	-	-	-	23.31%
Unknown	-	-	-	33.86%
Total	-	-	-	100.00%

Appendix Table 17: Wastewater Assets (%) By Criticality Band and Wind Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	-	49.80%
A	-	-	-	14.83%
B	-	-	-	15.17%
C	-	-	-	12.57%
Unknown	-	-	-	7.62%
Total	-	-	-	100.00%

Appendix Table 18: Water Supply Assets (%) By Criticality Band and Wind Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	6.06%	4.46%
A	-	-	1.54%	26.79%
B	-	-	6.23%	18.86%
C	-	-	5.92%	27.85%
Unknown	-	-	0.00%	2.29%
Total	-	-	19.74%	80.26%

Temperature

Appendix Table 19: Stormwater Assets (%) By Criticality Band and Temperature Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	-	12.07%
A	-	-	-	23.31%
B	-	-	-	7.45%
C	-	-	-	23.31%
Unknown	-	-	-	33.86%
Total	-	-	-	100.00%

Appendix Table 20: Wastewater Assets (%) By Criticality Band and Temperature Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	5.93%	43.87%
A	-	-	1.54%	13.29%
B	-	-	2.80%	12.38%
C	-	-	0.00%	12.57%
Unknown	-	-	0.00%	7.62%
Total	-	-	10.27%	89.73%

Appendix Table 21: Water Supply Assets (%) By Criticality Band and Temperature Risk Level

Criticality	High	Medium	Low	Very low
AA	-	-	4.08%	6.45%
A	-	-	1.54%	26.79%
B	-	-	6.22%	18.86%
C	-	-	5.26%	28.51%
Unknown	-	-	0.00%	2.29%
Total	-	-	17.10%	82.90%

APPENDIX G - WAIMAKARIRI DISTRICT COUNCIL 3 WATERS [W, WW, SW] ADAPTATION STRATEGIES

Appendix Table 22: Waimakariri District Council -3 Waters Adaptation Strategies

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Water Sources (Groundwater - Well)					
Increased precipitation, flooding landslides		Construct new and climate-resilient facility	Construct bund walls around centrifugal pumps and electrical control rooms to prevent ingress of flood waters Replace centrifugal pumps with submersible pumps Raise well-heads higher up	Allocate emergency funds for repair work after an event Increase budget for maintenance work Monitor contamination of sources	Consider other facilities if retrofitting is not possible
Increased temperature and number - of hot days	"5 day" peaks, source capacity vs customer demand	-	Increase extent of well field (duty-standby-emergency)	Increase extent of well field (duty-standby-emergency)	Connect to other (distributed) well fields
Droughts	"30 day+" source quantity, quality	Re-locate or find new sources e.g distributed well field and/or connect into multiple aquifers	Obtain predominant (primary) rights to source water e.g. Aquifer/catchment for primary human drinking water needs. Recognises hierarchy of Te Mana o te Wai values	Obtain e.g. Through infrastructure works, operations optimisation, the flexibility to switch between different water sources during times of drought. Undertake (sub)catchment water loss management programme e.g. DMA, acoustic smart meters	Connect to other (distributed) well fields
Sea-level rise	Source quality & quantity	Re-locate existing sources if practical (lift screens) or find new sources		Coastal side monitoring wells, placed strategically up to the current source. Use as intermediary barrier (extraction) to delay intrusion	Connect to other (distributed) well fields Blend sorces within DWQAR MAV and GV parameters

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Wind	Power source	-	Remove vegetation. Ensure alternative mains power sources in place	Allocate emergency funds for repair works after an event Increase budget for maintenance work Provide mobile or fixed onsite power generator	Provide mobile or fixed onsite power generator
Exterme Temperatures	Heat, Snow and Ice		Ensure source shielding (covered) and all weather site access in place. Durable equipment installed	Ensure all weather site access is in place. Increase inspection and maintenance or refurbishment	
Water Sources (Emergency Only - Surface Water [Gallery/Bore]					
Increased precipitation	Increased frequency and extent of flooding, landslides and erosion	Replace current backup sources with new sources not exposed to same risks	Reconstruct with highly resilient materials. Create upstream emergency bypass/sluice design for high flows+loads where practical	Allocate emergency funds for repair work after an event Increase budget for maintenance work Monitor contamination of sources	Abandon based on scale of damage - redirect monies to other source infrastructure improvements
Increased temperature and No. Of hot days	"5 day" peaks, source capacity vs customer demand	-	-	Increase extent of well field (length, depth)	-
Droughts	"30 day+" source quantity, quality		Increase extent of well field (length, depth)	Increase extent of well field (length, depth)	-

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Sea-level rise	Source quality & quantity	Re-locate existing sources if practical (lift screens) or find new sources		Coastal side monitoring wells, placed strategically up to the current source. Use as intermediary barrier (extraction) to delay intrusion	Connect to other (distributed) well fields Blend sorces within DWQAR MAV and GV parameters
Wind (power source)		-	Remove vegetation. Ensure alternative mains power sources in place	Allocate emergency funds for repair works after an event Increase budget for maintenance work Provide mobile or fixed onsite power generator	Provide mobile or fixed onsite power generator
Snow (and extreme cold days)		-	Ensure source structures are sufficiently strong/durable and all weather access is in place	Ensure all weather site access is in place. Respond rapidly to site (snow load impact)	-
Treatment Facilities -Water (incl post production storage)					
Increased precipitation	Increased frequency and extent of flooding, landslides and erosion	Construct new and climate-resilient facilities outside hazard exposure areas.	Stabilise landslide-prone areas by natural or geo-engineering methods Construct bund walls around underground tanks to prevent ingress of flood waters Increase treatment plant capacity to deal with high influent volumes / sediment load during storm events for shallow sources Strengthen existing raw and production water storage. Raise electrical equipment higher	Allocate emergency funds for repair works after an event Increase budget for maintenance work Increase raw and production water reservoir storage	Consolidation - consider continuity of service via other facilities if retrofitting is not possible

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Increased temperature and no. Of hot days	"5 day" peaks, source capacity vs customer demand	-	Construct facilities with internal temperature management. Identify alternative treatments e.g. Ozone, gas	Construct facilities with naturalised ventilation systems. Increase targeted instrument/dosing equipment mainteance during hot periods	Consider different treatment process
Droughts		-	-	-	-
Sea-level rise		Construct new climate-resilient facilities	Construct bund walls around underground tanks to prevent ingress of seawater	Monitor ground conditions (saturation, composition). Ensure dewatering facilities are in place	Consider treatment at other facilities if retrofitting is not possible
Wind		Construct new climate-resilient facilities	Remove vegetation. Ensure alternative mains power sources in place. Strengthen facility structures.		Ensure onsite generation available 24/7 including fuel
Snow (and extreme cold days)	Apline and foothills predominantly affected	-	Ensure buildings are sufficiently strong/durable and all weather access is in place. Strengthen if not. Protect/insulate external water, plant and fuel storage systems	Ensure all weather site access is in place. Respond rapidly to site (snow load impact) to assess and minimise asset failure risks	Ensure all weather site access is in place

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Treatment Facilities - Wastewater and Stormwater					
Increased precipitation, flooding, landslides		Construct new climate-resilient facilities	Stabilise landslide-prone areas by planting trees or geo-engineering methods Install resilient vegetation Construct bund walls around underground tanks to prevent ingress of flood waters Increase treatment plant capacity to deal with high influent volumes during storm events	Allocate emergency funds for repair works after an event Increase budget for maintenance work Increase storage capacity (online/off line)	Consolidation - consider continuity of service via other facilities if retrofitting is not possible
Increased temperature and No. of hot days	"5 day" peaks, source capacity vs customer demand	Construct new climate-resilient facilities	Construct facilities with internal temperature management. Install resilient vegetation (wetlands, basins)	Construct facilities with naturalised ventilation systems	Consider different treatment process (lifecycle cost, emissions)
Droughts		-	Install resilient vegetatione e.g. Wetlands	Install resilient vegetation and provide water during prolonged events	Replant / refurbish wetland-pond areas as required
Sea-level rise		Construct new climate-resilient facilities	Construct bund walls around underground tanks to prevent ingress of seawater	Monitor ground conditions (saturation, composition). Dewater	Consider transfer treatment at other facilities if retrofitting is not possible
Wind		Construct new climate-resilient facilities	Remove vegetation. Ensure alternative mains power sources in place. Strengthen facility structures. Extend "wave band" protection for ponds is robust	Ensure alternative mains power sources in place. Strengthen "wave band" protection for ponds	Ensure onsite generation available 24/7 including fuel

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Snow (and extreme cold days)	Apline and foothills predominantly affected	-	Ensure buildings are sufficiently strong/durable and all weather access is in place. Strengthen if not. Protect/insulate external water, plant and fuel storage systems. Provide temperature related treatment resilience to stop inversion/loss of operational bacteriological composition	Ensure all weather site access is in place. Respond rapidly to site (snow load impact) to assess and minimise asset failure risks. Provide temperature related treatment resilience to stop inversion/loss of operational bacteriological composition	Ensure all weather site access is in place. Obtain consent for emergency events (if possible)
Pipelines					
Increased precipitation, flooding, landslides		Transfer transmission pipes where area is vulnerable to landslides, or other climate impacts	Embed exposed transmission pipes where possible Raise exposed transmission pipes above maximum historical flood levels Encase exposed pipes in concrete when raising is not possible Replace regit pipes (AC to PVC) Strengthen pipe bridges (i.e. wastewater)	Allocate emergency funds for repair works after an event Increase budget for maintenance work Undertake rolling inflow (stormwater to wastewater) inspections & network monitoring with redirection processes	Consider new pipe alignment if retrofitting is not possible
Increased temperature and hot days		-	Allow for expansion/contraction at critical joints (above ground or within 0.5 m below ground) of new installations and longer length repairs	-	-

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Drought		-	Undertake routine leakage assessments. Utilised technlogies to monitor whole of network losses (and changes)	Increase maintenance to repair pipes cracked during wet/dry cycles WW- increase maintenance on wastewater pipes due to increase blockage rate	-
Sea-level rise		Re-locate pipelines (lift, sleeve, shield) noting minimum level of service requirements.	Target replacement of corrosion prone materials (pipes, fittings) with durable materials. Increase relining on applicable pipes e.g. EW, RCON, AC	Increase maintenance / spot repair of pipes to control water infiltration	Accept sea-water infiltration (corrosion) if any. Increase maintenance and funding for reactive responses e.g wastewater overflow
Wind (tree roots / fall)		Setbacks from pipelines enforced	New renewed pipes (extreme/high criticality) installed in resilient materials and systems	Allocate emergency funds for repair works after an event Increase budget for maintenance work	-
Snow (and extreme cold days)		-	Strengthen pipe bridges (i.e. Wastewater		Undertake routine inspection monitoring
Pumpstations - Wastewater & Stormwater					
Increased precipitation, flooding, landslides		Relocation of water pumpstations outside areas of exposure. Relocation of wastewater pumpstations along with feeder stations (to maintain gravity flows)	Construct bund walls including for all electrical systems. Where practical also lift electrical systems above agreed flood event level	Allocate emergency funds for repair works after an event Increase budget for maintenance work Prepare alternative access routes/options to access sites	-

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Increased temperature and hot days		-	Target critical joints and install expansion/contraction systems (above ground or within 0.5 m below ground)		
Drought		-	-	Increase gravity pipe maintenance cleaning and odour control - especially during sustained low flow periods	Increase gravity pipe maintenance cleaning and odour control - especially during sustained low flow periods
Sea-level rise		-	Construct bund walls around underground tanks to prevent ingress of seawater. Ensure negative buoyancy factor. Provide additional impermeable barrier (wrapping) to appropriate standards e.g ensure safe drinking water, H2S corrosion	Monitor ground conditions (saturation, composition). Install automated dewatering. Increase pump capacity to maximum output	
Wind (tree roots / fall)		-	Vegetation set back from pumpstations enforced - including overhead power. Provide alternative power sources e.g. Generators	Allocate emergency funds for repair works after an event Increase budget for maintenance work	Allocate emergency funds for repair works after an event Increase budget for maintenance work
Snow (and extreme cold days)		-	Provide automated internal building temperature management.	Allocate emergency funds for repair works after an event Increase budget for maintenance work	-

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Pumpstations - Water					
Increased precipitation, flooding, landslides		Relocation of water pumpstations outside areas of exposure. Relocation of wastewater pumpstations along with feeder stations (to maintain gravity flows)	Construct bund walls including for all electrical systems. Where practical also lift electrical systems above agreed flood event level	Allocate emergency funds for repair works after an event Increase budget for maintenance work Prepare alternative access routes/options to access sites	-
Increased temperature and hot days		-	Allow for exansion at critical joints (above ground or within 0.5 m below ground)	-	
Drought		-	Increase pump capacity and critical rising main capacity. Increase number of pumpstations in conjunction with sources	Prepare and implement water conservation plan	Prepare and implement water conservation plan
Sea-level rise		-	Construct bund walls around underground chambers e.g. Valve pits, cables to prevent ingress of seawater	Monitor ground conditions (saturation, composition). Provide automated dewatering (to approved disposal points)	Automated dewatering provided
Wind (tree roots / fall)		-	Set back from pumpstations enforced	Allocate emergency funds for repair works after an event Increase budget for maintenance work	Allocate emergency funds for repair works after an event Increase budget for maintenance work

Waimakariri District Council 3 Waters [W, WW, SW] Adaptation Strategies					
Climate Hazard	**Note**	**Delay and Re-locate**	**Harden and Protect**	**Accommodate and Maintain or Delayed Investment**	**Accept or Abandon**
Snow (and extreme cold days)		-	Provide automated internal building temperature management. Ensure external chemical / material storage conditions keep products within specification	Allocate emergency funds for repair works or resupply after an event Increase budget for maintenance work	-

APPENDIX H- WAIMAKARIRI DISTRICT COUNCIL 30 Year Climate Change budget

Appendix Table 23: Waimakariri District Council -3 Waters Adaptation Strategies

Amount	Scheme	Service	Adaption Method	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
$151,133.49	Kaiapoi	Stormwater	Accommodate and Maintain (0.01%)	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$2,380,449.67	Kaiapoi	Stormwater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97
$0.00	Kaiapoi	Stormwater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$106,780.00	Other	Stormwater	Accommodate and Maintain (0.01%)	10,678.00	10,678.00	10,678.00	10,678.00	10,678.00	10,678.00	10,678.00	10,678.00	10,678.00	10,678.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$503,727.44	Other	Stormwater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50,372.74	50,372.74	50,372.74	50,372.74	50,372.74	50,372.74	50,372.74	50,372.74	50,372.74	50,372.74
$0.00	Other	Stormwater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$2,485.03	Oxford	Stormwater	Accommodate and Maintain (0.01%)	248.50	248.50	248.50	248.50	248.50	248.50	248.50	248.50	248.50	248.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$92,468.10	Oxford	Stormwater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9,246.81	9,246.81	9,246.81	9,246.81	9,246.81	9,246.81	9,246.81	9,246.81	9,246.81	9,246.81
$0.00	Oxford	Stormwater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$23,134.91	Pegasus	Stormwater	Accommodate and Maintain (0.01%)	2,313.49	2,313.49	2,313.49	2,313.49	2,313.49	2,313.49	2,313.49	2,313.49	2,313.49	2,313.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$97,965.25	Pegasus	Stormwater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9,796.52	9,796.52	9,796.52	9,796.52	9,796.52	9,796.52	9,796.52	9,796.52	9,796.52	9,796.52
$0.00	Pegasus	Stormwater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$197,807.32	Rangiora	Stormwater	Accommodate and Maintain (0.01%)	19,780.73	19,780.73	19,780.73	19,780.73	19,780.73	19,780.73	19,780.73	19,780.73	19,780.73	19,780.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$1,841,895.47	Rangiora	Stormwater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	184,189.55	184,189.55	184,189.55	184,189.55	184,189.55	184,189.55	184,189.55	184,189.55	184,189.55	184,189.55
$0.00	Rangiora	Stormwater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$0.00	Woodend	Stormwater	Accommodate and Maintain (0.01%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$0.00	Woodend	Stormwater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$0.00	Woodend	Stormwater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$208,395.57	Kaiapoi	Wastewater	Accommodate and Maintain (0.01%)	20,839.56	20,839.56	20,839.56	20,839.56	20,839.56	20,839.56	20,839.56	20,839.56	20,839.56	20,839.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$3,684,153.33	Kaiapoi	Wastewater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	368,415.33	368,415.33	368,415.33	368,415.33	368,415.33	368,415.33	368,415.33	368,415.33	368,415.33	368,415.33
$217,979.33	Kaiapoi	Wastewater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21,797.93	21,797.93	21,797.93	21,797.93	21,797.93	21,797.93	21,797.93	21,797.93	21,797.93	21,797.93
$54,462.67	Other	Wastewater	Accommodate and Maintain (0.01%)	5,446.27	5,446.27	5,446.27	5,446.27	5,446.27	5,446.27	5,446.27	5,446.27	5,446.27	5,446.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$12,338,446.85	Other	Wastewater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,233,844.68	1,233,844.68	1,233,844.68	1,233,844.68	1,233,844.68	1,233,844.68	1,233,844.68	1,233,844.68	1,233,844.68	1,233,844.68
$294,349.68	Other	Wastewater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29,434.97	29,434.97	29,434.97	29,434.97	29,434.97	29,434.97	29,434.97	29,434.97	29,434.97	29,434.97
$19,211.62	Oxford	Wastewater	Accommodate and Maintain (0.01%)	1,921.16	1,921.16	1,921.16	1,921.16	1,921.16	1,921.16	1,921.16	1,921.16	1,921.16	1,921.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$650,693.71	Oxford	Wastewater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65,069.37	65,069.37	65,069.37	65,069.37	65,069.37	65,069.37	65,069.37	65,069.37	65,069.37	65,069.37
$1,137,578.67	Oxford	Wastewater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	113,757.87	113,757.87	113,757.87	113,757.87	113,757.87	113,757.87	113,757.87	113,757.87	113,757.87	113,757.87
$28,281.09	Pegasus	Wastewater	Accommodate and Maintain (0.01%)	2,828.11	2,828.11	2,828.11	2,828.11	2,828.11	2,828.11	2,828.11	2,828.11	2,828.11	2,828.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$903,872.43	Pegasus	Wastewater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90,387.24	90,387.24	90,387.24	90,387.24	90,387.24	90,387.24	90,387.24	90,387.24	90,387.24	90,387.24
$0.00	Pegasus	Wastewater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$238,923.46	Rangiora	Wastewater	Accommodate and Maintain (0.01%)	23,892.35	23,892.35	23,892.35	23,892.35	23,892.35	23,892.35	23,892.35	23,892.35	23,892.35	23,892.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$1,759,810.54	Rangiora	Wastewater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	175,981.05	175,981.05	175,981.05	175,981.05	175,981.05	175,981.05	175,981.05	175,981.05	175,981.05	175,981.05
$0.00	Rangiora	Wastewater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$55,490.17	Woodend	Wastewater	Accommodate and Maintain (0.01%)	5,549.02	5,549.02	5,549.02	5,549.02	5,549.02	5,549.02	5,549.02	5,549.02	5,549.02	5,549.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$1,362,330.48	Woodend	Wastewater	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	136,233.05	136,233.05	136,233.05	136,233.05	136,233.05	136,233.05	136,233.05	136,233.05	136,233.05	136,233.05
$235,600.24	Woodend	Wastewater	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23,560.02	23,560.02	23,560.02	23,560.02	23,560.02	23,560.02	23,560.02	23,560.02	23,560.02	23,560.02
$20,746.73	Kaiapoi	Water Supplies	Accommodate and Maintain (0.01%)	2,074.67	2,074.67	2,074.67	2,074.67	2,074.67	2,074.67	2,074.67	2,074.67	2,074.67	2,074.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$901,974.32	Kaiapoi	Water Supplies	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90,197.43	90,197.43	90,197.43	90,197.43	90,197.43	90,197.43	90,197.43	90,197.43	90,197.43	90,197.43
$403,801.47	Kaiapoi	Water Supplies	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40,380.15	40,380.15	40,380.15	40,380.15	40,380.15	40,380.15	40,380.15	40,380.15	40,380.15	40,380.15
$24,615.08	Other	Water Supplies	Accommodate and Maintain (0.01%)	2,461.51	2,461.51	2,461.51	2,461.51	2,461.51	2,461.51	2,461.51	2,461.51	2,461.51	2,461.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$1,896,237.38	Other	Water Supplies	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	189,623.74	189,623.74	189,623.74	189,623.74	189,623.74	189,623.74	189,623.74	189,623.74	189,623.74	189,623.74
$299,229.45	Other	Water Supplies	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29,922.95	29,922.95	29,922.95	29,922.95	29,922.95	29,922.95	29,922.95	29,922.95	29,922.95	29,922.95
$16,385.79	Oxford	Water Supplies	Accommodate and Maintain (0.01%)	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	15,113.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$1,663,952.92	Oxford	Water Supplies	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97	238,044.97
$155,179.76	Oxford	Water Supplies	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$0.00	Pegasus	Water Supplies	Accommodate and Maintain (0.01%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$0.00	Pegasus	Water Supplies	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$0.00	Pegasus	Water Supplies	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$89,926.21	Rangiora	Water Supplies	Accommodate and Maintain (0.01%)	8,992.62	8,992.62	8,992.62	8,992.62	8,992.62	8,992.62	8,992.62	8,992.62	8,992.62	8,992.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$6,480,657.38	Rangiora	Water Supplies	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	648,065.74	648,065.74	648,065.74	648,065.74	648,065.74	648,065.74	648,065.74	648,065.74	648,065.74	648,065.74
$329,873.67	Rangiora	Water Supplies	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32,987.37	32,987.37	32,987.37	32,987.37	32,987.37	32,987.37	32,987.37	32,987.37	32,987.37	32,987.37
$14,479.38	Woodend	Water Supplies	Accommodate and Maintain (0.01%)	1,447.94	1,447.94	1,447.94	1,447.94	1,447.94	1,447.94	1,447.94	1,447.94	1,447.94	1,447.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$994,188.37	Woodend	Water Supplies	Harden and Protect (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	99,418.84	99,418.84	99,418.84	99,418.84	99,418.84	99,418.84	99,418.84	99,418.84	99,418.84	99,418.84
$0.00	Woodend	Water Supplies	Relocate (120%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	CON202138-02 / 240207016698
REPORT TO:	KAIAPOI-TUAHIWI COMMUNITY BOARD
DATE OF MEETING:	18 March 2024
AUTHOR(S):	Dominic Mansbridge, Project Engineer Joanne McBride, Roading and Transport Manager
SUBJECT:	Proposal that the Tuahiwi Footpath be named "Johnno's Way"
ENDORSED BY: (for Reports to Council, Committees or Boards)	General Manager / pp Chief Executive

1. SUMMARY

1.1. The purpose of this report is to seek the Boards approval to name the new footpath in Tuahiwi "Johnno's Way" in commemoration of Johnno Crofts.

1.2. The Tuahiwi footpath was constructed in 2023 and is a 1.1-kilometre path that stretches from the Tuahiwi Urupa (Te Uru Ti) in the north, to 142 Tuahiwi Road in the south.

1.3. Following completion of the footpath, Mayor Gordon has met with representatives from Ngāi Tūāhuriri who propose to have an opening celebration for the path and for it to recognise Johnno Crofts and Denise Hamilton.

1.4. Johnno Crofts had a very large part in building the relationship between the Waimakariri District Council and Ngāi Tūāhuriri. He campaigned for the construction of the path and after his passing Denise Hamilton continued to advocate for the path until her death in 2022.

1.5. A seat commemorating Johnno Crofts and Denise Hamilton is to be installed along the path outside the Tuahiwi Reserve.

1.6. This proposal provides an opportunity to create a permanent memorial to important figures in the community.

2. RECOMMENDATION

THAT the Kaiapoi-Tuahiwi Community Board:

(a) **Receives** Report No. 240207016698.

(b) **Approves** the naming of the footpath, on the eastern side of Tuahiwi Road, starting at the Tuahiwi Urupa (Te Uru Ti) in the north, through to no. 142 Tuahiwi Road in the south, Tuahiwi as "Johnno's Way".

(c) **Approves** a memorial bench and plaque being installed adjacent to the new path, outside the Tuahiwi Reserve, to commemorate Johnno Crofts and Denise Hamilton.

(d) **Notes** that the cost to supply and installation of a memorial bench is estimated to be $4,278 excluding GST, and that this will be funded from Tuahiwi Footpath Budget (PJ 102011.000.5135) which has sufficient budget to allow for the bench and plaque.

(e) **Notes** that Ngāi Tūāhuriri have proposed to hold the opening celebrations on Wednesday 27 March 2024.

(f) **Notes** that the views of the wider community have not been sought on this proposal.

(g) **Circulates** this report to Utilities and Roading Committee for their information.

3. BACKGROUND

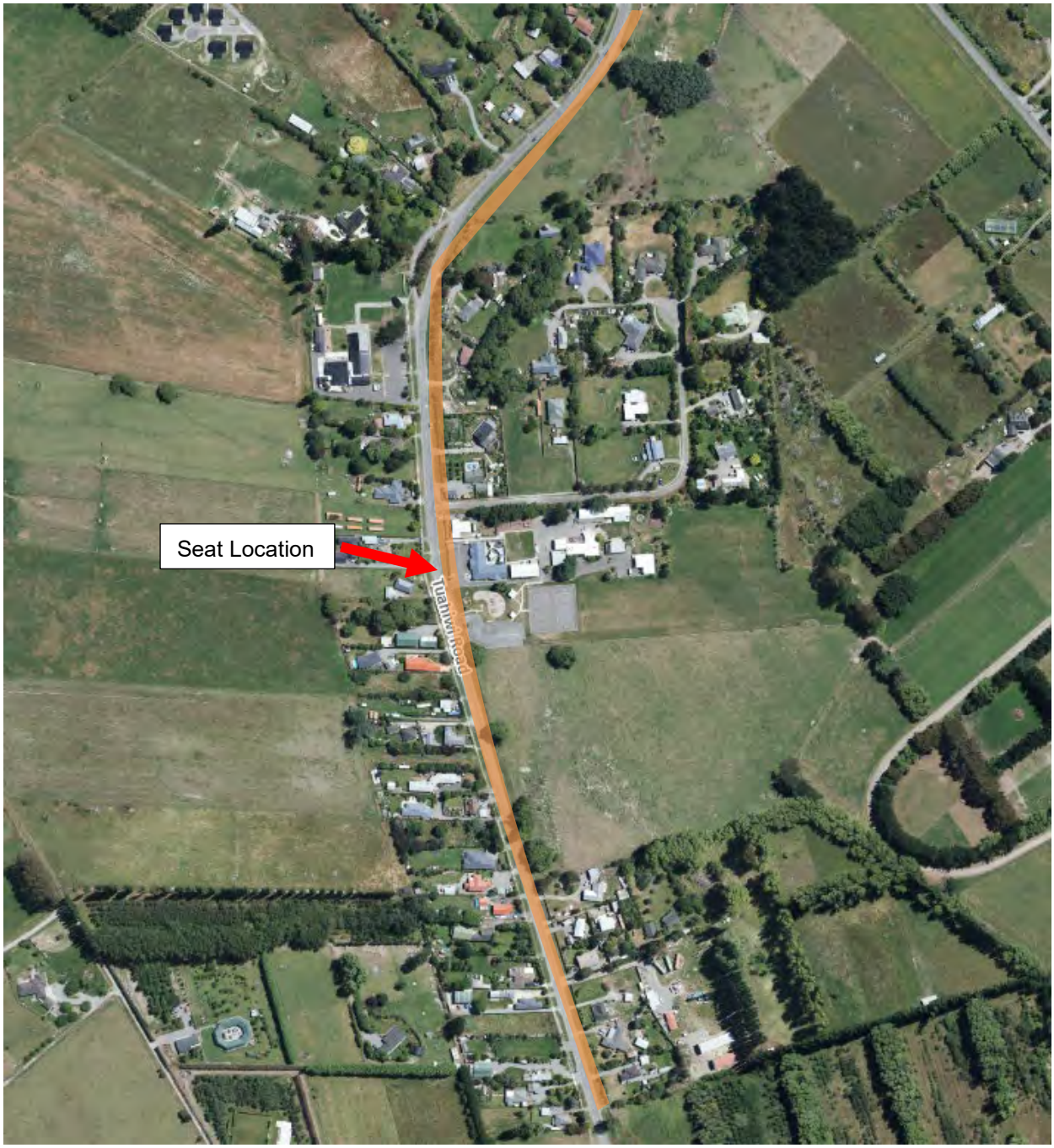

Figure 1 – Footpath and Seat Location

3.1. The Construction of the new footpath was largely carried out in the 2022 / 2023 financial year and sought to improve pedestrian connectivity within Tuahiwi.

3.2. Construction on the path commenced in April 2023, and was largely completed by June 2023, however there were remedial works which extended into July which meant the full project could not be full completed and the budget and expenditure had to be carried over into 2023/24.

3.3. Representatives of the Ngāi Tūāhuriri have proposed that the new footpath in Tuahiwi be named Johnno's Way to commemorate Johnno Crofts, and that a memorial bench be installed outside of the Tuahiwi Reserve.

3.4. Johnno Crofts was the Kaumatua of the Council for a number of years. His family originated from and resided in Tuahiwi. Johnno was a strong advocate for his community, successfully campaigning for council to construct a concrete footpath outside the Marae. Over many years Johnno advocated for a footpath to be constructed on the eastern side of the road to recognise the importance of the Urupa. Denise Hamilton took up the advocacy for this after Johnno passed away. She attended and spoke at several Council meetings including the Annual Plan which led to budget provision being approved. Following an informal meeting with the Mayor it was recommended that the name for the footpath be "Johnno's Way" to recognise the significant role Johnno had that led to the footpath being constructed.

4. ISSUES AND OPTIONS

4.1. The Board have the following options:

4.1.1. Option One - Approve the name suggested by Ngāi Tūāhuriri representatives as "Johnno's Way".

This is the recommended option given the proposal has come directly from Ngāi Tūāhuriri representatives and acknowledges the important roles that Johnno Crofts and Denise Hamilton have played within the Community.

4.1.2. Option Two – Decline the name suggested by Ngāi Tūāhuriri's and seek wider community views on the naming of the footpath.

This is not the recommended option as Tuahiwi is the home of Ngāi Tūāhuriri and the area has played a vital role in Ngāi Tūāhuriri history. As such Ngāi Tūāhuriri is the main stakeholder and have had input into this proposal, rejecting this proposal would likely cause reputational damage between the Council and Ngāi Tūāhuriri,

The bench and plaque commemorating Johnno Crofts and Denise Hamilton have been made and preparation for installation has been tentatively organized with a contractor for the week prior to the opening of the path. There is an estimated cost of $911 associated with these preparations.

4.1.3. Option Three – Decline the recommendation and do not name the path.

While it is uncommon to name paths, this is considered to be a unique situation and given the importance of Tuahiwi and its history. Therefore, this is not the recommended option.

4.2. It is noted that the naming of the footpath will not affect or change the adjacent road name, which will remain "Tuahiwi Road".

4.3. The Management Team has reviewed this report and support the recommendations.

5. IMPLICATIONS FOR COMMUNITY WELLBEING

5.1. There are not implications on community wellbeing by the issues and options that are the subject matter of this report.

6. COMMUNITY VIEWS

6.1. Mana whenua

Te Ngāi Tūāhuriri hapū are likely to be affected by or have an interest in the subject matter of this report.

This report requests to name the footpath in Tuahiwi as suggested by Ngāi Tūāhuriri representatives.

6.2. Groups and Organisations

There are not groups and organisations likely to be affected by, or to have an interest in the subject matter of this report.

6.3. Wider Community

The wider community is not likely to be affected by, or to have an interest in the subject matter of this report.

7. OTHER IMPLICATIONS AND RISK MANAGEMENT

7.1. Financial Implications

Construction of the Tuahiwi Gritted Footpath commenced in April 2023, and was largely completed by June 2023, however there were remedial works which extended into July which meant the full project could not be full completed and capitalised, and as such the budget and expenditure had to be carried over into 2023/24.

The full project budget is $450,000 of which the current expenditure is $437,822.

The full cost of implementing this proposal is $4,278 and is funded from the Tuahiwi Footpath Budget. As such there is sufficient budget for this proposal to proceed. The ongoing maintenance of the memorial bench is likely to be modest.

This budget is included in the Annual Plan/Long Term Plan.

7.2. Sustainability and Climate Change Impacts

The recommendations in this report do not have sustainability and/or climate change impacts.

7.3 Risk Management

There are not risks arising from the adoption/implementation of the recommendations in this report.

7.4 Health and Safety

There are not health and safety risks arising from the adoption/implementation of the recommendations in this report.

8. CONTEXT

8.1. Consistency with Policy

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

8.2. Authorising Legislation

8.3. Consistency with Community Outcomes

The Council's community outcomes are relevant to the actions arising from recommendations in this report.

Social

- Public spaces are diverse, respond to changing demographics and meet local needs for leisure and recreation.

Cultural

- Public spaces express our cultural identities and help to foster an inclusive society.
- The distinctive character of our takiwā, arts and heritage are preserved and enhanced.
- Local arts, culture and heritage are able to make a growing contribution to the community and economy.

8.4. **Authorising Delegations**

The Kaiapoi-Tuahiwi Community Board has delegated authority to receive this report and accept the recommendations on behalf of the Council.