Safety and Resilience Committee
6 March 2025

Meeting will be held in the Council Chamber at Level 2, Philip Laing House
144 Rattray Street, Dunedin
Live streamed on the ORC Official YouTube channel

Members:
Cr Gary Kelliher (Co-Chair)
Cr Alan Somerville (Co-Chair)
Cr Alexa Forbes
Cr Michael Laws
Cr Kevin Malcolm
Cr Lloyd McCall
Cr Tim Mepham
Cr Andrew Noone
Cr Gretchen Robertson
Cr Elliot Weir
Cr Kate Wilson

Senior Officer: Richard Saunders Chief Executive

Meeting Support: Cara Jordan Governance Support Officer

06 March 2025 08:30 AM

Agenda Topic **Page**

1. WELCOME

2. APOLOGIES

No apologies were submitted prior to publication of the agenda.

3. PUBLIC FORUM

No requests to address the Committee under Public Forum were received.

4. CONFIRMATION OF AGENDA

Note: Any additions must be approved by resolution with an explanation as to why they cannot be delayed until a future meeting.

5. DECLARATION OF INTERESTS

Members are reminded of the need to stand aside from decision-making when a conflict arises between their role as an elected representative and any private or other external interest they might have. Councillor interests are published on the ORC website.

6. CONFIRMATION OF MINUTES 3

Confirming the Minutes of the Safety & Resilience Committee 7 November 2024 as a true and accurate record.

7. OPEN ACTIONS FROM THE RESOLUTIONS OF THE COMMITTEE

There are currently no open actions for this Committee.

8. PRESENTATIONS

9. MATTERS FOR CONSIDERATION 7

9.1 Programme Update - Climate Resilience and RiF Tranche 1 7

To provide an update on the progress of the Otago Regional Council Climate Resilience and Regional Infrastructure Fund (RiF) Tranche 1 programmes.

9.2 Programme Update - Renewals Project 17

To provide an update on the progress of projects within the Otago Regional Council Engineering renewals programme. This report presents the projects planned for ORC Engineering assets intended to be underway within year 1 of the 2024 - 2034 Long term plan. Projects that are receiving central government funding are excluded from this report as they are reported separately.

9.3 Flood Forecasting and Public Information 26

To describe the flood warning system and service provided by the Otago Regional Council (ORC).

9.4 Clutha Delta Natural Hazards Adaptation 35

To update Council on progress with the Clutha Delta natural hazards adaptation programme including natural hazards assessments, and programme and engagement planning.

10. CLOSURE

Otago Regional Council

Safety and Resilience Committee
MINUTES

Minutes of an ordinary meeting of the Safety and Resilience Committee held in the Council Chamber, Level 2 Philip Laing House, 144 Rattray Street, Dunedin on Thursday 7 November 2024, commencing at 1:00 PM.

PRESENT

Cr Gary Kelliher	*(Co-Chairperson)*
Cr Alan Somerville	*(Co-Chairperson)*
Cr Alexa Forbes	*(online)*
Cr Michael Laws	*(online)*
Cr Kevin Malcolm	
Cr Lloyd McCall	
Cr Tim Mepham	
Cr Andrew Noone	
Cr Gretchen Robertson	
Cr Elliot Weir	
Cr Kate Wilson	

1. WELCOME

Chair Kelliher welcomed Councillors, members of the public and staff to the meeting at 1 pm. Staff present included Richard Saunders (Chief Executive), Anita Dawe (GM Regional Planning and Transport), Tom Dyer (GM Manager Science and Resilience) Joanna Gilroy (GM Environmental Delivery), Amanda Vercoe (GM Strategy and Customer, Deputy CE), Kylie Darragh (Governance Support).

2. APOLOGIES

Resolution: Cr Somerville Moved, Cr Noone Seconded:

That the apologies for Cr Mepham and Cr Robertson (for lateness) be accepted.

MOTION CARRIED

3. PUBLIC FORUM

No requests to address the Committee under Public Forum were received.

4. CONFIRMATION OF AGENDA

The agenda was confirmed as published.

5. DECLARATIONS OF INTERESTS

No changes to Councillor Declarations of Interests were noted.

6. PRESENTATIONS

No presentations were held.

7. CONFIRMATION OF MINUTES

Resolution: Cr Somerville Moved, Cr Weir Seconded

That the minutes of the Safety and Resilience Committee meeting held on 7 August 2024 be received and confirmed as a true and accurate record.

MOTION CARRIED

8. OPEN ACTIONS FROM RESOLUTIONS OF THE COMMITTEE

There are currently no open actions for this committee.

Cr Robertson joined the meeting at 1:20 pm.

9. MATTERS FOR CONSIDERATION

9.1. Roxburgh Natural Hazards Management

[YouTube 9:10] This paper updated the Council on the progress with the Roxburgh debris flows hazard management programme. Julion Wright, Natural Hazards Analyst, Tim van Woerden, Acting Manager Natural Hazards and Tom Dyer, General Manager Science and Resilience were available to respond to questions on the report.

Resolution SRC24-113: Cr Malcolm Moved, Cr McCall Seconded

That the Committee:

1. ***Notes** this report.*

MOTION CARRIED

9.2. Head of Lake Whakatipu Natural Hazards Adaptation Programme

[YouTube 46:35] This report updated the Committee on the progress related to the development of a natural hazard's adaptation strategy for the Head of the Lake Whakatipu area. Toan Nguyen, Senior Natural Hazards Adaptation Specialist (online), Ann Conroy, Team Leader Natural Hazards Adaptation, Tim van Woerden, Acting Manager Natural Hazards, Tom Dyer, General Manager Science and Resilience were present to respond to questions.

Resolution SRC24-114: Cr Somerville Moved, Cr Wilson Seconded

That the Committee:

1. ***Notes** this report.*
2. ***Notes** the Head of Lake Whakatipu natural hazards adaptation work programme progress and expenditure update.*
3. ***Recommends** that Council endorses the use of the information presented in the recent reports 1) Glenorchy and Kinloch natural hazards risk analysis, and 2) assessments of floodplain management interventions for the Dart and Rees Floodplains to inform natural hazards management and adaptation planning for the Head of Lake Whakatipu area.*

MOTION CARRIED

9.3. North East Valley Flood Risk Mitigation

[Youtube 1:01:00] This paper updated the committee on the programme for investigations into reducing the flood risk in North East Valley (Lindsay Creek). Tim van Woerden, Senior Natural Hazards Analyst (Acting Manager Natural Hazards), Tom Dyer, General Manager Science and Resilience, were available to respond to questions.

Resolution SRC24-115: Cr Wilson Moved, Cr Noone Seconded

That the Committee:

1. ***Notes** this report.*
2. ***Notes** the significance of the flood hazard risk in North East Valley.*
3. ***Endorse** the need for a programme for investigations into reducing the flood risk in North East Valley.*
4. ***Notes** the proposed programme for investigations into reducing the flood risk in North East Valley part of the draft Long-Term Plan 2024-2034 and the Infrastructure Strategy 2024-2054.*

MOTION CARRIED

9.4. Otago Region Natural Hazards Prioritisation

[YouTube 1:20:10] This paper presented the approach developed for the prioritisation of future natural hazards activities within the Otago region. Tim van Woerden, Senior Natural Hazards Analyst, Acting Manager Natural Hazards, Tom Dyer, General Manager Science and Resilience, were available to respond to questions.

Resolution SRC24-116: Cr Malcolm Moved, Cr Somerville Seconded

That the Committee:

1. ***Notes** this report.*
2. ***Notes** the proposed scope and intent of the natural hazard's prioritisation framework.*

MOTION CARRIED

10. CLOSURE

There was no further business and Chair Kelliher declared the meeting closed at 2:25 pm.

_____ _____

Chairperson Date

9.1. Programme Update - Climate Resilience and RiF Tranche 1

Prepared for: Safety and Resilience Comm

Report No. OPS2431

Activity: Governance Report

Author: Brett Paterson, Team Leader Programme Management

Endorsed by: Tom Dyer, General Manager Science and Resilience

Date: 6th March 2025

PURPOSE

[1] To provide an update on the progress of the Otago Regional Council Climate Resilience and Regional Infrastructure Fund (RiF) Tranche 1 programmes.

RECOMMENDATION

That the Committee:

1) ***Receives*** *this report.*
2) ***Notes*** *the progress with* Otago Regional Council Climate Resilience and Regional Infrastructure Fund (RiF) Tranche 1 programmes.

Otago Regional Council Climate Resilience Programme

[2] The Climate resilience programme was made up of four flood protection related projects ("shovel-ready" projects) that received approval for Provincial Growth Fund (PGF) funding valued at $5.44 million in 2020. Council approved funding of up to $3.2 million towards these projects on 23rd September 2020. The PGF funding was intended to create jobs and achieve climate resilience objectives. ORC's projects were part of a package of 55 flood protection projects with a total value of $337 million being delivered by regional councils/unitary authorities. The government co-invested $217 million in these projects, through the Ministry of Business, Innovation and Employment (MBIE).

[3] The four ORC Climate Resilience Programme projects were:

a. West Taieri Contour Channel and Bridges Upgrade (Contour Channel project),
b. Upgrade and Installation of Flow Management Structures at Robson Lagoon, Lower Clutha (Robson Lagoon project),
c. Riverbank Road Floodbank Stabilisation, Lower Clutha (Riverbank Road project),
d. Outram Flood Seepage Mitigation (Outram project)[1].

[4] All four projects have now been completed with the last of the Contour Channel floodbank being completed in December 2024 and site disestablishment in January 2025.

[1] This project is referred to as Outram Flood Protection in the MBIE Funding Agreement.

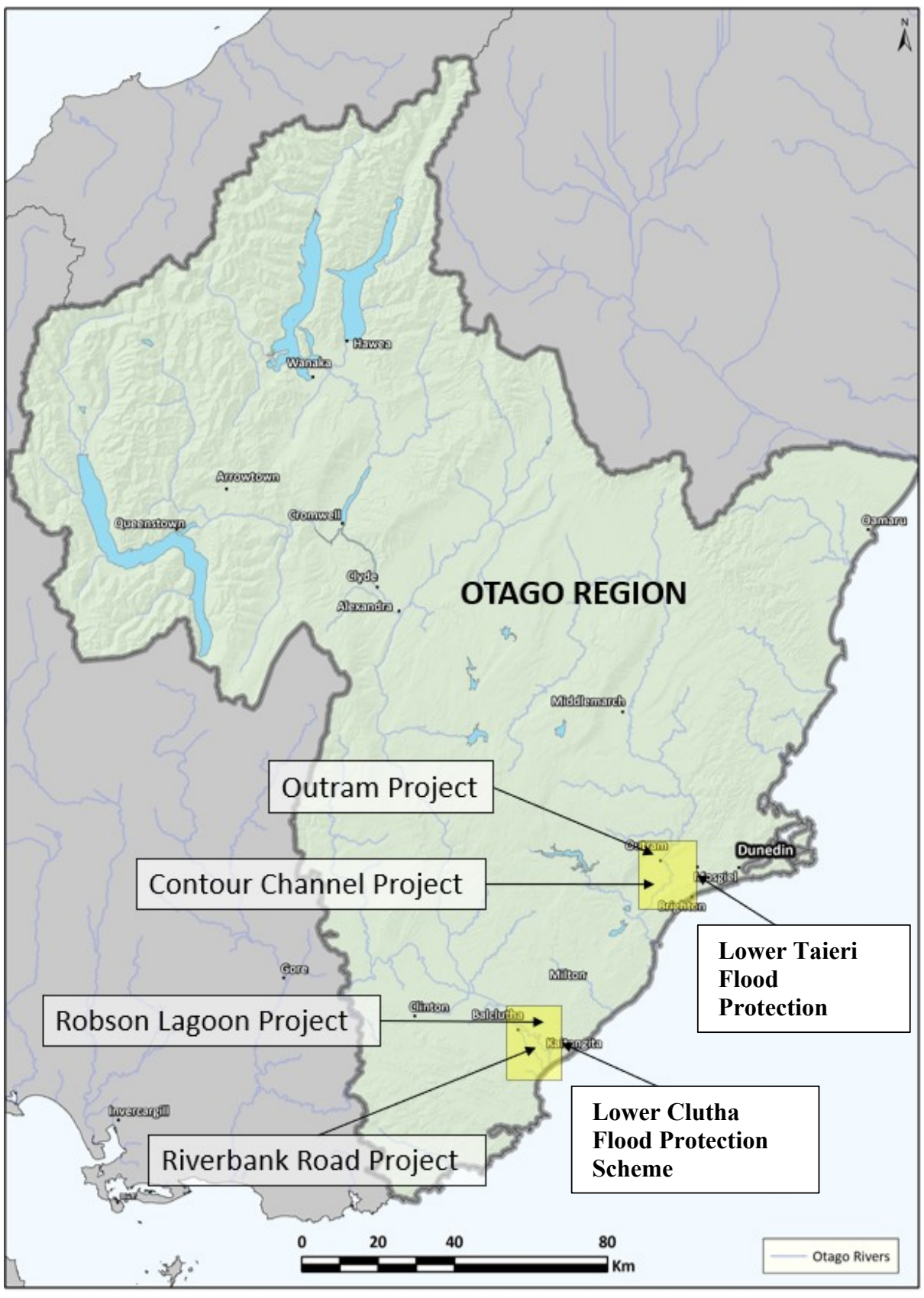

Figure 1: Climate Resilience Programme – Project location map.

Contour Channel Project

[5] The Contour Channel project involved the reconstruction of 3.3Km of floodbank between Miller Rd and Otakia Rd, and the replacement of two bridges (bridges 11 and 12) crossing the channel. A further bridge replacement (bridge 14) was included in the original scope of the project but was deferred to ensure the project remained within available budget. Bridge 14 has now been included within the RiF Tranche 1 project.

[6] The project was delivered under three construction contracts being Stage 5 and 6 floodbank construction, Stage 7 to 10 Floodbank construction, and Bridge 11 and 12 construction. The project was the continuation of a programme that ORC commenced in 2007 with Stages 1 to 4 completed by 2013.

[7] Construction of Stages 5 and 6 started on site on 24 January 2022. The works progressed well with only minor disruption due to poor weather. The site works were completed 6 May 2022 and practical completion was issued for the contract on 2 June 2022.

[8] Stage 7 of the floodbank commenced in January 2023 and progressed well over the summer construction season with Stage 7 being fully completed, and work beginning on Stage 8 before the site was disestablished for winter at the end of April 2023. Work recommenced on October 2023 from the Miller Rd end of the site with stages 9 and 10 being completed before disestablished for winter at the end of May 2024. Work recommenced again in November 2024 following a wet spring with the final section of floodbank completed in December 2024.

[9] Construction of Bridge 11 began onsite in March 2023 and progressed over autumn and into winter months. Bridge 11 was completed in September 2023. Bridge 12 construction began January 2024 and was completed in April 2024.

[10] All construction work within the project is now complete and the required completion reports have been submitted to MBIE.

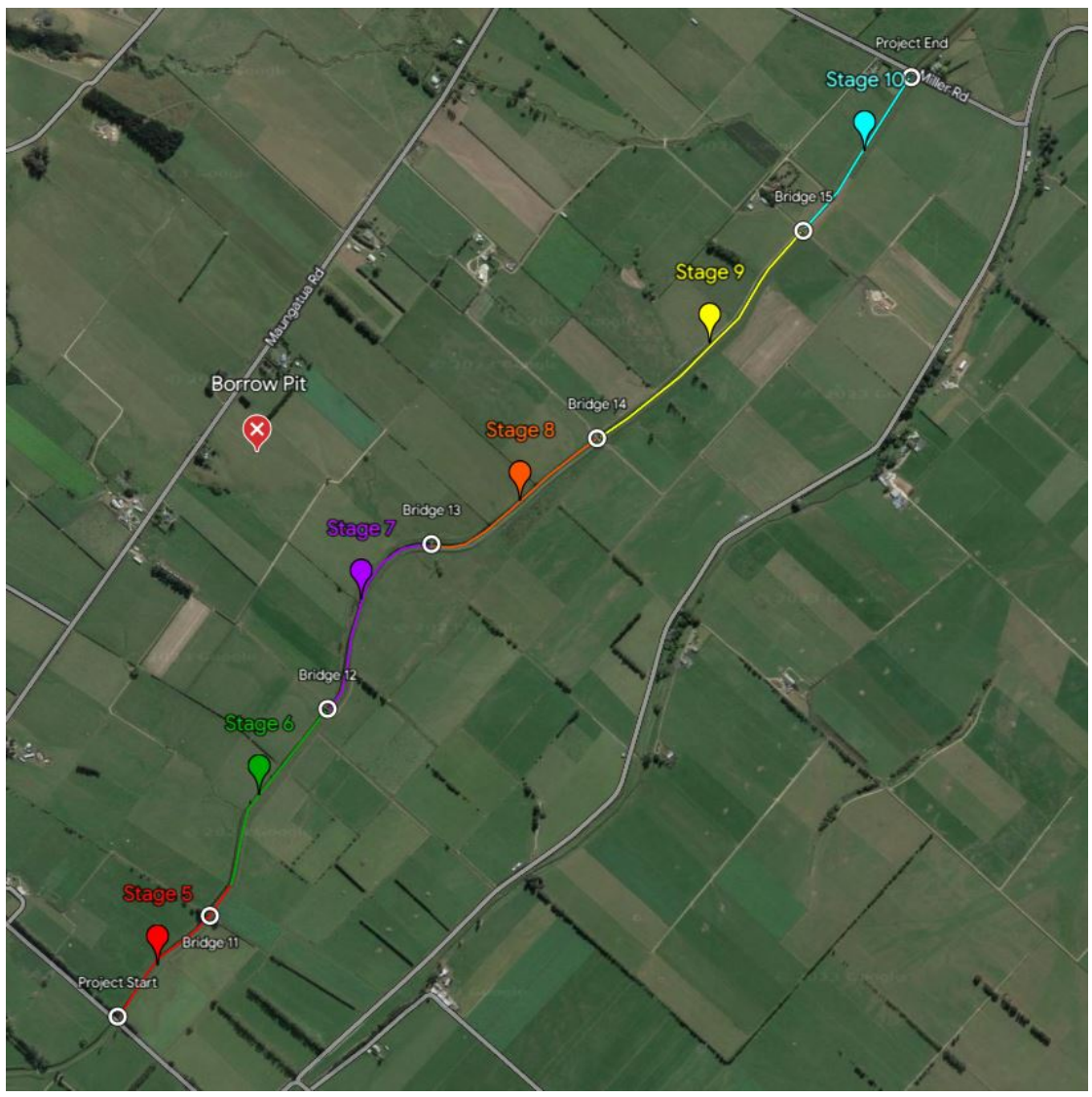

Figure 2: Contour Channel Stage map.

Figure 3: Bridge 11 replacement underway at Contour Channel (18 July 2023).

Outram Weighting Blanket

[11] The Outram weighting blanket is located on private land across 48, 54, 60 Bell Street and 528 Allanton Road along the toe of the floodbank. The weighting blanket, comprising of approximately 9,000 cubic metres of earth fill, reduces the seepage pressure within the floodbank and hence the likelihood of piping that may lead to catastrophic collapse of the floodbank during a flood event.

[12] Construction of the weighting blanket began in October 2022 with the major earthworks completed by late December 2022. Installation of drainage, fencing and reseeding occurred in early 2023. The works were fully completed and the required completion reports submitted to MBIE in July 2023.

Figure 4: Construction progressing at Outram site (22 November 2022).

Robson Lagoon

[13] The regionally significant Lake Tuakitoto Wetland complex, which includes Robson Lagoon, is located in the Clutha/Mata-Au catchment, approximately 7km northeast of Balclutha, Otago. This project has upgraded flow management structures within Robson Lagoon to improve flow during flood events, whilst maintaining sustainable water levels during normal and low flow conditions.

[14] The contractor established onsite on 10 January 2022 and installation of the instream structures was completed by March 2022. Following delivery and installation of long lead time automation equipment, the project works was completed in November 2022.

[15] The project is now fully complete with all required reporting submitted and accepted by MBIE.

Figure 5: (left): Opening speeches at Robson Lagoon field day and Figure 6: (right): The new control gate.

Riverbank Road

[16] Following the February 2020 flood, repairs were required at several sites along Riverbank Road in the Lower Clutha Flood Protection and Drainage Scheme. Four sites were included as part of ORC's Climate Resilience Programme.

[17] Damage at three of the sites was repaired using an environmentally friendly vegetative solution, while repair at the site adjacent to the Riverbank Road bridge at Stirling, required detailed investigation, design, and repair using approximately 3,500 cubic metres of rock to re-establish protection of 300m of floodbank (Figure 7).

[18] Work at the four sites was completed at the end of December 2021. The project is now fully complete with all required reporting submitted and accepted by MBIE.

Figure 6: Riverbank Road floodbank at bridge near Stirling (LC21), before(left) and after (right) reshaping and vegetation stabilisation.

Financial Summary of Climate Resilience Programme

[19] A summary of status of the ORC Climate Resilience Programme costs and funding is included in Table 1 below. The total budget as set out in the ORC/MBIE Funding Agreement is $8.5 million.

[20] MBIE committed 64% or $5.44 million towards this programme and ORC provided the remainder of the funding of $3.06 million.

[21] The breakdown by project showing expenditure to date for each project is included in Table 1. To date $8.34 million has been spent and ORC has claimed $5.44 million from MBIE.

Table 1: Climate Resilience funding summary.

Climate Resilience Programme as at 31 January 2023						
PROJECT	Project Budget Million $	MBIE Funding Committed Million $	ORC Funding Million $	Expenditure to Date Million $	MBIE Funding Received to date Million $	Est. Cost at Completion Million $
Contour Channel	5.73	3.67	2.06	5.29	3.67	5.45
Robson Lagoon	0.55	0.35	0.20	0.85	0.35	0.85
Riverbank Road	0.95	0.61	0.34	0.93	0.61	0.95
Outram	1.27	0.81	0.46	1.27	0.81	1.27
TOTAL	**8.50**	**5.44**	**3.06**	**8.34**	**5.44**	**8.52**

Regional Infrastructure Fund (RiF) Tranche 1

[22] The ORC has one project included within the RiF Tranche 1 programme being the continuation of the Contour Channel (West Taieri) Resilience Upgrade Project.

[23] Following approval by council at the August 2024 council meeting, ORC has entered into a funding agreement with the Ministry of Business, Innovation and Employment (MBIE). This RIF Grant Funding Agreement provides grant funding up to $5,400,000 (60% of total project cost) and requires the ORC to provide Co-Funding up to the value of $3,600,000 (40% of total project cost) as its component of total project costs. The expected total project cost is $9,000,000.

[24] The continuation of the Contour Channel (West Taieri) Resilience Upgrade Project includes the reconstruction of floodbank from Miller Road to Woodside Road, which is approximately 6.5 kilometres and includes the replacement or upgrade of bridges crossing the channel.

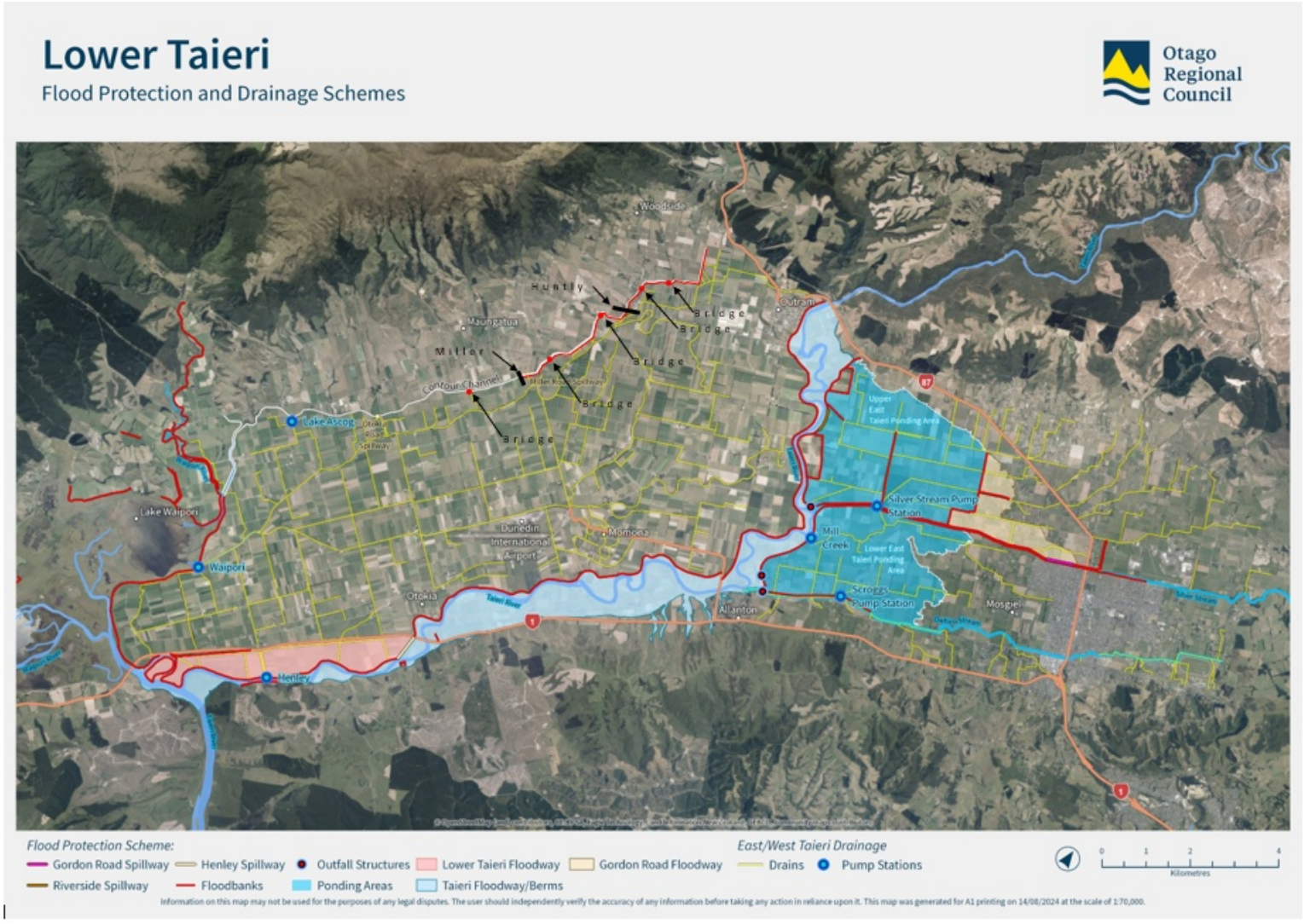

Figure 7: Map of Lower Taieri Flood Protection scheme indicating location of Contour Channel site.

[25] Construction work has already begun with the replacement of bridge 14. Work on the bridge began in October 2024 and is expected to be complete in March 2025.

Figure8: Bridge 14 construction progressing.

[26] Design and planning work is underway for the floodbank reconstruction. The floodbank design package has been awarded, survey work undertaken, and preliminary alignments developed. Borrow pits to provide the required fill source material have been identified and testing completed to confirm both the suitability of the material, and that sufficient quantity of material is available. Resource consent applications are in the process of being drafted to consent the floodbank works and borrow areas.

[27] The focus for the project over the coming months is to complete the design and consenting work for the floodbank reconstruction. It is anticipated that the construction works package will be tendered and awarded in Spring 2025.

[28] The next bridge work package will be developed once the final alignment and level of the reconstructed floodbank is confirmed through the floodbank design process. The floodbank design alignment is required to assess what work is needed to the existing bridges to fit with the upgrade floodbank.

[29] Overall the project is progressing as planned and is expected to meet schedule and budget expectations.

Financial Summary of Regional Infrastructure Fund (RiF) Tranche 1 Programme

[30] A summary of status of the ORC Regional Infrastructure Fund (RiF) Tranche 1 Programme costs and funding is included in Table 2 below.

Table 2: ORC Regional Infrastructure Fund (RiF) Tranche 1 Programme costs and funding.

Continuation of Contour Channel Resilience Upgrade (as at 31 January 2025)	
Budget	
Approved Project budget	***$9.0M***
MBIE Committed Funding	*$5.4M*
ORC Funding (Co-Funding)	*$3.6M*
MBIE funding received to date	*$0.33M**

Expenditure	
Committed expenditure (Value of contracts awarded)	*$1.26M*
Actual expenditure to date	*$0.82M*
Forecast cost at completion	*$9M*

** The first claim for the project (for the Q2 2024 / 2025) has been submitted to MBIE. Payment was received in February 2025.*

CONSIDERATIONS

Strategic Framework and Policy Considerations

[31] The projects presented within this report contribute to ORC's Resilience goals within the Strategic Directions of:

1. *Plans are in place to ensure that the region's most vulnerable communities (geographic and demographic) and ecosystems are resilient in the face of natural hazards.*

And*:*

2. *Our infrastructure is designed and built to accommodate variability and uncertainty associated with changing weather patterns and sea level rise.*

Financial Considerations

[32] Financial considerations are described in the report.

Significance and Engagement Considerations

[33] No considerations arising from this paper.

Legislative and Risk Considerations

[34] The MBIE funding agreements require ORC to fully cover any overspend within the programmes. This is a cost risk to ORC.

Climate Change Considerations

[35] The Contour Channel floodbank design includes climate change considerations with climate change scenarios allowed for within the design hydraulic model. Flood recovery has focused on reinstating like-for-like damaged infrastructure.

Communications Considerations

[36] There are no communications considerations with receiving this report.

NEXT STEPS

[37] Close Climate Resilience projects following the completion of all contract maintenance periods.

[38] Continue progressing the Regional Infrastructure Fund (RiF) Tranche 1 project to completion by December 2027.

[39] Continue to engage with MBIE and the River Managers Special Interest Group (SIG) to progress funding opportunities through the Regional Infrastructure Fund (RiF) Tranche 2 funding request submission.

ATTACHMENTS

Nil

9.2. Programme Update - Renewals projects

Prepared for: Safety and Resilience Comm

Report No. GOV2517

Activity: Governance Report

Author: Brett Paterson, Team Leader Programme Management

Endorsed by: Tom Dyer, General Manager Science and Resilience

Date: 6th March 2025

PURPOSE

[1] To provide an update on the progress of projects within the Otago Regional Council Engineering renewals programme. This report presents the projects planned for ORC Engineering assets intended to be underway within year 1 of the 2024 - 2034 Long term plan. Projects that are receiving central government funding are excluded from this report as they are reported separately.

RECOMMENDATION

That the Committee:

1) ***Receives*** *this report.*
2) ***Notes*** *the progress with* Otago Regional Council Engineering Renewals programme.

Lower Taieri Flood Protection Scheme

[2] **Riverside Spillway Investigations and Planning**

a. Project Phase: Investigation
b. Project Manager: Brett Paterson
c. LTP Budget: Year 1: $50k, Year 2: $150k, Years 4-10: $1,000k
d. Forecast Cost at Completion: $1,200,000

[3] The Riverside Spillway project seeks to investigate repair and upgrade options for the spillway which is prone to damage when in operation during flood events. An assessment by Tonkin and Taylor identified interim repair options to improve the spillways resilience, however these options have a high cost to implement. Alternatives spillway design options are being considered. The next steps include assessing at a high-level alternative spillway options and additional hydraulic model scenarios to further understand the flood risk associated with the spillway. The project is on track, with work progressing as planned and in line with the Long Term Plan.

Figure 1: Riverside Spillway operating November 2018

[4] **Silver Stream Capacity Maintenance**

a. Project Phase: Procurement
b. Project Manager: Brett Paterson
c. LTP Budget: Year 1: $200k, Year 2: $200k, Year 3: $200k, Years 4-10: $200k
d. Forecast Cost at Completion: $800,000

[5] The Silver Stream Capacity Maintenance project seeks to improve capacity to the Silver Stream by removing gravel and alluvium buildup. Resource consent and bylaw approval for extraction have been received in December 2024. Design work is nearing completion and the tender package for the first stage of work is currently on the market. The next steps include completing the procurement the first section of work. The project is on track, with an accelerated program to begin physical work this season.

[6] **Lower Pond Gravity Gates**

a. Project Phase: Design
b. Project Manager: Mike Burrows
c. LTP Budget: Year 1: $200k, Year 2: $1,000k, Year 3: $500k
d. Forecast Cost at Completion: $1,700,000

[7] The Lower Pond Gravity Gates project aims to investigate and repair the culvert and gates structures to prevent voids forming within the floodbank structure, and backflow of water from the Taieri River into the Lower Pond. The preliminary options report has been completed, and the recommended option of improvements to the existing structure including replacement of headwalls has been confirmed. The next steps include detailed design, obtaining consent, and procuring construction services. The project is on track, with work progressing as planned.

Figure 2: Lower pond gravity gates (upstream side)

[8] **Outram Feasibility Study**

a. Project Phase: Investigation
b. Project Manager Mike Burrows
c. LTP Budget: Year 1: $100k, Year 2: $100k, Year 3: $500k, Years 4-10: $4,300k
d. Forecast Cost at Completion: $5,000,000

[9] The Outram Feasibility Study aims to assess the structural integrity and risk of floodbank failure of the floodbank at Outram. The floodbank stability assessment has been completed and recommendations are being considered to inform the projects next steps. The project is progressing as planned.

West Taieri Drainage Scheme

[10] **Bridge 2 – Drain 10**

a. Project Phase: Design
b. Project Manager: Mike Burrows
c. LTP Budget: $500k
d. Forecast Cost at Completion: $500,000

[11] The existing Bridge 2 on Drain 10 has been identified as being in poor condition and requires repair or replacement. The project seeks to provide a fit for purpose bridge with sufficient load capacity for farming operations. Design services have been procured, site investigations completed, and a bridge replacement has been recommended. The next steps include assessing replacement options, completing detailed design and any required consenting work. The project is on track, with work progressing as planned and in line with the LTP.

Figure 3: Underside of bridge 2 indicating significant corrosion of beams

Leith Flood Protection Scheme

[12] **Leith Historic Walls: Feasibility**

a. Project Phase: Investigation
b. Project Manager: Brett Paterson
c. LTP Budget: Year 1: $100k, Year 2: $100k, Year 3: $1,100k
d. Forecast Cost at Completion: $1,300,000

[13] The Leith Historic Walls Feasibility project aims to evaluate the structural integrity of the historic walls between Forth St and Magnet Street. Stage 1, a desktop study and visual inspection has been completed, and the recommending report received to provide the scope for physical investigations (stage 2). The next steps include procuring the physical testing components of the investigations and obtaining any required consent and bylaw approvals for the investigation works. The results of Stage 2 will inform the Leith Walls Construction Project scheduled for year 4 of the LTP. The project is slightly delayed but still expected to achieve the required outputs as planned by the end of the 2025 / 2026 financial year.

Figure 4: Leith historic walls site extents

Lower Clutha Flood Protection and Drainage Scheme

[14] **Floodbank Realignment LC17**

a. Project Phase: Initiation
b. Project Manager: Brett Paterson
c. LTP Budget: Year 1: $50k, Year 2: $50k, Years 4-10: $1,000k
d. Forecast Cost at Completion: $1,100,000

[15] The Floodbank Realignment LC17 project involves relocating the floodbank adjacent to Riverbank Rd and removing or redistributing gravel in the Matau Branch of the Clutha River to address ongoing erosion issues. The project scope has been developed, and concept layouts for the bank relocation are being prepared. The next steps include conducting bathymetric surveys in the river and assessing options for gravel treatment, and engagement with adjacent landowners regarding floodbank relocation options. The project is currently on track and progressing as planned.

[16] **Drain 222 Sills**

a. Project Phase: Consenting
b. Project Manager: Mike Burrows
c. LTP Budget: Year 1: $150k, Year 2: $350k, Year 3: $150k
d. Forecast Cost at Completion: $650,000

[17] The Drain 222 Sills project involves replacing the stop logs on Bridge 4, which are used to manage water levels in Lake Tuakitoto. Design work is complete, and the consenting process is underway however due to the historic nature of the existing structure, the consenting process is taking more time than expected. Following consenting the construction work will be procured and implemented. The project remains on track, with construction work planned for the 2025 / 2026 season.

Figure 5: Drain 222 with sills in place.

Tokomairiro Drainage Scheme

[18] **Toko Bridge Repair**

a. Project Phase: Scoping
b. Project Manager: Felicity Murdoch
c. LTP Budget: Year 1: $100k, Year 2: $250k, Year 3: $250k
d. Forecast Cost at Completion: $600,000

[19] The Toko Bridge Repair project aims to assess and implement repairs to 13 bridges identified in a 2018 Calibre report assessing the condition of ORC-owned bridges within the Tokomairiro drainage scheme. To date site visits have been conducted for 50% of the affected bridges. The next steps include completing site visits for the remaining bridges and determining the program of works. The project is currently slightly delayed but is expected to achieve the planned outputs.

Figure 6: Tokomairiro Drain G, Bridge 11

River Management

[20] **Kaikorai Stilling Basin – Resilience and Environmental Enhancement**

a. Project Phase: Initiation
b. Project Manager: Felicity Murdoch
c. Scheme/River: Kaikorai River
d. LTP Budget: Year 1: $100k, Year 2: $450k, Year 3: $1,100k
e. Forecast Cost at Completion: $1,650,000

[21] The Kaikorai Stilling Basin project aims to improve the resilience and environmental conditions of the stilling basin structure which has been damaged by high flow events. Site visits have been conducted to assess the current condition and identify requirements for investigation work and scope development. The next steps include drafting the RFT for investigation and optioneering, including ecological and structural assessments. The project is on track, with investigation work planned to begin the financial year.

Figure 7: Kaikorai Stilling Basin indicating damage to concrete lining.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[22] The projects presented within this report contribute to ORC's Resilience goals within the Strategic Directions of:

1. *Plans are in place to ensure that the region's most vulnerable communities (geographic and demographic) and ecosystems are resilient in the face of natural hazards.*

And*:*

2. *Our infrastructure is designed and built to accommodate variability and uncertainty associated with changing weather patterns and sea level rise.*

Financial Considerations

[23] Financial considerations are described in the report. All projects in this report are funded through the 2024 – 2034 long term plan

Significance and Engagement Considerations

[24] No considerations arising from this paper.

Legislative and Risk Considerations

[25] No considerations arising from this paper.

Climate Change Considerations

[26] No considerations arising from this paper.

Communications Considerations

[27] There are no communications considerations with receiving this report. Communication and engagement requirements are assessed on a project by project basis.

NEXT STEPS

[28] Next steps for each project are described within the paper

[29] Continue progressing the project as described within the paper in line with the Long term plan 2024 - 2034

ATTACHMENTS

Nil

9.3. Flood Forecasting and Public Information

Prepared for: Safety and Resilience Comm

Report No. HAZ2502

Activity: Governance Report

Author: Jean-Luc Payan, Manager Natural Hazards

Endorsed by: Tom Dyer, General Manager Science and Resilience

Date: 6 March 2024

PURPOSE

[1] To describe the flood warning system and service provided by the Otago Regional Council (ORC).

EXECUTIVE SUMMARY

[2] ORC operates a flood warning system to provide a flood warning service to the public, communities, businesses, emergency management services and infrastructure managers (including ORC) potentially affected during a heavy rainfall event.

[3] The purpose of the flood warning service is to provide flood warnings and flood risk information, that enables a safe and timely response to heavy rainfall events.

[4] This achieved through the following four activities:

- Hydrological and meteorological monitoring and meteorological predictions
- Water levels and flows predictions
- Interpretation and message construction
- Communication and dissemination

[5] The system operates 24/7 with a Duty Flood Officer on-call all the time.

[6] In recent years, ORC invested in improvements to the flood warning system and further improvements are included in the 2024-34 Long-Term Plan.

[7] This report describes the flood warning system and services provided by ORC and presents the recent and planned improvement to the system.

RECOMMENDATION

That the Committee:

*1) **Notes** this report.*

BACKGROUND

[8] ORC operates a flood warning system to provide a flood warning service to the public, communities, businesses, emergency management services and infrastructure managers (including ORC) potentially affected during a heavy rainfall event. This service is also accessible to people from outside Otago such as road users.

[9] The information provided is, typically, current, and predicted lake and river levels and flows and the identification of likely affected areas and consequences.

[10] The information provided is also used to inform decisions related to the operation of ORC's flood protection schemes and Emergency Management response. This paper focuses on the ORC flood warning service which constitutes one element of the ORC response to a heavy rainfall event. Other elements of the response such as the operational response (e.g. management of the ORC flood protection schemes and river channels) or the Emergency Management response are not described in this report.

[11] The purpose of the flood warning service is to provide flood warnings and flood risk information, that enables a safe and timely response to heavy rainfall events.

[12] The flood warning service has been operating, at least, in the last 25-30 years. The flood warning system was updated through the years to account for technological changes and users' expectations and needs.

[13] The next sections describe the key components of the flood warning system that supports the provision of the flood warning service.

[14] The flood warning system is a set of connected activities (Figure 1) designed to operate together to achieve the purpose presented in paragraph 11.

[15] The system operates 24/7 with a Duty Flood Officer on-call all the time.

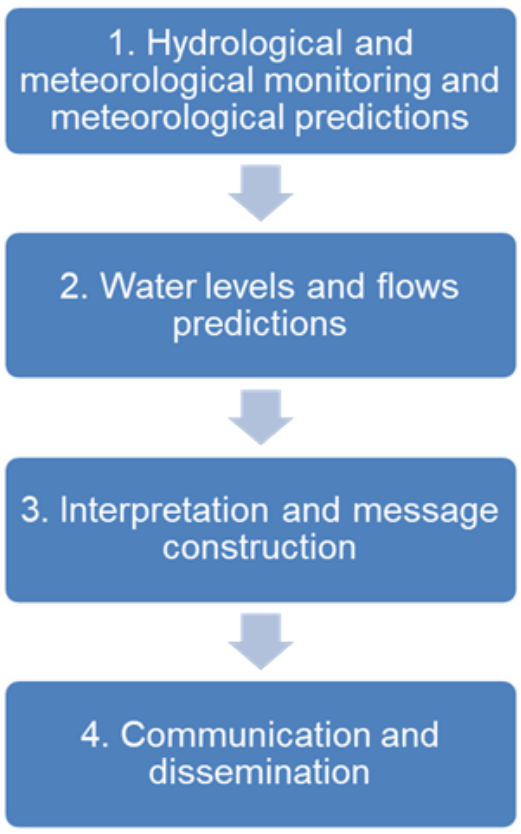

Figure 1. The components of the flood warning system

Hydrological and meteorological monitoring and meteorological predictions

[16] This activity consists of identifying environmental conditions (weather and catchment hydrological conditions) that are likely to result in high lake and river levels and flows in the region.

[17] It relies on meteorological information (forecasts, severe weather watches or warnings and observations including from radar) provided by MetService,[1] and on the hydrological monitoring network (lake and river levels and flows monitoring stations and rainfall stations) operated by ORC.[2]

Water levels and flows predictions

[18] This activity consists of predicting high lake and river levels and flows and their timing in potentially affected areas. This activity is informed by flood forecasting models developed for strategic locations (Figure 2) and by staff experience and knowledge of past flood events and catchment behaviours.

[1] MetService is the official weather information provider to ORC.
[2] Item 7.1 of the February 2022 Strategy and Planning Committee meeting: https://www.orc.govt.nz/media/11737/agenda-strategy-and-planning-20220209.pdf

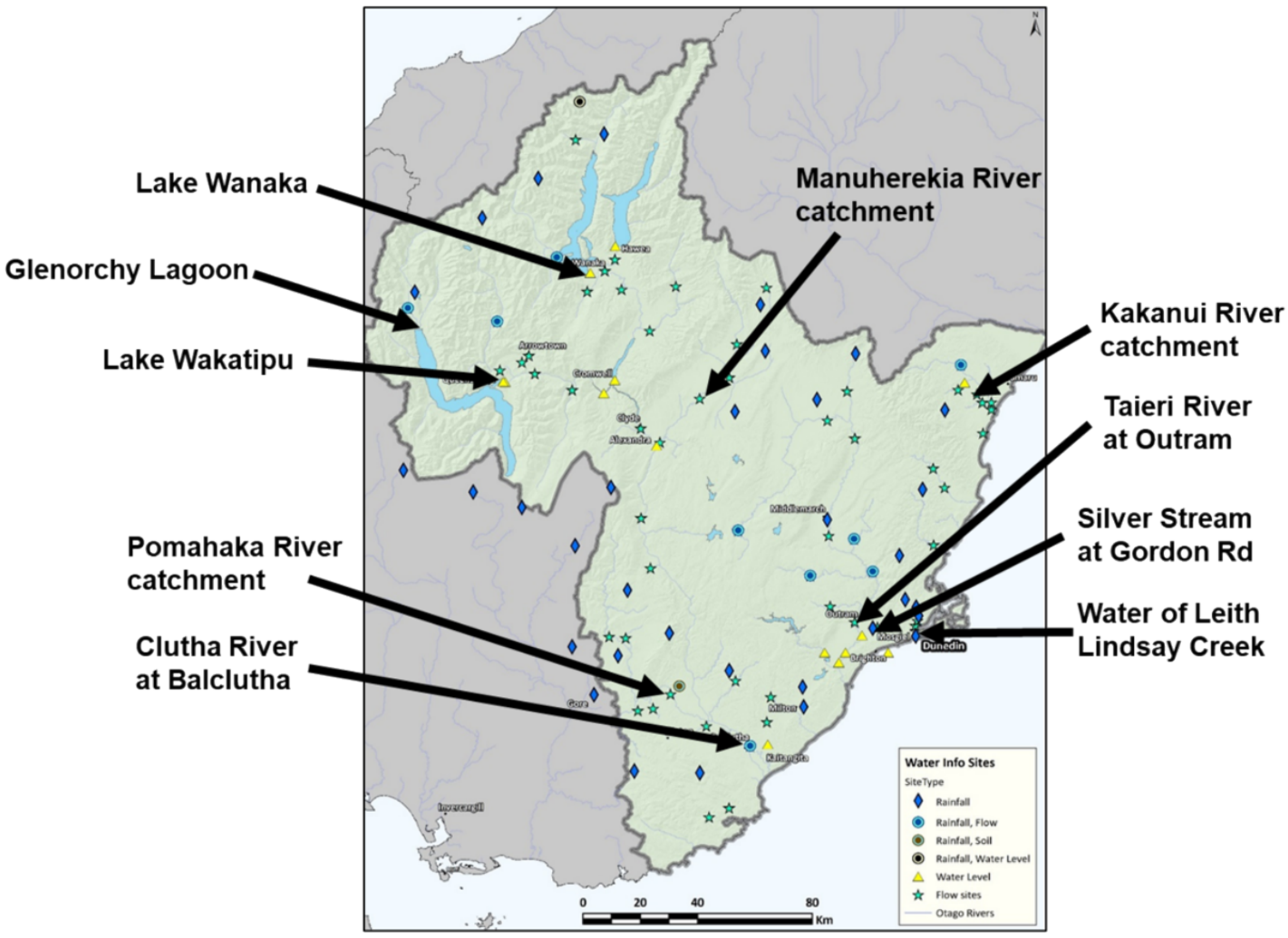

Figure 2. Location of the ORC flood forecasting models used to inform flood warning.

Interpretation and message construction

[19] This activity is crucial in the flood warning system. It consists of identifying in advance the impacts of the predicted flood levels on communities and infrastructure at risk. It relies on flood hazard studies, staff observations during the event and knowledge from past or historical events. Depending on the severity of an event, hydraulic models are sometimes used to inform operational decisions for some protection scheme areas (Water of Leith, Lower Taieri and Lower Clutha).

[20] It is also during this activity that the content of warning message is devised and tailored to the different recipients of this information. The message will be phrased differently if it is addressed to infrastructure managers, civil defence, or the public for example. The information also enables EM Otago to create emergency messages across the emergency Mobile Alert System (EMA), Otago Gets Ready, social media and the EM Otago Website. As a client EM Otago is wholly reliant on this service to supply timely information to response partners and emergency services.

Communication and dissemination

[21] This activity consists in disseminating warning information in a timely manner to people and organisations managing the response to or likely to be affected by the event.

[22] ORC flood warning system uses various forms of communication during flood events:

a. Warnings and information displayed on ORC website and on the ORC Environmental Data Portal (Figure 3). For large flood events, a dedicated webpage centralising warnings, helpful links and other flood related

information and resources can be set up. This was the case for example during the December 2019 flood event that affected the Clutha Catchment.

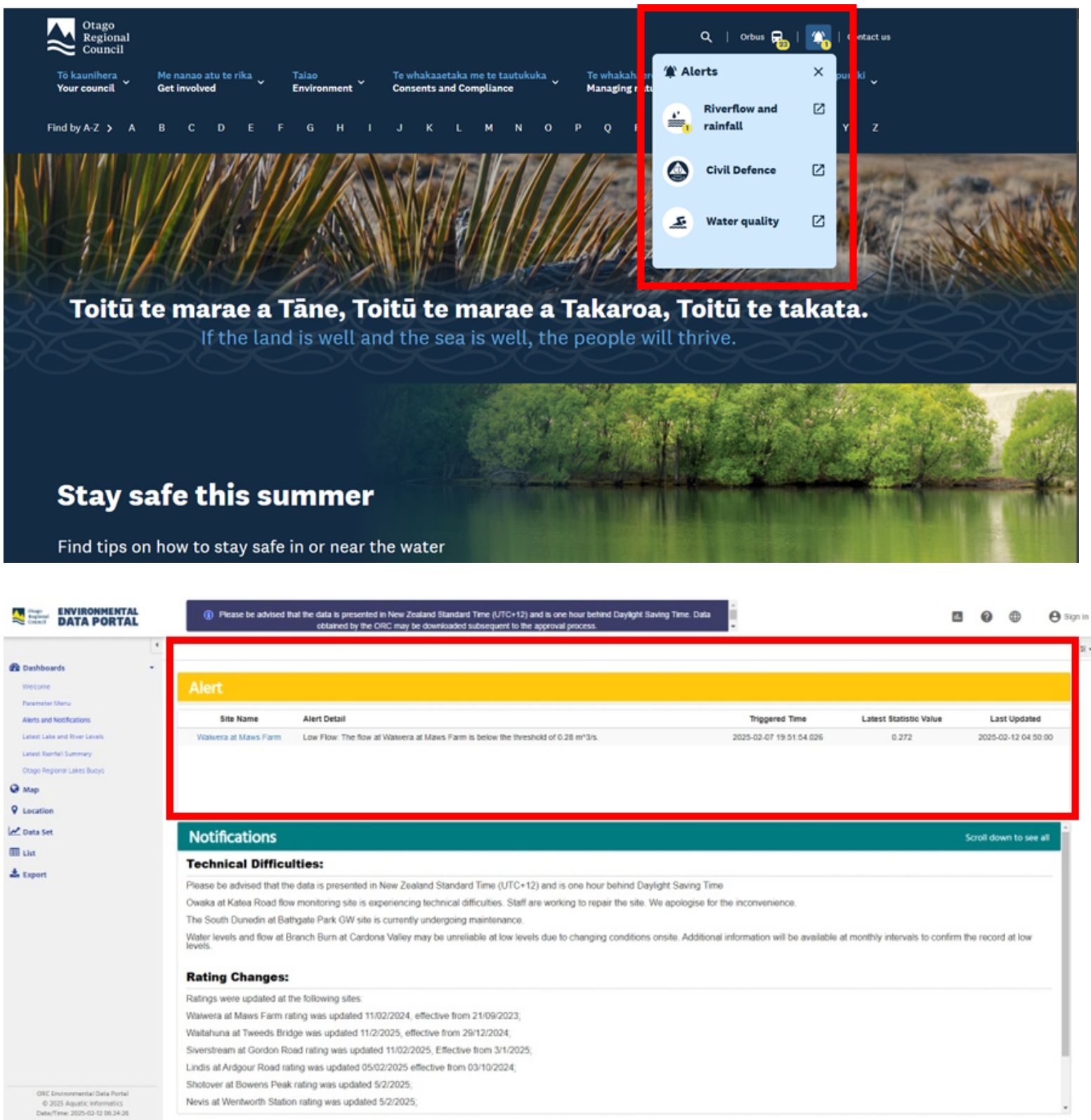

Figure 3. Alerts section of the ORC website (top) and on the Environmental Data Portal (bottom)

b. Warning information and situation updates are posted on social media such as ORC Facebook page or dedicated ORC flood warning Twitter/X accounts.
c. Media advisories and releases are issued depending on the scale, timing and severity of a flood event.
d. Direct contact with organisations or groups involved in the flood response. This is usually done by sending status reports prior and during the flood events. The reports provide information on the current and expected weather, river and lake conditions and on consequences on the likely affected areas.

e. Specific ring lists. When the flood warning system was initially developed, ways to accessing timely flood warning information were not readily and cheaply available to the possibly affected landowners or organisations. A series of "ring lists" based on predefined triggers (river levels or flows at indicator sites) were developed to ensure the service is provided efficiently. Usually, the ring lists are associated with landowners living or operating farms near rivers. However, the ring lists do not provide complete coverage of flood-prone areas in Otago. They do not cover some of the areas that have the highest flood risk. There are 24 ring lists, with a total of approximately 400 contacts that are currently managed by ORC part of the flood warning system. See the Discussion section for planned improvements to the "ring lists".

DISCUSSION

Recent, under development and planned improvements

[23] In recent years ORC invested in the following improvements to the flood warning system:

- Additional sites to the hydrological monitoring network, for example:
  - Water levels recorders were installed in the Glenorchy Lagoon, Lake Wakatipu at the Glenorchy boat ramp and a flow reorder in the Rees River. This was in response to the Glenorchy Community request following the February 2020 flood event.
  - A water level and flow recorder was installed in the Clutha River upstream of Balclutha (near the Tuapeka River confluence) and a rainfall station was installed in the Mt Teviot area. This will greatly assist the flood prediction for Balclutha and decisions related to the operation of the Lower Clutha Flood Protection and Drainage Scheme.
  - A rainfall station was installed on the Rock and Pillar range near Middlemarch. This site assists the flood response to Middlemarch.
  - A flow recorder was installed in the Kaikorai Stream. This new site will assist the flood response in Kaikorai valley.
- Rainfall observations and short-term predictions (nowcasting) from the weather radar installed in Otago in 2020 are used to inform the flood warning service.[3] In July 2024, the CDEM Group has also formally requested the Minister of Transport to improve the radar coverage in the region by requesting support in investigating the feasibility of extending weather radar coverage to encompass Central Otago and Queenstown-Lakes. This will strengthen our ability to safeguard communities and enhance our resilience against weather-related risks. The request was acknowledged by the Minister of Transport.

[3] Item 9.2 of the November 2023 Safety and Resilience Committee meeting: https://www.orc.govt.nz/media/15475/2023-11-09-sr-committee.pdf

- Improvement to the flood forecasting models for example to the Lower Clutha flood forecasting model, Lake Wanaka and Whakatipu forecasting models and the development of the Glenorchy lagoon forecasting model.

- An updated Environmental Data Portal which is more user-friendly, with improved functionalities and accessibility to the hydrological monitoring data.
- Coastal hazards forecasting for the Otago region is available since late 2024. Forecasts, provided by MetService, are available for 12 locations spaced along the Otago coastline and is used to provide early awareness of sea conditions (e.g. wave characteristics, sea height, wind characteristics) that may cause impacts (such as inundation or erosion) on infrastructure and properties along the coast.

[24] Other improvements are either underway or planned in the coming years:

- Incorporation of quantitative rainfall radar data in the flood forecasting models.
- Update to existing and development of new flood forecasting models.
- Improvements to the warning communication system to ensure better accessibility to the flood warning service. This will include an improved text messaging system and use of ring lists.
- Improved and more extensive assessment of the consequences of heavy rainfall event in the region. This will include flood hazard characteristics (such as extent, depth and velocities) assessments considering a range of weather scenarios, including maximum credible events.
- Improved integration and information sharing with Emergency Management Otago and public communications protocols.

[25] The improvements presented above are based on post-flood event debrief and review sessions with affected communities and groups and organisations involved in the response to the event. Those sessions provide the opportunity to discuss and reflects on what worked well and identify improvements and extension to the flood warning system and service.

OPTIONS

[26] N/A

CONSIDERATIONS

Strategic Framework and Policy Considerations

[27] The information presented in this paper reflects Council's Strategic Directions, "*Otago builds resilience in a way that contributes to community and environmental wellbeing through planned and well-managed responses to shocks and stresses, including natural hazards*" and "Otago is a climate-resilient region that plans for and invests in initiatives that reduce emissions and help us adapt to our changing climate"[4].

[4] ORC Strategic Directions: https://www.orc.govt.nz/your-council/our-team/strategic-directions

[28] It contributes to achieving the following goal of the Strategic Directions:

> "*Plans are in place to ensure that the region's most vulnerable communities (geographic and demographic) and ecosystems are resilient in the face of natural hazards*".

Financial Considerations

[29] The costs of delivering the flood warning service depend, among other factors, on the number of events occurring each year. The annual costs in 2021/2022, 2022/2023 and 2023/2024 were $213,301, $239,349 and $299,855 respectively.

[30] These costs include the operation of a 24/7 roster and associated training, maintaining and improving the flood forecasting models, and access to specific weather and coastal forecast and information. They exclude the costs of operating the monitoring network and the Environmental data portal.

[31] Flood warning improvement work is included in the 2024-34 Long-Term Plan (LTP) budget ($150,000 per year for three years between 2024/2025 and 2026/2027).

Significance and Engagement

[32] N/A

Legislative and Risk Considerations

[33] Although there is no direct obligation for ORC to provide a flood warning service, the provision of this service is critical to support Council functions defined in the Resource Management Act, the Soil Conservation and Rivers Control Act and the Civil Defence Emergency Management Act.

[34] The flood warning service assists communities and interested stakeholders and organisations manage the risks associated with flooding.

Climate Change Considerations

[35] The provision of this service assists in the adaptation to climate change.

Communications Considerations

[36] As set out in paper.

NEXT STEPS

[37] Continue the programme of improvement planned in the 2024-34 Long-Term Plan.

ATTACHMENTS
Nil

9.4. Clutha Delta Natural Hazards Adaptation

Prepared for:	Safety and Resilience Committee
Report No.	OPS2503
Activity:	Governance Report
Author:	Ann Conroy, Team Leader Natural Hazards Adaptation Pete Weir, Team Leader Natural Hazards Analysis Tim van Woerden, Senior Natural Hazards Analyst Jean-Luc Payan, Manager Natural Hazards
Endorsed by:	Tom Dyer, General Manager Science and Resilience
Date:	6 March 2025

PURPOSE

[1] To update Council on progress with the Clutha Delta natural hazards adaptation programme including natural hazards assessments, and programme and engagement planning.

EXECUTIVE SUMMARY

[2] The low-lying plains of the Clutha Delta (Figure 1) are exposed to a range of coastal, fluvial, and seismic natural hazard risks. Coastal hazard and flooding hazard risks are projected to be exacerbated by potential impacts of ongoing or projected geomorphic and climatic changes.

[3] Otago Regional Council (ORC) is following the Ministry for the Environment guidance on coastal hazards and climate change[1] as a framework for development of a Clutha Delta natural hazards adaptation programme.

[4] This paper provides an update on natural hazards activities since the previous committee papers on this work programme.[2] These include;

a) Analysis and data collection to characterise the October 2024 coastal Otago flooding event.
b) Hydraulic modelling and flood hazard assessment of the Clutha Delta.
c) A liquefaction hazard assessment for the Clutha Delta.
d) Analysis of Clutha River bed level trends at Balclutha.
e) Investigations focused on Koau Mouth and Puerua outfall, to inform potential infrastructure management decisions.

[5] This paper provides an update on current and proposed programme activities including natural hazards investigations and high-level programme and engagement planning.

[1] https://environment.govt.nz/publications/coastal-hazards-and-climate-change-guidance/
[2] Papers presented to the Safety and Resilience committee; 9 November 2023, 8 February 2024, 8 May 2024, and 7 August 2024.

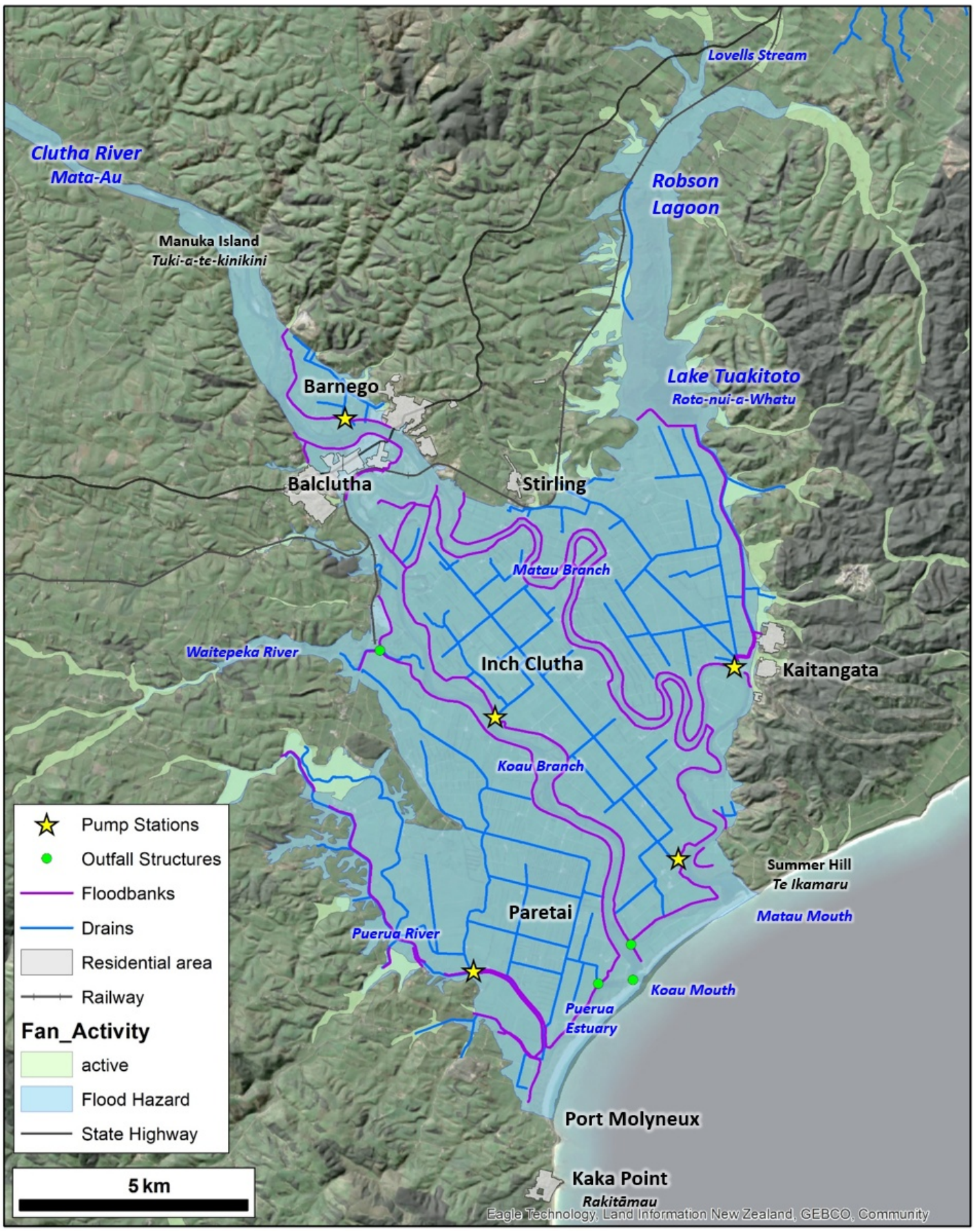

Figure 1: Overview map of the Clutha Delta, showing the main locations and ORC Lower Clutha Flood Protection and Drainage scheme infrastructure (e.g. floodbanks, drains, pump stations). The blue shaded area is the mapped flood hazard area, and the green shaded areas are mapped as active floodwater-dominated alluvial fans. Māori place names are from the Ngāi Tahu atlas Kā Huru Manu.[3]

[3] https://kahurumanu.co.nz/

RECOMMENDATION

That the Committee:

*1) **Notes** this report.*

BACKGROUND

[6] Otago Regional Council (ORC) is leading a programme of work to develop a natural hazard adaptation strategy for the Clutha Delta area.

[7] The natural hazards context, proposed natural hazards adaptation work programme, and investigations underway for the Clutha Delta were summarised in previous update papers to the Safety and Resilience Committee.[4]

[8] ORC is following the Ministry for the Environment guidance on coastal hazards and climate change[5] as a framework for development of a Clutha Delta natural hazards adaptation programme.

[9] The guidance includes a 10-step decision cycle structured around five main questions outlined in Figure 2. The work programme is currently in the first phase of the cycle ("*what is happening?*"), with progress on the scoping and investigations to increase our understanding of the key natural hazards on the delta, and early engagement planning.

[10] The framework is also being applied to other adaptation areas in Otago. Two of these programmes are further along the decision cycle; Head of Lake Whakatipu Natural Hazards Adaptation is currently at Step 7/8 and South Dunedin Futures is at Step 4/5. Lessons from these programmes are being used to inform the approach for Clutha Delta.

Figure 2: Overview of the 10-step decision cycle from Ministry for Environment (2024) guidance on coastal hazards and climate change.

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[4] 9 November 2023, 8 February 2024, 8 May 2024, 7 August 2024.

[5] https://environment.govt.nz/publications/coastal-hazards-and-climate-change-guidance/

NATURAL HAZARDS INVESTIGATIONS

[11] The previous update papers to the Safety and Resilience Committee noted as next steps several natural hazards investigations for the Clutha Delta area which were in progress or planned. This section provides an update on progress towards completion of those studies.

[12] These investigations will be externally peer reviewed to provide assurance of the robustness of findings.

[13] All investigation findings will be made publicly available, and opportunities given for discussion of findings with community, partners/stakeholders and councillors.

[14] Natural hazards studies will inform future natural hazards management responses.

Natural Hazards assessments following the October 2024 weather event

[15] In October 2024 a heavy rainfall event caused flood damage spread widely across the Otago region. Flood damages to ORC flood protection infrastructure were summarised in a December 2024 Council Paper.[6]

[16] To assist with understanding the likelihood and spatial extent of flooding in Otago from this weather event, two assessments have been completed;

a. An assessment to characterise the weather event, including review of rainfall accumulation and return period analysis.
b. Acquisition of a satellite-derived flood extent and depth information for the event.

<u>Characterisation of the October 2024 weather event</u>

[17] NIWA have completed an assessment to characterise the weather event,[7] including review of rainfall accumulations, rates and return periods for the event, based on both rain gauge and rain radar information.

[18] For longer durations, the event was considered significant along the coast from Nugget Point to Dunedin, with return periods exceeding 50 years for the 24- and 72-hour durations (Figures 3 and 4). For the Balclutha and Clutha Delta area, assessments show that the rainfall experienced was significant in terms of total accumulation, with totals of >120 mm over the event. The Inch Clutha received nearly 100 mm of rainfall in a 12-hour period, and 187 mm in total for the weather event (Table 1).

[19] Return period analysis indicates the most extreme rainfalls were recorded in a relatively narrow coastal margin from Dunedin city to the Clutha Delta (Figure 4). In the Clutha Delta area, return periods were relatively high, especially for longer-duration rainfalls of ≥24 hours (Table 2). The highest return period rainfall in the lower Clutha area was received at the Inch Clutha and Telford sites, being in the order of a 50-year return period event for 24, 48 and 72 hour rainfall totals.

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[6] ORC Report OPS2440, Flood Recovery Update. Presented to Otago Regional Council, 4 December 2024.
[7] Carey-Smith T and Meyers T, 2025. Analysis of October 2024 Otago rainfall event. Report prepared by the National Institute of Water & Atmospheric Research Ltd (NIWA) for Otago Regional Council.

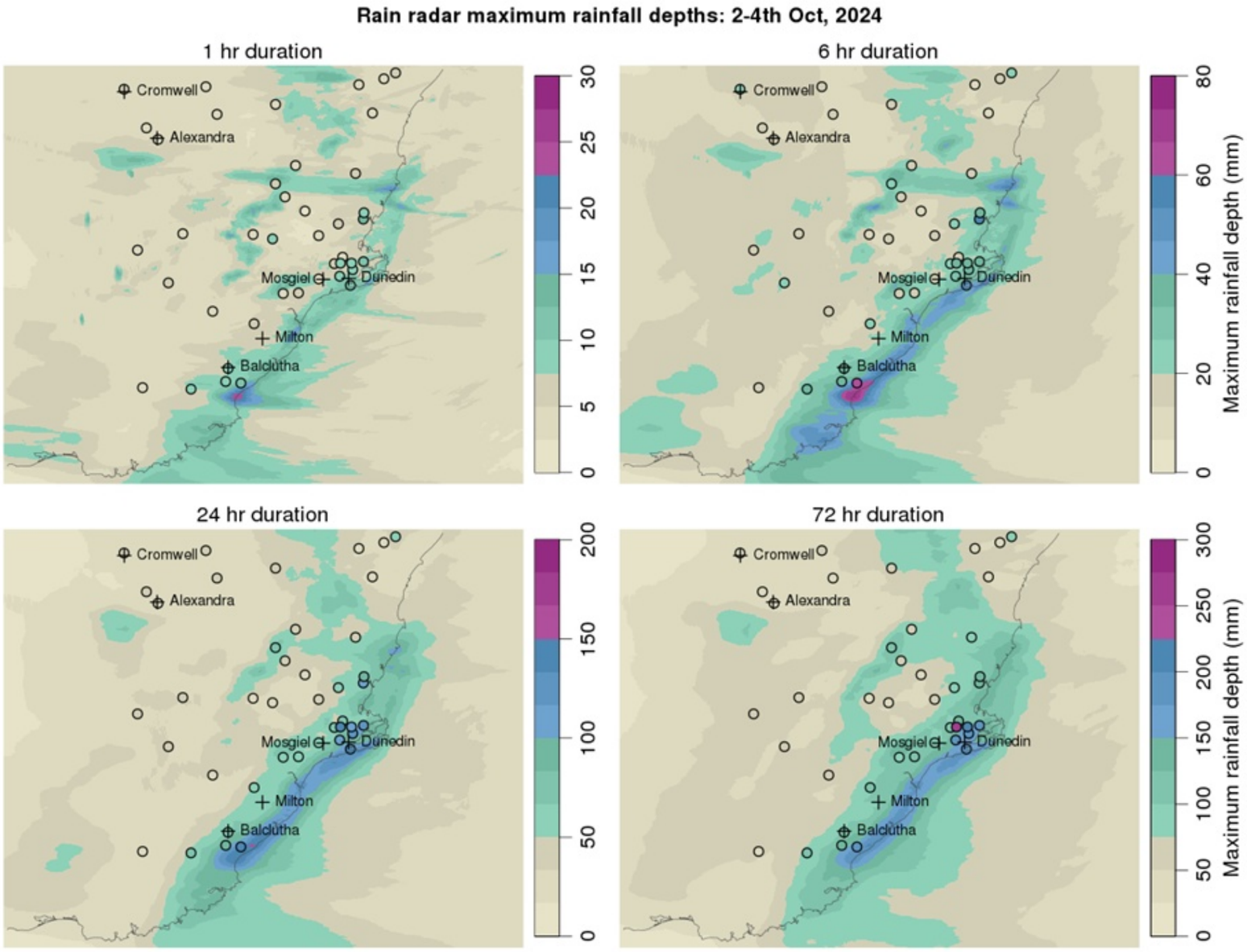

Figure 3: Spatial distribution of maximum rainfall depths during the October 2024 event for a range of durations. Maximum depths are shown for durations of 1, 6, 24 and 72 hours. The colours in the background image show the rainfall depths derived from radar observations. Filled circles show the corresponding maxima as measured by rain gauge.

Table 1: Maximum rainfall depths recorded in the Clutha Delta area between 2nd and 4th October 2024 for different durations. Rainfall amounts are shown in mm.

Name	ID	Maximum Rainfall Depth (mm)						
		Duration						
		1h	2h	6h	12h	24h	48h	72h
Clutha At Balclutha	EM287	8.0	14.5	35.5	57.5	80.0	102.0	120.0
Puerua At Lochindorb	EM399	8.0	15.0	37.1	53.1	77.5	97.0	121.5
Inchclutha Soils	EM931	12.5	22.5	63.4	96.8	140.6	168.4	187.8
Balclutha Telford Ews	**I69276**	**8.9**	**16.9**	**37.4**	**66.2**	**98.8**	**116.6**	**134.0**

Table 2: Estimated return periods (in years) for the 2-4 October 2024 event for durations between 1 and 72 hours. Estimates derived from the HIRDS[#] tool are indicated by a tilde (~) with other estimates based on direct gauge-based extreme value analysis. Cells with no numeric value indicate estimates lower than 2 years. Sub-daily values for Inch Clutha derived from HIRDS appeared to be significantly overestimated when compared against the gauge-derived values, and so values are not included in table (indicated by *).

Name	ID	Estimated Return Period (years)						
		Duration						
		1h	2h	6h	12h	24h	48h	72h
Clutha At Balclutha	EM287		2	8	12	10	15	21
Puerua At Lochindorb	EM399	~	~2	~8	~9	~11	~9	~12
Inchclutha Soils	EM931	~4	~7	*	*	56	48	56
Balclutha Telford Ews	**I69276**	**~**	**~3**	**~8**	**~27**	**~55**	**~45**	**~58**

[#] NIWA's High Intensity Rainfall Design System (https://niwa.co.nz/climate-and-weather/high-intensity-rainfall-design-system-hirds).

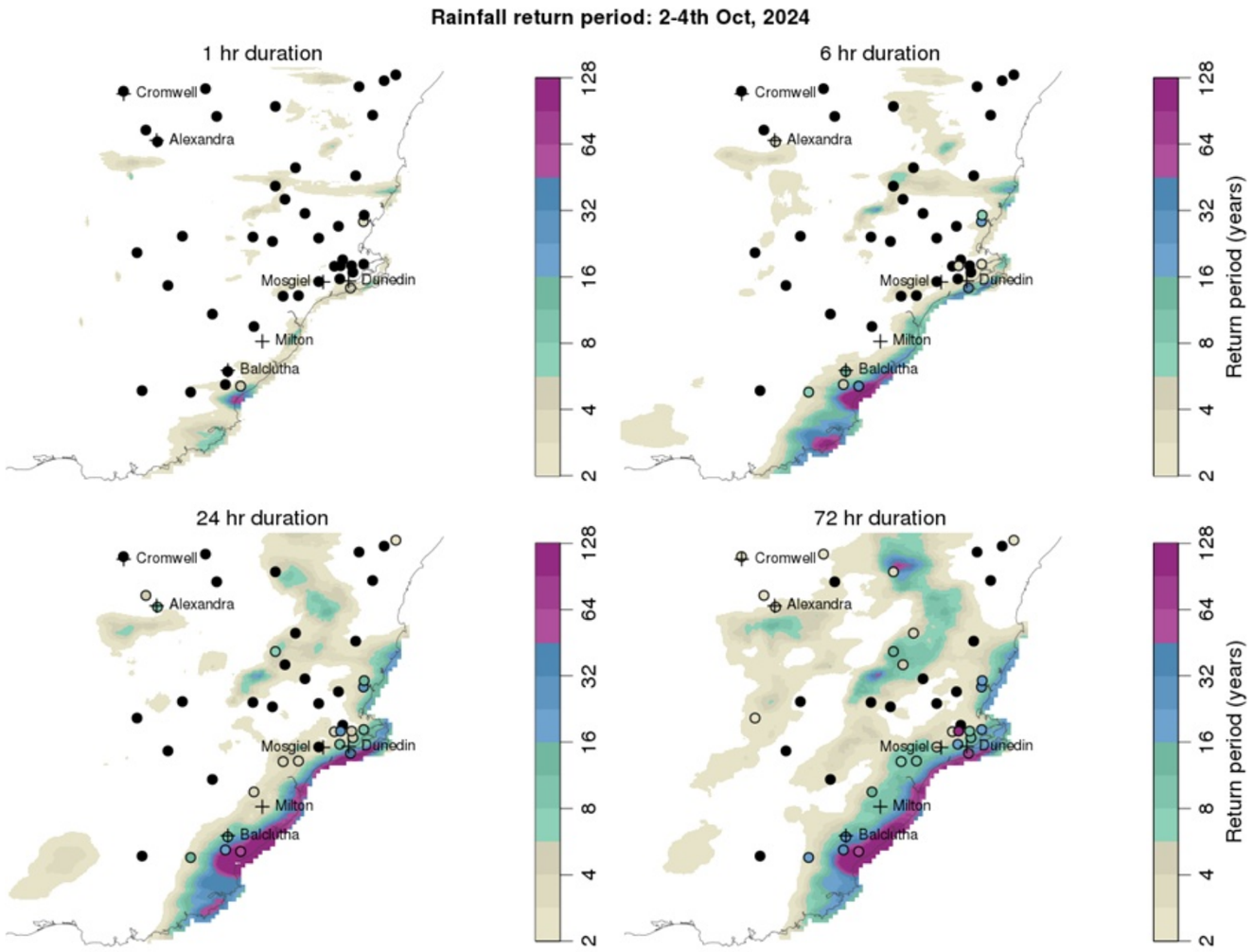

Figure 4: Spatial distribution of rainfall average recurrence intervals or return periods for a range of event durations. Return periods are shown for durations of 1, 6, 24 and 72 hours. The colours in the background image show the return periods derived from radar observations. Filled circles show the corresponding values derived from rain gauges (e.g. Table 2). White regions and black circles indicate that the return period was less than 2 years.

Satellite-derived flood extent and depth information

[20] A flood extent and depth information dataset has been acquired for the October 2024 weather event from ICEYE Ltd, through their New Zealand partner, Eagle Technology Ltd (Figures 5 and 6).

[21] The ICEYE dataset is based on synthetic-aperture radar (SAR) satellite data captured at ~12 hourly intervals through the weather event, compiled to show the approximate maximum extent and depth of floodwaters.

[22] The satellite data does not provide an exact 'measurement' of floodwater depth or extent but complements other flood intelligence data such as environmental monitoring of river flows, and on-ground or aerial observations to help build a picture of floodwater characteristics. It is of relatively coarse resolution (4-5m pixel size), and may be limited by factors including the timing of the flood peak relative to SAR data captures.

[23] For the Clutha Delta area, the dataset illustrates the very widespread occurrence of surface ponding and flooding during the event. Floodwaters were generally relatively shallow (<50cm, coloured blue in Figure 6), but were deeper at some locations, particularly along the western margin of the delta. Flooding was not derived from the Clutha River as flows remained well within floodbank capacity, but were sourced from the accumulation of rainfall runoff and inflows from local tributaries such as the Waitepeka and Puerua Rivers.

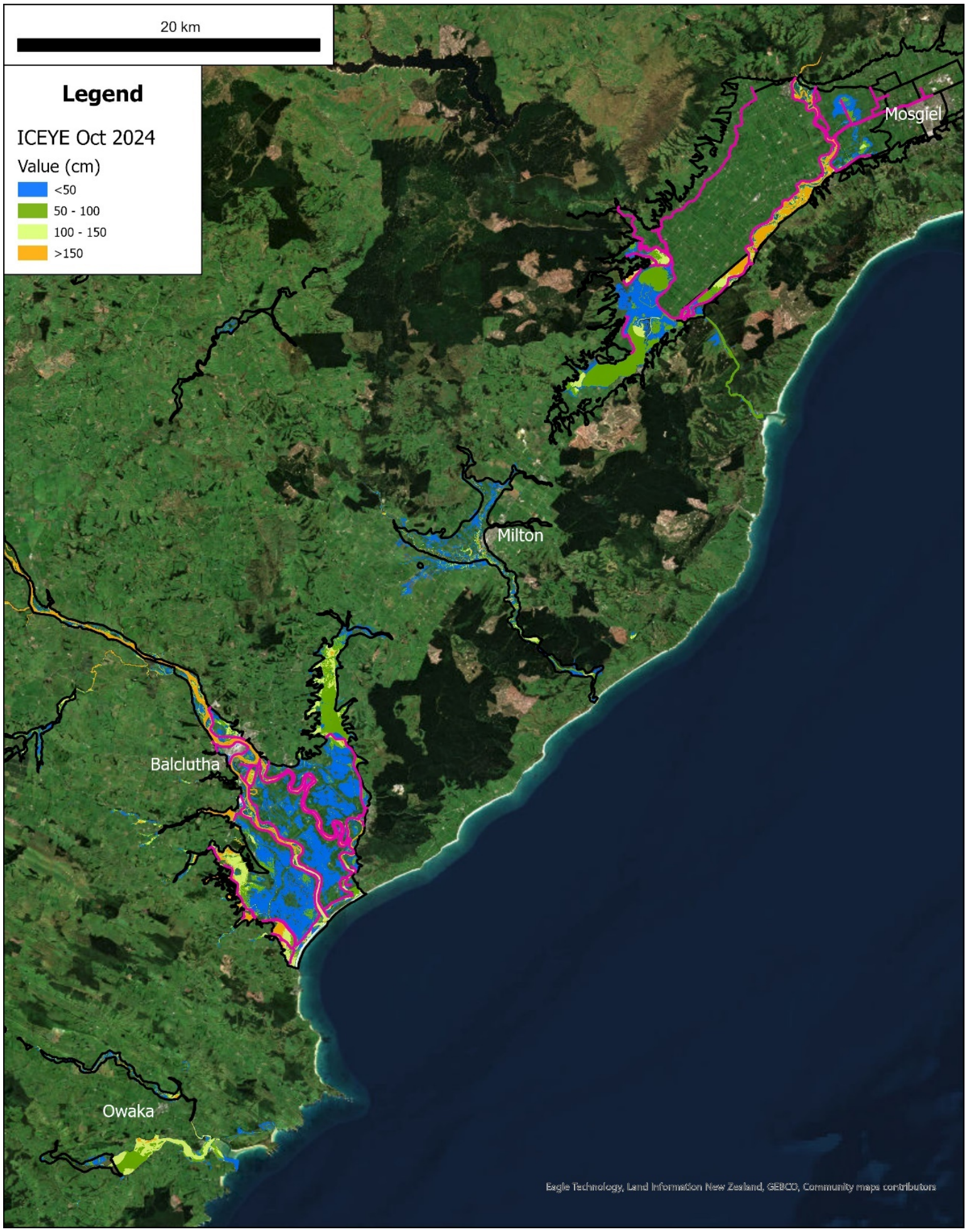

Figure 5: Satellite-derived flood depth information for the October 2024 weather event in the lower Taieri Plain, Tokomairiro Plain, Lower Clutha, and Owaka areas. Data from ICEYE Ltd, through their New Zealand partner, Eagle Technology Ltd. Pink lines are floodbanks of the lower Taieri and lower Clutha flood protection schemes, and the black outline shows the mapped 'flood-prone area' from ORC's regional-scale flood hazard mapping.

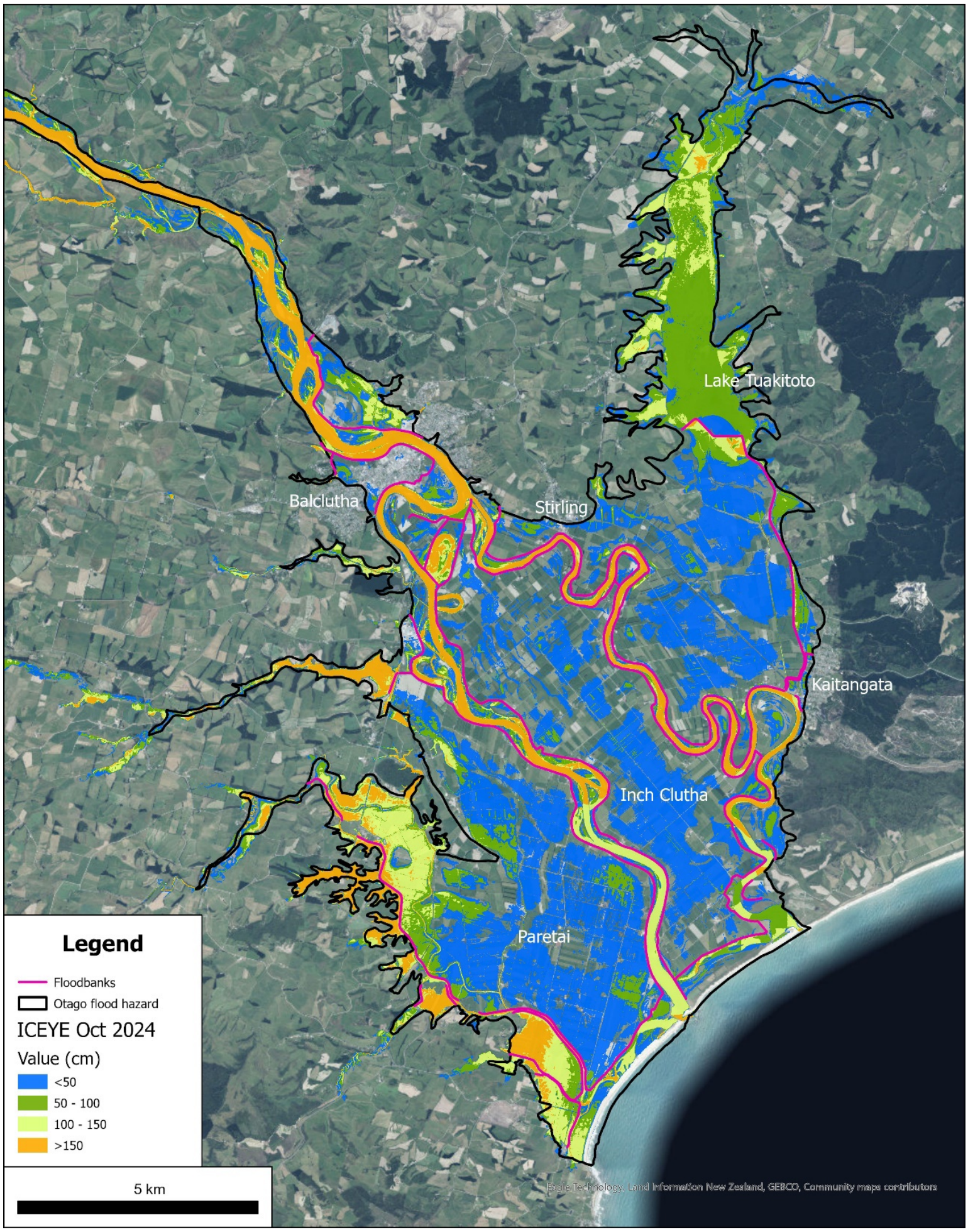

Figure 6: Satellite-derived flood depth information for the October 2024 weather event in the Clutha Delta area. Data from ICEYE Ltd, through their New Zealand partner, Eagle Technology Ltd. Pink lines are floodbanks of the lower Clutha flood protection scheme, and the black outline shows the mapped 'flood-prone area' from ORC's regional-scale flood hazard mapping.

Flood Hazard Assessment

[24] A comprehensive flood hazard assessment for the Clutha Delta is underway. Hydraulic modelling and flood hazard assessments are being carried out by ORC staff, with external expertise and advice as required. Model development is in progress.

[25] The assessment scope includes hydraulic modelling of the Clutha River/Mata-Au and significant tributary catchments, for a range of flow magnitudes including a "maximum credible" event. Modelling scenarios will consider the effects of climate change on river flows, changes to the channel morphology, the impacts of sea level rise, and potential breaches of floodbank structures.

[26] The project findings will be used to further develop flood hazard mapping and understanding, to inform evaluation of the flood protection scheme performance, and to guide Emergency Management Otago planning for flooding events.

Liquefaction hazard assessment

[27] ORC have engaged Tonkin + Taylor Ltd to undertake a high-level liquefaction hazard assessment for the wider Clutha Delta area, including Balclutha township.

[28] The study aims to enhance understanding of the potential liquefaction hazard beyond publicly available regional-scale information[8] such as hazard mapping by GNS Science.

[29] The investigation scope includes;

- Phase 1: Collection of additional geotechnical data and completion of geotechnical analysis, including liquefaction vulnerability categorisation mapping and estimation of key liquefaction hazard descriptors[9].
- Phase 2: Qualitative risk assessment for seismic hazards in the Clutha Delta area, including fault rupture, seismic shaking and liquefaction/lateral spreading.

[30] Geotechnical data collection was completed in November 2024, with 30 cone penetrometer tests (CPT) completed within the delta area. Together with existing data from previous geotechnical investigations for ORC and others, there are now >130 CPT tests in the delta area, with a broad spatial distribution to represent geotechnical conditions across the delta extent (Figure 7).

[31] The Phase 1 analysis and reporting is ongoing, and a draft report is expected for review mid-February. The qualitative seismic hazard risk assessment (Phase 2) will commence after completion of Phase 1 reporting and is scheduled to be delivered by mid-2025.

[8] ORC Natural Hazards Portal: http://hazards.orc.govt.nz

[9] e.g. Estimation of Liquefaction Severity Number (LSN), liquefaction triggering thresholds, cumulative thickness of liquifiable material, magnitude of shaking-induced reconsolidation settlement, and the expected lateral displacement at the ground surface due to lateral spreading and/or lateral stretch.

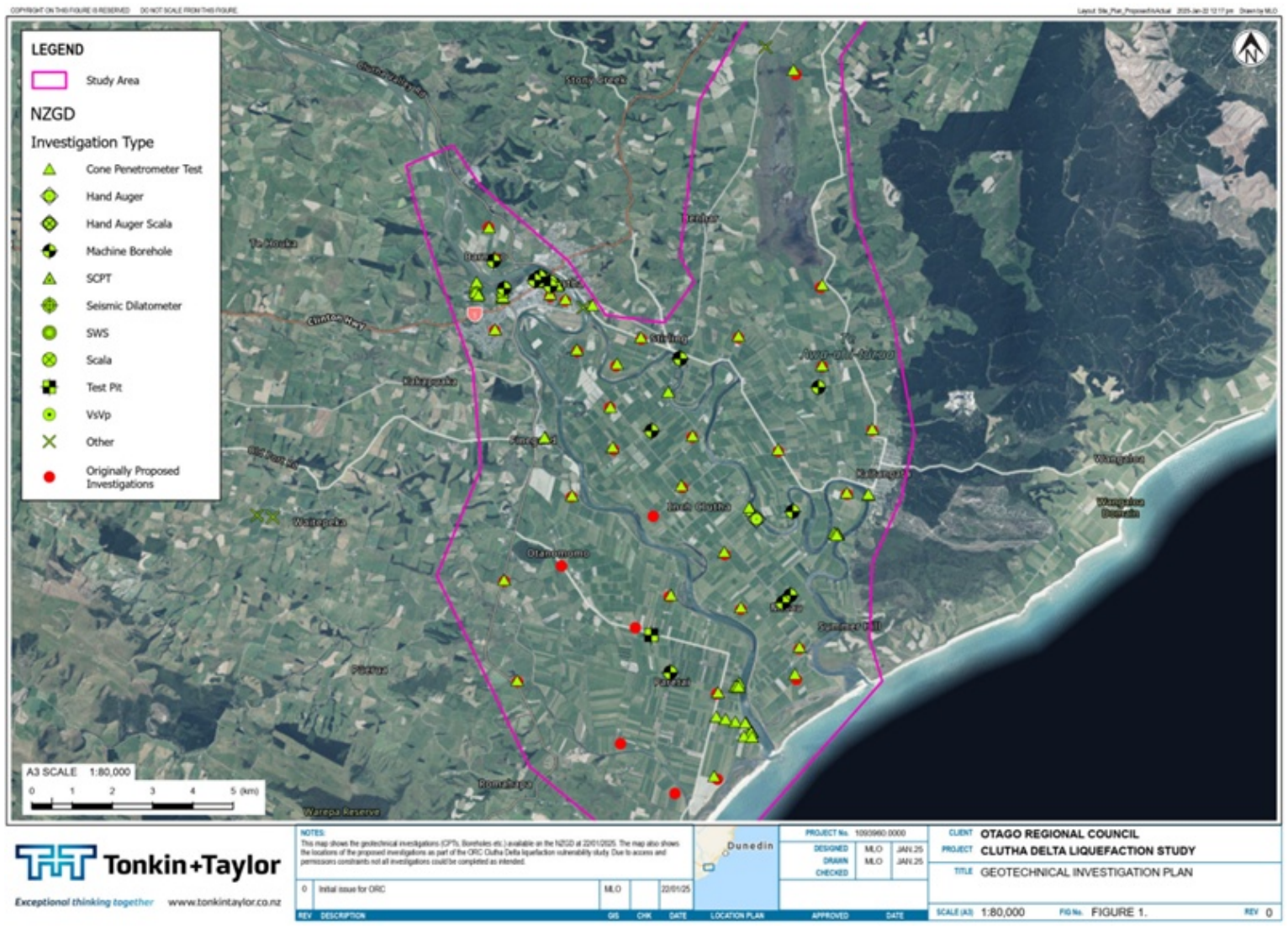

Figure 7: Geotechnical data available for analysis at the Clutha Delta, including the 30 new CPT tests collected for this liquefaction hazard assessment.

Clutha River bed level trends analysis

[32] ORC regularly monitors riverbed profiles for the entire Lower Clutha River (Roxburgh to the coast), especially within the area of the Lower Clutha Flood Protection and Land Drainage Scheme (from Barnego downstream). Since at least 2008, ORC has regularly analysed and reported on the monitoring datasets to assess and quantify changes in riverbed levels and morphology.

[33] ORC is aware of concerns from community members that bed levels may be building up, particularly in the Balclutha township area, and the potential impact on flood hazard.

[34] ORC has engaged NIWA to undertake an updated riverbed level assessment. The scope of the investigation is to compare and analyse all known survey data for the Clutha River in the vicinity of Balclutha to provide a comprehensive review of bed level trends. The effects of riverbed changes on water levels and flood hazard will also be assessed.

[35] Historical bed level information is being considered, including ORC's long-term dataset of surveyed cross-sections at Balclutha. 14 surveys from 1994-2024 have been compiled, in addition to bridge surveys at the Balclutha railway bridge dating from the late 1800's[10]. This dataset gives ORC a good temporal resolution for the identification and analysis of any changes over the last three decades. The locations of the cross-section locations in the Balclutha area are shown in Figure 8 below.

[10] ORC, 2008. Channel morphology and sedimentation in the Lower Clutha River.

[36] The report will be completed by mid-2025, and all findings from the surveys and studies noted above will be made publicly available.

Figure 8: Locations of Clutha River cross-section surveys in the Balclutha area currently being analysed by NIWA.

Koau Mouth and Puerua Investigations

[37] A natural hazard and engineering investigation project focusing on the Koau mouth of the Clutha River/Mata-Au and Puerua-Paretai area is being undertaken by Jacobs (NZ) Ltd. The study was prompted by the coastal erosion damages occurring in June 2023, and projections of longer-term shoreline retreat to have increasing impacts on the performance of ORC's coastal margin flood protection and drainage infrastructure.[11]

[38] Technical assessments are being undertaken to allow for thorough consideration of the potential benefits and challenges in potential infrastructure management decisions, and are structured around three key focus areas;

a. Understanding coastal processes and the July 2023 coastal erosion event.
b. Modelling and drainage performance studies.
c. Engineering Investigations.

[39] The first two stages of the investigations are largely completed, and the finalised technical report for this investigation is expected to be completed by mid-2025.

[40] Preliminary findings from the investigation (e.g. hydraulic modelling results and coastal morphology understanding) are also being used to inform design decisions for reinstatement of the Clutha River's Koau Mouth training line structure which breached in the October 2024 flooding event[12]. It is planned to provide a detailed update on the

[11] Jacobs (NZ) Ltd, 2021. Molyneux Bay and Clutha Delta Morphology Investigation. Prepared for Otago Regional Council.

October 2024 flood repairs and the financial implications to the March 2025 Council meeting.

PARTNER RELATIONSHIPS

[41] Staff are preparing a Memorandum of Understanding (MOU) to formalise the collaboration arrangements between CDC and ORC. It is expected that an MOU will guide collaboration at both governance and operational levels, and will be submitted to council for approval.

PROGRAMME PLANNING

[42] A high level programme plan is shown in Table 3. Typically, key technical findings are delivered and then community engagement follows to share the results. Approximately twice-yearly engagement is expected to be required through to delivery of a draft strategy.

[43] Programme planning is integrating ORC work programmes from different teams (e.g. Natural Hazard, Engineering, Environmental Monitoring and Science) as well as Emergency Management Otago, Clutha District Council, and mana whenua representatives. The integrated plan will also consider key drivers, adaptation focus areas and how the work will be phased to address the most immediate needs first.

[44] A key step of programme planning is the development of strategic and operational objectives to guide the direction of the programme and integration of ORC workstreams. This will be informed by engagement with partners including iwi, communities and stakeholders.

[45] The first iteration of a natural hazards adaptation strategy for the Clutha Delta is proposed to be completed by December 2027 for initial focus areas.

[12] See paragraphs 28-38 in: ORC, 2024. Flood Recovery Update. Report OPS2440 to Otago Regional Council, 4 December 2024.

Table 3: High level programme timeline showing sequence of key activities and associated community engagement to share the findings

Key activities	Technical Delivery Timeline	Associated Community Engagement
Natural Hazard Investigations - **flood hazard** - **liquefaction hazard** - **Clutha bed levels trend at Balclutha** - **Coastal hazards including Koau Mouth and Puerua outfall**	mid 2025	late 2025
Other supporting studies may include: - **groundwater analysis** - **environmental, social and economic baselines** - **cultural values** - **engineering / scheme supporting studies** - **review of environmental monitoring network**	late 2025	early 2026
Risk Assessment - **Qualitative (for delta)** - **Detailed for focus areas**	mid 2026	late 2026*
Adaptation approaches for focus areas	late 2026	late 2026*
Draft Strategy (including adaptation for focus areas)	mid 2027	mid 2027
First Iteration Strategy (timing depends on feedback on draft)	end 2027	early 2028

*Late 2026 community engagement may include both risk assessment findings and adaptation approaches

CONSIDERATIONS

Strategic Framework and Policy Considerations

[46] The information presented in this paper reflects Council's Strategic Directions, "Otago builds resilience in a way that contributes to community and environmental wellbeing through planned and well-managed responses to shocks and stresses, including natural hazards" and "Otago is a climate-resilient region that plans for and invests in initiatives that reduce emissions and help us adapt to our changing climate"[13].

[47] It contributes to achieving the following goals of the Strategic Directions:

- "*Plans are in place to ensure that the region's most vulnerable communities (geographic and demographic) and ecosystems are resilient in the face of natural hazards.*
- *Our infrastructure is designed and built to accommodate variability and uncertainty associated with changing weather patterns and sea level rise".*

[48] The proposed Otago Regional Policy Statement June 2021, notified in late March 2024, states that ORC and territorial authorities are both responsible for specifying objectives, policies and methods in regional and district plans for managing land subject to natural hazard risk. ORC specifically is responsible for "*identifying areas in the region subject to*

[13] ORC Strategic Directions: https://www.orc.govt.nz/your-council/our-team/strategic-directions

hazards and describing their characteristics as required by Policy HAZ–NH–P1, mapping the extent of those areas in the relevant regional plan(s) and including those maps on a natural hazard register or database."[14]

[49] The ORC Infrastructure Strategy 2024-2054 was adopted in June 2024, together with 2024-2034 Long-Term Plan adoption.[15] Diagram 3 of the Infrastructure Strategy outlines the timeline of proposed management activities for the Lower Clutha Flood Protection and Drainage Scheme over the coming three decades. The natural hazards adaptation work programme will complement and help guide these activities.

Financial Considerations

[50] The forward work programme is included in the 2024-34 Long-Term Plan budget, which provides funding towards delivery, implementation and monitoring of the Clutha Delta natural hazards adaptation strategy.

Significance and Engagement Considerations

[51] Engagement planning considers and is designed to be consistent with organisational commitments made through He Mahi Rau Rika: ORC Significance, Engagement and Māori Participation Policy. The engagement approach for the Clutha Delta natural hazards programme was outlined in the May 2024 and August 2024 update reports.

Legislative and Risk Considerations

[52] The work described in this paper helps ORC fulfil its responsibilities under sections 30 and 35 of the RMA and the Soil Conservation and Rivers Control Act 1941.

[53] Engagement planning will include a risk management plan for engagement related activities throughout the delivery of the programme.

[54] A new National Direction for Natural Hazards is expected to be in place by mid-2025. This will "*provide direction to councils on how to identify natural hazards, assess the risk they pose now and in the future, and how to respond to that risk through planning controls such as directing development away from high natural hazard risk areas, or providing appropriate mitigation of that risk*".[16]

Climate Change Considerations

[55] Climate change and sea level rise are key factors influencing natural hazards in the Clutha Delta area. These factors will be considered in natural hazard and risk assessments, particularly for flooding and coastal hazards.

[56] The 2024 climate change strategies of CDC[17] and ORC[18] both reference the adaptation programme and key partnerships between the councils.

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[14] https://www.orc.govt.nz/media/bcvh4vee/clean-appeals-version-porps-21-2001.pdf

[15] ORC Long-Term Plan (LTP) 2024-2034: https://www.orc.govt.nz/your-council/plans-and-strategies/long-term-plan-ltp/long-term-plan-ltp-2024-2034/

[16] https://www.gw.govt.nz/assets/Documents/2024/08/20240822-Letter-from-Minister-Bishop.pdf

[17] CDC Climate Change Strategy 2024: https://www.cluthadc.govt.nz/repository/libraries/id:2c0gik8bh17q9s5atec4/hierarchy/publications/strategies/Climate_Change_Strategy_2024.pdf

[18] ORC Climate Change Strategy 2024: https://www.orc.govt.nz/media/2julazyd/orc-climate-strategy-2024.pdf

Communications Considerations

[57] The programme team are continuing to work with the Communications team to ensure communications and engagement planning are integrated, complementary and build off each other.

NEXT STEPS

[58] The four current natural hazards investigations (Koau Mouth and Puerua investigations, flood hazard assessment, Balclutha bed levels analysis, and liquefaction hazard assessment) are scheduled to be completed by mid-2025. The first community engagement activities will follow to share the findings.

[59] Scoping of additional supporting studies for completion in 2025/26, including baseline studies and natural hazard risk assessment, is underway. It is expected this risk assessment would include detailed assessments of the main natural hazard risks in the delta area, and include consideration of the changing future risk profile, and of residual risks for the scheme areas.

[60] Progress to develop strategic and operational objectives of the programme and an integrated work programme across Council and with partners is ongoing.

ATTACHMENTS

Nil