

Infrastructure Committee 11 March 2020

Meeting is held in the Council Chamber, Level 2, Philip Laing House
144 Rattray Street, Dunedin



Members:

Cr Carmen Hope, Co- Chair	Cr Michael Laws
Cr Gary Kelliher, Co-Chair	Cr Kevin Malcolm
Cr Hilary Calvert	Cr Andrew Noone
Cr Michael Deaker	Cr Gretchen Robertson
Cr Alexa Forbes	Cr Bryan Scott
Hon Cr Marian Hobbs	Cr Kate Wilson

Senior Officer: Sarah Gardner, Chief Executive

Meeting Support: Liz Spector, Committee Secretary

11 March 2020 11:00 AM

Agenda Topic

Page

1. APOLOGIES

No apologies were received prior to publication of the agenda.

2. ATTENDANCE

Staff present will be identified.

3. 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.

4. CONFLICT OF INTEREST

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.

5. PUBLIC FORUM

Members of the public may request to speak to the Council.

6. CONFIRMATION OF MINUTES

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6.1 [Minutes - 11 December 2019 Infrastructure Committee Meeting](#)

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The Committee will consider minutes of the meeting as a true and accurate record, with or without changes.

7. ACTIONS

There are no outstanding actions for the Infrastructure Committee.

8. MATTERS FOR NOTING

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8.1	UPDATE ON FEBRUARY 2020 FLOODING	6
	To provide information on recent Otago region floods and provide an overview of recovery required to reinstate ORC assets impacted by the cumulative effect of the floods.	
8.1.1	Attachment 1: Lower Clutha - Priority Flood Damage Repairs Map 2020.02.18	31
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9.	CLOSURE	



Minutes of a meeting of the
Infrastructure Committee held in the
Council Chamber Wednesday, 11 December 2019
144 Rattray St, 2nd Level Philip Laing House, Dunedin
commencing at 1p.m.

Membership

Cr Carmen Hope (Co-Chair)
Cr Gary Kelliher (Co-Chair)
Cr Hilary Calvert
Cr Michael Deaker
Cr Alexa Forbes
Hon Marian Hobbs
Cr Michael Laws
Cr Kevin Malcolm
Cr Andrew Noone
Cr Gretchen Robertson
Cr Bryan Scott
Cr Kate Wilson

Welcome

Chairperson Carmen Hope welcomed Councillors, members of the public and staff to the meeting at 01:05 pm.

For our future

70 Stafford St, Private Bag 1954, Dunedin 9054 | ph (03) 474 0827 or 0800 474 082 | www.orc.govt.nz

1. APOLOGIES

Resolution

That the apologies for Cr Deaker be accepted.

Moved: Cr Kelliher

Seconded: Cr Hobbs

CARRIED

2. ATTENDANCE

Sarah Gardner	<i>(Chief Executive)</i>
Nick Donnelly	<i>(General Manager Corporate Services and CFO)</i>
Gavin Palmer	<i>(General Manager Operations)</i>
Sally Giddens	<i>(General Manager People, Culture and Communications)</i>
Richard Saunders	<i>(General Manager Regulatory)</i>
Gwyneth Elsum	<i>(General Manager Strategy, Policy and Science)</i>
Amanda Vercoe	<i>(Executive Advisor)</i>
Liz Spector	<i>(Committee Secretary)</i>
Jean-Luc Payan	<i>(Manager Natural Hazards)</i>
Michelle Mifflin	<i>(Manager Engineering)</i>

3. CONFIRMATION OF AGENDA

The agenda was confirmed as circulated.

4. CONFLICT OF INTEREST

No conflicts of interest were advised.

5. PUBLIC FORUM

No public forum was held.

6. PRESENTATIONS

No presentations were held.

7. CONFIRMATION OF MINUTES

There are no prior minutes.

8. MATTERS FOR COMMITTEE DECISION

8.1. Consideration of Draft Terms of Reference

Cr Hope introduced the report and led a discussion on the proposed Infrastructure Committee terms of reference. Cr Calvert made a motion.

Resolution

That the Council:

- 1) **Receives** this report.
- 2) **Refers** the proposed terms of reference for the Infrastructure Committee to Council for adoption on 11 December 2019.

Moved: Cr Calvert
Seconded: Cr Noone
CARRIED

9. MATTERS FOR NOTING

There were no matters for noting.

10. CLOSURE

There was no further business and Chairperson Hope declared the meeting closed at 01:24 pm.

Chairperson

Date

8.1. Update on February 2020 Flooding

Prepared for: Infrastructure Committee

Report No. OPS1003

Activity: Flood Protection & Control Works

Author: Jean-Luc Payan, Manager Natural Hazards;
Michelle Mifflin, Manager Engineering
Michele Poole, Acting Director Emergency Management

Endorsed by: Gavin Palmer, General Manager Operations

Date: 11 March 2020

PURPOSE

- [1] To provide information on the recent flooding in the Otago region, including the magnitude of the December 2019 and February 2020 Floods, the response to these floods and provide an overview of recovery required to reinstate ORC assets impacted by the cumulative effect of these floods.
- [2] Whilst this report provides an overview of the flooding experienced across Otago for the December 2019 and February 2020 flood events, it does focus on the response and recovery at the Lower Clutha, Balclutha due to the scale and magnitude of damage.

EXECUTIVE SUMMARY

- [3] Between November 2019 and February 2020 two heavy rainfall events affected the Otago region and the Clutha River catchment particularly: the November/December 2019 event had a long duration and large amounts of rain falling on the headwaters of Otago during this period; the February 2020 event was shorter, more widespread with the largest amounts of rain falling in the headwaters and in the lower parts of the Clutha River catchment. Both events resulted in elevated lake levels and high flows in the Clutha River catchment.
- [4] The February 2020 flood event triggered the activation of the Group Emergency Coordination Centre (EEC) under ORC Group Controller Richard Saunders, across three (3) districts. This was subsequently met with Mayoral Declarations of Emergency across Southland and Clutha.
- [5] ORC's flood protection schemes reduced the flood risk for approximately 20,000ha of land. This included approximately 9,300ha of agricultural land on the Clutha delta and the township of Balclutha. Overall, the schemes performed to expected levels of service, but some assets were damaged and require repair. The residual risk of breach is increased because the floodbanks are now known to have compromised integrity due to latent conditions which presented in this event. The events highlighted the vulnerability of some areas to the effects of future climate change.
- [6] ORC has been undertaking a structured assessment of all damage to its flood protection assets, river channels and other areas of concern, as reported. This has been led by an

independent resource to project manage the assessment of scope, costing and plan to repair in a prioritised manner which is risk based on in impact to level of service, community and property.

RECOMMENDATION

That the Council:

- 1) **Receives** this report.
- 2) **Notes that:**
 - a. *There has been a collaborative response effort between landholders, CDEM, ORC staff, and Territorial Authorities, namely Clutha District Council.*
 - b. *Preliminary costs for flood damage repair are being prepared and will be refined through further investigation, scoping and costing.*
 - c. *The current scheme funding for the Lower Clutha Flood Protection and Drainage Scheme may not provide for all necessary flood repair work.*
 - d. *Funding options for some of the flood damage repair across the lower Clutha are being investigated through the NEMA (National Emergency Management Agency).*
- 3) **Notes** the programmes and work underway to address scheme performance, levels of service and adaption to the effects of future climate change.

BACKGROUND

- [7] Between November 2019 and February 2020 two heavy rainfall events affected the Otago region and the Clutha River catchment particularly. The characteristics (location, duration and intensity) of the two events were quite different resulting in floods or high flows events with different characteristics: the November/December 2019 event had a long duration and large amounts of rain falling on the headwaters of Otago during this period; the February 2020 event was shorter, more widespread with the largest amounts of rain falling in the headwaters and in the lower parts of the Clutha River catchment (downstream of the Roxburgh dam).
- [8] Both weather events were independent, but their succession in a relatively short interval has brought to focus latent conditions of some of the flood protection assets which present damage.
- [9] Planned work programs for the current FY 19/20 have been impacted due to the changed priorities for staff post-floods and effects on staff resourcing.
- [10] The characteristics of the two events are described in more detail in the following section.
- [11] Flows and water levels mentioned in this report are provisional and still need to be validated. ORC acknowledge NIWA for water level data for Lake Wakatipu and Lake Wanaka and for rainfall data from the Matukituki at West Wanaka gauge. ORC also acknowledge Rural Fire for the rainfall data from the Tokomairiro at Mouth gauge.

November/December 2019 event

[12] During November 2019 and early December 2019 (from 1 November to 8 December) the headwaters of Otago (Clutha River catchment) received substantial amounts of rain in a succession of rainfall events of variable duration and intensities (Figure 1).

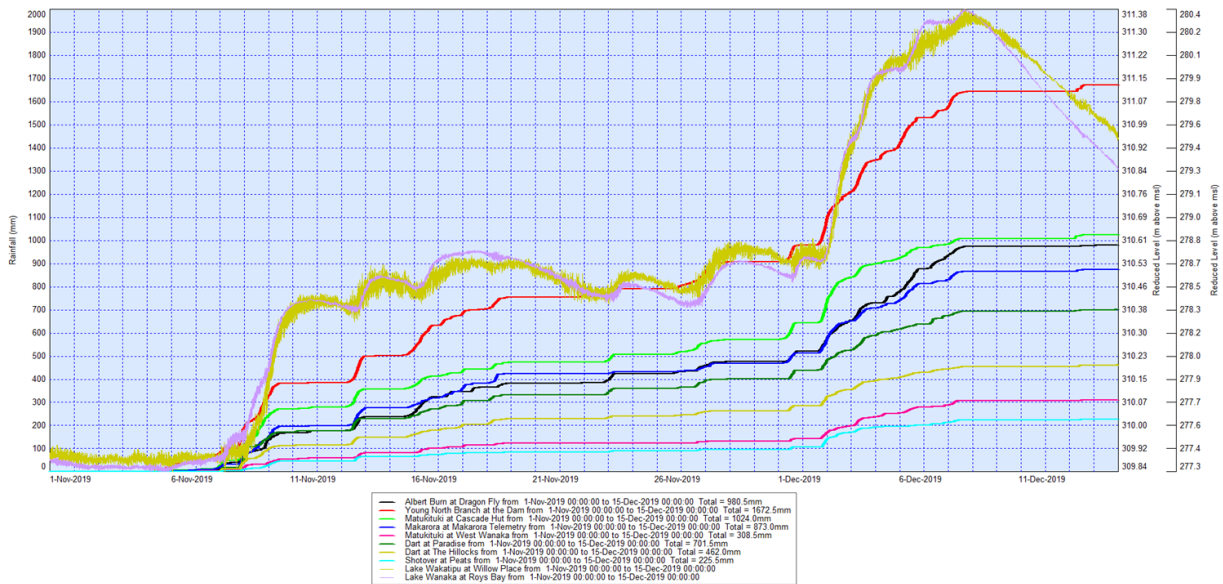


Figure 1. Cumulative rain at selected sites in the Clutha River catchment headwaters and Lake Wakatipu and Lake Wanaka water levels – 1 November 2019 to 15 December 2019. Steps in the cumulative rain indicate successive events.

[13] The succession of rainfall events at close intervals caused the water levels in Lake Wakatipu and Lake Wanaka to rise steadily and significantly over several weeks (Figure 2).

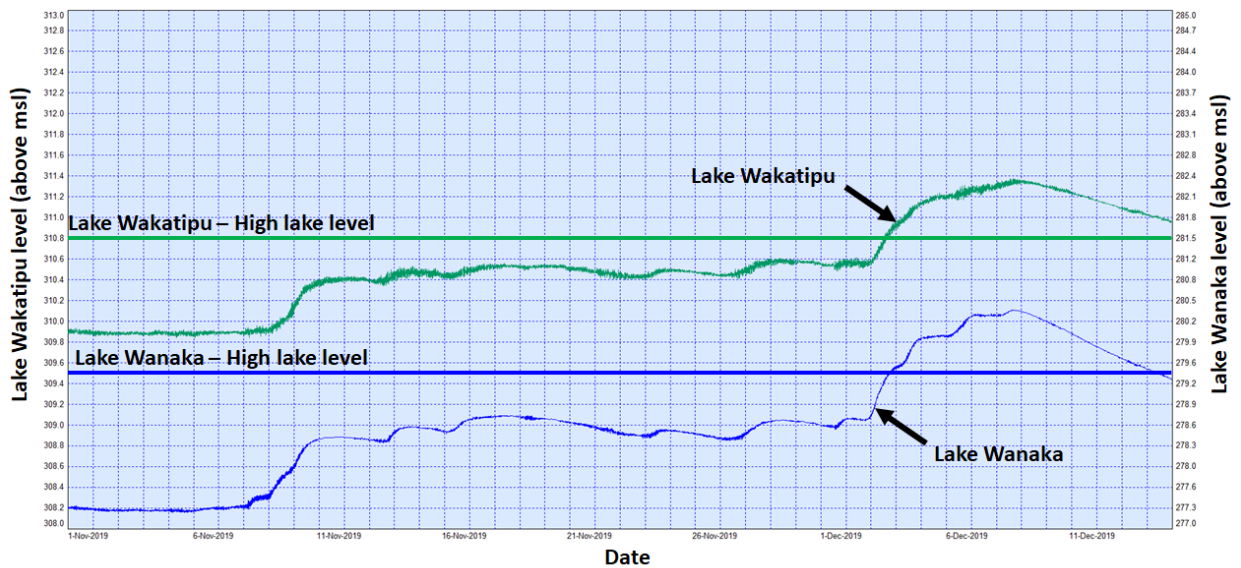


Figure 2. Lake Wakatipu and Lake Wanaka water levels – 1 November 2019 to 15 December 2019

- [14] Within the period between November 2019 and early December 2019, two larger events (8-9 November 2019 and 2-8 December 2019) resulted in sharper increases of lake water levels.
- [15] Lake Wakatipu peaked at 311.37m (above mean sea level). This peak is not in the top ten highest water levels on records¹ (Figure 3). It is, however, the second highest since the November 1999 memorable flood event.

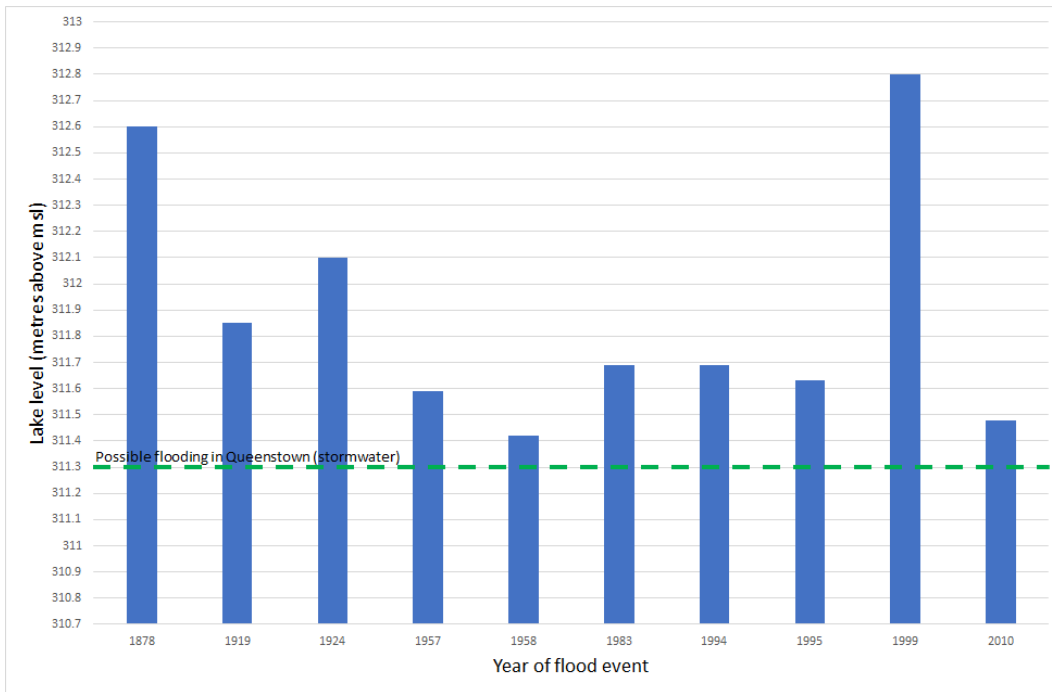


Figure 3. The 10 highest Lake Wakatipu levels since 1878

- [16] Lake Wanaka peaked at 280.37m (above mean sea level). This peak is the third highest water level on records² (Figure 4) and the highest since the November 1999 flood event. High lake levels inundated Ardmore Street on the Wanaka waterfront and were on the verge of flooding the lake front businesses.

¹ Continuous water level recording for Lake Wakatipu started in November 1962 but discrete high lake level information is available since at least 1878

² Continuous water level recording for Lake Wanaka started in February 1933 but discrete high lake level information is available since at least 1878

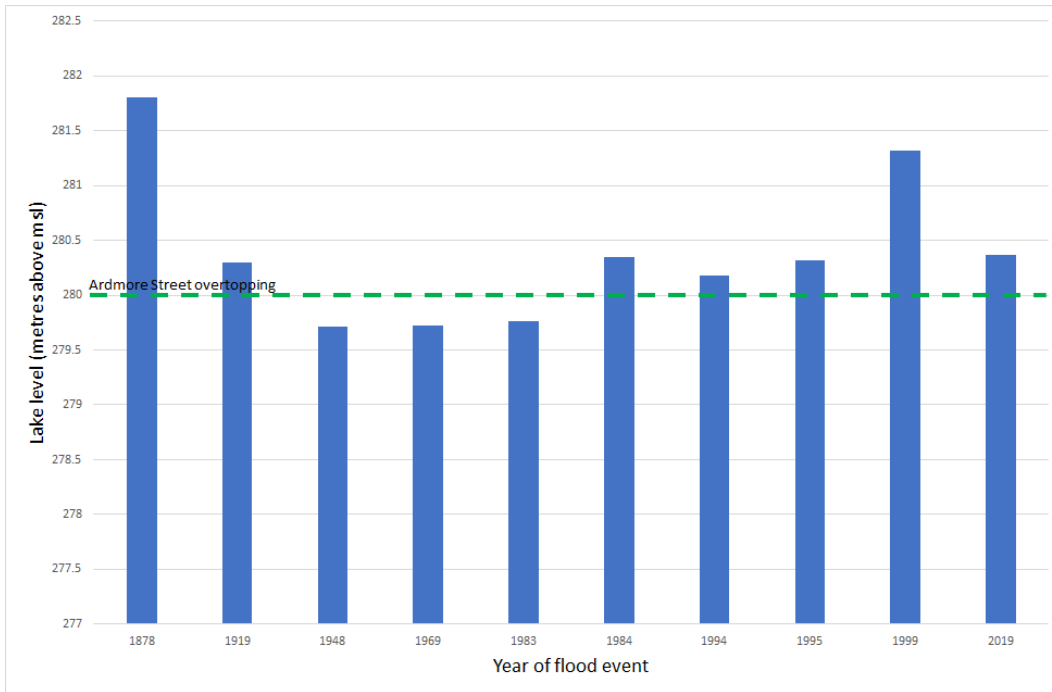


Figure 4. The 10 highest Lake Wanaka water levels since 1878

- [17] The water levels in Lake Wakatipu and Lake Wanaka took 24 days and 31 days respectively to decrease to the November/December mean levels.
- [18] The main rivers feeding Lake Wakatipu (e.g. the Dart River) and Lake Wanaka (e.g. the Matukituki River) experienced a succession of peaks between November and early December 2019. The successive peaks were not exceptionally high but happened at close intervals (typically 3-4 days between each peak). High flows in the Dart River affected low sections of Kinloch Road which was impassable at times.
- [19] Prolonged high lake levels caused the rivers draining the lakes to rise and to stay elevated for a long period. In particular, the Clutha River at Lake Wanaka outlet (Clutha River below Cardrona River confluence) peaked at 1040m³/s approximately (the third highest flow since recording started in April 1992 and the highest since the November 1999 flood). It took approximately 22 days for the flows to decrease to the mean December flow.
- [20] Bank erosion and damage to the ORC bank protection rockwork located on the Clutha River right bank upstream of the SH6 bridge in Albert Town have been observed since water levels receded (see section below for more details).
- [21] The flows in the downstream sections of the Clutha River subsequently rose and stayed high for a long period (the Clutha River at Balclutha remained above the first flood warning level for approximately three weeks). The flows in the downstream sections (from Clyde to Balclutha) were not, however, exceptionally high as no significant rainfall was observed in the lower parts of the catchment.

- [22] In the rest of the region, no significant rainfall was observed, and rivers did not reach high flows during this period.

February 2020 event

- [23] A low-pressure system to the south and southwest of the South Island brought heavy rainfall to most parts of Otago between 2 February and 4 February 2020. The rainfall event was widespread but the highest rainfall totals were recorded in the western (headwaters) and southern (lower sections of the Clutha River catchment downstream of the Roxburgh dam, Tokomairaro River catchment and in the Catlins) parts of the region (Figure 5).

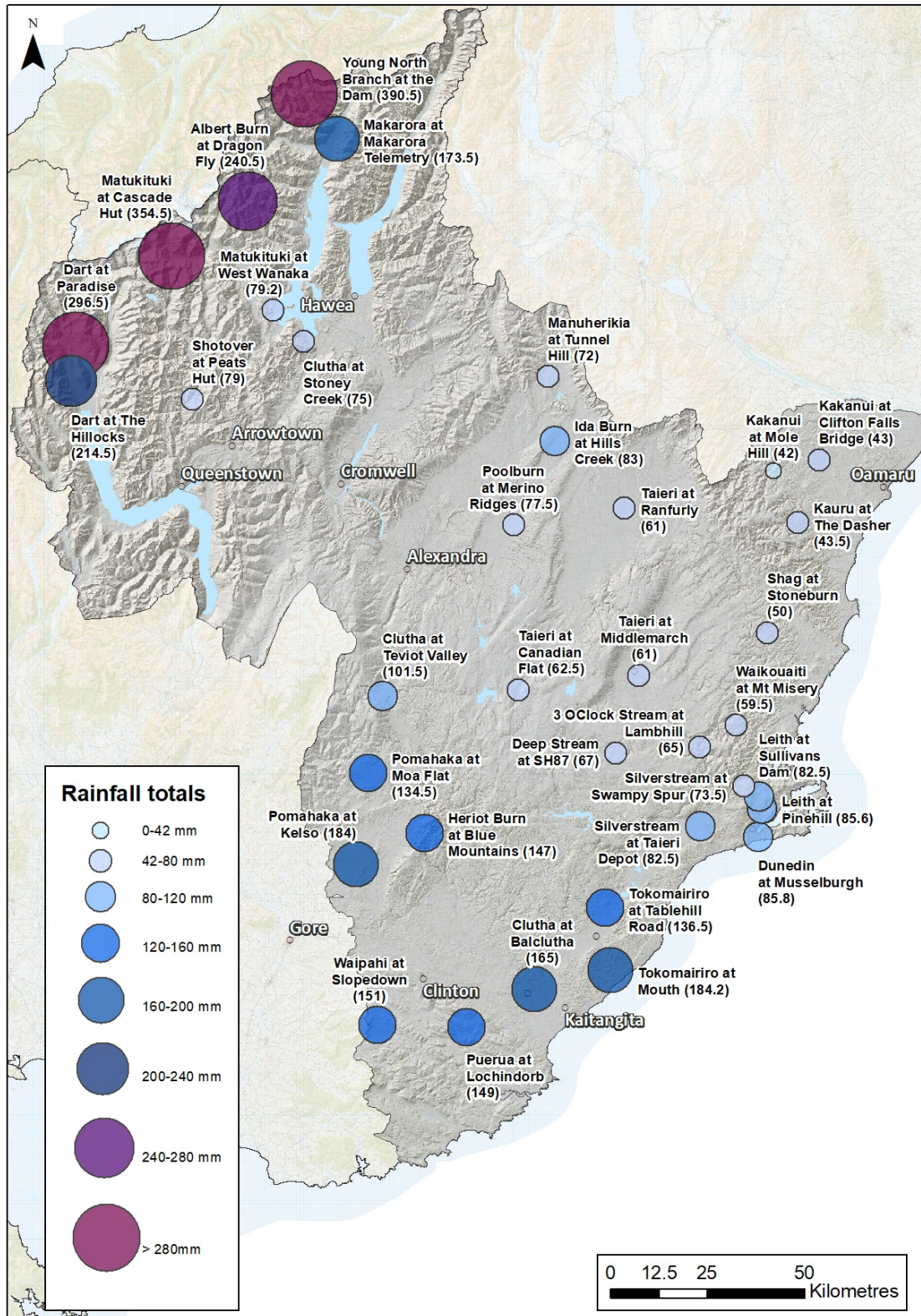


Figure 5. Rainfall total observed at rain gauges in Otago from 1 February 2020 midnight to 6 February 2020 midnight

- [24] In the headwaters notable amounts of rainfall fell during this period causing the rivers feeding Lake Wanaka and Lake Wakatipu to rise. The Dart River peaked just below 1800m³/s, about 20m³/s below its highest flow since recording started in June 1996. This elevated flow affected Kinloch Road.
- [25] On 4 February a section of floodbank protecting parts of Glenorchy from flooding from the Rees River overtopped causing flooding to the recreation ground, the golf course and private properties (Figure 6).



Figure 6. Flooding in Glenorchy, 4 February 2020 around 6.30pm. Rees River Delta in the foreground and Lagoon to the left of the photograph (photo: Luke Hunter, Done Rite Contracting Ltd)

- [26] Lakes levels rose sharply (Lake Wakatipu rose approximately 1.5m and Lake Wanaka 1.8m in about 55 hours) not reaching, however, flooding levels.
- [27] During steady rain on 4 February a debris flow emanated from Grassy Stream in the eastern Gibbston Valley. The debris flow initiated high in the catchment, and stripped vegetation as it travelled down channel. 'Tussock Creek' subdivision is built upon the Grassy Stream alluvial fan at the foot of the range. Through the subdivision, the debris flow deposited rocks and sediment, blocked culverts, inundated some driveways and parts of a vineyard but there were no reports of buildings being affected by flows (Figure 7).



Figure 7. View north down Tussock Creek subdivision (Gibbston Valley) showing sediment deposited in and around the channel, and across part of a vineyard. Much of the sediment blocking the creek had been cleared at time of photo (12th February 2020, photo ORC).

[28] In South Otago, although the rainfall intensities were not extremely high (usually not exceeding 8mm/h except in localised areas where a short two-hour burst of higher intensities up to 12mm/h was recorded on 3 February between 8pm and 10pm) the event was widespread and lasted up to approximately 72 hours with nearly continuous rainfall (Figure 8).

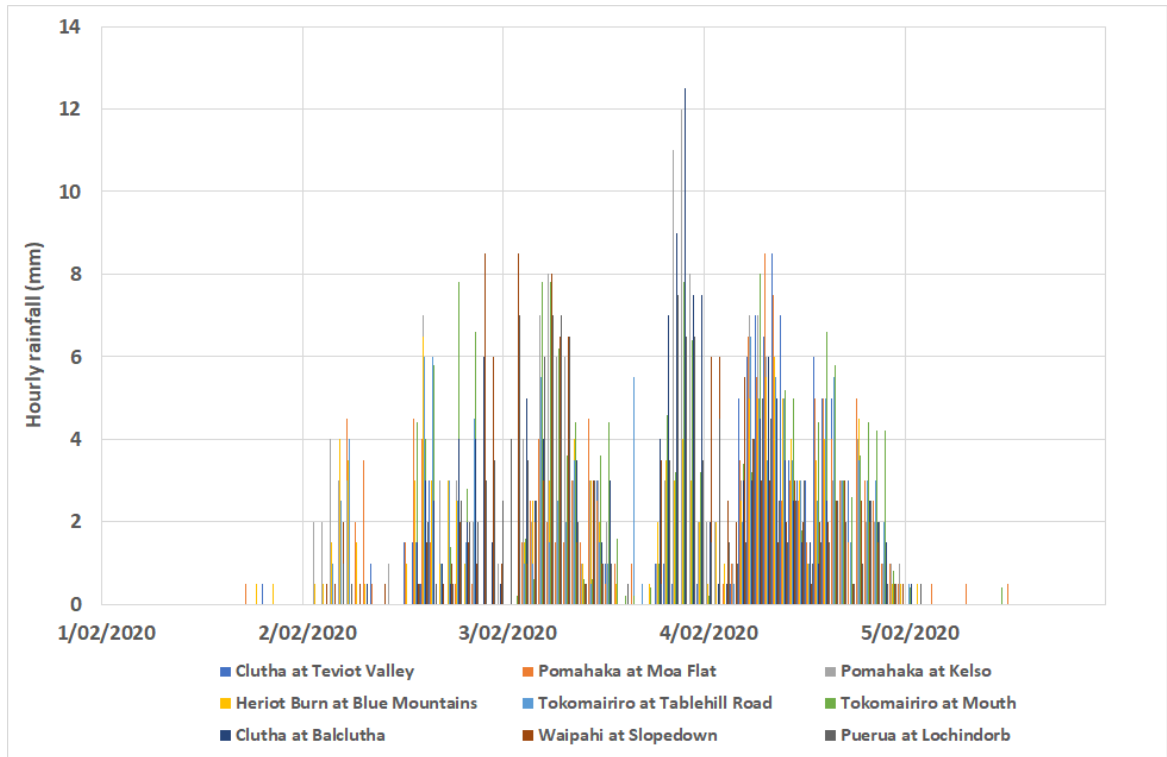


Figure 8. – Hourly rainfall at selected raingauges in the Lower Clutha, Tokomairao and Catlins areas

- [29] The Pomahaka River at Burkes Ford peaked at 874m³/s (the 6th highest flow since recording started in August 1961) which was not observed since the series of extreme floods in the late 1970s early 1980s.
- [30] The Clutha River at Balclutha peaked at 3179m³/s, the 8th highest flow on records¹ but the highest flow since the notable flood of November 1999.
- [31] The persistent rainfall resulted in significant flooding due to surface runoff and ponding in low-lying parts of the Clutha Delta (notably Barnego, Paretai, Inch Clutha, Kaitangata) (Figure 9 and Figure 10) and to riverbank overtopping, particularly in the Pomahaka River catchment.

¹ Continuous water level recording for the Clutha River at Balclutha started in July 1954 but discrete high flow information is available since at least 1863

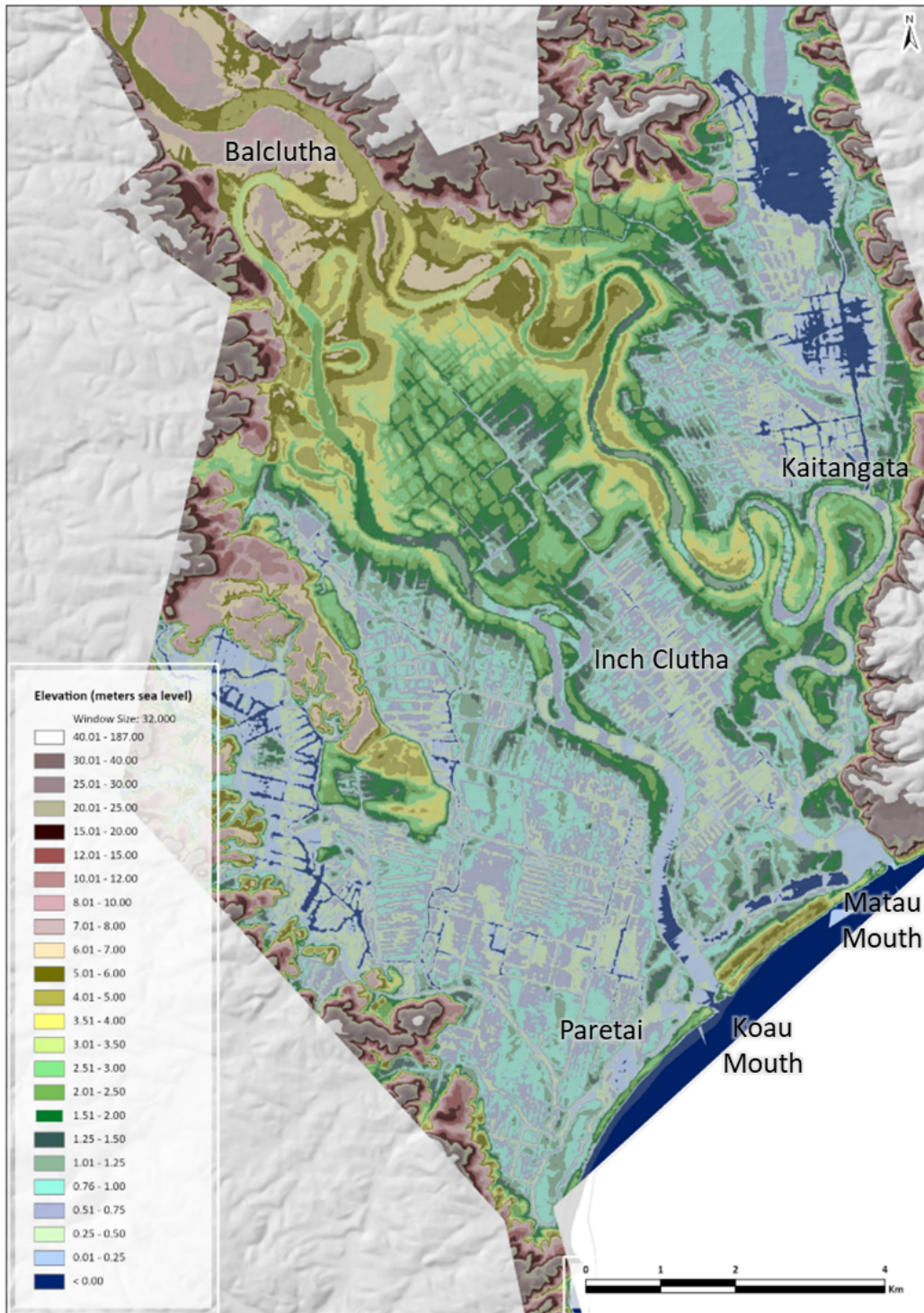
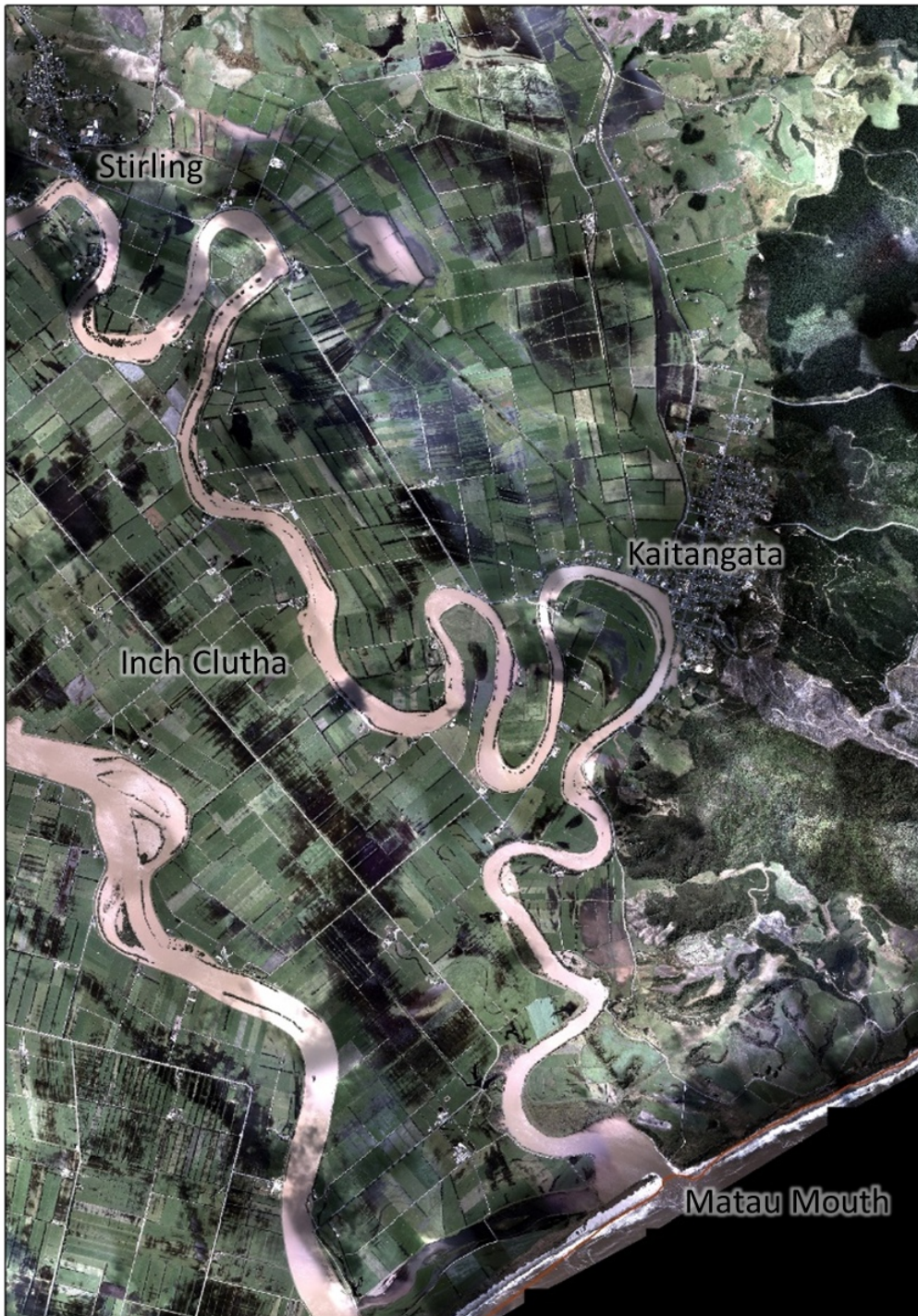


Figure 9. Land elevation derived from LiDAR data (2004) - Clutha Delta. Land elevation in metres relative to mean sea level



(a) Barnego and Balclutha



(b) Matau Branch, Inch Clutha, Stirling and Kaitangata



(c) Koau Branch, Otanomomo and Paretai

Figure 10. Aerial photos captured for ORC on Wednesday 5 February 2020 between 2.37pm and 5.39pm. Flows in the Clutha River were between 3,100m³/s and 2,980m³/s approximately (the river peaked at 3,179m³/s on Wednesday 5 February 2020 at 10am approximately). Darker water on land indicates surface runoff and ponding.

- [32] High lake levels contributed to sustained high flows in the lower parts of the Clutha River catchment.
- [33] Sea levels and high tides at the mouths of the Clutha River (Matau and Koau branches) were monitored by ORC but were not an issue during this event.
- [34] In the rest of the region, the rainfall was not continuous with most of the precipitation falling on 4 February and with intensities usually below 10mm/h. This was not sufficient to cause river levels to reach flooding levels.

FLOOD RESPONSE: FLOOD FORECASTING AND POST-EVENT NATURAL HAZARDS INVESTIGATIONS

- [35] Prior to and during both events, the ORC, through its Flood Duty Officers Team, have provided weather information interpretations, flood forecasting and situation reporting to a range of stakeholders and possibly affected groups: general public, Emergency Management Otago, Engineering Team and District and City Councils.
- [36] Close contact was maintained with MetService for updates on the weather situation and forecast and with Contact Energy Limited for the status and operation of the dams and reservoirs in the Clutha River catchment.
- [37] The information was disseminated using media advisories and releases, social media, targeted phone and text messages, regular briefings and on the ORC WaterInfo website and specifically created webpages (e.g. <https://www.orc.govt.nz/managing-our-environment/natural-hazards/flooding/clutha-catchment-lake-and-flow-situation>).
- [38] This service includes the provision of water levels and flow forecasts for selected lakes and rivers and interpretation of likely consequences of heavy rainfall event such as defining areas at risk of flooding.
- [39] Following both events specific natural hazards investigations have been initiated for the debris flow in Gibbston Valley (Tussock Creek) and the overtopping of the floodbank in Glenorchy. The purpose of those initial investigations is to evaluate the level of risk and recommend further actions.
- [40] Given the magnitude of the flows reached in some rivers in the Clutha River catchment and the levels in Lake Wanaka and Lake Wakatipu, efforts have been made by ORC to use this opportunity to capture valuable post-event data to document the consequence of the events. Data was mainly collected through aerial reconnaissance, site visits and debris marks and river cross-sections surveys.
- [41] This data will be used to better understand the natural hazard risks in the affected areas, to inform possible mitigation measures and assess the performance and assist in the repair of ORC flood protection and drainage infrastructures.

FLOOD RESPONSE: EMERGENCY MANAGEMENT OTAGO

- [42] Emergency Management Otago (EM Otago) is responsible for civil defence activities across Otago on behalf of the regional, district and city councils. Emergency Management Officers are embedded in the city council and each district council to support the TLAs' local capability. Five staff are based in the Group Emergency Management Office (GEMO) and provide the core of the Group Emergency Coordination Centre.
- [43] EM Otago liaised with ORC flood and engineering teams as well as partner agencies to coordinate and support the wider community response to the flooding in three districts. The impacts and activations in three districts automatically triggered the activation of the Group Emergency Coordination Centre (EEC) under Group Controller Richard Saunders (the Group activates when more than one district has an emergency).
- [44] EM Otago staff activated on Tuesday 4 February 2020, initially in support of Southland's state of emergency and then in locally and at ECC level in response to the increasing impacts of the sustained heavy rainfall in Clutha, Queenstown Lakes and Dunedin.
- [45] On Tuesday 4 February Queenstown Lakes District opened a civil defence centre in Frankton to receive the 84 trampers airlifted from the Fiordland tracks and support the Police to register the evacuees. Around 40 of the trampers were initially evacuated to Glenorchy where EM Otago assisted DOC and Police to provide shelter until they could be transferred to Queenstown. Sixty trapped vehicles were extracted from a stretch of SH6 between Frankton and Kingston which became isolated by slips. Access to homes in a private subdivision in Gibbston was cut by a slip and the Glenorchy road was among several routes closed by slips and surface flooding. Kingston was also cut off.
- [46] Lake Wakatipu did not reach the peak level recorded in December 2019. However, the Rees River overtopped a stopbank and flooded one residence in Glenorchy, resulting in the precautionary evacuation of a further 30 nearby homes. About 40 residents were accommodated overnight at Camp Glenorchy.
- [47] Dunedin City's Emergency Operations Centre was activated on 4 February in anticipation of surface flooding issues and the Council made sandbags available in South Dunedin. Of greater concern was the potential for an estimated 4000 Elton John fans to be stranded in the city overnight due to flooded roads. Accommodation in the city was already at capacity due to the Masters Games and concertgoers. Contingency arrangements were made with the University of Otago to open the university colleges for stranded travellers if required. A small number of visitors took up the offer, but most were able to reach their destinations that night, due to the combined efforts of Police, NZTA and Clutha District Council contractors who kept SH1 open south of Milton where the Tokomairiro River had flooded the road.
- [48] The Clutha District Emergency Operations Centre activated initially due to extensive surface flooding and road closures and extended its response when ORC modelling suggested the Pomahaka and Clutha Rivers could both approach record levels. Mayor Bryan Cadogan declared a state of emergency at 9.29pm due to worsening flooding. Rural properties in the Barnego area were warned to prepare to evacuate households and livestock. Civil defence centres were opened in Balclutha and Owaka to assist residents and stranded motorists trying to return to Southland.

- [49] On Wednesday 5 February engineers identified areas of vulnerability in the Hospital Road detention bank, Balclutha. Following geotechnical inspection, people in low-lying areas of urban Balclutha were advised to self-evacuate due to the risk that sudden bank collapse would inundate homes and businesses with little warning. There were also concerns for the integrity of a Waitapeka stopbank.
- [50] Motorcyclists trying to reach Invercargill for the Burt Munro Rally placed additional strain on Clutha's accommodation and welfare capability. Arrangements were made with Air BnB to make private accommodation available. In Tapanui the community supported around 50 stranded motorcyclists, which put a strain on available resources.
- [51] By Thursday 6 February rivers were dropping and damage assessments began in rural areas. The umbrella Otago Rural Advisory Group and the Rural Support Trust coordinated these efforts. On Friday 7 February all areas of urban Balclutha at risk from the potential failure of the Hospital Rd detention bank were cleared to reoccupy. The Clutha District Emergency Operations Centre stood down that evening after Mayor Cadogan terminated the State of Emergency.
- [52] The ECC remained active from until Friday 7 February to provide support to the districts, liaise with EOCs, emergency services, lifeline utilities and the National Emergency Management Agency (NEMA), and coordinate resources including personnel and pumps to assist in Clutha.
- [53] Three Dunedin-based staff were deployed to Balclutha, while the Alexandra-based Emergency Management Officer assisted with the evacuation of trampers in Glenorchy. The ECC was staffed by remaining EM Otago personnel and three drawn from the ORC.
- [54] Clutha District Council has been coordinating the recovery operations within the district, under the direction of Local Recovery Manager John Scott.
- [55] Debriefs of the flood response are being scheduled at local and regional level to identify corrective actions.

FLOOD RESPONSE: FLOOD PROTECTION & DRAINAGE SCHEMES

Lower Clutha System Level of Service (LoS)

- [56] The ORC provides a level of service across Otago which encompasses approximately 32,000 km² administered by the ORC. Within that area, there are identified responsibilities of river management, flood protection and drainage.
- [57] The Lower Clutha Flood Protection and Drainage Scheme encompasses an area from Barnego in the north to the mouths of the Matau and Koau branches of the Clutha River in the south. The Lower Clutha Flood Control Scheme protects and drains an area of approximately 9,300 ha covering the Clutha delta.
- [58] The majority of the protected area is farmland with the towns of Balclutha (4,062 people in 2006 Census) and Kaitangata (810 people in 2006 Census) within the Scheme boundaries. The area also includes the Finegand Freezing Works, south of Balclutha.
- [59] This scheme provides flood protection from the Clutha River and Drainage from the respective areas as shown on the Figure 11, to ensure that flooding (from rainfall and

ponding) up to standards, is conveyed through the system to the coastal mouths. This is achieved by the pump stations assets and the floodbanks, ponding areas and spillways that convey the overland flows.

[60] During the flood event, the level of service was maintained for the protection from the Clutha River as set out below and shown on Figure 11.

[61] The Level of Service provided by the Floodbanks for managing the Clutha River is as follows Figure 11 (all flows measured at Balclutha):

- Convey all floods with no failure of any scheme floodbank,
- No flooding of Barnego from Clutha River flows up to 2,850m³/s,
- No flooding of Kaitangata, Inch Clutha and Paretai from Clutha River flows up to 4,000m³/s,
- No flooding of Balclutha and Finegand from Clutha River flows up to 5,600m³/s.

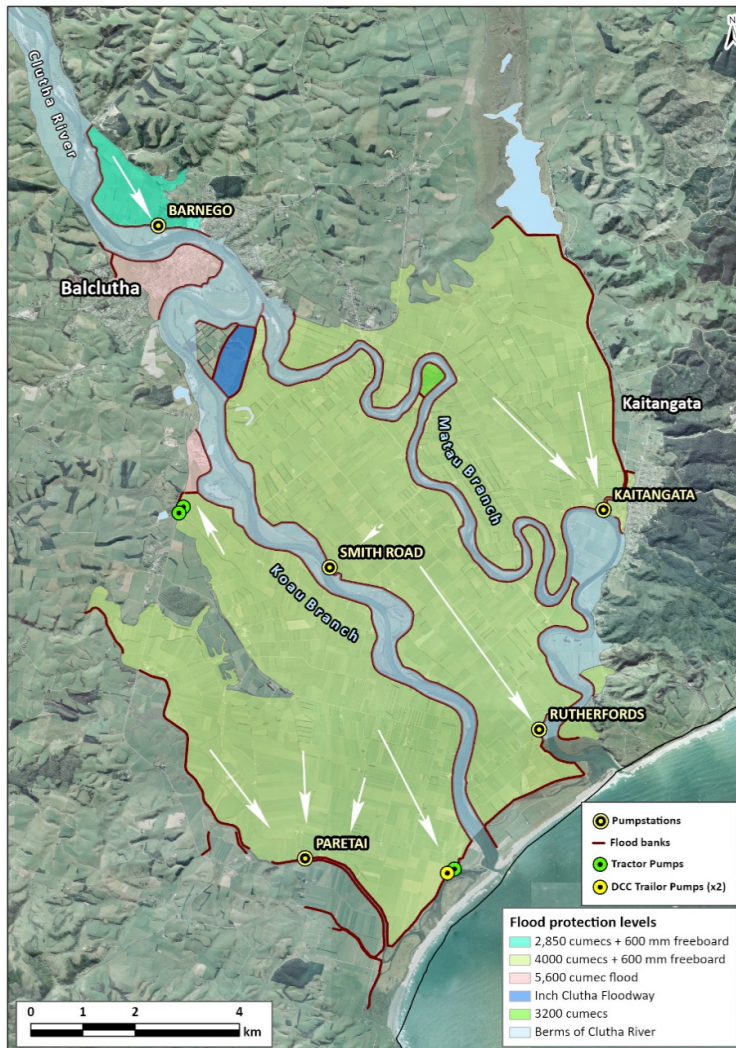


Figure 11: Overview of Scheme and Flow paths during flood event

- [62] The scheme also provides a level of service to a rural standard through a drainage network which is shown in Figure 12 to convey surface water to the pump stations.
- [63] This event as mentioned earlier in this paper contributed to a prolonged period of rainfall which contributed to > 80 mm of rain in the areas of Paretai which in comparison to our rainfall site “Clutha at Balclutha”, the average annual rainfall is about 670 mm/year.

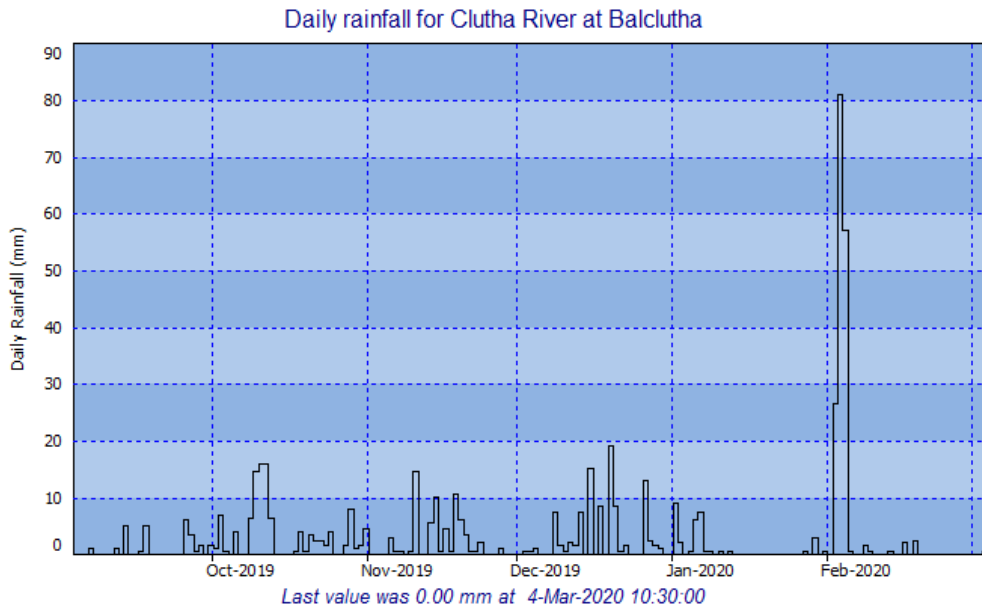


Figure 12. Daily rainfall for Clutha River at Balclutha

- [64] The Level of Service provided by the Drainage system and Pumping stations is as follows (Figure 12):
 - Drainage protection standards are measured in mm/day pumping capacity.
 - Inch Clutha is nominated at 9 mm/day (Rutherfords and Smith Rd Pump Stations)
 - Otanomomo and Paretai District 10 mm/day (Paretai Pump Station)
 - Barnego 11 mm/day (Barnego Pump Station)
 - Matau District 7.5mm/day (Kaitangata Pump Station)



Figure 13. Overview of Drainage network to Pump Stations

Flood Event Behaviour in Lower Clutha

[65] The February 2020 flood event combined several rainfall scenarios that resulted in flooding behaviour summarised as follows:

- A combination of prolonged rainfall events,
- Lake headwater flooding which contributed to high flows in the Clutha River,
- Pomahaka River flooding from its catchments contributing to Clutha River flow,

- Southern range rainfall that contributed to catchment flows in catchments such as; Waitepeka Creek, Hospital Creek (Balclutha) and others flowing into the lower Clutha, and
- Heavy localised rainfall causing ponding in the lower Clutha.



Figure 14. Impact on Lower Clutha Flood Protection and Drainage Scheme in vicinity of Balclutha (5 February 2020, flow in the Clutha River was 3,058m³/s approximately (the river peaked at 3,179m³/s on 5 February 2020 at 10am approximately) (Photo: Landpro)

[66] Impacts of these combined factors on the Lower Clutha Scheme were as follows:

1. The heavy localised rainfall inundated the drainage system which in turn flushed a huge amount of weed and debris through drains, blocking pump stations initially;
2. The Clutha River rose rapidly which also caused outflows from drainage into the Clutha to close;
3. The surrounding catchment rainfall and subsequent runoff caused in a short timeframe, less than 8 hours, volumes of ponding/stored water behind floodbanks (Waitepeka) and detention ponding (Hospital Creek Road) to reach near capacity, and;
4. Localised surface rainfall and ponding put pressure on rural communities to drain into drainage networks and pump stations.

Flood Response to the Scheme Level of Service during Flood

- [67] The above effects required the following flood response actions to be invoked to ensure the lower Clutha system remained functioning:
- Resourcing critical pump stations to ensure no blockages were delaying pumping.
 - Engaging Geotechnical engineering support on the ground to assess areas of concern.

- Excavating at the Waitepeka Spillway to relieve pressure from the floodbank which presented piping and compromise, until the outflow structure into Clutha River could open and flow (Figure 15).
- Supporting Clutha District Council in decision making processes concerning the Hospital Creek detention pond stopbank which was displaying signs of piping and seepage, and
- Deploying additional pumping to strategically assist drainage at the Paretai Pump station where the need was exacerbated by alteration, the Waitepeka spillway and a temporary outage of the Paretai pump station.

[68] The ORC does not provide under its current level of service additional pumping to drain excessive ponding water from rainfall.

[69] The ORC did recognise in mitigating the safety and protection of Owaka State Highway and preservation of the Waitepeka Bank, that lowering the spillway had an increased water effect into the overland path downstream of the spillway. Pumps were authorised for an approved period to assist drainage by the Manager of Engineering which has been documented.

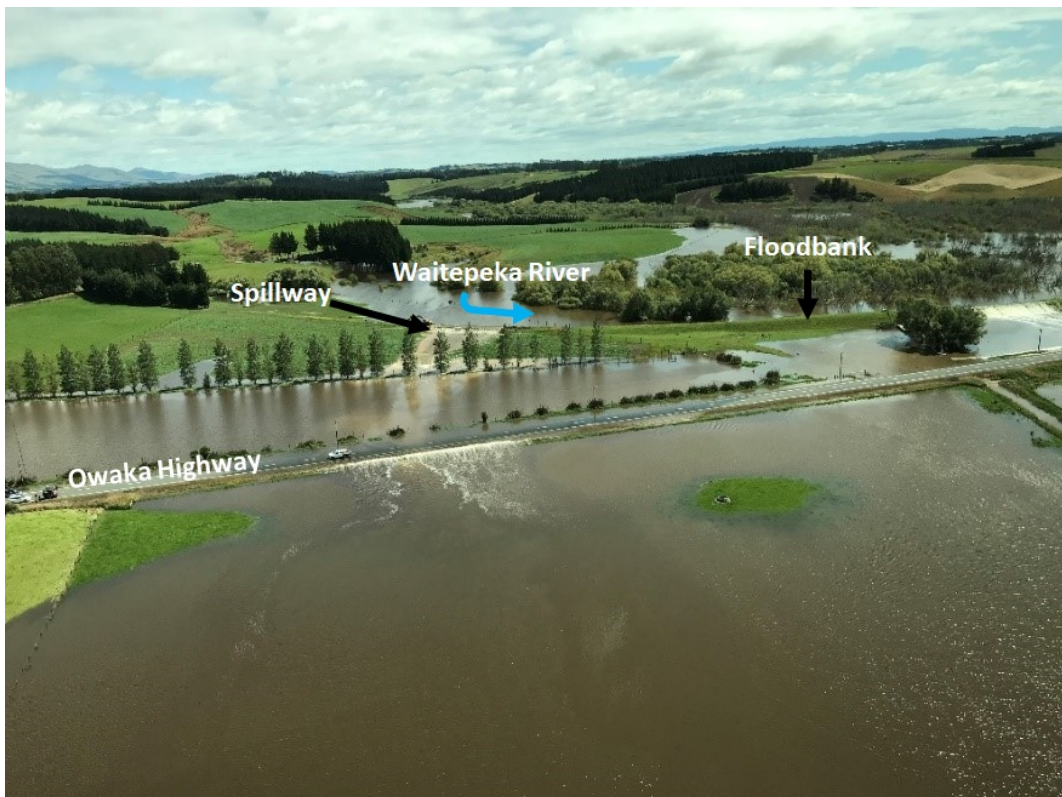


Figure 15. Waitepeka Floodbank showing the areas of piping 5th February 2020

Post Flood Assessment

- [70] An assessment is currently being managed by ORC staff. A dedicated Flood Response Project Manager is in place. The assessment will involve external geotechnical engineers and contractors providing input.
- [71] The assessment is necessary to establish the extent of repairs required and cost magnitude associated with restoring infrastructure to its full level of service function, where applicable.
- [72] Figure 16 provides the location of areas in which the flood damage has been located.

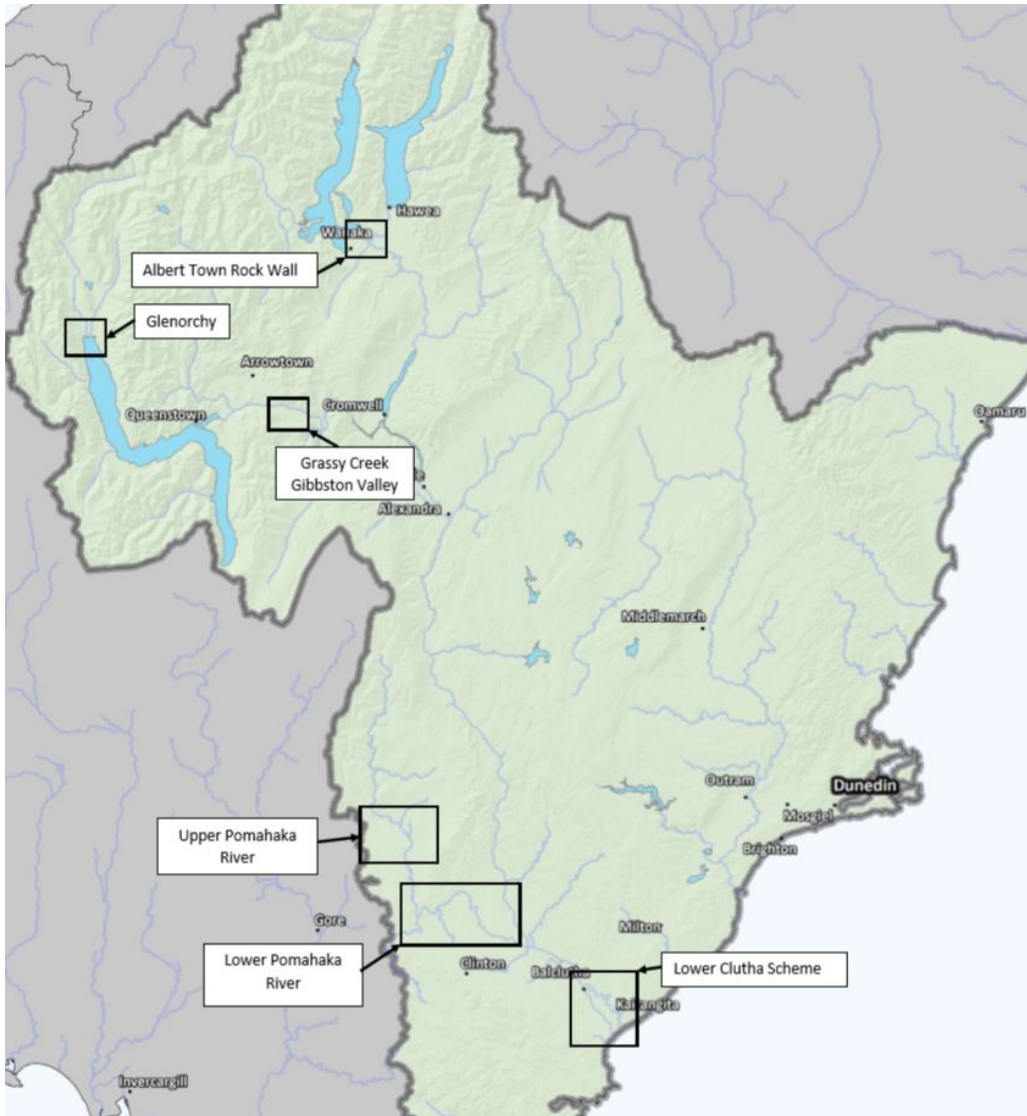


Figure 16. Overview of flood locations and major damage

- [73] The priority to implement flood recovery (or damage repair) should ideally be undertaken based on the residual risk the damage or impact raises. Funding availability and the complexity of the repairs will, of necessity, play a part in the order in which repairs are undertaken. It may be prudent to undertake some lower risk repairs ahead of higher priority work (with a high residual risk) simply because the work is easy to incorporate into planned activity and is relatively low cost.

- [74] Some flood recovery activities, such as minor repairs or debris removal may be able to be undertaken as part of the flood and drainage scheme budgets as part of business as usual (BAU).
- [75] These minor repairs can occur in parallel to necessary investigation, redesign and consideration of options for more complex (yet higher priority) works that may require more time. This will have a high importance and social value for the communities affected.
- [76] Areas where issues or damage were recorded during the flood events that are or will be addressed by current programmes of work are:
- The overtopping of the floodbank in Glenorchy. To be considered in the natural hazard strategy for the Head of Lake Wakatipu that is currently being developed by ORC and QLDC;
 - The performance of the Lower Clutha Flood Protection and Drainage Scheme that is currently under review. The review will confirm how the scheme is currently delivering the different levels of service and will assess the likely effects of climate change on its performance. The scheme performance assessment is also focussing on the effects of coastal hazards (erosion and inundation) in low-lying areas such as Paretai and Inch Clutha. Data collected after the flood events such as debris marks and cross section surveys will inform the scheme performance assessment;
 - Repair and maintenance work in the Pomahaka catchment will be guided by The Pomahaka River morphology and riparian management strategy developed in 2016. Information and observations collected during the flood events will also be used to update the strategy. Staff have made a number of visits to the area and are liaising with landholders.
- [77] Flood events, as with any adverse events encountered by the ORC, will present a challenge to our annual plan budgets.
- [78] Latent conditions and/or adverse weather events cause damage that is unplanned in work programs and budgets.
- [79] The damage that floods have created on infrastructure is financially being investigated for funding through a possible National Emergency Management Agency (NEMA), funding application for eligible repairs.
- [80] The infrastructure damaged from these flood events is not insured by the ORC. The infrastructure that is insured are the pump stations and assets associated with the pump stations. We have, however put an insurance notification in for the areas of damage, as the ORC has a role of monitoring and maintaining the flood banks, it subsequently has a potential liability for damage from any failure of the bank, until repairs are completed.

CONSIDERATIONS

Policy Considerations

- [81] Not Applicable

Financial Considerations

- [82] As set out in paper.

Significance and Engagement

[83] The significance of this event will depend on outcome and the full assessment of asset damage and funding implications.

Legislative Considerations

[84] ORC is operating under the provision of the Soil and Rivers Control Act 1941.

NEXT STEPS

[85] The next steps are:

- Continue the overall flood damage repair assessment to ascertain scope and costing of repairs.
- Commence investigations and design into Priority 1 areas of repair for FY 2019/2020.
- Apply for the NMEA funding, if eligible.
- Engagement with the Lower Clutha District Council on ownership of assets and collaborate on funding where relevant.
- Develop mitigation/response plans for areas that may be deferred to FY2020/2021 and the LTP.
- Proceed with investigations to refine costs and options for FY2020/2021 repairs.
- Incorporate information from the floods into scheme performance assessments and adaption planning for the Clutha and Dart/Rees deltas.

ATTACHMENTS

1. Lower Clutha - priority flood damage repairs map 2020-02-18 [**8.1.1** - 1 page]
2. Repair Priorities [**8.1.2** - 2 pages]

INITIAL ASSESSMENT OF REPAIRS as at 28th February 2020

The following table summarises the information gathered to date post the flood (15th February 2020) on known areas of damage across Otago. This assessment will form the basis of prioritising repairs and funding.

This is currently an indicative guide only of the priority of work identified by inspections.

Priority 1: further investigations and work (where feasible) to be undertaken as soon as possible and before the end of June 2020

Priority 2: investigation and work planned to be undertaken during the 2020/21 financial year, and

Priority 3: to be undertaken over a longer period, possibly planned and funded through the Long-Term Plan.

Issue No. & Priority	Area / Description	Risk	Description & Size
Issue 1 Priority 1 By 6/2020	Lower Clutha Riverbank Rd upstream of Renton Rd.	HIGH risk. Public safety hazard	Collapse of 100-150 m of stopbank and public access road.
Issue 2 Priority 1 By 6/2020	Lower Clutha Waitepeka stopbank.	HIGH risk. Public safety hazard to Okawa Hwy	Overtopped and piping failure of 430m of stopbank. Spillway to be reinstated.
Issue 3 Priority 2 In 20/21	Lower Clutha Hospital Rd Stopbank. Upstream of Balclutha	MEDIUM risk. Inundation risk to parts of Balclutha	Piping failure along 250m of stopbank. Requires investigation and options. Rebuild or alternatives.
Issue 4 Priority 1 By 6/2020	Lower Clutha -Main stopbank. Pressure relief wells & scour	LOW risk. Unlikely stopbank will fail. HIGH priority to investigate	Sediment discharge & slumping – 2 relief wells require further investigation. Minor repairs to scour on stopbank requires fixing at several locations
Issue 5 Priority 2 In 20/21 & LTP	Lower Clutha - river bank erosion, debris and gravel bank build up	LOW risk but exacerbates stopbank damage.	Bank erosion at several locations, debris and tree removal. Gravel build up needs to be addressed as it places additional pressure on eroded/slumping areas. Further investigation required.
Issue 6 Priority 1 By 6/2020	Lower Pomahaka River. Burning Plain Road River bank and road collapse	HIGH risk if road to be reinstated. LOW risk if road closed	Approx. 200m of river bank eroded and approx 100m of road washed out - requires rebuilding or closure (CDC decision).
Issue 7 Priority 2 In 20/21	Albert Town rock wall collapse (2019 issue)	MEDIUM risk. Repair required to prevent migration to SH6 bridge	Approx. 40m of 230m rockwall upstream of SH6 eroded and peeled back. Needs rock repair before it gets worse
Issue 8 Not ORC priority	Kawarau River Gibbston Valley – debris build up from Grassy Stream	LOW risk LOW priority	Debris flow down Grassy Stream blocked channel – residents have cleared & are seeking cost recovery. Not an ORC issue
Issue 9 Priority 2 In 20/21	Glenorchy - overflow of stopbank & town flooding	HIGH risk. –Potential urban flooding	Glenorchy floodbank overtopped into flooding a few houses up to 30 self-evacuated. Ongoing issue noted in 2007 in flood hazard assessment

Issue No. & Priority	Area / Description	Risk	Description & Size
Issue 10 Priority 2 In 20/21	Dart River– flooding of Kinloch Rd	HIGH risk to traffic and potential to strand travellers	Large lengths (approx. 1km) of Kinloch Rd. flooded, in 2020 and previous 2019 floods. Morphology study initiated (ORC)/ Road options require investigation (QLDC)
Issue 11 Priority 2 In 20/21 if at all	Upper Pomahaka River. Camperdown S bends Bank erosion & debris build up	LOW risk. Private farm land is affected.	Pomahaka River eroding and eating into private farm land on two very sharp corners of S bend over lengths of several hundred metres. Extensive deposition of tree debris on land in old floodplain. Sensitive issue as river needs room to meander naturally. Executive and/or political decision needs to be made on addressing or doing nothing.
Issue 12 Ongoing BAU	Pomahaka – general debris with some location specific (MacFarlane Road) large piles requiring more urgent action.	LOW risk. No urgent removal required	Debris has deposited on river bank and terraces at a number of places. Land and forest owners as well as CDC are clearing as needed for access. Ongoing debris removal may be able to be undertaken as part of regular scheme maintenance (BAU). There may be some specific instances where large debris piles require more urgent removal.