Canterbury 2021 Flood Recovery Update 7

April-September 2023

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Executive summary

Purpose:

This report provides an update on flood recovery progress by Environment Canterbury (ECan) for the period from April through September 2023. It follows updates 1 to 6 that have covered flood response and recovery from June 2021 through to the end of March 2023.

It documents progress with recovery works over this six-month period and provides a summary of costs to date. It also provides support for Claims 7 and 8 to the National Emergency Management Agency (NEMA) for eligible like-for-like replacement of assets lost as a result of the flood.

Background:

The significant rainfall event of 28-31 May 2021 over much of Canterbury, resulted in wide-spread flooding across the region. A region-wide state of emergency was declared on 30 May 2021. Flood damage, as a result of the exceptional rainfall, was significant and widespread across the region, affecting community infrastructure, public and private property and damaging or destroying significant ECan flood protection assets. Physical works in response to this event commenced immediately following the event and flood recovery works are ongoing.

This report (**Update 7**) includes progress on repairs to infrastructure damaged in the 2021 floods. Some sites already repaired, but still vulnerable, particularly tree edge protection, were re-damaged (damage-on-damage) through high flows in July to August 2022, and again in July 2023. Other 2021 damage sites, not yet repaired, had 2021 flood damage exacerbated by the 2022 and 2023 high flows. It is understood with NEMA that further damage to both yet to be repaired, and repaired 2021 flood damage sites, will be eligible for NEMA subsidy (subject to the usual verification process).

Response and Recovery Progress – this period April to September 2023:

Flood damage repairs during this period have focused on restoring river-edge flood protection through tree planting and installing anchored tree protection (ATP) at approximately 230 sites, with over 45,000 trees planted during this period. Approximately 18,000 trees (the remaining 30%) still need to be planted. Some of this work will be undertaken in October 2023 before it gets too hot and dry, and the remainder will be planted in the late fall from April to June 2024.

Physical repairs to a number of sites are still required, with some of these works also requiring tree planting. These are predominantly sites that were previously deemed as lower priority. The goal is to complete repairs to all remaining flood damage sites before the end of the 2023/24 financial year, i.e., by the end of June 2024.

The interactive web interface at www.ecan.govt.nz/FloodRepairMap provides real time progress on the status of 2021 flood recovery repairs.

The total number of 2021 flood recovery jobs are now 440 of which 328 or 78%[1] have been completed. Approximately 85% of the estimated total cost for flood recovery has been spent.

Financial Status:

The total cost of works to the end of September 2023 for flood recovery (including response) is $18.3 million. $13.4 million of these costs, above the ECan threshold of $4,1 million, are estimated to be eligible for application to the National Emergency Management Agency (NEMA) for a 60% central government contribution for like-for-like asset replacement.

Environment Canterbury has received payment to a total value of $4.9 million on the six claims already approved by NEMA. Claim 7 for $0.52 million, covering costs to the end of June 2023 and Claim 8 for $1.28 million covering costs to the end of September 2023 are being processed for submission to NEMA concurrently with this report. When Claims 7 and 8 are settled, NEMA will have co-funded approximately $6.75 million of the $18.3 million spent to date, with the remaining $11.6 million funded by ECan.

[1] 78% excludes 5 of the 440 jobs that have been deleted as duplicates or repairs deemed no longer needed.

The estimated total cost for 2021 flood recovery has been reduced to $21.5 million from the previous estimate of $22.2 million. Of the $21.5 million, the likely overall claim to NEMA is estimated at $8.0 million. The estimated remaining cost to Environment Canterbury will be $13.5 million. This is $1.7 million more than the original commitment from Environment Canterbury of $12.2 million.

Next Steps:

Next steps will focus on completing the remaining lower priority works and remaining tree planting before the end of June 2024.

Consideration of Climate Change:

Consideration has been given to options for betterment or improvement on what was previously in place, particularly improvements that account for climate change and the likelihood of increased frequency and more intense rainfall events.

The national guidance document “Application of Room for the River for NZ Rivers and Streams”, which includes knowledge gained from the Canterbury Floods, has been completed and is providing guidance to the river management sector for consideration of river management in the face of Climate Change. Where possible, repairs have been undertaken allowing more room for the river. Several examples are discussed in this report.

Since climate change betterment and other infrastructure improvements are outside of the like-for-like replacement of pre-flood infrastructure, they are not eligible for 60% NEMA co-funding and all betterment is therefore 100% Environment Canterbury funded.

Table of contents

Appendices

List of Tables

List of Figures

Appendix A. Flood Recovery Pole Planting

Appendix B. Flood Recovery Repair Progress

Appendix C. Key Sites Still Needing Flood Damage Repair

1 Introduction

This report is the seventh report to be provided to the National Emergency Management Agency (NEMA). It documents Environment Canterbury's flood recovery progress from April to September 2023. The previous six reports have covered flood response and recovery from June 2021 to March 2023.

This report provides an update on recovery works undertaken to the end of September 2023, including a summary of their costs for the period from April to September 2023 inclusive.

Details of the flood event of 28-31 May 2021 have been provided previously so are not repeated in detail here, other than the following summary for completeness.

The significant rainfall event of 28-31 May 2021 over much of Canterbury, resulted in wide-spread flooding across the region. Rainfall amounts exceeding the largest 72-hour rainfall totals on record were recorded at 28 of Canterbury's 84 rain gauges. Mount Somers rain gauge recorded 546mm in 72 hours, more than double the previous record 72-hour total. A region-wide state of emergency was declared on 30 May 2021. Flood damage, as a result of the exceptional rainfall, was significant and widespread across the region, affecting community infrastructure, public and private property and damaging or destroying significant ECan flood protection assets. Peak flows exceeded design capacities in several rivers in the Ashburton, Timaru and Mackenzie Districts resulting in several stopbank breaches and extensive erosion control vegetation loss.

Several high flow events have occurred since the 2021 flood, specifically in the winter of 2022 (July and August) and again in July 2023. These high flows have exacerbated the 2021 flood damage at a number of sites where flood damage repairs were either not complete or still in a fragile state, for example where tree edge protection was still being re-established. It is understood from discussions with NEMA that further damage to 2021 flood damage sites, will be eligible for NEMA subsidy (subject to the usual verification process).

2 Flood Repair Progress at 2021 Damage Sites

2021 flood repair progress is being tracked on the Environment Canterbury flood recovery webpage with an up-to-date flood damage repair status map located at: ecan.govt.nz/FloodRepairMap. A screen clip of this web site is shown in Figure 6-1.

The total number of flood damage repair jobs now stands at 440 of which 328 have been completed. This is up from 243 reported as completed in March 2023. Flood damage repairs (to the end of September 2023) are summarised for each district in Table 2-1 below. While these numbers match the web site snapshot (shown in Figure 6-1), note that the website is updated daily with direct links to the ECan job management system, so will always reflect the latest flood repair status.

Table 2-1: Status of flood damage repairs by District at 30 September 2023.

District or Description	Deleted	Draft	Accepted	Open	Monitoring	Completed	Total
Selwyn		2	1	2	1	15	21
Ashburton	3	20	10	13	4	186	236
Orari-Waihi-Temuka		5	4	8	4	68	89
Opihi		5	3	1	3	12	24
Ashley						5	5
Waimakariri-Eyre-Cust						15	15
Upper Hinds	2	11	1	4		24	42
Lower Hinds		4		1		2	7
Little River						1	1
Totals	**5**	**47**	**19**	**29**	**12**	**328**	**440**
		Remaining			Completed & Monitoring		%
		95			**340**		**78%**

There remain 95 current (draft+accepted+open) repair jobs. Note that 5 jobs have been deleted as there were duplicates or some jobs have been deemed as no longer requiring repairs, leaving 435 "valid" jobs. If the jobs completed, but still being monitored, are included in the completed job tally, it rises to 340 or 78% of valid jobs.

The location and estimated cost for work still to be undertaken is shown in Table 2-2 below. A large portion of the remaining 95 works require anchored tree installation or pole planting, so as much as possible of that vegetative work is being undertaken in October 2023 before it gets too hot and dry. The remaining tree work has been deferred to planting in the April-June quarter of 2024. Table 4-3 in the Financials section shows the forecast distribution of expenditure by quarter.

Table 2-2: Current flood damage repair jobs and their estimated cost to complete.

District or Description	Current Jobs	Estimated Cost $
Selwyn	5	316,000
Ashburton Rivers	43	988,400
Upper Hinds River	16	215,000
Lower Hinds River	5	105,000
Orari-Waihi-Temuka	17	707,400
Opihi	9	107,500
Totals	**95**	**2,439,300**

Key points to note from the tables above are that flood damage repairs have progressed steadily over the six-month reporting period. The focus has been river edge protection tree replacement which is described in more detail below.

Progress is reflected in the expenditure tracking chart shown in Figure 4-1.

2.1 Tree edge protection reinstatement and 2023 pole planting

As reported previously, the re-establishment of lost tree edge protection assets will take 5-10 years for trees to grow to where they provide the pre-flood level of river edge protection. Steps in this process include establishing a protected area where trees can be replanted, tying in large trees to act as an erosion buffer and undertaking infill planting of willow poles. In many cases this will create a suitable environment to interplant with native species once the willow trees have stabilised the area. Flood damage repairs are vulnerable to further damage until all the steps have been completed and then still vulnerable until the trees have had the opportunity to grow to a decent size.

An extensive pole planting effort was undertaken over the winter of 2023 to start to reinstate lost tree edge protection. Edge protection reinstatement included deep pole planting, ripping in of willow wands and tying of large live trees to anchors (ATP). Over 45,000 poles were planted at some 230 sites distributed over the different rating districts as shown in Table 2-3 below. At the end of September 2023, there remained an estimated 18,000 (30% of) poles still needing to be planted. The distribution by river of trees planted and still to plant shown in Appendix A, Figures A-1 and A-2.

Some late season planting is still underway in October 2023, with the remainder deferred to the April-June 2024 quarter.

Table 2-3: Tree planting completed to September 2023 and still required by June 2024 to reinstate tree edge protection.

Rating District	Number of Sites Planted to Sept 2023	Number of poles planted to Sept 2023	Estimated Sites Still to Plant by June 2024	Estimated Poles Still to Plant by June 2024	Percentage of Total Still to Plant
Selwyn	5	180	4	212	54%
Ashburton	84	15,489	31	2,928	16%
Hinds	29	1,895	13	783	29%
Orari-Waihi-Temuka	50	18,565	12	9,749	34%
Opihi	36	6,172	11	3,815	38%
Opuha Tributaries	26	2,914	5	556	16%
Total	**230**	**45,215**	**76**	**18,043**	**29%**

2.2 Progress at specific sites (April to September 2023)

Progress at key sites where repairs were undertaken during the reporting period are described in more detail below, with corresponding figures presented in Appendix B.

Orari at Stewart Rd
Further to the work undertaken prior to March 2023 (previously reported), during this period anchored tree protection (ATP) was installed along the front edges of the erosion protection bunds and infill pole planting completed between the bunds. The high flows of July 2023 caused some minor damage to the erosion protection bunds and displaced some of the concrete block anchors. Minor repairs to address this damage-on-damage have been completed (see Figures B-1 to B-5).

Ashburton North in vicinity of RDR
Repairs to three sites (A, B and C) with severe scour in the vicinity of the RDR on the Ashburton North Branch were completed. This included infilling the scour areas, creating erosion protection bunds and installing ATP along the river-edge bund. Infill pole planting was completed at each site. Again, as a result of the July 2023 high flows, there was some minor damage to the ATP and river-edge bunds at sites B and C, which has since been repaired. Refer to Figures B-6 to B-8.

Ashburton South at Mount Somers
Loss of tree edge protection occurred over approximately 2km directly upstream of SH72 in the vicinity of the former Mount Somers waste disposal site (Figure B-9). By the end of September 2023, work at this site had been mostly completed. It included re-instating an erosion protection bund at the upstream end of the works and forming a secondary diversion bund part way down the works. Infill planting of both native and willows was undertaken in close coordination with the landowner who was receptive to making more room for the river and retreating his cultivated lands somewhat from the river edge. At the lower end of the site a rock revetment was installed to protect the former Ashburton District Council (ADC) waste disposal site from further erosion. There was close collaboration with ADC on this part of the works. Refer to figures B-9 to B-11.

Sweetwater Creek
Flood damage included damage to six weirs and four large corner scours over a length of approximately 1.8km along Sweetwater Creek. Mitigation repairs completed included repairing the 6 weirs and installing an additional two weirs. Rock groynes were also installed at the 4 corners where severe scour had occurred. Completed works are shown in Figures B-12 to B-13.

The repairs were well tested in high flows in July 2023 and fared well except for one weir where downstream scour to the bank requires further mitigation. This additional repair is programmed to be undertaken over the summer of 2023-2024 and is discussed further in the section on sites that still need works below.

Orari at Taylors Road
Challenges on the Orari in the vicinity of Taylor Road were reported previously in Report Update 6. These included the narrowing of the riverbed in this area and previous repairs undertaken in May 2022

that were completely washed away in the winter 2022 high flows. Options to make more room for the river were considered at this location and discussed with the landowner. Since he was not receptive to the idea, it was decided to partially reinstate the existing asset at this location. However, it was made clear to the landowner that making more room for the river would be needed at this location in the future.

A more robust repair was designed (Figure B-14) and repairs were started before the end of September 2023. It is expected that the works will be completed by December 2023.

2.3 Key sites that still need works

95 sites still require 2021 flood damage repairs. The majority (over 60) of these sites require some form of tree edge protection. Many of these works were assessed as being lower risk, hence lower priority. Some of these sites are difficult to repair while others have simply required very minor repairs. Examples of these works are provided below.

Bowyers Stream at Lochheads Road
A number of flood damage sites on Bowyers Stream, still to be repaired, are illustrated by the Bowyers Stream at Lochheads Road sites (see Figures C-1 to C-2). At these sites, light anchored bank protection (LABP) river edge asset has been lost. Challenges to repairs at these sites include:

- The river is very narrow and sinuous with a single flow channel often hard up against the damaged area.
- Stakeholder consultation with the Department of Conservation, Fish and Game and local Iwi have indicated a preference to not undertake any in-river work between March and September, requiring the need to divert the river outside of these times.
- Remediation solutions are difficult to implement with high vertical eroded banks, over long distances, where vegetation has been washed out.

The relatively low risk and potentially expensive repairs due to these challenges have meant that these repairs have been made a lower priority until now. However, the ECan river edge protection asset has been lost and private property is already eroding so repairs are needed. Repairs will be implemented at these sites in the upcoming period.

Ashburton South at Mount Somers
Like challenges on the Bowyers Stream, there are several high eroded vertical faces on the true left bank of the Ashburton South Branch at Mount Somers (Figure C-3). Repairs have been specified at these locations, however due to the diversions required, these works were not able to be completed in the March to September time frame. Diversion is planned (Figure C-4) for the upcoming drier months with ATP tree work deferred to the April-June 2024 quarter.

Waihi at Geraldine stopbank repair
Approximately 200m of stopbank and heavy anchored bank protection were washed away at this site upstream of Geraldine. Initial inspection showed that the adjacent dwelling was on an elevated terrace so not at risk, hence this repair was put at low priority. Different repair options have been considered (Figure C-5) and discussed with the adjacent landowner who makes use of this parcel of crown land. A solution specified in Figure C-6, which makes more room for the river on a very tight bend has been agreed to with the adjacent landowner. This was possible in this case as the area being surrendered to make more room for the river is crown land. This repair is expected to be completed in the January to March quarter of 2024.

Waihi at Geraldine Heyman fence repairs
Heyman fences were installed at three locations in Geraldine to repair 2021 flood scour (Figure C-7). Before the willow poles planted along the Heyman fences could grow sufficiently to provide adequate tree edge protection, high river flows in the winters of 2022 and 2023 scoured out the river rock infill from behind the Heyman fences (Figures C-8 to C-10). More robust repair solutions have been designed that include the installation of stub rock groynes at the central and lower site in conjunction with backfilling with river rock behind the Heyman fences. Infilling with larger rock as well as river rock is proposed for the upper site. These repairs are planned to be implemented over the summer or 2023-24.

Sweetwater Creek weir mitigation
Repairs on Sweetwater Creek completed in June 2023, fared well in the 2023 high flows except for extensive scour downstream of weir 6 and minor scour downstream of weir 7 (see Figure B-13). The damage to weir 6 is illustrated in Figure C-11. Mitigation works are currently being designed to be implemented over the summer of 2023-24.

2.4 Next steps

The goal for October 2023 to June 2024 is to complete flood damage repairs at the remaining 95 sites. As much as possible of the vegetative work will be completed in October 2023 if conditions still allow trees to be planted. The remaining tree work will be deferred to the April-June quarter of 2024.

Works that don't involve tree planting such as some outstanding stopbank repairs, or construction of erosion protection bunds and groynes will be undertaken over the summer of 2023-24.

Preparation for planting in 2024 will also be a priority to ensure that planting can start as early as possible to be completed by June 2024.

3 Procurement

Previous emergency response work and temporary flood damage repairs were undertaken using ECan's list of pre-qualified contractors. The same procedure is being followed with the current emergency and temporary works. Some reinstatement works, particularly anchored tree protection will also need to still be procured in this way. This is because the work is complex and hard to specify, it is best completed by experienced operators on an hourly rate basis under adequate supervision.

Wherever possible, larger works have been and will continue be put to tender for competitive pricing following best procurement practice.

Due to the extent of pole planting required, a 2023 pole planting RFP was released in May 2023 to multiple contractors on the Environment Canterbury supplier panel agreement. Pole planting work packages were issued to responding contractors and spread among them. Due to the high level of interest, not all contractors that responded were able to be issued with pole planting work.

4 Financials

4.1 Flood response and recovery

Flood response costs to the end of September 2023 are $18.3 million as summarised in Table 4-1 below. Approximately $3.3 million has been spent on flood recovery during the report period from April to September 2023. Costs are subdivided into the flood affected river rating districts. A summary of the total costs to date separated into estimated non-eligible and eligible costs for claim to NEMA for subsidy is provided in Table 4-2.

Table 4-1: Canterbury 2021 flood recovery costs at 30 September 2023.

Description	Costs for Period Apr-Sep 2023	Total Costs to Date
Flood monitoring costs	-	275,129
Selwyn 2021 Flood Repair	166,481	625,426
Ashburton 2021 Flood Repair	1,776,374	10,798,471
OWT 2021 Flood Repair	1,131,040	4,234,705
Opihi 2021 Flood Repair	157,130	442,891
Ashley 2021 Flood Repair	-	132,346
WEC 2021 Flood Repair	-	516,036
Upper Hinds 2021 Flood Repair	92,857	269,558
Lower Hinds 2021 Flood Repair	799	123,008
Little River 2021 Flood Repair	-	4,427
	3,324,682	17,421,996
CDEM Response	-	414,523
Regional Parks Repair	-	63,806
Other Costs	-	439,168
	3,324,682	18,339,493

Table 4-2: Estimated NEMA eligible and non-eligible flood recovery costs for Canterbury 2021 Flood at 30 September 2023.

Description	Estimated Non-Eligible Costs	Estimated Eligible Costs	Total Costs to Date
River Rating Districts	2,093,409	15,324,966	17,418,375
CDEM Response	414,541		414,541
Regional Parks Repair	330,511	4,264	334,775
Other Costs	150,059	21,742	171,802
TOTAL	2,988,520	15,350,972	18,339,493

Figure 4-1 below shows the 2021 flood recovery expenditure profile to date as well as the forecast expenditure through to the end of the project. Forecast flood recovery expenditure by quarter, including physical works, pole planting and other costs (contingency, design, staff, plant etc) are included in Table 4-3 which feeds into the forecast expenditure graphic in Figure 4-1.

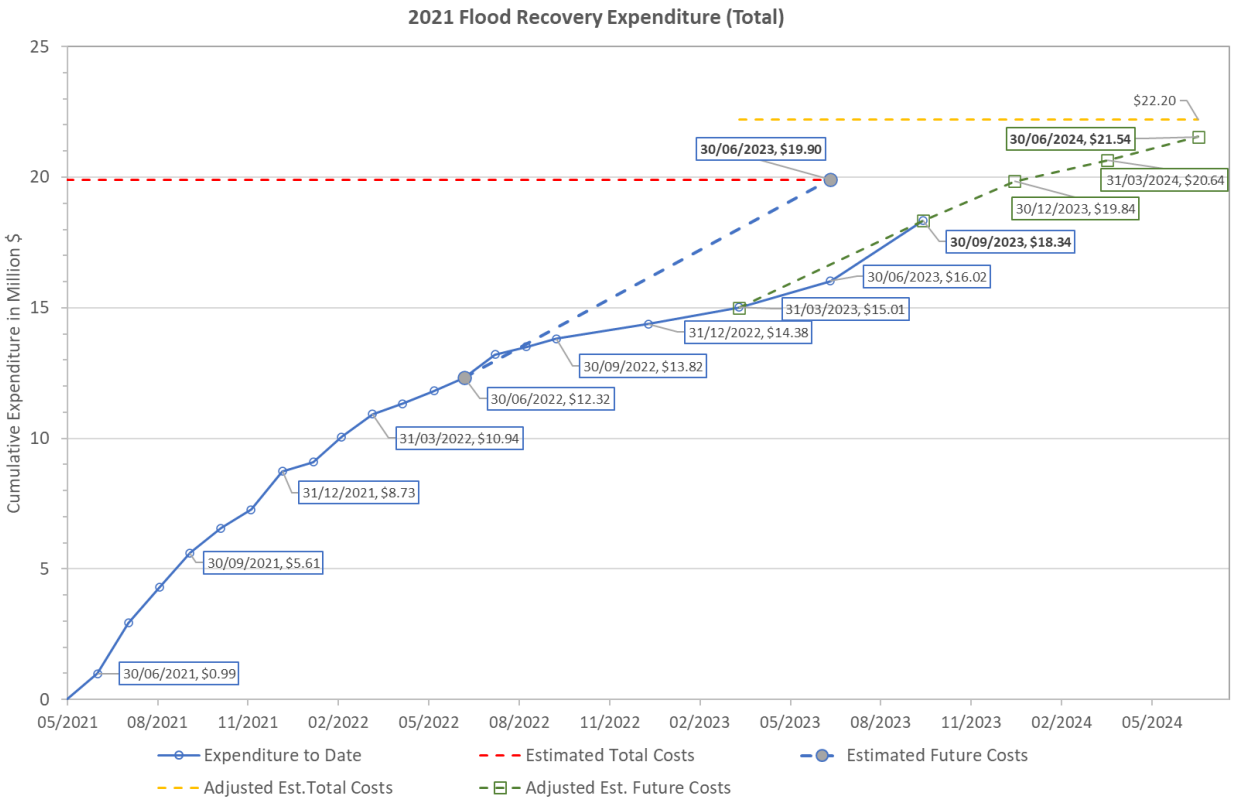

Figure 4-1: 2021 flood recovery expenditure profile.

Prior to the winter 2022 high flows and subsequent damage-on-damage, expenditure was tracking the expected spend profile to complete flood damage repairs for an estimated $19.9 million by June 2023. The adjusted estimate of total 2021 flood recovery cost, including damage-on-damage is now $21.5 million (see Table 4-5 that follows). The goal is to complete all 2021 flood damage repairs by June 2024 as shown in the adjusted spend profile.

The rate of spending increased over the six-month period from April to September 2023, particularly in the latter three months as pole planting was completed at multiple sites concurrently. The forecast expenditure by quarter to complete the remaining 95 repair works is shown in Table 4-3. This includes late spring (October 2023) planting work and non-planting related physical works to be completed through the summer of 2023 and into early 2024.

Table 4-3: Forecast flood recovery expenditure by quarter from 1 October 2023 through to completion expected by June 2024.

Quarterly forecast flood repair costs by rating district	Q2 To Dec 23	Q3 To Mar 2024	Q4 To Jun 2024	Totals $
Selwyn	155,000	150,000	11,000	316,000
Ashburton Rivers	500,200	100,000	338,200	938,400
Upper Hinds River	150,000	0	65,000	215,000
Lower Hinds River	0	105,000	0	105,000
Orari-Waihi-Temuka	436,000	160,000	81,400	677,400
Opihi	0	0	107,500	107,500
Contingency, Design, Staff, Plant etc.	283,132	283,132	283,132	849,397
Totals	**1,524,332**	**798,132**	**886,232**	**3,208,697**

4.2 NEMA eligible costs

Government policy[2] is to reimburse 60 percent of the combined eligible costs. These include response and essential infrastructure costs above 0.002 percent of the net capital value in the case of regional councils. For ECan, this threshold has been determined to be $4.1 million.

As presented in Table 4-4 below, ECan has assessed that $15.4 million of the flood recovery expenditure to the end of September 2023, are NEMA eligible costs (subject to NEMA confirmation).

ECan has submitted six claims to NEMA covering costs through the end of March 2023. Table 4-4 shows the value of each of these claims. Reimbursement of $4.9 million has been received for the first six claims.

Note that Claim 1 was subject to deduction of the initial threshold of $4.1 million. Claim 7 for $0.52 million and Claim 8 for $1.28 million, supported by information provided in this report, are currently under preparation to be submitted to NEMA.

Table 4-4: Estimated flood recovery costs with portion estimated as claimable from NEMA.

Claim	Period	Eligible Cost ($)	Threshold ($)	Claimable from NEMA (60%)	Cumulative Value Received ($)
Claim 1	June - Sep 2021	4,930,462	4,113,817	489,987	489,987
Claim 2	Oct 2021-Feb 2022	3,075,412		1,845,247	2,335,234
Claim 3	Mar-May 2022	1,650,540		990,324	3,325,558
Claim 4	June 2022	334,772		200,863	3,526,421
Claim 5	July-Sep 2022	1,306,367		783,820	4,310,241
Claim 6	Oct 2022-Mar 2023	1,056,651		633,991	**4,944,232**
Claim 7	Apr-Jun 2023	874,272		524,563	In progress
Claim 8	Jul-Sep 2023	2,135,247		1,281,148	In progress
TOTAL to Date		15,363,724		6,749,944	

4.3 Estimated flood recovery costs and their apportionment.

The estimated total cost for 2021 flood recovery at 30 September 2023 has been reduced to $21.5 million from the estimate of $22.2 million reported in Update 6 in April 2022. Not as much was spent on 2023 pole planting as was expected and the value of the contingency has been reduced as the end of works approaches. A summary of the latest estimate of cost at the end of September 2023 is provided in Table 4-5 below.

Based on these estimates and what we have learnt through processing NEMA claims to date, the overall cost for 2021 flood recovery to ECan is estimated to be $13.5 million with an expected central government contribution of $8.0 million through claims to NEMA.

[2] Section 33 of the Guide to the National CDEM Plan, 2015.

Table 4-5: Estimated 2021 flood recovery costs.

Estimated Costs	Original est. 31 July 2021 (Million $)	At 31 March 2023 (Million $)	At 30 Sept 2023 (Million $)
Flood Recovery costs (to date)	2.9	15.0	18.3
Estimated Future Flood Recovery Costs	16.8	7.2	3.2
Total Flood Response & Recovery Estimate	**19.7**	**22.2**	**21.5**
Estimated Non-Eligible Recovery Costs	-3.1	-5.0	-4.0
ECan Threshold for NEMA claim	-4.1	-4.1	-4.1
Eligible for 60% government subsidy (NEMA)	**$12.50**	**$13.10**	**$13.40**
Estimated Funding Mix	**Million $**	**Million $**	**Million $**
ECan Initial Threshold	4.1	4.1	4.1
ECan Non-Eligible Costs	3.1	5.0	4.0
ECan 40% of Eligible Costs	5.0	5.2	5.4
Total ECan Estimated Cost	**12.2**	**14.3**	**13.5**
NEMA 60% of Eligible Costs	7.5	7.9	8.0
Total	**19.7**	**22.2**	**21.5**

5 Risks

Most of the major stopbank breaches have now been repaired and the majority of tree edge protection re-planted. The highest risk remains possible wash-out of the fragile newly established vegetation, that is susceptible to wash-out with relatively minor high flows, until the vegetation is properly established. It will still take 5 to 10 years for river edge vegetation to become fully established.

The following table provides a summary of residual risk and ongoing risks to the flood recovery programme together with mitigation actions to reduce the likelihood of the risks becoming issues.

Table 5-1: Residual and flood recovery project risks

Risk	Description	Mitigation Action
Further floods	Severe weather may cause further flooding before or during flood damage repairs. This could increase the flood damage.	Undertake temporary repairs as soon as possible. (Complete) Communicate elevated residual risk to the community, especially in areas where river break-out has occurred. (Complete & Ongoing)
Spring thaw	High spring flows in the rivers when snowmelt occurs could pose further flood risk.	Assess most likely locations of high flows following spring thaws. Undertake priority temporary repairs in these areas. (Complete)
Funding	Security of funding	Ongoing communication with ECan Councillors is needed to keep them aware of funding needs from Council Reserves and potential risks. (Underway / Ongoing) Work closely with NEMA to maximize NEMA contributions and flood recovery. Closely monitor contractor and materials cost. Follow council procurement processes. Public tender for large works. (Underway / Ongoing)
Cost of works	The cost of fuel has increased significantly since the initial cost estimate was undertaken.	A contingency amount of 15% of the remaining physical works estimate has been added to the overall project

Risk	Description	Mitigation Action
Fuel cost Increases	Contractor rates are starting to reflect this.	cost estimate. This is one of the elements of the total cost estimate.
Material availability	The availability of material, particularly to undertake tree replacement. Both heavy and light anchored bank protection requires significant lengths of cable and anchors (typically concrete blocks).	Councils around the country have been made aware of ECan's need for steel cable. Alternative sources are being investigated. Immediate needs are covered. The availability of concrete blocks for ATP is critical and currently in short supply. Arrangements are being made to use moulds closer to the points of need and stockpile blocks before the 2023 planting season. Contingencies may need to be considered, including the use of higher cost rock protection where material availability limits the reinstatement of anchored tree protection.
Tree growth time	The time for re-establishment of tree edge protection poses a risk until trees can be established.	In critical areas of high risk, alternatives, particularly rock protection, may need to be considered to mitigate risk. As far as is practicable, live trees are being salvaged from the river fairways and being utilised in repair works. Many of these large trees will resprout and form the future erosion protection.
Staff resource	Staff resources are limited to undertake oversight and coordination of significant flood damage repairs.	Consider additional contract resource for flood damage assessment, prioritisation and works and on-site works supervision that cannot be delivered in-house.
Programme length	Property owners want works associated with their property undertaken first.	Prioritise flood damage repairs based on risk and develop and implement a communications plan. (ongoing) Communicate directly with property owners, and with the community, keeping them informed of works priorities. (ongoing)
Ground conditions	River levels from time to time will restrict access and be generally unsuitable to undertake large scale works.	Monitor river levels and plan works for drier months if possible. Communicate this risk to directly affected landowners. (ongoing)
Work stoppage	Any work stoppage due to a health and safety risk could significantly impact remediation.	A pole planting SOP is being developed to reduce the H&S risk and minimise the possibility of work stoppages during planting.
Further damage-on-damage	Further damage to recently completed and still vulnerable repairs is likely with high flows.	It is recognised that some further damage-on-damage will occur in future. A contingency has been included in the costs estimates to accommodate further repairs of damage-on-damage and the programme extended to June 2024 to allow for further repairs.
Seasonality	Tree planting can only occur in winter and early spring.	Preparation of trees, and contractors ahead of time to maximise the ability to undertake works during the planting season. (ongoing)
Environmental considerations	Works are restricted by fish spawning and bird nesting.	Plan to undertake works outside of these periods. (ongoing)

6 Communications and Community Engagement

An essential part of undertaking flood recovery is ongoing communication and community engagement.

The Environment Canterbury Flood Recovery web page is the primary means of communicating information regarding flood recovery efforts. Communication via the website is an effective way to communicate project progress to a wide audience and engage the community. The Flood Recovery webpage is located at: ecan.govt.nz/flood-recovery

A live map indicating the status and location of flood damaged sites needing repairs is still available. This interactive map can be accessed from the above webpage, or located directly at: ecan.govt.nz/FloodRepairMap

This map and its associated summary tables provide information on all flood damage repair jobs for the affected Canterbury districts. Summaries can be viewed based on user selection either of “All” areas, or by selecting a specific district. Clicking on each individual repair site on the map gives high-level information about the nature of the repair at that location and its status. A screen clip of the website is included in Figure 6-1 below.

One-on-one communication continues with affected landowners particularly around works planned or underway on or adjacent to their land. The interactive web page provides a valuable tool to keep landowners updated on the status of works at specific sites that affect them or are of interest to them.

Meetings

Further updates have been provided by way of the following meetings with council and rating district liaison committees. Additionally, many one-on-one meetings with impacted landowners have been undertaken to discuss works proposed at their properties.

Table 6-1: Summary of public / external meetings, since previous report.

Date	Meeting Description
14 September	Ashburton River Rating District Meeting
21 September	Upper and Lower Hinds Rating District Meeting
26 September	Opihi River Rating District Meeting
26 September	Orari Waihi Temuka Rivers Rating District Meeting
28 September	Selwyn River Rating District Meeting

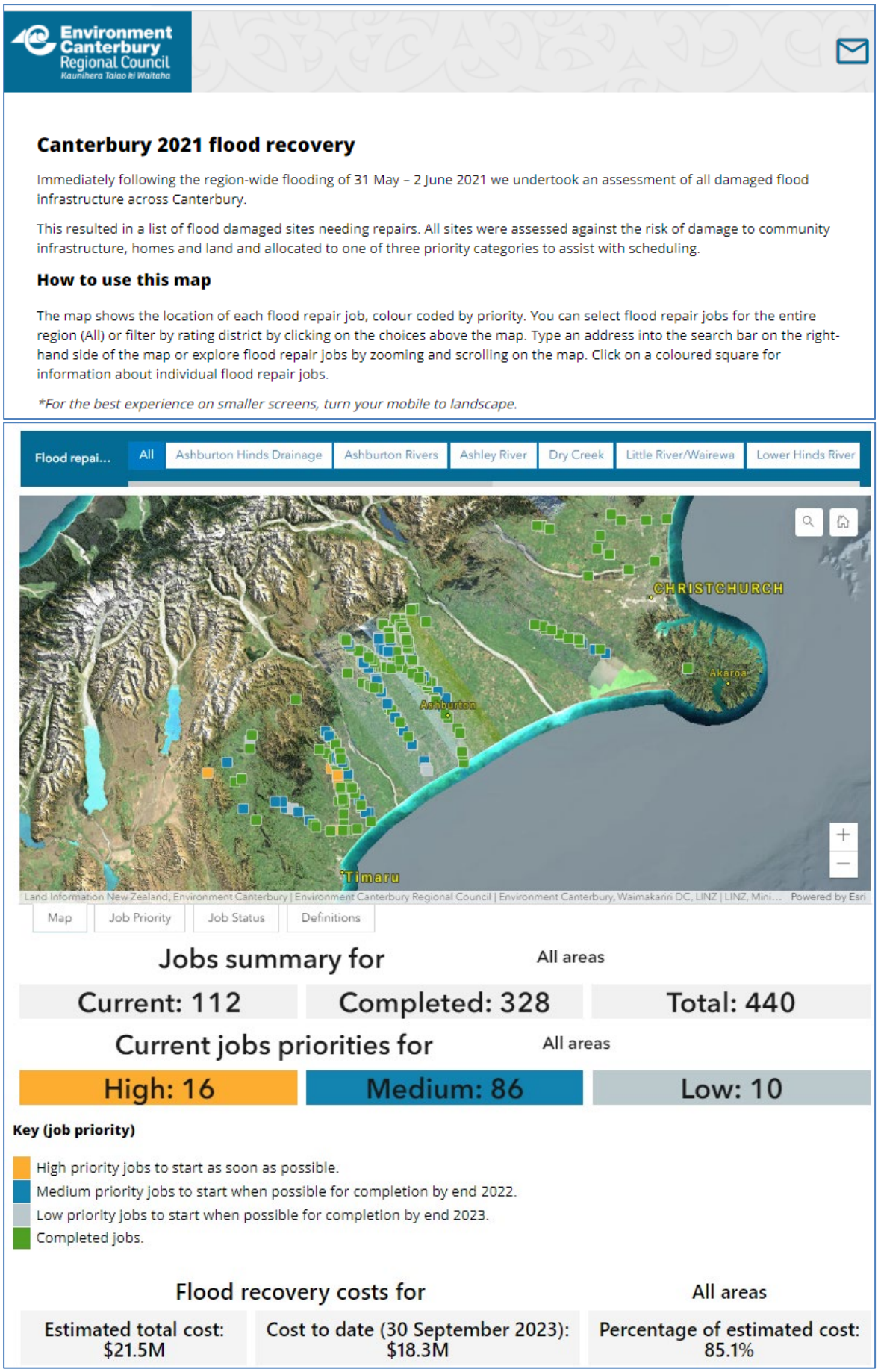

Figure 6-1: Screen clip of flood recovery interactive job status web page at 30 September 2023.

7 Betterment Opportunities

The future state of Canterbury's braided rivers may well look different to the pre-flood state, particularly when referencing overall river width, indigenous biodiversity, mahinga kai, recreation and other values. Because fairway widths have been reduced over the last 50 years, in many cases it may not be acceptable to simply build back 'like-for-like'.

In undertaking flood recovery repairs consideration is being given to opportunities for betterment that create a better balance between:

- providing an acceptable (or design) level of flood protection,
- incorporating the effects of climate change,
- restoring river ecosystems,
- incorporating "Te Mana o te Wai" principles,
- allowing more room for rivers,
- recognizing land owner expectations and
- providing a fair and reasonable transition pathway for change.

Furthermore, there may be some inadvertent betterment. This includes the need to replace the function of an asset with a different asset that performs the same function. For example, there may be certain locations where it is necessary to replace tree river edge protection with rock protection because of the level of risk, and the time limitations to re-establish replacement tree edge protection. As these opportunities are considered there will be ongoing discussion with NEMA as to the government co-funding eligibility.

A. Flood Recovery Pole Planting

Central Area - Actual flood recovery planting to September 2023, and estimates of planting still needed.

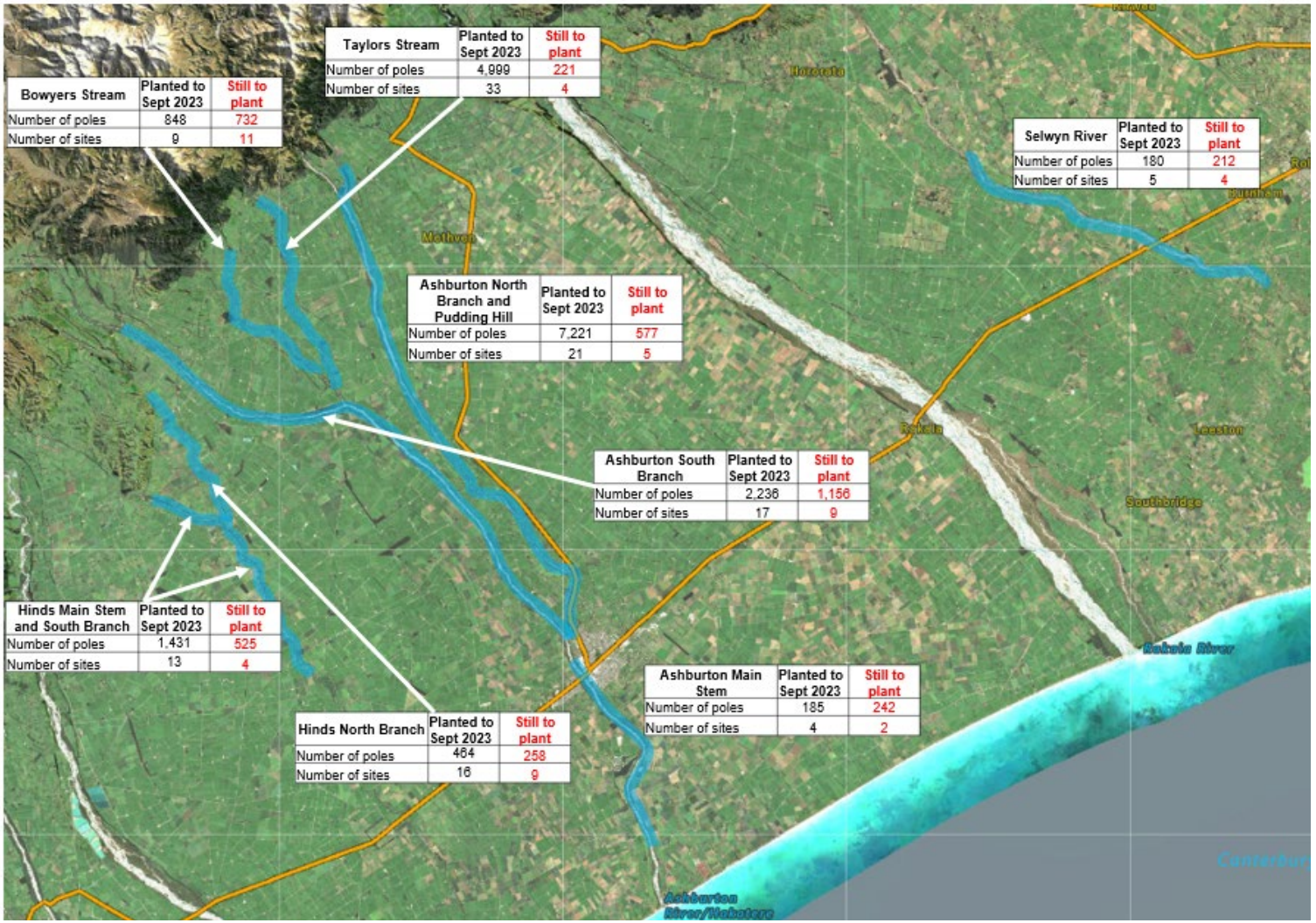

Figure A-1: Central Area Flood Recovery 2023 Pole Planting.

Southern Area - Actual flood recovery planting to September 2023, and estimates of planting still needed.

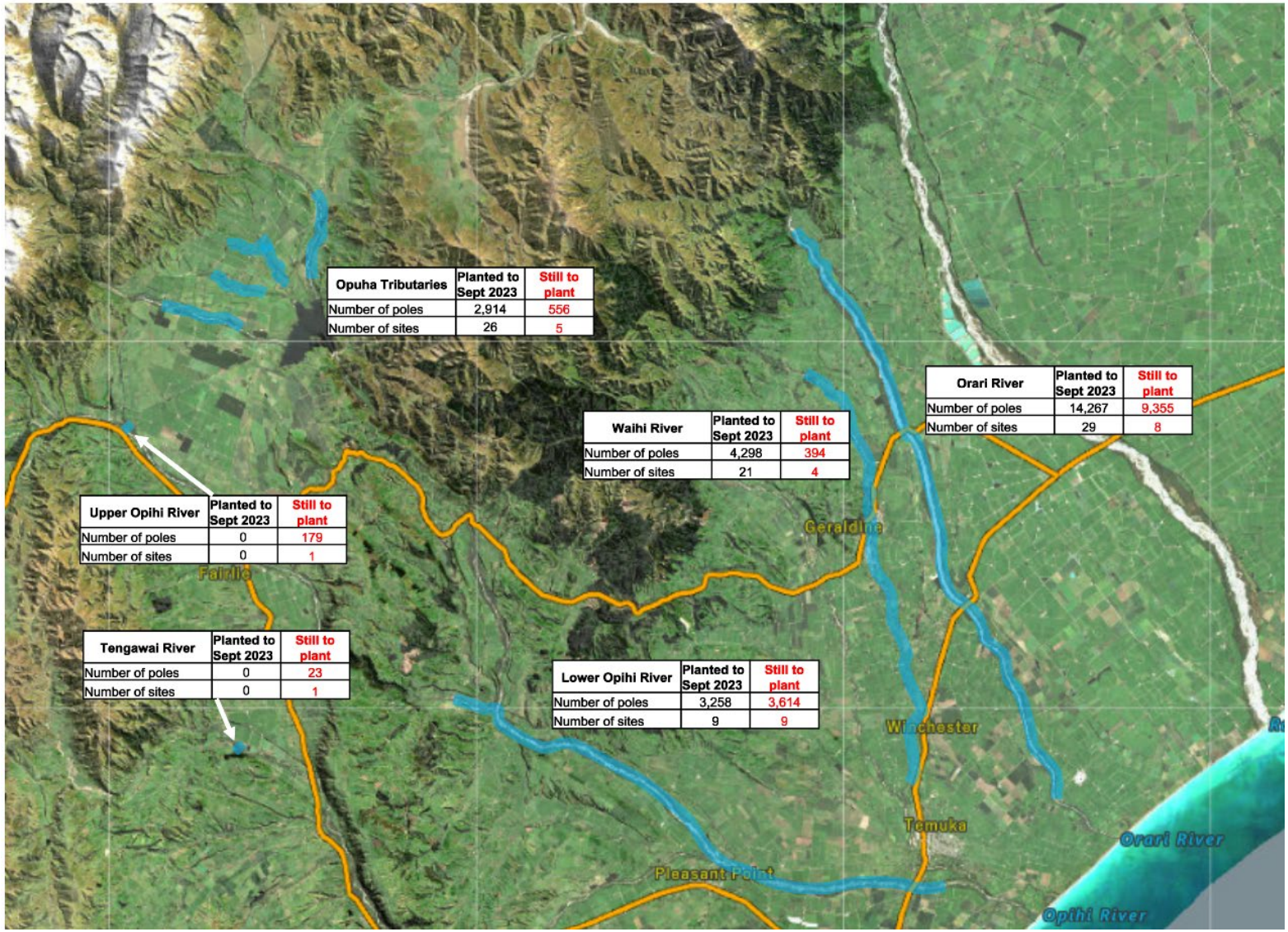

Figure A-2: Southern Area Flood Recovery 2023 Pole Planting.

B. Flood Recovery Repair Progress

1. Orari at Stewart Road repairs

Figure B-1: Orari at Stewart Road after completion of ATP and infill planting (8 June 2023).

Figure B-2: Orari at Stewart Road, detail of ATP and infill planting (8 June 2023).

Figure B-3: Orari at Stewart Road, minor damage after July 2023 high flows (23 August 2023).

Figure B-4: Orari at Stewart Road, minor damage detail (23 August 2023).

Figure B-5: Orari at Stewart Road after minor repairs (26 September 2023).

2. Ashburton North in vicinity of RDR

Figure B-6: Ashburton North at RDR, location of sites (left) and completed repairs at site A (right), 23 August 2023.

Figure B-7: Ashburton North at RDR, completed repairs at Site B, showing minor damage following July 2023 high flows (photos 23 August 2023).

Figure B-8: Ashburton North at RDR, completed repairs at Site C, showing minor damage following July 2023 high flows (photos 23 August 2023).

3. Ashburton South at Mount Somers

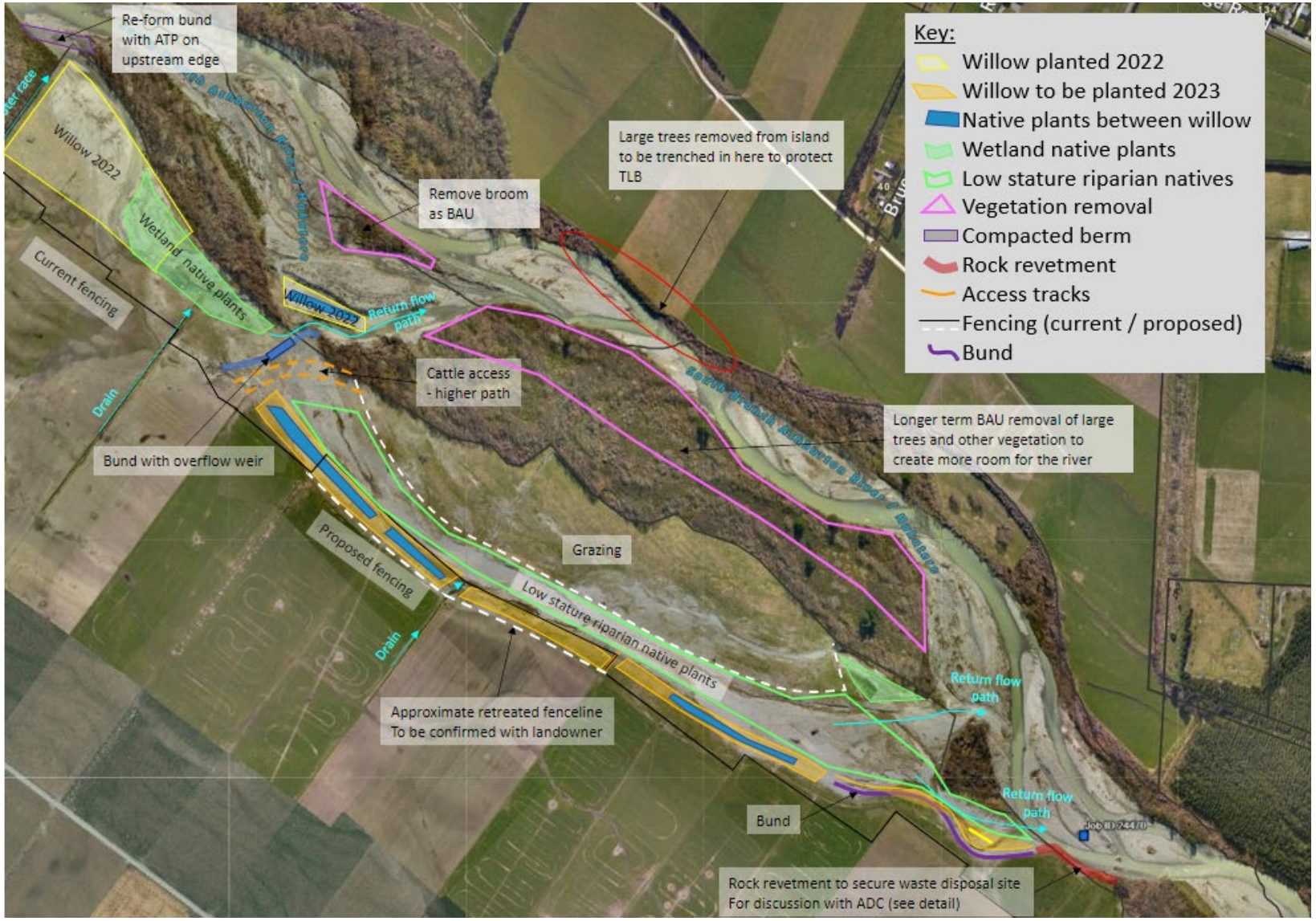

Figure B-9: Ashburton South at Mount Somers, overview of repairs for breakout and scour over 2km length.

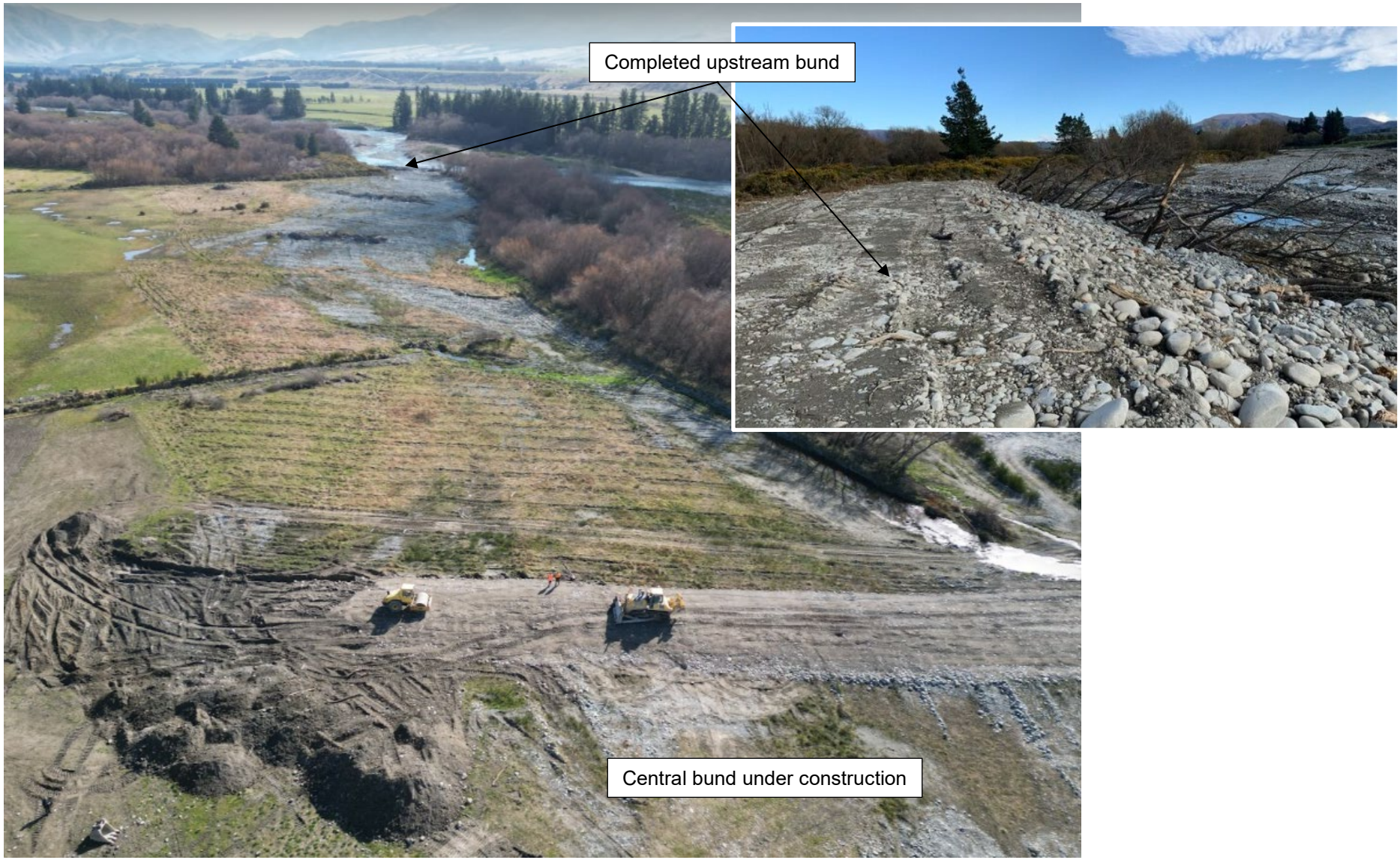

Figure B-10: Ashburton South at Mount Somers, central bund under construction (22 Aug 2023), with completed upstream bund with ATP (inset), early October 2023.

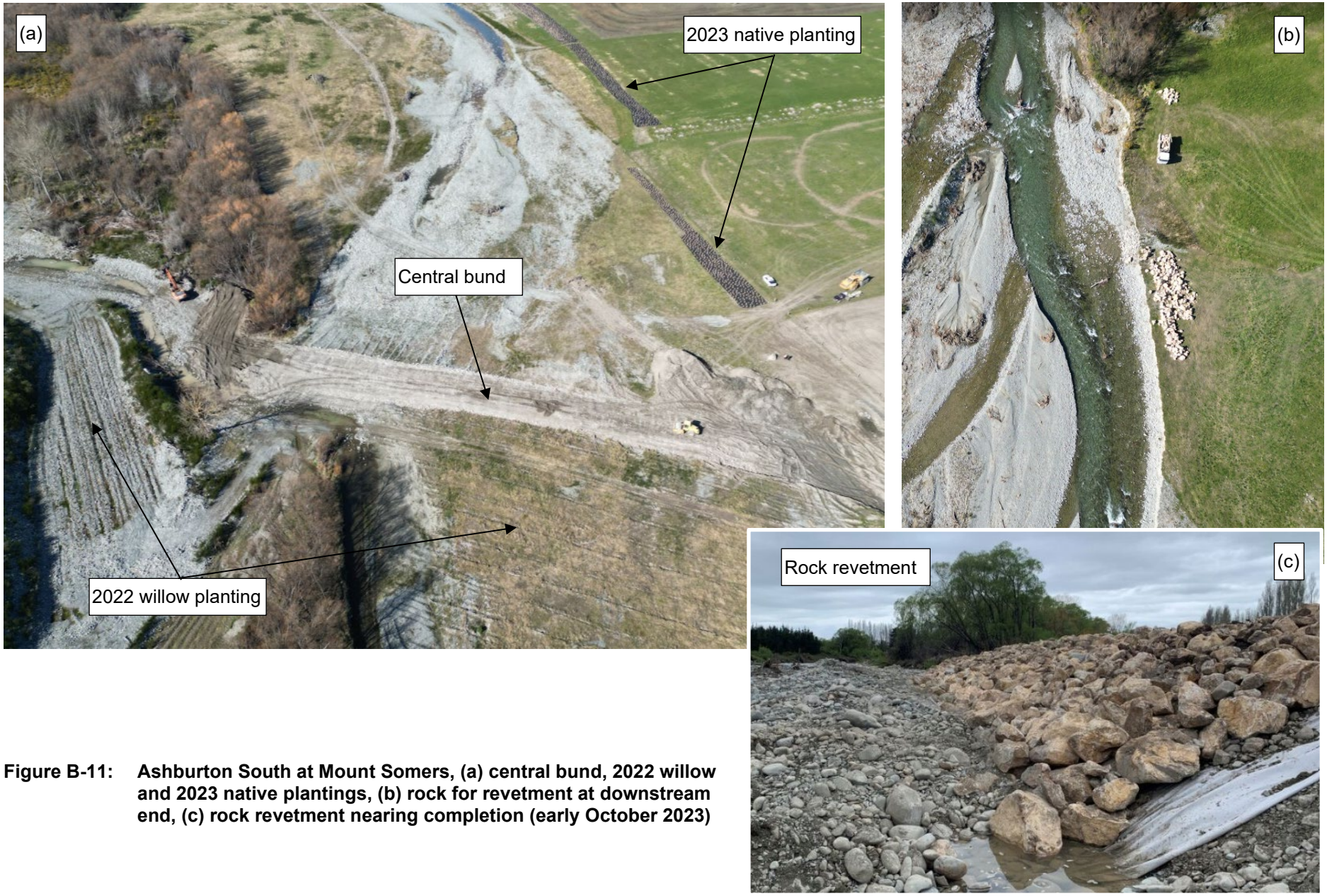

Figure B-11: Ashburton South at Mount Somers, (a) central bund, 2022 willow and 2023 native plantings, (b) rock for revetment at downstream end, (c) rock revetment nearing completion (early October 2023)

4. Sweetwater Creek (off Orari River)

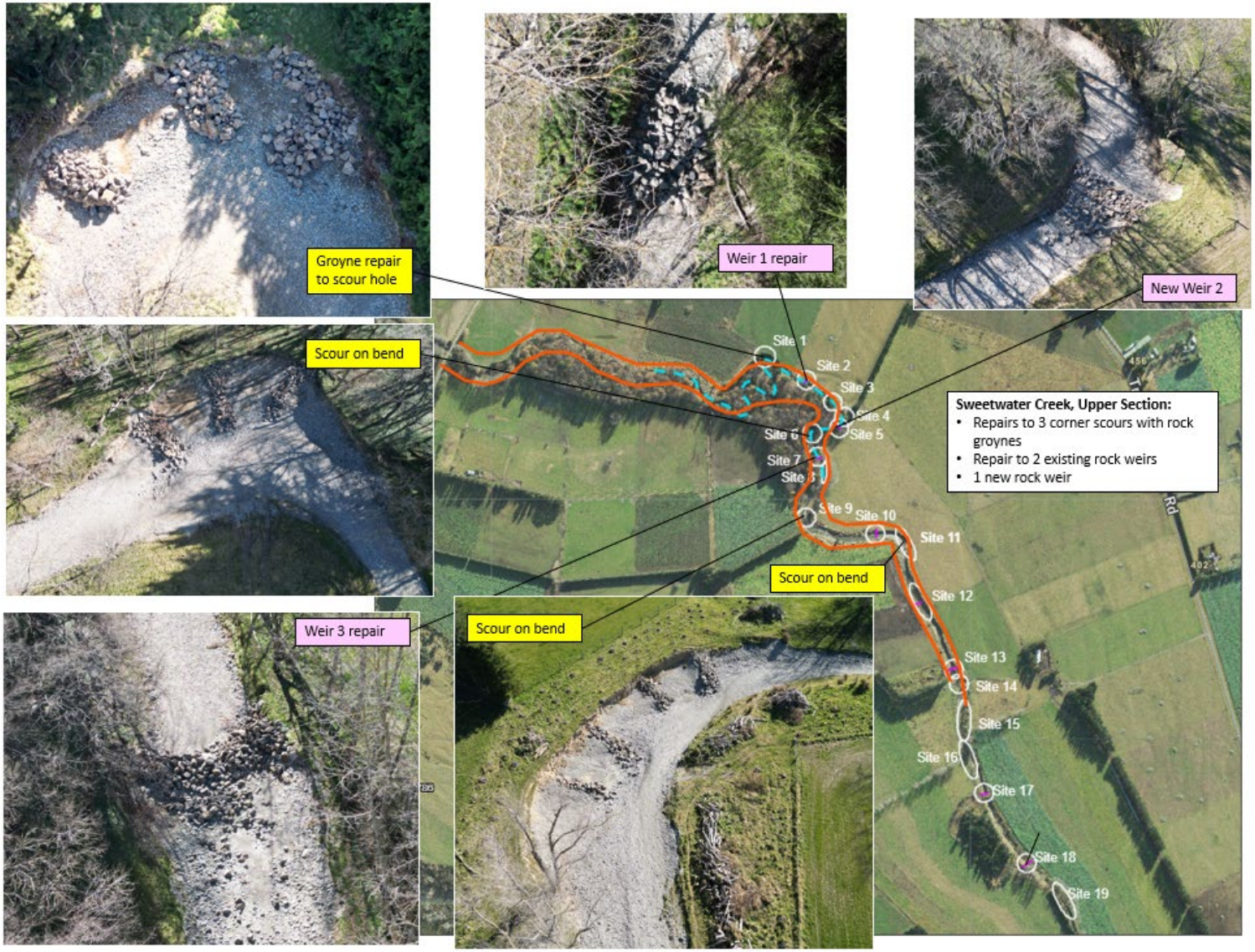

Figure B-12: Sweetwater Creek completed repairs, upper section (23 August 2023).

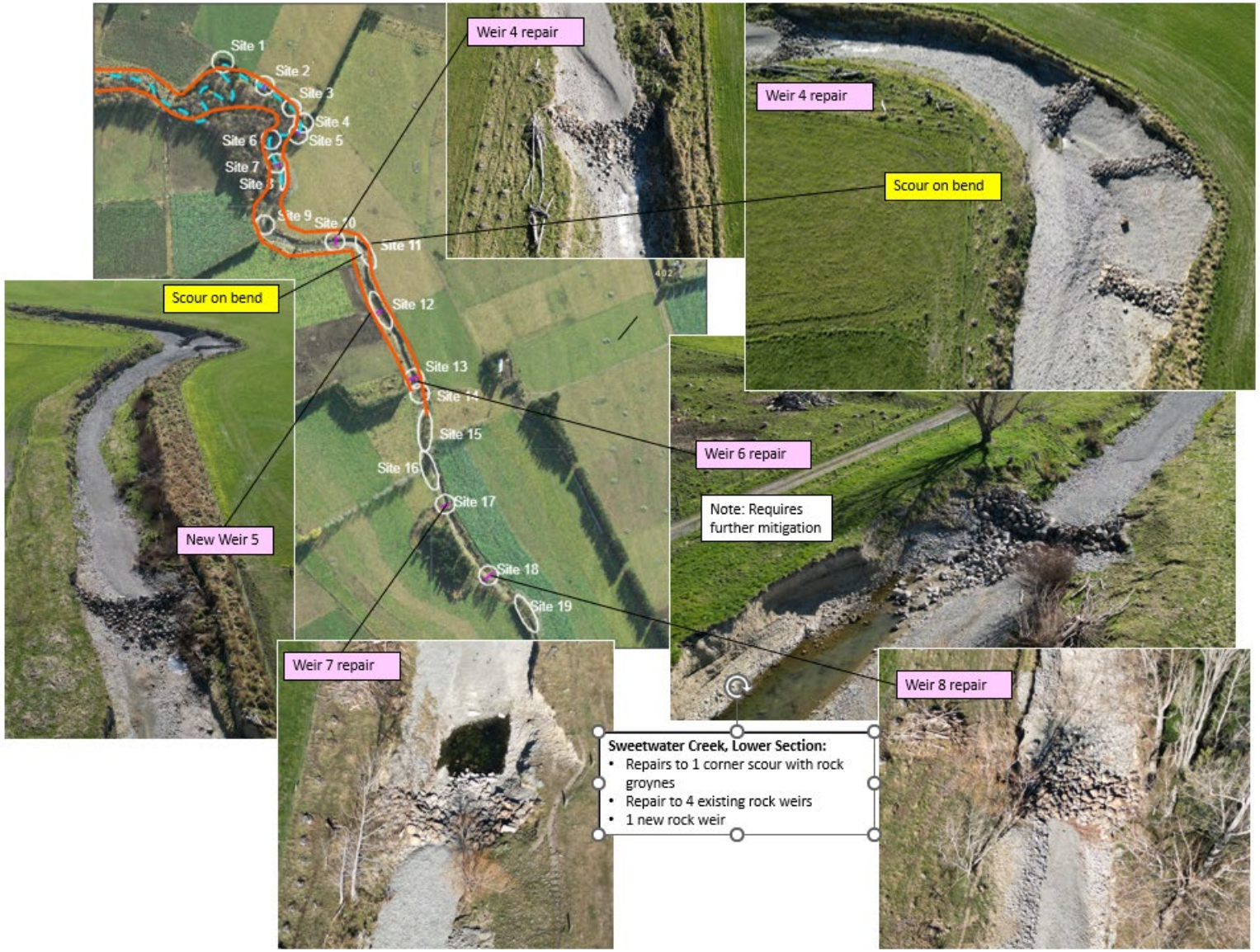

Figure B-13: Sweetwater Creek completed repairs, lower section (23 August 2023).

5. Orari at Taylor Road

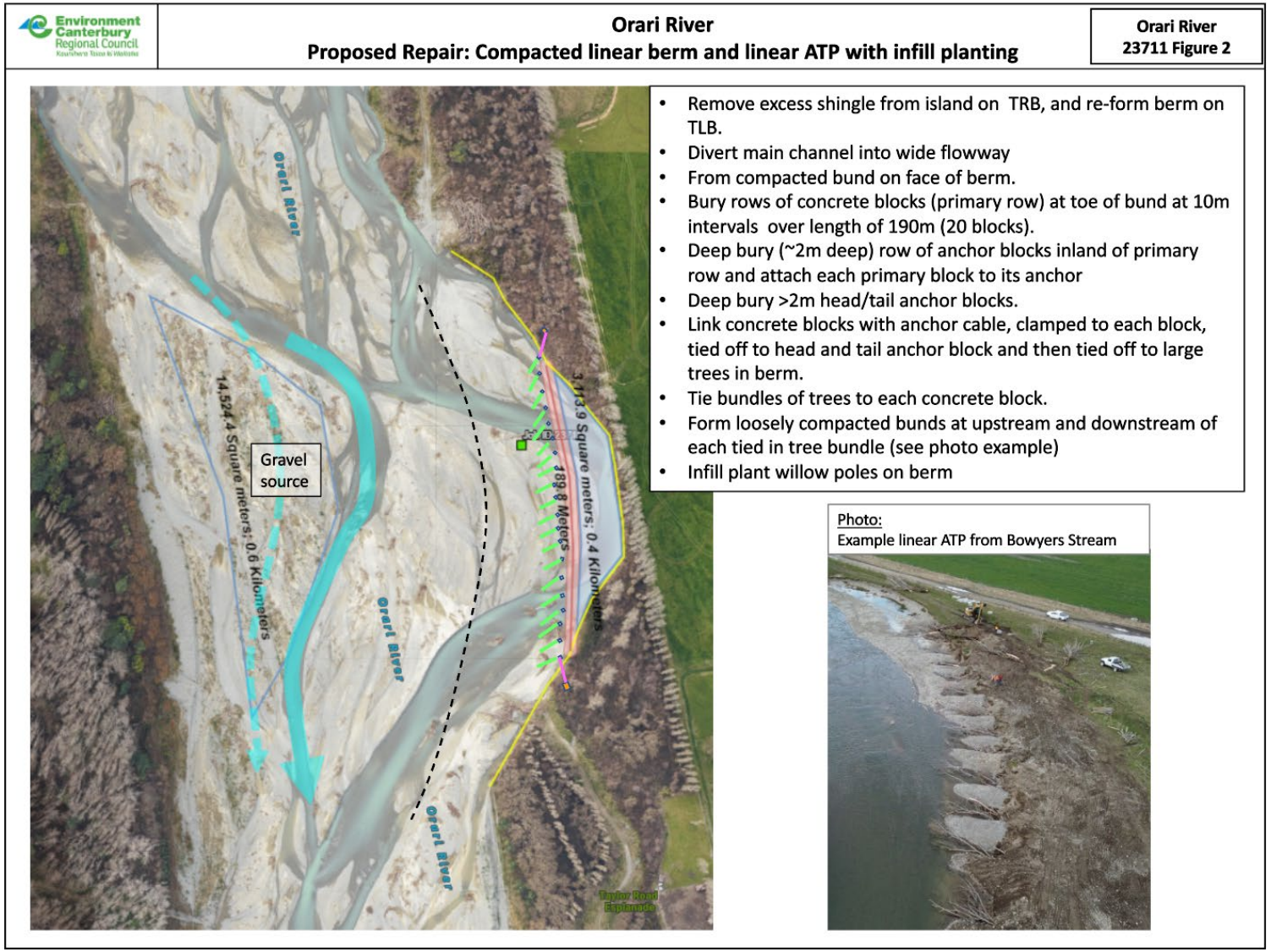

Figure B-14: Orari at Taylor Road, repair specification.

C. Key Sites Still Needing Flood Damage Repair

1. Bowyers Stream at Lochheads Road

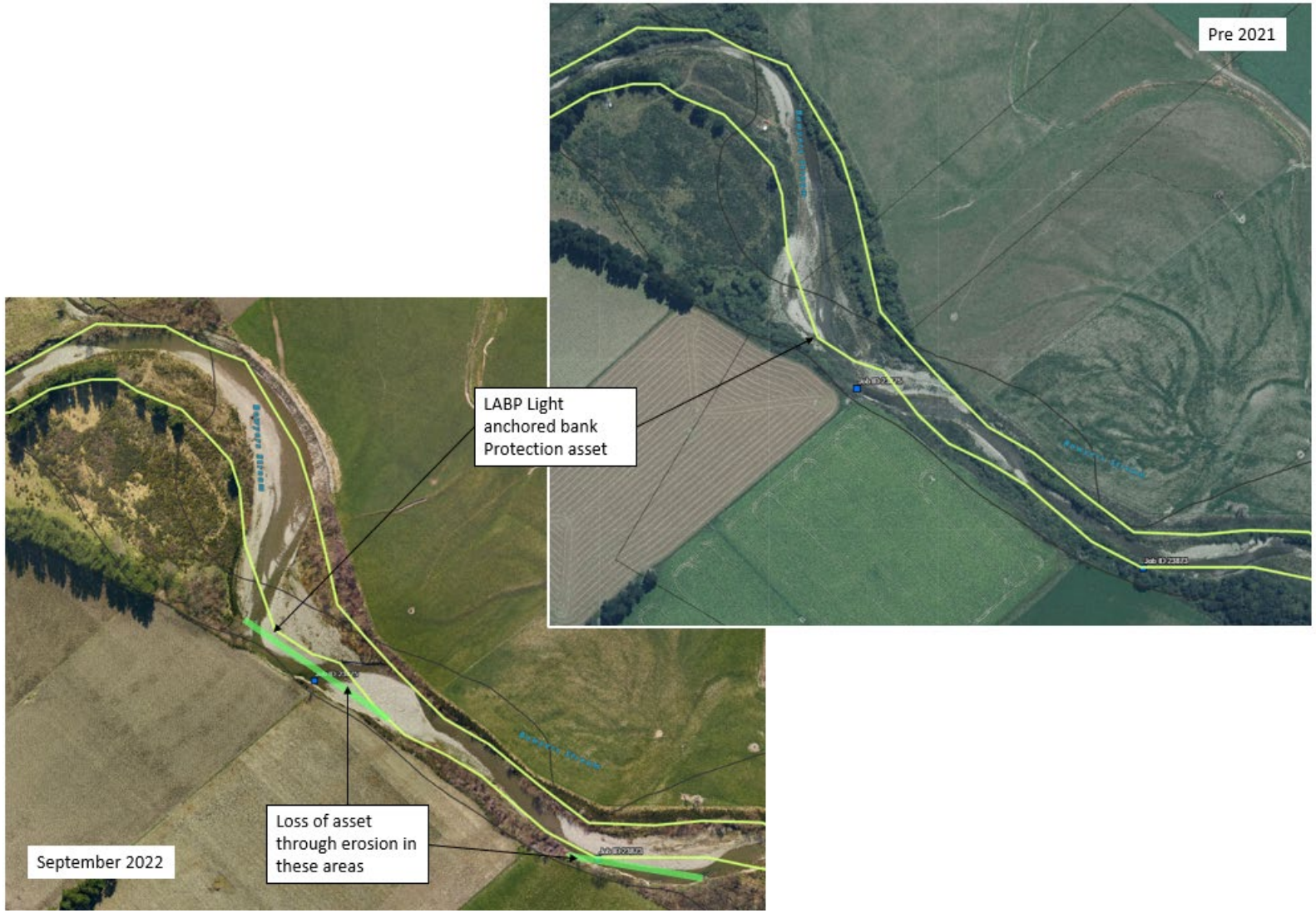

Figure C-1: Bowyers Stream at Lochheads Rd, loss of LABP asset through 2021 flood erosion.

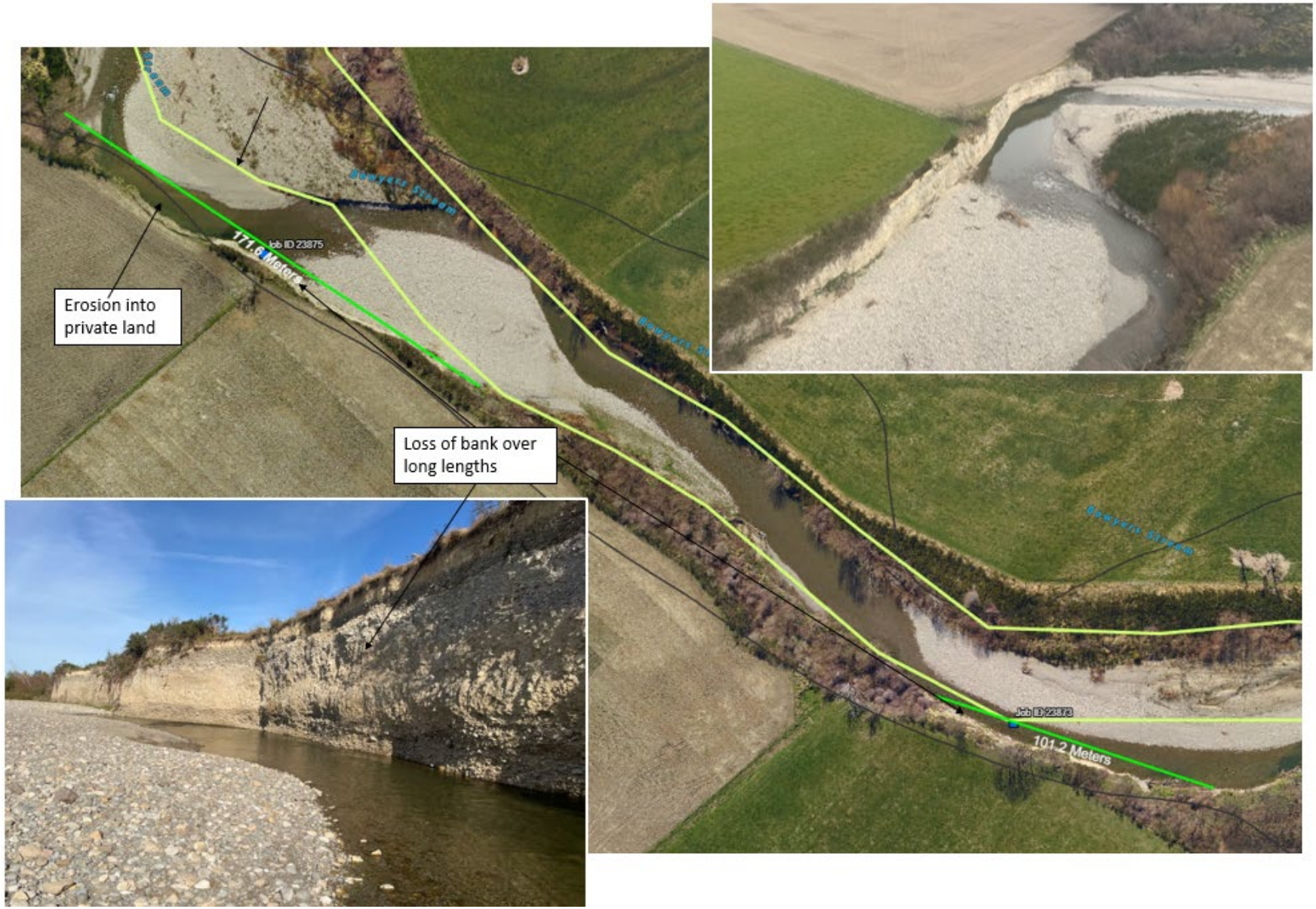

Figure C-2: Bowyers Stream at Lochheads Rd, high bank erosion.

2. Ashburton South at Mount Somers

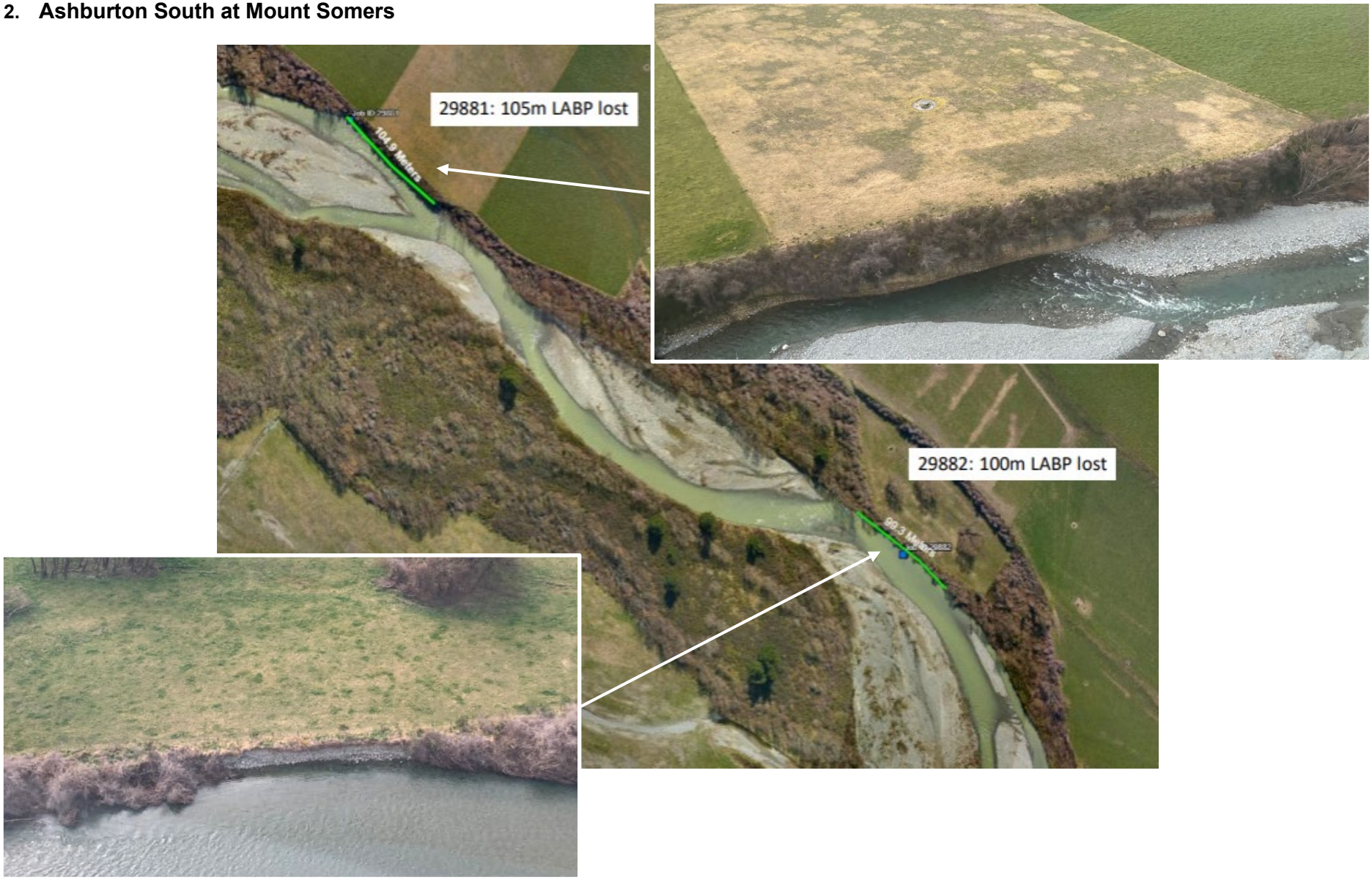

Figure C-3: Ashburton South at Mount Somers, vertical banks requiring repair.

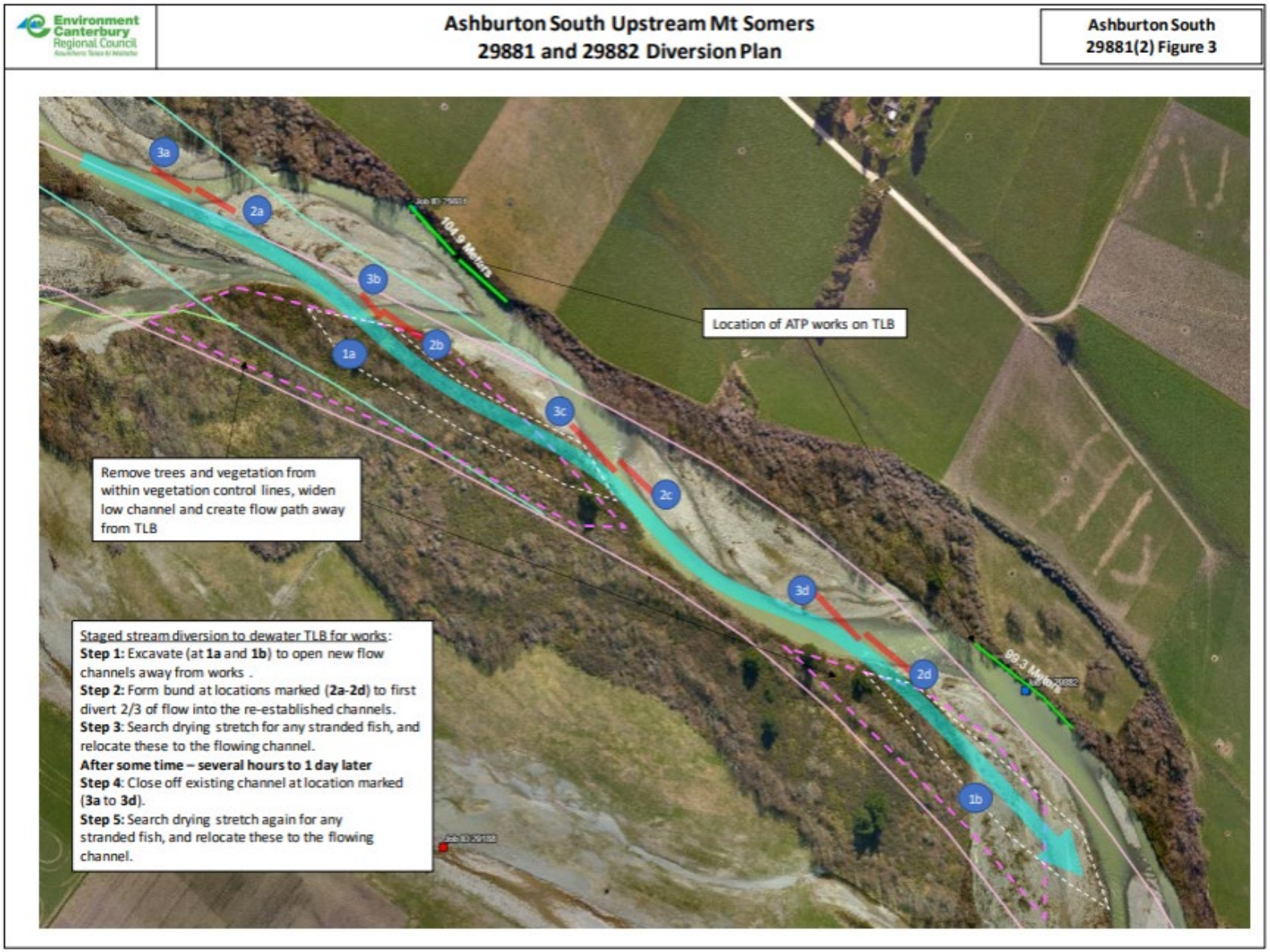

Figure C-4: Ashburton South at Mount Somers, diversion plan.

3. Waihi at Geraldine stopbank repairs

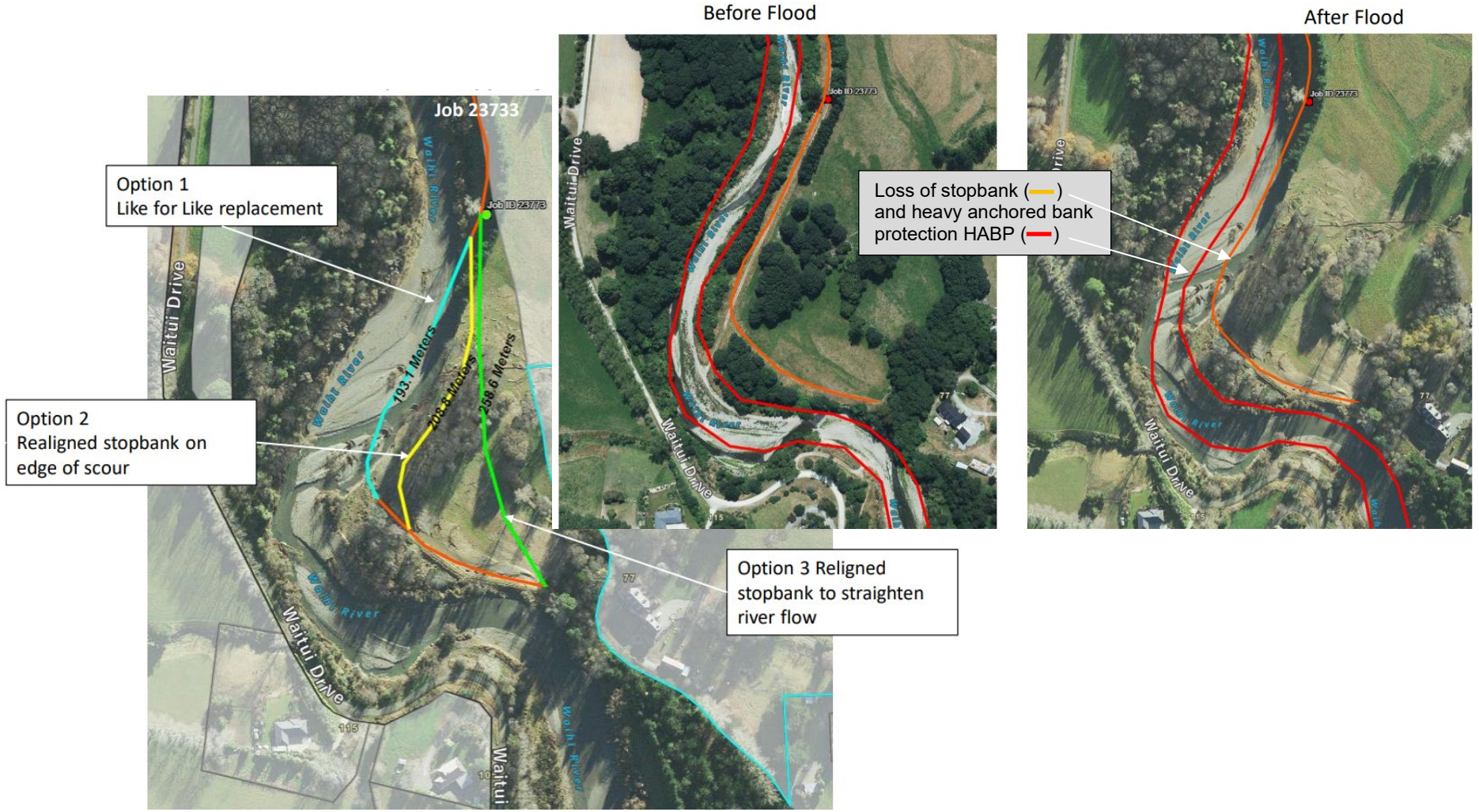

Figure C-5: Waihi at Geraldine stopbank damage and repair options.

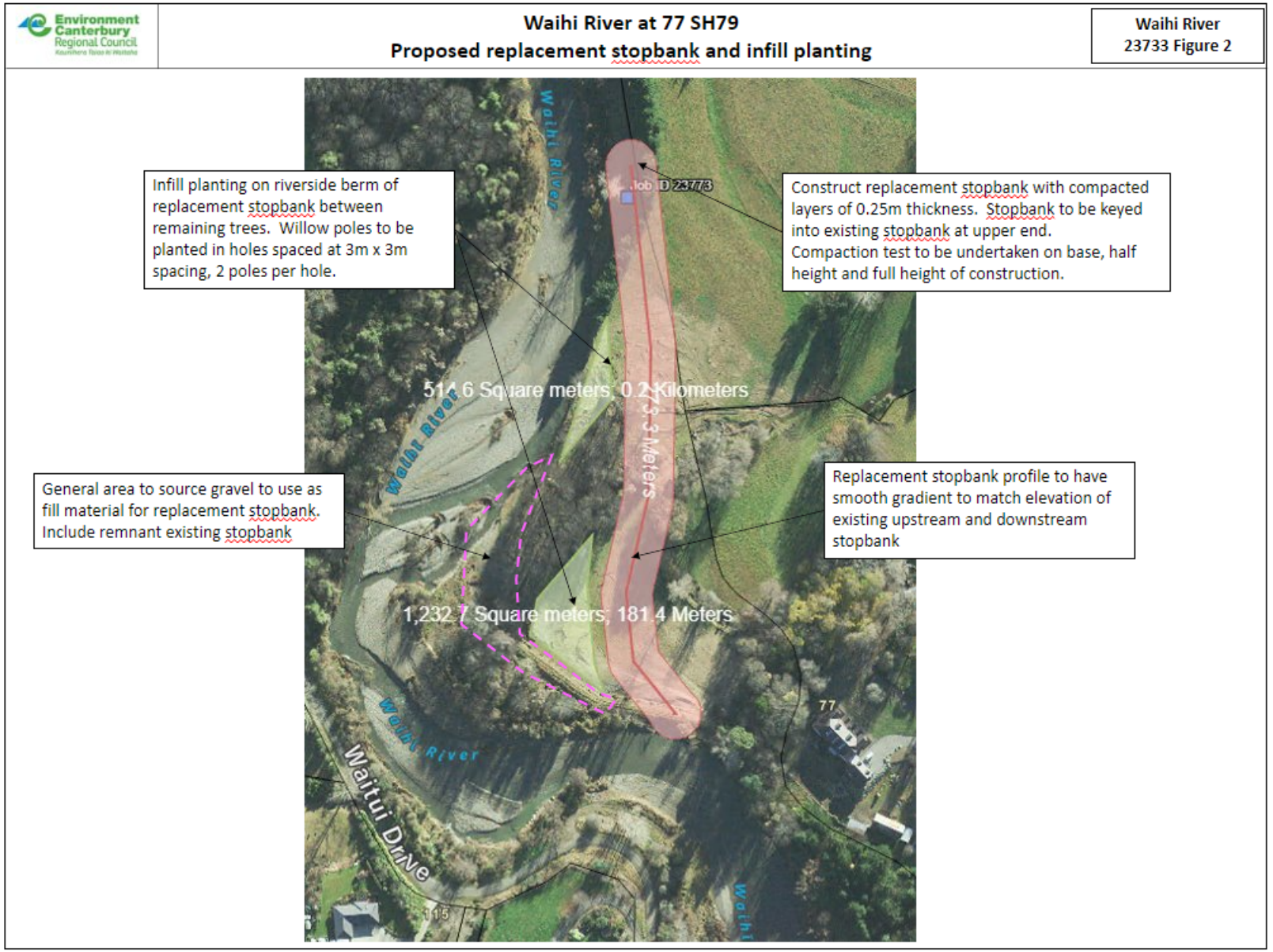

Figure C-6: Waihi at Geraldine replacement stopbank specifications.

4. Waihi at Geraldine Heyman fences

Figure C-7: Waihi at Geraldine, completed Heyman fences following 2021 flood damage.

Figure C-8: Waihi at Geraldine upstream of SH79 showing damage-on-damage scour due to winter high flows in 2022 and 2023.

Figure C-9: Waihi at Geraldine, Heyman fence downstream of SH79 showing damage-on-damage due to winter high flows in 2022 and 2023.

Figure C-10: Waihi at Geraldine High School, Heyman fence at showing damage-on-damage due to winter 2023 high flows.

5. Sweetwater Creek

Figure C-11: Sweetwater Creek, weir 6 requiring mitigation following damage-on-damage due to winter 2023 high flows.