Canterbury 2021 Flood Recovery Update 6

Ken Tarboton (Aqueus Consulting)
Shaun McCracken (Environment Canterbury)

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Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

200 Tuam Street
PO Box 345
Christchurch 8140
Phone (03) 365 3828
Fax (03) 365 3194

75 Church Street
PO Box 550
Timaru 7940
Phone (03) 687 7800
Fax (03) 687 7808

Website: www.ecan.govt.nz
Customer Services Phone 0800 324 636

Executive summary

Purpose:

This report provides an update on flood recovery progress by Environment Canterbury (ECan) for the period from October 2022 through March 2023. It follows updates 1 to 5 that have covered flood response and recovery from June 2021 through to the end of September 2022.

It documents progress with recovery works over this six-month period and provides a summary of costs to date. It also provides support for claim six 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.

Repair of the damaged infrastructure from the 2021 flood was on track and on budget in June 2022. In the winter of 2022 several high flow events occurred in quick succession in July and August 2022. These high flows exacerbated 2021 flood damage and caused additional damage to recently repaired, yet still vulnerable infrastructure. The previous report (Update 5) discussed the new 2022 damage as well as instances of further damage to the 2021 Flood damage. This report (Update 6) covers only 2021 flood damage including damage-on-damage from the 2022 high flows.

It is understood from initial discussions 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). Claim 6 to NEMA that corresponds with this Update 6 report includes claims for damage-on-damage to the 2021 flood damage.

Response and Recovery Progress – this period October 2022 to March 2023:

Flood damage repairs during this period have focused on completing repairs to sites where damage was exacerbated by the winter 2022 high flows. Progress at specific sites is presented in detail. Some key sites where repair works are required still remain. Some of these are large complex repairs requiring considerable coordination.

Preparation and planning for river-edge flood protection tree planting to be undertaken in the winter of 2023 has been another area of focus during this period. A large number of poles and wands will be required to be planted in 2023 and it is likely that there will still be some river-edge tree planting required in 2024. Details of the planned planting are presented.

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 403 of which 243 have been completed.

Financial Status:

The total costs to the end of March 2023 for flood recovery (including response) is $15.0 million. $8.3 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 $4.3 million on the five claims already approved by NEMA. Claim six for $0.66 million, covering costs to the end of March 2023, which corresponds to this report, has been submitted for review. When Claim 6 is settled, NEMA will have co-funded approximately $5.0 million of the $15.0 million spent to date, with the remaining $10.0 million funded by ECan.

The estimated total cost for 2021 flood recovery remains at $22.2 million as reported in Update 5 in September 2022. Of the $22.2 million, the likely overall claim to NEMA is estimated at $7.8 million. The estimated remaining costs to Environment Canterbury will be $14.4 million. This is $2.2 million more than the existing commitment from Environment Canterbury which is currently limited to $12.2 million.

A report to Council will be prepared as part of Annual Plan and Long Term Plan financial forecasting to provide options for consideration to fund the additional flood damage costs, and to request pre-approval of this additional funding.

Next Steps:

Next steps will focus on planting trees (poles or wands) to provide long term river-edge flood protection. This is best done in winter so will be a key activity over the next few months. At the same time there are still a number of flood damage repair works that need to be undertaken. Some of these are a result of exacerbating damage to works either recently completed or still underway during the winter 2022 high flows.

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.

First steps towards addressing climate change more comprehensively across the region include the use of river management zones that were conceptualised in the previous report (Update 5, Sept 2022). Preparation of a national guidance document on the “Application of Room for the River for NZ Rivers and Streams” is under preparation. This document, which includes knowledge gained from the Canterbury Floods will provide guidance to the river management sector for consideration of river management in the face of Climate Change.

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. However, ECan has indicated to NEMA that a comprehensive case for co-funding of betterment is likely across all the affected catchments from this event. In parallel with progressing this initiative, Environment Canterbury continues to seek long term sustained central government co-investment in flood protection schemes.

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1 Introduction

This report is the sixth report to be provided to the National Emergency Management Agency (NEMA). It documents Environment Canterbury's flood recovery progress from October 2022 to March 2023. The previous five reports have covered flood response and recovery from June 2021 to September 2022.

This report provides an update on recovery works undertaken to the end of March 2023, including a summary of their costs for the period from October 2022 to March 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.

In the winter of 2022 several high flow events occurred in quick succession in July and August 2022. These high flows which exacerbated 2021 flood damage and, in some areas, created new damage. Details of the new damage was presented in the previous report (Update 5).

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 403 of which 243 have now been completed (up from 188 in the previous report). The status of flood damage repairs (to the end of March 2023) is 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 31 March 2023.

District or Description	Draft	Accepted	Open	Monitoring	Completed	Total
Selwyn	6	1			11	18
Ashburton	34	16	19	10	138	217
Orari-Waihi-Temuka	21	11	3	2	45	82
Opihi	3	6	2		6	17
Ashley					5	5
Waimakariri-Eyre-Cust					14	14
Upper Hinds	14		3		16	33
Lower Hinds	4		1		2	7
Little River					1	1
Response including 2022 response				4	5	9
Totals	**82**	**34**	**28**	**16**	**243**	**403**

There remain 160 current (draft+accepted+open+monitoring) repair jobs. Of these, 16 have been completed and are being monitored to check if any further repairs are needed. That leaves 144 current jobs, of which 88 require works other than pole planting. The location and estimated cost for work to be undertaken (excluding willow pole planting) is shown in Table 2-2 below.

Table 2-2: Current flood damage repair jobs (excluding willow pole planting) and their estimated cost to complete.

District or Description	Current Jobs	Estimated Cost
Selwyn	6	156,000
Ashburton Rivers	41	1,042,600
Orari-Waihi-Temuka	24	1,066,000
Opihi	8	347,500
Upper Hinds River	4	59,000
Lower Hinds River	5	110,000
Totals	**88**	**2,781,100**

Key points to note from the tables above are that flood damage repairs have progressed steadily over the six-month reporting period. Completion of repairs to damage-on-damage and remaining works has been slower than expected and pole planting was not possible over the dry summer months. This is reflected in the expenditure tracking chart shown in Figure 4-1.

Figure 2-1 below shows geographically where the expenditure for repair sites has taken place. The message presented here is that the expenditure is geographically well spread throughout the flood affected catchments, with large clusters in the Ashburton, Orari and Waihi catchments.

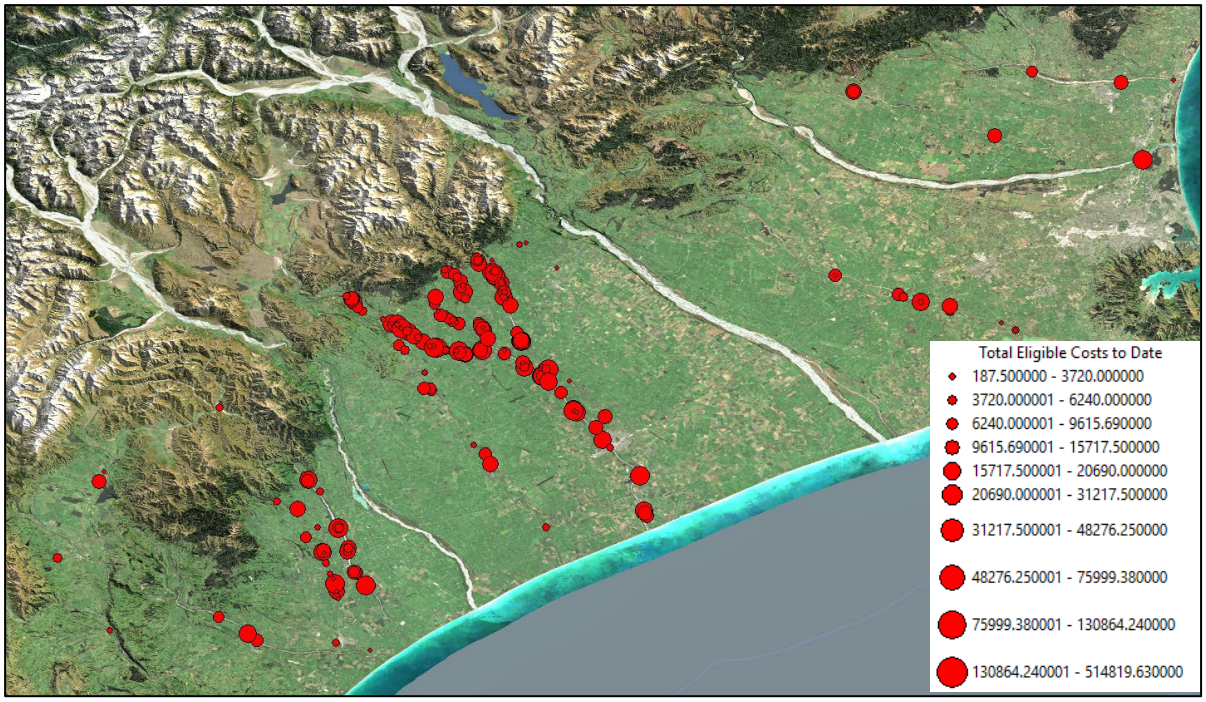


Figure 2-1: 2021 flood recovery expenditure geographic spread.

2.1 Progress at specific sites (October 2022 to March 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 A.

Orari at Stewart Rd

The extent of 2021 damage which was exacerbated during the 2022 high flows was previously reported in Update 5. A contract for repairs was awarded in October 2022 with work continuing through to January 2023 to complete repairs to the stopbank, the berm in front of it and to establish erosion protection groynes (Figures A-1 and A-2). Installation of ATP on the upstream side of the groynes and infill pole planting has been left to the winter of 2023.

Orari at Inglis Rd
Completed stopbank repairs and erosion bunds were reported in Flood Recovery Update 3, however ATP and infill planting had not been completed by July/Aug 2022 when high flows caused damage to the recently completed erosion protection bunds. Site A was not affected by the July/Aug flows, however the river returned hard against the recently repaired stopbank at Sites B and C. Realignment of the channel was required to compete repairs at these sites and also on the Orari at Peacocks on the true right bank.

Figure A-3 shows the location of the river hard against sites B, C and Peacocks directly after the flood (May 2021) and also following the July/August 2022 high flows. Figure A-4 shows the realigned channel in September and October 2022.

Figure A-5 shows the completed stopbank repair at Site A, with ATP and some infill planting undertaken in October 2022. Remaining infill planting is still to be undertaken in 2023.

Following channel realignment repairs to the damaged erosion protection bunds were undertaken at Sites B and C (Figure A-6 and A-7). ATP was also re-instated at these sites. Infill pole planting is required in the winter of 2023.

Orari at Peacocks
Following channel realignment, a deflection bund with ATP on its upstream edge was constructed and two rows of tree edge protection planted along the high eroded berm in an attempt to prevent further erosion of this high berm and private land loss. The trees have taken well (Figure A-8). The success of this repair remains to be tested with expected high flows in the winter of 2023.

Orari D/S SH79
Stopbank and erosion bund work was completed and reported in Flood Recovery Update 3 (March 2022). ATP work undertaken in May-June 2022 was partially washed out in the July/Aug 2022 high flows and the tips of the erosion protection bunds were also washed away. Since then the erosion protection bunds have been repaired, ATP restored and infill planting undertaken (Figure A-9).

Ashburton North downstream of confluence with Pudding Hill Stream
Figure A-10 shows the time sequence of scour, breakout and repairs at two locations on the Ashburton North Branch true left bank directly downstream of the confluence with the Pudding Hull Stream. (a) shows the scour directly after the May 2021 flood, while (b) shows the repairs that had been completed by May 2022 with erosion protection bunds and ATP. Infill tree planting was completed in the early winter of 2022 prior to the high flows which caused damage to the ATP and erosion protection bunds. The damage and infill planting are shown in Figure A-10 (c) as well as in more detail in Figure A-11.

Ashburton at River Road
Further damage to the repair on the Ashburton main stem at River Road was reported un Update 5 together with a plan for a proposed repair. Those repairs were undertaken in November 2022 (see Figure A-12.

Taylors Stream
Figure A-13 shows the pre-flood light anchored bank protection (LABP) washed out during the 2021 flood and subsequent flow over private land. Initial repairs were made in March 2022 with a line of anchored trees, then following the winter 2022 high flows more substantial anchored tree protection was installed (Figure A-14).

2.2 Key sites that still need works

Of the 160 current repair sites (Figure 6-1), 88 require work other than pole planting as indicated in Table 2-2. Of these, works required at several key sites are described below, with accompanying figures in Appendix B, to give an indication of the types of flood damage repair work that is still required.

Ashburton North in vicinity of RDR
Three sites in the vicinity of the RDR on the Ashburton North Branch had severe scour in the 2021 flood that was exacerbated in the 2022 high flows. Damage to these sites is shown in Figure B-1. Procurement for this work was completed in March 2023 and the work is currently underway.

Ashburton South at Mount Somers
Loss of tree edge protection occurred over a long length (approximately 2km) directly upstream of SH72 in the vicinity of a former Mount Somers waste disposal site (Figure B-2). Some planting was undertaken in May 2022 however much of this was washed out in July 2022. This is a complex site (Figure B-3) requiring discussion with the landowner on possible retreat options and coordination with Ashburton District Council. Options for mitigation include a combination of edge protection and native planting. Plans for recovery mitigation are still being progressed.

Sweetwater Creek
Flood damage included damage to six weirs and four large corner scours over a length of approximately 1.8km along Sweetwater Creek (Figure B-4). Design of the proposed repairs has been undertaken and the work awarded to a contractor following a competitive bid process. An additional 2 weirs have been proposed as enhancement work. Figure B-5 shows and example of the proposed repair for the corner scours and Figure B-6 an example of the proposed weir repair method. Work is underway and expected to be completed before winter 2023.

Orari at Taylors Road
On the Orari in the vicinity of Taylors Road, there is a general narrowing of the riverbed between the stopbank on the true left bank (TLB) and the heavy anchored bank protection (HAPB) on the true left bank (Figure B-7). The figure shows the scour on the TLB where a significant length of HAPB was lost. This was repaired by May 2022 (Figure B-8); however, the erosion protection bund and infill planting were completely washed away in the winter 2022 high flows. Options for a more robust way to mitigate flood damage at this location are under consideration including the possibility of making more room for the river at this location.

2.3 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 have stabilised the area.

Flood damage repairs are vulnerable to sustain 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.

Planning has been undertaken for the extensive pole planting effort required in the winter of 2023 to start to reinstate lost tree edge protection. As previously reported, the 2022 infill planting programme was severely impacted by the winter 2022 high flows which resulted in loss of freshly planted trees and also lost opportunity for planting during the 2022 winter period.

Areas requiring edge protection reinstatement have been reviewed including the type of edge required. This included deep pole planting, ripping in of willow wands and tying in of Anchored Tree Protection (ATP). The estimated number of poles (both deep poles and willow wands) required for flood recovery planting are indicated in Table 2-3 below together with the estimated cost for pole planting. The location of required pole planting is shown in Figures C-1 and C-2. As many as possible of these trees will be planted in the 2023 planting season, although realistically, some may need to be deferred to the 2024 planting season as river flow conditions, contractor availability, and availability of product (poles to plant) may prevent completion of all of this planting in 2023.

Table 2-3: Infill tree planting planned for 2023 to reinstate tree edge protection.

Rating District	Estimated number of poles to be planted	Estimated cost of planting
Ashburton	68,803	$ 1,324,682
Hinds	4,608	$ 96,127
Opihi	16,158	$ 342,540
Orari-Waihi-Temuka	28,069	$ 590,819
Selwyn	3,307	$ 62,255
Total	**120,944**	**$ 2,416,423**

2.4 Next steps

Priorities for April to September 2023 are to undertake as much as possible river-edge tree re-establishment through the planned pole planting and continue to progress outstanding physical works.

Given the extent of pole planting to re-establish river edge tree protection required, it is unlikely that this will be completed over the winter of 2023 and planting will continue through the autumn and winter of 2024.

Key sites at which works are required have been discussed above in Section 2.2. There are also a number of smaller work sites at which repairs will be undertaken during this period.

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, an RFP has been released in May to multiple contractors on the Environment Canterbury supplier panel agreement. Pole planting work packages will be issued to responding contractors and spread among them, with re-issue of further pole planting work packages based on performance.

4 Financials

4.1 Flood Response and Recovery

Flood response costs to the end of March 2023 are $15.0 million as summarised in Table 4-1 below. Approximately $1.2 million has been spent on flood recovery during the report period from October 2022 to March 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 31 March 2023.

Description	Costs for period Oct 2022 to Mar 2023	Total Costs to Date
Flood monitoring costs	0	275,129
Selwyn 2021 Flood Repair	34,435	458,945
Ashburton 2021 Flood Repair	618,868	9,015,397
OWT 2021 Flood Repair	492,487	3,110,364
Opihi 2021 Flood Repair	72,789	285,760
Ashley 2021 Flood Repair	713	132,346
WEC 2021 Flood Repair	0	516,036
Upper Hinds 2021 Flood Repair	0	176,701
Lower Hinds 2021 Flood Repair	0	122,209
Little River 2021 Flood Repair	0	4,427
Sub-total	1,219,293	14,097,314
CDEM Response	0	414,523
Regional Parks Repair	0	63,806
Other Costs	0	439,168
TOTAL		15,014,811

Table 4-2: Estimated NEMA eligible and non-eligible flood recovery costs for Canterbury 2021 Flood at 31 March 2023.

Description	Estimated Non-Eligible Costs	Estimated Eligible Costs	Total Costs to Date
River Rating Districts	1,771,860	12,321,834	14,093,693
CDEM Response	414,541		414,541
Regional Parks Repair	330,511	4,264	334,775
Other Costs	150,059	21,742	171,802
TOTAL	2,666,971	12,347,840	15,014,811

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.

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 $22.2 million (see Table 4-5 that follows). The estimated time to complete the repairs has been extended to June 2024 as shown in the adjusted spend profile.

The rate or repair and spending was reduced during the period from July 2022 to March 2023 as planting was not possible and reassessment of damage and planning was undertaken during this period. The rate of spending is expected to ramp up through the winter 2023 planting season and until December 2023. There will still be some non-planting related physical works through the summer of 2023 and 2024 and completion of any remaining planting in early winter (May- June 2024).

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

Forecast flood repair costs by quarter	Q4 To June 23	Q1 To Sept 23	Q2 To Dec 23	Q3 To Mar 2024	Q4 To Jun 2024	Totals
Rating District						
Selwyn	18,677	62,328	62,400	62,400	12,451	218,255
Ashburton Rivers	445,405	842,161	359,640	359,640	360,436	2,367,282
Hinds (Upper + Lower)	88,838	65,863	35,600	35,600	39,225	265,127
Orari- Waihi-Temuka	326,246	478,809	366,800	366,800	118,164	1,656,819
Opihi	102,762	192,770	43,000	43,000	308,508	690,040
Contingency, Design, Staff, Plant etc.	404,527	404,527	404,527	404,527	404,527	2,022,634
Total by quarter	**1,386,454**	**2,046,458**	**1,271,967**	**1,271,967**	**1,243,311**	**7,220,157**

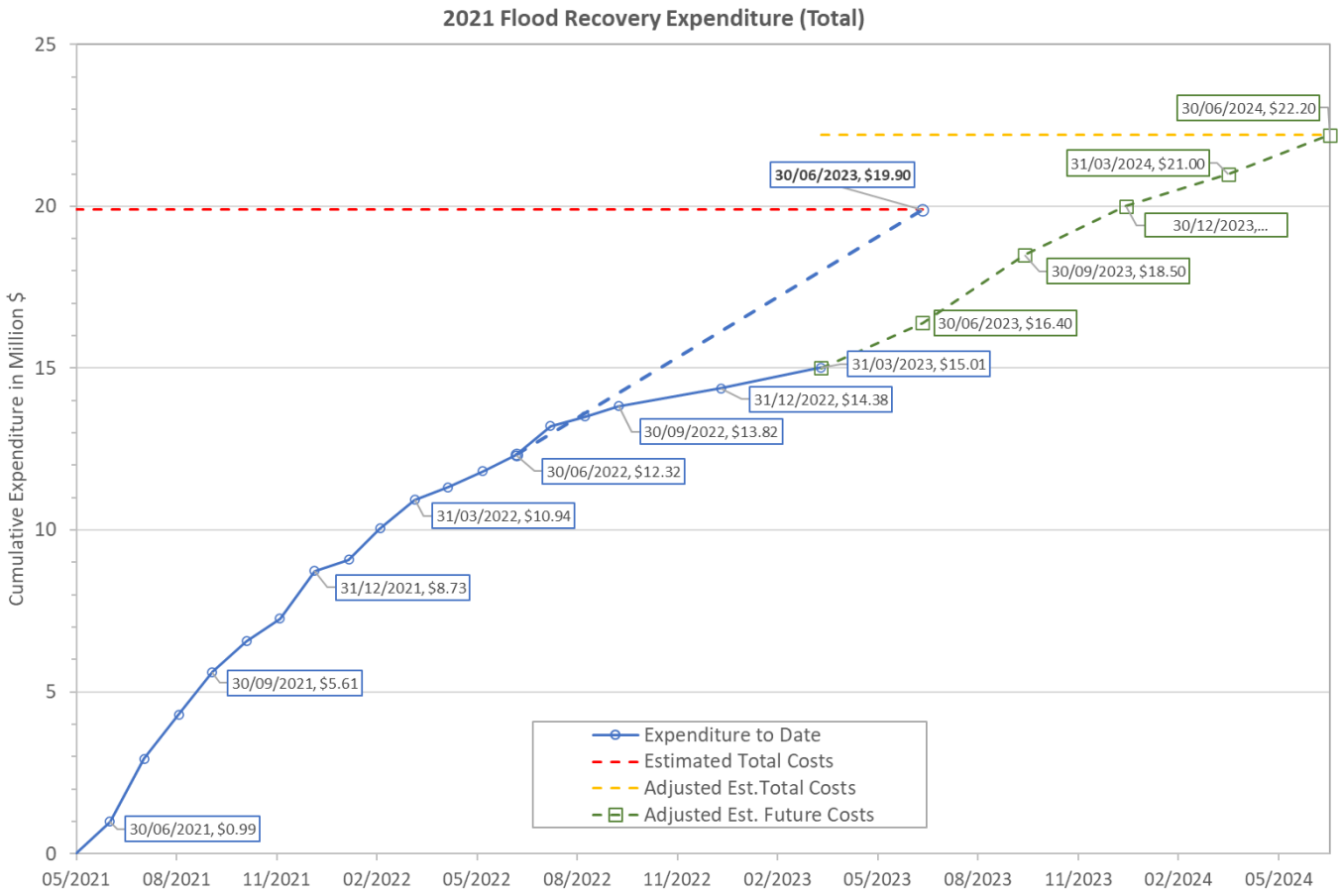


Figure 4-1: 2021 flood recovery expenditure profile.

4.2 NEMA Eligible Costs

Government policy[1] 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 above, ECan has assessed that of the flood recovery expenditure to the end of March 2023, approximately $12.4 million are NEMA eligible costs (subject to NEMA confirmation).

ECan has submitted six claims to NEMA covering costs through the end of March 2023. Table 5-3 below shows the value of each of these claims. Reimbursement for the first five claims has already been received to a total value of $4.3 million.

Note that Claim 1 was subject to deduction of the initial threshold of $4.1 million. Claim 6 for $0.66 million, that corresponds to this report, was submitted to NEMA for review on 3 May 2023.

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

Claim	Period	Eligible Cost ($)	Threshold ($)	Claimable from NEMA (60%)	Status
Claim 1	June - Sep 2021	4,930,462	4,113,817	489,987	Claimed
Claim 2	Oct 2021-Feb 2022	3,075,412		1,845,247	Claimed
Claim 3	Mar-May 2022	1,650,540		990,324	Claimed
Claim 4	June 2022	334,772		200,863	Claimed
Claim 5	July-Sep 2022	1,333,488		800,093	Claimed
Claim 6	Oct 2022-Mar 2023	1,102,051		661,231	In progress
TOTAL to Date		12,374,961		4,956,686	

4.3 Estimated flood recovery costs and their apportionment

4.3.1 2021 Flood Recovery (including 2022 damage on damage)

The estimated total cost for 2021 flood recovery at 31 March 2023 remains at $22.2 million as estimated and reported in Update 5 in October 2022. A summary of costs including those to the end of March 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 $14.4 million with an expected central government contribution of $7.8 million through claims to NEMA.

[1] 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 30 Sept 2022 (Million $)	At 31March 2023 (Million $)
Flood Recovery costs (to date)	2.9	13.8	15.0
Estimated Future Flood Recovery Costs	16.8	8.4	7.2
Total Flood Response & Recovery Estimate	**19.7**	**22.2**	**22.2**
Estimated non-Eligible Recovery Costs	-3.1	-6.2	-5.0
ECan Threshold for NEMA claim	-4.1	-4.1	-4.1
Eligible for 60% government subsidy (NEMA)	**$12.5**	**$11.9**	**$13.1**
Estimated Funding Mix	**Million $**	**Million $**	**Million $**
ECan initial threshold	4.1	4.1	4.1
ECan – Non Eligible Costs	3.1	6.2	5.0
ECan – 40% of Eligible Costs	5.0	4.8	5.3
Total ECan Estimated Cost	**12.2**	**15.1**	**14.4**
NEMA – 60% of Eligible Costs	7.5	7.1	7.8
Total	**19.7**	**22.2**	**22.2**

4.3.2 Funding considerations.

Currently, Council has committed $12.2 million of general rate funding towards flood recovery in the rating districts (Ashburton, Orari-Waihi-Temuka and Opihi) in which 2021 flood damage occurred. It is now estimated that an additional $2.2 million will be required for flood damage repairs in these catchments to bring the total estimated ECan contribution to $14.4 million as indicated in Table 4-5 above.

The additional funding required for 2021 flood damage repairs has been included in the 2023/24 Annual Plan budget for consideration and approval by Council.

5 Risks

Most of the major stopbank breaches have now been repaired. Without vegetation adjacent to them though, these stopbanks still remain a vulnerable point in the schemes. This risk became a reality during the winter 2022 high flows when fragile erosion protection bunds were partially washed away because anchored tree protection had not yet been fully established and tree edge protection either not yet established or was in the process of being established. Re-establishing this vegetation remains a high priority through the winter of 2023, however it is acknowledged a return to ‘full strength’ will take years as this vegetation will take time to grow.

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)

Risk	Description	Mitigation Action
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: Fuel Cost Increases	The cost of fuel has increased significantly since the initial cost estimate was undertaken. Contractor rates are starting to reflect this.	A contingency amount of 15% of the remaining physical works estimate has been added to the overall project cost estimate. This is one of the elements of the total $22.2 million 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 as a whole 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 2023 and 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.

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. Written or verbal updates and/or field visits have been carried out with all other flood related Committees between October 2022 and March 2023. 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
16 December	Opihi River Rating District Meeting
16 December	Orari Waihi Temuka Rating District Meeting
9 February	Selwyn River Rating District Meeting
10 February	Waimakariri Eyre Cust Rating District Meeting
14 February	Ashburton River Rating District Meeting

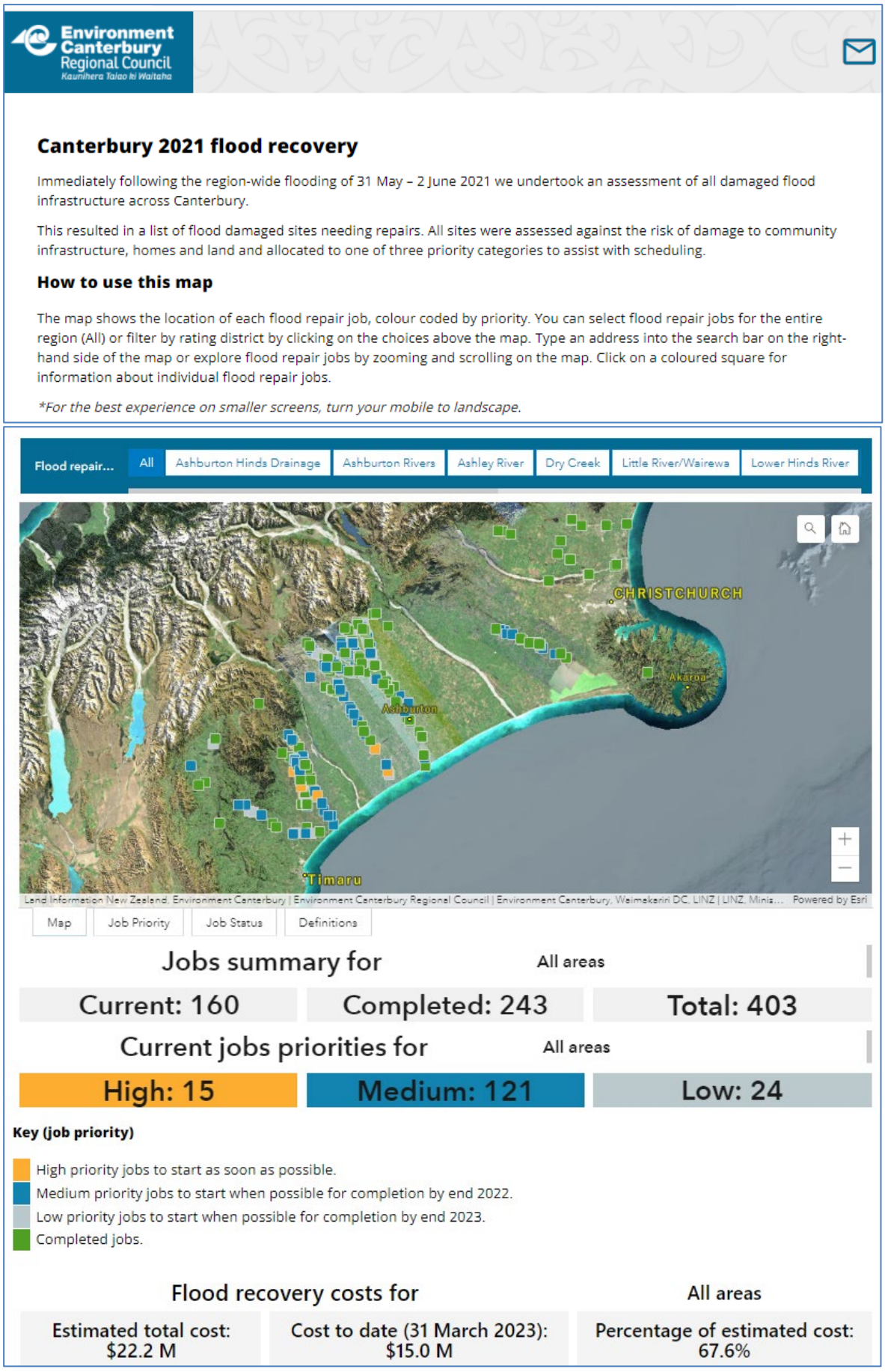


Figure 6-1: Screen clip of flood recovery interactive job status web page at 31 March 2023.

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 repair progress October 2022 – March 2023

Figure A-1: Orari at Stewart Road (a) tree edge protection loss and stopbank scour, (b) repaired stopbank, berm and erosion protection bunds, awaiting ATP and infill planting.

Figure A-2: Orari at Stewart Road aerials of (a) flood damage, (b) repaired stopbank, berm and erosion protection bunds, awaiting ATP and infill planting.

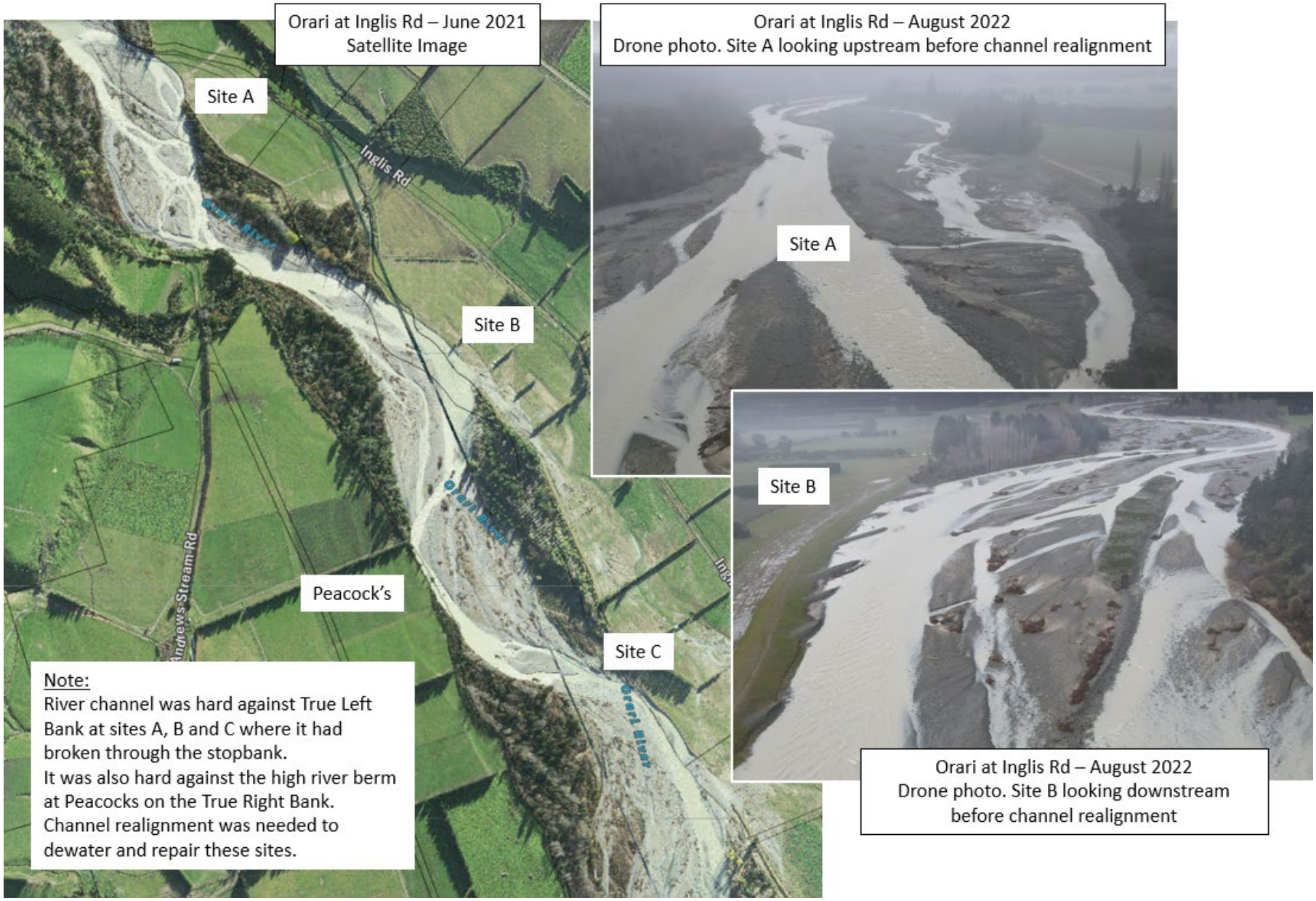


Figure A-3: Orari at Inglis Road before channel realignment.

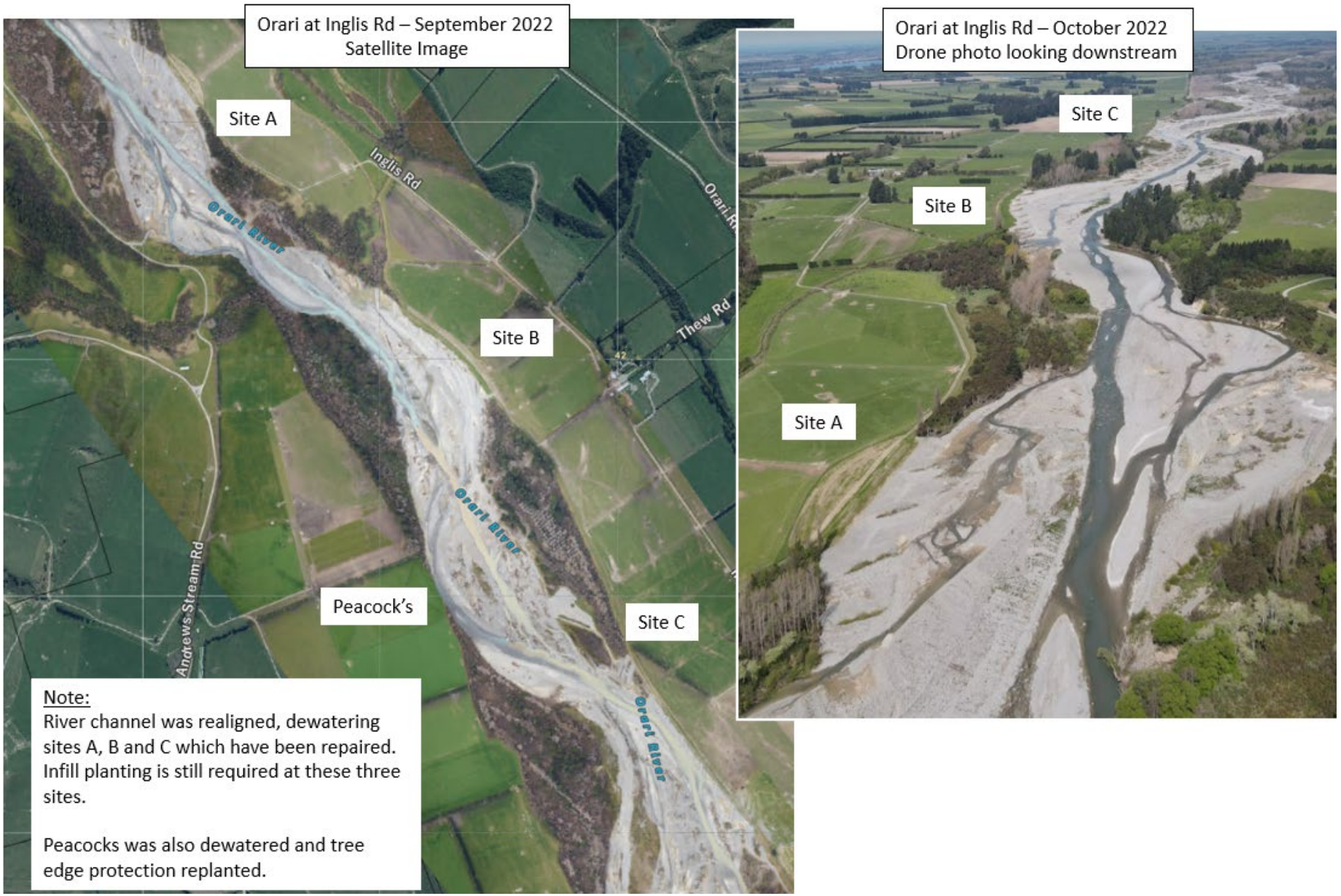


Figure A-4: Orari at Inglis Road after channel realignment.

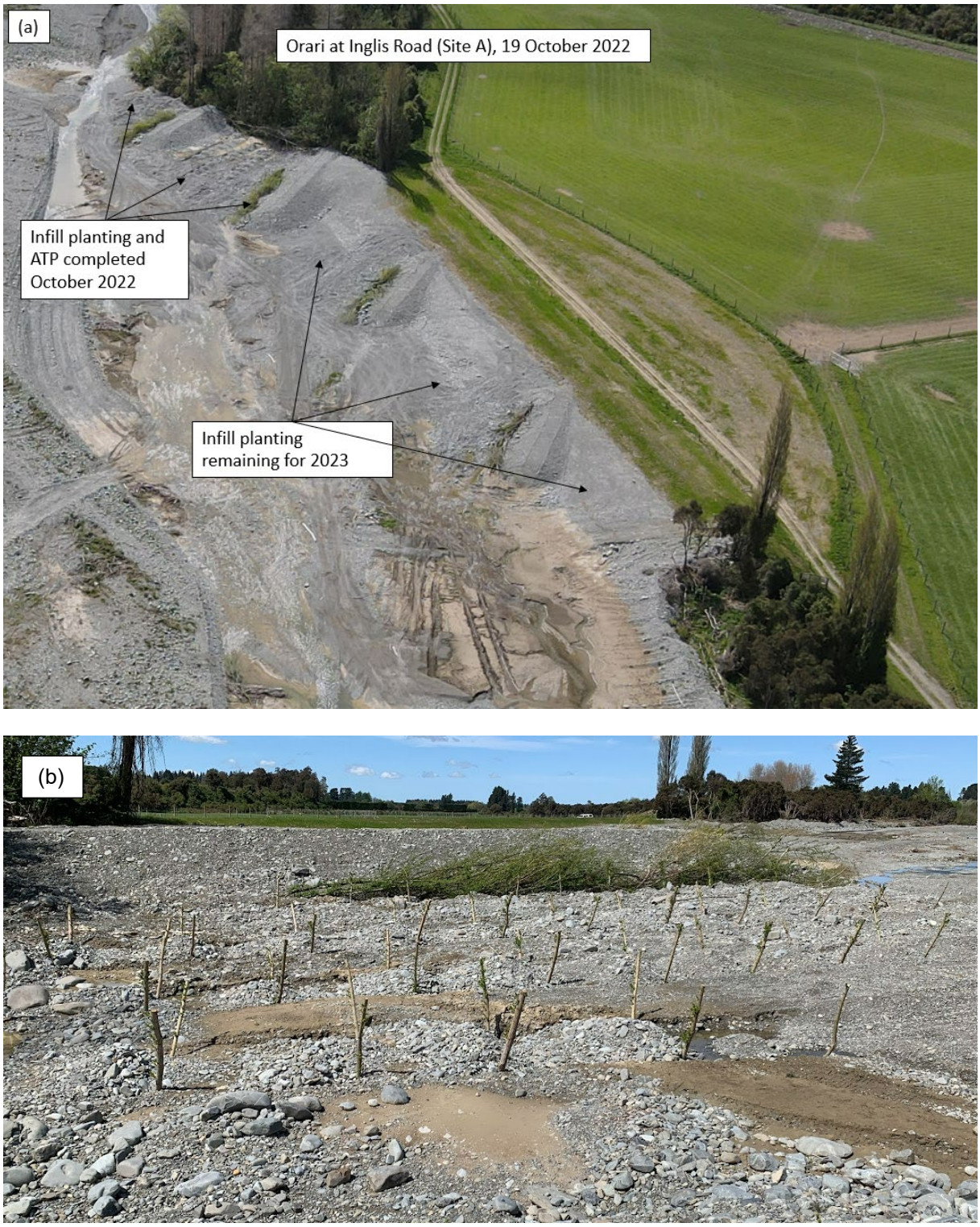


Figure A-5: Orari at Inglis Road, Site A: (a) completed stopbank and erosion bunds with some infill planting, (b) infill planting detail.

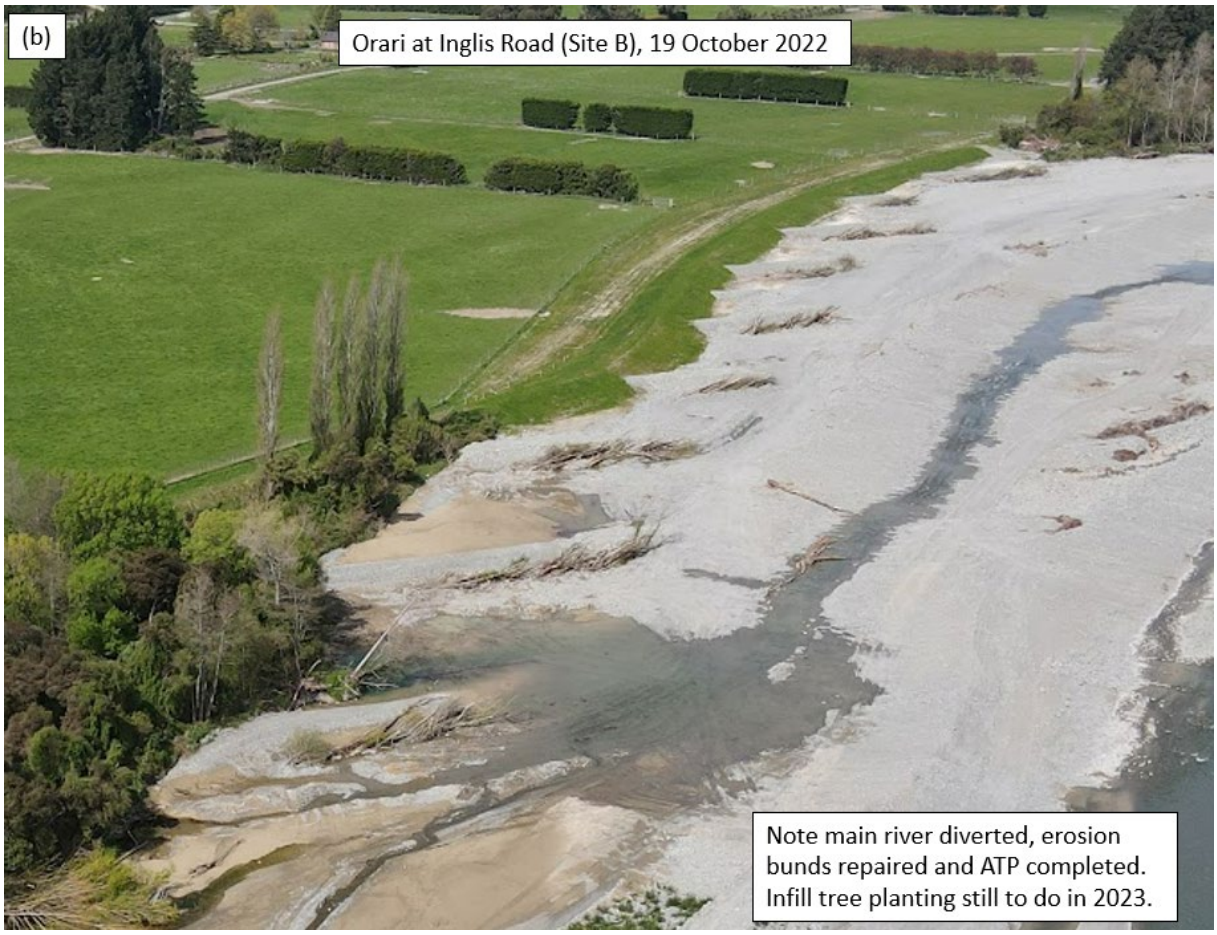


Figure A-6: Orari at Inglis Road, Site B: (a) damage to erosion protection bunds July/Aug 2022, (b) erosion bunds repaired and ATP complete, October 2022.

Figure A-7: Orari at Inglis Road, Site C: (a) damage to erosion protection bunds July/Aug 2022, (b) erosion bunds repaired and ATP complete, October 2022.

Figure A-8: Orari at Peacocks showing rows of infill planting along edge of eroded high berm in January 2022, (a) looking upstream, (b) looking downstream.

Figure A-9: Orari at SH79 showing completed ATP and infill planting (January 2023).

Figure A-10: Ashburton North Branch downstream of confluence with Pudding Hill Stream (a) directly following May 2021 flood, (b) following initial repairs, May 2022, and (c) following infill planting and further damage from winter 2022 high flows.

Figure A-11: Ashburton North Branch downstream of confluence with Pudding Hill Stream, details of repairs and infill planting.

Figure A-1213: Ashburton main stem at River Road, (a) following winter 2022 damage-on-damage, and (b) after minor repairs undertaken in November 2022.

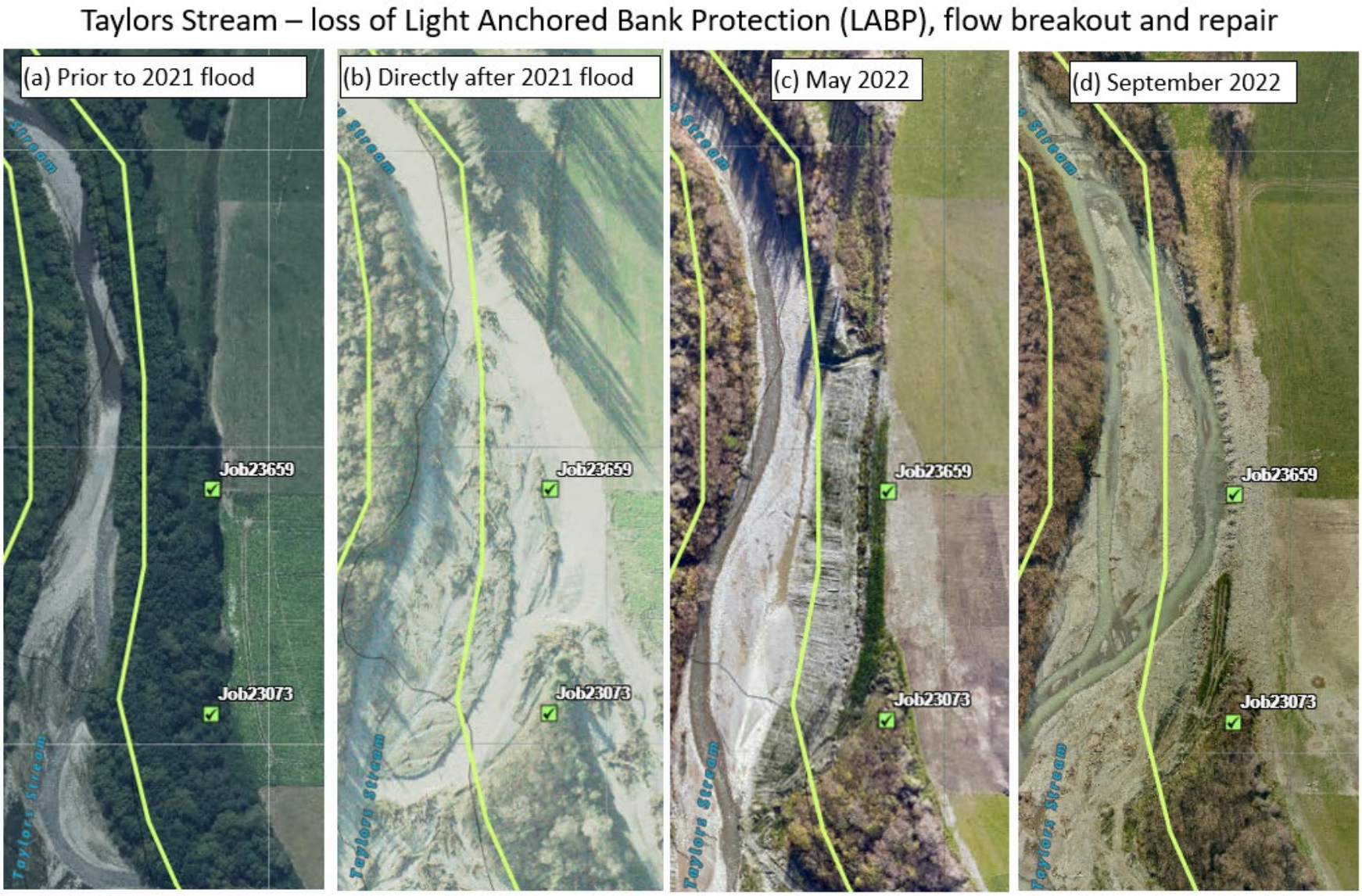


Figure A-14: Taylors Stream showing (a) pre-flood light anchored bank protection, (b) loss of LABP and flood breakout, (c) bunding and trenched trees to stabilise bank, May 2022, and (d) more substantial trenched trees, September 2022.

Figure A-15: Taylors Stream repair details (a) in August 2021, (b) and (c) trenched willows in March 2022, and (d) more substantial trenched willows, September 2022.

B. Key sites still needing flood damage repair

Figure B-1: Ashburton North in vicinity of RDR, 2021 flood scour damage at three sites.

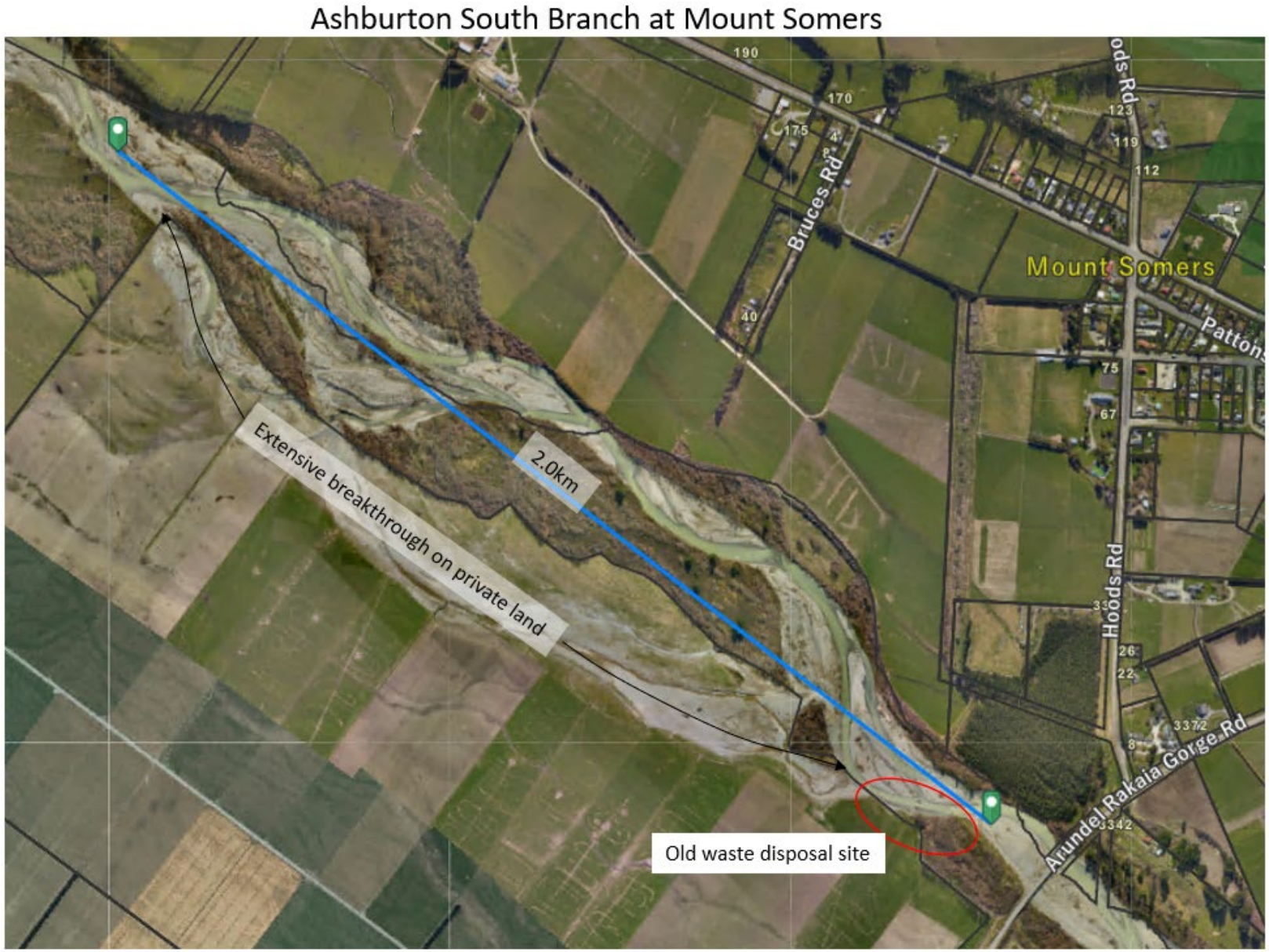


Figure B-2: Ashburton South at Mount Somers, breakout to still address.

Figure B-3: Ashburton South at Mount Somers, status and illustration of issues.

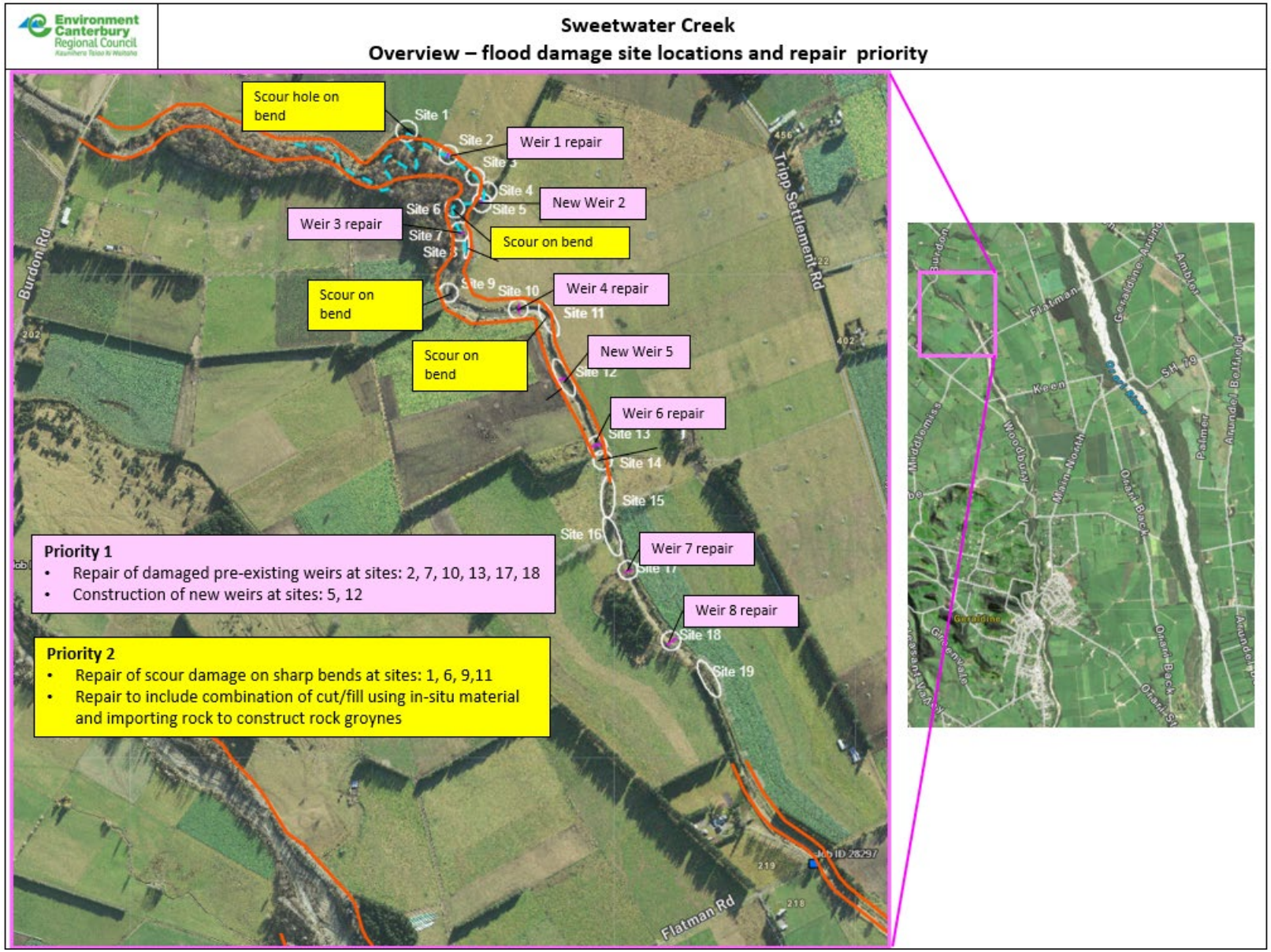


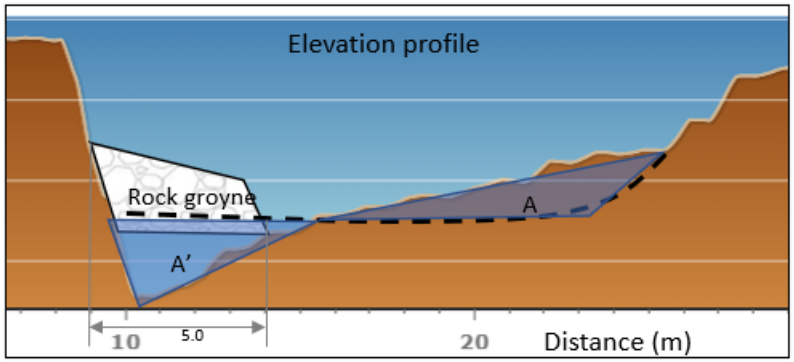
Figure B-4: Sweetwater Creek sites needing repair.

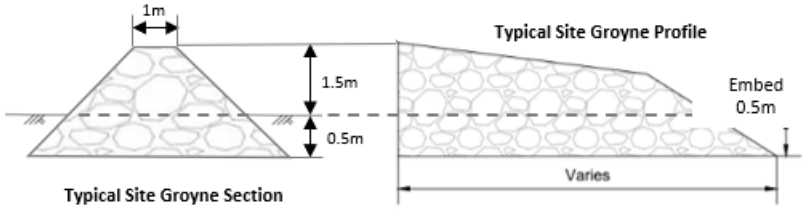
Environment Canterbury Regional Council

Sweetwater Creek

Site 1: Proposed repair – rock groynes and fill scour hole

1. Construct 3 rock groynes embedded into river bed and keyed into scour bank.
2. Fill outside bend between between groynes using cut from inside bend.





Groyne Specifications	Length (m)	Volume (m3)	Mass (tonne)
Groyne 1	5	30	78
Groyne 2	5	30	78
Groyne 3	5	30	78
Totals	**15**	**90**	**234**

Quantities Cut/Fill
Cut/Fill AA' = 100m2 x 1.0m = 100m3
Rock groynes= 234 tonne (imported rock)

Figure B-5: Sweetwater Creek, example of corner scour repair.

Figure B-6: Sweetwater Creek, example of weir repair.

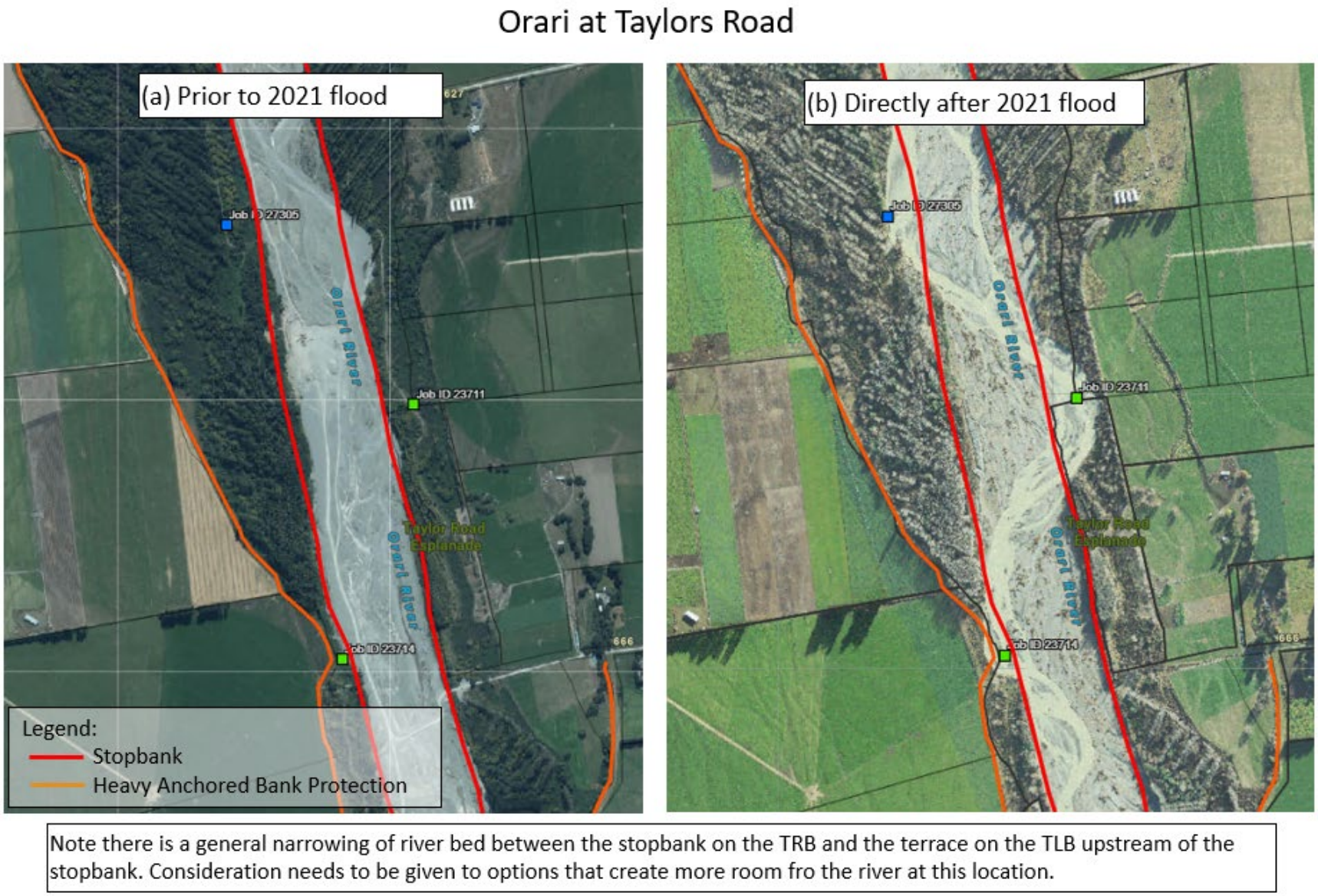


Figure B-7: Orari at Taylors Road, (a) before and (b) after 2021 flood.

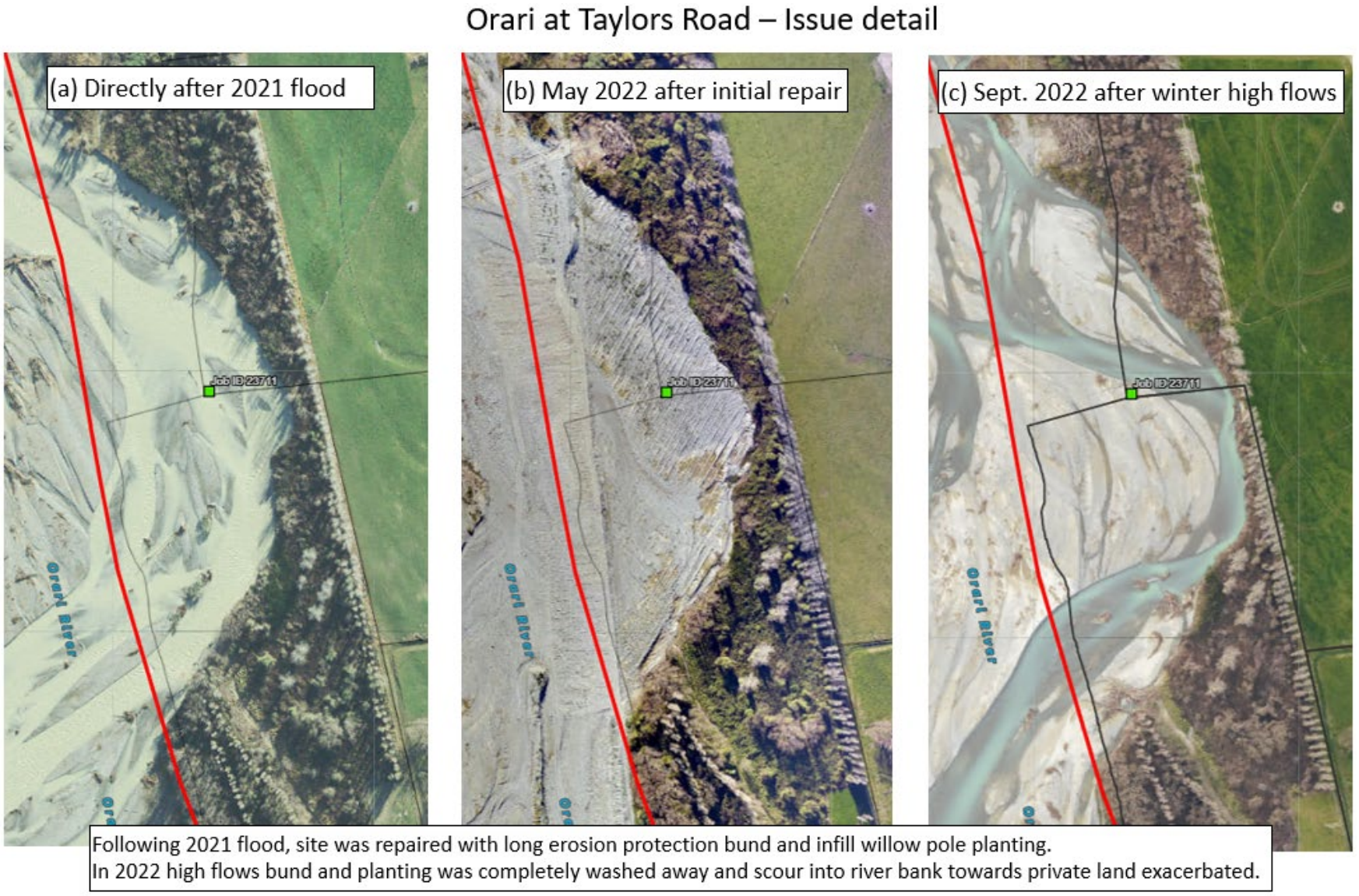


Figure B-8: Orari at Taylors Road detail, (a) after 2021 flood, (b) following initial repairs (May 2022), and (c) following winter high flows (September 2022).

C. Planned Flood Recovery Pole Planting

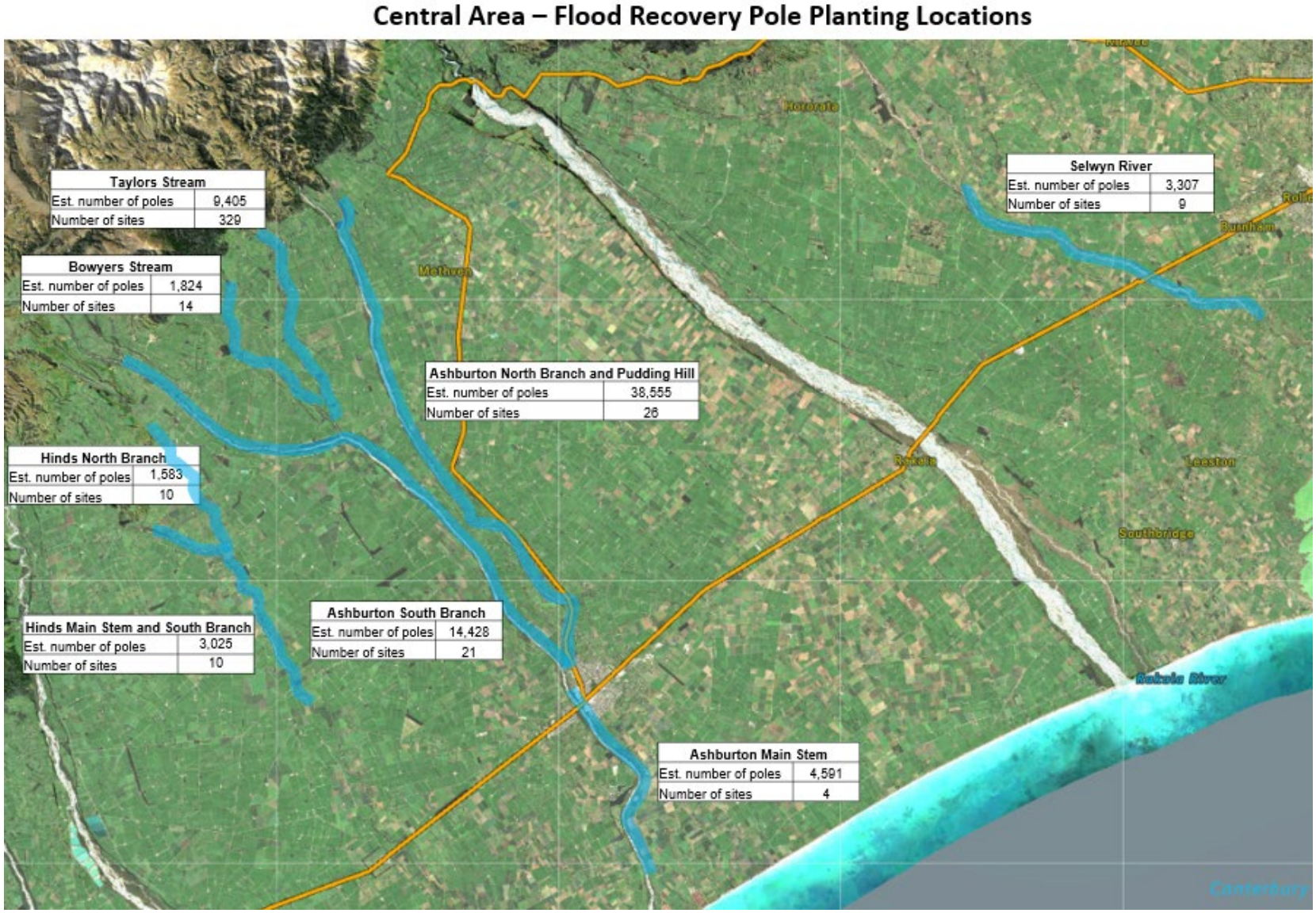


Figure C-1: Central Area Flood Recovery Pole Planting Locations.

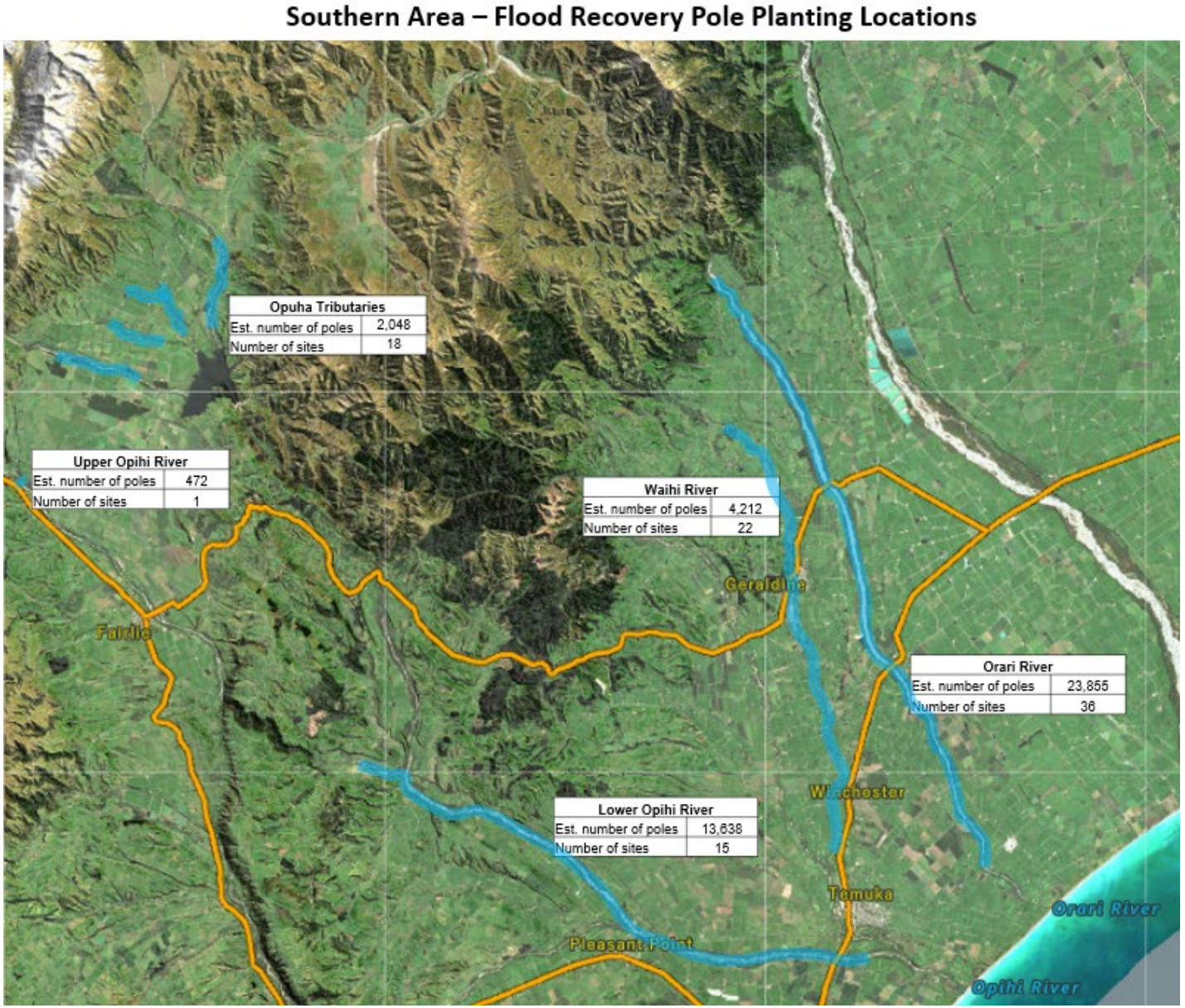


Figure C-2: Southern Area Flood Recovery Pole Planting Locations.