Canterbury 2021 Flood Recovery Update 4

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Executive summary

Purpose:

This report provides an update on flood recovery progress by Environment Canterbury (ECan) for the period from March through June 2022. It follows updates 1 to 3 that have covered flood response and recovery from June 2021 through to the end of February 2022.

It documents progress with recovery works over this four-month period and provides a summary of costs to date. It also provides support for the third and fourth claims 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.

Response and Recovery Progress – this period March to June 2022:

Focus during this period has been on completing permanent stopbank repair works, implementing anchored tree protection and undertaking infill pole planting to re-establish tree edge protection.

To date approximately 190 flood recovery jobs out of a total of 381 jobs have been completed. This is up from 131 completed jobs reported in the previous update.

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

Two major stopbank repairs have been completed during this period and over 2km of anchored tree protection has been installed at six locations. Approximately 43,000 poles have been planted as part of the tree edge protection reinstatement. This completes around 30% of the tree planting required to reinstate lost tree edge protection.

It should be noted that there have been several heavy rainfall events during July 2022, while this report has been in preparation. These have resulted in both new flood damage and further or re-damage to previously damaged sites. A priority over the next few months will be to assess this further damage and prioritise its repair.

Financial Status:

The total costs to the end of June 2022 for flood recovery (including response) is $12.3 Million. Of these costs, $10.0 Million are estimated to be eligible for application to the National Emergency Management Agency (NEMA) for a 60% central government contribution above a threshold for like-for-like asset replacement.

Environment Canterbury has submitted three claims to NEMA and received payment on the first two claims to a total value of $2.3 million. The NEMA 60% cost share has been applied to eligible costs above the ECan threshold of $4.1 million. The third claim is under review and the fourth claim for costs through to the end of June 2022 is in preparation.

The estimated cost for total flood recovery at the end of June 2022 remains $19.9 Million as previously reported. Costs for any new damage sustained in July 2022 are not included herein.

The indicative funding mix remains as previously reported (in March 2022) with a likely overall claim to central government for a contribution of $6.8 million towards flood recovery. The Environment Canterbury contribution is still estimated to be $13.1 million as at the end of June 2022.

These cost estimates will continue to be reviewed quarterly. The proposed commitment from Environment Canterbury is currently limited to $12.2 million. If it becomes clear that expenditure above this amount is likely, pre-approval for additional funding will be requested from Council.

Next Steps:

Next steps are first to reprioritise repairs based on further flood damage in July 2022, undertaking necessary temporary emergency repairs at high-risk sites. Thereafter re-establishment of tree edge protection and infill planting will continue, subject to other works re-prioritisation. As has been previously noted, it will be several years before tree edge protection can be fully re-established. River edges and stopbanks protected by these trees will remain vulnerable until the tree edge protection is fully re-established.

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. These improvements include creating more room for rivers in fairways that have already been widened by the flood. There are also opportunities to undertake cost effective repairs to flood protection infrastructure in the vicinity of flood damaged assets, while contractors are working in the area.

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. Discussions have been held with NEMA and River Scheme Committees regarding options for betterment in a small number of key locations. 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, it would be prudent to seek central government co-investment in flood protection schemes. Consideration of the additional betterment costs by River Scheme Committees has started on a case by case basis in some catchments.

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1 Introduction

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

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

2 Flood Repair Progress

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.

The total number of flood damage repair jobs now stands at 381 of which 190 have now been completed. The number of jobs has increased (from 350 at the end of March 2022) as tree edge protection reinstatement has been planned in more detail. The overall scope of work (prior to further damage in July 2022) has not significantly changed, rather it has been better defined.

The status of flood damage repairs (to the end of June 2022) 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.

Key points to note from the tables below are that flood damage repairs have progressed steadily over the four-month reporting period. The focus during this period has been on completing the major stopbank repairs and starting work on tree edge protection reinstatement (detailed in Tables 2-3 and 2-4).

Table 2-1: Status of flood damage repairs by District at 30 June 2022.

2021 Flood Repair - Job Status (Number in each category)						
District or Description	**Draft**	**Accepted**	**Open**	**Monitoring**	**Completed**	**Total**
Selwyn	9				8	17
Ashburton	43	3	23	24	108	201
Orari-Waihi-Temuka	25	10	5	4	30	74
Opihi	6	1	1		5	13
Ashley					5	5
Waimakariri-Eyre-Cust	1				13	14
Upper Hinds	5		19		8	32
Lower Hinds	3	1	1		2	7
Little River					1	1
Response and flood monitoring						17
Totals	92	15	49	28	180	381

2.1 Major stopbank repairs

Two major stopbank repairs were completed during this period in addition to those previously completed. These were the stopbanks on the Waihi River at Beeby Road and the Ashburton North Branch upstream of Walkhams Road. Details are included in Table 2-2 below and photos included in Appendix A.

Table 2-2: Stopbank works undertaken during this reporting period and their status

Location	Sites repaired	Stopbank length (m)	Erosion Protection Bunds (m)	Tree edge protection to follow (m)	Status at 30 June 2022 (Job numbers)
Ashburton North at Walkhams Road	2	290	none	none	Completed rebuild at Site A (210m, job 23612) and repair at Site B (20m. job 23614). Rebuild at Site C (60m job 23611) still to do.
Waihi at Beeby Road	1	190	120	190	Completed job 23750 including ATP and pole infill planting.
Total	3	480	120	190	

At the Beeby Road site on the Waihi River, both the stopbank and the tree edge protection assets were washed out. Because the stopbank repair was undertaken at the end of the summer, the anchored tree protection (ATP) and tree infill planting were undertaken at the same time.

2.2 Tree edge protection reinstatement

During the months of May and June 2022, tree edge protection reinstatement was undertaken at a number of sites. This included installation of ATP where needed, and planting willow poles or wands to replace areas of tree edge protection lost. As reported previously, this is the first step towards re-establishing the tree edge protection asset which will take several (5-10) years for trees to grow to where they provide the pre-flood level of river edge protection.

Table 2-3 below shows where ATP has been installed using large trees layered into a trench with their root balls tied to a wire rope attached to concrete block anchors.

Table 2-3: Anchored tree protection.

Location	Length of ATP (m)	Status
Opihi at Collett Rd.	150	Complete. Infill pole planting to follow.
Waihi at Hawke Rd.	90	Site A only. Not needed at site B and C. Complete. Infill pole planting to follow.
Waihi at Beeby Rd.	120	Complete and infill pole planting complete.
Orari at SH79 2 sites	410	Installation of concrete anchor blocks started at upstream site (160m), still to start at downstream.
Orari at Inglis Rd. 3 sites	820	Three sites, 150, 240 and 430m. Concrete anchor blocks installed. Trees still to be tied in.
Ashburton South at Walkhams Rd. (2 sites)	750	Complete and infill pole planting complete. Approx. 500m upstream o Walkhams Rd. and 250m on downstream side, true left bank.
Total	2,340	

Previously it has been reported that approximately 42km of tree edge protection asset was lost. More detailed investigation and planning has now determined and estimated of the area of trees that require replacing. Table 2-4 quantifies this for both the Central Area (Ashburton Rivers) and Southern Area (Orari, Waihi, Temuka and Opihi Rivers). Tree edge protection reinstatement is by deep planting (approx. 2m) of willow poles 2.5m long and approximately 50mm in diameter, or by “ripping in” smaller willow wands. By the end of June an estimated over 40,000 tree poles or wands had been planted over an area of approximately 61 ha as detailed in Table 2-4 below. Several examples of infill planting are

shown in Appendix A. Maps showing the areas of infill planting completed to date and that still required in both the Central and Southern areas are shown in Appendix B, together with details showing the documentation of actual planting.

Overall, around 30% of the infill tree planting had been completed by the end of June 2022.

Table 2-4: Infill tree planting to reinstate tree edge protection.

Area	Area requiring replanting (ha)	Area planted to date (ha)	No of poles planted to date	% Complete
Central Area (Ashburton Rivers)	83	26	18,840 (from dockets)	31%
Southern Area (Orari/Waihi/Temuka/Opihi Rivers)	136	35	24,500 (estimated from density)	26%
Total	**219**	**61**	**43,340 (estimate)**	**28%**

2.3 Next steps

Although this report covers progress through the end of June 2022, while the report was being written, there were several extreme rainfall events in July 2022. These have resulted in high flows in many of the Canterbury rivers and further flood damage. While flows have not reached the volumes of the May 2021 flood, they have tested and impacted the recently completed flood damage repairs.

There are a number of sites where repairs were still underway or had not yet started. There has been re-damage to sites already repaired, and exacerbation of damage to sites still awaiting repair. On the whole, most of the repairs stood up very well to the high flows.

A first next step is to assess the extent of damage, to sites already identified following the May 2021 flood (i.e., damage on damage), whether or not the site had been repaired. There also needs to be an assessment of new damage to sites not previously damaged.

Each site needs to be assessed for risk, with immediate emergency repairs undertaken at high risk sites. Temporary emergency works have progressed well over the last two weeks in July 2022.

An overall assessment of all damage is now required, together with a re-prioritisation of repairs based on risk.

An initial discussion with NEMA, has ascertained that further damage to sites already identified in the May 2021 flood, may be eligible for NEMA subsidy (subject to review of claims).

Damage to new sites needs to be tracked separately from damage to previously identified damage sites. The cost of repairs to the newly damaged sites, across the region will need to reach the Environment Canterbury threshold before a claim to NEMA for a subsidy of eligible costs can be made for damage at these sites.

Priorities for the next few months are:

- Risk based damage assessment and undertaking emergency temporary repairs,
- Separate cost assessment of “damage on damage” and “new damage”,
- Continuing with the programme of planned repairs,
- Starting permanent repairs to the newly damaged sites according to priority.

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 open tender following best procurement practice.

4 Financials

4.1 Flood Response and Recovery

Flood response costs to the end of June 2022 are $12.3 million as summarised in Table 4-1 below. Approximately $2.2 million has been spent on flood recovery during the report period from March to June 2022. 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 response costs for reporting period and total costs at 30 June 2022.

Description	Costs for period Mar 2022 to Jun 2022	Total Costs to Date
Flood monitoring costs	0	289,693
Selwyn 2021 Flood Repair	107,410	152,272
Ashburton 2021 Flood Repair	965,267	7,616,272
OWT 2021 Flood Repair	1,008,366	2,192,664
Opihi 2021 Flood Repair	83,469	197,369
Ashley 2021 Flood Repair	709	130,622
WEC 2021 Flood Repair	37,707	517,026
Upper Hinds 2021 Flood Repair	8,097	175,669
Lower Hinds 2021 Flood Repair	25,028	122,178
Little River 2021 Flood Repair	0	4,487
Sub-total	2,236,053	11,398,252
CDEM Response	0	414,541
Regional Parks Repair	0	334,775
Other Costs	3,528	171,802
TOTAL	2,239,580	12,319,370

Table 4-2: Canterbury 2021 Flood Response Costs at 30 June 2022.

Description	Estimated Non-Eligible Costs	Estimated Eligible Costs	Total Costs to Date
River Rating Districts	1,378,036	10,020,217	11,398,252
CDEM Response	414,541		414,541
Regional Parks Repair	330,511	4,264	334,775
Other Costs	150,059	21,742	171,802
TOTAL	2,273,147	10,046,223	12,319,370

Figure 4-1 below shows the expenditure profile to date. The profile of expenditure over the past four months from March to June has tracked very closely the expected spend profile. Temporary works and the majority of large stopbank rebuilds have now been completed. Tree edge reinstatement is expected to comprise most to the expenditure moving forward.

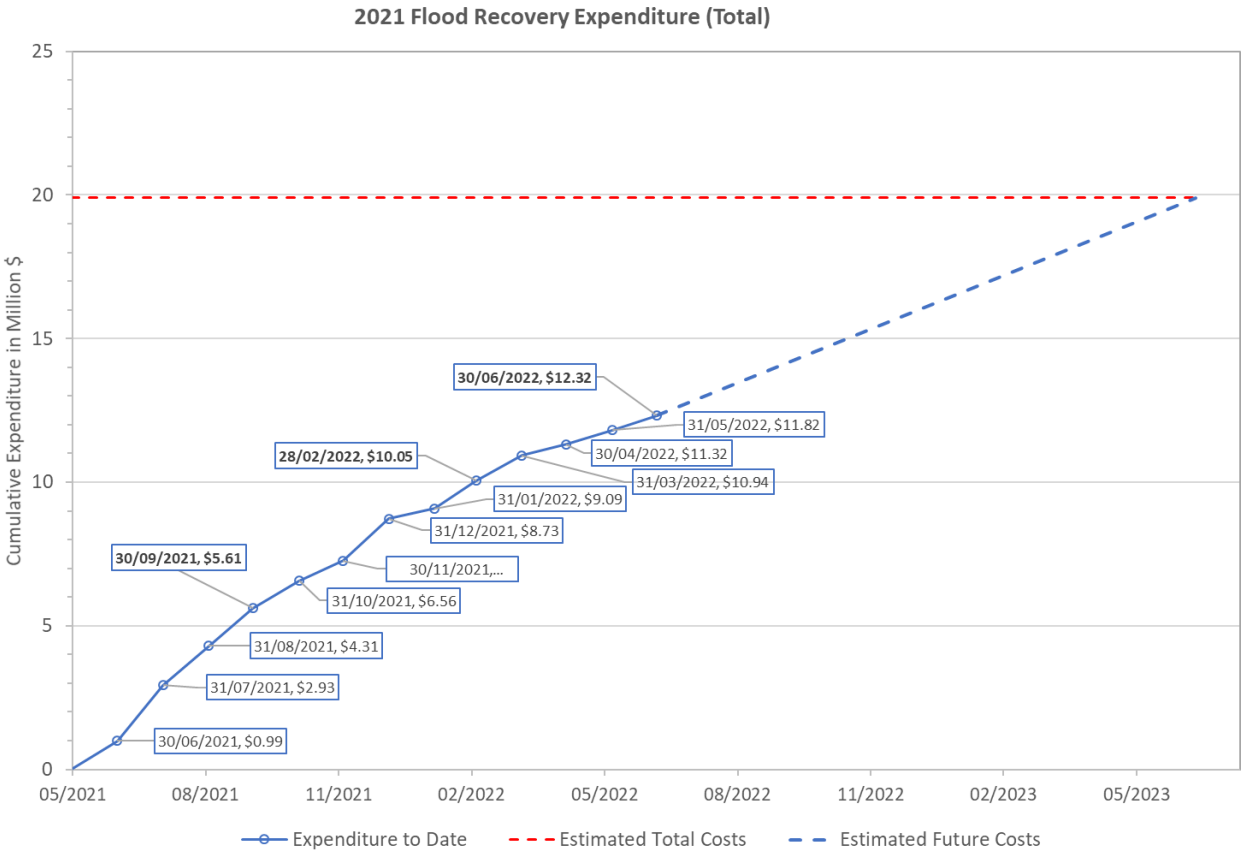

Figure 4-1: Summary of flood recovery expenditure profile.

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 4-2 above, ECan has assessed that of the flood recovery expenditure to the end of June 2022, approximately $10.0 million are NEMA eligible costs (subject to NEMA confirmation).

ECan has submitted three claims to NEMA covering costs through the end of May 2022. The fourth claim to cover costs in June 2022 will be submitted in early August 2022. Table 4-3 below shows these claims and the status of reimbursement. Note that Claim 1 was subject to deduction of the initial threshold of $4.1 million.

The estimated reimbursement value of Claims 1-4 for eligible flood recovery costs through June 2022 is $3.6 million (subject to NEMA review).

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

Table 4-3: 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	1,693,297		1,015,978	Under review
Claim 4	Jun-22	347,052		208,231	In preparation
	TOTAL	10,046,223		3,559,444	

4.3 Estimated Cost Apportionment

The overall estimated cost for flood recovery at 30 June 2022 remained $19.9 million (as previously reported). A summary of costs including those to the end of June 2022 is provided in table 4-4 below.

Based on these estimates and what we have learnt through processing NEMA claims to date, the overall cost for flood recovery to ECan is estimated to be $13.1 million with an expected central government contribution of $6.8 million through claims to NEMA.

These cost estimates will continue to be reviewed quarterly. The proposed commitment from ECan is currently limited to $12.2 million. If it becomes clear that expenditure above this amount is likely, pre-approval for additional funding will be requested from Council.

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

Estimated Costs	**Million $**
Flood Recovery costs (incl. response) to Jun 2022	$12.3
Estimated Future Flood Recovery Costs	$7.6
Total Flood Response & Recovery Estimate	**$19.9**
Estimated non-Eligible Recovery Costs	-$4.4
ECan Threshold for NEMA claim	-$4.1
Eligible for 60% government subsidy (NEMA)	**$11.4**
Estimated Funding Mix	**Million $**
ECan initial threshold	$4.1
ECan – Non Eligible Costs	$4.4
ECan – 40% of Eligible Costs	$4.6
Total ECan Estimated Cost	**$13.1**
NEMA – 60% of Eligible Costs	$6.8
Total	**$19.9**

5 Risks

Due to the extent of flood damage and the number of breakouts and breaks through flood protection infrastructure, the risk of further inundation remains high until permanent repairs can be implemented.

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. Re-establishing this vegetation is a high priority through the coming winter season, though 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)
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 10% of the remaining physical works estimate has been added to the overall project cost estimate. This is one of the elements of the total $19.9 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. 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)

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, particularly during periods where community engagement has been somewhat hampered by Covid 19 restrictions. The Flood Recovery webpage is located at: ecan.govt.nz/flood-recovery

During the reporting period, a live map indicating the status and location of flood damaged sites needing repairs was added. 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 March and June 2022. 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
21 February 2022	Pareora River Rating District Meeting
7 March 2022	Otaio River Rating District meeting
8 March 2022	Ashburton Hinds Drainage Rating meeting 8 March,
16 March 2022	Ashburton River Rating District meeting 16 March
24 May 2022	Canterbury Regional Council

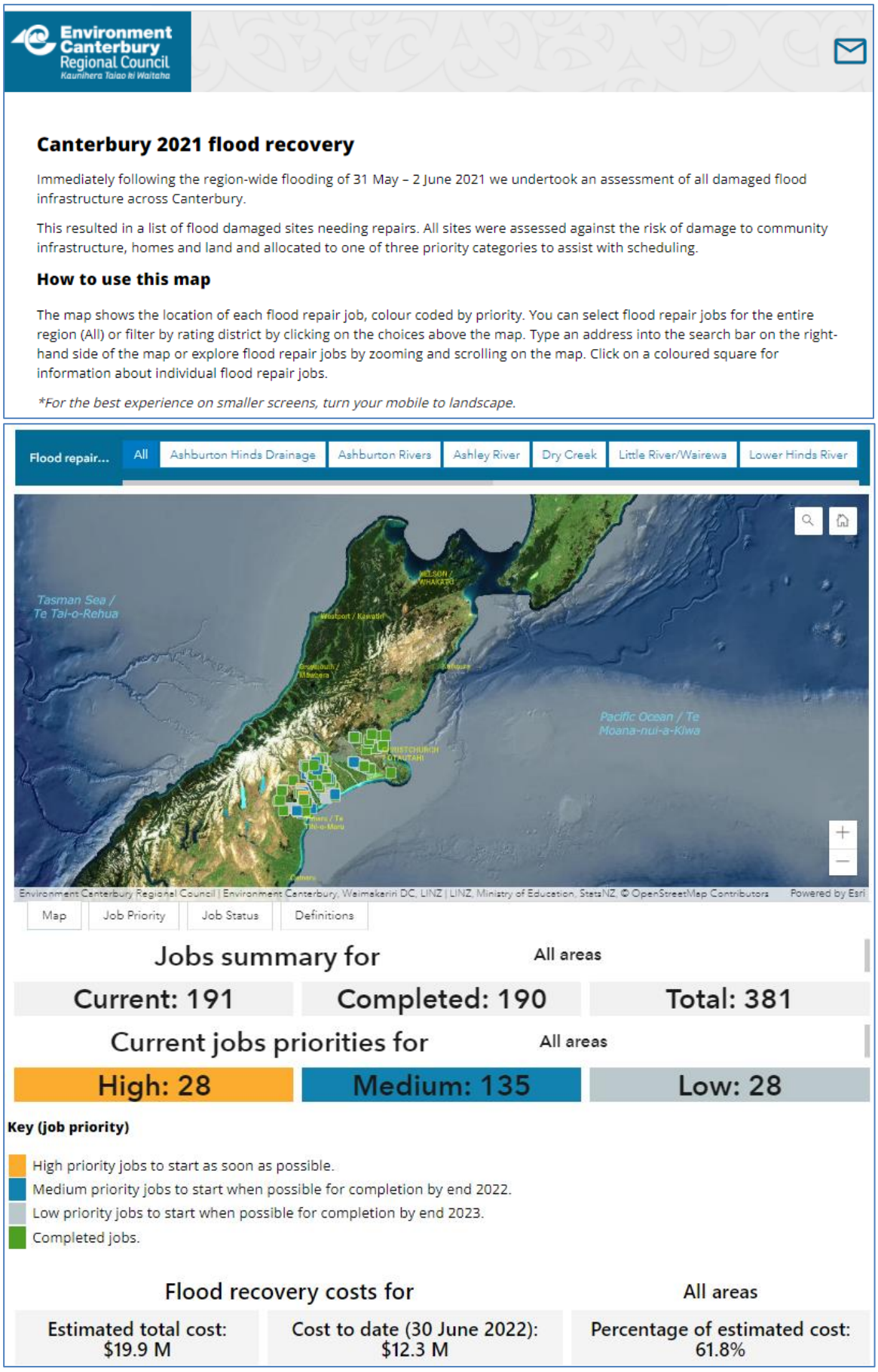

Figure 6-1: Screen clip of flood recovery interactive job status web page at 30 June 2022.

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 photos

Figure A-1: Ashburton North Branch at Walkhams Road (a) before and (b) after floodbank reinstatement.

Figure A-2: Waihi at Beeby Rd (a) before repair, (b) after stopbank reinstatement and installation of anchored tree protection.

Figure A-3: Aerial of Waihi at Beeby Rd (a) after temporary repairs and (b) during stopbank reinstatement.

Figure A-4: Orari true right bank upstream of Vance Road quarry, (a) before repair and (b) after infill planting.

Figure A-5: Orari at racecourse (a) after completion of rope and rail lines (October 2021) and (b) showing growth if poles by June 2022.

B. River edge protection – tree infill planting maps

Maps of infill tree planting are presented here to show the detail of locations at which tree planting is required following tree edge protection loss in the flood.

Figures B-1 and B-2 show tree planting required in the Ashburton Rivers area. Planting has been assigned to four different contractors. Figures B-3 to B-5 show the detail of the recorded area of planting for two different planting contractors. It includes the area actually planted, the number of poles/wands planted and the lineal river length of tree edge protection replanted.

Figures B-6 to B8 show the tree infill planting for the Orari, Waihi, Temuka and Opihi Rivers.

As indicated in the legend on the maps, areas still to be planted are shaded red, while those completed are shaded green.

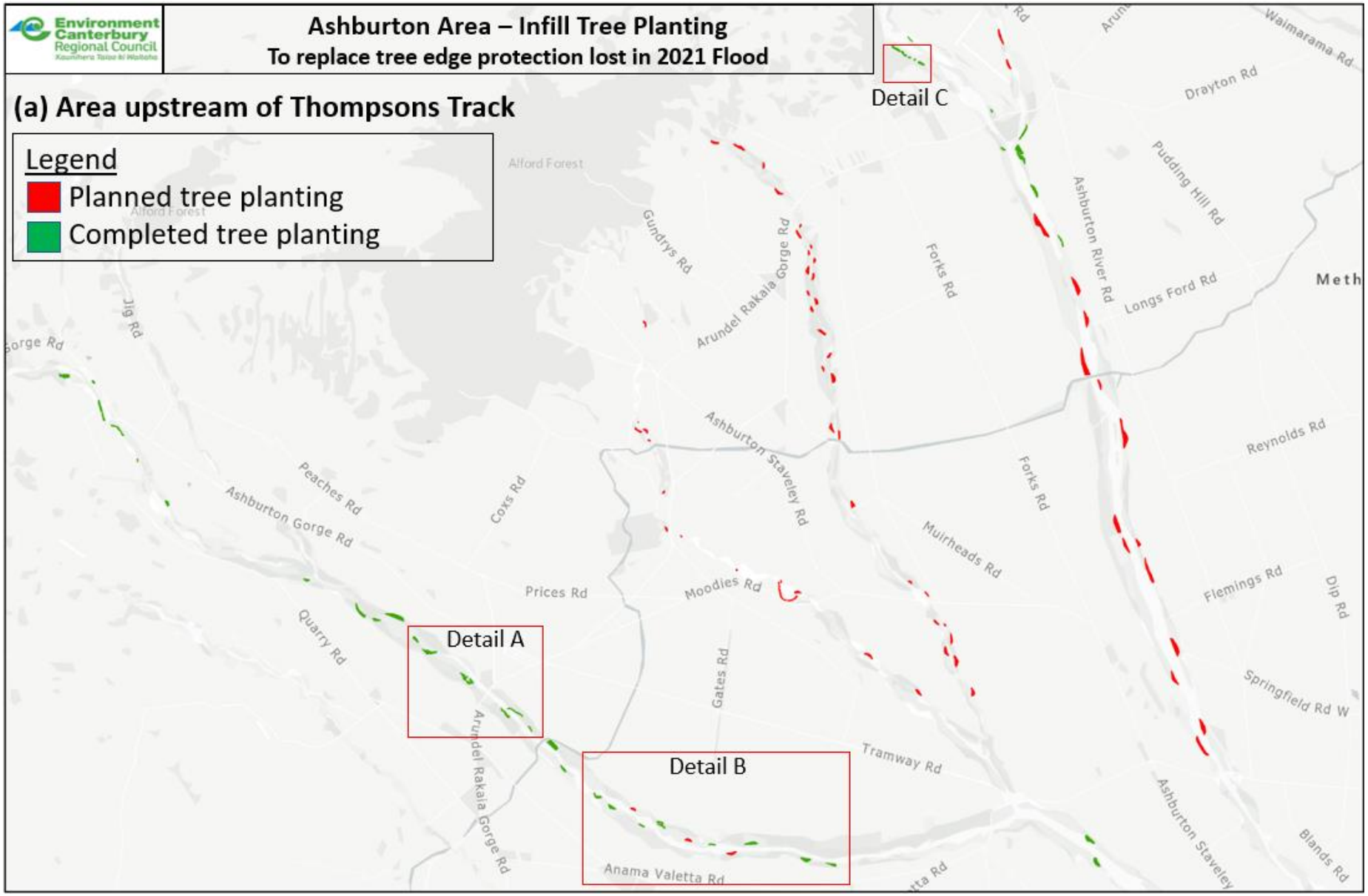

Figure B-1: Ashburton Area – Infill Tree planting (a) Upstream of Thompsons Track.

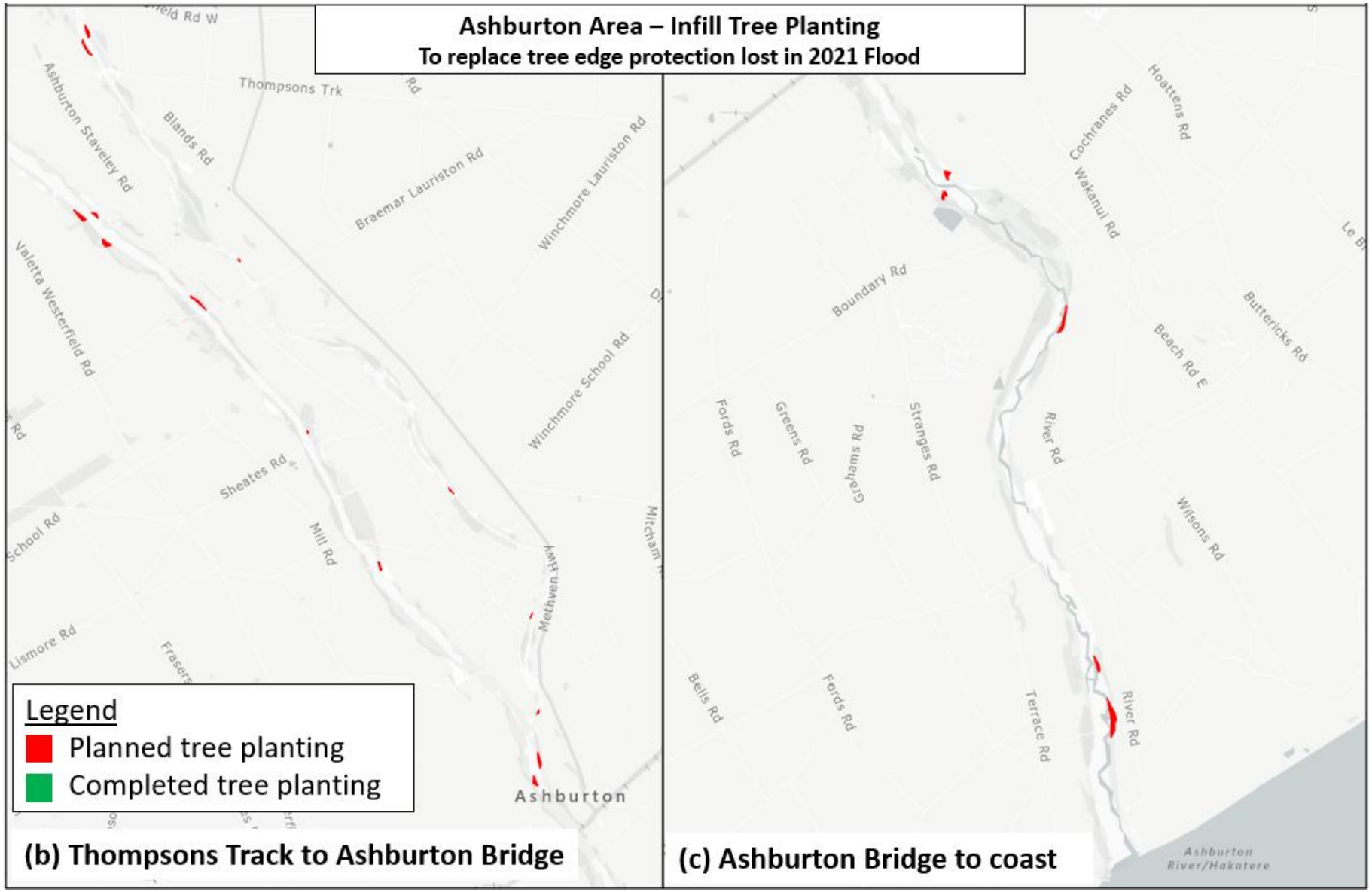

Figure B-2: Ashburton Area – Infill Tree planting (b) Thompsons Track to Ashburton Bridge and (c) Ashburton Bridge to coast.

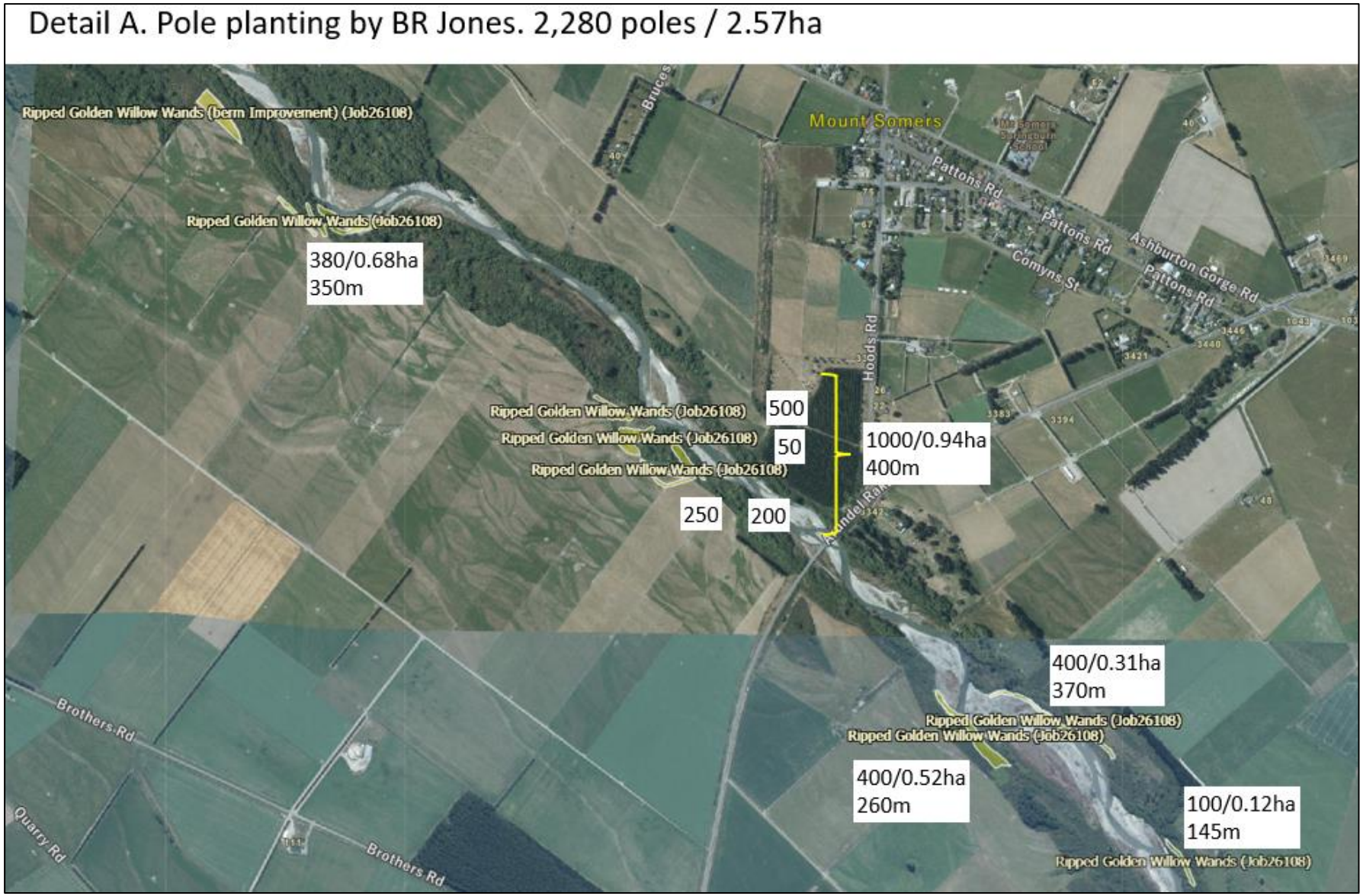

Figure B-3: Ashburton area, detail A – pole planting by BR Jones.

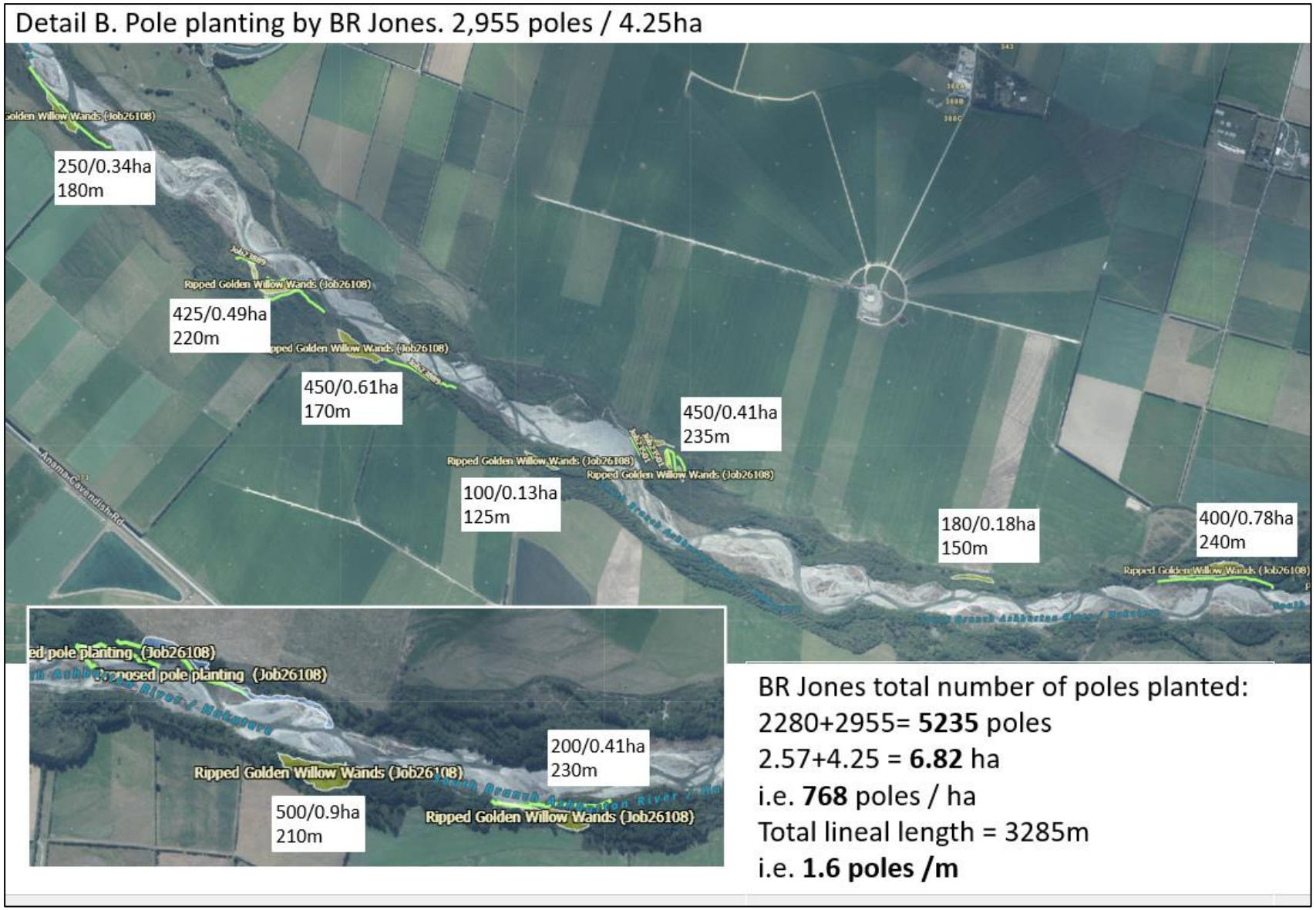

Figure B-4: Ashburton area, Detail B – pole planting by BR Jones.

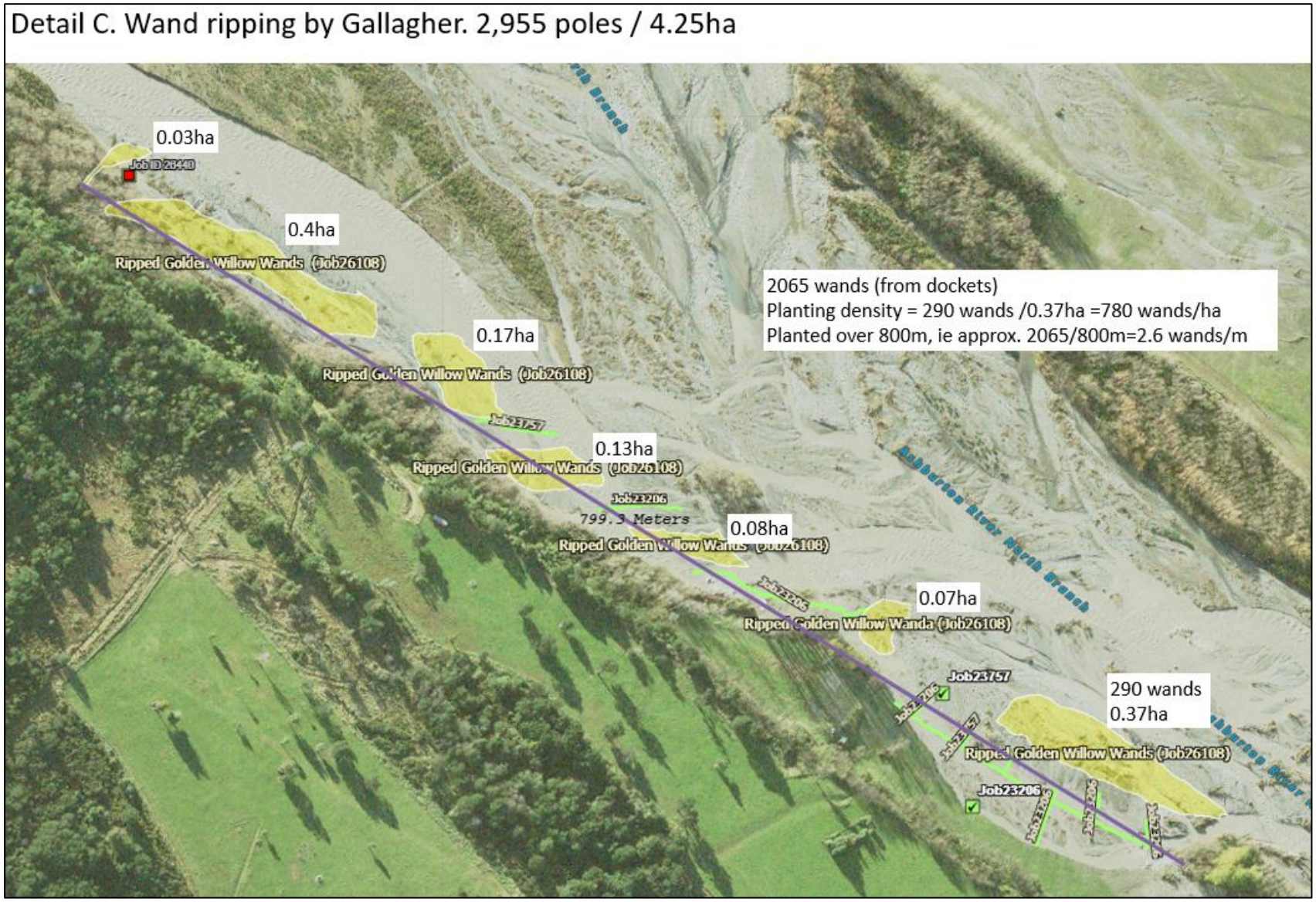

Figure B-5: Ashburton area, Detail C – wand ripping by Gallagher.

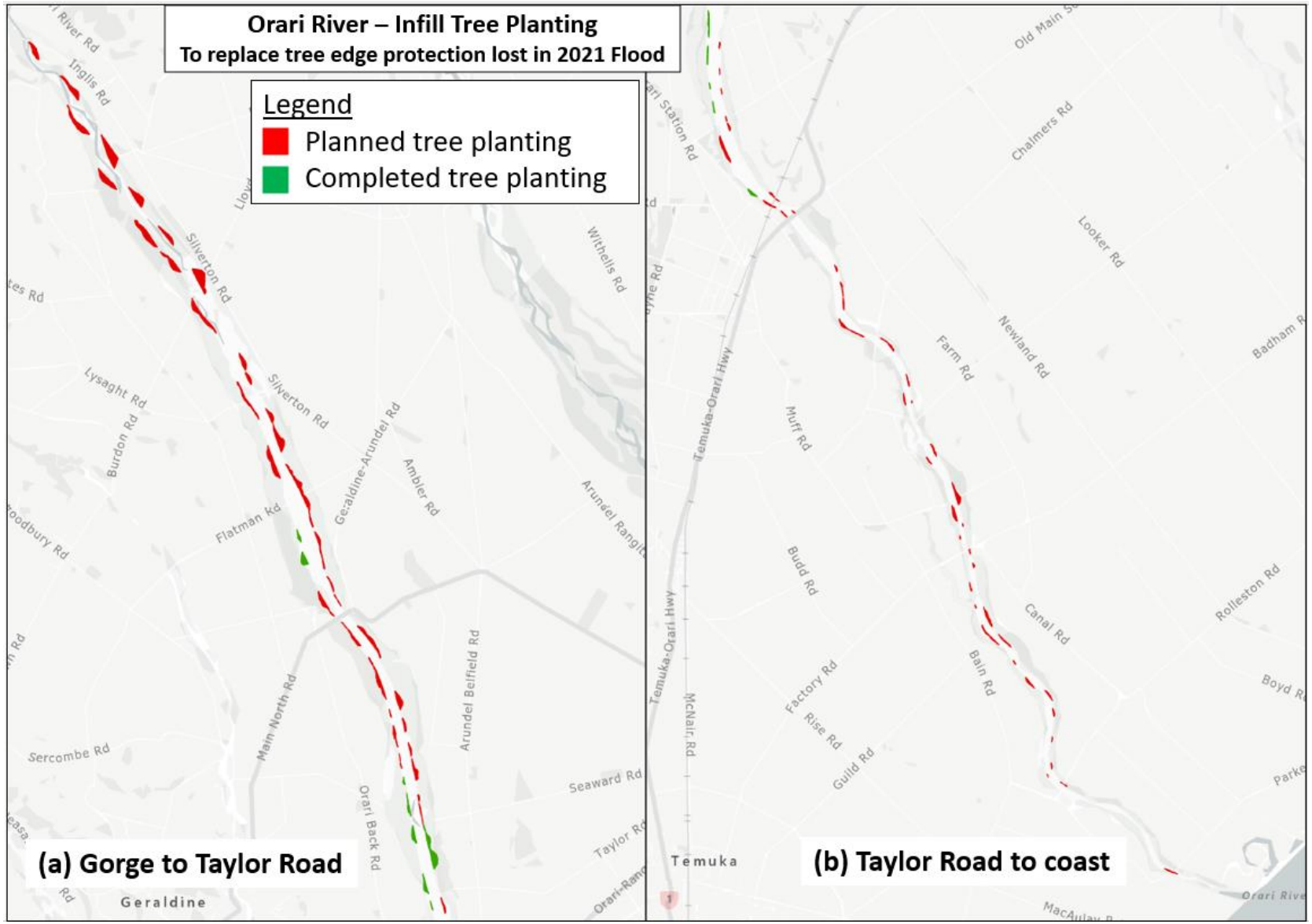

Figure B-6: Orari River – Infill Tree Planting.

Figure B-7: Waihi and Temuka Rivers – Infill Tree Planting.

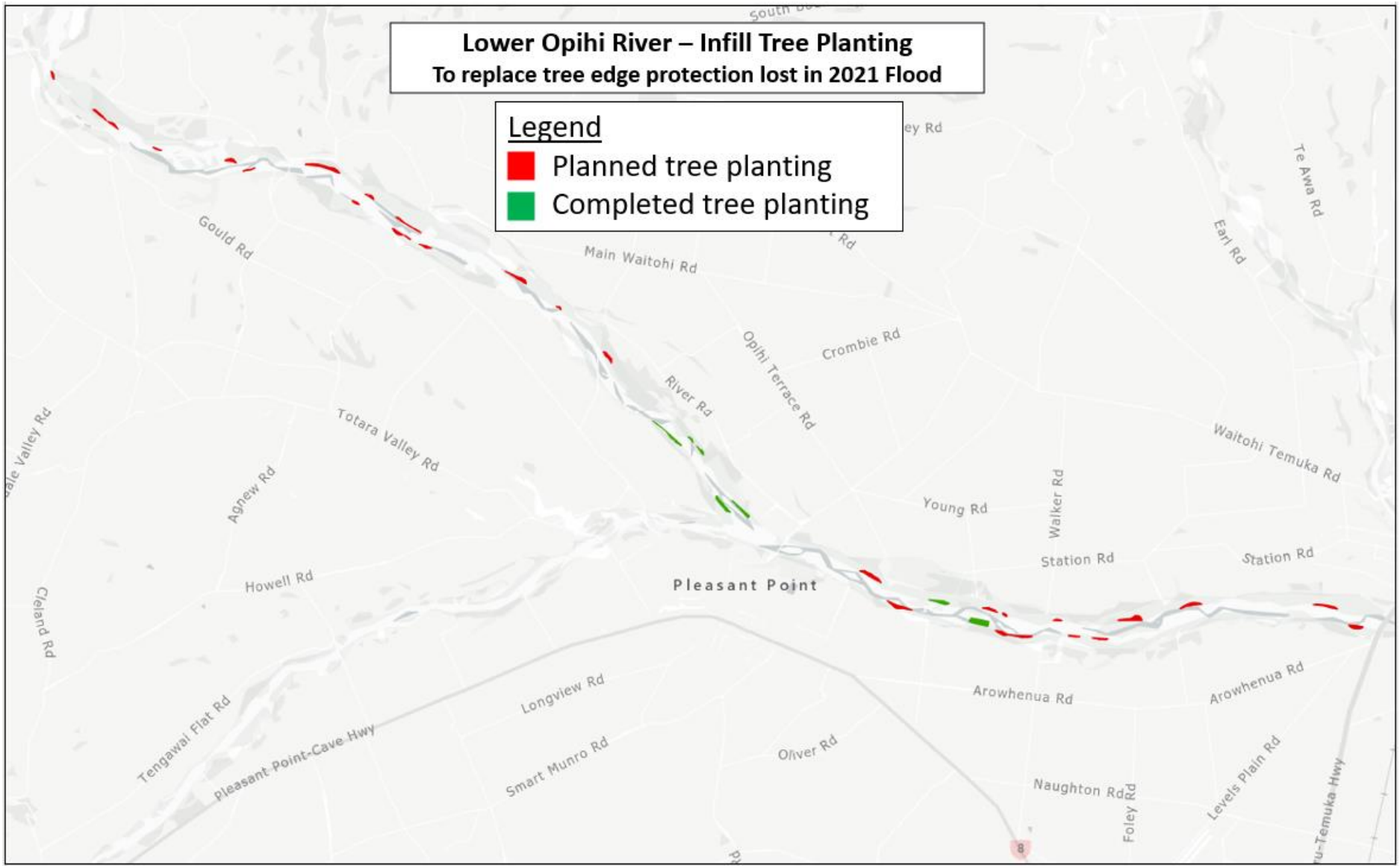

Figure B-8: Lower Opihi River – Infill Tree Planting.