Earth Sciences New Zealand

Monitoring and Management of West Coast River Mouth Openings

Prepared for West Coast Regional Council

March 2026



Prepared by:
Richard Measures

For any information regarding this report please contact:
Richard Measures
Hydrodynamics Scientist
Sediment Processes Group
+64 3 343 8066
richard.measures@earthsciences.nz

New Zealand Institute for Earth Science Limited
PO Box 8602
Riccarton
Christchurch 8440

Phone +64 3 348 8987

Client Report No: 2026053CH
Report date: March 2026
Project No: ELF25507

Revision	Description	Date
Version 1.0	Final version sent to client	18 March 2026

Quality Assurance Statement		
	Reviewed by:	Jo Hoyle
	Formatting checked by:	Terry Smith
	Approved for release by:	Charles Pearson

Cover photo: Artificial opening underway at the mouth of New River / Kaimata [West Coast Regional Council]

© New Zealand Institute for Earth Science Limited ("Earth Sciences New Zealand") 2025. All rights reserved. This publication may not be reproduced or copied in any form without the permission of the copyright owner(s). Such permission is only to be given in accordance with the terms of the client's contract with Earth Sciences New Zealand. This copyright extends to all forms of copying and any storage of material in any kind of information retrieval system.

Whilst Earth Sciences New Zealand has used all reasonable endeavours to ensure that the information contained in this document is accurate, Earth Sciences New Zealand does not give any express or implied warranty as to the completeness of the information contained herein, or that it will be suitable for any purpose(s) other than those specifically contemplated during the project or agreed by Earth Sciences New Zealand and the client.

Contents

Executive summary **5**

1 Introduction **6**

1.1 Background 6

1.2 Scope 6

2 Planning considerations **7**

2.1 Regional Coastal Plan 7

2.2 Consented openings 7

2.3 Coastal Hazard Areas 8

3 General river mouth issues **9**

3.1 Blockage/Flooding 9

3.2 Erosion 10

3.3 Fish passage 11

3.4 Sea level rise 11

4 Monitoring and triggers **12**

4.1 Water levels 12

4.2 Mouth position 12

5 Risks associated with artificial opening **14**

5.1 Failed opening or rapid reclosure 14

5.2 Increased wave propagation into mouth 14

5.3 Safety risks 14

5.4 Reduced lagoon area 15

6 High priority river mouths **16**

6.1 Karamea 16

6.2 Pororari 19

6.3 New River / Kaimata and Saltwater Creek 22

6.4 Hokitika 25

6.5 Okuru 27

6.6 Arawhata 30

7 General recommendations **32**

8 Acknowledgements 33

9 References 34

Appendix A List of river mouths 36

Tables

Table 6-1: Pororari River and Punakaiki Village: Elevations of key features. 22

Figures

Figure 2-1: Location of dynamic river mouths relevant to this report. 8
Figure 3-1: Mill Creek, Karoro with a closed mouth. 9
Figure 4-1: Sentinel 2 colour imagery of the Karamea River mouth. 13
Figure 6-1: Landsat imagery of Karamea artificial opening in 2014–2015. 16
Figure 6-2: Oblique aerial image of the Karamea River showing the location of the May 2016 artificial opening attempt. 17
Figure 6-3: Aerial photos of the Pororari River mouth in open and constricted configurations. 19
Figure 6-4: Pororari River and Punakaiki Village: LiDAR survey and location of surveyed features. 21
Figure 6-5: New River/Kaimata mouth locations 1951-2009. 23
Figure 6-6: Location of key features of the New River and Saltwater Creek. 23
Figure 6-7: 17 February 2025 artificial opening of the New River. 24
Figure 6-8: Configurations of the Hokitika River mouth used for flood modelling. 26
Figure 6-9: Effect of 'long' river mouth on 1% AEP Hokitika flood levels. 26
Figure 6-10: Various positions of the Okuru River mouth. 27
Figure 6-11: August 2019 artificial opening of the Okuru River. 28
Figure 6-12: LiDAR of the Okuru River mouth. 29
Figure 6-13: Neils Beach and Arawhata River mouth in 2003 and 2013. 30

Executive summary

Mechanical opening of river mouths has been used on the West Coast as a tool to manage flooding and, less commonly, erosion risks where river mouths become blocked, constricted, or significantly offset from the river centreline. Recent flood events elsewhere in New Zealand have highlighted the need for clearer guidance on when intervention is appropriate, how openings should be conducted and how risks should be managed.

This report was commissioned by West Coast Regional Council to review current river mouth management practices and provide guidance on monitoring, whether mechanical intervention is warranted, and at what point that should occur. The work involved site visits, surveys, analysis of LiDAR and satellite imagery, review of historic river mouth behaviour and opening records, and assessment of relevant planning provisions and previous studies.

River mouth behaviour on the West Coast varies widely, from highly engineered outlets such as the Grey and Buller Rivers, to large, dynamic natural mouths, and numerous small creeks that periodically close. Artificial opening is most commonly used to mitigate flood risk where mouth blockage or offsetting restricts discharge and causes water levels to rise behind the barrier. While openings can be effective in some situations, they carry risks, including failed openings, rapid re-closure, increased wave penetration, and health and safety challenges when openings must be undertaken close to flood events.

Six high-priority river mouths were assessed in detail: Karamea, Pororari, New River / Kaimata (and Saltwater Creek), Hokitika, Okuru, and Arawhata. These rivers all have dynamic mouths, assets at risk, and established rating districts. The assessment shows that artificial opening is a useful and appropriate tool at some locations (notably New River / Kaimata), but is either unreliable or unnecessary at others, where natural breaching, engineered flood defences, or erosion protection provide more robust risk management. In several cases, mouth position was found to be a more critical driver of flood risk than water level alone. River specific recommendations are provided in the report.

General recommendations regarding river mouth management are that:

- The Regional Coastal Plan rule allowing artificial openings of closed mouths as a permitted activity on specified rivers is appropriate for small rivers and creeks.
- Resource consents are recommended for artificial openings on larger rivers.
- Mouth position triggers are recommended as an alternative for water level triggers on mouths which experience significant migration.
- Flood modelling of rivers with dynamic mouths should include scenarios investigating different mouth configurations.
- Water level recorders are valuable for high priority rivers.
- Satellite data provides an easy way to monitor mouth configuration on larger rivers.

1 Introduction

1.1 Background

The mechanical opening of blocked or restricted river mouths has been used as a method for preventing flooding of property and infrastructure at several rivers on the West Coast. In the majority of situations monitored by West Coast Regional Council (WCRC) and community members, blocked or offset river mouths are opened naturally by small to moderate floods and hence no intervention is generally required, other than monitoring and observation. Mechanical opening is done judiciously due to cost and the possibility that tides and flows are not satisfactory for maintaining a clear opening.

Flooding in Wairoa (Hawke's Bay) in 2024, and the subsequent reviews and investigations (e.g., Christensen 2024) highlighted the need for clear planning around the use of mechanical opening for hazard mitigation. There is little data or guidance available to inform if or when intervention is appropriate for West Coast Rivers.

WCRC has requested advice and guidance on which West Coast rivers should be prioritised, and how they should be monitored.

1.2 Scope

The scope of this project was to review current river mouth management and provide guidance on what West Coast rivers should be monitored, how and where monitoring should be undertaken, whether or not mechanical intervention is warranted, and at what point that should occur. The project involved:

- A meeting with relevant council staff to discuss river mouth management and monitoring. This included identifying the "high priority" river mouths for more detailed analysis in this report.
- Site visits to the Hokitika, Taramakau, New River / Kaimata, Mill Creek and Pororari Rivers (noting that on previous projects I have undertaken site visits to numerous other West Coast river mouths all the way from Arawhata/Neils beach to Mokihinui).
- RTK-GPS survey of the elevation of key features at some of the visited river mouths.
- Collating existing data on priority river mouths including records of historic blockages/impedance and artificial opening.
- Reviewing literature on river mouth opening best-practice from around New Zealand, and West Coast river mouth behaviour.
- Reviewing available aerial and satellite imagery of priority river mouths.
- Analysis of LiDAR data for priority river mouths.

2 Planning considerations

2.1 Regional Coastal Plan

A plan change to the Regional Coastal Plan 2001 (Coastal Plan Change 2 – effective from 8 July 2010) made disturbance of the foreshore or seabed associated with clearing the outlet of certain West Coast rivers and creeks a 'permitted' activity (Rule 9.5.3.1A), provided several conditions are met (WCRC 2010). Key limitations on this permitted activity are that:

- It only relates to reopening of closed river mouths, where little or no surface flow reaches the sea.
- The outlet must be causing a backwater flooding hazard to adjoining land or infrastructure.
- The outlet shall be reinstated where the channel was last actively flowing prior to closure (i.e., it is not a permitted activity to relocate outlets).
- It is not a permitted activity to clear outlets in order to permanently drain lagoons or estuaries, or to allow fish passage.
- Artificial openings are only a permitted activity for the rivers and creeks listed in Schedule 6 of the Regional Coastal Plan (see Figure 2-1 and Appendix A).

Grey District Council make use of this permitted activity rule to reopen small creeks near Greymouth (e.g., Mill Creek).

2.2 Consented openings

Prior to the change to the coastal plan in 2010, or for rivers not listed in Schedule 6 of the coastal plan, a resource consent is required for any artificial openings. A resource consent is also required for any openings which relocate the river mouth or where the mouth is not fully blocked prior to the opening.

Active resource consents are held by the Department of Conservation for Kōhaihai River, and by Buller District Council for clearing/opening the mouths of small creeks and stormwater drains around Hector, Granity and Ngakawau. It is notable that the consent Buller District Council holds for Hector, Granity and Ngakawau expires in September 2026. This consent was originally granted in 2006, prior to the Regional Coastal Plan ammendment and while opening several of the creeks it covers would now be permitted activities under the Plan, some of the smaller local creeks and stormwater drains on the current consent are not listed in Schedule 6 of the plan.

As well as the active consents there have been previous consents for openings at various other rivers, creeks and lagoons, held by both district councils and private landowners (see Appendix A). Several of these consents contain specific water level thresholds for determining when an opening is allowed.

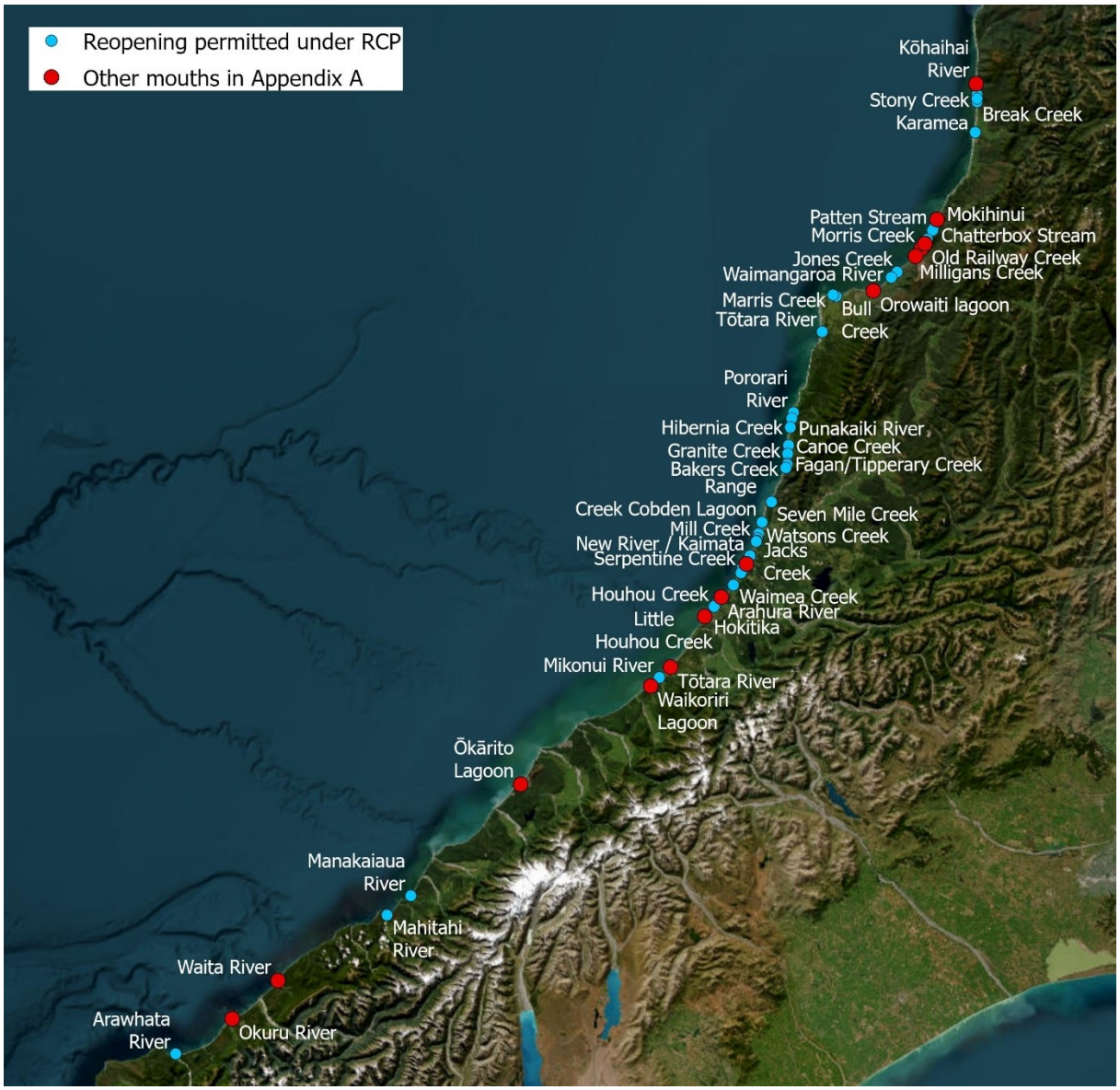


Figure 2-1: Location of dynamic river mouths relevant to this report. All mapped river mouths are listed in Appendix A. Blue dots indicate river mouths which are listed in Schedule 6 of the Regional Coastal Plan. Red dots indicate other dynamic river mouths which have hazards relating to river mouth behaviour.

2.3 Coastal Hazard Areas

Coastal Hazard Areas (CHAs) identify areas on the foreshore that have adjoining land, property or structures of value to individuals or the community which are at risk of harm or damage from erosion, flooding, or river migration. The latest review of CHAs, in 2022, identifies 26 discrete CHAs for the West Coast and describes the main hazards within each CHA (Measures and Rouse 2022). Several of the CHAs explicitly describe erosion and flood risks associated with mouth blockage or migration. The majority of river mouths where artificial opening or other management has been considered or undertaken are within CHAs. Appendix A identifies the CHA associated with each river mouth.

3 General river mouth issues

This section discusses different issues which can motivate artificial opening.

3.1 Blockage/Flooding

The primary reason for conducting artificial openings on the West Coast is generally to mitigate backshore flood risk caused by constriction, blockage or offsetting of the river mouth restricting the capacity of the mouth to pass high flows. If the mouth is blocked or constricted prior to high flows occurring in the river then water can back up inside the river and cause flooding. Generally high flows will naturally cause reopening, widening and/or straightening of constricted river mouths, but this can take time, sometimes happening too slowly to prevent flooding.

For small rivers and creeks, flooding is often linked to complete closure of the mouth. Closure can persist for extended period of time at low flows, with the entire flow exiting as seepage through the beach or as a shallow flow across the beach. This is a natural process and often only causes issues if flood flows occur while the mouth is closed. In this situation, water levels can rise rapidly causing flooding before the mouth breaches.



Figure 3-1: Mill Creek, Karoro with a closed mouth. Google Earth, 8 January 2019.

Artificially reopening smaller rivers and creeks requires relatively little effort, up to a few hours work for a single excavator. District councils regularly conduct artificial openings for numerous small creeks along the coast. Buller District Council has a resource consent to open creeks along the Hector, Granity and Ngakawau stretch of coast, whereas Grey District Council opens

creeks near Greymouth as a permitted activity under the Regional Coastal Plan. The permitted activity rule in the Coastal Plan generally works well for smaller creeks, although for small creeks with mouths which migrate a long way alongshore, the permitted rule does not allow repositioning the mouth, meaning a consent may still be required.

The mouths of larger rivers never fully close but waves can cause their mouths to migrate alongshore and/or become constricted. Alongshore migration extends the distance water must travel before reaching the sea, whilst constricted mouths increase head loss through the mouth. If a flood arrives whilst the mouth is migrated or constricted water levels inside the river are higher than they would be if the mouth was in line with the river or the opening was less constricted, increasing the risk of flooding.

Artificial openings to manage flood risk at larger river mouths generally involve opening a new/second mouth in line with the river. In successful openings, the new mouth captures significant river flow, which then drives natural widening and deepening of the new channel. Because the new mouth represents a more direct path to the sea it captures more flow than the original mouth, which eventually closes, leaving a single mouth in line with the river. Openings of this type cannot be conducted as a permitted activity under the Regional Coastal Plan as the river mouth was not closed prior to the opening, and the new mouth is in a different location.

3.2 Erosion

Erosion issues relating to river mouths tend to be related to larger rivers. Erosion issues can occur in several ways:

- **Bank erosion due to mouth migration:** As river mouths migrate alongshore, they can erode the backshore via bank erosion. Examples of this issue include farmland to the south of the Karamea river mouth in 2016 (see Section 6.1) and the Haast–Jacksons Bay Road behind the northerly migrating Okuru mouth in 2019 (Section 6.5).
- **Wave erosion through mouth:** Waves can propagate into open river mouths causing erosion of the river/lagoon backshore in line with the current location of the mouth. This issue can be worse following river floods which widen the mouth.
- **Coastal erosion:** Erosion of the open coast adjacent to river mouths can be influenced by river mouth position and behaviour. Certain river mouth configurations can store sand/gravel, preventing it from nourishing parts of the coastline and allowing the beach to erode. This erosion is often temporary as when a river mouth changes from a configuration where it is storing sediment it releases the stored sediment as a pulse. Hokitika beach experiences cycles of erosion as river sediment is stored and released in this way (Section 6.4).

Whilst artificial opening can be effective for managing some erosion risks, alternatives such as bank protection or retreat are often more appropriate. Bank protection can provide greater certainty in locations where there are high value assets at risk (e.g., Hokitika), and retreat may be necessary if there are broader coastal erosion issues.

3.3 Fish passage

A high proportion of Aotearoa's 31 species of native fish require access to or from the sea at some stage during their life (i.e., they are diadromous). Seasonality of fish migration varies between species, with some migration in and out of rivers occurring year-round. The main period for downstream migration is autumn, while most upstream migration takes place during spring (Snelder et al. 2007).

Mouth closure or constriction at key times can prevent or restrict fish passage. For some river and lagoon mouths elsewhere in New Zealand fish passage is a primary reason for conducting artificial mouth openings. However, opening to facilitate fish passage has not been identified as a major motivation to conduct artificial opening for West Coast rivers. This is potentially because most larger rivers on the Coast rarely close, frequent rain events cause regular reopening, and the closures which do occur are a natural process.

3.4 Sea level rise

Observed sea level on the West Coast has increased by approximately 200 mm over the last 30 years and is rising at an accelerating rate (Gardner 2023). Projections are for sea level rise to continue accelerating with the most up to date projections available online at https://searise.nz/maps/.

Sea level rise increases flood risk at river mouths, estuaries and lagoons, meaning that a flood event which previously would not have caused flooding is more likely to in the future. As well as increasing water levels, sea level rise also means the height of beach barriers is rising meaning that the river levels at which natural reopening occurs are getting higher. This shift in sea level is inevitably increasing pressure on the regional council to artificially open or straighten river mouths as a means of managing flood risk.

Increased flood risks at river mouths means that even with regular artificial opening it may not be possible to manage increasing flood risk in some high risk locations and that alternative defences or retreat will be required.

4 Monitoring and triggers

4.1 Water levels

River mouth water levels are relatively easy to monitor, provided suitably stable locations on the lagoon backshore or inflowing rivers can be identified. Monitoring is already installed or planned for several West Coast river mouths (see Appendix A). River mouth water level data are incredibly valuable for understanding and analysing flood risk. For example, water level data can be useful to validate flood modelling, or understand the role of river mouth blockage in past floods to inform better future management.

Using a simple water-level threshold to trigger an artificial opening can be unreliable for larger rivers. Under low-flow conditions, water levels may remain relatively low even when the river mouth is severely constricted or offset. When constricted, increased flow will cause the trigger threshold to be reached, but if the increased flow represents the rising limb of a flood it is often too late for an artificial opening to be implemented.

For smaller rivers and creeks water level triggers can be more useful as blockage/constriction of river mouths can be severe enough to raise water levels even under low flows. An example of this is the New River / Kaimata mouth at Paroa where mouth constriction/offsetting/blockage is regularly severe enough to elevate water levels even at low flows. However, even in this case there are times when the mouth is significantly offset/constricted to the point where flood flows could backup causing inundation, but under low flows the existing trigger level is not reached.

One potential option for a more effective water level trigger is to set a threshold based on low-tide water level as this is more responsive to river mouth blockage than high tide water level.

4.2 Mouth position

Monitoring river mouth position can provide an alternative trigger for rivers where the mouth can migrate and become offset. Historically, monitoring mouth position has typically involved manual observation but satellite imagery now provides an easy way to regularly monitor river mouth position. For example, freely available Sentinel 2 imagery provides usable 10 m resolution images at an approximately weekly frequency (frequency varies depending on cloud conditions at the time of data capture). Figure 4-1 shows an example of this imagery for Karamea, clearly showing the location and size of the river mouth. Higher resolution images are available for a fee from commercial providers (e.g., Planet.com), these are likely not necessary for larger rivers but would be needed for monitoring of smaller river/stream mouths not clearly visible in the freely available 10 m resolution images.

Elsewhere around New Zealand mouth position triggers have been used to trigger management of river mouths, typically involving artificial opening or repositioning. Often triggers are linked to some sort of reference object on the backshore allowing easy assessment on the ground or from satellite imagery.



Figure 4-1: Sentinel 2 colour imagery of the Karamea River mouth. Left image 4 January 2017 when the river mouth was offset by approximately 3 km, shortly before a new mouth breached directly opposite the river. Right image 14 February 2026 showing current mouth configuration. Sentinel 2 data are collected by the European Space Agency and were sourced from the Copernicus browser.

5 Risks associated with artificial opening

5.1 Failed opening or rapid reclosure

The largest risk associated with artificial openings of West Coast rivers is that the opening is unsuccessful or rapidly re-closes, failing to achieve the desired reduction in flood or erosion risk. Failure can occur if an opening is not completed in time before a flood, this is what happened at Wairoa in Hawke's Bay. Alternatively, failure can occur if river flows are too low at the time of opening, allowing waves to reclose the opening before it properly establishes.

The ease of opening, and hence the risk of failed openings, varies dramatically between rivers. Opening closed river mouths on smaller rivers and streams is often relatively easy, with work able to be completed quickly by a single excavator. Larger rivers require much more effort to successfully open as a larger channel must be dug, and the river is generally not fully closed prior to the opening, meaning that there is an existing alternative path for the river to drain through.

To successfully open some larger rivers requires that the opening is conducted immediately prior to a flood, so that the power of the flood can widen the opening. Relying on weather or flow forecasts to choose when to conduct an opening, particularly if it takes more than a few hours to conduct an opening, further adds to the risk.

For river mouths which are hard to open because of the time and effort required, or the need to rely on forecasts, alternative approaches may be more appropriate. Maintaining a lowered section of barrier crest to allow the river to naturally breach during high flows can be an alternative to relying on flood forecasts. Other means of managing risk such as stopbanking or erosion protection, or retreat of at-risk assets may be required if mechanical opening is unreliable.

5.2 Increased wave propagation into mouth

On larger rivers storm waves can propagate into river mouths and cause lagoon backshore erosion. Mouth position, width and orientation control exposure of the backshore to waves so for some mouths there is a risk that repositioning the mouth via mechanical opening could result in increased exposure for some parts of the backshore. Mouth migration is hard to predict, so even if mechanical opening is conducted at a location where backshore erosion is unlikely to pose a problem (i.e., in line with the river), there may be a risk that the new opening migrates to a position which exposes vulnerable sections of the backshore to erosion.

5.3 Safety risks

Accessing opening sites on river mouth beach barriers often requires driving machinery along the barrier. There is a risk that river flooding or wave events occurring whilst work is taking place may trap workers on the barrier with serious consequences. For example, if the barrier naturally breaches it may isolate a section of barrier between two mouths, or increasing wave height combined with rising tide and storm surge may suddenly result in waves starting to overtop the barrier. Conducting openings immediately prior to forecast flood events increases the risk.

5.4 Reduced lagoon area

Alongshore migration of river mouths helps increase the area of river mouth lagoons by resetting barrier position and width and by eroding the lagoon backshore (Measures et al. 2020). Repeated artificial opening to keep a central river mouth and limit alongshore migration can result in reduced lagoon area as parts of the lagoon infill with beach sediment. Mouth migration to the limits of the lagoon would periodically remove this infill, but artificial opening prevents or reduces this process.

Reducing lagoon area has potential ecological implications as lagoons are highly valued habitat for a range of fish and birds.

6 High priority river mouths

This section provides detailed commentary and recommendations for six specific rivers. These rivers all have special rating districts to fund hazard management associated with them, and they have dynamic mouths with associated mouth related hazards.

This section contains analysis of ground and water levels. Note that all elevations are reported in New Zealand Vertical Datum 2016 (NZVD2016).

6.1 Karamea

The Karamea River drains to the coast via the Ōtūmahana Estuary which has historically had either one or two mouths to the ocean, migrating over approximately 4.5 km of shoreline (Allis 2016). The main river mouth related issue at Karamea is that the mouth has at times been significantly offset from the river, extending the distance the river has to travel to reach the sea and thereby increasing flood levels during fluvial flood events. An extreme offset mouth could also cause erosion of farmland and potentially Kongahu Village to the south.

Artificial openings have previously been attempted at least twice for Karamea. A mechanical opening was conducted in November 2014 when the mouth was offset by approximately 1.5 km from the river's most direct path to the sea (Figure 6-1). Following the opening two mouths were present, including during a 2690 m^3/s flood (>5yr ARI) on 22 November 2014. However, despite this flood the new mouth closed naturally in January 2015.

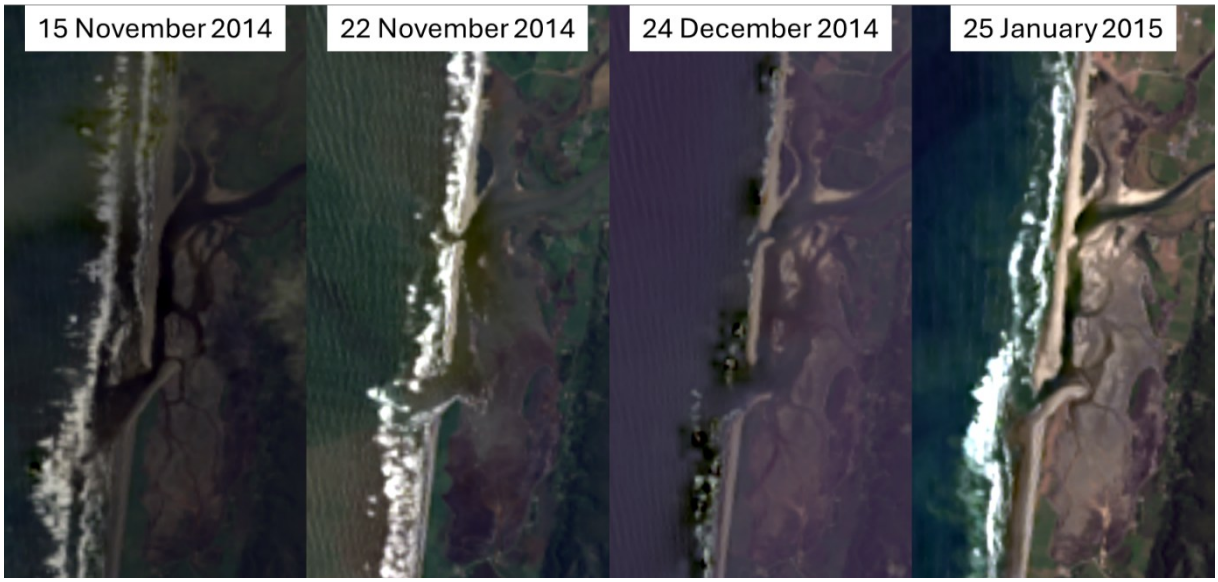


Figure 6-1: Landsat imagery of Karamea artificial opening in 2014–2015. 15 November 2014: mouth configuration prior to artificial opening. 22 November 2014: After artificial opening and immediately prior to river flood. 24 December 2014 northerly mouth remains open but is narrowing. 25 January 2015 northerly mouth has closed due to sediment build up. 30m resolution Landsat imagery is presented as this opening was prior to the availability of higher resolution Sentinel 2 imagery (starting in late 2015).

Following closure of the northern mouth the remaining mouth continued its southerly migration and a second attempt was made to artificially open a new mouth on 12-13 May 2016 but this was unsuccessful, with the mouth re-closing immediately despite a 2,300 m^3/s flood (approximately 5 yr ARI) on 13 May 2016 (Figure 6-2).

Following this 2016 opening attempt, it was recommended that an alternative to artificially opening a new mouth would be to maintain a series of low spots in the beach barrier at the desired opening site to facilitate natural spill-over and reopening in the event of a fluvial flood (Allis 2016). A 2640 m^3/s flood on 19 January 2017 resulted in a new opening. This opening persisted and in late 2018 the southerly mouth closed, leaving a single mouth roughly in line with the river.

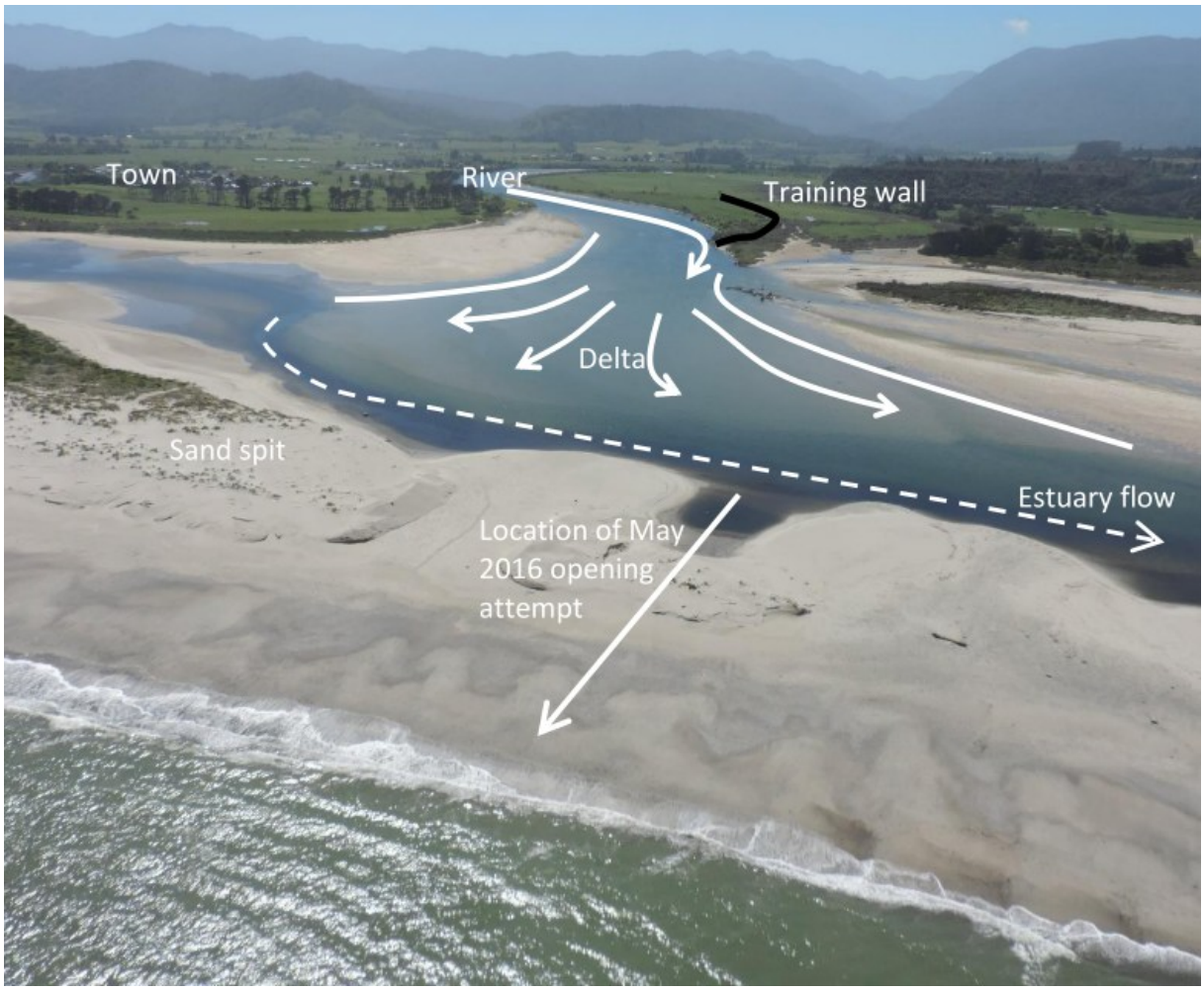


Figure 6-2: Oblique aerial image of the Karamea River showing the location of the May 2016 artificial opening attempt. Photo dated 22 November 2016, reproduced from Allis (2016) Figure 5.

These previous opening attempts demonstrate that artificial openings may be useful for managing flood risk in the Karamea River, but that the success of artificial openings is variable and dependent on the degree to which the existing opening is offset/constricted.

The Regional Coastal Plan contains a water level trigger for artificial opening at Karamea. The level trigger is described as 0.75 m below Wharf Road, measured at the flood gate culvert at the north end of the residential area. LiDAR shows the road elevation to be 2.1–2.4 m in that area of Wharf Road depending on exact location and whether the road centreline or edge is measured. This indicates that the trigger threshold corresponds to approximately 1.35–1.65 m. Inspection of the LiDAR suggests that at water levels of around 2.0 m the ground around some of the lowest lying buildings in Karamea would begin to flood.

The existing Coastal Plan permitted activity rule for river mouth openings is unlikely to be effective for conducting openings of the Karamea River for several reasons. Firstly, the Karamea River mouth never fully closes, which is a requirement for the opening rule contained in the plan. Secondly, the plan only allows re-opening at the last mouth location, so does not allow repositioning a mouth to a more desirable location. Thirdly, the water level trigger is unlikely to be reached during low river flows, meaning that there may be insufficient time to open the mouth once the trigger is reached.

Recommendations

Mouth position trigger: A mouth position trigger for artificial opening would be more appropriate than the current water level trigger. The benefit of a mouth position trigger is that it is not flow dependent, so the trigger can be crossed even during low flow periods meaning it is not necessary to wait for rising flows before the trigger is crossed. An appropriate trigger location is likely to be far enough offset that an artificial opening is likely to be effective (if the river mouth is not significantly offset then artificial opening is likely to fail with the river 'preferring' the existing opening), but not so far offset that the additional flood risk associated with the mouth position is too severe.

Consent to allow artificial opening in line with river: In the context of the Karamea River, artificial opening is only beneficial at times when the mouth is significantly offset. As the current coastal plan only allows for reopening of closed mouths in their last location, a consent will be required to allow opening a new /second mouth in line with the river to reposition the mouth. The mouth is currently quite central, and takes years to migrate, so seeking a consent could wait until significant migration starts to occur (informed by monitoring).

Maintaining a low point in the crest as an alternative to opening: Making a successful artificial opening may require works immediately prior to a river flood in order for the river flood to widen and enlarge the new cut before the waves close it. This approach risks a quick rising or poorly forecast flood occurring before the cut is completed, resulting in health and safety risks associated with working during high flows, or flooding if the cut is not completed in time. An alternative approach is to maintain a low spot in the barrier with the idea that river flows high enough to cause flooding would overtop the low spot and erode a new mouth. This approach was recommended previously for Karamea (Allis 2016) and is being applied at Wairoa (Hawke's Bay) to manage flood risk (HBRC 2025).

Model effects of different mouth positions: Hydrodynamic flood modelling is currently underway to better understand flood risk in Karamea. I recommend that this modelling includes an analysis of the impact of multiple different mouth positions on flood levels. The results of the modelling can then be used to inform understanding of how mouth position influences flood risk, helping to select an appropriate mouth position trigger.

Water level recorder: A water level recorder within the Ōtūmahana Estuary/Karamea river mouth is recommended as it would be valuable for monitoring the effect of mouth position on levels under different river flow conditions. Understanding river/sea interactions will only become more important over time with ongoing sea level rise.

6.2 Pororari

The main concern relating to the Pororari River mouth is flooding of Punakaiki Village caused by river floods when the river mouth is constricted and offset. Aerial photos show that the Pororari River mouth can switch relatively quickly from a fairly straight mouth (e.g., left panel in Figure 6-3) to a constricted and offset configuration (right panel in Figure 6-3). Offsetting of the river mouth can add approximately 700 m to the channel length before the rock cliffs on the northern side of the bay prevent further migration of the mouth. The mouth is often positioned hard against these cliffs (e.g., right panel in Figure 6-3).

Punakaiki residents describe a typical flooding scenario as happening when river flood flows arrived while the mouth was offset/constricted causing water levels to rise rapidly. Significant flow events would then cause overtopping/breach of the beach barrier resulting in a mouth aligned with the river.

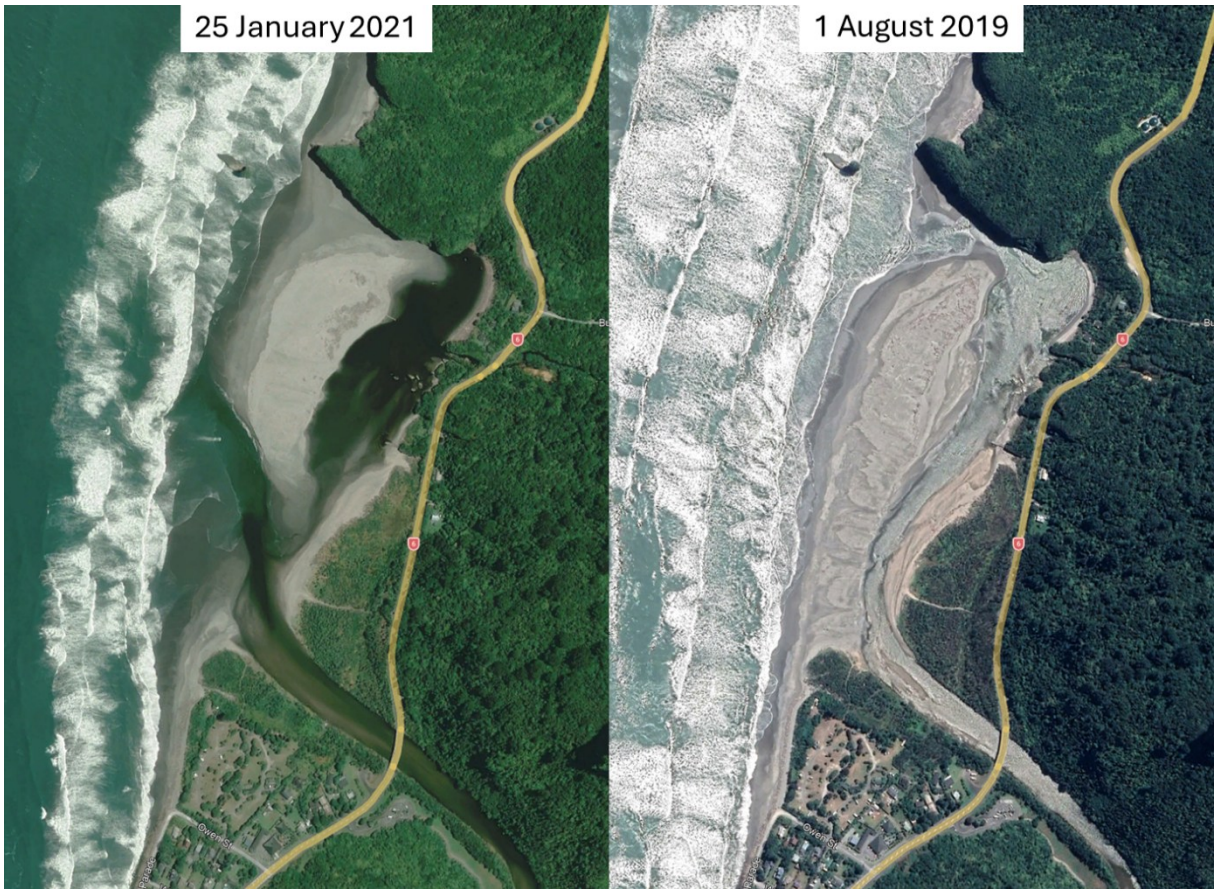


Figure 6-3: Aerial photos of the Pororari River mouth in open and constricted configurations. Imagery from Google Earth. Left panel shows the mouth in an open configuration and right panel in an offset/constricted configuration.

Analysis of the LiDAR data shows that there is a low lying area of ground along the eastern side of the campground and the properties which back on to it (Figure 6-4). A small area of garden and scrubland is below 2 m elevation, with a significantly larger area below 3 m. Once water levels reach 2.5 m the river starts to spill into the lower lying parts of the campground and gardens, and at approximately 3 m would likely start to affect houses and other buildings.

A network of embankments provides some protection from river flooding although drainage channels and small culverts provide land drainage through the existing embankments and would allow backflow from the river into the low lying areas. Improvements to the flood defence embankments, raising them and making them more continuous to better protect the village from river flooding are currently being designed (Allis 2026).

A specific trigger level for opening the Pororari River is included in Schedule 6 of the Regional Coastal Plan (WCRC 2010). This trigger level is marked by water reaching the base of a specific nikau palm, the location of which is indicated on a map in the plan. During the site visit we were informed by the homeowner that this tree had been blown down in a storm and was no longer present. The owner did indicate the approximate location where the tree used to be, which corresponded with a low area of land in the garden of 14 Punakaiki Road. The lowest ground levels at the approximate location indicated by the homeowner were surveyed during the site visit (1.37 m, point B in Figure 6-4 and Table 6-1). When processing the GPS data it was found that the surveyed low spot did not exactly correspond to the location marked on the map in the coastal plan so the ground level for this location was extracted from the LiDAR (marked C in Figure 6-4 and Table 6-1). I consider it most likely that the trigger level in the plan was intended to be approximately 1.5 m (i.e., high enough to cause noticeable inundation around the tree in the low spot of the garden).

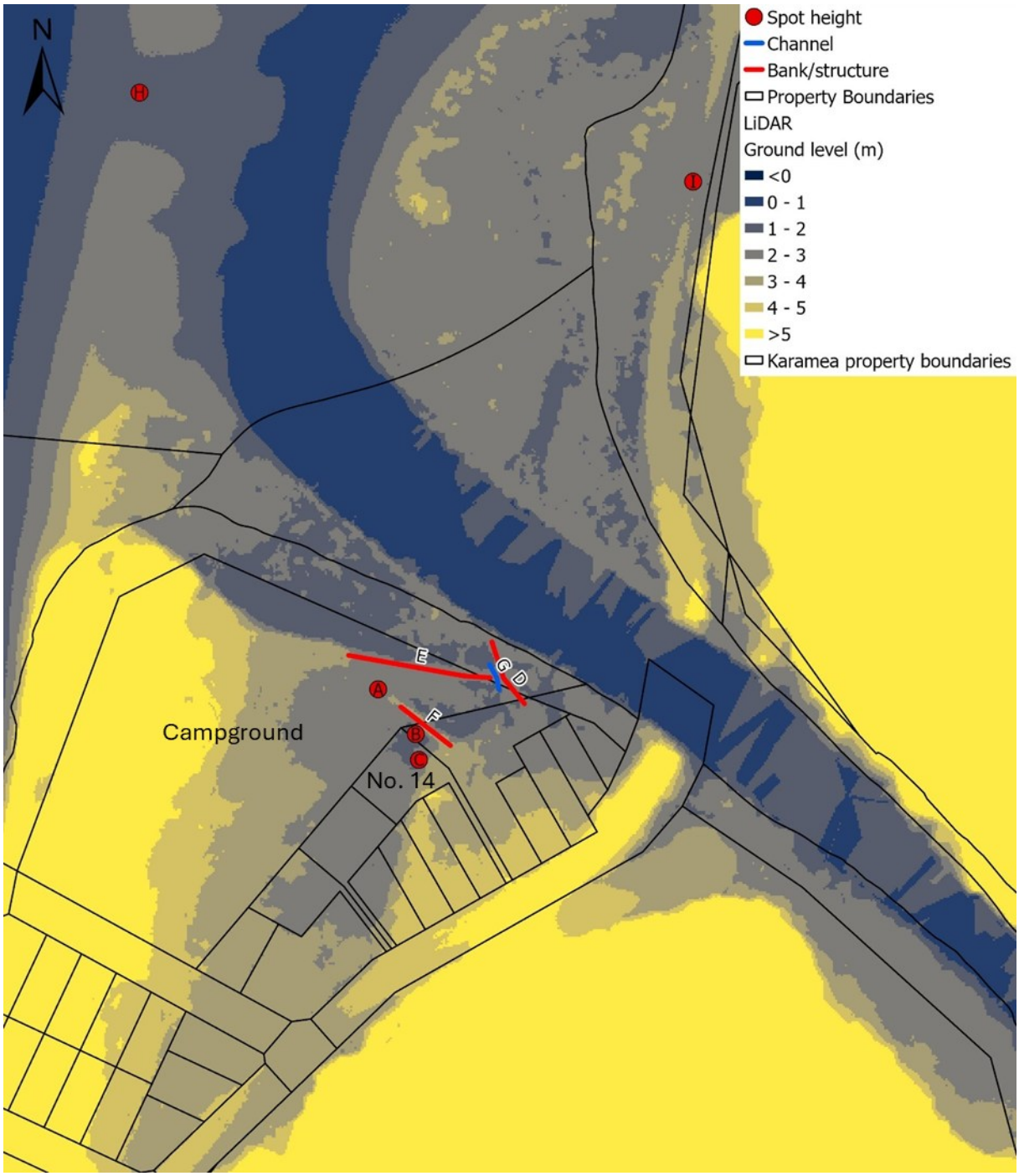


Figure 6-4: Pororari River and Punakaiki Village: LiDAR survey and location of surveyed features. Details of features labelled with letters are given in Table 6-1. LiDAR was captured for West Coast Regional Council by Aerial Surveys between 16 May 2020 and 11 July 2024.

Table 6-1: Pororari River and Punakaiki Village: Elevations of key features. Letters refer to locations marked in Figure 6-4.

	Description	Elevation (m NZVD2016)	Elevation data source
A	Spillover point into campground	2.46	RTKGPS survey
B	Low point in garden of 14 Punakaiki Road at approximate location of old nikau palm.	1.37	RTKGPS survey
C	Location trigger point nikau palm was mapped in the Regional Coastal Plan Schedule 6.	2.21	LiDAR
D	Embankment	2.5	RTKGPS survey
E	Embankment	Varies	Unsurveyed
F	Embankment	2.9	RTKGPS survey
H	Crest of beach barrier (indicative point location)	1.8–3.6	LiDAR
I	Low point on SH6 centreline	2.9	LiDAR

The LiDAR shows the crest of the beach barrier with a low point in line with the river of approximately 1.8 m, and other parts of the crest varying in height up to a maximum of 3.6 m. These heights seem consistent with resident's reports that during river flooding the river tends to overtop the barrier and breach a new outlet, but only after inundating the lowest lying areas of the village (up to about 2.5 m, corresponding with the river just starting to spill into the campground).

Recommendations

Artificial openings are not recommended for Punakaiki due to regular migration of the mouth and the ease with which the river naturally reopens in line with the river during moderate flood events. If artificial mouth openings were to be used, they would likely need to happen relatively frequently, with associated cost and potential disturbance impacts.

The proposed improvements to the flood protection bunds will help prevent river flooding up to and above the level at which the mouth naturally reopens. If these bunds are constructed, they should alleviate any need for artificial mouth openings.

Water level recorder valuable: The recently installed water level recorder is well positioned and should provide good quality data to understand the interaction of river flow, mouth configuration and flood risk.

6.3 New River / Kaimata and Saltwater Creek

The New River/Kaimata merges with Saltwater Creek at the coast and exits through a combined river mouth. This mouth is often deflected alongshore by wave driven sediment and can be closed. Previous mouth migration, and interaction with the Taramakau River mouth, has resulted in a series of coastal lagoons along the backshore. Analysis of historic aerial imagery by Smart (2010) shows that since 1951 the mouth has migrated between approximately 1 km south to 6 km north of where the New River/Kaimata first reaches the coast (Figure 6-5). Migration of the river mouth alongshore, or closure of the mouth, restricts drainage from the rivers increasing flood risk. Mouth migration has typically followed a pattern of migrating north alongshore until a

new mouth is opened shortening the path to the sea. Breaching of new mouths has occurred naturally during floods, as well as by artificial openings.

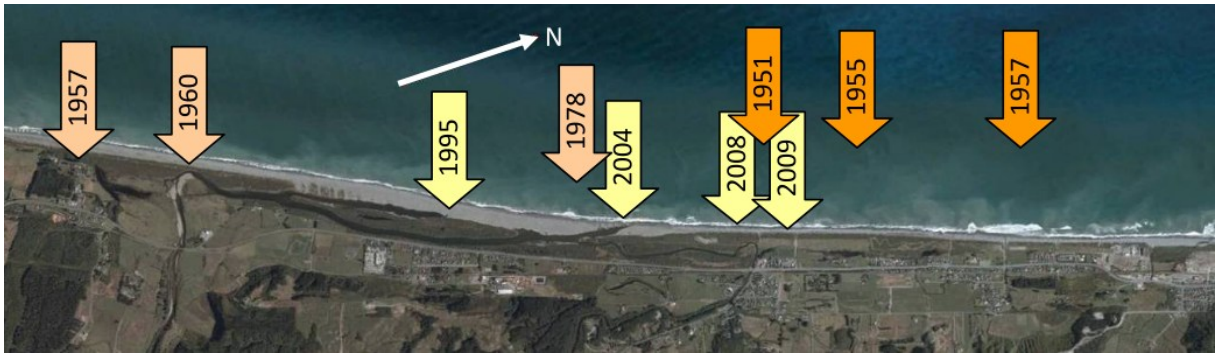


Figure 6-5: New River/Kaimata mouth locations 1951-2009. Mouth positions from historic aerial imagery shown on 2004 air photo. Figure reproduced from Smart (2010) Figure 5.

Major flooding of Paroa from Saltwater Creek occurred in 1978 when the mouth was elongated to the north (Smart 2010). During the flood the rivers naturally breached a new mouth helping to drain the flooding (location of breach shown in Figure 6-5 and Figure 6-6). Another significant flood event occurred in December 2010 when the river mouth was again offset a long way north from its shortest path to the sea. During this flood emergency works were undertaken to cut an artificial opening (location shown in Figure 6-6). A rock groyne was also constructed to the north of the new outlet to help limit alongshore migration of the mouth northwards (location marked in red in Figure 6-6).

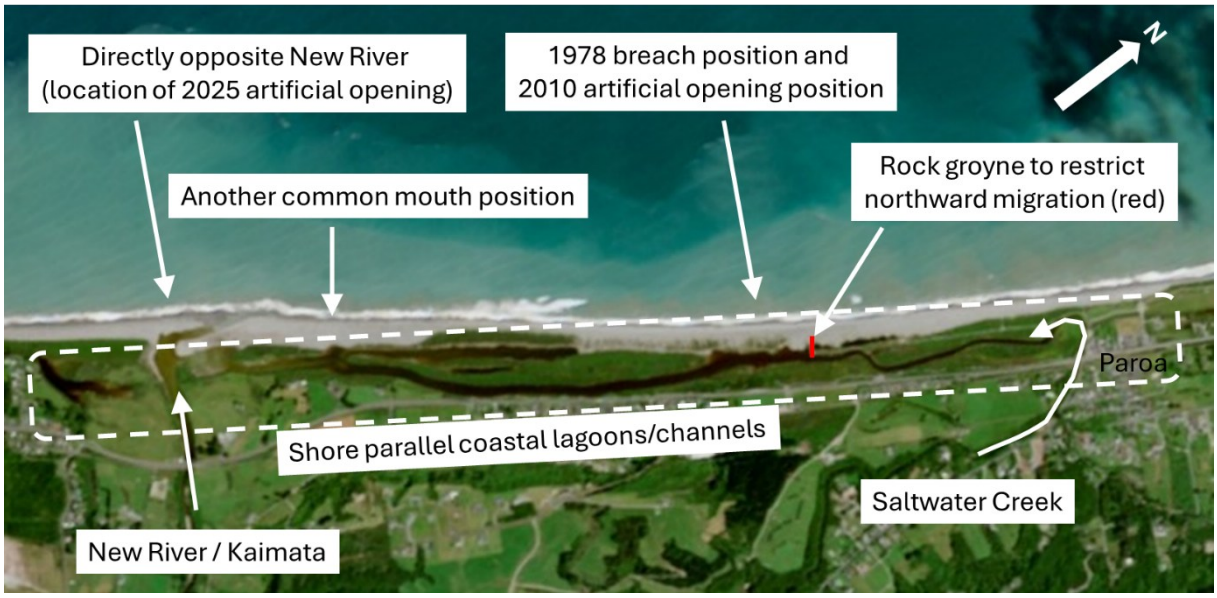


Figure 6-6: Location of key features of the New River and Saltwater Creek. Background aerial imagery is February 2026 Sentinel 2 satellite imagery.

Following this emergency work a trigger level was established for reopening the mouth, this is contained in Schedule 6 of the Regional Coastal Plan and is defined as water levels reaching the top of the culvert on the beach access road alongside the Paroa sports field. During my site visit I surveyed the top of the culvert (i.e., the trigger level) as 2.49–2.56 m on the downstream and upstream ends of the culvert respectively.

Mouth behaviour since 2012 is described in the Greymouth Floodwall Rating District Asset Management Plan (WCRC 2024). In early 2012 the outlet next to the new groyne became blocked. By July the back-up of water had reached the trigger level and the outlet was re-opened. The following year, the outlet blocked again and was re-opened in May 2013.

In June 2013 a combination of rough seas and flooding in New River breached a new outlet directly in line with the New River channel. Saltwater Creek maintained a separate outlet next to the groyne until July, when both outlets closed due to a build-up of gravel. In August 2013 the water again reached the trigger point and the outlet was re-opened next to the groyne.

The most recent artificial opening was carried out in February 2025 following closure of the mouth. An opening was cut directly in line with the New River (location in Figure 6-6 and photo of the opening in progress in Figure 6-7 and report cover).



Figure 6-7: 17 February 2025 artificial opening of the New River. Source: West Coast Regional Council.

Recommendations

Artificial openings: Artificial openings are a useful tool for managing flood risk from the New River / Kaimata and Saltwater Creek and should continue to be used when needed. A clear methodology should be defined for deciding when and where to undertake openings, and the procedure for making the cut.

Resource consent: A specific resource consent for artificial openings should be considered as this could allow greater flexibility to open in a different location to the where the channel was last actively flowing. Any resource consent should allow for adaptive management, evolving the opening procedure and decision making process as needed.

Water level recorder: The recently installed water level recorder will provide valuable information regarding mouth constriction. Once referenced to a datum it will be able to be linked to the opening threshold and used for decision making.

Flexibility to proactively open in the event of a forecast flood: Whilst the current trigger level seems to work reasonably well, there may be situations when a flood is forecast and the mouth is closed or constricted, but the trigger level has not yet been reached. Any resource consent should allow some flexibility to respond to forecast events proactively.

Consider lowering beach crest in the event of a forecast flood: Lowering the beach crest to allow natural breaching may be a good option in some situations. For example, lowering the crest at the location of the 1978 breach would allow Saltwater creek to spill out and create a second mouth in the event of a severe flood when the existing mouth is close to New River and constricted.

6.4 Hokitika

The main river mouth related concern at Hokitika is the potential for mouth offsetting to the south and/or constriction of the mouth, both of which increase flood risk by restricting discharge of flood water from the river and raising flood levels adjacent to Hokitika. A secondary concern relates to the interaction of mouth migration and shoreline erosion. This can happen when mouth configuration causes river sediment to be trapped in a large river mouth bar, preventing the sediment from replenishing the Hokitika beach and causing an erosion episode until the sediment is released. These issues are discussed in a report by Hicks (2016).

The effects of an offset mouth on flood risk were assessed as part of a sensitivity analysis conducted during recent flood modelling (Babu and Gardner 2025). After calibrating a 2D hydrodynamic model, simulations were run with a base scenario representing a short river mouth as well as a test case with a ‘long’ river mouth offset to the south (Figure 6-8). The ‘long’ river mouth configuration represents an elongated and constricted (narrowed) river channel and was based off aerial imagery of the 2016 mouth configuration. A 1% Annual Exceedance Probability (AEP) flood including the effects of climate change to 2100 (representative concentration pathway (RCP) 6.0 flow and 0.97 m sea level rise) were simulated for both river mouth scenarios. As the purpose of this modelling was for stopbank design, both scenarios included ‘glass wall’ stopbanks within the model preventing inundation of Hokitika. Comparing the results of the two scenarios shows that water levels adjacent to the Hokitika stopbanks would be approximately 0.9 m higher under the ‘long’ river mouth configuration (Figure 6-9).

Artificial opening to realign the river mouth has never been undertaken at Hokitika but has been considered at times when the mouth was extended to the south.



Figure 6-8: Configurations of the Hokitika River mouth used for flood modelling. Map shows the planform of the modelled 'long' river mouth scenario overlaid over imagery of the baseline 'short' mouth. The long mouth was based off 2016 aerial imagery. Figure reproduced from Babu and Gardner (2025) Figure 7-2.

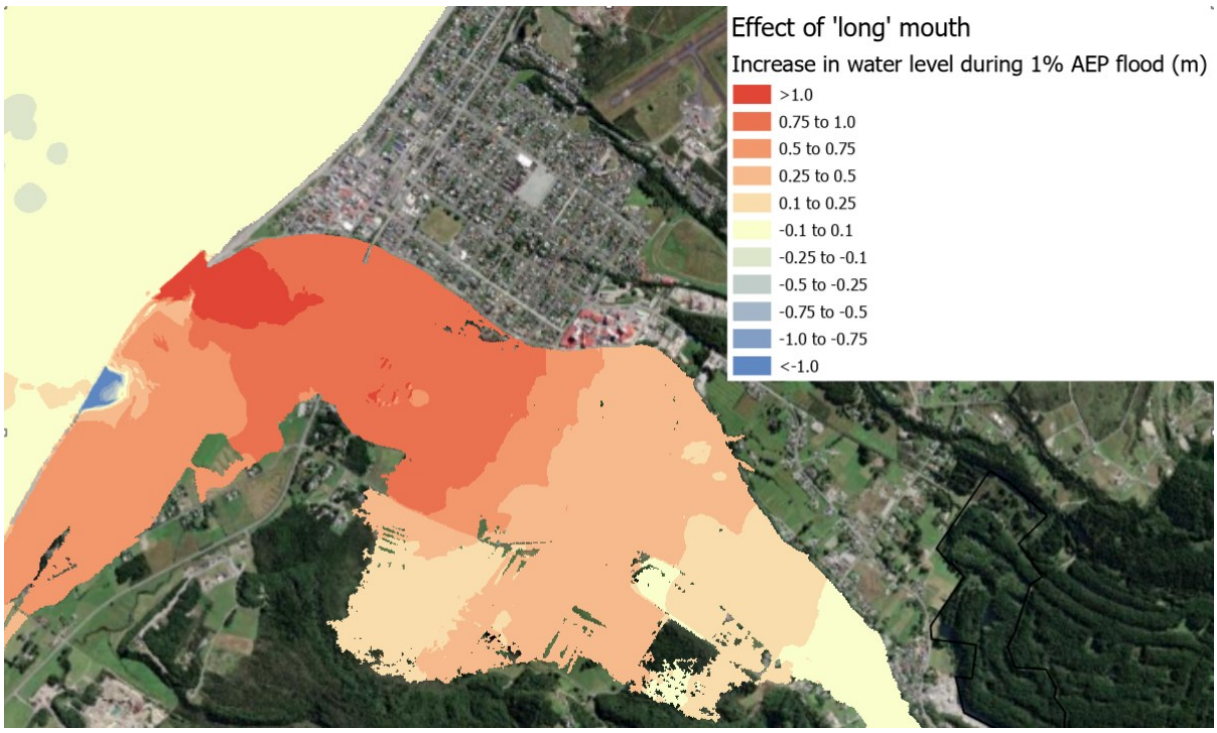


Figure 6-9: Effect of 'long' river mouth on 1% AEP Hokitika flood levels. Colouring shows the change in flood levels from the base scenario with a 'short' river mouth. Red areas indicate increased flood levels.

Recommendations:

Artificial opening is not recommended for Hokitika. Creating an artificial opening at Hokitika would be challenging, requiring significant effort. For a cut to work it would likely need to be undertaken immediately prior to a flood increasing the risks.

Use 'long' river mouth flood modelling simulation to inform design levels of Hokitika stopbank upgrades. I consider that the inclusion of an offset mouth scenario in the flood modelling done to inform the design of flood defences is best practice. I recommend that these results are carried forwards into the design of stopbank crest elevations, meaning that the defences are able to cope with different mouth configurations and artificial opening is not required.

Water level recorder: Installation of a water level recorder at the rivermouth is recommended. This would provide valuable data for flood modelling calibration/validation in the future. It would also provide valuable data to better understand the effect of mouth configuration on flood risk.

6.5 Okuru

The Okuru, Turnbull and Hapuka Rivers flow into a combined estuary enclosed by a beach barrier. The Okuru mouth, connecting this estuary to the Tasman Sea, migrates north and south of the rivers over approximately 7 km of shoreline. Analysis of historic imagery shows there can be either one or two mouths present at any time (Figure 6-10).

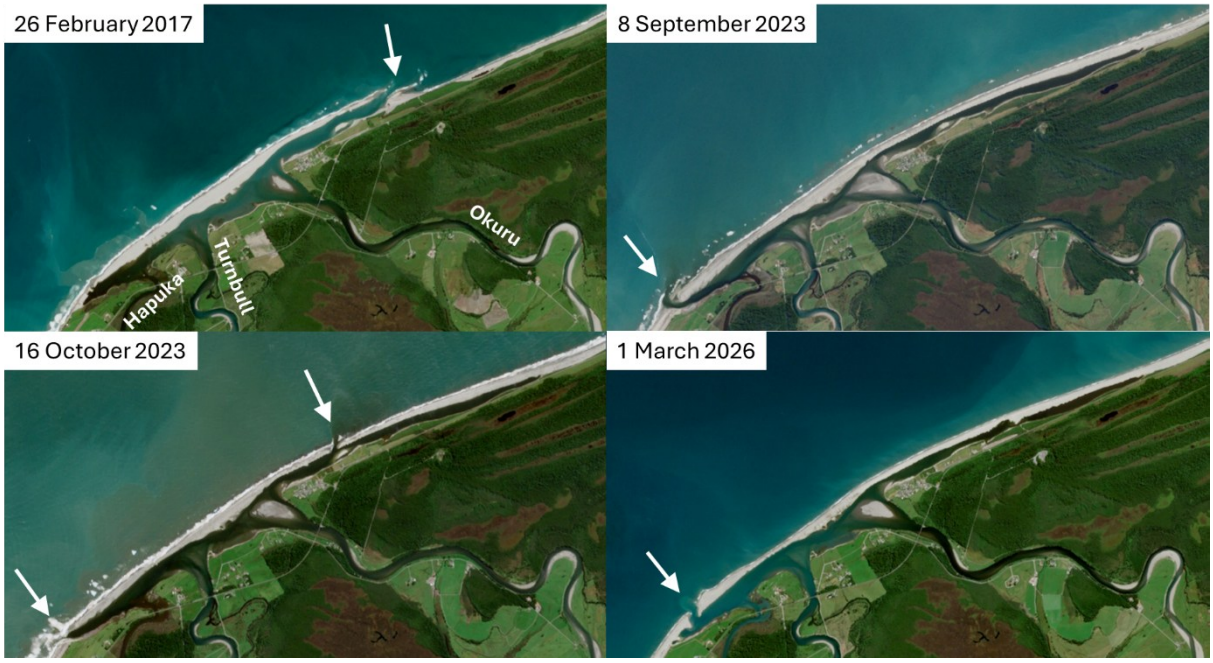


Figure 6-10: Various positions of the Okuru River mouth. Sentinel 2 satellite imagery showing a range of mouth positions including a period when there were two mouths simultaneously (October 2023).

The main river mouth issues at Okuru are backshore erosion and flood risk. Backshore erosion can occur at the ends of the lagoon if the mouth is at the extreme north or south and further migration causes it to "chew" into the backshore. Backshore erosion can also occur if waves are able to propagate through the mouth to the backshore, causing erosion directly in line with the mouth if the mouth is wide. Rock protection was constructed around Okuru township in

2000 to protect against erosion from both the Okuru River west of the township and the Tasman Sea / estuary to the north (erosion protection highlighted in red in Figure 6-11).

Flooding can occur during high river flows if the mouth is constricted and/or offset a long way north or south restricting the ability of the lagoon to drain. LiDAR shows that the Barrier crest height is around 3.0 to 3.8 m for most of its length. There are extensive areas of land around the estuary lower than this, which would be vulnerable to flooding before the barrier overtopped (Figure 6-12). Land levels around the houses in the township range from around 2.5 to 4.0 m. A stopbank with crest level of approximately 3.6 m helps defend the township from flooding.

Artificial mouth openings have been used in the past with mixed success. An artificial opening in September 2019 was cut to try to relieve backshore erosion at the north end of the lagoon which was threatening the Jackson Bay Road between Haast beach and Okuru (Figure 6-11, described in Sherman 2019). However, satellite imagery showed that the artificial opening re-closed quickly.

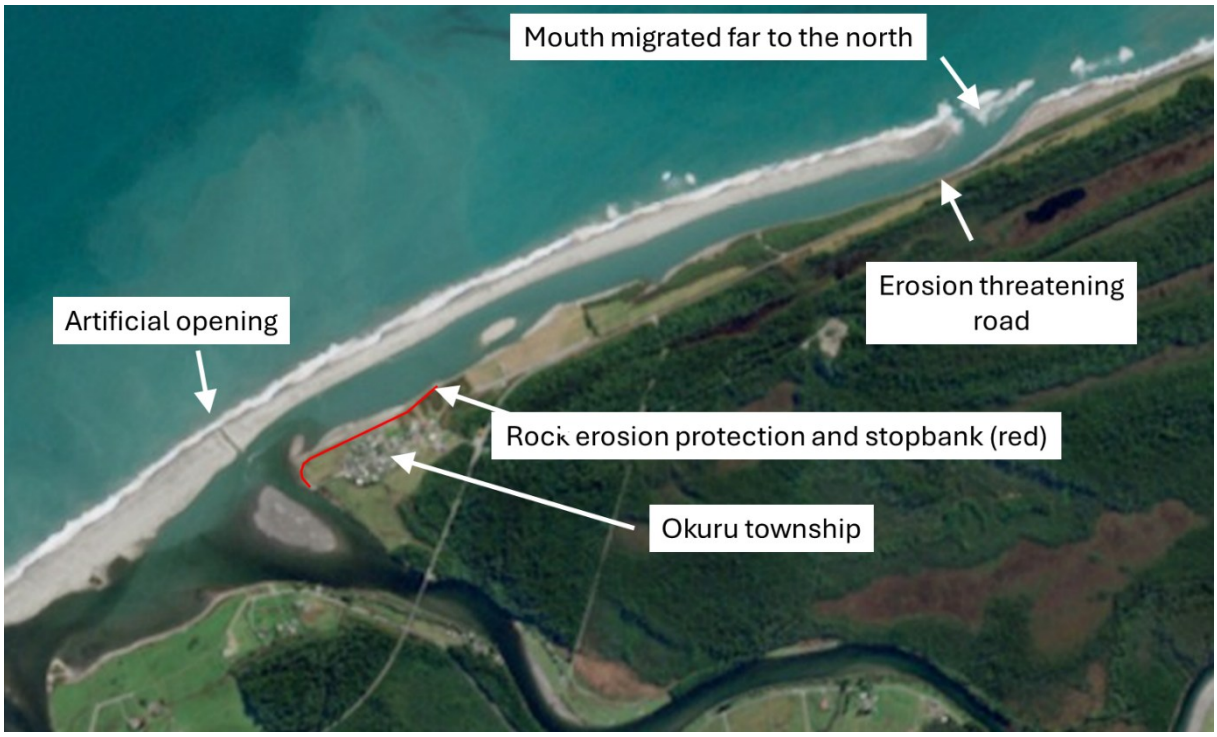


Figure 6-11: August 2019 artificial opening of the Okuru River. Sentinel 2 satellite imagery from 30 August 2019 following artificial opening (opening occurred around 26-28 August 2019). The next available image (2 September 2019) showed the cut had re-closed.

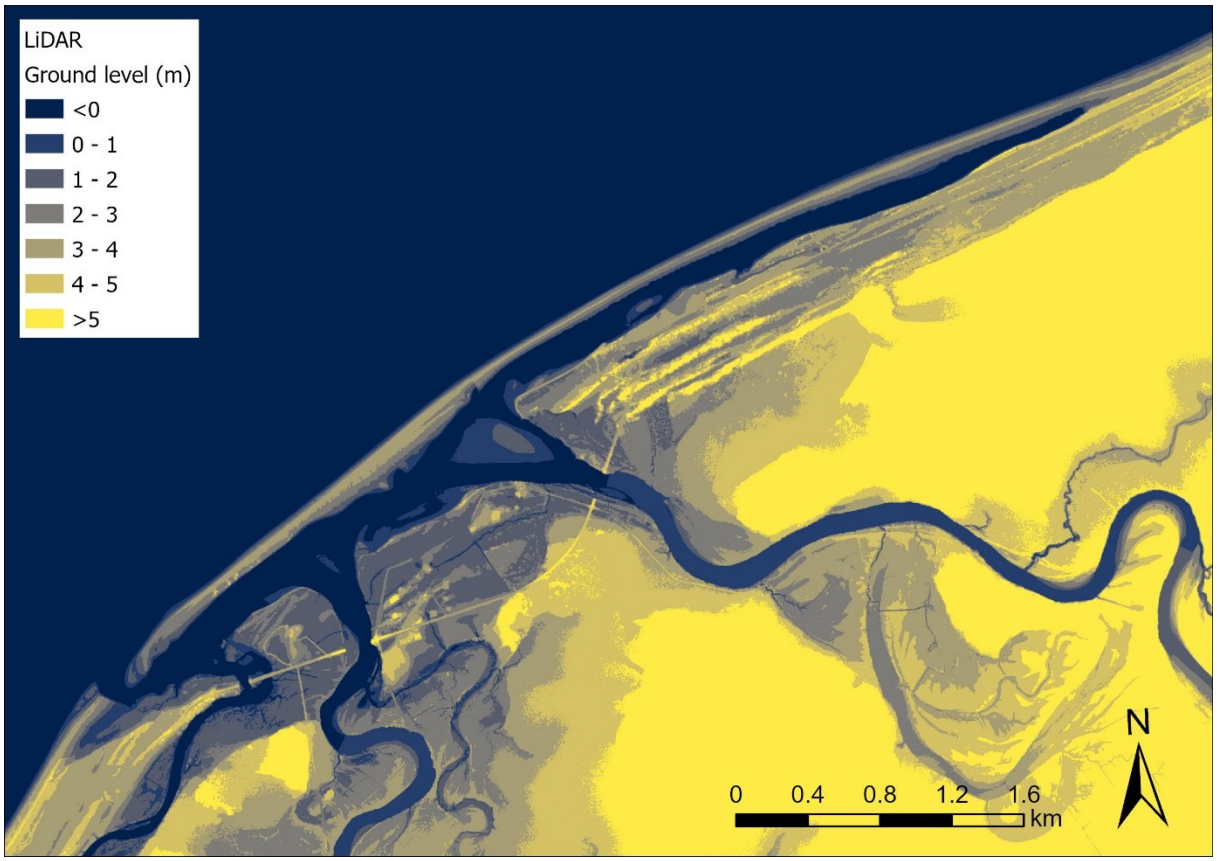


Figure 6-12: LiDAR of the Okuru River mouth. LiDAR was captured for West Coast Regional Council by Aerial Surveys between 16 May 2020 and 11 July 2024.

For an artificial opening to be successful it may require a river flood soon after opening to widen it and prevent re-closure. Due to the length of the barrier, machinery has to travel several kilometres along the coast to reach the opening site in line with the Okuru River. This means that during floods or high wave events there is the potential for machinery to get cut-off by unplanned breach of the barrier (i.e., if a second mouth forms at the other end of the barrier, then machinery would be stranded on the barrier between two openings).

Mouth openings are used to reposition the mouth rather than reopen a closed mouth, so openings cannot be carried out under Section 6 of the Regional Coastal Plan and would need a resource consent.

Recommendations

Prioritise erosion and flood protection rather than artificial openings: Whilst artificial openings can help relieve flood and erosion risks at Okuru they are risky. Openings may re-close, failing to achieve the desired benefit, and there are health and safety risks associated with operating on the barrier prior to a flood. For these reasons I recommend prioritising managing the flooding and erosion risks via other means, such as the bank protection and stopbanking used to manage risks around the township.

Consider a mouth position trigger: Given that the mouth issues are related to mouth position rather than closure, it is unlikely that a water level threshold is appropriate for triggering artificial

openings. If openings are deemed necessary and a trigger is required, then a mouth position trigger is likely to be more appropriate than a water level trigger.

Water level recorder valuable: I understand that a water level recorder has recently been installed at the road bridge. This instrument will provide valuable data to understand the interaction of river flow, mouth configuration and flood risk.

6.6 Arawhata

The settlement of Neils Beach is located on the left (southwest) side of the Arawhata River mouth. The river bed is approximately 1 km wide immediately upstream of the mouth. A sand and gravel barrier beach extends across most of the width of the river. The river mouth has historically migrated across the full width of the river channel. Unlike some of the other river mouths in this report the mouth has not migrated significantly beyond the margins of the riverbed width.

In 2016 there were significant shoreline erosion concerns at Neils Beach and investigation showed that these were partially linked to river mouth position (Hicks 2016). Over several years prior the river mouth had migrated to the northeast, away from the settlement. This meant that river sediment was being directed to the east instead of nourishing the shoreline in front of the township.

Hicks (2016) identified that the river mouth behaviour and shoreline erosion were both likely linked to the balance of river sediment supply and longshore transport, with periods of higher river supply and lower waves to cause the river mouth to bulge, and periods of lower river supply and larger waves (such as in the years prior to 2016) causing the river mouth to migrate northeast and the shoreline to erode.

Whilst the mouth had already naturally repositioned itself centrally at the time of the 2016 report, artificial mouth repositioning was considered in that report as a potential approach to manage future migration.



Figure 6-13: Neils Beach and Arawhata River mouth in 2003 and 2013. Note the central river mouth in 2003 and the northeast directed river mouth in 2013. Figure reproduced from Hicks (2016) Figure 3-11.

Recommendations

No trigger thresholds required. Erosion hazard takes a while to develop. For example, the 2016 erosion issues had been preceded by several years of the mouth being offset to the northeast. Any artificial mouth openings for erosion management would be infrequent and there should be time to make an informed decision whether an opening would be beneficial. For this reason, I do not recommend trigger thresholds be developed for the Arawhata.

Monitor shoreline position and mouth configuration. The Arawhata mouth is dynamic with the balance of river and coastal sediment transport determining behaviour. Monitoring mouth and shoreline position would be beneficial to inform decisions regarding river mouth management. Monitoring could be via traditional techniques (e.g., shoreline profiles) or satellite imagery.

7 General recommendations

In Section 6 I have outlined recommendations for specific river mouths. This section summarises more general recommendations for river mouth management on the West Coast.

Regional Coastal Plan approach appropriate for small river and creeks: Reopening of most small rivers and creeks which need to be reopened is a permitted activity under the Regional Coastal Plan. The conditions of the plan are appropriate and can be utilised by district councils or landowners. There are some small creeks and drains currently opened by Buller District Council under a resource consent which are not listed in Schedule 6 of the Regional Coastal Plan.

Resource consents for artificial openings on larger rivers: Artificial openings on larger rivers are not handled well by the permitted activity rule in the Regional Coastal Plan. Even for the rivers listed in Schedule 6 of the plan, openings are only allowed in the event of complete closure, meaning that the permitted activity rule never applies. For larger rivers where artificial opening is required, I recommend that river specific resource consents are most appropriate. The decision making, risks, and opening protocols will necessarily vary between rivers making it hard to capture in a 'global' consent or coastal plan rule.

Consider mouth position triggers: Mouth position triggers are useful for mouths which experience significant migration. Mouth position triggers are easy to understand and monitor and can be used to trigger openings to reposition river mouths. Agreeing mouth position triggers in advance of them needing to be used allows appropriate consultation and leads to clear decision making once they are triggered.

Include assessment of mouth configuration in any flood modelling: Any flood modelling of rivers with dynamic mouths should include scenarios investigating the sensitivity of flood levels to mouth configuration (as done for the recent Hokitika model updates). Flood modelling could be used to inform setting of appropriate mouth position triggers.

Water level recorders for high priority rivers: Installing water level recorders in high priority / problem river mouths is valuable. Any water level recorders should be maintained to known vertical datums, ideally with gauge boards installed to allow easy checking or manual observation in the event of gauge failure.

Satellite monitoring of mouth configuration on larger rivers: Modern satellite data provides a powerful tool for monitoring mouth configuration, allowing regular tracking of mouth position. Monitoring could be conducted manually, for example regularly checking imagery if a mouth is approaching a mouth position trigger threshold. Alternatively, it could be automated with data on mouth position and width presented as a daily or weekly timeseries.

Plan for the effects of sea level rise: Sea level rise will increase flood risk at river mouths, increasing pressure to conduct artificial openings. Risk management needs to consider how the risk at river mouths will increase over time and identify when artificial openings alone are no longer appropriate to manage risk. A dynamic adaptive pathways planning (DAPP) approach to respond to these effects may be necessary for some locations (Lawrence and Bell 2024).

8 Acknowledgements

This report builds on an excellent discussion document prepared by Paulette Birchfield ("Management of River Mouth Openings" April 2025). My site visit to the Pororari River mouth was aided by the campground owners and the residents of 14 Punakaiki Road. Matt Gardner (Land River Sea Consulting) supplied the model results presented in Figure 6-9.

9 References

Allis, M. (2016) *Letter to Paulette Birchfield regarding management of the Karamea River mouth*. https://www.wcrc.govt.nz/repository/libraries/id:2459ikxj617q9ser65rr/hierarchy/Documents/Publications/Natural Hazard Reports/Buller District/Karamea/Niwa Report on Karamea River Mouth Location.pdf

Allis, M. (2026) Pororari River flood protection bund at Punakaiki, West Coast. *Allis & Co. report reference 2026003 for WCRC*.

Babu, B. S., Gardner, M. (2025) *Hokitika River flood modelling: 2D model upgrade 2024 report*. https://www.wcrc.govt.nz/repository/libraries/id:2459ikxj617q9ser65rr/hierarchy/Documents/Publications/Natural Hazard Reports/Westland District/Hokitika/WCRC039c-HokitikaModelRebuild_Report_05-11-2025_Final.pdf

Christensen, K. (2024). Independent operational review of the Wairoa River bar management. https://www.hbrc.govt.nz/assets/Document-Library/00305-Independent-Review-Wairoa-River-Bar-Management-FINAL.pdf

Gardner, M. (2023) Sea level rise observations in New Zealand and the West Coast. *Land River Sea Consulting Memo to Westport Residents*.

Hawke's Bay Regional Council (2025) New Wairoa River mouth management approach boosts flood resilience. *HBRC News Release*. https://www.hbrc.govt.nz/our-council/news/archive/article/1932/new-wairoa-river-mouth-management-approach-boosts-flood-resilience

Hicks, M. (2016) Rivermouth-related shore erosion at Hokitika and Neils Beach, Westland. *NIWA Report CHC2016-002 for West Coast Regional council*. https://www.wcrc.govt.nz/repository/libraries/id:2459ikxj617q9ser65rr/hierarchy/Documents/Publications/Natural Hazard Reports/Coastal Hazards/Westland Coastal Hazards/Rivermouth-related shore erosion at Hokitika and Neils Beach (NIWA 2016).pdf

Lawrence, J., Bell, R. (2024). *Coastal hazards and climate change guidance*. Ministry for the Environment. https://environment.govt.nz/assets/publications/Coastal-hazards-and-climate-change-guidance-2024-ME-1805.pdf

Measures, R. J., Rouse, H. (2022). Review of West Coast Region Coastal Hazard Areas. *NIWA Client Report CHC2012-081 version 2.2 for West Coast Regional Council*. https://ttpp.nz/wp-content/uploads/2022/04/CHA_2022-Measures-and-Rouse.pdf

Sherman, J. (2019, August 29) Okuru River mouth cut to prevent washout. *Otago Daily Times online news*. https://www.odt.co.nz/regions/west-coast/okuru-river-mouth-cut-prevent-washout

Smart, G. M. (2010). Report on the River Mouth Situation at Paroa. https://www.wcrc.govt.nz/repository/libraries/id:2459ikxj617q9ser65rr/hierarchy/D

ocuments/Publications/Natural Hazard Reports/Grey District/Greymouth/Paroa Rivermouth Situation Report G Smart June 2010.pdf

Snelder, T., Macky, G., Jellyman, D., Sagar, P. (1997) Flow regime requirements at river mouths for instream ecological values. NIWA Client Report CHC97/69 Prepared for the Ministry for the Environment.

West Coast Regional Council (2010) The Regional Coastal Plan provisions as amended by Plan Change 2. https://www.wcrc.govt.nz/repository/libraries/id:2459ikxj617q9ser65rr/hierarchy/Documents/Publications/Regional Plans/Regional Coastal Plan/Plan Change/Operative rule 9.5.3.1A.pdf

West Coast Regional Council (2024) *Greymouth Floodwall Rating District 2023-2026 Asset Management Plan*. https://www.wcrc.govt.nz/repository/libraries/id:2459ikxj617q9ser65rr/hierarchy/Documents/Services/Special Rating Districts/Greymouth/Asset Management Plans/Greymouth Asset Management Plan 2023-2026-Final.pdf

Appendix A List of river mouths

This list includes all river mouths contained in Schedule 6 of the Regional Coastal Plan, as well as mouths which have active or expired consents for opening, and other river mouths which have been identified as having significant mouth closure or mouth migration related hazards. This is not a comprehensive list of all rivers on the West Coast, and does not include remote river mouths with no or very few assets at risk.

River/lagoon name	Permitted activity[1]	Resource consent	Trigger for openings[2]	Water level recorder	Coastal Hazard Area	Notes
Kōhaihai River		RC-2015-0006 (active)			CHA1	Department of Conservation consent
Stony Creek	Yes				CHA1	
Candle Creek	Yes				CHA1	
Break Creek	Yes				CHA1	
Karamea	Yes		~1.35–1.65 m		CHA1	See section 6.1
Mokihinui					CHA2	Dynamic mouth with bank erosion and flooding risks.
Chatterbox Stream	Yes				CHA2	
Patten Stream	Yes				CHA2	
Dufty Stream	Yes				CHA2	
Lamplough Stream	Yes				CHA3	
Dean Stream	Yes				CHA3	
Old Railway Creek		RC05170 (active)				Buller District Council consent[3].
Ngakawau River	Yes				CHA3	
Morris Creek		RC05170 (active)			CHA3	Buller District Council consent[3].
Cooper Stream	Yes	RC05170 (active)			CHA3	Buller District Council consent[3].
Bradley Stream	Yes	RC05170 (active)			CHA3	Buller District Council consent[3].
Granity Stream	Yes	RC05170 (active)			CHA3	Buller District Council consent[3].
Milligans Creek		RC05170 (active)				Buller District Council consent[3].
Twins Stream	Yes	RC05170 (active)			CHA3	Buller District Council consent[3].
Jones Creek	Yes				CHA3	
Waimangaroa River	Yes				CHA3	
Deadmans Creek	Yes				CHA4	
Orowaiti				Yes	CHA4	
Bull Creek	Yes					

River/lagoon name	Permitted activity[1]	Resource consent	Trigger for openings[2]	Water level recorder	Coastal Hazard Area	Notes
Marris Creek	Yes					
Okari Lagoon					CHA8	
Tōtara River (Nth of Charleston)	Yes				CHA8	
Pororari River	Yes		~1.5 m	Yes	CHA12	See Section 6.2.
Punakaiki River	Yes				CHA13	
Hibernia Creek	Yes					
Canoe Creek	Yes				CHA14	
Granite Creek	Yes				CHA14	
Fagan/Tipperary Creek	Yes				CHA14	
Barrytown dredge ponds	Yes				CHA14	
Bakers Creek	Yes				CHA14	
Seven Mile Creek	Yes				CHA16	
Range Creek Cobden Lagoon	Yes				CHA17	
Watsons Creek	Yes				CHA18	
Mill Creek	Yes				CHA19	
Jacks Creek	Yes				CHA19	
Clough Creek	Yes				CHA19	
New River / Kaimata (& Saltwater Creek)	Yes		2.5 m	Yes	CHA19	See Section 6.3.
Taramakau River		RC03239 (expired 2009)			CHA20	Westland District Council consent.
Serpentine Creek	Yes	RCN96213 (expired 2016)			CHA20	Westland District Council consent allowed realigning/straightening of outlet.
Acre Creek	Yes				CHA20	
Waimea Creek	Yes				CHA20	
Flowery Creek (& Kabukabuka Creek)	Yes	RC04102 (expired 2014)			CHA20	Private consent allows opening of creek mouths into the Arahura river.
Arahura River					CHA20	Dynamic river mouth but few assets at risk.
Little Houhou Creek	Yes				CHA21	
Houhou Creek	Yes				CHA21	
Hokitika River					CHA21	See Section 6.4.

River/lagoon name	Permitted activity[1]	Resource consent	Trigger for openings[2]	Water level recorder	Coastal Hazard Area	Notes
Tōtara River (nr Ross)						Very dynamic river mouth but few assets at risk.
Mikonui River	Yes					
Waikoriri Lagoon (Black Creek, Granite Creek, Waikoriri Creek)		RC02099 (surrendered 2020)	~3.0m			Westland District Council consent. Trigger level is stainless steel bolt 600 mm below deck of black creek bridge. Trigger must have been exceeded for at least 2 weeks or there are "extreme climatic conditions" (presumably flooding).
Ōkārito Lagoon		RCN93252 (expired 2013)	Yes		CHA22	Westland District Council consent. Trigger level for openings was the underside of the deck planking on the Ōkārito Wharf.
Manakaiaua River (Hunts Beach)	Yes				CHA23	
Mahitahi River (Bruce Bay)	Yes				CHA24	
Waita River						Very dynamic river mouth with shore parallel lagoon and some buildings at risk of flooding
Okuru River				Yes	CHA25	See Section 6.5.
Waiatoto River					CHA25	Dynamic river mouth has potential erosion threat to road.
Arawhata River (Neils Beach)	Yes				CHA26	See Section 6.6.

Table notes:

1. River mouths listed under Schedule 6 for the Regional Coastal Plan making it a permitted activity to reopen the river mouth if it has closed.
2. Where the trigger water level is known or able to be estimated it is listed here in terms of NZVD2016. Approximate trigger levels (indicated by ~) have been estimated based on LiDAR elevations of relevant features (such as bridge decks or road centrelines).
3. This consent contains numerous additional stormwater drain outlets not listed in this table.