1 Akaroa Wharf – Construction Methodology

1.1 Introduction

Akaroa Wharf has reached the end of its design life, and it is no longer economically viable to maintain the existing structure. CCC is seeking to rebuild a new wharf in the existing wharf's location. The new wharf structure needs to accommodate the modern needs of both commercial and recreational wharf users and will incorporate floating pontoons on both the northern and southern faces to meet the demand for additional berth space.

CCC has now approved the concept designs for the new Akaroa Wharf prepared by Holmes[1] and the floating pontoon layout prepared by Enviser and Shearwater Consulting, allowing the project to proceed to the consenting phase. Attachment A sets out the concept design and approximate location.

A suite of resource consents are required, from CCC and ECan, which will be publicly notified and decided by hearing.

1.2 Key features

The Akaroa Wharf will be rebuilt generally in the existing wharf's location. To allow for minor adjustments in the alignment of the wharf through detailed design, a construction envelope is proposed for the new wharf. This envelope covers the existing alignment of the wharf, an option to move the wharf to the north by 1.5 – 2.5 m. The alignment may also be adjusted to avoid clashes with the existing pile layout. The wharf deck and supporting piles will all be constructed within this envelope. Ancillary features, like ladders, fender piles and other fittings, may extend beyond the envelope. The exact orientation of the wharf will be dependent on the piling layout and will be refined during detailed design.

The wharf will be approximately 185 m long and 8 m wide for most of its length. The new wharf will follow a similar form to the existing wharf but with the following changes:

1.2.1 Marine side elements

- The wharf height will be raised to 3.06 m LVD-37 or 12.10 m CDD which is between 500-600 millimetres higher than the existing deck to allow for sea-level rise and storm surges.
- The proposed wharf will be approximately in its original location or, potentially, offset from its existing alignment by 1.5 – 2.5 m to the north.
- New floating pontoons will be arranged on the northern and southern faces of the main wharf. The pontoons will be accessed from the main wharf by gangways and small piled platforms.
- The southern floating pontoon will include infrastructure for diesel refuelling.
- A new crane will be installed on the western end of the wharf to assist commercial vessels with loading/unloading.
- Removal of part of the original 1887 abutment and associated reclamation back, to accommodate the increase in deck height and lateral shift of the wharf. A small area of reclamation, enclosed by a concrete 'L-wall' seawall, is proposed on the northern side of

[1] Holmes (5 July 2024) Akaroa Wharf Renewal – Design Features Report – Concept Design

where the new wharf will meet the shoreline. See Figure 1 and Attachment A for a concept of this feature and extent of abutment removal.

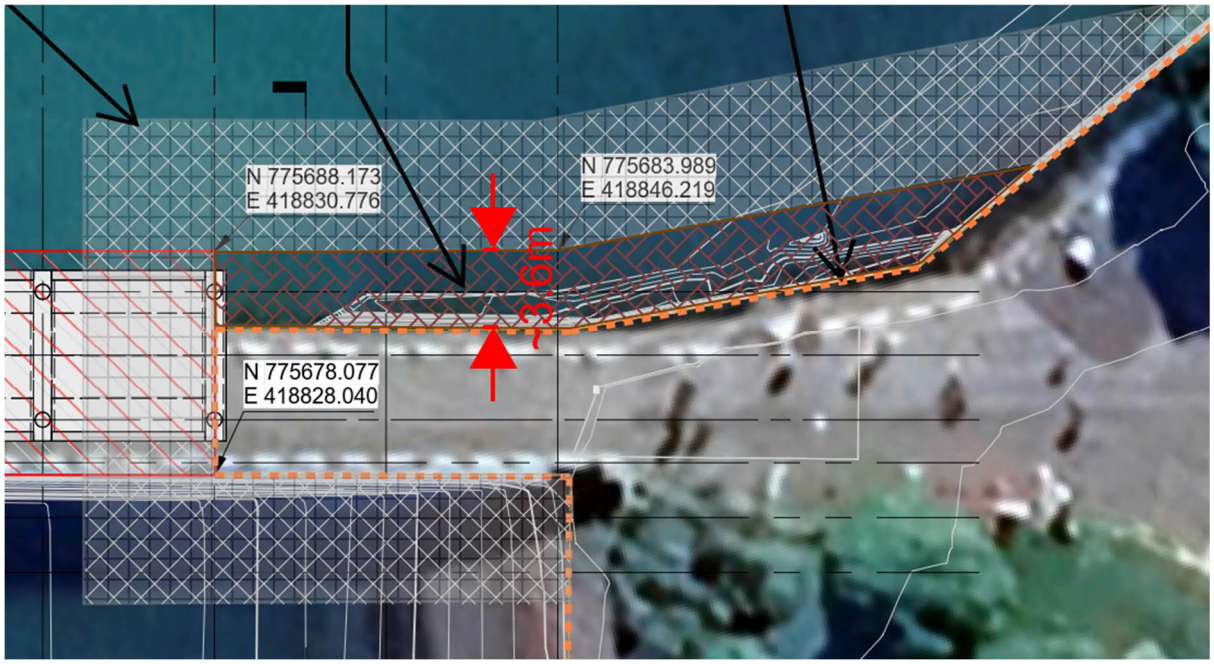


Figure 1. 'L-wall' seawall, shown between red arrows, against the northern wall of the wharf abutment (Holmes, 2025)

- Wharf materials will include reinforced concrete decking, steel-encased concrete piles, timber fender piles and timber deck elements along with various wharf fittings (bollards, lighting etc).
- To facilitate construction, a small loading ramp will be constructed on the southern side of the Akaroa boat ramp. This will require a temporary reclamation, disturbance of the seabed, placement of geotextile, granular fill and rip rap protection. A concrete surface may be required. Refer to Figure 2a for a concept of this ramp. 2-4 steel piles (610mm diameter) will be driven along the southern side of the existing boat ramp to form a training wall to facilitate the barge loading/unloading.
- The seaward approach to this ramp will require dredging to facilitate barge access (see Figure 2b). The dredge channel will extend approximately 90m from the shoreline, be approximately 30m wide. In total, approximately 1,500 m^3 of seabed will be dredged with the spoil removed to/placed either to the south of the berth pocket, or to the west where existing dredge spoil, from dredging for the boat ramp access channel, is currently placed. Dredging will be undertaken via mechanical excavator, either based on a barge, or from shore at low tide, or a combination of both.

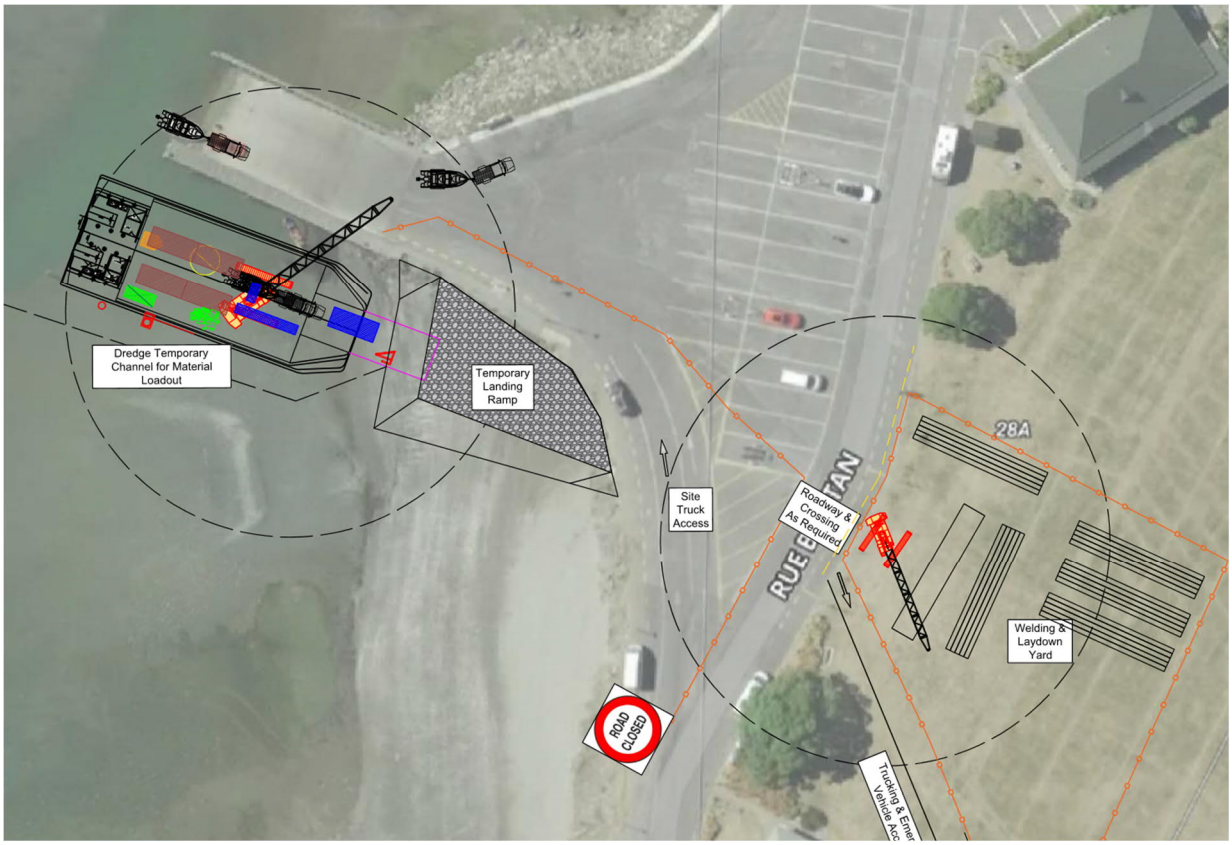


Figure 2a. Temporary landing ramp at the entrance to the wharf (HEB, 2025)

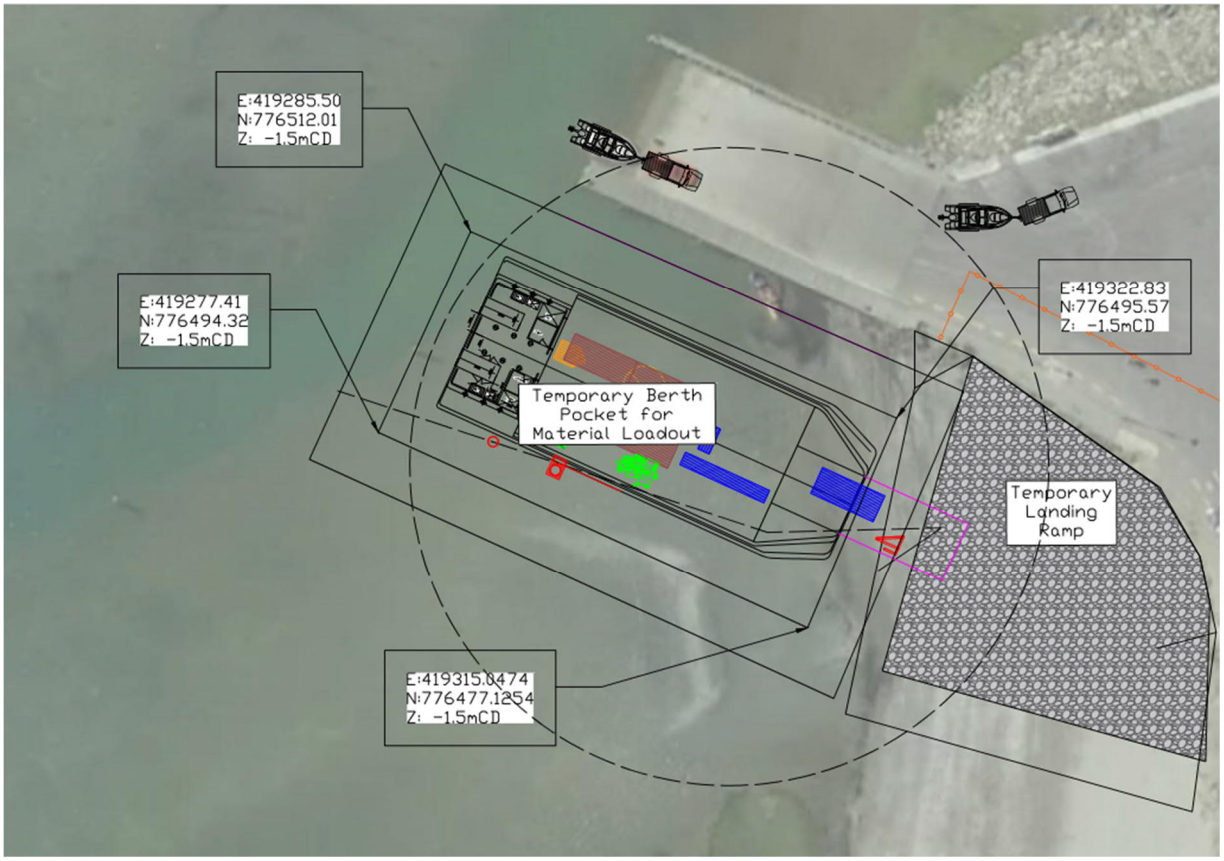


Figure 2b. Temporary berth pocket at the entrance to the wharf (HEB, 2025)

1.2.2 Land side elements

- Two construction phase laydown areas (1 and 2). These are described in more detail below.
- A vehicle staging area (located at Bruce Slipway).
- A closed section of road near the recreation ground boat ramp.
- Construction phase alterations to parking spaces and traffic movements.
- Trenching to connect services.
- Earthworks to remove the abutment and construct the new seawall, abutment and prepare for surface finishes.
- Sealing and concrete works to provide a finished surface.

2 Construction phase

Construction includes marine and landside activities; both are described in broad terms in the following sections. This information is based on the contractor's stated methodology.

The first step will be to undertake the enabling works, this will comprise the following:

1. Establish a laydown area at the recreation ground boat ramp (Laydown 1), and install security, fencing, containers and traffic management at the main wharf area (Laydown 2)
2. Establish the boat ramp (and undertake dredging) to allow the Patiki to berth alongside to transfer plant and materials.
3. Mobilise the Patiki to Akaroa (from Lyttelton).
4. Install gravity support piles and supplementary timber beams to support existing buildings post demolition
5. Construct the 'L-wall' at the base of the existing wharf.

Following piling for the building support, the piling and demolition works will commence. The piling methodology will rely on the existing wharf structure for support of the piling gates, so demolition will follow behind the landside piling front. The general sequence is as follows:

- Enabling works will commence, primarily the construction of the 'L-wall' to provide support and staging space for the piling.
- The piling rig (crawler crane) will track out behind the L-wall to install the first pile bent
- A small section of deck will be cut out and removed in the location of one pile in the bent, the other pile will likely sit outside the face of the existing wharf.
- The piling gate (two piles) will be placed on the existing wharf deck and secured in place.
- The piling rig will pitch and place the steel piles (all piles are expected to be pitched and driven in a single length). The piles will have a steel driving tip welded to the end to enable driving into the weathered basalt.
- Vibro piling (or potentially bored) methods (using a 100-ton crawler crane with an ICE 28RF vibro hammer) will be used to drive the piles as far as possible. This is a variable frequency, resonance free hammer that minimises vibration and reduces noise.
- A percussion piling hammer will then be used to drive the piles until the desired embedment into the basalt is achieved.
- If the required embedment cannot be achieved with percussive piling, the pile will need to be removed, and the driving tip removed. The open ended casing will be vibro installed back to refusal and a drill rig will be used to drilla socket into the basalt before the pile is re-driven.

- Once the piles are installed, they will be filled with concrete and the capping beams will be put in place.
- Temporary platforms/grillage will be installed on the capping beam to allow the piling rig to advance to the next bent. Temporary piles may be required to support this temporary works, but they will be the same diameter (or smaller) than the permanent piles.
- A second, marine-based piling crew, will undertake a similar operation with a piling rig based on the barge. The marine-based rig will work from the outer end, install piles and then demolish the existing wharf. Once it has met up with the land-based rig, it will assist the land-based operation with the capping beams and placement of concrete in the piles. The marine plant will also be used to remove all the old timber piles that clash with the new, with the remainder cut at seabed level using HEB's hydraulic shears.
- NB the piling rigs will not undertake piling concurrently, but the work fronts will advance together.
- Most wharf demolition materials will be shuttled by marine plant to Laydown 1 for unloading. Some of the demolition materials, particularly those sections demolished by the landside piling rig (and the buildings) will be transported by road.
- Any remaining sections of wharf will be demolished, and the wharf deck can be constructed, which will comprise:
    - Placement of precast deck elements on the capping beam
    - Installation of temporary formwork
    - Pouring the topping slab
- Finishing works (surface finishes, furniture installation, and electrical) will following completion of the wharf deck. Buildings may be constructed at this point. This section has been left until last to prevent damaging these items.

An example of the potential working setup is shown in Figures 3a and 3b below.

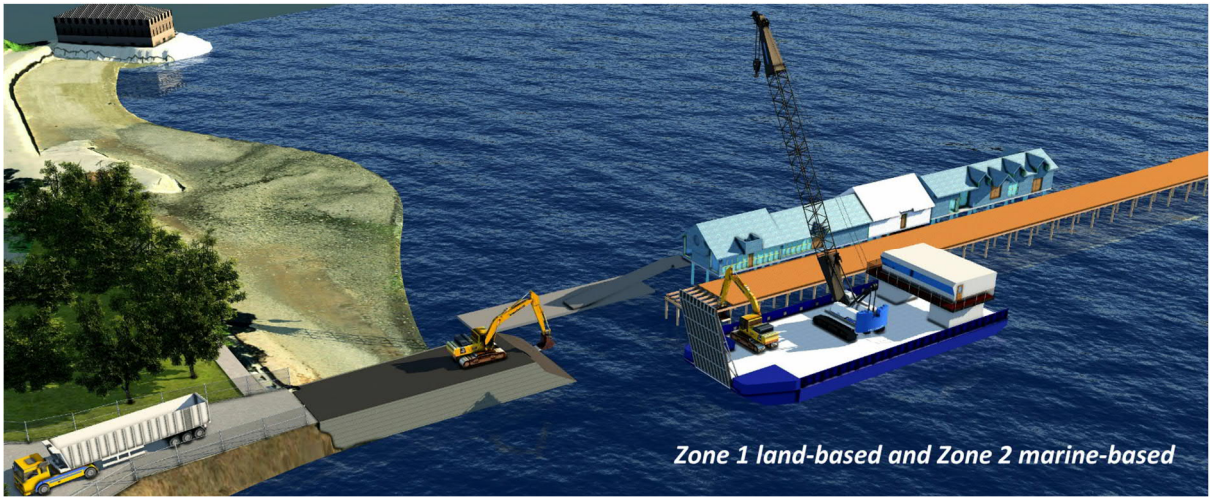


Figure 3a. Conceptual machine layout (HEB, 2024)

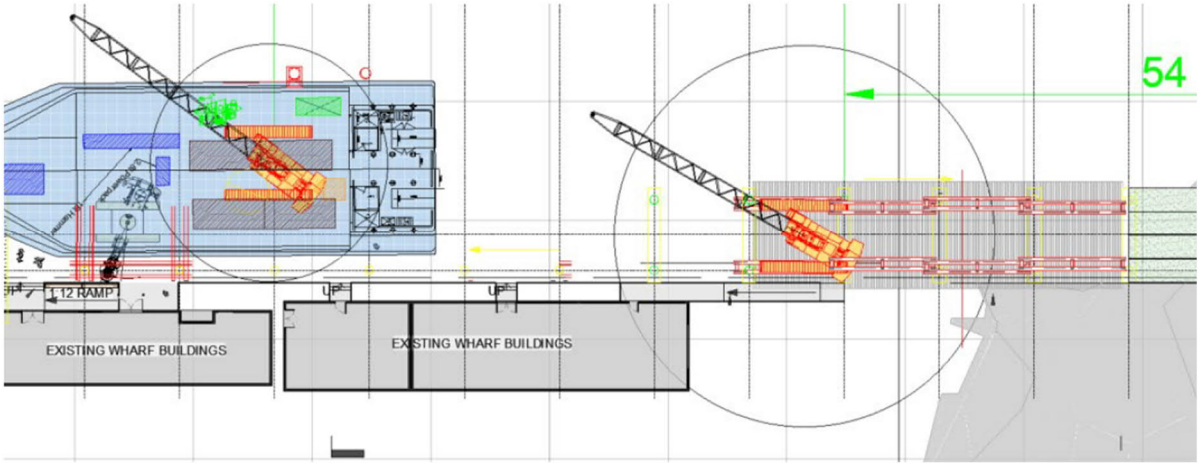


Figure 3b. 2D model of cranes and drill rig working ranges on the Patiki and staging (HEB, 2024)

Staging and Temporary Works Requirements

Land-based activities

- Laydown areas.
- Access, security, surfaces in the laydown areas.

Marine-based activities

- Landing ramp on the southern side of the boat ramp.
- Temporary piles to support the platforms/grillage.
- Landing ramp on the southern side of the boat ramp
- Training wall piles (2-4 steel piles 610mm diameter) at the boat ramp.
- Dredging (circa 1,500 m^3) at the boat ramp to provide barge access.

Laydowns (shown in Attachment B)

- Laydown 1 will be used as the main load out facility (with boat ramp access kept operational for the public)
- As Laydown 1 has enough space for the working plant to operate in and for storage of materials and containers. A 1.8m fence around the area will be erected to protect the public and existing trees. A security camera will be positioned I this location. Traffic management will be important at this location, and there will be a permanent gateman or traffic controller positioned here to direct movements and maintain traffic along Beach Road without impacting the corner of Church Road.
- Laydown 2 is at base of the Akaroa Wharf, outside the heritage areas and the public road. This laydown includes the Customs House and small park next to it. A 1.8m fence around the area will be erected to protect the public and existing trees. A security camera will be positioned in this location. Traffic management will be important at this location.
- Truck Staging Area at Bruce Slipway will be a holding point for concrete trucks during concrete pours.
- Road Closed Area will allow safe access to the temporary loading ramp.

Logistics and Traffic Management Approach

- Some items like the demolished concrete causeway will need to be taken out by road, however, the main wharf structure will be transported on the Patiki to Laydown 1 where it can be sorted and collected.
- Precast will be transported from the boat ramp to the work site via the Flexifloat barge or a self-propelled barge to allow the cranes to reach items from fixed locations.
- Traffic controls will need to be established at the wharf entrance and boat ramp for the entire duration of the project.
- Deliveries will be coordinated around busy times to avoid congestion for the travelling public.

The following notes provide additional information on the construction methodology and assumptions:

- It is assumed that dredging is not required for vessel navigation purposes (in the operational phase).
- Material/soil etc from the abutment removal will be re-used in the 'L-Wall' or disposed of at an authorised land-based facility. If larger rocks are present, they may be re-used as riprap.
- That placement of materials on the seabed will be confined to within the design footprints for the wharf (including L-wall and riprap) and floating pontoons.

2.1 Duration of works

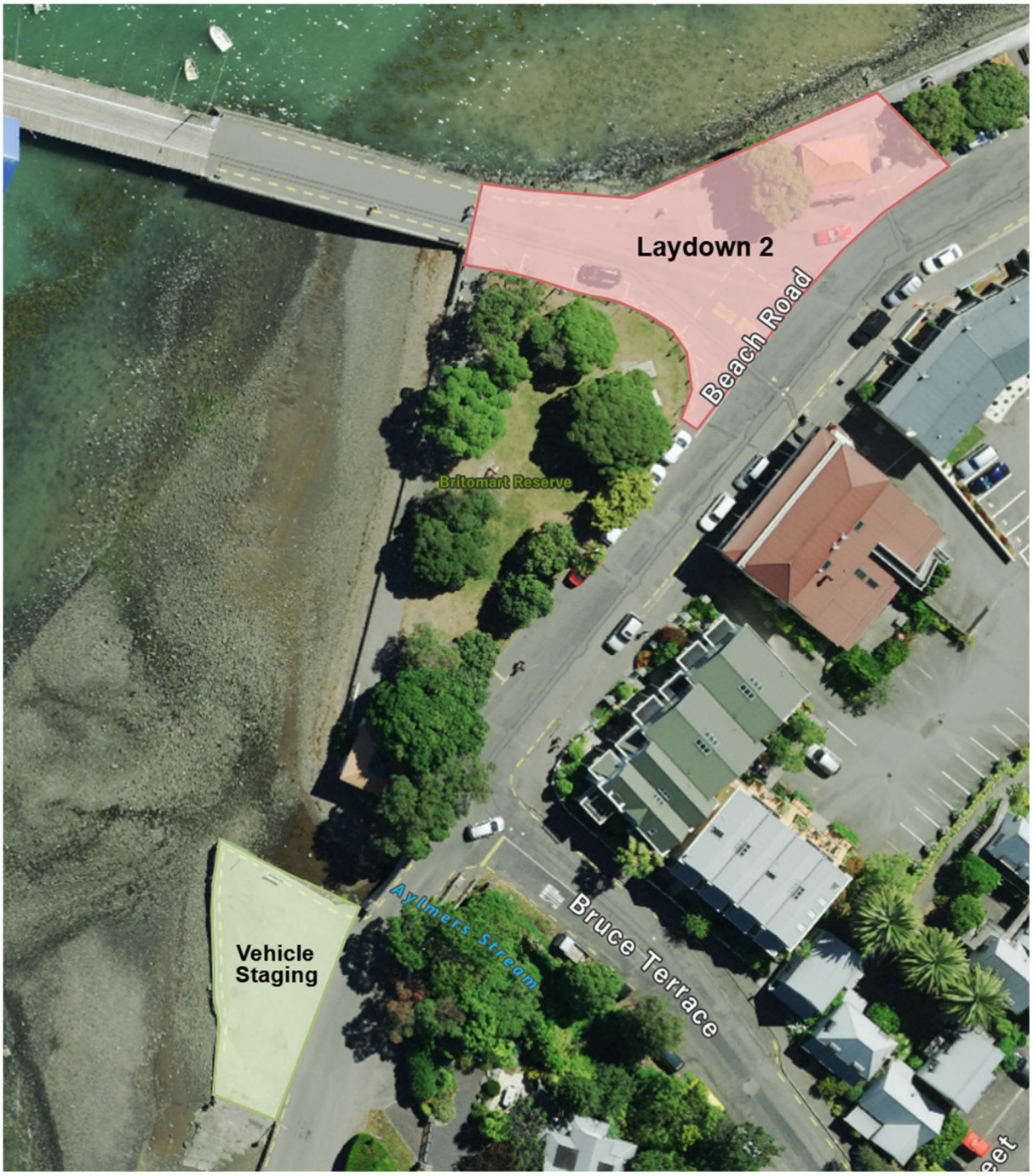
A full programme is yet to be prepared, but initial estimates are an overall programme over 11-14 months comprising (noting some works are concurrent):

- Site setup 1-2 months
- Demolition 2-3 months
- Piling and deck 5-6 months
- Deck furniture, services and pontoons 3-4 months

Attachment A

Attachment B

Laydown 1 at the Recreation Ground and the section of road to be closed for waterside access



Laydown 2 at the entrance to the wharf and vehicle staging area at Bruce Slipway