Oruku Landing CEC

Preliminary Design Report

Prepared for Whangarei District Council
Prepared by Beca Limited

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Executive Summary

1.1 Introduction/Overview

The Oruku Landing Conference and Events Centre (CEC) is a significant piece of social infrastructure for the Northland region. Beca has been engaged by Whangarei District Council (WDC) to refine the concept design and carry out further site investigation works to reduce the risks around design and cost estimate. This report documents the status of the design as of 29 October 2021 and includes changes which have been made due to the following:

- Input from Gaining Edge (events centre consultant engaged by WDC)
- Input from WDC Events team
- Input from Christchurch Convention Centre (via Otakaro & WDC)
- Latest sea level rise predictions from Northland Regional Council
- Input on design from Matakohe Architecture & Urbanism Ltd (engaged by WDC)
- Input on values assessment from Landform Consulting Ltd (engaged by WDC).

The design inputs were led by Beca Whangarei, supported by HB Architecture (Whangarei) who are engaged as a sub-consultant, as well as other Beca regional offices. Other sub-consultants engaged by Beca are Marshall Day Acoustics (Kerikeri), Marshall Day Entertech (events & theatre design), and Southern Hospitality (commercial kitchen design). All the design team except Marshall Day Entertech have Whangarei/Northland addresses.

This Executive Summary contains an overall summary of the different areas of the CEC facility, their function, design solutions, and items still to be resolved. In the Appendices each design discipline has prepared a report detailing the design solutions to date. In addition, there is an updated cost estimate and a risk register highlighting residual risks.

Note: the Boardwalk design width was extended from 7 to 10m in the last few days before issue of this report, the preliminary design has been reworked and a provision cost figure provided. This will be followed up with a formal addendum.

1.2 Preliminary Design Elements

The design development summarised in this report was based on the concept design documentation (received by WDC from the developer) submitted for resource consent under the Environmental Protection Authority (EPA) process in May 2021. The intent was to develop this design sufficiently to meet NZCIC guidelines for Preliminary Design, however ongoing disruptions due to COVID lockdowns in Auckland and Northland (from August 2021) has meant site investigations have not been completed to the extent required e.g. geotechnical and environmental. Furthermore, the concept design completed was not to NZCIC guidelines, and as a result this report while titled Preliminary Design does not fully meet this guide at the time of issue. The areas that still need to be addressed are highlighted in the relevant sections.

The CEC concept design, submitted for resource consent with the full Oruku Landing Development, was adopted as the design basis for the preliminary design. The design was developed through a series of reviews and workshops with WDC (and their advisors), Beca, HB Architecture, Marshall Day Acoustics & Entertech, and Southern Hospitality.

Primary areas of focus for this phase of design have included:

- Removal of the basement (cost reductions) and incorporation of the kitchen and storage functions into other areas of the building.

  - Management and costs of soil handling and disposal are significantly reduced by limiting the volume of soil to be disturbed.
  - Management of water table levels during construction is also significantly reduced.
- Accommodating new building floor level to meet latest sea level rise data predictions (now 3.5m RL from 3.05m RL) within the original concept design building height.
- Incorporation of building services plant, fire and associated infrastructure with minimal impact on the building envelope being consented (e.g. height)
- Confirming structural set-out and optimised grid layout.
- Improving conference and events centre spaces multipurpose functionality for all spaces, and therefore commercial attractiveness for differing events.
- Expanding front of house (FOH) gathering areas (by over 20%) and providing better connectivity between back of house (BOH) and FOH areas to improve operational functionality.
- Input from specialist kitchen designers to confirm size and configuration of kitchen spaces to meet design criteria for banquet dining.
- Input from specialist conference and events technical designers to confirm technical equipment & storage requirements and the size of BOH areas for differing functions.
- Input from specialist acoustics designer to meet acceptable noise limits for expected events.
- Incorporating expected conference and events centre administration and management requirements into layout configurations (while minimising impact on building envelope).
- Updating carparking, drop-off and accessibility strategies and other operational requirements impacting the floor plans and surrounding areas.

Overall, the project has achieved a ~11% reduction in gross floor area (GFA) from concept design to preliminary design phases (reducing the GFA by 590m^2 to ~4644m^2).

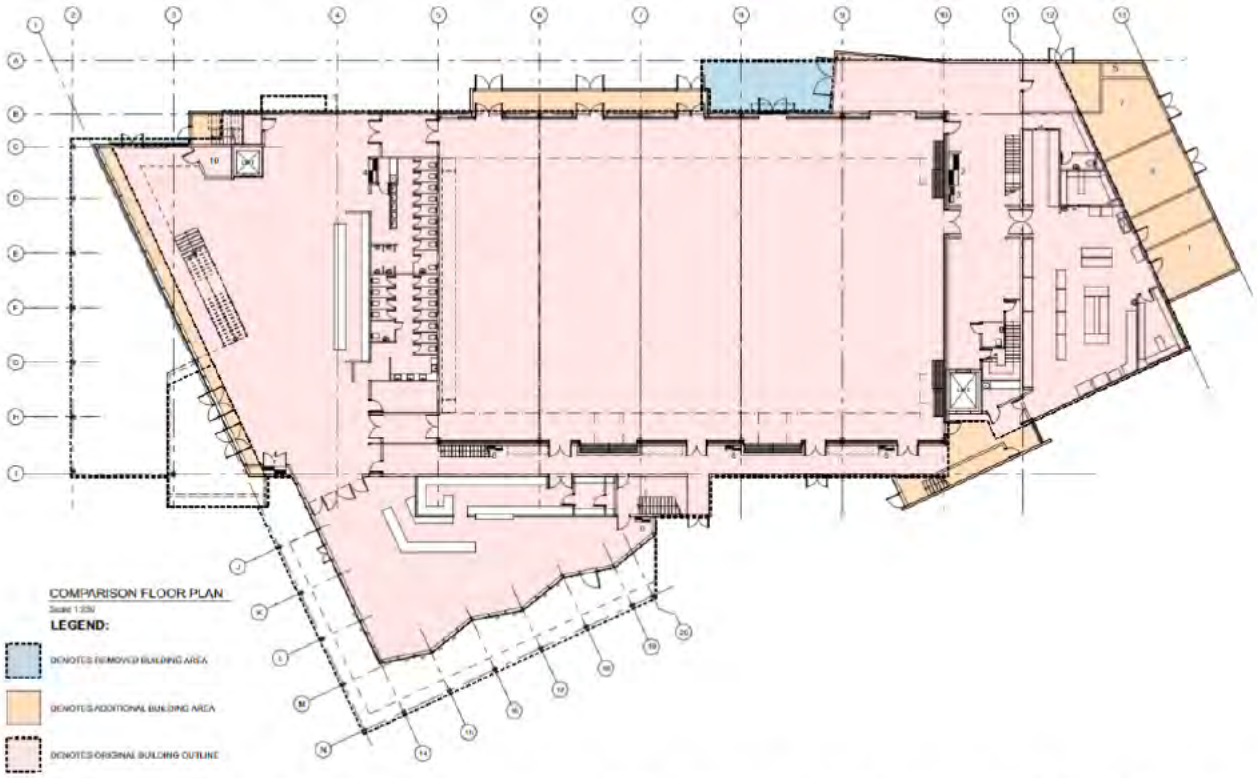

Figure 1: Changes to CEC footprint from concept to preliminary design (Courtesy: HB Architecture)

A full set of architectural drawings can be found in Appendix A of this report.

1.2.1 Foyer

The foyer area at the FOH has been expanded to provide better circulation and gathering space for before, intermissions, or after events. The reception area has been designed as a multipurpose space that could accommodate reception/welcome, box office ticketing, or as a servery/bar depending on the event requirements.

There is a manager's office off the foyer (adjacent to the reception) that can double for storage of key equipment or supplies. Other areas accessed from this space include:

- Events Space (main auditorium)
- Cafeteria
- Stairs & Lift (to mezzanine)
- Services corridor/room
- Toilet facilities for public/patrons

The stairs leading up to the mezzanine floor are intended to be a feature of this area and encourage better health and well- being as well as energy conservation through walking (where visitors/patrons are able). The original lift has been moved to an outside wall for less abled patrons, and a second stairwell included for fire egress.

1.2.2 Mezzanine & Meeting Rooms

On the first floor is a mezzanine area (over 900m^2) open on one side to the foyer below and leading to three meeting rooms of differing sizes. There is a second multipurpose reception space that could accommodate reception/welcome area or become a servery/bar depending on the event requirements. Other areas accessed from these mezzanine spaces include:

- Balcony over the plaza
- Pre-function/Restaurant area (a further 235m^2)
- Stairs & Lift (to ground floor)
- Services corridor/room
- Toilet facilities for public/patrons.

1.2.3 Events Space

The main auditorium has 1000m^2 of clear space allowing numerous configurations to flex up or scale back, depending on the event type and number of people. It is designed to accommodate the types of events and scale already shared publicly (i.e.1000 people standing, 750 terraced seated, 650 banquet dining). The design also includes the flexibility and more detail for the smaller regional events it is intending to attract e.g. multi-purpose areas, meeting / function areas and numerous smaller, more intimate theatre, performance, or speaker options.

This events space has been designed for events ranging from large to regional sized conferences (i.e. 200-300 people) and exhibitions/shows, to theatre and music performances.

Figure 2: Impression of banquet dining with stage in events space

As a result, the events space includes the following features:

- Retractable seating (up to 750)
- Modular staging system (up to 144m^2 performing space)
- Catwalks
- Acoustic design for the differing events stated
- Operable walls (partitioning the space into three independent areas)

- Control room (technicians)
- Numerous loading options for faster turnaround between events e.g., direct loading into the main event space from Riverside Drive (through double loading doors or fire doors) or via the back of house area.

Figure 3a & b: Retractable seating and plenary speaker impressions

1.2.4 Café/Eateries

On the ground floor is a 240m^2 cafeteria which can be accessed from the foyer and also with external access to the plaza and boardwalk. It has been designed to be a standalone café for third party tenancy, utilising the CEC areas for public toilets (FOH) and staff facilities (BOH). It has been equipped with a caterer's kitchen to remove dependency on the main ground floor kitchen, so it can operate on a daily basis.

Figure 4: Impression of cafeteria looking on to the Oruku plaza

On the first floor is another 235m^2 area designated for a restaurant and/or pre-function area. This space can only be accessed through the CEC foyer and stairs/lift to the first floor. It also has been designed to be a standalone facility with access the same as the cafeteria. It has been equipped with a small kitchen and bar facilities to remove dependency on the main kitchen (BOH); although for more complex dining events there is good connectivity to the main kitchen (if required).

1.2.5 Back of House Facilities

The BOH facilities are over three floors with the kitchen and backstage area on the ground floor, and the support areas on the first floor and above. Once again these have been mostly been designed as multipurpose spaces so the function could change depending on the type of event held. The support areas include:

- Storage
- Dressing rooms
- Green room
- Kitchenette, toilet facilities, lockers
- Admin spaces
- Staff facilities
- Services lift/Stairs
- Technical store
- Security

Access to the first floor is via several stairwells as well as a service lift with direct access from loading facilities to streamline operational handling processes. There are now dedicated connecting corridors at both levels from FOH and BOH to also assist streamline operations. There are also numerous plant and chiller rooms shown in the BOH area across both of these levels, with access from inside and externally, depending on event frequency and other requirements.

1.2.6 Plaza & Boardwalk

Adjacent to the CEC is the Oruku plaza and boardwalk. Maximising the usage of the waterfront facing function space and its interaction with outdoor plaza space is a key feature of this development, being river front. The plaza and boardwalk are an integral part of the accessibility to the CEC (including fire/evacuation egress) as well as enabling multiple use areas and improving general functionality through extending gathering spaces.

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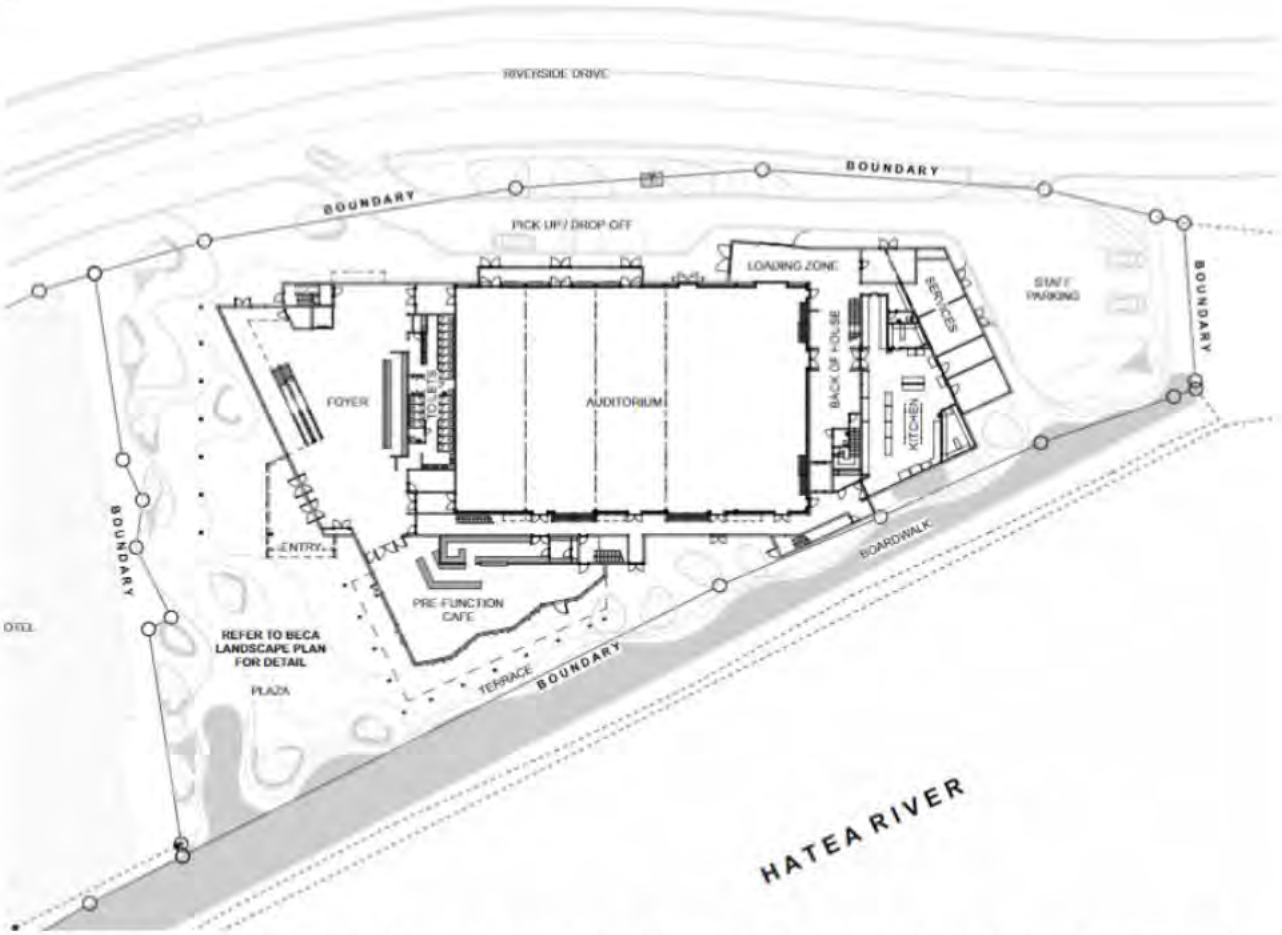


Figure 5: Overview of Events Centre site including Riverside Drive and Hatea River (Courtesy: HB Architecture)

1.2.7 Access and Car parking

Access for all vehicles to the site off Riverside Drive has not changed from the concept design, with single access and exit from the site at the eastern end and western end respectively (left hand turn primarily).

Loading and deliveries shall be to the designated back of house areas for all equipment and supplies. Reverse truck loading and side loading functionality has not changed at ground level since the concept design. However, with the removal of the basement truck loading dock, further flexibility with side loading has been provided and now includes the direct access to the main auditorium (through a second parallel loading door or through the double fire exit doors facing Riverside Drive).

Consideration has now been given to staff parking, drop-off areas (for limited accessibility), as well as loading and deliveries. Public carparking was not part of the brief for this report: it was envisaged public carparking could be provided by the private development next to the CEC, or mostly likely from existing WDC carparks at Pohe Island, Riverside Drive, or the CBD. Some events will likely require shuttle services and traffic management, and these will be managed per event with the proposed new drop-off areas.

1.2.8 Identity / Building Expression

The architecture and functionality of the building has a responsibility to reflect the values and aspirations of WDC as well as build on the cultural elements developed during the concept design phase. The design response to these priorities has not changed from the original concept brief as part of the whole Oruku Landing Development. It incorporates the direct use of materials, finishes and environmental techniques to

reflect the history of the Oruku Landing (e.g., waka, po) and elements of the Hatea River, as well as reflect the transient occupancy of the CEC with a more open building finish (compared to the proposed adjacent hotel and apartment complexes).

Figure 6: Impression of CEC Building & Plaza Appearance

1.2.9 Site

The Oruku Landing site is on the north side of the Hatea river (44-48 Riverside Drive, Whangarei). It is currently owned by the developer Golden Kiwi Holdings Ltd although ownership will be transferred to NDC (date unknown). It is understood WDC will purchase the block designated for CEC from the developer after late November 2021 (also about the time of the expected resource consent decision approval).

1.3 Preliminary Design Outcomes

1.3.1 Acoustics

A full acoustic report can be found in Appendix B of this report.

While there has been significant design development throughout the venue, the overall auditorium concept remains largely the same as in concept design. Floor areas / volumes are still similar in the auditorium. Therefore, the same risks and issues previously raised for this project still apply.

The auditorium has the potential to be a space with quality acoustics and to provide for a range of expected uses, however the large volume of the room and the multi-purpose flexible nature of the building mean that this will require careful design to achieve. This is an inevitable result of the acoustic tension between the different proposed uses in multi-purpose spaces: the acoustics that best serve banquets are not the same as those that best serve unamplified music.

As the volume is large, the room will need to "work hard acoustically" to provide a good environment for the broad range of activities envisaged in the auditorium. This will require large areas of absorption, as well as reflectors and diffusing materials throughout the space. These materials are often required to be bespoke constructions, which will add to overall costs. Acoustic materials (such as reflectors and diffusers) will be

visually "present" in the space and will require architectural integration and suitable finishes. This was anticipated in concept design.

There has been a rationalisation of the sub-divided conference room spaces in the main auditorium through the recent design review. However, the same risks still exist, sound insulation through large operable walls will inevitably be low and immediately adjacent sub-divided rooms will not be well sound insulated from each other. WDC needs to understand and accept these risks and clearly identify how conferences can be *managed* within the acoustic constraints that will inevitably occur.

Key challenges and risks:

The main challenges and risks in developed and detailed design progresses are:

Issue	Risks / Issues
Sound insulation requires careful specification	Adequate sound insulation will increase costs and will potentially pose practical challenges (e.g., smoke makeup air, ceiling specification). Without adequate sound insulation, loud bands will need to finish by 10:30 / 11pm or (in the worst case) may not be able to perform at all. Without adequate sound insulation, traffic noise intrusion into the building could also be too high.
Room acoustics requires careful specification and implementation	Large room volumes require large areas of acoustic materials (absorbers, reflectors, diffusers), increasing costs. Without suitable room acoustics, the conference venue will suffer from poor speech intelligibility for unamplified speech (and in the worst case could suffer from poor acoustics for amplified speech).
Conference room operable wall constraints need to be understood and practicable management measures be identified to overcome these.	Without a realistic understanding of the sound insulation provided by operable walls, the utilisation of the building for conferences may be overestimated.
Mechanical services noise requires extensive review and specification of significant attenuation	Our initial analysis shows extensive noise control may be required both inside and outside the building. External noise reductions may be technically challenging. Exceedance of the consented external noise limits is possible. Exceedance of internally specified noise limits would result in a space with reduced quality.

Issue	Risks / Issues
No consent has been issued	No consent has been issued yet and all design decisions have been based on a "proposed" list of potential consent conditions. Final consent conditions may be significantly different to those proposed (e.g. lower nose limits) which may have significant implications on the potential operation of the conference and events centre.

Next Stage:

The next stage is likely to be critical for acoustics. The following requires careful design:

- **Mechanical services:** a detailed analysis of mechanical plant noise is required, and practicable noise control methods need to be identified and implemented in the design. Space constraints mean that the acoustic engineer, mechanical services engineer and architect will need to work closely to identify how the required noise control will be implemented in the design. Attenuators and other noise control measures need to be specified and shown on drawings.
- **Room Acoustics:** If the current design is approved and the auditorium volumes remain the same, the room acoustic model will need to be progressed to identify where clarify, loudness and intelligibility can be improved. The materials required for reflectors and diffusers will need to be determined and the areas set aside for these identified. The design and orientation of reflectors will need to be progressed in three dimensions. Absorption materials will need to be further considered and the integration with the rest of the space further progressed.
- **Sound insulation:** one of the most critical elements is the sound insulation of the space. The roof, wall and entry/smoke makeup paths concepts need to be refined through developed design to ensure they are constructable within budget and that sound insulation risks are avoided.

To inform the above, WDC need to carefully review the current design. The final brief then needs to be clearly communicated to Marshall Day Acoustics. Specific decisions need to be made to ensure that the needs of the space are clearly communicated to us and that key decisions (e.g. the specific ways in which the auditorium will be configured during conferences) are made and communicated. As part of this, WDC should recognise constraints that we have identified (such as the constraints that will exist between immediately adjacent sub-divided conference room spaces) and identify how these are proposed to be managed.

Further to this, WDC should be aware that the competing requirements of the brief will mean that the auditorium will function better in some than in others. As such, it is critical that the WDC communicate which uses should be prioritised and which can be compromised. We will work with the design team to develop effective options for all modes, but realistically we need to know which uses should be prioritised.

Another critical risk is the resource consent. No consent has been issued yet and all design decisions have been based on a "proposed" list of potential consent conditions. Final consent conditions may be significantly different to those proposed which may have significant implications on the potential operation of the conference and events centre. These risks should be carefully considered before any detailed design is progressed.

1.3.2 Events & Theatre

A full events and theatre report can be found in Appendix C of this report.

The design basis for developing the theatre and events centre infrastructure scope has been to support events equipment, as well as ensure the minimum level of equipment required to serve basic events on opening. This does not appear to be the basis of the concept design which was very light on detail.

The approach to identifying scope was to adopt a mid-range cost approach with mid-range brands and models for the types of events and technology expected in a modern CEC. It includes areas not covered by building services, for instance:

- networking infrastructure,
- overhead rigging,
- staging equipment & control systems,
- production lighting & sound systems, and
- video production.

The associated costing has been developed with awareness of the budgetary constraints that apply to the project. The scope identified will not be sufficient to serve all events, with special effects and specific production needs requiring additional equipment to be procured as needed. The equipment shown will serve a single moderately sized event in the main hall, for example a 550-seat dramatic presentation or a single full hall dinner.

1.3.3 Kitchens

The kitchen design basis and costs estimate report can be found in Appendix D of this report.

Main Kitchen

We have based the style of catering upon a Cook / Chill / Regeneration service model; this style of function catering is widely in use both in NZ and overseas as the preferred method of function centre management.

The advantages of this style of kitchen management are:

- Requires less staff to operate and more flexibility around service times.
- Less staff means less footprint to the kitchen area, as a large brigade of chefs is not required at time of plating up to get meals out to guests in a timely manner, and a reduction in staff costs.
- Meals are prepared in advance and plated in timely manner throughout the course of the day, avoiding the peaks of a live plate up scenario, which also requires large quantities of food to be ready at exact times.

Café/Restaurant Kitchens

The approach for the café and restaurant kitchen designs has been based on the existing WDC operating model for café tenancies in Whangarei i.e. fit out a basic kitchen, with more specialty items like coffee machines etc forming part of the tenant's brief.

1.3.4 Building Services

The complete building services design report is provided as part of Appendix E of this report. This report in Appendix E summarises the proposed basis for the design of building services and to record options and key decisions that are being considered.

The previous project scheme was used as the basis of the preliminary design development and has been rationalised and further developed. The services have been coordinated with the wider project team and the inputs and briefing information provided as part of the engagement with WDC. We have also provided some Key Decision Memorandums (KDM) where specific inputs were required from WDC on key aspects. Some additional inputs are required from WDC which are noted in the report in Appendix E, and we also recorded

some key decisions taken by Beca in the current design development in conjunction with the current project brief and requirements. These are summarised below.

Heating, Ventilation and Air-Conditioning Systems

- Number of reverse cycle air-cooled chiller plant located in Back of House Roof (L3) to provide chilled and heating hot water each sized for 60-70% of the building load.
- Air handling units (AHUs) per grid zone are provided for the main events space with roof mounted with diffusers for air-conditioning. Ducted return and spill air system are coupled with the individual AHUs.
- Air conditioning provided to front of house areas using dedicated AHUs and variable air volume (VAV) terminals.
- Back of house areas provided with outdoor air ventilation and comfort cooling in occupied areas via fan coil units.
- Toilet, loading dock, plantrooms, are provided with general exhaust ventilation systems.
- Kitchen exhaust systems to fans at roof level are provided for the main kitchen (3 No.), Café (1 No.), and Restaurant (1 No.).
- Conference and events space provided with atrium smoke exhaust fans at roof level. Performance requirements yet to be finalised by the fire engineer. Smoke exhaust make-up air via louvre on Hatea river façade and operable doors.
- A standalone building management system (BMS) will be provided to monitor and control all plant. IP network based with remote access capability as well as the capability to be linked to existing WDC BMS.

Electrical Systems

- Ring-main incoming HV feed (TBC by NorthPower agreement)
- Single oil type transformer located externally with direct access for NorthPower.
- No permanent on-site generator. Generator plug-in point provided in loading dock for a rental generator.
- In-rack UPS provided for continuity of critical security and communications network
- One Low Voltage Main Switch Board (LVMSB) required and proposed to be located on Level 1.
- The LVMSB to supply all Distribution Boards (DBs), Motor Control Centres and other electrical loads.
- Power factor correction to be provided.
- Main LV distribution cables to be XLPE Cu type
- The electrical risers with DB cupboards to be accessed from common space.
- Separate DBs provided for the partitioned event spaces and stage
- Facility for metering to be provided at all DBs and MCCs if required via the building management system
- Earthing in accordance with AS/NZS 3000.
- General lighting including emergency and egress lighting to be LED.
- Separate containment for power and communications to be provided from the comms rooms, DB cupboards and risers, through the services zones. Final run-out via catenary wires and / or conduits.
- DALI and DMX lighting control systems proposed to allow for zoning of lighting, time scheduling, local override and diming of luminaires
- Metered supplies monitored via the building management system (BMS)
- The AV and Theatre Consultant will specify and locate the stage lighting
- Lighting will generally be controlled by a combination of occupancy sensors, time clock, and / or BMS.
- Exterior lighting (facade, signs, landscape areas) to be controlled via a timeclock schedule and photocell.

- All general lighting luminaires will be LED.

Communications, Security and AV (ICT) Systems

- Communication systems including: 2 No. Fibre connections to the main communications room and Cat 6A structured cabling system for both wired and wireless data. Dedicated A/V cabling, MATV cabling.
- Access control system: a number of potential card technologies to be discussed with WDC. It will be provided to cover all entrances, stair wells, back of house areas, lifts and secure areas.
- IP video management system providing CCTV coverage of entrances and main public and back of house areas. The system will be capable of remote access and monitoring.
- Duress buttons at reception and point of sales areas.
- Intercom system covering building entrances (for after-hours use) and other access points.
- A/V systems to include TVs, digital signage, linked to IPTV and MATV content, background music in public areas and lifts.
- Public address with a zoned interface.

Plumbing and Drainage Systems

- Domestic water supply comprising booster pumps and reticulation pipework.
- Domestic hot water supplied via heat pumps located on L2 roof with a primary ring main. Tempering valves provided at point of use or for groups of fixtures.
- No natural gas supply proposed for the building to align with the sustainability objectives.
- Gravity wastewater collection system serving the building.
- Gravity storm water system discharging to the storm water network, this is documented by others.
- Separate flushing valve water distribution system serving the toilets
- Centralised grease converters for main kitchen greasy waste drainage.
- Local grease collection for the café and restaurant kitchens

Fire Protection Systems

- Automatic Sprinkler system to all areas in accordance with NZS 4541 while being amended by Appendix B of C/AS2.
- The system will be supplied by a Class C1 water supply.
- Due to the lack of flow and pressure test results of the town main in Riverside Drive, the components of the Class C1 water supply cannot confidently be determined at this point in time.
- A single enhanced safety sprinkler control valve set will be provided to serve the system.
- The valve set will have an interface with a Fire Brigade Alarm (FBA) which will automatically inform the fire service of the status of the sprinkler system
- Communication and Electrical rooms may be sprinkler protected or provided with other means of fire suppression and detection systems – to be discussed and agreed with WDC.
- Fire Hydrant system to all areas in accordance with NZS 4510 including hydrant outlets at each floor and a test valve at roof level.
- Fire Alarm system in accordance with NZS4512:2010 – combination of Type 6 (sprinklers and manual call points) and Type 7 (sprinklers, smoke detection and manual call points).
- Kitchen hoods and ductwork maybe be sprinkler protected or provided with other means of fire suppression – to be discussed and agreed with WDC.

1.3.5 Fire Engineering

The Fire Engineering report can be found in Appendix F.

Fire engineering design was completed to the Ministry of Business, Innovation and Employment (MBIE) Acceptable Solution compliance document C/VM2 Verification Method: Framework for Fire Safety Design

Amendment 6, 5th November 2020, this is the basis for demonstrating compliance with the New Zealand Building Code (NZBC).

Key design issues reviewed during the prelim design phase included:

- Confirmation of the site boundaries - as this has an impact on any fire rating requirements to the external wall, especially the western end facing the river. Additionally, this may also have an impact on occupant ability to egress via the west elevation and reach a safe place without passing onto adjacent property.
- Confirmation of the use of back of house spaces i.e., currently the on the ground level the occupant load is not expected to exceed 50.
- Changes to the architectural plans to alter stair layouts, egress door locations, number of egress doors required and the separation between egress routes as noted in the fire engineering sketches.
- Co-ordinate with design team on seating layouts to allow for safe egress from the events space. This will be resolved in future design phases.
- Co-ordination on mechanical extraction system is required to establish extraction / make up air paths, and for future design phases
- Requirement of hydrant outlet within the back of house stair is to be discussed with the local FENZ safety officer.

1.3.6 Geotechnical

A full geotechnical reports and investigation results can be found in Appendix G of this report.

Geotechnical investigations were undertaken during this design phase as well as sourcing all available data about the Oruku Landing site from the regional council, local surveyors, and collected data from land ownership changes.

Current Design Basis:

The site was reclaimed by filling over harbour muds sometime between 1903 and 1940. The ground profile beneath the site typically comprises around 4m of fill and sandy alluvium, that is liquefiable when saturated, overlying around 10m of soft compressible clays to around 12m depth. Below the soft clays is a sequence of interbedded sands and silts underlain by weathered rock improving with depth. Competent founding material (rock) is inferred at a depth of around 20m.

The reclamation soils are generally unsuitable for shallow foundations. It is recommended to use moderate diameter bored and cast-in-situ socketed piles into competent rock at depth. Piles may be subject to negative skin friction if the site is loaded by filling.

The reclamation is marginally stable, filling on the reclamation or dredging in the river close to the riverbank will further reduce the stability. Stabilisation of the reclamation edge can be achieved through the use of a retaining wall tied back through the structure or (preferred) through the use of ground improvement. A preliminary design has been prepared for a retaining wall and an area of ground improvement to be undertaken.

The soft soils beneath the reclamation are compressible. While it is necessary to rase the platform level to reduce flooding risk, filling on the reclamation should be avoided as this is expected to cause large settlements (circa 300mm) that may take many years to complete. To avoid these settlement issues, we recommend the use of suspended structure to form plaza areas around the building and the use of expanded polystyrene (EPS) beneath structures/buildings rather than filling wherever possible.

Preliminary designs have been prepared for costing purposes. The recommended 'base case' solution is to support the building, plaza and the boardwalk on piles founded below compressible soils and to use a ground improvement to stabilise the surrounding soils and provide additional lateral stability.

Next stage

Note that the geotechnical investigations that would normally be completed prior to commencing the Preliminary Design but were not finished during this design phase due to COVID pandemic government restrictions preventing the contracted drilling rig operators from continuing collection of the coring samples in the locations identified. It is recommended these investigations are completed as soon as allowable.

1.3.7 Structural

A report and set of structural drawings can be found in Appendix H of this report.

The main CEC building has an overall footprint of approximately 90m x 40m and is generally two storeys high. The key drivers influencing the proposed preliminary structural scheme are compatible with the architectural concept, services requirements, operational needs of the building, and developing a structurally efficient and cost-effective scheme. The proposed structural scheme was developed based on the following considerations:

Main Building Frame

A structural grid of approximately 8.6m x 8m has been adopted based on efficient spans for the reinforced concrete suspended ground floor (podium) structure and to significantly reduce the number of roof trusses and associated fabrication costs.

Superstructure

Steel and mass timber were considered for the main structural frames. Mass timber is considered a viable option for the structure. It has significantly lower embodied carbon, is more in keeping with cultural drivers and is more sustainable than a steel frame. A steel frame with Comflor composite concrete slab and composite beams was chosen for the following reasons:

- Composite beams are more cost effective and structurally efficient.
- Shallower overall structural depth and larger spans can be achieved with composite structure.
- Precast concrete cladding (required for acoustics) is heavy. Timber structure would need to be significantly larger than steel to resist the lateral loads.
- Steel trusses spanning the 28m event space can be significantly shallower than timber alternatives and can support higher loads.
- Efficient structural grids are shorter for optimum timber design, this would require more structure and reduce clear spans / column free spaces or a compromise on head room or building height to achieve the same spans.

There are various options for composite concrete floors including precast planks and rib and infill floor systems with structural concrete topping. Comflor was adopted as it is cost effective, a robust diaphragm system and precast planks such as Hollowcore are no longer considered good practice in structural design due to their seismic performance.

Lateral System

Ideally the building is designed to be as lightweight as possible to minimize the gravity and seismic loads on the building and the corresponding structural member sizes and foundations required to support them.

For the events centre, heavy precast concrete walls are needed around the event space to achieve the required acoustic performance for the building. These walls have also been incorporated into the lateral system as shear walls to avoid the need for additional bracing of the steel frames. Distributing the lateral

loads over these longer wall lengths also avoids high localized over-turning forces and higher demands on the foundations directly below braced bays.

Vertical steel braced bays are provided in a few discreet locations around the building perimeter where there are no shear walls and where additional lateral load paths are required. For example, in the glazed facades.

Substructure / Foundations

Shallow pad footings are typically the most cost-effective foundation system for a low-rise building. The ground conditions at the Oruku site are poor and not suitable for ground bearing structures, as such the building will need to be completed, supported on deep piled foundations.

Due to the liquifiable layers and soft soils, the ground will provide limited lateral resistance to the piled foundations and a significant length of piles will be required to cantilever above embedment under a seismic event.

Driven CHS piles have been adopted due to their vertical and lateral load carrying capacity under these conditions. Driven piles are also considered more appropriate in the soft soil conditions than bored piles.

Driven piles are good in contaminated sites due to the lack of arisings requiring disposal, the disadvantage of the driven piles is the noise and vibration generated during piling operations. This will need to be mitigated during construction.

Piled foundations and ground beams will be detailed as moment frames to optimize forces and displacements in the foundations under lateral loads

Plaza

The current plaza structural scheme is the same as the concept estimate: that fill with a paving surface. An alternative structural scheme for the plaza would be a suspended reinforced concrete structure with a suspended slab supported on ground beams and deep piled foundations. The main factors considered in adopting this alternative option would around of settlement of soft soil layers and the reduced level of ground improvement required to project the existing sea wall if a ground bearing option was adopted. Refer to the Geotechnical section for further details.

The building structural grid and podium structure has been extended across the plaza area. The podium structure will need to be stepped in some locations to accommodate setting out and falls in the current landscaping scheme.

Boardwalk

A steel frame has been adopted for the boardwalk structure with a large structural grid / pile centres to minimize the number of piles to be installed in the river. The steel structure is efficient but detailing and corrosion protection will need to be carefully considered to provide suitable durability in the marine environment.

Timber joists and decking have been indicated for the boardwalk level for consistency with the landscape scheme. The indicative joist sizes allow for maintenance access for light vehicles (<2500kg) along the boardwalk.

A structural separation is indicated at the junction of the events centre and adjacent development site boundary to isolate the section of boardwalk along the edge of the event centre from the impact of construction activities on the adjacent site.

Risks

The primary risk in relation to the proposed structural scheme is in the ground and may result in modification of the proposed layouts including:

- Ground obstructions / unable to drive a pile in a particular location requiring design of transfer structure revised setting out of structure.
- Unexpected ground conditions locally requiring alternative foundation solutions.

Other risks potentially requiring redesign of the structure include:

- Availability or cost escalation of particular construction materials or products.
- Design changes initiated by Client, stakeholders, or contractor.

Opportunity for next stage:

The current structural scheme has been developed to be compatible with the other design disciplines but is largely driven by cost consideration. A mass timber structure is a feasible option for a facility of this scale and complexity but does require some compromise with respect to depth of structural zones, efficient spans, building height and cost. A hybrid option would offer the opportunity to provide timber structure instead of steel / composite structure in suitable locations where it is easy and cost neutral (or beneficial) to do so. For instance, CLT floors, plant floors, internal frames where deeper beams can be accommodated.

1.3.8 Civil

A full civil report and drawings can be found in Appendix I of this report.

An initial assessment of the impacts of predicted sea level rise concluded that the building floor level proposed as part of the concept design should be increased from RL 3.05m to RL3.5m a memo supporting this recommendation is appended in Appendix I. A preliminary design has been produced and drawings are also appended. Key outcomes from the preliminary design are listed below.

Earthworks

Removal of the basement and raising the level of the building has resulted in the elimination of any cut being required across the site. A site strip of approximately 150mm to remove existing surface materials has been recommended. This will generate approximately 870m^3 of material that will be removed from site. Approximately 3280m^3 of imported high fill will be required to up the building floor level and 4200m^3 of imported hardfill will be required to make and the stripped ground level to the formation level required for pavement construction.

Site Grading

Preliminary site grading has been undertaken based on the proposed landscape design. The site will be gently contoured with grades in the range of 1 in 50 to 1 in 200 to meet drainage requirements as well as providing an accessible outdoor plaza area for the general public.

Pavements

Plaza areas will be formed with a rigid concrete pavement with finishes to the Landscape Architect's details.

The access road and car park will be formed using a flexible pavement with an AC surface (asphalt).

It has been noted by the geotechnical engineers that settlement of the site due to increased loadings if conventional fill is used on the site. If conventional fill is used in the next stages of design, this risk will need to be considered to mitigate the risks of pavement failure due to this likely settlement.

Overland Flow

The existing overland flow path that runs directly through the site as indicated on the WDC GIS system will not impact the proposed building however it is proposed to divert the overland flow path around the northern

perimeter of the building to minimise impacts on the plaza areas. The flow path will discharge to the Hatea River at the eastern end of the building.

Stormwater

Separate storm water systems are proposed serving the plaza area and the access road and car park:

- Stormwater in the plaza areas will be collected via grated channel drains and discharged to a gravity pipe system. This system will discharge to the Hatea River via new outfall under the proposed boardwalk. No stormwater treatment is proposed for the plaza area as it will only be subject to very infrequent vehicular movements.
- Stormwater from the access road and car park will be collected via catchpits and discharged to a gravity system. A proprietary stormwater treatment device is proposed (Stormwater 360 or Hynds). This device will remove contaminants generated by vehicles using the access road and car park. Treated stormwater will then be discharged to a new manhole connected to the existing stormwater outfall at the Eastern End of the building. CCTV survey of this outfall is recommended to assess its current condition.

Stormwater reuse

A stormwater reuse tank is being proposed. This will store run off from roof areas only for reuse with the building and potentially irrigation around the external garden areas. A 30,000l buried tank is proposed at this stage. Overflow from the tank will be connected to the proposed stormwater system. It is likely that a concrete slab and surround will be required for the tank to mitigate potential flotation risks.

Wastewater

Previous reporting undertaken at concept design stage suggested that the existing wastewater pipe in Riverside Drive is relatively deep and that a gravity system for the proposed development would likely work.

A review of the as built drawings provided would suggest that existing manhole A7 in riverside drive is only 1.28m deep. The latest survey provided would indicate the lid level of this manhole is at RL3.06m. and therefore has an invert level of RL1.78m.

At this stage a surveyed level of the invert of the existing pipe has not been able to be undertaken. It is recommended that this survey is undertaken before the next stage of the design to confirm this assumption

To achieve minimum grades for self-cleaning velocity and avoid clashes with the building substructure and the wastewater pipework within the building a gravity connection to Riverside Drive may not be possible. A packaged pump station has been provided as part of the preliminary design to mitigate this risk however once levels are confirmed this may be able to be removed.

Water Supply

A 100mm diameter ductile iron water supply connection from Riverside Drive is proposed. This will serve both fire and potable supply. Metering and a valve chamber will be located in the car park. Backflow preventors are also proposed.

Power

A new transformer in the verge of Riverside Drive is proposed. This will be supplied and installed by Northpower. Ducting to the building from the transformer will be provided.

Comms

A new comms pit is proposed in the verge of Riverside Drive and a multiple ducted connection to the building will be provided.

Risks

The predicted settlements in plaza pose a risk to the lifespan of the proposed pavements and will also impact any inground services in these areas.

Opportunity for next phase:

The need for a packaged pumpstation will need to be further investigated and confirmed. Stormwater design to be further refined based on predicted settlements in the plaza areas to minimise the amount of inground pipework in the plaza area that may be affected by these settlements.

1.3.9 Landscaping/Urban Design

A full landscape report and drawings can be found in Appendix J of this report.

The preliminary landscape design of the CEC has sought to articulate the themes identified within the Concept Design. In addition, it has further resolved functional and technical aspects of the site to realise opportunities and maximise existing constraints. As with the Concept Design, the Preliminary Design objectives are to create a landscape that:

- Is Connected to Water and Place
- Has local and unique character
- Has overt cultural and historical reference

The riverfront location remains a strong influence on the landscape design and the proposed preliminary design has visually strengthened this connection through the introduction of seating, elements and patterns derived from the waterflow of the Hatea River and the resultant indentations left on the mudflats. The cultural elements, interpreted from historical use and iwi interconnection, have been maintained through the continued inclusion of Waka pole wayfinding markers and swing / hammock type seating which is located under the shade of proposed trees. The project continues to allow for the Hatea loop to link along the edge of the site through the retention of the proposed boardwalk to the riverfront.

Preliminary Design

The following changes and amendments, since Concept Design, now form a part of the preliminary landscape design:

- The improved functionality of the plaza to maximise use of sunny areas, mitigate wind and provide for multitude of uses
- Improved connectivity to the CEC through the removal of elements
- The inclusion of external lighting to promote CPTED (safety) and extend hours of use within the plaza and on the boardwalk
- Seating and steps along the boardwalk edge to account for the raised building platform
- informal seating with unimpeded views of the river and city
- The inclusion of drop-off parking and minimal staff parking to partially mitigate inconvenience of distance between nearest parking facilities and allow the CEC to function without the adjacent proposed development.
- The inclusion of drop-off parking is a key proponent of improving universal access and mobility impaired access.
- The inclusion of a loading zone outside the dripline of the existing pohutakawa trees to enhance their protection

- The width of the boardwalk is set at 10m. However, it is noted that waterfront promenades with large pedestrian traffic volumes in Auckland have a maximum width of 8m, any future reduction of width will allow for a more efficient use of funding within the wider project.
- The inclusion of stainless-steel balustrade to the length of the boardwalk to reduce the risk of serious injury and drowning.

Opportunity for Next Phase:

There remains an opportunity to further reduce plaza structural costs through consideration of light weight flexible paving (on fill instead of the podium solution), and whether this paving media would accommodate safe operations (following settlement) while still maintaining the required functionality and access around the CEC. Alternatively, the risk of settlement impact could also be offset by increasing green spaces with the plaza.

1.3.10 Environmental/Contaminated Land

A Contamination Assessment was undertaken at 48 Riverside Drive in Whangārei, as part of the proposed redevelopment and construction of the CEC Refer to Appendix K for the report. The investigation aimed to assess the potential risks of soil contamination to the proposed works and inform a management plan for suitable handling and disposal requirements.

A previous contamination assessment carried out by Tonkin and Taylor (T+T) in 2020 identified the following activities, set out on the Ministry for the Environment (MfE) Hazardous Activities and Industry List (HAIL), to have been undertaken at the site:

- **HAIL A17** (bulk fuel storage – 'storage tanks or drums for fuel, chemicals or liquid waste')
- **HAIL D5** (workshops and hazardous goods stores – 'engineering workshops with metal fabrication')
- **HAIL E1** ('asbestos products known to be in a deteriorated condition')
- **HAIL E4** (commercial concrete manufacture – 'commercial concrete manufacture or commercial cement storage')
- **HAIL F5** (boat yard – 'port activities including dry docks or marine vessel maintenance facilities')
- **HAIL I** (lead-based paint and consolidated gravel fill/reclaimed land – 'any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment')

An initial soil investigation was carried out by T+T across a wider site area. The extent of the investigation was limited in the area where the CEC is proposed to be developed and not considered adequate to fully understand the soil contamination risk.

The scope of works of the Beca contamination assessment comprised a review of information in existing documents and undertaking soil and groundwater sampling in conjunction with a geotechnical investigation. Recovered soil samples were submitted for laboratory testing to target identified contaminants of concern. Preliminary pH testing was undertaken to provide an indication of whether there are Acid Sulphate Soils (ASS) present. Laboratory results were assessed against human health and environmental criteria to determine the potential risks for site workers during construction and future land use.

The investigation targeted accessible material to a maximum depth ranging between 1.5 and 2.0m below ground level (bgl). No visual signs of buried waste were noted below 0.7m bgl in any of the sampled locations. The laboratory results indicated heavy metal concentrations above the recorded background soils concentrations and the presence of Tributyl Tin, Total Petroleum Hydrocarbon (TPH) and Polycyclic Aromatic Hydrocarbons (PAH) in various locations. All results were below the adopted human health risk criteria and not considered to represent soils that would pose a risk to future site users or construction workers during further development.

The environmental risk criteria were exceeded for copper in three soil samples and zinc in one sample recovered during the current and previous investigations. These exceedances were noted in samples recovered along the southern portion of the site between the main building and the waterfront where historical boat building and maintenance activities were carried out. The exceedances were reported for samples recovered between 0.1 and 0.75m bgl. Material below 0.75m bgl does not appear to be impacted and are not considered to pose a risk to groundwater.

The T+T report noted that disturbance of the surface material where fragments of Asbestos Containing Materials (ACM) were observed on the western boundary of the site will need to be carried out as "Class B Asbestos Removal Works". The final depth of impacted material around the building on the western boundary of the site cannot be confirmed until the building has been removed. Asbestos demolition surveys will be required prior to the demolition of any existing structures. A licensed asbestos removalist will have to manage the removal of surface and impacted soil on the western boundary of the site. Any soil disturbance to the east of sample locations SS03, SS04 and CPT04 (refer to Figure 7 of Appendix K) can be considered unlicenced asbestos works (still requiring asbestos controls).

Asbestos was detected in two surface soil samples along the southern portion of the site during the Beca investigation. The results were at and below the laboratory limit of detection for Fibrous Asbestos / Asbestos Fines (FA/AF) of 0.001% w/w and not considered to pose a risk to human health during further development in this portion of the site. No visual signs of buried ACM or bulk waste disposal was noted in any of the sampling locations suggesting that the material has not been impacted.

Based on the environmental risk from copper and zinc on the southern portion of the site and the asbestos contamination in soil on the western boundary of the site, proposed earthworks should be undertaken in accordance with procedures set out in a Contaminated Soil Management Plan (CSMP). Robust unexpected contamination discovery protocols can manage residual risk within those areas.

The preliminary pH testing results showed the potential presence of ASS. The assessment was limited to accessible soils during the geotechnical investigation and a final depth of 2.2m bgl.

The contaminant concentrations observed within the sampling across the site were consistent with material that is suitable to be reused at the site where they are disturbed. Contaminated spoils can therefore be reused if appropriately observed, monitored, managed and/or capped.

Off-site disposal of spoils from the western boundary of the site, where asbestos contamination poses to be a risk, should be considered to avoid or limit ongoing and long-term management. Any spoil from surface to a maximum depth of 0.75m bgl, on the southern portion of the site and in the vicinity of sampling locations CPT05, CPT207 and CPT07 (refer to Figure 7 of Appendix K), should be disposed off-site as opposed to being reused as far as possible since this material may impact the surrounding groundwater and river.

Where spoil is not considered to be suitable for reuse (e.g. due to geotechnical specifications), it should be disposed at an off-site facility authorised to accept such materials.

Next Phase

Preliminary pH testing results showed the potential presence of ASS but was limited to accessible soils during the geotechnical investigation. No commentary can be made for ASS at deeper depths which proposed excavations and piling will intercept. Until a stage where more information and analysis are undertaken to reduce the potential risks, conservative design principles should be adopted for concrete and steel structures above and below the water table where ASS may exist. Additional soil analysis would further assess whether excavated soil will need to be treated and neutralised prior to disposal, see section 1.8 for next stage.

1.4 Cost Estimate

The purpose of the preliminary design phase was to de-risk the project through ascertaining scope and therefore improving costs certainty from the concept design estimate (from +/-25%/20%). For comparative purposes, Table 1 has been updated with the preliminary design estimate for Conference and Events Centre (CEC) scope including full fitout to meet performance expectations and differing event types.

Table 1: Comparison Estimates – Concept & Preliminary Design

#	Description	Concept Est. $	Prelim Est. $	Prelim Maturity (%)
1	Conference & Events Centre, CEC (with plaza, services/utilities, landscaping & geotech)	80,000,000	87,450,000	Class 3 (+20%/-15%)
	Seawall Allowance / ground improvements to CEC site only	3,500,000	6,650,000	Class 3 (+20%/-15%)
2	Oruku Boardwalk	4,600,000	9,000,000	Provision Figure only - separate Addendum to be issued.
3	*Ferry Terminal (pontoon design assumed)***	*2,600,000*	*Included for comparison only*	
4	*Connecting Bridge***	*20,000,000*	*Included for comparison only*	
5	LTP Projects: Wastewater Upgrade, Punga Grove Ave Intersection, Seawall, Pathways	2,500,000	Not updated	Class 5 (+50%/-50%)
	TOTAL ($ NZ)	**$113,200,000**	**$128,200,000**	
	Land Purchase (additional)	**$10,000,000**	**$10,000,000**	

***Note: The electric ferry terminal and bridge costs were not part of this design brief so have not been updated in this report.*

Key changes for the CEC fixed costs are shown in Table 2 below, along with the reasons for the changes in the preliminary estimate (positive and negative). The main points to note include:

- Removal of the basement resulted in an 11% reduction in GFA.
- Complexities in designing for the difficult geotechnical environment have impacted the building costs
- Increased fit out costs and associated building costs to meet the project brief for maximum event size, functionality, and performance.
- The Boardwalk has not been updated to reflect complexity or staged approach required to interface the different site owners – these costs are likely to be increase beyond concept design estimates.
- The LTP projects scopes have not changed significantly since preliminary design and hence have not been updated.

Table 2: Physical Works Costs – Concept to Preliminary Design

#	Description	Concept Est. $	Prelim Est. $	Key Differences Reasons
E1	Site Preparation	1,749,000	1,477,000	Less contaminated soil due to basement removal. Dewatering allowance also reduced. Fill costs increased due to higher building floor level (RL3.5m).
E2	Substructure	6,694,000	5,646,000	Reduced foundations & lift pits due to basement removal. Increased piles (<10%) to slight increase in building footprint. Reduced concrete floor slab area.
E3	Frame	5,084,000	6,444,000	Increased weight for superstructure (building now above ground). Increased extent of intumescent paint allowance (as a result). Reduced steel trusses but offset but increased secondary steel (associated with fitout)
E4	Walls	1,851,000	914,000	Reduced area of precast walls from basement removal.
E5	Upper Floors	688,000	692,000	
E6	Roof	1,734,000	1,718,000	
E7	Exterior Walls & Finish	2,458,000	3,068,000	Increased area of external wall for acoustic performance. (VE Item) Additional external doors for fire access/egress.
E8	Windows & Exterior	109,000	250,000	Increased number of doors for fire egress. Increased external door specification for acoustic performance.
E9	Stairs & Balustrades	659,000	960,000	Increased numbers due to fire egress, and connectivity between FOH and BOH and to technical support areas.
E10	Interior Walls	1,387,000	990,000	Reductions from finalised design and budget vendor pricing.
E11	Interior Doors	244,000	580,000	Increased number of doors due to more mature design layout and fire connectivity design improvements.
E12	Floor Finishes	772,000	740,000	
E13	Wall Finishes	1,010,000	1,060,000	Green room detail included.
E14	Ceiling Finishes	1,699,000	2,785,000	Increased allowances for fire rated panels and baffled ceilings for acoustic performance. Acoustic panels in Events Centre.
E15	Fixtures & Fittings	3,740,000	3,904,000	Increased kitchen costs by $794k to provide commercial as well as restaurant and café kitchens (three lease spaces).

				Improved budget costs from vendors. Note: $289k moved to client purchase FF&E Costs (below).
E16	Sanitary Plumbing	887,000	1,012,000	Allowance for booster pumps included (VE Item) Electric hot water included as well as related sundry items (previously included below)
E17	HVAC	2,000,000	3,582,000	Preliminary design was based on a larger habitable space (above ground) with multi-functional areas. Reductions in breakout areas have not minimised cost changes e.g. reduced number of meeting rooms and in main events space from 4 to 3. Changes in HVAC performance e.g. ventilation in gathering areas discounted in preliminary design (VE Item). Related sundry items included (previously included below).
E18	Fire Services	794,000	1,088,000	Fire design to latest NZ codes. Related sundry items included (previously included below).
E19	Electrical Services	1,787,000	2,436,000	Full electrical scope as per project brief (VE item).
E20	Lifts / Access	1,500,000	670,000	Reduced due to removal of stage and floor lifts, one less building lift.
E21	Special Services	321,000	3,100,000	Increased Technical/AV equipment due to types of events included in project brief (VE Item). New scope including overhead rigging and production lighting, and sound, previously assumed provided by users per event.
E22	Drainage	119,000	413,000	Site wide design included in prelim design. New water reuse tank included (sustainability driven).
E23	External works	2,871,000	4,094,000	Increased paths paved areas about CEC ~700m2 with culturally sympathetic design (VE Item). Street furniture & fixtures increased by $328k including higher spec seating and cultural design elements (VE Item) Additional fill to raise plaza to meet higher building floor level $500k
E24	Sundry Items	586,000	505,000	
	Sub-total CEC	**40,743,000**	**$47,623,000**	**Class 3 (+20%/-15%)**

The balance of the costs to make up to $87,450,000 (Item 1 in Table 1) is made up of contingencies, P&G, Margin, Professional Fees, escalation, consents and insurances, and client direct costs. Full cost estimates can be found in Appendix L.

Value Engineering completed during the preliminary design phase, has been incorporated in the cost figures and approaches above, as far as possible. There are further opportunities for simplification of the scope (and potential costs reductions) noted in Table 2 above (VE Items), as well as these below:

- Building and services optimisation.
- Incorporation of lighter structural members (e.g., timber – less embodied carbon) to support possible sustainability outcomes.
- Optimisation of CEC fitout and some structural/building finishing details versus event scale & functionality/performance
- Optimisation of landscaping (external) scope against incorporated cultural design values.

1.5 Programme

1.5.1 Key dates

The programme is based on a number of key milestone dates as noted in the following table.

Milestone	Date
Decision by WDC to proceed	30 November 21
Vacant possession of the site	16 March 22
Resource Consent obtained no later than	30 June 22
Piling commences no later than	30 September 22
Overall project completion	April 2024

The detailed programme is included in Appendix M.

1.5.2 Commentary

The key change to the design since the previous report has been more detail around the ground improvement works adjacent to the sea wall. This has resulted in additional activities added to the programme. The main features of the programme are that the ground improvement and piling works will be split out from the main design at the end of developed design in order to fast track the detail design of these packages. This is required so that piling can commence by the September 2022 deadline for CIP funding. There will also be other early works packages, see the following section for more details.

The boardwalk construction has been split into two stages to allow for access from the adjoining development site. This does not impact on the overall programme.

The basement has now been removed from the design which has saved some time in the sub-structure works. It is envisaged however that current constraints on supplies of labour and materials due to COVID will continue. Due to this the overall programme duration has been kept unchanged to allow for the reduced productivity currently being experienced on large construction projects and potentially delayed start dates due to future COVID government strategies.

The overall estimated construction period from start of demolition to completion is 25 months.

The design stages follow the NZCIC guidelines for design and it is expected that Preliminary Design will be complete by the end of October.

Construction will be staged to allow for early works packages as noted above.

1.5.3 Procurement

Discussions with WDC regarding procurement have been at a very high level to date. During this stage of design ECI discussions have been held with a number of specialist sub-contractors to obtain inputs on design, supply chain constraints, programme and budget. Some of these are:

- Commercial kitchen – Southern Hospitality Ltd

- Piling – Spiral Drillers
- Façade – Thermosash
- Retractable seating – Profirm Commercial
- Modular stage – MD Entertech
- Operable Walls – Hufcor
- Bifold Doors – Mirage Doors

Meeting the programme milestone dates depends on early works packages being let in advance of the main contract as follows:

- Asbestos removal
- Demolition and site clearance
- Piling
- Bulk filling
- Ground improvement works

It is likely that these packages will be let independently of the main contract unless a decision is made to formally engage a main contractor on an ECI basis at the next design stage.

Main contractor procurement is still to be discussed in detail however early indications from WDC are that this should be a fully designed tendered package with contractor design elements. Recent circumstances around availability of materials and labour together with the consequential cost increases dictates that there should be further discussion on how this risk is allocated through the tender process.

1.6 Risk Management

An updated Project Risk Register and Safety in Design Register developed during this phase can be found in Appendices N and O respectively.

Two workshops were completed as part of this design phase:

1. A full risk review of the project risks, frequency, consequence and mitigations / controls.
2. A number of Safety and Design (SiD) workshops were held looking at building-use, building design as well as civil/landscaping. These reviewed the almost completed preliminary design and captured risks and suggested controls for the next design stages.

There were no significant new project risks identified during this design phase, and further confirmation that risk to the programme delivery is going to continue to be challenging for this project. The preliminary design phase provided more particulars about the risks that could impact the programme; the high risk areas include:

- Impacts of COVID and lockdowns seen on project costs and programme from limited materials supplies, higher rates, less or no availability and loss of productivity of contracting resources.
- Interfaces with adjacent properties, and limited access during construction has negative impacts on the boardwalk and seawall costs and programme.
- Acceleration of piling and ground improvement designs may lead to less optimal project costs (to meet schedule).
- Alignment between fitout / performance expectations and capital budget.
- Continued stakeholder engagement and support.
- Settlement of the plaza expected in the first 5 years will impact on cost, programme, and ultimately escalation costs.

There are mitigations in place for all the risks identified and these will be closely monitored as the project and design progresses.

1.7 Consenting/Planning

A Preliminary Design Planning Assessment and Strategy was prepared and is provided at Appendix Q. The purpose of this is to:

- capture identified changes made to the CEC design or scope through development of the preliminary design,
- provide advice on any identified additional triggers or changes to reasons for resource consent, and
- recommend a consenting pathway to obtain any further approvals required for the design changes.

A summary of the findings and recommendations is provided below.

1.7.1 Update on EPA Application

Northland Development Corporation (the 'Applicant') are preparing a resource consent application to construct and operate a hotel and entertainment precinct at 44A, 44B, 46 and 48 Riverside Drive (Oruku Landing). An Order in Council has been gazetted which includes Oruku Landing within the COVID-19 Recovery (Fast-track Consenting) Act 2020 as being referred to an expert consenting panel. The application consists two stages:

- Stage One: a hotel, mixed use building, marina and boardwalk; and
- Stage Two: multi-purpose conference and events centre and public plaza.

The development has been gazetted and it is understood the Applicant plans to formally lodge the applications with the Environmental Protection Authority (EPA) in December 2021, including a response to information requested by the EPA. Once resource consent is obtained through referral to the EPA, it will be transferred to WDC for implementation of Stage Two, the CEC and also the partial transfer of the 'public' elements of Stage One.

1.7.2 Project Updates and Changes Since Concept Design

Design changes relevant to consenting are separated into two key areas: the CEC, and potential works to the existing rock seawall.

Key design changes to the CEC considered from a consenting perspective relate largely to the building envelope, parking and transport, or any changes to the use of the building. No change to the use of the building is proposed. Design changes identified include alterations and additions to the building envelope, addition of plant rooms and roof plant and addition of a car parking area.

Following further geotechnical investigation and structural design, the need for ground improvement works to the site and upgrade and replacement of the existing rock seawall was identified.

1.7.3 Issues / Gaps Addressed

<u>Planning Context</u>

Since preparation of the draft application provided to Beca, the Appeals Version of the Whangarei District Plan (WDP) is now to be treated as operative, unless there are any outstanding appeals. For the purpose of the CEC, there are no appeals on any applicable rules (only new rules which are under appeal), therefore the provisions in the Appeals Version relevant to the site are considered operative. The planning assessment undertaken reflects this change.

<u>Consenting Requirements -</u>

Conference and Event Centre

Changes in consenting requirements under the WDP for the CEC include:

- Rule WZ-R3 Building and Major Structure Height: increase in max height to 15m (roof plant) (discretionary)
- Rule WZ-R4 Building and Major Structure Setbacks: CEC building is located within 3m of the open space zone. New design brings the building closer to, and adjoining, the boundary with the open space zone, and further infringes the MHWS 10m setback (discretionary)
- Rule WZ-R5 Building and Major Structure Height in Relation to Boundary: increase in infringement between the building and the Open Space Zone boundary (discretionary)
- Rule WZ-R8 Building and Major Structure Coverage: The CEC building footprint will increase by 99m2 to 3047m2 (overall site increase of 0.8% to 63.5%, or a coverage of 52.8% of the newly subdivided CEC site) (discretionary)
- Rule WZ-R10 Car Parking: Carparking is proposed at the eastern end of the site within 20 metres of the MHWS that is not within a building (discretionary).

Seawall

WDC holds an existing resource consent with Northland Regional Council (NRC) to place, use and occupy space with rock seawalls, maintain and repair rock seawalls using heavy machinery and to alter and extend rock seawalls in specified locations.

Consequential to ground improvement works there may be a need to replace the rock seawall on a like-for-like basis. This may be able to be undertaken as maintenance and repair activities in accordance with the existing resource consent. However, this interpretation would need to be confirmed with NRC.

If it is determined by NRC that the activity is not covered by the existing resource consent, a new resource consent would be required. The likely reasons for consent additional to those already being sought through the EPA process include:

- RMA Section 12 Coastal Permit: A coastal permit will be required for the temporary occupation and use of the coastal marine area.
- The alteration or extension of authorised structures (Operative Coastal Plan)
- The reconstruction, alteration, extension of a hard protection structure (Proposed Regional Plan)

Diversion of (ground) water and discharge of contaminated groundwater are also likely to be required to undertake the ground improvement works associated with the seawall replacement. Further design detail and liaison with NRC would be required to determine the exact consenting requirements.

Other

Potential additional consent triggers not accounted for or applied for in the lodged fast track application have been identified. This includes for prerequisite and enabling infrastructure (if required), including:

- Underwater noise from piling works for the boardwalk
- Diversion of (ground) water and discharge of contaminated groundwater associated with ground improvements works and bulk earthworks
- Riverside Pump Station upgrade
- Pedestrian and cycle bridge

Detailed design and identification of the construction methodology is required before the consenting requirements can be determined for these activities. It is likely some consents will be required for all activities, possibly with the exception of the Pump Station upgrade.

1.7.4 Statutory Approval Pathway

Conference and Event Centre

Three RMA approval strategies were considered to obtain the resource consents required for the design changes to the CEC:

- Addendum to the current EPA application for Oruku Landing.
- Section 127 change of consent conditions; and
- New resource consent relying on existing application as part of the existing environment

Based on an initial review of effects, the recommended strategy is for an addendum to the EPA application to be prepared and lodged with the application in December 2021. This will likely result in the shortest timeframe for obtaining the approvals to undertake the works, with the design changes consented at the same time as the rest of the development.

Inputs likely to be required for an addendum include:

- Revised Plans and Drawings
- Update / Addendum to the Cultural Impact Assessment
- Update / Addendum to the Landscape and Visual Assessment
- Update / Addendum to the Urban Design Assessment
- Addendum to the Assessment of Effects on the Environment outlining the changes in scope, consenting triggers and effects.

Information to assist an addendum can be provided to the Applicant in parallel to the delivery of this Preliminary Design Report.

The risk of not pursuing this strategy, it that there is insufficient time to alter / amend or seek new consents for the changes and enable piling to commence by September 2022.

Seawall

Because the replacement of the seawall is a new activity that has not been assessed in the EPA application, it is recommended that, if it is required (subject to confirmation from NRC on the use of the existing consent), a separate resource consent application for the works be submitted to NRC.

Based on the likely resource consent requirements, the following technical inputs would likely be required:

- Assessment of Effects on the Environment
- Seawall Design Drawings
- Cultural Impact Assessment
- Construction methodology outline
- Environmental controls and construction management plans – particularly erosion, earthworks and flood
- controls.
- Reasoning for proposed works and assessment of three additional options/construction methods.

It is anticipated that it will take six to nine months to obtain these approvals.

Other

Additional resource consents will need to be obtained separately for any construction works, prerequisite and enabling infrastructure once more details are known.

1.7.5 Risk

Key risks identified are as follows:

- EPA application rejected (very unlikely, medium)
- EPA application declined (unlikely, very high)
- EPA conditions are onerous, unexpected and combined (very likely, low)
- Known additional consents (low, low)
- Addendum approach fails (unlikely, very high)
- Potential additional consent requirements for the works or enabling infrastructure for which detail is not
- yet known (likely, medium).

1.7.6 RMA Planning Work for Next Stage

Based on the above, planning tasks required in the next stage would involve confirmation of additional consenting requirements such as for the seawall works, construction works and any pre-requisite infrastructure and the preparation and lodgement of any relevant / required resource consent applications.

There will also need to be a transfer of the consents from the applicant to WDC and possibly splitting out of the Boardwalk elements from the Stage One consents.

This assumes the Addendum to the EPA strategy is successful.

1.8 Opportunities & Decisions for the Next Stage

The following areas not completed during the Preliminary Design (due to COVID restrictions) will need to be progressed with urgency at the beginning of the next design stage, to further de-risk the project scope and reduce contingency allowances:

- Geotechnical coring sampling completion
- Completion of local services testing e.g., fire hydrant
- Contaminated land and environmental testing:
    - Asbestos demolition surveys should be undertaken prior to any building demolition works at the site.
    - Soil and groundwater sampling should be undertaken if any soil from deeper than 2m bgl or groundwater be extracted during earthworks, including during piling.

The next stage of design should prioritize the following areas to keep the project programme on track and to assist achieving milestones for piling:

- Optimisation of piling design (with updated geotechnical and environmental information).
- Review and confirm WDC requirements for project brief (see Appendix R) and expectations of costs against event centre performance, functionality, and project outcomes. Initial feedback from Keith Beal (CHC Convention Centre) suggests there are opportunities for rationalising this element of cost.
- Optimisation of building design against services, acoustics, and events/theatre scopes including closeout of Key Decision Memorandums, see list below (KDMs).
- Further land and environmental testing:
    - Once more details around the design and proposed construction works have been confirmed and the consent conditions have been reviewed, a CSMP will be prepared to include suitable management procedures for undertaking earthworks.
    - Should excavation works extend below the highest recorded groundwater level (approximately 0.5m bgl) and require handling and offsite disposal, then further testing of soil identified as Potential Acid Sulphate Soil should be undertaken. Piles and construction

materials to be located below the groundwater level will have to be designed assuming the presence of acid sulphate soils unless it can be ruled out by further testing.

- Continuation of ECI engagements started in Preliminary Design to confirm programme impacts on materials supply, and contract resources.
- WDC to complete land title changes between Oruku plot and Hatea walkway reserve to enable fire wall requirements to be realised (see Fire Engineering for further details).

KDMs By - Issued / Status

1. Civil - Finished Floor Level / Approved
2. Building Services - Services Layouts / Pending
3. Structural - Timber Structure / Draft
4. Structural - Plaza Substructure / Draft

1.8.1 Other Opportunities

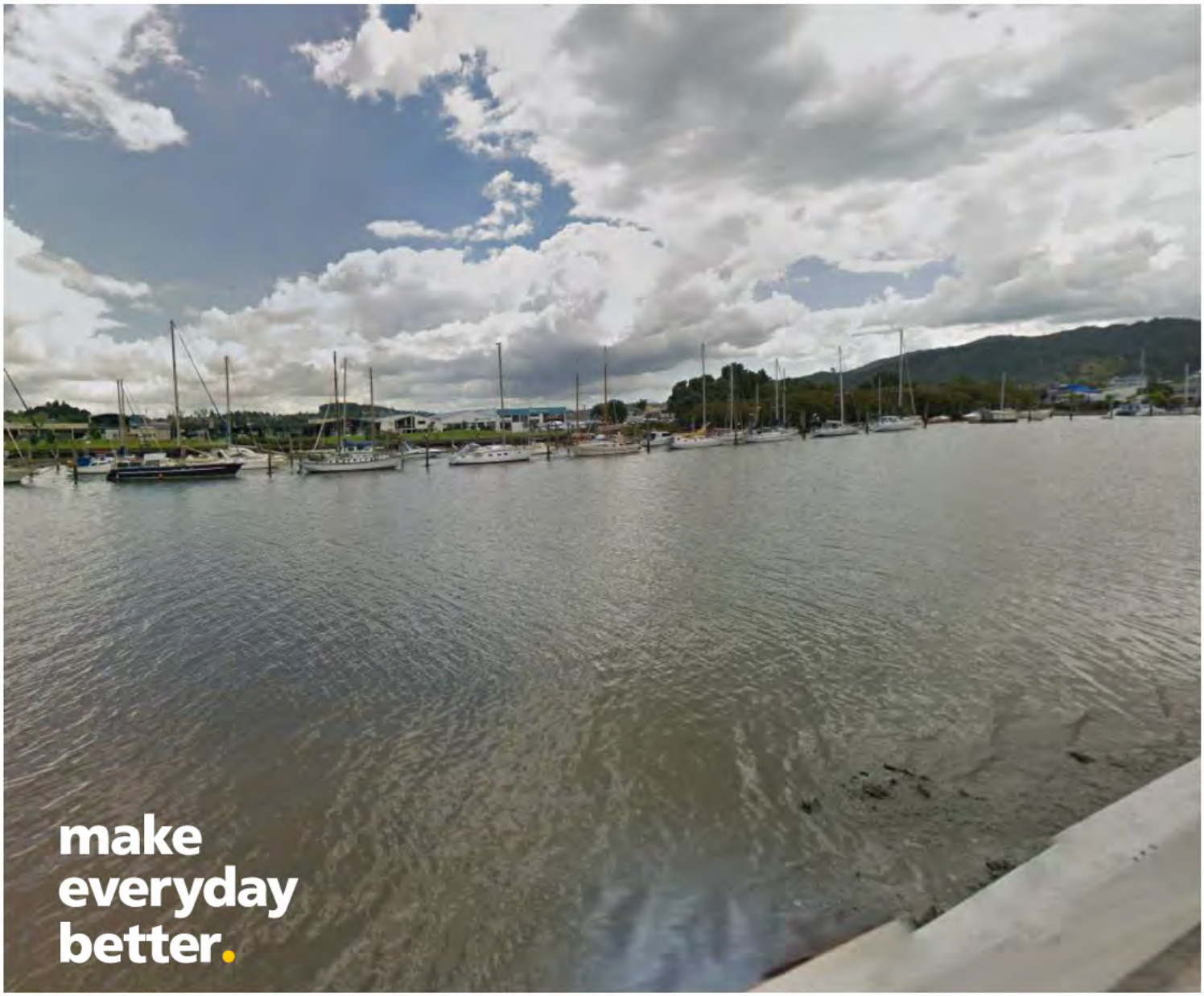
- BIM360 Modelling information - requirements to be agreed with WDC and update design team approach for the next phase. The benefits include streamlined design information sharing and asset data capture for future handover.
- Sustainable Design - early in the preliminary design phase, an ESD workshop and review was completed to gauge WDC appetite and consider options for certified sustainable design. Of the six options proposed (including no certification) for the future design phases an aspirational target of Zero Carbon certification (internationally recognised standard) was recommended. This was concluded to be the most achievable target certification, assuming 3rd party investment in solar panels to offset operating costs. Appendix P has the full Environmentally Sustainable Design (ESD) assessment.

Oruku Landing Bridge Feasibility Study

Report

Prepared for Whangarei District Council
Prepared by Beca Limited

1 November 2021



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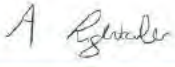
Reviewed by	Andy Lightowler		04/11/2021
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on behalf of	Beca Limited		

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Executive Summary

The proposed development known as Oruku Landing, on the northern side of the Hātea River includes a conference and events centre, hotel, and apartments. The only connection between Whangarei City Centre and this development is the existing Canopy bridge and Victoria bridge.

This study has been prepared by Beca Limited (Beca) for Whangarei District Council (WDC) to consider whether a new bridge connection between Oruku Landing and Whangarei City Centre ("the project") is feasible, what benefits may be derived and provides a recommendation on a feasible and suitable bridge location. The scope of the study excluded consideration of alternatives to a bridge e.g. Gondola or bus link. An option to progress with no new bridge (do-nothing option) was also considered.

The project supports the strategic direction set out by the strategic and precinct plans developed for different areas surrounding the proposed connection. This also supports the targets set out in the Walking and Cycling Strategy for Whangarei by providing a safe, and additional, connection for people walking around the Hātea River.

The potential users of this connection include people accessing Oruku Landing travelling to and from the conference and events centre, hotel and apartments from Whangarei City Centre, people heading towards Whangarei City Centre from suburbs on the northern and eastern side of the Hātea River and people walking or cycling the Hātea Loop. The proposed connection provides the following benefits to potential users:

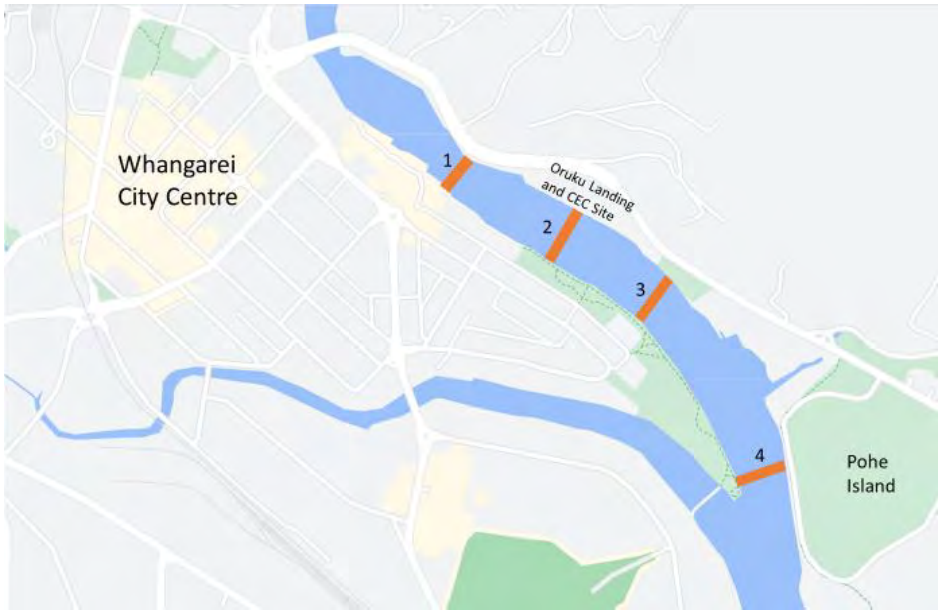
- Increased safety for people accessing Oruku Landing
- More direct access to Oruku Landing from Whangarei City Centre
- Additional crossing along the Hātea Loop.
- Provides for active transport modes
- Supports walking and cycling as a lifestyle

The objectives of this project that have been agreed with WDC include:

- Provision of direct connectivity to the Oruku Landing development
- Improved connectivity for the community
- Improved connectivity for tourists.

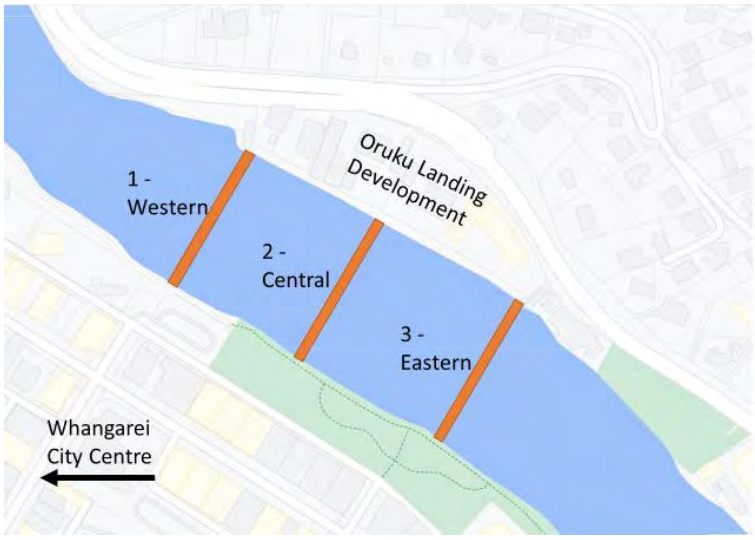
To investigate and determine a feasible pedestrian and cycle bridge location an options assessment process was undertaken. Four longlist options were developed and assessed against the project objectives, as well as a do-nothing option. The four options are shown in the following figure.

- Option 1: To the north-west of the development
- Option 2: Connecting into the development
- Option 3: To the south-east of the development
- Option 4: At Hihiaua Park and connecting with Pohe Island.



Long list Option 2 was identified as the preferred option to be taken forward to be further developed and analysed at the shortlist stage. This was because the bridge provided a direct connection into Oruku Landing, meeting the key objective of the project, whereas options 1, 3 and 4 did not provide direct access to Oruku Landing.

Three shortlist options were developed which were variants of Long list Option 2. The three shortlist options are shown in the following figure and included connections into the western (option 1), central (option 2), and eastern (option 3) areas of Oruku Landing.



The three shortlist options, and the do-nothing option, were assessed using a Multi Criteria Assessment (MCA) tool and were assessed against a set of 13 criteria with measures for each criterion identified. The criteria covered environmental, cultural, socio-economic, movement, construction, and cost considerations. Each criterion was qualitatively scored by technical experts and then challenged at an MCA workshop.

A Hui with Hapu representatives of Te Parawhau, Ngati Kahu O Tongare, WDC, Beca and the Cultural Impact expert for the Oruku Landing project was held on Wednesday 27 October. Support for the selection of Long List Option 2 was received. While no specific differentiation based on Cultural

values / Impacts was identified between the short list options, more detailed information was needed to inform this assessment. If project funding is confirmed a full Cultural Impact Assessment will be necessary, and that is the most appropriate mechanism to explore the impacts of the short list options.

Following the MCA workshop, the western option was determined not to be preferred due to a combination of constraints identified at the western end of the Oruku Landing site. These constraints included construction constraints, likely reclamation of the coastal marine area, impacts on, and proximity to the waka landing site, associated adverse effects on associated cultural values, noise, light and maintenance access.

Both the Central and Eastern options were identified as feasible bridge locations to provide a connection between Whangarei City Centre and the Oruku Landing development. Benefits and disbenefits are summarised in the table below.

	Benefits	Disbenefits
Central Option	• Provides a direct connection into the public plaza and closer connection to the city centre • Located within WDC and publicly owned land • Improves user safety, social cohesion, and urban design outcomes. • Supports social cohesion and connectivity for the community and tourists	• Impact to Whangarei Marine Trust property (moorings) • Delay to boat navigation • Noise and lights from the operation of the bridge would likely impact residents of the proposed apartment building and hotel guests. • Staging of Oruku Landing development could impact constructability.
Eastern Option	• Located within WDC and publicly owned land • Provides a suitable connection into the Oruku Landing development • Integrates with surrounding land uses • Has minimal impact on Whangarei Marina Trust property • Improves user safety, social cohesion, and urban design outcomes. • Supports social cohesion and connectivity for the community and tourists	• May impact access to boat shed • Greatest delay to boat navigation • Longest span of approx. 120m

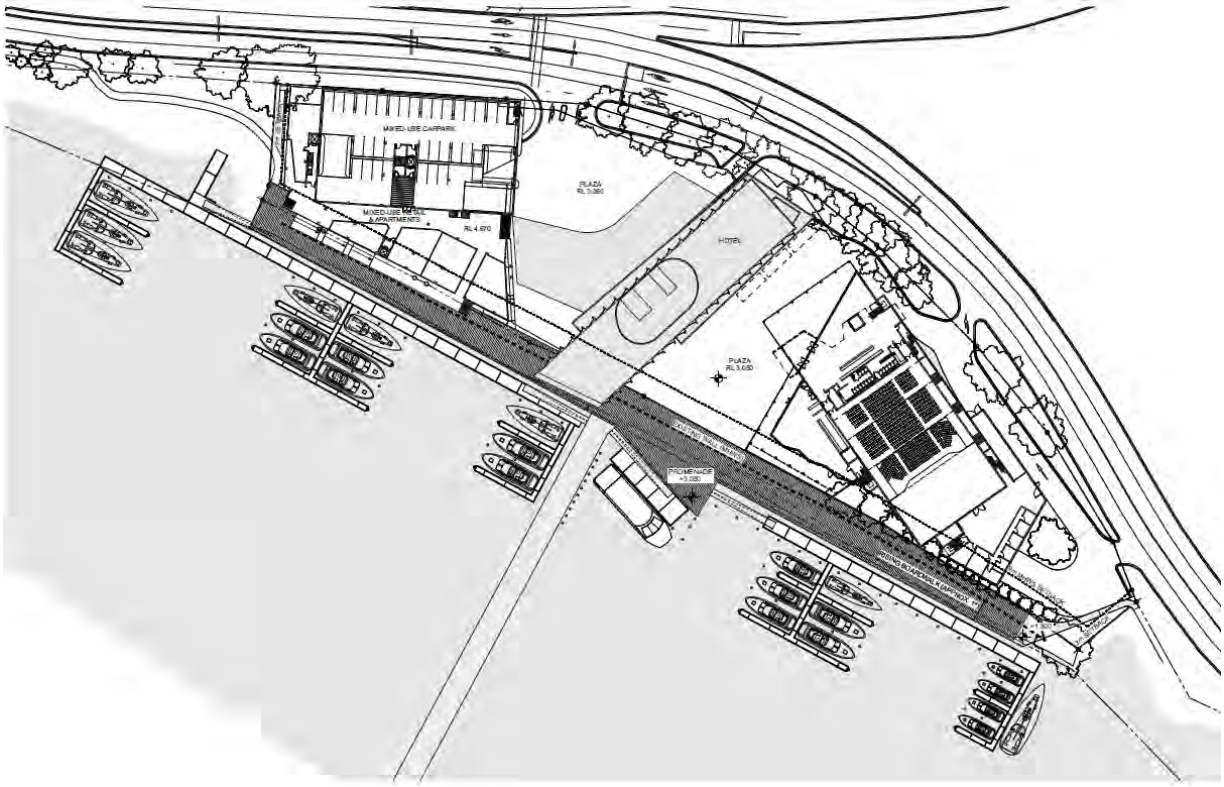
While both options are a suitable solution, they would both need to be explored further in more detail considering design refinement, constructability, and staging, and be subject to consultation with key stakeholders and affected parties. The do-nothing option is feasible; however, it is not preferred as it does not provide the benefits that a bridge option provides.

Consideration has also been given to whether the preferred option would change if the assumptions made in the MCA were to change, e.g. the issues raised by the harbourmaster could be overcome, if additional car parking was provided in the CBD, etc. This concluded that there may not be a need for a bridge if the assumptions were to change.

1 Introduction

This feasibility study is for a proposed shared walking and cycling connection between Whangarei City Centre and a new development at Oruku Landing and the northern side of Hātea River. The proposed connection is shown in **Figure 1.1**.

Figure 1.1 – Proposed Oruku Landing development and Bridge connection to Whangarei City Centre (source: Northland Development Corporation)



This study has been prepared by Beca for WDC to consider whether a new bridge connection between Oruku Landing and Whangarei City Centre (“the project”) is feasible and provides a recommendation on a feasible and suitable bridge location, or whether doing nothing is feasible and preferred.

The project forms part of the wider development that is being undertaken at the Oruku Landing site which includes a conference and events centre, hotel, mixed use building and apartments. The conference and events centre will be able to hold events with a maximum capacity of 1,000 people. There is also proposed to be 20 riverfront apartments and five retail outlets.

In parallel to this study, initial design work has been undertaken on the concept design of a bridge. The findings of this work are contained in a separate concept design report for the bridge.

This Feasibility study seeks to address the issue of connecting people in the city centre with the conference centre and other development on Oruku Landing. The current access to the site where this development is planned is constrained and may cause issues for some people. There are currently walking and cycling facilities but these are not ideal for moving lots of people at once. There

is also a bus service that runs down Riverside Drive however this is also not suitable for moving lots of people. This is shown in **Figure 1.1**.

The study also reviews the benefits of the connection to commuters, recreational users, and tourists by providing an additional connection across the Hātea River. This connection would provide a suitable alternative for residents heading to Whangarei City Centre from the suburbs on the northern and eastern side of the Hātea River and provide a connection for a shorter loop of the existing Hātea Loop route (shown in **Figure 1.1**).

2 Strategic Context

2.1 The Whangarei Context

Since 2010, Whangarei's population has grown by 17,100 from 81,200 in 2010 to 98,300 in 2020. Growth projections from the Whangarei District Growth Strategy projected the growth in Whangarei's population to be 21,600 from 98,300 in 2020 to 119,900 in 2051.

Whangarei City Centre is a large area covering approximately 170 hectares made up of a retail centre, the waterfront, large pockets of retail trade, a civic area, large format retail sites, an events centre, green spaces, and natural features. Businesses are spread widely across the city centre, which creates fragmented connections and issues between these areas. Very few people live in the city centre, but a third of the people that are employed in the Whangarei District, work in the city centre. During the weekdays, it is busy and bustling, but the night-time and weekends are generally much less active.

There is a population of 8,600 people (Census 2018 Statistical Area 2) living on the northern and eastern side of the Hātea River that this project would benefit by providing an alternative connection into the city centre. There are also 1,000 people who currently live in the Whangarei city centre area who could also benefit from this project. There is also the possibility that a new connection would be utilised by some of the 8,400 people that live in the suburbs surrounding the city centre. There are 9,300 people who work in the city centre. **Figure 2.1** shows the populations of each of the Census Statistical Area 2 areas surrounding Whangarei City Centre and key areas that may use the new connection. Additionally, the central area has recently been rezoned to encourage residential living in in the CBD and Hihiaua Peninsula areas.

Figure 2.1 – Population of Statistical Area 2 areas around Whangarei City Central (Census 2018)

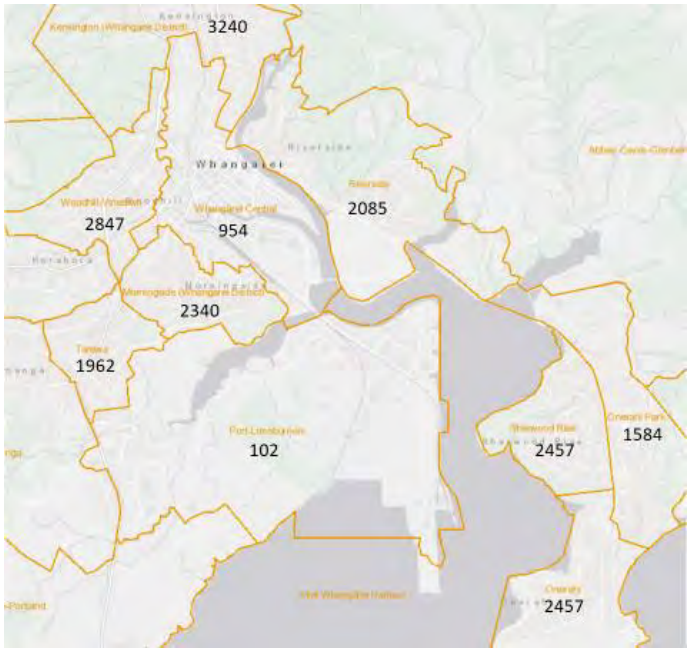


Figure 2.2 shows all the areas surrounding Whangarei City Centre and how many people travel into this area for work or education on a daily basis. This figure shows that there are over approximately 1,500 people who live on the northern and eastern side of the Hātea River who travel into Whangarei City Centre daily for employment or education. A small portion of these people currently access

Whangarei City Centre using active modes and may utilise this new connection for access into this area.

Figure 2.2 – Number of people entering Whangarei City Centre from the surrounding Statistical Area 2 areas (Census 2018)

2.2 Oruku Landing Development

The development at Oruku Landing includes a conference and events centre, hotel, apartments, public plaza, bars, and restaurants. The civic component of this development is the conference and events centre. This is a multipurpose theatre and events centre capable of accommodating up to 1,000 people with a variety of conference and entertainment modes.

The conference and events centre is located on the eastern side of the site, bounded by both Riverside Drive and the Hātea Loop. This will allow the main space to be used in a range of configurations, including as a conference venue, trade show, performance space and festive occasions. The western end of the building includes a double height canopy that projects into the public plaza defining the main entry, with the main access being off the new plaza.

There will be also be 20 riverfront apartments, a hotel, five retail outlets and a boardwalk that connects into the Hātea Loop and provides an outlook over the Hātea River and back towards the Whangarei City Centre as well as other amenities.

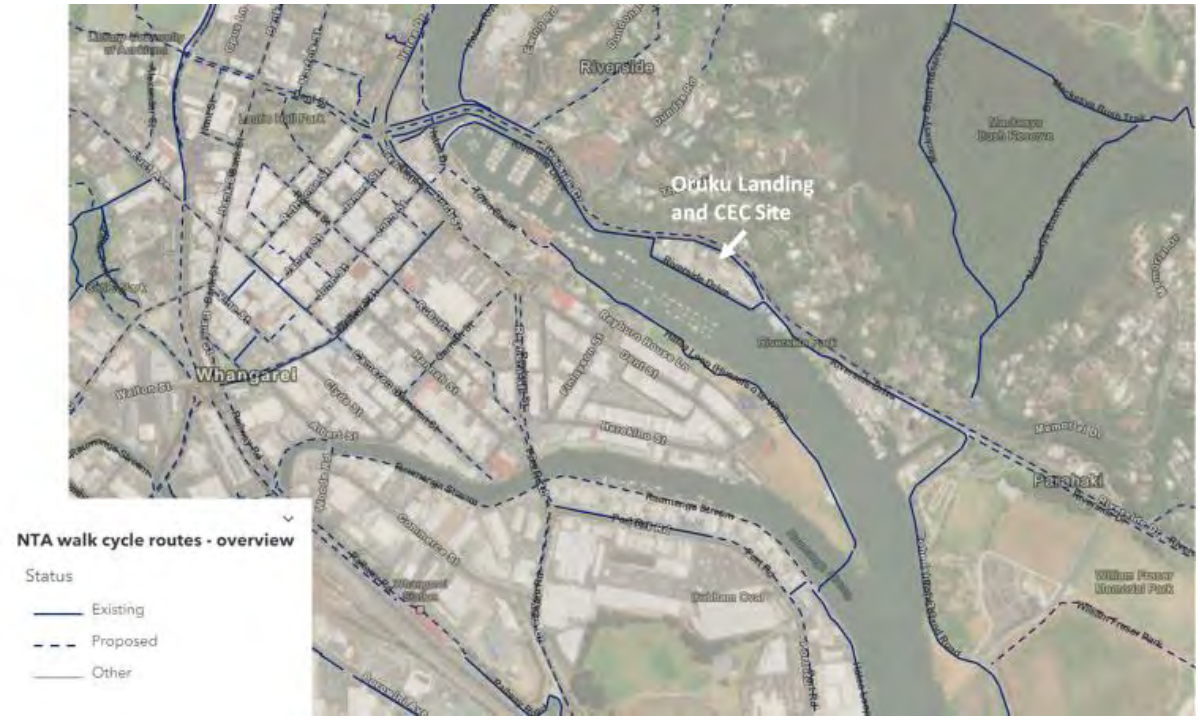
2.3 Walking and Cycling in Whangarei

Travel in the Whangarei District is currently dominated by private vehicle trips. In 2018 around 75 percent of all journeys to work were made by private vehicle or company vehicles, compared to around 69 percent of all journeys to work for New Zealand. In Whangarei, around 1 percent of journeys to work are cycling journeys and around 4 percent are walking.

There are 35.3km of cycleways in the Whangarei District. Of the 35.3 kilometres of cycleways in the Whangarei, 16.7km are separated cycleway or shared paths and 18.6km are on-road cycleways. **Figure 2.3** and **Figure 2.4** show the current and proposed walking and cycling networks around Whangarei.

Figure 2.3 – Current walking and cycling network in Whangarei (Viastrada, 2021)

Figure 2.4 – Proposed walking and cycling network in Whangarei (Viastrada, 2021)



There are currently links from Riverside Drive into the city and around Pohe Island towards the Town Basin. There are proposed improved connections along Riverside Drive, through the town basin and Whangarei City Centre which will help people connect to the proposed bridge. These will help to connect the overall walking and cycling network between the city centre and outer suburbs.

The proposed connection also links into the Hātea Loop which run alongside the Hātea River and connects at the Te Matau ā Pohe bridge and Victoria Canopy Bridge. The walkway connects the Town Basin, William Fraser Memorial Park, Kotuitui Whitinga, Clapham's Clocks, Reyburn House gallery, Riverbank Theatre, Waka and Wave Millennium sculpture. The entire loop is accessible for walking, running, cycling, mobility aids, scooters, and push chairs.

2.4 Potential Connection Users

The demand for the proposed connection is likely to come from a number of users, which include:

- Conference and events centre at Oruku Landing (1,000 people maximum capacity)
- Apartments and hotel
- Retail outlets
- Commuters
- Recreational users
- Tourists.

Demand will be greatest when there are events on at the conference centre however it can be assumed that a large number of people will head to the conference centre by private vehicle.

Residents of the apartments and hotel guests may also be constant users of the proposed bridge to connect between the development and Whangarei City Centre. It is unlikely that all the trips made will

be walking or cycling trips, however with the proposed connection they may make a greater proportion of their trips by walking or cycling.

Demand from commuters/recreational users/tourists may not be very high however the proposed connection will provide an alternative route for people heading from the northern and eastern side of the Hātea River toward Whangarei city centre. Recreational users and tourists may choose to use this connection as an alternative on the Hātea Loop or other walking or cycling trips they may be making.

2.5 Whangarei District Council Strategic Plans

2.5.1 Whangarei City Centre Plan 2017

The Whangarei City Centre Plan (WCCP), prepared by WDC, is structured around key outcomes for the City Centre. This plan identifies transformational moves which are the fundamental changes that assist in delivering the key outcomes. The WCCP encompasses the wider Whangarei City Centre area and the waterfront along the eastern side of Hātea River.

The key outcomes and transformational moves are supported through a design-led process which has used the knowledge of the business community and building owners, as well as expertise from WDC.

The WCCP informs future land use planning through the District Plan. It identified future projects and outlines where more detailed design thinking is required. Fundamentally, the WCCP presents a common vision for the City Centre, shared by WDC, the community, business owners, landowners, and potential developers.

The key outcomes of the WCCP include:

- Experience
- Connectivity
- Living
- Employment and Education
- Design.

The key transformational moves of the WCCP include:

- City Core
- Movement Networks
- Strategic Sites
- Inner City Living
- Quality Design
- Waterfront
- Entranceways.

The WCCP identifies the Oruku Landing site as a strategic development site to be a catalyst for change in the City Centre. In addition, it is located within the Waterfront Precinct of which the WCCP identifies WDC's intent to maximise the use of the waterfront as a key destination and focus for redevelopment.

2.5.2 Whangarei City Centre - City Core Precinct Plan 2019

The City Core Precinct Plan (CCPP), prepared by WDC, contains recommendations for the public realm and open spaces and for all forms of circulation. It aims to reshape how residents and visitors experience the city core by placing greater emphasis on the quality of the urban environments. By

improving the streets to better accommodate different modes of transport, increasing the quality of street and open space design, insisting on the quality of new development, and promoting health and social inclusion through investment in the public realm, among many other measures, the city core can be rediscovered as a place to visit, work, live and shop.

The city core provides the opportunity for signature developments that will reflect and highlight residential and employment opportunities to the residents of Whangarei and beyond. The CCPP will ensure that development throughout the area is coordinated, both functionally and aesthetically, to ensure that it operates well, is an attractive and supportive environment for residents, employees and visitors and addresses its close relationship to the surrounding environment. In respect of its importance, the CCPP will provide the foundation for an iconic civic presence that both reflects and integrates into the broader community.

This will all be achieved through excellence in both urban design and architecture. The plan presents a conceptual representation of development and outlines land use, streetscape components, urban design, and key projects.

The CCPP will be a key document used to inform future projects, public space improvements, infrastructure, and the Whangarei District Plan.

2.5.3 Hihiaua Precinct Plan 2015

The Hihiaua Precinct Plan (HPP) outlines WDC's strategic direction to manage growth and development from 2015 for the following 20-30 years. Precinct planning is a tool to consider an area's development potential and coordinate efficient delivery of key infrastructure, land use planning and community services. The HPP envisaged that this will be progressively implemented through a plan change and through partnerships between the public and private sectors, community groups, business owners and landowners. Since its inception, a plan change has rezoned land within the Hihiaua Precinct from Town Basin and Business 2 zones to Open Space, Waterfront and Mixed-Use zones enabling increased mixed-use development include open space, commercial and residential uses.

Over time, as light industrial activities relocate to other appropriate sites, vacant land is expected to be redeveloped to create a vibrant and attractive inner city residential mixed-use precinct. Objectives, policies, and rules in the District Plan along with the change of land use zoning provides opportunities for residential/mixed use activities to establish in the precinct and create an integrated open space network.

The Hihiaua Precinct is currently predominantly comprised of light industrial servicing and commercial activities. However, among these uses there is an eclectic mix of activities including cultural/entertainment activities, offices, education, medical services, retail, and residential uses. Light industrial uses include automotive repairs, marine-related industries, warehouse, small-scale, manufacturing, and commercial uses such as professional offices and retail. Other land use activities include a medical centre, dentist, storage facility, theatre, Art Trust museum, lunch bar/café, gym, pub, play centre, professional offices, and residential dwellings.

2.6 Strategic Alignment

2.6.1 Northland Regional Land Transport Plan

The Northland Regional Land Transport Plan (RLTP) 2021 prepared by Northland Regional Council (NRC) sets out the strategic priority and investment for transport across each region in New Zealand. There are four ten-year priorities from the Northland RLTP that relate to this project. They are:

- Reducing transport related deaths and serious injuries
- Economic and tourism development
- Provide people with better transport options and consider the needs of the transport disadvantaged (including transport choice in rural communities)
- Future proofing and long-term planning.

2.6.2 Northland Walking and Cycling Strategy

The Northland Walking and Cycling Strategy, prepared by NRC, was developed to help guide the direction and investment into walking and cycling across the region. There are four strategic outcomes in the strategy that relate to this project, these are:

- Developing appealing and cohesive walking and cycling networks that connect Northland
- Growing walking and cycling participation and promoting Northland's coastal point of difference
- Improving community wellbeing including creating economic opportunity
- Ensuring walking and cycling infrastructure, and its use, is sustainable.

2.6.3 Whangarei Long Term Plan 2021-2031

One of the key strategic priorities outlined in the Whangarei Long Term Plan is transport. Within this it is acknowledged that there is a need to provide suitable alternative transport options for people. Walking and cycling is one of the keys to this and this project aligns with this by providing an alternative option for many people and opening up walking and cycling opportunities into the future. The proposed connection will help to support a suitable alternative for people walking and cycling in the area and to the city centre.

2.6.4 Whangarei District Plan

The District Plan regulates land use development within Whangarei, enabling varied uses and intensities of development through district plan zoning. District Plan objectives, policies and provisions can be used to determine the potential future demand this project may see with changing land use enabled through zoning provisions throughout the city centre. The land on the southern side of Oruku Landing is currently a generally light industrial (business) environment. Zoning in the area includes mixed use, waterfront, and open space zoning which enables a mix of uses to establish in the area. To the west of this area, land is zoned for mixed use, city centre, waterfront, and open space, with the city centre zone enabling more intensive development. A key objective of the District Plan is to promote active transport by facilitating cycle and pedestrian connectivity within new subdivisions and developments and, where appropriate, to existing developments, reserves, or other public spaces.

2.6.5 Whangarei City Core Precinct Plan

The CCPP aims to enhance the experience people visiting or entering the city centre. The key areas of this are to improve the pedestrian environment, changing the city centre environment towards mixed use and enhancing the green and open spaces and creating green corridors. With this change it can provide connections that people want to use as active mode corridors that connect to the Oruku Landing bridge and Whangarei City Centre. The key drivers that relate to the proposed connection include:

- Reinforce easy navigation
- Nurture the city core character
- Encourage active edges
- Ensure connections
- Develop a quality public realm.

2.6.6 Whangarei Walking and Cycling Strategy

The Whangarei Walking and Cycling Strategy outlines the ways in which the WDC wants to increase walking and cycling participation across the city. This project can help encourage more people to walk and cycle as a transport mode, and for recreational purposes, contributing to a healthy and vibrant community and growing economy.

The key goals of the Walking and Cycling Strategy that relate to this project include:

- A safe and connected urban walking and cycling environment
- More people walking and cycling, more often
- A destination where walking and cycling is a lifestyle.

2.6.7 Hihiaua Precinct Plan

The HPP directly affects the area that the bridge will connect into on the Whangarei City Centre side of the Hātea River. Currently on the Whangarei City Centre side of the Hātea River is a school, culture centres and an arts precinct. HPP outlines the future land use this area is expected to have and what this may mean for people who may reside there or use the area. The plan does not specify any connections across the Hātea River; however, the need will only grow with changing land use. In the short term the connection will provide access to the cultural centres and industrial areas, however in the long term it will change to providing a connection that will provide access to the mixed-use precinct area and cultural centres.

2.6.8 Summary

A connection between Whangarei City Centre and Oruku Landing development would have a wide range of benefits that involve the city centre, waterfront, new development, and the wider community. The key takeaways from the strategic alignment are:

- Will help to improve pedestrian and cyclist safety
- Provides an improved connection across the Hātea River
- Provides for alternative transport modes
- Nurtures the city core and Hihiaua Precinct
- Supports walking and cycling as a lifestyle
- Makes Whangarei a destination for walking and cycling
- Will contribute towards developing a quality public realm
- Future proof a transport connection to support future development and long-term planning.

3 Methodology, Project Objectives and Assumptions

3.1 Methodology

The methodology for undertaking the options assessment is summarised below:

1. **Project Objectives:** Development and identification of project objectives, agreed with WDC.
2. **Assumptions:** Identification of assumptions to be adopted through the development of options and the assessment process.
3. **Long list option development**: Development of four long list options providing a connection across the Hatea River.
4. **Long list assessment**: the four long list options were assessed against the project objectives to determine a preferred alignment to further develop and take forward to a shortlist assessment.
5. **Short list option development**: The preferred long list option was developed into a short list of options which included do nothing and three bridge variant options connecting into Oruku Development.
6. **Short list assessment**: A Multi Criteria Assessment (MCA) tool was adopted to assess the short list options. 13 criteria were developed that covered environmental, cultural, socio-economic, movement, construction, and cost considerations. The three options were assessed and qualitatively scored against the criteria by technical experts.
7. **MCA Workshop**: An MCA workshop was held on October 8th 2021 with technical experts, WDC and cultural design advisors to challenge the scoring and assessment undertaken.
8. **Hui:** A hui was held on October 27th, 2021.
9. **Preferred Option**: Following the MCA assessment, workshop and hui, a preferred outcome was identified.
10. **Sensitivity analysis**: consideration was given to whether the preferred option would change if the assumptions made in the MCA were to change.

3.2 Objectives

The three project objectives that were set for the project by Beca and WDC at a workshop held on 8 October 2021 (see **Appendix A**) are:

- Provision of direct connectivity to the Oruku Landing development
- Improved connectivity for community
- Improved connectivity for tourists.

These objectives have been used to assess the longlist options and inform the shortlist options that were assessed.

3.3 Assumptions

The following assumptions were used to develop and evaluate the long list and short list of options. Further assumptions made within the options assessment are outlined in the Multi Criteria Assessment (MCA) commentary in **Appendix A**.

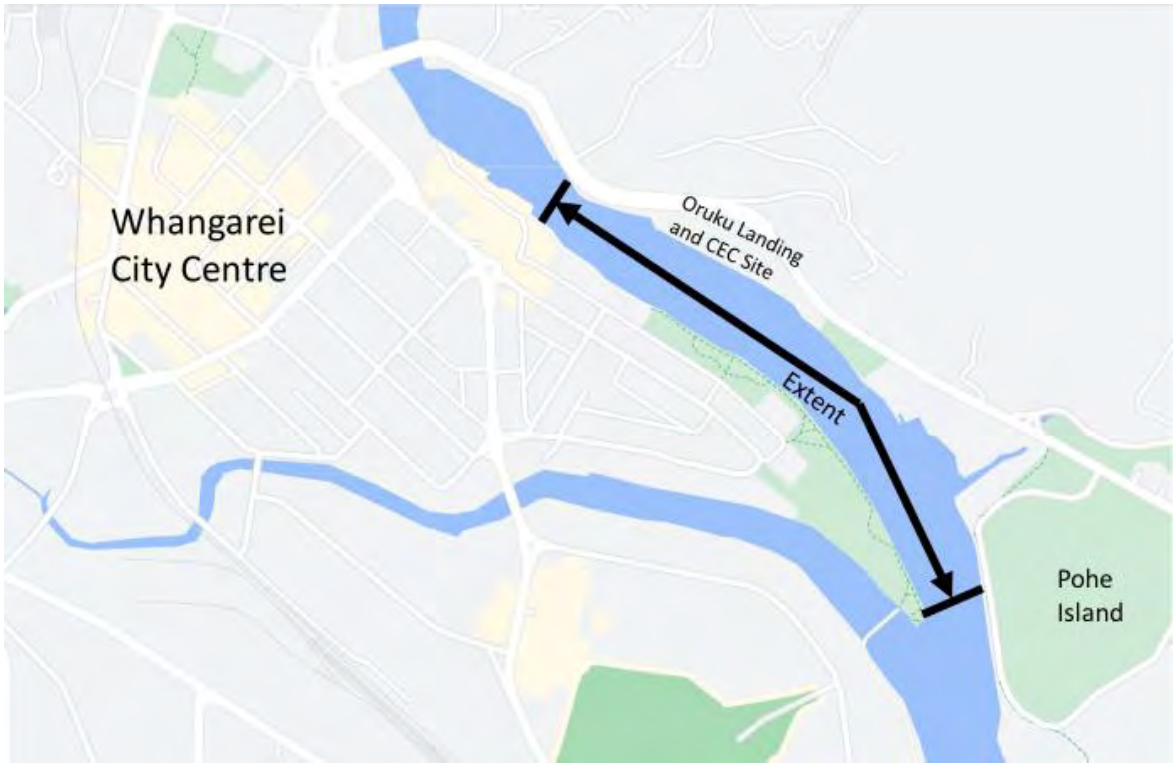
- The longlist and shortlist assessments were both qualitative
- Assessment is only based on current facilities, not planned infrastructure (apart from where stated in criteria) or services (e.g. additional car parking provision or changes to current bus services)
- Minor improvements to any new connections between Oruku Landing and Whangarei City Centre (e.g. footpath improvements, street lighting)
- Short list options are indicative, and the final decision may change during further design stages
- Estimates of future demand or mode shift due to the crossings are not calculated, though demand is considered qualitatively.

4 Option Development

4.1 Extent of Potential Connections

The potential extent that this connection will lie within is shown by **Figure 4.1**. The connection will lie between Whangarei Marina to the north-west and Riverside Park to the south-east. The extent of potential connections was guided by the objectives and current infrastructure. There is no need for a bridge further north due to the existing infrastructure and the southern extent falls at the tip of the Hihiaua peninsula.

Figure 4.1 – Extent of the connection between the city centre and Oruku Landing



4.2 Type of Bridge

Two types of bridges that were considered for the proposed connection are a bascule bridge or a swing bridge:

- Lifting bridge: A bascule bridge is a type of movable bridge in which a span rotates vertically about an axis at one end of the deck.
- Swing bridge: A swing bridge is a type of movable bridge that has as its primary structural support a vertical locating pin and support ring, usually at or near to its centre of gravity, about which the turning span can then pivot horizontally.

A swing span bridge will take out a large extent of marina space adjacent to the bridge when it opens, and it will require a balancing back span. Considering these factors, a swing bridge has not been considered further and all bridge options have been assumed to be a lifting bridge.

4.3 Do Nothing Option

The Do-Nothing option means using the existing infrastructure along the Hātea River (Canopy Bridge or Victoria Bridge) as the key route for people to take between the development and the city centre.

This may also mean the continued use of the public transport route that runs down Riverside Drive from the city centre.

This option also means no upgrade to any of the existing infrastructure between the city centre and Oruku Landing development site (e.g. additional car parking provision) and no increase or additional bus services introduced to meet demand or take people from a specific location to the development.

4.4 Longlist of Options

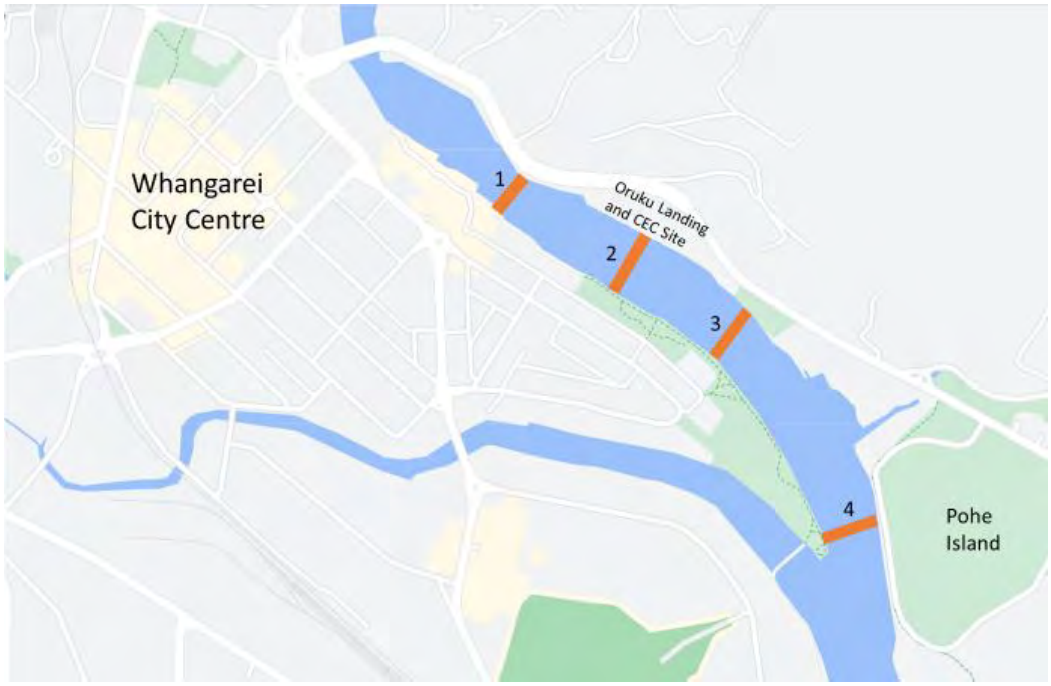
Four potential pedestrian and cycle bridge options were identified as shown in **Figure 4.2**. All options comprise a bridge that is suitable for all active modes. It will be consistent with guidelines for shared path widths to ensure any conflicts between cyclists and pedestrians are minimised. It will also minimise gradients to ensure it is suitable for all ages and abilities.

It was agreed with WDC that the scope of options to be considered would exclude alternatives to a bridge, including a gondola, bus link, improved Park and Ride options, etc.

The long list options are as follows:

- Option 1: Bridge to the north-west of the development
- Option 2: Bridge connecting into the development
- Option 3: Bridge to the south-east of the development
- Option 4: Bridge at Hihiaua Park and connects with Pohe Island.

Figure 4.2 – Longlist options along the Hātea River



The following assessment is made against the four options with reference to the project objectives:

4.4.1 Longlist Option 1: Bridge to the north-west of the development.

A pedestrian and cycling bridge in this location would not provide a direct connection between the development and the city centre. This is also the shortest distance across the Hātea River. It would cause significant operational issues for the Town Basin Marina and impact on key marina assets and provides only marginally shorter route than via the Canopy Bridge. This location is just to the east of

the waterfront precinct and just to the west of Reyburn House Art Gallery on the city side of the Hātea River.

4.4.2 Longlist Option 2: Bridge connecting into the development.

A pedestrian and cycling bridge in this location would provide the best connection for people accessing Oruku Landing. This is the only option that connects directly into the development which means it would be the best link for all the land uses that have been planned as part of the new development. This connects well with the city centre, Hihiaua precinct area and waterfront area and will provide some benefit to future development in the Hihiaua Precinct connecting with Pohe Island.

4.4.3 Longlist Option 3: Bridge to the south-east of the development.

A pedestrian and cycling bridge in this location would connect Riverside Park on the north side and Hihiaua Park on the south side of the Hātea River. This would provide an adequate connection to the conference centre; however, it does not support the remainder of the development as well. This connection also provides an alternative turnaround for the Hātea Loop, being around the midpoint between the two existing bridges that connect the loop across the Hātea River. It will support future development in the Hihiaua Precinct with connection to Pohe Island

4.4.4 Longlist Option 4: Bridge at Hihiaua Park and connects with Pohe Island.

A pedestrian and cycling bridge that connects the bottom of Hihiaua Park to Pohe Island. This provides a better connection between Whangarei City Centre and Pohe Island. This would be the greatest distance for people connecting from Whangarei City Centre to the Oruku Landing development. This connection would provide a connection to the education, recreation, and cultural areas in the Hihiaua precinct.

4.5 Longlist Review

Longlist options 1, 3 and 4 were discounted from further consideration due to the lack of alignment with the main objective of this project as they do not provide a direct connection for people accessing the Oruku Landing development from the city centre. None of these options connected directly into the Oruku Landing development site, therefore they did not meet this objective.

Further, Longlist option 1 was not considered as there are two existing bridges, Victoria Bridge and Victoria Canopy Bridge, which provide suitable alternatives to this location. This location is also an issue due to the marina operations being directly affected. This option did not contribute toward the two other objectives as the existing bridges already serve the purpose of a suitable connection for the community and tourists.

While Longlist option 3 does not directly connect to the Oruku Landing development, it meets the two other objectives of providing a suitable connection for the community and tourists as it will provide an alternative connection for people heading into Whangarei city centre or walking around the Hātea Loop or along the Hātea River.

Longlist option 4 is a good option for a future connection between Pohe Island and the Hihiaua Precinct and then to the City Centre, however it would not be an effective connection to or for the Oruku Landing development. This option provides a suitable connection for the community by connecting Pohe Island and the Hihiaua Precinct.

Longlist option 2 was taken forward due to the direct connection it provides to Oruku Landing and because it provides a suitable connection for the community and tourists providing an alternative

connection for people heading into Whangarei city centre or walking around the Hātea Loop or along the Hātea River.

4.6 Shortlist options

Long list option 2 was further developed into three different pedestrian and cycle bridge options for the shortlist as shown in **Figure 4.3**.

All three of the shortlist options connect directly into Oruku Landing and have been developed from Option 2 of the longlist, as follows:

- **Shortlist Option 1**: At the western end of the development. This bridge option is close to the apartments. This is the shortest bridge option out of the three bridge options.
- **Shortlist Option 2**: In the centre of the development as part of the development. This bridge option is close to the plaza area.
- **Shortlist Option 3**: At the eastern end of the development providing. This bridge option is close to the conference and events centre. This is the longest bridge out of the three shortlist options.

Figure 4.3 – Shortlist bridge options

5 Option Assessment

5.1 Assessment Criteria

The following criteria were used to assess the shortlist options as part of analysis to reach a preferred option (**Table 5.1**). Each of these criteria were assessed qualitatively and equally, with no weighting applied.

Table 5.1 Assessment Criteria

Objectives	Provision of direct connectivity to the Oruku Landing development. Improved connectivity for commuters and recreational users. Improved connectivity for tourists.	
Criteria		
Environmental	Significant ecological areas	Extent of effects (including during construction): ·Significant indigenous flora ·Significant habitats of indigenous fauna ·Indigenous biodiversity ·Stream / waterway and marine ecology
	Natural Hazards	Sustainability and resilience risks (coastal hazards, inundation areas, climate events)
Cultural	Cultural/Mana Whenua	Refer to section 5.3 below
	Historic heritage	Extent of effects on: ·Sites and places of valued heritage buildings, scheduled trees (with heritage value) and places. ·Sites and places of archaeological value. ·Sites and places of European cultural heritage

Socio-Economic	Property	Consider: ·Scale of public / private land (m2 / number of properties / special status of impacted property) ·Impact to marina property and boat sheds
	Land Use integration	To what extent will the option impact on the future development of land in relation to integration with the existing and future land use scenario (including any planned development or surrounding zoning changes that enable future development).
Socio-Economic	Urban Design	To what extent does the option support a quality urban environment, particularly relating to: ·Place making (context and planned place making considerations. An inviting, pleasant, and high amenity public realm) ·Legibility ·Connectivity and proximity ·Accessibility
	Social Cohesion	Impact on, use, connectivity / accessibility in relation to: ·Employment ·Communities ·Shops / services / other community and cultural facilities / 'attractors' ·Severance ·Scale of effect on existing community facilities and open space ·Public access to the coast, rivers and lakes ·School ·Economic
Movement	Safety	Extent of safety effects on users.
	Transport economic benefits	Travel time benefits for users.
	Impact to boat users/marina navigation	The extent to which the option maintains functionality of marine space and impacts boat users.
Construction	Construction impacts and constructability	Construction impacts on people and businesses regarding: ·Traffic & noise ·Recreational users of the loop

		·Earthworks related effects including dust ·Quality of life and amenity ·Economic impacts on businesses / community / town centres ·Impact on Marina users/boat users
Cost	Capital Operational	Constructability opportunities and constraints. Level ($, $$, $$$) of ·Carbon cost ·Property purchase cost ·Capital cost ·Operational cost

5.2 Evaluation Process

The evaluation process chosen for this assessment involves each option being evaluated against criterion, with either a positive impact to the criterion (light/dark green), negative impact to the criterion (orange/red) or neutral or minimal impact to the criterion (grey). There was no weighting given to the criteria that was being assessed. Each of the Beca subject matter experts (SMEs) evaluated each of the categories prior to the workshop with WDC, these were challenged by WDC to finalise the evaluation for each category.

As described above, the evaluation of each criteria was undertaken using the following scale:

Large positive impact
Slight positive impact
Neutral or minimal impact
Slight negative impact
Large negative impact

The Cultural/Mana Whenua category has not been scored due to this approach not being appropriate. Narrative on the initial feedback from Hapu at the Hui held as part of this process is provided in section 5.3 below.

The scoring for the cost category of the MCA was undertaken using the following scale:

-	Negligible cost
$	Slight cost
$ $	Moderate cost
$ $ $	Large cost

The Do-Nothing option was scored first for each option, providing a baseline score. Afterwards, the three bridge options were scored relative to the Do-Nothing option.

Table 5.2 below outlines the criteria assessed and the resulting score that was given to each of the options.

A fatal flaw is deemed to be any issue with any of the alignments that means it will not be possible for a particular bridge option to be constructed or meet the assessment criteria in an acceptable way. If any bridge option has a fatal flaw, it will not be assessed as part of the MCA process. Fatal flaws may include not being able to obtain the appropriate resource consents, significant impacts that cannot be appropriately managed, inability to appropriately connect on either side of the river, or constraints that inhibit construction of the bridge.

5.3 Consenting and Engagement

Resource consent will be required for any of the bridge options, as is standard with an infrastructure project of this size and nature. This will be referenced in the concept design report, this will have more detail on the consents required. A number of consenting considerations have fed into the development and assessment of the MCA criteria, which gives focus to RMA Part 2 matters, among project specific objectives and criteria.

Engagement with key stakeholders was undertaken during option development to further understand the constraints in the area and marina environment. The project team met with the bridge operator, harbourmaster, and active modes planner for NRC. From these meetings we gained an understanding of what the current operations of Te Matau ā Pohe are and how this will influence this bridge, boat movements along the Hātea River and future walking and cycling infrastructure as well as potential for micro-mobility devices in the future.

The need to remove or relocate marina moorings on the city side of the Hātea River, operated by the Whangarei Harbour Marina Management Trust, is possible for any of the bridge options. Whangarei Marina are a key stakeholder who should be continued to be engaged with throughout the project development and consenting process.

A Hui with Hapu representatives of Te Parawhau, Te Kahu o Tongare, WDC and the Cultural Impact expert for the Oruku Landing project was held on Wednesday 27 October. Support for the selection of Long List Option 2 was received. While no specific differentiation based on Cultural values / Impacts was identified between the short list options, more detailed information was needed to inform this assessment. If project funding is confirmed a full Cultural Impact Assessment will be necessary, and that is the most appropriate mechanism to explore the impacts of the short list options.

Further consultation and engagement with Hapu, key stakeholders, affected parties and the wider community is recommended as the project progresses, particularly through any resource consent process.

5.4 Land and Property Issues

The key land and river uses that surround the areas where the bridge may be located include Oruku Landing, WDC open space, private boatsheds, Whangarei Marina moorings, the waterfront precinct, as well as the commercial, retail, cultural, education and recreation land uses in the Hihiaua Precinct.

The main property constraints include the private boatsheds on the northern side of the Hātea River, which site adjacent to the Oruku Landing site at both ends, the private elements of the Oruku Landing Development and Whangarei Marina moorings on the city side.

5.5 Multi Criteria Analysis (MCA) of Short-listed Options

The MCA workshop was undertaken on Friday 8th October between the Beca project team and WDC and considered four options, these included the three bridge options from the shortlist options and the Do-Nothing option. The MCA table was pre-populated by the SMEs from Beca and were challenged in the MCA workshop by WDC. Summary notes of the workshop are contained in **Appendix A** and a sensitivity analysis is provided in **Appendix C.**.

Table 5.2 MCA Evaluation

MCA Topic	Criteria	0 - Do Nothing	1 - Western	2 - Central	3 - Eastern
Environmental	Ecology	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact
	Natural Hazards	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact
Cultural	Cultural/Mana Whenua*				
	Historic Heritage	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact
Socio-Economic	Property	Neutral or minimal impact	Large negative impact	Large negative impact	Slight negative impact
	Land Use Integration	Slight negative impact	Large positive impact	Large positive impact	Slight positive impact
	Urban Design	Large negative impact	Large positive impact	Slight positive impact	Slight positive impact
	Social Cohesion	Neutral or minimal impact	Large positive impact	Large positive impact	Slight positive impact
Movement	User Safety (land based)	Slight negative impact	Slight positive impact	Large positive impact	Large positive impact
	Transport benefits	Large negative impact	Slight positive impact	Slight positive impact	Neutral or minimal impact
	Impact to boat users/marine navigation	Slight positive impact	Neutral or minimal impact	Large negative impact	Slight negative impact
Construction	Construction impacts and constructability	Neutral or minimal impact	Large negative impact	Slight negative impact	Slight negative impact
Cost	Cost	Negligible cost	Moderate cost	Moderate cost	Moderate cost

*Intentionally left blank

5.6 Shortlist Assessment

The assessment of each option against each criterion is included in **Appendix A** and summarised below.

5.6.1 Do Nothing

The Do-Nothing option does not provide the opportunity for the planned integration of Oruku Landing to the City Centre and Hihiaua Precinct. The Oruku Landing development will become an isolated spot without the connection. This option misses the opportunity to improve and further activate the Cityside riverbank. It negatively impacts legibility, connectivity, and accessibility by not providing an opportunity to improve the existing facilities. This option will have no impact on the social cohesion opportunities that exists.

This option exposes cyclists and pedestrians in high pedestrian zones around Quayside shops, including narrow paths on either side of the Canopy bridge. It will require cyclists and pedestrians to travel further to cross from Oruku development (1.3km between the carpark on the southern side of the Hātea River and the Oruku Landing development). Conversely this option has no impact on marine navigation and safety.

Do Nothing has no impact on property. It also has no construction requirements or cost associated with it as there are no upgrades to existing facilities or services included as part of this option.

5.6.2 Western Option (Option 1)

The western option provides better integration into the city centre and waterfront land uses and potential future development in these areas. This option provides a more direct connection to employment and social attractors in the city centre. This option improves urban design outcomes against all measures which includes place making, legibility, connectivity, proximity, and accessibility.

The western option is the shortest bridge and proximity to city centre is the best. This option still has some conflict between pedestrians, cyclists, and vehicles with the carpark on the southern side of the Hātea River. This option requires cyclists and pedestrians to travel the shortest distance (0.2km between the carpark on the southern side of the Hātea River and the Oruku Landing development). This option has marginally less impact on navigation into the swing moorings opposite the Oruku site as it is upstream of most of these.

This option would require the removal of mangroves that are adjacent to Reyburn Art Gallery which have already been approved for removal through a separate resource consent.

The western option will likely impact access to the boat shed on the western side of the Oruku site and will impact Whangarei marina property (moorings and dinghy pontoon) requiring their relocation or removal. The abutments of the western option have the potential to encroach into the proposed mixed-use building on the Oruku Landing site or require reclamation to accommodate the abutment. The nearest historic heritage site is Reyburn House, approximately 100m northwest from the city side of this option. The nearest archaeological site is Oruku Pa, approximately 100m northwest from the landing side of this option. However, these sites are not directly affected by the option. The area directly north of the Oruku Landing site has been identified as a waka landing site.

5.6.3 Central Option (Option 2)

The central option provides a balance between integration with the city centre and Hihiaua Precinct. This option links directly into the plaza planned for Oruku Landing providing a better connection to the plaza and events centre. This option improves urban design outcomes against all measures which includes place making, legibility, connectivity, proximity, and accessibility.

The central option provides suitable proximity to city centre for pedestrians and cyclists. This option removes marginal conflicts between pedestrians, cyclists, and vehicles from the carpark and increases the perception of safety due to open space around the landing area on the city side. This option requires cyclists and pedestrians to travel the shortest distance to reach the Oruku Landing development (0.2km between the carpark on the southern side of the Hātea River and the Oruku Landing development).

This option will not impact any boat sheds, however, will have the greatest impact on Whangarei marina property (moorings) and would restrict space for new berths at the Oruku site. This is because vessels passing through the central navigation span would have difficulty manoeuvring into berths close to the bridge.

5.6.4 Eastern Option (Option 3)

The eastern option provides better integration with the future Hihiaua Precinct and the proposed catalyst project. However less weighting is given to this future development than that of the city centre area, therefore a lesser positive impact than the western and central options. With regard to social cohesion and access to social attractors, this option provides better connectivity to education, recreation, and cultural uses within Hihiaua Precinct. However, with more weight given to the city centre attractors this option has a slightly less positive impact than the western and central options.

This option would improve connectivity, but its distance from the city centre and marina basin would not significantly help improve legibility, connectivity, and proximity. It would have no effect on 'Place Making' of existing activity centres such as the marina basin. It also has the disadvantage of arriving at the plant room/ service area of conference and event centre within Oruku Landing, missing opportunities to maximise the vibrancy of the proposed plaza.

This option removes marginal conflicts between pedestrians, cyclists, and vehicles compared to the western carpark which lands in the carpark. This option has an increased perception of safety due to the open space around the landing area on the city side. This option requires cyclists and pedestrians to travel slightly longer than the Western and Central options to reach the Oruku Landing development (0.3km between the carpark on the southern side of the Hātea River and the Oruku Landing development). This option has the disadvantage that all vessels in the marina and future Oruku berths will need to navigate past the bridge as it would be downstream of all moorings. This is compared to the other bridge options where some vessels will be moored downstream of the bridge.

This option may be able to avoid or have lesser impacts to Whangarei marina property (moorings) however is likely to impact accessibility to the western most boat shed on the eastern side of the Oruku site.

5.7 Preferred Option

Following the MCA workshop both the Central and Eastern options were identified as feasible bridge locations to provide a connection between Whangarei City Centre and the Oruku Landing development.

The western option was not preferred due to a combination of constraints identified at the western end of the Oruku Landing site, including:

- The proximity of the proposed mixed-use building to the site boundary and bridge construction requirements would likely require reclamation of the coastal marine area (CMA) to accommodate bridge abutments and provide access to construct the bridge without impacting the mixed-use building.
- Reclamation is generally sought to be avoided and at this location within the CMA is expected to result in significant adverse effects due to impacts on and proximity to the waka landing site and adverse effects on associated cultural values.
- Noise and lights from the operation of the bridge would likely impact residents of the proposed apartment building.
- Access for maintenance of the bridge would be more difficult due to the proximity of surrounding buildings and the requirement to access land owned by the Northland Development Corporation.

The do-nothing option is a feasible option; however it is not preferred as it does not provide the benefits that a bridge option provides.

Both the central and eastern options could be explored in more detail and progressed through to consenting if funding is approved. The benefits and disbenefits of each option are summarised in **Table 5.3**.

Table 5.3 Benefits and Disbenefits of Central and Eastern Options

	Benefits	Disbenefits
Central Option	• Provides a direct connection into the public plaza and closer connection to the city centre • Located within WDC and publicly owned land • Improves user safety, social cohesion, and urban design outcomes. • Supports social cohesion and connectivity for the community and tourists	• Impact to Whangarei Marine Trust property (moorings) • Delay to boat navigation • Noise and lights from the operation of the bridge would likely impact residents of the proposed apartment building and hotel guests. • Staging of Oruku Landing development could impact constructability.
Eastern Option	• Located within WDC and publicly owned land • Provides a suitable connection into the Oruku Landing development • Integrates with surrounding land uses • Has minimal impact on Whangarei Marina Trust property • Improves user safety, social cohesion, and urban design outcomes. • Supports social cohesion and connectivity for the community and tourists	• May impact access to boat shed • Greatest delay to boat navigation • Longest span of approx. 120m

While both options are a suitable solution, they would both need to be explored further in more detail considering design refinement, constructability, and staging, and be subject to consultation with Hapu, key stakeholders and affected parties.

6 Conclusion – Summary of Recommendation

The Feasibility Study for a bridge connection between Oruku Landing development and Whangarei City Centre has concluded that both the Central (Shortlist option 2) and the Eastern option (Shortlist option 3) are feasible pedestrian and cycle bridge location options that could be progressed to resource consenting if funding is approved.

This was concluded after a longlist process that meant four long list bridge location options along the Hātea River were refined to three shortlist options that connected directly into the Oruku Landing development. These three shortlist options were analysed through the MCA process to determine a preferred or feasible option. Both the Eastern and Central options were found to be feasible and preferred options. Both options would need to be explored further in more detail considering design refinement, constructability, and staging, and be subject to consultation with Hapu, key stakeholders and affected parties.

As the design for the bridge is similar for both preferred options there is the chance to move the location of the bridge to find the optimal location around either the Central or Eastern option.

A

Appendix A - Option Workshop / Multi Criteria Assessment

MCA Topic	Criteria	0 - Do Nothing	1 - Western	2 - Central	3 - Eastern
Environmental	Ecology	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact
		The Hātea River is tidally influenced and is identified in the PNRP as having significant ecological values for birdlife and sea life; however, this overlay is broadly applied to the entire Whangarei Harbour and on its own does not relate to any specific habitat or site. The river at the different landing locations is dredged on a regular basis for marina purposes and has significantly modified banks with minimal riparian cover. Regardless of the above, the river will be a significant migration pathway for anadromous fish and occasionally seals and all construction works should follow best practice to minimise bed disturbance. Piles will not destroy a large amount of habitat; construction will need to manage debris and noise. The completed bridge is unlikely to result in loss of habitat or ecology values.			
			Western option would require the removal of mangroves that are adjacent to Reyburn Art Gallery which have already been approved for removal through a separate resource consent.		
	Natural Hazards	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact
		Regional Plan Maps indicate that all options will be located in areas subject to coastal and flood inundation and are all within the tsunami evacuation zones. Appear to be no difference between options for Natural Hazards.			
Cultural	Cultural/Mana Whenua				
	Historic Heritage	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact	Neutral or minimal impact
		None of the options are anticipated to impact recorded historic heritage or archaeological sites. Construction impacts of piles may cause vibration which historic heritage is sensitive to. However, all bridge options are significantly set back from any recorded site and any potential impacts would be appropriately managed during construction.			
			The nearest historic heritage site is Reyburn House, approximately 100m northwest from the city side of this option.		

MCA Topic	Criteria	0 - Do Nothing	1 - Western	2 - Central	3 - Eastern
			The nearest archaeological site is Oruku Pa, approximately 100m northwest from the landing side of this option.		
Socio-Economic	Property	Neutral or minimal impact	Large negative impact	Large negative impact	Slight negative impact
		Do Nothing has no impact on property.	All three bridge options will occupy similar areas of the Oruku development property and Council owned property on the city side.		
			The western option will likely impact access to the boat shed on the western side of the Oruku site and will impact Whangarei marina property (moorings). The abutments of the western option have the potential to encroach into the proposed mixed-use building.	The central option will not impact any boat sheds, however, will have the greatest impact on Whangarei marina property (moorings). Central option will have the greatest impact on the proposed Oruku Marina.	The eastern option may be able to avoid or have lesser impacts to Whangarei marina property (moorings) however is likely to impact accessibility to the western most boat shed on the eastern side of the Oruku site.
	Land Use Integration	Slight negative impact	Strong positive impact	Strong positive impact	Slight positive impact
		Do Nothing removes the opportunity for the planned integration of Oruku Landing to the City Centre and Hihiaua Precinct. It will become an isolated spot without the connection.	In assessing the land use integration more weight was given to future development of Oruku Landing and the Town Basin, than the future development of Hihiaua Precinct. The bridge options support integration of existing land uses including the City Centre and future development planned through the Hihiaua Precinct Plan to Oruku Landing. Hihiaua Precinct Plan envisages mixed-use development, however likely not for a decade or so.		
			The western option provides better integration into the city centre and waterfront land uses and potential future development.	The central option provides a balance between integration with the city centre and Hihiaua precinct, with greater weight given to	The eastern option provides better integration with the future Hihiaua precinct and the catalyst project. However less weighting is given to

MCA Topic	Criteria	0 - Do Nothing	1 - Western	2 - Central	3 - Eastern
				the city centre. This option links directly into the plaza planned for Oruku Landing.	this future development, therefore a lesser positive impact than the western and central options.
	Urban Design	Large negative impact	Strong positive impact	Slight positive impact	Slight positive impact
		Do Nothing option misses the opportunity to improve and further activate the Cityside riverbank. Do Nothing negatively impacts legibility, connectivity, and accessibility.	The western option improves urban design outcomes against all measures. Western option is the shortest bridge and proximity to city centre is the best.	The central option improves urban design outcomes against all measures. Central option provides suitable proximity to city centre.	The eastern option would improve connectivity, but its distance from the city centre and marina basin would not significantly help improve legibility, connectivity, and proximity. It would have no effect on 'Place Making' of existing activity centres such as the marina basin. It also has the disadvantage of arriving at the plant room/ service area of Oruku Landing missing opportunities to maximise the vibrancy of the proposed plaza.
	Social Cohesion	Neutral or minimal impact	Strong positive impact	Strong positive impact	Slight positive impact
		Do Nothing will have no impact on the social cohesion that exists.	In assessing social cohesion, more weight was given to attractors and employment in the city centre than to other surrounding attractors within the Hihiaua Precinct and Pohe Island. Any bridge option would draw and increase foot traffic along the river's edge. This in turn would offer the potential to increase the length of the town basin and its associated commercial activities. A bridge reduces severance and provides better connectivity and accessibility across the river in both directions to, and between, the social attractors. All three bridge options will impact on/occupy public open space. A bridge will increase use and enjoyment of the coastal environment bringing people down to and across the river (slight increase as there is already a pathway around the coast).		

MCA Topic	Criteria	0 - Do Nothing	1 - Western	2 - Central	3 - Eastern
			The western option provides a more direct connection to employment in the city centre.	Central option provides a better connection to the plaza and events centre on the Oruku Landing side.	The eastern option is balanced compared to the western options by providing better connectivity to education, recreation, and cultural uses. However, with more weight given to the city centre attractors this option has a slightly less positive impact.
Movement	User Safety	Slight negative impact	Slight positive impact	Strong positive impact	Strong positive impact
		Do Nothing exposes cyclists and pedestrians in high pedestrian zones around Quayside shops, including narrow paths on either side of the Canopy bridge.	Western option still has some conflict between pedestrians, cyclists, and vehicles with the carpark on the southern side of the Hātea River.	Central option removes marginal conflicts between pedestrians, cyclists, and vehicles from the carpark. Increased perception of safety due to open space around the landing area on the city side.	Eastern option removes marginal conflicts between pedestrians, cyclists, and vehicles from the carpark. Increased perception of safety due to open space around the landing area on the city side.
	Transport Benefits	Large negative impact	Slight positive impact	Slight positive impact	Neutral or minimal impact
		Do Nothing requires cyclists and pedestrians to travel further to cross from Oruku development (1.3km).	Western option requires cyclists and pedestrians to travel the shortest distance to reach the Oruku Landing development (0.2km).	Central option requires cyclists and pedestrians to travel the shortest distance to reach the Oruku Landing development (0.2km).	Eastern option requires cyclists and pedestrians to travel slightly longer than the Western and Central options to reach the Oruku Landing development (0.3km).
	Marine Navigation	Slight positive impact	Neutral or minimal impact	Large negative impact	Slight negative impact
		Do Nothing has no impact on marine navigation.	All bridges will provide some delay to all vessels that need to travel along the river. There will need to be pontoons on either side of the bridge for vessels to stop alongside while waiting for the bridge to open which will restrict manoeuvrability.		
			Western option has marginally less impact on	Central option would result in the loss of a	Eastern option has the disadvantage that all

MCA Topic	Criteria	0 - Do Nothing	1 - Western	2 - Central	3 - Eastern
			the swing moorings opposite the Oruku site as it is upstream of most of these.	number of existing moorings and would restrict space for new berths at the Oruku site. This is because vessels passing through the central navigation span would have difficulty manoeuvring into berths close to the bridge.	vessels in the marina and future Oruku berths will need to navigate past the bridge as it would be downstream of all moorings.
Construction		Neutral or minimal impact	Large negative impact	Slight negative impact	Slight negative impact
		Do Nothing has no construction associated with it.	All bridge options will have construction impacts however they will be temporary and will be able to be managed appropriately during construction. On the landing side, assume similar impact for all options as the site is developed concurrently. All three options will have temporary impacts on marina and vessels operations due to temporary works and construction works in the river and on both banks. Build temporary trestles on the river for all bridge options and building will need to happen from each side. Dust, noise, and vehicles are all impacts that will occur due to the bridge construction.		
Cost		Negligible cost	Moderate cost	Moderate cost	Moderate cost
		Do Nothing has no cost associated with it.	All three options have similar constructability constraints with the need to provide temporary access for plant and equipment and laydown areas on each bank.		
			The western bridge option is the shortest, therefore should be the cheapest but only marginally.	There are marginal increases in length compared to the western option (10%).	There are marginal increases in length compared to the western option (15%).

B

Appendix B – Option Workshop Attendees

Meeting: MCA Workshop for Oruku Landing development connection

Date: 8th October 2021

Time: 1-3pm

Place: Microsoft Teams Meeting

The following people attended the MCA Workshop:

Name	Role	Criteria Assessment Lead
Beca Evaluation Experts		
Gary Nates	Associate – Transport Engineering MCA workshop facilitator	Movement • User safety (land based) • Transport benefits • Impact to boat users/marine navigation
Kaitlyn Ritchie	Planner	Cultural • Historic heritage • Socio-Economic • Property • Land use integration • Social cohesion
Leon Keefer	Associate – Environmental Planning	Environmental • Ecology • Natural Hazards
Nigel Parker	Senior Associate – Landscape Architecture	• Socio-Economic • Urban Design
Will Pank	Technical Director – Structural Engineering	Construction • Construction impacts and constructability • Cost
Jason Luo		Cost
Beca Project Team		
Blair Masefield	Branch Manager – Northland	-
Ben McKibbin	Transport Planner	-
Charanjit Singh	Senior Structural Engineer	-
Danielle Lind-Corkill	Associate – Project Manager	-
Whangarei District Council		
Simon Weston	General Manager – Infrastructure	-
Shelley Wharton	Manager – Infrastructure Planning & Capital Works	-
Sandra Boardman	General Manager – Community	-
Tony Collins	Manager – District Development	-
Fiona Pratt	Matatau Project Engineer	-
Cultural Design Advisors (listening capacity)		
Jade Kake	Cultural Design Advisor	-
Hope Puriri	Cultural Design Advisor	-

C

Appendix C – Sensitivity Analysis

Sensitivity Analysis

The outcomes of the MCA were based on the assumptions made and outlined in section 3.2. If any new assumptions were introduced, or assumptions changed over time, it is possible the outcomes of the MCA would vary, including the possibility that any bridge option may not be viable. Should these assumptions change, consideration should be given to any changes in outcome. Some potential scenarios have been identified below.

If new carparking was developed on the Oruku Landing side of the Hātea River, the need for a connection may be reduced due to an assumption that most people would travel to the venue by private vehicle and utilise the new carparking.

The Harbourmaster needs to ensure that navigation can be maintained to for all moorings north of the Oruku Landing. A bridge may not be viable if it is seen to have a significant impact on boat navigation and operation of the function of the harbour.

If the bridge costs escalate and becomes unaffordable in comparison to the expected benefits, consideration should be made to whether the project is progressed or whether funds be put towards improving the existing connection between Whangarei City Centre and the Oruku Landing development site.

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Oruku Landing Bridge Concept Design

Final Report

Prepared for Whangarei District Council
Prepared by Beca Limited

4 November 2021

Revision History

Revision N°	Prepared By	Description	Date
A	Charanjit Singh	Draft for client review	29/10/2021
B	Charanjit Singh	Final report	04/11/2021

Document Acceptance

Action	Name	Signed	Date
Prepared by	Charanjit Singh		04/11/2021
Reviewed by	Will Pank		04/11/2021
Approved by	Blair Masefield		04/11/2021
on behalf of	Beca Limited		

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Executive Summary

The proposed development known as Oruku Landing on the northern side of the Hātea River includes a conference and event centre, hotel and apartments. The only connection between Whangarei City Centre and this development is the existing Canopy bridge and Victoria bridge.

Whangarei District Council (WDC) has engaged Beca Ltd. (Beca) to carry out the feasibility assessment and concept design for a new shared path bridge crossing the Hātea River and connecting the proposed Oruku Landing development to Whangarei City Centre. This Concept Design Report captures the methodology and findings of the concept design for the proposed bridge. It has been prepared in parallel with the Feasibility Study which presents the options assessment undertaken to recommend a preferred bridge location.

The concept design report provides inputs for WDC to complete the business case and confirm a delivery strategy that meets the cost, operational, programme and design expectations for the new shared path bridge.

The report describes the method of assessment and selection of a preferred option. A collaborative process of assessment was undertaken by the design team with multiple stakeholders from WDC internal team, Mana Whenua, the Harbourmaster and Marina operators.

A long list of four location options was developed and assessed including:

- Option 1: To the north-west of the development
- Option 2: Connecting into the development
- Option 3: To the south-east of the development
- Option 4: At Hihiaua Park and connecting with Pohe Island.

Long list option 2 was identified as preferred and taken forward to further develop at the short list stage. The following short list options were assessed:

1. Bridge connecting Whangarei City Centre at the western end of Oruku Landing development
2. Bridge connecting Whangarei City Centre at the centre of Oruku Landing development.
3. Bridge connecting Whangarei City Centre at the eastern end of Oruku Landing development.

These three short list options and the do-nothing option were assessed using a Multi Criteria Assessment (MCA) tool. Following the MCA both the central and eastern options were identified as feasible bridge locations.

Following the outcome of the MCA workshop concept design of new shared path bridge at the central location was progressed. A range of opening bridge types were assessed for appropriateness in the context of the site and location including bascule and swing bridges for the central navigation channel. Considering spatial constraints, the impact of swing bridge operation on existing boat and marina users, as well as back-span requirements making access for emergency repairs problematic, the swing bridge option was discarded, and a concept design was progressed for a single leaf bascule bridge option. Structural forms were assessed for constructability and efficiency seeking a cost-effective solution that meets WDC's requirements. Economical precast concrete approach spans are proposed with a lightweight single leaf steel bascule span designed to limit demands on the mechanical and electrical equipment required for opening at the navigation channel.

A rough order cost estimate based on the limited amount of the design carried out to date was prepared. The cost estimate includes contingencies appropriate for the level of design at this early concept stage. Rough order expected estimate (P50) including 30% contingency is $18 million. Following Waka Kotahi NZTA cost

estimate manual, 2ed section 9.2 guidance an allowance of -10% or +20% as funding risk contingency is to be added (P95 estimate). With funding risk contingency, the proposed bridge is expected to cost in the order of $16 million to $22 million.

At this stage WDC needs to confirm that design can be progressed to next stage depending on the availability of funding.

Subject to confirmation from WDC it is recommended that next steps be taken in the delivery process for the proposed single leaf bascule option:

1. Commence the planning process to gain resource consents for the project as soon as possible.
2. Continue with the design development to progress to preliminary design stage, to support the planning process and to update cost estimates for the proposed bridge.
3. Decide on a procurement strategy and proceed to enable collaborative construction planning with designers and constructors during the detailed design phase.

1 Introduction

Whangarei District Council (WDC) has engaged Beca to carry out the feasibility assessment and concept design for a new shared path bridge crossing Hātea River connecting the proposed development at Oruku Landing to Whangarei City Centre. This Concept Design Report captures the methodology and findings of the concept design for the proposed bridge.

The proposed link will be an approximately 120m long bridge providing a pedestrian and cycle shared use path connection between the north and south banks of the river. The bridge needs to provide a clearance envelope for the smaller boats in the navigational channel of the river. The bridge will also need to provide an unobstructed navigational channel for larger boats. This will be achieved by providing an opening span at the central navigational channel of the river.

This Concept Design Report sits alongside the Feasibility Study undertaken for the project which outlines the strategic need and benefits of a bridge at this location and presents the options assessment undertaken to recommend a preferred bridge location. Building on the Feasibility Study, the Concept Design Report confirms a preferred bridge form that is deliverable and meets the operational, programme and design expectations for the Oruku Landing bridge.

For the preferred option a concept design has been developed and a high-level cost estimate are provided to meet the financial and programme requirements. Finally, preliminary considerations regrading Safety in Design and stakeholder engagement to date are included as part of this report. A Safety in Design workshop will be conducted with involvement from Beca design team, wider WDC team, Harbourmaster and Marina operators in next stage of the design.

2 Design Requirements

The location for the bridge was assessed through a multi-criteria analysis described in the Feasibility Report and summarised in Section 3. A number of high-level design criteria that are considered in the concept design of the shared path bridge are summarised below.

The design needs to fit within the context of the site and the river environment in central Whangarei. While the need for the bridge and the objectives of the project are discussed in detail in the Feasibility Report a critical factor for design is the requirement to tie in with the development plans for the Oruku Landing complex.

In the design process Beca consulted with the Harbourmaster on navigational requirements for river users and channel dredging operations. The Te Matau ā Pohe bridge operators also provided advice on operating procedures that need to be applied to the proposed shared path bridge. Liaison was also carried out with representatives of the Whangarei Harbour Marina Trust to understand the impacts on existing moorings in the river and potential mitigation measures. While initial discussions with mana whenua were held at a high level there are opportunities for incorporation of cultural values into the bridge design that can be explored as design progresses from this initial concept stage.

A key issue for WDC is to assess the affordability of a bridge option at the preferred location. The design needs to be a cost-effective solution in order to proceed, while at the same time using this opportunity to create a place-making feature of the urban environment within central Whangarei.

Constructability is an essential feature of the bridge concept to enable efficient construction processes for installation in the river, while seeking to minimise environmental impacts and restrictions to river vessels. Offsite fabrication of structural components is assumed to be utilised where possible to mitigate adverse effects.

2.1 Design Criteria

In terms of design standards, the Waka Kotahi NZ Transport Agency Bridge Manual and associated standards are generally applied in the concept design. For the geometrical requirements of the shared path including width, gradient, barriers etc., the Austroads design guide for pedestrian and cycle paths is applied as described in this Section of the report.

The Concept Design is designed according to the following standards:

- New Zealand Building Code (NZBC)
- Waka Kotahi NZ Transport Agency Bridge Manual, 3rd edition Amendment 3 (BM)
- Austroads Guide to Road Design Part 6A: Pedestrian and Cyclist Paths 2009 (Austroads guide)
- AS/NZS 5100.6:2017 - Bridge design Part 6: Steel and composite construction
- SNZ TS 3404:2018 – Durability requirements for steel structures and components
- NZS 3101: 2006 Amendment 3 – Concrete structures (NZS 3101)

The bridge structure is considered as an importance level 2 structure according to the BM with a design life of 100 years. Considering the marine environment, concrete elements of the bridge will be designed to meet NZS 3101 requirements for exposure classification C and steel elements will be designed to meet SNZ TS 3404 requirements for atmospheric corrosivity category C5-M.

2.2 Geometric Requirements and Minimum Clearances

2.2.1 Navigational Clearance

A clearance envelope is proposed in the navigational channel for the passage of small river boats without the need to open the bridge. It is proposed to provide 16m wide x 3m high envelope underneath the bridge deck between deck soffit and Mean High Water Spring level (MHWS).

The proposed clear width is the same navigational channel dimension as provided at Te Matau ā Pohe bridge, which enables passage of the largest vessesl using the river including the dredging barge that maintains the channel.

2.2.2 Shared Path Width

The proposed bridge will provide a 3.2m clear width between raised kerbs on either side of the deck. This width meets requirement for a local access or commuter shared use path as per Austroads Guide to Road Design Part 6A Table 7.4. This width has factored in the proposed use of readily available precast concrete deck units which are assessed to be a cost-effective structural form for the approach spans on either side of the central opening span. The use of three single hollow core beams (SHC) in the deck cross section for the approach spans enables a width in excess of 3m. As part of the exercise to select an appropriate width for the bridge two and four SHC beam cross sections were also considered as shown in figure below:

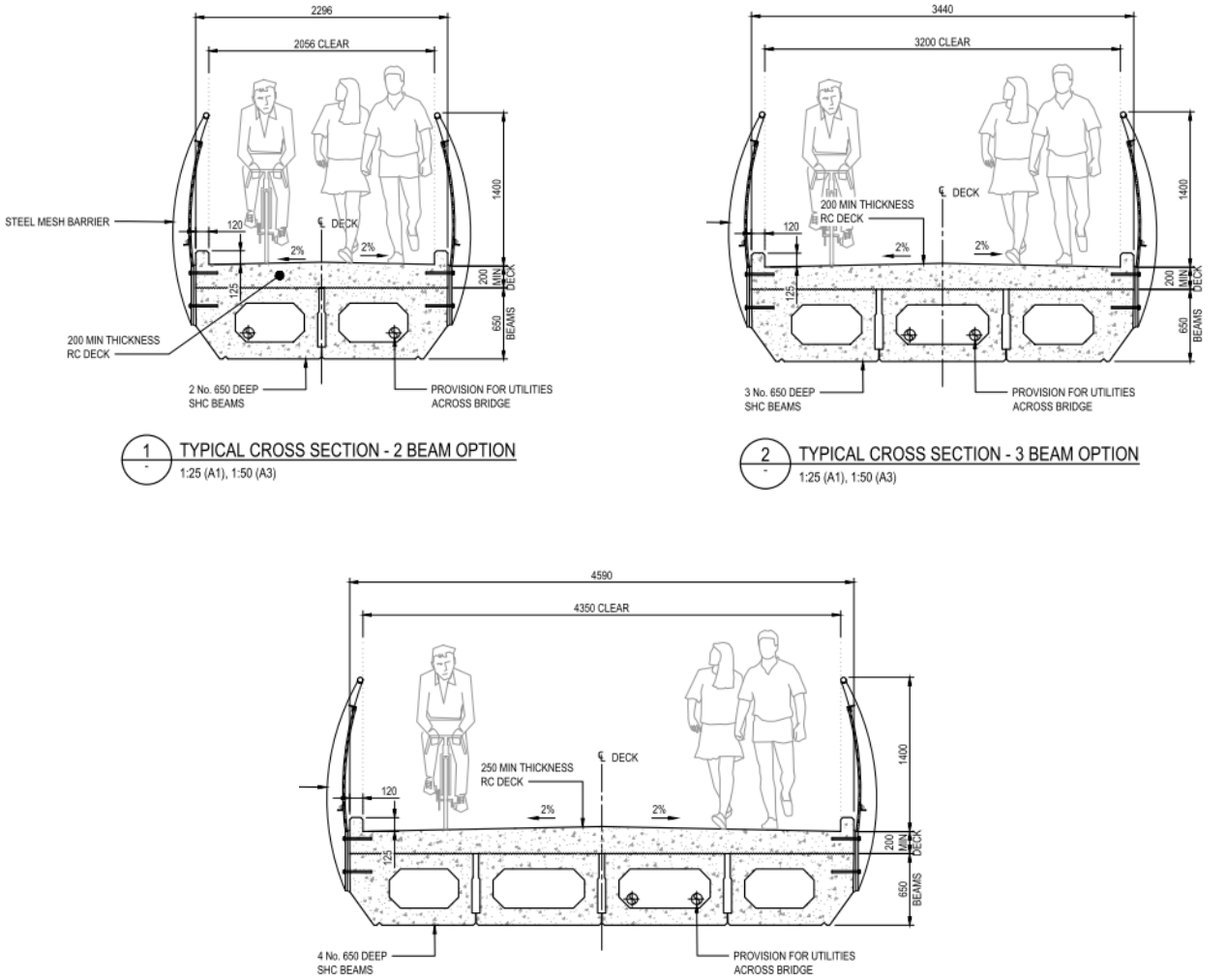


Figure 2-1: Shared path width options

A two SHC beam cross section would only provide approximately 2m clear width which is too narrow for a shared path and does not meet Austroads guide requirements, while a four SHC beam cross section would provide a 4.35m clear width which will meet Austroads guide requirement but is not adopted in order to optimise the cost of the bridge.

2.2.3 Bridge Approaches

The vertical profile of the bridge needs to rise from both banks of the river to provide the proposed navigational clearance beneath the opening span. To achieve this a maximum gradient of 1:20 (i.e. 5% slope) will be adopted for the concrete approach spans. A short length of ramp up to the bridge on city side bank will be at 1:14 gradient to achieve a short and accessible approach to the bridge deck from existing ground level. At the Oruku Landing side, it is proposed that riverside boardwalk is raised to match bridge approach level.

2.3 Operation and Maintenance Requirements

The options to be considered need to provide adequate response to the operation and maintenance requirements as these aspects have significant impact on the whole life costs of this type of moving structure.

The mechanical and electrical (M&E) equipment will have to provide a reliable system that can be operated and maintained without any major failures that would put the bridge out of service for extended periods. Routine maintenance for all the elements and major replacement for some items will still be required as part of a standard inspection and maintenance plan. Routine inspections and maintenance tasks need to be feasible in short timeframes (6-8 hours) to allow repair works to be performed overnight.

It is also a requirement to provide redundancy in the M&E equipment to make sure that a single fault of the main operating elements will not leave the bridge out of service.

Operation of the bridge (i.e. opening of bascule span to allow for river vessel navigation) will need to be coordinated with operation of the Te Matau ā Pohe bridge downstream.

2.4 Site Location Constraints

There are many constraints considered in the concept design. Some of these constraints relate to the specific characteristics of the site, the multiple and varied users that will be serviced by the new bridge, geometric constraints, intended use for surrounding areas, etc.

Some of the key site location constraints are listed below:

- Navigation channel needs to be made available on demand and therefore operations of the bridge (openings and closures) will not be managed by a fixed schedule.
- Existing boat mooring berths in the Hātea River need to be preserved as far as possible and impacts on these berths need to be minimised.
- Power for M&E equipment to be drawn from city centre side. This will require the main pier supporting the opening span to be located on city centre side.
- A temporary construction yard to be located on city centre side.
- The reduced (ground) levels of city centre side and Oruku Landing side are not the same and that difference will have to be resolved in design.

3 Bridge Options Assessment

As requested by WDC, the options assessment exercise focused on two main aspects of the new bridge design i.e. location and bridge typology.

3.1 Bridge Alignment

The Oruku Landing Feasibility Study provides a detailed overview of the options assessment undertaken to identify the preferred bridge alignment. The below provides a summary of the assessment undertaken.

3.1.1 Longlist Options

Four longlist options were developed and assessed against the project objectives. The four options are shown in Figure 3-1.

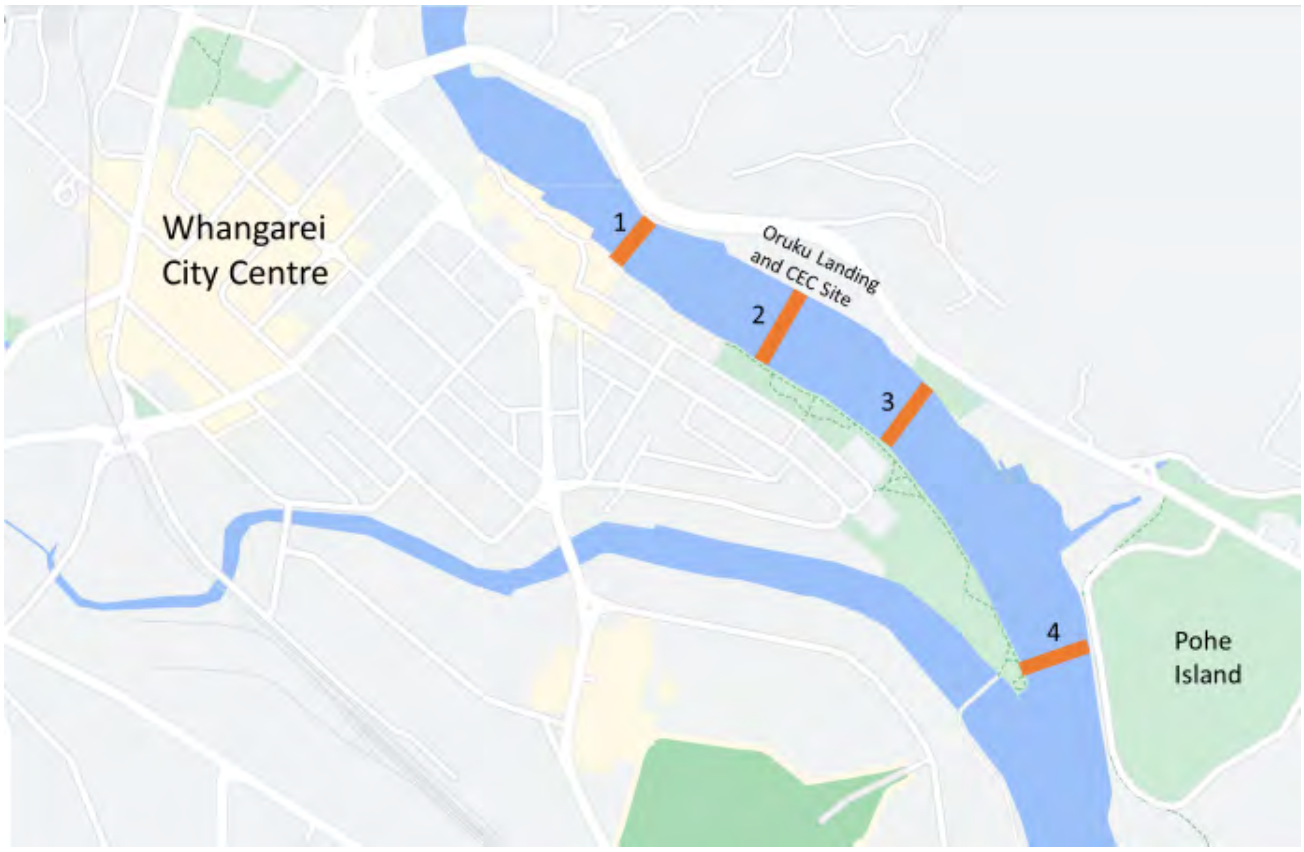


Figure 3-1: Long List Options

Long list Option 2 was identified as the preferred option to be taken forward to be further developed and analysed at the shortlist stage. This was because the bridge provided a direct connection into Oruku Landing, meeting the key objective of the project.

3.1.2 Shortlist Options

Three shortlist options were developed which were variants of Long list Option 2 and shown in Figure 3-2. These options vary in total length of bridge with Western, Central and Eastern options approximately 105m, 114m and 121m long,

The three shortlist options, and the do-nothing option, were assessed using a Multi Criteria Assessment (MCA) tool and were assessed against a set of 13 criteria with measures for each criterion identified. The criteria covered environmental, cultural, socio-economic, movement, construction, and cost considerations.

Each criterion was qualitatively scored by technical experts and then challenged at an MCA workshop on 8th October 2021.

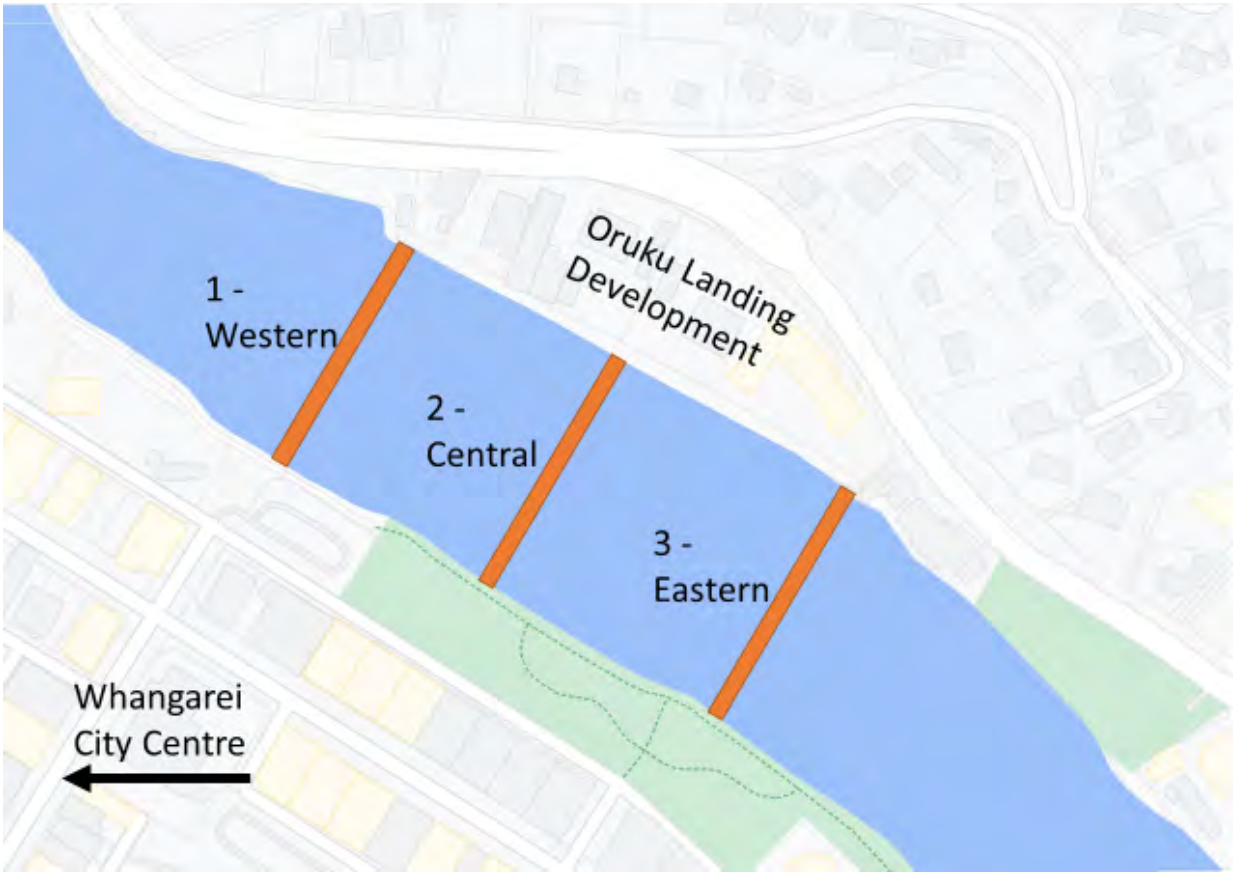


Figure 3-2: Shortlist locations

3.1.3 Preferred Option

Following the MCA workshop, the western option was determined not to be preferred due to a combination of constraints identified at the western end of the Oruku Landing site. Both the Central and Eastern options were identified as feasible bridge locations to provide a connection between Whangarei City Centre and the Oruku Landing development. The do-nothing option is feasible; however, it was not preferred as it does not provide the benefits that a bridge option provides.

While both the central and eastern options are a suitable solution, they both need to be explored further in more detail considering design refinement, constructability, and staging, and be subject to consultation and engagement with Hapu, key stakeholders and affected parties.

The development of the concept design documented in this Concept Design Report is based on the central option, however, it is anticipated this design could be adopted for any location between the central and eastern options, subject to investigation of site-specific geotechnical conditions.

3.2 Bridge Typology

For the navigational opening span, the following two options were considered:

3.2.1 Bascule span (single leaf)

The bascule span option provides a vertical movement of the deck when the span opens via rotation of the structure around a horizontal axis. This option is most efficient with a counterweight that helps to balance the deck weight and minimise the required power for the lifting operation. The vertical movement can be

achieved using a hydraulic cylinder mechanism as illustrated for the Wairau Stream Bridge at Milford Marina on Aucklands North Shore in the photo below.

Figure 3-3: Bascule bridge example - Wairau Stream Bridge

3.2.2 Swing bridge

The swing bridge option provides a horizontal movement of the deck via rotation around a vertical axis. This type of structure often includes cable-stays to help minimise deflections at the nose of the deck and a short back-span that helps to counterbalance the main span. The rotation is achieved using a slewing bearing mechanism housed in the main pier.

Figure 3-4: Swing bridge example - Deptford Creek Bridge

3.2.3 Preferred Option

Considering spatial constraints, the impact of swing bridge operation on existing boat/marina users and back-span requirements making access for emergency repairs problematic, the swing bridge option was discarded. The single leaf bascule bridge was selected as the preferred option for the opening span.

In terms of the structural form of the bridge, the approach spans are proposed to be pre-stressed concrete as a cost effective and durable solution that minimises future maintenance liabilities. A three SHC beam cross section with a 200 thick cast-in-situ concrete deck is proposed based on option evaluations and experience from previous projects.

For the opening span a steel structure is proposed to minimise weight and reduce demands on the mechanical and electrical equipment for opening the bascule bridge. A structural concept utilising a steel

orthotropic deck supported on steel beams with a counterweighted mast structure is proposed. This is a tried and tested structural solution for lightweight opening bridges that can be fabricated offsite and lifted into position by cranes in a single operation.

4 Preferred Option Development

4.1 Structural Form

The preferred option is a single leaf bascule bridge with a 23m long main span and approach structures approximately 56m long on the southern side and 34m long on the northern side of the dredged channel. The length of the opening span allows space for the structural depth and lifting equipment to be accommodated alongside the required 16m wide navigation channel when open to vessels.

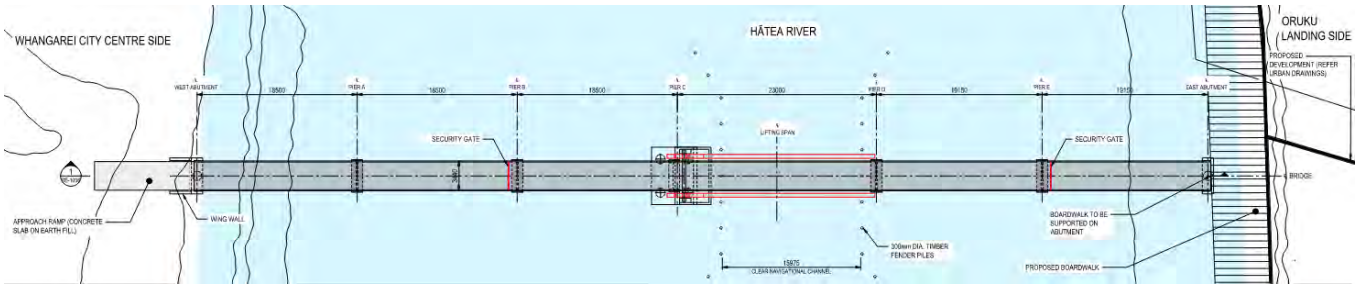


Figure 4-1: Plan arrangement of the bridge

The navigational span consists of two parallel symmetrical steel structures that support a single bridge deck. Each of the leaves is an L-shaped structure with variable depth steel box girder cross-section with lowest depth at both ends, and maximum depth at junction of vertical and horizontal elements where design forces are at their highest. The deck is made of steel plate supported on longitudinal stiffeners spaced at regular intervals. These deck stiffeners run parallel to the main beams. The orthotropic deck is supported on cross girders spanning in the transverse direction between the main beams. Steel box sections with an orthotropic deck are used for lightweight construction to minimise power requirements for the M&E equipment.

The design intention is to express the bridge structure in its architectural form. The steel elements comprise functioning structural members which during detailed design can be elegantly shaped to create a slender sculptural form. As the structure is viewed from many angles when moving from closed to open positions it is important to consider the design of each piece as a single 3-dimensional object. A selection of images below illustrates the concept form of the bridge and the opening span arrangement.

Figure 4-2: View showing full length of the bridge concept design

Figure 4-3: View showing full length of the bridge from the Oruku Landing

Opening and closing movements are achieved via rotation around a horizontal axis connected to rotating bearings built into the apex of the L-shaped structures. This design creates vertical motion which minimises use of marine space.

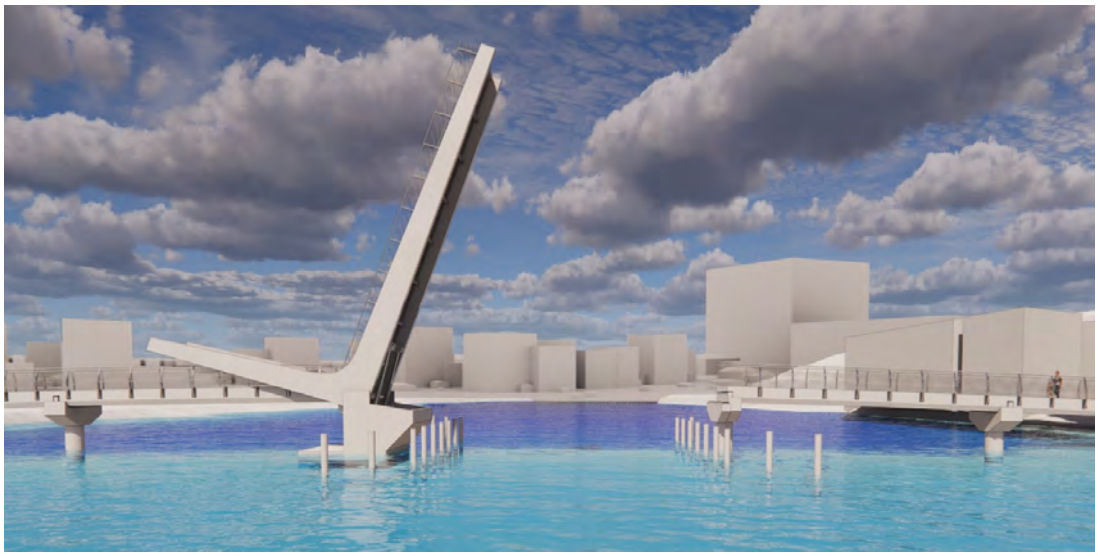


Figure 4-4: View of the bridge in open configuration

The steel superstructure of the navigation span is opened from main pier which also houses the hydraulic cylinders that operate the bascule span. This pier is constructed in reinforced concrete and supported by a group of bored piles as an appropriate form of foundation at this location. Piles are made of reinforced concrete and cast into sockets in the underlying Northland Allochthon mudstone bed rock with permanent steel casings.

Approach spans are constructed from precast SHC beams supported on reinforced concrete headstocks integral with reinforced concrete bored pile foundations.

Figure 4-5: View of the bridge from the city side in open configuration

Refer to drawings included in Appendix A for further detail of the proposed concept design.

4.2 Geotechnical design

This concept geotechnical assessment has been based on limited information. A geotechnical investigation, limited in scope due to Covid-19 Government imposed restrictions, has been undertaken on the northeast side of the river to inform the preliminary design of the proposed Oruku Landing Conference and Events Centre. Details of this investigation have been reported separately (Beca, 2021, Oruku Landing – Geotechnical Factual Report and Beca, 2021, Oruku Landing – Preliminary Geotechnical Interpretative Report) and should be referred to for description of the regional geology and ground conditions underlying the proposed Oruku Landing site.

A desktop study was also undertaken to search for historical data relevant to ground conditions on the southwest side of the river, however no relevant geotechnical information was discovered. In the absence of site-specific information, the sub-surface profile on the southwest side has been assumed to be similar to that encountered at the Oruku Landing site, with the potential of deeper depth to rock.

The subsurface profile at each riverbank has been assumed as man-made fill, typically of non-cohesive soils, overlying compressible and typically low strength marine and alluvial deposits, overlying Northland Allochthon soils and rock of the Whangai Formation. The fill is absent within the river, with surficial deposits outside the dredged channel assumed to consist of several metres thickness of soft recent marine sediments. A geological cross section at the proposed bridge location is presented in Appendix C.

Concrete bored piles are proposed for the bridge, socketed into very weak Whangai Formation mudstone which is anticipated to be encountered at depths of 25m below ground level or more. The Whangai Formation rock is typically highly sheared and an ultimate (failure) end bearing capacity of 7MPa and skin friction of 100kPa socket is recommended for concept design. Uplift capacities are also limited in these materials and may be assumed as 100kPa ultimate (failure) within the rock socket for concept design. For the concept design stage, a geotechnical strength reduction factor of 0.5 has been adopted.

At the abutments negative skin friction is expected from static settlement due to the compressible nature of the soils and loading imposed by filling for approach ramps and ground improvement. An imposed load of

approximately 2100kN is estimated for these piles for concept design. This corresponds to a calculated NSF with a 1.35 load factor applied.

Geotechnical vertical capacity recommended for adoption at concept design stage for a 1m diameter bored pile with 8m rock rocket are presented in Table 4.1 below.

Pile Size (diameter)	Pile Type	Unfactored Geotechnical Vertical Compression Capacity (kN) per pile	Dependable Geotechnical Vertical Compression Capacity (kN) per pile (excl. NSF)	Dependable Geotechnical Vertical Compression Capacity (kN) per pile (incl. NSF – static case at abutments)
1000mm	Bored pile with an 8m rock socket	8007 kN	4004 kN	1918 kN

Table 4.1 Geotechnical Vertical Compression Capacity

Based on analysis undertaken for the proposed conference and events centre liquefication is expected to occur in the reclamation fill during seismic loading. Lateral spreading of these materials towards the sea wall is likely to result, imposing a large lateral load on the abutment/piles. Analysis also indicates the riverbank is at marginal stability under static conditions and additional loading such as construction of approach ramps may lead to slope failure. The north-eastern abutment of the proposed bridge is anticipated to land within the zone of ground improvement proposed for the conference centre to mitigate these risks. Similar treatment is recommended at the south-western abutment, with a zone of ground improvement around the abutment, or alternative retaining solutions.

Potential ground improvement methods are discussed in the conference and events centre report. At this stage in the design process it is recommended that an allowance be made for an improved block of 25m long parallel to the river bank, 10m wide and 10m deep (refer Figure 4-6below). A cutter soil mixing lattice or block has been assumed and temporary works design will need to take into account the requirement for access, temporary working platform etc. The works would need to take place landward of the existing seawall (i.e. not in the river).

Failure of the channel side slopes in the river may occur under seismic loading, and the piles within the river should be designed to account for lateral loading within the top 2-3m within the riverbed to account for this. The stability of these slopes and magnitude of the load will be dependent on the dredge profile adopted and the strength of the riverbed soils. Lateral support available to the top of the piles from the in-situ material is likely to be minimal and will require further investigation and analysis at later design stages.

To inform preliminary design of the bridge specific geotechnical investigation is recommended which should include intrusive testing at proposed pier and abutment locations. This will inform the geotechnical analysis required to define the various risks that have been identified and inform design of appropriate mitigation measures.

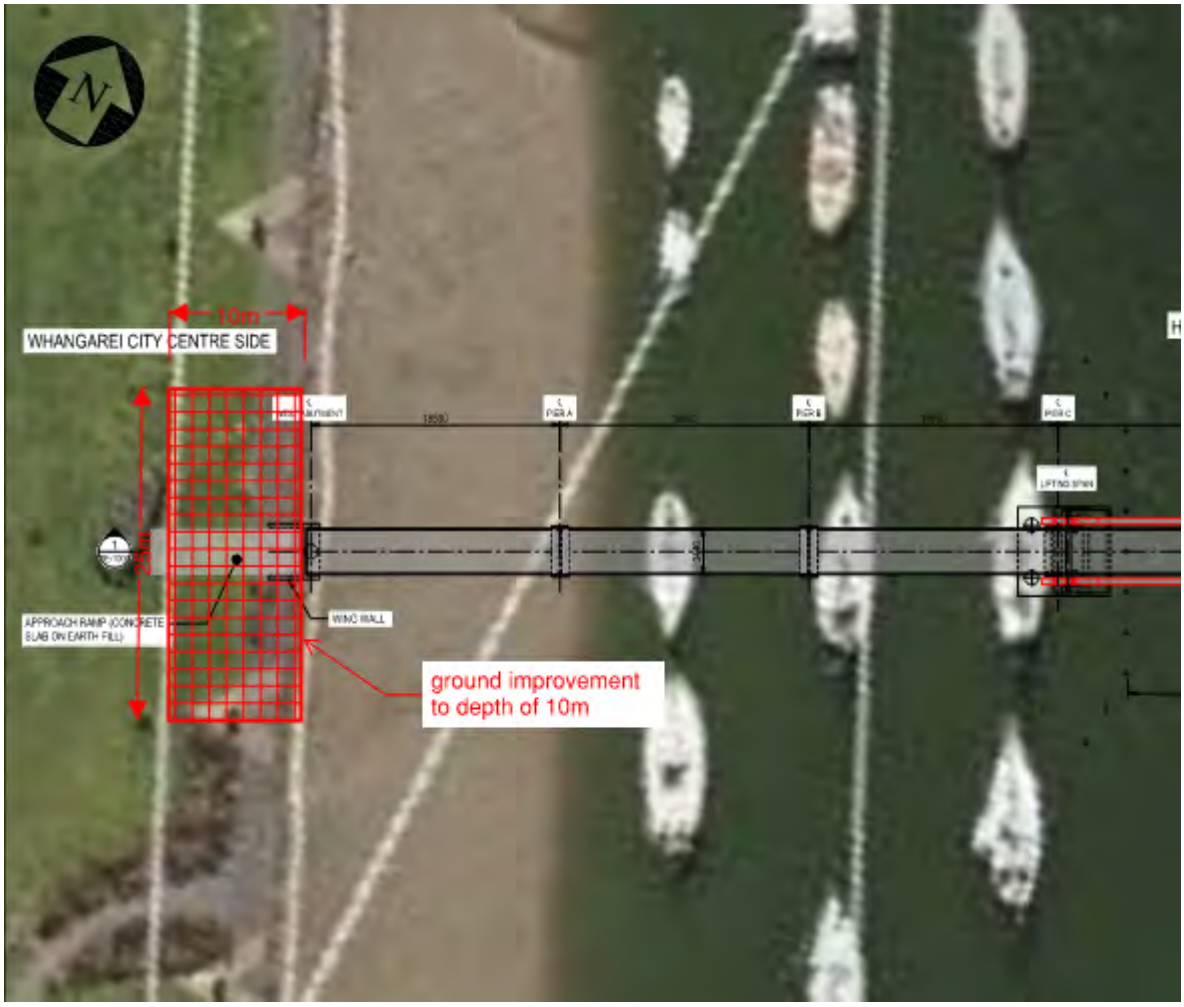


Figure 4-6 Approximate location of proposed concept for ground improvement block (Not to scale).

4.3 Geometry and Clearances

The proposed bridge provides a 3.2m clear width for the shared path which satisfies the Austroads guide requirement. The navigation span in the closed position will provide a 3m high x 16m wide navigation channel under soffit of the main beams.

4.4 M&E Equipment

The operating equipment to raise the navigational span is based on a standard tried and tested arrangement for the bascule bridges around the world.

The navigational span is mounted on a horizontal trunnion. The pivot is formed from a cylindrical casting or fabrication for rotation of the deck. Opening/closing of the span is facilitated by hydraulic cylinders. These cylinders are fixed at base of the main pier and connected to the fabricated transfer beam connected to both longitudinal box girders. This will enable cylinders to generate enough torque resulting in rotation of the span about horizontal axis. Bearing elements at both ends of the trunnion will be formed from low friction, high wear resistance material.

Twin hydraulic cylinders are proposed to provide redundancy so that in the event of a cylinder failing the second cylinder can lift and support the opening span on its own.

Each cylinder will be supplied with pressurised oil by a hydraulic power unit. The power unit consists of a large tank to contain the oil, multiple hydraulic pumps, valves and filtration units. Multiple pumps are provided

so that in the event of a single pump failing, the remaining pumps can continue to operate the opening span at reduced speed.

The main pier of the navigational span will be on the Whangarei City Centre side. The power unit will be stationed in a machine room located off the bridge towards this side. Pressurised oil will be carried to hydraulic cylinders via stainless steel pipes capable of carrying highly pressurised oil.

Additional stand-by-power supply is proposed to enable operation of the bridge during a power supply outage.

4.5 Operation and Maintenance

The bridge is proposed to be operated either remotely using CCTV by the operators of the Te Matau ā Pohe bridge or from a new control booth. Direct lines of sight will be supplemented with CCTV cameras to cover upstream and downstream along the river and the whole length of the bridge along with its approaches.

Access onto the navigational span prior to and during span operation will be restricted via automated gates on each approach span. Prior to gate operation, warning lights and sound alarms will be activated to provide a warning to the public that the gates are about to close, and span is about to be moved.

The deck positions will be monitored by multiple position sensors. The signals from these will be fed into the control system to enable the electrical equipment to safely operate the hydraulic valves which in turn result in the span moving.

Operation of the bridge (i.e. opening of bascule span to allow for navigation) will be coordinated with operation of the Te Matau ā Pohe bridge.

The detailed design will specify performance requirements for all equipment with a life to first major maintenance or replacement of a minimum 25 years. Operation and Maintenance manuals and spare parts lists will form part of the toolkit to define routine ongoing maintenance requirements for the mechanical and electrical equipment.

4.6 Construction Methodology

Based on our experience of delivering many bridges and other structures in marine environments in New Zealand and overseas, we have prepared an initial construction methodology outlining a sequence of critical stages for implementation of the proposed bridge.

The main steps required for construction of the new bascule bridge are as follows:

- Piling for the new bridge foundations.
- Construction of piers and abutments.
- Construction of the main pier.
- Construction of concrete approach spans.
- Off-site fabrication of steelwork and M&E equipment.
- Installation of M&E equipment.
- Installation of navigational span steel superstructure.
- Testing and commissioning of bridge operations.

The final construction methodology will depend on the contractor’s resources and equipment available during the implementation stage. For the basis of this Concept Design it has been assumed that access for construction in the river will be provided by temporary staging with barges used at critical stages for delivery of plant and equipment. In order to provide space for access for bridge construction, temporary haul roads

and laydown areas for storage of materials will be needed on both banks of the river. Access to the final bridge location will need to be coordinated with construction of the apartment, hotel and conference centre buildings on the Oruku Landing site. This methodology and precise sequence of construction stages will be developed during later stages of the project and may need to account for / be influenced by the construction methodology for the Oruku Landing boardwalk

4.7 Programme

The design and construction programme of the proposed bridge needs to be aligned with construction of the Oruku Landing development.

The estimated design and construction programme for the proposed bridge will include 6-month design and consenting period followed by 12-month construction period. This design programme is tight and will require the design and consenting process to run in parallel for 6 months.

5 Cost Estimate

5.1 Scope of the Concept Cost Estimate

The scope of the present option assessment and Concept Design report includes a high-level cost estimate for the bridge concept to confirm the budget for the works.

The rough order cost estimate has been based on the limited amount of the design carried out to date. The cost estimate includes contingencies appropriate for the level of design at this early concept stage. Updates to the cost assessment can be made and more information can be included of the details and quantities of the materials once WDC allows for the design to move to next stages.

We have used pricing information from our extensive database of construction projects throughout New Zealand compiled from our involvement in bridge projects over several decades.

5.2 Concept Design Cost Estimate

The high-level break-down of the estimated construction costs is shown below:

Table 5.1: High level cost estimate

No.	Description	Cost
1	Ground improvement	$0.5M
2	Foundation and substructure	$1.64M
3	Superstructure	$2.39M
4	Mechanical and Electrical	$2.52M
5	Miscellaneous, finishes	$1.76M
6	Preliminary and General costs (25%)	$2.2M
7	**Total for Physical work**	**$11.0M**
8	Allowance for project development, pre-implementation & implementation phase (21% on 7)	$2.96M
9	Contingency (30% on 7, 8)	$4.19M
10	**TOTAL COST ESTIMATE (7, 8, 9)**	**$18.15M**

Expected cost estimate (P50) for the new bridge is $18 million. Following Waka Kotahi NZTA Cost Estimate Manual (SM014) 2ed, section 9.2 guidance, further allowance for funding risk contingency is added to P50 cost estimate to determine 95th percentile (P95) cost estimate. This risk can have a beneficial impact (opportunity, assumed as -10% on P50) or a detrimental impact (threat, assumed as +20% on P50). Based on this approach lower-bound cost estimate will be $16 million and upper-bound cost estimate will be $22 million (P95).

Refer to Figure 5-1 for P50 and P95 cost estimate explanation.

Refer to Appendix B for more information about cost estimate.

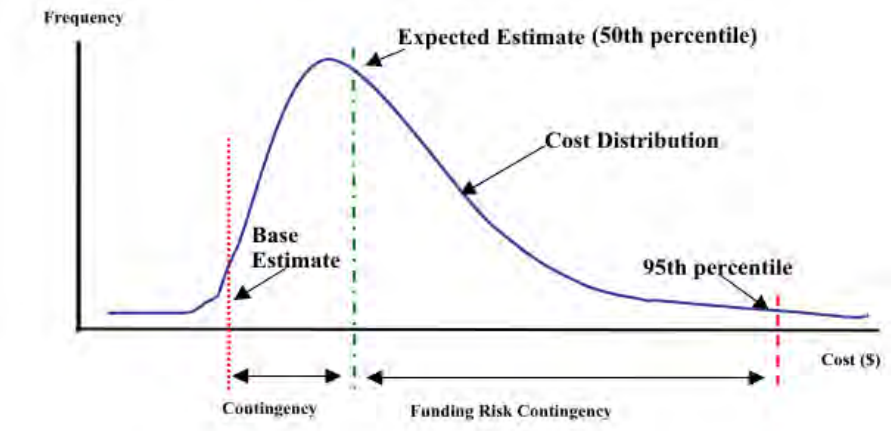


Figure 5-1: Probabilistic distribution of cost estimate (from Waka Kotahi NZTA cost estimate manual, 2ed)

6 Safety in Design

Safety in Design is an integral part of the design process and it is particularly important for an opening bridge to assess potential hazards associated with design, operation, and maintenance of the crossing. Safety considerations on design, construction, operation, and marine safety were considered during the preferred option and structural typology selection.

Precast construction methodology is proposed for concrete elements of the bridge except for the piles to minimise safety risks during construction. Similarly, it is proposed to fabricate structural steel navigation span off-site and transport it to the bridge location via river using a barge and cranes to lift it into place.

A Safety in Design workshop will be conducted with involvement from Beca design team, wider WDC team, Harbourmaster and Marina operators in next stage of the design.

7 Stakeholder Engagement

Engagement with key stakeholders was undertaken during option development and assessment to understand the constraints in the area and marina environment. This engagement is summarised below. Ongoing engagement with these stakeholders will be required through further design development and consenting processes.

7.1 Harbourmaster

An online meeting was held on 20th September 2021 with the Regional Harbourmaster. Discussion with the Harbourmaster provided valuable information and understanding of the current operations of Te Matau ā Pohe and how this will influence the proposed Oruku Landing bridge. The Harbourmaster shared information on boat movements along the Hātea River, the location of the navigational channel and general patterns of use within the river that fed into the options assessment process and helped develop the concept design.

7.2 Whangarei Marina Trust

The Whangarei Marina and its property is a key constraint in the project area. A meeting was held with the project team, WDC and the Whangarei Marina Trust (the Trust) on 28th September 2021. The purpose of the meeting was to provide an overview of the project, its current status and obtain information and feedback from the Whangarei Marina Trust about the marina operations and their property.

The Trust have 187 berths in the marina basin and raised concerns about the proposed bridge being an additional constraint for boat users and the potential impacts or removal of moorings within the Hātea River. The Trust identified they are not in favour of any bridge and that the central bridge option would have the most impact to the marina. The project team shared a number of ways to manage operation of the bridge and the marina to manage impacts should the bridge be taken forward.

The Trust provided additional information on dredging, vessel movements, existing bridges operation protocols, moorings and general use and patterns of the river that fed into the options assessment process and helped develop the concept design.

7.3 WDC Multi Criteria Assessment Workshop

As part of the options assessment process, an MCA workshop was held on 8th October 2021 with representatives from WDC, the project team and cultural design advisors. The purpose of the workshop was to present, discuss and challenge the preliminary scoring against each criterion by technical specialists. Workshop attendees provided useful insight and challenge to strengthen the options assessment process. That process is summarised in section 3.

7.4 Mana Whenua

A hui with Hapu representatives of Te Parawhau and Te Kahu o Torongare was held on Wednesday 27 October, 1-3pm in the Council Chambers. The outcomes of this Hui are contained in the Feasibility Report.

8 Consenting

A preliminary planning review was undertaken to determine the likely resource consenting requirements to implement the proposal. The below provides an overview of the planning context of the site and likely resource consenting requirements. Further design detail and a full planning assessment will be required to determine the exact consenting requirements.

8.1 Planning context

District and regional plans relevant to the proposal are:

- **Whangarei District Plan Appeals Version:** The Appeals Version of the Whangarei District Plan (WDP) is now to be treated as operative, unless there are any outstanding appeals. No appeals are considered relevant to the proposal.
- **Proposed Regional Plan for Northland – Appeals Version:** The Proposed Regional Plan for Northland (PRPN) will not be fully operative until all appeals are resolved. Where a rule in the Proposed Regional Plan has not been appealed, in accordance with Section 86F of the Resource Management Act, it must be treated as operative (and any previous rule as inoperative).
- **Operative Northland Regional Water and Soil Plan (NRWSP):** for works on the riverbanks that are not covered by operative rules in the PRPN.
- **Operative Regional Coastal Plan (NRCP):** for works within the coastal marine area that are not covered by operative rules in the PRPN.

Under the WDP, the proposed bridge location site is zoned Open Space Zone and may extend into the Waterfront Zone at its northern extent (see Figure 8-1). Under the Operative Regional Coastal Plan, the coastal area is zoned Marine 2 (Conservation Management Area) and Marine 4 (Controlled Mooring) Management Area (see Figure 8-2). Under the Proposed Northland Regional Plan, the coastal area is zoned Whangarei City Centre Marine Zone and Marina Zone (see Figure 8-3).

Figure 8-1: WDC Zoning (proposed bridge location shown in dashed outline)

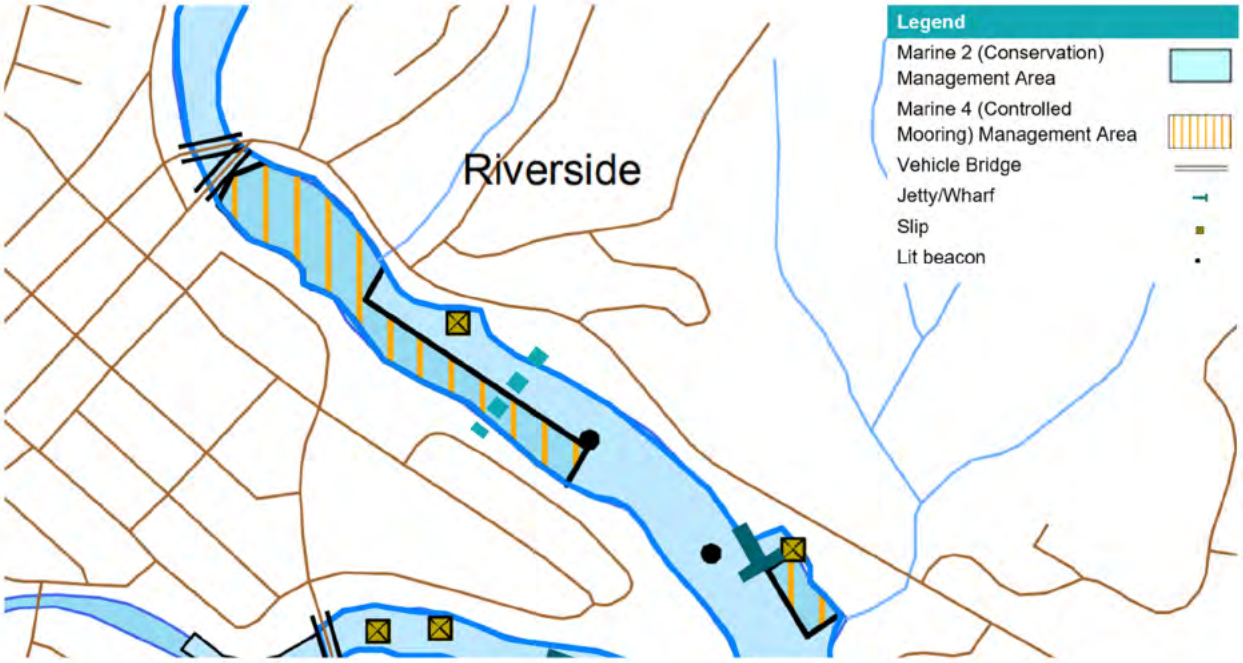


Figure 8-2: Operative Regional Coastal Plan Map (proposed bridge location shown as a dashed line)

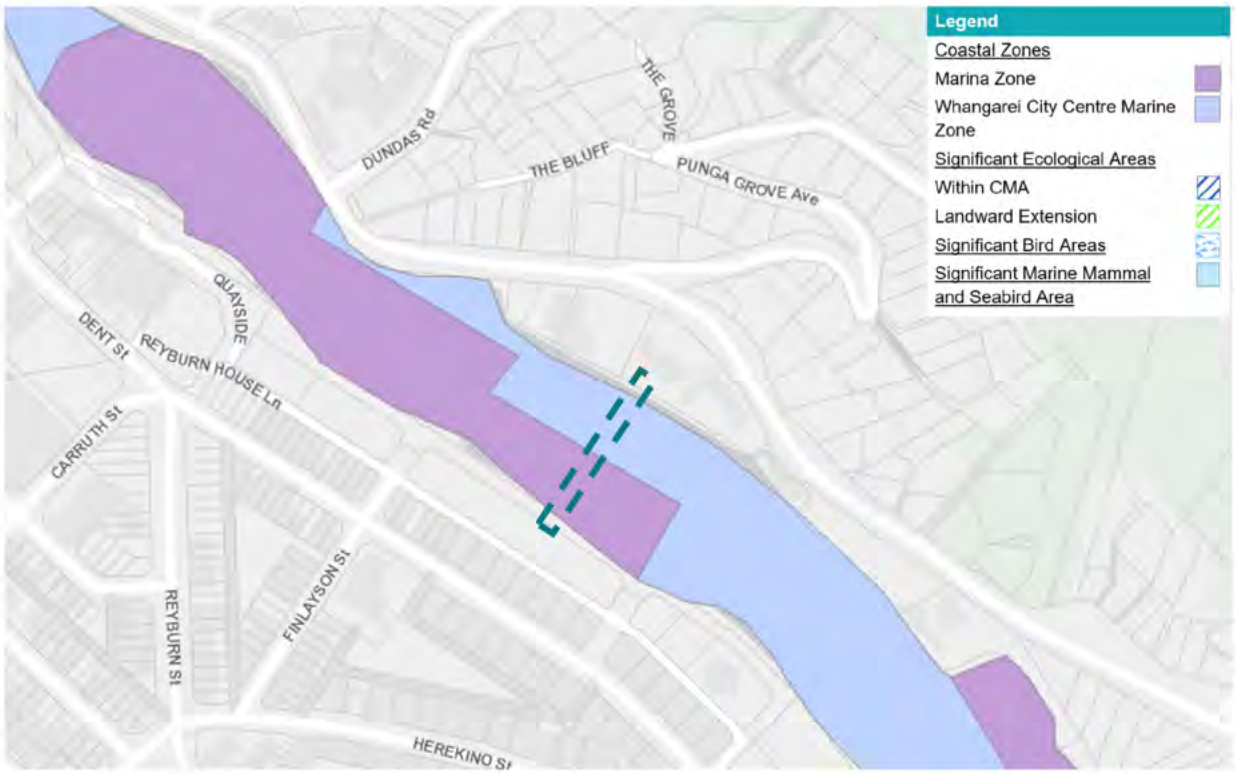


Figure 8-3: Proposed Northland Regional Plan showing Coastal Zones and significant areas (proposed bridge location shown in dashed outline)

8.2 Likely consent requirements and risks

Both regional and district resource consent would be required to implement the bridge. Based on an initial review, we have identified key consenting issues likely to require consideration and assessment. A full planning assessment will need to be undertaken to determine the consenting requirements following further design refinement. Key considerations and potential consent requirements include:

- Structures in marine zones and occupation of the coastal marine area (CMA)
- Cultural impacts
- Capital and maintenance dredging and spoil disposal
- Earthworks
- Geotechnical matters including settlement and groundwater
- Discharge of stormwater from land disturbance activities
- Discharge of contaminants / stormwater if standards not met
- Reclamation (if required)
- Coastal ecology and processes
- Noise and vibration – both on land and underwater
- Flood hazard
- Construction traffic
- Placement or relocation of a mooring and the occupation of space (if required for mitigation)

There are two key consenting pathways that could be followed to obtain the necessary approvals, these are: a combination of regional and district plan consents or a notice of requirement to designate land and regional resource consents. It is recommended the resource consent pathway is adopted given the small footprint of the bridge located on land.

Table 8.1 outlines initial consenting risks that could pose time and cost implications if not managed appropriately.

Table 8.1: Consenting Risk

Risk	Description	Risk Rating
Public Notification	Notification of a resource consent application and/or a notice of requirement can be a risk to programme delivery. Due to the nature of the project and public interest, it is likely the project would be publicly notified. To minimise risk of submissions in opposition and a lengthy hearings and appeals process, consultation and engagement should be undertaken with the community and key stakeholders.	
Impacts on affected parties	The project has the potential to directly impact property of the Whangarei Marina Trust and boat users. Similar to the above, engagement with these directly affected parties is required and mitigation measures should be explored to minimise any impacts.	
Cultural Values	The surrounding area is of great cultural significance to Hapū, particularly Parihaka Maunga and Oruku Pa. The nature of the works in the CMA has the potential to impact cultural values. If the project is found to have significant impacts on cultural values, it may result in unfavourable project outcomes and could impact upon the consenting timeframes. Continued engagement and consultation with Hapū is required throughout the design and consenting phase. Possible mitigation measures could focus on cultural monitoring, landscaping, cultural design input, sediment control, stormwater discharge and contaminated soil.	

Risk	Description	Risk Rating
Reclamation is required	The New Zealand Coastal Policy Statement seeks to avoid reclamation of land in the CMA, posing a strict policy test for the project to meet if reclamation is required. Further design development should seek to avoid reclamation of the CMA in the first instance.	

Risk Rating Key:	 **Low**	 **Medium**	 **High**
	Minimal impact to consentability, time and cost.	Moderate impact to consentability, time and cost	Significant impact to consentability, time and cost

9 Conclusions and Recommendations

9.1 Conclusion

This report describes the method of option assessment carried out for the proposed Oruku Landing shared path bridge, and selection of a preferred option for development into a concept design. A collaborative process of assessment was undertaken with multiple stakeholders from wider WDC team and Beca design team.

The feasibility study has concluded that both the Central (Shortlist option 2) and Eastern option (Shortlist option 3) are feasible shared path bridge location options that could be progressed to resource consenting if funding is approved.

The single leaf bascule bridge at Central (Shortlist 2) option was taken forward as the preferred option for development of the concept design, with assessment of feasibility and cost estimate.

It was estimated that the cost of the preferred option could be in range of $16 million to 22million. At this stage cost estimates are based on early concept level of design.

9.2 Recommendations

At this stage WDC needs to confirm that design can be progressed to next stage depending on availability of the funding.

Following the confirmation from WDC it is recommended that next steps be taken in the delivery process for the proposed single leaf bascule option:

1. Commence the planning process to gain resource consents for the project as soon as possible.
2. Continue with the design development to progress to preliminary design stage, to support the planning process and to update cost estimates for the proposed bridge.
3. Decide on a procurement strategy and proceed to enable collaborative construction planning with designers and constructors during the detailed design phase.

A

Appendix A – Oruku Landing Bridge Concept Design Drawings

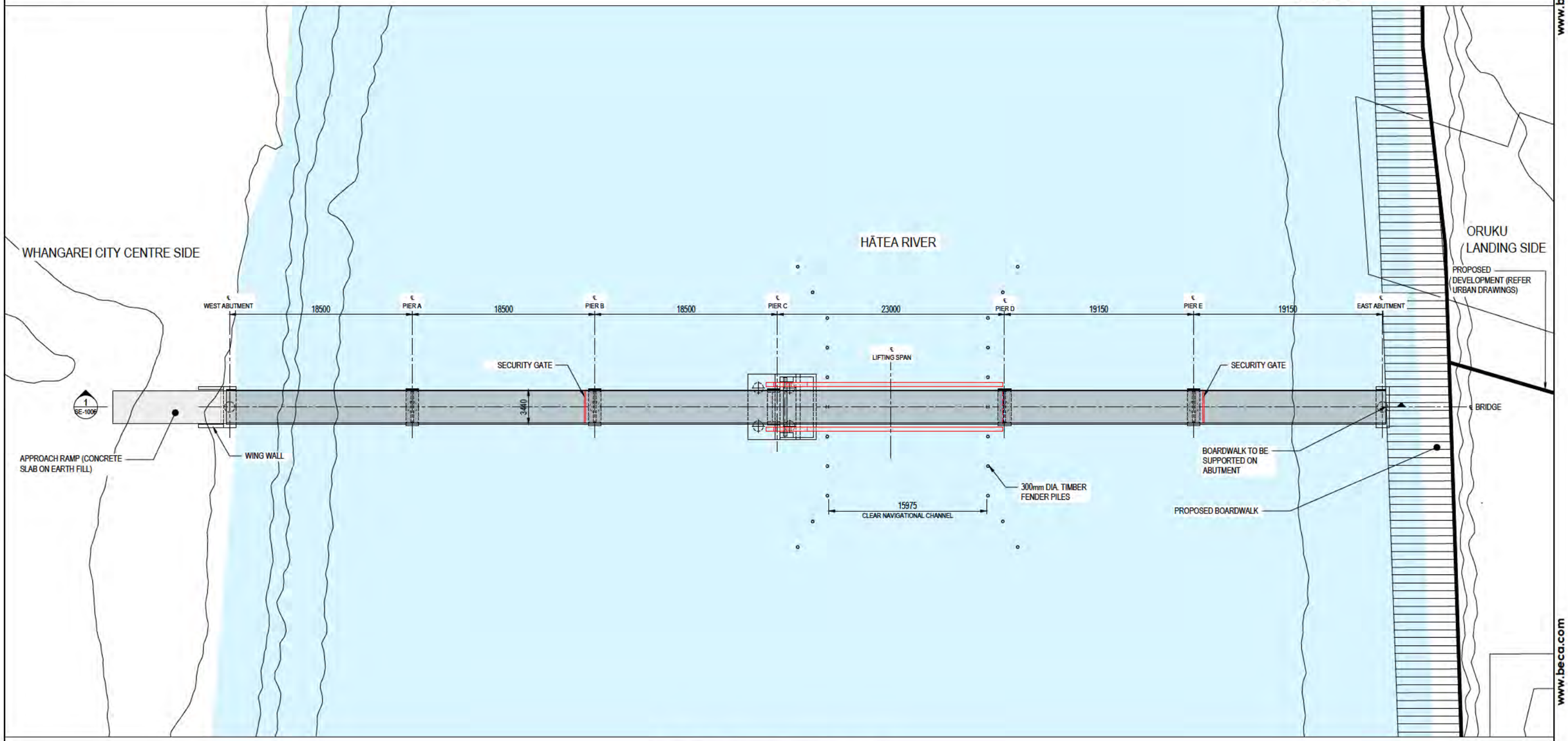
Drawing Plotted: 29 Oct 2021 9:24 am

NOTES:

1. ALL DIMENSIONS ARE IN mm UNO. CHAINAGES AND LEVELS ARE IN m UNO.

2. DESIGN SPECIFICATIONS :
   - 2.1 DESIGN LIFE : 100 YEARS.
   - 2.2 IMPORTANCE LEVEL : 2
   - 2.3 CONCRETE EXPOSURE CLASSIFICATION : C
   - 2.4 ATMOSPHERIC CORROSIVITY CATEGORY FOR STRUCTURAL STEEL : C5-M
   - 2.5 ALL STEEL PLATES TO BE GRADE 350 TO AS/NZS 3678:2011
   - 2.6 ALL BEAM SECTIONS TO BE GRADE C350L0 TO AS/NZS 1163
   - 2.7 ALL ANGLES TO BE GRADE 300 TO AS/NZS 3679.1
   - 2.8 CONCRETE STRENGTHS:
     - REINFORCED CONCRETE PILE: 30MPa
     - REINFORCED CONCRETE PIER: 50MPa
     - PRECAST PIER HEADSTOCK: 50MPa
     - CAST-IN-SITU ABUTMENT: 50MPa
     - PRECAST SHC BEAMS: 50MPa
     - CAST-IN-SITU DECK SLAB: 50MPa

3. DESIGN LOADS:
   - 3.1 LIVE LOAD : 5kPa



PLAN - ORUKU LANDING BRIDGE
SCALE 1:200 (A3), 1:400 (A1)

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk.	Appd	Date
+	UNDER REVISION				

Drawing Originator: Beca

Original Scale (A1) As Shown	Design	C. Singh	Oct '21	Approved For Construction*
Reduced Scale (A3) Half Shown	Drawn	V. Panthees	Oct '21	
	Dsg Verifier	W. Pank	Oct '21	
	Dwg Check	C. Singh	Oct '21	Date

* Refer to Revision 1 for Original Signature

Client: Whangarei District Council

Project: ORUKU LANDING

Title: ORUKU LANDING BRIDGE PLAN

Discipline: STRUCTURAL ENGINEERING

Drawing No.: 4242786-SE-1005 Rev.: A

DO NOT SCALE

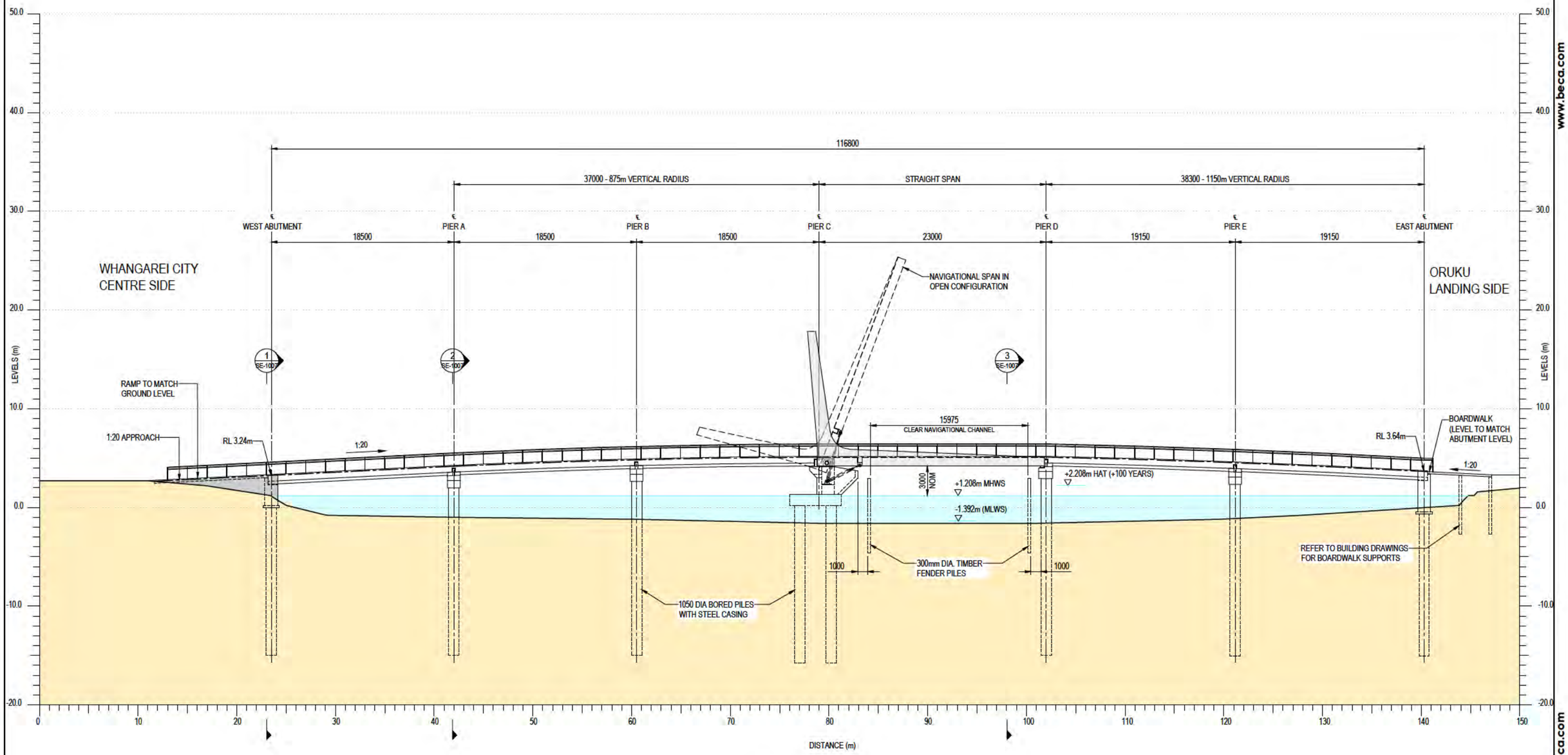
IF IN DOUBT ASK.

Document No. 4242786-SE-1005.DWG

Drawing Plotted: 29 Oct 2021 9:07 am

NOTES:

1. FOR NOTES REFER TO DRAWING SE-1005.



1 SE-1005 LONG SECTION

1:200 (A1), 1:400 (A3)

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PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
+	UNDER REVISION				

Drawing Originator: Beca

Original Scale (A1) As Shown	Design	C. Singh	Oct '21	Approved For Construction*
Reduced Scale (A3) Half Shown	Drawn	V. Panthees	Oct '21	
	Dsg Verifier	W. Pank	Oct '21	
	Dwg Check	C. Singh	Oct '21	Date

* Refer to Revision 1 for Original Signature

Client: Whangarei District Council

Project: ORUKU LANDING

Title: ORUKU LANDING BRIDGE ELEVATION

Discipline: STRUCTURAL ENGINEERING

Drawing No.: 4242786-SE-1006 Rev.: A

Document No. 4242786-SE-1006.DWG

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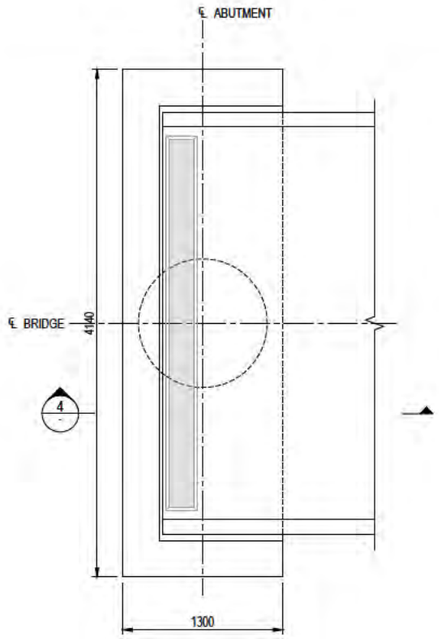
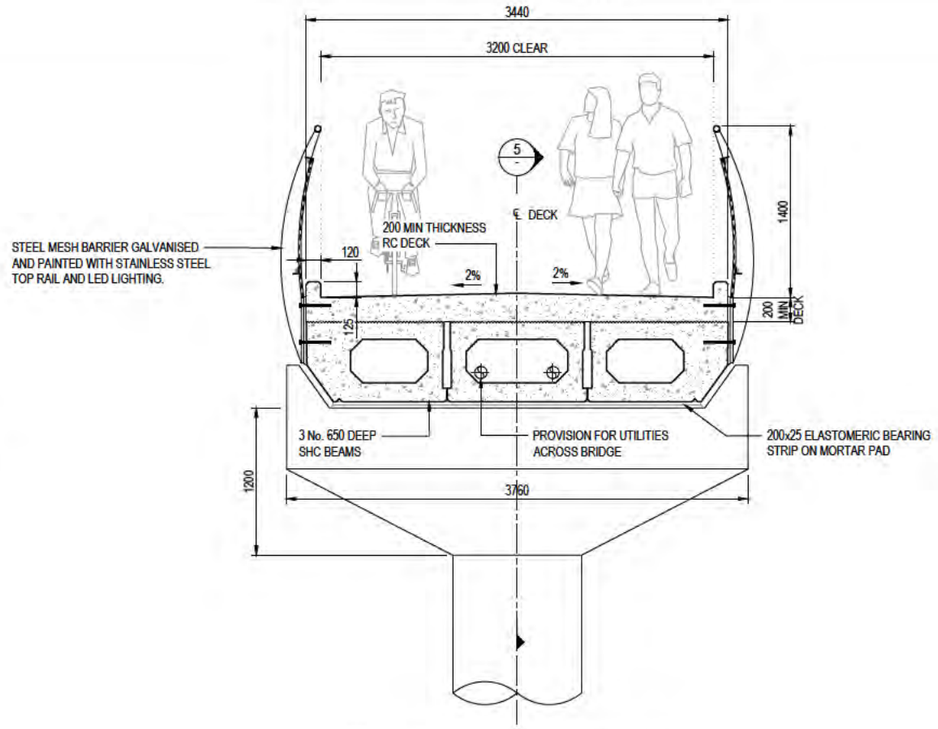
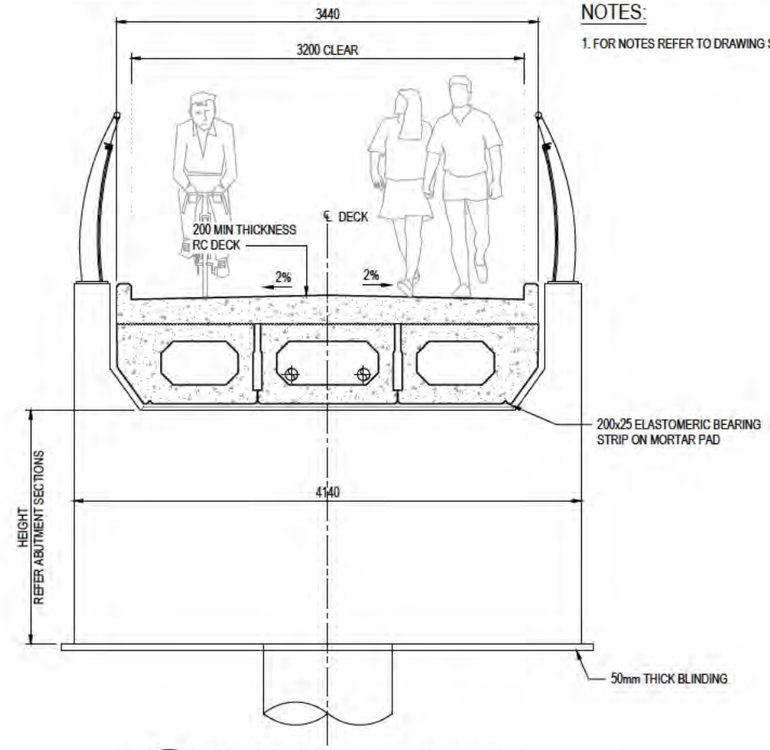


PLAN - ABUTMENT CAP
1:25 (A1), 1:50 (A3)



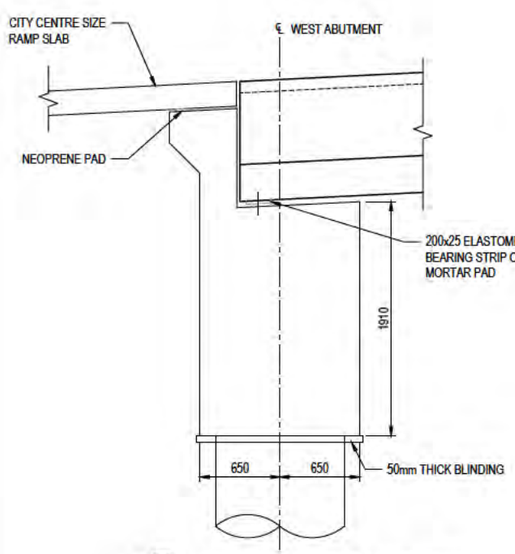
2 SE-1006 TYPICAL CROSS SECTION AT PIER
1:25 (A1), 1:50 (A3)



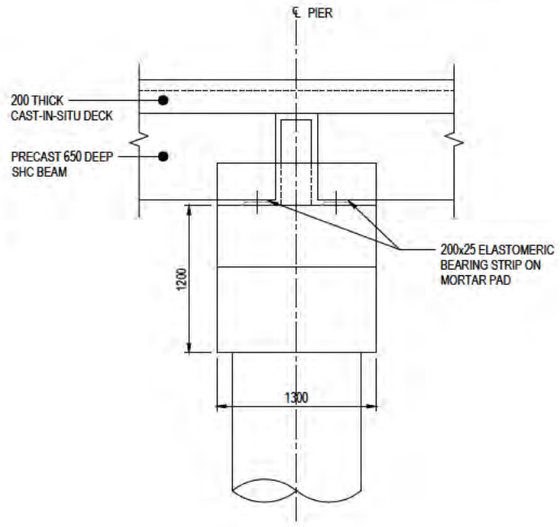
1 SE-1006 FRONT ELEVATION - ABUTMENT CAP
1:25 (A1), 1:50 (A3)

NOTES:

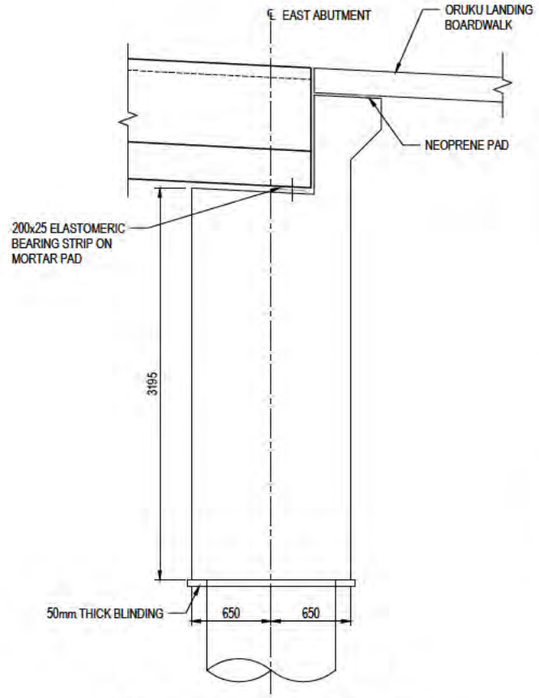
1. FOR NOTES REFER TO DRAWING SE-1005.



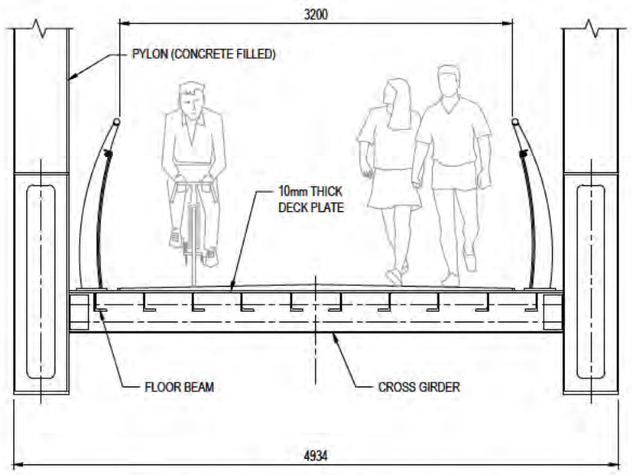
4 SE-1006 SECTION AT WEST ABUTMENT
1:25 (A1), 1:50 (A3)



5 SE-1006 SECTION
1:25 (A1), 1:50 (A3)



6 SE-1006 SECTION AT EAST ABUTMENT
1:25 (A1), 1:50 (A3)



3 SE-1006 CROSS SECTION OF NAVIGATIONAL SPAN
1:25 (A1), 1:50 (A3)

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
*	UNDER REVISION				

Drawing Originator: Beca

Original Scale (A1) As Shown	Design	C. Singh	Oct '21	Approved For Construction*
	Drawn	V. Panthees	Oct '21	
Reduced Scale (A3) Half Shown	Dsg Verifier	W. Pank	Oct '21	
	Dwg Check	C. Singh	Oct '21	Date

* Refer to Revision 1 for Original Signature

Client: Whangarei District Council

Project: ORUKU LANDING

Title: ORUKU LANDING BRIDGE ABUTMENT AND PIER DETAILS

Discipline: STRUCTURAL ENGINEERING

Drawing No.: 4242786-SE-1007 Rev.: A

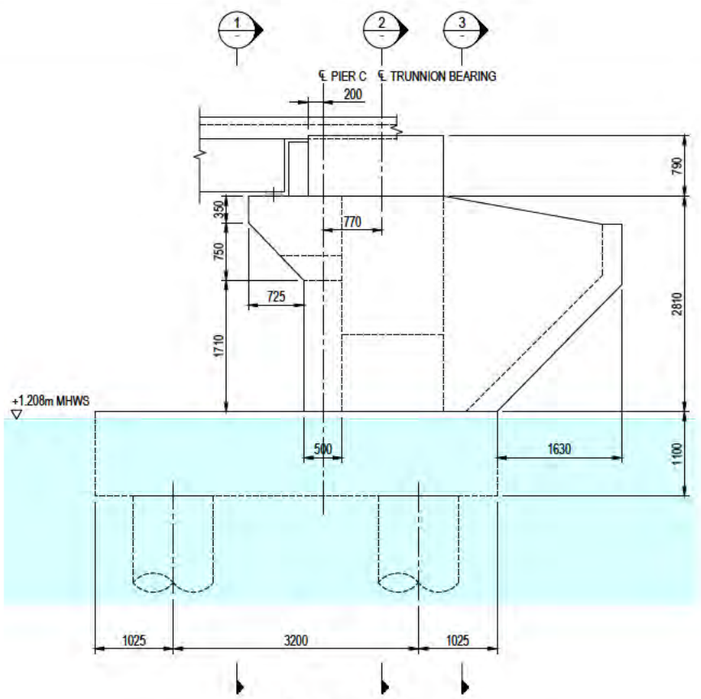
DO NOT SCALE

IF IN DOUBT ASK.

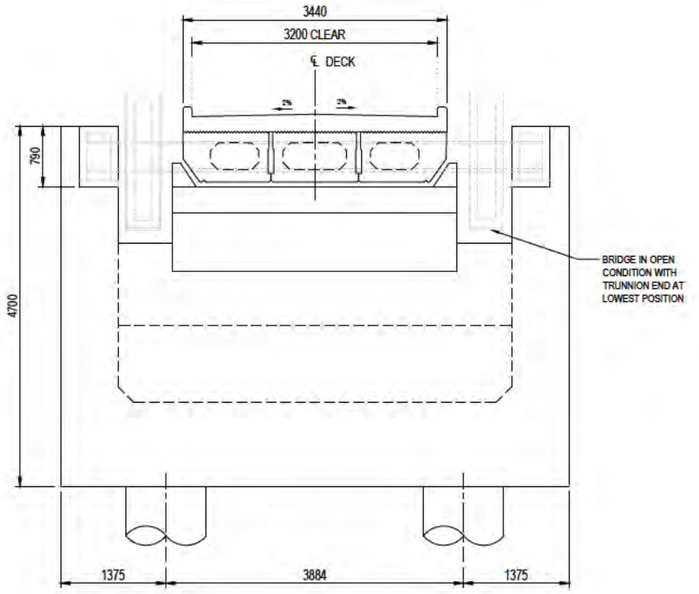
Drawing Plotted: 27 Oct 2021 4:46 pm

NOTES:

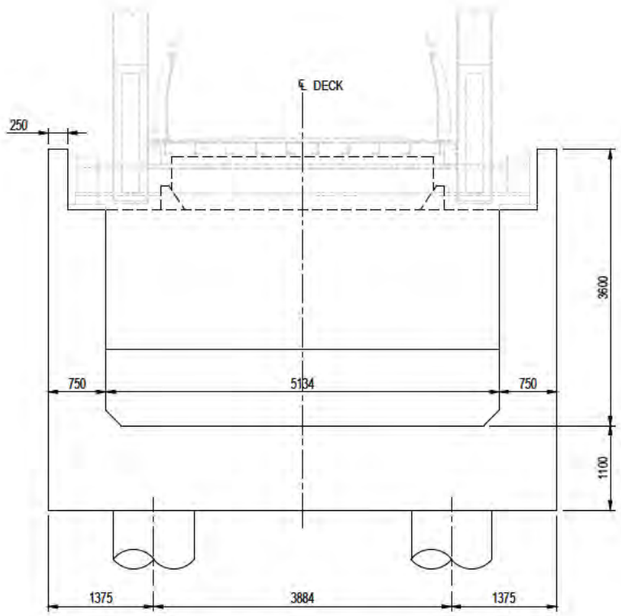
1. FOR NOTES REFER TO DRAWING SE-1005.



1 ELEVATION
1:40 (A1), 1:80 (A3)



1 SECTION
1:40 (A1), 1:80 (A3)



2 SECTION
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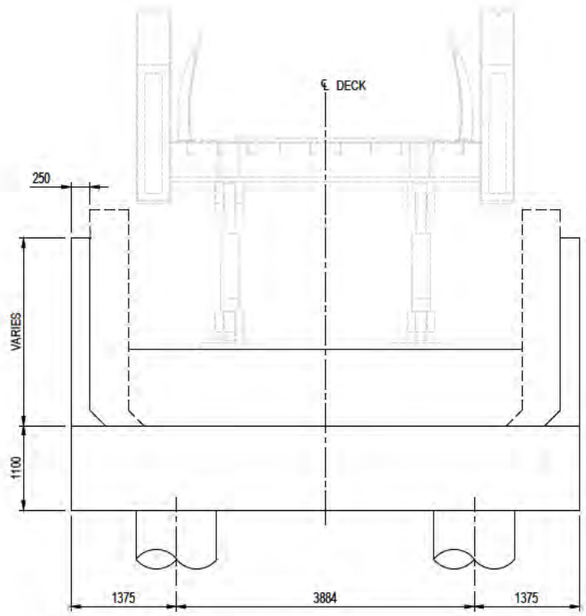


3 SECTION
1:40 (A1), 1:80 (A3)

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
*	UNDER REVISION				

Drawing Originator: Beca

Original Scale (A1) As Shown	Design	C. Singh	Oct '21	Approved For Construction*
	Drawn	V. Panthees	Oct '21	
Reduced Scale (A3) Half Shown	Dsg Verifier	W. Pank	Oct '21	
	Dwg Check	C. Singh	Oct '21	Date

* Refer to Revision 1 for Original Signature

Client: Whangarei District Council

Project: ORUKU LANDING

Title: ORUKU LANDING BRIDGE PIER - C DETAILS

Discipline: STRUCTURAL ENGINEERING

Drawing No.: 4242786-SE-1008 Rev.: A

DO NOT SCALE

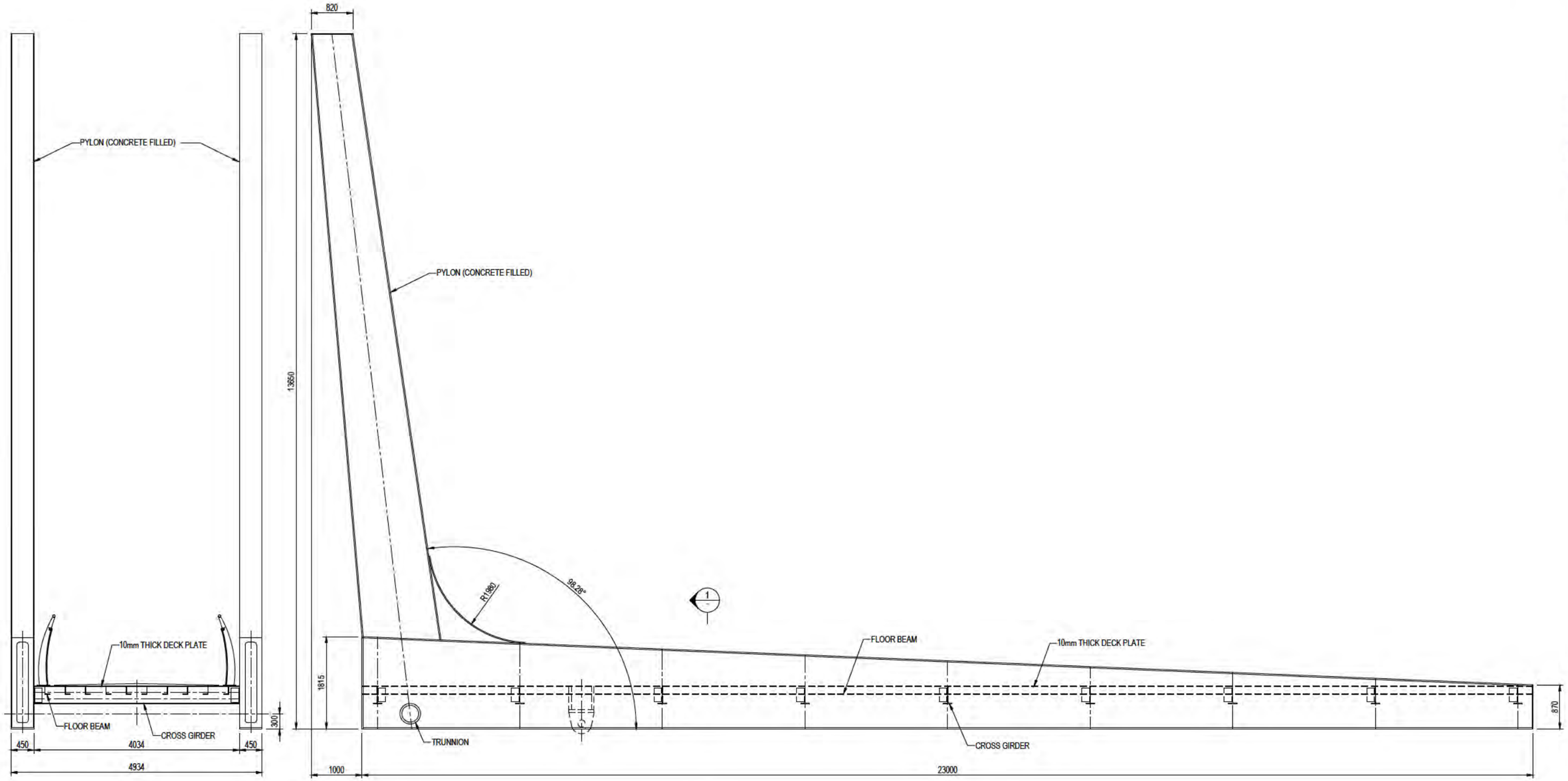
IF IN DOUBT ASK

Document No. 4242786-SE-1008.DWG

Drawing Plotted: 27 Oct 2021 1:01 pm

NOTES:

1. FOR NOTES REFER TO DRAWING SE-1005.



1 SECTION
1:40 (A1), 1:80 (A3)

ELEVATION
1:40 (A1), 1:80 (A3)

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
+	UNDER REVISION				

Drawing Originator: Beca

Original Scale (A1) As Shown	Design	C. Singh	Oct '21
	Drawn	V. Panthees	Oct '21
Reduced Scale (A3) Half Shown	Dwg Verifier	W. Pank	Oct '21
	Dwg Check	C. Singh	Oct '21

Approved For Construction* Date

* Refer to Revision 1 for Original Signature

Client: Whangarei District Council

Project: ORUKU LANDING

TITle: ORUKU LANDING BRIDGE MAIN SPAN STEEL DETAILS

Discipline: STRUCTURAL ENGINEERING

Drawing No.: 4242786-SE-1009

Rev.: A

B

Appendix B – Cost Estimate

Oruku Landing Bridge Cost Estimate

Beca
Cost Advisory

	Description	Total
	ORUKU LANDING BRIDGE COST ESTIMATE	21,780,000
	Estimate prepared by: Jason Luo	
	Estimate reviewed by: Carl Viljoen	
	Date of Estimate: October 2021	
	Job No: 4242786	
	Inputs	
	Drawings 4242786-SE-002 to 007 and 1005 to 1008	
	Scope of Work	
	Demolition and reinstatement of portion of existing seawall (stone masonry)	
	Ground improvement	
	Construct 122.5m long x 3.44m wide pedestrian bridge across Hatea river	
	Construct 5m long x 3m wide x 3m high reinforced concrete plant room (chamber)	
	Supply and install Integrated handrail lighting	
	Supply and install M & E	
	Supply and install Cameras	
	Assumption	
	6m wide trestle at both approaches	
	5m x 5m grid for 25m long x 10m wide x 10m deep 750mm diameter CFA piles	
	Contract period - 12 months	

Oruku Landing Bridge Cost Estimate

Beca
Cost Advisory

Description	Total
34m long 1050mm dia. bored pile with 16mm thick permanent casing (30MPa concrete, 280 kg/m3)	
4140mm long x 1300mm wide x 2675mm deep reinforced concrete abutment pile cap with 4140mm long x 400mm wide x 850mm deep reinforced concrete backwall (50MPa, 180 kg/m3)	
5600mm high x 1050mm dia. reinforced concrete pier (50MPa, 250 kg/m3) (Pier A)	
6500mm high x 1050mm dia. reinforced concrete pier (50MPa, 250 kg/m3) (Pier B)	
6500mm high x 1050mm dia. reinforced concrete pier (50MPa, 250 kg/m3) (Pier D)	
5900mm high x 1050mm dia. reinforced concrete pier (50MPa, 250 kg/m3) (Pier E)	
6635mm long x 6635mm wide x 1100mm deep reinforced concrete cap with 6635mm long x 750mm wide x 2575mm deep reinforced concrete side walls (50MPa, 200 kg/m3)	
3760mm long x 1300mm wide x 1200mm deep reinforced concrete pier crosshead with 1300mm long x 100mm wide x 350mm deep reinforced concrete side walls and 3760mm long x 250mm wide x 350mm deep reinforced concrete upstand (50MPa, 180 kg/m3) (Piers A, B, D & E)	
5000mm long x 3000mm wide x 3000mm high reinforced concrete plant room (chamber)	
2No x 150mm dia. services ducts	
Allowance for Environmental Compliance - $300,000	
Allowance for Traffic Management - $50,000	
Allowance for Preliminary and General - 25%	
Allowance for consultant fees - 19%	
Allowance for Client Managed Costs - 6%	
Allowance for Consenting Monitoring Fees - $40,000	
Contingency - 30%	
Funding risk - 20%	

Oruku Landing Bridge Cost Estimate

Beca
Cost Advisory

	Description	Total
	Allowance for Consent fees - $100,000	
	Exclusions	
	Property costs	
	GST	
	Escalation from February 2022	
	No allowance has been made for the impacts of extraordinary global events (such as the current COVID-19 outbreak) within the base estimate.	

Oruku Landing Bridge Cost Estimate

Beca
Cost Advisory

	Description	Unit	Quantity	Rate	Total
1	**ENVIRONMENTAL COMPLIANCE**				
2	Allowance for Environmental Compliance	LS	1	300,000.00	300,000
	Sub Total for Environmental Compliance				300,000
4	**GROUND IMPROVEMENT**				
5	Allowance for guide beams	m	131	500.00	65,500
6	10m long x 750mm dia. 3MPa unreinforced CFA piles	No	174	1,600.00	278,400
7	Spoil to waste	m3	770	50.00	38,500
8	Extra value over for contaminated material (50%)	m3	385	150.00	57,750
9	Allowance for quality control testing	LS	1	29,850.00	29,850
10	Site survey, setout and pile markings	LS	1	30,000.00	30,000
	Sub Total for Ground Improvements				500,000
12	**TEMPORARY WORKS**				
13	6m wide temporary trestle with fingers (East abutment)	m	65	9,200.00	598,000
14	6m wide temporary trestle with fingers (West abut)	m	74	9,200.00	680,800
	Sub Total for Temporary Works				1,278,800
16	**PILING**				
17	Mob/demob piling rig	LS	1	47,000.00	47,000
18	34m long 1050mm dia. bored pile with 16mm thick permanent casing (30MPa concrete, 280 kg/m3)	No	10	101,200.00	1,012,000
19	300mm dia. timber fender piles	No	20	8,000.00	160,000
	Sub total for Piling				1,219,000
21	**SUBSTRUCTURE**				
22	Allow for demolition and reinstatement of portion of existing seawall (stone masonry)	LS	1	5,000.00	5,000
23	4140mm long x 1300mm wide x 2675mm deep reinforced concrete abutment pile cap with 4140mm long x 400mm wide x 850mm deep reinforced concrete backwall (50MPa, 180 kg/m3)	No	2	28,900.00	57,800
24	5000mm long x 400mm wide x 2050mm deep reinforced concrete wingwalls (250 kg/m3)	No	4	11,800.00	47,200
25	5600mm high x 1050mm dia. reinforced concrete pier (50MPa, 250 kg/m3) (Pier A)	No	1	8,400.00	8,400
26	6500mm high x 1050mm dia. reinforced concrete pier (50MPa, 250 kg/m3) (Pier B)	No	1	9,700.00	9,700
27	6500mm high x 1050mm dia. reinforced concrete pier (50MPa, 250 kg/m3) (Pier D)	No	1	9,700.00	9,700
28	5900mm high x 1050mm dia. reinforced concrete pier (50MPa, 250 kg/m3) (Pier E)	No	1	8,800.00	8,800
29	6635mm long x 6635mm wide x 1100mm deep reinforced concrete cap with 6635mm long x 750mm wide x 2575mm deep reinforced concrete side walls (50MPa, 200 kg/m3)	No	1	159,800.00	159,800
30	3760mm long x 1300mm wide x 1200mm deep reinforced concrete pier crosshead with 1300mm long x 100mm wide x 350mm deep reinforced concrete side walls and 3760mm long x 250mm wide x 350mm deep reinforced concrete upstand (50MPa, 180 kg/m3) (Piers A, B, D & E)	No	4	14,000.00	56,000

Oruku Landing Bridge Cost Estimate

Beca
Cost Advisory

	Description	Unit	Quantity	Rate	Total
31	5000mm long x 3000mm wide x 3000mm high reinforced concrete plant room (chamber)	No	1	50,000.00	50,000
32	200 x 25 Elastomeric bearing strips with mortar pad	m	28	200.00	5,600
	Sub Total for Substructure				418,000
34	**SUPERSTRUCTURE**				
35	19.15m long x 650mm deep 50MPa precast concrete single hollow core beams	No	6	34,500.00	207,000
36	18.5m long x 650mm deep 50MPa precast concrete single hollow core beams	No	9	33,800.00	304,200
37	PF rods	m	188	40.00	7,520
38	Grout to shear keys	m3	8	4,800.00	38,400
39	200mm thick reinforced concrete deck (250 kg/m3)	m2	314	630.00	197,819
40	Supply, fabrication and delivery of structural steel to site including surface treatment	t	72.24	11,000.00	794,640
41	Supply and delivery of temporary bracing (10% of total weight)	t	7.23	5,000.00	36,150
42	Install structural steel deck bridge	LS	1	177,000.00	177,000
43	Non-slip finish to steel deck (5mm epoxy surfacing)	m2	80	250.00	20,000
44	1400mm high galvanised steel handrails with stainless steel top rails	m	234	2,100.00	491,400
45	Integrated handrail lighting	m	234	450.00	105,299
46	2No x 150mm dia. services ducts	m	117	50.00	5,850
	Sub Total for Superstructure				2,385,279
48	**M & E**				
49	Allowance for M & E	LS	1	2,500,000.00	2,500,000
50	Cameras	No	2	8,000.00	16,000
	Sub Total for M & E				2,516,000
52	**APPROACHES**				
53	Timber boardwalk at Eastern abutment	m2	28	1,800.00	50,400
54	Ramp at Western abutment including backfill with GAP65	m2	70	420.00	29,400
55	Landscape design at southern bank (Whangarei City Centre side):	LS	1	50,000.00	50,000
	Sub Total for Approaches				129,800
57	**TRAFFIC MANAGEMENT**				
58	Allowance for Traffic Management	LS	1	50,000.00	50,000
	Sub Total for Traffic Management				50,000
60	**PRELIMINARY AND GENERAL**				
61	Allowance for Preliminary and General	%	8,796,878	0.25	2,199,220
62	Rounding	LS	1	3,902.41	3,902
	Sub Total for Preliminary and General				2,203,122
	TOTAL FOR PHYSICAL WORKS				11,000,000
65	**PROJECT DEVELOPMENT PHASE**				
66	Allowance for consultant fees - Investigation and Reporting	LS	1	500,000.00	500,000

Oruku Landing Bridge Cost Estimate

Beca
Cost Advisory

	Description	Unit	Quantity	Rate	Total
67	Allowance for Client Managed Costs (1%)	%	11,000,000	0.01	110,000
68	Allowance for Consent Fees	PS	1	100,000.00	100,000
69	Rounding	LS	1		0
	Total for Project Development Phase				710,000
71	**PRE-IMPLEMENTATION PHASE**				
72	Allowance for consultant fees (10%)	%	11,000,000	0.10	1,100,000
73	Allowance for Client Managed Costs (2.5%)	%	11,000,000	0.025	275,000
74	Rounding	LS	1	5,000.00	5,000
	Total for Pre-Implementation Phase				1,380,000
76	**IMPLEMENTATION PHASE**				
77	Allowance for consultant fees (5%)	%	11,000,000	0.05	550,000
78	Allowance for Client Managed Costs (2.5%)	%	11,000,000	0.025	275,000
79	Consenting Monitoring Fees	LS	1	40,000.00	40,000
80	Rounding	LS	1	5,000.00	5,000
	Total for Implementation Phase				870,000
	PROJECT BASE ESTIMAE				13,960,000
83	**CONTINGENCY**				
84	Allowance for Construction (30%)	%	11,000,000	0.30	3,300,000
85	Allowance for project development phase (30%)	%	710,000	0.30	213,000
86	Allowance for Pre-implementation phase (30%)	%	1,380,000	0.30	414,000
87	Allowance for Implementation phase (30%)	%	870,000	0.30	261,000
88	Rounding	LS	1	2,000.00	2,000
	Total for Contingency				4,190,000
	TOTAL EXPECTED ESTIMATE (P50)				18,150,000
91	**FUNDING RISK**				
92	Allowance for Construction (20%)	%	14,300,000	0.20	2,860,000
93	Allowance for project development phase (20%)	%	923,000	0.20	184,600
94	Allowance for Pre-implementation phase (20%)	%	1,794,000	0.20	358,800
95	Allowance for Implementation phase (20%)	%	1,131,000	0.20	226,200
96	Rounding	LS	1	400.00	400
	Total for Funding Risk				3,630,000
	95TH PERCENTILE ESTIMATE				21,780,000

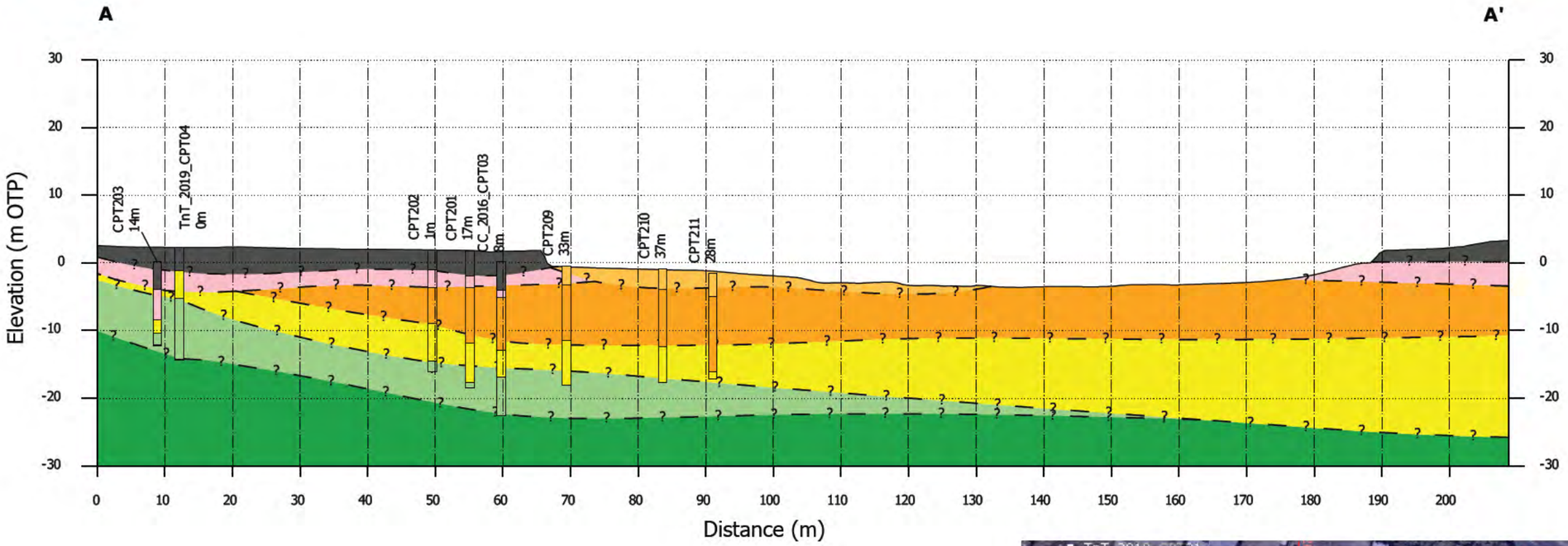
C

Appendix C – Geotechnical Long Section

Section A

Oruku Landing Development

Whangari City Centre



Legend

- 1nc - Fill - Non-Cohesive
- 2vscl - Holocene Sediments - Very Soft to Soft Clay
- 2ls - Holocene Sediments - Loose Sand
- 2fc - Holocene Sediments - Firm Clay
- 2int - Holocene Sediments - Interbedded
- 3wc - Whangai Colluvium
- 3wc - Whangai Colluvium (Sandy)
- 3ew - Whangai EW
- 3vw -Whangai VW

Scale: 1:750

NOTE: The draft Sale and Purchase agreement has been redacted and is withheld on the basis that it remains confidential as between Council and the Vendor whilst negotiations are ongoing.