Auckland Council

Tamaki Path

Construction Methodology Plan

August 2017

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Executive Summary

The Tāmaki Path is a proposed 2.5 to 3 m wide shared walk and cycle pathway from Point England Reserve to Panmure Wharf. The Tāmaki Path forms a section of Auckland Council's Greenway Paths, an initiative to increase connectivity by improving links between open space facilities.

The Tāmaki Path is a contiguous path which runs through a range of different environments including coastal edge reserves, native bush, mown grass, grazed paddock, recreational areas.

This report has assessed and demonstrated how the proposed Tāmaki Path construction, both the Southern and Northern sections of the Path, including associated structures, can be managed to minimise adverse effects on the environment as well as maintain safe and efficient operation of existing public spaces and access to private properties.

Whilst the methodology described in this report is preliminary, subject to further development and finalisation on awarding of the construction contracts, it provides sufficient guidance on the intended approach to construction and the methods that will be adopted to minimise any potential construction impacts on the environment.

Construction of the overall Tāmaki Path will be split into two construction contracts – the Southern and Northern sections. The Southern section can be split further in six construction stages, and the Northern section can be split further into two construction stages.

Recommendations were made for the construction stages which should be completed in the summer/earthworks season, and those which may be suitable during the winter season.

In summary, the key measures are:

- Ensuring management plans are prepared for Traffic, Health and Safety, Environment, and Quality prior to commencement of works.
- The staging of works having regard to the season and activities on adjoining reserves.
- Maintaining private property and reserve access.
- Providing minimal disturbance to the affected properties.
- Proactively managing and minimising stormwater and sediment run-off from areas of open earthworks.
- Maintaining flow in the Wai O Taiki Stream.
- Ensuring protocols for Accidental Discoveries or damage to trees are in place.
- Re-instating vegetation and implementing mitigation planting.

1. Introduction

1.1 Project background

The Tāmaki Path is a proposed 2.5 to 3 m wide shared walk and cycle pathway from Point England Reserve to Panmure Wharf. The Tāmaki Path forms a section of Auckland Council's Greenway Paths, an initiative to increase connectivity by improving links between open space facilities.

The Tāmaki Path is a contiguous path which runs through a range of different environments including coastal edge reserves, native bush, mown grass, grazed paddock and recreational areas.

1.2 Purpose of this report

The purpose of this report is to describe the proposed construction methodology for the Tāmaki Path. Construction is anticipated to be divided into two construction contracts. These contracts would cover the following areas:

- Southern – from the Panmure Wharf entry up to Point England Road
- Northern – from Point England Road to North of Omaru Creek

Figure 1 Proposed Tāmaki Path

This report is divided into main sub-sections for the South and North separately.

Whilst the details methodology described in this report is preliminary, subject to further development and finalisation on awarding of the construction contracts, it provides sufficient guidance on the intended approach to construction and the methods that will be adopted to minimise any potential construction impacts on the environment.

1.3 Limitations

This report has been prepared by GHD for Auckland Council and may only be used and relied on by Auckland Council for the purpose agreed between GHD and Auckland Council as set out in this section of this report.

GHD otherwise disclaims responsibility to any person other than Auckland Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Auckland Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

A suggested methodology and preliminary construction programme have been identified for the works. The following sections include selected overall methodology considerations for the works and specific construction methodologies.

1.4 Construction management plans

The Contractor should prepare and follow suitable plans for the works:

- Quality Plan
- Health and Safety Plan
- Traffic Management Plan
- Environment Management Plan[1]

[1] The Environment Management Plan will include amongst other things:

- Stormwater and sediment run-off during construction
- Accidental spill protocols
- Accidental discovery protocols
- Protection of trees
- Re-instatement of vegetation

2. Southern section

2.1 Location and surrounding environment

This section of the proposed Tāmaki Path connects the Panmure Wharf Reserve with the Mount Wellington War Memorial Reserve, the Dunkirk and Riverside Reserves. There are a number of proposed path entry/exit points from Dunkirk and Riverside Roads.

The surrounding environment is mainly comprised of reserve land (with a playground area), sports fields, and coastal landscape.

2.2 Construction methodology

The critical aspects of the project involve maintaining traffic flow, providing public safety, protection to the environment, pedestrian access to existing reserve and sports fields, providing private property access, and keeping existing services live as much as possible throughout the project.

To maintain pedestrian access, construction zones/areas of the path will need to be fenced off to allow public access in safe areas only. Temporary traffic management will need to comply with requirements as set out in the Code of Practice for Temporary Traffic Management (COPTTM).

2.2.1 General staging of works

Staging of works within the sports field should consider the season such that the sports facilities are able to remain operational during construction.

Typical sequencing is expected to include:

- Service diversions and any works below ground.
- Vegetation and topsoil removal and stockpiling, as required.
- Construction of drainage paths, to manage overland flow through the site.
- Stabilisation of ground in the grassed areas to allow for vehicle machinery access.
- Construction of boardwalks and retaining walls.
- Construction of final surfacing (exposed aggregate concrete with or without shell, Aggrok surfaces for amenity areas).
- Construction of timber bridges and other structures.
- Undertake final surfacing works along the alignment.
- Install wayfinding signage.
- Reinstate vegetation in accordance with mitigation planting plans.
- Open the path for cyclist and pedestrian movements.

2.2.2 Arboricultural requirements

A number of trees are located in the vicinity of the proposed Southern alignment. For works in the vicinity of trees, the following should be carried out:

- All works associated with the proposed Tamaki Paths Project should be carried out in accordance with the Arboricultural Assessment report *GreensceneNZ Ltd*, dated 21 July 2017, submitted with the application.

- Hold a pre-commencement meeting with a Council arborist before any work is carried out at any of the sites. At the pre-commencement meeting, suitable strategies and tree protection details will be discussed and agreed on a site for site basis with a Council arborist.
- Protected trees and vegetation should be protected from damage for the duration of the works.
- All tree removals and pruning shall be undertaken by Council approved arborists in accordance with arboricultural best practices.
- All removals must ensure that adjacent vegetation, including root zones are not damaged or subject to mechanical compaction, including restricting vehicle access and use of track mats or similar ground protection.
- All work within the protected root zone of the retained trees will be initially dug using hand tools only.

To prevent the spread of kauri dieback disease caused by *Phytophthora agathidicida*. This shall be adhered to when working within close proximity of New Zealand kauri (*Agathis australis*).

- Ensure that all equipment to be used on site has been thoroughly cleaned of any soil and associated material potentially carrying kauri dieback before it enters site.
- Where works are to occur within three times the radial spread of a kauri, all equipment and machine including but not limited to hand tools, excavator buckets, tracks and attachments to be sprayed with Trigene disinfectant before and after excavations.
- Excess excavated material in some instances can be used on site e.g. behind retaining walls. As long as this material is not distributed widely over the site.
- Any excess excavated material that cannot be used on site within three times the radial spread of a kauri must be taken from site and disposed of at an approved landfill.
- Where works occur within three times the radial spread of a kauri, aboricultural monitoring is required to ensure that best practises have been adhered to.

2.2.3 Archaeological requirements

There no documented archaeological sites on the South section of the proposed Tamaki path.

However, if subsurface archaeological evidence is unearthed during construction (e.g. intact shell midden, hangi, storage pits relating to Maori occupation, or cobbled floors, brick or stone foundation, and rubbish pits relating to 19th century European occupation), work will cease immediately in accordance with an agreed Accidental Discovery Protocol. This will include notifying the Auckland Council, Heritage NZ and tangata whenua where the discovery relates to artefacts associated with Maori occupation or Auckland Council, Heritage NZ, tangata whenua and NZ Police if the discovery relates to koiwi tangata (human remains). The works will not continue, until approval is obtained from the relevant authorities. Where possible, significant archaeological material encountered should be preserved and protected in situ.

All contractors working on the project must be briefed on the possibility of encountering archaeological evidence, and of the contractor's responsibility with regard to notification of any discovery of archaeological evidence.

2.2.4 Sediment and erosion control

Erosion and sediment measures will be implemented on site to avoid discharges of sediment off site, into surface water bodies or the coastal environment. These measures may include but will not be limited to:

- Minimisation of the area of open ground at any one time
- Silt fencing
- Filter socks during construction
- Stabilising topsoil stock piles and disturbed ground

Sediment and erosion control will be the responsibility of the contractor.

A storm water assessment report for erosion and sediment control have been written by GHD and can be used for further recommendations for this project.

2.2.5 Noise

Noise generated during construction will generally comply with the New Zealand Standard NZS 6803:1999 "Acoustics - Construction Noise".

To mitigate the effects of construction noise, mitigation measures during the construction period will include the limiting of construction times to occur during normal working hours (7.30 am to 6 pm, Monday to Saturday). In addition, the contractor will provide prior notification to adjacent landowners/occupiers advising of construction activities.

2.3 Sequencing of construction

The sequence of works to be adopted will be determined, in detail by the contractor, following discussion with Auckland Council, the Engineer to the Project and other relevant stakeholders. Depending on the start of the construction contract, either the works to be commenced in the winter, or in the summer season will take precedence. The summer season in this context generally refers to the earthworks season January to April, but may be extended where the seasonal weather permits works to continue.

Stages to be commenced in summer are:

- Mount Wellington Memorial Reserve and Panmure Wharf Entry – path construction
- Dunkirk Reserve - bridge construction

Stages which can be commenced in winter include:

- Cantilevered boardwalk behind Marist Rugby Club building
- Path at Riverside Reserve
- Dunkirk Reserve – Path construction
- Path behind private properties at Riverside Avenue

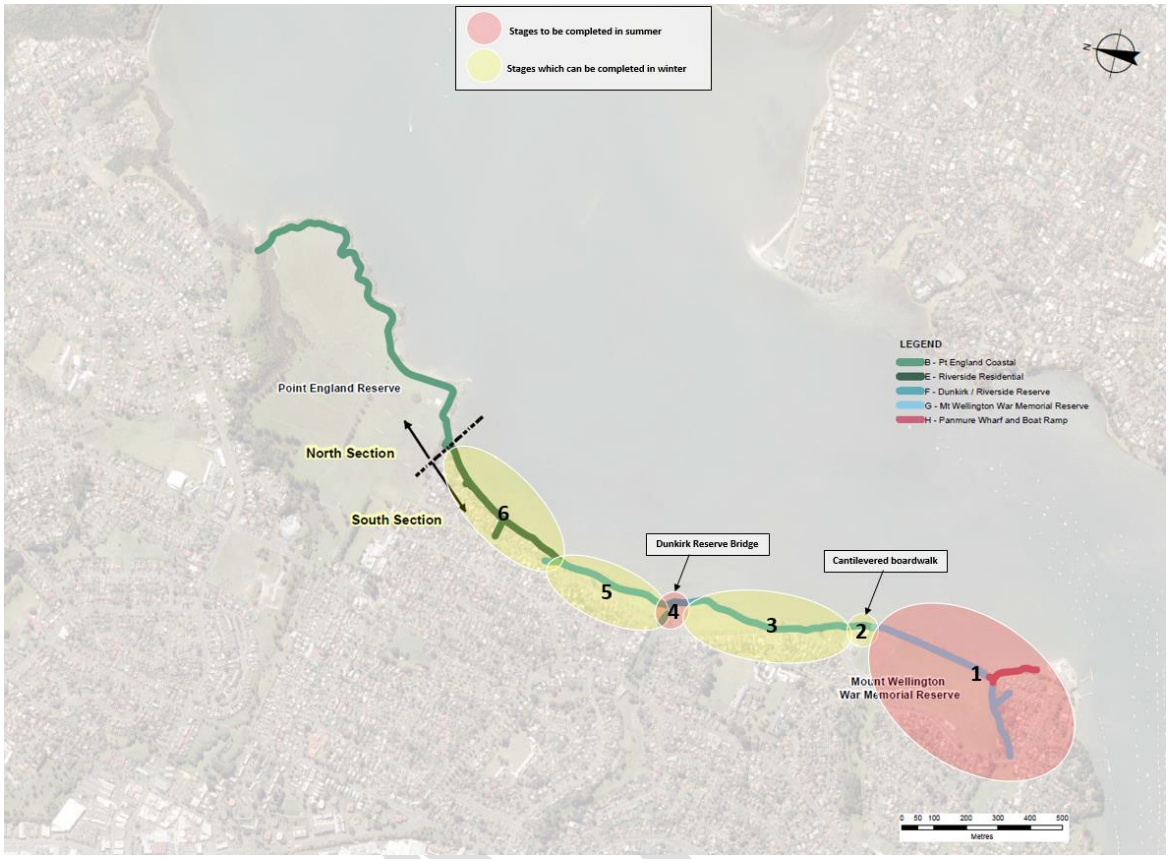

Figure 2 Construction stages for Southern section

2.4 Stages to be commenced in summer

2.4.1 Stage 1: Panmure Wharf entry and Mt Wellington War Memorial Reserve

This construction stage is divided into two geographical parts: (1) Panmure Wharf entry; (2) Mt Wellington War Memorial Reserve.

The outline of each step to complete the ***Panmure Wharf entry*** stage is listed below:

- Establish site offices and machinery storage areas at the Panmure Wharf reserve entry carpark area.
- Install construction signage and traffic (including pedestrian) management.
- Install erosion and sediment control, and tree protection measures.
- Remove vegetation and strip topsoil from the Panmure Wharf reserve entry, and stockpile.
- Install retaining wall at the Panmure Wharf reserve entry.
- Backfill behind retaining structure.
- Form path surface, including drainage channels.
- Construct drainage under path.
- Install basecourse (minimum GAP40) and leave as machinery vehicle access until stage construction is completed.

- Once construction machinery access is no longer required through the Panmure Wharf entry, install final surfacing (exposed aggregate concrete with or without shell) at this location.
- Construct amenity areas.
- Topsoil and reinstate vegetation and complete mitigation planting if proposed.

The outline of each step to complete the ***Mount Wellington War Memorial Reserve*** stage is listed below:

- Amend construction signage and traffic (including pedestrian) management through to the playground and sports field areas.
- Install erosion and sediment control, and tree protection measures through to the playground and sports field areas.
- Remove vegetation and strip topsoil and stockpile.
- Install retaining wall opposite the walkway to Armein Road.
- Backfill behind retaining structure.
- Form path surface, including drainage channels.
- Construct drainage under path.
- Install basecourse (minimum GAP40) and leave as machinery vehicle access until stage construction is completed.
- Once construction machinery access is no longer required through this section, install final surfacing (exposed aggregate concrete with or without shell).
- Construct surface and furniture at amenity areas.
- Topsoil and reinstate vegetation and complete mitigation planting if proposed.

2.4.2 Stage 4: Dunkirk Reserve Bridge

This stage includes construction of a 3.0 m wide, single span, straight timber bridge over the stream channel that extends upstream to Boundary Reserve.

The outline of each step to complete this stage is listed below:

- Establish site offices and machinery storage areas at Dunkirk and Riverside Reserves.
- Install construction signage and traffic (including pedestrian) management.
- Remove vegetation and strip topsoil and stockpile.
- Install erosion and sediment control, and tree protection measures.
- Install bridge piles.
- Install bridge abutments.
- Construct bridge bearers and joists.
- Fill around abutment areas to form the bridge approaches.
- Install decking, balustrades and handrails.
- Form path basecourse and surface (exposed aggregate concrete with or without shell, and Aggrok) at the approaches.
- Topsoil and reinstate vegetation and complete mitigation planting if proposed.

2.5 Stages suitable for commencement in winter

2.5.1 Stage 2: Behind Marist Rugby Club – Cantilevered Boardwalk

This stage includes installation of a timber 2.5 m wide cantilevered boardwalk behind the existing timber structure at the Marist Clubrooms.

The outline of each step to complete this stage is listed below:

- Establish site offices and machinery storage areas at Dunkirk Reserve/nearby area.
- Install construction signage and traffic (including pedestrian) management.
- Remove vegetation and strip topsoil and stockpile.
- Install erosion and sediment control, and tree protection measures.
- Remove barbed wires from the existing fence for the Rugby Club building.
- Install boardwalk piles.
- Construct boardwalk bearers and joists.
- Install decking, balustrades and handrails.
- Fill around the ends of the boardwalk to form path connection.
- Form path basecourse and surface (exposed aggregate concrete with or without shell) at the approaches.
- Topsoil and reinstate vegetation and complete mitigation planting if proposed.

2.5.2 Stage 3: Dunkirk Reserve

This stage includes construction of exposed aggregate concrete path through to Dunkirk Reserve, located between the cantilevered boardwalk and the Dunkirk Reserve Bridge.

The outline of each step to complete the stage is listed below:

- Establish site offices and machinery storage areas at the Dunkirk Reserve entry.
- Install construction signage and traffic (including pedestrian) management.
- Install erosion and sediment control, and tree protection measures.
- Strip topsoil and stockpile.
- Install retaining walls where necessary (particularly at an identified location north of the cantilevered boardwalk.
- Backfill behind retaining structure.
- Form path surface, including drainage channels.
- Construct drainage under path.
- Install basecourse (minimum GAP40) and leave as machinery vehicle access until stage construction is completed.
- Once construction machinery access is no longer required, install final surfacing (exposed aggregate concrete with or without shell) at this location.
- Construct surface and furniture at amenity areas.
- Topsoil and reinstate vegetation and complete mitigation planting if proposed.

2.5.3 Stage 5: Riverside Reserve

This stage includes construction of exposed aggregate concrete path through to Riverside Reserve, located between the Dunkirk Reserve Bridge, and the boardwalk over the tree roots of the notable Pohutukawa tree.

The outline of each step to complete the stage is listed below:

- Establish site offices and machinery storage areas at the Riverside Reserve.
- Install construction signage and traffic (including pedestrian) management.
- Install erosion and sediment control, and tree protection measures.
- Strip topsoil and stockpile.
- Form path surface, including drainage channels.
- Construct drainage under path.
- Install basecourse (minimum GAP40) and leave as machinery vehicle access until stage construction is completed.
- Once construction machinery access is no longer required, install final surfacing (exposed aggregate concrete with or without shell) at this location.
- Construct surface and furniture at amenity areas.
- Topsoil and reinstate vegetation and complete mitigation planting if proposed.

2.5.4 Stage 6: Behind Riverside Avenue Private Properties

This stage includes construction of an exposed aggregate concrete path (with or without shell) along the back of private properties at Riverside Avenue, and construction of a timber boardwalk over the tree roots of a notable pohutukawa tree.

The outline of each step to complete the stage is listed below:

- Establish site offices and machinery storage areas at the reserve, between 206 and 208 Riverside Avenue.
- Install construction signage and traffic (including pedestrian) management.
- Install erosion and sediment control, and tree protection measures.
- Strip topsoil and stockpile.
- Install retaining walls where necessary.
- Backfill behind retaining structures.
- Form path surface, including drainage channels.
- Construct drainage under path.
- Install basecourse (minimum GAP40) and leave as machinery vehicle access until stage construction is completed.
- Once construction machinery access is no longer required, install final surfacing (shell/hoggin) at this location.
- Construct surface and furniture at amenity areas.
- Topsoil and reinstate vegetation and complete mitigation planting if proposed.

3. Northern section

3.1 Location and surrounding environment

This section of the proposed Tāmaki Path starts at Point England Road, following the existing path along Point England Reserve, and continuing northwards up to the northern abutment of the proposed Omaru Road bridge.

The surrounding environment is predominantly reserve land, sports field, and coastal.

3.2 Construction methodology

The critical aspects of the project involve maintaining traffic flow, providing public safety, protection to the environment, pedestrian access to existing reserve and sports fields, providing private property access, and keeping existing services live as much as possible throughout the project.

To maintain pedestrian access, construction zones/areas of the path will need to be fenced off to allow public access in safe areas only. Temporary traffic management will need to comply with requirements as set out in the Code of Practice for Temporary Traffic Management (COPTTM).

3.2.1 General staging of works

Staging of works within the sports field should consider the season such that the sports facilities are able to remain operational during construction.

Typical sequencing is expected to include:

- Service diversions and any works below ground.
- Vegetation and topsoil removal and stockpiling, as required.
- Stabilisation of ground in the grassed areas to allow for vehicle machinery access.
- Construction of boardwalks and retaining walls.
- Construction of final surfacing (exposed aggregate concrete with or without shell, Aggrok surfaces for amenity areas).
- Construction of timber bridges and other structures.
- Undertake final surfacing works along the alignment.
- Install wayfinding signage.
- Reinstate vegetation in accordance with mitigation planting plans.
- Open the path cyclist and pedestrian movements.

3.2.2 Arboricultural requirements

A number of trees are located in the vicinity of the proposed Northern alignment. For works in the vicinity of trees, the following should be carried out:

- All works associated with the proposed Tamaki Paths Project should be carried out in accordance with the Arboricultural Assessment report *GreensceneNZ Ltd*, dated 21 July 2017, submitted with the application.
- Hold a pre-commencement meeting with a Council arborist before any work is carried out at any of the sites. At the pre-commencement meeting, suitable strategies and tree

protection details will be discussed and agreed on a site for site basis with a Council arborist.

- Protected trees and vegetation should be protected from damage for the duration of the works.
- All tree removals and pruning shall be undertaken by Council approved arborists in accordance with arboricultural best practices.
- All removals must ensure that adjacent vegetation, including root zones are not damaged or subject to mechanical compaction, including restricting vehicle access and use of track mats or similar ground protection.
- All work within the protected root zone of the retained trees will be initially dug using hand tools only.

To prevent the spread of kauri dieback disease caused by *Phytophthora agathidicida*. This shall be adhered to when working within close proximity of New Zealand kauri (*Agathis australis*).

- Ensure that all equipment to be used on site has been thoroughly cleaned of any soil and associated material potentially carrying kauri dieback before it enters site.
- Where works are to occur within three times the radial spread of a kauri, all equipment and machine including but not limited to hand tools, excavator buckets, tracks and attachments to be sprayed with Trigene disinfectant before and after excavations.
- Excess excavated material in some instances can be used on site e.g. behind retaining walls. As long as this material is not distributed widely over the site.
- Any excess excavated material that cannot be used on site within three times the radial spread of a kauri must be taken from site and disposed of at an approved landfill.
- Where works occur within three times the radial spread of a kauri, aboricultural monitoring is required to ensure that best practises have been adhered to.

3.2.3 Archaeological requirements

There are documented archaeological sites on the North section of the proposed Tamaki path.

If subsurface archaeological evidence is unearthed during construction (e.g. intact shell midden, hangi, storage pits relating to Maori occupation, or cobbled floors, brick or stone foundation, and rubbish pits relating to 19th century European occupation), work will cease immediately in accordance with an agreed Accidental Discovery Protocol. This will include notifying the Auckland Council, Heritage NZ and tangata whenua where the discovery relates to artefacts associated with Maori occupation or Auckland Council, Heritage NZ, tangata whenua and NZ Police if the discovery relates to koiwi tangata (human remains). The works will not continue, until approval is obtained from the relevant authorities. Where possible, significant archaeological material encountered should be preserved and protected in situ.

All contractors working on the project must be briefed on the possibility of encountering archaeological evidence, and of the contractor's responsibility with regard to notification of any discovery of archaeological evidence.

3.2.4 Sediment and erosion control

Erosion and sediment measures will be implemented on site to avoid discharges of sediment off site, into surface water bodies or the coastal environment. These measures may include but will not be limited to:

- Minimisation of the area of open ground at any one time

- Silt fencing
- Filter socks during construction
- Stabilising topsoil stock piles and disturbed ground

Sediment and erosion control will be the responsibility of the contractor.

A storm water assessment report for erosion and sediment control have been written by GHD and can be used for further recommendations for this project.

3.2.5 Noise

Noise generated during construction will generally comply with the New Zealand Standard NZS 6803:1999 "Acoustics - Construction Noise".

To mitigate the effects of construction noise, mitigation measures during the construction period will include the limiting of construction times to occur during normal working hours (7.30 am to 6 pm, Monday to Saturday). In addition, the contractor will provide prior notification to adjacent landowners/occupiers advising of construction activities.

3.3 Sequencing of construction

The sequence of works to be adopted will be determined, in detail by the contractor, following discussion with Auckland Council, the Engineer to the Project and other relevant stakeholders. Depending on the start of the construction contract, either the works to be commenced in the winter, or in the summer season will take precedence. Due to the sensitivity of this environment, the majority of the Path length is proposed to be commenced during summer: The summer season in this context refers to the earthworks season January to April 2018 but may be extended where the seasonal weather permits works to continue.

Stages to be commenced in summer are:

- Omaru Curved Bridge construction
- Point England Coastal path construction

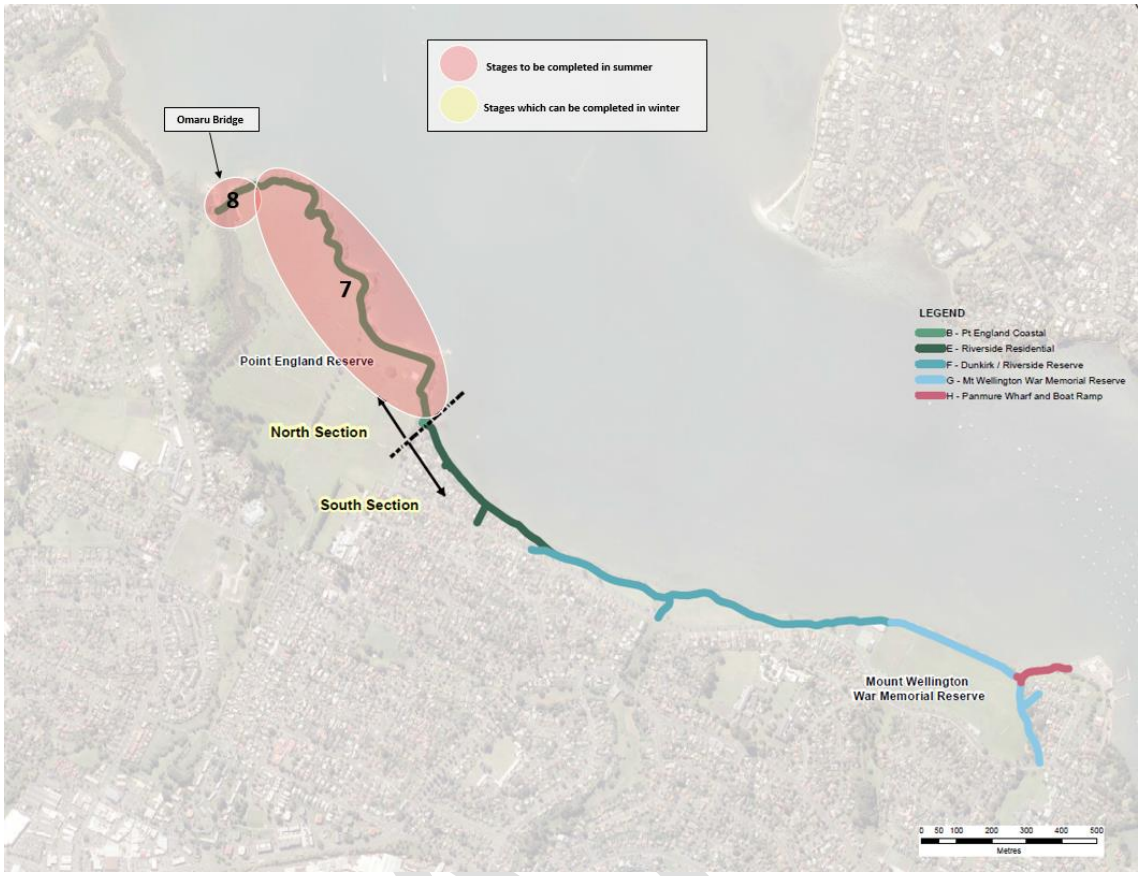

Figure 3 Construction stages for Northern section

3.4 Construction stages

3.4.1 Stage 7: Point England Coastal

This stage includes construction of a shell/hoggin path through along the boundary of Point England Reserve, from Point England Road in the south, up to the proposed Omaru Bridge location.

The outline of each step to complete the stage is listed below:

- Establish site offices and machinery storage areas at Point England Reserve
- Install construction signage and traffic (including pedestrian) management
- Install erosion and sediment control, and tree protection measures
- Strip topsoil and stockpile
- Install retaining walls where necessary
- Backfill behind retaining structures
- Form path surface, including drainage channels
- Construct drainage under path
- Install basecourse (minimum GAP40) and leave as machinery vehicle access until stage construction is completed
- Once construction machinery access is no longer required, install final surfacing (shell/hoggin) at this location
- Construct surface and furniture at amenity areas

- Topsoil and reinstate vegetation and complete mitigation planting as required

3.4.2 Stage 8: Omaru Curved Bridge

This stage includes construction of a new 3.5 m wide, approximately 53 m long timber bridge over Wai O Taiki stream.

The proposed works associated with the bridge construction specifically includes:

- Mangroves clearing at the footprint of the proposed bridge timber piles
- Other vegetation clearing where machinery access is required from both ends of the proposed bridge
- Installation of timber piles, cross braces, bearers, joists, timber decking, timber balustrades, and steel handrails
- Reinstatement of the area and vegetation impacted by the project

Access to the Omaru Bridge Site

Site access will be via the existing vehicle access points on Point England Road or Elstree Avenue for the southern side of the bridge, and Kiano Place for the northern side of the bridge, with traffic management approval from Auckland Transport, and property owner approval for access obtained from private owners, and Auckland Council Parks. If property fences are to be removed for access, these will be reinstated to the existing standard, as soon as practicable after work is completed.

The Contractor shall erect appropriate signs to show accesses and restricted routes. Before the signs are erected, the Contractor shall submit the signage details in writing to the Engineer and the relevant road controlling authority for approval.

At the cessation of work on any day, the Contractor shall completely barricade and lock all entrances to the site to prevent non-permitted vehicle access onto the site.

Generally, heavy vehicle movements associated with land disturbance and bulk earthworks operations are limited to the delivery and removal of the machinery and plant required to undertake the earthworks and the removal of soil.

Care should be taken when using crane, hiab or similar lifting machines to erect the timber piles to ensure the grounds are not significantly impacted and if damage is done to the grounds (which is currently predominantly unpaved/grassed areas), this vegetation is reinstated, and mitigation planting is implemented as soon as possible after completion.

The following measures should be employed to ensure that there are limited impacts on the grounds resulting from the land disturbance operation:

- Work will be scheduled to be carried out in summer or autumn when the ground is dry.
- Vehicle access will be suspended should the ground conditions become too wet due to heavy rain.
- The entry/exit point is clearly defined and will ensure that the safe and convenient movement of traffic, pedestrians and cyclist is not compromised.
- All soils removed from site for disposal as cleanfill, managed fill or to landfill shall be transported in covered trucks.
- The adjoining road network is to be kept clear of mud and debris at all times.
- Prior to removal of any vegetation for example three mature pohutukawa trees on the northern bank of Omaru creek and an areas of mature mangroves the engineer will be

notified and await confirmation/approval for works to proceed. In addition to this the removal of mangroves should be carried out during the autumn or winter season to minimise impacts on potential banded rail breeding sites.

One or more stabilised access ways will be constructed to lead to the area of works. The "construction entrance" is to be provided in accordance with TP90 and GD05, i.e. it will maintain a minimum gravel depth of 150 mm over a 10 m length and minimum 4 m width on a geotextile layer. Trucks transporting fill to the site and excess soil from site and excavators will use this access way to avoid damage to the existing shared path and park grounds.

Earthworks and Installation of Timber Bridge

All construction works will be undertaken in accordance with the appropriate occupational health and safety guidelines to ensure the safety of the construction workers, visitors to the site and general public is maintained.

Material excavated will be disposed of to an approved landfill.

During construction, sections of the Pt England Reserve, and the existing path may need to be partially closed to enable a sufficient safety zone. During this time, appropriate barriers and signage will be put in place to protect members of the public.

Planted areas disturbed by the project work shall be reinstated and mitigation planting undertaken as required.

Protection of Stream

The contractor will take care to maintain the natural wetland including the fluctuations of water levels important to wildlife. The stream will therefore not be blocked off.

Appropriate erosion and sediment control measures, including silt fences, and a container impoundment system will be provided to prevent contaminated water from entering the watercourse.

All construction rubbish will be managed on site and disposed of appropriately.

Storage Area

All construction materials and machinery to be used on both sides of the proposed bridge, are to be stored at appropriate locations identified by the Contractor and agreed upon by the property owners. Suggested laydown areas are shown by the blue stars in the figure below.

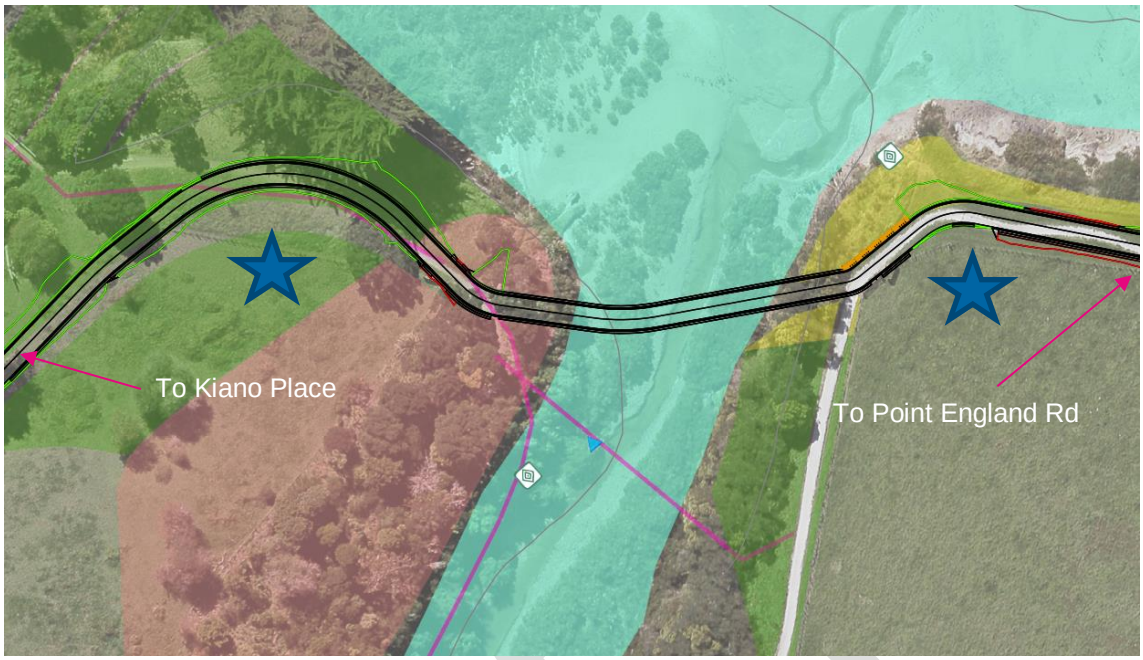

Figure 4 Suggested construction access locations, equipment/machinery storage (shown as blue stars)

Reinstatement

Upon completion of bridge, all surfaces shall be reinstated to an acceptable standard in accordance with relevant AT specifications. This includes reinstatement of the surrounding area and vegetation.

The Contractor shall reinstate all works, and repair any damage caused by its operation to at least the standard of the original condition prior to construction. The permanent surface shall be similar in type quality texture and strength to the surrounding material.

Specific Works Methodology

The overview of the proposed Omaru Bridge specific construction methodology is described in the headings below:

- Staging of works
  - The construction of the proposed timber bridge will be staged to allow for flows through the stream/estuary.
- Erosion and sediment control
  - Appropriate erosion and sediment control measures, including silt fences, and a container impoundment system must be provided to prevent contaminated water from entering the watercourse.
- Installation of piles and cross braces
  - A temporary bridge scaffolding is proposed to be constructed underneath the proposed bridge for staff and machinery access.
  - All mangroves under the footprint of the proposed bridge will be cut down to seabed level during low tide. The mangroves will be mulched and disposed off-site. The mangrove roots will be left in place to avoid unnecessary disturbance of the marine mud. The piles will then be bored or driven through any roots located in the proposed pile locations.

  - A cofferdam will be constructed on a one side of the river channel to allow flow of water through one section of the river and construction of the piles, cross braces, bearers on a dry area.
  - Once this section is complete, the current cofferdam will be removed and another cofferdam constructed on the other side of the river channel, allowing the remaining piles, cross bracers and bearers to be constructed.
  - Once the piles, cross braces and bearers have been fixed the cofferdam will be removed.
  - A pump will be required to dewater the region within the cofferdam with water discharging via an approved treatment device (turkey's nest or similar).
  - The region within the two abutments will require some excavation and armouring of the ground. This includes the piles at the two abutments.
- Installation of joists
  - A crane will be utilised on either side of the timber bridge to lift and allow bolting of the joists to the bearers.
- Installation of timber decking and timber balustrades
  - The timber decking will be installed starting from the two ends of the bridge. Once the decking is installed the timber balustrade will bolted in place.
- Reinstatement of the site
  - Landscape planting will be undertaken to reinstate the site to a similar or better condition than existed prior to construction.

Machinery and Equipment Resources

A general list of the construction equipment to be used as part of the bridge construction works has been given below. The list identifies the typical construction equipment used for these type of projects, and may vary from the actual equipment used on site as this is dependent on the Contractors finalised construction methodology.

- Traffic management vehicles and equipment
- Tracked excavators (up to 20 tonnes)
- Pump for channel dewatering
- Tracked crane
- Contractor's transportation vehicles
- Timber works hand tools
- Stabilised surfaces (for channel bed and machinery access)

4. Conclusions

This report has demonstrated how the proposed Tāmaki Path construction, both the Southern and Northern sections of the Path, including associated structures, can be managed to minimise adverse effects on the environment as well as maintain safe and efficient operation of existing public spaces and access to private properties.

Whilst the methodology described in this report is preliminary, and subject to further development and finalisation on awarding of the construction contracts, it provides sufficient guidance on the intended approach to construction and the methods that will be adopted to minimise any potential construction impacts on the environment.

Construction of the overall Tāmaki Path will be split into two construction contracts – the Southern and Northern sections. The Southern section can be split further in six construction stages, and the Northern section can be split further into two construction stages.

Recommendations were made for the construction stages which should be completed in the summer/earthworks season, and those which may be suitable during the winter season.

In summary, the key measures are:

- Ensuring management plans are prepared for Traffic, Health and Safety, Environment, and Quality prior to commencement of works.
- The staging of works having regard to the season and activities on adjoining reserves.
- Maintaining private property and reserve access.
- Providing minimal disturbance to the affected properties.
- Proactively managing and minimising stormwater and sediment run-off from areas of open earthworks.
- Maintaining flow in the Wai O Taiki Stream.
- Ensuring protocols for Accidental Discoveries or damage to trees are in place.
- Re-instating vegetation and implementing mitigation planting.

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