MWH

BUILDING A BETTER WORLD

Glen Innes to Tamaki Drive Cycle RouteShared Path Scheme Assessment Report

Prepared for Auckland Transport

January 2015

This document has been prepared for the benefit of Auckland Transport. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEAD
Stephen Sinclair	Andrew McDonald

PREPARED BY		
Rachel Blewden / Andrew McDonald	.....	...27/...01/...15
CHECKED BY		
Nick Gluyas	.....	...27/...01/...15
REVIEWED BY		
Nick Gluyas	.....	...27/...01/...15
APPROVED FOR ISSUE BY		
Andrew McDonald	.....	...27/...01/...15

AUCKLAND
MWH House Level 3, 111 Carlton Gore Road, Newmarket, Auckland 1023
PO Box 9176, Newmarket, Auckland 1149
TEL +64 9 580 4500, FAX +64 9 580 7600

REVISION SCHEDULE

Rev No	Date	Description	Signature or Typed Name (documentation on file). Prepared by	Checked by	Reviewed by	Approved by

Executive Summary

Project Description and Objectives

MWH New Zealand Ltd (MWH) has been commissioned by Auckland Transport (AT) to prepare a Scheme Assessment Report for the design of the Glenn Innes to Tamaki Drive Cycle Route between Merton Road in Glen Innes to Tamaki Drive. This report identifies and investigates identifies a recommended option.

The route has four distinct sections based on the environment and treatment options. The route is split into four sections as follows:

- Section 1: Merton Road to St Johns Road
- Section 2: St Johns Road to Meadowbank Rail Station
- Section 3: Meadowbank Rail Station to Orakei Rail Station
- Section 4: Orakei Rail Station to Tamaki Drive

Each section could be a standalone project, but the whole is greater than the sum of the parts and should be considered as an integrated package of works that can be constructed in stages.

The preferred route will link the proposed shared path on Merton Road (currently in the detail design stage) as part of the Point England to Panmure cycleway project and the existing cycle path on Tamaki Drive providing a key connection for cyclists and pedestrians from the eastern suburbs into the city. The route transverses a range of different environments such as open fields, bush sections, bridge structures with elevated views and over water sections, providing a unique and pleasant experience.

The preferred route is an off road path and will be designed to provide a cycle metro standard and will cater for pedestrians including disability users. The proposed route is fully segregated from traffic with only one road crossing. This provides a high level of service and safety rarely able to be achieved on a route 7 km long. The virtually traffic free route helps to overcome the key safety concern that deters people from cycling. The proposed route will help encourage the largest potential group of cyclist, the 'interested but concerned' group. The preferred alignment meets the project objectives, will appeal to a wide cross section of path users and is expected to contribute significantly to the promotion of walking and cycling in the region.

Overview of Engineering, Planning, Social, Environmental and Economic Aspects of the Project and Analysis Undertaken

The preferred option will achieve a 4 m wide shared path with a minimum 1 m buffer zone / vegetation clearance either side. This will enable the full path width to be used and will provide a location within the buffer zone for the placement of lighting, signage and landscaping. Structures will be 4.5 m wide. Allowing for the minimum shy zone of 0.3 m from the handrails, structures at 4.5 m wide will achieve an effective width of 3.9 m which provides excellent consistency along the route.

It is desirable to achieve gradients of 5% or less, however due to topographical challenges, this is not physically possible, particularly for Sections 1 and 2. However it is possible to achieve maximum gradients of 8.3% (1:12). Where steep gradients of 8.3% occur a flat rest area of 1.2 m can be provided. This will allow the route to cater for disabled users.

The path surface will generally be concrete providing a high level of riding surface and minimising maintenance costs. Where possible the bridge structures will also have a concrete surface. However some of the lightweight structures such as the elevated bridge in Section 2 will have a glass reinforced plastic deck to minimise weight and to provide improved grip.

Analysis of compliance with the Land Transport Management Act 2003, the Government Policy Statement, the Auckland Regional Land Transport Strategy and other applicable transport planning documents shows that the shared path will contribute to the objectives of those documents and fits well with the overall and specific policy framework, particularly in regard to environmental suitability, integrated transport network and public health promotion objectives.

The delivery of the pathway provides a social resource of significance due to its function, its multiplicity of use and its importance to the well-being of the community through providing an off road shared pathway that will enable the community to undertaken healthy activities in a safe environment.

Despite these general benefits, the proposed shared path will provide public access which allows the risk of anti-social and unlawful activities to emerge. These include vandalism, graffiti, loitering and also the potential for crime due to increased access to adjacent properties. In order to mitigate the likelihood of these potentially adverse effects, CPTED (crime prevention through environmental design) principles have been incorporated into the design of the proposed shared path. Mitigation measures include directional lighting, excellent visibility, landscaping and permeable tubular fencing.

Economic analysis showed a net positive benefit for the preferred option. The shared path will assist commuter cyclists with reduced travel times and improved safety. Improvements in the Auckland Regional cycling network encourage use of cycling as an active transport mode over private motor vehicle use reducing congestion, providing mode choice and promoting improve health through active transport.

Economic Evaluation

For the preferred route the benefit cost ratio (BCR) is 3.6 and the expected scheme estimate is $37,420,108 (excluding GST). The evaluation has been calculated in accordance with the NZTA Economic Evaluation Manual.

Conclusion and Recommendations

The preferred route provides a high quality shared path that is safe and segregated from traffic. It will promote walking and cycling and contribute to the objectives of national and regional strategies.

The proposed path has been evaluated in accordance with the full walking and cycling procedures in the NZ Transport Agency Economic Evaluation Manual. The economic analysis has determined a BCR of 3.6 for the proposed scheme and therefore the project is considered economically viable for NZTA funding.

This project is recommended to be progressed to the detailed design stage.

Auckland Transport

Glen Innes to Tamaki Drive Cycle Route

CONTENTS

Executive Summary i
1 Introduction 1
2 Problem Description 1
2.1 Project Objectives 1
3 Target Audience 2
4 Site Description 3
4.1 Location and Interface with Local Roads 3
4.2 Services 4
4.2.1 Section 1 Services 4
4.2.2 Section 2 Services 5
4.2.3 Section 3 Services 5
4.2.4 Section 4 Services 5
4.3 Surrounding Land Use and Character 6
4.3.1 Section 1: Merton Road to St Johns Road 6
4.3.2 Section 2: St Johns Road to Meadowbank Rail Station 7
4.3.3 Section 3: Meadowbank Rail Station to Orakei Rail Station 7
4.3.4 Section 4: Orakei Rail Station to Tamaki Drive 8
4.4 Landscape Values, Wetlands and Waterways 8
4.5 Archaeological, Historical or Cultural Sites 10
4.6 Long Term Maintenance and Operation Factors 10
4.7 Topographical, Geotechnical, Development, Environmental, Social and Archaeological Factors 11
4.8 Maori Influences 11
4.9 Crash History 12
4.10 Surrounding Community Factors 12
4.11 Surrounding Transport and Access Patterns 12
4.12 Current and Potential Constraints and Opportunities 13
4.12.1 Connectivity Constraints and Opportunities 14
4.12.1.1 Section 1 Constraints 14
4.12.1.2 Section 2 Constraints 15
4.12.1.3 Section 3 Constraints 17
4.12.1.4 Section 4 Constraints 18
4.13 Visual Qualities 19
5 Collected Data 21
5.1 Traffic Data 21

5.2 Crash Data 21
5.3 Geotechnical Assessment 22
6 Stakeholder Management Strategy and Consultation 24
7 Preferred Option and Alternative 25
7.1 Cycle Route 25
7.1.1 Section 1 25
7.1.1.1 Section 1 - Preferred Route 25
7.1.1.2 Other Off-Road Options Considered 27
7.1.1.3 Section 1 On-Road Options 28
7.1.2 Section 2 29
7.1.2.1 St Johns Road Crossing Options 30
7.1.2.2 Section 2 On-Road Options 31
7.1.3 Section 3 32
7.1.3.1 Section 3 – Preferred Option 32
7.1.3.2 Other Options Considered 32
7.1.4 Section 4 33
7.1.4.1 Section 4 Preferred Option (Blue Route) 33
7.1.4.2 Section 4 – Red Option 34
7.1.4.3 Section 4 – Yellow Option 34
7.1.4.4 Section 4 – Green Option (On-road) 35
7.2 Path Surface Treatments 37
7.3 Structure Surface Treatments 37
7.4 Structures 37
7.5 Retaining Options 39
7.5.1 Retaining Walls 39
7.5.2 Embankments / Battered Slopes 39
7.6 Stormwater Management 39
7.7 Path Lighting 39
9 Evaluation 42
9.1 Land Transport Management Act 2003 Compliance Assessment 42
9.1.1 Introduction and Policy Background 42
9.1.2 Land Transport Management Act 2003 42
9.1.3 National Land Transport Programme 2012-2015 43
9.1.4 Government Policy Statement on Land Transport 43
9.1.5 The National Infrastructure Plan 2011 43
9.1.6 Connecting New Zealand 2011 44
9.1.7 Auckland Regional Land Transport Strategy 45
9.1.8 Auckland Regional Land Transport Programme (RLTP) 2012-2015 46
9.1.9 Auckland Plan 47
9.1.10 2012-2041 Integrated Transport Programme 48

9.1.11 New Zealand Energy Efficiency and Conservation Strategy 2011-2016 48
9.1.12 Auckland Cycle Network 48
9.2 Resource Management Act 49
9.2.1 New Zealand Coastal Policy Statement 2010 (NZCPS) 50
9.2.2 National Environmental Standard for Assessing and Managing Contaminants 51
9.2.3 The National Policy Statement for Freshwater Management 2011 51
9.2.4 Hauraki Gulf Marine Park Act 2000 (HGMPA) 51
9.2.5 Auckland Regional Policy Statement 52
9.2.6 Auckland Council District Plan (Isthmus Section) 52
9.2.7 Auckland Council Regional Plan: Air, Land and Water 53
9.2.8 Auckland Council Regional Plan: Sediment Control 54
9.2.9 Auckland Regional Plan: Coastal 54
9.2.10 Proposed Auckland Unitary Plan 55
9.3 Cost Estimate 56
9.3.1 Scheme Estimates 56
9.4 Economic Evaluation 56
9.4.1.1 Project Benefits 57
9.4.1.2 Analysis Period and Discount rate 57
9.4.1.3 Growth Rate 57
9.4.1.4 Cycle Demand 58
9.4.1.5 Pedestrian Demand 59
9.4.1.6 Cycling Travel Time Savings 59
9.4.1.7 Health and Environmental Benefits – Walking Faculty Benefits 59
9.4.1.8 Safety Benefit 59
9.4.1.9 Benefit-Cost Evaluation 60
9.4.2 Sensitivity Analysis 60
9.4.2.1 Other General Issues 60
9.4.2.2 Summary of Economic Evaluation 61
10 Social and Environmental Management 61
10.1 Summary of Surrounding Environment 61
10.1.1 Section 1 61
10.1.2 Section 2 62
10.1.3 Section 3 62
10.1.4 Section 4 62
10.2 Landscape and Visual 63
10.2.1.1 Construction Effects 63
10.2.1.2 Operational Effects 63
10.2.2 Ecological 63
10.2.2.1 Construction Effects 63
10.2.2.2 Operational Effects 64

10.3 Cultural and Heritage Values 64
10.3.1.1 Construction Effects 64
10.3.1.2 Operational Effects 64
10.4 Social 64
10.4.1 Construction Effects 64
10.4.2 Operational Effects 64
10.5 Noise 65
10.5.1 Construction Effects 65
10.5.2 Operational Effects 65
10.6 Air Quality 65
10.6.1 Construction Effects 65
10.6.2 Operational Effects 65
10.7 Vibration 65
10.7.1 Construction Effects 65
10.7.2 Operational Effects 65
10.8 Stormwater 66
10.8.1 Construction Effects 66
10.8.2 Operational Effects 66
10.9 Hazardous Substances 66
11 Risk 66
12 Preferred Option 66
13 Preliminary Design Philosophy Statement 67
14 Preliminary Land Requirement Plans 67
15 Planning Requirements 67
15.1 Relevant Planning Documents 67
15.1.1 Auckland Regional Policy Statement 67
15.1.2 Operative Auckland City District Plan 1999 – Isthmus Section 68
15.2 Resource Consent Requirements 69
15.3 Building Consent Requirements 71
16 Conclusion 71

LIST OF TABLES

Table 4-1 : Bus Stops and Bus Services near Shared Path 13
Table 5-1 : Cyclist Movement Count 21
Table 5-2 : Traffic Statistics 21
Table 5-3 : Cyclist Crashes Along Orakei Road 22
Table 5-4 : Cyclist Crashes Along Ngapipi Road – Kepa Road – Kohimarama road 22
Table 5-5 : Cyclist Crashes Along Remuera Road – St John Road 22
Table 8-1: Objectives and results of the GPS that this project contributes to. 43

Table 8-2: Extract of census data 57
Table 8-3 : Cyclist AADT Estimation Based on Count Data 58
Table 8-4 : Economic Analysis Summary 60
Table 8-5 : Preferred route sensitivity analysis 60

LIST OF FIGURES

Figure 3-1: Cycling demographic of the 4 types of cyclists in Portland 2
Figure 4-1: Location Plan 3
Figure 4-2: Aerial showing the division of the route sections 4
Figure 4-3: Extract from Map Series 8, Sheet 3, Operative Coastal Plan 8
Figure 4-4: Extract from Map Series 1 Sheet 30- Coastal Plan 9
Figure 4-5: Map showing 36.625 ha of land returned to Ngati Whatua Orakei Trust 12
Figure 4-6 : Section 1 constraints 15
Figure 4-7: Section 2 topographical constraints 16
Figure 4-8: Section 2 route connectivity 17
Figure 4-9: Section 3 route constraints 17
Figure 4-10: Section 4 route constraints 18
Figure 4-11: View from the top of Section 1 near St Johns Road looking south 19
Figure 4-12: Visualisation of the bush section through Purewa Valley in Section 2 20
Figure 4-13: Visualisation of the view across Hobson Bay in Section 4 20
Figure 7-1: Section 1 preferred option 27
Figure 7-2 : Route options investigated along Section 1 28
Figure 7-3: Initial range of route options investigated along Section 2 29
Figure 7-4: Route options investigated along Section 2 30
Figure 7-5: Options for crossing St Johns Road 31
Figure 7-6 : Route options investigated along Section 3 33
Figure 7-7 : Route options investigated along Section 4 34
Figure 7-8: Safety concerns due to width constraints 36
Figure 7-9: Residential driveway gradients as high as 24.8% 36
Figure 7-10: Thorn Orus luminaire is an example of low mount height lighting 41
Figure 7-11: Thorn Orus vandal resistant bollard is an example of low mount height lighting 41
Figure 8-1 Proposed Eastern Corridor designation 55
Figure 8-2: Scheme Estimates 56
Figure 8-3: GIS map showing the areas of extraction of travel to work census data 57

LIST OF APPENDICES

Appendix A	Scheme Estimates
Appendix B	Option Workshop Report
Appendix C	Crash History Data

Appendix D	Consultation and Communication Plan
Appendix E	Risk Register
Appendix F	Concept Details of Retaining Walls
Appendix G	Stormwater Management Report
Appendix H	Preliminary Design Philosophy Statement
Appendix I	Geotechnical Reports
	I.1 Preliminary Geotechnical Assessment Report
	I.2 Geotechnical Factual and Interpretive Report
Appendix J	Economic Evaluation Manual Worksheets
Appendix K	Preliminary Site Investigation (Contamination)
Appendix L	Section 1 Detailed Site Investigation (Contamination)
Appendix M	Multi Criteria Analysis Assessment
Appendix N	Scheme Design Drawings
	N.1 Section 1
	N.2 Section 2
	N.3 Section 3 and 4

1 Introduction

Auckland Transport (AT) has commissioned MWH to prepare a Scheme Assessment Report (SAR), into options for a possible off-road shared walking and cycling path from Merton Road, Glen Innes to Tamaki Drive.

Two Project Feasibility Reports have previously been prepared for this project:

- A18: Eastern Transport Corridor Cycleway – Project Feasibility Report, SKM, 16 September 2008
- Hobson Bay Shared Path – Project Feasibility Report, Beca, 17 October 2012

This report has been prepared in accordance with NZTA Minimum Standard Z/9 – Scheme Assessment Report. It covers the design issues of the shared path route, discusses alternatives for the location of the shared path for some of the sections, describes geotechnical testing and assessment carried out, and contains social and environmental screening information in accordance with NZTA Minimum Standard Z/19 - Social and Environmental Management and Land Transport Management Act 2003 compliance assessments. An economic analysis including a (BCR) has been undertaken and seeks NZ Transport Agency funding.

A topographical survey has been completed for Section 1 only and scheme design drawings for all options have been prepared LIDAR data. A comparison of our topographical survey for Section 1 with LIDAR indicated a good match providing us confidence in the LIDAR data. A copy of the Project Risk Register, Stormwater Management Report, and option cost estimate, economic evaluation manual worksheets and preliminary design philosophy statement are included in appendices to the report.

2 Problem Description

It is important to provide people with mode choices for travel as not everyone has access to a motor vehicle. This project will investigate options for providing active transport mode choices between Glen Innes and Tamaki Drive. While walking trips are catered for through the provision of footpaths, the gradients of some roads will inhibit some disabled and elderly people. The Auckland eastern suburbs of Glen Innes, Glendowie, St Johns, St Heliers, Meadowbank and Orakei have limited cycling infrastructure. The lack of dedicated cycling infrastructure restricts people's access to their community.

Connectivity is further restricted by the rain line, which creates a severance between the southwest and the northeast side. The only rail crossing locations for pedestrians and cyclists are at St Johns Road and Orakei Road. Both are high traffic volume roads with no cycling facilities.

The Glen Innes to Meadowbank and the Orakei Station to Tamaki Drive are the two missing links in the Regional Cycle Network (RCN) between Tamaki Drive and Glen Innes. In addition, the existing boardwalk across Orakei Basin has become very popular and would benefit from widening. Once completed the shared path route will form part of an approximately 7 km section of the Auckland Cycle Network (ACN) providing a cycling and walking route from Glen Innes to Tamaki Drive and onwards to the Auckland central business district and nearby employment centres.

2.1 Project Objectives

The project objectives are:

A. To identify a preferred route for a shared path that;

- connects the existing sections of the Auckland Cycle Network between Glen Innes and Tamaki Drive

- provides for a Cycle Metro level of service for commuter cyclists in recognition of its function as part of the Auckland Cycle Network. AT has adopted the following definition for a Cycle Metro;

Cycle Metros take the highest priority as they target the highest number of potential users. They are high quality and traffic free segregated routes located within motorway corridors, rail corridors and on arterial or major collector roads. They offer a high level of safety connecting metropolitan / town centres, public transport interchanges and other key destinations. They can be shared off road paths along road corridors, rail corridors, through parks, reserves and esplanades or separated cycle facilities on road. The treatment is generally a 3 m wide shared path or a one/two-way protected cycle lane or a buffer cycle lane.

B. To develop a cost effective shared path whilst balancing the need to provide for a good standard of facility that is consistent with its function as a strategic component of the Auckland Cycle Network.

C. To provide for a shared path that;

- Is safe, convenient and attractive path for walking and cycling'
- supports a variety of user types and confidence levels;
- promotes sustainability through the encouragement of walking and cycling as an alternative to motorised transport

3 Target Audience

A paper called "Four Types of Cyclists" by Roger Geller identified four types of cyclists and estimated their demographic distribution in Portland, USA. A summary of the demographic distribution is shown in Figure 3-1.

The report also stated "poll after poll has found again and again that the number one reason people do not ride bicycles is because they are afraid to be in the roadway on a bicycle. They are generally not afraid of other cyclists, or pedestrians, or of injuring themselves in a bicycle-only crash."

The largest proportion are the 'Interested but Concerned' group who are curious about cycling but are too afraid to. To effectively encourage and promote cycling, it is important to build a facility that will appeal to as wide a demographic as possible, but particularly the group of potential cyclists that are interested but concerned. To do this it is important that the facility is safe and segregated from traffic.

Figure 3-1: Cycling demographic of the 4 types of cyclists in Portland

The cycle trip purpose is important to understand. Given the location, the connection to Tamaki Drive and the link into the city, the route is likely to appeal to the following cyclists:

- Commuter
- Recreational
- Sports / competitive
- Tourist

The route is predominantly expected to cater for commuter cyclists, therefore the design will need to reflect this. By achieving a quality facility that caters for commuter cyclists it will address much of the needs for other trip purposes and can be supplemented by additional treatments, e.g. wayfinding signs to cater for recreational and tourist trips.

Pedestrians are expected to use the route for commuting, recreation (walking, jogging, skateboarding, etc.), neighbourhood visits (family trips) and tourists. To maximise the potential user base, the design should take into account requirements for users with disabilities.

4 Site Description

4.1 Location and Interface with Local Roads

The Glen Innes to Tamaki Drive shared walking and cycling path will seek to implement an approximately 7 km section of the ACN between the Glen Innes and Tamaki Drive.

The project will connect key destinations, including the Glen Innes Station area, the Meadowbank Station and the Orakei Station. The connection to Tamaki Drive will provide good linkages to the shared use path and on-road cycle lanes on Tamaki Drive and access to the city centre. The route parallels approximately, the existing rail line. The location plan is shown below in Figure 4-1.

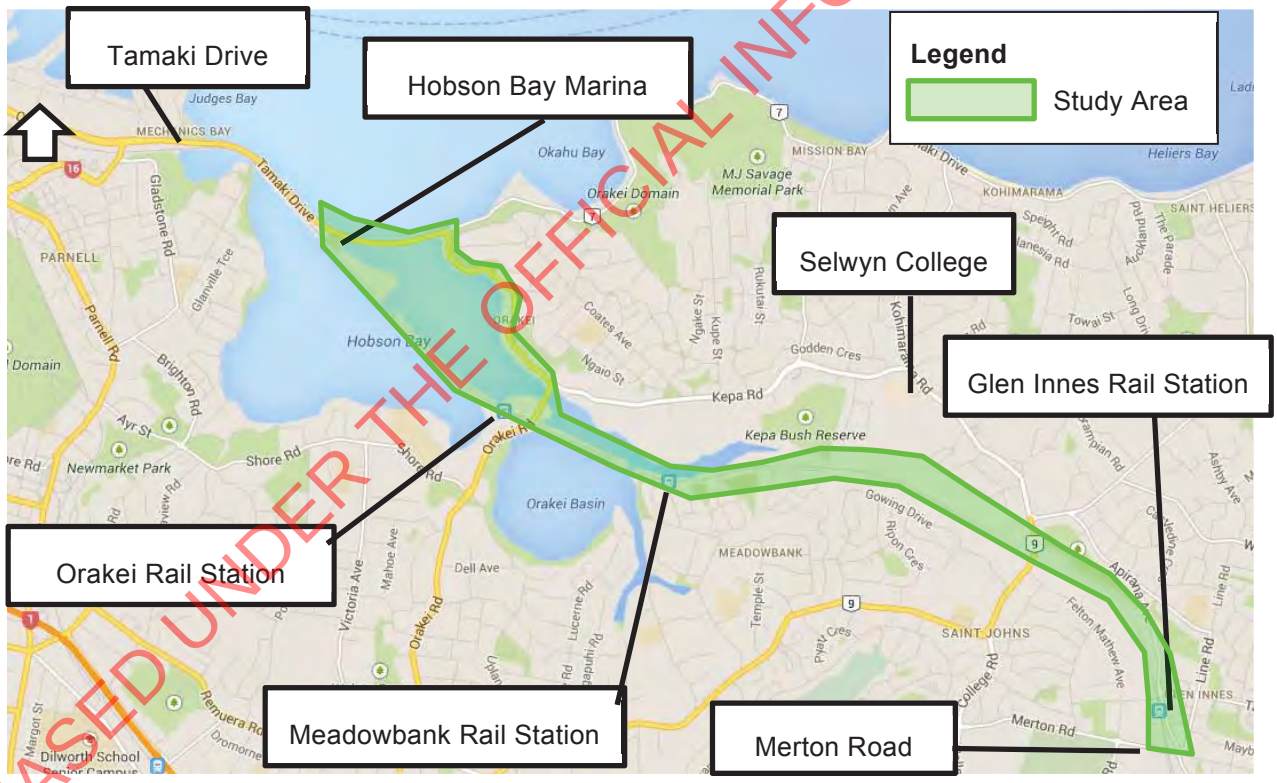

Figure 4-1: Location Plan

The route has four distinct sections based on the environment and treatment options. As a consequence it is expected that some sections could be progressed faster than others and thus a staged approach will be implemented in order to progress construction. The four sections are shown in Figure 4-2 and are described as follows:

- Section 1: Merton Road to St Johns Road
- Section 2: St Johns Road to Meadowbank Rail Station
- Section 3: Meadowbank Rail Station to Orakei Rail Station

- Section 4: Orakei Rail Station to Tamaki Drive

Each section could be a standalone project, but the whole is greater than the sum of the parts and should be considered as an integrated package of works.

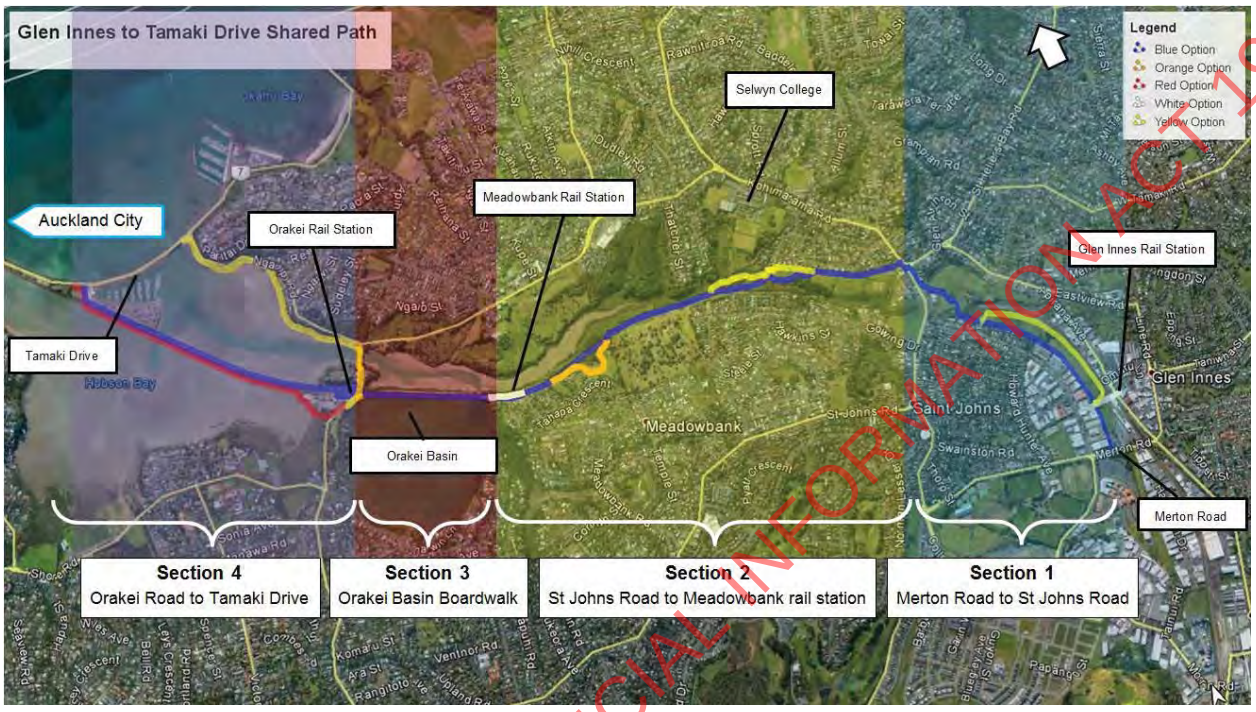

Figure 4-2: Aerial showing the division of the route sections

These sections will be described in more detail and will form the major headings of this report with the options assessed, the route connectivity and the constraints discussed for each section.

4.2 Services

Affected utilities have been identified and are grouped by section and noted below. Refer to the general layout drawings for each section attached in Appendix N for chainage references.

4.2.1 Section 1 Services

- There are sewer lines that cross the proposed shared path at about chainage 670 and 780. At these locations the path is at grade with the existing ground level and the sewer line is expected to be at a depth that will not conflict with the path construction.
- The services plans indicate a stormwater outlet at about chainage 740. However, this is an open water course (stream) which will be bridged.
- There is a street light at about chainage 1535 that will require relocation.
- An underground vector electricity cable (400v) runs under the proposed cycle path route near 315 St Johns Road at about chainage 1535, 1540 and 1605. The cable is approximately 0.4 m deep.
- An underground vector gas line (MP4 100mm PE) runs under the proposed cycle path route near 315 St Johns Road at about chainage 1605.The gas line is approximately 0.9 m deep.
- An underground water service line (depth and location not identified on map) runs under the proposed cycle path route near 315 St Jones Road at about chainage 1485-1630. (Note this is indicated on services plan scheme drawings).

4.2.2 Section 2 Services

- FX Duct and Fibre is proposed to be installed in existing KiwiRail backbone 100mm duct which runs alongside the current railway track (depth and exact location not indicated on maps) on the northern side. The proposed shared path track also runs parallel to the railway tracks. A railway over bridge will be provided at about chainage 1820 which will lead the shared path over the railway tracks. A Vodafone cable also runs in the same location.
- A active underground vector communications cable (depth and exact location not identified on map) is located under existing driveway entrance between 402 St Johns Road and 331 Kohimarama Road at about chainage 45.
- An underground waste water service line (depth and location not identified on map) runs under the proposed cycle path route at about chainage 85, 1265, 1780, 2310, 2335-2480, 2545-2615, and 2625-2645. (Note this is indicated on services plan scheme drawings).
- An underground storm water service line (depth and location not identified on map) runs under the proposed cycle path route at about chainage 570, 780, 1035, 1195, 1315, 1985, 2025, 2295, 2305, 2485 and 2650-2679. (Note this is indicated on services plan scheme drawings).
- LINZ marker CYM8 appears to be in the vicinity of the shared path track at about chainage 2190.
- LINZ marker CYM7 appears to be in the vicinity of the shared path track at about chainage 2340.
- An underground vector electricity cable (6,600-11,000v) runs under the proposed cycle path route opposite 9 Purewa Road at about chainage 2455-2550. The cable is approximately 0.9-1.1 m deep.

4.2.3 Section 3 Services

- FX Duct and Fibre is proposed to be installed in existing KiwiRail backbone 100mm duct which runs alongside the current railway track (depth and exact location not indicated on maps). The proposed shared path track also runs parallel to the railway tracks. A Vodafone cable also runs in the same location.
- An active underground vector communications cable (depth and exact location not identified on map) is located before Orakei Road Bridge which crosses the rail way tracks at about chainage 705.
- An underground vector electricity cable 6,600-11,000v (depth and exact location not identified on map) is located before Orakei Road Bridge which crosses the rail way tracks at about chainage 705.
- An underground vector gas line MP4 (depth and exact location not identified on map) is located before Orakei Road Bridge which crosses the rail way tracks at about chainage 705.
- An underground waste water service line (depth and location not identified on map) runs under the proposed cycle path route at about chainage 25. (Note this is indicated on services plan scheme drawings).
- An underground storm water service line (depth and location not identified on map) runs under the proposed cycle path route at about chainage 25. (Note this is indicated on services plan scheme drawings).

4.2.4 Section 4 Services

- There is a street light at about chainage 1075 that will require relocation.
- FX Duct and Fibre is proposed to be installed in existing KiwiRail backbone 100 mm duct which runs alongside the current railway track (depth and exact location not indicated on

maps). The proposed shared path track also runs parallel to the railway tracks. A Vodafone cable also runs in the same location.

- An underground telecom/chorus fibre optic or high capacity cable runs under the proposed cycle path route near Orakei Road Bridge at about chainage 770 - 860. The cable is approximately 0.6 m deep.
- An underground telecom/chorus fibre optic or high capacity cable runs under the proposed cycle path route near Tamaki Drive at about chainage 2510 and 2670. The cable is approximately 0.6 m deep.
- An underground vector electricity cable (400v) runs under the proposed cycle path route near Orakei Road Bridge at about chainage 965 - 985. The cable is approximately 1m deep.
- An underground vector electricity cable 400v (depth and exact location not identified on map) runs under the proposed cycle path route near Tamaki Drive at about chainage 2480, 2650 and 2670. The cable is approximately 1 m deep.
- An underground water service line (depth and location not identified on map) runs under the proposed cycle path route near Tamaki Drive at about chainage 2670. (Note this is indicated on services plan scheme drawings).
- An underground waste water service line (depth and location not identified on map) runs under the proposed cycle path route at about chainage 715 - 795, 1520 and 1625. (Note this is indicated on services plan scheme drawings).
- An underground storm water service line (depth and location not identified on map) runs under the proposed cycle path route at about chainage 1040 - 1180. (Note this is indicated on services plan scheme drawings).

4.3 Surrounding Land Use and Character

For the purpose of this section reference to zones is largely linked to those included in the Operative District Plan.

4.3.1 Section 1: Merton Road to St Johns Road

This section sits between Felton Mathews Avenue and Apirana Avenue and includes a large area of public owned land that has been designated for decades for both the Proposed Eastern Transport Corridor (D14-05) and Railway Purposes – North Island Main Trunk Railway (B10-05). The land at the southern end of the section between Felton Mathew Avenue and the rail corridor is zoned Business 4 in the Operative District Plan and the land at the northern end is largely zoned Residential 6a. The rail corridor itself where it is at grade is zoned Special Purpose 3 (where it is in the tunnel the land above is zoned Residential 6a). The land at the southern end of the section between the rail corridor and Apirana Avenue is largely zoned Mixed Use and the northern end is Open Space 2 and Residential 6a. The land fronting St Johns Road is zoned Residential 6a and 6b and Open Space 2.

Large scale industrial / business properties (including Countdown) front Felton Mathew Avenue and back on to project area. There are two businesses (landscape supply and timber yard) located adjacent to the existing Eastern rail line and Glen Innes Rail station are on land that is designated as D14-05 and zoned Business 4.The physical entrance to the section of the route from Merton Road is located between Countdown and the landscaping supply yard. Behind the Merton Road properties the area opens up into a fenced paddock used for horse grazing with some mature trees. A fenced and planted pedestrian walkway (and tunnel under the rail line) separates this end of the route from the middle of the section.

The midsection is also occupied by grassed paddocks and trees located between larger industrial uses and dwellings that are accessed from Felton Mathew Avenue. The residential properties and the land within the D14-05 corridor are zoned Residential 6a. The rail line zoned Special Purpose 3 runs to the east of the paddocks and beyond the rail line is 1- 2 story buildings occupied by retail, office and semi industrial activities and associated carparking/ storage. These properties are accessed from

Apirana Avenue. From the intersection of Apirana Avenue and Eastview Road to St Johns Road residential properties front Apirana Avenue and back on to the lower section of Apirana Reserve.

The northern end of this section is largely contained within Apirana Reserve. Residential lots front Apirana Avenue and St Heliers Bay Road and back on to the reserve at this section. Many of the properties have bush/scrub between them and grassed area of the reserve. At the St Johns Road frontage there are a small number of residential properties. A handful of retail businesses are set back from the road by an area of off street parking are located on land owned by Auckland Council zoned Residential 6b and also designated for the Easter Corridor. The route will be contained in the wide St Johns Road reserve once if leaves Apirana Reserve.

4.3.2 Section 2: St Johns Road to Meadowbank Rail Station

This section of the route is on land that is part of the valley located to the west of St Johns Road behind the residential properties that front St Johns Road and includes the paddocks and bush to the north of the rail line and the south of the residential properties in Whytehead Crescent, the end of John Ryman Place, a bush covered area of Selwyn College, Kempthorne Crescent, and Thacher Street. The residential properties that front St Johns Road are zoned Residential 6a as is the land to the north and south of the section occupied by residential dwellings. Selwyn College's land is located to the north is designated and zoned Special Purpose 2.

Road access to the middle of this section is limited as there are no access ways from these nearby roads. Running through the section is the rail corridor (part of the designation B10-05) also zoned Special Purpose 3 and the corridor of land identified as D14-05 in this section is zoned Open Space 2.

On the southern side of the rail line are residential properties that are accessed from Gowing Drive and the lower area of Purewa Cemetery. To the west of the cemetery are the Tahapa East and Tahapa West reserves separated by housing located on Mamaku Street. The houses accessed from the end of the Kapua St cul–de-sac and then Meadowbank Rail station. Purewa Cemetery is zoned Open Space 4. Both of the Tahapa Reserves are zoned Open Space 2. The houses at the end of the Kapua St cul–de-sac and Mamaku Street are zoned Residential 6a.

Adjacent to this section are the upper reaches of the Purewa Creek and the tidal section of the creek below the Kepa Bush reserve and the land used for grazing by the St Helier's Bay Pony Club (accessed from Kepa Road). The land to the north of the rail line on the banks of the creek is zoned Open Space 1. The land occupied by the Kepa Bush Reserve is Open Space 1 and the land used by the St Heliers Pony Club is largely Open Space 2 although a strip of Open Space 1. In 2013 the area leased to the Pony Club was returned to Ngati Whatua Orakei Trust. It is classified as a reserve (Pourewa Creek Recreation Reserve).

4.3.3 Section 3: Meadowbank Rail Station to Orakei Rail Station

This section includes the Orakei Basin, a tidal lagoon used for water sports originally created as an explosion crater, the rail line that runs on an embankment that now forms the northern edge of the basin, the Orakei Basin sluice gates under the rail line that control the water level in the basin and the existing boardwalk on the southern side of the rail line that forms part of the relatively new Orakei Basin walkway. The rail line is on reclaimed land and is zoned Special purpose 3 and designated (B10-05). The water to the north and south of the rail line is in the Coastal Marine Area (covered in the Regional Plan Coastal) and is within the Coast Protection Area 2.

On the northern side of the rail line are tidal mudflats and grassed and treed banks sloping down from Kepa Road that are zoned Open Space 1 and 2. Also on the slopes looking down on to the section of the route is residential development and St Joseph's School accessed from Brenton Place, a cul-de-sac accessed from Kepa Road. The school is zoned Special Purpose 2 and the residential development is a mix of Residential 6b and 7b.

At the western end of the section is the Orakei Road Bridge linking Kepa Road to the Orakei Peninsula. On the eastern side is the Orakei Bay Function Centre on land Open Space 2, the rail line is zoned Special Purpose 3 on the eastern side of Orakei Road but all the land on the western side including the land within the designations for the rail line and D1405 the Eastern Transport Corridor is in the Mixed Use – Orakei Point zone. Land around the edge of the Point is zoned Open Space 1.

4.3.4 Section 4: Orakei Rail Station to Tamaki Drive

Hobson Bay and Whakatakataka Bay located within the Coastal Marine Area (covered in the Regional Plan Coastal) and identified as Coast Protection Area 2 make up the bulk of this section. Moorings are located in Whakatakataka Bay with access to the harbour under Tamaki Drive. The southern side edge of the CMA includes the Hobson Bay Walkway, and the playing fields of Saint Kentigern Boys School , the coastal cliffs and residential development of Burwood Crescent and the end of Victoria Avenue (land is zoned Residential 2b), the playing fields of Thomas Bloodworth Park and Shore Road reserve and the coastal cliffs and residential development (Residential 1 and 2) on the cliffs on the Parnell side of Hobson Bay. On the northern side of the CMA are the treed coastal cliffs and Ngapipi Road with some residential development and boat sheds located on the CMA closer to the intersection with Tamaki Drive.

At the Tamaki Drive end of the section is the Outboard Boating Club marina, hardstand and boat ramps and a mini-golf course and parking on Open Space 3 zoned land. Running through the middle of the Section 4 is the existing rail embankment still zoned Special Purpose 3 and designated except where there are bridge structures supporting the rail line.

4.4 Landscape Values, Wetlands and Waterways

Most of the project area is located either at sea level or is in the floor of a valley surrounded by ridges/cliffs now occupied by either residential development or spaces used by the public. The project area has maintained a degree of natural character (even if it has been modified due to the introduction of the rail line) and in the case of the sections to the north of St Johns Road there are ecological values and habitats associated with the areas of bush and the close proximity to the coast.

Hobson Bay, the Orakei Basin and Purewa Creek are part of the Coastal Marine Area and are classified as Coastal Protection Area 2 in the Operative Regional Plan: Coastal. The Coastal Plan (Map Series 8, Sheet 3) identifies part of the Hobson Bay as a significant area for wading birds (refer Figure 4-3).

Figure 4-3: Extract from Map Series 8, Sheet 3, Operative Coastal Plan

The Coastal Protection Area values identified[1] in the Coastal plan for these areas (identified as 51a- c in Figure 2 below) are related to being identified as a breeding area for a variety of shag species and feeding areas used by these birds along with a variety of other coastal and wading birds.

[1] Schedule 3: Coastal Protection Areas, S3-12, Auckland Council Regional Plan: Coastal 2004

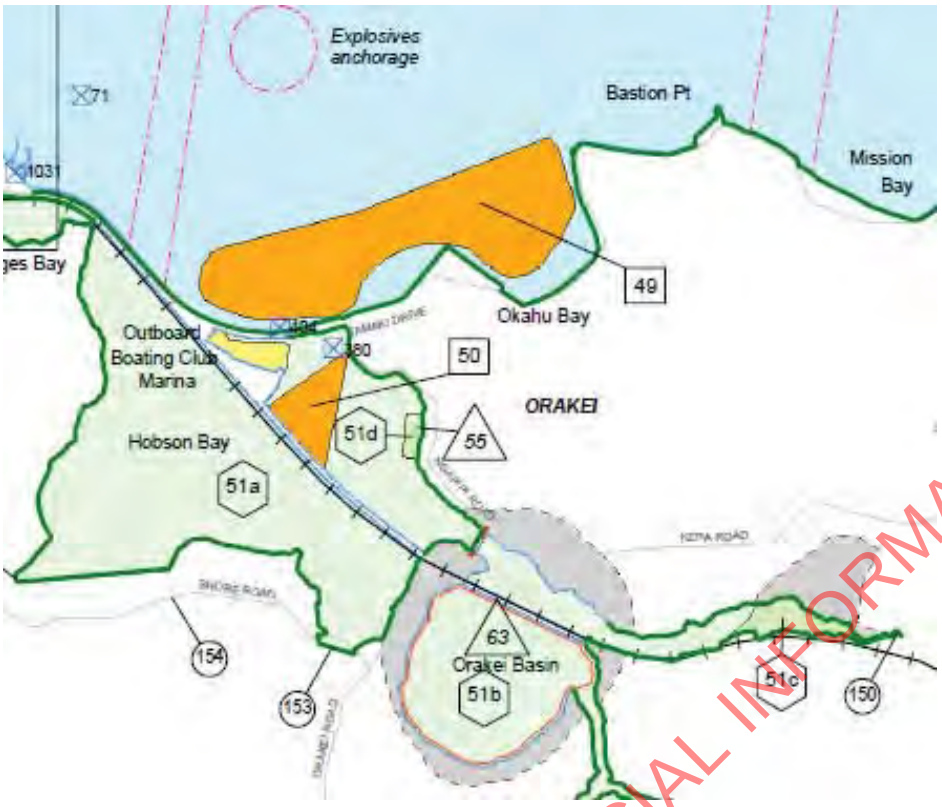

Figure 4-4: Extract from Map Series 1 Sheet 30- Coastal Plan

The Coastal Plan also recognises Orakei Basin (51b) is a large, conspicuous explosion crater and associated tuff ring that has been breached by a stream and invaded by rising sea level and that some of the largest mangroves in the ecological district grow in the Purewa Stream area (51c) and that the value of these mangroves is enhanced by the gradation from mangrove forest into the coastal forest of Purewa Reserve.

In addition the Orakei Basin Tuff Ring and Explosion Crater (63) and Ngapipi Road/Hobson Point Greensand Exposure (Orakei Greensands (55)[2] have been identified as Areas of Significant Conservation Value in the Coastal Plan. The Coastal Plan notes that both the geological features are considered to be nationally important and that is why the Department of Conservation has selected both as Areas of Significant Conservation value (ASCVs).

The Orakei Greensands area (51d) with its values being historically important as it is the type locality of several Mollusca and of numerous Foraminifera collected by Hochstetter in 1859 and described by Karrer in 1864.

The Operative District Plan also lists the flooded explosion crater and tuff ring applying to Orakei Basin, and the land beyond (Kepa Road, Purewa Road, Lucerne Road, Darwin Lane, Upland Road, and Orakei Road). The land is scheduled as a site of geological significance in Appendix 3B, Schedule of Geological Features (D12-04).

In addition the Auckland District Plan identifies the area on the landward side of the CMA as being subject to the Coastal Management Area (Ref B04-01) and rules in 5B.7 related to the construction of buildings and structures and the removal of vegetation.

Selwyn College (Lot 18 DP 18321) and 337 Kohimarama Road (Pt Lots 1-3 DP 23745 Pt Lots 10, 18, 22 DP 18321) are identified in the Auckland District Plan (Appendix 3C) as being a significant ecological area (C13-09). 337 Kohimarama Road and the Kepa Bush Reserve as well as the Thatcher

[2] Schedule 4: Areas of significant conservation value , S4-29 Auckland Council Regional Plan: Coastal 2004

Reserve at 35 Thatcher Ave are also identified as being affected by the significant ecological area (C13- 08). Other significant ecological areas are identified on the northern side of Ngapipi Road. One (C12-05) is immediately to the west of the Kepa Road/ Orakei Road intersection and the other C11-11 is on the section of Ngapipi Road to the south of Paratai Drive .

A large number of volcanic view shafts originate from points along Kepa Road, Ngapipi Road and Tamaki Drive and apply across the CMA. These features have been included in the PAUP but the manner in which they are mapped in more detailed.

The coastal marine area also forms part of the Hauraki Gulf Marine park.

4.5 Archaeological, Historical or Cultural Sites

There are no historical, cultural, archaeological sites registered or recorded within Section 1 affected by the project under either the PAUP or the Operative Plan. A site walkover identified the potential of a midden.

The Operative District Plan does not identify any archaeological sites in Section 2, however it is worth noting that the Purewa Cemetery was established in 1889 having been part of the St Johns College estate. It is believed that Bishop Selwyn landed at the end of the Purewa Creek in 1844 and set up the temporary settlement of Purewa at the location of the cemetery before building the college at its exiting location. Sites and places of value to Mana Whenua are identified in the PAUP to the south of John Rymer Place and in the section abutting the Rail line through to the Meadowbank station. These sites are identified as archaeology of Maori Origin.

To the east of the Meadowbank Station in Section 3, the PAUP identifies a number of sites and places of value to Mana Whenua. These sites are archaeology of Maori Origin and relate to sites registered with the NZ Archaeological Association. Also in section 3 an extensive archaeological feature D11-10 (Orakei Basin, West Reserve Orakei Road 191-215. Maori village and terraces) is shown in the operative plan as applying to the section of Orakei Point south of the rail line and in the PAUP. It is understood that this feature is related to Orakei Pa (R11/87) a pa recognized as being associated with, and of significance to, Ngati Whatua[3] that extended over most of the Orakei peninsula in pre European times. Work undertaken by Clough & Associates in 2008 as part of the work on Plan Change 260 identified middens at the northern end of Orakei Point. The PAUP has also identified sites and places of value to Mana Whenua at the end of the Point and at the location of the Orakei West Reserve.

Located in Section 4 are the boat sheds on Ngapipi Road, identified in the PAUP as historic heritage

4.6 Long Term Maintenance and Operation Factors

The formed path is 4 m wide and will cater for maintenance type activities as it is not expected that large equipment will be required for shared path maintenance activities. The main constraint is on Section 2 where the 140 m ramp structure is provided for walker and cyclists. This is a light weight structure that will not accommodate motor vehicles. An alternative maintenance vehicle route may need to be developed for Section 2 along the existing track alignment, however this route is only 3 m wide with a drop offs along the south edge and will require a stream crossing.

There are no other identified factors at the site affecting the long term operation of the proposed shared path.

[3] Identified in the Orakei Point Assessment (dated August 2008) prepared by Clough & associates for Plan Change 260 to the Isthmus Plan

4.7 Topographical, Geotechnical, Development, Environmental, Social and Archaeological Factors

The existing ground profile along the proposed alignment is a downward batter away from the edge of the motorway shoulder. This topographical factor affects the choice of option in that an alignment which is closer to the edge of the shoulder will require fewer earthworks to be carried out.

Much of the existing material on site is engineered fill material, placed during construction of the adjacent motorway and subsequent widening works. This is a geotechnical factor which may impact the choice of option. See Appendix I for further geotechnical information.

The existing environment is heavily modified and the differences in environmental factors between the options under consideration are negligible.

The close proximity between the proposed off-road cycle way and adjacent residential properties are a social factor which will affect the choice of options. Of particular concern, is the need to maintain privacy and security for the residents of these properties.

No development or archaeological factors which affect the choice of option have been identified.

4.8 Maori Influences

In May 1841 the Kohimarama block, was purchased from Ngati Paoa. The 6000 acre block extended from Mission Bay and St Heliers to the Panmure Basin and covered the land in Section 1 and Section 2. Te Wai o Taiki (Tāmaki estuary) to the east of section 1 was an extremely significant waterway for Iwi both for access to the upper river portages and for the significant estuary / inshore fishing grounds.

In the period prior to European settlement, Orakei Peninsula in the middle of sections 3 and 4 is understood to be a significant area of Maori settlement. Orakei Point was used as a pa and the area was known as Takaparawha and was significant because of the unusual location and landform that it occupied. Orakei Peninsula was acquired by the Crown in 18541 from Ngati Whatua. Orakei Pa is also a significant scheduled archaeological site. The majority of surviving archaeological features, are protected within the Orakei Basin West Reserve,

The land on the northern side of the Purewa Creek was part of the Orakei Block. Recently an area of land described as the Purewa Creek Stewardship Area (Figure 3) was vested in Ngati Whatua o Orakei through the Ngati Whatua Deed of Settlement 2011. The land a recreation reserve is to be administered by the Ngāti Whātua o Ōrākei Reserves Board (the joint Ngāti Whātua Ōrākei-Auckland Council body that administers the Whenua Rangatira at Bastion Point). It was agreed through the settlement that the geographic name of the Purewa Creek will be changed to Pourewa Creek.

Figure 4-5: Map showing 36.625 ha of land returned to Ngati Whatua Orakei Trust [4]

4.9 Crash History

A summary of the findings from a full analysis of the Crash Analysis System (CAS) is contained in Section 5.3 and core data is documented in Appendix C.

4.10 Surrounding Community Factors

For Section 2 in particular, the railway track and the Purewa Creek creates a severance between the communities on the southwest and the northeast sides. This is further exacerbated by the steep topography in the area. The proposed rail over bridge will help to alleviate this limitation with potential connections to other pathway developments such as the Orakei Greenways programme and the Kepa Bush Restoration Plan. This creates connections and provides the community travel choice.

The proposed shared path options will not hinder or otherwise impact any existing access to any property.

4.11 Surrounding Transport and Access Patterns

Pedestrian demand in the local road network in close proximity to the south of the proposed shared path alignment is high and is largely generated by residential properties in the area.

The proposed shared path will have no direct impact on the local transport system for motorised traffic. The increased accessibility of cycling as a viable alternative to private motor vehicle use may create some reduction in demand for motorised transport modes in the surrounding area.

The shared path will generally follow the railway corridor from Glen Innes train station to Tamaki Drive adjacent Orakei Boating Club. Pedestrians and cyclists access would likely be provided along the route with specific emphasis provided at Glen Innes, Meadowbank and Orakei train stations.

While the cycle route typically is located away from general vehicle corridors, there are locations where scheduled bus services are located in close proximity to the share path. Table 4-1 shows the bus services which would have close connection to the route:

[4] Sourced from Pourewa Creek Reserve, Orakei, Archaeological Survey prepared for Ngati Whatua Orakei Trust Russell Foster and Associates, January 2014

Table 4-1 : Bus Stops and Bus Services near Shared Path

Location	Bus Stop Number	Bus Service
Glen Innes Train Station	8799, 7821, 7818,	007, 655, 595, 745
St Johns Road / St Heliers Bay Road Intersection	7836, 7843	710, 715, 715x, 716, 717, 745, 770, 771, N62
Orakei Train Station	7778, 7769	685X, 770, 771

Major destinations are the Auckland Central Business District via Tamaki Drive to the west and, more locally, the Glen Innes Town Centre on Apirana Avenue to the East. Tamaki Drive and Mission Bay to the north are major recreational destinations in the surrounding area.

No negative potential impacts associated with the off-road shared path options examined in this report are identified in the Auckland City Council and Auckland Regional Authority Long Term Council Community Plans, Auckland Regional Growth Strategy or Auckland Land Transport Strategy. All of these documents do make reference to the benefits of cycling as a transport mode and seek to encourage cycling through the development of a regional cycling network. The proposed shared path options considered in this report are consistent with these options.

The Glen Innes to Tamaki Drive link is also a key component of the NZTA Strategic Cycle Network.

4.12 Current and Potential Constraints and Opportunities

The proposed shared path will connect to the Pt England to Panmure Cycleway project that is currently in the design phase, and connects to the shared path on Tamaki Drive. This will complete a strategic link for the Auckland cycle network.

To appeal to the widest range of path users, it is desirable to minimise the gradient. However the gradients that can be achieved are limited by the topography along the route. Gradients have been minimised through route selection and alignment adjustments wherever possible. The absolute maximum gradient is 1:12 (8.3%) for short sections. Where steep gradients exist, the detail design will look to comply with the disability standard of providing 1:12 gradients for a length of 9 m followed by a 1.5 m flat rest area.

For Section 1 and the start of Section 2, NZTA wished to keep the path alignment to the margins (e.g. the boundaries) in order to maximise the potential of the remaining land parcel. With the preferred alignment there are embankments that have been created as a result of building development and the path needs to run along the top of the embankment. To accommodate the 4 m wide path this requires substantial earthworks fill for approximately 400 m. This also results in removal of trees along the top of the embankment including a pohutukawa. The alternative is to align the path along the toe of the embankment, however this uses a greater extent of the NZTA land parcel. The benefits of shifting the alignment are:

- Avoid the removal of trees.
- Improved visibility.
- Provides an opportunity for the placement of street / cultural art and additional planting to enhance the area and improve the user experience.
- Reduced construction cost.
- Improvement of gradients.
- Minimised earthworks will help to speed up construction and delivery of the project.

It is recommended to review the path alignment at the embankment locations during the detail design stage.

Boarding the fence line also limits the ability to raise the ground level more than a couple of hundred millimetres above existing as it will result in the path users overlooking the adjacent properties.

Where the path is within the rail corridor the path will need to comply with KiwiRail requirements. This includes the key constraints of locating the path outside the electrification gantries or 2.75 m away from the centre of the closest track. The over bridge is required to clear the electrification by 1 m. The path alignment also needs to allow KiwiRail's future plans to provide a third rail line on the north side of the rail tracks.

4.12.1 Connectivity Constraints and Opportunities

The project aims to establish and improve connectivity and to create the opportunity for additional connections to be established. This is particularly important for Sections 1 and 2 as discussed below.

4.12.1.1 Section 1 Constraints

This section of the route has good connectivity options with a mix of pedestrian and cycle access identified. Formalising the connection between 78 and 80 Felton Mathew Avenue as shown in Figure 4-6 is key to providing good quality accesses to the shared path. It will also become a vital access point for construction. NZTA are currently in negotiations with the landowner.

The topography presents challenges achieving suitable gradient, particularly the section that climbs over the tunnel.

The underpass to the Glen Innes rail station and the town centre is an unattractive connection. With the length of the underpass, average lighting and poor visibility the perception is that there are personal safety concerns. It is understood the KiwiRail would prefer to provide an over bridge at this location. This would need to be investigated as a separate project in context of the Glen Innes redevelopment and rationalisation of the bus interchange.

Figure 4-6 : Section 1 constraints

4.12.1.2 Section 2 Constraints

As shown in Figure 4-7 the route passes through Purewa Bush, which is isolated from housing and activities that help to provide passive surveillance. As result this can create opportunities for crime and concerns for personal safety, both real and perceived. The design will need to consider principals of crime prevention through environmental design (CPTED) to overcome these concerns.

There are some connectivity challenges through the middle and to the east of the route due to the inlet, the Purewa Stream and the steep gradients north of the rail line as shown in Figure 4-7. The

existing rail line also creates a severance issue. However, there are some good pedestrian connections to the west end of Section 2 with some suitable for upgrading to cater for cyclists as shown in Figure 4-8.

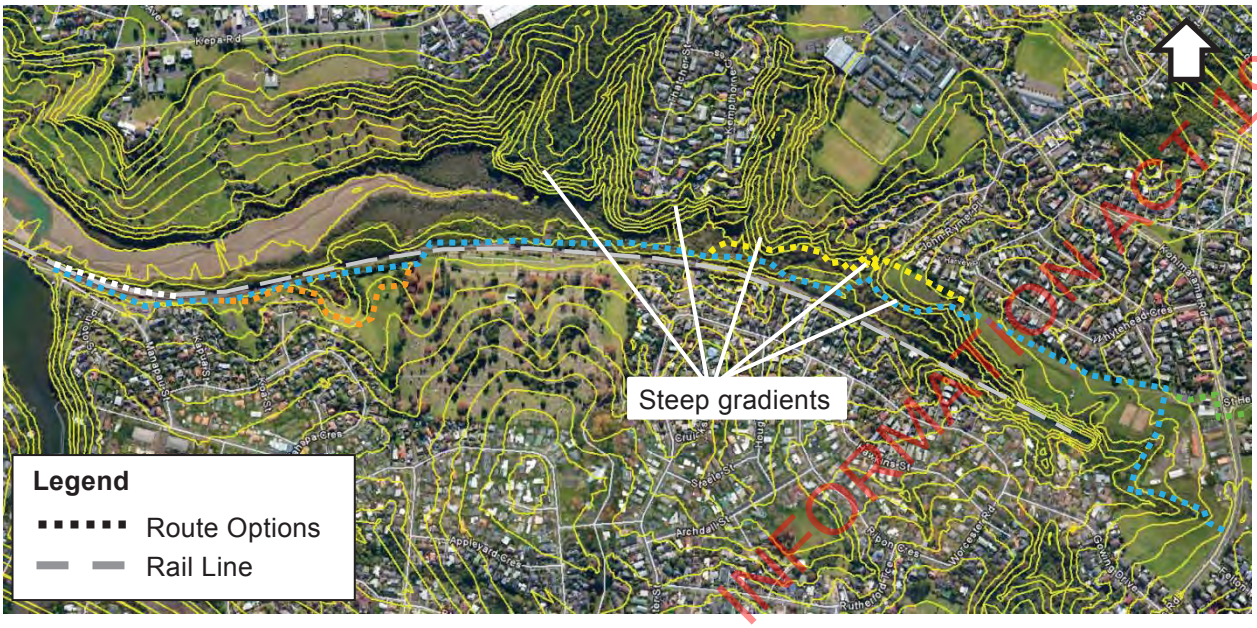

Figure 4-7: Section 2 topographical constraints

Potential links or zones where links are desirable have been identified in Figure 4-8. North of the rail line potential connections could be created along the eastern boundary of Selwyn College with an alternative connection option from Whytehead Crescent. Both of these options would require land purchase. It is also noted that a housing development is proposed on the section east of Selwyn College.

South of the rail line a potential connection via Gowing Drive would be desirable. This would require land purchase. The rail line severance would require a rail over bridge. Alternatively a connection could be provided through the Purewa cemetery to the location of the proposed over bridge. This would also require land purchase to create the connection to the cemetery, and requires approval from the cemetery landowner(s) to allow the connection along the north boundary of the cemetery. A link to a busy arterial road such as St Johns Road via the cemetery's private road would provide a valuable connection to the path. The private road is scenic and could accommodate off-road and / or on-road facilities.

It is noted that the Orakei Greenways Plan and the Restoration Plan for Kepa Bush have both identified potential walking routes around the Kepa Bush and Selwyn College area. The routes come within close proximity to the blue route. The Purewa Stream crossing creates the main challenge to connecting the route.

This project will incorporate connectivity considerations into the development, but may not resolve these connectivity issues. However it does provide a catalyst for new connections to be created to the shared path. In particular the rail over bridge location at the western boundary of the cemetery does support the development of good connections to Gowing Drive and St Johns Road while helping to overcome the rail severance.

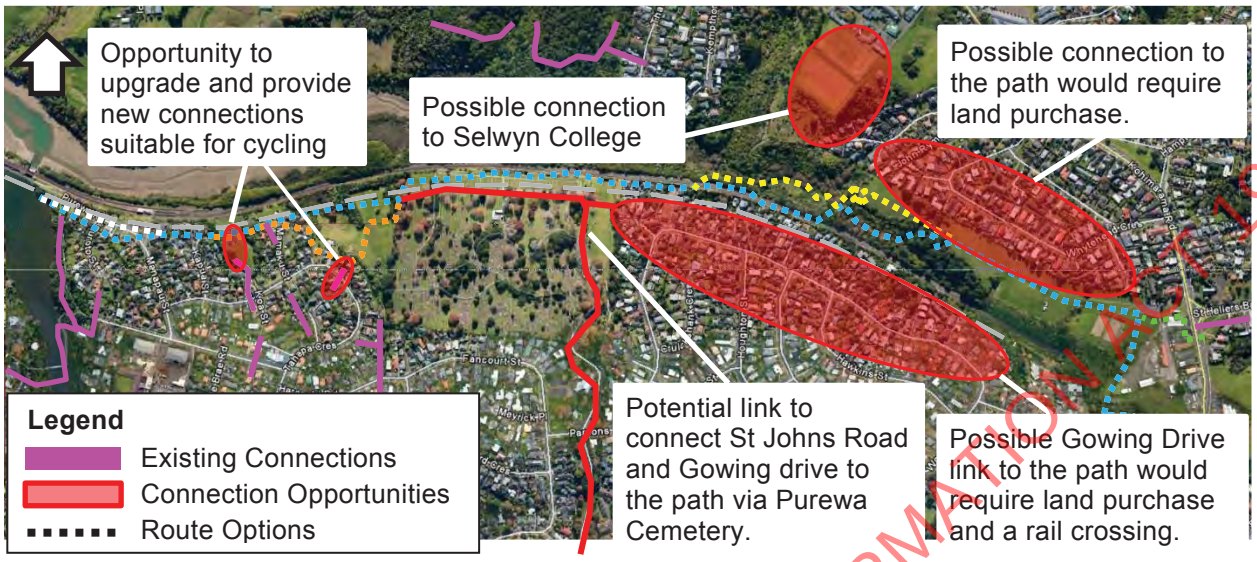

Figure 4-8: Section 2 route connectivity

4.12.1.3 Section 3 Constraints

If possible the boardwalk structure will be widened to 4.5 m, providing an effective width of 4 m. The intent is to widen the boardwalk without the need to replace or add additional piles as this will minimise cost, user disruption and consent requirements. Structural information on the boardwalk has been provided, however geotechnical information has been requested but is still outstanding in order to confirm the extent of widening possible.

The constraints for Section 3 are shown in Figure 4-9.

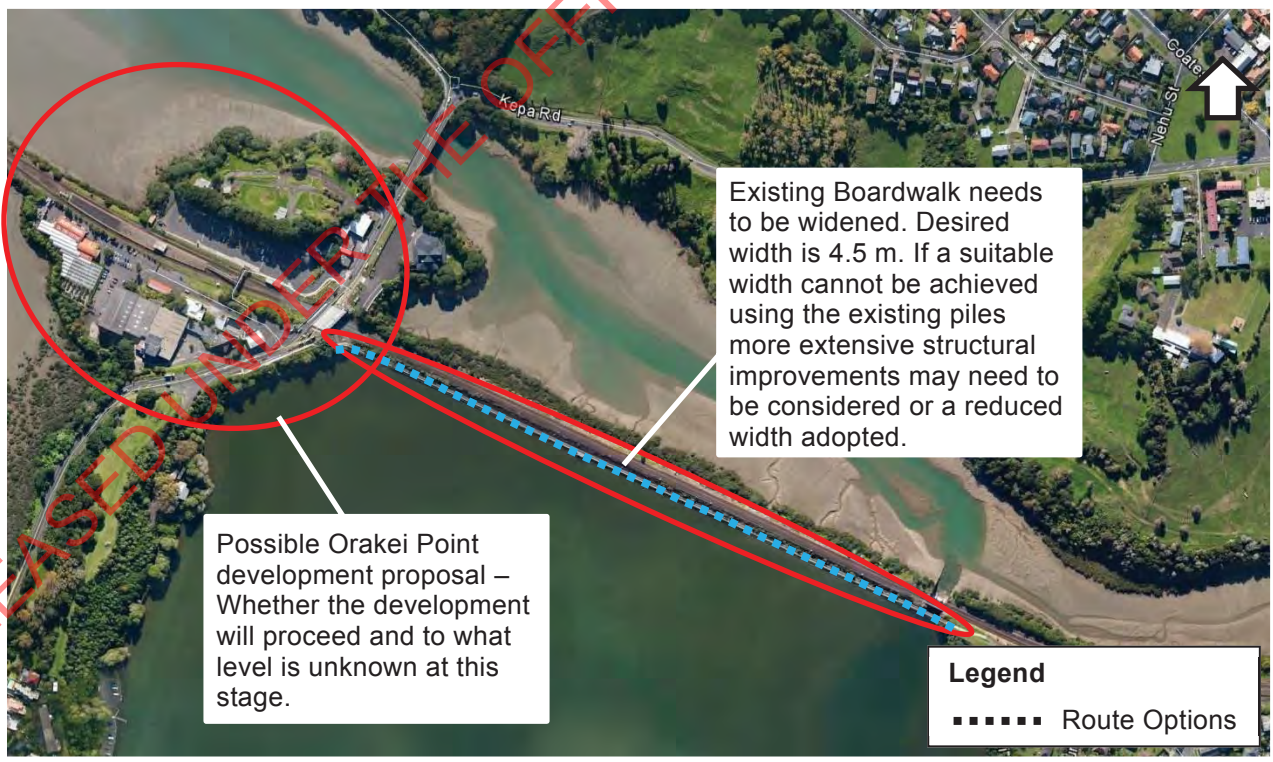

Figure 4-9: Section 3 route constraints

4.12.1.4 Section 4 Constraints

At this stage it is not clear whether the proposed Orakei Point development will proceed, and if it does what form the development will take. Auckland Transport are monitoring the status of the development and options will be investigated to incorporate walking and cycling connections to link with the shared path as more information becomes available. If the development does not proceed, options have been identified that will provide links to the Hobson Bay sections.

For the blue route the geotechnical conditions are expected to be difficult. The structure will need to be outside the third track option for KiwiRail. Land purchase from the Hobson Bay Marina may be required and / or relocation of unidentified services.

The main constraints for the yellow route are widening of the Orakei Road Bridge and the pinch point adjacent to the boat sheds where the path would narrow to approximately 2.5 m.

The constraints for Section 4 are shown in Figure 4-10.

Figure 4-10: Section 4 route constraints

4.13 Visual Qualities

The route will provide users a range of visual experiences. Section 1 provides vistas across fields to towards the rail line and the Glen Innes town centre. From the elevated location south of St Johns Road the route provides extensive views to Mt Wellington and across the eastern suburbs.

Figure 4-11: View from the top of Section 1 near St Johns Road looking south

From the elevated portion of Section 2 there are views across the pony club fields and Purewa Valley to central Auckland. The portion through Purewa Valley will provide path users a unique bush experience in the middle of urban Auckland, and the wide route corridor will provide excellent visibility. A visualisation of the path through the Purewa Bush of Section 2 is shown in Figure 4-12. In Section 2, there is also an opportunity for the path to connect and link through Tahape Reserve.

Figure 4-12: Visualisation of the bush section through Purewa Valley in Section 2

Sections 3 and 4 provide the opportunity to provide views across Orakei Basin and Hobson Bay respectively. A visualisation of the option across Hobson Bay parallel to the rail line of Section 4 is shown in Figure 4-13.

Figure 4-13: Visualisation of the view across Hobson Bay in Section 4

5 Collected Data

5.1 Traffic Data

Two cyclist surveys was undertaken on 04/11/2014, one at St Heliers Bay Road/ Kohimarama Road between the hours of 7 am to 9 am and 3:30 pm to 6 pm and the other at Orakei Road railway over bridge between the hours of 7 am to 9 am and 4:00 pm to 6 pm.

The cycling peak hours on St Heliers Bay Round / Kohimarama Road Intersection occurred on 7 am for the morning peak and 4 pm for the evening peak. Both peak hour periods showed the predominate movements are the through movements along Kohimarama Road south with a total of 20 cyclists during the am and 6 cyclist during the pm.

The cycling peak hour on Orakei Road railway over bridge occurs on 7:15 am for the morning peak and 4:45 pm for the afternoon peak. The predominate movement during the am peak are the northbound movement along Orakei Road with a total of 14 cyclists while the pm peak predominate movement are the southbound movement along Orakei Road with a total of 9 cyclists.

Table 5-1 shows the total count during the peak hours of each surveyed locations

Table 5-1 : Cyclist Movement Count

Location	AM Peak Hour Count	PM Peak Hour Count
St Heliers Bay Road / Kohimarama Road Intersection	45	18
Orakei Road	40	29

Table 5-2 presents vehicle counts that were taken from the Auckland Transport website.

Table 5-2 : Traffic Statistics

Location	5 Day ADT	7Day ADT	Count Start Date
Merton Road	10184	9647	13/08/2012
St John Road	15453	14990	23/05/2012
Kohimarama Road	18581	17993	31/05/2012
Orakei Road	12649	11447	13/11/2012
Ngapipi Road	13788	12668	14/09/2012
Tamaki Drive	11814	11157	14/09/2012
Remuera Road	24665	23566	13/02/2012
Kepa Road	16765	16332	14/06/2012

5.2 Crash Data

A search of the NZTA CAS database for the crashes occurring on the route over the last five years was undertaken. The list of locations is listed below:

- Intersection of Kohimarama Road and St Johns Road
- Kohimarama Road, Kepa Road and Ngapipi Road (Between
- St Johns Road and Remuera Road (between Broadway and College Road)
- Orakei Road (between Kepa Road and Shore Road)

A copy of the crash history data is included in Appendix C, including English language and coded listings, crash list detail report and collision diagram CAS outputs.

A summary of the CAS output is included below:

- At the intersection Kohimarama Road and St Johns Road has 15 crashes with no crashes involving cyclists.
- Along the route of Orakei Road there have been 32 crashes with four (4) crashes involved cyclists. (refer to Table 5-3)
- Along the route of Kohimarama Road, Kepa Road and Ngapipi Road there have been 189 crashes with 16 involving cyclists. (refer to Table 5-1)
- Along the route of St johns Road and Remuera Road there have been 329 crashes with 24 involving cyclists. (refer to Table 5-5)

Table 5-3 : Cyclist Crashes Along Orakei Road

Year	Fatal	Serious	Minor	Non-injury	Total
2009	0	0	0	2	2
2010	0	0	1	1	2
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0

Table 5-4 : Cyclist Crashes Along Ngapipi Road – Kepa Road – Kohimarama road

Year	Fatal	Serious	Minor	Non-injury	Total
2009	0	1	2	1	4
2010	0	0	2	0	2
2011	0	3	1	0	4
2012	0	0	4	0	4
2013	0	0	1	1	2

Table 5-5 : Cyclist Crashes Along Remuera Road – St John Road

Year	Fatal	Serious	Minor	Non-injury	Total
2009	0	0	4	0	4
2010	0	1	2	1	4
2011	0	1	7	1	9
2012	0	0	3	1	4
2013	0	0	2	1	3

5.3 Geotechnical Assessment

As part of the Preliminary Geotechnical Assessment Report (PGAR) (see Appendix I), a desktop study was completed. The findings indicated that the proposed shared path route will cross highly variable terrain consisting of four main geological formations; Auckland East Coast Bays, Auckland Volcanic Field, Puketoka Formation and Taupo Pumice Alluvium.

Section 1 of the route begins at Merton Road and runs over moderately undulating grassed land behind industrial and residential property up to St Johns Road. Section 2 carries on from St Johns Road to Meadowbank Train Station and will largely run alongside the rail corridor; this route is covered in thick vegetation with some steep slopes around the Purewa Stream. Starting at Meadowbank Station, Section 3 of the route is proposed to run along the existing boardwalk across

the Orakei Basin and connect with the Orakei Station; no geotechnical investigation has been proposed for this section as the current concept design involves widening the existing boardwalk. Section 4 which will connect Orakei Station with Tamaki Drive has two route options being considered; crossing Hobson Bay with an independent structure, or following the outside edge of Hobson Bay.

Throughout the length of the route several structures are proposed which will require ground investigation. These include retaining walls, bridges, fill embankments and cut slopes each of which will have a targeted ground investigation comprising of boreholes, Cone Penetration Tests (CPTs), test pits, hand augers and Dynamic Cone (Scala) Penetrometers or a combination thereof. These investigations have been recommended to assess ground conditions associated with the various structures proposed for this shared path.

Ground investigations for this project have so far been completed for Section 1 only and comprised test pit and hand auger investigations with Shear Vane, Scala penetrometer and laboratory testing. Soils have been logged in general accordance with *NZGS Field Description of soil and Rock,* December 2005. Un-drained shear strengths of cohesive soils have been determined using a hand held Shear Vane and a calibrated correction factor applied. The investigations comprised the following:

- 10 Hand Auger with Shear Vane and Scala penetrometer tests (HA1 to HA10),
- 3 Test pits with Shear Vane and Scala penetrometer tests (TP1 to TP3).

From the results of the site investigation and the desk study, the inferred geological sequence along Section 1 of the proposed shared path route is that of the Auckland East Coast Bays Formation from the Waitemata Group and the Puketoka Formation from the Tauranga Group. The weathered rock from this formation was encountered at relatively shallow depth, particularly where the proposed earth embankment is located. The overlying silt and clay that was encountered throughout the site was stiff to very stiff. The Factual and Interpretive reports have been provided in Appendix I.

Interpretation of the information gathered during the site investigation found;

- In-situ soils, excluding topsoil are considered suitable for reuse as fill provided they are not too wet of optimum.
- Cut slopes up to 4 m high should be no steeper than 1.5H:1V
- Cut slopes over 4 m high should be no steeper than 2H:1V
- Fill slopes should be no steeper than 2H:1V
- Retaining walls supporting cut slopes with imported granular fill should be designed for a preliminary coefficient of active earth pressure of 0.33, subject to confirmation of geometry.
- Retaining walls supporting fill materials with imported granular fill should be designed for a preliminary coefficient of active earth pressure of 0.4, subject to confirmation of geometry.
- If mechanically stabilised earth (MSE) structures over 2m high are constructed use of the site won material could be considered following further testing.
- Shallow foundations are considered appropriate for any proposed bridge structures. Subject to confirmation of final geometry, an initial factored bearing capacity (for use with ultimate limit state loads) of 150 kPa can be adopted.

The western side of the proposed shared path runs very close to private property boundaries for the first 1000 meters and at times this will require retaining walls up to 2.5m high. It is recommended that an H pile soldier pile wall with timber lagging be utilised due to limited space. If a greater than 2.5m high retained height is required, our initial recommendation is to use a crib wall as an H pile timber wall will become too expensive and likely require some form of anchoring. For retained heights of less than 0.5 m it is recommended that a nib wall be used or cut slope if the space permits it.

For the earth embankment proposed near the end of section 1 (CH1070), it is recommended that this be constructed using unreinforced fill on the western side (visible to current landowners) and the eastern side (hidden from view) be constructed using geogrid reinforcement to create a steeper slope

that will help reduce fill quantities and culvert lengths. Beyond the earth embankment it is recommended that cut and fill slopes be utilised given the available space and stiff clay material.

Section 2 from St Johns Road to Meadowbank station has had a walkover and desktop study completed to date. The proposed route has been modelled showing the expected horizontal and vertical geometry; however as this geometric design has been based on Lidar information and the area around the Purewa Stream is heavily vegetated, the existing ground levels will require to be confirmed following a topographical site survey.

Throughout the length of section 2 using cut and fill techniques to obtain the required geometry should be sufficient. To provide efficiencies some modification to the proposed route could be considered so that cut/fill balances are achieved thus minimising the requirement for imported fill material. Near the end of the site between CH2350 and 2450 at Meadowbank Station there is a large cut proposed above the shared path which may not be an efficient use of space. It may be advisable to reduce the size of this cut using a retaining structure such as a crib wall.

After the Meadowbank Station overbridge, the proposed path rises from alongside the rail corridor to road level. It is likely that a retaining wall (H pile with timber lagging) will be required on the downslope side of the path to achieve this geometry as a fill embankment would likely encroach on the rail corridor.

Section 3 of the proposed route as mentioned earlier should not require any geotechnical investigation as it is proposed to widen the existing boardwalk crossing the Orakei Basin, which had a site investigation of its own. Should geotechnical information from the existing boardwalk not be available for design, then geotechnical testing will be required, particularly around the bridge area spanning the control gates. The proposed widening of the existing boardwalk will consist of either clipping on the additional width required or adding another row of piles alongside to accommodate the extra width.

Section 4 will follow one of two route options; crossing Hobson Bay with an independent structure, or bordering the outside edge of Hobson Bay. Should crossing Hobson Bay be the chosen route, our research suggests that the founding conditions will be very soft estuarine material overlying bedrock. Our investigation will be focussed on determining geotechnical parameters required for the design of any piled foundations.

Should the alternate route skirting Hobson Bay be the selected route, similar testing will be required for piling the boardwalk section along the coastline and landowner negotiations will be required where the path nears Ngapipi Road. The benefit of selecting the coastline pathway over the bay crossing is the reduction in the extent and cost of geotechnical testing as the proposed structure will likely be a lightweight timber structure that will require shallower piling depths. Both route options will require widening of the existing pathway under Orakei Road Bridge; as-built and construction information has already been requested from Auckland Transport. In order to widen the pathway, the material along the bridge abutment and its approaches will need to be retained. The structure will depend on existing construction information and would likely include a reinforced earth wall on the approaches and a concrete retaining wall adjacent to the abutment.

Typical concept details of the retaining walls are provided in Appendix F.

6 Stakeholder Management Strategy and Consultation

A consultation and communications strategy has been prepared for this project and is attached in Appendix D. The consultation strategy is intended to be a living document which will be progressively populated and updated to reflect further information and understanding of the project as it develops the opinions of the community it will affect, and any changes in approach to the project.

Consultation has been undertaken early in the design process. This has helped to capture design input and enabled stakeholders to be engaged with the project. There has been a focus on engagement for Section 1 as there is a desire to fast track the construction of this stage.

The following organisations have been consulted at workshops and meetings:

- Orakei Local Board
- Maungakiekie-Tāmaki Local Board
- Auckland Council Parks
- Auckland Council Central and Islands Planning Unit
- Auckland Council Major Infrastructure Team
- KiwiRail
- New Zealand Police
- Cycle Action Auckland
- Meadowbank Pony Club
- Iwi

A public open day was held on the 22 November 2014 at St Chads Church, 38 St Johns Rd., Meadowbank. In general the open day feedback was positive, and a total of 55 submissions were received. The recurring themes of the feedback is summarised below:

- Concerns about littering: suggestions for bins frequent along the path.
- Pleased that it provides a segregation between traffic and cyclists / pedestrians.
- There is a general sense of urgency around the project: people want it done now.
- Many requests for connections for Meadowbank (Gowing Drive) and St Thomas' School and Selwyn College, even if this requires an over- or under-bridge to cross the railway tracks.
- The Hobson Bay option adjacent to the rail track is preferred over the option around the edge of Hobson Bay.
- People were happy with the option of a lit path for safety and security of walking/cycling at night, but there is a respondent with horses nearby who is concerned about the light pollution affecting the animals (also the fences etc.).
- Concerns about the path negatively affecting the Purewa stream.
- Concerns about the gradients.

7 Preferred Option and Alternative

7.1 Cycle Route

As previously described in Section 4.1 the route has been divided into four sections. This section will describe the options considered or chosen for each section.

7.1.1 Section 1

For Section 1, a final route has been chosen using the Multi Criteria Analysis (MCA) method. The technical note which outlines the process used and the workshop attendees is attached in Appendix M.

7.1.1.1 Section 1 - Preferred Route

The preferred route for Section 1 is shown in Figure 7-1. This option provides a direct route along the western property boundary of the NZTA corridor. It is in close proximity to private properties which provides improved route security through passive surveillance, but landowners (mainly the residential

properties to the north) may have concerns with the proximity of the path. This option provides a link to the signals at the intersection of St Johns Road / St Heliers Bay Road / Kohimarama Road.

The cycle path will be 4 m wide with a 1 m buffer on either side. The surface of the 4 m wide path will be concrete.

Access to the local road network is provided to Merton Road, Felton Mathew Avenue and St Johns Road / St Heliers Bay Road intersection.

It is necessary to install a retaining wall along the western side of the path for the majority of Section 1 due to the undulating nature of the terrain. For this section gradients of up to 1:12 (8.3%) are proposed for portions of the route but nothing above 1:12. On the eastern side of the path the terrain can be battered back to existing ground level.

Two bridges are required to cross streams. The first bridge is north of the underpass alleyway, and the second is approximately 50 m south of the informal access from Felton Mathew Avenue.

Between the beginning of the rail tunnel and the residential properties there is a valley. It is proposed to build an earth ramp structure across this valley in order to achieve the desired gradients for cyclists. The earth ramp will be fenced on either side.

The path will cross two residential property driveways near the intersection with St Heliers Bay Road.

Drawings for Section 1 are contained in Appendix N.

Figure 7-1: Section 1 preferred option

7.1.1.2 Other Off-Road Options Considered

Other options considered for Section 1 are described in the Workshop Report produced and is contained in Appendix B.

Figure 7-2 shows the other route options considered for Section 1. In assessing these options it was considered critical that the connection to the underpass and Felton Mathew Avenue was as far west as possible. This helps to future proof by allowing as much length as possible for bridge ramps should a rail over bridge be required to replace the existing underpass in the future.

Figure 7-2 : Route options investigated along Section 1

7.1.1.3 Section 1 On-Road Options

The alternative road options are Felton Mathew Avenue and Apirana Avenue.

Felton Mathew Avenue has a 7-day Annual Average Daily Traffic (AADT) volume of 5116 based on a 2012 count, with 5.5 heavy vehicles. To meet the cycle metro criteria of providing protected cycle lanes the treatment options would include:

- parking removal for the full length; or
- kerb set back on both sides to provide protected cycle lanes. This would result in street light relocation and removal of most of the street trees; or
- kerb build out and path widening on one side of the road. The northeast side provides the best opportunity, however there would be a lot of driveway conflict including conflict with commercial driveways. This option would also require street light relocation and removal of most of the street trees.

The main constraint for Felton Mathew Avenue is the gradients of 12% for over 100 m. Gradients of 12% will be challenging for most cyclists, pedestrians and will not cater for wheel chair users or the elderly.

Due to the heavy vehicle volumes, the steep gradients and the difficulty providing a protected cycleway, Felton Mathew Avenue was not considered appropriate and would not deliver the project objectives identified in Section 2.1 and as such it was not investigated further.

Apirana Avenue would require the same treatment options as identified for Felton Mathew Avenue, but with more intersection treatments including the roundabout with Line Road. There is no traffic count information in the AT database, but it is expected to be higher than Felton Mathew and with the mix of residential and commercial properties there will be a reasonable percentage of heavy vehicles. The gradients on Apirana Avenue are 9.5% for over 100 m.

Due to the heavy vehicle volumes, the steep gradients and the difficulty providing a protected cycleway, Apirana Avenue was not considered appropriate and would not deliver the project objectives identified in Section 2.1 and as such it also was not investigated further.

7.1.2 Section 2

Figure 7-3 shows the initial range of off-road options considered at the early stages of the investigation, with the blue line indicating the preferred option for Section 2. The merits of each option are discussed in the Workshop Report attached in Appendix B. These options were then narrowed down to the options shown in Figure 7-4.

Figure 7-3: Initial range of route options investigated along Section 2

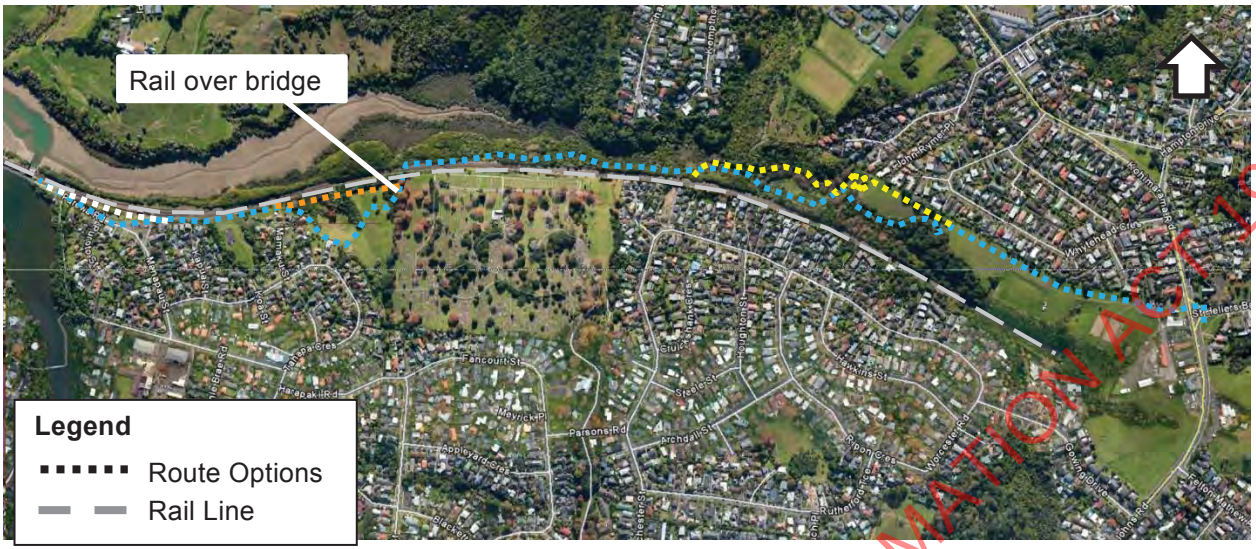

Figure 7-4: Route options investigated along Section 2

A key constraint identified for Section 2 is the concern for personal safety through the Purewa Bush section. The design will incorporate CPTED principals to provide a high standard of path lighting and good visibility with landscape design features such as cultural art and the use of retaining walls with uneven surfaces to discourage tagging. In addition, discussions with the police have indicated that they will monitor the route by bicycle. There have been expressions of interest by organisations such as a monarch butterfly club to base themselves in the bush. This would help to create activity and combined with the expected popularity of the path will help to create passive surveillance and improve safety.

In summary the blue route offers the optimised alignment in terms of suitable gradient, keeps to the margins of the NZTA property, creates connections at Tehapa Reserve and minimises significant retaining wall costs that would be required for the yellow, orange and white route. The rail bridge crossing location was selected as the most appropriate location as this is where the plateau through the bush rises up gradually to be level with the rail crossing. There is sufficient flat area to support bridge pilling (subject to geotechnical confirmation) and it can be undertaken within crown land.

7.1.2.1 St Johns Road Crossing Options

The following three options were considered for the crossing of St Johns Road and are shown in Figure 7-5.

Upgrade the existing signalised intersection of St Johns Road, St Heliers Bay Road and Kohimarama Road to cater for cyclists.

A. Install a new ‘toucan’ signalised crossing near the existing pedestrian refuge.

B. Signalise the intersection of Felton Mathew Avenue and St Johns Road.

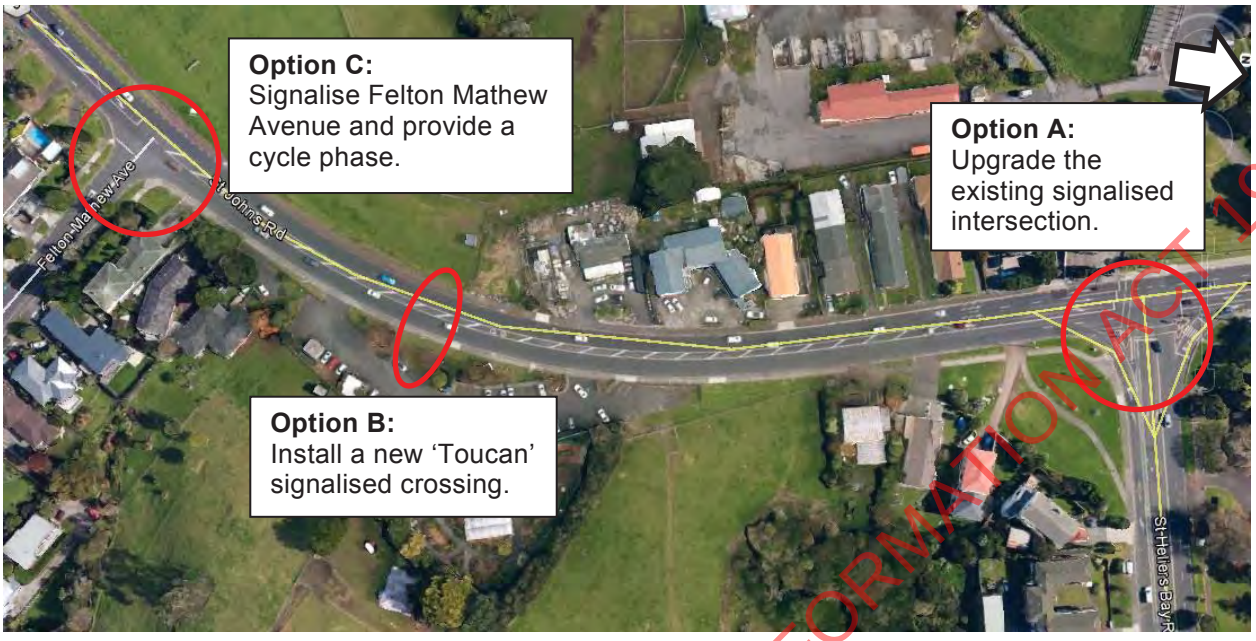

Figure 7-5: Options for crossing St Johns Road

The Orakei local board advised that there have been discussion with AT to signalise the Felton Mathew Avenue / St Johns Road intersection due to the difficulty exiting Felton Mathew Avenue during peak periods. However this would require a 70 m deviation away from the pedestrian and cyclist desire line. This would create a risk of introducing dangerous behaviour with pedestrians and cyclists attempting to cross St Johns Road at uncontrolled locations. This is particularly undesirable for this route as the path users have been provided a high level of safety and protection from vehicular traffic for the whole route. A single hazardous location can deter people from using a route.

Options A and B were assessed as part of the MCA for Section 1. It was important consider the Section 1 route in context of the preferred crossing location. During the MCA Option A was selected as the preferred crossing location. The key considerations were:

- If the Felton Mathew Avenue signalisation did go ahead in the future, then the signalised 'toucan' crossing would result in 3 signalised intersections with a short distance. This would result in inefficiencies and delays on the network.
- Option A connects with existing cycle lanes on St Heliers Bay Road.
- The connection to the start of the Section 2.

The MCA assessment is provided in Appendix M.

7.1.2.2 Section 2 On-Road Options

There are on-road options on both sides of Purewa Valley.

Along the south side, an on-road route identified included collector roads such as Gowing Drive, Parsons Road, Harapaki Road and Meadowbank Road. The 7-day AADT on Parsons Road and Meadowbank Road is 1,248 and 1,766 vehicles respectively based on 2012 count data. There is no traffic count information available for Gowing Drive and Harapaki Road. This route has lower traffic volumes but 15 intersections along the length of the route with 6 intersections that would require cyclists to make a right turn movement depending on the direction of travel. It is also a bus route and very narrow kerb to kerb.

To meet the cycle metro criteria of providing protected cycle lanes the treatment options would include:

- parking removal for the full length; or

- kerb set back on both sides to provide protected cycle lanes. This would result in street light relocation and removal of most of the street trees; or
- kerb build out and path widening on one side of the road. The northeast side provides the best opportunity, however there would be a lot of driveway conflict including conflict with commercial driveways. This option would also require street light relocation and removal of most of the street trees.

The main constraint along Gowing Drive is the undulating vertical alignment with gradients of 12% for sections longer than 200 m. Gradients of 12% will be challenging for most cyclists, pedestrians and will not cater for wheel chair users or the elderly.

Due to the steep gradients and the difficulty providing a protected cycleway, this route was not considered appropriate and would not deliver the project objectives identified in Section 2.1. It was not investigated further.

Other on-road option includes the route along St Johns Road / Remuera Road and Meadowbank Road and the route along Kohimarama Road and Kepa Road. These routes are both along regional arterial roads, with AADTs of 14,990 and 16,332 respectively based on a 2012 traffic counts. Meadowbank Road has sections that exceed 11% gradients and Kepa Road has gradients exceeding 13%. These route are less desirable due to the high traffic volumes with 20% to 25% heavy vehicles. This route also contains some significant intersections for cyclists and pedestrians to negotiate.

These routes have sections with steep gradients, high traffic volumes, a high proportion of heavy vehicles and significant intersections to negotiate. These routes were not considered appropriate and would not deliver the project objectives identified in Section 2.1 and as such they were not investigated further.

7.1.3 Section 3

7.1.3.1 Section 3 – Preferred Option

Figure 7-6 shows the route options considered for Section 3. For this section there are only two possible options which are to widen the existing boardwalk or to provide a new structure on the north side of the rail line. Both options considered for Section 3 are described in the workshop report produced and is contained in Appendix B.

The preferred option for Section 3 requires widening the existing boardwalk across Orakei Basin which currently caters to cyclists and pedestrians as shown by the blue route in Figure 7-6. The boardwalk is approximately 2.5 m wide. The preference is to widen the boardwalk to 4.5 m to maintain route consistency and level of service. The extent of widening is subject to confirmation of the structural review.

7.1.3.2 Other Options Considered

Due to the topographical constraints along the north side of the rail line from Section 2, there are no feasible connection opportunities at the west end using a new structure on the north side of the rail line. To connect with Section 2, a rail over bridge would be required which is costly and introduces undesirable gradients into the route. Therefore this option was not suitable with no benefits over the alternative and was not considered for further investigation.

Figure 7-6 : Route options investigated along Section 3

7.1.4 Section 4

Figure 7-7 shows the route options considered for Section 4. There is a proposed development at Orakei Point. The development site is shaded in red in Figure 7-7. Whether the development will proceed and if so to what extent is unknown at this stage. Therefore the options developed are based on the existing road infrastructure. The final design will need to be updated as more detailed information regarding the development becomes available. All options considered for Section 4 are described in the workshop report produced and is contained in Appendix B.

7.1.4.1 Section 4 Preferred Option (Blue Route)

This option is a new structure on the northern side of the rail line. It is noted that this is also the same side as the proposed KiwiRail third track option, so the structure would need to be outside of this. This option provides a scenic and direct route across Hobson Bay towards Tamaki Drive and the Auckland CBD. This section is already modified due to the rail line, therefore the addition of a structure will not have as significant impact on the environment. Subject to the final design, land purchase may be required where the path neighbours the Hobson Bay Marina. The path will connect with Tamaki Drive at the northern end.

The blue route was the preferred option based on the open day feedback.

With people accessing the rail station from the park and ride car park, and cyclists travelling along the route, there is some conflict that is likely to occur as it may become congested in this area during peak

periods. During the detail design it will be important to manage this conflict by controlling cyclists speeds, providing warning signs for both cyclists and pedestrians and through setting priorities.

7.1.4.2 Section 4 – Red Option

The Red Option was discarded due to the high cost of providing a rail over bridge without any additional benefits.

Figure 7-7 : Route options investigated along Section 4

7.1.4.3 Section 4 – Yellow Option

This option borders the outside edge of Hobson Bay. A clip on structure would be required on the Orakei Road bridge and a boardwalk would be constructed around the bay. This route is slightly longer than the blue route with a greater expected environmental impact of the foreshore and coastline vegetation. It was noted during a project workshop by a Ngāti Whātua representative that the yellow route is along the last unmodified piece of Hobson Bay and would be undesirable from an environmental perspective. The route would need to link to Ngapipi Road at the boat sheds. Along the boat sheds the route would narrow to approximately 2.5 m creating a pinch point for approximately 110 m. As a commuter link to the city centre, this option is less direct, but for recreational users it provides a good connection to the beaches along Tamaki Drive to the east. Due to better

geotechnical conditions the construction cost of the board walk around the edge of the bay is expected to be lower, however this is offset by the need to widen the existing Orakei Road Bridge and to provide a signalised crossing across Orakei Road.

7.1.4.4 Section 4 – Green Option (On-road)

Ngapipi Road is a Regional Arterial with an AADT of 12,668 based on 2012 tube count data. The percentage of heavy vehicles associated with that count is 4.1%, however this is much lower when compared to previous years which are consistently between 13.4% to 16.5%. Given the proximity to the port and that Ngapipi Road is an arterial route, it is expected that the heavy vehicle volumes are between 13.4% to 16.5%.

While the route contains gradients, similar to Section 1 and 2, the philosophy has been to minimise gradients wherever possible. Compared to the other options, the route along Ngapipi Road introduces gradients of up to 5.7% for approximately 400 m either side of Ngaiwi Street.

A significant safety concern for this option is the ability to provide a suitable facility for a section of the route shown in Figure 7-8 where the carriageway width is constrained. The gradient north of Ngaiwi Street is between 4% and 5% where higher cyclists speeds can be expected. In this location the gradients of the residential driveways are as steep as 24.8% as shown in Figure 7-9. The issue is compounded as the driveways have no level area for vehicles to rest when exiting the driveways. Therefore drivers are likely to nose their cars onto the flat area of the footpath to improve visibility and to avoid a hill start. This is compounded by contra-flow cycling as residents exiting their driveways will need good visibility in both directions and may not expect cyclists in the contra-flow direction. This creates a dangerous combination of risks that cyclists, pedestrians and residents exiting their driveways will need to assess. To encourage walking and cycling the path needs to be safe and suitable for a wide range of users, and children in particular may not have the cognitive ability to adequately assess the risks present.

The existing footpath width is 2.4 m. Given the volume of cyclists expected to use the route, the following improvements are recommended to adequately improve safety:

- Widen the path to a minimum of 4 m.
- Install a buffer zone between driveways and the path. With higher expected cyclists speeds, this will help to provide time for cyclists and residents exiting their driveways to react to each other.
- Provide a 5 m flat area for vehicles exiting driveways to safely stop and to provide visibility to oncoming cyclists, pedestrians and motor vehicles.

It is not considered feasible to realign the road to obtain sufficient width to achieve the above recommendations and to offset the conflict risks.

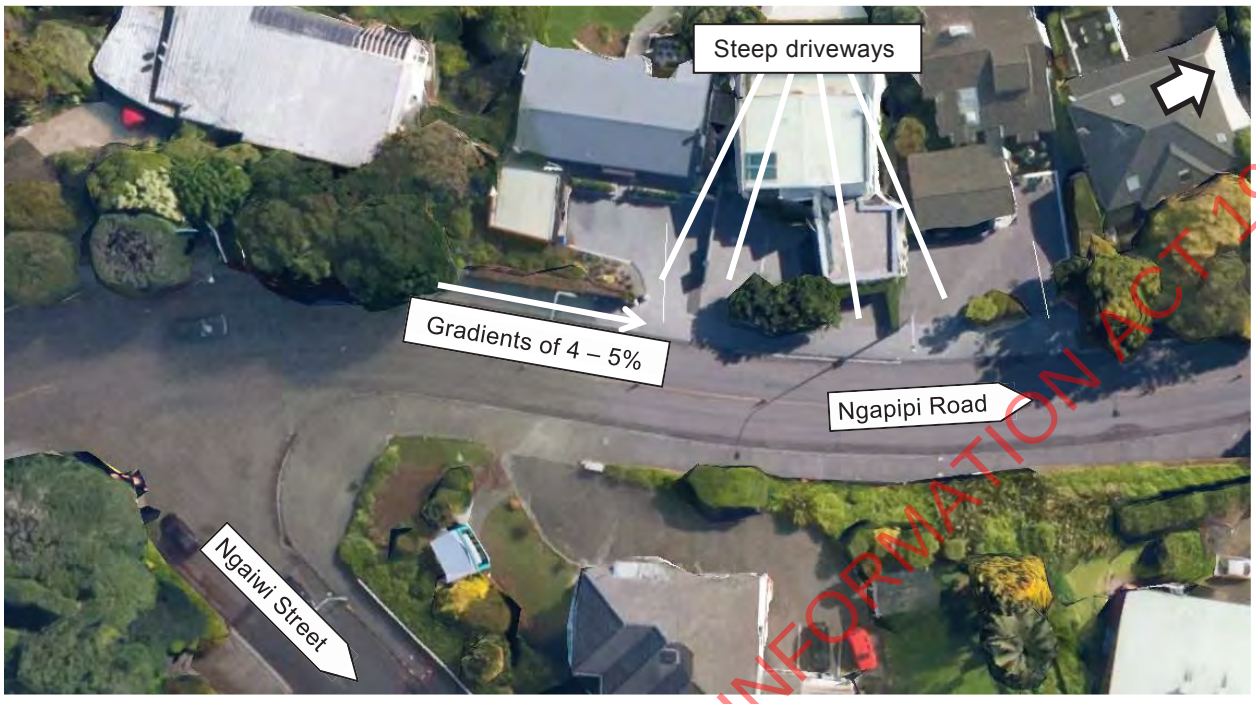

Figure 7-8: Safety concerns due to width constraints

Figure 7-9: Residential driveway gradients as high as 24.8%

A path along Ngapipi Road will be protected from traffic. However, the environment is completely different from the rest of the route by bringing users into a busy trafficked environment. Previous sections have been fully segregated from traffic. The environment will be less attractive to recreational users. While recreational users are not captured in census data and the economic evaluation, given that the route connects to Tamaki Drive (a major recreational attraction), it should be acknowledged that this option will limit the uptake of those users, particularly novice cyclists and families.

This option is not considered safe and would not deliver the project objectives identified in Section 2.1. Therefore this option was not investigated further.

7.2 Path Surface Treatments

For a cycle metro route a smooth surface running surface is expected. Therefore a gravel surface is not satisfactory. The options considered are concrete, asphalt and porous concrete (no fines concrete). The preferred option is concrete with a broom finished surface as it provides a smooth running surface, good friction properties and is low maintenance. The low maintenance aspect is important as there are sections of this route that are difficult to access. The percentage increase in impermeable surface is negligible and

Porous concrete was considered but was rejected as the permeable benefits are not significant in the proposed environment. Porous concrete is approximately 140% more expensive than standard concrete and is not as durable. As a result the whole of life costs of permeable concrete is estimated to be 420% more expensive than standard concrete. This is not economically viable for this project.

Asphalt was considered but requires higher maintenance than concrete which is difficult given the location and accessibility.

7.3 Structure Surface Treatments

In general most structures will have a concrete surface for consistency with the path surface. However the ramp bridge in Section 2, the Orakei Basin boardwalk in Section 3 and the ramp into the park in ride in Section 4 are light structures. Typically these would have a timber deck, however timber becomes slippery when wet. Timber decks are often treated with treads, or chicken wire to help improve the friction qualities, but is still often not satisfactory. Therefore it is proposed to use glass reinforced plastic (GRP) decking as it is lightweight with good friction properties.

7.4 Structures

Structures will be 4.5 m wide. Allowing for the minimum shy zone of 0.3 m from the handrails, structures at 4.5 m wide will achieve and effective width of 3.9 m, which is consistent with the path width.

Two bridge structures have been identified on Section 1 from 260 to 270 and 750 to 760. Culvert structures at these locations have been excluded due to a requirement of providing not restriction within the waterways. The waterway at these locations is generally located some 1.0 m to 1.5 m below the finished level of the bridge and the bridge spans are 10 m in length.

A relatively simple single span structure can be provided at these two location using common construction materials. The requirement for maintenance vehicle access over the bridge will mean the deck needs to be of concrete construction. This will also ensure the path running surface is in compliance with the cycleway metro standard. The concrete deck can be formed as either a cast in-situ or precast concrete element. The cast in-situ option will require either permanent or temporary formwork supported on a main structural element. The main structural element could be in the form of structural steel beams, reinforced concrete beams, or precast concrete hollowcore units. For ease of construction and given the relatively good access to the construction site the option adopted is the use of precast concrete hollowcore units with a concrete topping. The hollowcare units could be supported on end abutments that are founded in competent subsoils. Should the founding conditions at the surface be found unsuitable then the abutment structure could be provided with piles.

Between chainage 1,065 and 1,220 a mechanically stabilised earth (MSE) wall structure was selected in favour of a bridge structure as it provides a natural aspect that replicates the existing environment and provides an opportunity for planting to screen the path from adjacent properties.

Section 2 from chainage 745 to 870 requires a long elevated bridge structure to pass over a section of steep terrain, and a stream crossing. The elevated bridge is 125 m long with a maximum height of 11.5 m. The difference in the ground levels on each side of the section of steep terrain result in the bridge being inclined at 8% as the path tracks from the high eastern end down to the western end.

The bridge slope is reduced at a midway point along the bridge to provide a break in the path and also allow an observation platform to be provided. The bridge is also formed with a series of horizontal curves to again breakup the alignment and assist in providing a level of control on downhill speeds. At this location there is no requirement for maintenance vehicles to use the bridge. Appropriate bollards will be required at each end of the bridge to restrict vehicle access.

Slender type structures, for aesthetic reasons, are going to be preferable at this location given the structure is elevated and in view from each end of the shared path. Without the imposed loading from the maintenance vehicle, the decking can utilise a lighter system than concrete. This in turn will allow the bridge beams, support towers and foundations to be of lighter construction. Decking formed with Glass Reinforced Plastic (GRP) is considered to be a material that will provide a solid slip resistant surface that would be suitable for a cycle metro facility. GRP is a very light but extremely strong material and will allow the support structure to this elevated deck to be relatively light. A series of structural steel beams spanning between structural steel towers is the preferred option to provide a slender aesthetic structure. The GRP has a design life greater than 50 years and the structural steel elements can be provided with a surface protection system that would be suitable for the environment. Foundations will depend on the results from the geotechnical investigations but are likely to be in the form of spread reinforced concrete footings. Another cost effective option considered was a swing bridge, however the movement and perceived instability was not considered desirable on a commuter route.

The rail over bridge provides a crossing over the existing railway. The over bridge is elevated to provide the required 6.0 m clearance above the tracks. Ramp structures are required at each end of the over bridge to take the path from the ground level up to the over bridge height. The over bridge will be 30 m long and the approach ramps will be formed as a series of 9 m long inclined sections at 1:12 gradient, with 1.2 m long level platforms. At this location there is no requirement for maintenance vehicles to use the bridge. Appropriate bollards will be required at each end of the bridge to restrict vehicle access. This structure needs to have a design life of 100 years and needs to be low maintenance due to the proximity to the railway overhead electric lines.

For durability requirements the over bridge needs to be formed using concrete. Standard precast concrete bridge beams specifically design for the lower imposed loading is preferred for this element. A cast in-situ topping would be required to form the running surface and also tie the precast concrete units together. It is proposed to place the pier structures supporting each end of the bridge at least 5.0 m away from the nearest railway centreline, so as to avoid the need to provide a crash protection system. Any crash protection system provided is likely to be in the form of independent wall.

In Section 3 the widening of the existing timber boardwalk is required. The existing boardwalk is 2.5 m wide and formed with timber piles, bearers and joists with a timber deck. The timber deck has been lined with surface plastic netting for slip resistance. At this location there is no requirement for maintenance vehicles to use the bridge.

For ease of construction the existing boardwalk will be widened along the northern side by 1.8 m. Given that maintenance vehicles will not use the bridge, GRP decking can be utilised. Removal of the 150 x 50 timber decking provides the opportunity to reuse these members on the timber pole and panel retaining walls. The boardwalk extension will be formed using timber post, bearer and joists. Care will be required with the post installation due to the proximity of a 300 dia sewer pipe, generally near the ground surface and offset by 1.8m from the northern edge of the boardwalk. The new pole will need to be placed with 1.0 m clearance to the sewer pipe and therefore the timber bearers will need to cantilever out to allow the boardwalk deck width to be increased to the 4.5m width. At the eastern end of the boardwalk the structure transitions into the 25 m span bridge to clear over the waterway outlet. At this location the structure will still be upgraded with the GRP decking, but the widened section will be formed using structural steel beams spanning 25 m and supported on new cast insitu concrete abutments.

In Section 4 the gradients following the park and ride vehicle entrance are too steep and inconsistent with the rest of the route. Therefore it is proposed to provide a light weight timber structure. The ramp with have 1:12 gradients for 9 m, with 1.2 m long level platforms. Given the gradient of the ramp the deck will be upgraded the GRP decking for improved friction. The structure will be approximate 65 m long.

In Section 4 a new crossing over Hobson Bay is proposed. The bridge structure will be located within a tidal estuary environment and will run parallel to the railways causeway which forms a division across Hobson Bay. At low tide the seabed is exposed in the area of the proposed shared path. The path will be required to span over two openings which are approximately 25 m in width. At this location access for maintenance vehicles is required. This structure needs to have a design life of 100 years and needs to be low maintenance due to difficulties with external access.

Given the durability requires and design life a concrete structure is preferred at this location. A concrete structure in the form of bored piles down to competent rock, pile capping / cross head and a standard precast concrete bridge beam is considered the best options. Bridge beams spanning in the order of 25 m between support cross heads and pier structure would provide a reasonably efficient structural solution. The other option considered was to install the path on a pontoon structure, however at low tide the bay has no minimum water level (e.g. the bay becomes mud flats) which would cause the pontoons to bottom out. This would result in the pontoons settling in an unpredictable manner. This would also create difficulty of the transition from the pontoons to the bridge structures required over the channel.

7.5 Retaining Options

7.5.1 Retaining Walls

The concrete nib wall design was selected for low height walls as a cost effective option.

The H-pile and timber rounds was selected for retaining wall less than 1.5 m as it provided a cost effective option that is visually pleasing and helps to counteract the ingress of graffiti as it doesn't have a flat surface.

Crib walls are suitable for large retaining heights above 1.5 m and helps to counteract the ingress of graffiti as it doesn't have a flat surface

7.5.2 Embankments / Battered Slopes

Where possible, retaining walls will be avoided in preference of providing a battered slope. This minimises surfaces for graffiti, blends better with the natural surrounds and provides an open environment for the path users, improving their experience.

7.6 Stormwater Management

Short-term construction phase and long-term serviceability management of stormwater discharges from the shared path, for the considered options, are discussed in Appendix Gof this report.

In summary, it includes

- A description of erosion and sediment control measures during construction
- Locations and design approaches to crossing existing drainage pipelines, overland flowpaths, waterways
- Concept design details for new stormwater infrastructure and long term erosion control
- Water quality controls
- Any identified flood risk constraints

7.7 Path Lighting

The lighting design has assumed a P2 lighting category.

The preferred mounting height is 6 m as it is less intrusive and is what has been adopted across the Auckland region.

Based on the modelling, the 30LED luminaire achieved the spill light requirement of 10 lux while maximising the spacing of the lighting poles. Therefore this is the preferred default lighting option for the pathway.

GI2TD Shared Path						
Cree LEDway 30LED 700mA 70W Series E - 0° Tilt						
Mounting Height	Maximum Spacings (m)			Spill Light (Maximum Lux at Rear Boundary - Behind LED)		
	P1	P2	P3	P1	P2	P3
6	19	25	33	12.6	10	9.6
7	21	28	37	10.5	8.4	8
8	22	30	40	9.1	6.9	6.5

GI2TD Shared Path						
Cree LEDway 20LED 700mA 47W Series E - 0° Tilt						
Mounting Height	Maximum Spacings (m)			Spill Light (Maximum Lux at Rear Boundary - Behind LED)		
	P1	P2	P3	P1	P2	P3
6	17	22	30	9.5	7	6.5
7	18	25	33	8.2	5.9	5.5
8	19	26	36	7.2	5.1	4.4

The boardwalk in Section 3 will not be able to support standard street lights as identified above. However it is important to provide lighting for consistency. However low mount height lighting will be feasible, and will likely need to mount to the handrail. An example of low mount height lighting is shown in Figure 7-11. These lights can achieve the required horizontal luminance in accordance with NZS1158, however it is unlikely to achieve the vertical luminance requirement for category P1, P2 and P3 lighting categories. Category P4 does not have a vertical luminance requirement, therefore would comply with P4 category lighting. This has been adopted as the preferred lighting for Section 3, but this will be investigated further during the detail design stage.

Figure 7-11 shows a low mount height bollard, which could be considered in some locations where the visual impact is a significant concern. This will become apparent as further stakeholder consultation is undertaken during the detail design stage.

The main detriment of these lights is that they are subject to vandalism. It is also noted that they are not LED luminaires.

The adopted lighting categories will need to be agreed at the detailed design stage.

Figure 7-10: Thorn Orus luminaire is an example of low mount height lighting

Figure 7-11: Thorn Orus vandal resistant bollard is an example of low mount height lighting

9 Evaluation

9.1 Land Transport Management Act 2003 Compliance Assessment

9.1.1 Introduction and Policy Background

Growing concern for the need to support sustainable transport solutions is resulting in the NZTA and local authorities increasingly planning and designing schemes that are consistent with Government policy to increase travel choice and encourage active travel modes and to promote cycling and walking as an alternative to the private car.

Against this background, the proposed Glen Innes to Tamaki Drive Shared Path project has been designed taking into account current Government policies on Travel Demand Management. The main policy documents against which the scheme has been assessed are listed below.

Promoting cycling as an alternative to the private car is a key contributor to encouraging environmental sustainability in the Auckland region. An overall target for cycling contained in the Regional Land Transport Strategy, is to double the approximately one percent of morning peak trips made in Auckland by cycle by 2016. It is against this background that AT is proposing this scheme

9.1.2 Land Transport Management Act 2003

The Land Transport Management Act (LTMA) governs the way the country's land transport system is managed and funded. The purpose of the Act is to contribute to an effective, efficient, and safe land transport system in the public interest.

To do this the LTMA:

Promotes an integrated approach to land transport funding and management;

- Seeks to improve social and environmental responsibility in land transport funding, planning and management;
- Seeks to improve long-term planning and investment in land transport and ensure that funding is allocated in an efficient and effective manner; and
- Sets out requirements for the development of regional land transport plans

While significant investment has already been made in walking and cycling infrastructure throughout the region, there is the potential for cycling to make a larger contribution to safe, efficient, integrated and sustainable land transport system. To achieve an increase in the use of cycling in the day-to-day transport options for the travelling community, cycling must be seen as a real practical and safe transport choice.

With this in mind, the AT is promoting the Glen Innes to Tamaki Dive Cycle route project to increase the attractiveness and role of cycling as a transport mode in order to increase travel choice and reduce the use of, and dependence on private cars. This will both help to reduce the pressure on local road space and also promote healthy living and improved fitness for the local community, which can in turn contribute to overall increases in productivity.

As with other existing off-road cycle lanes provided across the city, Glen Innes to Tamaki Dive Cycle route will be developed to ensure that access and movement of cyclists is a priority and that the use of the route is as safe, secure, convenient and attractive as possible. This will in turn increase the awareness of the importance of cycling, and hence increase its adoption as a practical alternative to the car, among all sectors of the population, but with particular emphasis on trips to work, schools, shopping, cultural and leisure activities.

Providing a cycling network that potential users can feel safe on, will widen the utility of cycling to a greater proportion of the Community. Given the environment that the route travels through and the opportunity for local connections the pathway will also be attractive and useful for walkers, commuting and recreational.

9.1.3 National Land Transport Programme 2012-2015

The NLTP is a planning and investment partnership between local authorities and the NZ Transport Agency. Four key themes underpin the activities within it:

- ensuring value for money
- supporting economic growth and productivity
- improving safety
- providing a range of travel choices

To make the most of investments, the NZTA and local authorities are increasingly working together - to maintain and build improvements to local roads, state highways and public transport and operate all these components safely as "one network". The 2012-15 NLTP supports an investment level of around $79 million through the walking and cycling activity class. In addition, approximately $80 million of walking and cycling facilities are also expected to be provided as part of investments in roading projects and other activities. NLTP investment is targeted at making cycling and walking safer - and therefore more attractive. The other main priority for this investment is to help relieve severe congestion in the main centres. This is especially important to help unclog key passenger and freight routes at peak times. Walking and cycling are seen in the NLTP as being relatively low cost solutions which assist in building additional capacity into existing transport networks.

Providing the Glen Innes to Tamaki Drive Shared Pathway is consistent with making cycling and walking mores attractive and relieving congestion by providing a direct route for cyclists and walkers to and from the CBD .

9.1.4 Government Policy Statement on Land Transport

The Government Policy Statement on Land Transport Funding (GPS) sets out the government's priorities for expenditure from the National Land Transport Fund over the next 10 years.

The 2015 GPS directs funding towards priority transport initiatives, including continuing the Roads of National Significance. Additional Crown funding will implement the Auckland Transport Package, Accelerated Regional Roading Package and Urban Cycleways Package/Programme announced by the Prime Minister on 18 August 2014, with the aim of making significant improvements to cycling infrastructure in the main urban centres. The package establishes the Urban Cycleway Investment Panel, which will investigate opportunities to invest in urban cycleways that expand and improve the cycling network.

The 2015 GPS increases the annual maximum available funding by 3.5 percent per annum (compared to 1.9 percent under GPS 2012) to reflect opportunities to provide more options for active modes of transport.

This project supports the objectives and results of the Government Policy Statement 2015 (GPS) summarised in Table 9-1.

Table 9-1: Objectives and results of the GPS that this project contributes to.

GPS Objectives	GPS Results
A land transport system that provides appropriate transport choices.	Provide appropriate travel choices, particularly for people with limited access to a private vehicle.
	Increased safe cycling through improvement of cycle networks.
A land transport system that mitigates the effects of land transport on the environment.	Mitigation of adverse environmental effects

9.1.5 The National Infrastructure Plan 2011

The National Infrastructure Plan is designed to reduce uncertainty for businesses by outlining the Government's intentions for infrastructure development over a 20 year timeframe. It is directional

rather than directive, that is, it provides a framework for infrastructure development rather than a detailed list of projects. The document includes a series of actions, working towards the next release in 2014.
The government's 20-year vision for New Zealand's infrastructure is:

> *By 2030, New Zealand's infrastructure is resilient, coordinated and contributes to economic growth and increased quality of life*

The National Infrastructure Plan outlines a 3-year programme of work to progress this vision.

Government's overall vision for transport is:

> *A transport sector that supports economic growth by achieving efficient and safe movement of freight and people.*

Relevant goals for transport infrastructure set out in the plan include:

- Maximising the potential synergies between regional planning and central government strategies.
- A flexible and resilient transport system offering greater accessibility and can respond to changing patterns in demand.
- A continued reduction in the number of accidents, deaths and serious injuries that occur on the network.

Delivering the Glen Innes to Tamaki Drive shared pathway will assist in delivering these goals.

In relation to investment in walking and cycling the plan notes that:

- on local networks people are able to choose from a range of transport choices, and the quality, location and design of infrastructure can have a significant influence on those choices – such as whether to walk, cycle, use a private vehicle or take public transport.
- The National Land Transport Fund (NLTF), which local government matches investment in, provides up to $650 million per annum for maintenance and renewal of local roads, passenger transport subsidies and infrastructure for walking and cycling.

Delivering the Glen Innes to Tamaki Drive shared pathway is aligned with the plan in this respect.

9.1.6 Connecting New Zealand 2011

Connecting New Zealand draws together the policy direction set out in a number of other guidance documents, including the National Infrastructure Plan and the Government Policy Statement on Land Transport Funding 2012/13–2021/22 (GPS 2012).

It summarises the government's broad policy direction for the transport sector. It sets out the government's plans for an effective, efficient, safe, secure, accessible, and resilient transport system that supports the growth of NZ's economy. Connecting New Zealand is based around the government's three key themes which set the direction for the development of the transport system over the next 10 years. These are:

- economic growth and productivity
- value for money
- road safety

Connecting New Zealand notes that investment in walking and cycling also makes a contribution to economic growth and productivity and that to maximise these benefits, the government will direct funding to reduce congestion and/or improve pedestrian and cyclist safety. Connecting New Zealand also notes that the Government will improve modal choice in our main urban areas, so people can make greater use of public transport, walking and cycling, thereby reducing their emissions

Providing the Glen Innes to Tamaki Drive Shared Pathway is consistent with Connecting New Zealand as it will improve modal choice and enable greater use of cycling and walking by providing a direct route for cyclists and walkers to and from the CBD.

9.1.7 Auckland Regional Land Transport Strategy

The Auckland Regional Transport Strategy 2010 – 2040 is a legacy document developed by the former Auckland Regional Council under the Land Transport Management Act 2003. The requirement for an RLTS was removed by the LTMA Amendment Act 2013 and the 30 year vision of the RLTS in Auckland was effectively replaced by the Auckland Plan prepared by the Auckland Council.

The proposed shared path is considered to be consistent with the Auckland Regional Land Transport Strategy. In particular, the following objectives outcomes and targets are relevant to the project:

Objective Improving access and mobility

Outcome	Performance Target
Improved community connectedness	Increase in walking and cycling mode share in urban areas (measured in terms of trip legs) to 23% (2020) and 35% (2040). (17.2% in 2009).
	Improvement in residents perception of walking and cycling accessibility (measured in terms of the proportion of people who felt that a person could get around the region extremely or quite well by walking or cycling). (Cycling 39% and walking 52%in 2008).
	Improvement in the perceptions of access to work and study (measured in terms of the proportion of people who rated each mode suitable for 'most' or 'all' of their trips to study or work). (PT 24%, private transport 67%, motorcycles 26%, cycling 14% and walking 17% in 2009).
	Completion of 50% of the regional cycle network by 2016 and 100% by 2026. (21% in 2009).

Objective: Protecting and promoting public health

Outcome	Performance Target
Main outcome: Increased walking and cycling.	Increase in walking and cycling mode share in urban areas (measured in terms of trip legs) to 23% (2020) and 35% (2040). (17.2% in 2009). Increase in the average distance travelled by walking per person over five years of age to 1.3kms per day (0.65 kms per day in 2009). Increase in the number of cyclist movements at defined survey points.

Objective: Ensuring environmental sustainability

Outcome	Performance Target
Improved protection of sites with historic, environmental and cultural value.	No accurate measures are available, however, transport projects are expected to undertake environmental impact assessments as standard project planning and design.
Improved stormwater quality	Measures of stormwater quality specifically related to transport causes are not available.

Providing the Glen Innes to Tamaki Drive Shared Pathway is consistent with the RLTS as it will improve connectedness, by providing a direct route for cyclists and walkers to and from the CBD and provide local connections; will promote and protect public health by enabling more pedestrians and cyclists to use off road routes over longer distances and will ensure environmental sustainability through providing a greater level of knowledge of the historic, environmental and cultural values along

the route and through managing stormwater from the impervious surface created in a sustainable manner.

9.1.8 Auckland Regional Land Transport Programme (RLTP) 2012-2015

The Regional Land Transport Programme is required by legislation to state the transport priorities for the next six years and order by priority all planned activities for the next three years. The RLTP is used to prioritise applications for government funding through the New Zealand Transport Agency (NZTA).

Auckland Transport is required to prepare an RLTP every three years covering all transport activities undertaken by NZTA State Highways, Auckland Transport and the Regional Land Transport Strategy (RLTS) work undertaken by Auckland Council. Its mandate covers the Auckland region and all land transport modes except rail track responsibilities. It sets out the transport projects and services over the next three years Auckland Transport will implement to progress the long term transport outcomes of the Auckland Plan.

Four priority focus areas have been identified that, when addressed, will contribute to fulfilling the transport expectations set out in the Auckland Plan, the Government Policy Statement on land transport funding and the Regional Land Transport Strategy.

- Support the integration between land use and transport
- Improve the efficiency and effectiveness of the region's transport networks
- Maintain and make best use of the existing transport system
- Improve transport safety and reduce the adverse impacts from transport on the surrounding environment

Continuing improvements to walking and cycling infrastructure, including further progress on the regional cycle network is identified as one of the key priorities of the programme
The RLTP notes that plans to increase walking and cycling in Auckland need to include steps to address the safety issues associated with these modes and that congestion, together with a high level of reliance on the private car for short trips instead of active modes of travel such as walking and cycling could lead to future health problems for the region's residents.

The RLTP notes that in addition to the physical transport network, the transport system includes a number of functional elements. These include the movement of freight, business traffic, school and university students, commuters, recreational and social users, which in turn support a local sense of place and community.

The RLTP notes that the cornerstones of Auckland's transport network are the strategic and regional arterial road and rail networks, the public transport networks and the walking and cycling networks.

The RLTP notes that walking and cycling facilities will continue to be upgraded to:

Improve the 'walkability' of the planned high density activity centres and accessibility by bicycle

- Encourage walking and cycling to school
- Further develop the planned regional cycle network for longer distance and recreational travel.

Key initiatives to reduce emissions and lower energy use include provision for walking and cycling activities

Funding provision is made for the Auckland Eastern Corridor Cycleway (Meadowbank to Glen Innes) in the RLTP.

Providing the Glen Innes to Tamaki Drive Shared Pathway is consistent with the RLTP as it will add a section of the planned regional cycle network, thereby enabling longer distance and recreational travel. It is noted that the pathway is also a section of the Ring Path from the Greenways Project that circles the isthmus. The Glen Innes to Tamaki Drive Shared Pathway will also improve walkability' and accessibility by bicycle, by providing a direct route for commuter cyclists and walkers to and from the

CBD and provide local connections for students to and from schools as well as recreational and social users. This in turn will reduce emissions and lower energy use.

9.1.9 Auckland Plan

A spatial plan or Auckland is required under section 79 of the Local Government (Auckland Council) Act 2009 and its purpose is to contribute to Auckland's social, economic, environmental, and cultural well-being through a comprehensive and effective long-term (20- to 30-year) strategy for Auckland's growth and development. The Auckland Plan was adopted by the Auckland Council on 29 March 2012 following consultation on the Draft Auckland Plan.

The Auckland Plan sets strategic direction in a 30 year spatial framework for the growth and development of Auckland. The Auckland Plan has a strategic vision to make Auckland one of the world's "most liveable" cities.

The strategic direction for transport set out in the Auckland Plan seeks to, amongst other things:

- Create better connections and accessibility
- Deliver quality infrastructure
- Develop an economy that delivers opportunity and prosperity
- Radically improve the quality of urban living
- Create a stunning city centre, with well-connected quality neighbourhoods
- Contribute to tackling climate change
- Move to outstanding public transport within one network.

Providing a well-connected and high quality cycle network contributes to the four strategic transport priorities for Auckland:

1. Manage Auckland's transport as a single system
2. Integrate transport planning and investment with land-use development
3. Prioritise and optimise investment across transport modes
4. Implement new transport funding mechanisms

Cycling supports the transformational shift associated with moving to outstanding public transport within one network. Cycle routes and facilities at public transport stations (e.g Glen Innes, Meadowbank and Orakei rail stations) will expand the public transport catchment areas and support higher public transport frequencies.

The Auckland Plan contains a target to deliver 70 percent of the Auckland Cycle Network by 2020 and complete the network by 2030. It is estimated that approximately 30 percent of the Cycle network is in place currently and based on funding in the current Long-term Plan, 40-50 percent would be completed by 2020.

Currently 1.2 percent of trips to work in Auckland are by cycling. Auckland does not currently have a specific mode share goal for cycling, however, the Auckland Plan does state that across all of Auckland by 2040, 45 percent of trips in the morning peak are targeted to be non-car based (walking, cycling and public transport) compared to 23 percent at present.

As a Council Controlled Organisation, AT must act consistently with the Auckland Plan, give effect to, or act consistently with, the policies and plans of Auckland Council such as the Council's Long Term Plan (LTP), and all documentation defining the Council's strategic direction.

Providing the Glen Innes to Tamaki Drive Shared Pathway is consistent with the Auckland Plan as it will add enable greater mode share goal for cycling through provision of a section of the planned regional cycle network and it will provide the opportunity to expand the public transport catchment areas and support higher public transport frequencies through the pathway connecting to the Glen Innes, Meadowbank and Orakei Rail Stations.

9.1.10 2012-2041 Integrated Transport Programme

Auckland's Integrated Transport Programme (ITP) developed by AT and the NZTA in collaboration with Auckland Council, sets out the 30 year investment programme across the transport system to meet the transport priorities outlined in the Auckland Plan. It looks at all transport modes and covers all transport agencies not just AT.

The programme provides a consolidated transport investment programme across the transport system over the next 30 years, covering state highways and local roads, railways, buses, ferries, footpaths, cycleways, intermodal transport facilities and supporting facilities such as parking and park-and-ride

The ITP recognises the need for a wider suite of interventions and greater emphasis in the last two decades for stronger transport demand management to reduce congestion on the road network, e.g. by encouraging more use of the improved public transport system and walking and cycling facilities.

Providing the Glen Innes to Tamaki Drive Shared Pathway will add a new section of the cycle network and will enable and encourage more use of the improved public transport system and walking and cycling.

9.1.11 New Zealand Energy Efficiency and Conservation Strategy 2011-2016

The current New Zealand Energy Strategy and New Zealand Energy Efficiency and Conservation Strategy was released on 30 August 2011 it is a companion to the Government's primary statement of energy policy set out in the New Zealand Energy Strategy 2011-2021. This Strategy has a purpose promoting energy efficiency, energy conservation and renewable energy within the context of a sustainable energy future. The strategy's central aim is therefore to improve New Zealand's energy efficiency by twenty percent by 2012 and increase the amount of renewable energy use.

The Strategy recognises that energy savings can be achieved if people and businesses choice less energy intensive forms of travel and freight transport and seeks to improve the efficiency and reliability of key freight corridors and the metro passenger networks, as well as achieving better integration of regional freight movement across road, rail, sea and air

It also recognises that greater financial, promotional, strategic policy and institutional support should be provided for low energy modes e.g. public transport, walking and cycling, and higher vehicle occupancies.

In line with this Strategy the Glen Innes to Tamaki Dive Cycle project will demonstrate institutional commitments to energy savings and the promotion of sustainable transport system in Auckland.

9.1.12 Auckland Cycle Network

Auckland Transport has a plan for the delivery of a network at three difference levels – Metro, Connector and Feeder.

- METRO - provides segregation from traffic along shared paths, off road routes and protected cycle lanes
- CONNECTORs - are not fully segregated routes and are the more traditional cycle lanes marked by painted lines
- FEEDERs - can be a mixture of segregation, shared paths and on-road routes but are located on quiet neighbourhood streets and where there are low traffic speeds. These routes link residential streets, parks and community facilities including schools. The Feeder network also aligns with Local Board Greenway proposals.

As reported by Auckland Transport in 2014 the completion of the Auckland Cycle Network will take a number of years to complete and will be delivered in partnership with other organisations including NZTA and Auckland Council[5].

[5] https://at.govt.nz/media/314411/Cycling-plans-for-2014.pdf available on AT website 22 Dec 2014

The proposed Glen Innes to Tamaki Drive route is one of the cycle infrastructure projects that falls under the category of Metro as it provides segregation from traffic along a shared off road route. It will along with the planned improvements to local connections between Point England and Panmure enhance connectivity

The 7.3km off road route from Glen Innes to Tamaki Drive following the rail corridor is shown as a Cycle Metro link in the version of the Network reported to the Auckland Council Infrastructure Committee in March 2014.

9.2 Resource Management Act

Part 2 of the RMA sets out the key drivers for the legislation Section 5.

The purpose of the RMA as stated in section 5 is:

> *"…. to promote the sustainable management of natural and physical resources."*

In summary, this requires management of the use of natural and physical resources in a way that enables people and communities to provide for their social, cultural and economic well-being while sustaining those resources for future generations, protecting the life supporting capacity of ecosystems, and avoiding, remedying or mitigating adverse effects on the environment.

The project is consistent with section 5 of the RMA as it represents sustainable management of natural and physical resources through:

- Enabling the region to provide for their social, cultural and economic wellbeing through the maintenance of existing transport networks the Auckland Region by providing more capacity in those networks through the provision of alternative modes;
- Enabling the local community to provide for their social, cultural and economic wellbeing through minimising the adverse impact of the designation on the development, growth and employment opportunities ; and
- Implementation of measures that, where possible and as far as practicable, avoid, remedy or mitigate adverse effects on the environment.

The project seeks to deliver a Cycle Metro route that will become a physical resource of significance in the Auckland Region due to its function, its multiplicity of use and its importance to the social and economic well-being of the community through providing an off road shared pathway will enable the community to undertaken healthy activities in a safe environment.

Section 6 of the RMA sets out 'Matters of National Importance' that are to be recognised and provided for in managing the use, development and protection of natural and physical resources. Matters in section 6 that are relevant to the project include:

- the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development; and
- the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna; and
- the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga; and
- the protection of historic heritage from inappropriate subdivision, use, and development

With regard to Section 1 and 2 it is noted that the natural character of the land on which the project is located was changed by both Maori and by early European settlement when the area was initially cleared and farmed. Construction of the main trunk rail line followed by the development of the residential suburb at Meadowbank resulted in changes to the wider area but the area was largely undeveloped until the late 1950's and 1960's. The area in which Sections 1 and 2 are located has been relatively unaltered since and has been grassed areas in the case of the section from St Johns Road to Glen Innes and largely grass/ bush in Section 2 from St Johns Road to Meadowbank Station.

Part of the reason for this is that the land has been held in public ownership for over 40 years and been subject to a designation (since 1977 at least) to identify and protect it as a transport route (the proposed Eastern Transport Corridor).

While construction of the works creates potential adverse effects generally associated with the scale of earthworks, there is also construction of stream crossings; removal of existing vegetation from areas identified as significant ecological features and the potential impact on cultural values and archaeological features as well as impacts on the CMA . These are balanced by potential beneficial effects such as removing invasive plants, reducing the reliance on motor vehicles and promoting the use of a safe off road option for cyclists and pedestrians to commute and for recreation.

With respect to Sections 2 and 3, the route proposes to follow the alignment of the rail line through Orakei Basin, and then to cross over Orakei Road and the cross Hobson Bay to Tamaki Drive. This will both provide a direct route at a comfortable grade and minimise both visual effects and the potential impact on the CMA as it will utilise the existing and visually significant man made features such as the rail embankment, the reclamation of the Outboard Boating Club hardstand and Tamaki Drive itself with the natural features of the coastal edge on the eastern side of Hobson Bay and both sides of Orakei Basin (largely treed and undeveloped) untouched. While an alternative route that runs from Orakei Peninsula to follow Ngapipi Road has also been identified this route largely follows the existing road from Orakei Road and could impact on some of the trees along Ngapipi Road.

A section by section assessment of the project at detailed design will be required to ensure that significant natural and physical resources are protected from works or that the effects are mitigated.

Section 7 identifies a number of "other matters" to be given particular regard. Those of relevance are:

(aa) The ethic of stewardship:
(c) The maintenance and enhancement of amenity values:
(b) The efficient use and development of natural and physical resources:
(f) Maintenance and enhancement of the quality of the environment:

Auckland Transport, like all other councils and Council Controlled Organisations, must operate the transport network within an 'ethic of stewardship'. The project is being delivered on public land purchased decades ago for a transport function. The project aligns with this purpose and once constructed will be maintained and managed with the public and future generations in mind. The provision of public access into the project area by cycle and walking will ensure that matters such as weed management are better addressed due to the higher level of access to the area. It also provides the opportunity for enhancement planting to mitigate effects on habitats and indigenous vegetation.

Section 8 relates to the Treaty of Waitangi and states:

"In achieving the purpose of this Act, all persons exercising the functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiritio Waitangi)".

The project is unlikely to be contrary to the principles of the Treaty of Waitangi.

9.2.1 New Zealand Coastal Policy Statement 2010 (NZCPS)

The purpose of the NZCPS is to state policies in order to achieve the purpose of the RMA, in relation to the coastal environment of New Zealand. Two sections of the project (Section 3 and 4) have direct contact with the Coastal Marine Area (CMA), and Section 2 is located in the broader "coastal environment as it is around Purewa Creek where issues of the land and water interface.

Objective 1 and Policy 22 of the NZCPS are relevant to the project. Objective 1 seeks to safeguard the coastal environment and its ecosystems by maintaining and enhancing coastal water quality. Policy 22 requires that subdivision, use or development does not significantly increase sedimentation in the coastal marine area and that land use activities are controlled to reduce sediment loadings in runoff and stormwater systems

9.2.2 National Environmental Standard for Assessing and Managing Contaminants

The National Environmental Standard (NES) for Assessing and Managing Contaminants (NES-CS) relates to the assessment and management of health effects from exposure to contaminants in soil. The NES-CS applies a framework for assessing contaminants in soil and provides a national set of planning controls and soil contaminant values. The NES-CS enables 'use' to be made of affected land but ensures that:

- District planning controls are appropriate and nationally consistent;
- Councils gather and apply the information needed for efficient decision making on contaminated or potentially contaminated land; and
- The soil guideline values are appropriate and applied consistently.

The NES Regulations applies in relation to a new Notice of Requirement or an Outline Plan of Works and to any resource consents required to deliver the project.

Preliminary site investigation has been undertaken of land uses along the route and is attached in Appendix K. Tahape Reserve in Section 2 is split into two, and the western reserve is situated on a closed landfill which may pose a risk to human health.

A detailed site investigation has been undertaken for Section 1 and is attached in Appendix L. The analytical results indicate that there will be negligible risks to human health from exposure to contaminants in soil during the construction of Section 1 of the proposed Glen Innes to Tamaki Drive Shared Path. While the adjacent industrial land poses a continual risk of contamination to the surrounding land (such as from chemical spills), and the source of fill material is unknown, the risks to site workers and the public is still considered low to contaminant concentrations being well below human health guidelines.

A detailed site investigation should be undertaken for the remaining sections to quantify the level of contamination along the proposed route with reference to appropriate soil contaminant standards outlined in the NES.

9.2.3 The National Policy Statement for Freshwater Management 2011

The National Policy Statement for Freshwater Management 2011 (Freshwater NPS) came into force on 1 August 2014. This NPS sets out the objectives and policies for freshwater management under the RMA. From 1 July 2011 decision-makers under the RMA must have regard to the Freshwater NPS in consenting decisions.

The Freshwater NPS objectives and policies must be considered when making an application under the ARP: ALW. Given that there are a number of streams crossed, the matters of concern in relation to the NPS will be addressed through regional plan consents. The project will need to show how it will not compromise the freshwater values in the NPS.

9.2.4 Hauraki Gulf Marine Park Act 2000 (HGMPA)

When assessing applications for activities within the Gulf and its catchment, the consent authority is required to have regard to sections 7 and 8 of HGMPA as though they were a national policy statement.

The HGMPA provides special recognition for the Hauraki Gulf and this has implications for the resource management framework. RMA plans and applications must have particular regard to the provisions of sections 7 and 8 of the HGMPA. Section 7 provides that the interrelationship between the Hauraki Gulf, its islands, and catchments and the ability of that interrelationship to sustain the life-supporting capacity of the environment of the Hauraki Gulf and its islands are matters of national significance. Section 8 of the HGMPA provides that to recognise the national significance of the Hauraki Gulf it should be managed for several specific objectives including the protection and, where appropriate, the enhancement of the life-supporting capacity of the environment and the natural, historic and physical resources of the Hauraki Gulf, its islands, and catchments. This includes those resources with which tangata whenua have an historic, traditional, cultural, and spiritual relationship

and those resources which contribute to the recreation and enjoyment of the Hauraki Gulf for the people and communities of the Hauraki Gulf and New Zealand.

Purewa Creek drains to Orakei Basin and the Hobson Bay and from there to the Waitemata the area is therefore part of the Gulf. The project will need to show how it will not compromise the life supporting capacity of the Gulf.

9.2.5 Auckland Regional Policy Statement

The Regional Policy Statement for Auckland (RPS) became operative in August 1999. The Proposed Auckland Unitary Plan was notified in 2013 to replace the RPS once it has completed its statutory processing (the submission / hearing process) and decisions take legal effect. The role of the operative RPS is to achieve the purpose of the Resource Management Act by providing an overview of the resource management issues for Auckland and policies and methods to achieve integrated management of the natural and physical resources of the region.

Chapter 4 Transport describes how transport networks should be developed and the principles which should be applied. The RPS describes the policy of motor vehicle emissions in these words:

- *Encouraging the use of less pollutive transport modes such as walking and cycling;*
- *Promoting more efficient transport modes including, but not restricted to passenger rail and rail freight, buses and ferries, cycling and car-pooling;*
- *Implementing strategic policies to promote patterns of land use activities which minimise the need to travel, and take account of local climatic conditions; and*
- *Bringing into effect measures to reduce emissions of contaminants at source.*

The Glen Innes to Tamaki Dive Cycle route project is part of both NZTA's and AT's overall strategy to promote more efficient transport modes which will have less adverse impact on the environment. The development of this project will encourage the use of a transport mode, which is environmentally friendly and easily integrated with other transport systems and modes.

Other parts of the RPS are relevant due to the environment that the route follows.in particular:

- Chapter 6, Heritage is concerned with the protection of heritage resources of spiritual, cultural and historical significance. Mana whenua are being consulted to understand the spiritual and cultural significance of that land that will be directly affected by the project.
- Chapter 8 Water Quality seeks to maintain water quality in water bodies and coastal waters and enhance degraded water. The project's stormwater design and the focus on limiting effects and restricting new structures in the CMA will ensure that water quality in water bodies and coastal waters is maintained.

9.2.6 Auckland Council District Plan (Isthmus Section)

The Isthmus Section of the Auckland District Plan deals with resource management issues and is the primary (operative) document for the management of effects of land use development in the district pending the Proposed Auckland Unitary Plan taking full legal effect. It also controls the subdivision of land and sets standards for (among other things) traffic and transport requirements.

The plan recognises that

"The bicycle is a useful and environmental friendly form of alternative personal transport and that its use should be encouraged".

This is in line with the vision and objectives of the New Zealand Transport Strategy, to promote a sustainable transport system that is affordable, integrated, safe and responsive to people's needs. The proposed off-road cycle facility will increase safety and personal security to cyclists.

The route followed by the project is for the most part (with the exception of Apirana Reserve and the Tahapa and Tahapa East Reserves) designated as D14-05 Proposed Eastern Transport Corridor with the following wording:

This requirement for a designation has been carried forward from the former Auckland City 1991 Transitional District Plan, with its purpose being to secure the opportunity for a future transport corridor.

At the time of public notification of the Proposed District Plan (1 July 1993), it was not possible for the Council to delineate the final form of the transport corridor designation, as the necessary transport studies had not been completed.

The Council expects to be in a position by the end of 1997 to decide in principle the appropriate form or forms of transport for the transport needs and options for meeting them. As part of this process, the Council will consult with local residents and provide them with all relevant information as it becomes available.

If the Council proposes to carry out any development on the proposed Eastern Transport Corridor, the Council will withdraw this designation and replace it with a fresh requirement, in accordance with Section 168 of the Act. That fresh requirement will be publicly notified, and determined in accordance with the provisions of Part VIII of the Act.

The expiry date of this designation was extended to 1 November 2015, by S78 of the Local Government (Auckland Transitional Provisions) Act 2010.

In accordance with section 184A(2)(b) of the Act, the council resolved on 11 August 2004 that it had made, and was continuing to make, substantial progress or effort towards giving effect to the designation and extended the designation lapse period until 11 August 2014.

This designation does not provide for the construction of the project, but rather just secures the corridor so that it can't be used for other purposes (although most of the land it covers is already owned by NZTA or the Council).

The designation has been rolled over into the PAUP – see Figure 10

In close proximity is the land designated B10-05 Railway Purposes – North Island Main Trunk Railway. The project crosses the designation at three places:

- At grade above the tunnelled section close to Apirana Reserve
- In a bridge to be constructed to the east of the Meadowbank Station and
- At Orakei Road

Written approval from KiwiRail will be required under section 176 of the RMA to undertake work within the Rail Purposes designation.

9.2.7 Auckland Council Regional Plan: Air, Land and Water

The Auckland Council Regional Plan: Air, Land and Water (ARP: ALW) provides a framework to promote the integrated and sustainable management of Auckland's air, land and water resources (excluding the CMA). The transitional provisions from the Freshwater NPS 2014 have been inserted into the ARP: ALW and where appropriate will be considered. The Plan includes provisions focused on protecting the natural environment and natural character, particularly water bodies and significant habitats, and avoiding or mitigating adverse effects on these values. This is particularly relevant for the construction works occurring in Sections 2-4.

In addition the plan seeks to manage discharges from storm water, and contaminated land and other contaminant generating activities to land and/or water. These are relevant in the project will result in new impervious surface in an area where the receiving environment for discharges is Purewa Creek and potentially the harbour. The ARP: ALW also seeks to protect the natural characteristics of lakes and permanent streams and avoid or mitigate the adverse effects of modifying these water bodies.

In section 1 there is an ephemeral stream and an intermittent/ permanent stream in the northern length of Section and two intermittent permanent streams in the southern part of the section[6]. A

[6] 88A Merton Road, St Johns to 279 St Johns Road Ecological Assessment November 2014 Opus for NZTA

stream that is the upper reaches of Purewa Creek runs through the bottom section of Section 2. The form of any stream crossing and the impact of the crossing on natural character and ecological criteria, will need to be considered as will the adverse effects of the installation of the crossing and in particular loss of the natural streambed.

The impact of any structure on flooding also will need to be considered as Rule 7.5.29 (a) of the ARP: ALW states "the activity shall not result in an increase to existing flood levels on land or structures other than that owned and controlled by the person undertaking the activity

9.2.8 Auckland Council Regional Plan: Sediment Control

The Auckland Council Regional Plan: Sediment Control (ARP:SC) addresses sediment discharge, and defines the mechanisms for avoiding, mitigating or remedying any adverse effect on the environment and in particular water quality due to sediment discharge from bare earth surfaces. The plan addresses the issue of elevated sediment generation and discharge from areas which are cleared of vegetation, and/or subject to land disturbance and specifies controls on the discharge of sediment laden runoff related to specific activities and their proximity to water bodies, wetlands and coastal waters. Such areas are identified as Sediment Control Protection Areas and works within 50 metres landward of the edge of a watercourse, or wetland of 1,000m² or more are considered to be within the Sediment Control Protection area. The objectives and policies of this plan seek to minimise sediment discharge; avoid, remedy or mitigate the effects of any sediment discharge on water quality and areas of significance and value; and to sustain the mauri of water.

Construction of an earthen embankment is proposed as an option for Section 1. The impact of the bulk earthworks in terms of the discharge of sediment discharge will need to be minimised during construction and any sediment runoff particularly related to earthworks undertaken in the vicinity of the streams and the CMA will also need to be managed through resource consents to minimise the effects on water bodies and any significant habitats or areas of spiritual or cultural significance. Works located in Section 2 will need to be sensitively managed as it has both significant ecological areas and sites and places of value to mana whenua.

9.2.9 Auckland Regional Plan: Coastal

One of the functions of the Auckland Council, as outlined in Section 30 of the Resource Management Act (RMA), is the control of the region's coastal marine area in conjunction with the Minister of Conservation. The Auckland Regional Plan: Coastal (the Coastal Plan) outlines the approach to managing activity in a range of coastal environments.

The Hobson Bay and Orakei Basin sections of the project are located in the coastal marine area. Hobson Bay is a shallow sheltered estuarine system and the Orakei Basin is an explosion crater that is subject to tidal change with the movement controlled by a sluice gate under the rail line. Both are bordered by intense urban development. Certain activities are restricted under sections 12, 14 and 15 of the RMA, unless specifically allowed by a rule in a coastal plan or resource consent.

As noted earlier the water to the north and south of the rail line in both Sections 3 and 4 is within the Coast Protection Area 2. The plan notes a number of specific features – in section 3, geological values of Orakei Basin and the ecological values of the Purewa Stream area. In addition the Orakei Basin Tuff Ring and Explosion Crater and Ngapipi Road / Hobson Point Greensand Exposure (Orakei Greensands(55)[7] are identified as Areas of Significant Conservation Value in the Coastal Plan and considered to be nationally important.

The key outcome of the project is in line with one of the key principles of the Coastal Plan, namely ensuring public access to the coast for recreation purposes. There are aspects of the project that will require resource consent under the Coastal Plan such as the consent structures in the CMA however the impact of the project will be minimal as the preferred option in Sections 3 and 4 is to rely on the existing rail reclamation that crosses the CMA.

[7] Schedule 4: Areas of significant conservation value , S4-29 Auckland Council Regional Plan: Coastal 2004

9.2.10 Proposed Auckland Unitary Plan

The Proposed Auckland Unitary Plan (PAUP) provisions in the RPS layer provide overarching policy direction for the project. The RPS layer of the PAUP identifies the need for a well-located and designed compact urban form with land use and transport integrated to improve transport efficiency and enhance accessibility.[8] The PAUP in Chapter B, 3.3 states that Auckland's transport system contributes to social, economic and cultural wellbeing, and that the efficient, effective and safe operational improvements to the transport system are fundamental to the regional and national economy. It also notes that the integration of land use with transport is improved by the delivery of a transport system that is planned, funded and staged to enable the delivery of quality urban growth.[9]

In addition to RPS-level objectives and policies, the PAUP also contains 'Auckland-wide' objectives and policies, and objectives and policies related specifically to individual zones, overlays and precincts. These provisions apply as regional plan rules and district plan rules. Relevant regional plan rules relate to the effect of the project on natural resources, and relate to the zones and overlays occurring along the project route. Some of the rules that are relevant for this project have legal effect from the date the PAUP was notified and others indicate a different approach from the operative regional or district plan rules. It is therefore appropriate to consider these rules, particularly where submissions may result in the rules being amended during the course of the project (all decisions are expected to be released by the end of 2016 at the latest). Regard will need to be had to those rules having immediate legal effect and the weighting of the PAUP provisions against the operative provisions will need to be determined by the decision maker at the time the decision is made, and will be dependent on where the PAUP is at in the process and whether the provisions represent a clear policy shift.

The project is consistent with the land use framework established within the PAUP and is consistent with the strategic direction set in the RPS layer of the PAUP. There are aspects of the project that are expected to require resource consent under the PAUP, being culverts, the volume of earthworks to achieve grades that will benefit cyclists, the introduction of new impervious surface and because some works will occur in areas identified in the PAUP as significant ecological features or sites and places of value to mana whenua .

It is noted that the Eastern Corridor designation has been rolled over into the PAUP (refer Figure 9-1).

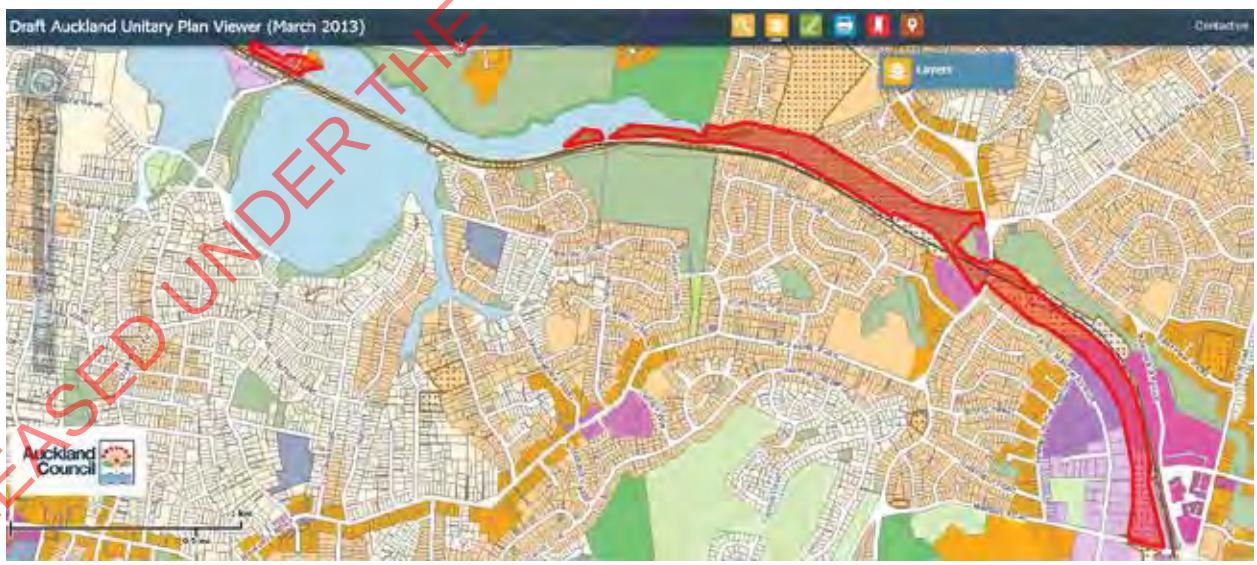

Figure 9-1 Proposed Eastern Corridor designation

[8] PAUP Auckland Council 2013, Part 1 Introduction and Strategic Direction Chapter B Regional Policy Statement 2. Enabling quality urban growth 2.1 providing for growth in a quality compact urban form.

[9] Id. Part 1 Introduction and Strategic Direction Chapter B Regional Policy Statement Enabling economic wellbeing 3.3 Transport

9.3 Cost Estimate

9.3.1 Scheme Estimates

As discussed in Section 7 of this report, there is a clear preferred option for sections 1, 2 and 3., although ongoing consultation will be required to finalise the section through Tehapa reserve or whether to follow the rail line. However this isn't a distinct option with vastly different costs or benefits.

For Section 4 there are two distinct options, however again there will not be a substantial cost difference and other factors, such as environmental impact are likely to have a greater bearing on the option selection than the economics. Therefore the Scheme Estimate (SE) was prepared for the preferred option only, as shown in Figure 9-2: .

Figure 9-2: Scheme Estimates

SE	July 2014	Preferred Option
Base Estimate		$ 30,071,772
Contingency (20.4%)		$ 6,348,336
Expected Estimate		$ 37,420,108

The key project risks are associated with the earthworks and the structures and in general have attracted a higher contingency, of between 20% to 25%.
This is particularly a risk for the Section 2, 3 and 4 as no topographical survey or geotechnical testing has been undertaken. LIDAR data has been used for the design of these sections. This is expected to yield a reasonable result as a comparison of the topographical survey with the LIDRA for Section 1 indicated good consistency. In addition, the design team have walked the route several times, and there is scope to modify the path alignment to suit contour level which helps to limit the likelihood of significant increases. The geotechnical conditions for Sections 1, 2 and 3 are unlikely to have a significant effect on the path design, but may affect the founding of structures.

The design basis for the Orakei Basin boardwalk is that the existing piles can be reused. This will be finalised once geotechnical information from the boardwalk construction is made available. If the existing piles cannot be reused, the cost is likely to be closer to the 95% percentile estimate.

The construction phasing is expected to phased as follows:

- Section 1 in year 1 (commencing April 2015)
- Section 2 in year 2 (commencing October 2016)
- Section 3 in year 2 (commencing June 2016)
- Section 4 in year 3 (commencing April 2017)

Error! Reference source not found. contains full copies of the estimates as well as an elemental breakdown of all physical works costs.

9.4 Economic Evaluation

The following are the options considered for the economic evaluation:

- "Do Minimum" options is a "Do Nothing" option
- Preferred Option – $37,420,108

An economic evaluation has been carried out using a combination of full and simplified procedures. The benefits are derived from the simplified procedures (SP11) – Walking and Cycling worksheets in accordance with NZTA's Economic Evaluation Manual (EEM) however all discounting for the costs and benefits have been adjusted to reflect the construction phasing of each section. Refer to Appendix J for the economic evaluation worksheets.

9.4.1.1 Project Benefits

Benefits associated with travel time savings, walking and cycling facilities and crash cost savings were included in the assessment. All benefits are calculated based on the completion date in accordance with the procedure given in the Economic Evaluation Manual SP11.

9.4.1.2 Analysis Period and Discount rate

The economic evaluation has been undertaken using the 40 year analysis and 6% discount rate in accordance to the latest EEM procedures.

9.4.1.3 Growth Rate

The growth rate increase was calculated comparing the increase in cycling numbers between the 2006 and 2013 travel to work census information in the area. The data was extracted using the buffer zone method in accordance with Worksheet 7 of the SP11 EEM procedures for estimating new cycling numbers and is shown in Figure 9-3. Based on the buffer zones, the number of people that cycled to work was 1,020 and 1,626 in 2006 and 2013 respectively as shown in Table 9-2. This is an increase of 59% over seven years or 6.89% annually based on an exponential growth calculation.

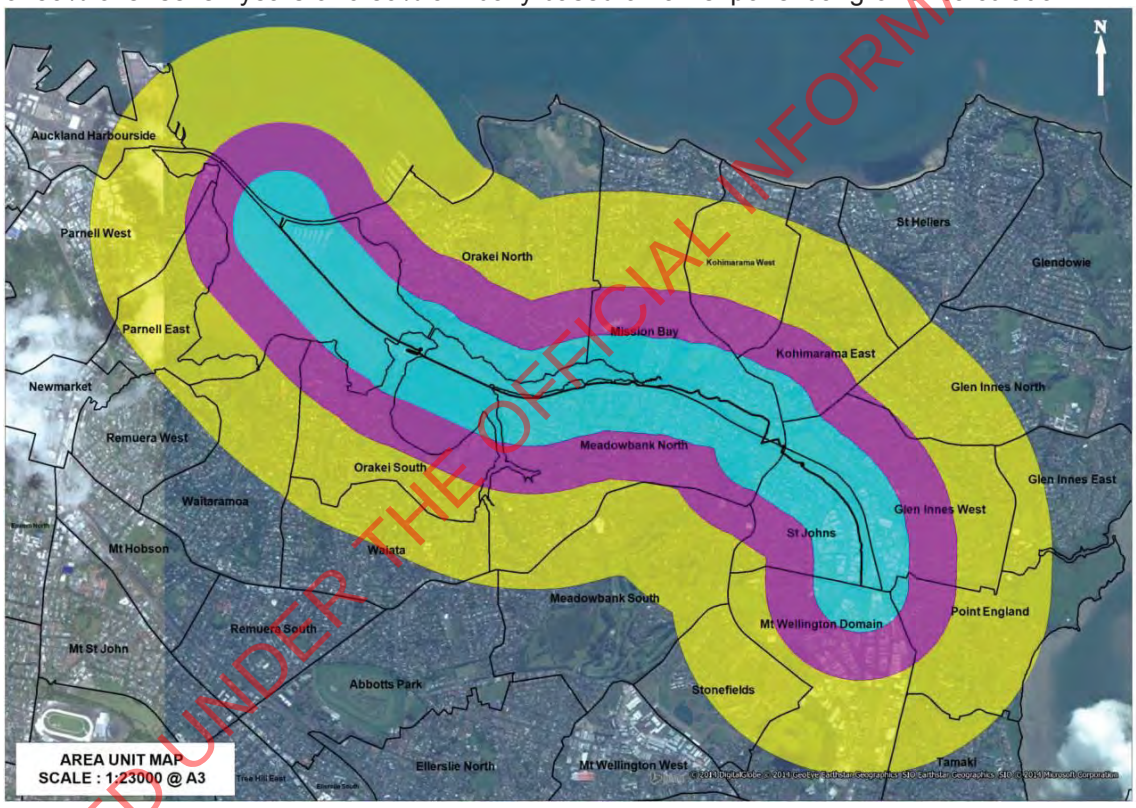

Figure 9-3: GIS map showing the areas of extraction of travel to work census data

Table 9-2: Extract of census data

Census Area Units	Bicycled 2006	Bicycled 2013
Abbotts Park	24	33
Auckland Harbour side	12	27
Glen Innes East	9	12
Glen Innes North	66	96
Glen Innes West	27	45
Kohimarama East	72	153

Census Area Units	Bicycled 2006	Bicycled 2013
Kohimarama West	90	126
Meadowbank North	72	171
Meadowbank South	42	60
Mission Bay	153	198
Mt Wellington Domain	9	18
Orakei North	108	207
Orakei South	36	54
Parnell East	18	54
Parnell West	78	102
Point England	45	36
Remuera West	12	30
St Heliers	33	57
St Johns	45	54
Stonefields	3	9
Tamaki	15	18
Waiata	15	24
Waitaramoa	36	42
Grand Total	**1020**	**1626**

9.4.1.4 Cycle Demand

The cycle demand as a result of the new facility has been estimated using Worksheet 7 of the SP11 EEM procedures. This is based on a GIS assessment of population density adjacent to the route as shown in Figure 9-3. To justify the accuracy of the prediction, cycle traffic counts were undertaken on 11/11/2014 in the following locations:

- Orakei Road railway overbridge
- Kohimarama Road St Heliers Bay Road

The survey locations were chosen as they are expected to be representative of expected cyclist volumes as well as their likelihood to induce route change for cyclists. The count information was used to estimate cyclist AADT based on Appendix 2 of the Cycle Network and Route Planning Guide and the results are summarised in Table 9-3.

Table 9-3 : Cyclist AADT Estimation Based on Count Data

Basis of Analysis	Orakei Road	Kohimarama Road / St Heliers Bay Road
Surveyed Time	7AM-9AM 4PM-6PM	7AM-9AM 3:30PM-6:00PM
Estimated % of cyclists change to proposed route	80% along Orakei Road 100% underneath bridge	80%
Predicted AADT	270	174
Total AADT	444	

It is assumed that 80% of the cyclists observed during the survey would utilised the proposed cycle route as it provides a faster and safer cycling corridor to and from the CBD and other nearby attractions such as schools and recreational areas.

As shown above, the estimated cyclists AADT from the two (2) locations are 444 which is only 61 less than the 505 cyclists predicted using the SP11 method. Observations has also indicated that these routes are also used by large pelotons of cyclists, however these have been observed outside the peak periods, which would suggest that the AADT is likely to be higher than calculated. This in turn supports the SP11 method in reflecting the true potential cycle demand. The route is expected to appeal to a wide user base due to the high level of safety, directness and attractiveness, which will more than account for the difference of 61 cyclists, therefore the SP11 method of estimating cycle demand has been adopted for the economic evaluation.

The results of the economic evaluation are summarised in the following table for the scheme. Costs and benefits in net present value are provided, with the resulting benefit-cost ratio and the first year rate of return (FYRR).

9.4.1.5 Pedestrian Demand

The pedestrian demand as a result of the new facility has been estimated using the mode split between pedestrian and cyclist using the Orakei basin boardwalk. This location was used because the existing function and environment would be similar to what is being proposed and it lies within the scope of improvements.

From the traffic survey conducted on 11/11/2014, 161 pedestrians were recorded using the boardwalk which is approximately three (3) times more than the 37 cyclists recorded. Based on the existing mode split between cyclist and pedestrians, a conservative assumption was made to expect the shared path to generate an equal number of pedestrians and cyclists as a result of the proposed works.

9.4.1.6 Cycling Travel Time Savings

The travel time savings of the project is calculated in four (4) sections each representing a phase in the project construction. This method was use as the cycle shared path would be completed in stages and benefits resulting from the works would partially materialise before the full completion of the entire project.

It is assumed each section would take one year to complete construction with section 2 and 3 being constructed at the same time in year 2. This assumption would provide a conservative result of benefits as section 1, 2 and 3 are estimated to only take six (6) months for construction, this means there would be six (6) months of resulting benefits not catered for in the prediction.

The travel time saving were based on the length of the each route, average speed of the cyclists, and the relative attractiveness of the proposed facility.

The cycling speed for “Do Min” was assumed to be 15 km/h to reflect the delays expected from the intersections and traffic controls under existing parallel routes for cyclists.

For other options, the cycling speed was assumed to be 22 km/h as the proposed work are designed to the standard of a cycling metro.

It is worth noting travel time savings does not include benefits for pedestrians as it is assumed that pedestrians would not significantly change speed / travel time.

The PV of travel time savings for the cyclists over a 40 year analysis period due to the preferred route is $44,207,622.

9.4.1.7 Health and Environmental Benefits – Walking Faculty Benefits

The facility benefits for the cyclists were based on the length of the new facility and number of additional cycle trips per day. The health and environment benefits for the preferred route is $70,554,287.

9.4.1.8 Safety Benefit

The safety benefits were evaluated using SP11 procedure only, and no detailed safety benefits analysis has been undertaken using the crash history. The safety benefits for the preferred route is $3,113,894.

9.4.1.9 Benefit-Cost Evaluation

Table 9-4 below gives the summary of the economic evaluation of the preferred option.

Table 9-4 : Economic Analysis Summary

Basis of Analysis	Preferred Route
PV cost of "Do Min"	0
PV cost of the option	$33,000,086
PV Cycling Travel Time Savings	$44,207,622
PV Cyclist Benefits	$70,554,287
PV Crash Cost Savings	$3,113,894
PV Total Benefits	$99,290,772
Benefit/Cost Ratio (BCR)	3.6
First Year Rate of Return (FYRR)	9.0

9.4.2 Sensitivity Analysis

A sensitivity analysis has been undertaken for the preferred option and a summary is shown in Table 9-5:

Table 9-5 : Preferred route sensitivity analysis

Item	Base Case	BCR	Lower Bound	BCR	Upper Bound	BCR
Capital Cost	$37,419,000	3.6	Base +20%	3.0	Base - 20%	4.5
Pedestrian Numbers	Equal number of cyclists / pedestrian	3.6	50% of cyclists	2.87	150% of cyclists	4.3
Existing Cyclist Numbers	505	3.6	based on traffic counts (444)	3.4	+20% of Base	3.9
Growth Rate	6.89	3.6	2%	2.3	7.5%	3.7

9.4.2.1 Other General Issues

The project is focused on enabling and improving cycling and providing in addition to new walking route. Both of these are an alternative to motorised transport. Facilitating these modes of transport are a key sustainability target.

This project is funded solely by AT and NZTA. It is not part of a package of projects in that the benefits and cost have been derived independently of other projects. However, the project does form part of a number of improvements being delivered regionally and nationally to enhance cycling viability, security and safety. In that sense it is a practical step in delivering a regional and national strategy.

There is only a minor effect anticipated on the road network at the St Johns Road / St Heliers Bay Road / Kohimarama Road signalised intersection. This is due to the proposed improvements, however the proposed project will further integrate and encourage alternative modes of transport – walking & cycling. Safety on the road network will be significantly improved by removing the conflict of travel modes on the existing roads many of which are steep or heavily used by freight and commercial traffic. There is an existing demand for cycling and the proposed new route will further enhance this.

Encouraging walking and cycling by developing this type of facility will inevitably improve mobility, public health and environmental sustainability. This project is considered to have high viability / low risk.

9.4.2.2 Summary of Economic Evaluation

The project achieves a BCR of 3.6 indicating that the project if financially viable. Therefore the economic efficiency is rated as medium.

The sensitivity analysis shows that the lower bound of the BCR does not drop below two due to a single factor, thus indicating that the project viable and robust.

10 Social and Environmental Management

10.1 Summary of Surrounding Environment

The environment surrounding the project area comprises:
Section 1: business /residential development being Glen Innes town centre, surrounding business and mixed use area on Felton Mathews Avenue and Apirana Avenue ;
Section 2: residential and open space bush areas in Meadowbank; and

Section 3 - 4: coastal marine area and wider residential and public space catchment of Orakei and Hobson Bay.

The project is largely located within land already designated area for the Eastern Corridor and is close to and crosses land designated by Kiwi Rail that includes the existing Eastern Line. The project route follows undulating terrain containing paddocks used for grazing horses and trees and shrubs, dense bush, and will travel across the coastal marine area of Hobson Bay and Orakei Basin relying on the existing Eastern Line reclamation where possible.

The general topography of the proposal area is a mixture of steep to moderate slopes and valley (in line with the rail alignment near Purewa Creek). The land overall generally slopes up from Glen Innes towards St Johns Road and then down from St Johns Road towards Purewa Creek at sea level. The proposed shared pathway itself will for some of the route designed to traverse significant change in gradient and will need be at an appropriate height to safely cross over the rail line as required to meet KiwiRail's requirements. The sections over the coastal marine area will be approximately at the same level as the rail line.

The existing amenity of the wider area of Stages 1, 2 and 3 is affected by the presence of the existing rail line (the Eastern Line) that runs along the same route as the project. Stage 4 is also affected by the traffic noise from Tamaki Drive. The overall landscape and visual amenity of the corridor the proposed shared path will follow is mixed. From a distance the corridor in the section from Glen Innes to St Johns Road and the section from St Johns to the bush near Selwyn College is almost semirural sleeved into urban development. This is largely due to the paddocks with large specimen trees being are used for horse grazing and areas of bush. Weeds are present in amongst the vegetation.

Across sections 3 and 4 the landscape is dominated by the rail line.

The style and quality of dwellings is mixed with a number of multi-unit developments as single storey detached dwellings. The majority of dwellings on Felton Mathews Avenue have open views to the corridor to take advantage of the north facing aspect. Fencing types along the boundary vary. Planting along the residential boundary is generally open with a sense of passive surveillance from overlooking houses potentially improving the perception of the route. Houses in section 2 are elevated and look out over the project route.

10.1.1 Section 1

Sixteen residential allotments (some containing multiple dwellings) with access to Felton Mathew Avenue share a rear boundary with the land contained in the Eastern Corridor in Section 1. Around 40 residential properties (some containing multiple dwellings) share a rear boundary with the section of Apirana Reserve that the project will traverse. For a number of properties there is a 50 m wide area

of bush/gulley separating them from the project. Four properties at the corner of St Heliers Bay Road and St Johns Road will have the shared path traverse the wide road reserve in front of them to the intersection.

10.1.2 Section 2

On the western side of St Johns Road around thirty residential properties (generally single dwellings) that front Whytehead Crescent, Harvey Place and John Rymer Place will share their rear boundary with the project where it is located in this location the land designated for the Eastern Transport Corridor. The cycle path then drops down to the valley floor at the rear of Selwyn College where it will cross the upper reaches of the Purewa stream and crosses the rail line to travel parallel with Purewa Cemetery (on the southern side of the rail line) before crossing the rail line in the vicinity of Tahapa Reserve east and then travel to the rear of nine residential properties that front Tahapa Crescent and Manaku Street before crossing Tahapa Reserve and Meadowbank Station. There are six dwellings that front Manapau St in the vicinity of the Meadowbank Station that will look out on to the shared path.

10.1.3 Section 3

From Meadowbank station the proposal will follow the boardwalk that is adjacent to the rail line through to Orakei Peninsula . This is the next area where private land fronts or is close to the project is at Orakei Peninsula where a development that could include 700 apartments and 20,000 m2 of commercial development is proposed.

10.1.4 Section 4

From the Orakei Peninsula the project crosses Hobson Bay with two options being considered, one that hugs the northern coast of the Bay relying on Ngapipi Road and the other that follows the rail line that then touches down at the Outboard Boating Club marina before making its way to Tamaki Drive

The proposal will travel close to and potentially over a number of sites of archaeological value and sites and places of cultural and historic value. Known sites are identified in the PAUP. The area of coastal marine area and the area around the Purewa is of ecological value as recognised in the Coastal Plan, the district plan and PAUP. It is possible that new sites and features will be identified through the works associated with the project an accidental discovery protocol in place.

In summary, the positive effects of the proposal are significant in terms of:

- Improved cycle and pedestrian safety in the area;
- Providing sections of the Auckland Cycle network between Tamaki Drive and Glen Innes.
- Providing a section of the Greenway Project Ring Route
- ; and provides for a Cycle Metro level of service for commuter cyclists

The completion of the link would provide for continuous walking and cycling facilities between the city centre and the eastern suburbs.

The following potential adverse effects have been identified:

- Short-term impacts on visual and landscape values through construction works;
- Temporary effects of noise, vibration and dust during construction; and
- Potential privacy/safety issues for adjacent land owners.
- Potential loss of ecological, heritage, archaeological and cultural values

Potential effects will be avoided, remedied or mitigated, as far as practicable, through avoidance where possible, the engineering design and appropriate construction methods, sensitive landscaping and restoration planting.

10.2 Landscape and Visual

10.2.1.1 Construction Effects

Changes to the landscape due to the removal of trees and vegetation, changes to the contour of the land and the extent of ground disturbing works; could cause effects on the visual amenity for users of adjacent reserves and local residents

Neighbouring residential properties in Section 1 will have close views of the works area, with the greatest level of change being experienced by those who have open fencing on the boundary or have decks and outdoor areas overlooking the shared pathway . In the case of the section 2 properties backing on to the pathway that front Whitehead Crescent, Harvey Place and John Rymer Place are also likely to experience construction effects due to the proximity of the route at these locations.

Properties on the southern side of Whytehead Crescent and Harvey Place and at the end of John Rymer Place and Thatcher Street will potentially have close views of the works as will elevated properties that may be a little further removed. All will experience the change from the pasture they can see currently.

Properties close to the rail line near Gowing Drive and Tipene Place and close to Meadowbank Station and at the end of Mamaku and Kapua Streets and users of both Tahapa Reserve and Tahapa Reserve East will potentially have close views of the works and may experience effects from loss of vegetation associated with the need to access the route and clear vegetation to construct the pathway.

Properties overlooking Orakei Basin and Hobson Bay will see change but the extent will not be significant as they have long views and the pathway will be seen as an extension of the existing boardwalk on the section of the rail reclamation that traverses Orakei Basin and will essentially 'cling; to the rail line across Hobson Bay.

Depending on the timing of construction of the pathway in sections 3 and 4, some parts of the development proposed at Orakei Point will have views of the cycle way during construction.

Ongoing consultation with nearby landowners and appropriate construction methodologies should ensure any disruptions are minimal and will not cause annoyance or ongoing disturbance. These include limiting the work hours to standard daytime hours only (approximately 7.00 am to 6.00 pm).

Overall, it is considered that neighbouring properties will experience a degree of visual impact during construction but these will be no more than minor.

10.2.1.2 Operational Effects

Following completion of the shared path and associated works it is considered that the proposal will have beneficial effects on landscape and visual issues as it will improve the level of access to sections of the corridor such as Apirana Reserve, which currently has a low level, and is used as a rubbish tip.

Landscape planting will need to be considered to provide the following reaction of screening for adjoining residential properties;

- Softening of the visual impact of fencing and structures where possible;
- Provisions of a high degree of visibility along the shared path, ensuring CPTED principles are incorporated;
- replanting of native species to ensure the design is low maintenance, while providing ecological benefits; and
- Removal of existing rubbish and weed species from the corridor.

10.2.2 Ecological

10.2.2.1 Construction Effects

A review of Section 1 by Opus commissioned by NZTA notes that pre-human vegetation at the site would have been pohutukawa/puriri/karaka/broadleaf forest (Singers et al., 2013), with any wet areas likely containing kahikatea/pukatea swamp forest. Maori fires would have most likely reduced this to seral vegetation (bracken, manuka), similar to the rest of the isthmus, by the time of European

settlement. The current vegetation is predominantly pasture grass with scattered exotic and native vegetation, characteristic of the pre-urbanised European period throughout the eastern suburbs.

The upper area of Section 2 also has an area of pasture grass used for grazing but much of the section has bush identified in the PAUP and the operative plan lists as a significant ecological feature C13-09 Selwyn Bush.

During construction there will be an initial loss of existing vegetation including a number of native trees. However, the quality of the existing vegetation is mixed with a number having only been planted in recent years. Extensive areas of grass and weeds will be removed from the project area prior to earthworks..

10.2.2.2 Operational Effects

Operational effects should be less than minor.

10.3 Cultural and Heritage Values

10.3.1.1 Construction Effects

Based on a desktop analysis, it has been identified that Section 2 and 3 contains sites of cultural, archaeological or historic value. While there are no features identified in the relevant planning documents for the rest of the route, recent walk over of Section 1 suggests that a midden could be located in the and while that section has been affected by the construction of the rail line may still be of significance to tangata whenua.

AT is consulting with mana whenua and Maori Interest will be confirmed through that process

During construction there will be an initial loss of existing vegetation and initial effects on streams along the route. Impacts on cultural, archaeological or historic values will need to be assessed and considered during detailed design.

10.3.1.2 Operational Effects

Operational effects should be less than minor.

10.4 Social

10.4.1 Construction Effects

The proposal may cause a number of minor adverse effects during construction. These include potential nuisances caused by noise, dust, vibration and diesel fumes generated by construction machinery.

10.4.2 Operational Effects

The delivery of the pathway provides a social resource of significance due to its function, its multiplicity of use and its importance to the well-being of the community through providing an off road shared pathway that will enable the community to undertaken healthy activities in a safe environment.

Once the proposed shared path is operating, it is expected that the following positive effects will result. Improved cycle safety in the area;

- Connectivity between Glen Innes, Meadowbank and Orakei with Tamaki Drive;
- Providing the opportunity for a connection between Meadowbank and Selwyn College; and
- Providing a direct cycle route into Auckland Central Business District

Despite these general benefits, the proposed shared path will provide public access which allows the risk of anti-social and unlawful activities to emerge. These include vandalism, graffiti, loitering and also the potential for crime due to increased access to adjacent properties.

In order to mitigate the likelihood of these potentially adverse effects, CPTED (crime prevention through environmental design) principles have been incorporated into the design of the proposed

shared path. Mitigation measures include directional lighting, excellent visibility, landscaping and permeable tubular fencing.

10.5 Noise

10.5.1 Construction Effects

Noise generated by earthmoving machinery such as engine noise will be audible in the immediate vicinity. It is expected that any noise generated by construction activities will not exceed the limits specified in New Zealand Standard 6803:1999 Acoustics – Construction Work. This will be confirmed at the detailed design stage.

10.5.2 Operational Effects

The ongoing operation of the shared path is unlikely to create any noise effects of significance given the quiet-nature of cycling and walking compared to motor vehicles. There is however the potential for noise to be created by cyclists and pedestrians utilising the proposed shared path.

The proposed shared path is located immediately adjacent to eastern rail line and as a result there is an existing significant ambient noise level when trains operate along the line . While this noise is intermittent it is considered that the proposed shared path is unlikely to contribute to or create any additional adverse noise/nuisance effects.

A full acoustic report will be undertaken by Styles Group.

10.6 Air Quality

10.6.1 Construction Effects

Dust generation/drift is considered likely as a result of the construction works. Dust control measures in accordance with Auckland Regional Council's Erosion and Sediment Control Guidelines (TP 90) will be used to control dust and prevent nuisance effects on the nearby dwellings.

10.6.2 Operational Effects

Operationally, it is anticipated that the proposed shared path can help reduce localised carbon dioxide emissions and consequently improve air quality by providing for and encouraging more sustainable methods of transport.

10.7 Vibration

10.7.1 Construction Effects

Vibration will occur from earthworks but moreover during the driving of piles during the bridge construction phase. With a number of residential dwellings in close proximity to the works, the effects, albeit temporary in nature, could pose more than minor effects.

Adjacent residential properties that are likely to be affected by these works will be notified in advance of when they are likely to occur, and working hours will be limited to certain times in order to minimise any adverse vibration effects.

10.7.2 Operational Effects

The ongoing operation of the shared path is unlikely to create any vibration effects of significance given the nature of cycling and walking compared to motor vehicles.

Furthermore, as the proposed shared path is located immediately adjacent to the eastern rail line it is considered the proposed shared path is unlikely to contribute to or create any additional adverse vibration effects.

10.8 Stormwater

10.8.1 Construction Effects

Potential construction effects include the generation of sediment laden runoff during rainfall events. The sediment laden runoff could either discharge into the existing stormwater systems and into the downstream receiving environment (including the CMA) or it could discharge onto the adjacent properties.

The construction effects will be managed by the provision of Sediment & Erosion Control facilities such as: staging the works to minimise the extent of exposed surfaces, stabilisation of areas once construction is completed and the use of Erosion & Sediment Control practices such as those included in ARC TP 90 to contain sediment runoff within the project area.

10.8.2 Operational Effects

Potential operational effects of stormwater runoff include increased flow and the discharge of contaminants into the receiving environment.

Areas along the project route are identified as subject to flood in the non statutory layer of the PAUP.

Contaminant generation is considered to be a low risk from the shared path due to the nature of the activity. The effect from the shared path will be negligible and will not require specific water quality treatment. However the proposed vegetated buffer will provide natural treatment for this low risk.

10.9 Hazardous Substances

Diesel and petrol are likely to be stored and situated on site over the construction period in quantities sufficient for construction purposes. To minimise the risks posed to work crews and the surrounding environment from accidents during storage and handling of these fuels, appropriate storage and contingency measures will be implemented. These include staff training and supervision in matters such as handling and spill contingency and emergency procedures, and appropriate storage.

11 Risk

A fully populated risk register was created during the development of the options and subsequent scheme design. The register is included at Appendix E. The risks and opportunities were scored based on the product of their consequence, likelihood and mitigation ratings in relation to successfully delivering the construction of the shared path route. There were 19 risks and one opportunity identified. Of the 19 identified risks, zero were rated extreme threat, 10 as high threats, 7 as moderate threats and 2 as low threats. The opportunity identified was rated as extreme opportunity.

The two highest risks related to:

- Construction within the Coastal Marine Area which could lead to stakeholder objections and the ability to obtain consents. This relates to the works in Section 3 and 4.
- Significant cost increases during project development as a result of difficult terrain conditions and resultant mitigation measures

The opportunity identified was the generation heightened positive public interest and community support for the project.

12 Preferred Option

The scheme plans in Appendix N show the preferred route option. This is essentially the off-road blue route as described in Section 7 of this report. The only modification to the blue route is the adoption of the orange route in Section 2 through Tehapa reserve. The preferred routes will need to take into

account feedback from stakeholder consultation as the options are developed during the detailed design stage.

13 Preliminary Design Philosophy Statement

The preliminary design philosophy statement is provided in Appendix H and is supplemented below by the design philosophy for the structural design.

The bridge structural design philosophy that has been applied to the structural elements of this project are as follows:

- Existing subsoils have adequate capacity for the imposed foundation loads.
- The bridge structures will have adequate structural capacity for a 4.0 kPa pedestrian loading.
- The bridge structures designated for use by a maintenance vehicle will have adequate structural capacity for a medium vehicle in accordance with AS/NZS 1170, i.e. 5.0 kPa uniformly distributed loading and 31 kN point load. The bridge structures will not be designed for highway vehicle loading in accordance with the NZTA Bridge Manual.
- The bridge piers to the railway overbridge will be provided with impact protection in accordance with the NZTA Bridge Manual.
- The bridges designated for use by the maintenance vehicles will have handrailing with adequate capacity as a barrier for medium vehicle traffic in accordance with AS/NZS 1170.
- A design working life of 50 years has been selected for the bridge structures, except for the railway overbridge and associated ramps, and the Hobson Bay Bridge, which will both have a design working life of 100 years.
- Terrain factors for wind loading in accordance with AS/NZS 1170 will be generally Terrain Category 2 (i.e. open terrain grassland) except for Hobson Bay and Orakie Basin which will be Terrain Category 1.5 (i.e. Open Water Surface).
- The bridge structures are required to provide a 4.5 m clear width between and edge kerbing or handrails.
- Standard handrails 1.4 m high and with openings no larger than a 100 mm will be provided along each side of the bridge. This form of handrail will be increased to 1.8m on the elevated bridge and rail over bridge.

14 Preliminary Land Requirement Plans

No land requirement plans have been produced, however it is recommended to formalise the existing informal access point opposite 57 Felton Mathew Avenue. NZTA are currently undertaking negotiations with the landowner with a view of purchasing land to create an access. However as a result of encroachment by the property owner, there may be a land swap arrangement.

15 Planning Requirements

15.1 Relevant Planning Documents

Below is a brief assessment of the relevant sections of the statutory planning documents that apply to the proposal. .

15.1.1 Auckland Regional Policy Statement

It is considered that this proposed shared path is consistent with the objectives and policies of the Auckland Regional Policy Statement. For example:

Objectives 4.3

> *"1. To avoid, remedy, or mitigate the adverse effects of transport on the environment and, in particular:...*
>
> *(ii) to reduce the need for the transport system to use non-renewable fuels;...*
>
> *2. To develop a transport network which enables all sections of the community to gain access to community resources.*
>
> *3. To develop a transport network which provides an acceptable level of accessibility between important activity areas.*
>
> *4. To develop a transport network which is as safe as is practicable."*

15.1.2 Operative Auckland City District Plan 1999 – Isthmus Section

The proposal area, falls within the jurisdiction of Auckland City Council and the Operative Auckland City District Plan 1999 – Isthmus Section. The proposal area is within the AT designation for the Eastern Corridor (D14 05) and the Kiwi Rail designation - but has a range of underlying zonings.

Section 1

Zones under the Operative District Plan
Residential 6a and Business 4
Residential 6a
Open Space 3

Section 2

Zones under the Operative District Plan
Residential 6a (near Rail station _
Special Purpose 3 - Transport Corridor (rail designation)
Open Space1 , 2 and 4(Purewa Cemetery)
Purewa Road

Section 3

Zones under the Operative District Plan
Special Purpose 3 - Transport Corridor (rail designation)
Open Space 2 and 3(Orakei Peninsula)
Orakei Road
Mixed Use – Orakei Point

Section 4

Zones under the Operative District Plan
Special Purpose 3 - Transport Corridor (rail designation)
Open Space 3 (Outboard Boating Club hardstand)
Tamaki Drive

The proposal is consistent with activities anticipated in the road, the open space zones (subject to rules related to earthworks and removal of vegetation) and the Special Purpose 3 zone where any

facility designed primarily for the movement of people and/or goods is permitted . The pathway is a non- complying activity in the Residential 6a and Business 4 zones.

The proposal is also considered to be consistent with the Transport objectives and policies of the District Plan. For example:

Objective 12.3.1 – *"To manage the use and development of the City's transportation resources in a way that promotes the protection and enhancement of the City's environment"*

Policy –

- *"By supporting and promoting a transportation system designed and managed to encourage the efficient use of energy."*

Objective 12.3.2 –

- *"To improve access, ease and safety of movement within the City, while ensuring that adequate provision is made for the various transport needs of the region"*

Policies –

- *"By providing new roads or other facilities where these are considered essential.*
- *By enhancing public and personal safety through reducing opportunities for crime to occur through appropriate design and management of transportation facilities."*

15.2 Resource Consent Requirements

Although the proposal area is largely located within AT's existing designation it is considered that a new Notice of Requirement would be a suitable mechanism for the development of the proposed shared pathway as relying on the underlying zoning would require a range of resource consents in the Residential and Business zones where the activity is a non- complying activity . In addition under the district plan consent would be required for:

- Land use consent for earthworks as a Controlled Activity pursuant to Rule 4A.2B of the Operative Auckland City District Plan 1999 – Isthmus Section.
- Land use consent for the removal of, and works within the dripline of, trees as a Restricted Discretionary Activity pursuant to Rule 5C.7.3.3C of the Operative Auckland City District Plan 1999 – Isthmus Section as part of the route falls on land that is not 'urban enviuroinment' .
- Land use consent for structures as a Controlled Activity pursuant to Rule 10.7.3.1 of the Operative Auckland City District Plan 1999 – Isthmus Section.

The following regional consents may be required:

Consent Type	Activity	Activity Status	Relevant Regional Plan Rule
Land use consent (s9(1) RMA	Disturbing the soil of a piece of land with concentrations of contaminants above standards – area known for asbestos	Restricted discretionary activity	NES-CS Regulation 1010
Discharge permit (s15 RMA)	Discharge of contaminants from land containing elevated levels of contaminants that is undergoing remediation or land disturbance	Controlled Activity - To remain a controlled activity the activity must meet the controls of Rule H4.5 (2.2.2), which are that the Council must have been provided with a Detailed Site Investigation report and a Remedial Action Plan	ARP:ALW Rule 5.5.44
Discharge permit (s15 RMA)	Discharge of contaminants from disturbance or remediation of land containing elevated levels of contaminants	Controlled Activity-	PAUP Rule H4.5 (2.2.1)
Land use consents (s9(2) RMA)	Earthworks greater than 0.25 hectares in area within the sediment control protection area (i.e. within 50m of the watercourse)	restricted discretionary activity	ARP:SC Rule 5.4.3.1
Water permit (s14 RMA) and land use consent (s13 RMA)	Proposed culvert greater than 30 metres in length (measured parallel to the direction of water flow) and has a diameter greater than 900 mm[11].	restricted discretionary activity	ARP:ALW Rule 7.5.9
Water permit (s14 RMA) and land use consent (s13 RMA)	Structure in stream may be permitted but if can't comply with standards consent required	Permitted/ Restricted discretionary activity	PAUP H, 4, 4.13 – Rivers. Activity 2.5

[10] The NES-CS is a National Environmental Standard which applies to any designation under section 9(1) of the RMA. The NES-CS applies to any 'piece of land' described in regulation 5, which, in summary, is land where a hazardous activity or industry is likely to have taken place – unless sampling shows that there is no significant contamination.

[11] ALWP, Chapter 7, Rule 7.5.9, page 24. Other than as provided for by Rules 7.5.2 to 7.5.6 and 7.5.8.

Land use consent (s9(2) RMA)	'Network utilities and road networks earthworks greater than 2500m2 and 2500m3	Permitted if meets general permitted activity controls; if not then restricted discretionary activity	PAUP Rule H4.2 (1.1)
Land use consent (s9(2) RMA)	Earthworks in the 100 year ARI flood greater than 50m	restricted discretionary activity	PAUP Rule H4.2 (1.2)
Land use consent (s9(2) RMA)	The use of land for impervious area (flow)	Restricted discretionary activity	PAUP Rule H4.14 (2.1)

15.3 Building Consent Requirements

Building consents required for retaining walls, structures which have a surcharge and cycle/pedestrian bridge will be sought from Auckland Council once the advanced design has been completed.

16 Conclusion

The proposed scheme provides the best solution given the topographical and environmental constraints. It meets the objectives of a cycle metro route and provide a high standard facility that will encourage an increase in walking and cycling.

The proposed scheme conforms with the strategic and policy positions contained in the Land Transport Management Act 2003, the Government Policy Statement, the National Land Transport Programme, the Auckland Regional Transport Strategy and the Auckland Regional Land Transport Programme.

The proposed path has been evaluated in accordance with the full walking and cycling procedures in the NZ Transport Agency Economic Evaluation Manual. The economic analysis has determined a BCR of 3.6 for the proposed scheme and therefore the project is considered economically viable for NZTA funding.

This project is recommended to be progressed to the detailed design stage.