



Rail Level Crossing Grade Separation Feasibility Study
Final Report – Volume 1

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Appendices

Appendix A

Level Crossings information

Appendix B

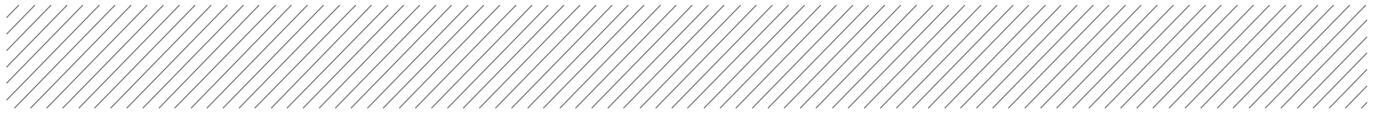
FE Summaries

Appendix C

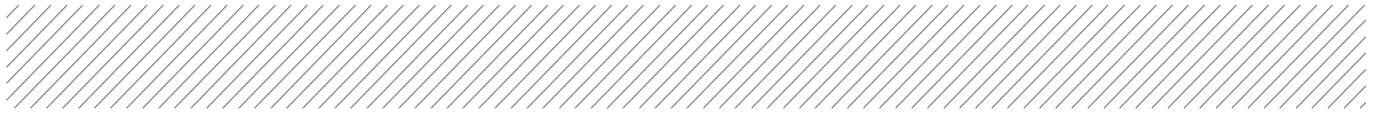
Concept Drawings – See Volume 2

Appendix D

Planning Related information



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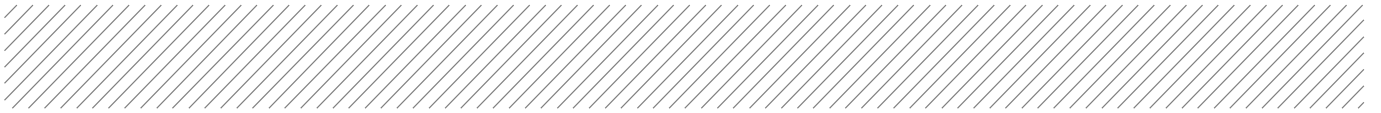


Executive summary

TBC with AT

Key messages

TBC with AT



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1 Introduction

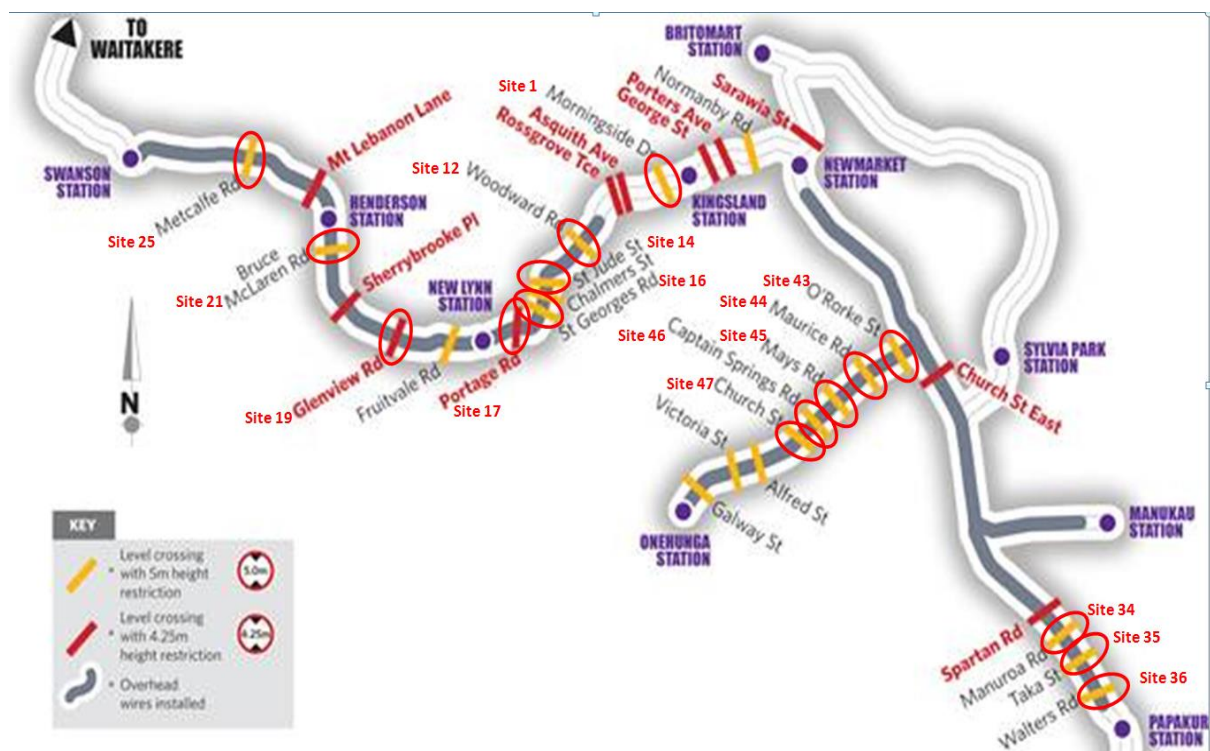
1.1 Background

AT has initiated an investigation into the feasibility of the removal of all of the 31 public at-grade rail road level crossings within the Auckland metro train area (Papakura to Swanson). Removal of each rail road level crossing would constitute either the closure of the crossing to road vehicles (provision would be investigated for a grade separated crossing for pedestrians and cyclists) or the grade separation of the level crossing.

AT had made an initial assessment of all 31 level crossings and identified those where closure of the road connection across the level crossing could be feasible, primarily from a road network operations perspective. Ten level crossing locations were identified as *potential* closure candidates and a further five locations noted as *possible* closure candidates. Further work is being undertaken by AT to test these initial assessments.

Of the 31 rail road level crossings assessed, the remaining 16 locations have been identified as likely requiring grade separation to facilitate the removal of the current at-grade facility.

This **Rail Level Crossing Grade Separation Feasibility Study** (The Study) has assessed these 16 locations, circled on map 1 and listed in table 1 below.



Map 1 – level crossing locations

Site	AT Project ID	Crossing Name	KRN Line	Kmage
1	NAL – W – 06	Morningside Drive	NAL	12.80
12	NAL – W – 11	Woodward Road	NAL	15.80
14	NAL – W – 13	St Jude Street	NAL	17.40
16	NAL – W – 15	St Georges Road	NAL	18.23
17	NAL – W – 16	Portage Road	NAL	18.88
19	NAL – W – 18	Glenview Road	NAL	22.43

21	NAL – W – 20	Bruce McLaren Road	NAL	25.55
25	NAL – W – 23	Metcalfe Road	NAL	29.50
34	NIMT – S – 07	Walter Road	NIMT	649.19
35	NIMT – S – 08	Taka Street	NIMT	650.38
36	NIMT – S – 10	Manuroa Road	NIMT	650.89
43	OBL – 01	O'Rorke Road	OBL	0.59
44	OBL – 02	Maurice Road	OBL	1.03
45	OBL – 03	May Road	OBL	1.89
46	OBL – 04	Captain Springs Rd	OBL	2.13
47	OBL – 05	Church Street	OBL	2.23

Note: NAL - North Auckland Line, NIMT - North Island Main Trunk, OBL - Onehunga Branch Line

Table 1: 16 Sites Assessed

, The output of this feasibility study will be used to inform the business case for progressing with any grade separation initiatives and, following approval to proceed, the development of a grade separation programme. This is a high level assessment intended to inform decision making only. Further work will be needed to provide a more detailed review to understand the safety, operational and system impacts of each level crossing on both the rail and road networks.

The Study summarised in this report has been undertaken in two phases:

Phase One:– Pilot study of 3 level crossings assessment (completed in July 2013)

Phase Two:- The remaining 13 level crossing sites using the agreed methodology derived in Phase One.

All of the level crossings included within the Study are public road crossings which consist of a vehicle crossing with at least one pedestrian crossing alongside.

Phase One included development of the assessment methodology including the detailed assumptions underpinning the infrastructure, property requirements and impacts, constructability, cost estimates and key site specific aspects important in consideration of possible options. Following agreement of the methodology and assumptions, assessments were undertaken on three pilot locations (St Judes, Morningside and Bruce McLaren).

1.2 Scope of Works

. The Study has included the development of a simple, consistent approach to assessing the feasibility of grade separating an existing public at-grade road level crossing, ensuring that the methodology is robust and able to meet AT's goals and objectives. The Scope of works for the Study was as follows:

- Site assessment for three pilot level crossing sites. The three pilot sites were collaboratively chosen with the AT project team. These sites were:-
 - **Morningside Drive (Site 1)**
 - **St Jude Street (Site 14)**
 - **Bruce McLaren Road (Site 21)**
 -
- Develop a template solution for each of the following three grade separation treatment options:
 - i. Road bridge over rail on existing road alignment with the railway retained at its current level (Road Over)
 - ii. Rail trench under road with the road retained at its current level (Rail Under)
 - iii. Hybrid of i and ii consisting of partial raising of road and lowering of rail to achieve required train clearance beneath road bridge.

For the template solution for each option develop a list of key design assumptions.

- Develop plans showing road over, rail under and a hybrid option showing the extent of infrastructure, services relocations, property access adjustments and an assessment of properties required to be purchased.
- Develop an assessment of the benefits and challenges associated with the options developed for each site.
- Develop an indicative preliminary budgetary cost estimate for each option.
- Deliverables of the study included a site assessment of each current level crossing location which consisted of the following:
 - Crossing layout
 - Surrounding land use
 - Future planned developments that may affect the crossing
 - Approach road type and traffic volumes
 - Daily train volumes (passenger and freight)
 - Known level crossing issues
 - Major overhead and underground services
- Level crossing grade separation options

It was agreed with the AT project team at the commencement meeting of the 12th June 2013 that a simple robust assessment methodology be developed and used consistently for all sites to ensure that the goals and objectives are met.

The agreed assessment methodology for each site is outlined below:

1. Review of each site using Auckland Council GIS system
2. Review KRN S&I diagrams to confirm the crossing locations
3. Obtain existing rail alignment from KRN. If unavailable, the rail alignment was assumed to be based on the available GIS information
4. The road alignment was assumed to be based on available GIS information
5. Overlay the existing road and rail alignments to establish the level crossing profile
6. Develop three options for consideration as follows.:
 - **Option 1:** Road Over
 - **Option 2:** Rail Under
 - **Option 3:** Hybrid of Road over and Rail under (note this was only developed if both options 1 and 2 were shown to be feasible)
7. Produce a plan showing option footprint and extent of property required.
8. Review options with AT project team and agree which to complete assessment work and produce cost estimates for, and which to park due to insurmountable issue making option unfeasible.
9. Complete assessment and develop cost estimates for options above as agreed with the AT project team
10. Apply visual and access impact lines to assess the extent of the infrastructure intrusion on the adjoining properties.
11. Identify property requirements including those required to enable construction of rail trench.

1.3 Options Assessment Criteria

Option assessments at each level crossing site for each of the three options were undertaken using the following criteria:-

- On-line impacts to existing highway alignment and rail alignments,
- Other impacts beyond the level crossing to the highway and rail alignments,
- Impact to adjacent properties
- Construction disruption, costs and likely duration.

Each option for each site was rated with High (H), Medium (M) or Low (L). The rating was derived to simply rate the impact, in a simplistic manner, together with highlighting areas that should be further considered at a later stage. From the rating a preferred option and a second best option were determined..

A note section has been included to highlight possible challenges and potential alternatives that may be worthwhile considering in future stages of the project. It also notes any options considered unfeasible and discounted from the Study.

The assessment includes indicative costs. This is to illustrate the cost difference between options as well as the overall budget requirement to deliver the option. The cost estimate includes property costs (as provided by AT). It is noted that these costs are indicative only and based on high level initial design assessment using specific constraints and assumptions, and is appropriate to inform AT's initial level crossing removal budget and programme requirements.

1.4 Reference Materials

The following were received from AT and other sources, which form the basis of this study.

Material Description	Date/ Rev	From / Notes
Acts and Regulations		
Local Government Act	1974	
Railway Act	2005	
Standards		
Auckland Rail Station Development Guide		AT
Traffic Control Device Manual Pt9 Level Crossing		NZTA
KRN Track Code T003		KRN Wellington library
KRN Track Code T100 and Code Supplements		KRN Wellington library
KRN Track Code T200		KRN Wellington library
KRN W201 Rail Bridge Design Brief		KRN Wellington library
KRN W605 Road Over Rail Bridge		KRN Wellington library
KRN S&I Diagram		KRN Wellington library
Part 4: Intersections and Crossings - General		Austraods
Track information		
KRN S&I Diagram		KRN Wellington library
Records		
Traffic counts		AT
Reports, Plans		
Railway Level Crossing Study	2004	AT/Opus
Level Crossing – Road Traffic Impact Assessment	2006	AT/Opus
Rail Level Crossing – Pedestrian Counts	2013	AT/Gravitas
CRL Network Wide Rail Operational Issues	2013	AT/Aurecon
Others		
Bus routes / Time Table		MAXX Web Site

Material Description	Date/ Rev	From / Notes
Rail Time Table		MAXX Web Site
Over Height/Weight Vehicle Routes		NZTA Web Site
Height Restrictions for Level Crossing in Auckland		KiwiRail

Table 2: Key reference used in this Study

1.5 Limitation of this Report

This Study was developed in conjunction with the AT Project Team to establish a feasibility reporting template for the removal of rail level crossings and a proposed methodology with which to assess the merits of potential options.

The report developed presents some possible solutions to be considered for each of the level crossing sites. There may be further options at each site (outside of the Study project scope) that are more appropriate that should be investigated as part of further work into grade separation. The identified generic construction costs are also presented. These costs have not been developed for individual sites but rather developed to assess possible costs for each option identified. The construction cost template has been designed to enable scheduled items to be easily updated as part of future assessment work. It was not the intention of this study to derive site specific cost estimates beyond that required for indicative budgetary purposes.

2 System Wide Assumptions & Caveats

2.1 Road Geometric Assumptions

A number of geometric assumptions pertaining to the road design have been developed and agreed with the AT Project. The road geometric assumptions are presented in the following table. These project design parameters have been used to develop the concept options. Individual site specific requirements have necessitated some assumptions to be revisited; these are highlighted in the assumptions for each site.

Item	Assumption
Road Maximum Grade	5%
Property Access From Road Maximum Grade	1/8 (12.5%)
Road Bridge Width	2 Lanes general traffic lanes 3.5m each
	Cycle lane either side of road 1.5m each
	Pedestrian Either side of Cycle way 2.0m each Total clear width 14m
Road Bridge Vertical Clearance to track	1.4m (bridge deck + topping)
	6.5m road to rail separation
Road Bridge (Horizontal Clearance)	Total clear span 10m (also see 2.2 below)
Parking	No parking on grade separated road corridor
Oversize Vehicle Allowance	Accommodate 10m by 6m wide box load

Table 3: Assumptions relating to Road

2.2 Rail Geometric Assumptions

A number of rail geometry assumptions have been presumed for the purposes of this assessment. These assumptions have been agreed with AT and are presented in the following table. In some areas these standards have been adjusted to meet specific requirements of the site considered. These assumptions will need to be agreed before being used for any further investigative work.

Item	Assumption
Rail Maximum Grade	2% desirable (2.5% maximum) for freight¹
Rail Bridge Width	Assume 2 track layout 3 m wide 4 m clearance Total clear width 10m
Rail Bridge Vertical Clearance	5.5m clearance rail to soffit
	1.3m (bridge deck + track)
	6.8m track to road separation
Rail Bridge Horizontal Clearance	Total clear span 14m
Platform Length Minimum	150m (assuming loading platform)
	Assume longitudinal platform is level
Platform Gradient	1% maximum
Access To Stations	Assume combination of lift and stair
	Stair 2.2m wide
	Lift 3.5m wide
	Pedestrian waiting area on bridge 5m by 5m

¹ – maximum grade for EMU's is 4%

Table 4: Assumptions relating to Rail

2.3 Indicative Road Bridge (Typical Construction for Road over Rail Bridge)

The proposed solution for each Road over Rail option used in this Study is governed by the extent of the new bridge over the rail and road approaches along the existing road alignment and the railway operational requirements including rail station connectivity if required, during the construction and operational phases of the project. The following assumptions were presumed for each site:

- The bridge structure will carry the road cross section as stated in Section 2.1 of this document,
- The bridge structure will consist of single hollow-core deck units to the required deck width to provide a minimal deck thickness to minimise the extent of the road approach works,
- hollow-core units will be transversely post-tensioned together to allow load sharing,
- allowance for station connection will be provided on the bridge, if required,
- side protection will be as per NZTA requirement for the type of road and traffic on the bridge,
- the deck will be supported by reinforced concrete abutment headstocks on bored cast in-situ piles,
- approaches will be in the form of reinforced earth panel (or similar) retaining walls.

2.4 Indicative Rail Bridges (Typical Construction for Rail over Road Bridge)

The structural form and configuration for the rail over road bridges may vary from site to site, which will be influenced by the site constraints, construction methodology and programme, as well as operational requirements during the implementation phase of the project. The following assumptions were made to produce comparable options for each site:

- the superstructure will carry a ballasted track formation,
- it will consist of single hollow-core deck units to make up the required deck width,
- hollow-core units will be transversely post-tensioned together to allow load sharing,
- allowance for future provision of Maintenance walkways will be provided on both sides of the bridge but only a handrail will be installed,
- the superstructure will be supported on reinforced concrete abutment headstocks supported on bored cast in-situ piles,
- approaches retaining walls will either be bored pile retaining walls or post and panel retaining walls similar to those currently in use across the network.

2.5 Indicative Pedestrian Subways and Bridges

There are no pedestrian subways or bridges required for the three selected sites for The Study. However, for other sites where a pedestrian subway or footbridge may be required, basic space and cross sectional requirements should be based on the Auckland Rail Station Development Guide. For a subway, a 2.5m square structure in form of precast concrete box units should be appropriate, with approach retaining walls and ramps. For footbridges, the typical station bridge in the Auckland Rail Station Development Guide can be utilised as a template with either ramps or lifts to cater for the vertical transfer of mobility impaired persons.

2.6 Future Rail Development and Service Patterns

There are a number of rail related improvement and development projects either recently completed or being implemented, which may have major and immediate impact to the level crossing replacement project and should be considered with any subsequent studies. These projects could have a direct influence on the project definition requirement, general design philosophy and/ or specific construction methodology. These issues will require further discussion and guidance from the AT project team. The following table provides the list of current known key projects that will require further understanding with any future work.

No	Project	Principal	Date
1	Re-Signalling (complete)	KiwiRail	2010 – mid 2013
2	Electrification	KiwiRail	2010 – end 2014
3	Introduction of new Electric Rolling Stock	AT	2010 – mid 2016
4	Third Main – South of Otahuhu	KiwiRail	2011 – tba
5	DART Project	KiwiRail	Completed
6	Platform Extensions	AT	2014
7	Further station upgrades	AT	2014-tba

Table 5 – Existing projects that impact the outcome of the Study

The following table indicates some of the future projects that may impact on any design consideration with future work

No	Project	Principal	Date
1	City Rail Link	AT	tba
2	Airport Rail Line	NZTA	Uncommitted
3	SH1 to SH20 East and West Link	NZTA	Uncommitted
4	SH16 Upgrade	NZTA	Uncommitted
5	Duplication of Onehunga Line		
6	Onehunga and Avondale Rail Link		

Table 6 – Future projects that may impact the sites

The following table indicates possible future train demands (Train per Hour – TPH) through the crossings for each of the 16 sites. These were sourced from AT as provisional train frequencies. They are subject to change. AT should be consulted for the latest train plan frequencies.

Site	AT Project ID	Crossing Name	KRN Line	2016 TPH	2021TPH	2031 TPH
1	NAL – W – 06	Morningside Drive	NAL	12	21	26
12	NAL – W – 11	Woodward Road	NAL	12	21	26
14	NAL – W – 13	St Jude Street	NAL	12	21	26
16	NAL – W – 15	St Georges Road	NAL	12	21	26
17	NAL – W – 16	Portage Road	NAL	12	21	26
19	NAL – W – 18	Glenview Road	NAL	12	21	26
21	NAL – W – 20	Bruce McLaren Road	NAL	12	21	26
25	NAL – W – 23	Metcalfe Road	NAL	12	12	12
34	NIMT – S – 07	Walter Road	NIMT	15	18	18
35	NIMT – S – 08	Taka Street	NIMT	15	18	18
36	NIMT – S – 10	Manuroa Road	NIMT	15	18	18
43	OBL – 01	O'Rorke Road	OBL	4	6	12
44	OBL – 02	Maurice Road	OBL	4	6	12
45	OBL – 03	May Road	OBL	4	6	12
46	OBL – 04	Captain Springs Rd	OBL	4	6	12
47	OBL – 05	Church Street	OBL	4	6	12

Table 7 – Assumed Train Plan Frequencies

2.7 Preliminary Indicative Costs

The indicative cost for each site has been derived in accordance with NZTA's Cost Estimation Manual (SM14). These estimates are not intended as detail costs estimates for each option. Rather they should be considered as indicative rough order of costs for the purposes of providing an indication of

the quantum of investment required and for comparing options prior The cost estimates are in line with the level required of the design.

The indicative high level cost estimates (in Appendix B) detail the probable costs associated with the provision of infrastructure relating to the following:

- road over rail, ,
- rail under road,
- hybrid of these (assumed 50/50 combination of road over rail and rail under road)

It should be noted that costs may vary as the design process progresses through future pieces of work. As the design process progresses the constraints and conditions of each site will be better understood, and the costs able to better reflect these. In the course of this feasibility Study, the following cost assumptions have been made to reflect the current understanding of site conditions.

Item	Description	Assumption
Property Related Costs		
	Property Costs	The property costs are based on the Land Capital Values (LCV), which is derived from the Latest Land Values (LLV) and Land Improvement Values (LIV), which were supplied by AT, (Further assessment of these shall be carried out in future studies)
	Property cost for construction and temporary rail alignments ¹	Cost of Property required for the construction and temporary track alignments are allowed for Option 2 – Rail Trench and Option 3 - Hybrid. The principal of working spaces applied for the options are as indicated on the drawing XXXXX in Appendix C of this document
	Property acquisition agents fees	2.5% of transactions (for both purchase and disposal) values
Investigation and Reporting		
	consultancy fees	1.5% of Total Physical works & Contractor PG Cost
	AT managed costs	0.5% of Total Physical works & Contractor PG Cost
Design and project documentation		
	consultancy fees	3.5% of Total Physical works & Contractor PG Cost
	AT managed costs	1.0% of Total Physical works & Contractor PG Cost
Contingency and Funding Risk		
	Contingency	Due to the early nature of this study in the project life cycle, a 50% contingency on the base estimate has been included
	Funding Risk	Due the high level natural of the study, a funding risk assessment has not been done
Element Costs		
1.1	MSQA	3.0% of Total Physical works & Contractor PG Cost
1.2	AT-managed costs	1.5% of Total Physical works & Contractor PG Cost
1.3	Consent monitoring fees	1.2% of Total Physical works & Contractor PG Cost
2.1	Management of environmental compliance requirements	5.0% of Earthwork, ground improvement and drainage costs
2.2	Preparation and management of compliance managements plans	2.0% of Earthwork, ground improvement and drainage costs
3.1	Site Clearance, demolition	Allowed a Lump Sum of \$500,000 for the activities
10.1	AT cost of other authority and utility companies costs (after cost share) and contractors margins	Allowed a Lump Sum of \$1,000,000 (as a minimum) for the activities, and increased if the site was more complicated or in the city centre location
12.1	Temporary traffic diversions	Allowed a Lump Sum of \$150,000 (as a minimum) for the activities, and increased if the site was more complicated or in the city centre location

Item	Description	Assumption
12.2	Traffic management physical works costs	Allowed a Lump Sum of \$100,000 (as a minimum) for the activities, and increased if the site was more complicated or in the city centre location
13.1	Establishment, temporary site accommodation, disestablishment	5.0% of Total Physical works cost
13.2	Contractor's supervision	1.5% of Total Physical works cost
13.3	Overheads, insurances	12.5% of Total Physical works cost
13.4	Temporary works design and traffic management planning	1.0% of Total Physical works cost
13.5	Project plans, traffic management plans, environmental management plans, reporting	1.0% of Total Physical works cost
13.6	As-built requirements	0.5% of Total Physical works cost
14	Extraordinary construction costs – Rail works	Temporary track (and platform, where appropriate) related costs included for Option 2 and 3 ¹ , Blocks of Line, Network electrical isolation costs, etc.

¹ – based on the assumption that the rail network remains operational during construction requiring temporary realignment of tracks with possible property acquisition in areas where the existing rail corridor is not wide enough to accommodate the temporary track plus the construction area for the rail trench.

Table 8 – Cost Assumptions

2.8 Adjoining Properties Access Assumptions

A key output of the Study was to identify for each grade separation option which properties surrounding the level crossings would have their existing access compromised. To ascertain the affected properties, an assumed maximum gradient of 1 in 8 has been applied to the proposed design. Where an existing property access is impacted by a road bridge structure, a new site access of maximum 1 in 8 gradient was applied. This 1 in 8 gradient reflects what is considered acceptable grade to access the land/ property from the structure itself. Where a revised access of 12% was not achievable, alternative access was provisioned.

The new access ramp extends from the road bridge structure into the adjacent property to identify the area required to accommodate any revised access to the property. Yellow hatching on the drawings, Appendix C, associated with each proposed option presents the potential extent of any access ramp from the road bridge structure and accordingly identifies the potential properties that may be required to be purchased as part of the project to accommodate the design.

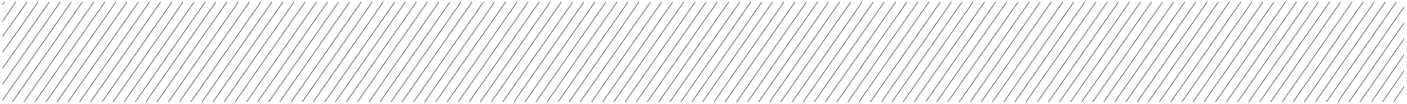
This is considered a highly conservative approach to identify the properties with affected access. Further investigation of specific sites would likely derive alternative access options. These alternative access options could be in the form of a newly provided access road running parallel to the proposed structure, or alternative access through other parts of the site.

Property purchase in the vicinity of each level crossing may provide an opportunity to redevelop an area to integrate the grade separated structure (bridge or rail trench) with surrounding development. This was discussed with the AT project team; future development options that integrate with grade separation will be investigated in subsequent phases of this project.

2.9 Property Purchase Assumptions

Where the existing property access is compromised by the proposed road bridge structure, acquisition of the property was assumed. This assumption generally captured the properties adjacent to the new grade separated road. This assumption does not include purchase of properties whose current access remains viable however the property is close to a new road bridge.

Delivery of the options listed in the Study assumes that the property is purchased, and the costs reflect the current value of the properties. If upgrade or development of any of the properties occurs this would likely impact both the ability to acquire the properties and the associated cost. It is



suggested that properties required to deliver each option be identified and properties secured to mitigate this risk.

2.10 Road Upgrade or Development

The scope of the Study did not include assessment of the impact of proposed network wide road upgrades or developments in and near the level crossings. These should be investigated and assessed as part of any future work.

2.11 Local Property Development

The scope of the Study did not include assessment of proposed future development in the vicinity of the level crossings. The study has assumed that the adjacent land uses will be as presently identified in the Council's District Plan.

Any significant development in the vicinity should be identified and implications of this on the individual site investigated. These implications would include to traffic generation, site access and how the development would integrate with the proposed road bridge structure .

3 Site 1: Morningside Drive

Road Name:	Morningside Drive (01)	Control Type	KRN Line:	NAL
Project ID	NAL-W-06	(As in TCDM Part 9:Section 6)	Km'age:	12.80
Xing Name:	Morningside Drive Ped Dn	Active/FLBs ¹ (Veh Control)	KRN S&I:	2993
	Morningside Drive	Active/FLBs & HABs ²	Nos of Track	3
	Morningside Drive Ped Up	Active/FLBs (Veh Control)	Nearest Stn:	Morningside

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

3.1 Site Description

The existing Morningside Drive level crossing is located in the Albert – Eden Local Board area, and is 12.8km from the start of North Auckland Line (NAL), adjacent to the Morningside Rail Station. This section of Morningside Drive is bounded by New North Road (70m) to the north and McDonald Street (65m) to the south. The 12.5m wide existing road carriageway is flanked by two 3.5m wide footways and berms which lead to the vehicular level crossing and separate pedestrian level crossings on both side of the road. The road alignment is relatively flat along the length. Morningside Drive is classified as a **collector road** and carries local bus services. The neighbouring area is surrounded by commercial properties with high density private dwellings situated to the south west corner of the crossing. Both commercial and residential properties have direct access onto Morningside Drive via either commercial or residential road vehicle crossings.



Photo 1: Morningside Drive crossing looking eastward

There are three railway tracks (up, down and siding approach roads) crossing over the existing level crossing. The Morningside Station has a 150m long island platform on the western side of the crossing. The platform is accessed by a pedestrian underpass at the western end from New North Rd, and by a pedestrian level crossing (Ped up) at the eastern end of the station. The railway comes out from a small cutting to the east into an embankment after the station to the west, which leads onto rail over road bridges (38A and 38B) that pass over New North Rd 800m from the level crossing at NAL chainage 13.5km.

During large crowd events at Eden Park Kingsland Station is used as stage event trains to the west and back to Britomart. To facilitate efficient expedient loading of trains post event, trains are stacked back to the west of Kingsland station and occasionally require the closure of the level crossing to accommodate queued trains.

3.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 12.5m wide carriageway width 2 x 3.5m wide footway and berm 70m to a major intersection with New North Road 46 degree skew to the rail 5.0m height restriction for OLE 	<ul style="list-style-type: none"> Collector Road carrying 7,274 (AADT) Bus route 220, 221, 222, 223 and 224 1,198 pedestrian movements per day (825 peak) On street parking on approaches
Rail	<ul style="list-style-type: none"> gradient of 1.2% located west of the Station no vertical curves within station and siding area/stabling yard Path and ramp link to east end of the platform, the platform end will require widening for lift and stair 	<ul style="list-style-type: none"> Close proximity to the Morningside Station 3 tracks layout from east at crossing then into 4 tracks to the west after crossing Junction and track works for the stabling yard Freight traffic uses this section of track

From	Infrastructure Constraints	Operational Constraints
	<ul style="list-style-type: none"> to connect to a road bridge Kingsland Station 120 m west of the crossing Rail bridges 700m west of the crossing, any lowering would likely require lowering of New North Rd Station underpass from western end of platform 	
Properties	<ul style="list-style-type: none"> Large commercial units to the NW, NE and SE Large high density residential unit to the SW 	<ul style="list-style-type: none"> Vehicle property accesses from commercial and residential units
Services	<ul style="list-style-type: none"> Overhead electricity wire 150 Sewer under western footpath 100 water main under western footpath 	<ul style="list-style-type: none"> Height restriction from the electrical overhead wire 5.0m
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 9 – Specific Site Constraints – Morningside Drive Level Crossing

3.3 Grade Separation Site Specific Assumptions

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing (50km/hr) 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 10 – Specific Assumptions – Morningside Drive Level Crossing

3.4 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Long Section - Road Over Rail					Long Section - Rail Under Road					Long Section - Hybrid Option				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	200	20	30	110	90	400	230	30	240	200	100	20	30	20	80
H	5.5	6.5	6.4	1.9	--	4.0	6.3	6.4	5.5	--	2.9	3.7	3.6	2.9	--
W	15	14	14	14	14	10	23	23	23	10	14	14	14	14	14
G%	5.0	5.0	--	--	--	2.5	2.2	--	--	--	5.0	5.0	--	--	--
L'											280	30	15	180	130
H'											2.6	2.6	2.8	2.9	--
W'											10	23	23	23	10
G'%											2.0	2.4	--	--	--
On Line Impacts															
On Road	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L

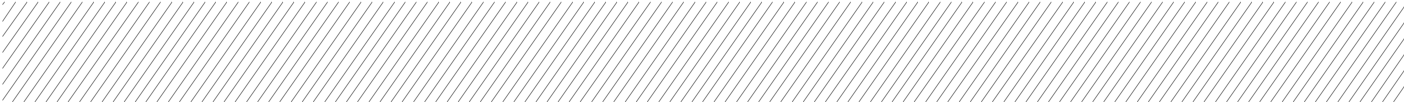
Option	1			2			3		
Alignment	Elevated road will impact to driveways and adjacent streets			As existing			Elevated road will impact to driveways and adjacent streets		
On Railway Alignment	H	M	L	H	M	L	H	M	L
	As existing			W2, W3 & W4 (width allowed for NAL up & down mains, plus additional sidings) high			W2, W3 & W4 (width allowed for NAL up & down mains, plus additional sidings) high		
Other Area Impacts									
On Road Infrastructure	H	M	L	H	M	L	H	M	L
	Elevated road will require elevation of New North Road intersection			Rail over Road Bridge BR 38A&B west across New North Road required to be at lower level; New North Rd also would require lowering ^{2 and 3}			None		
On Railway Infrastructure	H	M	L	H	M	L	H	M	L
	New station access at east end to new road level with lift and stair			New station platforms and accesses for both ends to street level with lift and stairs			New station platforms and accesses for both ends to street level with lift and stairs		
Impacts on Others									
Adjacent Properties	H	M	L	H	M	L	H	M	L
	A number of properties required for the alignment			A number of properties required for temporary rail alignment			A number of properties required for temporary rail alignment and final road levels		
Impacts from Construction									
Complexity & Disruption	H	M	L	H	M	L	H	M	L
	Temporary level crossing and railway closures will be required			Managed disruption to rail services and temporary bridge for highway traffic			Managed disruption to rail services and temporary bridge for highway traffic		
Costs	H	M	L	H	M	L	H	M	L
Construction		■			■			■	
Property		■			■			■	
Total		■			■			■	
Likely Duration	H	M	L	H	M	L	H	M	L
	8 to 12 Months			12 to 24 Months			Over 24 Months		
Other Issues									
1	The future training services pattern and proposed CRL will have major effect to the operation of this level crossing								
2	Option 2 exceeds maximum grade on the eastern approach to the Crossing. To gain a complying grade Kingsland station will need to be lowered								
3	At the Western end the track is not able to rise out of the ground fast enough not to compromise the New North Rd Underpass Bridge.								
4	The implementation of the grade separation should be coinciding with the station and area wide development to provide better economic returns.								

Table 11 – Output Summary for Morningside Drive Level Crossing

3.5 Road & Rail Considerations

Option 2, rail under road, is shown to exceed maximum grade on the eastern approach to the level crossing. To gain a complying grade to the east, Kingsland station would need to be lowered. To the west, bringing the track back up at the maximum allowable grade would still require the rail bridge over New North Rd to be lowered with a consequential requirement to lower New North Rd. These points should be better understood during the next stage of option assessment.

The level crossing on Morningside Drive is in close proximity to the New North Road signalised intersection (70m). In order to provide sufficient clearance and maintain the assumed maximum 5%



gradient, the road alignment of New North Road is required to be raised. In total a 325m section of New North Road will need to be raised, in some sections as much as 2m across.

Additional constraints to be considered in a future assessment of the site include potential access to both McDonald Street and Taylors Road.

4 Site 12: Woodward Road

Road Name:	Woodward Road (12)	Control Type	KRN Line:	NAL
Project ID	NAL-W-11	(As in TCDM Part 9:Section 6):	Km'age:	15.80
Xing Name:	Woodward Road Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&I:	3024
	Woodward Road	Active/FLBs ¹ & HABs ²	Nos of Track	2
	Woodward Road Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Mt Albert

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

4.1 Site Description

The existing Woodward Road level crossing is located in the Albert-Eden Local Board area, at 15.80km from the start of North Auckland Line (NAL) and approximately 400m to the Southwest of Mt Albert Station. The crossing is 70m northeast from the intersection of Woodward Road, New North Road and Richardson Road, and 60m southwest of Fersey Ave (a residential street). The 9m wide existing carriageway is flanked a 3.5m wide footway and wide grass berm on each side of the road. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. The highway alignment is relatively flat at and either side of the crossing (rises to 2% at the Woodward Road, New North Road and Richardson Road intersection). The rail alignment from Mt Albert station is almost flat to the crossing then increases down the slope to approximately 1.6%.



Photo 2: Woodward Road crossing looking southward

The road is classified as a **district arterial** and is a designated overweight and over dimension route.

The area to the north is residential, to the south west a combination of residential and corner commercial retail units and the south east corner houses a petrol station. There are a number of commercial and residential vehicle access ways off Woodward Rd. There are 2 tracks (up and down NAL) crossing over Woodward Rd.

4.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 9m wide carriageway width 2 x 3.5m wide footway and berm 70m to a major intersection with New North Road and Richardson Road 60m to a minor intersection with Jersey Ave 46 degree skew to the rail 5.0m height restriction for OLE 	<ul style="list-style-type: none"> District arterial road carrying 11,474 (AADT) Oversize and overweight vehicles route No current bus routes use crossing On street parking on approach 722 Pedestrian movements per day (430 peak)
Rail	<ul style="list-style-type: none"> gradient of 1.6% located south of the crossing . gradient of 0% located north of the crossing two tracks layout The eastern approach is governed by the location of Mt Albert Station The western approach is limited by the possible proofing for the South Down Line junction 	<ul style="list-style-type: none"> Close proximity to the Mt Albert station Freight trains uses this section of track
Properties	<ul style="list-style-type: none"> Surrounded by residential units Petrol station located on the southeast corner 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial and residential units
Services	<ul style="list-style-type: none"> Overhead electricity wire 100/200 water mains under western side footpath Fibre optic cable along northern side of railway 	<ul style="list-style-type: none"> TBC

	line <ul style="list-style-type: none"> 840 water main under crossing and the intersection 	
Others	TBC	TBC

Table 16 – Specific constraints for Woodward Road Level Crossing

4.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 7% Road Road/Rail separation 6.5m (road over) Speed as existing (50kph) 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private drive gradient 12.5% (1 in 8)

Table 12 – Specific Assumptions –Woodward Road Level Crossing

4.4 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	360	140	30	125	240	250	90	30	80	200	180	140	30	125	120
H	5.9	6.8	6.8	3.1	--	5.7	6.7	6.1	4.0	--	3.0	3.4	3.5	1.6	--
W	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
G%	5.0	5.0	--	--	--	2.5	0.8	--	--	--	5.0	5.0	--	--	--
L'											200	90	30	80	150
H'											2.3	3.7	3.3	2.0	
W'											10	10	10	10	10
G'%											2.5	0.5	--	--	--
On Line Impacts															
Ex Highway Alignment	H	M	L	H	M	L	H	M	L						
	Elevated road will impact to driveways and adjacent streets Elevated road requires either a raised connection with Jersey Ave or the closure of Jersey Ave/Woodward Rd junction					As existing					Elevated road will impact to driveways and adjacent streets Does this option impact on Jersey Ave???????				
Ex Railway Alignment	H	M	L	H	M	L	H	M	L						
	As existing					The alignment will provide a road / rail separation of 6.5m and has to tie back in before the Mt Albert Station and the future Southdown Line Junction					The alignment will provide a road / rail separation of 6.5m				

Option	1			2			3		
Other Area Impacts									
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L
	Tie in of the elevated road will go through and beyond the New North Road intersection Elevated road requires either a raised connection with Jersey Ave or the closure of Jersey Ave/Woodward Rd junction			None			Tie in of the elevated road will just end within the New North Road intersection		
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L
	None			Future design needs to consider the tie in alignment with the Southdown Line			Future design needs to consider the tie in alignment with the Southdown Line		
Impacts on Others									
Adjacent Properties	H	M	L	H	M	L	H	M	L
	A number of properties required for the alignment including Jersey Ave.			A number of properties required for temporary rail alignment			A number of properties required for temporary rail alignment and final road levels		
Impacts from Construction									
Complexity & Disruption	H	M	L	H	M	L	H	M	L
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic		
Costs	H	M	L	H	M	L	H	M	L
Construction	■			■			■		
Property	■			■			■		
Total	■			■			■		
Likely Duration	H	M	L	H	M	L	H	M	L
	8 to 12 Months			12 to 24 Months			Over 24 Months		
Other Issues									
1	The future train service pattern and proposed CRL will require further consideration once known								
2	Future design should consider any future tie in with the Southdown Line Alignment								
3	Alternate locations for grade separated crossing should be included as part of future study								
4	Closing of Jersey Road (i.e. divert traffic to Harbutt Ave) could potentially reduce the direct impact to individual properties along the Road								

Table 13 – Output Summary for Woodward Road Level Crossing

4.5 Road & Rail Considerations

The existing alignment of Woodward Road is a two lane two way road of straight alignment, traversing in a north-south direction, with a major intersection located 70m to the south of the crossing (New North Road). A minor intersection with Jersey Ave is 60m from northern side of rail tracks. Both intersections are required to be raised 2.0m and 6.5m, respectively. This is required to enable Woodward Road to pass over the rail tracks with a minimum 5.5m clearance from track to underneath of the road bridge with a maximum road vertical gradient of 5%.

The rail alignment for the option 2 is restricted by the location of Mt Albert Station platforms and the possible junction of the future Southdown Line.

5 Site 14: St Jude Street

Road Name:	St Jude Street (14)	Control Type	KRN Line:	NAL
Project ID	NAL-W-13	(As in TCDM Part 9:Section 6):	Km'age:	17.40
Xing Name:	St Jude Street Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&I:	3024
	St Jude Street	Active/FLBs ¹ & HABs ²	Nos of Track	2
	St Jude Street Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Avondale

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

5.1 Site Description

The St Jude Street level crossing is located in the Whau Local Board area and is at 17.4km from the start of North Auckland Line (NAL), adjacent to the Avondale Rail Station. This section of St Jude Street is bounded by the Great North Rd/Wingate St/Saint Georges Rd intersection (150m) to the west and the Blockhouse Bay Road/New North Rd/Crayford St intersection (250m) to the northeast. The 12.5m wide existing carriageway is flanked by two 3.5m wide footpaths and berms which lead to the vehicular level crossing with both pedestrian level crossings set back from the carriageway. The highway alignment is relatively steep grade at 8% (east to west).



Photo 3: St Jude Street Crossing looking westward

St Jude Street is classified as **district arterial** and is designated as an oversize and overweight vehicles route. It is surrounded by residential dwellings, with high density 4-storey residential complex situated to the south west corner of the crossing. There are residential property access onto St Jude St.. Both Donegal Street and Layard Street are adjacent to the crossing.

There is a local retail area at the bottom of St Jude St. St Jude Anglican church is 50m northeast of the level crossing.

There are railway tracks (up and down) crossing over the existing crossing. The Avondale Station has two 150m long side platforms and is 90m north of the crossing. The platform is accessed by a ramp and steps with pedestrian level crossing to the north end and by a pedestrian rail level crossing (Ped up) at the southern end which also serves as the St Jude St footpath crossing. The railway grade is from a steep incline (2.6%) and comes out into a small cutting at the station.

5.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 12.5m wide carriageway width at the level crossing 2 x 3.5m wide footway and berm Two major intersections within 300m radius 46 degree skew to the rail on radius Steep gradient over the entire length of the road Layard Street is adjacent to the crossing and behind the down platform 5m height restriction for OLE 	<ul style="list-style-type: none"> District arterial road carrying 19,812 (AADT) 426 pedestrian movements per day (310 peak) Oversize and Overweight vehicles route No current bus routes use road On street parking on approach
Rail	<ul style="list-style-type: none"> A gradient of 2.6% located west of the Station two tracks layout with platform grade at 1% path and ramp link to south end of the platform 	<ul style="list-style-type: none"> Close proximity to the Avondale Station Close proximity of the Chalmers St Level Crossing Close proximity of the Avondale pedestrian crossing Freight trains uses this section of track

From	Infrastructure Constraints	Operational Constraints
Properties	<ul style="list-style-type: none"> Large apartment units to the SW Residential units surround the site 	<ul style="list-style-type: none"> Driveway accesses from commercial and residential units
Services	<ul style="list-style-type: none"> Overhead electricity wire 150 Sewer under existing platform Telecom cable under eastern footpath 	<ul style="list-style-type: none"> Further clarification of services is required
Others	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A

Table 14 – Site Constraints for St Jude Street Level Crossing

5.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 12% Road Road/Rail separation 6.5m (road over) Speed as existing Consideration of sight safe stopping distance 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Property access gradient 12.5% (1 in 8)

Table 15 – Local assumptions for St Jude Street Level Crossing

5.4 Road & Rail Considerations

Due to the close proximity of St Jude Street to the Great North Road intersection, a steep gradient of 12% is required to achieve road over rail clearance. It is considered that this is a maximum gradient and that an iterative design exercise could reduce this. The design presented is considered a conservative approach.

5.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	140	30	30	30	80	460	250	30	--	340	70	50	30	30	40
H	5.9	6.7	6.0	4.4	--	7.3	7.1	6.5	6.5	--	2.9	3.1	3.5	3.5	--
W	12.5	12.5	12.5	12.5	12.5	10.8	18.6	10.8	10.8	--	12.5	12.5	12.5	12.5	12.5
G%	12.0	0.5	--	--	--	-2.1	1.0	--	--	--	12	0.5	--	--	--
L'											300	260	30	--	280
H'											3.6	3.4	3.0	3.0	--
W'											10.8	18.6	10.8	10.8	--
G'%											2.1	1.3	--	--	--
On Line Impacts															
Ex Highway	H	M	L			H	M	L			H	M	L		

Option	1			2			3		
Alignment	Elevated road will impact to driveways and adjacent streets The side road intersections of Donegal St, Geddes St and Layard St with St Jude St would all need to be closed to vehicle access (all join to other roads).			As existing			New highway will impact to driveways and adjacent streets		
Ex Railway Alignment	H	M	L	H	M	L	H	M	L
	As existing			New alignment will require extensive retaining walls on both sides of the rail corridor			New alignment will require extensive retaining walls on both sides of the rail corridor		
Other Area Impacts									
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L
	New highway will go beyond intersection to Great N Road			The new rail alignment will require the closure of the crossing at Chalmers St. Layard Street would need to be restricted or closed during construction. The Blockhouse Bay Road over Rail Bridge will need underpinning as the track needs to be lowered under the road bridge by 3.8m			Layard Street would need to be restricted or closed during construction		
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L
	New station access at west end to new road level with ramps will be required			New Station platforms and accesses for both ends to street level with lift and stairs			New Station platforms and accesses for both ends to street level with lift and stairs		
Impacts on Others									
Adjacent Properties	H	M	L	H	M	L	H	M	L
	A number of properties required for the alignment			A number of properties required for temporary alignment			A number of properties required for both final and temporary alignments		
Impacts from Construction									
Complexity & Disruption	H	M	L	H	M	L	H	M	L
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic		
Costs	H	M	L	H	M	L	H	M	L
Construction		■			■			■	
Property		■			■			■	
Total		■			■			■	
Likely Duration	H	M	L	H	M	L	H	M	L
	8 to 12 Months			12 to 24 Months			Over 24 Months		
Other Issues									
1	The new rail alignment will require the closure or grade separation of the level crossing at Chalmers St.								
2	The new rail alignment will require a new Avondale Station								
3	The new rail alignment will require the underpinning of Blockhouse Bay Road over Rail Bridge								
4	Layard St crossing and Avondale Station Entrance will be restricted and will require modification								
5	Instead of constructing individual access for adjacent properties, separated service road should be considered in the future design.								

Table 16 – Output Summary for St Jude Street Level Crossing

6 Site 16: Saint Georges Road

Road Name:	Saint Georges Road (16)	Control Type	KRN Line:	NAL
Project ID	NAL-W-15	(As in TCDM Part 9:Section 6):	Km'age:	18.23
Xing Name:	Saint Georges Road Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&C:	3024
	Saint Georges Road	Active/FLBs ¹ & HABs ²	Nos of Track	2
	Saint Georges Road Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Avondale

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

6.1 Site Description

The Saint Georges Road level crossing is located in the Whau Local Board area, at 18.23km from the start of North Auckland Line (NAL) and 900m to the south of Avondale station. The level crossing is 330m north of a "T intersection" between Wolverton Road and Saint Georges Road, and 150m to the south of Kelvinside Tce. The 9.5m wide existing carriageway is flanked by 3.5m wide footpaths on either side of the road. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. Both road and railway alignments are relatively flat at the crossing. A median traffic island installed on either side of the rail tracks is used to separate opposing traffic



Photo 4: General view of the Xing looking northward

The road is classified as a **district arterial** and is currently used as a bus route. It is surrounded on the western side by residential properties and on the eastern side by high density residential apartments which back onto an industrial/commercial estate area centred around Lansford Cres. There are a number of property driveways which exit onto Saint Georges St. The residential apartments at the southeast are accessed off Sainly Lane which is 40m to the south of the level crossing.

The gradient of the railway is set at the maximum grade for freight traffic, being from the east is around 2% and steepens slightly towards the west. It flattens then to 0.0% as it passes across the Whau River

6.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 9.5m wide carriageway width 2 x 3.5m wide footpath and berm 330m to a major intersection 30 degree skew to the rail Access road to residential apartments is located 40m to the SE of the crossing 	<ul style="list-style-type: none"> Road carrying 8,862 (AADT) Adjacent local roads Bus routes 191,193 On street parking on approach 326 pedestrian movements per day (234 peak)
Rail	<ul style="list-style-type: none"> gradient of 0.8% located south of the crossing gradient of 2.3% located north of the crossing two tracks layout Rail bridge over Whau River approximately 420m SW of crossing 	<ul style="list-style-type: none"> Maximum gradient of track in vicinity means grade changes have a far reaching impact including the St Jude Street, Chalmers Street and Portage Rd level crossings Freight traffic uses this section of track
Properties	<ul style="list-style-type: none"> Directly surrounded by residential properties and apartments, with commercial/industrial park adjacent. 	<ul style="list-style-type: none"> Driveways from commercial and residential units accessing onto Saint Georges St
Services	<ul style="list-style-type: none"> Overhead electricity wire 675 Sewer across the crossing 	<ul style="list-style-type: none"> TBC

	<ul style="list-style-type: none"> 100/150 water mains under crossing Fibre optic cable under crossing 	
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 17 – Specific constraints for Woodward Road Level Crossing

6.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing (50kph) Sight Line 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Alignment speed as existing Horizontal alignment as existing Rail bridge (Bridge 58) located west of the crossing is to be retained 	<ul style="list-style-type: none"> Property access gradient 12.5% (1 in 8)

Table 18 – Specific Assumptions – St Georges Road Level Crossing

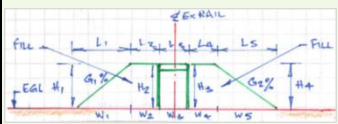
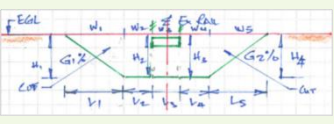

6.4 Road & Rail Considerations

The existing alignment of Saint Georges Road is a two lane two way road of straight alignment, traversing in a north-south direction. There are no major road constraints on this site. The road over rail option for Saint Georges Road, with a minimum track clearance of 5.5m over the rail tracks and a maximum gradient of 5%, does not impact on either Kelvinside Tce or the Wolverton Rd/St Georges Road intersection.

Both a Rail Under Road and a combination of a Road Over/ Rail Under option have been considered. However both options require a considerable length of track to the north to be lowered which includes having to grade separate both Chalmers St and the St Jude St level crossings (Chalmers St Options could also include closure). These excessive rail adjustments may make the rail under options financially unviable.

The excessive track gradient of 2.5% (compensated for horizontal geometry) for both options extends over 1.5km from the Saint Georges Road crossing, before tying into existing. If the options are to be included for the future design, the study area should extend to north of the Avondale Station.

6.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	140	70	30	70	110	800	800	30	70	200	50	70	30	70	50
H	4.6	6.4	6.6	4.9	--	6.9	6.6	6.1	4.2	--	2.3	3.2	3.5	2.5	--
W	10	10	10	10	10	16	10	10	10	10	10	10	10	10	10
G%	5.0	5.0	--	--	--	2.1	2.1	--	--	--	5.0	5.0	--	--	--
L'											300	900	30	70	200
H'											3.4	3.6	3.3	2.1	--

Option	1			2			3						
W'									16	10	10	10	10
G'%									1.9	1.1	--	--	--
On Line Impacts													
Ex Highway Alignment	H	M	L	H	M	L	H	M	L				
	Elevated road will impact to driveways and adjacent streets			As existing			Elevated road will impact to driveways and adjacent streets						
Ex Railway Alignment	H	M	L	H	M	L	H	M	L				
	As existing			W2 width allows for NAL up & down mains, plus additional width for Avondale station. G'1 & G'2 either side of Avondale station (1% through station)			W2 width allows for NAL up & down mains, plus additional width for Avondale station. G'1 & G'2 either side of Avondale station (1% through station)						
Other Area Impacts													
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L				
	New highway would require diversion of Sainly Lane to reduce the property impacts			Both Chalmers Street and St Jude St level crossings will require grade separation (Chalmers St options could also include closure)			Both Chalmers Street and St Jude St level crossings will require grade separation (Chalmers St options could also include closure)						
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L				
	As Existing			Track lowering will be required between Blockhouse Bay Road and east abutment of Whau Creek Bridge (Bridge 58) New Avondale Station will be required			Track lowering will be required between north of Avondale Station and east abutment of Whau Creek Bridge (Bridge 58) New Avondale Station will be required						
Impacts on Others													
Adjacent Properties	H	M	L	H	M	L	H	M	L				
	A number of properties required for the alignment			A number of properties required for temporary alignment			A number of properties required for both final and temporary alignments						
Impacts from Construction													
Complexity & Disruption	H	M	L	H	M	L	H	M	L				
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic						
Costs	H	M	L	H	M	L	H	M	L				
Construction		■			■			■					
Property		■			■			■					
Total		■			■			■					
Likely Duration	H	M	L	H	M	L	H	M	L				
	8 to 12 Months			12 to 24 Months			Over 24 Months						
Other Issues													
1	New highway alignment for Option 1 (and option 3?) will require diversion of Sainly Lane to reduce the property impacts												
2	When investigating the rail options for this location in the future, the crossings at St Jude Street and Chalmers Street need to be considered												
3	The rail gradient between St Jude Street and Saint Georges should not exceed 2.5% to cater for freight traffic												

Table 19 – Output Summary for Saint Georges Road Level Crossing

7 Site 17: Portage Road

Road Name:	Portage Road (17)	Control Type	KRN Line:	NAL
Project ID	NAL-W-16	(As in TCDM Part 9:Section 6):	Km'age:	18.88
Xing Name:	Portage Road Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&I:	2997
	Portage Road	Active/FLBs ¹ & HABs ²	Nos of Track	2
	Portage Road Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	New Lynn

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

7.1 Site Description

The existing Portage Road level crossing is located in the Whau Local Board area, at 18.88km from the start of North Auckland Line (NAL) and to the east of New Lynn Rail Station. The crossing is 300m north of the Portage Road/ Clark Street intersection . The 11.5m wide existing carriageway is flanked by a 3.5m wide footpath and grass berm on either side of the road. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. Both highway and railway alignments are relatively flat at the crossing.



The road is classified as a **district arterial** and is not a bus or over dimension vehicle route. The surrounding area is occupied by commercial and industrial properties. Olympic park is located on the southeast corner of the crossing. There are a number of commercial vehicle accesses in this section of Portage Road.

There are railway tracks (up and down) crossing over the existing crossing. 150m to the east of the crossing is rail bridge (Bridge 58) over the Whau Creek in the Olympic Park Reserve. On the northern side of the rail track a pedestrian walkway connects Portage road to Veronica Street to the west. To the west the railway passes the 300m through the New Lynn Rail station trench to the underground New Lynn Rail station. The trench passes under Veronica St 109m west of the crossing. .

7.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 11.5m wide carriageway width 2 x 3.5m wide footway and berm 300m to a major intersection 90 degree skew to the rail 4.25 headroom restriction for the OLE 	<ul style="list-style-type: none"> Roads carrying 10,833 (AADT) Close proximity to Clark St and New North Road High volume of commercial vehicles On street parking on approach 121 pedestrian movements per day (peak 76)
Rail	<ul style="list-style-type: none"> gradient of 0.0% located south of the crossing . gradient of 1.2% located north of the crossing two tracks layout Whau River rail bridge 150m to the east Road bridge approximately 190m west of crossing New Lynn Rail Trench to the west of crossing Pedestrian walkway crossing to Veronica Close proximity to Veronica Street overpass 	<ul style="list-style-type: none"> Close proximity to the New Lynn Station Freight traffic uses this section of track
Properties	<ul style="list-style-type: none"> Surrounded by industrial/ commercial units Olympic park on SE corner 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial and industrial units
Services	<ul style="list-style-type: none"> Overhead electricity wires 150/200 water mains under crossing Fibre optic cable to the south of crossing 	

Others	• TBC	
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Table 20 – Specific constraints – Portage Road Level Crossing

7.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing (50kph) 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 21 – Specific Assumptions – Portage Road Level Crossing

7.4 Road & Rail Considerations

Portage Road is single lane in either direction with minor changes in horizontal alignment within the crossing and 150m to the north,.

The road over rail option follows the existing horizontal alignment as per the Study scope. However, the elevated road alignment should avoid including these minor horizontal alignment because it makes it difficult to achieve the required vertical alignment, super-elevation, and sight distances. It is recommended to provide a large continuous curve instead of these minor horizontal direction changes. This may impact on additional properties.

A Rail Under Road option was considered; it would require the Whau River rail bridge, the and the recently completed New Lynn rail trench and station all to be lowered. This option was discussed with the AT team and was deemed unfeasible to pursue further due to significant cost and operational impacts.

A Combination Road Over / Rail Under was also considered; it would also require changes to the Whau River rail bridge and New Lynn Station and was deemed unfeasible. .

7.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	90	40	30	50	160	250	130	20	600	400	50	40	30	50	80
H	5.2	6.7	7.0	7.5		0	7.1	7.9	9.5	--	2.6	3.4	3.5	3.8	--
W	12	12	12	12	12	10	10	10	25	10	12	12	12	12	12
G%	5.0	5.0	--	--	--	1.9	2.4	--	--	--	5.0	5.0	--	--	--
L'											250	150	20	600	350
H'											0	4.8	5.5	6.9	--
W'											10	10	10	25	10
G'%											1.3	2.0	--	--	--

Option	1			2			3		
On Line Impacts									
Ex Highway Alignment	H	M	L	H	M	L	H	M	L
	Elevated road will impact to driveways and adjacent streets			As existing			Elevated road will impact to driveways and adjacent streets		
Ex Railway Alignment	H	M	L	H	M	L	H	M	L
	As existing			The new alignment to go beyond the recent completed New Lynn Rail Trench as well as dropping the Whau Creek Rail Bridge beyond an acceptable level.			The new alignment to go beyond the recent completed New Lynn Rail Trench as well as dropping the Whau Creek Rail Bridge beyond an acceptable level.		
Other Area Impacts									
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L
	New highway will be tie back to existing alignment within 200m either side of the crossing			Major traffic disruption during the construction for New Lynn shopping area			Major traffic disruption during the construction for New Lynn shopping area		
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L
	As Existing			Complete reconstruction of New Lynn Rail Trench and Station – significant rail services disruption			Complete reconstruction of New Lynn Rail Trench and Station – significant rail services disruption		
Impacts on Others									
Adjacent Properties	H	M	L	H	M	L	H	M	L
	A number of properties required for the alignment			A number of properties required for temporary alignment			A number of properties required for temporary alignment		
Impacts from Construction									
Complexity & Disruption	H	M	L	H	M	L	H	M	L
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic		
Costs	H	M	L	H	M	L	H	M	L
Construction		■			■			■	
Property		■			■			■	
Total		■			■			■	
Likely Duration	H	M	L	H	M	L	H	M	L
	8 to 12 Months			Over 24 Months			Over 24 Months		
Other Issues									
1	Only viable option for this location is Option 1, Options 2 and 3 will significantly impact the newly completed New Lynn Rail Trench and Station, and require the Whau River rail bridge to be lowered beyond an acceptable level.								
2	The horizontal curves for the highway alignment should be removed.								
3	The access to Olympic Park would need to be relocated								

Table 22 – Output Summary for Portage Road Level Crossing

8 Site 19: Glenview Road

Road Name:	Glenview Road (19)	Control Type	KRN Line:	NAL
Project ID	NAL-W-18	(As in TCDM Part 9:Section 6):	Km'age:	22.43
Xing Name:	Glenview Road Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&C:	2997
	Glenview Road	Active/FLBs ¹ & HABs ²	Nos of Track	2
	Glenview Road Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Glen Eden

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

8.1 Site Description

The existing Glenview Road level crossing is located in the Waitakere Local Board area, at 22.43km from the start of North Auckland Line (NAL) and at the western end of Glen Eden Rail Station (includes historic rail buildings). 40m to the south of the level crossing is the "T intersection" of Glenview Road and West Coast Road which is in the heart of the Glen Eden shopping centre. On the southwest corner of the level crossing is a large carpark currently used as the Glen Eden Rail station park n ride site. 50m to the north of the crossing Glenview Rd intersects with Clayburn Road and Waikumete Rd. Glen Eden Primary school is located on the eastern side of Glenview Rd just north of Clayburn Rd. On the western side of Glenview Rd north of Waikumete Rd is located the Glen Eden fire station and Waikumete cemetery.



Photo 6: Glenview Road crossing looking southward

The 12.5m wide existing carriageway is flanked by a 3.5m wide footpath and wide grass berm on the western side of the road. On the eastern side the footpaths feed into the level crossing mazes on both sides which join the station platform access ramps. The level crossing consists of a vehicular crossing (2 lanes eastern side, median, one lane west) with two separated pedestrian level crossings. Glenview Rd is at a 6% grade through the crossing. Immediately north of the road crossing the highway veers 45° to the right. The rail is on a 1.0% grade falling from the east.

The road is classified as a **district arterial** and is not a bus or over dimension vehicle route. It is surrounded by commercial/retail units and the Glen Eden Rail station. The commercial retail units and the park n ride carpark have direct access onto Glenview Road via either road vehicle crossings. There are railway tracks (NAL up and down) crossing over the existing crossing. The western end of the rail Station platforms is located 20m east of the crossing.

8.2 Site Constraints

From Road	Infrastructure Constraints	Operational Constraints
	<ul style="list-style-type: none"> 12.5m wide carriageway width (across the rail track) 2 x 3.5m wide footway and berm 40m to a major intersection and Glen Eden shops 50m to a minor road intersection 45 degree skew to the rail 4.25m headroom restriction for OLE Waikumete cemetery to north west Glen Eden Fire station to north west Glen Eden Primary school to north east 	<ul style="list-style-type: none"> Road carrying 11,434 (AADT) Local Roads and off-road public parking around the crossing On street parking on north east approach only 2,044 pedestrian movements per day (1,166 peak)

Rail	<ul style="list-style-type: none"> gradient of 1.0% located east of the crossing . gradient of 0% located west of the crossing two tracks layout Glen Eden station immediately to the east of the crossing Pedestrian bridge 180m to the east of crossing 	<ul style="list-style-type: none"> Adjacent to the Glen Eden station Freight traffic uses this section of track
Properties	<ul style="list-style-type: none"> Surrounded by commercial properties, rail station, carpark Glen Eden shops 40m to the south 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial units
Services	<ul style="list-style-type: none"> Overhead electricity wires 150 water mains under crossing Fibre optic cable under crossing Vector transmission line to the north of crossing 	<ul style="list-style-type: none"> TBC
Others	<ul style="list-style-type: none"> Gle Eden Primary School adjacent to crossing Wiakumete cemetery near crossing Steep topography around crossing, which makes the on line tie in relatively difficult 	<ul style="list-style-type: none"> TBC

Table 23 – Site Constraints – Glenview Road Level Crossing

8.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5.5% Road Road/Rail separation 6.5m (road over) Speed as existing (50kph) 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 24 – Specific Assumptions – Glenview Road Level Crossing

8.4 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	85	90	50	190	200	300	300	30	300	350	45	90	50	190	100
H	5.0	6.2	8.1	3.8	--	6.5	6.6	6.7	5.9	--	2.4	3.5	3.5	1.3	--
W	26	26	13	13	13	10	16	16	10	10	26	26	13	13	13
G%	5.0	5.0	--	--	--	2.1	2.0	--	--	--	5.0	5.0	--	--	--
L'											200	300	30	150	350
H'											3.4	3.5	3.6	3.7	
W'											10	16	16	10	10
G'%											1.6	1.2	--	--	--
On Line Impacts															
Ex Highway Alignment	H	M	L	H	M	L	H	M	L						
	Significantly elevated West Coast Rd/Glenview Rd intersection in			As existing			Significantly elevated West Coast Rd/Glenview Rd intersection in								

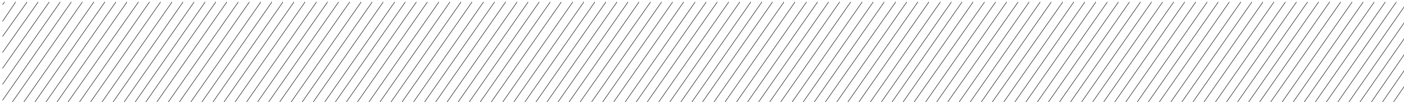
Option	1			2			3		
	the Glen Eden shops requires 440m of West Coast Rd to also be raised. Elevated road will impact to driveways and adjacent streets						the Glen Eden shops requires West Coast Rd to also be raised. Elevated road will impact to driveways and adjacent streets		
Ex Railway Alignment	H	M	L	H	M	L	H	M	L
	As existing			Due to the existing topography on either side of the crossing, in excess of 1.2km of track lowering would be required to accommodate the proposed alignment			Due to the existing topography on either side of the crossing, in excess of 1.0km of track lowering would be required to accommodate the proposed alignment		
Other Area Impacts									
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L
	New highway will also require raising of West Coast Road			As existing			New highway will also require raising of West Coast Road		
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L
	New station access at east end of crossing to new road level with lift and stair			New Station platforms and accesses for both ends to street level with lift and stairs			New Station platforms and accesses for both ends to street level with lift and stairs		
Impacts on Others									
Adjacent Properties	H	M	L	H	M	L	H	M	L
	Extreme impact to existing shopping area in addition to other properties along the raised alignment			The lowering of station will impact the adjacent properties both during construction and at the final alignment			Extreme impact to existing shopping area in addition to other properties along the raised alignment. The lowering of station will impact the adjacent properties both during construction and at the final alignment		
Impacts from Construction									
Complexity & Disruption	H	M	L	H	M	L	H	M	L
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic		
Costs	H	M	L	H	M	L	H	M	L
Construction		■			■			■	
Property		■			■			■	
Total		■			■			■	
Likely Duration	H	M	L	H	M	L	H	M	L
	Over 24 Months			Over 24 Months			Over 24 Months		
Other Issues									
1	None of the on-line options (. Option 1, Option 2 and Option 3) are considered viable for this location,.								
2	Alternative options will be required for the replacement grade separated crossing								

Table 25 – Output Summary for Glenview Road Level Crossing

8.5 Road & Rail Considerations

The existing alignment of Glenview Road in the vicinity of the crossing is a three lane two way road with flush medians (solid for 5m either side of the crossing), traversing in a north-south direction. A major intersection with West Coast Road is located 40m to the south, and a minor intersection with Waikumete Road and Clayburn Road is 50m to the north.

To deliver a road over rail solution along the existing road alignment the West Coast Rd/Glenview Rd intersection would require raising 8.5m and the Waikumete Rd/Clayburn Rd 2.7m giving a minimum 5.5m clearance over the existing rail tracks with maximum road gradient of 5%. 440m of West Coast Rd would also need to be raised causing an extreme impact to the Glen Eden shops. This was



discussed with the AT project team; it was agreed that due to the extreme impact this option would have on the Glen Eden shops, the option was dismissed as not being feasible to pursue further.

A Rail under Road option was considered; to lower the track and merge the vertical alignment back into the existing would require over 1.2km of track rebuild. The combination of Road Over / Rail Under option was also considered; this option would require over 1.0km of track rebuild. These options were discussed with the AT team and both deemed unfeasible to pursue further.

9 Site 21: Bruce McLaren

Road Name:	Bruce McLaren Road (21)	Control Type	KRN Line:	NAL
Project ID	NAL-W-20	(As in TCDM Part 9:Section 6):	Km'age:	25.55
Xing Name:	Bruce McLaren Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&C:	2997
	Bruce McLaren Road	Active/FLBs ¹ & HABs ²	Nos of Track	2
	Bruce McLaren Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Sunnyvale

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

9.1 Site Description

The existing Bruce McLaren Road level crossing is located in the Henderson – Massey Local Board area, at 25.55km from the start of North Auckland Line (NAL) and to the north of Sunnyvale Rail Station (at 25.0km). Henderson rail station is approximately 800m north of the crossing. The crossing is 10m west of the "T junction" intersection between Bruce McLaren Road and Railside Avenue. (Note: Southern leg of Railside Avenue is a no through road. The 11.5m wide existing carriageway is flanked by two 3.5m wide footpaths on Bruce McLaren Road. Railside Avenue only has a footpath on the eastern side. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. Both highway and railway alignments are relatively flat at the crossing.



Photo 7: Bruce McLaren Xing looking North West

The road is classified as **collector/ district arterial** and is an existing bus route. It is surrounded by low levels industrial units. An access road immediately to the west of the crossing leads to the Henderson Train Stabling Yard and adjacent industrial complex located at the northwest corner of the crossing. There are a number of commercial property vehicle accesses off Bruce McLaren in the vicinity of the crossing..

There are two railway tracks (up and down) passing the level crossing. The rail entrance of the Henderson stabling yard is located some 500m north of the crossing Any future southern entrance into the stabling facility would likely impact the level crossing.

9.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 11.5m wide carriageway width 2 x 3.5m wide footway and berm 7m to a major intersection 90 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> Local Road 10,760 (AADT) High volume of commercial vehicles Bus routes 154, 163 On street parking on approach 206 pedestrian movements per day (106 peak)
Rail	<ul style="list-style-type: none"> gradient of 0.8% located south of the crossing . gradient of 0% located north of the crossing two tracks layout Rail turnout to yard at 500m north of the crossing Close proximity of Sunnyvale Station 	<ul style="list-style-type: none"> Close proximity to the Sunnyvale (500m away) Junction and track works for the stabling yard Freight traffic uses this section of track
Properties	<ul style="list-style-type: none"> Surrounds by industrial/ commercial units Stabling yard highway entrance at NW of the Xing 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial units
Services	<ul style="list-style-type: none"> Overhead electricity wire to the west 150 Sewer just north of the crossing footpath 	<ul style="list-style-type: none"> TBC

	<ul style="list-style-type: none"> 150/200 water mains under crossing 	
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 26 – Site Constraints – Bruce McLaren Road Level Crossing

9.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at stations set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5 (1 in 8)%

Table 27 – Specific Assumptions – Bruce McLaren Road Level Crossing

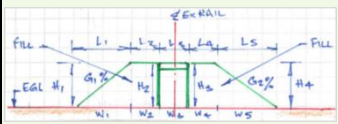
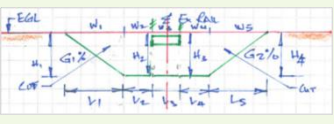
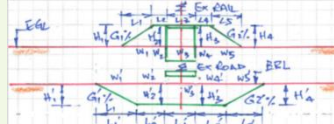
9.4 Road & Rail Considerations

The existing alignment is a two lane two way road, traversing in a east-west direction. A major intersection with Railside Avenue is located 7m to the east, and a major access to the adjoining industrial estate is located 10m west of the rail tracks. The unrestricted vehicle path is from Bruce McLaren into Railside Ave. Railside Ave traffic from the south of the crossing travelling north are required to give way.

Due to the major traffic flow characteristic (most of the traffic turn right from Railside Avenue into Bruce McLaren Road), the proposed road over rail option catered for this movement as the main alignment with secondary ramps to provide links to properties east of the junction. A Service road/ramp is provided beneath the new elevated road alignment to reduce the impact on the major access to the neighbouring industrial estate. This allows the proposed elevated road alignment to be over the rail tracks of minimum 5.5m with a maximum highway gradient of 5%.

For the rail under road option, the lowered rail alignment was constrained by the location of Sunnyvale station to the south and the entrance layout of the stabling yard (to the north, adjacent to Henderson Station). The option can be achieved requiring over 900m of track to be lowered. The combination of Road Over / Rail Under option would provide better tie in constraints at both ends. However, both these options will deny the opportunity to provide future a south end entrance to the stabling yard.

9.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	60	120	40	110	80	270	150	30	150	310	30	60	40	50	50
H	1.8	6.9	6.9	1.9	--	5.3	6.9	6.8	4.3	--	0.9	4.0	4.0	0.9	--
W	14	14	14	14	14	11	11	11	11	11	14	14	14	14	14
G%	5.0	5.0	--	--	--	2.5	2.5	--	--	--	5.0	5.0	--	--	--
L'											280	30	15	180	130
H'											2.6	2.6	2.8	2.9	--

Option	1			2			3						
W'									11	11	11	11	11
G'%									2.0	2.4	--	--	--
On Line Impacts													
Ex Highway Alignment	H	M	L	H	M	L	H	M	L				
	New alignment is off set from the current alignment to conform with the current design standard			As existing			New alignment is off set from the current alignment to conform with the current design standard						
Ex Railway Alignment	H	M	L	H	M	L	H	M	L				
	As existing			Cut retaining walls will be required for the new alignment			Retaining walls will be required for the new alignment						
Other Area Impacts													
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L				
	Elevated road will impact on accesses to adjacent properties and to the southern end of Railside Avenue			As existing			Elevated road will impact on accesses to adjacent properties and to the southern end of Railside Avenue						
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L				
	As Existing			Future connection between the southern end stabling yard and the main line will be lost			Future connection between the southern end stabling yard and the main line will be lost						
Impacts on Others													
Adjacent Properties	H	M	L	H	M	L	H	M	L				
	A number of properties required for the alignment			A number of properties required for temporary alignment			A number of properties required for temporary alignment						
Impacts from Construction													
Complexity & Disruption	H	M	L	H	M	L	H	M	L				
	impacts to rail operations would need to be managed, and closure periods minimised.			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary level crossing bridge will be required for highway traffic						
Costs	H	M	L	H	M	L	H	M	L				
Construction		■			■			■					
Property		■			■			■					
Total		■			■			■					
Likely Duration	H	M	L	H	M	L	H	M	L				
	8 to 12 Months			12 to 24 Months			Over 24 Months						
Other Issues													
1	Option 1 will be slightly off line to the existing junction to cater for the highway traffic flow and improve the sight line. Property would be required.												
2	Ramp for the east section of the Railside Avenue (westbound traffic) would be required												
3	Service access for the NW industrial estate and stabling yard would need to be considered for the option 1 alignment												
4	Options 2 and 3 may interfere with future plans to create a southern link into the Henderson train stabling yard close to Bruce McLaren Rd												

Table 28 – Output Summary for Morningside Drive Level Crossing

10 Site 25: Metcalfe Road

Road Name:	Metcalfe Road (25)	Control Type	KRN Line:	NAL
Project ID	NAL-W-23	(As in TCDM Part 9:Section 6):	Km'age:	29.50
Xing Name:	Metcalfe Road Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&C:	2998
	Metcalfe Road	Active/FLBs ¹ & HABs ²	Nos of Track	2
	Metcalfe Road Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Ranui

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

10.1 Site Description

The existing Metcalfe Road level crossing is located in the Henderson – Massey Local Board area, at 29.50km from the start of North Auckland Line (NAL) and to the east of Ranui Rail Station (at 29.75km). The crossing is bounded by a “T intersection” between Metcalfe Road and Ranui Station Road to the north and a “T intersection” between Metcalfe Road and Pooks Road to the south. A further 30m south of the Pooks Rd junction is a small roundabout controlling the intersection of Munroe Rd and Metcalfe Rd.



Photo 8: Metcalfe Road Xing looking eastward

The 11.5m wide existing carriageway is flanked by two 3.5m wide footpaths. The level crossing consists of a vehicular crossing complete with short length raised median islands with two separated pedestrian level crossings. The highway is on around a 4% grade through the crossing, with the rail at around a 0.8% grade.. The road is classified as **collector/ district arterial** and is on an existing bus route. It is not a designated over dimension route. It is mostly surrounded by residential properties. On the north east corner is a Jehovah's Witness centre. Ranui rail station platforms begin 80m from the crossing. There are a number of property driveways existing onto Metcalfe Rd.

There are two railway tracks (up and down) passing over the existing crossing. The Ranui Station has two 150m long island platforms on the western side of the crossing. The platforms are accessed by footpaths on either side of the railway track, extending from the crossing to the station. Ramps are located on the footpath to lead up onto the platforms on both sides. A pedestrian rail level crossing is located 240m away from the level crossing at the western end of the station to allow pedestrians to cross between platforms.

10.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 11.5m wide carriageway width 2 x 3.5m wide footway and berm 20m both north and south to major intersections 45 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> The road has 14,330 (AADT) Adjacent local roads High volume of residential vehicles Bus routes 087,097,14 On street parking on northern approach 204 pedestrian movements per day (128 peak)
Rail	<ul style="list-style-type: none"> gradient of 1.3 % located east of the crossing gradient of 0.5% located west of the crossing two tracks layout adjacent to the Ranui rail station 	<ul style="list-style-type: none"> Close proximity to the Ranui Station (90m away) Freight traffic uses this section of track
Properties	<ul style="list-style-type: none"> Surrounded by residential units 	<ul style="list-style-type: none"> Highway vehicle accesses from residential units

Services	<ul style="list-style-type: none"> Jehovah's witness centre on north east corner Overhead electricity wire to the west 225 Sewer just west of crossing 100/180/355 water mains under crossing Fibre optic cable under crossing 	<ul style="list-style-type: none"> TBC
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 29 – Specific constraints – Metcalfe Road Level Crossing

10.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 30 – Specific Assumptions – Metcalfe Road Level Crossing

10.4 Road & Rail Considerations

The existing alignment of Metcalfe Road is a two lane two way road, traversing in a north-south direction. Major intersections with Pooks Road (60m from crossing) and Munroe Road (40m from crossing) are located on the southern side of the crossing, and another major intersection with Ranui Station Road is 20m to the north of the crossing.

For the road over rail option, the Pooks Rd and Munroe Rd intersections are brought together to form a four way intersection with Metcalfe Rd. Both this resulting four way intersection and the Ranui Station intersection require raising 3.0m and 6.0m, respectively. This would enable Metcalfe Road to pass over the rail tracks with a minimum of 5.5m with a maximum highway gradient of 5%.

In terms of proximity between Ranui Station Road and the rail tracks, it is recommended in the future design to disconnect Ranui Station Road with Metcalfe Road, where traffic could make a detour through Elwarth Way and Duxfield Drive. For both track lowering options, consideration of the close proximities of Ranui Station needs to be taken into account for the alignment development. The alignment for Option 2 has been developed to provide a smooth run in and run out on the eastern approach, at the same time providing a future connection to the work basin / stabling yard (The old KiwiRail Ranui work yard). The alignment for Option 3 has not taken these into the consideration.

10.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	350	170	40	60	260	300	160	30	280	350	180	170	40	60	
H	3.4	4.7	5.4	3.6		4.9	6.8	6.9	6.1		1.7	2.4	3.0	2.8	
W	14	14	14	14	14	10	10	10	16	10	14	14	14	14	14
G%	5.0	5.0				0	2.4				5.0	5.0			

Option	1			2			3				
L'							150	80	30	280	250
H'							3.3	3.7	4.0	3.3	
W'							10	10	10	16	10
G'%							0.9	2.4			
On Line Impacts											
Ex Highway Alignment	H	M	L	H	M	L	H	M	L		
	Elevated road will have major impacts to adjacent highways and driveways Realignment of the Pooks-Metcalf- Munroe intersections			As existing			Elevated road will have impacts to adjacent highways and driveways				
Ex Railway Alignment	H	M	L	H	M	L	H	M	L		
	As existing			Ranui Station would be affected and realignment of the vertical alignment would be required to provide a smooth run in and run out for the eastern approach			Ranui Station would be affected and realignment of the vertical alignment would be required to provide a smooth run in and run out for the eastern approach				
Other Area Impacts											
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L		
	New highway will go beyond intersections on either side of the level crossing			As existing			New highway will go beyond intersections on either side of the level crossing				
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L		
	New station access at east end to new elevated road level with lift and stair			New Station platforms and accesses for both ends to street level with lift and stairs			New Station platforms and accesses for both ends to street level with lift and stairs				
Impacts on Others											
Adjacent Properties	H	M	L	H	M	L	H	M	L		
	A number of properties required for the alignment			None			A number of properties required for the highway alignment				
Impacts from Construction											
Complexity & Disruption	H	M	L	H	M	L	H	M	L		
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic				
Costs	H	M	L	H	M	L	H	M	L		
Construction		■			■			■			
Property		■			■			■			
Total		■			■			■			
Likely Duration	H	M	L	H	M	L	H	M	L		
	12 to 24 Months			12 to 24 Months			Over 24 Months				
Other Issues											
1	Outflow from ponds to the east may be affected due to lowering of vertical rail alignment										
2	The highway works can be reduced by making some of the local roads to a no through road										
3	Options could be implemented with station redevelopment										

Table 31 – Output Summary for Metcalfe Road Level Crossing

11 Site 34: Walters Road

Road Name:	Walters Road (34)	Control Type	KRN Line:	NIMT
Project ID	NIMT-S-07	(As in TCDM Part 9:Section 6)	Km'age:	649.19
Xing Name:	Walters Road Ped Dn	Active/FLBs ¹ (Veh Control)	KRN S&I:	3043
	Walters Road	Active/FLBs ¹ & HABs ²	Nos of Track	2
	Walters Road Ped Up	Active/FLBs ¹ (Veh Control)	Nearest Stn:	Takanini

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

11.1 Site Description

The current Walters Road level crossing is located in the Papakura Local Board area, at 650km from the start of the North Island Main Trunk (NIMT) and to the south east of Takanini train station (1.4km). 280m to the southwest of the crossing is a five exit roundabout intersection between Great South Road, Walters Road, Inlet Road and Longford Park Drive. This section of Walters Road is bounded by Tironui Road (240m southwest), Braeburn Place (100m northeast) and Arion Road (140m northeast). The 12.5m wide existing carriageway is flanked by a 3.5m wide footpath and wide grass berm on either side of the road. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. Both highway and railway alignments are relatively flat at the crossing.



Photo 9: Walters Road crossing looking northeastward

The road is classified as **collector/ district arterial** and is not a bus or designated as an over dimension vehicle route. It is surrounded by commercial units on the western and north-eastern sides and residential on the south-eastern side.. The new Takanini Village shopping centre including the Takanini Warehouse occupies the north east corner, serviced by Arion Rd.. Both commercial and residential properties have direct access onto Walters Road via either commercial or residential road vehicle crossings. There are railway tracks (up and down approach roads) crossing over the existing crossing.

The Takanini area has drainage challenges being relatively flat and with peat being a major soil component in the area.

11.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 12.5m wide carriageway width 2 x 3.5m wide footway and berm 280m to a major intersection 10m to a minor intersection with Arion Road 70 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> The road has 7,000 (AADT) High volume of commercial vehicles On street parking on approach 175 pedestrian movements per day (110 peak) Local roads and property accesses Close proximity to Southgate Retail Centre and Takanini Village Development
Rail	<ul style="list-style-type: none"> gradient of 0.6% located south of the crossing gradient of 0.5% located north of the crossing two tracks layout 	<ul style="list-style-type: none"> Close proximity to Taka St crossing (1.2km) Close proximity to Subway Rd crossing (1.3km) Freight traffic uses this section of track
Properties	<ul style="list-style-type: none"> Surrounded by commercial and retail units and residential properties in the southeast corner 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial and residential units
Services	<ul style="list-style-type: none"> Overhead electricity wire Fibre Optic Cable just to the east of crossing 180/200 water mains adjacent to crossing 	<ul style="list-style-type: none"> TBC
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 32 – Site Constraints Walter Road

11.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.0m wide lane (due to close proximity of neighbouring properties) Cycle Lane 1.2m (due to close proximity of neighbouring properties), Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing (50kph) 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 33 – Specific Assumptions –Walters Road Level Crossing

11.4 Road & Rail Considerations

The existing alignment of Walters Road is a two lane two way road of straight alignment, traversing in a northeast-southwest direction. A minor intersection with Arion Road is located 140m east of the crossing.

For the road over rail option this intersection would need to be raised a maximum of 1.2m. This would allow Walters Road to pass over the rail tracks with a minimum clearance of 5.5m with a maximum highway gradient of 5%. No particular allowance was made for the newly completed Takanini Village Development, as its main access is located off the Arion Road, and because the final highway alignment could be positioned southward to reduce the impact to the properties on the northern side of the road (this would further impact the properties on the southside however).

For Options 2 and 3 rail lowering alignment, no specific considerations were made other than those specified on the KiwiRail standards. However, confirmation of the location of a future 3rd main should be ascertained for future design development.

11.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	140	60	30	70	100	250	80	20	200	250	70	60	30	70	50
H	5.7	7.1	7.1	4.9	--	5.0	6.5	6.8	5.5	--	2.9	3.6	3.1	2.5	--
5.0	13	13	13	13	13	10	10	10	10	10	13	13	13	13	13
G%	5.0	5.0	--	--	--	2.3	2.5	--	--	--	5.0	5.0	--	--	--
L'											200	80	20	100	250
H'											3.1	3.8	3.9	3.6	--
W'											10	10	10	10	10
G'%											1.1	2.2	--	--	--

Option	1			2			3		
On Line Impacts									
Ex Highway Alignment	H	M	L	H	M	L	H	M	L
	Elevated road will impact to driveways and adjacent streets			As existing			Elevated road will impact to driveways and adjacent streets		
Ex Railway Alignment	H	M	L	H	M	L	H	M	L
	As existing			The horizontal alignment may require adjust to suit the construction methodology			The horizontal alignment may require adjust to suit the construction methodology		
Other Area Impacts									
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L
	New highway may need to move southward to maintain access to the new Takanini Village shopping centre			As existing			New highway may need to move southward to maintain access to the new Takanini Village shopping centre		
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L
	As existing			The area is known to have poor ground conditions, which would have major impacts (risks) on the rail under road option			The area is known to have poor ground conditions, which would have major impacts (risks) on the rail under road option		
Impacts on Others									
Adjacent Properties	H	M	L	H	M	L	H	M	L
	A number of properties required for the alignment			properties may needed for temporary track during construction			A number of properties required for temporary alignment		
Impacts from Construction									
Complexity & Disruption	H	M	L	H	M	L	H	M	L
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic		
Costs	H	M	L	H	M	L	H	M	L
Construction		■			■			■	
Properties		■			■			■	
Total		■			■			■	
Likely Duration	H	M	L	H	M	L	H	M	L
	8 to 12 Months			12 to 24 Months			Over 24 Months		
Other Issues									
1	The connectivity to the adjacent retail areas needs to be considered for the road over rail option.								
2									
3	The requirement and location of a future 3 rd main needs to be confirmed								

Table 34 – Output Summary for Walters Road Level Crossing

12 Site 35: Taka Street

Road Name:	Taka Street (35)	Control Type	KRN Line:	NIMT
Project ID	NIMT-S-08	(As in TCDM Part 9:Section 6)	Km'age:	650.38
Xing Name:	Taka Street Ped Dn	Active/FLBs ¹ (Veh Control)	KRN S&I:	3043
	Taka Street	Active/FLBs ¹ & HABS ²	Nos of Track	2
	Taka Street Ped Up	Active/FLBs ¹ (Veh Control)	Nearest Stn:	Takanini

¹ – FLBs = Flashing Lights and Bells.

² – HABS = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

12.1 Site Description

The existing Taka Street level crossing is located in the Papakura Local Board area, at 650.38km from the start of North Island Main Trunk and 240m to the southeast of Takanini Rail Station. 220m west of the level crossing is the major intersection of Great South Road, Walter Strevens Drive and Taka St. Immediately adjacent (10m to the west) is the Taka St junction with Takanini Road. . Takanini School Road is 290m to the east.



Photo 10: Taka Street crossing looking south west

The 10.5m wide existing carriageway is flanked by a 3.5m wide footpath and grass berm on either side of Taka Street.

The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. Both highway and railway alignments are relatively flat at the crossing.

The road is classified as **collector/ district arterial**, is not a bus route nor designated as an over dimension vehicle route. It is surrounded by residential properties on three sides. On the southwest side immediately next to the crossing is the Takanini lodge. A Z service station occupies the site on the corner of Great South Rd and Taka St. Access to Takanini road is located adjacent to crossing, just 10m to the west . There are a number of residential vehicle access ways together with the access from the Takanini lodge and the Z service station exiting onto Taka St..

There are two railway tracks (up and down) crossing over the existing crossing. Takanini Station has a 155m long island platform 240m northwest of the Taka Street level crossing. The platform can be accessed from the Taka St crossing via a pedestrian footpath on the western side of the railway line and a pedestrian ramp up on to the platform at the southern end.

The Takanini area has drainage challenges being relatively flat and with peat being a major soil component in the area.

Confirmation of the location of a future 3rd main should be ascertained for future design development

12.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 10.5m wide carriageway width 2 x 3.5m wide footpaths and berms 220m to a major intersection 10m to a minor intersection with Takanini Road 60 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> The road has 3,200 (AADT) Adjacent accesses and local roads connections High volume of residential vehicles On street parking on approach 332 pedestrian movements per day (212 peak)
Rail	<ul style="list-style-type: none"> gradient of 0.0% located SE of the crossing . gradient of 0.0% located NW of the crossing two tracks layout 	<ul style="list-style-type: none"> Close proximity to the Takanini station (240m) Close proximity to Manuroa Rd crossing (500m) Freight traffic uses this section of track

	<ul style="list-style-type: none"> Takanini Rail Station Platform island 240m to the NW of crossing 	
Properties	<ul style="list-style-type: none"> Surrounded by residential properties, Takanini lodge and the Z service station 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial and residential units
Services	<ul style="list-style-type: none"> Overhead electricity Fibre optic cable running parallel to railway line 200 water mains under crossing 140m southeast is the 110/220kv Transpower line 	<ul style="list-style-type: none"> TBC
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 35 – Specific constraints for Taka Street Level Crossing

12.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.0m wide Lane (due to close proximity of neighbouring properties) Cycle Lane 1.2m (due to close proximity of neighbouring properties), Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing (50kph) 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

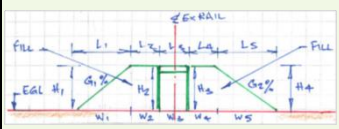
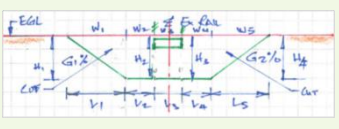
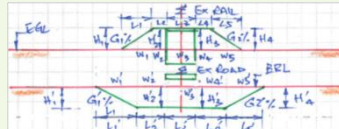
Table 36 – Specific Assumptions –Taka Street Level Crossing

12.4 Road & Rail Considerations

The existing alignment of Taka Street is a two lane two way road of straight alignment, traversing in roughly an east-west direction. The intersection with Takanini Road is located 10m to the west of the crossing. In the road over rail option the Takanini Rd intersection would need to be raised a minimum of 6.5m, which would allow Taka Street to pass over the rail tracks with a minimum 5.5m clearance at a maximum highway maximum gradient of 5%. Given the proximity between Takanini Road and rail tracks, it is recommended to close the northern entrance into Takanini Rd off Taka St (traffic would access Takanini Rd off Beach Road or Glenora Rd both off Great South Road).

Under Option 2 (rail under road), lowering of the track would require Takanini Rail station to be rebuilt at a lower level and the Manuroa Road level crossing would need to be lowered. Under option 3 (combination of road over and rail under), only Takanini station would need to be rebuilt. The AT project team noted that the future of the Takanini rail station including its location is the subject of a current investigation.

12.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	140	50	20	50	270	300	120	20	110	400	70	50	20	30	140
H	5.8	6.7	6.6	5.7	--	5.9	7.0	7.0	6.1	--	2.9	3.4	3.1	2.9	--
W	11	11	11	11	11	10	10	10	16	16	11	11	11	11	11

Option	1					2					3				
G%	5.0	5.0	--	--	--	2.4	1.0	--	--	--	5.0	5.0	--	--	--
L'											250	70	20	110	300
H'											3.8	3.9	3.9	3.1	--
W'											10	10	10	16	16
G'%											2.5	1.0	--	--	--
On Line Impacts															
Ex Highway Alignment	H	M	L			H	M	L			H	M	L		
	Elevated road will impact driveways (including the access into the Takanini lodge and the Z service station)and Takanini Rd					As Existing					Elevated road will impact driveways and adjacent streets				
Ex Railway Alignment	H	M	L			H	M	L			H	M	L		
	As existing					Lowered rail track impacts Takanini Station and Manuroa Rd level crossing					Lowered rail track impacts Takanini Station				
Other Area Impacts															
Ex Highway Infrastructure	H	M	L			H	M	L			H	M	L		
	Additional intersection layout adjustment may be required extend into Great South Road														
Ex Railway Infrastructure	H	M	L			H	M	L			H	M	L		
	New station access at east end of new road level with lift and stair					The area is known to have poor ground conditions, which would have major impacts (risks) on the rail under road option					The area is known to have poor ground conditions, which would have major impacts (risks) on the rail under road option				
Impacts on Others															
Adjacent Properties	H	M	L			H	M	L			H	M	L		
	A number of properties required for the alignment					As existing					A number of properties required for temporary alignment				
Impacts from Construction															
Complexity & Disruption	H	M	L			H	M	L			H	M	L		
	Temporary level crossing and railway closures will be required					Major disruption to rail services and temporary bridge for highway traffic					Major disruption to rail services and temporary bridge for highway traffic				
Costs	H	M	L			H	M	L			H	M	L		
	Construction														
	Property														
	Total														
Likely Duration	H	M	L			H	M	L			H	M	L		
	8 to 12 Months					12 to 24 Months					Over 24 Months				
Other Issues															
1	The impact on the Manuroa Rd level crossing needs to be considered for the rail under road option.														
2	The requirement and location of a future 3 rd main needs to be confirmed														

Table 37 – Output Summary for Taka Street Level Crossing

13 Site 36: Manuroa Road

Road Name:	Manuroa Road (36)	Control Type	KRN Line:	NIMT
Project ID	NIMT-S-10	(As in TCDM Part 9:Section 6)	Km'age:	650.89
Xing Name:	Manuroa Road Ped Dn	Active/FLBs ¹ (Veh Control)	KRN S&I:	3043
	Manuroa Road	Active/FLBs ¹ & HABs ²	Nos of Track	2
	Manuroa Road Ped Up	Active/FLBs ¹ (Veh Control)	Nearest Stn:	Takanini

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

13.1 Site Description

The existing Manuroa Road level crossing is located in the Papakura Local Board area, at 650.89km from the start of North Island Main Trunk and 250m to the northwest of the Takanini Rail Station. The crossing is bounded by Oakleigh Avenue (100m) and Princess St (200m) to the east, and 160m west to the major Great South Road-, Beaumaris Way - Manuroa Road intersection. The 10.5m wide existing carriageway is flanked a 3.5m wide footpath and grass berm on either side of the road. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. Both highway and railway alignments are relatively flat at the crossing.



Photo 11: Manuroa Road crossing looking south west

The road is classified as **collector** and is not a public bus route. It is surrounded by a high density of residential properties. Located on the north east corner is the Top kids day-care centre which has two accesses onto Manuroa Rd 10m and 40m respectively from the crossing. There are a number of residential vehicle access which will be affected by the works.

There are railway tracks (up and down) crossing over the existing crossing. The Takanini Station has a 155m long island platform to the southeast side of the crossing. There is no current formal access to this platform from the crossing although there is an unformed track along the western edge that appears used for pedestrian access..

13.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 10.5m wide carriageway width 2 x 3.5m wide footpaths and berms 160m to a major intersection 100m to a minor intersection with Oakleigh Ave 60 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> The road has 11,214 (AADT) Adjacent access connections High volume of residential and commercial vehicles On street parking on approach 202 pedestrian movements per day (117 peak) Used by overweight vehicles
Rail	<ul style="list-style-type: none"> gradient of 0.0% located south of the crossing . gradient of 0.8% located north of the crossing two tracks layout Takanini Station approx. 250m southeast of crossing Possible future 3rd main 	<ul style="list-style-type: none"> Close proximity to the Takanini Station (250m away) Freight traffic uses this section of track
Properties	<ul style="list-style-type: none"> High density of residential homes 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial and private units
Services	<ul style="list-style-type: none"> Overhead electricity wire 150 Sewer just northwest of the crossing 100/225/230 water mains adjacent to crossing Fibre optic cable running parallel to railway line 	<ul style="list-style-type: none"> TBC

Others	• TBC	• TBC
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Table 38 – Specific constraints for Manuroa Road Level Crossing

13.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.0m wide Lane (due to close proximity of neighbouring properties) Cycle Lane 1.2m (due to close proximity of neighbouring properties), Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing (50kph) 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 39 – Specific Assumptions – Manuroa Road Level Crossing

13.4 Road & Rail Considerations

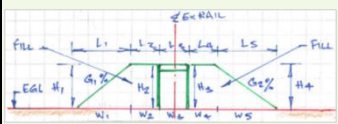
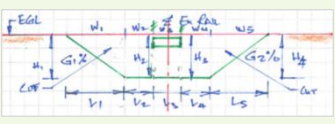
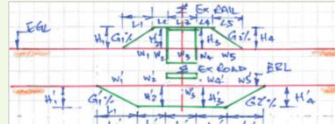
The existing road alignment of Manuroa Road is a two lane two way road of straight alignment, traversing in an east-west direction.

The major intersection with Great South Road is located 160m to the west, and a minor intersection with Oakleigh Ave is 100m to the east. Both intersections are required to be raised by a minimum of 0.3m and 3.5m, respectively. This would allow Manuroa Road to pass over the rail tracks of a minimum clearance of 5.5m with a maximum highway gradient of 5%.

A Rail Under Road (option 2) was considered. As with Taka St rail under road option, the lowering of the rail to pass under Manuroa Rd would require both a rebuild of Takanini station and the lowering of the Taka St level crossing.

Under option 3 (combination of road over and rail under), only Takanini station would need to be rebuilt. The AT project team noted that the future of the Takanini rail station including its location is the subject of a current investigation.

13.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	120	40	20	60	100	400	130	20	150	300	60	40	20	60	50
H	5.3	6.7	6.8	5.4	--	5.4	6.8	6.9	6.0	--	2.7	3.4	3.3	2.7	
W	11	11	11	11	11	16	16	10	10	10	11	11	11	11	11
G%	5.0	5.0	--	--	--	1.3	1.0	--	--	--	5.0	5.0	--	--	--
L'											400	80	20	100	150
H'											3.3	3.8	3.7	2.5	--
W'											16	16	10	10	10

Option	1			2			3				
G'%							1.0	1.7	--	--	--
On Line Impacts											
Ex Highway Alignment	H	M	L	H	M	L	H	M	L		
	Elevated road will impact driveways and adjacent streets			As Existing			Elevated road will impact to driveways and adjacent streets				
Ex Railway Alignment	H	M	L	H	M	L	H	M	L		
	As existing			Lowered rail track impacts Takanini Station and Taka St level crossing			Lowered rail track impacts Takanini Station				
Other Area Impacts											
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L		
	Additional intersection layout adjustment may be required extend into Great South Road			The area is known to have poor ground conditions, which would have major impacts (risks) on the rail under road option			The area is known to have poor ground conditions, which would have major impacts (risks) on the rail under road option				
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L		
	Station access improvement opportunities.			New Station platforms and accesses for both ends to street level with lift and stairs			New Station platforms and accesses for both ends to street level with lift and stairs				
Impacts on Others											
Adjacent Properties	H	M	L	H	M	L	H	M	L		
	A number of properties required for the alignment			A number of properties required for temporary alignment			A number of properties required for temporary alignment				
Impacts from Construction											
Complexity & Disruption	H	M	L	H	M	L	H	M	L		
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic				
Costs	H	M	L	H	M	L	H	M	L		
Construction	■			■			■				
Property	■			■			■				
Total	■			■			■				
Likely Duration	H	M	L	H	M	L	H	M	L		
	8 to 12 Months			12 to 24 Months			Over 24 Months				
Other Issues											
1	The impact on the Taka St level crossing needs to be considered for the rail under road option.										
2	The requirement and location of a future 3 rd main needs to be confirmed										

Table 40 – Output Summary for Manuroa Level Crossing

14 Site 43: O'Rorke Road

Road Name:	O'Rorke Road (43)	Control Type	KRN Line:	OBL
Project ID	OBL-01	(As in TCDM Part 9:Section 6)	Km'age:	0.59
Xing Name:	O'Rorke Road Ped Dn	Active/FLBs ¹ (Veh Control)	KRN S&I:	2994
	O'Rorke Road	Active/FLBs ¹ & HABs ²	Nos of Track	1
	O'Rorke Road Ped Up	Active/FLBs ¹ (Veh Control)	Nearest Stn:	Penrose

¹ – FLBs = Flashing Lights and Bells.

² – HABs = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

14.1 Site Description

The existing O'Rorke Road level crossing is located in the Maungakiekie – Tamaki Local Board area and is at 0.59km from the start of Onehunga Branch Line (OBL), adjacent to the Penrose Rail Station. The crossing is within the "T intersection" between O'Rorke Road and Station Road East. The traffic signals controlling this intersection span the crossing. This section of O'Rorke Road is bounded by Station Road East (5m) to the north and Rockridge Avenue (280m) to the south. The Maurice Rd level crossing is 450m to the west.



Photo 12: O'Rorke Road Xing looking south east

The 12.5m wide existing road carriageway is flanked by two 3.5m wide footpaths which lead to the vehicular level crossing and separated pedestrian level crossings on either side. The road alignment is relatively flat along the length. O'Rorke Rd is classified as a **collector road** and does not currently act as a local bus route. It is a designated oversize and overweight vehicle route and is largely surrounded by large scale industrial units. O'Rorke Rd is in a highly industrial area and carries a correspondingly higher proportion of commercial and heavy vehicles. There are a number of commercial vehicle accesses which exit onto O'Rorke Rd. There are no residential properties that have direct access to this section of the road. There is one main railway track crossing over the existing crossing. The Penrose Station – Onehunga branch (known as platform 3) has a 100m long side platform and is 300m away from the O'Rorke Rd level crossing. The platform is accessed by a ramp further north off Station Rd (East). The main Penrose station which serves passengers travelling north/south is accessed via a ramp from the northern end of platform 3 and a pedestrian footbridge over the existing railway line. The railway grade is from a steep incline (2.2%) and becomes level at the station.

High voltage overhead powerlines cross the level crossing along the alignment of the rail track.

The AT project team indicated that at some stage in the future, a second track may be installed along the Onehunga line to allow increased frequency of service.

14.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 12.5m wide carriageway width 2 x 3.5m wide footpaths within a major intersection 90 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> Collector road carrying 9,781 (AADT) 227 pedestrian movements per day(151 peak) Oversize and overweight vehicle route No current bus routes use the crossing High volume of commercial vehicles No on street parking on approach
Rail	<ul style="list-style-type: none"> gradient of 0.7% located north east of the crossing gradient of 1.3% located west of the crossing one track layout Penrose Station platform 3 approximately 300m to 	<ul style="list-style-type: none"> Close proximity to Penrose station and pedestrian overbridge crossing Close proximity to the Maurice Road Level Crossing (450m)

From	Infrastructure Constraints	Operational Constraints
	the east of the crossing	
Properties	<ul style="list-style-type: none"> Surrounded by large industrial/ commercial units 	<ul style="list-style-type: none"> Accesses from commercial and industrial units
Services	<ul style="list-style-type: none"> Overhead electricity wire 110/ 220kv Transpower line over existing crossing parallel to railway line 375 stormwater drain under crossing 250 Water mains under w footpath of O'rorke Rd 630 water main under eastern footpath 	<ul style="list-style-type: none"> Further clarification of services is required
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 41 – Site constraints –O'Rorke Road Level Crossing

14.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 42 – Specific Assumptions –O'Rorke Road Level Crossing

14.4 Road & Rail Considerations

The existing alignment of O'Rorke Road in the vicinity of the crossing is a four lane two way road, traversing in a north to south direction. The crossing is within the major signalised intersection with Station Road. The minor intersection of Olive Road and Station Rd East is 50m west from the crossing. Both of these intersections would need to be raised up to allow O'Rorke Road to pass over the rail tracks with a minimum clearance of 5.5m and a maximum road gradient of 5%. A key consideration is the road over rail option is the clearance to the 110/ 220kv overhead Transpower line.

A Rail under Road option (Option 2) was considered. This would require track lowering back through Penrose station platform 3 and along the NAL back as far as the Great South Rd overbridge. This was discussed with the AT project team; the option was deemed too intrusive and unfeasible to pursue further.

Option 3 (combination of road over and rail under) would also require lowering of Penrose station platform 3 but would not impact the NAL.

14.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	105	65	60	30	95	300	280	30	100	330	50	65	60	30	60
H	5.6	6.7	6.5	5.3	--	4.6	6.5	6.5	4.7	--	2.3	3.4	3.3	2.7	
W	24	24	12	12	12	10	10	10	16	16	24	24	12	12	12
G%	5.0	5.0	--	--	--	2.0	2.2	--	--	--	5.0	5.0	--	--	--

Option	1			2			3							
L'										230	100	30	80	125
H'										1.9	3.5	3.5	0.7	--
W'										10	10	10	10	16
G'%										2.1	2.5	--	--	--
On Line Impacts														
Ex Highway Alignment	H	M	L	H	M	L	H	M	L					
	Elevated road will impact to driveways and adjacent streets Signalised intersection would be elevated.			As existing			Elevated road will impact to driveways and adjacent streets Signalised intersection would be elevated.							
Ex Railway Alignment	H	M	L	H	M	L	H	M	L					
	As existing			Would require portion of NAL plus Penrose platform 3 to be lowered			Would require Penrose platform 3 to be lowered							
Other Area Impacts														
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L					
	Elevated road will include a 380m length of Station Road East to also be raised with impacts to the Olive Rd intersection.			Major impact to the NAL			Elevated road will include a section of Station Road East to also be raised with impacts to the Olive Rd intersection.							
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L					
	As existing			New Station platforms and accesses to street level with lift and stairs for Penrose platform 3			New Station platforms and accesses to street level with lift and stairs for Penrose platform 3							
Impacts on Others														
Adjacent Properties	H	M	L	H	M	L	H	M	L					
	A number of properties required for the alignment. Possible relocation of the 110/220kv Transpoweroverhead power lines required			A number of properties required for the alignment			A number of properties required for temporary alignment. Possible relocation of the 110/220kv Transpoweroverhead power lines required							
Impacts from Construction														
Complexity & Disruption	H	M	L	H	M	L	H	M	L					
	Temporary level crossing and railway closures will be required			Major disruption to rail services (Onehunga and NAL) and temporary bridge for highway traffic			Major disruption to rail services (Onehunga) and temporary bridge for highway traffic							
Costs	H	M	L	H	M	L	H	M	L					
Construction		■			■			■						
Property		■			■			■						
Total		■			■			■						
Likely Duration	H	M	L	H	M	L	H	M	L					
	8 to 12 Months			12 to 24 Months			Over 24 Months							
Other Issues														
1	.The grade separation solution for each of the level crossings on the Onehunga line need to be looked at as a package – the rail passenger journey along the Onehunga line needs to be relatively smooth as opposed to travelling under one intersection then back to grade then under again.													
2	The rail under road (Option 2) will have major effect to the NAL and existing Penrose Station / Junction, and has thus been discounted from further investigation													
3	The requirement of future Onehunga rail line duplication is to be confirmed													
4	The OBL platform at Penrose station will be impacted by the rail options													
5	The road over rail option (both Options 1 and 3) may have major impact to clearance of Transpower 110/220kv Electricity Line													

Table 43 – Output Summary for O'Rorke Road Level Crossing

15 Site 44: Maurice Road

Road Name:	Maurice Road (44)	Control Type	KRN Line:	OBL
Project ID	OBL-02	(As in TCDM Part 9:Section 6):	Km'age:	1.03
Xing Name:	Maurice Road Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&I:	2975
	Maurice Road	Active/FLBs ¹ & HABS ²	Nos of Track	1
	Maurice Road Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Te Papapa

¹ – FLBs = Flashing Lights and Bells.

² – HABS = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

15.1 Site Description

The existing Maurice Road level crossing is located in the Maungakiekie – Tamaki Local Board area and at 1.03km from the start of Onehunga Branch Line (OBL), 440m west of O'Rorke Rd level crossing and adjacent to the Winstones sidings (~750m west), Mays Rd crossing (860m west) and Te Papapa Station (~900m west).

The crossing is 40m south of the "T intersection" of Maurice Road and Station Road East. Maurice Road is bounded by Station Road East (40m) to the north and Church Street (650m) to the south of the crossing. The 11.5m wide existing carriageway is flanked by two 3.5m wide footpaths which lead to the vehicular level crossing and two separated pedestrian level crossings. Both highway (2%) and railway alignments (0.6%) are relatively flat at the crossing.



Photo 13: Maurice Road crossing looking northward

The road is classified as a **collector** and is not a bus or over dimensioned vehicle route. It is largely surrounded by large industrial units. There are a number of commercial vehicle accesses which exit onto Maurice Rd. Off Station Rd East 80m to the east is the intersection with Fairfax Avenue and the west 80m is a major entrance into an industrial/warehouse area.

There is one main railway track crossing over the existing crossing. There are no current platforms adjacent to the crossing (a platform to serve major events at Mt Smart stadium has been suggested in the vicinity).

High voltage overhead powerlines cross the level crossing along the alignment of the rail track.

The AT project team indicated that at some stage in the future, a second track may be installed along the Onehunga line to allow increased frequency of service.

15.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 11.5m wide carriageway width 2 x 3.5m wide footway 40m to a major intersection with Station Road East 60 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> Collector road carrying 4,793 (AADT) 84 Pedestrian movements per day (53 peak) High volume of commercial vehicles On street parking on approach No current bus routes use the crossing
Rail	<ul style="list-style-type: none"> Gradient of 0.8% to the east of crossing Gradient of 1.8% to the west of crossing one track layout 	<ul style="list-style-type: none"> Bounded by O'Rorke Rd level crossing (40m) Mays Rd (860m) level crossings
Properties	<ul style="list-style-type: none"> Surrounded by industrial/ commercial units 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial units
Services	<ul style="list-style-type: none"> Overhead electricity wire 	<ul style="list-style-type: none"> Further clarification of services is required

	<ul style="list-style-type: none"> 110/ 220kv Transpower line over existing crossing parallel to railway line 150 Sewer line south of the crossing 250 water retail pipe parallel to road 	
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 44 – Specific constraints for Maurice Road Level Crossing

15.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 45 – Specific Assumptions –Maurice Road Level Crossing

15.4 Road and Rail Considerations

The existing alignment of Maurice Road is a two lane two way road, traversing in a north to south direction. On the north side of the crossing the north bound lane separates into one left turn one right turn lane. Traffic from the north off Station Rd East merge into one single lane on the north side of the crossing. A major intersection with Station Road is located 40m from the crossing. The Fairfax Avenue intersection is 80m to the east along Station Rd East.. Both of these intersections would need to be raised up to allow Maurice Road to pass over the rail tracks with a minimum clearance of 5.5m and a maximum road gradient of 5%. A key consideration is the road over rail option is the clearance to the 110/ 220kv overhead Transpower line.

Both Rail under Road options (Options 2 and 3) were considered; the rail track could be lowered without impacting on other level crossings..

15.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	125	75	90	100	70	260	75	30	95	150	65	75	90	100	40
H	4.9	6.7	6.5	2.9	--	4.6	6.5	6.5	4.8	--	2.4	3.4	3.5	1.5	
W	26	26	13	13	13	10	10	10	10	10	26	26	13	13	13
G%	5.0	5.0	--	--	--	2.3	2.2	--	--	--	5.0	5.0	--	--	--
L'											230	100	30	80	125
H'											2	3.5	3.5	1	--
W'											10	10	10	10	10

Option	1			2			3					
G'%							2.0	1.2	--	--	--	
On Line Impacts												
Ex Highway Alignment	H	M	L	H	M	L	H	M	L			
	Elevated road will impact to driveways and adjacent streets			As existing			Elevated road will impact to driveways and adjacent streets					
Ex Railway Alignment	H	M	L	H	M	L	H	M	L			
	As existing			Single track alignment may double tracking in the future			Single track alignment may double tracking in the future					
Other Area Impacts												
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L			
	New highway will go beyond intersection to Station Road			As existing			New highway will go beyond intersection to Station Road					
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L			
	As existing			Alignment may restrict future widening			Alignment may restrict future widening					
Impacts on Others												
Adjacent Properties	H	M	L	H	M	L	H	M	L			
	A number of properties required for the alignment Possible relocation of the 110/220kv Transpower overhead power lines required			As existing			A number of properties required for temporary alignment. Possible relocation of the 110/220kv Transpower overhead power lines required					
Impacts from Construction												
Complexity & Disruption	H	M	L	H	M	L	H	M	L			
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic					
Costs	H	M	L	H	M	L	H	M	L			
	Construction		■			■			■			
	Property		■			■				■		
	Total		■			■				■		
Likely Duration	H	M	L	H	M	L	H	M	L			
	8 to 12 Months			12 to 24 Months			Over 24 Months					
Other Issues												
1	The grade separation solution for each of the level crossings on the Onehunga line need to be looked at as a package – the rail passenger journey along the Onehunga line needs to be relatively smooth as opposed to travelling under one intersection then back to grade then under again.											
2	The road over rail option (both Options 1 and 3) may have major impact to clearance of Transpower 110/220kv Electricity Line											
3	The requirement of future Onehunga rail line duplication is to be confirmed											

Table 46 – Output Summary for Maurice Road Level Crossing

16 Site 45: Mays Road

Road Name:	Mays Road (45)	Control Type	KRN Line:	OBL
Project ID	OBL-03	(As in TCDM Part 9:Section 6):	Km'age:	1.89
Xing Name:	May Road Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&C:	2975
	May Road	Active/FLBs ¹ & HABS ²	Nos of Track	1
	May Road Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Te Papapa

¹ – FLBs = Flashing Lights and Bells.

² – HABS = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

16.1 Site Description

The existing Mays Road level crossing is located in the Maungakiekie – Tamaki Local Board area and at 1.89km from the start of Onehunga Branch Line (OBL), adjacent to the Te Papapa Station (40m west) and Winstone Siding (110m east). The crossing is bounded by Felix Street (160m) to the North West and Church Street (190m) to the South. Captain Springs Rd level crossing is 240m west with the and Church St level crossing a further 100m west.

The 9m wide existing carriageway is flanked by two 3.5m wide footway and wide grass berms on Mays Road. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. Both highway (2.5%) and railway alignment(1%) are relatively flat at the crossing.

The road is classified as **distributor arterial** and is not a bus or over dimension vehicle route. It is surrounded on three sides by low levels industrial and commercial units and on the north west corner by a high density residential apartment complex. There are a number of commercial and residential vehicle accesses that exit onto Mays Rd. Felix Street consists mainly of residential properties.

There is one main railway track (with sidings to the west) passing over the existing crossing. The Te Papapa platform is 95m long and is 40m west of the level crossing. The platform is accessed by a ramp from the south side of the Mays Road level crossing. The railway grade is flat from the crossing to the station.

High voltage overhead powerlines cross the level crossing along the alignment of the rail track.

The AT project team indicated that at some stage in the future, a second track may be installed along the Onehunga line to allow increased frequency of service.



Photo 14: Mays Road Xing looking south east

16.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 9m wide carriageway width 2 x 3.5m wide footway and berm 190m to a major intersection Close to 90 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> Distributor arterial road carrying 20,369(AADT) 134 pedestrian movement per day (84 peak) High volume of commercial vehicles On street parking on the south east side of Mays Rd only No bus routes over the crossing
Rail	<ul style="list-style-type: none"> gradient of 1.7% located east of the crossing one track layout Winstone's siding on the east side of the crossing 	<ul style="list-style-type: none"> Close proximity to the Te Papapa Station Close proximity to the Captain Springs Rd and Church St level crossings
Properties	<ul style="list-style-type: none"> Surrounded on three sides by industrial/ commercial units 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial and private units

	<ul style="list-style-type: none"> Residential apartment block located on the NW corner of crossing 	
Services	<ul style="list-style-type: none"> Overhead electricity wires 110/ 220kv Transpower line over existing crossing parallel to railway line 150 Sewer just south of the crossing and 225 sewer just east of the crossing 150/200/1500 water mains under crossing Water wholesale chamber adjacent to crossing 	<ul style="list-style-type: none"> Further clarification of services is required
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 47 – Specific constraints –Mays Road Level Crossing

16.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 6% Road (to avoid works on Church Street) Road/Rail separation 6.5m (road over) Speed as existing 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 48 – Specific Assumptions –Mays Road Level Crossing

16.4 Road & Rail Considerations

The existing alignment of Mays Road is a two lane two way road, traversing in a roughly north to south direction. For the Road over Rail option, the road approach ramps and bridge do not impact either Felix St or Church Street to the south and Felix Street, and would allow Mays Road to pass over the rail tracks with a minimum clearance of 5.5m at a maximum road gradient of 5%. A key consideration is the road over rail option is the clearance to the 110/ 220kv overhead Transpower line.

A Rail Under Road option was considered; lowering the rail track to pass under Mays Rd would require a lowering (or other treatment) to both the Captain Springs Rd and Church Street level crossings as well as the rebuild of the Te Papapa station. The Combination Road Over / Rail Under option was considered; this option would avoid having to alter either the Captain Springs Road or Church St level crossings.

16.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	50	50	30	30	160	200	180	30	140	250	100	20	30	20	80
H	2.8	6.4	6.6	6.2	--	3.8	6.4	6.3	4.7	--	2.9	3.7	3.6	2.9	--
W	13	13	13	13	13	10	10	10	16	16	14	14	14	14	14
G%	5.0	6.0	--	--	--	2.5	2.5	--	--	--	5.0	5.0	--	--	--
L'											200	80	30	40	200
H'											2.8	3.3	3.1	3.3	--

Option	1			2			3				
W'							10	10	10	16	16
G'%							2.1	0.1	--	--	--
On Line Impacts											
Ex Highway Alignment	H	M	L	H	M	L	H	M	L		
	Elevated road will impact driveways and adjacent streets, and pedestrian access onto Te Papapa station			As existing			Elevated road will impact driveways and adjacent streets, and pedestrian access onto Te Papapa station				
Ex Railway Alignment	H	M	L	H	M	L	H	M	L		
	As existing			Would impact Te Papapa station, Captain Springs Rd and Church St level crossings			Would impact Te Papapa station				
Other Area Impacts											
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L		
	Elevated road footprint would not impact Church St if maximum grade at 6%.			Level crossings at Captain Springs Road and Church Street will be impacted							
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L		
	New station access at east end to new road level with lift and stair			New Station platforms and accesses for both ends to street level with lift and stairs			New station access at east end to new road level with lift and stair				
Impacts on Others											
Adjacent Properties	H	M	L	H	M	L	H	M	L		
	A number of properties Required for the alignment Possible relocation of the 110/220kv Transpower overhead power lines required			A number of properties required for temporary alignment			A number of properties required for temporary alignment Possible relocation of the 110/220kv Transpower overhead power lines required				
Impacts from Construction											
Complexity & Disruption	H	M	L	H	M	L	H	M	L		
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic				
Costs	H	M	L	H	M	L	H	M	L		
Construction		■			■			■			
Property		■			■			■			
Total		■			■			■			
Likely Duration	H	M	L	H	M	L	H	M	L		
	8 to 12 Months			12 to 24 Months			Over 24 Months				
Other Issues											
1	New vertical alignment will affect level crossings at Captain Springs Rd and Church St.										
2	The grade separation solution for each of the level crossings on the Onehunga line need to be looked at as a package – the rail passenger journey along the Onehunga line needs to be relatively smooth as opposed to travelling under one intersection then back to grade then under again.										
3	The road over rail option (both Options 1 and 3) may have major impact to clearance of Transpower 110/220kv Electricity Line										
4	The OBL platform at Te Papapa Station and Siding will be impacted by the rail options										
5	The requirement of future Onehunga rail line duplication is to be confirmed										

Table 49 – Output Summary for Mays Road Level Crossing

17 Site 46: Captain Springs Road

Road Name:	Captain Springs Road (46)	Control Type	KRN Line:	OBL
Project ID	OBL-04	(As in TCDM Part 9:Section 6):	Km'age:	2.13
Xing Name:	Captain Springs Rd Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&C:	2975
	Captain Springs Rd	Active/FLBs ¹ & HABS ²	Nos of Track	1
	Captain Springs Rd Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Te Papapa

¹ – FLBs = Flashing Lights and Bells.

² – HABS = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

17.1 Site Description

The existing Captain Springs Road level crossing is located in the Maungakiekie – Tamaki Local Board area and at 2.13km from the start of Onehunga Branch Line (OBL), with Te Papapa Rail Station 150m to the east. The crossing is 60m north of the signalised intersection of Captain Springs Road and Church Street. Grotto St is 100m north of the crossing; Church St is 60m to the south. The 11.5m wide existing carriageway is flanked by 3.5m wide footpaths, with wide grass berms on the north side. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. The highway alignment is relatively flat at the crossing. The rail is at a 2.3% grade



Photo 15: Captain Springs Road Xing looking northward

The road is classified as **local/collector road** and is used by school buses (not public buses). It is not a designated over dimension route. It is surrounded by low level industrial units on the eastern side and residential units on the west.

Both commercial and residential properties have direct property access onto Captain Springs Road via either commercial or residential road vehicle crossings.

The Church St level crossing is only 100m further southwest from the Captain Springs Rd level crossing. They are separated by a small pocket park.

There is one main railway track passing over the existing crossing. The Te Papapa Station has a 95m long island platform on the eastern side of the crossing. The platform is accessed from Captain Springs Rd by a ramp along the southern side of the rail track.

High voltage overhead powerlines cross the level crossing along the alignment of the rail track.

The AT project team indicated that at some stage in the future, a second track may be installed along the Onehunga line to allow increased frequency of service.

17.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 11.5m wide carriageway width 2 x 3.5m wide footpaths and berm on north side 60m to a major intersection 46 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> Local/collector road carrying 5,115(AADT) 250 Pedestrian movement per day (157 peak) Current school bus route through the crossing High volume of commercial vehicles On street parking on approaches
Rail	<ul style="list-style-type: none"> gradient of 1.2% located north east of the crossing. one track layout Te Papapa station 150m north east of the 	<ul style="list-style-type: none"> Close proximity to Te Papapa Station Close proximity to the Church St level crossing

From	Infrastructure Constraints	Operational Constraints
	<ul style="list-style-type: none"> crossing Pedestrian access ramp to station on the east side of the crossing 	
Properties	<ul style="list-style-type: none"> Surrounded by industrial/ commercial units on the east side of crossing Residential properties located to the west of the crossing 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial and private units
Services	<ul style="list-style-type: none"> Overhead electricity wires 150 Sewer just east of crossing 100/200 water mains under crossing 110/ 220kv Transpower overhead power lines immediately south of crossing 750/675 stormwater drains to the west of crossing 	<ul style="list-style-type: none"> TBC
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 50 – Specific constraints –Captain Springs Road Level Crossing

17.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 51 – Specific Assumptions –Captain Springs Road Level Crossing

17.4 Road & Rail Considerations

The existing alignment of Captain Spring Road is a two lane two way road, traversing in a north to south direction. The Road over Rail option would require the Captain Springs Rd/Church St intersection to be raised some 6m and would require the Church St level crossing to also be raised. This significant intervention would see 420m of Captain Springs Rd and some 300m of Church St needing to be rebuilt. This would allow Captain Spring Road to pass over the rail tracks with a minimum clearance of 5.5m with a maximum road gradient of 5%. A key consideration is the road over rail option is the clearance to the 110/ 220kv overhead Transpower line.

The Rail Under Road options (both option 2 and option 3) were considered; they both would require lowering (or other treatment) to both the Mays Road and Church Street level crossings and the rebuilding of Te Papapa station.

17.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	90	25	35	90	150	400	310	20	70	100	100	20	30	20	80
H	6	6.7	6.3	5.3	--	7.3	6.8	6	3.8	--	3.0	3.4	3.6	2.7	
W	13	13	13	13	13	16	16	10	10	10	13	13	13	13	13
G%	5.0	5.0	--	--	--	2.4	2.1	--	--	--	5.0	5.0	--	--	--
L'											350	200	20	70	100

Option	1			2			3				
H'							4.8	3.6	2.6	2.3	--
W'							16	16	10	10	10
G'%							2.3	1.0	--	--	--
On Line Impacts											
Ex Highway Alignment	H	M	L	H	M	L	H	M	L		
	Elevated road will impact to driveways and adjacent streets including major intersection			As existing			Elevated road will impact to driveways and adjacent streets including major intersection				
Ex Railway Alignment	H	M	L	H	M	L	H	M	L		
	As existing			Would impact Te Papapa station, Mays Rd and Church St level crossings			Would impact Te Papapa station, Mays Rd and Church St level crossings				
Other Area Impacts											
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L		
	New highway will not go beyond intersections			Level crossing at May Road and Church Street will be impacted			Level crossing at May Road and Church Street will be impacted				
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L		
	New station access at east end to new road level with lift and stair			New Station platforms and accesses for both ends to street level with lift and stairs			New station access at east end to new road level with lift and stair				
Impacts on Others											
Adjacent Properties	H	M	L	H	M	L	H	M	L		
	A number of properties Required for the alignment Possible relocation of the 110/220kv Transpower overhead power lines required			A number of properties required for temporary alignment			A number of properties required for temporary alignment Possible relocation of the 110/220kv Transpower overhead power lines required				
Impacts from Construction											
Complexity & Disruption	H	M	L	H	M	L	H	M	L		
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic				
Costs	H	M	L	H	M	L	H	M	L		
Construction	■			■			■				
Property	■			■			■				
Total	■			■			■				
Likely Duration	H	M	L	H	M	L	H	M	L		
	8 to 12 Months			12 to 24 Months			Over 24 Months				
Other Issues											
1	New vertical alignment will affect level crossings at Captain Springs Rd and Church St.										
2	The grade separation solution for each of the level crossings on the Onehunga line need to be looked at as a package – the rail passenger journey along the Onehunga line needs to be relatively smooth as opposed to travelling under one intersection then back to grade then under again.										
3	The road over rail option (both Options 1 and 3) may have major impact to clearance of Transpower 110/220kv Electricity Line										
	The requirement of future Onehunga rail line duplication is to be confirmed										
4	The OBL platform at Te Papapa Station and Siding will be impacted by the rail options										

Table 53 – Output Summary for Captain Springs Road Level Crossing

18 Site 47: Church Street

Road Name:	Church Street (47)	Control Type	KRN Line:	OBL
Project ID	OBL-05	(As in TCDM Part 9:Section 6):	Km'age:	2.23
Xing Name:	Church Street Ped Up	Active/FLBs ¹ (from Veh Control)	KRN S&I:	2975
	Church Street	Active/FLBs ¹ & HABS ²	Nos of Track	1
	Church Street Ped Dn	Active/FLBs ¹ (from Veh Control)	Nearest Stn:	Te Papapa

¹ – FLBs = Flashing Lights and Bells.

² – HABS = Half Arm Barriers:

Both ¹ and ² come from NZ Transport Agency's *Traffic control devices manual* part 9 Level crossings

18.1 Site Description

The existing Church St level crossing is located in the Maungakiekie – Tamaki Local Board area and at 2.23km from the start of Onehunga Branch Line (OBL), with Te Papapa Rail Station 250m to the east. The crossing is 60m west of the signalised intersection of Captain Springs Road and Church Street. Mountjoy Place is 170m west of the crossing; Captain Springs Road is 60m to the east. The 25m wide existing carriageway is flanked by 3.5m wide footpaths, with wide grass berms on the north side. The level crossing consists of a vehicular crossing with two separated pedestrian level crossings. The highway alignment is relatively flat at the crossing. The rail is at a 2.3% grade.



Photo 15: Captain Springs Road Xing looking northward

The road is classified as **local/collector road**, is not on a bus route and is not a designated over dimension route. It is surrounded by residential to the west a pocket park to the north east and retail to the south east.

Both commercial and residential properties have direct property access onto Church St via either commercial or residential road vehicle crossings.

The Captain Springs Road level crossing is only 100m further northeast from the Church St level crossing. They are separated by a small pocket park.

There is one main railway track passing over the existing crossing.

High voltage overhead powerlines cross the level crossing along the alignment of the rail track.

The AT project team indicated that at some stage in the future, a second track may be installed along the Onehunga line to allow increased frequency of service.

18.2 Site Constraints

From	Infrastructure Constraints	Operational Constraints
Road	<ul style="list-style-type: none"> 11.5m wide carriageway width 2 x 3.5m wide footway and berm 60m to a major intersection with Captain Springs Road 45 degree skew to the rail 5.0m Headroom clearance for OLE 	<ul style="list-style-type: none"> Collector road carrying 13,000 (AADT) 194 Pedestrians per day (100 peak) High volume of commercial vehicles On street parking on approach
Rail	<ul style="list-style-type: none"> gradient of 2.3% located north east of the crossing one track layout Te Papapa station 250m north east of the crossing 	<ul style="list-style-type: none"> Close proximity to Captain Springs Road level crossing Proximity to Mays Road level crossing
Properties	<ul style="list-style-type: none"> Surrounded by commercial units to the SE of the 	<ul style="list-style-type: none"> Highway vehicle accesses from commercial and

	<ul style="list-style-type: none"> crossing Residential properties to the north and west of the crossing 	residential units
Services	<ul style="list-style-type: none"> Overhead electricity wire 110/ 220kv Transpower overhead power lines parallel to rail track 600 Sewer across the level crossing 150/100 water mains under crossing 	<ul style="list-style-type: none"> TBC
Others	<ul style="list-style-type: none"> TBC 	<ul style="list-style-type: none"> TBC

Table 54 – Specific constraints – Church Street Level Crossing

18.3 Grade Separation Site Specific Assumptions and Caveats

Road Related	Rail Related	Others
<ul style="list-style-type: none"> 2 x 3.5m wide Lane Cycle Lane 1.5m, Pedestrian 2.0m Max gradient 5% Road Road/Rail separation 6.5m (road over) Speed as existing 	<ul style="list-style-type: none"> Max gradient 2% desirable (2.5% maximum) compensated grade for freight Rail to road separation 6.5m (rail under) Gradient at station set as existing Alignment speed as existing Horizontal alignment as existing 	<ul style="list-style-type: none"> Private way gradient 12.5% (1 in 8)

Table 55 – Specific Assumptions – Church Street Level Crossing

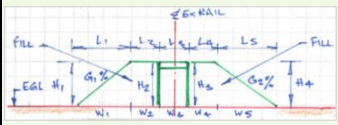
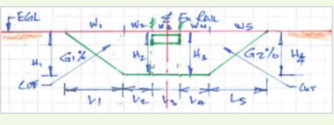
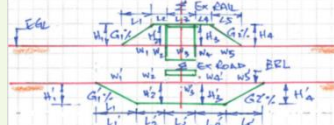
18.4 Road & Rail Considerations

The existing alignment of Church Street through the level crossing is a two lane two way road, traversing in an east to west direction.

The Road over Rail option would require the Captain Springs Rd/Church St intersection to be raised some 6m and would require the Captain Springs Rd level crossing to also be raised. This significant intervention would see 420m of Captain Springs Rd and some 300m of Church St needing to be rebuilt. This would allow Church St to pass over the rail tracks with a minimum clearance of 5.5m with a maximum road gradient of 5%. A key consideration is the road over rail option is the clearance to the 110/ 220kv overhead Transpower line.

The Rail Under Road options (both option 2 and option 3) were considered; they both would require lowering (or other treatment) to both the Mays Road and Captain Springs Rd level crossings, and the rebuilding of Te Papapa station.

18.5 Options Assessment

Option	1					2					3				
Descriptions & Dimensions															
Description	Road Over Rail					Rail Under Road					Combination of Option 1&2				
Key Dimension Diagram															
Estimated Key Dimensions (m)															
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L	100	30	40	50	90	450	270	30	50	150	50	30	40	50	45
H	5.2	6.5	6.7	4.8	--	7.7	6.9	6.0	4.1	--	2.6	3.3	3.8	2.4	
W	13	13	13	13	13	16	16	10	10	10	13	13	13	13	13
G%	5.0	3.0	--	--	--	2.5	2.4	--	--	--	5.0	3.0	--	--	--

Option	1			2			3				
L'							200	370	30	50	50
H'							3.5	3.7	3.2	1.7	--
W'							16	16	10	10	10
G'%							2.4	2.4	--	--	--
On Line Impacts											
Ex Highway Alignment	H	M	L	H	M	L	H	M	L		
	Elevated road will impact to driveways and adjacent streets including major intersection			As existing			Elevated road will impact to driveways and adjacent streets including major intersection				
Ex Railway Alignment	H	M	L	H	M	L	H	M	L		
	As existing			Would impact Te Papapa station, Mays Rd and Captain Springs Rd level crossings			Would impact Te Papapa station, Mays Rd and Captain Springs Rd level crossings				
Other Area Impacts											
Ex Highway Infrastructure	H	M	L	H	M	L	H	M	L		
	New highway will not go beyond intersections			Level crossing at May Road and Church Street will be impacted			Level crossing at May Road and Church Street will be impacted				
Ex Railway Infrastructure	H	M	L	H	M	L	H	M	L		
				New Te Papapa station platforms and accesses for both ends to street level with lift and stairs			New Te Papapa station access at east end to new road level with lift and stair				
Impacts on Others											
Adjacent Properties	H	M	L	H	M	L	H	M	L		
	A number of properties required for the alignment Possible relocation of the 110/220kv Transpower overhead power lines required			A number of properties required for temporary alignment			A number of properties required for temporary alignment Possible relocation of the 110/220kv Transpower overhead power lines required				
Impacts from Construction											
Complexity & Disruption	H	M	L	H	M	L	H	M	L		
	Temporary level crossing and railway closures will be required			Major disruption to rail services and temporary bridge for highway traffic			Major disruption to rail services and temporary bridge for highway traffic				
Costs	H	M	L	H	M	L	H	M	L		
Construction	■■■■■			■■■■■			■■■■■				
Property	■■■■■			■■■■■			■■■■■				
Total	■■■■■			■■■■■			■■■■■				
Likely Duration	H	M	L	H	M	L	H	M	L		
	8 to 12 Months			12 to 24 Months			Over 24 Months				
Other Issues											
1	New vertical alignment will affect level crossings at Mays Road and Captain Springs Rd										
2	The grade separation solution for each of the level crossings on the Onehunga line need to be looked at as a package – the rail passenger journey along the Onehunga line needs to be relatively smooth as opposed to travelling under one intersection then back to grade then under again.										
3	The road over rail option (both Options 1 and 3) may have major impact to clearance of Transpower 110/220kv Electricity Line										
4	The requirement of future Onehunga rail line duplication is to be confirmed										
5	The OBL platform at Te Papapa Station and Siding will be impacted by the rail options										

Table 56 – Output Summary for Church Street Level Crossing

19 Preliminary Planning Assessment

This section details a preliminary planning assessment undertaken as part of the Study. This is intended to provide a high level understanding of potential resource management constraints associated with the proposed structures in the road way. The assessment does not provide information relating to the individual sites but rather provides an understanding of the overarching considerations associated with any structure in the road corridor as discussed further in Section 20 that follows.

19.1 Bridge Structure

The construction of a bridge within the road reserve and over rail designation has been assessed under the Auckland Council District Plan: Isthmus Section (**ACDP: I**), the Auckland Council District Plan: Papakura Section (**ACDP: P**), and the Auckland Council District Plan: Waitakere Section (**ACDP: W**). This assessment is summarised in the following sections.

19.1.1 Auckland Council District Plan: Isthmus Section

Rules for the construction of bridges and works within the road reserve are provided for in Chapter 4A: General Rules – Network Utilities section. The rail designation in the Isthmus has an underlying zoning of Special Purpose 3 Zone (Transport Corridor) covered in Chapter 10: Special Purpose Zone. The relevant rules from the two chapters are outlined in **Appendix D1**. Overall, the construction of bridges within the road reserve and rail designation (Special Purpose 3 Zone) in ACDP: Isthmus would likely be a **Permitted Activity**, provided grade of access standards are met under Rule 12.8.2.1(c).

The nine sites included in this preliminary assessment within the Isthmus area are the rail crossings on Morningside Drive (Kingsland), Woodward Road (Mount Albert), St Jude Street (Blockhouse Bay), St George Road (Avondale), O'Rorke Road (Penrose), Maurice Road (Penrose), Mays Road (Onehunga), Captain Spring Road (Onehunga), and Church Street (Onehunga). The surrounding land-uses for these sites are characterised by a combination of residential, business, industrial, open space, mixed-uses, railway and strategic roads. The surrounding land-uses for each of the sites are outlined in more detail in **Appendix D2**.

19.1.2 Auckland Council District Plan: Papakura Section

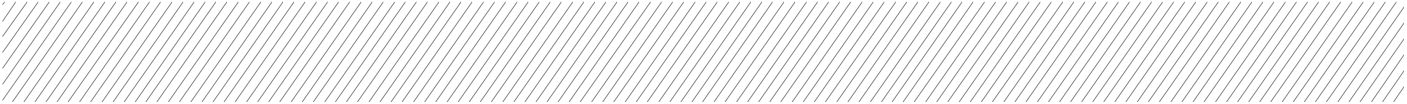
Rules for the construction of bridges and works within the road reserve and rail area are provided for in Chapter 11: Network Utilities, Transport and Roading. The relevant rules from the chapter are summarised in **Appendix D3**. The construction of a bridge within the road reserve and rail designation would likely be a **Controlled Activity** under the ACDP: P due to the structure exceeding the permitted height and ground coverage. This activity status assumes the bridge meets the height in relation to boundary requirements and is no greater than 9m in height.

Three sites in the Papakura area were included in this preliminary assessment, including rail crossings on Walters Road (Takanini), Taka Street (Takanini), and Manuroa Road (Takanini). The surrounding land-uses for these sites are generally a mix of residential, commercial, and industrial activities. **Appendix D4** outlines the surrounding land-uses for each of the sites in more detail.

19.1.3 Auckland Council District Plan: Waitakere Section

Rule 5.2(b) of the Transport Environment Chapter of the ACDP: W allows for any activity involving infrastructure associated with transport in the current rail corridor. The relevant rules from the chapter are summarised in **Appendix D5**. Overall, the construction of a bridge within the road reserve and rail designation under the ACDP: W would likely constitute a **Discretionary Activity** because the bridge structure exceeds the Permitted and Controlled Activity standards for height above ground level and above-ground area.

The four sites included in this preliminary assessment in the Waitakere area are the rail crossings on Portage Road (New Lynn), Glenview Road (Glen Eden), Bruce McLaren Road (Henderson), and Metcalfe Road (Henderson). The surrounding land-uses for these sites is characterised by town



centres and suburban shopping centres, industrial/employment areas, residential activities, and open space. The surrounding land-uses for each of the sites are outlined in more detail in **Appendix D6**.

19.2 Other Resource Consent Considerations

Other consents associated with construction of the bridge will be required and will likely include:

- Construction Noise/vibration
- Earthworks
- Stormwater discharge (construction and operation)
- Works within tree drip line/tree removal

19.2.1 Proposed Auckland Unitary Plan (PAUP)

There are a number of areas of the PAUP that may potentially need to be considered/included in the resource consent application for the proposed bridge construction, including:

- Earthworks in Mana Whenua site and place of value/significance
- Earthworks 1% AEP flood plain
- Outstanding Natural Landscape
- Outstanding Natural Feature
- Significant Ecological Area
- Stormwater discharge

19.2.2 Stakeholder Consultation/Engagement

Stakeholder consultation/engagement is anticipated with the following:

- KiwiRail
- Directly affected property owners and occupiers
- Adjacent property owners and occupiers
- Local Boards
- Iwi

19.2.3 Specialist Assessment to support Assessment of Environmental Effects

The following specialist assessments are anticipated to support the Assessment of Environmental Effects:

- Urban Design Treatment/Framework
- Landscaping
- Visual impact assessment
- Cultural Impact Assessment (if site is in or near a Site and Place of Value/Significance to Mana Whenua)
- Noise/Vibration
- NES Contaminated Land
- Traffic
- Geotechnical

20 Summary of the Reviews

20.1 Project Expected Estimate (Total Costs)

The following table illustrate the Project Expected Estimate (total costs without funding risks):

Site	Location	Option 1 Highway Flyover			Option 2 Railway under Ex Highway			Option 3 50/50		
		Infrastructure	Property	Total	Infrastructure	Property	Total	Infrastructure	Property	Total
1	Morningside Drive	████	████	████	████	████	████	████	████	████
12	Woodward Road	████	████	████	████	████	████	████	████	████
14	St Jude Street	████	████	████	████	████	████	████	████	████
16	Saint Georges Road	████	████	████	████	████	████	████	████	████
17	Portage Road	████	████	████	████	████		████		
19	Glenview Road	████			████	████		████		
21	Bruce McLaren Road	████	████	████	████	████	████	████	████	████
25	Metcalfe Road	████	████	████	████	████	████	████	████	████
34	Walters Road	████	████	████	████	████	████	████	████	████
35	Taka Street	████	████	████	████	████	████	████	████	████
36	Manuroa Road	████	████	████	████	████	████	████	████	████
43	O'Rorke Road	████	████	████	████	████	████	████	████	████
44	Maurice Road	████	████	████	████	████	████	████	████	████
45	Mays Road	████	████	████	████	████	████	████	████	████
46	Captain Springs Rd	████	████	████	████	████	████	████	████	████
47	Church Street	████	████	████	████	████	████	████	████	████

Table57 – Indicative Project Expected Estimate summary



20.2 Possible Future Considerations (NAL)

Possible considerations for future Investigations and designs stages should include:

- Morningside Drive and Woodward Road impact to the proposed CRL service patterns
- St Jude Street and St Georges should be investigated as a single package
- Portage Road road over rail option should only be considered for this site
- Glenview Road;, alternative site options outside of the existing road alignment need to be identified for grade separation.
- Bruce McLaren should consider the requirements of stabling facilities at Henderson
- Metcalfe Rd solution should be developed in conjunction with any future Ranui station redevelopment

20.3 Possible Future Considerations (NIMT)

Possible considerations for future Investigations and designs stage should include:

- Walters Road solution should assess the shopping areas to the north of the crossing.
- Taka Street and Manuroa Road with Takanini Station development should be considered as a single package

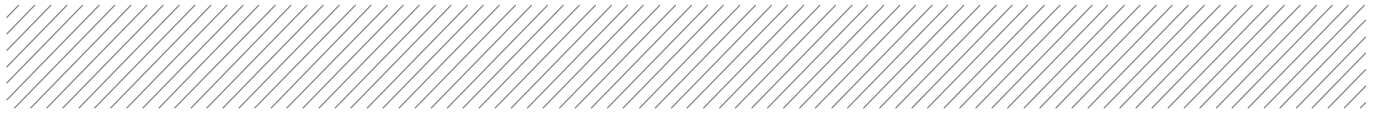
20.4 Possible Future Considerations (OBL)

Possible considerations for future Investigations and designs stage should include:

- The impact of the overhead 110/ 220KV power line on the Road over Rail option
- O'Rorke Road Option 2 is not feasible, as it requires significant additional track to join back into the NAL in the Penrose area
- Mays Road, Captain Springs Road and Church Street should be considered as a single package, given their close proximity to one another.

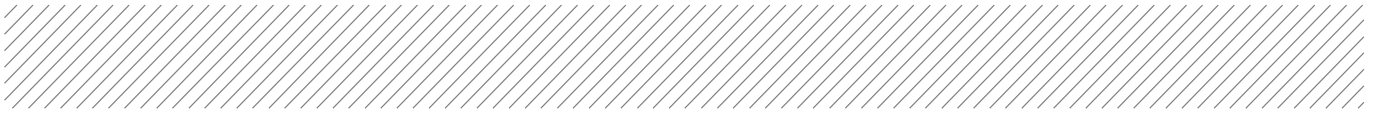
Appendices





Appendix A

Level Crossings information



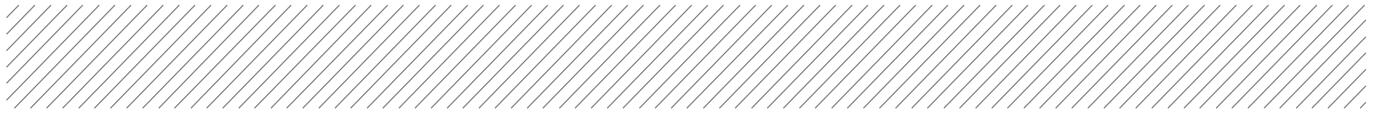
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Level Crossing Info

AT Project ID	Road Name	Crossing Type	Control (as defined in Pt 9)	Kmage	Usage	Non OHL
North Auckland Line						
01	NAL- S- 01 Church Street East Church Street East Ped Dn	Road	Half Arm Barriers	1.42		
02	NAL- W- 01 Kingdon Street Pedestrian	Pedestrian Down	Active	1.42		
03	NAL- W- 02 Normanby Road Normanby Road Ped Up Normanby Road Ped Dn	Road	Half Arm Barriers	10.15		
04	NAL- W- 03 Mount Eden Pedestian 1 Mount Eden Pedestian 2	Pedestrian Up Pedestrian Down	Active Active	10.15 10.15		
05	NAL- W- 04 Porters Avenue Ped Up Porters Avenue Ped Dn Porters Avenue	Pedestrian Stand Alone	Active	10.73		
06	NAL- W- 05 George Street Ped Dn George Street Ped Up George Street	Pedestrian Stand Alone	Active	10.73		
07	NAL- W- 06 Morningside Drive Dn Morningside Drive Up Morningside Drive	Pedestrian Up Pedestrian Down	Active Active	10.86 10.86		
08	NAL- W- 07 Asquith Avenue Asquith Avenue Ped Up Asquith Avenue Ped Dn	Road	Half Arm Barriers	10.86		
09	NAL- W- 08 Rossgrove Terrace Rossgrove Terrace Ped Up Rossgrove Terrace Ped Dn	Pedestrian Down	Active	11.37		
10	NAL- W- 09 Baldwin Avenue Pedestrian	Pedestrian Up	Active	11.37		
11	NAL- W- 10 Llyod Avenue Pedestrian	Road	Half Arm Barriers	11.37		
12	NAL- W- 11 Woodward Road Woodward Road Ped Dn Woodward Road Ped Up	Pedestrian Down	Active	12.80		
13	NAL- W- 12 Crayford Street Pedestrian	Pedestrian Up	Active	12.80		
14	NAL- W- 13 St Jude Street St Jude Street Ped Up St Jude Street Ped Dn	Road	Half Arm Barriers	12.80		
15	NAL- W- 14 Chalmers Street Chalmers Street Ped Up Chalmers Street Ped Dn	Pedestrian Up Pedestrian Down	Active Active	14.03 14.03		
16	NAL- W- 15 St Georges Road St Georges Road Ped Up St Georges Road Ped Dn	Road	Half Arm Barriers	14.03		
17	NAL- W- 16 Portage Road Portage Road Ped Up Portage Road Ped Dn	Pedestrian Up Pedestrian Down	Active Active	14.13 14.13		
18	NAL- W- 17 Fruitvale Road Fruitvale Road Ped Up Fruitvale Road Ped Dn	Road	Half Arm Barriers	14.13		
19	NAL- W- 18 Glenview Road Glenview Road Ped Up Glenview Road Ped Dn	Pedestrian Stand Alone	Active	14.34		
20	NAL- W- 19 Sherrybrooke Place Sherrybrooke Place Ped Up Sherrybrooke Place Ped Dn	Pedestrian Stand Alone	Active	14.90		
21	NAL- W- 20 Bruce McLaren Road Bruce McLaren Road Ped Up Bruce McLaren Road Ped Dn	Road	Half Arm Barriers	15.80		
22	NAL- W- ?? Corban Estate Pedestrian	Pedestrian Down	Active	15.80		
23	NAL- W- 21 Mt Lebanon Lane Mt Lebanon Lane Ped Up Mt Lebanon Lane Ped Dn	Pedestrian Up Pedestrian Down	Active Active	15.80 15.80		
24	NAL- W- 22 Sturges Road Pedestrian	Pedestrian Stand Alone	Active	14.90		

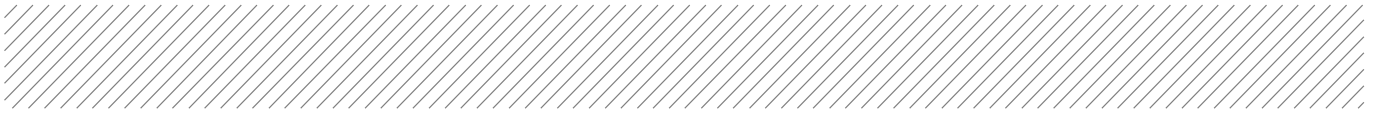
Level Crossing Info

AT Project ID	Road Name	Crossing Type	Control (as defined in Pt 9)	Kmage	Usage	Non OHL
25	NAL- W- 23 Metcalf Road Metcalf Road Ped Up Metcalf Road Ped Dn	Road Pedestrian Up Pedestrian Down	Half Arm Barriers Active Active	29.50 29.50 29.50		
26	NAL- W- 24 Ranui Pedestrian	Pedestrian Stand Alone	Active	29.75		
27	NAL- W- 25 O'Neills Road Pedestrian	Pedestrian Stand Alone	Active	31.39		
North Island Main Trunk						
28	NIMT- S- 01 Tuhimata Road Pedestrian	Pedestrian Stand Alone	Active	632.95		Non OHL
29	NIMT- S- 02 Crown Road	Road	Half Arm Barriers	633.57		Non OHL
30	NIMT- S- 03 Sutton Road	Road	Half Arm Barriers	643.36		Non OHL
31	NIMT- S- 04 Opheke Road	Road	Half Arm Barriers	644.60		Non OHL
32	NIMT- S- 05 Boundary Road	Road	Half Arm Barriers	645.53		Non OHL
33	NIMT- S- 06 Tironui Pedestrian	Pedestrian Stand Alone	Active	648.85		
34	NIMT- S- 07 Walter Road Walter Road Ped Dn	Road Pedestrian Down	Half Arm Barriers Active	649.19 649.19		
35	NIMT- S- 08 Taka Street Taka Street Ped Up Taka Street Ped Dn	Road Pedestrian Up Pedestrian Down	Half Arm Barriers Active Active	650.38 650.38 650.38		
36	NIMT- S- 09 Takanini Pedestrian 1 Takanini Pedestrian 2	Pedestrian Stand Alone Pedestrian Stand Alone	Passive Passive	650.57 650.57	station station	
37	NIMT- S- 10 Manuroa Road Manuroa Road Ped Up Manuroa Road Ped Dn	Road Pedestrian Up Pedestrian Down	Half Arm Barriers Active Active	650.89 650.89 650.89		
38	NIMT- S- 11 Spartan Road Spartan Road Ped Dn	Road Pedestrian Down	Half Arm Barriers Active	651.46 651.46	H'way H'way	
39	NIMT- S- 12 Ta Mahia Pedestrian 1 Ta Mahia Pedestrian 2	Pedestrian Stand Alone Pedestrian Stand Alone	Active Active	652.32 652.32	station station	
40	NIMT- S- 13 Homai South Pedestrian Homai North Pedestrian	Pedestrian Stand Alone Pedestrian Stand Alone	Active Active	655.62 655.77	station station	
41	NIMT- S- 14 Papatoetoe Pedestrian 2 Papatoetoe Pedestrian 1	Pedestrian Stand Alone Pedestrian Stand Alone	Active Active	660.52 660.52	station station	
42	NIMT- S- 15 Glen Innes South Pedstrian Glen Innes North Pedstrian	Pedestrian Stand Alone Pedestrian Stand Alone	Active Active	672.53 672.72	station station	
Onehunga Branch Line						
43	OBL- 01 O'Rorke Road O'Rorke Road Ped Dn O'Rorke Road Ped Up	Road Pedestrian Down Pedestrian Up	Half Arm Barriers Active Active	0.59 0.59 0.59		Bi D'tional Bi D'tional Bi D'tional
44	OBL- 02 Maurice Road Maurice Road Ped Dn Maurice Road Ped Up	Road Pedestrian Down Pedestrian Up	Half Arm Barriers Active Active	1.03 1.03 1.03		Bi D'tional Bi D'tional Bi D'tional
45	OBL- 03 May Road May Road Ped Dn May Road Ped Up	Road Pedestrian Down Pedestrian Up	Half Arm Barriers Active Active	1.89 1.89 1.89		Bi D'tional Bi D'tional Bi D'tional
46	OBL- 04 Captain Springs Rd Captain Springs Rd Ped Dn Captain Springs Rd Ped Up	Road Pedestrian Down Pedestrian Up	Half Arm Barriers Active Active	2.13 2.13 2.13		Bi D'tional Bi D'tional Bi D'tional
47	OBL- 05 Church Street Church Street Ped Dn Church Street Ped Up	Road Pedestrian Down Pedestrian Up	Half Arm Barriers Active Active	2.23 2.23 2.23		Bi D'tional Bi D'tional Bi D'tional
48	OBL- 06 Alferd Street Alferd Street Ped Dn Alferd Street Ped Up	Road Pedestrian Down Pedestrian Up	Half Arm Barriers Active Active	2.77 2.77 2.77		Bi D'tional Bi D'tional Bi D'tional
49	OBL- 07 Victoria Street Victoria Street Ped Dn Victoria Street Ped Up	Road Pedestrian Down Pedestrian Up	Half Arm Barriers Active Active	2.98 2.98 2.98		Bi D'tional Bi D'tional Bi D'tional
50	OBL- 08 Galway Street	Road	Half Arm Barriers	3.32		Bi D'tional



Appendix B

FE Summaries



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Client Ref:	NAL-W-06 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Morningside Drive (Site 7) NAL 12.8km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL-W-06 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Morningside Drive (Site 7)	Prepared By:	TP
	NAL 12.8km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL-W-06 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Morningside Drive (Site 7)	Prepared By:	TP
	NAL 12.8km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 11 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Woodward Road (Site 11) NAL 15.80	Prepared By:	TP
		Checked By:	JA

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 11 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Woodward Road (Site 11)	Prepared By:	TP
	NAL 15.80	Checked By:	JA

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 11 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Woodward Road (Site 11) NAL 15.80	Prepared By:	TP
		Checked By:	JA

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL-W-13 (Rev01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	St Jude Street (Site 14) NAL 17.4km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL-W-13 (Rev01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	St Jude Street (Site 14) NAL 17.4km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL-W-13 (Rev01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	St Jude Street (Site 14) NAL 17.4km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 15 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	St Georges Road (Site 16) NAL 18.23	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 15 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	St Georges Road (Site 16)	Prepared By:	TP
	NAL 18.23	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 15 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	St Georges Road (Site 16)	Prepared By:	TP
	NAL 18.23	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 16 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Portage Road (Site 17)	Prepared By:	TP
	NAL 18.88	Checked By:	SL

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These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL-W-20 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Bruce McLaren Road (Site 21)	Prepared By:	TP
	NAL 25.55km	Checked By:	SL

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These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
	Construction			
1	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL-W-20 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Bruce McLaren Road (Site 21)	Prepared By:	TP
	NAL 25.55km	Checked By:	SL

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These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
	Construction			
1	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL-W-20 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Bruce McLaren Road (Site 21)	Prepared By:	TP
	NAL 25.55km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
	Construction			
1	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 23 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Metcalfe Road (Site 25)	Prepared By:	TP
	NAL 29.50	Checked By:	JA

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 23 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Metcalfe Road (Site 25)	Prepared By:	TP
	NAL 29.50	Checked By:	JA

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NAL - W - 23 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Metcalfe Road (Site 25)	Prepared By:	TP
	NAL 29.50	Checked By:	JA

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
	Construction			
1	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NIMT-S-07 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Walters Road (Site 34) NIMT 649.19km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NIMT-S-07 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Walters Road (Site 34)	Prepared By:	TP
	NIMT 649.19km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NIMT-S-07 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Walters Road (Site 34)	Prepared By:	TP
	NIMT 649.19km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NIMT-S-08 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Taka Street (Site 35) NIMT 650.38km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NIMT-S-08 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Taka Street (Site 35)	Prepared By:	TP
	NIMT 650.38km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NIMT-S-08 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Taka Street (Site 35)	Prepared By:	TP
	NIMT 650.38km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
	Construction			
1	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref: NIMT-S-010 (Rev 01)	Date: 24/11/2014
Project: AT Level Crossing Feasibility Studies	Job No: 236852
Location: Manuroa Road (Site 37) NIMT 650.89km	Prepared By: TP Checked By: SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NIMT-S-010 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Manuroa Road (Site 37)	Prepared By:	TP
	NIMT 650.89km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	NIMT-S-010 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Manuroa Road (Site 37)	Prepared By:	TP
	NIMT 650.89km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
	Construction			
1	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref: OBL-01 (Rev 01)	Date: 24/11/2014
Project: AT Level Crossing Feasibility Studies	Job No: 236852
Location: O'Rorke Road (Site 43) OBL 0.59km	Prepared By: TP Checked By: SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
	<i>Sub-total base physical works</i>			
D	Total construction			
E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref: OBL-01 (Rev 01)	Date: 24/11/2014
Project: AT Level Crossing Feasibility Studies	Job No: 236852
Location: O'Rorke Road (Site 43) OBL 0.59km	Prepared By: TP
	Checked By: SL

Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
14	Extraordinary construction costs (inc Rail)			
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	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL-01 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	O'Rorke Road (Site 43) OBL 0.59km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
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	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
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	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL - 02 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Maurice Road (Site 44) OBL 1.03km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
2	Environmental compliance			
3	Earthworks			
4	Ground improvements			
5	Drainage			
6	Pavement and surfacing			
7	Bridges			
8	Retaining walls			
9	Traffic services			
10	Service relocations			
11	Landscaping			
12	Traffic management and temporary works			
13	Preliminary and general			
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	<i>Sub-total base physical works</i>			
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E	Project base estimate (A+B+C+D)			
F	Contingency (Assessed/Analysed) (A+B+C+D)			
G	Project expected estimate (E+F)			
	Project property cost expected estimate			
	Investigation and reporting expected estimate			
	Design and project documentation expected estimate			
	Construction expected estimate			
H	Funding risk (Assessed/Analysed) (A+B+C+D)			
I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL - 02 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Maurice Road (Site 44)	Prepared By:	TP
	OBL 1.03km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
	- the AT managed costs			
C	Total design and project documentation			
1	Construction			
	MSQA			
	- consultancy fees			
	- the AT managed costs			
	- consent monitoring fees			
	<i>Sub-total base MSQA</i>			
	Physical works			
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	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL - 02 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Maurice Road (Site 44)	Prepared By:	TP
	OBL 1.03km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
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	MSQA			
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	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL - 03 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	May Road (Site 45)	Prepared By:	TP
	OBL 1.89km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
	- consultancy fees			
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	MSQA			
	- consultancy fees			
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	- consent monitoring fees			
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I	95th percentile project estimate (G+H)			
	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL - 03 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	May Road (Site 45)	Prepared By:	TP
	OBL 1.89km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
B	Total investigation and reporting			
	Design and project documentation:			
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	<i>Sub-total base MSQA</i>			
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	Project property cost 95th percentile estimate			
	Investigation and reporting 95th percentile estimate			
	Design and project documentation 95th percentile estimate			
	Construction 95th percentile estimate			
Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL - 03 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	May Road (Site 45)	Prepared By:	TP
	OBL 1.89km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
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		Option 3 - 50/50		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
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11	Landscaping			
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	<i>Sub-total base physical works</i>			
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Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL - 04 & OBL - 05 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Captain Spring Road (Site 46) & Church Street (Site 47) OBL 2.13km & OBL 2.23km	Prepared By:	TP
		Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
These estimates are exclusive of escalation and GST.*

		Option 1 - Highway Flyover		
Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
	- consultancy fees			
	- the AT managed costs			
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Date of estimate		Cost index (Qtr/Year)		
Estimate external peer review by		Signed		
Estimate accepted by the AT		Signed		

Client Ref:	OBL - 04 & OBL - 05 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Captain Spring Road (Site 46) & Church Street (Site 47)	Prepared By:	TP
	OBL 2.13km & OBL 2.23km	Checked By:	SL

*Notes: The figures in this document are for outline indicative costs comparison and should not be used as budgetary or construction cost estimates.
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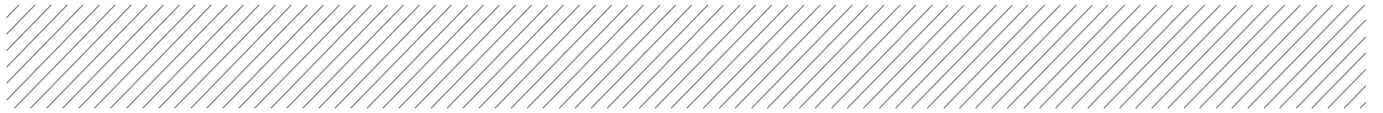
Option 2 - Railway Under H'way @ERL

Item	Description	Base estimate	Contingency	Funding risk
A	Nett project property cost			
	Investigation and reporting:			
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	Design and project documentation 95th percentile estimate			
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Client Ref:	OBL - 04 & OBL - 05 (Rev 01)	Date:	24/11/2014
Project:	AT Level Crossing Feasibility Studies	Job No:	236852
Location:	Captain Spring Road (Site 46) & Church Street (Site 47)	Prepared By:	TP
	OBL 2.13km & OBL 2.23km	Checked By:	SL

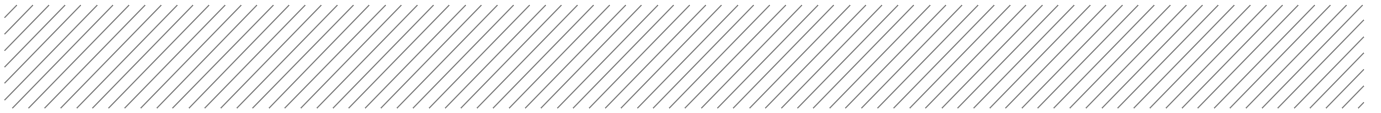
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Item	Description	Base estimate	Contingency	Funding risk
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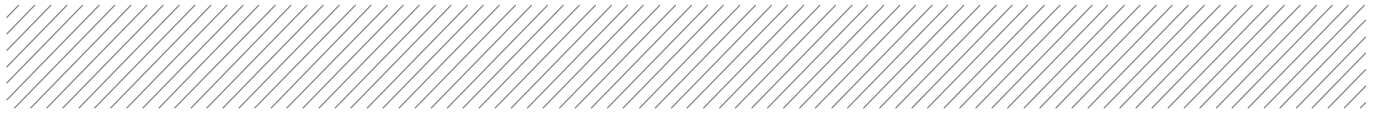


Appendix C

Concept Drawings – See Volume 2



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Appendix D

Planning Related information

Appendix D1

Rule Reference	Provision	Activity Status
4A.4.6 B.(ii) Network Utilities Permitted Activities	<i>(ii) The construction (including earthworks), operation and maintenance of roads is a permitted activity throughout the Isthmus and includes: – Bridges for roads, tramways, railways and underpasses and retaining walls</i>	Permitted
10.7.3 Special Purpose Zone	<i>Any facility designed primarily for the movement of people and/or goods</i>	Permitted
12.8.2.1 Access To Sites	<i>Every parking and loading space shall have access from a road, in accordance with the following standards: (c) The grade of access shall not be steeper than 1 in 4 for land zoned residential, and 1 in 8 for land zoned other than residential. For curved ramps and driveways, the gradient is measured along the inside radius. Ramps or driveways terminating on a grade steeper than 1 in 20 prior to the road reserve shall be provided with a platform not steeper than 1 in 20, located adjacent to the road boundary. For land zoned residential the length of the platform shall not be less than 4m, and for land zoned other than residential, not less than 6m. Where the driveway gradient is steeper than 1 in 8, a transition section will be required to avoid inadequate ground clearance.</i>	Likely to comply

Auckland Council District Plan (I) Abstract

Appendix D2

Subject Site	Zoning	Zone Description
Morningside Drive	Business 4	<i>Low to medium intensity light industrial and service uses.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>
Woodward Road	Residential 6A	<i>Medium intensity residential neighbourhoods.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>
	MU	<i>Mixed Use</i>
	Residential 2B	<i>Generously sized lots, wide roads and low densities.</i>
	Residential 7A	<i>Range of building types, including three and four storey multi-unit developments.</i>
	Business 1	<i>Existing small centres which can be found throughout the residential areas of the City</i>
St Jude Street	Residential 5	<i>Low intensity detached homes, mainly low rise (1-2 storeys), at lower densities (1-2 units per site) on sites with relatively generous areas of open space.</i>
	Mixed Use	<i>Zone contains residential activity, coupled with a range of business and leisure activities, creating a unique and diverse mixed use urban environment.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>
St George Road	Residential 6A	<i>Medium intensity residential neighbourhoods.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>
O'Rorke Road	Business 5	<i>Low to medium intensity industrial activity.</i>
	Business 4	<i>Low to medium intensity light industrial and service uses are the dominant activities.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>
Maurice Road	Business 5	<i>Low to medium intensity industrial activity.</i>
	Business 4	<i>Low to medium intensity light industrial and service uses are the dominant activities.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>

Subject Site	Zoning	Zone Description
Mays Road	Business 5	<i>Low to medium intensity industrial activity.</i>
	Business 4	<i>Low to medium intensity light industrial and service uses are the dominant activities.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>
	Business 4	<i>Low to medium intensity light industrial and service uses are the dominant activities.</i>
Captain Spring Rd	Business 5	<i>Low to medium intensity industrial activity.</i>
	Business 4	<i>Low to medium intensity light industrial and service uses are the dominant activities.</i>
	Business 6	<i>Heavy, noxious or otherwise unpleasant industrial activity within the City.</i>
	Residential 6A	<i>Medium intensity residential neighbourhoods.</i>
	Open Space 1	<i>Land of particular scenic, heritage, natural or habitat value.</i>
	Open Space 2	<i>Open space for informal recreation</i>
	Open Space 3	<i>Sites in the district which are used primarily for organised sports and recreation.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>
Church Street	Business 5	<i>Low to medium intensity industrial activity.</i>
	Business 4	<i>Low to medium intensity light industrial and service uses are the dominant activities.</i>
	Business 6	<i>Heavy, noxious or otherwise unpleasant industrial activity within the City.</i>
	Residential 6A	<i>Medium intensity residential neighbourhoods.</i>
	Open Space 1	<i>Land of particular scenic, heritage, natural or habitat value.</i>
	Open Space 2	<i>Open space for informal recreation</i>
	Open Space 3	<i>Sites in the district which are used primarily for organised sports and recreation.</i>
	Special Purpose 3	<i>Applies to all existing railway rights of way and to particular strategic roads.</i>

Surrounding Land uses for the Level Crossings in Auckland (I)

Appendix D3

Rule Reference	Provision	Activity Status/ compliance
Part 10 Definitions	<i>Network Utilities means any activity relating to:</i> <i>vi. construction, operation or maintenance of roads and railway lines</i>	N/A
11.8.1 Permitted Activities	<i>4. Any above-ground network utility where the structures for that activity:</i> <i>i. have a ground coverage of less than 50m²; and</i> <i>ii. have a height not exceeding 7.5m; and</i> <i>iii. are on allotments less than 200m² in area.</i>	Does not comply: The bridge structure will likely be approximately 6m to 7m in height and exceed 50m ² ground coverage.
11.8.2 Controlled Activities	<i>4. The construction of new roads and associated facilities including retaining walls, culverts and bridges and traffic signs and control devices.</i> <i>All controlled activities must meet the following standards and terms set out in Rules 4.9.8.1, 4.10.8.1, 4.11.7.1, 4.12.8.1, 4.13.8.2, 4.14.8.1 and 4.15.8.2 as appropriate to the zone concerned:</i> <u><i>Residential 1, 2 and 3</i></u> <i>Max height: 9m</i> <i>Height in relation to boundary: No part of any building shall exceed a height of 2 metres plus the shortest horizontal distance between that part of the building and the nearest lot boundary.</i>	Complies: The height of the structure is less than 9m. Height in relation to boundary is not applicable because the proposal is not a building.

Auckland Council District Plan (P) Abstract

Appendix D4

Subject Site	Zoning	Zone Description
Walters Road	Urban Commercial 2	<i>Subject to commercial development which supplements and complements the Central Business Area.</i>
	Urban Industrial 3	<i>Medium industrial zone</i>
	Reserve	<i>Wide range of uses ranging from local amenity and passive recreation to large scale reserves often containing significant sporting and recreational facilities.</i>
	Urban Residential 1	<i>Standard residential zone incorporating much of the residential land in the District.</i>
	Urban Residential 2	<i>Enables the establishment of more intensive residential activities as well as a limited range of non-residential activities.</i>
	Urban Residential 3	<i>Provides for residential activities in the Keri Hill area. Some parts of Keri Hill have problems of instability and further development will be subject to favourable geo-technical reports.</i>
Taka Street	Urban Residential 1	<i>Standard residential zone incorporating much of the residential land in the District.</i>
	Urban Industrial 1	<i>Light industrial zone and provides opportunities for small, localised activities.</i>
	Reserve	<i>Wide range of uses ranging from local amenity and passive recreation to large scale reserves often containing significant sporting and recreational facilities.</i>
Manuroa Road	Urban Residential 1	<i>Standard residential zone incorporating much of the residential land in the District.</i>

Surrounding Land uses for the Level Crossings in Auckland (P)

Appendix D5

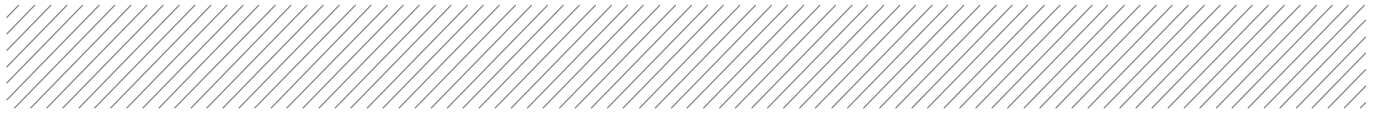
Rule Reference	Provision	Activity Status
5.1 (b) Permitted Activities (Transport Environment Chapter)	<p><i>(i) is an above-ground sewage, stormwater or water pipe and</i></p> <ul style="list-style-type: none"> – <i>has a height not exceeding 1.0 metre above ground level; and</i> – <i>a diameter not exceeding 300mm; and</i> – <i>extends for an above-ground distance not exceeding 25.0 metres at any one place;</i> 	N/A
5.1 (b) Permitted Activities (Transport Environment Chapter)	<p><i>(ii) is any other infrastructure which has a height not exceeding 1.5 metres above ground level and covers an above ground area not exceeding 2m².</i></p>	Does not comply: The bridge structure will likely be approximately 6m to 7m in height and exceed 2m ² in above ground coverage.
5.2 (a) Controlled Activity (Transport Environment Chapter)	<p><i>Activities meeting the following performance standards are Controlled Activities:</i></p> <p><i>Any activity involving infrastructure not meeting the standards specified in Rule 5.1 where the activity has a height not exceeding 2.5 metres above ground level and covers an above ground area not exceeding 6m²</i></p>	Does not comply: The bridge will likely be approximately 6m to 7m in height and exceed 6m ² in above ground coverage.
5.2 (b) Controlled Activity (Transport Environment Chapter)	<p><i>Any activity involving infrastructure associated with transport in the current rail corridor referenced as NZR1 and shown on the Human Environment Maps as at 15 October 1995.</i></p>	Controlled: The bridge structure will be constructed over the current rail corridor.
Rule 5.3 Discretionary Activity (Transport Environment Chapter)	<p><i>Activities meeting the following performance standard are Discretionary Activities:</i></p> <p><i>Any activity involving infrastructure or connections not meeting the standards specified in Rules 5.1 or 5.2, provided that no new infrastructure having a height exceeding 12 metres may be located on a sensitive ridgeline, headland, cliff or scarp.</i></p>	Discretionary: The height and area of the bridge structure will not meet Rules 5.1 and 5.2, but will be lower than 12m.

Auckland Council District Plan (W) Abstract

Appendix D6

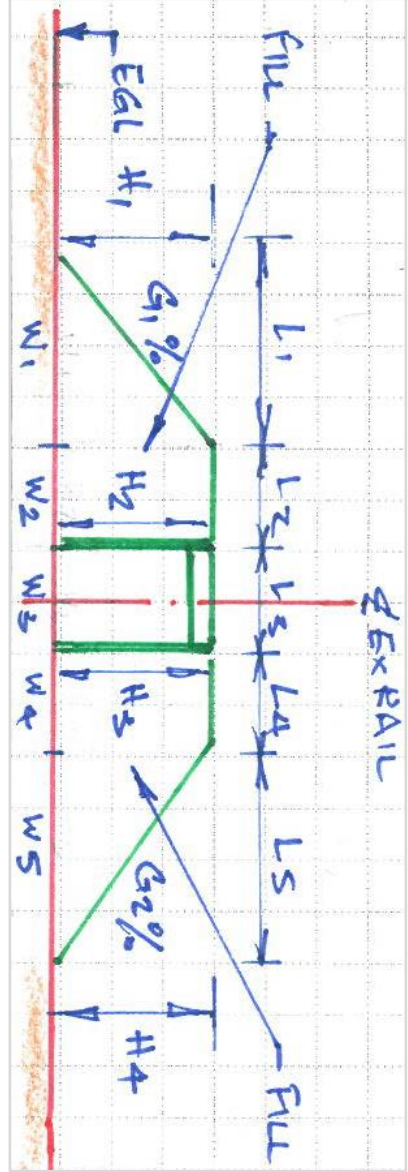
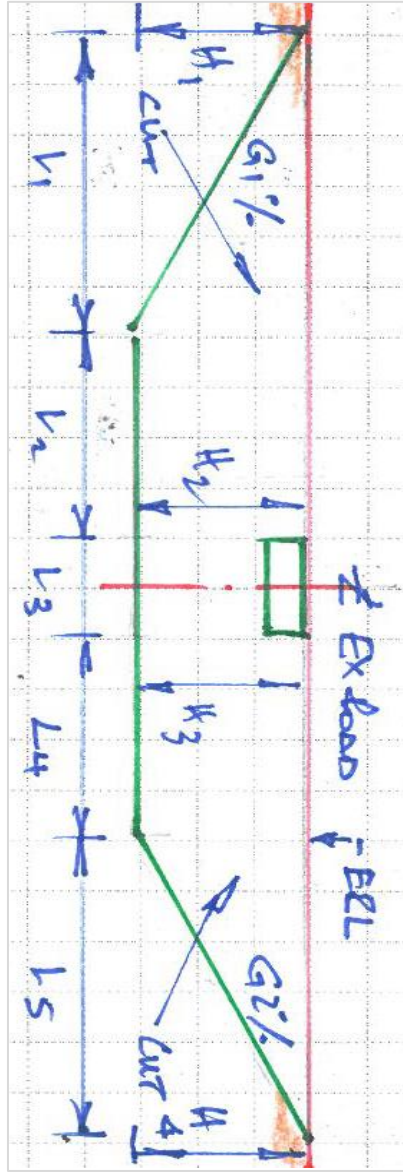
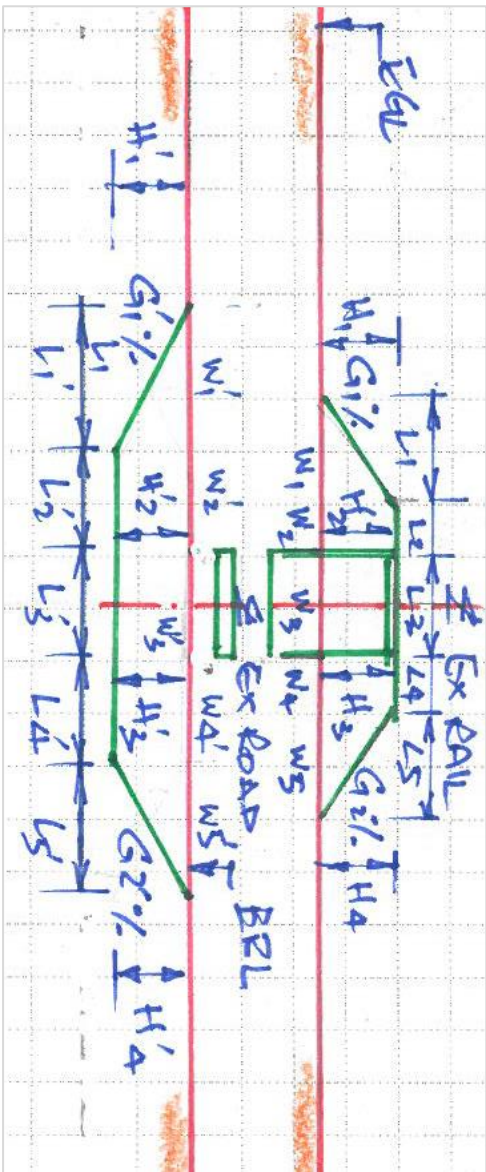
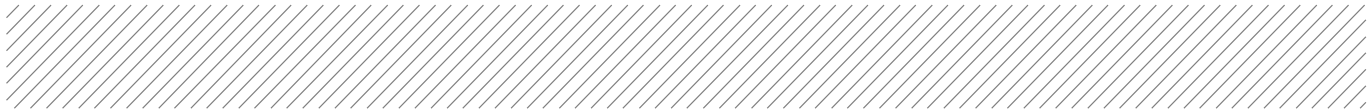
Subject Site	Zoning	Zone Description
Portage Road	Working Environment	<i>Covers the industrial/employment areas</i>
	Community Environment	<i>Covers the town centres, suburban shopping centres and blocks of shops</i>
	Open Space	<i>Covers land owned by the council, the Auckland Regional Council or other public agencies.</i>
Glenview Road	Living 1	<i>Covers urban and suburban residential areas</i>
	Community	<i>Covers the town centres, suburban shopping centres and blocks of shops.</i>
Bruce McLaren Road	Working Environment	<i>Covers the industrial/employment areas</i>
Metcalfe Road	Living Zone	<i>Covers urban and suburban residential areas</i>
	Open Space	<i>Covers land owned by the council, the Auckland Regional Council or other public agencies.</i>

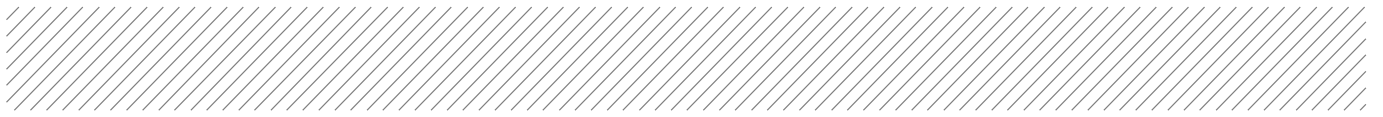
Surrounding Land uses for the Level Crossings in Auckland (W)



Appendix E

Option Assessment – Key Dimension Diagrams







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