ŌTAKI TO NORTH OF LEVIN PFRs

Report No. 6: Levin Heavy Vehicle Bypass

Prepared for NZ Transport Agency

February 2013

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QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEAD
Tracy Couchman	Phil Peet

PREPARED BY		
Dhimantha Ranatunga	……..	……/……/……
CHECKED BY		
Phil Peet	……..	……/……/……
REVIEWED BY		
Marten Oppenhuis	……..	……/……/……
APPROVED FOR ISSUE BY		
Phil Peet	……..	……/……/……

WELLINGTON
Level 1, 123 Taranaki Street, Wellington 6011
PO Box 9624, Te Aro, Wellington 6141
TEL +64 4 381 6700, FAX +64 4 381 6739

REVISION SCHEDULE

Rev No	Date	Description	Signature or Typed Name (documentation on file).			
			Prepared by	Checked by	Reviewed by	Approved by
A	4/12/12		JP	PP	MO	PP

Executive Summary

This report is one of a number of reports being undertaken to determine the package of improvements that should be implemented in the short to medium term to improve the safety and efficiency of the highway between Ōtaki and north of Levin as part of the Wellington Northern Corridor Road of National Significance (RoNS).

The purpose of this report is to determine the opportunities for providing a bypass to remove Heavy Commercial Vehicles (HCVs) from travelling through the main street of Levin. Presently State Highway 1 (SH1) travels directly through the urban and retail centre of the Levin township and significant numbers of HCVs travelling through Levin result in negative social and environmental effects.

This report is not a standard Project Feasibility Report (PFR) and instead uses a higher level options assessment via a comparative approach on the basis that insufficient data exists to reasonably undertake an economic assessment or formulate benefit-cost ratios.

A variety of options are considered, with four taken forward and compared against the existing (i.e. continuing with north-south HCV through traffic using SH1 in central Levin).

A summary of the high level cost esitmates are shown below.

Table 1-1: Option Cost Estimates

Option Description	Expected Estiamte	95th Percentile Estimate
Option 6-1 One-way pairs	$12.7M	$16.3M
Option 6-2 Roslyn Road	$16.4M	$20.9M
Option 6-3 Greenfield Heatherlea East	$21.0M	$27.0M
Option 6-4 Tiro Tiro Road Extension	$18.0M	$23.0M

It is evident that none of the options considered offer a completely viable solution and all involve a significant capital cost whilst the solutions proposed will themselves have consequential and negative effects (for residents and businesses). The report concludes that all options have some merit in combination with some clear disbenefit. It is apparent that no single option is clearly preferable. Further analysis may be warranted at the SAR stage to consider the social and environmental impact of the existing and proposed options.

From the investigations and assessment completed to date, it is recommended that the existing situation be retained for the short to medium term.

Longer term, further consideration of the adjacent PFRs in combination is recommended. A key consideration will be an assessment of the interdependency of Options 6-2 & 6-3 with the adjacent PFR to the south (PFR No. 5, SH1/57 Connections). If either Option 6-2 or 6-3 was combined with the bifurcation options for PFR No. 5, it is entirely possible that this could offer major benefits for all through traffic.

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1 Introduction and Background

Using the outcomes of the Ōtaki to North of Levin Scoping Report and addendum, the NZTA decided that the most appropriate strategy for the highway between Ōtaki and north of Levin is to upgrade the existing highways as the first stage of a long term strategy. This allows the NZTA to realise important safety benefits in the short to medium term whilst deferring the need to construct four lanes for the time being.

This Project Feasibility Report (PFR) is one of a number of reports being undertaken to determine the package of improvements that should be implemented to improve the safety and efficiency of the highway between Ōtaki and north of Levin as part of the Wellington Northern Corridor Road of National Significance (RoNS).

The objectives of the Wellington Northern Corridor RoNS, which runs from Wellington Airport to north of Levin, are:

- To enhance inter regional and national economic growth and productivity;
- To improve access to Wellington's CBD, key industrial and employment centres, port, airport and hospital;
- To provide relief from severe congestion on the state highway and local road networks;
- To improve the journey time reliability of travel on the section of SH1 between Levin and the Wellington Airport; and
- To improve the safety of travel on state highways.

For the Ōtaki to north of Levin section; the objectives are:

- To provide best value solutions which will progressively meet (via a staged approach) the long term RoNS goals for this corridor of achieving a high quality four lane route;
- To provide better Levels of Service, particularly for journey time and safety, between north of Ōtaki and north of Levin;
- To remove or improve at-grade intersections between north of Ōtaki and north of Levin;
- To engage effectively with key stakeholders; and
- To lodge Notices of Requirement and resource consents as appropriate with the relevant consent authorities for the first individual project by the 2013/14 financial year.

The projects that are being developed to help meet these objectives are presented in Section 2.

The purpose of this report is to consider the opportunities for providing a bypass of the Levin township – primarily for Heavy Commercial Vehicle (HCV) traffic, by providing an alternative route for these vehicles to avoid using the section of State Highway 1 through central Levin.

The geographical extent of this project commences in the south from the SH1 / SH57 Kimberley Road to approximately the intersection of SH1 & Koputaroa Road in the north. The study area therefore includes the township of Levin, the geographical areas to the north and south of Levin as well as approximately 7.5 km of SH1. Adjacent PFRs include: PFR No. 5 (SH1/57 Connection), PFR No. 7 (Levin Signals) and PFR No. 10 (Queen Street Intersection).

The outcome of this report will be considered alongside the outcomes of the other PFRs and used to determine the best package of works to progress as the first stage of the long term strategy.

2 Projects Currently Being Investigated

The projects that are currently being investigated to meet the short to medium term objectives of the Ōtaki to north of Levin RoNS project are presented in Figure 2-1:

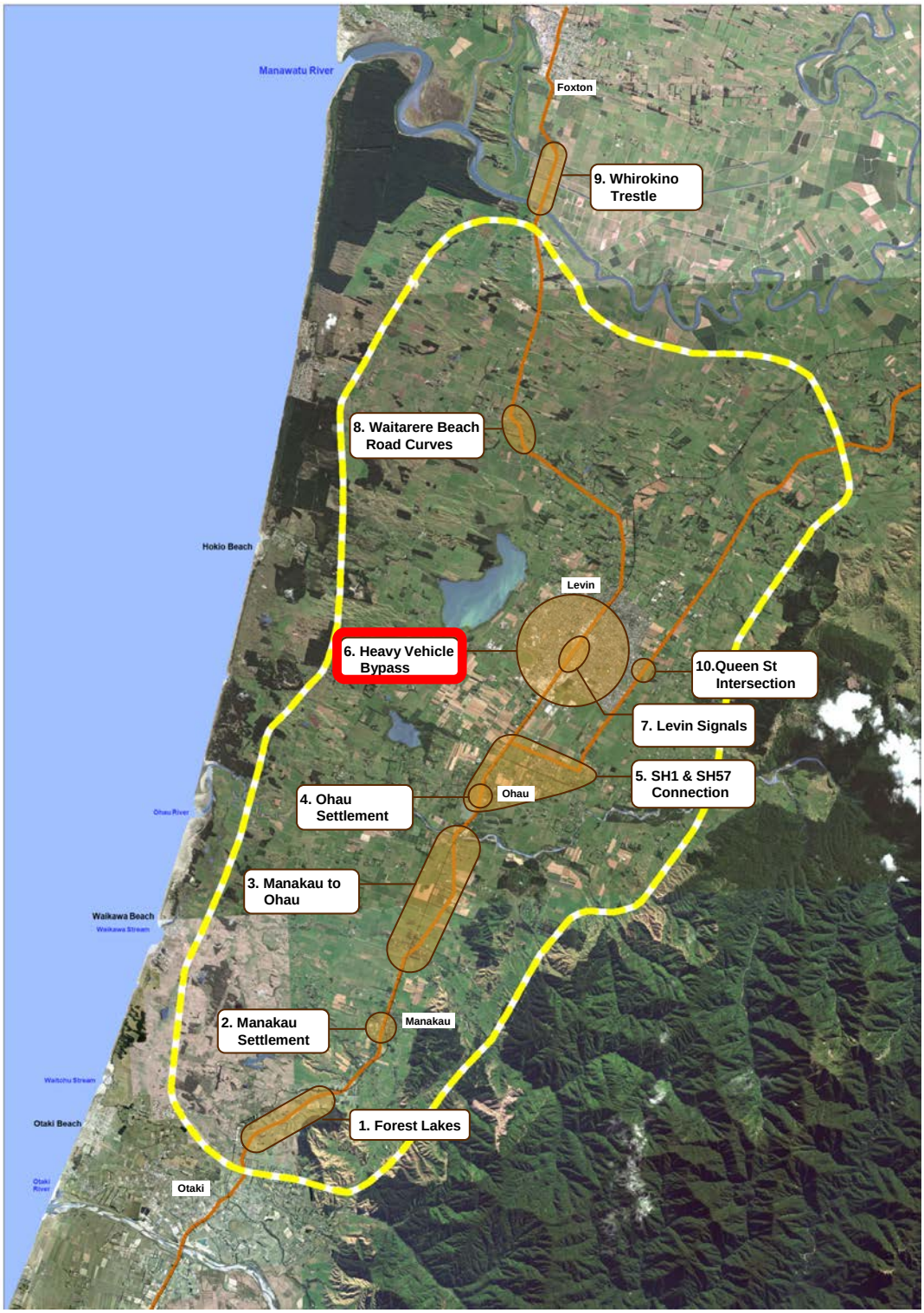


Figure 2-1: Projects Currently Being Investigated

In addition to the above PFRs, reports are also being undertaken on Route Improvements (i.e. passing lanes, seal widening, walking and cycling, side friction etc) (Report No. 11) and on Four Lane Alignments (Report No. 12).

3 Description of Problem

3.1 Ōtaki to North of Levin

State Highway 1 and State Highway 57 through the study area have a number of deficiencies, resulting in a poor crash history and a number of locations where the free flow of vehicles is restricted by the tight physical characteristics of the highway.

State Highway 1 currently follows the historic route established in the late 19th and early 20th centuries. As a consequence it is constrained by a now substandard alignment, towns and settlements, narrow curved bridges and significant side friction caused by local roads, commercial frontages and property accesses for the entire stretch.

3.2 HCVs using Levin

Presently, SH1 runs directly through the centre of Levin with the State Highway forming the main north-south route within the town (Oxford Street). As this is the main route through the town, a high proportion of retail and commercial development is located along the highway frontage and periphery and this generates considerable parking and pedestrian movement.

HCVs use this route through Levin given its highway classification and because it is the shortest route. However due to the adjacent land uses and associated effects this creates, there is a desire for the NZTA to consider other alternative routes for HCV through traffic to avoid using central Levin – this will serve to remove these conflicts together with improving the local social and environmental impact.

Improving the existing SH1 route through Levin, by creating a high standard four lane expressway through the central part of the town was considered earlier in the investigations and discounted on the basis of the impact and adverse effects that this would directly create for the Levin community (in terms of severance, connectivity, property acquisition, heritage and environmental quality).

The crash history within Levin is concerning with an over proliferation of crashes within the township involving HCVs. By considering an alternative route for HCVs, it is likely that the vast majority of these conflicts will be removed (although non-through HCV traffic with legitimate access requirements to central Levin would still utilise the existing route).

A further consideration relates to the movement of over dimension (OD) vehicles. SH1 through the centre of Levin forms the authorised over dimension route. However, two alternative OD routes exist, as the SH1 OD route is compromised due to the overhead traffic signals at the Oxford Street / Bath Street intersection and Oxford Street / Queen Street intersections. This results in OD vehicles being forced to detour using Mako Mako Road, Weraroa Road, York Street or alternatively using Durham Street, Salisbury Street, Queen Street West, Bristol Street and Exeter Street.

4 Site Description

The project area consists of a 7.5 km length of SH1 (from RP967/9.94 to RP967/17.40), running from the SH1/SH57 intersection in the south to the intersection of SH1/Koputaroa Road in the north. In addition, the geographical area to the east and west of SH1 (which includes the SH57 corridor) is also considered for potential bypass opportunities. The terrain throughout this section is primarily flat. There are a number of relatively minor horizontal curves throughout the Levin urban area and a long sweeping horizontal curve north of the township.

SH1 is a two lane undivided highway with approximately 3.5 m lane widths. There is a lack of uniformity in shoulder width, though long sections do include a shoulder of between 1.5-2.0m.

SH57 is also a two lane undivided highway, with 3.0 m - 3.5 m lane widths and shoulders between 1.0 m - 2.0 m. Presently at the southern end, the SH57 classification experiences a 90 degree curve (<20 m radius) at the intersection between Kimberley Road and Arapaepae Road.

The study area is shown in Figure 4-1 below:

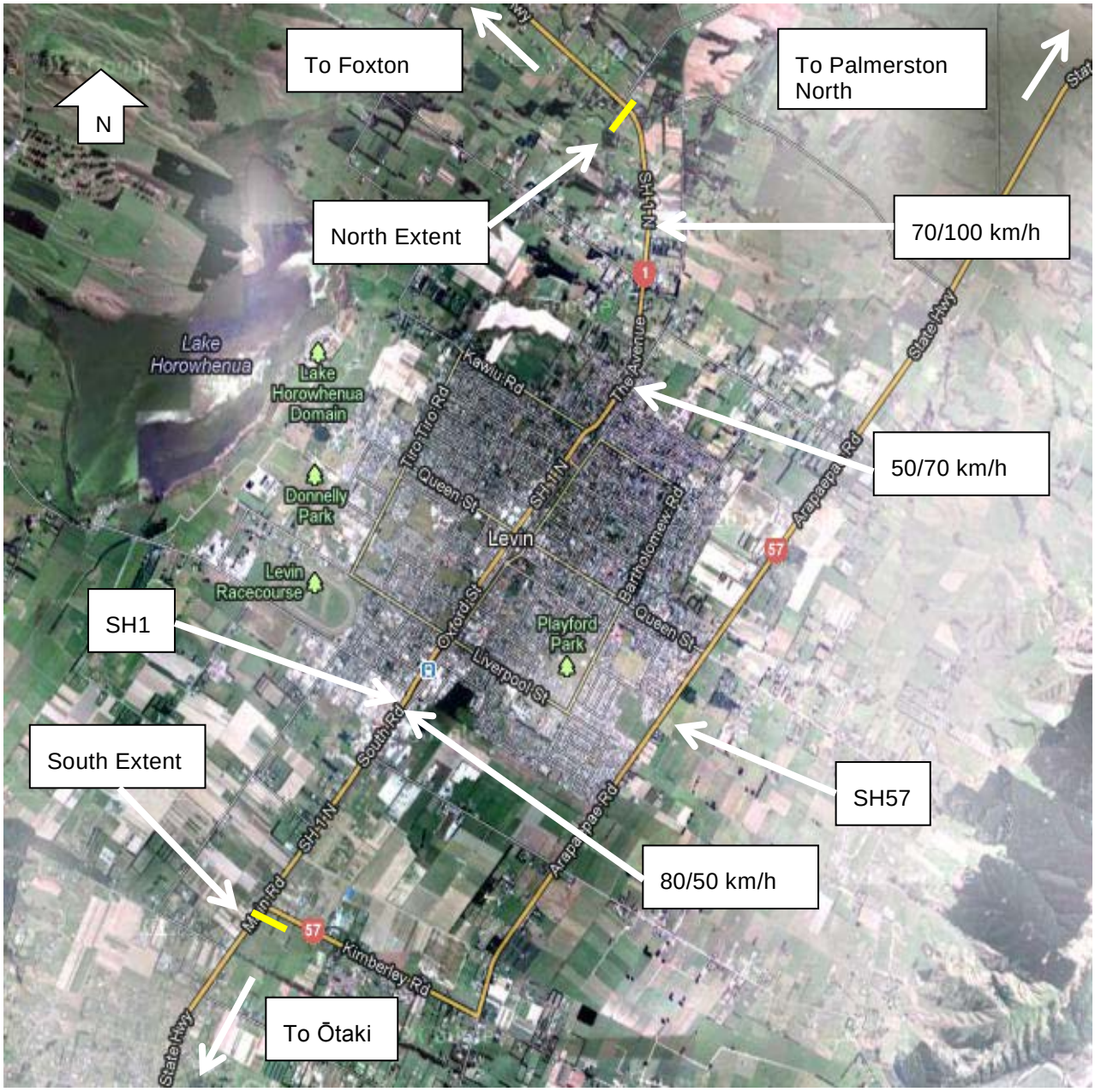


Figure 4-1: Study Area

An overdimension (OD) route operates through central Levin on SH1. An alternative also exists using Mako Mako Road, Weraroa Road, York Street, with a further alternative OD route being Durham Street, Salisbury Street, Queens Street West, Bristol Street, Exeter Street, to avoid the overhead traffic signals along SH1 (see Appendix B).

The North Island Main Trunk (NIMT) rail line runs predominantly parallel to SH1 for a large section of the overall Ōtaki to Levin study area and this is true for almost the entirety of the study area covered by this report. Between SH57 and South Lane, it is immediately adjacent and between South Lane and (approximately) Kawiu Road, there is additional separation between SH1 and the rail of around 60 m. From Roslyn Road northwards, SH1 and the rail begin to diverge, with the rail heading northeast toward SH57 and SH1 heading north.

Traffic speeds on SH1 throughout the study area vary, with incremental reductions approaching the centre of the town and greater development density. Travelling south to north through the study area the speed changes take place at the following route positions:

- 80 km/h to 50 km/h at RP967/15.36

- 50 km/h to 70 km/h at RP967/12.61
- 70 km/h to 100 km/h at RP967/11.71

5 Traffic Statistics

The Annual Average Daily Traffic (AADT) on SH1 within the study area for 2011, proportion of HCVs is as follows:

- Levin, Kawiu Road / Gordon Place: 9,650 vehicles per day (vpd) with 12.1% HCVs.
- Levin, Oxford Street: 13,600 vehicles with 7.0% HCVs.
- Levin, south of town: 11,500 vehicles with 9.0% HCVs.

South of the study area at the Ohau telemetry site(Count Site ID: 01N00988), AADT flow was 14,600 vehicles per day (2011) with the proportion of Heavy Commercial Vehicles (HCVs) at 10% and traffic growth rate (calculated using 1992-2011 data) of 1.3%. Whilst this is south of the study area it provides both a more accurate AADT figure (due to continuous counting at the telemetry site) and also a good indication of the traffic immediately south of the area being considered.

The total traffic volumes (all vehicles) at the three Levin count sites have all reduced during the last 5 years, with volumes reducing by between 6 - 12% over the 5 year period.

Using the 2011 vehicle number plate survey information, it is possible to determine the proportions of heavy vehicles travelling straight through Levin and hence the number than could be diverted onto a bypass).

Table 5-1: Levin Through HCV Proportions

Time Period	HCV through-traffic volume	HCV access traffic[1] volume	Through traffic percentage
AM Peak	49	29	63%
Inter-peak	81	50	62%
PM Peak	47	17	73%

Table 5-1 above shows that around two thirds of heavy vehicle traffic travels straight through Levin. Conversely this means that if a heavy vehicle bypass was implemented which attracted all through HCVs, a third of all heavy vehicle traffic would still use SH1 for at least some of its length.

Horowhenua District Council (HDC) has a multitude of traffic counts for the local roads within the study area, however these are not considered in any detail in this report.

The Saturn modelling undertaken includes a large number of the intersections within central Levin. The 2041 AM peak, inter-peak and PM peak model outputs have been assessed and almost all intersections continue to operate with a good Level of Service (generally LoS B).

Further traffic information on the existing OD route through Levin is provided in Appendix C.

The SAR, if a HCV bypass is pursued, will require a robust traffic model at the cordon area to enable a full traffic assessment to be made.

[1] Access traffic includes traffic which enter and leave Levin through the same screen line, traffic which enters on SH1 and leaves on SH57 or which stays in Levin for more than 8 minutes (typical travel time through Levin is between 4 and 6 minutes)

6 Crash History

6.1 Crash Data

As this report is producing an options assessment rather than a full PFR, it is considered appropriate to approach the crash analysis focusing on HCV related recorded crashes as the results will not be used to influence the economic analysis (as none is being produced for this report). Therefore, the crash analysis has considered only the crashes that include a HCV. In addition, the crash analysis has only considered the section of Levin between Tararua Road and Roslyn Road as this is the section where most of the crashes are located (i.e. the main urban area). The analysis considered SH1 as well as the local road network 500 m either side.

A review of NZTA's CAS database over the five-year period from January 2007 to December 2011 revealed a total of 37 crashes within the study area which involved a HCV.

The project area has not been assessed using either the High Risk Rural Roads Guide[2] (HRRRG) or the draft High Risk Intersections Guide[3] (HRIG), as neither is appropriate for this type of study.

The following tables provide a summary of the CAS output data for HCVs in the study area:

Table 6-1: Annual Distribution of Crashes

Year	Fatal	Serious	Minor	Non-Injury	Total	DSi*
2007	-	1	1	3	**5**	1
2008	-	-	1	7	**8**	-
2009	-	-	3	5	**8**	-
2010	-	1	1	4	**6**	1
2011	-	-	-	10	**10**	-
Total	**-**	**2**	**6**	**29**	**37**	**6**

* Death and serious injury casualties

Table 6-2: CAS Crash Type

Crash Type	Number of Reported Crashes	Percentage of Reported Crashes
Overtaking	4	11%
Straight Lost Control / Head on	1	3%
Bend Lost Control / Head on	4	11%
Rear End / Obstruction	16	43%
Crossing / Turning	11	30%
Pedestrian Crashes	1	3%
Miscellaneous Crashes	-	0%
Total	**37**	**100%**

[2] High Risk Rural Roads Guide (HRRRG), NZTA, September 2011
[3] High Risk Intersection Guide (HRIG), NZTA, Draft March 2012

Table 6-3: High Risk Rural Roads Guide Crash Type

Crash Type	Number of Reported Crashes	DSi	Percentage of Reported Crashes
Head-on	-	-	-
Run-off Road	4	-	11
Intersection Crashes	19	1	51
Other	14	1	38
Total	**37**	**2**	**100**

The crashes classified as 'Other' above include two crashes related to traffic signals, two left side 'side-swipe' crashes and two crashes relating to both vehicles turning in the same direction. All of the remaining 'other' crashes were single incident occurrences.

Table 6-4: Crash Causation Factors of Reported Injury Crashes

Causation	Number of Reported Injury Crash Causation Factors
Alcohol	2
Too fast	1
Failed giveway/stop	9
Overtaking	2
Incorrect lane/position	15
Poor handling	6
Poor observation	18
Poor judgement	12
Fatigue	1
Vehicle factors	2
Road factors	4
Other	1

Table 6-5: Environmental Factors

	Wet	Dry		Night	Day		Weekend (Fri 6:00PM to Monday 5:59AM)	Weekday
No.	6	31		5	32		6	31
%	16	84		15	86		16	84

Of the crashes involving HCVs occurring within the 3.75 km length (and buffer zone) of the study area:

- None were fatal, two were serious, six were minor and twenty-nine were non-injury.
- Both serious crashes occurred at the Bath Street / SH1 intersection. The first was a car travelling westbound on Bath Street failing to comply with a red traffic signal and colliding with a HCV travelling north on SH1. The second involved a truck turning left from Bath Street onto SH1 (south) and colliding with a pedestrian who was crossing (pedestrian crossing against traffic signal).
- More HCV crashes were recorded on the local road network (21 crashes) than the State Highway network (16 crashes).
- 19 (51%) involved intersection related movements resulting in one serious (1 DSi), and four minor injury crashes and a further fourteen non-injury crashes.

- Only 4 crashes (11%) involved runoff road crashes, resulting in no injuries. Given the posted speed throughout the length analysed (70km/h on the outskirts of the town centre, and 50km/h through central Levin) in combination with road vertical and horizontal curvature this is to be expected.
- Throughout the five year analysis period of the project length, there were zero head-on crashes involving a HCV.
- The main crash types were loss of control turning right (3 crashes), crossing without turning (6 crashes) and manoeuvring other (5 crashes)
- 'Poor Observation' was a causal factor in almost half (49%) of the crashes; crashes with incorrect lane / positioning or poor judgement also a contributory factor in 41% and 32% of crashes respectively.
- (19%) crashes involved objects being struck with 5 of the 7 objects being a parked vehicle

See Appendix C for crash data and collision diagram.

7 Options Considered

Four options, which address a heavy vehicle bypass of Levin, have been considered for this section of SH1 from Heatherlea East Raod in the north to Kimberly Road in the south.

The Do-minimum option is to retain the existing route through Levin for HCV traffic. No special provision would be made for HCV traffic and the existing situation with its social and environmental concerns would remain.

The four options considered are outlined below:

Option 6-1 One-way Pairs - This option involves the provision of separate northbound and southbound HCV routes either side of the central urban area.

Option 6-2 Roslyn Road – This option would involve utilising SH57 and Roslyn Road to bypass Levin. It would require a significant upgrade to the existing Roslyn Road together with improved connections to SH1 and SH57.

Option 6-3 Greenfields Heatherlea East – This option has a number of similarities to Option 6-2, however, instead of upgrading Roslyn Road, a new greenfield road is proposed (two possibilities are shown on the drawing) that would link SH1 (near to Heatherlea East Road) to SH57 approximately 500 m - 700 m north of Roslyn Road.

Option 6-4 Tiro Tiro Road Extention – This option would see require a 2.4 km extention to Tiro Tiro Road on the eastern side of Levin through to SH1, allowing heavy vehicles to bypass the main street.

7.1 Discarded Options

A number of options were initially considered. These are briefly described below:

7.1.1 Mako Mako Road, Weraroa Road, York Street

This route was discounted on the basis that the intersection of York Street and SH1 would require traffic signals to support the likely number of HCVs. Traffic signals at this intersection are not desirable given this route is an existing OD route alternative and would be compromised by the provision of traffic signals. In addition, signals here would inevitably delay both northbound and southbound HCV traffic, as well as other state highway and local road traffic.

7.1.2 Mako Mako Road, Tiro Tiro Road, Kawiu Street

Similar to the route described in section **Error! Reference source not found.** above, this route has also been discounted on the basis of requiring traffic signals at the intersection of Kawiu Street and SH1.

7.1.3 Tyne Street, Cambridge Street, South Lane Two Way

This forms the southbound route of the one-way pairs of Option 6-1. However, it has been discounted for two-way use as there is little separation between the rail for right turning traffic. Furthermore, providing this route two-way would require traffic signals to support the right turn movements for HCVs which would compromise the OD route (as defined in Section 3.2.).

A further sub-option was also considered which, rather than using South Lane, the route would continue along Cambridge Street South with a new connection somewhere near Tararua Road. This was again discounted due to rail separation issues and the requirement for traffic signals.

7.1.4 Railway Corridor

Using the existing rail corridor was investigated as a possible bypass route, however this was discounted as some locations are narrow and rail land would be difficult to obtain due to the potential for future double tracking.

7.1.5 Bruce Road

This option was considered due to the opportunity provided with the improved connection of SH1 and SH57 assessed in PFR No. 5, Option 5-2 Roundabout (alternatively this would also work with a compact half diamond interchange which was considered conceptually but not reported upon). Option 5-2 would allow a relatively straightforward additional connection to be made to Bruce Road, west of the existing SH1/57 intersection.

The bypass would follow the route of Bruce Road, along with Hokio Beach Road, Mabel Street, Mako Mako Road, Tiro Tiro Road followed by the extension of Tiro Tiro Road to SH1 as per Option 6-4.

This Option has been discounted due to the number of 90 degree turns required between Bruce Road and Tiro Tiro Road. Land acquisition here is likely to be problematic and costly due to the numbers of houses affected or by impacting upon the racecourse. Furthermore, a major issue is the land east of Tiro Tiro Road close to the Mako Mako Road intersection which is a cemetery and therefore any land acquisition is unlikely to be feasible.

7.2 Option 6-1: One-way Pairs

See Appendix D for Bypass Options drawing.

It would require the support of HDC as a local bylaw would be required to restrict HCV movements through central Levin (except for legitimate access purposes). As a result, HCVs travelling through the centre of Levin would be legally required to use the northbound and southbound bypass lengths.

The benefit of a separate northbound and southbound route is that the routes can be made more efficient for each direction by ensuring the turning movements for each route are simple to make with minimised conflicting traffic (and therefore delay) i.e. left turns off and on to SH1.

7.2.1 Option 6-1 Northbound

For HCV traffic travelling in a northbound direction through Levin, the route proposed would be: SH1, Mako Mako Road, Weraroa Road, York Street, SH1. This route has the benefits of ensuring the turns, off and onto, SH1 are left turns whilst the two right turns are on the local roads (therefore being conflicted only by a single stream of oncoming traffic). The associated gap acceptance required by HCVs for these movements is thereby lessened and significant delays are anticipated to be unlikely.

It is noted that the northbound HCV route is currently used as an alternative over dimension (OD) route to SH1 (itself an OD route). Using this route in future as the permanent bypass route for all northbound HCVs is highly likely to necessitate pavement strengthening because of the additional HCV usage (a rough order cost allowed for in the estimate).

A school with associated zebra pedestrian crossing facility exists on York Street, with a similar arrangement on Weraroa Road for another school. There is also a humped pedestrian crossing facility on Weraroa Road (a traffic calming hump in combination with a raised pedestrian crossing).

7.2.2 Option 6-1 Southbound

For southbound HCV traffic, the route would become SH1, Tyne Street, Cambridge Street, South Lane, SH1. This route also includes two left turns from and to SH1. There would be right turns required for the turn from Tyne Street into Cambridge Street and from Cambridge Street into South Lane. The traffic counts collected in 2011 have been assessed for the SH1 / Tyne Street intersections and whilst flows are generally low, there are short peaks within the peaks when flows do get reasonably high, with some movements experiencing up to approximately 75 vehicles for a 15 minute period[4]. Should this option be taken further, the performance of this intersection should be assessed (such as with Sidra modelling) to assess Level of Service and delay as well as considering alternative intersection layouts or priority.

The right turn from Cambridge Street into South Lane also warrants further assessment. At present South Lane has priority at this T intersection, which could be problematic for HCV traffic waiting to turn from Cambridge Street into South Lane. The turning counts collected by MWH in 2011 and the HDC traffic counts do not provide adequate information to form an initial judgement.

The southbound route also requires HCVs to negotiate two small roundabouts. Traffic counts from the Cambridge Street / Queen Street roundabout reveal this is a well-used intersection and therefore further assessment of the effect of diverted HCVs here would need to be undertaken. Traffic counts at the second roundabout (Cambridge Street / Bath Street) show the throughput at this intersection is less than at Cambridge Street / Queen Street, though further analysis is nonetheless advisable.

Pavement strengthening would almost certainly be required for the south bound route.

7.2.3 Option 6-1 Summary

The condition and pavement design information held by HDC should be considered but there will also be a need for additional pavement testing at the SAR stage. Beyond this, it is unlikely that any significant physical works would be required for both of these two routes, except for signage or intersection priority changes. It is acknowledged that these routes are likely to be highly unpopular given their proximity to residential property and the two schools on York Street and Wararoa Road for the northbound route.

Furthermore, the delaying effect of additional route length and turning movements for HCVs are likely to be unpopular with operators. These options could result in enforcement challenges in ensuring through HCVs used the bypass routes, whilst legitimate access for HCVs through central Levin would need to be maintained.

7.3 Option 6-2: Roslyn Road

See Appendix E Bypass Options drawing.

The bypass would be significantly longer than the existing route. From the projected Roslyn Road intersection with SH1 to the existing SH1/57 intersection, the current route length for vehicles travelling through central Levin is 5.9 km. The Roslyn Road route (Option 6-2) is 9.8 km – though it should be noted that, ultimately, this could change dependent upon the preferred option from PFR No. 5 and overall route strategy. However, speeds and free flow of vehicles will be improved on the bypass, in comparison to the existing route.

For Roslyn Road to be suitable for high volumes of two-way HCV usage, an upgrade would be required. Widening of the seal to 11 m is proposed (two 3.5 m traffic lanes and two 2.0 m sealed shoulders), together with swale drainage. The existing pavement design is likely to be unsuitable for the significant volumes of HCVs and therefore strengthening has been allowed for in the rough order cost estimation.

The existing Roslyn Road reserve is approximately 20 m and therefore (significant) property acquisition to achieve the widening is likely to prove unnecessary. Services may require relocation. The existing posted speed on Roslyn Road is 70 km/h – an assessment should be made (at SAR stage) to ascertain if this should be retained or altered.

Presently at the northern end of Roslyn Road, a 90 degree curve exists at the rail before a further 90 degree curve takes the road over the rail at grade and forms a left in / left out intersection with SH1. As this would be unsuitable for HCVs, a new link is proposed connecting Roslyn Road straight through to

[4] This movement was the right turn from SH1 into Tyne Street for the 5.00-5.15pm period

SH1, avoiding the two 90 degree curves and circuitous route. Grade separation would be required and given the rail is elevated at this point, it has been assumed at this stage that the road would drop beneath the rail. A new link (approximate length of 300 m) and roundabout intersection would be constructed with SH1.

The existing 4 way priority controlled (crossroad) intersection of Roslyn Road and SH57 is proposed to be upgraded to a roundabout to ensure HCV traffic is not unduly delayed by SH57 traffic. However, it is recommended that due cognisance is given to PFR No. 10 regarding the roundabout at Queen Street / SH57 as an upgrade of Roslyn Road may alter traffic patterns for traffic travelling between Levin and destinations north on SH57. The disbenefit identified for through traffic at a proposed Queen Street / SH57 roundabout is also noted as an indication of what can be expected for a bypass roundabout.

This option would also then link into the various solutions detailed in PFR No. 5 (SH1/57 Connections and Arapaepae Curve), such as the improvements to the Arapaepae Road / Kimberley Road curve and grade separation at SH1/57 or the bifurcation options. This is important as, for Option 6-2 to be viable, then the route speed and delay at intersections along the bypass route will need to be improved. Whilst a local bylaw could prevent HCVs using section of SH1 through the centre of Levin, there needs to be a good alternative provided otherwise there is a risk of industry backlash, bad publicity and HCVs diverting onto other, less appropriate, local roads (and hence enforcement challenges).

This option is likely to be highly unpopular with Roslyn Road residents.

7.4 Option 6-3: Greenfield Heatherlea East

See Appendix D for Bypass Options drawing.The benefits of a proposed link rather than upgrading Roslyn Road relate to greater flexibility on the actual alignment of the route as well as reduced impact on properties that front Roslyn Road. Conversely, there are associated disbenefits with costs for land acquisition and road construction. Grade separation would also be required at the rail – the best method has not yet been determined and would depend on the actual position of the proposed link and local topography to ensure the most cost-effective solution. The new link would be approximately 2.75 km in length through entirely farming land and it should be possible to avoid most farm buildings and property severance.

A roundabout is proposed at the intersection of the proposed greenfields link and SH57. As with the previous option, this is likely to be critical for HCV traffic movements (particularly vehicles travelling south of Levin and needing to perform a right turn manoeuvre). However, in terms of economic efficiency, there is likely to be significant disbenefits to the SH57 through traffic as this is presently unimpeded. The intersection between the proposed link and SH1 is also likely to require a roundabout.

This option would result in a route length of approximately 10.8km whereas the existing SH1 route is approximately 7.2 km[5] though it should be noted that, ultimately, this could change dependent upon the preferred option from PFR No. 5 and overall route strategy, and therefore a more detailed assessment of the route length for adjoining options should be considered at the SAR stage (as dependent upon the combinations of options selected, overall route lengths couldl change significantly).

A local bylaw would be required to prevent HCV through traffic using central Levin.

7.5 Option 6-4: Tiro Tiro Road Extension

See Appendix D for Bypass Options drawing.

With this western option, the route for HCVs would be the same for northbound and southbound traffic. In a northbound direction, HCVs would use SH1, turning left into Mako Mako Road, then turning right into Tiro Tiro Road, continuing along Tiro Tiro Road until its termination at Kawiu Road. At this point a proposed road would be constructed to become the extension of Tiro Tiro Road[6], heading in the same direction, until it connected with SH1 in the north. The intersection between the proposed road and SH1 would require further investigation, and a roundabout has been included in the rough order estimate at

[5] Distances are measured between identical points where the option splits from the existing to permit an accurate comparison
[6] It is noted that the extension of Tiro Tiro Road is a named road at present (Patikei Road) for approximately half the length of the proposed road. However this is unformed i.e. no metal course or seal.

this stage (however, given the propensity for turns would be a right turn in southbound and a left turn out northbound it is possible that a priority intersection here may suffice, safety permitting).

The proposed road length required is approximately 2.4 km, and a proposed intersection with Lindsay Road would be required.

It is noted that a significant proportion of this route, through Mako Mako Road and Tiro Tiro Road is residential and therefore the bypass is likely to be extremely unpopular. There is a school and zebra pedestrian crossing located along Tiro Tiro Road. The length of route using Mako Mako Road and Tiro Tiro Road is 3 km, giving a total route length of 5.4 km. This compares favourably with the existing route on SH1 through central Levin which is approximately 5.9 km. Intersection forms and priority should be investigated further if this route becomes a preferred option (for example at the Tiro Tiro Road intersection with Queen Street, the latter has priority with Tiro Tiro Road being under stop control – this may warrant further consideration to support HCV bypass route reliability / journey time). Speeds on the bypass option have been estimated at 100 km/h along the new link, and 50 km/h on existing roads.

In this option, the alignment would result in left turns in to Mako Mako Road, and right turns out onto SH1 from Mako Mako Road. This being the case, it is possible that the existing priority intersection would no longer be appropriate due to the delay to HCVs coupled with the propensity for greater conflict due to the increased turning volumes of large vehicles. Therefore, an upgraded intersection arrangement may be warranted (such a traffic signals or a roundabout is allowed for in the rough order estimate), though any changes to this intersection should not prevent over dimension vehicles from using either the SH1 overdimension route, or the alternative route via Weraroa Road).

As with Options 6-1 and 6-2, there is likely to be a requirement to strengthen the local road sections which will become the HCV bypass with the existing pavement design unlikely to be suitable for the vastly increased HCV volumes (this is included in the cost estimates).

As with all options a local bylaw would be required to prevent HCV through traffic using central Levin (requiring the support of HDC & Police).

7.6 Typical Cross Section

A single typical cross section has been considered in this report and applies only to proposed (new) road construction or upgrades of existing, where required. The typical section is considered at this stage to be two 3.5 m traffic lanes and two 2.0 m sealed shoulders with associated swale drain provision. Where HCVs will run along existing routes and no upgrade is mentioned in the option description, no works are proposed – generally, based on the available data, road widths and layout appear to be acceptable. These are the assumptions that have been made in the cost estimates. However, both the road condition and pavement design should be considered at the SAR stage to determine the strengthening works required. A conservative approach has been taken allowing for subbase, basecourse and noise reducing asphalt surface

Clear zones or safety barriers have not been incorporated into this high level concept HCV Bypass study. It is however feasible that some edge protection could be required particularly where new road lengths are proposed through greenfield locations as it would be beneficial on these routes to provide for higher speeds for freight efficiency.

Typical section detail:

- Two 3.5 m traffic lanes (undivided)
- Two 2.0 m sealed shoulders
- Two 0.5 m unsealed shoulders
- Two swale drains (of nominally 4.0 m width dependant on topography, pavement depth and cut and fill requirements)

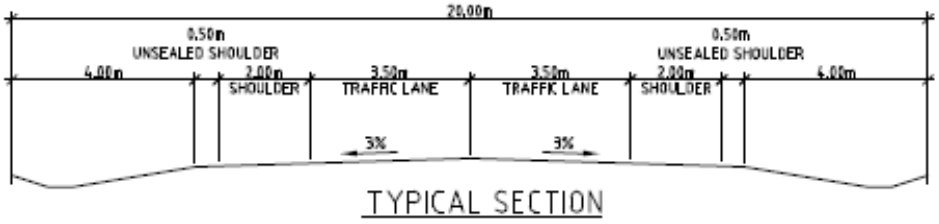


Figure 7-1: Typical Cross Section

8 Design Statement

This project is at a high level feasibility stage, and therefore several assumptions have been made in the design.

The design assumptions include the following:

- The cost estimate has been based on the judgement of an engineer who has knowledge of the site using sketch plans.
- The cost estimate has been based on the assumption that the project can be built using proven technology.
- No adverse ground conditions are encountered (e.g. soft subgrade or contaminated material). Geotechnical testing will be a requirement at the next stage.
- For the structures element, an initial concept assessment has been undertaken. A full structural assessment should be undertaken at scheme stage, particularly given the lack of topographical and geotechnical information.
- Where the existing highway is retained, strengthening will be required (pavement design to be determined).
- A conservative pavement design of 450 mm sub-base & 170 mm M4 type basecourse has been assumed for all strengthening and new road construction due to variable subgrade within this area. Surfacing varies dependant on location (varying between chipseal, SMA or structural AC).
- Some drainage provision has been included (culverts & headwalls) within the cost estimation but this is estimated based purely on the judgement of a drainage engineer.
- Clear zones and safety barrier have not been incorporated into the design.
- Earthwork extents have been estimated as no topographical survey data is available.

9 Options Assessment

Initially, it was intended to perform a Multi-Criteria Analysis (MCA) on the selected options to determine the preferred solutions to take forward to the SAR. A MCA was considered appropriate because undertaking an economic evaluation on the options was not considered feasible due to the high level nature of this investigation.

However, an MCA is best undertaken where input from a range of stakeholders can be provided to ensure it is suitably representative. With an MCA, careful consideration of the weighting of attributes and the scoring is essential and can be highly subjective. As a result, a more general options assessment has been undertaken which highlights the key issues to be considered for each option, but does not attempt to score, weight or prioritise the options at this stage. It is advisable that this options assessment be used as the basis of more detailed discussions with a broader group of stakeholders at a later stage. The options assessment is shown in Table 9-1 & Table 9-2 below.

Table 9-1: Options Appraisal 1

Option	Immediate Frontage Effect	Wider Community Effect	Archaeology / Heritage / Cultural	Planning Effects	Reliance on adjacent PFR
Existing Route	• Negative effect on streetscape in central Levin • Some public dissatisfaction / business effects	• Real & perceived safety concerns with type and volumes of vehicles	• Notable trees (row of Plane trees, Oxford Road/SH1)	• Use existing designation/alteration to designation (status quo) • Consultation likely to be intense	• No reliance on other PFRs
Option 1 **One-way pairs**	• Significant negative for northern route, residential frontages full length (educational facility on Weraroa Road) • Impact on southerly route but fewer residential frontages	• Mixed – improvements on SH1 route but adverse effect on local area • Some severance created	• Notable tree (Karaka tree, York Street) • Heritage buildings (Horowhenua College Main Building and Walkerley Homestead, Weraroa Road; St John's Methodist Church (Cambridge Street)	• New highway designation • Consultation likely to be intense • Contaminated sites alongside proposed route (Cambridge Street) • School site on Weraroa Road / York Street	• No reliance on other PFRs
Option 2 **Roslyn Road**	• Some residential and life style blocks on Roslyn Rd – would result in objections	• Improvements by removing 'through' HCVs from central Levin	• Notable tree (Copper Beech, Arapaepae Road)	• Consultation likely to be intense • Contaminated site alongside proposed route (Arapaepae Road) • Gladstone Greenbelt Structure Plan • Need to limit access to proposed roads	• Yes – Kimberley Road / Arapaepae Road curve and SH1/57 connections essential for route
Option 3 **Heatherlea East (Greenfield)**	• Little impact, new route across existing farmland	• Improvements by removing 'through' HCVs from central Levin	• Notable trees (Copper Beech, Arapaepae Road; various, Heatherlea East Road)	• New road designation • Consultation likely to be intense • Contaminated site alongside proposed route (Arapaepae Road) • Gladstone Greenbelt Structure Plan • Limit access to proposed roads	• Yes – Kimberley Road / Arapaepae Road curve and SH1/57 connections essential for route
Option 4 **Tiro Tiro Road Extension**	• Significant negative for Mako Mako Rd and Tiro Tiro Rd (school located on Tiro Tiro Rd) • Greenfield highway little impact on surrounding area	• Improvements by removing 'through' HCVs from central Levin • Severance to areas around new route • Expected objections from Lindsay Road area	• No heritage features	• New road designation • Consultation likely to be intense • Contaminated site alongside proposed route (Tiro Tiro Road) • School site (Tiro Tiro Road) • Maori owned land • Limit access to proposed roads	• No reliance on other PFRs

Table 9-2: Options Appraisal Continued

Option	Safety	Route length**	Bylaw Enforcement	Journey Time	Property Acquisition	Construction Cost
Existing Route	• Poor crash history - over proliferation of HCV related crashes in Levin presently	• Do minimum base case	• Not Applicable	• Base case scenario,	• None required	• Zero
Option 1 **One-way pairs**	• Potential to create conflict with pedestrian and cyclists (note presence of school) • Residential conflict	• Northern, 800 m longer compared to existing • Southern, 200 m longer compared to existing	• Could prove difficult due to extra route length	• Some increase on existing (note intersection delays in addition to route length)	• None required	• *Medium* • *Due to strengthening*
Option 2 **Roslyn Road**	• Improved by removing HCVs from urban area • Residential conflict	• Significant, approximately 4 km additional distance compared to existing (10 km total)*	• Could prove difficult due to extra route length and vehicles with legitimate access requirements in Levin	• Would increase on existing, but increased speed and free flow conditions partially offset journey length	• Very limited, possibly some for Roslyn Rd widening • Farmland required for new link from Roslyn to SH1 • Requirement for SH57 roundabout	• *Medium* • Need for grade separation for rail, new 300 m highway link, widening of Roslyn and new roundabout
Option 3 **Heatherlea East (Greenfield)**	• Improved by removing HCVs from urban area	• Significant, approximately 3.6 km additional distance compared to existing route (10.8 km total)*	• Could prove difficult due to extra route length and vehicles with legitimate access requirements in Levin	• Would increase on existing, but increased speed and free flow conditions partially offset journey length	• Yes – to accommodate new link, land is entirely farmland and possible to avoid majority of farm buildings & severance	• *High* • 2.75 km greenfield highway construction, SH57 roundabout & grade separation at rail
Option 4 **Tiro Tiro Road Extension**	• Potential to create conflict with pedestrian and cyclists (note presence of school also) • Intersection with Lindsay Road would need to be cautiously designed (potential for high severity crashes)	• Shorter than existing by 500 m (5.4 km total)	• Reasonable	• Estimated to be approximately equal***	• Yes – for Tiro Tiro Road extension. Mainly farmland farm access but some (<5) residential properties likely to be affected	• *Med-High* • New 2.4 km greenfield highway construction, property acquisition but no major intersection works or grade separation

*Notes that the additional distance could be reduced depending upon option selected in PFR No. 5
**Route length for each option is measured to the corresponding point of the do-minimum to allow a like-for-like comparison
***1.8 km of existing within 100 km/h zone, 900 m at 70 km/h, remaining 3.2 km at 50 km/h, Option 4 assumed 2.4 km new link at 100 km/h, remaining 3 km at 50 km/h = 0.094 hours for Do min, 0.084 hours for option (similar timings). Based on free speed and ignoring intersection or geometric delay

10 Option Discussion

The option assessment provides a useful comparison of the key parameters for each of the alternative options. Most apparent is the lack of a clear preferred option (or options) as all have considerable negative impacts that need to be considered further against the existing situation and the social and environmental gains.

One key issue is the attractiveness of the option as a HCV bypass. Freight movement is a key economic activity and any solution proposed by the NZTA needs to be reasonably attractive to HCV operators or risks imposing unnecessary costs on freight movement and will not be defensible. In this regard, route length and journey time are particularly important.

10.1 Route Efficiency

Whilst increases in route length can potentially be offset by major improvements in journey speed, the route length increases for Option 6-2 and 6-3 are so significant that, as standalone projects, they are intuitively unattractive (given route length increases of approximately 60% and 40% respectively). It is possible that the bypass routes may increase speeds to reduce the delaying effect of the extra travel distance. However, given the Level of Service through central Levin is good and predicted to remain this way, it is highly likely that the route through Levin will remain the quickest and most efficient. Additionally, it is important to realise that whilst increased speeds on the bypass route may lessen the time taken to travel the additional distance, additional fuel cost and road user charges would remain as a direct negative consequences to HCV operators.

Therefore, Options 6-2 and 6-3, when considered in isolation as bypass options of Levin, do not offer an acceptable solution. Further consideration of these options in combination with the other PFRs is certainly warranted – long term there may be a case for the combined option from PFR No. 5 and one of these two options becoming the new SH1 and the section through central Levin being declassified to local road status.

Option 6-1 is not a significant detour for HCVs in terms of travel distance. However, in reality this bypass option would result in considerable delays due to the number of turning movements involved. There is also a perception frustration issue with HCV drivers travelling along SH1 and being able to see the direction they wish to proceed in and then being forced onto an alternative route.

Option 6-4 may be more attractive to freight operators because this offers a directness of route with a travel distance and journey time that is comparable to the existing situation, though this will be dependent upon the various intersection forms proposed.

It is noted that options that result in routing of HCVs through residential areas will create social and environmental effects for residents, community facilities and businesses in Levin. Diverting heavy vehicles through residential locations is highly problematic and controversial and therefore is not advisable. This could in fact lead to a worsening of the current situation and justification of the capital cost to achieve such an outcome would be difficult.

10.2 Non-HCV Traffic

Route attractiveness is also an important consideration for non-HCV travellers. Providing a route that is attractive for HCVs, by extension, is likely to be attractive to all through traffic vehicles. This potentially creates a dichotomy for Levin – as the social and environmental improvements secured through the creation of a viable bypass are offset by the negative economic impact for the town as all vehicular through traffic no longer passes the central retail area. This could be compounded by declassification of the SH1 route through Levin. This could be investigated further through modelling at a later stage.

Further discussion would be required to establish whether the entirety of the new bypass routes would gain highway classification or remain local road. This consideration would also influence whether the bypass options should be designated as Limited Access Road(s) to prevent transferal of frontage activity.

10.3 Legitimate Access & Enforcement

There is also the issue surrounding legitimate access requirements for HCV operators that have business in Levin. Whilst accurate information is not currently available regarding the split of access traffic to through traffic – an assumption can nevertheless be made that significant numbers of HCVs would still need to use the route through central Levin. This would result in a situation where the negative effects of HCV traffic is subsequently experienced by additional receiving environments as well as SH1 through central Levin – replicating, rather than removing, the issue.

Enforcing a system where some HCVs are permitted to use central Levin (for legitimate access purposes) and others are not is likely to prove extremely difficult as well as labour intensive.

11 Cost Estimates

The expected and 95th percentile estimates for the options are detailed in Table 11-1 below.

Table 11-1: Cost Estimates

Option Description	Expected Estimate	95th Percentile Estimate
Option 6-1 – One-way pairs	$12.7M	$16.3M
Option 6-2 – Roslyn Road	$16.4M	$20.9M
Option 6-3 – Greenfield Heatherlea East	$21.0M	$27.0M
Option 6-4 – Tiro Tiro Road Extension	$18.0M	$23.0M

The cost estimates for the options have been calculated using concept layouts of the options (with no survey data) and are based on the design statement assumptions as listed above. The cost estimates for the options are given in Appendix E.

Property costs have been included in the options cost estimation based upon information provided by NZTA to MWH in 2011[7]. These figures are calculated considering land use and zoning and applying a broad land value rate to the areas required for the improvements.

11.1 Risk Assessment

The risks to the project have been assessed using the General Approach as determined in the NZTA Risk Management Process Manual (AC/Man/1).

The major potential risks associated with the Heavy Vehicle Bypass improvement project are considered to be:

- Project unable to get funded due to constrained funding environment.
- Strengthening of local roads requires major service relocations / protections
- Inaccurate cost estimate due to level of available data at this high level feasibility state, including utility information and assumptions in regards to topography, geotechnical and land value / use.
- Conceptual structures type / position are not achievable due to surrounding properties / land uses.
- Incompatibility with adjacent sections improvement works.
- Traffic delays during construction.
- Environmental effects during construction.
- Community concerns of both existing and proposed routes.

[7] Email provided from Mitchell Cocking (NZTA) to Marten Oppenhuis (MWH) on 12 August 2011

- Impacts on existing services.
- Land acquisition difficulties.
- Difficulties in obtaining resource consents and/or alteration to designation.
- Opposition from local iwi.
- Additional landowner accommodation works required.

12 Social and Environmental Assessment

The Scoping Report phase of the Ōtaki to Levin RoNS identified a number of social and environmental factors which provide an overview to some of the issues that will need to be assessed during the scheme assessment phase for the HCV. The five options being investigated (including the Do-minimum option) will require an assessment against a number of the factors and as discussed in Section 9 a basic options assessment has been undertaken which highlights the key issues to be considered for each option.

Those associated with social and environmental issues include:

- Historic buildings located in Weraroa Road (Horowhenua College Main Building and Walkerley Homestead) and St John's Methodist Church in Cambridge Street;
- Notable trees that require protection in York Street, Oxford Road/SH1, Arapaepae Road and Heatherlea East Road;
- Schools in York Street, Weraroa Road and Tiro Tiro Road.
- Listed contaminated sites in the vicinity of proposed works in Cambridge Street, Oxford Road, Arapaepae Road and Tiro Tiro Road; and
- Maori owned land in vicinity of the extension of Tiro Tiro Road

During the next assessment stage (scheme assessment) a Multi-Criteria Analysis (MCA) on the selected options to determine the preferred solutions should be undertaken. An MCA would be carried out with input from a range of stakeholders with careful consideration of the weighting of attributes.

High level consultation has been carried out under the scoping phase of the Ōtaki to north of Levin RoNS and on-going consultation will continue with stakeholders throughout the planning and design process. Given that the proposed options for the HCV go through established residential areas, residents are likely to oppose the proposals and consultation will be an important component of the project.

The area as a whole is identified as being of cultural importance to the iwi of Rangitane o te Whanganui a Tara, Ngati Raukawa ki te Tonga and Ngati Toa Rangitira.

A Consultation Plan for the entire Ōtaki to north of Levin project has been prepared and consultation will be undertaken in accordance with the plan. The purpose of the plan is to:

- Provide a documented process for intended engagement with the community, including the project context, the parties involved, and desired outcomes;
- Maximise effective and efficient engagement of community within generally tight time constraints;
- Provide the specifics of consultation to be undertaken, including timeframes;
- Help the project team to proactively manage risks to the project/project future from inappropriate or inadequate community engagement; and
- Help the project team to constructively manage community expectations.

13 Resource Management Issues

The project must meet all statutory requirements. There are a number of documents (both statutory and non-statutory) that must be considered when planning for the state highway improvements. In particular, the requirements of the Resource Management Act, the operative Horowhenua District Plan and the Horizons Regional Plan (proposed One Plan) will be assessed to ensure that the proposed project meets the plan provisions and follows the statutory process.

13.1 District Plan Provisions

13.1.1 Designations

SH1 and SH57 are designated under the Horowhenua District Plan for "state highway purposes" (D2) and (D3) respectively. A section of Oxford Road/SH1 is also designated (D5) (Map 23) as "proposed road widening purposes" with NZTA the requiring authority. The existing designations are narrow in places and may need to be altered to accommodate the road improvements. Options requiring a realignment of sections of the highway may require a new designation, and sections of road that are not currently designated may need to be designated. The option of revoking the status of the road to a local road could be investigated. Should these roads remain "state highway", NZTA will be required to give notice to the Council of its requirement to alter the designation (NOR). An outline plan would also be required to indicate the scale of the prosed works within the designation. Alternatively, NZTA could apply for a resource consent (land use consent) to carry out the proposed works outside the designation.

School sites are designated in the vicinity of the proposed route options. Horowhenua College (D33) (Map 23) and Levin North Primary School (D31) (Map 20) are located in Weraroa Road, and Levin Intermediate (D32) (Map 23) is located in Tiro Tiro Road.

The Cemetery (D71) (Map 23) located on the corner of Mako Mako Road and Tiro Tiro Road is designated with Horowhenua District Council the requiring authority.

Sections of SH1 run alongside the railway line. The rail corridor is designated (D1) under the District Plan.

13.1.2 Heritage Issues

Schedule 2 of the District Plan identifies heritage structures. The following historic buildings are identified in the vicinity of the proposed options:

- Horowhenua College Main Building (H15) (Map 23) located in Weraroa Road;
- Walkerley Homestead (H17) (Map 23) located at 120A Weraroa Road; and
- St John's Methodist Church (H7) (Map 24) located at 90 Cambridge Street.

The following notable trees are identified in the District Plan:

- Various trees located at 307 Heatherlea East Road (Map 8);
- Row of Plane trees on road reserve in Oxford Street/SH1 (Map 23);
- Copper Beech at 'Annandale' Arapaepae Road (Map 8); and
- Karaka at 28 York Street (Map 21).

13.1.3 Proposed Gladstone Greenbelt Structure Plan

The proposed Horowhenua District Plan includes the proposed Gladstone Greenbelt Residential Area Structure Plan which is a non-statutory plan. The operative District Plan is under review and is currently open to submissions.

The structure plan area covers a large block of farmland bordered by SH57, Queen Street East, Tararua Road and Gladstone Road. The structure plan recognises that SH57 is a potential Levin bypass route and a 100 m corridor has been identified alongside the existing road to provide sufficient width to cater for future upgrades.

13.2 Regional Plan Provisions

The final designs and construction plans will determine what regional consents are required. Depending on the selected option, the following resource consents are likely to be required under the proposed One Plan administered by the Horizon's Regional Council:

- Land use consents for the placement/extension of structures in the riverbed;
- Bore permit for geotechnical investigation;
- Stormwater discharges from bulk earthworks;
- Soil and vegetation disturbance;
- Discharges of contaminants to land; and
- Discharge of contaminants to air from road construction.

13.3 Other Provisions

Depending on the options pursued, the proposed works may involve earthworks that have the potential to unearth Maori artefacts. Current information does not identify any known sites but an archaeological authority may be required should a site be discovered. The extension of Tiro Tiro Road traverses Maori owned land.

14 Geotechnical Requirements

A preliminary geotechnical appraisal report was prepared by MWH in 2011. This report outlined that the majority of the stretch of the highway is under lained by beach deposits (Ōtaki Sandstone). To investigate the subsurface conditions along the alignment which includes the Heavy Vehicles Bypass study area, MWH recommended field investigations consisting of hand-auger bores, boreholes and test pits.

The preliminary geotechnical appraisal report for the Ōtaki to Levin RoNS noted the following aspects in regards to the subject study area:

- It has moderate settlement potential;
- It has a seismic potential due to the proximity of the active Northern Ohariu Fault;
- It has low susceptibility to liquefaction; and
- It is not located within a tsunami influence zone.

15 Land Requirements

Land requirement has been included in the concept development and cost estimation as follows:

- Option 6-1 requires no land
- Option 6-2 requires 4,000m^2 of land (affecting 2 individual property appellations)
- Option 6-3 requires 81,000m^2 of land (affecting 26 individual property appellations)
- Option 6-4 requires 22,000m^2 of land (affecting 10 individual property appellations)

The land calculations are based on that required for the construction of the road using aerial plan areas. It is entirely feasible that these areas will change when property negotiations take place and entire plots are required to be purchased.

16 Maintenance Issues

The current proposals would result in three specific changes to the maintenance regime:

- maintenance and repair of proposed bridge or arch structures where grade separation for the rail is required.
- maintenance of additional / proposed links sections of road either by the NZTA or Council.
- There would be increased maintenance requirements for HDC should local roads become used for the HCV bypass (or conversely if local road links are upgraded to highway status this will become and NZTA responsibility).

17 Conclusions and Recommendations

The option assessment presented in this report is the first stage in the process to consider the opportunities available to provide a HCV bypass of central Levin. The provision of such a solution is being investigated as the volume of HCVs using SH1 through central Levin is perceived to bring adverse social and environmental effects.

It is evident that none of the options considered offer a completely viable solution and all involve a significant capital cost whilst the solutions proposed will themselves have consequential and negative effects (for residents and businesses). Alternative options, beyond the four considered in this report, certainly do exist though none have thus far been identified as being preferential to the four assessed and have therefore been discounted.

Without the benefits of an economic analysis, it is difficult to empirically or objectively compare the options. For this reason this qualitative assessment was undertaken as the first stage in the process. None of the options are likely to provide significant benefits as they all result in similar or longer journey times. Indeed, it could be argued that all of the options have similar or greater negative effects to that of the existing route. Further, as heavy vehicle traffic volumes would be split (as over 30% still have access requirements in Levin), implementation of a heavy vehicle bypass could then result in these negative impacts being encountered on two routes rather than just on SH1.

A traditional economic evaluation would not adequately incorporate the social and environmental benefits (or disbenefits) that could be realised with the provision of a bypass. If further analysis of the bypass options is considered feasible, quantification of these aspects by an economist at SAR stage would be worthwhile (for example by undertaking a willingness to pay survey or similar). Additionally, a robust traffic model will be critical to understanding the likely impacts of the bypass options.

From the investigations and assessment completed to date, it is recommended that the existing situation be retained for the short to medium term. The existing Level of Service in Levin is reasonably good, the adverse effects created by the route are not intolerable and the alternatives are costly, unattractive to HCVs and result in other negative effects.

Longer term, further consideration of the adjacent PFRs in combination is recommended. A key consideration will be an assessment of the interdependency of Options 6-2 & 6-3 with the adjacent PFR to the south (PFR No. 5, SH1/57 Connections). If either Option 6-2 or 6-3 was combined with the bifurcation options for PFR No. 5, it is entirely possible that this could offer major benefits for all through traffic.

Appendix A Photographs

HCVs using central Levin (1)

HCVs using central Levin (2)

Appendix B Traffic Data

New Zealand Transport Agency Traffic Volumes 1992 onwards

REGION	STATE HIGHWAY	DISTANCE	TMS SITE	TC	LOCATION	AADT 1992	AADT 1993	AADT 1994	AADT 1995	AADT 1996	AADT 1997	AADT 1998	AADT 1999	AADT 2000	AADT 2001	AADT 2002	AADT 2003	AADT 2004	AADT 2005	AADT 2006	AADT 2007	AADT 2008	AADT 2009	AADT 2010	AADT 2011	2000 HV	2001 HV	2002 HV	2003 HV	2004 HV
8	1N	827	00100827		HIHITAHI - Telemetry Site 29 - Near Deacons Rd	3420	3600	3700	3920	4000	4030	4242	4254	4261	4307	4424	4729	4826	4797	4755	5015	4592	4728	4658	4536	507	412	468	729	770
8	1N	839	00100839		Hautapu (Taihape Deviation)	4200	4210	3760	4300	4390	4440	4670	5090	4546	4690	4719	4772	4820	4758	5159	5105	4529	5052	4833	4601	227		236	736	1075
8	1N	843	00100843		Mataroa Rd (Taihape)									6205	8587	6187	6498	6667	6569	7108	6802	6163	6670	6682	6211	310	430	1259	1323	953
8	1N	847	00100847		Utiku Straights	4880	4750	4390	4930	5050	5170	5440	5930	5170	5210	5479	5689	5510	5418	5936	5817	5338	5798	5556	5223	259		274	877	935
8	1N	865	00100865		Mangaweka North	4110	4200	4490	4830	4960	4980	5240	5710	4705	4750	4869	4653	5053	4876	5546	5215	4793	5114	5155	4734	236		244	911	989
8	1N	881	00100881		Hunterville, North Vinegar Hill Rd	4280	4550	4650	4700	4750	4960	5220	5690	4697	4740	4433	4527	4807	4739	4631	4857	4695	4831	4565	4622	234		221	481	546
8	1N	904	00100904		Rata South at Mangaraupi Bridge	4260	4520	4500	4650	4680	5010	5270	5680	4798	6569	4793	4641	4854	4731	4619	4664	4762	4639	4505	4434	240	329	240	814	852
8	1N	916	00100916		Greatford	3280	3610	3330	3870	4190	4290	4330	4960	5790	5816	5736	5257	6087	5991	5972	6249	5836	5774	5804	5727	290	290	286	558	692
8	1N	923	00100923		Bulls North	4500	4620	4640	5070	5370	5850	5910	6040	5469	5187	5182	5135	5449	5521	5373	5459	5125	5131	5014	5048	274	260	260	546	620
8	1N	926	00100926		Bulls, Rangitikei River Bridge	9910	10170	10700	11040	11280	11570	11680	12960	12236	14212	12447	12569	12888	12965	13193	13173	12590	12619	12858	12430	612	710	622	1336	1463
8	1N	930	00100930		SANSON - Telemetry Site 38	9050	9600	9900	10310	10425	11030	11129	11413	11403	11552	11830	11841	11995	12300	12290	12528	11820	12211	12305	12045	1101	1180	1210	1258	1299
8	1N	940	00100940		Carnarvon, South of Campions Line	4040	4430	3770	4270	4320	4430	4470	4960	4932	5193	5258	4975	5124	5290	5052	5234	4806	5707	5051	5290	246	260	263	529	583
8	1N	954	00100954		Himatangi, South of Pioneer Highway	6020	6170	6600	7220	7310	7720	7800	8120	6689	6263	6875	6715	6933	6922	7115	7416	6544	6313	6940	6976	334	314	344	714	788
8	1N	962	00100962		Foxton	7420	7020	7260	7780	7850	8060	8140	12740	8290	8238	9438	8593	8790	9338	8958	9218	8407	8038	7928	8017		412	472	913	248
8	1N	965	00100965		Whirokino								8960	7570	8245	7748	7947	7721	8514	8072	8262	7872	7299	7697	7767		412	387	3956	315
8	1N	979	00100979		Levin, Kawiu Rd - Gordon Pl	8290	8470	8980	9600	9690	9590	9940	9660	9080	9600	9837	9524	10124	10401	10079	10323	9871	9486	9439	9647		480	492	1152	1313
8	1N	981	00100981		Levin, Oxford St								14060	12765	14173	13872	14044	14502	14931	14648	15428	14889	13984	13932	13591	638	709	694	1264	1382
8	1N	984	00100984		Levin, South of Town	10570	10850	11230	11930	12300	12160	12600	12960	12250	12143	12157	11662	12467	12343	12085	12341	12098	11737	11458	11484		607	608	1050	1187
8	1N	988	00100988		OHAU - Telemetry Site 56 - Ohau Overbridge	11300	11700	11800	12650	13110	13020	13505	14480	13135	14104	14399	14831	14977	15145	14860	15347	14872	15080	15004	14643	1061	1222	1264	1335	1401
9	1N	998	00100998		Otaki, North Waitohu Stream Bridge	11500	10900	11400	11900	12100	12300	13800	12500	13200	13485	13875	14394	14510	14746	14713	15038	14614	14682	14708	13930		674	1219	1295	1382
9	1N	1001	00101001		Otaki, North of Waerenga Rd							17400	16000	15500	12922	16376	16744	16736	17135	17027	17360	16212	16348	16606	15863		646	725	1021	1075
9	1N	1002	00101002		Otaki River Bridge	12400	11800	12300	13100	13200	13900	15500	15200	15200																	
9	1N	1002	00101011		Marycrest (dual loop)															16860	17177	16664	16268	16798	15573					
9	1N	1017	00101017		Waikanae, North of Elizabeth St								20900	19700	18550	20027	20850	21489	21186	21395	21891	21164	21458	21537	20235		928	887	1271	1380
9	1N	1021	00101021		Paraparaumu North, near Kapiti Lookout	16700	17200	18200	19700	19700	20600	21900	23800	23800	22272	23189	23491	23512	23389	23368	23624	22863	23660	23651	22628		1114	1026	1433	1510
9	1N	1024	00101024		Coastlands, Paraparaumu North of Ihakara St								24800	23400	22513	24298	24364	24387	24832	24645	25186	24566	25744	25923	24316		1126	1076	1487	1567
9	1N	1028	00111028		Queen Elizabeth Park Southbound Passing Lanes											11800	12113	14486	12072	12322	12593	12283	12872	12961	12158					
9	1N	1028	00121028		Queen Elizabeth Park Northbound Passing Lanes											11800	12113	14486	12072	12322	12593	12283	12872	12961	12158					
9	1N	1029	00101029		Waterfall Road																									
9	1N	1031	00101031		Paekakariki, South of MacKays Crossing	20600	19000	19600	19600	20900	21700	22400	23200	23700	21835	23603	24226	24132	24233	21993	24374	23637	24708	25012	24070		1092	1044	1477	1551
9	1N	1040	00101036		PUKERUA BAY - Telemetry Site 47 (Piezo Axle Classification)		17700	18250	18900	19450	20600	20634	21536	21391	21172	21590	22202	21958	22095	21993	22959	22382	23379	23804	23219	888	782	955	1321	1383

New							
TMS SITE	2005	2006	2007	2008	2009	2010	2011
	HV	HV	HV	HV	HV	HV	HV
00100827	866	913	781	904	857	885	905
00100839	1060	1150	871	773	898	982	934
00100843	939	1366	1218	1123	1011	1052	977
00100847	977	1140	846	1076	1032	1035	974
00100865	955	1200	1020	1054	969	686	630
00100881	527	901	890	1025	985	952	1075
00100904	831	514	867	1053	982	904	1096
00100916	667	1139	1064	1424	1008	1073	1225
00100923	983	956	972	896	739	732	738
00100926	1444	1470	1500	1630	1441	1445	1397
00100930	1299	1299	1422	1466	1416	1493	1519
00100940	589	563	808	936	451	750	851
00100954	1255	1122	888	1154	853	819	1342
00100962	852	619	906	826	848	944	993
00100965	796	720	782	1066	807	975	1075
00100979	956	630	1082	1057	893	975	1167
00100981	873	726	884	1216	971	974	951
00100984	917	939	1014	1246	1039	1036	1038
00100988	1385	1337	1384	1507	1441	1502	1473
00100998	1310	1517	1863	1649	1380	1726	1481
00101001	1137	1773	1737	1623	1621	1771	1575
00101002							
00101011		1715	1971	1614	1304	1347	1614
00101017	1406	1434	1567	1477	1390	1516	1565
00101021	1642	1954	1811	1778	1632	1853	1779
00101024	1648	1651	1803	1713	1669	1823	1881
00111028							
00121028							
00101029							
00101031	1608	1514	4652	1744	1931	1944	1833
00101036	1188	1514	1498	1561	1515	1675	1797


Lake Horowhenua
LEVIN
Alternative daytime route clearance 5.6m
© 2007 Terralink International Ltd
Overdimension Vehicle Route
State Highway
Traffic light
Roundabout
One way street
SCALE 1 : 25 000
0
500m
1km
LEVIN
11-9

Appendix C Crash Data

CRASH LIST DETAIL REPORT

Run on: 15 Aug 2012

Crash List: Levin_Local and SH1_ Trucks only (37 crashes)

Total Injury Crashes:	8
Total Non-Injury Crashes:	29
	37

Crash Type	Number	%
Overtaking Crashes:	4	11
Straight Road Lost Control/Head On:	1	3
Bend - Lost Control/Head On:	4	11
Rear End/Obstruction:	16	43
Crossing/Turning:	11	30
Pedestrian Crashes:	1	3
Miscellaneous Crashes:	0	0
TOTAL:	37	100 %

Location	Local road	%	St.Highway	%	Total	%
Urban	21	57	15	41	36	97
Open road	0	0	1	3	1	3
TOTAL:	21	57	16	43	37	100 %

Intersection/Midblock	Number	%
Intersection:	22	59
MidBlock:	15	41
TOTAL:	37	100 %

Environmental Factors	Number	%
Light/Overcast Crashes:	32	86
Dark/Twilight Crashes:	5	14
TOTAL:	37	100 %
Wet/Ice:	6	16
Dry:	31	84
TOTAL:	37	100 %

Day/Period	Number	%
Weekday	31	84
Weekend	6	16
TOTAL:	37	100 %

Vehicles	Number	%
Car	26	68
Van/Ute	4	11
Truck	38	100
Bus	0	0
Motorcycle	2	5
Bicycle	0	0
TOTAL:	70	184 %

Note: Percentages represent the % of crashes in which the vehicle, cause or object appears.

Crash factors (*)	Number	%
Alcohol	2	5
Too fast	1	3
Failed Giveway/Stop	9	24
Overtaking	2	5
Incorrect Lane/posn	15	41
Poor handling	6	16
Poor Observation	18	49
Poor judgement	12	32
Fatigue	1	3
Disabled/old/ill	1	3
Pedestrian factors	1	3
Vehicle factors	2	5
Road factors	4	11
Other	1	3
TOTAL:	75	203 %
Crashes with a:		
Driver factor	67	181 %
Environmental factor	4	11 %

(*) factors are counted once against a crash - ie two fatigued drivers count as one fatigue crash factor.

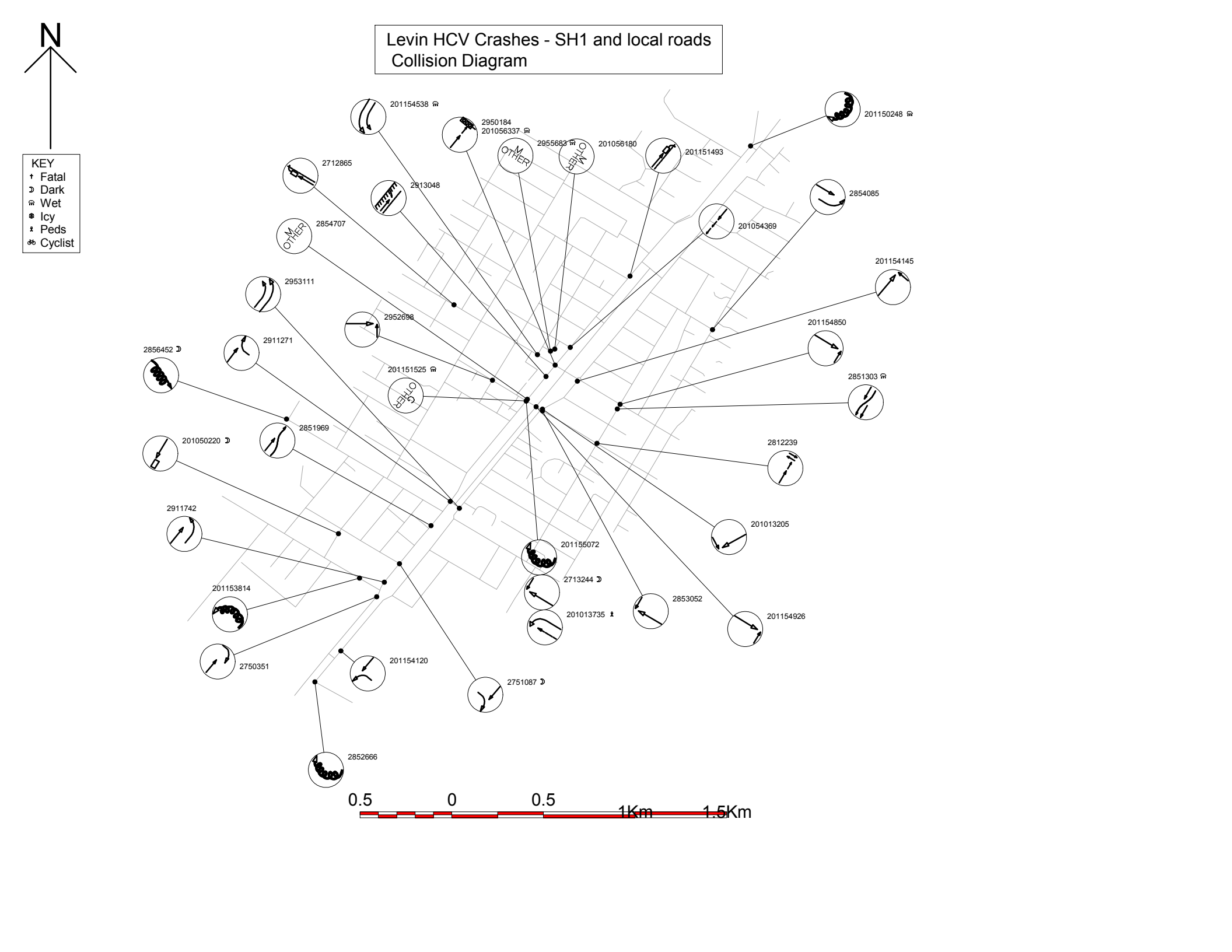
Note: Driver/vehicle factors are not available for non-injury crashes for Northland, Auckland, Waikato and Bay of Plenty before 2007. This will influence numbers and percentages.

Crashes with objects(s) struck	7	19 %

Object Struck	Number	%
House Or Bldg	1	3
Parked Vehicle	5	14
Vehicle	1	3
TOTAL:	7	20 %

Crash Numbers

Year	Fatal	Serious	Minor	Non-Inj
2007	0	1	1	3
2008	0	0	1	7
2009	0	0	3	5
2010	0	1	1	4
2011	0	0	0	10
TOTAL:	0	2	6	29

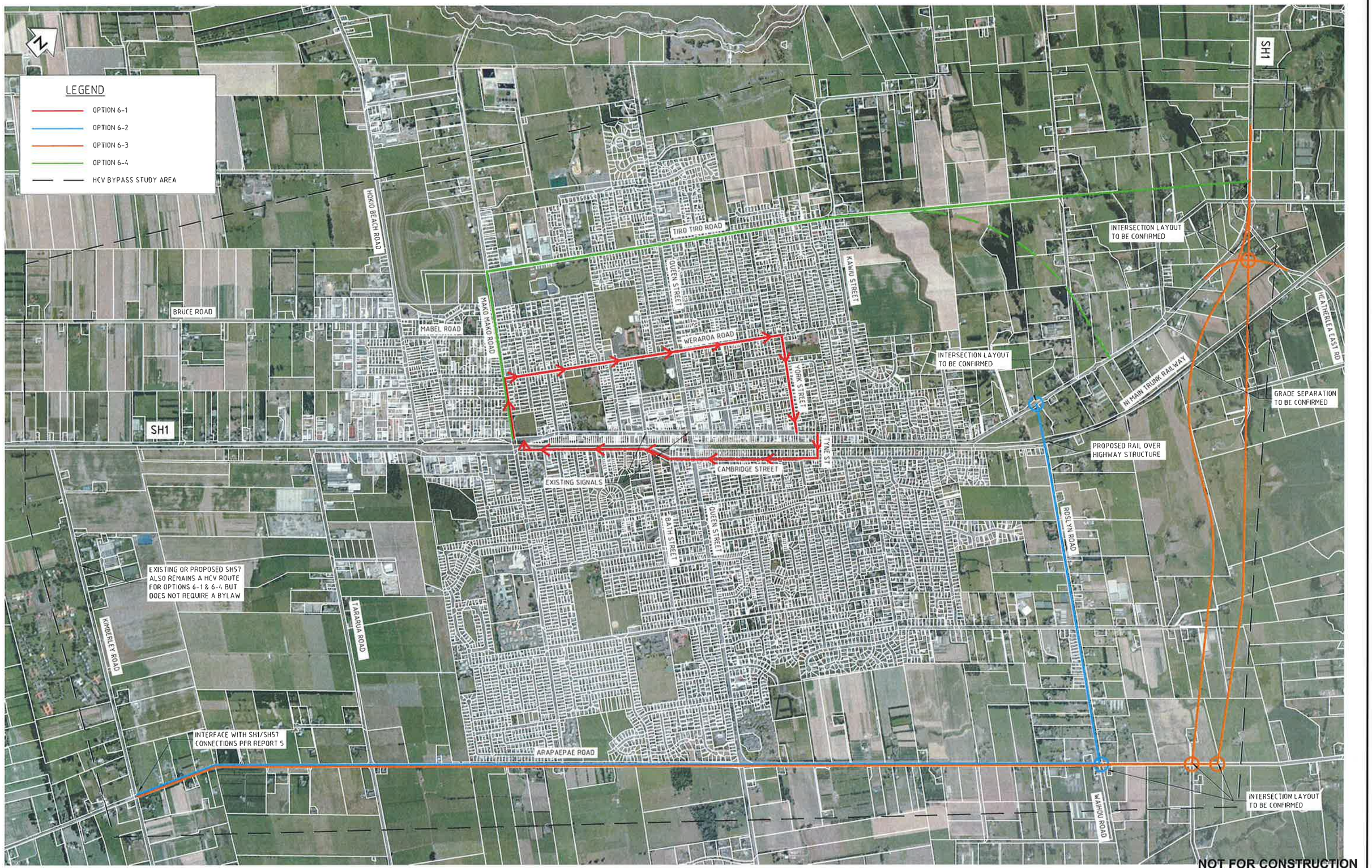

N
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist
Levin HCV Crashes - SH1 and local roads
Collision Diagram
201154538
2950184
201056337
2955683
201056180
201151493
201150248
2712865
2913048
2854085
2854707
201054369
201154145
2953111
2952698
201154850
2911271
2856452
201151525
2851303
2851969
201050220
2812239
2911742
201013205
201155072
2713244
201153814
2853052
201013735
201154926
2750351
201154120
2751087
2852666
0.5
0
0.5
1Km
1.5Km

CRASH RO	CRASH DIS	CRASH DIR	SIDE ROAD	CRASH ID	CRASH DATE	CRASH DO	CRASH TIM	MVMT DESCR	CAUSES	ROAD WET	LIGHT	WTHRa	JUNC TYPE	TRAF CTRL	CRASH FAT	CRASH SEV	CRASH MIN
BATH ST		I	CAMBRIDG	2853052	17/06/2008	Tue	1530	TRUCK1 NBD on BATH ST hit CAR2 crossing at right angle from right	TRUCK1 failed to give way at give way sign, didnt see/look when required to give v	Dry	Bright Sun	Fine	Roundabo	Give Way S	0	0	0
BATH ST		I	SALISBURY	2952698	14/06/2009	Sun	1005	TRUCK1 EBD on SALISBURY ST hit CAR2 crossing at right angle from right	CAR2 failed to give way at stop sign, didnt see/look when required to give way to t	Dry	Overcast	Fine	X Type Jun	Stop Sign	0	0	0
CAMBRIDGE ST		I	BATH ST	201154926	17/11/2011	Thu	930	CAR1 EBD on CAMBRIDGE ST hit TRUCK2 crossing at right angle from right	CAR1 failed to give way at give way sign, didnt see/look when required to give way	Dry	Overcast	Fine	Roundabo	Give Way S	0	0	0
CAMBRIDGE ST		I	BATH ST	201013205	8/11/2010	Mon	1433	TRUCK1 SBD on CAMBRIDGE ST hit MOPED2 crossing at right angle from r	TRUCK1 failed to give way at give way sign, didnt see/look when required to give v	Dry	Bright Sun	Fine	Roundabo	Give Way S	0	0	1
CAMBRIDGE ST		I	LIVERPOOL	2953111	2/06/2009	Tue	1416	TRUCK1 and CAR2 both NBD on CAMBRIDGE ST and turning; collided	TRUCK1 turned left from near centre line, didnt see/look behind when changing la	Dry	Bright Sun	Fine	T Type Jun	Give Way S	0	0	0
CAMBRIDGE ST		I	QUEEN ST	201154145	1/10/2011	Sat	800	CAR1 NBD on CAMBRIDGE ST hit TRUCK2 crossing at right angle from righ	CAR1 alcohol suspected, failed to give way at give way sign, attention diverted by	Dry	Bright Sun	Fine	Roundabo	Give Way S	0	0	0
CAMBRIDG	220	N	TARARUA F	201154120	30/08/2011	Tue	1139	TRUCK1 SBD on CAMBRIDGE ST SOUTH hit CAR2 merging from the left	CAR2 failed to give way at driveway, didnt see/look when visibility obstructed by o	Dry	Bright Sun	Fine	Driveway	Nil	0	0	0
HOKIO BEA	130	W	SH 1N OXF	201153814	9/08/2011	Tue	831	TRUCK1 WBD on HOKIO BEACH ROAD lost control turning left, TRUCK1 hit	TRUCK1 lost control when turning, misjudged speed of own vehicle VAN2 parked	Dry	Bright Sun	Fine	Driveway	Nil	0	0	0
MAKO MA	10	W	TIRO TIRO	2856452	10/12/2008	Wed	415	VAN1 EBD on MAKO MAKO ROAD lost control; went off road to right, VAI	VAN1 fatigue (drowsy, tired, fell asleep)	Dry	Dark	Fine	T Type Jun	Give Way S	0	0	0
MCKENZIE	30	S	KEEPA ST	201050220	2/02/2010	Tue	2145	CAR1 SBD on MCKENZIE ST hit parked veh, CAR1 hit Parked Vehicle	CAR1 suddenly swerved to avoid animal	Dry	Dark	Fine	Unknown	Nil	0	0	0
QUEEN ST WEST		I	BRISTOL ST	201154538	28/10/2011	Fri	845	TRUCK1 and CAR2 both SBD on BRISTOL ST and turning; collided	TRUCK1 didn't signal in time incorrect signal, long vehicle tracked outside lane CA	Wet	Overcast	Fine	T Type Jun	Give Way S	0	0	0
QUEEN ST	50	E	NELSON ST	2712865	29/08/2007	Wed	1323	TRUCK1 WBD on QUEEN ST WEST hit rear of CAR2 turning right from cent	TRUCK1 following too closely ENV: entering or leaving private house / farm	Dry	Bright Sun	Fine	Driveway	Nil	0	0	1
ROOSEVELT ST		I	QUEENWO	2854085	5/08/2008	Tue	1045	CAR1 EBD on ROOSEVELT ST sideswiped by TRUCK2 turning left	CAR1 overtaking on left, failed to notice indication of vehicle in front, misjudged in	Dry	Overcast	Fine	T Type Jun	Give Way S	0	0	0
SERVICE LA	50	E	BRISTOL ST	2955683	6/10/2009	Tue	1530	TRUCK1 EBD on SERVICE LANE hit Parked Vehicle while manoeuvring	TRUCK1 didnt see/look behind when reversing/manoeuvering CAR2 parked or sto	Wet	Overcast	Light Rain	Unknown	Nil	0	0	0
SERVICE LA	50	S	STANLEY ST	201056180	16/11/2010	Tue	1100	TRUCK1 SBD on SERVICE LANE hit CAR2 manoeuvring	TRUCK1 didnt see/look behind when reversing/manoeuvering CAR2 parked or sto	Dry	Overcast	Fine	Unknown	Nil	0	0	0
TARARUA ROAD		A	CAMBRIDG	2852666	30/05/2008	Fri	1512	TRUCK1 WBD on TARARUA ROAD lost control turning right on right hand l	TRUCK1 too fast entering corner, lost control when turning	Dry	Overcast	Fine	Unknown	Nil	0	0	0
WINCHESTER ST		I	BATH ST	2812239	9/06/2008	Mon	1645	CAR1 NBD on WINCHESTER ST hit rear end of TRUCK2 stop/slow for cross	CAR1 alcohol test above limit or test refused, failed to notice car slowing	Dry	Bright Sun	Fine	X Type Jun	Stop Sign	0	0	1
WINCHESTER ST		I	QUEEN ST	201154850	9/11/2011	Wed	1255	TRUCK1 EBD on QUEEN ST EAST hit CAR2 crossing at right angle from righ	CAR2 failed to give way at give way sign, didnt see/look when required to give way	Dry	Overcast	Fine	X Type Jun	Give Way S	0	0	0
WINCHEST	30	S	QUEEN ST	2851303	31/03/2008	Mon	1323	CAR1 SBD on WINCHESTER ST changing lanes/overtaking to right hit TRUC	CAR1 following too closely, misjudged speed of own vehicle	Wet	Overcast	Mist	Unknown	Nil	0	0	0
Z FCT SHEL	40	N	OXFORD/D	2952924	17/04/2009	Fri	620	TRUCK1 SBD on Z FCT SHELL hit VEHB manoeuvring, TRUCK1 hit House Or	TRUCK1 misjudged speed of own vehicle	Dry	Twilight	Fine	Unknown	Nil	0	0	0
Z REST ARE	100	N	SH 1N/KAV	2757677	9/12/2007	Sun	1000	CAR1 SBD on Z REST AREA hit Parked Vehicle while manoeuvring	CAR1 wrong pedal	Dry	Bright Sun	Fine	Unknown	Nil	0	0	0
1N/967/12.147		I	ROSLYN RC	201150248	18/01/2011	Tue	1150	TRUCK1 SBD on SH 1N lost control turning right on right hand bend	TRUCK1 mechanical	Wet	Overcast	Fine	T Type Jun	Nil	0	0	0
1N/967/13	20	N	YORK ST	201151493	17/02/2011	Thu	1055	TRUCK1 NBD on SH 1N hit rear of CAR2 turning right from centre line	TRUCK1 failed to notice car slowing CAR2 following too closely ENV: entering or l	Dry	Bright Sun	Fine	Driveway	Nil	0	0	0
1N/967/13.63		I	STANLEY ST	201054369	18/08/2010	Wed	1205	OTHER1 SBD on SH 1N hit rear end of TRUCK2 stop/slow for queue	OTHER1 following too closely, misjudged speed of own vehicle	Dry	Overcast	Fine	T Type Jun	Nil	0	0	0
1N/967/13.755		I	QUEEN ST	2950184	3/01/2009	Sat	1930	TRUCK1 NBD on SH 1N hit rear end of CAR2 stop/slow for signals	TRUCK1 following too closely, misjudged intentions of another party	Dry	Bright Sun	Fine	X Type Jun	Traffic Sign	0	0	0
1N/967/13.757		I	QUEEN ST	201056337	18/12/2010	Sat	1205	TRUCK1 NBD on SH 1N hit rear end of SUV2 stop/slow for signals	TRUCK1 following too closely	Wet	Overcast	Light Rain	X Type Jun	Traffic Sign	0	0	0
1N/967/13	80	S	QUEEN ST	2913048	29/09/2009	Tue	1200	CAR1 NBD on SH 1N hit TRUCK2 angle parking	CAR1 misjudged speed, etc of vehicle coming from behind or alongside	Dry	Bright Sun	Fine	Unknown	Nil	0	0	1
1N/967/13	10	N	BATH ST	2854707	5/08/2008	Tue	1055	TRUCK1 NBD on SH 1N hit VAN2 manoeuvring	TRUCK1 misjudged speed of own vehicle VAN2 parked or stopped ENV: road surfa	Dry	Bright Sun	Fine	X Type Jun	Stop Sign	0	0	0
1N/967/14.006		I	BATH ST	2713244	13/10/2007	Sat	1951	CAR1 WBD on BATH ST hit TRUCK2 crossing at right angle from right	CAR1 did not stop at steady red light	Dry	Dark	Fine	X Type Jun	Traffic Sign	0	1	0
1N/967/14.006		I	BATH ST	201151525	25/04/2011	Mon	1102	TRUCK1 WBD on SH 1N hit turning CAR2	TRUCK1 turned left from near centre line, long vehicle tracked outside lane, didnt	Wet	Overcast	Light Rain	X Type Jun	Traffic Sign	0	0	0
1N/967/14.006		I	BATH ST	201155072	9/12/2011	Fri	930	TRUCK1 NBD on BATH ST lost control turning right, TRUCK1 hit Parked Ve	TRUCK1 lost control, misjudged speed of own vehicle ENV: road surface unusually	Dry	Bright Sun	Fine	X Type Jun	Traffic Sign	0	0	0
1N/967/14.006		I	BATH ST	201013735	9/12/2010	Thu	1242	TRUCK1 WBD on BATH ST turning left hit PEDESTRIAN crossing SH 1N fror	TRUCK1 didnt see/look when visibility limited by roadside features, blind spot PED	Dry	Bright Sun	Fine	X Type Jun	Traffic Sign	0	1	0
1N/967/14.696		I	LIVERPOOL	2911271	23/02/2009	Mon	1700	TRUCK1 NBD on SH 1N hit MOPED2 merging from the right	MOPED2 didnt see/look behind when changing lanes, position or direction, impare	Dry	Bright Sun	Fine	T Type Jun	Give Way S	0	0	1
1N/967/14	100	S	MAKO MA	2851969	29/04/2008	Tue	1037	TRUCK1 NBD on SH 1N changing lanes to left hit VAN2	TRUCK1 cut in after overtaking	Dry	Overcast	Fine	Unknown	Nil	0	0	0
1N/967/15.132		I	KEEPA ST	2751087	16/03/2007	Fri	654	TRUCK1 SBD on SH 1N hit CAR2 merging from the right	CAR2 attention diverted, misjudged speed etc of vehicle coming from another dirn	Dry	Twilight	Fine	T Type Jun	Give Way S	0	0	0
1N/967/15	50	N	HOKIO BEA	2911742	15/04/2009	Wed	1330	CAR1 NBD on SH 1N sideswiped by TRUCK2 turning left	CAR1 following too closely ENV: entering or leaving private house / farm	Dry	Bright Sun	Fine	Driveway	Nil	0	0	1
1N/967/15	40	S	HOKIO BEA	2750351	25/01/2007	Thu	1239	TRUCK1 NBD on SH 1N hit CAR2 turning right onto SH 1N from the left	CAR2 failed to give way at driveway, misjudged intentions of another party ENV: ∈	Dry	Overcast	Fine	Driveway	Nil	0	0	0

Appendix D Outline Plans

DO NOT SCALE - IF IN DOUBT ASK

ORIGINAL SIZE A1



NOT FOR CONSTRUCTION

REV			DRAWN	CHECKED	APPROVED	DATE
A	WORKING PLOT	REVISIONS	BB	BJW	PP	20/02/13

	Name	Date
SURVEYED		
DESIGNED	B.Browne	11/12
DESIGN CHECK	P.Peet	02/13
DRAWN	B.Timblick	11/12
DRAWING CHECK	B.Wilkinson	02/13
APPROVED	P.Peet	20/02/13

MWH

NZ TRANSPORT AGENCY WAKA KOTAHI

NZ TRANSPORT AGENCY
OTAKI TO LEVIN PFR'S

PFR 6 - ALL OPTIONS
LEVIN HEAVY VEHICLE BYPASS

Status Stamp: WORKING PLOT

Date Stamp:

SCALES (A1) 1:10,000

Drawing No.	Sheet No.	Rev.
80500902-06-001	C001	A

XREFS

Appendix E Cost Estimates

Project Estimate - Form A

Project Name: Otaki to Levin PFR Study
PFR 6 (Levin Heavy Vehicle Bypass)
Option 6-1

FE
Feasibility Estimate

Item	Description	Base Estimate	Contingency	Funding Risk
A	**Nett Project Property Cost**	**0**	**0**	**0**
	Investigation and Reporting			
	- Consultancy Fees	**50,000**	**10,000**	**16,500**
	- NZTA-Managed Costs	**0**	**0**	**0**
B	**Total Investigation and Reporting**	**50,000**	**10,000**	**16,500**
	Design and Project Documentation			
	- Consultancy Fees	**50,000**	**10,000**	**16,500**
	- NZTA-Managed Costs	**0**	**0**	**0**
C	**Total Design and Project Documentation**	**50,000**	**10,000**	**16,500**
	Construction			
	MSQA			
	- Consultancy Fees	**50,000**	**10,000**	**16,500**
	- NZTA-Managed Costs	**0**	**0**	**0**
	- Consent Monitoring Fees	**0**	**0**	**0**
	Sub Total Base MSQA	**50,000**	**10,000**	**16,500**
	Physical Works			
D1	Environmental Compliance	50,000	10,000	16,500
D2	Pavement and Surfacing	7,700,000	1,540,000	2,541,000
D3	Intersection Upgrades	800,000	160,000	264,000
D4	Traffic Services	40,000	8,000	13,200
D5	Service Disruptions	1,687,500	337,500	556,900
D6	Traffic Management and Temporary Works	100,000	20,000	33,000
D7	Preliminary and General	100,000	20,000	33,000
D8	Extraordinary Construction Costs	0	0	0
D9	(blank)			
D10	(blank)			
D11	(blank)			
D12	(blank)			
D13	(blank)			
	Sub Total Base Physical Works	**10,477,500**	**2,095,500**	**3,457,600**
D	**Total Construction & MSQA**	**10,527,500**	**2,105,500**	**3,474,100**
E	**Project Base Estimate** (A+B+C+D)	**10,627,500**		
F	**Contingency** (Assessed / Analysed) (A+B+C+D)		**2,125,500**	
G	**Project Expected Estimate** (E+F)		**12,753,000**	
	Project Property Cost Expected Estimate		**0**	
	Investigation and Reporting Expected Estimate		**60,000**	
	Design and Project Documentation Expected Estimate		**60,000**	
	Construction Expected Estimate		**12,633,000**	
H	**Funding Risk** (Assessed / Analysed) (A+B+C+D)			**3,507,100**
I	**95th Percentile Project Estimate** (G+H)			**16,260,100**
	Project Property Cost 95th Percentile Estimate			**0**
	Investigation and Reporting 95th Percentile Estimate			**76,500**
	Design and Project Documentation 95th Percentile Estimate			**76,500**
	Construction 95th Percentile Estimate			**16,107,100**

Base Date of Estimate	**30 Nov 2012**	**Cost Index**
Estimate prepared by:	**Oliver Brown**	**Signed**
Estimate internal peer review by:	**Marten Oppenhuis**	**Signed**
Estimate external peer review by:		**Signed**
Estimate approved by NZTA Project Manager:		**Signed**

Note: (1) These estimates are exclusive of escalation and GST.

Project Estimate - Form A

Project Name: Otaki to Levin PFR Study
PFR 6 (Levin Heavy Vehicle Bypass)
Option 6-2

FE
Feasibility Estimate

Item	Description	Base Estimate	Contingency	Funding Risk
A	**Nett Project Property Cost**	**300,000**	**60,000**	**99,000**
	Investigation and Reporting			
	- Consultancy Fees	**300,000**	**60,000**	**99,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
B	**Total Investigation and Reporting**	**300,000**	**60,000**	**99,000**
	Design and Project Documentation			
	- Consultancy Fees	**300,000**	**60,000**	**99,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
C	**Total Design and Project Documentation**	**300,000**	**60,000**	**99,000**
	Construction			
	MSQA			
	- Consultancy Fees	**300,000**	**60,000**	**99,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
	- Consent Monitoring Fees	**0**	**0**	**0**
	Sub Total Base MSQA	**300,000**	**60,000**	**99,000**
	Physical Works			
D1	Environmental Compliance	50,000	10,000	16,500
D2	Earthworks	192,250	57,700	96,100
D3	Ground Improvments	57,650	11,500	19,000
D4	Drainage	127,200	25,400	42,000
D5	Pavement and Surfacing	2,912,950	582,600	961,300
D6	Intersection Upgrades	5,000,000	1,000,000	1,650,000
D7	Bridges / Structures	1,960,000	392,000	646,800
D8	Retaining Walls	75,000	15,000	24,800
D9	Traffic Services	100,400	20,100	33,100
D10	Service Disruptions	1,687,500	337,500	556,900
D11	Landscaping	79,150	15,800	26,100
D12	Traffic Management and Temporary Works	108,000	21,600	35,600
D13	Preliminary and General	100,000	20,000	33,000
	Sub Total Base Physical Works	**12,450,100**	**2,509,200**	**4,141,200**
D	**Total Construction & MSQA**	**12,750,100**	**2,569,200**	**4,240,200**
E	**Project Base Estimate** (A+B+C+D)	**13,650,100**		
F	**Contingency** (Assessed / Analysed) (A+B+C+D)		**2,749,200**	
G	**Project Expected Estimate** (E+F)		**16,399,300**	
	Project Property Cost Expected Estimate		**360,000**	
	Investigation and Reporting Expected Estimate		**360,000**	
	Design and Project Documentation Expected Estimate		**360,000**	
	Construction Expected Estimate		**15,319,300**	
H	**Funding Risk** (Assessed / Analysed) (A+B+C+D)			**4,537,200**
I	**95th Percentile Project Estimate** (G+H)			**20,936,500**
	Project Property Cost 95th Percentile Estimate			**459,000**
	Investigation and Reporting 95th Percentile Estimate			**459,000**
	Design and Project Documentation 95th Percentile Estimate			**459,000**
	Construction 95th Percentile Estimate			**19,559,500**

Base Date of Estimate	**30 Nov 2012**	**Cost Index**
Estimate prepared by:	**Oliver Brown**	**Signed**
Estimate internal peer review by:	**Marten Oppenhuis**	**Signed**
Estimate external peer review by:		**Signed**
Estimate approved by NZTA Project Manager:		**Signed**

Note: (1) These estimates are exclusive of escalation and GST.

Project Estimate - Form A

Project Name: Otaki to Levin PFR Study
PFR 6 (Levin Heavy Vehicle Bypass)
Option 6-3

FE
Feasibility Estimate

Item	Description	Base Estimate	Contingency	Funding Risk
A	**Nett Project Property Cost**	**1,335,000**	**267,000**	**440,600**
	Investigation and Reporting			
	- Consultancy Fees	**300,000**	**60,000**	**99,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
B	**Total Investigation and Reporting**	**300,000**	**60,000**	**99,000**
	Design and Project Documentation			
	- Consultancy Fees	**500,000**	**100,000**	**165,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
C	**Total Design and Project Documentation**	**500,000**	**100,000**	**165,000**
	Construction			
	MSQA			
	- Consultancy Fees	**500,000**	**100,000**	**165,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
	- Consent Monitoring Fees	**0**	**0**	**0**
	Sub Total Base MSQA	**500,000**	**100,000**	**165,000**
	Physical Works			
D1	Environmental Compliance	100,000	20,000	33,000
D2	Earthworks	1,850,000	555,000	925,000
D3	Ground Improvments	202,000	40,400	66,700
D4	Drainage	898,500	179,700	296,500
D5	Pavement and Surfacing	2,183,500	436,700	720,600
D6	Intersection Upgrades	5,000,000	1,000,000	1,650,000
D7	Bridges / Structures	2,800,000	560,000	924,000
D8	Retaining Walls	75,000	15,000	24,800
D9	Traffic Services	248,000	49,600	81,800
D10	Service Disruptions	675,000	135,000	222,800
D11	Landscaping	471,000	94,200	155,400
D12	Traffic Management and Temporary Works	108,000	21,600	35,600
D13	Preliminary and General	100,000	20,000	33,000
	Sub Total Base Physical Works	**14,711,000**	**3,127,200**	**5,169,200**
D	**Total Construction & MSQA**	**15,211,000**	**3,227,200**	**5,334,200**
E	**Project Base Estimate** (A+B+C+D)	**17,346,000**		
F	**Contingency** (Assessed / Analysed) (A+B+C+D)		**3,654,200**	
G	**Project Expected Estimate** (E+F)		**21,000,200**	
	Project Property Cost Expected Estimate		**1,602,000**	
	Investigation and Reporting Expected Estimate		**360,000**	
	Design and Project Documentation Expected Estimate		**600,000**	
	Construction Expected Estimate		**18,438,200**	
H	**Funding Risk** (Assessed / Analysed) (A+B+C+D)			**6,038,800**
I	**95th Percentile Project Estimate** (G+H)			**27,039,000**
	Project Property Cost 95th Percentile Estimate			**2,042,600**
	Investigation and Reporting 95th Percentile Estimate			**459,000**
	Design and Project Documentation 95th Percentile Estimate			**765,000**
	Construction 95th Percentile Estimate			**23,772,400**

Base Date of Estimate	**30 Nov 2012**	**Cost Index**
Estimate prepared by:	**Oliver Brown**	**Signed**
Estimate internal peer review by:	**Marten Oppenhuis**	**Signed**
Estimate external peer review by:		**Signed**
Estimate approved by NZTA Project Manager:		**Signed**

Note: (1) These estimates are exclusive of escalation and GST.

Project Estimate - Form A

Project Name: Otaki to Levin PFR Study
PFR 6 (Levin Heavy Vehicle Bypass)
Option 6-4

FE
Feasibility Estimate

Item	Description	Base Estimate	Contingency	Funding Risk
A	**Nett Project Property Cost**	**535,000**	**107,000**	**176,600**
	Investigation and Reporting			
	- Consultancy Fees	**300,000**	**60,000**	**99,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
B	**Total Investigation and Reporting**	**300,000**	**60,000**	**99,000**
	Design and Project Documentation			
	- Consultancy Fees	**300,000**	**60,000**	**99,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
C	**Total Design and Project Documentation**	**300,000**	**60,000**	**99,000**
	Construction			
	MSQA			
	- Consultancy Fees	**300,000**	**60,000**	**99,000**
	- NZTA-Managed Costs	**0**	**0**	**0**
	- Consent Monitoring Fees	**0**	**0**	**0**
	Sub Total Base MSQA	**300,000**	**60,000**	**99,000**
	Physical Works			
D1	Environmental Compliance	100,000	20,000	33,000
D2	Earthworks	959,500	287,900	479,800
D3	Ground Improvments	116,300	23,300	38,400
D4	Drainage	630,500	126,100	208,100
D5	Pavement and Surfacing	6,000,500	1,200,100	1,980,200
D6	Intersection Upgrades	3,300,000	660,000	1,089,000
D7	Traffic Services	131,600	26,300	43,400
D8	Service Disruptions	1,687,500	337,500	556,900
D9	Landscaping	358,000	71,600	118,100
D10	Traffic Management and Temporary Works	100,000	20,000	33,000
D11	Preliminary and General	100,000	20,000	33,000
D12	Extraordinary Construction Costs	0	0	0
D13	(blank)			
	Sub Total Base Physical Works	**13,483,900**	**2,792,800**	**4,612,900**
D	**Total Construction & MSQA**	**13,783,900**	**2,852,800**	**4,711,900**
E	**Project Base Estimate** (A+B+C+D)	**14,918,900**		
F	**Contingency** (Assessed / Analysed) (A+B+C+D)		**3,079,800**	
G	**Project Expected Estimate** (E+F)		**17,998,700**	
	Project Property Cost Expected Estimate		**642,000**	
	Investigation and Reporting Expected Estimate		**360,000**	
	Design and Project Documentation Expected Estimate		**360,000**	
	Construction Expected Estimate		**16,636,700**	
H	**Funding Risk** (Assessed / Analysed) (A+B+C+D)			**5,086,500**
I	**95th Percentile Project Estimate** (G+H)			**23,085,200**
	Project Property Cost 95th Percentile Estimate			**818,600**
	Investigation and Reporting 95th Percentile Estimate			**459,000**
	Design and Project Documentation 95th Percentile Estimate			**459,000**
	Construction 95th Percentile Estimate			**21,348,600**

Base Date of Estimate	**3 Dec 2012**	**Cost Index**
Estimate prepared by:	**Oliver Brown**	**Signed**
Estimate internal peer review by:	**Marten Oppenhuis**	**Signed**
Estimate external peer review by:		**Signed**
Estimate approved by NZTA Project Manager:		**Signed**

Note: (1) These estimates are exclusive of escalation and GST.