



# OTAKI TO NORTH OF LEVIN TAYLORS ROAD TO LEVIN NORTHERN CONNECTION

REPORT ON IDENTIFICATION AND ASSESSMENT OF  
OPTIONS

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# Sign-off Sheet

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# PART ONE

## 1 Introduction and Background

### 1.1 Context

This report provides information on further work undertaken in relation to the identification and evaluation of possible locations for a suitable route for a potential four-lane expressway between Taylors Road (to the north of Otaki) and State Highway 1 (SH1) north of Levin. The future route would also take into account and provide for State Highway 57 (SH57). The actual design of an expressway, any staging, and the portions of the whole route which would require four lanes are not the subject of this report and will be investigated at a later date.

Previous work has been undertaken on a suitable route between Taylors Road and Ohau, which was envisaged as four lanes as far as a bifurcation connecting into both SH1 and SH57 in the vicinity of the Ohau River. From the bifurcation, there would be two lanes on each route. Such options would rely on the existing SH1 from Ohau through Levin, and on the existing SH57 from approximately Arapaepae Road<sup>1</sup>.

A number of reports describe the investigations undertaken to date on this section of the Otaki to North of Levin part of the Wellington Northern Corridor Road of National Significance (RoNS). The key reports are listed in Appendix A.

Previous investigations have involved extensive consultation over several years, including with stakeholders and the wider community<sup>2</sup>. They have also involved close liaison with Horowhenua District Council (HDC), and, as appropriate, Kapiti Coast District Council (KCDC), Horizons Regional Council (HRC) and Greater Wellington Regional Council (GWRC). In 2015, HDC recommenced work on a Town Centre Development Strategy as part of its overall Growing Levin study<sup>3</sup>. As part of the information to assist the development of this strategy the NZ Transport Agency has undertaken to work together with HDC to investigate possible long-term road transport options that would take traffic, particularly heavy vehicle traffic, away from the main town centre.

Earlier investigations as part of the Otaki to North of Levin (O2NL) RoNS project had determined that a four-lane expressway could not be practically accommodated within the existing town centre or nearby urban area for a number of reasons<sup>4</sup>.

Similarly, any route option which would pass to the west of Levin urban area had also been largely ruled out in earlier investigations<sup>5</sup>.

### 1.2 Levin Heavy Vehicle Bypass Study

In late 2012 as part of a range of possible short-term improvements, an investigation was undertaken of a possible heavy vehicle bypass for Levin<sup>6</sup>. This looked at four possible options as well as the status quo. One of these options was a greenfield route utilising SH57 and connecting across to SH1 via the vicinity of Heatherlea Road. All the other options utilised existing streets and minor extensions or modifications within the urban area.

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<sup>1</sup> With appropriate upgrades over time on both State Highways, including for example the recently-designated Waitarere Beach Road Curves Project.

<sup>2</sup> Results of public consultation are contained in the various consultation reports. The public consultation activity has been supplemented with meetings with key stakeholders, particularly with Iwi.

<sup>3</sup> Growing Levin seeks to leverage off the improved travel times to Wellington which will result from the completion of the sections of the Wellington Northern Corridor RoNS to the south, and to enhance the ability of the town to attract new residents, commercial and industrial activity, and visitors. Subsequent work undertaken by HDC has had a wider economic focus.

<sup>4</sup> See "Otaki to North of Levin RoNS – Corridor Stage Initial Considerations", MWH, July 2011.

<sup>5</sup> See "Scoping Report – Otaki to North of Levin Expressway", MWH, July 2012 - see section 11.

<sup>6</sup> Otaki to North of Levin PFR's, Report No.6, Levin Heavy Vehicle Bypass, MWH, February 2013.

This report concluded that none of the options considered offered a completely viable solution, all involved considerable capital cost, and all would have consequential negative effects for residents and businesses. On that basis, it was recommended that the existing situation be retained for the short to medium term. The report acknowledged that alternative possible routes exist but had not been identified or evaluated. It also acknowledged interdependency between areas of improvement to SH1 to the north and south and any potential Levin bypass and suggested that projects could be considered together. Further work was carried out in 2013<sup>7</sup>, which led to identification of an option for consultation, although the benefit-cost ratio (BCR) was still low and a bypass was not seen as needed in the short to medium term.

A potential bypass route option was the subject of public consultation in November 2013, with open day material showing a SH57 to SH1 connection within a shaded area north of Roslyn Road<sup>8</sup>.

Feedback reported in the consultation report<sup>9</sup> indicated that the Levin community was open to the idea of a bypass as long as it took heavy vehicles out of the existing town but did not draw away all traffic. Some other route options were also proposed through the consultation processes. Newsletter 09 (March 2015) also noted that studies had determined that a bypass was not needed in the short-term but that other investigations would not foreclose opportunities for this in the future.

Because of the limited nature of this earlier bypass investigation, it has been set aside and a “clean slate” approach adopted for the further investigations undertaken in 2016 and described in this report.

### 1.3 Objectives

As a parallel process to the early stages of the investigations described in this report, the overall project objectives were reviewed. As this part of the overall project area comprised a large portion of the original O2NL project, it was considered that the review should provide clear statements which would encompass the area from its southern extremity at Taylors Road to north of Levin, superseding previous statements which were targeted at specific areas. The current Project objectives are:

- reduce travel times on the state highway network;
- reduce deaths and serious injuries on the state highway network;
- enhance the resilience of the state highway network; and
- provide appropriate connections that integrate the state highway and local road networks to serve urban areas.

These are influential in processes of route choice and detailed design for a future expressway in the area and have been taken into account in the work documented in this report.

### 1.4 Process

This report sets out the investigations to assist the NZ Transport Agency to determine route options for a four-lane expressway from Taylors Road to north of Levin. These have been undertaken in three stages, broadly, as follows:

**Stage 1:** Focussing on the area north of the area already investigated (i.e. from the vicinity of the junction of Kimberley Road and Arapaepae Road) and to the east and north of Levin urban area – the Levin northern connection - information on constraints and opportunities was gathered. This is described in Part Two of this report.

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<sup>7</sup> Ōtaki to North of Levin, Levin Bypass, Project Feasibility Report, MWH, November 2013.

<sup>8</sup> <http://www.nzta.govt.nz/assets/projects/otaki-to-north-of-levin/Potential-Levin-Bypass.pdf>

<sup>9</sup> Ōtaki to North of Levin, Supplementary Consultation Report, Stage 4, April 2014.

**Stage 2:** A range of possible corridors which could contain an expressway route within the Stage 1 area were identified and evaluated, and viable options determined. This is described in Part Three of this report.

**Stage 3:** The options for the Levin corridor section were examined in terms of their ability to link with options earlier identified further south, to form continuous route options from Taylors Road (north of Otaki) to Koputaroa, just north of Levin. This stage also involved evaluation of each combined route in terms of a range of interchange options along the length of the combined route to provide connections into the local road network including the local communities and Levin. This is described in Part Four of this report.

The remainder of this report describes the investigations, analysis and findings of these three stages of work. The investigations described cover work done in the period July to November 2016. However, the wider range of earlier investigations and the information which had been gained at these earlier stages, contributed significantly to the ability to undertake the work described in this report over a relatively short period<sup>10</sup>.

The investigations have led to the identification of options which will be the subject of stakeholder and community consultation in 2017. The outcomes of the consultation processes will assist the Transport Agency in its identification of a preferred option or options.

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<sup>10</sup> A separate report has been prepared, which provides a summary of the process and the technical environmental work carried out to date and the overall findings in terms of the route options identified for consultation in this report. See References in Appendix A.

## PART TWO

# 2 Stage 1 Investigations

### 2.1 Approach

Stage 1 of the investigation focused on the Levin northern connection. The stage involved identifying the area of interest which should be investigated further for the location of a possible northern connection from the Arapaepae Road vicinity to SH1 north of Levin, investigating the constraints and opportunities within the area, and undertaking a preliminary identification of possible route locations.

This stage involved preparatory work by technical experts and the involvement of a wider group for a site visit and structured workshop, as described below.

### 2.2 Determining the Initial Study Area

Determining the initial study area<sup>11</sup> involved taking into account the northern end of the possible routes determined as part of the Taylors Road to Ohau (T2O) investigations, all of which had joined to SH57 in the vicinity of the intersection of Arapaepae Road (SH57) and Kimberley Road.

In determining the area of interest for a Levin northern connection, it was decided to encompass sufficient area for a corridor which could be to the east or west of the current Arapaepae Road, as well as along Arapaepae Road itself.

As far as the north of the current Levin urban area, the width of the study area remained relatively constant at 1.2km. This would allow for a route that entered from the south-west to swing to join or cross the Arapaepae Road alignment, but to skirt the existing urban development which is built up to the road (but does not access directly on to it) to the west of the study area. To the east, sufficient space was provided for an alignment to cross still relatively undeveloped farmland (although within an identified growth area of Levin) but retaining realistically close proximity to Levin, recognising that the alignment needed to reconnect with the present alignment of SH1 north of Levin. Further extension of the study area to the east was considered to add too much additional travel distance (and therefore time and cost) to future travel on SH1.

The northern part of the study area was determined at the south by the northern extent of the urban development of Levin and the alignment of the existing SH1 (recognising that crossing or realignment of SH1 in this area may be an option). At the northern extremity it was determined (as to the east of Levin) by what was considered to be the maximum extent of area for a connecting alignment, but not excessive, additional travel distance. The extent of the agreed study area is shown in Figure 2.1 on the following page.

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<sup>11</sup> This was undertaken by MWH engineering and planning advisers, and circulated to the Transport Agency for comment.





Figure 2-1: Study Area for Levin Northern Connection, outlined in red (north at the top of figure)

### 2.3 Information Collection, Constraints and Opportunities

The extent of the study area was provided to the project’s technical experts in ecology, archaeology, planning, tangata whenua values, geotechnical considerations, landscape (including visual and urban design), property and productive land with a request to undertake preliminary investigations of the area prior to attending a site visit and workshop. The Briefing Note for this is provided in Appendix B, which includes the Agenda for a site visit and workshop.

Following the site visit on 3<sup>rd</sup> August 2016 a workshop was held to discuss the area and the constraints and opportunities for a possible expressway and connection to SH1 north of Levin. This site visit and workshop was attended by NZ Transport Agency representatives, the project’s various technical experts and engineering and legal advisors, and representatives of HDC and Horizons Regional Council<sup>12</sup>. The workshop used projections of aerial photos (Google Earth) overlaid with various mapped information. The material was presented and discussions led on each technical discipline by an expert in that field. Notes from the workshop are provided in Appendix C, and where detailed material was provided in written form by a technical expert, that is provided in Appendix D.

Key outcomes from the discussion are summarised, as follows:

**Planning** – the study area includes part of a future growth area for Levin, to the east of SH57, which is based on large lot development. Although the area is not yet fully-planned, some development has been allowed. The District Plan shows an

<sup>12</sup> The area of interest for this part of a possible route is entirely within the area of these two councils.

approximately 100m wide transport corridor adjacent to and east of SH57. There are also expanded areas zoned for residential development just north of Levin's current urban area. The District Plan identifies the Tararua Road area south of Levin as the main area for future industrial development. The Plan also identifies and seeks to protect versatile (Class 1 and 2) soils to the north-west of SH57.

**Landscape/Visual** – the landscape throughout the study area is largely a working rural landscape with average values and no outstanding natural features or landscapes. The landscape absorption capacity is good to the east of SH57 and average to the north of Levin<sup>13</sup>. The need for a rail overbridge (and any other major structures on any route) would require specific consideration. Visual effects will be most apparent to existing dwellings in the area and mitigation will be needed where possible.

**Ecological Values** – features and values were provided in mapped form. Two key forest areas to the east of SH57 and south of Queen Street should be avoided, and ideally a route would not traverse the space between them. At least one has Powelliphanta (New Zealand snails), and these are monitored by the Department of Conservation. There are further (but less) significant bush patches around Avenue North Road. North of the study area there is a swamp system, and the northern part of the study area (from Heatherlea Road north) potentially contains areas which could be recognised as wetlands as part of drainage and gully systems and poorly drained soils.

**Archaeological/Cultural Values** – there are two main iwi whose rohe includes the study area in part, with some cross-over – Raukawa in the north and Muaupoko in and around Levin. Roslyn Road is an approximate boundary. There may be other groups with interests. Kereru Marae is outside the area and there appear to be no Māori reserve areas or land blocks within the study area. There are a small number of pre-1900 homesteads within the area, which would be archaeological sites in terms of the Heritage NZ Puhere Taonga Act. Chief amongst them is the Prouse homestead south of Queen Street, but there is also a site to the north of Queen Street associated with the Adkins family. In pre-European times the whole area was forested and probably contained clearings near streams and birding camp areas. There will be areas of cultural importance and archaeological sites, but these are not known of in any detail. There has been one find of a possible human remain within the area (site identified) but this was not authenticated at the time. There is some archaeological risk throughout the area, associated with this generally poor level of information.

**Geological and Geotechnical Aspects** – there are no known fault lines, but there is a diversity of soils including marine and windblown sands which may require special treatment, and reduced slopes. Design and construction management techniques will be needed for some areas and aspects (compressible soils, any peat, sediment runoff through control of extent of exposed areas). The rail line lies in an area of gullies and this will need particular attention in future design if there is a crossing point in this area. The area around SH57 seems to contain few issues or limitations. There are quarries nearby and imported material will be needed for any road. (See summary report in Appendix D).

**Soils** – about 70% of the area is Class I and II soils and the remainder Class III and IV. It will be impossible for any route to avoid high quality soils. Much of the land is in productive rural use, but other areas have been fragmented into lifestyle blocks.

**Property** – as a potentially entirely greenfield route, there will be numerous property issues. There are some large blocks which may have ownership complexity, but this

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<sup>13</sup> Absorption capacity in landscape terms means the ability of the landscape to contain the route of the expressway and its structures without being dominated by the new road. Considerations include topography, the layout of paddocks and existing roads, plantings and natural features.

has not yet been looked into. No Māori land blocks have been identified within this area but further checking is required. This is also the case for aspects such as QE II covenants. Property issues will need to be considered in more detail as part of the next stages of investigation.

**Stormwater and Flooding** – stormwater management will require careful attention, particularly in the north of the area. Fish passage will be needed wherever streams are modified or culverted.

The conclusion from the discussion was that there were important but relatively localised constraints associated with ecological and archaeological values. The extent of development, particularly lifestyle development and dwellings throughout the rural area was noted and wherever recent consents had been granted for such areas these would pose constraints which may not yet be apparent from the site visit. It was recognised that any expressway route is likely to affect numerous dwellings. In geotechnical and stormwater management terms, a future route could be engineered effectively in all parts of the study area with varying degrees of difficulty.

## 2.4 Interaction with Local Roading and Connectivity

Although not a constraint or particular opportunity, the workshop also discussed the need for a future expressway to make provision for local as well as regional and national transport needs, and for connectivity.

It was identified that, as with parts of the Wellington Northern Corridor RoNS further to the south, severance would be a major consideration and that access and provision for established community movement patterns would need to be provided for.

Direct access to major traffic-generating nodes such as industrial areas would be desirable and connection to Levin's town centre would require specific consideration. Other important established patterns of movement would need to be provided for via overbridges or underpasses joining local roads, or via other routes, where access to the new road was limited. Walking and cycling need to be catered for: this is becoming increasingly important for the local community and for tourism, and origins and destinations include parks such as Kimberley Reserve.

A discussion was also held on staging, including improving temporary passing opportunities, or permanent opportunities if parts of SH57 remained in two lane form in the longer term. It was noted that an on-line route, for example on SH57, could involve considerable difficulties during construction upgrades for an expressway so an off-line option could be preferable<sup>14</sup>.

## 2.5 Preliminary Identification of Route Options

At the end of the workshop there was a discussion about the practical extent of the area within which a route should realistically be located. It was decided that the northern extent of the area of interest should be pulled back closer to Heatherlea East Road on SH57. Also, the sharp corner excluding an area north of Levin close to the urban area but not yet developed could be eased as it could provide for a route option which would be shorter than other route options in the northern section.

There then followed a discussion on route options and some preliminary routes were sketched out. It was noted that the routes should be mapped out at least 100m wide and, if possible, more for further investigation and to provide scope to manage and mitigate the effects of any specific alignment within a wider corridor.

The preliminary routes were to be further evaluated in high-level engineering terms before being circulated prior to the further investigations by other technical experts in preparation for the second workshop.

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<sup>14</sup> See further discussion in section 3.2 of this report.

## PART THREE

# 3 Stage 2 Investigations

### 3.1. Approach

Following on from Stage 1, the intention of Stage 2 was to identify and evaluate preferred route options within the area identified in Stage 1. This exercise would take into account the information about constraints and opportunities identified at the earlier workshop and the additional considerations and information which were either inherent in the project's objectives, or which emerged during the Stage 2 process itself. The systematic approach set out in the following sections was taken.

### 3.2. Preliminary Identification of Route Options

The project team's engineers, in consultation with the team's planners, developed several route options within the reduced Study Area polygon described in section 2.5.

A key influential consideration was the relationship with SH57 and appropriate crossing locations of Queen Street to the east of Levin.

A route option that replaced SH57 fully on the same alignment to the east of Levin, or that intruded into the developed urban area to the west, in this vicinity was considered unacceptable because of environmental impacts<sup>15</sup> and the practical difficulty of a major intersection at the current intersection of Queen Street and SH57<sup>16</sup>. However, further to the south, an alignment could commence slightly to the west of the existing junction of Arapaepae Road and Kimberley Road, on the current alignment, or to the east of this intersection.

Two potentially acceptable crossing-places for an expressway on Queen Street east were identified, taking into account identified constraints to the north and south. The eastern most of these crossing places avoided new development areas, vegetation areas and, as far as possible, existing dwellings<sup>17</sup> approximately 1.3km to the east of the current SH57 alignment.

The second was closer to the existing SH57 alignment, and passed between valued remnant bush areas and west of an identified area of archaeological values including one of the district's few remaining pioneer homesteads.

From these two crossing points of Queen Street, five potential broad route alignments were identified which would have the ability to link back to an alignment further to the south in the vicinity of the Arapaepae Road/Kimberley Road intersection.

North of the two crossing points, four route options were identified which would connect back into SH1 north of Levin at the vicinity of the western edge of the polygon in Figure 1. However, two at the northern end had the ability to connect to either the eastern or western option south of Queen Street, making six options in total.

These were circulated to the Transport Agency and the technical experts for preliminary review, and discussed with HDC. As a result of this process a further possible route lying between and connecting to those already identified was added to give a total of seven route options north of Queen Street.

While most options were shown as approximately 150-200m in width, part of one of the northern options was shown as approximately 300-350m in width. This reflected the relatively ubiquitous character of that part of the area with few specific constraints. Issues around the need to cross the rail line ideally at right angles, or as close as possible to that, and the desire for a straight merge back into the existing SH1 alignment north of Levin

<sup>15</sup> This would include the impact of an additional parallel access road at least on the eastern side.

<sup>16</sup> This difficulty had also been noted in earlier work on intersections – see Otaki to North of Levin SH1 – SH57 Connection: SH57 Intersections, Options Assessment Report, MWH, 2015.

<sup>17</sup> One identified with potential historic values.

led to the recognition that there was very limited flexibility at the north-western end of any route in this area.

Because of the importance of the Queen Street crossing as a fulcrum to an overall connecting route through this area, it was decided that the further investigations and analyses should be undertaken in two parts; a southern section and a northern section. The findings of the assessment could then be combined to identify at least one preferred route for consultation and further consideration.

At this stage there was no specific investigation of potential intersection locations. However, sufficient work was done by the engineering team to be satisfied that a range of possible locations was available. Further, it was determined that investigations should proceed on the basis of a four-lane expressway standard route (i.e. sufficient space for this configuration must be available within the corridor being considered) as far as the bifurcation between SH1 and SH57, which would be north of Queen Street in all options. From wherever this bifurcation was located, the continuation of SH57 and a greenfields connection to SH1 north of Levin should be considered as a high-standard single lane road. This needed to be taken into account in evaluating the options as the engineering requirements would be slightly different.

The route options identified at the start of the Stage 2 process are shown in Appendix E.

### 3.3. Multi-Criteria Analysis of Route Options for Levin Northern Connection

#### 3.3.1. Routes for Analysis

Once feedback had been received on the route options, they were given numbers and a second workshop was organised at which a multi-criteria analysis (MCA) would be undertaken.

Figure 3-1 on the following page shows the route options identified within the reduced area of interest polygon which would be the subject of the MCA. Note that some are overlapping, so a description is also provided in Table 3-1 on the following page.

To assist the various participants prepare for the workshop, a briefing note was sent out along with plans showing the route options and a draft agenda. The Briefing Note and draft Agenda are included in Appendix F. In brief, the technical experts were asked to undertake any necessary further research or investigations and to be ready to lead discussions in their area of expertise. The briefing note also set out possible criteria for the MCA with a request that participants consider them and come prepared to discuss them and to suggest any that were considered to be missing or superfluous.

#### 3.3.2. Multi-Criteria Approach

The MCA process and workshop approach has been described in relation to earlier analyses in the O2NL project<sup>18</sup>. The MCA workshop was to apply the “decision conferencing”

methodology. Attendees included an appropriate range of technical specialist and project team members as well as experts from HDC and Horizons.

The MCA workshop used information from the earlier Stage 1 Workshop and additional material provided by the experts (see Appendix H which includes the notes from these experts).

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<sup>18</sup> See for example “Ōtaki to North of Levin, Taylors Road to Ohau River Four Laning, Further Options Report”, September 2015, Section 4.1.



Figure 3-1: Route Options applied in the MCA

**Table 3-1: Description of Route Options**

No.	Colour (see Figure 3.1 and Appendix E)	Description
<b>Southern Sections</b>		
<b>NC1</b>	Light green	Starts west of SH57 before crossing the highway and running parallel and close to SH57.
<b>NC2</b>	Purple	Parallel and east of SH57, in close proximity to existing highway
<b>NC3</b>	Pink	Crosses Queen Street to east of Wakefield Road
<b>NC4</b>	Aqua	Commences further east than previous options, then cuts back to run parallel and close to SH57.
<b>NC5</b>	Blue	Also commences further east and moves away from SH57, crossing Queen Street east of Wakefield Road junction.
<b>Northern Sections</b>		
<b>NC6</b>	Pink	Commences at Queen Street close to SH57 and curves sharply, crossing Roslyn Road and connecting at northern project extent.
<b>NC7</b>	Yellow	Very similar to NC6, but curve starts further north so crosses Roslyn Road closer to SH57 before running on same alignment as Pink.
<b>NC8</b>	Green	Less apparent on Figure 3.1 because underneath lime and purple alignments. Starts close to SH57, running parallel to highway on eastern side, curves tightly to cross SH57 north of Roslyn Road then follows an almost straight alignment to northern extent
<b>NC9</b>	Lime	Commences at Queen Street close to SH57, running parallel to SH57 before crossing SH57 at a point further north than the NC8 and NC10 options, with a smoother curve closer to Heatherlea East Road.
<b>NC10</b>	Purple	Starts further east on Queen Street, then crosses SH57 closer to Roslyn Road, heading west to the northern project extent.
<b>NC11</b>	Orange	Also starts further west at Queen Street, but crosses SH57 further north than NC10.
<b>NC12</b>	Beige	Option starts east on Queen Street (as with NC10 and NC11), but cuts back more sharply, crossing SH57 close to the Roslyn Road/SH57 intersection, then follows NC7 alignment to the northern extent.

The composite map of the routes in Figure 3-1 and Appendix E were the basis of the evaluation. However, more detailed maps of each route option were also provided, which were able to be overlaid on an aerial photograph, cadastral plan, district plan maps and maps from the technical advisors (where these were provided).

### 3.3.3. Choice of Criteria

As noted in the Briefing Note for the workshop:

*“The process relating to the Levin Northern Connection has been preceded by reasonably detailed studies and a number of MCAs which have been applied to route options south of Arapaepae Road. It will be important that the approach at this workshop is reasonably consistent with previous exercises. However, the area we are now looking at is geographically different, with fewer natural environmental values and large watercourses and a greater level of existing and planned development.*”

*It would be expected that some of the earlier criteria which have been applied may no longer be relevant, and that new criteria which take into account the particular characteristics of the location may be appropriate. This will be a matter for discussion at the workshop."*

The Briefing Note set out the "most used" and "most recent" criteria used in the T2O MCA exercises.

In discussion at the workshop, it was decided that this area was sufficiently different to justify some different criteria, although most would remain the same as had been used in the most recent MCA (on the refinement of route option TO17) further south. The following criteria were applied:

**Landscape/Visual Impact** – this criterion took into account existing landscape character on a broad basis and the likely impact a particular route option would have. It considered potential landscape and urban design effects when passing through or near to townships or lifestyle areas, but did not take into account direct visual effects on dwellings (which came into the category of effects on dwellings).

**Ecological Risk** – this criterion relied on the identification of areas of ecological value, including vegetation, wetlands and riparian and river/stream crossings. It was acknowledged that the evaluation was being undertaken at the broad route scale, so the criterion related to the risk of adverse effects on these areas rather than proven adverse effects. Without details of design and a comprehensive understanding of the extent of disturbance and opportunities to mitigate effects, the criterion had to be risk-based.

**Archaeological Risk** – as there are few known archaeological sites within the polygon area, this criterion was based on potential effects on those sites and areas as well as on the risk of encountering archaeological features, based on the limited information that was available.

**Cultural Values** – this takes into account the range of values that tangata whenua are likely to associate with the area, including past use or associations, current ownership, and elements of the natural environment such as waterways and wetlands.

**Productive Land Values** – this criterion was based on the recognition of the inherent productive values of Classes I to III soils.

**Impact on Dwellings** – this criterion took into account direct effects on existing dwellings, including the need to remove dwellings or the potential need for mitigation of adverse effects associated with the expressway route.

**District Plan Impacts** – this addressed impacts on growth areas and current zoning.

**Project Objectives** – this criterion relied on the objectives as they were currently in draft at the time and focussed on safety, efficiency and ability to connect well to Levin town centre.

**Property Degree of Difficulty** – this included the number of properties, extent of severance of existing properties, the ability to align a route option with property boundaries, potential for effect on farming/business operations, and any known land tenure issues.

**Engineering Considerations** – this criterion addressed expected difficulties with construction of a route option, including matters such as likely geotechnical



considerations, extent of structures needed, and potential flooding and groundwater issues.

**Cost** – indicative order of cost of options.

As well as the general discussion, the workshop took guidance from each of the technical experts as to the scope of the criteria. Where relevant, more than one area of expertise contributed to a criterion: for example both landscape/visual and property experts had considered direct effects on dwellings. Information from both was integrated in the Impact on Dwellings criterion. Similarly, the expert on productive land contributed information on property effects.

The project team's advisor on tangata whenua values was not available for this workshop, so it was agreed that he should undertake scoring for this criteria at a later date, for final review by the project team.

In assessing options, reasonable mitigation was taken into account. It was also assumed that all options would include adequate provision for property access and local connectivity (to allow for reasonable continuation of established patterns such as journeys to school and other local services).

There are 11 assessment criteria, which is an acceptable number<sup>19</sup>.

It was noted at the workshop that there was some potential for double counting, particularly with engineering aspects and cost, effects on dwellings and properties, and archaeology/heritage and tāngata whenua values. It was decided that these issues could best be handled during the scoring and weighting discussions. It was also noted that in some cases, the same aspects could justifiably be assessed under two criteria. The possibility of removing cost from the analysis and considering it as a separate item was also raised. This could be undertaken later in the analysis.

Additional criteria were also briefly considered at the workshop as follows:

- Natural hazards (this was subsumed in Engineering Degree of Difficulty)
- Lifelines (there was no basis to distinguish alternatives in terms of lifelines)
- Noise (given corridor width and tools available, noise was considered to be capable of being mitigated to accepted standards, although this matter would need to be carefully considered as part of the refinement of any route)
- Air quality (considered to be able to be addressed later, although this matter would need to be carefully addressed in later stages of investigation).

For the reasons in the bullet-points above, none of these were included as separate criteria.

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<sup>19</sup> Eight to twelve criteria is the ideal. With an increasing number of criteria, each criterion reduces in importance and it can become difficult to distinguish between options.

### 3.3.4. Scoring System

The workshop decided to apply the scoring system set out in the Briefing Note, reproduced in Table 3-2 below.

**Table 3-2: Basis for Scoring Used in the MCA**

Score	Description
1	The option presents few difficulties on the basis of the criterion being evaluated, taking into account reasonable mitigation proposals. There may be significant benefits in terms of the attribute.
2	The option presents only minor areas of difficulties on the basis of the criterion being evaluated, taking into account reasonable mitigation proposals. There may be some benefits in terms of the attribute.
3	The option presents some areas of reasonable difficulty in terms of the criterion being evaluated. Effects cannot be completely avoided. Mitigation is not readily achievable at reasonable cost, and there are few or no apparent benefits.
4	The option includes extensive areas of difficulty in terms of the criterion being evaluated, which outweigh perceived benefits. Mitigation is not readily achievable.
5	The option includes extreme difficulties in terms of achieving the project on the basis of the criterion being evaluated.

Where scores of 5 were identified, it was to be considered if the criterion in this section was sufficiently adverse to constitute a fatal flaw<sup>20</sup>.

### 3.3.5. Scoring Process

The decision conferencing process workshop proceeded in accordance with good practice. The technical experts briefed to lead off discussion did so after the discussions on criteria and scoring. The necessary protocols were followed to ensure that the outcome would be as reliable as possible.

The criteria were described and discussed by the relevant technical expert, identifying issues relevant to each option and building upon information from the Stage 1 Workshop and any additional findings in their preparation for the workshop. Following this, the workshop attendees raised any questions or matters relating to the implications of a particular route option, and proceeded to score each route option for each criterion. Each criterion was scored for the southern options first, and then for the northern options as a second part of the process. To avoid patterning, the order of options for each criterion was varied. In almost all cases, full consensus was achieved and a single agreed score awarded. Only in three cases was there slight disagreement and the two scores were recorded for sensitivity analysis.

The names of those who took part in the scoring process are set out in the Workshop Notes, provided in Appendix G. Appendix H includes the notes provided by technical experts as background to the workshop.

### 3.3.6. Scoring of Criteria – Southern Sections

The outcomes of the scoring of the southern sections are set out in Table 3-3 below, with key points from the discussion leading to the scores outlined below.

<sup>20</sup> In practice, no scores of 5 were awarded in the Stage 2 MCA.

**Table 3-3: Scoring of Southern Route Options**

Criteria	Landscape/Visual	Ecological Risk	Archaeological Risk	Tangata Whenua Values	Productive Land Values	Dwellings	District Plan	Objectives	Property Effects	Engineering Degree of Difficulty	Cost
NC1	2	3	4	1	2	4	2	1	3	2	1
NC2	1	3	4	1	2	4	2	1	3	1	1
NC3	3	1	1	1	2	3	3 / 4	2	3	1	1
NC4	1	3	4	1	2	3	2	1	3	1	1
NC5	2	1	1	1	2	3	3 / 4	2	3	1	1

**Landscape/Visual Impact** – The area was generally able to absorb a route, but there were some discernible differences. Route options NC2 and 4 were the most direct, had least effect on dwellings and aligned best with cadastral boundaries. Option NC3 is the route with the greatest visual effect at it cuts across cadastral boundaries, especially at the southern end. Options NC1 and 5 fall between the others in terms of landscape and visual effect. Scores of 1 to 3 were awarded. It was noted that mitigation may be able to be achieved as routes are refined and other mitigation such as planting considered.

**Ecological Risk** – In the southern sections there are only two areas of bush of considerable significance, and these lie on either side of options NC1, 2 and 4 south of Queen Street and so these options were each scored 3. The bush patch closest to SH57 is recognised in the District Plan and by the Department of Conservation but it is likely that their values are similar. No rivers, streams or wetlands have been identified in this area. Options NC3 and 5 were considered to have no issues and were scored 1.

**Archaeological Risk** – The area has been used for a range of activities in pre-European times but there are no identified archaeological sites. The Prouse homestead and curtilage has been continuously occupied since before 1900 and therefore comprises an archaeological site likely to be of considerable significance. The three options which would have some effect on this site, NC1, 2 and 4, were scored 4, with the other routes scoring 1.

**Tangata Whenua Values** – This criterion was scored after the workshop by Morrie Love. As there are no known sites or Māori land ownership affected by any of the routes, all were scored a 1.

**Productive Land Values** – There are valuable and productive soils throughout the area, but they are somewhat fragmented now and much of the land is in an area earmarked for urban development. All options were scored 2.

**Dwellings** – The number of dwellings which lay within the broad route area formed the basis for scoring of this criterion. All route options affected numerous dwellings. Options NC1 and 2 contained approximately twice as many dwellings as the remaining options and were scored as 4, with the remaining three options scored as 3.

**District Plan** – All options cross an area shown for Levin’s growth in the District Plan (low-density residential use following a structure plan process). Options NC1, 2 and 4 follow at least in part, an alignment for a future State Highway shown within this structure plan area so were scored as 2. Options NC3 and 5 cut across this area on an angle and were therefore scored less well. There was slight disagreement as to the extent to which this would adversely impact on future development in this area with some HDC representatives seeking a score of 4 while the remainder of the workshop was comfortable with a score of 3. Both scores were recorded and the implications of each investigated later.

**Project Objectives** – All options scored well under this criterion due to their straight and direct nature. Options NC3 and 5 which are further away from the exiting urban area of Levin were awarded slightly less favourable scores, with potentially slightly greater potential for adverse economic impact on the Levin town centre.

**Property Effects** – It was recognised that all options would affect a number of properties and would sever properties, including multiple blocks held in the same tenure. There was insufficient information to distinguish between the options, so all were scored 3.

**Engineering Degree of Difficulty** – The geotechnical and topographical conditions mean that all routes score well. Route option NC1 would involve complex crossing of SH57 in the vicinity of Tararua Road so scored slightly less well.

**Cost** – There was considered to be no real difference between options. Given the nature of the area, it was likely that costs would be within the same order of magnitude and at the lower end of a potential scale. All were awarded a score of 1.

As can be seen from the scores in Table 3-3, the relatively ubiquitous nature of the area means that the differences between options are relatively modest. The two bush areas and the archaeological significance of the Prouse homestead mean that the three route options which approach closest to Queen Street draw some of the higher scores, whereas route options affecting dwellings near to SH57 at their southern end also attract higher scores.

On the basis of property impacts, soils, tangata whenua values and costs, the southern route options were not distinguishable. However, these scores were retained for the transparency of the record, and as the criteria were also to be applied to the northern sections.

### 3.3.7. Scoring of Criteria – Northern Sections

The outcomes of the scoring of the northern sections are set out in Table 3-4, with key points from the scoring discussion set out below.

**Table 3-4: Scoring of Northern Route Options**

Criteria	Landscape/Visual	Ecological Risk	Archaeological Risk	Tangata Whenua Values	Productive Land Values	Dwellings	District Plan	Objectives	Property Effects	Engineering Degree of Difficulty	Cost
NC6	4	2	3 / 4	2	3	4	2	2	3	3	1
NC7	3	2	3	1	3	4	1	1	3	3	1
NC8	1	2	1	1	3	4	1	2	3	2	2
NC9	3	2	2	2	3	4	1	3	3	3	2
NC10	1	3	2	1	3	4	1	3	4	2	2
NC11	3	3	2	2	3	4	1	3	4	3	2
NC12	3	3	2	2	3	4	1	3	4	3	2

**Landscape/Visual Impact** – as most of the route options cut across the grain of the human landscape patterns to some extent, the visual and landscape impacts are mostly greater than in the southern section. In this respect, options NC8 and 10 have the least impact on the landscape as they either parallel or cross areas with larger blocks. The remaining options directly affect closely-settled areas or are angled to the cadastre. Option NC6 has the most adverse potential, so was scored 4.

**Ecological Risk** – There are small areas of bush north of Queen Street and west of SH57 which may be affected, and the northern-most options are located within the area which contains water-courses and small wetlands. Scoring for this criterion was either 2 or 3 across all routes.

**Archaeological Risk** – With more waterways pre-European use of the area would have been expected to be greater than in the southern sections. The only potential known site<sup>21</sup> is near route option NC6, but records have not been verified. On that basis, NC6 was scored as 3 or 4 (reflecting the uncertainty about archaeological values rather than disagreement at the workshop) with other route options as 1 or 2.

**Tangata Whenua Values** – The scoring of NC6 as 2 reflects the potential that the unverified archaeological find indicates earlier settlement. The three northern options approach areas of potential cultural significance and have also been scored slightly higher because of this.

**Productive Land Values** – All land is highly productive value, but its potential is reduced by the current extent of fragmentation. All routes scored equally.

**Dwellings** – All options affect a large number of dwellings so were scored equally.

<sup>21</sup> A bone, possibly part of human remains, recorded some decades ago.

**District Plan** – Option NC6 extends into an area identified but not yet developed for Levin’s growth, resulting in a score of 2. The remainder scored 1 as they traverse rural zoned areas.

**Project Objectives** – The variation in route length (from 5.2km to 6.8km) would affect both safety and journey times (efficiency). The ability to service Levin, local connection potential and resilience were also taken into account to give composite scores which varied from 1 (option NC7) to 3 (options NC9 to 12).

**Property Impacts** – The range of routes impacted between 32 and 46 properties, each with numerous severance issues. The options which cross Queen Street at the eastern-most point all had the potential to affect existing National Grid lines. The scoring of these options as 3 or 4 reflected this.

**Engineering Degree of Difficulty** – This section posed more challenges than the southern sections, due to ground conditions and topography. Options NC8 and 10 were slightly better in this regard at the northern end, so were scored 2 with remaining options scoring 3.

**Cost** – Variations largely reflect route length, with options NC6 and 7 being scored 1.

Table 3-4, setting out the scores, indicates that the northern section is more challenging than the southern section for identification of a route as the scores awarded overall were somewhat higher. However, no scores of 5 were awarded. Both productive land values and impacts on dwellings provided no basis to differentiate between options. In particular, the consistent score of 4 awarded to the dwelling criterion means that the social impacts of any route are likely to be relatively significant unless refinements are able to avoid direct effects on dwellings.

### 3.3.8. Weighting

It was decided that the scoring for the northern and southern sections should not be combined, but the sections should remain separate for the further analysis. This would retain transparency in the process and would help address the situation where options which were not able to be joined up were preferred for each section. In such a case, a range of options should be retained. This approach was taken into account in developing the workshop weighting, which was to apply to both the northern and southern sections. After reviewing the scoring, the workshop discussed the weighting system to apply. The weights arrived at are presented in the top line of Table 3-5 on the following page. This can be regarded as the agreed view of the key technical and specialist advisors involved in the project. The workshop was aware that additional analyses would be undertaken as a later stage, along with sensitivity analysis applying the different scores elicited at the workshop (three such situations had arisen).

Excepting for the one criterion which had been scored identically across all options and engineering degree of difficulty, all criteria were considered important enough to be given substantial weight. The most important aspects were considered to be achieving the project objectives, followed by impacts on dwellings and property and archaeological values. The relatively high values awarded by the workshop participants reflect the combined view that all criteria were relevant and well-targeted to the decision which would eventually be needed on a preferred option<sup>22</sup>.

Weighting systems are usually much more challengeable than scoring, as they can be readily developed from a range of different perspectives. Thus a single result is always vulnerable to criticism that the weighting system is wrong. An alternative means of investigating the robustness of a preference is to subject the scoring to a range of

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<sup>22</sup> Recognising that the MCA is only one of a number of considerations which will contribute to the eventual route choice.

weightings and review the outcomes in terms of their consistency and range of differences.

To analyse the route option preferences, a range of weighting systems was developed subsequently. These are also shown in Table 3-5 and are described in general terms below. Note that the first weighting system is the only one subject to discussion by a group. The other five systems have been developed by Allan Planning and Research on the basis of understanding a range of possible relevant considerations<sup>23</sup>.

**Table 3-5: Weighting of Criteria**

Weighting Options	Landscape/Visual	Ecological Risk	Archaeological Risk	Tangata Whenua Values	Productive Land Values	Dwellings	District Plan	Objectives	Property Effects	Engineering Degree of Difficulty	Cost
<b>Workshop Participants</b>	7	7	9	8	5	9	8	10	9	5	8
<b>RMA s6</b>	6	10	10	10	2	3	5	3	2	2	2
<b>Social</b>	5	5	8	8	3	10	8	5	8	3	5
<b>Environmental</b>	5	10	3	3	3	0	3	0	0	0	0
<b>Cultural</b>	5	3	10	10	0	3	0	0	0	0	0
<b>Economic</b>	0	0	1	0	5	5	5	5	8	5	10

**Workshop Weighting** – this weighting was developed in discussion and agreement at the workshop and is described as the technical view of the Transport Agency’s project advisors. See discussion above.

**RMA Section 6 Weighting** – while this places maximum weight on three of the four section 6 RMA aspects potentially at play in respect of the project (ecology, heritage and tāngata whenua values) it recognises that the occurrence of these values are neither extensive or particularly high in this area, so other values also have a place. Landscape values have not been elevated to the same level as the other s6 matters in this analysis, as “outstanding” qualities and elements were not identified in the area affected by the route options by the specialist involved, and it would thus be inappropriate to elevate them to a very high weight. Some weight is placed on the district plan analysis in this case, as this can be considered reflective of section 6 matters, but other criteria are left at low levels.

The remaining weighting systems are related to quadruple bottom line considerations. The analysis on this basis is relevant to matters to be taken into account under the LTMA and other national infrastructure policy approaches. They are also pertinent to RMA and LGA considerations.

**Social** – all criteria have a social component, so all are given some weight. The highest weighting is given to direct impact on dwellings, followed by tāngata whenua and archaeological risk aspects which have a high social component in this area,

<sup>23</sup> This type of process has been applied in similar analyses for major infrastructure in the past, to ensure robustness in analysis.

property effects and district plan considerations. All other criteria have some social relevance in this productive rural area, with engineering aspects least relevant.

**Environment** – this places the highest weight on the physical environmental element of ecology, with other criteria which integrate physical environmental considerations with social/community values also given some weighting. Criteria without a physical environment component are omitted.

**Cultural** – this highly weights tāngata whenua cultural values and archaeology/heritage, followed by ecological and impacts on dwellings but also acknowledges cultural significance in the established rural landscape and its settlement pattern, and its remaining ecological values, all of which have a cultural dimension.

**Economic** – this excludes a number of criteria which have little or no direct economic bearing on the project or the local economy. It emphasises cost and effects on property, but applies some weighting to other criteria with an economic component<sup>24</sup>.

These alternative weighting systems provide a sensitivity analysis for the robustness of the outcome. As far as practicable they have mirrored weighting systems used in earlier MCA processes in the T2O sections although the criteria are somewhat different.

### 3.4. Analysis

The six weighting systems have been applied to the workshop scores set out in sections 3.3.6 and 3.3.7, and are shown tabulated in Tables 3-6 and 3-7 on the following page. Lowest scores are highlighted and indicate the better performing options. The results can be seen graphically in Appendix I.

The same analysis was performed without the cost scores included and are shown in Table 3-8 and 3-9 on the following pages. This did not change the preferences in the tables below. Results are also shown graphically in Appendix I.

**Table 3-6: Analysis of Southern Route Options (Scores x Weights for Different Weighting Systems) Costs Included**

Route Option	Workshop Participants	RMA(\$6)	Social	Environmental	Cultural	Economic
NC1	2.29	2.42	2.44	2.48	2.61	2.07
NC2	2.11	2.27	2.33	2.30	2.45	1.95
NC3	2.00	1.76	2.14	1.81	1.52	2.19
NC4	2.01	2.22	2.19	2.30	2.35	1.84
NC5	1.92	1.65	2.07	1.63	1.35	2.19

<sup>24</sup> This quadruple bottom-line weighting is a different type of evaluation from the Benefit Cost Ratio (BCR) evaluation normally undertaken by the Transport Agency.



**Table 3-7: Analysis of Northern Route Options (Scores x Weights for Different Weighting Systems) Costs Included**

Route Option	Workshop Participants	RMA(\$6)	Social	Environmental	Cultural	Economic
NC6	2.63	2.58	2.70	2.59	2.84	2.42
NC7	2.26	2.15	2.33	2.19	2.35	2.19
NC8	2.00	1.62	2.06	1.59	1.39	2.42
NC9	2.56	2.29	2.54	2.19	2.35	2.65
NC10	2.39	2.07	2.43	2.07	1.81	2.72
NC11	2.74	2.51	2.73	2.56	2.45	2.84
NC12	2.74	2.51	2.73	2.56	2.45	2.84

**Table 3-8: Analysis of Southern Route Options (Scores x Weights for Different Weighting Systems) Costs Excluded**

Route Option	Workshop Participants	RMA(\$6)	Social	Environmental	Cultural	Economic
NC1	2.20	2.38	2.37	2.48	2.61	1.84
NC2	2.02	2.24	2.26	2.30	2.45	1.72
NC3	1.91	1.73	2.07	1.81	1.52	1.95
NC4	1.92	2.18	2.11	2.30	2.35	1.60
NC5	1.83	1.62	2.00	1.63	1.35	1.95

**Table 3-9: Analysis of Northern Route Options (Scores x Weights for Different Weighting Systems) Costs Excluded**

Route Option	Workshop Participants	RMA(\$6)	Social	Environmental	Cultural	Economic
NC6	2.54	2.55	2.63	2.59	2.84	2.19
NC7	2.17	2.11	2.26	2.19	2.35	1.95
NC8	1.82	1.55	1.91	1.59	1.39	1.95
NC9	2.38	2.22	2.40	2.19	2.35	2.19
NC10	2.21	2.00	2.29	2.07	1.81	2.26
NC11	2.56	2.44	2.59	2.56	2.45	2.37
NC12	2.56	2.44	2.59	2.56	2.45	2.37

The analysis indicates that for the southern section, option NC5 is clearly the best performing option under all weighting schemes except for the economic weighting, where option NC4 performs better. The second best performing option is NC3 under all weighting schemes except for the economic weighting, where option NC2 is second. These findings are mirrored when the scorings for costs are taken out. The outcome reflects the adverse impact on values and risks associated with impinging on areas of ecological and

archaeological/heritage values<sup>25</sup> in the area south of Queen Street. The findings also reflect the economic benefits of having a shorter and more direct route in the southern section.

For the northern sections, option NC8 was clearly the better performing option under all weighting systems except for the economic weighting, where option NC7 was best. Where costs were taken out, the preference situation remained the same except that NC8 was equal to NC7. The second best performing option was less clear in the northern section, with option NC10 performing best under three weighting schemes (RMA, Environmental and Cultural), and NC7 under two (Workshop Participants and Social weightings). Under the economic weighting system, NC6 and NC8 scored equally in second place. When costs were taken out, second preferences remained the same except that NC9 joined NC6 as second equal.

The analyses in the tables and graphs for the southern sections (Appendix I) were undertaken using scores of 4 for routes NC3 and NC5 for the District Plan criterion. This was a more adverse scoring than the score of 3 sought to be awarded by a proportion of workshop attendees (see Table 3-3). Had these more favourable scores been awarded, this would not have changed the order of preference but it would have made these two options more clearly first and second preference.

For the northern section, there had been a similar uncertainty in the score for Archaeological Risk related to option NC6, where scores of 3 and 4 were awarded (see Table 3-4). The tables and graphs (Appendix I) have been based on a score of 3. The one score difference would not have changed the order of preference for options, except that NC6 would have fallen away as second equal when analysed both with and without the inclusion of costs.

It is immediately obvious from the above analysis that the best performing option for the southern section, NC5, cannot be joined directly to the best performing option for the northern section, NC6.

Because of this, following the analysis, it was recommended to the Transport Agency that at least two continuous options should be retained for further consideration in a subsequent stage of analysis. These options should be based on the best performing options from the southern and northern sections, joining with the most favourably rated options from the other section – i.e. NC5, the most favourable for the southern section could only join to NC10, 11 or 12 in the northern section. Of these, NC10 would be most suitable.

For the northern section, NC8 was the best scored option. This could only join to NC1, 2 and 4. Of these, NC4 was the most favoured.

Further to these recommendations, it is noted that at the northern end, which lies west of SH57 both recommended options would utilise the broad width of options NC8 and NC10. The width of this option allows variations in alignments within it which would be investigated at the route refinement stage.

An issue arose when considering how the options which emerged at the southern end would tie in with options previously identified as preferred options for the T2O section. These options had concluded at a northern point much closer to Arapaepae Road than the southern termination points of NC4 or 5. For this reason it was recommended that a future option should provide for a slightly more western alignment of NC4 at the southern end than shown.

### 3.5. Intersections/Interchanges

The analysis reported above was concluded after the MCA workshop. However, the workshop had also discussed interchange options. This discussion followed the MCA scoring and weighting, and interchange options had not been incorporated in the scoring

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<sup>25</sup> Following the workshop an additional review of the information available on the Prouse homestead was sought from Ian Bowman, an expert on built heritage. This confirmed that the values are likely to be locally and possibly regionally significant.

(beyond a brief mention in some of the discussions about the Engineering Degree of Difficulty criterion).

The session on interchanges involved presentations by the project's engineers and subsequent discussions and questions, and a preliminary identification of advantages, disadvantages and issues for each option at each location. The engineering briefing note on intersections is included in Appendix H.

To achieve expressway standard, both spacing and design of interchanges must achieve certain nationally-applied standards, although there could be some flexibility to meet specific circumstances. This was encompassed in the discussion.

The following background was provided:

- Four key geographical areas should be considered for interchanges or intersections for the northern connection:
  - Tararua Road Area
  - Queen Street Location
  - SH57/Heatherlea Area
  - Northern Extent.
- Four types of interchanges or intersections should be considered, each with different land needs and impacts. Not all would be possible or suitable at each location. The types under consideration were:
  - Roundabout
  - Spread diamond
  - Compact diamond
  - Half diamond.
- The optimal interchange/intersection locations do not preclude options at other locations, but these had been selected as the most likely points (given the approximately 9km length).
- Spacing between interchanges means they will be less common than local road connections. A guide is a minimum 5-8km between interchanges – however this is only a guide and the distance can be shorter so long as adequate level of safety is achieved.
- There is no decision as yet on interchange (grade separated) or intersection. That needs to be part of the wider consideration. It was noted that the intersection/interchange strategy at this stage needs to be the long term solution (staged implementation would be considered later).
- For at-grade options, the only option acceptable from an engineering point of view is a roundabout, based on Safe System principles. However roundabouts are inconsistent with RoNS objectives and are less desirable than grade separated interchanges.
- Consideration of options for each location needs to happen together (i.e. options at each location are interrelated).

A full MCA process was not undertaken for the interchange and intersection options at this workshop. Instead it was agreed to do a high level and broad assessment of the positives, negatives and likely feasibility of each intersection type at each location.

### 3.6. Analysis of Interchanges

A number of high-level comments about the potential locations and designs of the intersections were made by workshop participants, as set out below.

#### Tararua Road Area

It was noted that options close to SH57 would require relocation of SH57.

Option	Comments
<b>Roundabout</b>	<ul style="list-style-type: none"> <li>Not good in this location (for efficiency/safety/readability reasons) – this would be the first at-grade intersection on the expressway north of Wellington.</li> </ul>
<b>Spread Diamond</b>	<ul style="list-style-type: none"> <li>Not appropriate near to Kimberley Road/Arapaepae Road intersection (insufficient space for ramps).</li> <li>Not impossible for eastern routes which are further away from the intersection.</li> </ul>
<b>Compact Diamond</b>	<ul style="list-style-type: none"> <li>Not appropriate near to Kimberley Road/Arapaepae Road intersection (insufficient space for ramps).</li> <li>Would fit in this landscape.</li> <li>Would only work on the three western options with relocation of Kimberley Road/Arapaepae Road intersection.</li> </ul>
<b>Half Diamond</b>	<ul style="list-style-type: none"> <li>Possibly would fit in this location, with south facing ramps (potentially in tandem with north facing ramps at Queen Street).</li> <li>Would not be out of context, given preceding interchange forms on the Wellington Northern Corridor RONS are half diamonds.</li> </ul>

## Queen Street Location

There was discussion around whether Queen Street should go over the expressway or vice-versa. It is generally considered preferable for an expressway to remain at-grade with local roads elevated over due to smaller structures, but the opposite had tended to happen on the RoNS projects to the south.

Option	Comments
<b>Roundabout</b>	<ul style="list-style-type: none"> <li>Less appropriate – however has worked at Taupo.</li> </ul>
<b>Spread Diamond</b>	<ul style="list-style-type: none"> <li>Would only work for eastern alignments, due to ramp spacing.</li> </ul>
<b>Compact Diamond</b>	<ul style="list-style-type: none"> <li>Possibly too large for western options due to potential effects on Prouse homestead (needs to be looked at more closely), may require expressway over and local roads under.</li> <li>Appropriate for eastern options.</li> </ul>
<b>Half Diamond</b>	<ul style="list-style-type: none"> <li>Possible with north facing ramps only.</li> <li>Could work in tandem with a similar arrangement at Tararua Road.</li> </ul>

## Heatherlea Area

It is unlikely that an interchange here would be feasible if there is also one at Queen Street (as it is too close) but could be acceptable if there is no interchange at Queen Street.

Option	Comments
<b>Roundabout</b>	<ul style="list-style-type: none"> <li>Could be an option at any route, although proximity is still potentially a concern with some options.</li> </ul>

Option	Comments
<b>Spread Diamond</b>	<ul style="list-style-type: none"> <li>• Could work in this location on options NC9, 10 and 11</li> </ul>
<b>Overbridge (no connection)</b>	<ul style="list-style-type: none"> <li>• Would work with any Queen Street interchange, and likely to be preferable if there is an interchange at Queen Street due to proximity.</li> </ul>
<b>Compact Diamond</b>	<ul style="list-style-type: none"> <li>• May work for options NC9, 10 and 11 only; and only if no interchange at Queen Street.</li> </ul>
<b>Half Diamond (south facing ramps)</b>	<ul style="list-style-type: none"> <li>• May work for options NC9, 10 and 11 only. Could complement north facing ramps at Queen Street.</li> </ul>

## Northern Extent

Option	Comment
<b>Roundabout</b>	<ul style="list-style-type: none"> <li>• May work in this location but concern for northbound traffic, particularly if first at-grade intersection, as a route would already be on a downhill grade with a bridge elevated over the rail line.</li> <li>• Would work with a northbound passing lane.</li> </ul>
<b>Half Diamond</b>	<ul style="list-style-type: none"> <li>• Wouldn't require a new structure, as it could combine with an expressway bridge over the rail line.</li> <li>• Can tie in the local roads.</li> <li>• Avoids right turns onto or off the highway, which is positive.</li> <li>• Ramps would be north facing.</li> <li>• Geometry is a bit of an issue with the topography and rail line.</li> <li>• Good access into Levin.</li> <li>• Likely to result in some property and visual effects.</li> </ul>
<b>Spread Diamond</b>	<ul style="list-style-type: none"> <li>• Could be feasible at this location but likely to have significant property impacts.</li> </ul>
<b>Compact Diamond</b>	<ul style="list-style-type: none"> <li>• Unlikely to be feasible at this location.</li> </ul>

Key points from this analysis would assist in the further development of combined route and intersection/interchange options. It was decided by the workshop that further processes would be needed to identify and assess options before public and stakeholder consultation (beyond those stakeholders involved in the workshop who would continue to be involved).

## PART FOUR

### 4 Stage 3 Investigations

#### 4.1 Approach

This third stage of investigations involved preparatory work, particularly relating to intersection locations and types, along broad routes between north of Otaki (Taylors Road) and north of Levin that had earlier been identified as options worthy of further investigation.

In the southern part of this area, the project investigations had identified two broad route options<sup>26</sup>, TO2 and TO17<sup>27</sup>, which should be investigated further. Such investigations were put on hold while options for the Levin northern connection were being investigated, as reported in the earlier sections of this report.

The method of identifying the preferred northern connection options has been described earlier in this report. A review of these options had been undertaken by the project team's engineers, and it was considered this should briefly be reviewed by the wider group of technical experts, with an opportunity to comment.

A further outstanding aspect related to the connection between the Taylors Road to Ohau section (including allowing for a connection through to SH57) and the NC (northern connection) options. Again, it was determined that it would be beneficial for the wider group to consider and discuss these and determine their appropriateness.

Finally, a further MCA should be undertaken on the integrated route options and associated interchange options. This exercise should narrow down the range of route/interchange options which would be put out in 2017 for consultation with stakeholders and the wider public.

Key components of this work were undertaken by the engineering team for review by the technical experts prior to a further workshop being convened. This section of the report describes the processes and outcomes.

Appendix J sets out the Agenda and two briefing notes (Briefing Note and Background Note) for the third workshop, held on 25<sup>th</sup> October 2016. The notes from the meeting are provided in Appendix K.

#### 4.2 Review of Outcome of Second Workshop

The detailed outcomes of the second workshop were presented at the third workshop, with a recommendation to proceed with the two options shown in cyan (known as NC4) and purple (known as NC5) on Figure 4-1 on the following page, recognising that flexibility had to be retained at the southern end to join the options to TO2 or TO17.

A possible alternative more direct connection to replace the purple route had been prepared and was discussed at the workshop, shown as red on Figure 4-1. This is known as option NC13.

<sup>26</sup> See "Ōtaki to North of Levin, Taylors Road to Ohau River Four Laning, Further Options Report", September 2015. This report was the culmination of several stages of investigation.

<sup>27</sup> While TO1 and TO4 had also been recommended for further investigation, the project team in consultation with the Transport Agency had subsequently confirmed that TO2 had fewer environmental and social impacts, and equal benefits to those options, and should be the representative eastern route for further investigation and consultation.



Figure 4-1: Preferred Broad Route Options for Levin Northern Connection, and Alternative Considered

The NC13 option was evaluated in comparison to NC5 (using the pair-wise comparison<sup>28</sup> method) against the criteria from the second workshop. The findings were as follows:

**Landscape and Visual** – the main effect constitutes impact on nearby houses. There are slightly greater impacts from NC13 than NC5

**Ecology** – no real issues. The NC13 route is slightly worse than NC5 due to presence of a small number of mature indigenous trees.

**Archaeology** – a historic homestead (associated with the Adkins family) was noted as being present to the north of Queens St and very close to or within the NC13 route. This property has been heavily modified. This historic house would be impacted by the NC13 route but not the NC5 route. Consequently the NC13 route is worse than NC5 route.

**Tangata Whenua** – no real difference between NC13 and the NC5 routes.

**Productive Soils** – both routes are similar in terms of this criterion.

**District Plan** – both routes dissect the identified growth area. No difference between options.

**Impacts on Dwellings** – NC13 is considerably worse than NC5, particularly north of Queen Street where there are some approved subdivisions as well as existing dwellings. It also impinges more closely on the Redwood Grove development, south of Queen Street.

**Fit to Project Objectives** – no real difference between NC5 and NC13.

**Property Difficulty** – no real difference between NC5 and NC13.

<sup>28</sup> This method is an accepted technique by which the better option of two is determined.

**Cost** – NC13 would be the same as NC4 to the south, and very close to NC 5 at the north. There would be no real difference between the options.

On balance, it was decided that NC13 had a number of issues, particularly around archaeology and potential effect on dwellings, which meant that it should not be preferred to NC5.

However, ways should continue to be sought when refining the alignment of NC5 to make the alignment as straight and direct as possible. As the northern part of NC5 (NC10) was a broader corridor, there was some flexibility there.

### 4.3 Review of T2O Route Options and Connections to NC Options

There were two aspects addressed in this section of the workshop:

- A discussion and review of TO2 and TO17 routes
- An examination of the ability of the two southern route options to join with NC5, which was located further to the east at the southern end than the point at which either of the options had terminated<sup>29</sup>.

The discussions are described in the following sections.

#### 4.3.1 Review of TO2 and TO17 Routes

The TO2 and TO17 route options are shown on Figure 4-2 on the following page.

It was noted that both the TO2 and TO17 route options had assumed a bifurcation of the expressway south of, or at, the Ohau River to join with SH1 at Ohau. On both routes, the sections past the Ohau River had been envisaged as two lane sections. More recent work on route refinement for the TO17 option had however considered the possibility of a full expressway as far as Arapaepae Road<sup>30</sup>, so there was confidence that a four-lane highway could be accommodated here.

However, the section of T2O from the Ohau River to Arapaepae Road near the Kimberley Road intersection had only ever been considered as a modern two-lane road, although all investigations had been undertaken at a broad corridor scale. It was important that the implications of a wider road in this location should be documented at this stage, prior to consultation.

The Background Note had set out the criteria which had been applied to the earlier MCAs in the area. Rather than undertake a full MCA, the workshop determined that it was more helpful to note the specific implications of a wider road on route option TO2 between the Ohau River and the Kimberley Road vicinity, keeping in mind the criteria from the former MCAs.

<sup>29</sup> Due to the previous intention to connect them to the existing alignment of Arapaepae Road (SH57).

<sup>30</sup> See Otaki to Levin RoNS - Taylors Road to South Levin Four-Laning, MWH, April 2016.



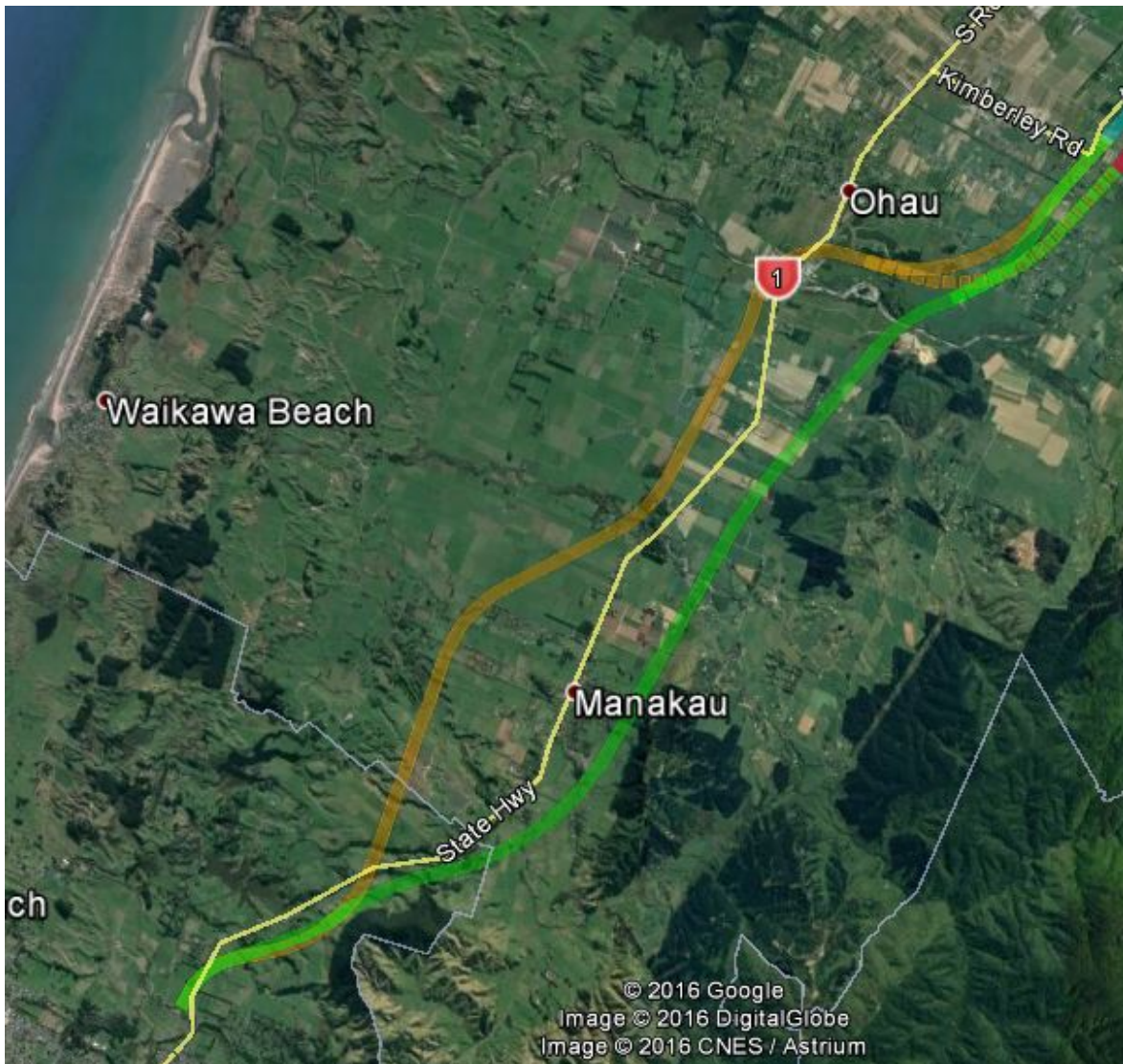


Figure 4-2: Indicative Locations of Route TO2 and TO17 (including potential connections to NC routes)

The following points were made:

- As a two-lane road, within the broader corridor, it had been possible to negotiate a “pinch-point” at Muhunoa East Road (see Figure 4-3) where there were three significant areas of mature bush. A four-lane route would have significant implications in this area and would affect at least one of the areas.
- The geometry in this area would become problematic if there were requirements to minimise effects on the bush. While the alignment could be swung to the south to avoid the southern area of bush, this would result in further geometric issues from the need to avoid river terraces.
- Since the earlier MCA, issues around earlier Māori land ownership in the vicinity of the bush areas had been raised. If this was the case, there could be important cultural issues which had not been identified in earlier investigations<sup>31</sup>.

The workshop effectively confirmed the expectations, from previous analyses, that the TO2 option was associated with some potentially significant adverse effects in the vicinity of

<sup>31</sup> It had been found that early records showed that one parcel of land had been identified on plans as a Reserve in favour of two Maori owners (one a Chief) out of a parcel with a greater number of Maori owners. None of the land appears to now be Maori Land.

Muhunoa East Road. These potential issues would be increased if a wider four-lane expressway alignment was needed in this area.

#### 4.3.2 Connecting TO2 and TO17 to NC4 and NC5

It was considered desirable to assess connections between all identified preferred options north and south. Four plans showing these options (including a NC4 route that was moved closer to Arapaepae Road as had been foreshadowed in the previous workshop) were provided to the experts for their review. While the weaving of routes necessary for their integration could have taken place within the southern end of the NC route options, the extent of development in that area and the significance of Arapaepae Road as the major SH57 route, meant that it was preferable to provide for the integration further to the south and more into the rural area.

Figure 4-3 below shows the options that were provided<sup>32</sup>. On this figure, TO2 is shown as orange and TO17 as light green; NC4 is aqua and NC5 red.

The workshop decided that a full MCA process for these short sections would not be necessary but that key points should be recorded to assist in the later choice of continuous routes for further consultation. This was undertaken on the basis of the criteria which had been used for the previous workshop (Stage 2) reported in Part Three of this report. The following key points were recorded from the workshop:

**Landscape and Visual** – the two eastern options (joining both southern routes to NC5) are better than the two western options (joining both southern routes to NC4) as they affect less houses and have less impact on the local road network. However, all options would be workable.

**Ecology** – there is a marginal preference for eastern options over western options due to potential streams and wetland areas west of Arapaepae Road.

**Archaeology** – no real difference between any of the options.

**Tangata Whenua** – neutral between the options.

**Productive Soils** – the eastern options are marginally better.

**District Plan** – no real difference between any of the options.

**Impacts on Dwellings** – all options are equally difficult. The existence of a new 11-lot subdivision opposite the end of McLeavey Road, not yet fully developed, was a complicating factor for the eastern routes.

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<sup>32</sup> The original circulated plans had shown each option separately and had addressed the local road networks including local accesses as well.



Figure 4-3: Options to Integrate T20 and NC Route Options

**Fit to Project Objectives** – no real difference between any of the options.

**Property Degree of Difficulty** – not known, but the expectation was that there would be nothing to distinguish between the options.

**Engineering Degree of Difficulty** – Western options are marginally preferable, largely due to the extent of local access roads necessary.

**Cost** – Western options are marginally preferable, but costs would be of the same order.

In summary, for the T20 connections, an option that avoids the bush areas to the south then connects to the NC alignments east of McLeavey Road was likely to be more favoured. For T17 a route connection further east was also marginally ahead of other options.

It was also noted that the density of local roads in this area means that any option will be complex.

The conclusion was that any of the four connecting options that had been put forward were feasible and there were no potential fatal flaws. There was a slight preference overall for connections that followed eastern-most options.

## 4.4 Multi-Criteria Analysis of Continuous Route Options with Intersections

### 4.4.1 Background

This section of the workshop commenced with an update on progress in determining appropriate interchange locations and designs. It now took into account the full length of expressway from the southern extent at Taylors Road (where the Pekapeka to Otaki RoNS project concluded), maintaining the two route options TO2 and TO17, through to SH1 north of Levin<sup>33</sup> maintaining the NC4 and NC5 options. While previous investigations of the Taylors to Otaki area had considered intersection options, this had been at a high level and no conclusions had been reached. This earlier work relating to the T2O area was set aside for the purposes of this option assessment.

It was also noted that, in accordance with the overall project objective of improved resilience, it was now intended that the existing SH1 should remain fully connected through the project area, which would provide the basis of local connectivity and for local journeys.

There are now six general possible locations for interchanges. From the south, these are:

- Manakau
- Ohau River
- Tararua Road
- Queen Street
- SH57 north of Levin
- SH1 north of Levin.

As with the previous discussion of interchanges, it was emphasised that not all would necessarily be provided, as some have insufficient distance between. This was particularly the case with Queen Street and Tararua Road. Depending on the types of interchange, the precise location would also vary.

The range of types of intersection under consideration are:

- Full diamond
- Half diamond
- Bifurcation.

The option of a roundabout was not acceptable to the Transport Agency as part of a long-term plan for an expressway in this area.

The Transport Agency had also confirmed that, because of the significant volumes of traffic involved travelling to Palmerston North and beyond, the only option which would be acceptable at SH57 north of Levin would be a bifurcation.

Other key points which had emerged in preparation for the workshop were:

- The SH1 north of Levin interchange option is limited to a half diamond to provide grade separation and remove the crash risk particularly from right turn movements, given this will be a heavily used intersection for all traffic travelling to and from Levin from SH1 to the north. Some form of grade separation would be necessary to maintain appropriate movements<sup>34</sup>.

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<sup>33</sup> Here the second workshop had concluded that there was one general location where the new road could effectively merge with SH1.

<sup>34</sup> This is a long-term solution; medium term could be something else (such as an at-grade roundabout).

- If an interchange is provided at Queen Street, the existing SH57 needs to be closed off at the northern SH57 bifurcation so that all Levin traffic uses the expressway. If there is no interchange at Queen Street, for example if one was provided at Tararua Road instead, then the existing SH57 could be maintained through the bifurcation.
- If a bifurcation is provided at Ohau River than an interchange at Manakau would not be proposed (due to demand not justifying both, and limitations of the spacing of interchange facilities).
- For all options the expressway will generally be at grade with local road network flyovers at key locations.

#### 4.4.2 Option Description

A schematic had been prepared showing the possible interchange types, locations and the routes they related to. This is shown as Figure 4-4 on the following page.

The schematic and the options identified for analysis was not an exhaustive list of every permutation. It was however a realistic set of options based on the following:

- Expected need for local connectivity and access
- Spacing between interchanges
- Discussion on interchange locations from the previous workshop.

The options were discussed at the workshop and it was decided that they represented an appropriate range. There were no obvious omissions or workable combinations that had been overlooked.

The route/interchange options for analysis are also briefly described in Table 4-1. Note that the positioning of the route means different positioning of some of the interchange types e.g. a bifurcation or full diamond interchange at Manakau would be either east or west of the existing SH1, depending on the route with which it was associated).

Scaled options on an aerial photographic base had been provided to the technical experts to enable them to gauge the extent of land requirements and potential environmental effects, prior to the workshop. This also showed the different locations of the interchanges on the different routes, which also resulted in different environmental impacts.

### Otaki to North Levin INTERCHANGE DIAGRAM

- TO2
- TO17
- NC4
- NC5

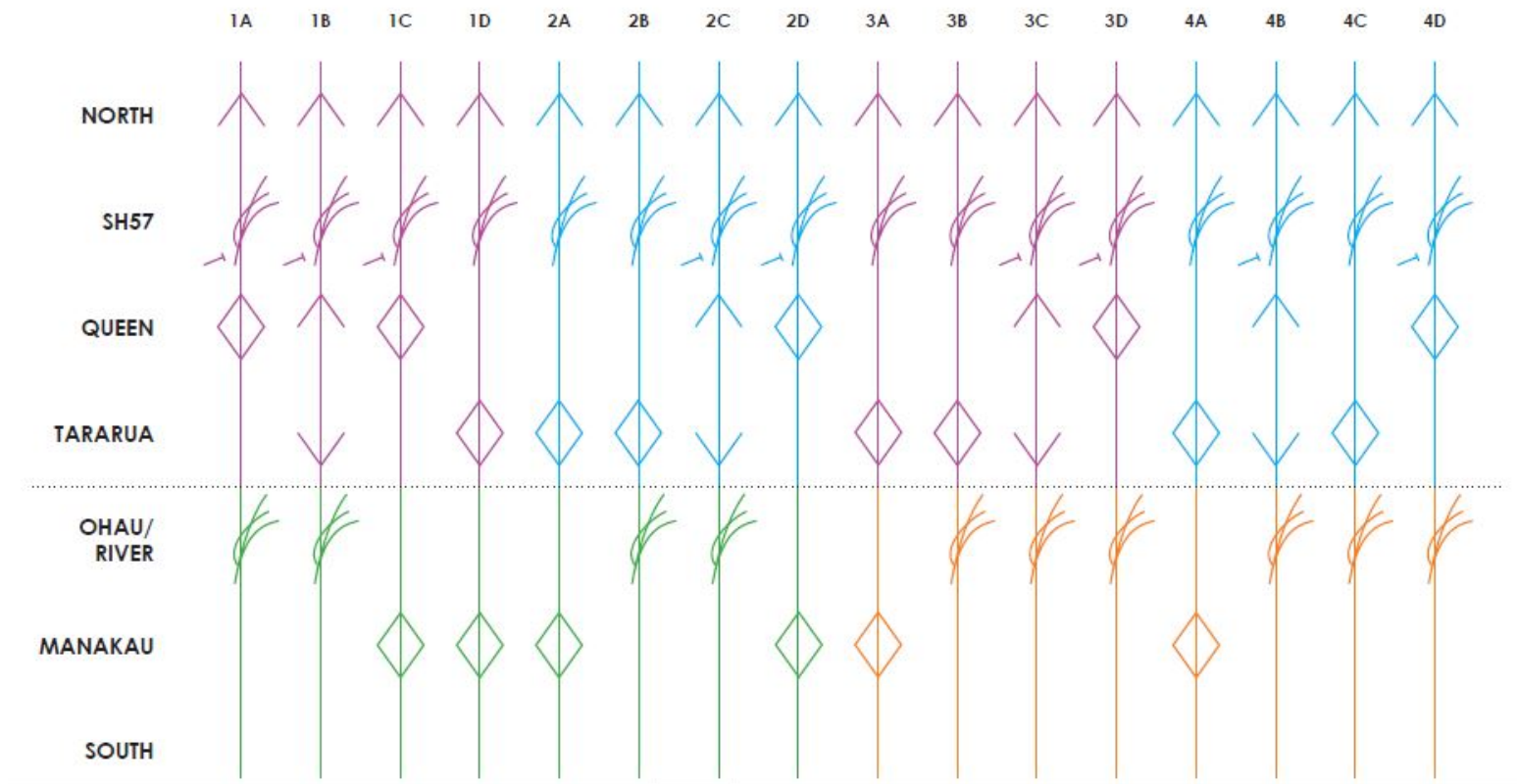


Figure 4-4: Schematic of Interchange and Route Options for Evaluation

**Table 4-1: Route/Interchange Options**

No.	Route Basis	Interchange Location/Type
1A	TO17/NC5	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen – full diamond</li> <li>• Ohau River - bifurcation</li> </ul>
1B	TO17/NC5	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen/Tararua – two half-diamonds</li> <li>• Ohau River – bifurcation</li> </ul>
1C	TO17/NC5	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen – full diamond</li> <li>• Manakau – full diamond</li> </ul>
1D	TO17/NC5	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (full access)</li> <li>• Tararua – full diamond</li> <li>• Manakau – full diamond</li> </ul>
2A	TO17/NC4	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (full access)</li> <li>• Tararua – full diamond</li> <li>• Manakau – full diamond</li> </ul>
2B	TO17/NC4	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (full access)</li> <li>• Tararua – full diamond</li> <li>• Ohau River – full bifurcation</li> </ul>
2C	TO17/NC4	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen/Tararua – two half diamonds</li> <li>• Ohau River – bifurcation</li> </ul>
2D	TO17/NC4	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen – full diamond</li> <li>• Manakau – full diamond</li> </ul>
3A	TO2/NC5	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (full access)</li> <li>• Tararua – full diamond</li> <li>• Manakau – full diamond</li> </ul>
3B	TO2/NC5	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (full access)</li> <li>• Tararua – full diamond</li> <li>• Ohau River – bifurcation</li> </ul>
3C	TO2/NC5	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen/Tararua – two half diamonds</li> <li>• Ohau River – bifurcation</li> </ul>
3D	TO2/NC5	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen – full diamond</li> <li>• Ohau River – bifurcation</li> </ul>
4A	TO2/NC4	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (full access)</li> <li>• Tararua – full diamond</li> <li>• Manakau – full diamond</li> </ul>

4B	TO2/NC4	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen/Tararua – two half diamonds</li> <li>• Ohau River – bifurcation</li> </ul>
4C	TO2/NC4	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (full access)</li> <li>• Tararua – full diamond</li> <li>• Ohau River – bifurcation</li> </ul>
4D	TO2/NC4	<ul style="list-style-type: none"> <li>• North SH1 – half interchange with north facing ramps</li> <li>• SH57 – bifurcation (no local access)</li> <li>• Queen – full diamond</li> <li>• Ohau River – bifurcation</li> </ul>

#### 4.4.3 Criteria and Scoring System

The criteria adopted for evaluation needed to be relevant to both the route and the interchanges, as they were to be applied to the combination. It was however noted that the routes had already been through MCA processes and had been shortlisted from a comprehensive range of options, so the focus should be largely, but not exclusively, on the interchanges and their relationship to the routes.

It was recognised that the interchanges would require considerable land areas, would involve structures, and would vary in the levels of access they provided.

The following criteria were developed from these in the Background Note prepared for the workshop (see Appendix J):

**Landscape/Visual** – this covers effects on landscape character, including degree of modification, presence and impact of structures at intersections, and “fit” of intersections into landscape.

**Ecological Risks** – any impacts on valued ecological areas.

**Property Effects** – direct effects on properties such as total area of land required, number of parcels affected, implications on parcels.

**Impacts on Tangata Whenua Values** – impacts on Māori-owned land, areas with tangata whenua values, and severance between important areas.

**Impacts on Archaeological and Heritage Values** - taking into account known values and likelihood of encountering archaeological sites.

**Effects on Productive Land** – loss of productive values because of direct loss of land and severance of existing productive units.

**Effects on Dwellings** – indirect effects including visual, noise, and amenity effects and direct loss of dwellings.

**Local Connectivity** – providing for local/community travel patterns and access to centres of Manakau, Ohau, Otaki, Kimberley and the rest of Horowhenua.

**Geometry** – effectiveness/adequacy of route and interchange layout and design (inclusive of safety), route length implication on journey times.

**Levin Access** – ability to provide effective connectivity to Levin including the town centre.

**Cost** – includes route and interchange costs; indicative only.



It was recognised that there was some overlap between criteria (such as productive land values and property effects, and property effects and dwellings). It was considered that a level of overlap was acceptable, as this is a real reflection of how the community would view the values in the area and would therefore express social as well as physical impacts. Double counting would be considered, and efforts made to ensure it was as limited as practical, as the criteria were scored.

A further criterion was proposed which related to the fit of the option with the District Plan – specifically the identified growth area to the east of Arapaepae Road where a structure plan is required. There were a range of views as to the appropriateness of this criterion, given that it affected only a small part of any option. In the event, it was not scored. Subsequently, it was agreed with HDC that it should not be part of the MCA exercise and a separate investigation should be undertaken at a later date<sup>35</sup> as to how future development could be accommodated in relation to the option(s) considered in the MCA. This work was undertaken and is reported in Appendix M<sup>36</sup>.

It was agreed that the scoring system, based on the numeric 1 to 5 scores used in earlier analyses should be slightly modified to reflect the nature of the criteria. The modified scoring descriptions are set out below in Table 4-2.

**Table 4-2: Basis of Scoring used in the MCA (Third Workshop)**

Score	Description
1	The option presents few difficulties or offers substantial benefits on the basis of the criterion being evaluated, taking into account reasonable mitigation proposals to minimise adverse effects (if relevant).
2	The option presents only minor areas of difficulties or a high level of benefit on the basis of the criterion being evaluated, taking into account reasonable mitigation proposals to minimise adverse effects (if relevant).
3	The option presents some areas of reasonable difficulty or a moderate level of benefit in terms of the criterion being evaluated. Adverse effects cannot be completely avoided and mitigation is not readily achievable at reasonable cost (if relevant).
4	The option includes extensive areas of difficulty or a low level of benefit in terms of the criterion being evaluated. Mitigation of adverse effects is not readily achievable (if relevant).
5	The option includes extreme difficulties in terms of achieving the project or no apparent benefit on the basis of the criterion being evaluated.

Cost was to be scored on a relative scale across the options, rather than aligning with the above criteria.

#### 4.4.4 Scoring Process

As with the previous MCA exercises, the workshop proceeded on the basis of the decision conferencing protocols (described in section 3.3.5 of this report). The names of those who took part in the scoring process are set out in the Workshop Notes provided in Appendix K. As the ecological expert (Adam Forbes) was unable to attend the workshop, it was agreed that the workshop scores should be reviewed by him at a later date<sup>37</sup>.

<sup>35</sup> But prior to public consultation.

<sup>36</sup> The report finds that the two route options have different merits, depending on Levin’s growth. The eastern-most option is best suited to growth – for example if the structure plan areas was able to be developed more intensively in future. The option close to SH57 would form a containing edge to the existing urban area.

<sup>37</sup> This was done and the workshop scores were confirmed. Dr Forbes has also reviewed the notes on the earlier evaluations of routes and connections at the workshop.

Notes prepared for this workshop by technical experts are included in Appendix L.

#### 4.4.5 Scoring of Criteria

The outcomes of the scoring of the criteria for the combined route/interchange options are set out in Table 4-3, with key points from the discussion leading to the scoring<sup>38</sup>. Items that scored particularly well are highlighted, as are those items which scored poorly at a 5. Those that are also marked with an asterisk are considered to be close to a fatal flaw for the option involved.

**Table 4-3: Scoring of Integrated Route and Interchange Options**

Option (see Figure 4-3 and Table 4-1)	Landscape/Visual	Ecology	Property Effects	Tangata Whenua and cultural values	Heritage/Archaeology	Productive Land	Effects on Dwellings	Local Connectivity	Geometry	Levin Access	Cost
1A	4	3	4	4	3	2	3	4	1	3	1
1B	4	3	4	4	3	2	2	4	1	3	1
1C	3	2	4	3	2	2	3	3	1	4	2
1D	3	2	3	3	2	2	2	3	1	2	3
2A	2	3	3	3	4	2	2	2	1	2	2
2B	3	4	3	4	4	2	2	3	1	1	2
2C	3	4	4	4	4	2	2	3	1	3	1
2D	4	5	4	3	4	2	3	2	1	4	1
3A	3	2	5*	5	4	3	2	3	3	2	3
3B	4	3	5	5	4	3	2	3	3	1	2
3C	4	3	5	5	4	3	2	3	3	3	1
3D	4	2	5	5	4	3	3	4	3	3	1
4A	3	3	5*	5	4	3	2	2	3	2	3
4B	4	4	5	5	4	3	2	3	3	3	1
4C	4	4	5	5	4	3	2	3	3	1	2
4D	5	5	5	5	5	3	3	3	3	3	1

**Landscape/Visual Impacts** – overall, the potential effects of a Queen Street interchange and a bifurcation at Ohau (on either route) will be substantial, but the western options at each don't fit the landscape as well as the eastern options. The bifurcation at SH57 is substantial, but is common to all options. Option 2A was identified as the best option, scoring a 2 (subject to further development of design) and 4D the worst. The lack of scores of 1 indicates the potential for negative visual effect from the presence of the new expressway and the

<sup>38</sup> Further detail is provided in the Workshop Notes in Appendix K, and in additional notes from the experts in Appendix L.

presence of grade-separated structures at several locations, despite the working rural landscape context.

**Ecological Impact/Risk** – options 2B, 2C and 2D scored most adversely, along with 4B, 4C and 4D. Of the former, two involve adverse ecological effects on a small stand of bush north of the Ohau River and potential effects on the river itself, and two involve varying degrees of potential adverse effect on bush south of Queen Street. Of the latter, all involve varying degrees of potential adverse effect on bush south of Queen Street. It was noted that options involving the TO2 route would need to make strenuous efforts to limit or mitigate adverse effects on bush at Muhunoa East Road although these had not been scored down because of that.

**Property Effects** – overall, it was considered that all options had a high degree of difficulty associated with them. Options 3A and 4A have a major impact on Māori land due to the location of the full diamond interchange at Manakau – this makes these options close to fatally flawed. All options utilising the TO2 route impinged to a considerable extent on Māori land and were scored as 5. Options 1D, 2A and 2B were considered best, but still scored 3 each. These removed structures from the Queen Street interchange and involved route option TO17.

**Tangata Whenua/Cultural Values** – all options based on TO2 sever tangata whenua settlement areas from the coast as well as having direct effects on land and cultural sites so were all scored 5. Options 1C, 1D, 2A and 2D, all of which involved a full diamond interchange on TO17 at Manakau, were scored highest at 3.

**Heritage/Archaeology** – building on work previously undertaken, it was considered that the interchanges did not particularly worsen the situation except with respect to potential impacts associated with a full or partial diamond at Queen Street. In general terms, the combination of route options TO17 and NC5 were the best and scored more highly (3s and 2s, with the 2s involving a full diamond at Manakau rather than a bifurcation). Route 4D scored worst (a 5) due to high risks associated with a bifurcation at Manakau on route option TO2 in association with a full diamond interchange at Queen Street.

**Productive Land** – the interchanges added little to the assessment previously undertaken on routes. In this report, route TO2 had the greatest influence on the scoring (with effects of NC4 and NC5 being similar). On this basis, scores of 2 were applied to options that utilised TO17 and scores of 3 to all other options.

**Effects on Dwellings** – taking into account the scope of this criterion, both direct and indirect effects were considered. Generally, there was a level of commonality between some routes where effects were most concentrated so all options would have a similar level of adverse effect. Options 1A, 1C, 2D, 3D and 4D scored slightly worse, at 3, from all the others which were scored 2. This was due to the potential impact of the expressway alignment and structures associated with the full diamond at Queen Street in relation to existing dwellings along Arapaepae Road on both sides of SH57.

**Local Connectivity** – there was a level of uncertainty for this criterion associated with local travel patterns over a wide area, and how they would be modified, not being fully understood. Modelling (no yet complete) would help clarify this. On the basis of what is currently known, Options 2A, 2D and 4A were scored best, taking into account location, spacing and types of intersections and how they related to local townships. Options 1A, 1B and 3D were scored the worst due to lack of benefit to people living south of Ohau.

**Geometry** – all routes are designed for the RoNS speed of 110kph, and intersections all meet required standards. Given this, the key differentiators are length of route and curvature. In this respect, options utilising TO2 are worse in terms of curvature, with the routes utilising NC5 being slightly worse than those utilising NC4 (but not to the extent that warrants a difference in score). Similarly, options that use TO17 score best, with those that join to TO4 slightly ahead, but again not to the extent that warrants a different score.

**Levin Access** – in terms of accessing Levin, options 2B, 3B and 4C were scored best. All utilise a full diamond at Tararua Road and it was acknowledged that internal roading adjustments would be needed within the Levin urban area roading system. These were followed by options 1D, 2A, 3A and 4A which similarly utilise the full diamond interchange at Tararua Road, this case in association with a full diamond interchange at Manakau. The options that scored worst under the Levin Access criterion were options 1C and 2D, both of which coupled full interchanges at Queen Street and Manakau with cut-off local access at SH57.

**Cost** – cost was assessed on the basis of corridor length plus structures (other costs such as land costs, local road costs other than local road bridges, design costs and contingencies were excluded). Overall there was approximately a 10% variation in cost, leading to a range of scoring between 1 and 3.

The scoring set out in Table 4-3 does not indicate clear patterns, although it appears that the options from 3A to 4D have scored worse under key RMA categories and in terms of the Geometry criterion, reflecting issues around the alignment of TO2, rather than intersection specific issues. It is noted that full consensus was reached on all scoring.

#### 4.4.6 Weighting

As with the earlier MCAs covered in this report and earlier in the overall O2NL project, a range of weighting systems has been applied to the raw scores from the workshop.

The workshop had placed high weight on all criteria (8 or 10 out of a possible 10). Further weighting systems were developed by Allan Planning and Research, along lines consistent with earlier analyses but taking into account the different criteria. The weightings developed are set out in Table 4-4 and described below.

**Table 4-4: Weighting Systems Applied to Route and Intersection Scorings**

Weighting Options	Landscape/Visual	Ecology	Property Effects	Tangata Whenua Values	Heritage/Archaeology	Productive Land	Effects on Dwelling	Local Connectivity	Geometry	Levin Access	Cost
<b>Workshop</b>	10	8	8	10	8	8	10	8	8	10	8
<b>RMA s6</b>	6	10	2	10	10	2	3	2	2	3	2
<b>Social</b>	5	5	8	8	8	5	10	10	3	8	5
<b>Environmental</b>	5	10	0	3	3	3	0	0	0	0	0
<b>Cultural</b>	5	3	0	10	10	0	3	0	0	0	0
<b>Economic</b>	0	0	8	0	0	5	5	8	5	8	10

**Workshop Weighting** – this weighting was developed in discussion and agreement at the workshop and is described as the technical view of the Transport Agency’s project advisors.

**RMA Section 6 Weighting** – while this places maximum weight on three of the four section 6 RMA aspects potentially at play in respect of the project (ecology, heritage and tāngata whenua

values) it recognises that the occurrence of these values are neither extensive or particularly high in this area, so other values also have a place. Landscape values have not been elevated to the same level as the other s6 matters in this analysis, as “outstanding” qualities and elements were not identified in the area affected by the route options by the specialist involved, and it would thus be inappropriate to elevate them to a very high weight.

**Social** – all criteria have a social component, so all are given some weight. The highest weighting is given to impact on dwellings, followed by local connectivity. Levin access, property effects, tangata whenua values and heritage/archaeological impacts – aspects which have a high social component in this area – were also given high weighting. All other criteria have some social relevance in this rural area, with geometry least emphasised.

**Environment** – this places the highest weight on the physical environmental element of ecology, with other criteria which integrate physical environmental considerations with social/community values also given some weighting. Criteria without a physical environment component are omitted.

**Cultural** – this highly weights tāngata whenua cultural values and archaeology/heritage, followed by ecological and impacts on dwellings but also acknowledges cultural significance in the established rural landscape and its settlement pattern, and its remaining ecological values, all of which have a cultural dimension.

**Economic** – this excludes a number of criteria which have little or no direct economic bearing on the project or the local economy. It emphasises cost and effects on property, but applies some weighting to other criteria with an economic component including connectivity, access to Levin and geometry<sup>39</sup>.

These alternative weighting systems provide a sensitivity analysis for the robustness of the outcome. As far as practicable they have mirrored weighting systems used in earlier MCA processes in the T2O sections although the criteria are somewhat different having been tailored to the combined route and interchange circumstances.

#### 4.4.7 Analysis of Options

The outcome of the analysis is set out in Tables 4-5 and 4-6 on the following page and shown graphically in Figure 4-5 and 4-6. In Table 4-5 and 4-6 the first and second scoring options area highlighted, as the scores are often very close.

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<sup>39</sup> This quadruple bottom-line weighting is a different type of evaluation from the Benefit Cost Ratio (BCR) evaluation normally undertaken by the Transport Agency.

**Table 4-5: Analysis of Route and Interchange Options (Scores x Weights for Different Weighting Systems) – Costs Included**

Route Option	Workshop	RMA(\$6)	Social	Environmental	Cultural	Economic
1A	2.96	3.19	3.13	3.21	3.48	2.61
1B	2.85	3.13	3.00	3.21	3.39	2.51
1C	2.69	2.56	2.83	2.33	2.58	2.82
1D	2.38	2.38	2.44	2.33	2.48	2.43
2A	2.35	2.77	2.45	2.79	3.06	2.06
2B	2.63	3.25	2.72	3.54	3.65	2.06
2C	2.83	3.37	2.97	3.54	3.65	2.35
2D	3.04	3.56	3.11	4.04	3.68	2.45
3A	3.17	3.35	3.23	2.96	3.77	3.06
3B	3.17	3.56	3.19	3.58	4.03	2.69
3C	3.29	3.63	3.33	3.58	4.03	2.82
3D	3.40	3.54	3.53	3.17	4.03	3.06
4A	3.17	3.50	3.16	3.38	3.87	2.90
4B	3.38	3.83	3.40	4.00	4.13	2.82
4C	3.25	3.75	3.25	4.00	4.13	2.69
4D	3.75	4.38	3.77	4.75	4.81	2.92

**Table 4-6: Analysis of Route and Interchange Options (Scores x Weights for Different Weighting Systems) – Costs Excluded**

Route Option	Workshop	RMA(\$6)	Social	Environmental	Cultural	Economic
1A	2.88	3.15	3.07	3.21	3.48	2.41
1B	2.77	3.10	2.93	3.21	3.39	2.31
1C	2.52	2.48	2.69	2.33	2.58	2.41
1D	2.13	2.27	2.24	2.33	2.48	1.82
2A	2.19	2.69	2.32	2.79	3.06	1.65
2B	2.46	3.17	2.59	3.54	3.65	1.65
2C	2.75	3.33	2.91	3.54	3.65	2.14
2D	2.96	3.52	3.04	4.04	3.68	2.24
3A	2.92	3.23	3.03	2.96	3.77	2.45
3B	3.00	3.48	3.05	3.58	4.03	2.29
3C	3.21	3.60	3.27	3.58	4.03	2.61
3D	3.31	3.50	3.47	3.17	4.03	2.88
4A	2.92	3.38	2.96	3.38	3.87	2.29
4B	3.29	3.79	3.33	4.00	4.13	2.61
4C	3.08	3.67	3.12	4.00	4.13	2.29
4D	3.67	4.35	3.71	4.75	4.81	2.71

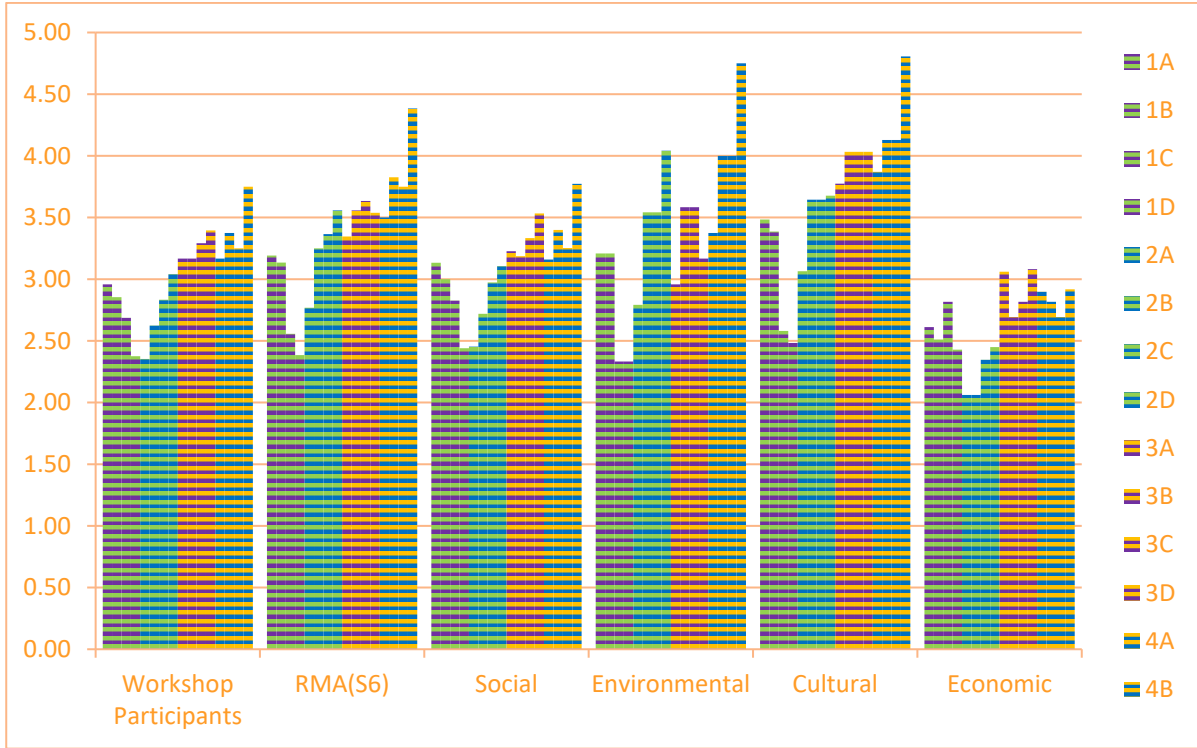


Figure 4-5: Outcome of Analysis of Route and Interchange Options – Costs Included

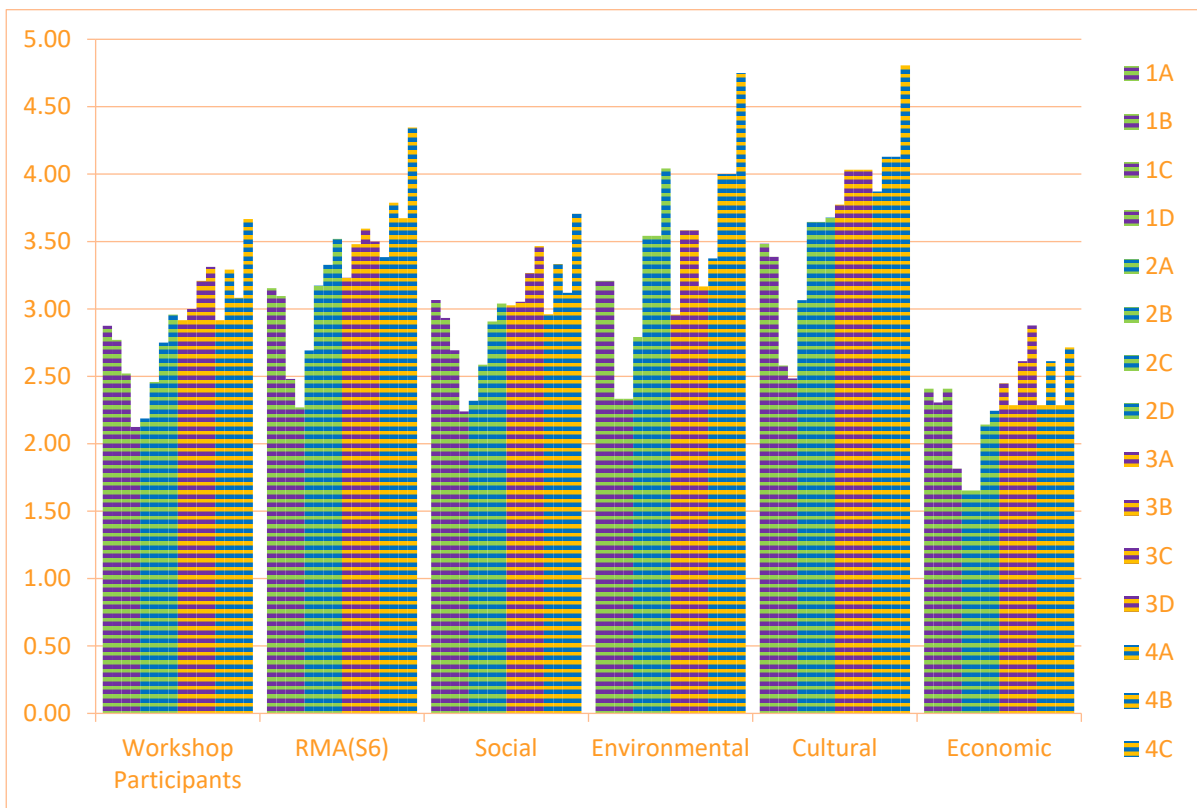


Figure 4-6: Outcome of Analysis of Route and Interchange Options – Costs Excluded

Tables 4-5 and 4-6 and Figures 4-5 and 4-6 show that Option 1D is clearly the most favoured option, scoring lowest in five of the six weighting systems, followed by Option 1C and 2A which score equal or second in three of the six weighting systems.

Option 2B scores equal to 2A under the Economic weighting system.

These results apply whether costs are incorporated in the analysis or not.

In general terms, the options that utilise TO17 score more favourably than those that utilise TO2, although the RMA and Environmental weighting systems result in some overlap, particularly when the option includes NC4 and interchange components at Queen Street.

Of the options utilising TO2, option 3A which has full diamond interchange at Tararua Road and Manakau is best, both with and without costs. This is followed by option 4A, which performs equally well or slightly better under the Workshop, Social and Economic analysis. However, for both these options, the extent of property effects was considered to comprise close to a fatal flaw, due to the extent of Maori-owned land and associated values involved in the full diamond interchange at Manakau. On this basis, options 3A and 4A can both be regarded as carrying a greater level of risk of implementation than the other options. The outcomes for the remaining options utilising TO2 are quite varied, with no clear third preference. Options 3B and 4C appear the next options which should be considered. These are identical in terms of the TO2 intersection configuration, but utilise different routes for the NC section. Both have full diamond interchanges at the Tararua Road location, and both are therefore able to provide full access at the SH57 bifurcation.

From the earlier discussion of the scoring outcomes, it is clear that there is no option which is free of issues, problems or environmental impacts. This analysis has provided a formalised, transparent and structured means of comparing the disparate options.

This analysis provides information and a guide on the options which should proceed to public and stakeholder consultation.



## PART FIVE

### 5 Conclusion

This report has summarised the techniques and findings of analyses of possible broad routes for a continuation of the Wellington Northern Corridor RoNS from Taylors Road through to north of Levin. This report explains the analyses undertaken to assist the Transport Agency in making decisions on a preferred option or options for further investigation.

The investigations to date have assumed a four-lane expressway standard at least as far north as the bifurcation of SH57 and a new two lane highway route connecting back to SH1<sup>40</sup>. The routes identified can be described as largely greenfield, impinging to a limited extent on existing settlements and urban areas. The present SH1 is assumed to remain as a continuous route available for local traffic.

A key element of the investigations has related to a connection from the vicinity of the Arapaepae Road/Kimberley Road intersection around and to the north of Levin. In contrast to the area further to the south, which has been subject to investigations of route options for a longer period, much of the work reported here has been undertaken on the basis of a completely new investigation.

Once viable options had been identified from Arapaepae Road / Kimberley around and to the north of Levin, the investigations then integrated these with the most favourable route options from the southern section (Taylors Road to Arapaepae Road / Kimberley) and investigated intersection locations and types across the full combined length.

The findings of the analysis have highlighted preferences for an eastern route and for interchange options which avoid Queen Street close to the existing SH57 alignment. However, the findings of the various MCAs are still at a high level and a representative range of options should form the basis for consultation before undertaking further refinement of one or more identified route and interchange options

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<sup>40</sup> The investigations have however involved routes that are of sufficient width throughout to enable four-lane expressways