NZ Transport Agency

SH1N Widening and Tarewa Road Intersection Improvements

Design Philosophy Statement

June 2015
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1. Introduction

1.1 General

This report describes the design philosophy and standards adopted for the Detailed Design phase of the SH1 – Tarewa Road Intersection Improvements and SH1N Widening Detailed Design project.

Design constraints have been identified and the design approach in working with these constraints has been outlined in this report.

1.2 Site Locality and Details

The project site is located on SH1 in the vicinity of at Tarewa Road intersection in Whangarei. It is 500 m long and begins at RP 266/0.2 and ends at RP 266/0.8.

Figure 1: Site Location Plan

The existing route is located in an urban environment and covers a 500 m section of SH1 running north/south in the vicinity of Raumanga. Tarewa Road intersects SH1 from the east, and forms the primary link between SH1 to the south and the Whangarei CBD. North of the intersection, the road crosses the Raumanga Stream and continues through a residential area. South of the intersection, there is residential development on the eastern side, and open space (Tarewa Park) on the western side.
2. **Background**

2.1 **Previous Studies**

The NZ Transport Agency has previously carried out a number of studies for this section of SH1. These include:

- Scheme Assessment Report, Northern Civil, 2010.
- Whangarei Urban Area PFR (Tracks model), Gabites Porter, 2008.

2.2 **Project Objectives**

The current problems being experienced in at this intersection include:

- Extended queues during the evening peak turning left out of Tarewa Road.
- Extended queues during peak periods turning right into Tarewa Road from SH1.
- Peak hour congestion northbound on SH1 between the Tarewa Road intersection and SH1/SH14 intersection.
- No pedestrian crossing facilities currently available in the vicinity of the intersection.

To address the problems noted above, and to align with NZTA’s strategy for this intersection, the following summarises the transport objectives for this detailed design project:

- Increase capacity on the SH1 corridor.
- Improve safety at the intersection for all road users including cyclists and pedestrians.

Urban design objectives have been identified as:

- Contribute to sense of place through a gateway concept
- Provide a positive experience for multi-modal users
- Integrate with the local environment
- Minimise the impact of the highway

2.3 **Extent and Scope of this Study**

The intersection layout presented in Northern Civil Ltd drawing 1413 “Option 1A – Aerial Plan” Sheets 1 and 2, and detailed in the July 2010 Scheme Assessment Report forms the basis for the detailed design. Copies of these drawings are attached as Appendix A.
3. Design Standards

The applicable standards adopted for design are summarised below.

3.1 NZ Transport Agency

- Draft State Highway Geometric Design Manual (December 2000)
- Stormwater Treatment Standard for State Highway Infrastructure (May 2010)
- Pedestrian Planning and Design guide (December 2007)
- NZTA P39 Standard Specification for Highway Landscape Treatments
- Planning Policy Manual
- LTNZ (Now part of NZTA) RTS 18 – New Zealand On-road Tracking Curves for Heavy Motor Vehicles (2007).
- NZTA M30 List of Accepted Luminaires
- Bridging the Gap: Urban Design Guidelines (October 2013)
- Landscape Guidelines – Final Draft (September 2014)
- Stormwater Treatment for Road Infrastructure (May 2010)
- Guide to assessing road-traffic noise using NZS 6806 for state highway asset improvement projects (October 2011)
- State highway construction and maintenance noise and vibration guide (August 2013)

3.2 AUSTROADS

In addition to the Draft State Highway Geometric design Manual (2000), the geometric design of the intersection will be cognisant of the requirements set out in the Austroads 2009 guidelines as noted below:

- Further Austroads guidelines which are of relevance to this project are as follows:
  - AUSTROADS, Pavement Design - A Guide to Structural Design of Road Pavements, 2004
  - AUSTROADS, Pavement Rehabilitation - A Guide to the Design of Rehabilitation Treatments for Road Pavements, 2004
- Other relevant AUSTROADS publications
3.3 Whangarei District Council

- Standards for Engineering Design and Construction (April 2009)
- Whangarei District Urban Design Strategy (2011)
- Whangarei District Walking and Cycling Strategy (March 2012)

3.4 Northland Regional Council

- Long Term Plan 2012–2022 (LTP), adopted in June 2012
- Annual Plan 2014/15

3.5 New Zealand/Australian Standards

- AS/NZS 1158.1.1:2005 – Road Lighting – Vehicular Traffic (Category V) lighting – performance and design requirements
- AS/NZS 1158.1.2:2010 - – Road Lighting – Vehicular Traffic (Category V) lighting – Guide to design, installation, operation and maintenance
- AS/NZS 1158.3.1:2005 – Road Lighting – Pedestrian Traffic (Category P) lighting – performance and design requirements

4. Design Philosophy

4.1 Introduction

The design philosophy adopted for this project is based on the design requirements of the proposed improvements as illustrated Northern Civil Ltd drawing 1413 “Option 1A – Aerial Plan” Sheets 1 and 2.

The scope of the proposed intersection improvements is as follows:

- Redesign of the intersection at Tarewa Road and SH1 to provide a signalised intersection with no right turn out of Tarewa Road, four lanes between Tarewa Road and SH14 and improved pedestrian crossing facilities
- Replacement of the existing two lane Otaika Bridge with a four lane bridge
- Providing the formation for a future cycleway (to be constructed separately by others at a later stage) under the bridge.

4.2 Design Speed

The present posted speed limit along SH1 and on Tarewa Road is 50 kph. The proposed intersection improvements are not expected to change the speed environment at the intersection. Therefore a design speed of 60 kph will be adopted.

4.3 Design Vehicle

The design vehicle used to track the proposed intersection will comply with NZTA requirements (RTS 18) being an 18 m (six axle) semi-trailer. The computer programme AutoTurn will be used to determine vehicle swept paths to define the intersection layout.
4.4 Bridge Design

This Design Philosophy Statement covers some of the broad issues relating to the bridge design. However, the specific considerations around the design philosophy for the bridge are included in the Bridge Design Statement (documented separately).

It is noted that the design of the bridge aesthetics should be developed in conjunction with the urban design concepts and in the context of the adjoining park, noting future increase in visibility from the adjoining open space, and future cycle way stream corridor (as well as driver experience north and south).

4.5 Urban design

Urban design principles and concepts have been developed alongside an assessment of urban design effects. As part of the assessment, an analysis of the urban environment provided an understanding of the existing character, including the broad scale patterns of the corridor in the context of the surrounding environment.

In urban design terms, the focus of this assessment of the effects of the proposal was in relation to the impact of the highway on the amenity values and aesthetic appreciation of the environment; in particular, the role of the highway in terms of ‘link and place’.

In addition to design speed (refer to 4.6.4 below), other aspects of the ‘link and place’ approach that have been adopted are:

- Catering for a variety of transport modes and linkages
- Providing an appropriate speed environment that is reinforced through imageability
- Designing the park for social interaction (i.e. an inviting and safe place)
- Creating a gateway appearance and function to the city centre

4.6 Cross Sectional Standards

4.6.1 Lane Widths

- 3.5 m wide right turn lanes. This is considered appropriate for this project due to the expected usage by heavy vehicles.
- 3.5 m wide through lanes on SH1.
- 3.5 m wide lanes on Tarewa Road on its approach to SH1.

4.6.2 Shoulder Widths and Cycle Lanes

A minimum sealed shoulder of 1.5 m will be adopted for the design. The proposed sealed shoulder widths will tie into existing.

4.6.3 Batter Slopes

A batter slope of 1:4 will be adopted where deemed practicable in both cut and fill situations (Section 4.5 Austroads Guide to Road Design Part 3: Geometric Design). However, there are likely to be a number of locations where new walls will be needed to replace existing walls being removed to accommodate the widening.

All slopes and retaining within the project should be considered as part of the overall Landscape and Urban Design for the project to ensure that the final surface treatments are integrated within the project. For example slope gradients and finished levels should allow for the specified
depths of topsoil, mulch and planting set out within the NZTA P39 Standard Specification for Highway Landscape Treatments

### 4.6.4 Clear Zones

Where practicable a clear zone width will be adopted for design as per Section 4.5 Austroads Guide to Road Design Part 3: Geometric Design. This is based on:

- Cut and fill batter slopes being no steeper than 1:4 where practicable.
- Design speed 60 kph.
- Design ADT > 6,000 vpd.

### 4.6.5 Sight Distance

Sight distances will be reviewed and where practicable improved as per Section 4.5 Austroads Guide to Road Design Part 3: Geometric Design for a design speed of 60 kph.

### 4.7 Pavement

#### 4.7.1 Traffic Loading

<table>
<thead>
<tr>
<th>Source</th>
<th>Road</th>
<th>AADT</th>
<th>% HCV</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAR</td>
<td>SH1</td>
<td>26,200</td>
<td>10</td>
<td>1997</td>
</tr>
<tr>
<td></td>
<td>Tarewa Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAMM</td>
<td>SH1</td>
<td>&gt;20,000</td>
<td>6</td>
<td>2012</td>
</tr>
<tr>
<td></td>
<td>Tarewa Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>SH1</td>
<td>26,200</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tarewa Road</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parameters for pavement design are summarised below:

- Traffic growth rate of 3\% per annum has been considered from the analysis done by Northern Civil Consulting Engineers Ltd.
- Design period of 25 years.
- Design subgrade CBR of 3.5 (to be confirmed after testing).
- 10\% heavy vehicles.

#### 4.7.2 Pavement Philosophy

The pavement design used on an adjacent project immediately north of the site (the improvements of SH1 and SH14 intersection), was based on a layer of 50 mm deep Asphaltic Concrete on a 120-160 mm layer of bitumen treated base course (BTB) over 190 to 300 mm of AP 65, with a design CBR of 4\% on the subgrade. To keep consistent with this adjacent project, a similar pavement design will be considered as one of the options for widening SH1 on this project.

Subject to addressing overland flow paths, another option that will be explored will be the modification of the existing pavement combined with an overlay. This option would seek to minimise excavation and if practicable retain some of the value in the existing pavement.

Pavement design for the bridge is to match with the rigid behaviour of the concrete edge beam to ensure minimum reflective cracking between the pavement and the bridge beams. A BTB
approach or a more rigid approach may be considered (depending on testing). The pavement for the bridge widening is to be built on engineered fill, laid and compacted to the earthworks specifications.

Widening on Tarewa Road is to be designed to match the lesser traffic loading on that route (relative to SH1).

There is a possibility that the overall reconstruction of SH1 and Tarewa Road intersection may be required as part of the contract works. However, this greatly depends on the pavement test results to be undertaken as part of this project. This option should also be considered once testing is completed to provide a longer life to the intersection if warranted.

Final design options will be considered to optimise the project life costs.

### 4.7.3 Surfacing

A single coat grade 2 and 4 surfacing has been allowed for within the scheme assessment cost estimate. However, RAMM information has shown the use of OGPA on some sections of SH1. Consideration of the benefits and limitations of using SMA surfacing at the proposed intersection will be made given the high percentage of HCVs and turning volumes at the location. It is expected that applying SMA would diminish the vehicle breaking, turning effects and shear stresses on the surface of the proposed intersection.

GHD proposes that the remaining area of SH1 within the scope of work will be surfaced to match surfacing completed for the improvements of SH14 and SH1 intersection. This will ensure continuity in surfacing of SH1. Use of OGPA can also be considered.

Tarewa Road pavement will be reconstructed and surfaced to match new surfacing at the intersection with SH1 up to 5 m from the new edge of seal on SH1. Remaining area of Tarewa road will be reconstructed and considered resurfaced to match existing surfacing to ensure continuity in surfacing.

Matipo Road pavement will be milled and resurfaced 5 m from the edge of seal of SH1. New surfacing is to match surfacing on SH1 to ensure continuity.

The existing bridge deck is to be resealed to match the new surfacing on the widened section. The expansion joint on the bridge and approaching the bridge deck are to be exposed and not surfaced with asphalt to avoid cracking along the joints.

### 4.7.4 Constructability

To minimise traffic disruption and assist in constructing the works, GHD will develop the design so that large portions can be constructed outside of live traffic lanes. This approach will primarily be followed south of the bridge where two lanes will be constructed within the existing Tarewa Park. Traffic will be diverted onto these lanes once they are complete and half of the bridge has been constructed. The remaining works south of the bridge will then be constructed. North of the bridge the ability to construct the works outside of live traffic lanes will be more difficult. However the focus will initial be on service relocation and widening works. This will limit disruption to the activities involved in completing the pavement between kerblines to the end of the projects programme.

A stepping process will be used when tying in to the existing pavement on SH1 and Tarewa Road at the construction joints. The stepping widths are laid and compacted in 300 mm widths to the designed layer depths.

Care should be taken to avoid saturating and disturbing the subgrade soils. Some moisture conditioning may be required if the soils are outside of their optimum moisture contents during construction. Soils disturbed during construction should be suitably compacted prior to
placement of the basecourse. Installation of subsoil drains where the pavement is in cut to prevent water ingress into the lower pavement layers should be considered.

All topsoil and any weaker or organic rich areas encountered following exposure of the subgrade should be sub excavated and replaced with suitably compacted base coarse material. A 5% contingency for over-excavation should be allowed for during construction.

4.8 Stormwater Drainage

4.8.1 Pavement Drainage

The maximum spacing of sumps shall be 90 m. Double sumps shall be provided at low points and on gradients exceeding 8%. Based on visual assessments there are not expected to be any areas with gradients exceeding 8%. Sumps may also be required where there is potential for ponding, where flow could leave the channel (tangent points at intersections), and upstream of accessible (pram) crossing locations.

Sump leads shall be at least 300 mm NB for single sumps and 375 mm NB for double sumps at a minimum grade of 1%. Sump gratings shall be suitable for crossing by bicycles.

4.8.2 Water Quality Treatment

It is expected that water quality treatment will be managed to comply with ARC TP10 by collecting pavement runoff in catchpits before treating and discharging into existing watercourses (subject to resource consent requirements). Specific requirements will be discussed with NRC. As part of this discussion reference will be made to treatment provided on recently completed sections immediately to the north of the project (i.e. SH1/14). Where no other overall treatment mechanisms are practicable stormwater treatment shall be incorporated into sumps using sump silt screens.

4.8.3 Drainage Pipes and Culverts

New pipe crossings under SH1 will be a minimum of 375 mm diameter. Crossings under local roads will comply with Whangarei District Council minimum requirements being no less than 300 mm diameter. Under carriageways the minimum depth to crown shall be 1200 mm unless specifically designed.

An existing 300 mm diameter pipe culvert crosses under SH1 approximately 300 m north of the intersection with Tarewa Road. No modifications apart from lengthening the existing culvert on the eastern side is proposed to accommodate the proposed SH1 widening.

There is currently a mass block wall on the western side of this existing culvert. The geometric design will endeavour to minimise the impact of the widening on this new wall. It is proposed to install a similar wall on the eastern side of the culvert as part of the culvert extension works.

All wall works will be in accordance with NZTA’s Bridge Manual.

4.8.4 Design Storms

The stormwater network shall be designed to handle the events set out in Table 2.

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Table 2 – Stormwater Design Events

<table>
<thead>
<tr>
<th>Item</th>
<th>% AEP</th>
<th>ARI (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piped network, no surcharge</td>
<td>50%</td>
<td>1:2</td>
</tr>
</tbody>
</table>
Piped network, allowing discharge within 300 mm of lid level | 20% | 1:5
Overland flow paths | 1% | 1:100
Flood Protection (all areas) | 1% | 1:100

### 4.8.5 Waterway Design

The waterway beneath the new bridge shall be designed to:

- Not exacerbate existing upstream water levels during a 100 year ARI flood event. This is expected as the cross section under the new bridge is expected to be greater than the currently cross section.
- Not interrupt traffic during a 100 year ARI flood event.
- Minimise the risk of blockages and obstructions noting that other geometric constraints may impact this criteria.
- Provide a freeboard of 0.6 m below the bridge sofit in a 100 year ARI storm event. This will however be subject to confirmation by NZTA as this may require a trade-off with other design considerations.

### 4.8.6 Climate Change

Allowance shall be made for climate change for all post-development flows in line with the recommendations of the Ministry for the Environment, which indicates a figure of 20% by 2090 as its upper limit for Whangarei.

Pre-development flows shall be based on rainfall data in their original form to represent a true assessment of the future impact of the proposed development on the environment.

### 4.9 Street Lighting

The lighting shall be designed to the following categories in accordance with the relevant standard from AS/NZS 1158:

- SH1 and Tarewa Road intersection: Category V3.
- Bridge underpass: Category P10.

It is suggested new luminaires be LEDs and selected from NZTA M30 list of accepted luminaires. The existing lighting poles are unlikely to be able to be reused and new poles will be required to replace power-pole mounted luminaires. All new poles shall be specified to AS/NZS 1158 standards.

The electrical supply for the streetlights shall be by NZTA for the intersection and for approximately 50 m along Tarewa Road (notionally the end of the new island nosing). Beyond this point, the electrical supply shall be by Whangarei District Council. The electrical supply for lighting along SH1 and the bridge underpass shall be by NZTA.

### 4.10 Road Marking and Signage

Road marking will be in accordance with MoTSAM with options for road marking materials (for example thermoplastic) being assessed and considered as part of design.

Signage design will consider the change in form of intersection layout with appropriate advance warning signage to alert drivers of the intersection layout. Every effort will be made to reuse existing signs as appropriate.
4.11 Utility Services

The proposed intersection improvements affect a number of utilities as summarised below:

- There are Telecom services down both sides of SH1 and down the northern side of Tarewa Road. There is a “Clear” fibre optic cable on the eastern side of SH1 coming from the south. It crosses over Tarewa Rd at the intersection of SH1 and continues along the left-hand side of Tarewa Road. All these cables will need to be located, protected and/or relocated. There are five manholes that will need to be upgraded to roadway manholes.

- There are overhead power cables on the western side of SH1 and along the northern side of Tarewa Rd. The power cables cross over both roads to feed the properties on the eastern and southern sides respectively. There are 20 poles that will need to be relocated. There are low voltage underground power cables around the intersection with Tarewa Road, and at other locations, to feed the streetlights. These will need to be located, protected and/or relocated.

- There are gas services on the eastern side of SH1 along the northern extents of the project area. Heading south from SH14, the gas line crosses over SH1 approximately 70 m north of Matipo Place and continues south on the western side right through the length of the site. A gas line is located along the northern side of Matipo Place (on the approach to SH1, noting the gas line is present on both sides in the vicinity of the cul-de-sac head) and also crosses SH1 on the northern side at the intersection with Tarewa Rd. This also crosses Tarewa Rd and continues along the eastern side of SH1 through the southern extents of the site. These will need to be located, protected and/or relocated.

- There are water services down both sides of the road servicing all the properties. These will need to be located, protected and/or relocated.

- There are sewer services running through the site with the main lines and manholes running predominately down the existing carriageway. These will need to be located, protected and/or relocated.

Contact with the affected utility operators will be initiated at the onset of detailed design to determine whether any other new services have been laid since the scheme assessment and to also request a review of the previous service relocation and/or protection requirements.

Liaison with the affected utility operators will continue throughout detailed design as the layout is refined and better certainty of service relocation and/or protection requirements are known.
4.12 Geotechnical

4.12.1 Subgrade Strength for Pavement

The scheme assessment report recommends a design CBR of 4% with undercuts of material below this value. Preliminary pavement design will be conservatively conducted with a CBR of 3.5%. Geotechnical investigation to accurately calculate the subgrade strength will be conducted, and the detailed design based upon actual values.

4.12.2 Ground Conditions for Cuts and Fills

The scheme assessment report identified that existing batters are stable with near vertical faces. Therefore, it is not anticipated that difficulties will be encountered in the design of cut/fill. The design will detail retaining walls where required.

4.12.3 Pile Design

The exact nature of the bridge foundation design depends on the detailed geotechnical investigation; however, the scheme assessment report suggests piles into the sandstone layer. Consideration will be given to constructability requirements, such as ground water levels for concreting, use of casings etc.

4.12.4 Bridge Approach

Settlement slabs will be provided at either abutment as required by the NZTA Bridge Design Manual.

Considerations include:

- Subgrade strength for pavement
- Ground conditions for earthworks and cuts/fills
- Need for retaining structures
- Pile design/foundation design for the bridge
- Bridge abutment design and settlement considerations
- Approach to designs with variable ground conditions
- Design standards
- Geotechnical risks to be considered

The approach related specifically to the bridge design is covered within the Bridge Design Statement which has been prepared as a separate document.

4.13 Land Requirements

4.13.1 Land Acquisition

Land purchase is required along both sides of SH1. It is understood that no adverse reaction has yet been received from the owners as a result of initial discussions carried out during the scheme assessment phase (undertaken by others). Further discussions will be required with property owners as part of detailed design. This is considered a substantial project risk, and is discussed in detail in section 7.3.1.
5. Departure from Standards

No departure from standards is anticipated at this stage.
6. Environmental and Social Considerations

6.1 Environmental

No major environmental effects are anticipated as a result of the proposed improvements. There will be some changes arising from the taking of land, including public park land and private residential properties, and some changes associated with stormwater requirements. Generally, however, the most significant effects relate to construction activities associated with the pavement widening and intersection upgrade at Tarewa Road. The following is a summary of the environmental assessment.

6.1.1 Water Resources

Erosion and sediment control will be required to manage run-off from the earthworks associated with SH1 widening and Tarewa Road construction.

The additional impermeable surface area associated with the above realignment will require detailed assessment of stormwater effects due to the increased impermeable area.

6.1.2 Air Resources

Construction associated with pavement widening for the SH1 and Tarewa Road will result in air discharges in the way of dust emissions. This will need to be effectively managed, with requirements specified when preparing the project specifications prior to tendering the physical works.

6.1.3 Natural Features and Landscape

A separate urban design and landscape assessment has been undertaken. Matters addressed in the urban design assessment related to connectivity, urban form, and amenity and quality of the environment. The results of the assessment are reproduced below.

In the wider sense of urban form the site is within a section of the District that currently moves state highway traffic (i.e. it has a national function) north and south, and the proposed design will continue to enable this movement. There will also be increased efficiency of movement, and the proposed new intersection will facilitate improved access to the city centre, while continuing to sustain the sub-regional and local settlements along the highway.

Longer term there can also be expected to be a reduced travel time within the region as sections of the WUI Corridor Plan are constructed.

There will be no effects on existing land use overall, although there will be changes to some individual lots where they are required to be acquired for the road works. Generally, however, roading works and widening will only require minor changes to the existing form and land use, and changes to the existing character will be small.

These changes include:

- Retaining walls and replacement fencing along Otaika Road North;
- New bridge, traffic islands and lights at Tarewa Road and Otaika Road intersection;
- Tree removal along Otaika Road South (mainly within Tarewa Park).

Positive design measures that are expected to result in improved urban design effects include:

- Gateway treatment signalling the improved entry to the city centre at Tarewa Road;
- Cycleway improvements as part of the WDC Walking and Cycling Strategy with new road crossings and a new bridge underpass connection;

- Stormwater improvements to Tarewa Park;

Riparian and amenity planting for Tarewa Park and Raumanga Stream.

Generally, it is considered that the scale and nature of the works will be relatively modest for a national highway, and that the amenity effects are able to be managed through appropriate design. The number of residents who are potentially affected is limited to Otaika Road North and South (with negligible effects for residents on Tarewa Road).

Effects for residents on Otaika Road South are rated low with small changes to access and other effects limited to visual effects as a result of road widening and loss of trees. Proposed landscape works will integrate the road into the landscape and it is considered that amenity values will be maintained or enhanced.

For residents on Otaika Road North, amenity effects will be more adverse than those for Otaika Road South as a result of increased proximity and level changes but will still be low as the magnitude of change is not considered large. Generally the design of the road seeks to avoid or manage visual, noise, severance and environmental impacts on the area.

Landscape design in this character area will seek to maintain the status quo as far as possible with regard to amenity values.

6.1.4 Historical, Heritage, Cultural Resources and Sites

The site is not believed to be of historical or cultural importance; no issues have been identified from planning maps, nor have Iwi raised any significant concerns in previous consultation.

6.1.5 Construction and Maintenance Material

Construction and maintenance materials will be considered when preparing the project specifications prior to tendering the physical works.

Materials from sustainable sources will be considered if they are deemed economic and shall support the requirements of the local network operators.

6.1.6 Noise and Vibration

Operational road-traffic noise needs to be subject to a NZS 6806 screening assessment. No major issues have been identified thus far.

6.2 Social and Economic Effects

6.2.1 Social Effects

Social effects include temporary delays to traffic during construction. This will be minimised by installing appropriate temporary traffic management and undertaking work outside of the peak periods. Access to properties adjoining SH1 and local roads will need to be maintained at all times during construction.

Construction noise is likely to impact residents of properties adjacent to the site. It is proposed that the adherence to the noise limits of NZS 6803 as specified in the tender documents.

The proposed intersection improvements results in positive social effects in the creation of a safe road environment.
6.2.2 Economic Effects

The economic effects during construction are likely to be minimal in general, as the majority of the properties adjacent to the site are residential or leisure (Tarewa Park). However, there are a small number of commercial properties (noting the motel in particular) which may potentially suffer a reduction in trade due to construction.

Construction will cause small delays to traffic, but these delays are justified by the anticipated improvements and benefits of the completed project. The design will endeavour to mitigate some of these effects by limiting conflict points during the construction period occurring within the site and providing alternative route options to minimise delays.

6.2.3 Communication and Consultation

Consultation is a critical element of achieving a successful project outcome, particularly with the range of adjoining land uses (which includes motels, commercial properties and residential dwellings) in addition to other key stakeholders such as the Whangarei District Council, Northland Regional Council and Iwi.

Consultation will be carried out throughout the life of the project; however, there will be different levels of consultation across the various stakeholders at different stages of the project. This is outlined below:

**Table 3 – Stakeholders and Consultation**

<table>
<thead>
<tr>
<th>Key Stakeholder</th>
<th>Primary Consultation Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDC Walking and Cycling Team</td>
<td>Start of the project, after preliminary design</td>
</tr>
<tr>
<td>WDC Building Consent Team</td>
<td>After detailed design of the bridge</td>
</tr>
<tr>
<td>WDC Planning Team</td>
<td>Start of project</td>
</tr>
<tr>
<td></td>
<td>After development of the design philosophy statement</td>
</tr>
<tr>
<td></td>
<td>After preliminary design</td>
</tr>
<tr>
<td>NRC</td>
<td>After preliminary design</td>
</tr>
<tr>
<td>Iwi</td>
<td>Start of project</td>
</tr>
<tr>
<td></td>
<td>After preliminary design</td>
</tr>
<tr>
<td>Service Authorities</td>
<td>Start of project and ongoing</td>
</tr>
<tr>
<td>Crown Property Services</td>
<td>Start of project</td>
</tr>
<tr>
<td></td>
<td>After preliminary design</td>
</tr>
<tr>
<td>Network Managers</td>
<td>Start of project</td>
</tr>
<tr>
<td></td>
<td>After preliminary design</td>
</tr>
<tr>
<td></td>
<td>After detailed design</td>
</tr>
<tr>
<td>Affected landowners</td>
<td>Via open days and as directed by NZTA and Crown Property Services</td>
</tr>
<tr>
<td></td>
<td>After preliminary design as directed by NZTA</td>
</tr>
</tbody>
</table>
While the overall consultation will be led by NZTA, design and/or other support will be made available as appropriate.

The detailed consultation stage will commence after the completion of the preliminary design. It is envisaged that the large stakeholder parties such as WDC, NRC, Iwi, NZTA Network Managers and the various utility services will be engaged individually through their individual minders.
7. **Risk Management**

A risk assessment was carried out as part of the scheme assessment. Of the risks identified the following require further consideration as part of detailed design to minimise the identified risk compromising the delivery of a successful project.

7.1 **Unknown Utility Services**

While all effort has been made to identify existing utility services at the intersection as part of the scheme investigation, there may be the possibility that an unknown underground service may be present at the project site having not been identified as part of the earlier scheme assessment.

There is the risk of increased project costs should unidentified services being discovered during construction. To minimise the risk and to better identify the relocation/protection requirements at the site we will maintain contact with the utilities within the intersection during the detailed design, particularly once the footprint of the proposed intersection improvements are confirmed.

7.2 **Geotechnical**

For this project geotechnical risk is largely associated with unknown ground conditions. This risk is mitigated to some extent through the field investigations and laboratory testing carried out as part of the earlier scheme assessment. However, further geotechnical investigations will form part of the detailed design.

A suitable contingency will be assessed and adequate allowance made in the Design Estimate to account for remaining uncertainty in ground conditions which will be confirmed and further managed during construction.

7.3 **Planning**

7.3.1 **Land Acquisition**

The horizontal road layout will form the basis of the project footprint which will be used to develop the land purchase drawings. These will be sent through to Crown Property Services to open negotiations with property owners. Land purchase work and consultation works are a high risk item in which sufficient time needs to be allowed for in the negotiations.

Efforts will be made to minimise the project footprint and subsequently the amount of land take required. For example consideration will be given to narrowing the median island and bridge structure. However the potential requirement to provide a right turn pocket to access Matipo Place may negate the ability to narrow the road width in this area.

Minimising the amount of earthworks due to road geometrics may remove the need for multiple resource consents and reduce both the time required to apply for the consents, the processing fees and the cost of ongoing inspections during construction.

Other urban design risks are also associated with land acquisition, and it will be important to manage the design of the boundary interface between the road and private properties. To this end, a table of proposed designs has been prepared for Crown Property Services.

7.3.2 **Designation**

Currently, there is an existing road designation in place for SH1 and Tarewa Road. However with the proposed road widening works, the new road will fall outside of the road designation. As such, designation consent in the form of a Notice of Requirement is required.
The designation consent will be applied for after the completion of the preliminary design. However, prior to the application for this consent, a review will be conducted of the existing conditions of the current designation to determine whether the existing conditions of the current designation can be extended to cover new project area. If this can be done, then the NoR can be obtained using the scheme assessment drawings. This will provide enough time to obtain the consent in advance of the project completion date.

There is provision under the RMA for the NoR to be processed on a non-notified basis if affected party approval is provided by directly affected parties (in this case the landowners and occupier where land is required and WDC) and the effects are no more than minor. Without knowing the landowner & occupiers’ reaction to the extent of land take, there is a risk that these parties may not provide affected party approval, which could cause delays to the NoR process in that the NoR may require notification and may require hearings. Again, early and ongoing consultation will minimise this risk.

7.3.3 Resource Consents

There are two types of resource consents when working in the Whangarei area:

- A Whangarei District Council (WDC) Resource Consent, and;
- A Northland Regional Council (NRC) Resource Consent.

The WDC consent is concerned with the immediate effects within the project area such as minor earthworks. The NRC consent is concerned with large scale effects that can affect other areas such as large earthworks and discharges into the Raumanga Stream.

As discussed above, the geometric design philosophy will seek to reduce the amount of earthworks to be carried out on this project, making the above resource consents easier to obtain. Moreover, pre-lodgement meetings will be held with WDC/NRC to discuss in detail the proposed design, and obtain agreement in principle on the overall approach.

7.4 Project Funding

It is understood from the earlier scheme assessment that the Benefit/Cost (BC) analysis undertaken at that time resulted in a marginal BC ratio. However, it is understood that the project is to be progressed on the basis of achieving the agreed scope and objectives, noting that this is likely to result in an eroded BC which may not satisfy traditional funding requirements. NZTA have been explicit in advising GHD that this project is part of a wider programme of projects and that the funding has been secured on this basis. As a result the individual BC for this project is not deemed to be relevant. Should this understanding change then this would represent a substantial risk to the delivery of the construction phase of the project.

7.5 Project Cost

The current project costs are those that have been prepared as part of the Scheme Assessment Report and not updated as part of this Design Philosophy Statement. Project costs will be updated and a Design Estimate prepared once the design is further advanced. Although the design philosophy for the proposed intersection improvements remains fundamentally similar to the scheme design, there are a number of issues that may affect costs:

- The Scheme Assessment was completed in 2010. Construction and land take costs may have increased since this cost estimate was undertaken.
• Legislation or construction best practices may have changed since the Scheme Assessment, resulting in increased safety compliance costs (for example traffic management).

• Based on a preliminary assessment a number of elements in the scheme cost estimate are expected to be insufficient. Two specific examples are the allowance for services and utilities, and the allowance for pavement remediation.

• There are opportunities to incorporate components with higher capital costs but with lower lifetime costs (for example LED street lighting) which may increase project cost.

• There are opportunities for efficiencies to be developed in the design, reducing costs (for example through reduced land take).

Moreover, as noted above there are a number of project risks that could adversely impact project costs. These risks will be managed throughout the design process.
8. Construction Methodology

8.1 General

Traffic management during construction will need to comply with requirements set out in NZTA’s Code of Practice for Temporary Traffic Management (COPTTM) for a Level 2 road.

A lower temporary speed limit will be required during construction and apply to SH1 and local roads.

8.2 Methodology

Construction of the intersection improvements will need to be staged to allow the intersection to remain operational during construction and to minimise the impact on road users.

To allow the intersection to remain operational during construction, a typical sequencing is expected to include:

- Service diversions and below ground works.
- Construction of half of the new bridge ‘off line’ and two lanes to the south of this bridge thorough to the southern extent of the project up to the underside of the final surfacing layer and provide a sacrificial two coat chip sealed surface to allow temporary marking.
- Widening works to the north of the bridge and outside of a live traffic corridor that would continue to provide a lane in each direction.
- Divert traffic onto the new lanes/bridge.
- Provide temporary pedestrian access across the stream on the western side of the new bridge and close pedestrian access on the eastern side.
- Ban the northbound right turn movement from SH1 to Tarewa and redirect this movement up to the SH1/14 intersection. Permanently ban the right turn movement out of Tarewa to SH1 north.
- Demolition of the old bridge.
- Construction of the second half of the new bridge.
- Construction of the new road layout south of the new bridge. Whilst maintaining the ability for south bound traffic on SH1 to turn left into Tarewa and for traffic to exit from Tarewa to SH1 south.
- Undertake final surfacing works south of the new bridge and over the new bridge and apply permanent road marking.
- Open the new intersection to traffic and pedestrian movements.
- Reconstruct the pavement to the north of the bridge and tie into the SH1/14 project.
Appendix A –
Scheme Drawings (Northern Civil Ltd, Drawings 1413)
Option A
Cross Section A

Typical Cross Section
NOT TO SCALE

Design to be detailed
with final intersection
design (not shown)

Project Starts
436/2010-20

See standard
cross section A

New raised
traffic island
56m²

New raised
traffic island
12m²

New raised
traffic island
23m²

New raised
traffic island
22m²

OPTION 1A
Controlled Intersection
without right turn bay
<table>
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<tr>
<th>Elevation</th>
<th>Existing Ground Level</th>
<th>Finished Ground Level</th>
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Document Status

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<th>Reviewer</th>
<th>Approved for Issue</th>
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