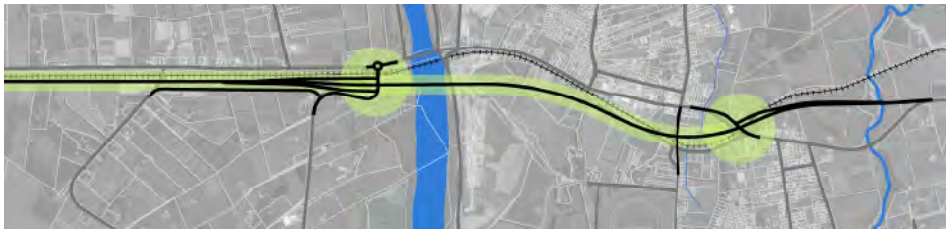
Appendix D

Option Assessment Working Papers

NZ TRANSPORT AGENCY
WAKA KOTAHI



Peka Peka to Otaki Expressway
Further SAR Phase MCAT Assessment
Working Paper June 2011

Quality Assurance Statement

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Revision Schedule

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1	6/7/11	First Draft	SDR	T. Coulman	T. Coulman
2	6/9/11	SARA Issue	SRT	T. Coulman	T. Coulman

NZ Transport Agency

Contents

Appendices:

1. Executive Summary

This paper summarises the outcomes of further option and multi criteria assessment of connection options at Otaki, Old Hautere Road, Te Horo and alignment alternatives at Mary Crest, completed during the scheme phase of the PP2O project.

As part of the February 2011 consultation process the team sought public feedback on the form, function, and location of interchanges and connections along the Peka Peka to North Otaki (PP2O) Project. This included a preferred and alternative option at North Otaki, South Otaki, and Te Horo. The proposals were communicated through a brochure delivered to households in the district and a series of public open days that utilised a set of story boards and a strip map of the whole route. Feedback was sought on the proposals and is summarised in a Consultation Report (June 2011).

While there was good support for the overall proposal a number of key issues were identified requiring further investigation and assessment. These included:

- Otaki E-W Connectivity – a strong desire highlighted by Kapiti Coast District Council (KCDC), the Otaki Community Board (OCB) and the community to retain two vehicular connections between east and west Otaki.
- Old Hautere Rd Connectivity – a desire to retain connectivity at Old Hautere Road (the consultation proposal identified the possibility of introducing a cul-de-sac).
- A strong community, KCDC and OCB desire for Te Horo Proposal B, being a local connection located to the north of Te Horo Beach Road.
- A strong desire to minimise or avoid impact on newly identified ecological bush remnants as well as the potential cultural and heritage values of the dunescape at Mary crest.

As part of the further option identification and refinement process the following options were identified and assessed at each of the focus areas:

Otaki E-W (all include a bridge at the 'ramp')			
Option EW1	***Option EW2***	***Option EW3***	***Option EW4***
Pedestrian bridge at Rahui Rd (as consulted preferred)	Improved Road bridge at Rahui Road	Waerenga Rd connection under elevated expressway and at-grade rail crossing	Bridge connection to Waerenga Rd plus pedestrian bridge at Rahui Rd
Old Hautere Rd			
Option OH1	***Option OH2***	***Option OH3***	
Cul-de-sac (as consulted option)	Grade separated bridge connection	At-grade link to Otaki Gorge Rd	
Te Horo			
Proposal A	***Proposal B***		
Local bridge connection at School Road (as consulted preferred option)	Local bridge connection Nth of Te Horo Beach Road (as per 2009 concept)		

Mary Crest Alignment			
West 1	***West 2***	***East***	
As consulted alignment passing through Mary Crest	Modified western alignment avoiding bush remnants	Alignment crossing to the East south of the Mary Crest dunes	

A series of staged meetings and workshops were held with KCDC, GWRC and KiwiRail during April and May to develop the above options and then run through the assessment outcomes. As part of the process KCDC were involved in a Multi criteria assessment tool (MCAT) assessment workshop (4th May 2011) where the various specialist assessments were brought together in order to compare and screen the options with a view to identifying preferred outcomes. A stakeholder briefing on the 11th May 2011 conveyed the MCAT and assessment outcomes to the wider stakeholder group, and following further consideration by the core management team and DMT team on the 23rd and 25th May the following preferred options were identified:

Otaki E-W:
Option EW2, an improved road, pedestrian and cycle bridge connection across Rahui Rd has been identified as the preferred option for maintaining two points of E-W connectivity. Improvements to the rail and expressway relationship, refined flood assessments, and changes to the eastern approach geometry allow for a reduced structure height (approx 8.5m) and approach grades (approx 8%). This option was assessed as providing the best overall outcome in that it retains the current desire lines, has the most contained visual impact, and provides a positive incremental benefit cost ratio when compared to an improved pedestrian-cycle bridge at this location.

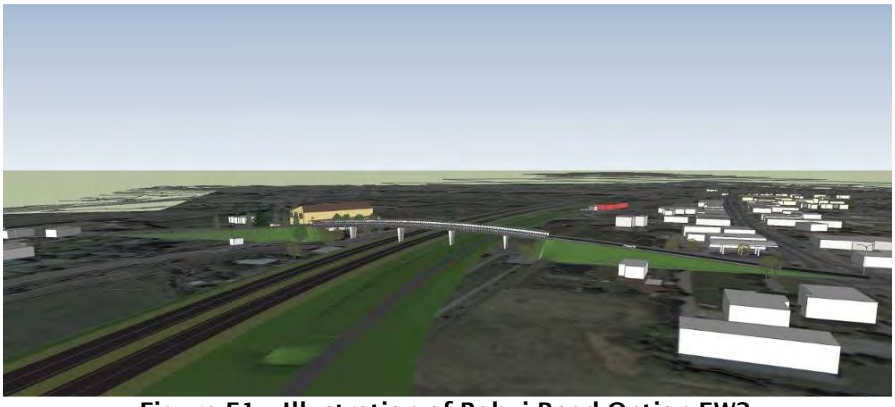


Figure E1 – Illustration of Rahui Road Option EW2

Old Hautere Road:
Option OH3, which provides for an at-grade link to the south Otaki interchange and Otaki Gorge Road has been identified as the preferred option (similar to the 2009 option), and provides positive incremental benefits over a cul-de-sac proposal. While this option provides slightly less connectivity than a grade separated crossing it delivers significantly better value for money, only marginally reduced connectivity benefits, and reduces the localised visual/landscape and property effects of introducing a grade separated structure at Old Hautere Rd. Speed control/calming measures will need to be explored with KCDC to manage speeds in this area.

Figure E2 – Plan of Old Hautere Road Option OH3

Te Horo:
Proposal B has received significant local community support, together with endorsement/support from both KCDC and the OCB. While the MCAT process has indicated an enhanced outcome with Proposal A (improved pedestrian/cycle connections), it is recognised that Proposal B has local support, reduced impact on residential dwellings, and shifts the grade separated structure to the north of the main settlement. On this basis, and the fact that flood management can be addressed, Proposal B is recommended to be taken forward.

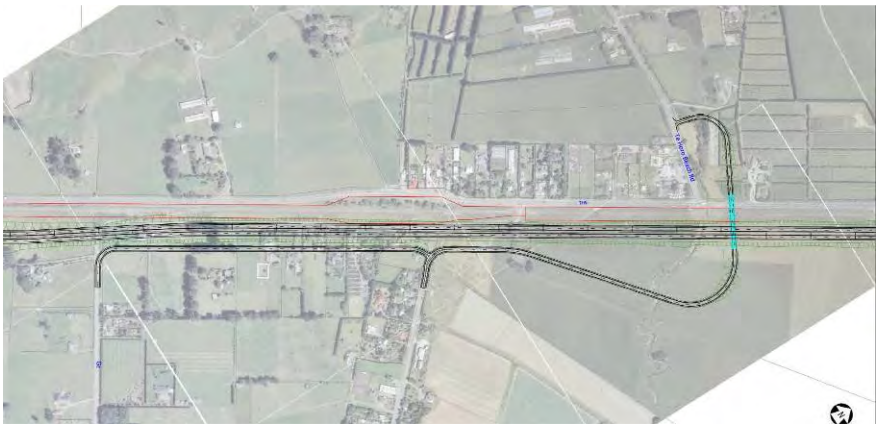


Figure E3 – Illustration of Te Horo Proposal B

Mary Crest:
While the MCAT assessment indicated an eastern option may provide the better outcome, the West2 option has been identified as the preferred option. This decision has been reached on the basis that it reduces impacts relative to West1 (by avoiding the bush remnant areas), avoids a significant 15m high southern fill embankment associated with an eastern option, and avoids the impact on more properties to the east. A West2 option also avoids a significant shift away from the historic corridor (and newly effected land owners) associated with an eastern alignment. Further liaison with Te Waari Karkeek and Raukawa has highlighted support for this option.

Figure E4 – Plan illustrating West2 Option at Mary Crest

Feedback from a meeting with KCDC and OCB on the 4th July 2011 suggests a good level of support for the above recommendations at Mary Crest, Te Horo, and Otaki. A formal position from the OCB and KCDC is yet to be received in respect of the preferred option at Old Hautere Rd

2. Introduction

Following completion of the project scoping phase, the PP2O proposals for the overall route and proposed connectivity options were taken to public consultation in February 2011. As part of this consultation process the team sought feedback on the form, function, and location of interchanges and connections along the Peka Peka to North Otaki (PP2O) Project. This included a preferred and alternative option at North Otaki, South Otaki, and Te Horo.

Further geotechnical investigations and baseline environmental assessments have also been undertaken since completion of the scoping phase and this new data highlighted significant ecological values within the Mary Crest area which would be significantly impacted by the scoping phase alignment.

The key issues relayed in the consultation feedback are summarised in Section 3 below. The feedback obtained has been considered and assessed in more detail with a focus on further option consideration, development and assessment at the following key focus areas:

- Otaki East-West connectivity (Rahui Road and Waerenga Road)
- Old Hautere Road connectivity
- Te Horo connectivity
- Mary Crest alignment

This working paper summarises the key consultation feedback/issues, together with the further option assessment completed in order to arrive at a refined proposal for the PP2O Project.

3. Focus Areas and Options

3.1.1 Otaki and Rahui Road

Introduction:

At Otaki the preferred Proposal A for the North Otaki interchange provides for a diagonal East-West linkage between East and west Otaki parallel to the existing SH1 rail overbridge (referred to locally as the 'ramp'). Assessment during the scoping phase demonstrated that while this resulted in the loss of one East-West connection (Rahui Rd) there was more than sufficient capacity to cope with projected demands, inclusive of race day events. In addition to the northern interchange, the options consulted on during February 2011 included a pedestrian/cycle bridge at Rahui Road (preferred option), and a road bridge at Rahui Road.

Key Consultation Feedback/Issues:

The key issues and feedback from consultation included:

- KCDC and the OCB stated that the loss of connectivity was unacceptable (accepting that this is considered a resilience/connectivity not capacity issue).
- KCDC/OCB view that from a community perspective Rahui Rd is important as a vehicular connection.
- OCB/KCDC would like to know what a refined bridge crossing would look like, and whether further measures could be explored to reduce heights and improve visual impacts.
- OCB raised subway variants, however KCDC will not support these given flood management risks (these were examined with KCDC during the scoping phase).
- KCDC and OCB requested an understanding and worked up examples of any viable alternatives to the south (noting their 1st priority around Rahui Rd).

Further Options Considered:

The options considered in more detail included the following:

	Otaki E-W (all include a bridge at the 'ramp')					
Option	***Option EW1***	***Option EW2***	***Option EW3***	***Option EW4***	-	-
Description	Pedestrian bridge at Rahui Rd (as consulted preferred)	Improved Road bridge at Rahui Road	Waerenga Rd connection under elevated expressway and at-grade rail crossing	Bridge connection to Waerenga Rd plus pedestrian bridge at Rahui Rd	Expressway elevated over Rahui Road	Waerenga Road link with grade separated rail and expressway
Extent of assessment	Subject to further option refinement to enhance pedestrian cycle bridge (straight approach ramps) followed by MCAT assessment	Subject to further option refinement to reduce bridge heights and grades (8.3m v 10m at scoping phase) followed by MCAT assessment	Option developed followed by MCAT assessment	Option developed followed by MCAT assessment	Option developed, however scale and extent of elevated expressway and retaining walls within Otaki seen as highly significant negative. Dropped from further consideration.	Option developed, however significant technical flaws identified given impacts on the rail geometry. Dropped from further consideration.

Table 3.1 Summary of Options considered at Otaki East-West

Figures 3.1 to 3.6 illustrate the Otaki E-W options considered and assessed as part of the further MCAT process.

Figure 3.1 Illustration of Improved Rahui Rd Pedestrian Cycle Bridge (Option EW1)

The pedestrian bridge option has been refined since the earlier consultation brochure concept to address identified urban design enhancements and feedback from KCDC and OCB. To provide a pedestrian/cycle bridge that aligns with the desired urban design outcomes for the area a more aesthetically pleasing slender bridge structure concept has been developed, together with opening out (straightening) of the approach ramps to align with pedestrian desire lines. This results in additional property impacts relative to a bridge with switchback ramps. In the illustration above it is expected that the end bridge spans would be replaced with earth embankments to better interface with reserve areas. On the east side the bridge could be pulled towards the existing Rahui Road (placing it closer to the old Dairy Factory than a road bridge equivalent).

The maximum bridge height would sit approximately 8.5m above the existing Rahui Rd level. This height has been reduced (was 10m at scoping phase) through further rationalisation of flood design levels, shifting the railway line closer to the expressway and through developing a more slender bridge concept.

Figure 3.2 Plan Illustration of Improved Rahui Rd Vehicular Bridge (Option EW2)

The Rahui Road bridge alignment has been improved since the scoping phase (consulted option) to provide an improved buffer to the old Dairy Factory, and to improve gradients. County Road can be retained as a local access with this option and linked around and under the bridge as illustrated in Figures 3.2 and 3.3.

The maximum bridge height and grades have been reduced to approximately 8.5m and 8% respectively compared to approx 10m and 12.5% at the scoping and consultation phase. This has been achieved by shifting the railway closer to the expressway, refining flood freeboard levels, adopting a more slender curved insitu bridge; and easing of the approach grades which has pulled down the elevation of the crest curve.

Figure 3.3 Perspective Illustration of Improved Rahui Rd Vehicular Bridge (Option EW2)

Figure 3.4 Plan Illustration of Waerenga Rd Vehicular linkage (Option EW3 and EW4)

The at-grade Waerenga Rd option (expressway elevated – Figure 3.5) re-creates an at-grade railway crossing (at a location where KiwiRail will have a switching line for the station and future double tracking) and elevates the expressway to approximately 6m above existing ground levels. The expressway is also shifted further to the east with the Waerenga Rd link depressed approximately 1.5m below ground level. The railway alignment is also shifted further to the east to achieve acceptable stacking lengths on the rail crossing approach. For the purposes of assessment it was agreed (with NZTA and KCDC) that a pedestrian/cycle linkage would also be required at Rahui Rd to meet existing and future pedestrian desire lines.

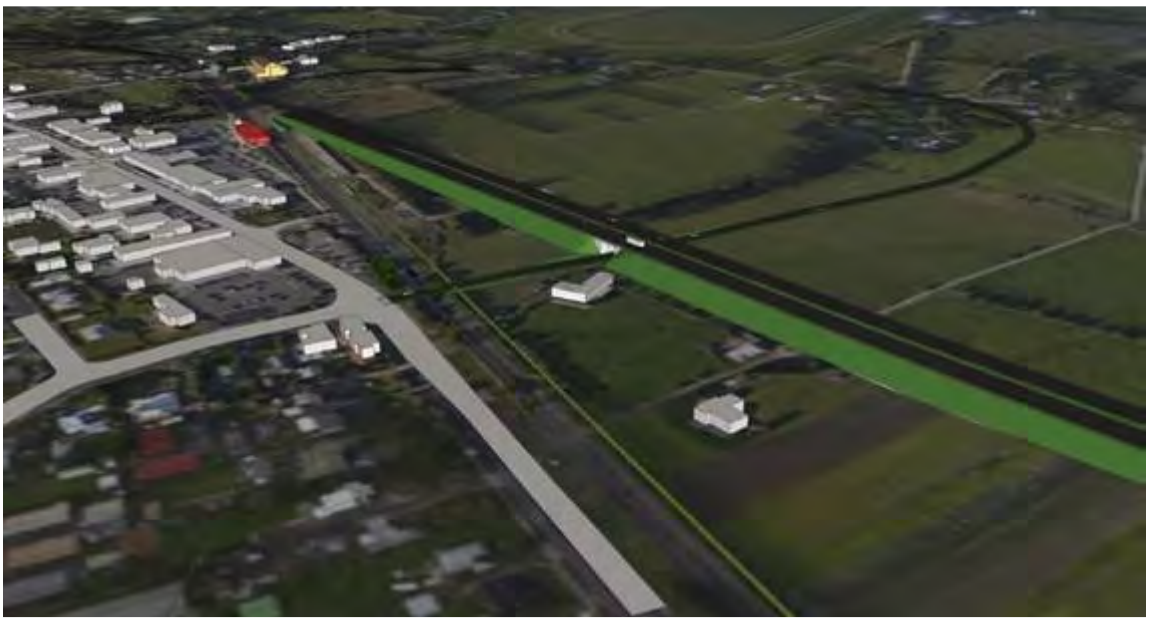


Figure 3.5 Perspective Illustration of Waerenga Rd At-grade Vehicular Link (Option EW3)

The Waerenga Rd bridge option (Figure 3.6) was proposed by KCDC as an alternative to the at-grade option with the view to eliminating an undesirable at-grade railway crossing. In order to minimise residential property impacts on the west side of the local arterial the only pragmatic option is to utilise part of the New World car park on which to land the western abutment and spans of the bridge. This option presents a high cost and high visual impact option. As with the at-grade option it was agreed (with NZTA and KCDC) that a

pedestrian/cycle linkage would also be required at Rahui Rd to meet existing and future pedestrian desire lines.

Figure 3.6 Perspective Illustration of Waerenga Rd Vehicular Bridge (Option EW4)

3.1.2 Old Hautere Road

Introduction:

At Old Hautere Road the as-consulted option proposed a cul-de-sac on the basis of earlier feedback from local residents around the willingness to travel the additional detour length and due to concerns around anti social driver behaviour (boy racers).

Feedback from the local community, OCB and KCDC highlighted the need to consider further options to enhance or retain connectivity.

Key Consultation Feedback/Issues:

The key issues and feedback from consultation included:

- Loss of connectivity relative to the existing situation i.e. lack of support for a cul-de-sac option (It is noted that the 2009 KCDC submission did not raise any concern relating to Old Hautere Rd given that a local link to Otaki Gorge Rd was included).
- Concerns regarding emergency access.
- Local community submissions were split with greater than 50% supporting a cul-de-sac, while the remainder would like a form of linkage.

Further Options Considered:

The options considered in more detail included the following:

	Old Hautere Rd			
Option	***Option OH1***	***Option OH2***	***Option OH3***	-
Description	Cul-de-sac (as consulted option)	Grade separated bridge connection	At-grade link to Otaki Gorge Rd	At-grade link south to School Road link at Te Horo
Extent of assessment	MCAT assessment	Option developed (and variants identified)	Option developed followed by MCAT	Option developed but not supported by KCDC given creation of parallel loop to the south and reduced

		followed by MCAT assessment	assessment	connectivity relative to other options. Dropped from further consideration.

Table 3.2 Summary of Options considered at Old Hautere Road

Figures 3.7 to 3.10 illustrate the Old Hautere Road options considered and assessed as part of the further MCAT process.

Figure 3.7 Plan Illustration of Grade Separated Old Hautere Rd option (Option OH2)

The grade separated Old Hautere Road option (Figure 3.7 and 3.9) provides a local road bridge connection across the expressway, railway, and local arterial to provide a direct connection to the local arterial. Because the expressway is depressed over this part of the route (see Figure 3.12 below) the local grade separation dictates that a bridge rather than subway is adopted. Given the width of the rail reserve at this location a long structure is required, sitting approximately 7 to 8m above the local arterial. The option has local impacts on newly affected properties. Variants to that shown have included shifting the bridge approximately 30m through to 150m to the south to increase the offset to remaining buildings on the East, together with a variant proposed by KCDC that raised the local arterial to meet the bridge connection (Figure 3.11 below). The assessments completed were cognisant of these variants.

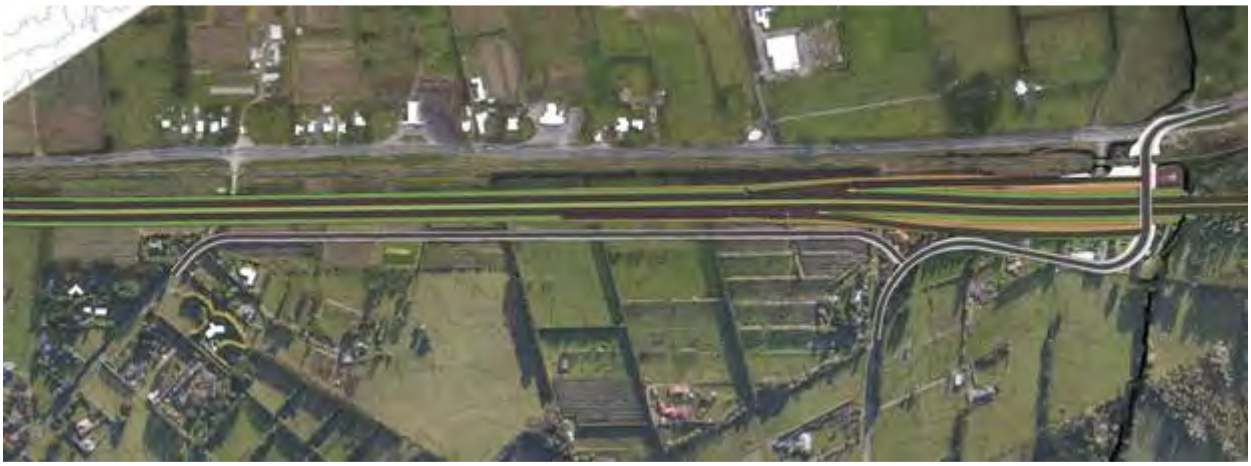


Figure 3.8 Plan Illustration of At-Grade Old Hautere Rd option (Option OH3)

The at-grade link (Option OH3 in Figure 3.8) provides a parallel link back to Otaki Gorge Rd in a similar way to the 2009 scheme proposal. Further optimisation of the expressway alignment allows the linkage to be retained closer to the rail corridor than illustrated in Fig 3.8 above. Given that the expressway is depressed past this linkage (approximately 4m below ground midway along the link) visibility of the expressway from the local arterial and linkage will be limited and offers the opportunity for bunding/screening (Figure 3.12).

It is assumed that the at-grade option will provide a pedestrian/cycle path adjacent and on the west side of the link road to provide for these movements to and from Otaki.

Local residents have cited concerns regarding vehicle speeds and behaviours in this area, so any option will require consideration of this. With the at-grade option there may be opportunity to consider speed control devices to control traffic and speed on the straight between Old Hautere Rd and Otaki Gorge Rd. Examples are included in figure 3.13 below.

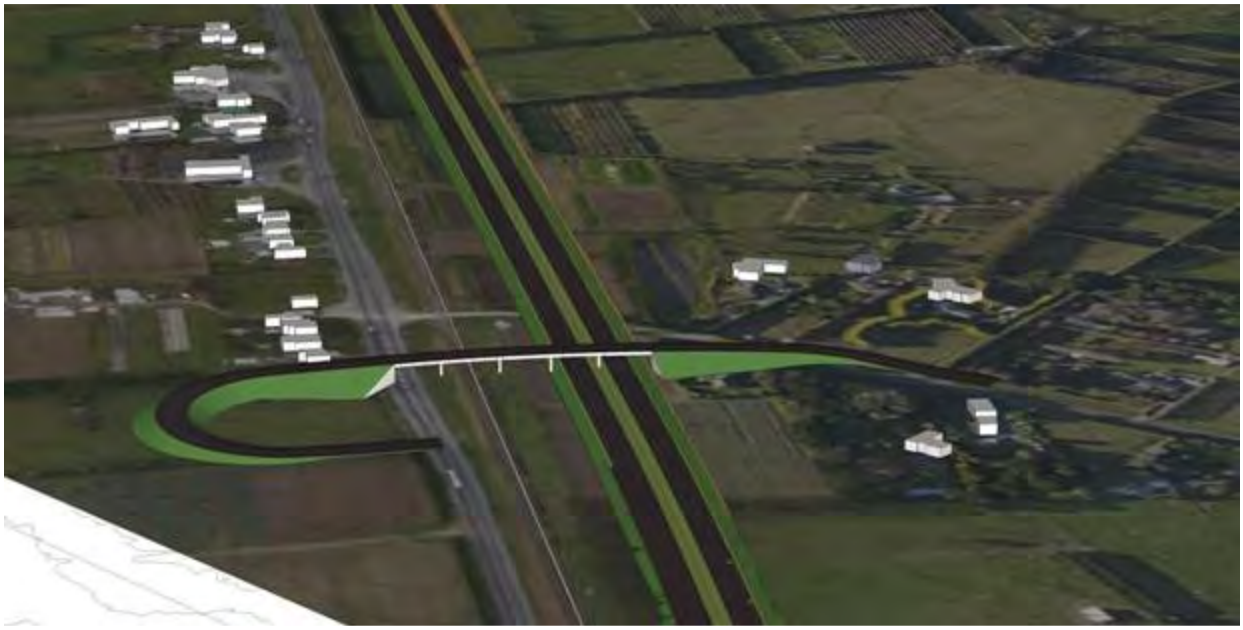


Figure 3.9 Perspective Illustration of Grade Separated Old Hautere Rd option (Option OH2)

Figure 3.10 Perspective Illustration of At-Grade Old Hautere Rd option (Option OH3)

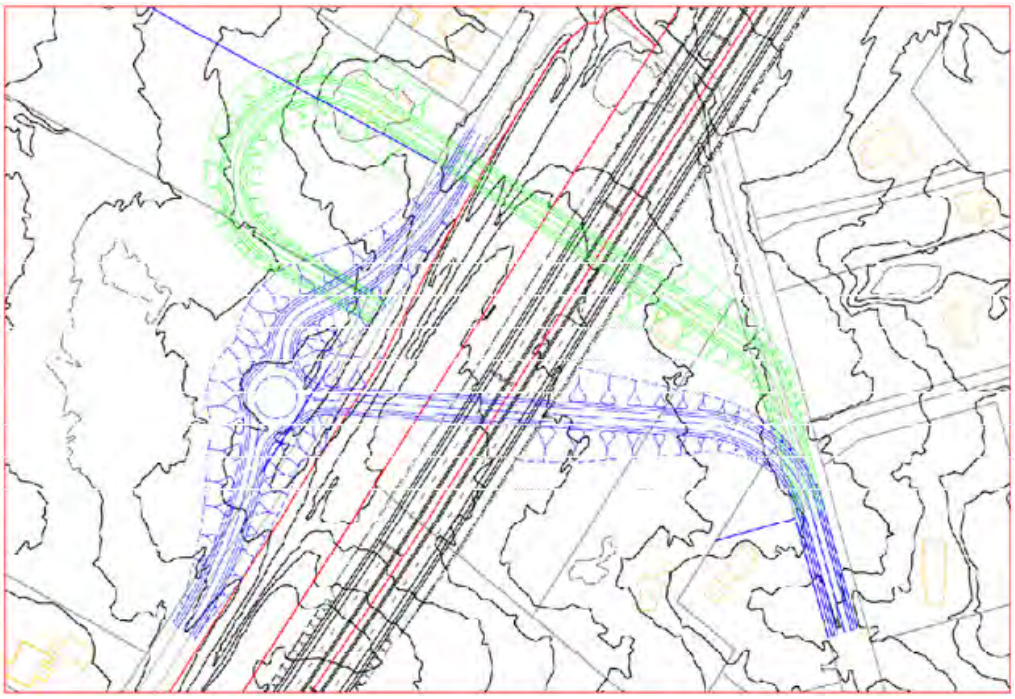


Figure 3.11 Plan Illustration of KCDC Alternative Grade Separated Old Hautere Rd option

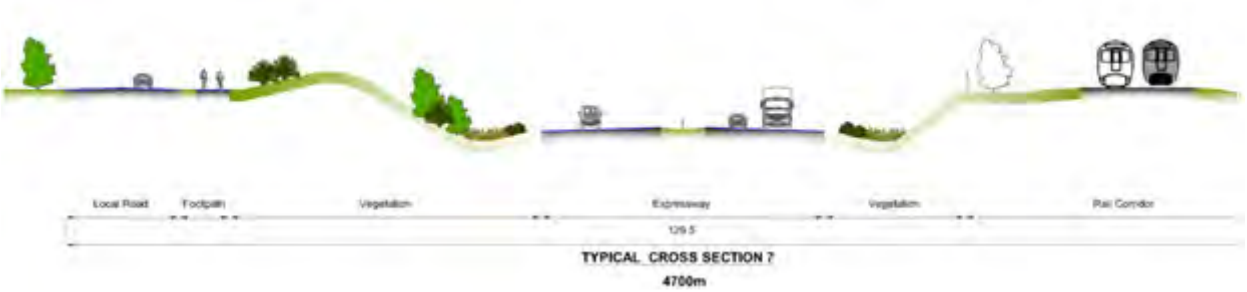


Figure 3.12 Section Illustration of depressed expressway midway along the at-grade link option

Figure 3.13 Traffic calming examples

3.1.3 Te Horo Options

Introduction:

Two options were taken forward to public consultation in February 2011. This included a preferred proposal (Proposal A) providing a local connection over the expressway at School Road just to the south of the Red Café, and Proposal B (the 2009 option) providing a local connection over the expressway just to the north of Te Horo Beach Road.

Key Consultation Feedback/Issues:

The key issues and feedback from consultation included:

- KCDC and OCB support and stated preference for Proposal B, rather than Proposal A.
- The majority of submissions favoured Proposal B given the proximity of visual and residential/business impacts of Proposal A.
- Primary reason for this feedback is the proximity of the elevated structure and embankment effects in relation to local residences and the Red Cafe.

Options Considered:

An extensive array of options was considered during the scoping phase and no new alternatives were identified as part of the further scheme investigation. Further assessment has focused on more detailed flood assessment and modelling together with consideration of the earlier MCAT outcomes in light of the consultation feedback. The options re-considered in more detail included the following:

	Te Horo	
Option	***Proposal A***	***Proposal B***
Description	Local bridge over expressway at School Road	Local bridge over expressway Nth of Te Horo Beach Road
Extent of assessment	MCAT Re-assessment based on consultation feedback	Further detailed flood assessment followed by MCAT Re-assessment

Table 3.3 Options Considered at Te Horo

Figures 3.14 and 3.15 illustrate the Te Horo options considered and assessed as part of the further MCAT process.

Figure 3.14 Te Horo Proposal A

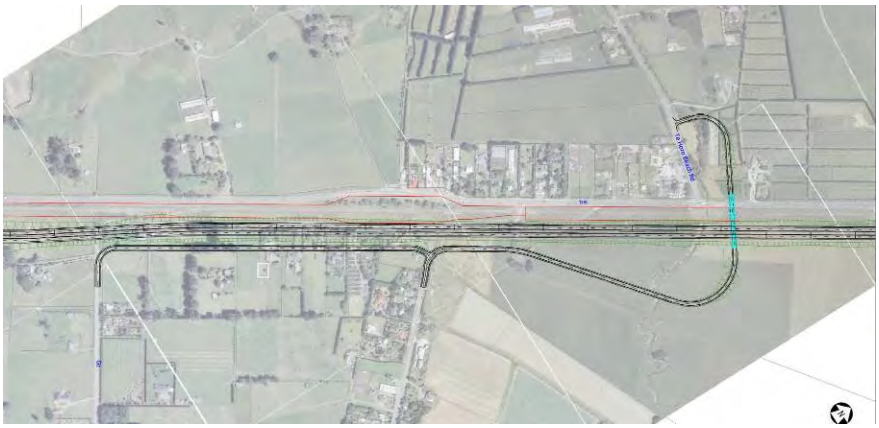


Figure 3.15 Te Horo Proposal B

3.1.4 Mary Crest Options

Introduction:

Specific consultation feedback was not sought on the Board preferred alignment at Mary Crest, however baseline ecological surveys completed following the scoping phase identified an area of regionally significant bush remnant with tree specimens up to 200-300 years old (Kahikatea trees) that are not abundant on the Kapiti Coast.

Through the consultation process feedback from local Iwi and the heritage and cultural advisors identified areas of potential heritage and cultural significance in the dunescape at Mary Crest associated with the former Te Horo Pa (a papa kaianga, or village) which is likely to be dispersed in nature.

Feedback from the above, together with submissions from OCB and KCDC highlighted the need to consider further alignment options to explore ways of mitigating or avoiding these potential impacts.

Key Consultation Feedback/Issues:

The key issues and feedback from consultation included:

- Regionally significant stands of native bush remnant (200-300yr old tree specimens) identified in 2011 baseline survey and were raised in the KCDC and OCB submission.
- Potential sites of cultural significance within southern dunes.

Further Options Considered:

The options considered in more detail included the following:

	Mary Crest		
Option	West 1	West 2	East
Description	As consulted alignment passing through Mary Crest & eastern bush remnant	Modified western alignment avoiding bush remnants	Alignment crossing to the East, south of the Mary Crest dunes
Extent of assessment	MCAT assessment	Option developed followed by	Option developed followed by

		MCAT assessment	MCAT assessment

Table 3.4 Options considered at Mary Crest

Through the scoping and consultation process alternative locations were identified for crossing the rail and local road corridor near Mary Crest. These alignments are indicated in Figure 3.16 below.

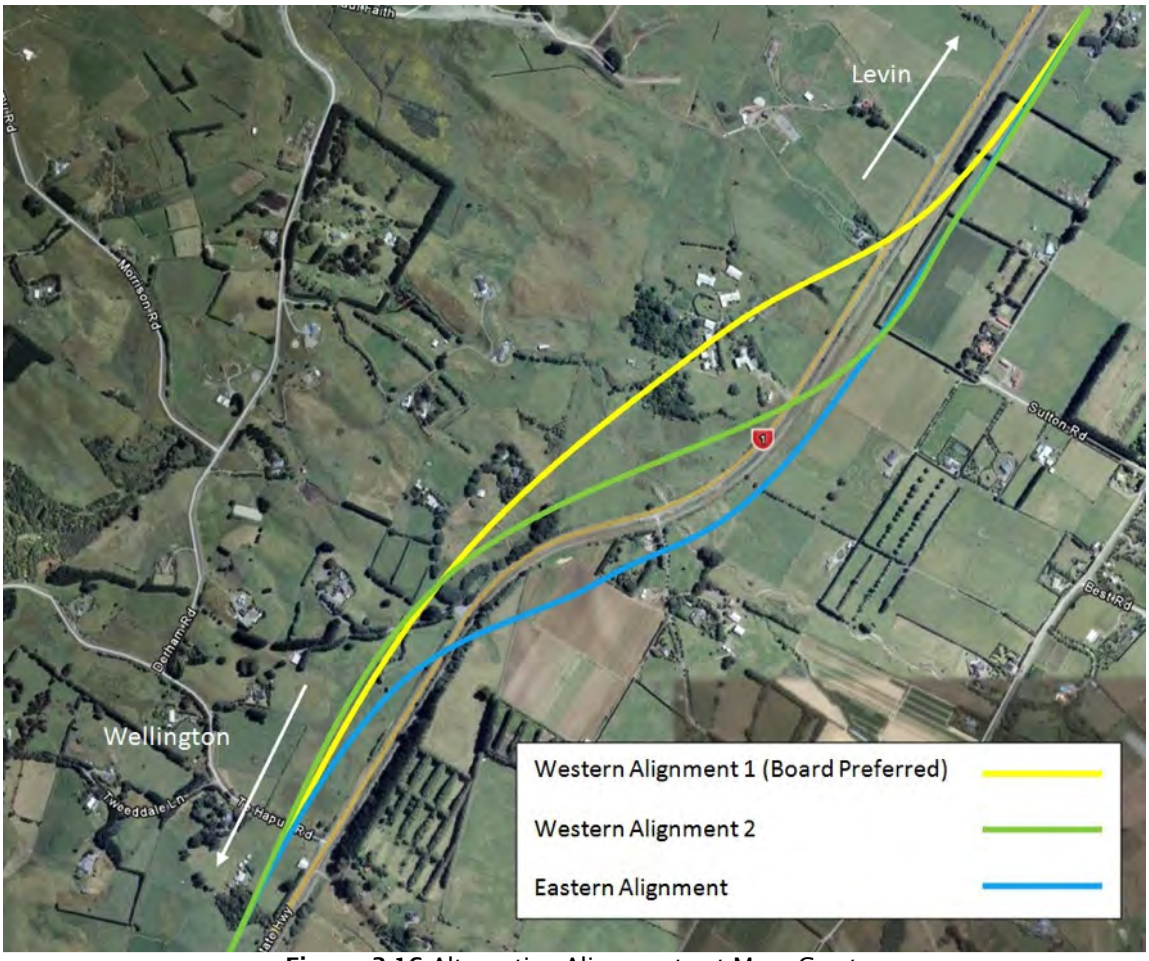


Figure 3.16 Alternative Alignments at Mary Crest

Western alignment 2 (west 2) is a refined version of the original Board Preferred western alignment. This refinement was developed when the importance of the Mary Crest bush remnants was realised (changes to the district plan will be made to classify this bush as regionally significant). The west 2 alignment has reduced radius curves (still meeting the RoNS desirable standards) to allow it to cross SH1 further south than the Western alignment 1. The west 2 alignment and associated local arterial avoids the Mary Crest bush remnants and more of the peat deposits further to the west. The west 2 alignment also impacts on less dwellings, and fewer dunes than the Board Preferred alignment.

The eastern crossing location makes use of the existing plateau (former sea cliffs) on the eastern side of the North Island Main Trunk Line (NIMTL) to create a natural embankment for the northern approach of the overbridge. The crossing occurs approximately 300m North of Te Hapua Road. The expressway then utilises the natural topography for the northern approach ramp and re-joins the Board Preferred option just to the north of Mary Crest. The location of the crossing south of the dunes leads to a localised high embankment to the south (up to approximately 15m above the adjacent low ground).

The eastern alternative avoids most of the anticipated peat areas on the western side of the NIMTL and also avoids the Mary Crest bush remnants. The alternative would not affect as many dwellings as the Board Preferred Option (west 1) and would avoid the equestrian centres at Mary Crest. The alternative also allows a larger portion of the existing SH1 to be used as a local road.

A crossing point even further to the south than the one in Figure 3.16 was investigated (refer to section 12.4 of the 2011 Scoping Report) however crossings further south have raised the following issues;

- Cutting through areas of regionally significant native bush.
- Crossing of more deeply incised natural drainage channels.
- It would complicate the proposed Peka Peka interchange and the connection to Hadfield Road, increasing cost.
- Property accesses would be required either under or over the expressway to gain access to the local road.

Figures 3.17 to 3.19 below illustrate the Mary Crest options developed and assessed as part of the further MCAT process.

Figure 3.17 West1 Option at Mary Crest (as consulted)

Figure 3.18 Eastern Option at Mary Crest

Figure 3.19 West2 (Improved) Option at Mary Crest

4. Engineering Feasibility Assessment and Property Affects

4.1.1 Otaki East-West Connectivity Options

Each of the four alternatives for providing east-west connectivity in Otaki involve bridge structures. EW1 and EW2 involve bridge structures at Rahui Road, while EW3 and EW4 also involve bridge structures further to the south to connect into the existing SH1 opposite Waerenga Road.

Option EW1 involves a pedestrian bridge structure which resulted in a bridge with grades of approximately 8%. The bridge would have straight approach ramps which would have earth embankments at either end to better integrate with the surrounding areas. The bridge would still require 6m clearance from the expressway. The structure would be long and slender and have approximately four spans. EW1 involves an upgrade of County Road and the intersection of County Road with the existing SH1 as it becomes the main access to the race course. In plan, a tapered bridge deck has been adopted to provide the right architectural balance.

Option EW2 involves a road bridge structure at Rahui Road with approach grades of approximately 8%. The bridge structure assumed has opted for integral pier-deck connections rather than separate pier heads to provide a more robust low maintenance structure in addition to being slender in appearance (critical at this location). A curved outer edge of the bridge cross section will also assist in achieving the desired architectural outcome at this location. The bridge will provide for a combined use path plus on road shoulder provision for cyclists. Option EW2 does not include an upgrade to County Road which can be left as a local access except for some minor changes to the intersection with the existing SH1, and Rahui Rd. The bridge will have earth embankments at either end and would have four spans to provide a more open appearance and opportunity for the County Rd connection and greenspace (on the west side) to connect under the bridge. A pier in the central reserve will be required at this location in order to achieve workable approach grades and the desired aesthetic outcome.

Flood assessment modelling has been completed for option EW2 and provided an overflow path is retained to the south the localised flooding effects are readily mitigated. The existing Mangapouri Stream 'throttle' will be retained on the upstream side of the expressway to safeguard the downstream Otaki town centre from flooding.

Option EW3 involves an at grade link to the existing SH1 adjacent to Waerenga Road together with a pedestrian bridge at Rahui Road. The second link to the south involves an extension to Te Roto Road, which the expressway will bridge over, before connecting into the existing SH1 via an at-grade rail crossing. The expressway will require elevating to approximately 6m above ground level while providing for a 4.9m local access clearance (the local access would be depressed by up to 1.5m below adjacent ground level). The at-grade rail crossing introduces significant issues with regards to safety and efficiency, especially when consideration is given to KiwiRail's need for a switching loop at the station and potential future double tracking. KiwiRail have identified operational and safety concerns with this option and a strong preference for Option EW2 to eliminate the crossing.

Option EW4 connects into Waerenga Road via a substantial bridge crossing of the expressway, NIMTL and existing SH. The link connects into the intersection of Waerenga and Dunstan Streets adjacent to the New World car park. This overbridge is approximately 140m long and has significant cost implications due to its scale and the need to cross three transport corridors. The proximity and of intersections on the western side and detour leg onto the existing SH1 are also seen as less than desirable.

4.1.2 Old Hautere

Of the three options for Old Hautere only one involves a bridge structure while the other two involve at-grade solutions. Option OH1 involves the construction of a simple turn-around area in order to 'dead-end' Old Hautere Road. This may have some small impacts on the adjacent properties however these would be less than minor.

Option OH2 requires a structure crossing the expressway, NIMTL and existing SH1. The bridge would be approximately 8m high and 120m long (a requirement for 5.5m clearance to the railway, and 6m on the local arterial). The bridge will launch from the end of Old Hautere Road impacting on property on the southern side of Old Hautere Rd. The embankments on the eastern and western side of the existing SH1 will also impact on previously unaffected landowners. These embankments could be up to 8m high and are likely to have a significant impact on the local landscape (this being a high point along the overall alignment).

Option OH3 involves a link road connecting Old Hautere to Otaki Gorge Road, approximately 1km long. The link would be at-grade and provide connectivity to the expressway and the existing SH1 via the Otaki Gorge interchange. The at-grade link will have property impacts on properties already affected by the expressway. The at-grade option could raise potential issues/concerns around vehicle speeds due to the long, straight nature of the link. As described in Section 3.1.2 above, there are opportunities to consider and implement traffic calming measures along the link to promote a lower speed environment.

The option identified by KCDC (Figure 3.11) presented several technical concerns that that result in such an option being less than desirable. These included introduction of delays to the main local arterial flows, increase crash risks with an elevated roundabout/intersection, and the extent of elevated earthworks.

4.1.3 Te Horo Alternative

Other than refining expressway and local road levels there has been no significant change to the layouts of either Te Horo Option A or B since the scoping assessment. Further work has been completed on the flooding assessment of the Mangaone and the impact this has on the expressway level through the area. This further work has allowed the freeboard levels to be confirmed and slight level changes to the expressway made.

Proposal B has been selected following public consultation. This option gives a shorter main structure but results in an extra bridge over the Mangaone Stream on the upstream side and a further culvert on the downstream side.

4.1.4 Mary Crest Alternatives

Two alternatives are proposed at Mary Crest, one which crosses to the eastern side of the existing SH1 and NIMTL south of Mary Crest and a revised western proposal which has smaller radii curves.

The eastern alternative takes advantage of the topography on the eastern side of the rail for the northern approach ramp, this means the northern approach will require minimal fill as the existing ground is able to be utilised. The eastern alternative does result in an embankment approximately 15m on the southern embankment. It is believed that the eastern side of the NIMTL consists of much better ground conditions than those on the western side and the alignment would be expected to cross a significantly smaller number of peat deposits given the expected presence of alluvial fan deposits. A new local access road would also need to be formed on the eastern side of the expressway in order to maintain access to severed properties. Future realignment of the NIMTL at Mary Crest would require a new local arterial road to accommodate the rail easing.

The revised western alignment (West 2) has the same bridging requirements as the Board Preferred alignment; however the bridge may be shorter given a reduced skew. The West 2 alignment encounters similar conditions to the West 1 options; however there is a reduction in the area of peat encountered. The West 2 alignment has a modified local arterial which closely follows the expressway alignment through Mary Crest providing property access and replicating the existing SH1. The Mary Crest West 2 alignment reduces the land available between the expressway and the existing NIMTL compared with the West 1 alignment. The West 2 alignment does not preclude the future rail realignment from occurring at this location but will require the rail easing to occur to the east.

A further alternative identified by KiwiRail was considered and a preliminary level to consider whether there was a pragmatic option that allowed the rail easing and expressway to be constructed at the same time. This option is illustrated in Figure 4.1 below. While such an option may be technically feasible it introduces similar issues to the Eastern option with respect to creation of a significant southern approach embankment (approx 14-15m at location A) to achieve grade separation of the rail and expressway. The increased skew and

resulting length (60m longer) of the bridge structure and associated retaining walls would also lead to significant additional cost. Given these factors this basis the option was not considered further.

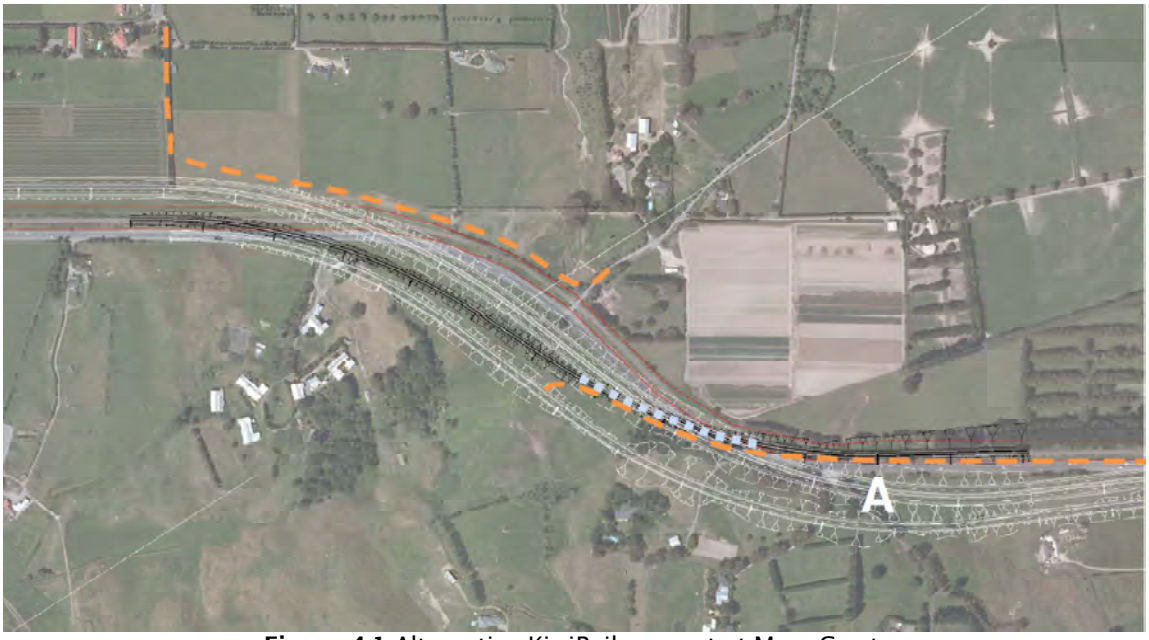


Figure 4.1 Alternative KiwiRail concept at Mary Crest

4.2 Transportation

Further transportation investigation has been completed for the Otaki East-West Connectivity and Old Hautere Road options, which is attached in Appendix A. No further transportation assessment has been undertaken at Te Horo or Mary Crest.

4.2.1 Otaki East - West Connection

Each of the options considered has been modelled in SATURN to assess the associated benefits. The resulting incremental benefit cost ratios are summarised in the following table.

East - West Link Options	Cost Difference	Benefits Difference	Incremental BCR
EW1 - Pedestrian/Cycle bridge at Rahui Rd	Base Option		
EW2 - Road at Rahui Rd	+ $2 M	+ $7 M	3.50
EW3 - Waerenga Rd link under expressway with at-grade rail	+ $11 - 12M	+ $8 M	0.67
EW4 - Waerenga Rd link grade separated (bridge over)	+ $15 - 16 M	+ $8 M	0.50

Table 4.1 – Incremental BCRs for Otaki E-W options

The results show that both EW3 and EW4 have the same amount of benefit over the current preferred option (EW1). EW2 has slightly lower benefits than both EW3 and EW4. However, Option EW2 has a significantly lower cost than both EW3 and EW4 and thus has a far better incremental BCR. Given that the incremental BCR for the Improved Rahui Road Bridge (Option EW2) is greater than one, the BCR is better than the option of providing only a single east-west vehicular connection (Option EW1).

Pedestrian and cycle counts undertaken by KCDC show that approximately 100 users per day currently travel along Rahui Road east of Te Roto Road. It is unknown what proportion of these users continue along Rahui Road and what proportion use County Road. However as a pedestrian/cycle link is proposed across the expressway under all options, there should be little difference between the options.

4.2.2 Old Hautere Road Connection

At Old Hautere Rd existing daily traffic volumes are approximately 300-400 vehicles/day, increasing to approximately 500 vehicles per day by 2026. These volumes are significantly lower than the current approximately 3,000 vehicles a day utilising Rahui Road.

The travel pattern at the existing Old Hautere Rd intersection has approximately 70% of vehicles heading south equating to approximately 17 vehicles/hr (am peak). Of these, only approximately 2 to 3 vehicles/hr are estimated to travel to Te Horo.

Each of the options considered has been modelled in SATURN to calculate the incremental BCR for each option as shown in the table 4.2 below.

Old Hautere Road Connection Options	Cost Difference	Benefits Difference	Incremental BCR
OH1 - Cul-de-sac	Base Option		
OH2 - Grade separated Connection	+ $10 - 11 M	+ $5 M	0.45
OH3 - Link to Otaki Gorge Road	+ $3 - 4 M	+ $5 M	1.25

Table 4.2 Incremental BCRs for options at Old Hautere Rd

The results show that both the grade separated connection (OH2) and the link to Otaki Gorge Road (OH3) both have the same amount of benefit over the cul-de-sac option (OH1). However, the link to Otaki Gorge Road (OH3) has a significantly lower cost than the grade separated connection (OH2) thus achieving a far better BCR. Given that the incremental BCR for the link to Otaki Gorge Road (OH3) is greater than one, the BCR is better than the option of providing only a cul-de-sac (OH1).

4.3 Property

The identified property effects are:

4.3.1 Otaki East-West Connectivity Options

EW1 and EW2 will affect parcels along Rahui and County Roads due to the embankments required for the bridge approaches. An additional property is affected by EW2 due to the realignment of County Road for the approach to the bridge. EW3 affects additional properties due to the Rahui Road Bridge and the extension of Te Roto Road to provide for the Waerenga Link. Option EW4 has the most significant property impacts as it has the same affects as EW3 while also impacting on properties adjacent to Otaki New World.

Proposal	Additional Parcels Affected	Additional Dwellings Affected
EW1 Pedestrian/Cycle Bridge	2	2
EW2 Road Bridge	3	3
EW3 Waerenga Under	5	2
EW4 Waerenga Over	9	4

Table 4.3 Otaki East-West Connectivity Property Effects Comparison

4.3.2 Old Hautere Road

Old Hautere Rd options only affect additional properties with the grade-separated connection. OH1 and OH3 both have increased affects on already affected properties (although OH1's affects are only very minor). OH2 affects previously un-affected properties on the eastern and western side of the existing SH1 where the overbridge's embankments are to be formed.

Proposal	Additional Parcels Affected	Additional Dwellings Affected
OH1 Cul de Sac	0	0
OH2 Grade Separated	2	0
OH3 Otaki Gorge Link	0	0

Table 4.4 Old Hautere Rd Property Effects Comparison

4.3.3 Te Horo Alternative

No change to the earlier scoping phase assessment and property impacts.

4.3.4 Mary Crest Alternatives

A comparison of the property affects of the two alternative options are summarised below in Table 4.5.

Proposal	Additional Parcels Affected	Additional Dwellings Affected
Western Option 1	16	3
Western Option 2	14	1
Eastern Alternative	10	0

Table 4.5 Mary Crest Property Effects Comparison

5. Feasibility Cost Estimation

5.1 General

The estimate produced has generally been prepared and reviewed in accordance with NZTA's 'Cost Estimate Manual' (SM014), bearing in mind the level of preliminary design and investigation undertaken.

5.2 Methodology

The estimate has been prepared using the same parameter rate method as used for the PP20 'Draft' Scoping Report. The parameter rates have been developed based on previous projects of a similar nature. Where quantities have been used, for example earthworks volumes and local access road lengths, these have been measured from CAD drawings or taken from MX design outputs.

In some instances low, medium and high parameter rates have been derived for the same activity to reflect the different nature of the work. For example, a higher rate for temporary traffic management has been used in urban areas and a lower rate in rural areas.

The property costs for the alternatives are based on NZTA supplied Land Valuations for the Wellington Region for the relevant affected parcels.

5.3 Assumptions and Exclusions

5.3.1 General

The following section identifies the assumptions and exclusions used during the estimating process. The estimates have been prepared based on a preliminary feasibility design, available site and general information about the type of construction and the scope of the work.

5.3.2 Assumptions

In forming the estimates a number of assumptions have been made to form a complete estimate.

- NZTA managed costs have allowed for costs associated with the project but managed by the NZTA. No provision has been made for extraordinary circumstances such as High Court appeals etc. An allowance of 1% of the Physical Works costs has been allowed for NZTA managed costs for each phase of the project.

5.3.3 Exclusions

The following items are excluded from the estimates:

- GST
- Escalation beyond the time the estimate was prepared, namely 3rd quarter 2010
- Sunk costs
- Operation and maintenance costs once the project is constructed

5.4 Risk

5.4.1 Quantitative Risk Assessment

For the purposes of this option comparison exercise base estimates have been adopted for input into the MCAT process. Construction risk profiles for the options at each location are similar and a full quantitative risk assessment will be completed for the preferred options as part of the scheme assessment report.

5.5 Outputs

5.5.1 Estimates

The base estimates for the options are summarised below in **Error! Reference source not found.** to 5.4.

Table 5.1 Mary Crest Alignment Estimates

	West 1	West 2	Eastern Alignment
Base Estimate	$67,900,000	$67,000,000	$64,900,000

Table 5.1 Te Horo Option Estimates

	Te Horo Option A	Te Horo Option B
Base Estimate	$17,900,000	$18,900,000

Table 5.2 Otaki East-West Connectivity Options

	EW1	EW2	EW3	EW4
Base Estimate	$6,000,000	$8,400,000	$17,700,000	$21,400,000

Table 5.3 Old Hautere Connectivity Options

	OH1	OH2	OH3
Base Estimate	$50,000	$10,400,000	$3,800,000

5.5.2 Mary Crest Alternatives

The Western 2 Mary Crest alignment is of a similar cost to the Western 1 alignment. The similarity in costs is due to;

- Although the Western 2 alignment generates more cut it also has a greater fill requirement than the west 1 alignment.
- The Western 2 alignment has a shorter length of local arterial to construct to replace the existing SH1 compared with the west 1 alignment.

The Eastern Mary Crest Alternative, when compared with the West 1option is cheaper due to;

- Earthworks – lower quantities of imported fill required due to the topography on the eastern approach.
- Property Costs – due to the lower number of dwellings affected.
- Bridges – due to a smaller deck area and the topography of the approach on the eastern side.

5.5.3 Otaki East-West Connectivity

The Otaki East-West Connectivity options vary significantly, with the main cost differentiators being:

- The additional cost of the road bridge in EW2 compared with an improved pedestrian/cyclist bridge in option EW1
- The additional property required for the Waerenga Link in options EW3 and EW4.
- The cost of the local road, at-grade rail crossing, and overbridge in EW3.
- The cost of the additional property on the western side of the NIMTL, the embankments and large overbridge structure required to cross the expressway, NIMTL, and existing SH1 in EW4.

5.5.4 Old Hautere Rd Connectivity

The Old Hautere estimates indicate the differing scale of the three options. The main cost differences between the options are;

- OH1 has a negligible cost as it involves only the construction of a turn-around area.
- The property, approach embankments and structure costs of OH2.
- The property and link road construction costs of OH3.

5.6 Cost Sensitivity Considerations

5.6.1 Peat Depths at Mary Crest

Peat maps in conjunction with available field data along the western alignment were used to determine the amount of peat areas the alternative alignments traverse.

The estimates of the peat volumes for each of the three Mary Crest options are shown below in Table 5.4.

Alignment	Estimated Peat Volume
Western 1Aignment	67,000m^3
Western 2 Alignment	54,000m^3
Eastern Alignment	45,000m^3

Table 5.4 Mary Crest Alignments Estimated Peat Volumes

As expected the eastern option encounters a lower volume of peat then either of the Western options.

The extent of the peat influences the option cost significantly, this is due to the depth of the peat encountered. The assumed construction methodology is to excavate the peat and backfill with a suitable material. The volume of peat encountered on the eastern side compared with the western is a significant contributor to the cost savings of the eastern option.

5.6.2 Other Variables

There are a number of variables that will affect the cost differential between the options. These aspects may increase or reduce the cost differential but will not influence which option is the most cost effective.

These variables include:

Earthworks Rates
The rate of imported fill could potentially vary considerably depending on the source of material. Any variance in these rates would have a large impact on the cost differential. As part of the scheme assessment phase of the project this will be investigated further enabling a more robust rate and better understanding of risk to be developed.

Ground Conditions
In addition to peat material the subgrade suitability may be different between the options (due to varying ground conditions). Any variability in this respect is likely to have a minimal effect on the cost comparison at an option level.

6. Specialist Assessment

6.1 Introduction

This section summarises (at a high level) the views of the relevant specialists on the options assessed. While all specialists assessed the options, general comments that apply to all options have not been provided and only commentary that influences the decision making process is included. This does not therefore provide an assessment of effects for each option, as this will be undertaken during the Scheme Assessment process for the preferred option.

The rating assessment adopted by the specialists and team are those documented in section 11.2 of the 2011 Scoping Report and as summarised below.

Rating	Explanation / Thresholds
+3 Highly Significant Positive	Of *significant* local, regional or national benefit
+2 Moderate Positive	Of local and/or regional benefit
+1 Minor	Of local benefit only
0 Neutral	No or negligible effects
-1 Minor	Of a local impact only – easily mitigated
-2 Moderate Negative	Moderate negative local and/or regional negative effects that can be mitigated
-3 Highly Significant	Of local, regional or national negative *significance*. Very difficult to mitigate.
FATAL FLAW (FF)	Will *stop* the project – of such national/regional/local significance, or technical constraint that it cannot be mitigated or consented.

6.2 Mary Crest

6.2.1 Transport Outcomes

6.2.1.1 Road User Safety

The West 1 and alternative Mary Crest alignments are all assessed as neutral in that they provide minor improvements over the short length of consideration. However, it is noted that the eastern alternative actually removes a rail crossing servicing a small number of properties, which could be considered a minor positive effect.

6.2.2 Social and Environmental Results

A short summary paragraph of key findings for each assessment is provided below.

6.2.2.1 Terrestrial ecology

There is a significant difference in effects between the Mary Crest options. The as-consulted Western 1 alignment was rated as a highly significant negative due to potential loss and fragmentation of an area of wetland and forest habitat potentially including some of the largest kahikatea in the District, possibly considered to be regionally significant. It may be possible to avoid some of the largest tree specimens with further design; however the values of this habitat will still be significantly compromised. The Western 2 alignment was rated as a moderate negative due to proximity of the historic bush remnants and a potential wetland area (although far less impact than the West 1 alignment given that the bush remnants can be avoided). The Eastern Alternative rated as neutral with no significant effects expected.

6.2.2.2 Landscape and Visual

The Mary Crest West 1 alignment rated as a significant negative due to large areas of cut and fill that would not follow the natural topography. The West 2 was rated as a moderate negative as the impacts were deemed to be less than the West 1 alignment given the route does not cut through the dunes to the same degree as the West 1 alignment. The Mary Crest Eastern Alternative rated as a moderate negative as cut and fill is still required, but with lower volumes and the bridge structure better utilises existing topography therefore having a lower overall visual impact. While the eastern alternative requires a 15m high approach embankment to the south, it is of a similar height to old sea cliff remnants to the east.

6.2.2.3 Urban Design

The Mary Crest West 1 alignment was rated as a minor negative effect due to creation of residual spaces between corridors, large cut and fill volumes and deviation from natural topography. The West 2 alignment was rated a minor negative effect for the same reasons as the West 1 alignment. The Mary Crest Eastern Alternative option rated as a neutral effect due to maintenance of existing access, better utilisation of topography and minimisation of residual spaces.

6.2.2.4 Archaeology, heritage and cultural

The Mary Crest West 1 alignment was rated as a moderate negative effect due to the impacts on the hill dune area from Te Hapua Road north toward Mary Crest as a focus of pre European / mid 19th century Maori occupation. This includes a possible pa site between Mary Crest and Te Hapua Road on the higher hills (western side of existing road), plus possible burial sites. The area behind Mary Crest (to the west) is considered waahi tapu (spiritually or culturally important). More information on this is required from tangata whenua as to the exact location and extent. The West 2 alignment was also rated as a moderate negative effect for the same reasons and the West 1 alignment.

The Mary Crest Alternative rated as neutral as the alignment largely avoids the area and effects noted above.

6.2.2.5 Rural land use

The Mary Crest West 1 and West 2 alignments rated as a minor negative effect due to the alignments cutting through what appears to be productive rural properties. The Mary Crest Eastern alignment rated as a moderate negative due to the alignment cutting through what appears to be a working productive unit. Note this rating was changed from minor negative to moderate negative in the workshop as the option was noted to impact on winery and horticultural units.

6.2.3 Economic Value

6.2.3.1 Capital Investment

The capital investment rating was based on the following relative cost premiums against the base option of the West1 option. Refer to Section 5 for discussion around the capital investment implications of each alternative.

Rating	Interchange Options Cost Difference
+ Highly Significant Positive	- >$10M (cost reduction)
+ Moderate Positive	- $2-10M
+ Minor Positive	- $1-2M
Neutral	± $1M
- Minor Negative	+ $1-2M
- Moderate Negative	+ $2-10M
- Highly Significant Negative	+ >$10M (cost increase)

Option West1 and West2 were rated as neutral in that they have similar estimated costs. However the Eastern option was rated as a minor positive given estimated savings over the western options.

6.2.3.2 Achieving RMA Approval

The Mary Crest West 1 alignment is a moderate negative due to the issues relating to terrestrial ecology and heritage with the Mary Crest bush remnants. The West 2 alignment is also considered a moderate negative; however some of its effects are able to be mitigated to a further extent than those in the West 1 alignment (e.g. avoidance of the bush remnants and reduction in impact at the dunes). The eastern alternative is neutral as the effects identified are able to be mitigated.

6.3 Te Horo

The MCAT assessment completed as part of the scoping phase remains valid following a further review of the ratings by specialists. These ratings are summarised in Section 11.3 of the Scoping Report.

6.4 Old Hautere Road

6.4.1 Transport Outcomes

6.4.1.1 Road User Safety

OH1 was rated as a minor positive as it removes the at-grade rail crossing, however it has less benefit than OH2 and OH3 because of the further detour required. OH2 and OH3 were rated as moderate positives due to the removal of the at-grade rail crossing and the relative short detour length introduced. All three options would also have a dedicated cycle facility.

6.4.1.2 Traffic Level of Service

OH1 was rated as a moderate negative because of the detour for traffic and residents on Old Hautere Road to get to the existing SH1 or the expressway. OH2 was rated as a moderate positive because of the improvements in traffic connectivity to and from the existing SH1 and the expressway. OH3 was rated as a minor positive instead of a moderate positive due to the additional detour for southbound trips using the local arterial.

6.4.1.3 Integration with Other Modes

OH1 was rated as a minor negative as it provides no additional linkage or connectivity between other modes of transport. OH2 was rated as a moderate positive as it provides a direct linkage to the existing SH1 for other modes. OH3 was assessed as a minor positive as it provides a more convoluted linkage for the other modes in the southerly direction.

6.4.2 Social Outcomes

A short summary paragraph of key findings for each assessment is provided below.

6.4.2.1 Severance

OH1 was rated as a minor negative as it removes the existing link onto SH1 and results in local residents (at the cul-de-sac end) travelling approximately 7km to access SH1. OH2 is rated as a minor positive as it retains the existing link onto SH1, and will improve safety of access by providing a grade-separated overbridge. OH3 is rated as neutral as it severs the existing link onto SH1 but provides a direct route onto SH1 and the expressway to the north, it does introduce a detour of approximately 1.9km to travel south on the local arterial, however this is expected to affect a relatively small number of movements. Option OH3 may also improve the safety of access by providing a grade-separated overbridge.

6.4.2.2 Support for Current and Future Land Use

OH1 was rated as neutral as it supports focus on existing Otaki urban areas as places for future population and employment growth. OH2 was rated as a minor negative because the road bridge embankments will create

a loss of land. OH3 was rated as a moderate negative due to the additional amount of horticultural land affected.

6.4.2.3 Disturbance to Community during Construction

OH1 was rated as neutral as there are no construction impacts outside of the Expressway construction. OH2 was rated as a moderate negative due to the localised construction impacts directly around the overbridge and the potential for impacts on the existing SH1 and the NIMTL. Option OH3 was rated as a minor negative due to localised construction impacts for the properties directly around the new road connection.

6.4.3 Environmental Outcomes

6.4.3.1 Urban Form

OH1 was rated as a minor negative due to the reduced integrated connectivity with other rural roads and the small number of residences affected. OH2 was rated as a moderate negative due to the impact of the large bridge structure in the rural environment, the large footprint and the reduction in amenity value of adjacent residents. OH3 was rated as a minor negative due to due to the increase in the overall corridor footprint with the addition of the link road to Otaki Gorge Road.

6.4.3.2 Landscape and Visual

Option OH1 was rated as neutral because of minimal impact on landscape features. OH2 was rated as a moderate negative because of the removal of shelterbelt and the introduction of a large bridge structure to a rural environment. However, the OH2 visual effects could be mitigated by planting and use of spill through embankments. OH3 was rated as a minor negative as the local road is being introduced into a landscape already dominated by existing road and railway.

6.4.4 Economic Value

6.4.4.1 Capital Investment

The capital investment rating is based on the same scale described in Section 6.2.3 above. Options have been compared against the base option of OH1.

Option OH2 was rated as highly significant negative given increased costs of greater than $10M, while option OH3 was rated as a moderate negative. Refer to Section 5 for discussion around the option estimates.

6.5 Otaki E-W Connection

6.5.1 Transport Outcomes

6.5.1.1 Road User Safety

EW1 was rated as a moderate positive due to the removal of the Rahui Road at-grade rail crossing and the improvements to the existing SH1/County Road intersection. EW2 was rated as a highly significant positive due to the removal of the at grade crossing and maintenance of the existing Rahui Road link, hence eliminating the need for the majority of the traffic to use the SH1/County Road intersection. EW3 was rated as a minor positive due to the removal of the Rahui Road at-grade crossing; however this option includes a new rail crossing at Waerenga Road. EW4 was rated as a moderate positive due to the removal of the at-grade rail crossing and the grade-separated crossing of Waerenga Road.

6.5.1.2 Traffic Level of Service

EW1 was rated as a minor negative due to the removal of the Rahui Road Link and the detouring of traffic from east Otaki on County Road and up to the existing SH1/County Road intersection. EW2 was rated as a moderate positive due to the retention of the existing Rahui Road linkage and the improvements in traffic flow gained from the removal of traffic from the existing SH1 onto the expressway. EW3 was also rated as a moderate

positive as from a modelling perspective the alternative route along Waerenga Road attracts more traffic and hence benefit. EW4 was rated as a minor positive given the closely spaced intersections on the western connection to the local network.

6.5.1.3 Integration with Other Modes

Options EW1 and EW2 were rated as minor positives as they both provided a grade separated link of the rail corridor for both pedestrians and cyclists, however option EW2 results in a slightly better outcome for school buses and other services using the existing Rahui Road vehicle link. While EW3 and EW4 were given a greater positive (+2) due to the fact that they both provide greater connectivity for pedestrians/cycles through the provision of the Rahui Road pedestrian/cycle bridge as well as a new east / west connection for Otaki south of the current railway precinct, which could be utilised by pedestrians, cyclists and buses. Although EW3 has the advantage of being at grade and more accessible, it has the disadvantage of being the only option to retain an at grade rail crossing and the associated potential safety issues.

6.5.2 Social Outcomes

A short summary paragraph of key findings for each assessment is provided below.

6.5.2.1 Severance

Option EW1 severs the direct vehicle link between east and west Otaki, however when combined with the County Road upgrade this link is still provided, albeit convoluted. EW1 maintains pedestrian/cyclist access with the bridge in place of the former Rahui Road rail crossing and with a reduction in traffic volumes on the former SH1 may improve the safety of east-west trips. EW1 provides an opportunity for improved pedestrian/cyclist access to the railway station. EW1 was rated as a minor negative due to the loss of vehicle connectivity across Rahui Road.

EW2 maintains pedestrian/cyclist and vehicle access between east and west Otaki along the existing Rahui Road route. EW2 has the same improvements to the safety of east west trips as EW1 due to the reduction in traffic volumes on the former SH1 and also provides opportunity for improved pedestrian/cyclist access to the railway station. EW2 is rated as a minor positive due to the improvement in east-west connectivity across Rahui Road due to the removal of the rail crossing.

EW3 and EW3 include the same effects as EW1, but also provide an additional east-west link for pedestrians/cyclists (not dedicated) and vehicles. This link is currently not provided. The EW3 and EW4 options were rated as a minor positive.

6.5.2.2 Economic Effects/Business Activity

EW1 has no direct impact on business activity, and as such was rated as neutral. The link between east Otaki, the Otaki Railway Retail Precinct and Otaki Town Centre is maintained via the pedestrian/cyclist bridge and the upgraded County Road.

EW2 has no direct impact on business activity. The link between east Otaki and the Otaki Railway Retail Precinct and Otaki Town Centre is maintained and improved via the Rahui Road bridge. EW2 was seen as a minor positive as it will improve the link the Otaki Retail Area has with East Otaki.

Both EW3 and EW4 have the same effects as EW1 with the Rahui Road pedestrian/cyclist bridge. Both options were seen to take traffic away from the Railway Retail area and as such were rated as minor negatives.

6.5.2.3 Support for Current and Future Land Use

EW1 was rated as neutral as it supports focus on the existing Otaki urban areas as places for future population and employment growth. EW2 was also rated as neutral for the same reason as EW1 as well as it reflecting the existing street pattern.

EW3 and EW4 will have the same effects as EW1 as well as having the potential to open up an area currently zoned rural along Te Roto Road which is not consistent with the KCDC district plan. EW3 and EW4 will also impact on existing land around New World. Options EW3 and EW4 were rated as moderate negative.

6.5.2.4 Recreational Activity

EW1 provides access for race day traffic to the Otaki Maori Racing Club via an upgraded County Road. This represents no additional distance for traffic from the north and a detour of approximately 600 metres for

traffic from the south. EW1 was rated as a minor negative due to the reduction in connectivity along Rahui Road. EW2 is rated as neutral as it maintains the current Rahui Road link for race day traffic to the Otaki Maori Racing Club.

EW3 and EW4, in addition to the EW1 effects, provide an additional link for race day traffic to the Otaki Maori Racing Club. As such, both EW3 and EW4 were rated as minor positives.

6.5.3 Environmental Outcomes

6.5.3.1 Urban Form

EW1 was rated as a minor negative as it cuts the existing vehicle connection on Rahui Road whilst introducing a new pedestrian/cyclist structure across the expressway and NIMTL. EW2 was rated as neutral as it reflects existing street patterns but the structure will affect the existing relatively flat environment.

EW3 was rated as neutral as it does not provide a significantly different level to connectivity levels and doesn't impact on the main urban form to the west of the NIMT rail corridor. EW4 was rated as a moderate negative due to impact the new long span bridge will have on the western side of the NIMT, especially the effect the scale of the structure will have on the neighbouring properties.

6.5.3.2 Landscape and Visual

EW1 was rated as a minor negative due to the structure and earth embankments placed within an environment which does not currently include any of these elements. EW2 was also rated as a minor negative for the same reasons as EW1 but will result in a heavier structure and a more constrained view shaft along the expressway route.

EW3 was rated as a moderate negative as it introduce a new, 'greenfield' route requiring the removal of numerous large trees at its eastern end and at the NIMTL crossing. EW4 was rated as a highly significant negative due to the visually heave structure and proposed MSE eastern abutment. The visual affects of the over bridge are not as contained as they are at Rahui Road.

6.5.3.3 Flood Risk

EW1 was rated as neutral as there are no significant embankments required for the crossing, and the crossing does not result in a significant increase in flood risk. EW2 was rated as a minor negative as the approach embankments for the local bridge result in an increased flood risk upstream of expressway due to the loss of flood storage from the embanked overpass at Rahui Road, however this can be mitigated by ensuring overland flows to the south are not constrained.

EW3 was rated as a minor negative due to a portion of the new local link being submerged in a flooding event. EW4 was rated as neutral as raising of the local road eliminated flood risk.

6.5.3.4 Heritage Archaeology

EW1 was rated as a minor negative due to the physical and visual impact on the property on Rahui Road and the structure being adjacent to the old Dairy Factory building. EW2 was rated as a moderate negative due to the proximity impact of the road bridge on the old Dairy Factory by the larger earth embankment adjacent to it. Both EW3 and EW4 have no further effects than those in EW1 and as such are both minor negatives due to the impacts of the pedestrian/cycle bridge at Rahui Road.

6.5.3.5 Noise

EW1 was rated as a minor negative as although the Rahui Road link is pedestrian/cyclist only, traffic is diverted onto an upgraded County Road, increasing the road noise along this route as well as the noise from the expressway. EW2 is also rated as a minor negative due to the noise generated from the expressway. EW3 and EW4 were both rated as moderate negatives due to the greenfields nature of the new links through areas which are currently relatively quiet.

6.5.4 Economic Value

6.5.4.1 Capital Investment

The capital investment rating was based on the following relative cost premiums against the base option of EW1:

Rating	Interchange Options Cost Difference
+ Highly Significant Positive	- >$10M (cost reduction)
+ Moderate Positive	- $2-10M
+ Minor Positive	- $1-2M
Neutral	± $1M
- Minor Negative	+ $1-2M
- Moderate Negative	+ $2-10M
- Highly Significant Negative	+ >$10M (cost increase)

EW1 was rated as neutral (i.e. the base used as a comparison). Option EW2 was rated as a moderate negative given increased costs of between $2-6M. Both options EW3 and EW4 were rated as significant negative given increased costs of greater than $10M. Refer to Section 5 for a summary of the costs.

6.5.4.2 Achieving RMA Approval

Options EW1, EW2 and EW3 were rated as neutral given that all were considered readily consentable. Option EW4 was rated a minor negative given the scale of visual impact associated with option.

7. MCAT Results

7.1 Introduction

The team used the Multi Criteria Analysis Tool (MCAT) created during the scoping stage of the project to assist in the evaluation of the positive and negative effects of each option. Refer to the Peka Peka to Otaki Scoping Report (section 11.2) for a description of how the MCAT was created, its purpose, and its primary and secondary criteria.

7.2 Method

The project team met to review all secondary criteria in the MCAT and together identified those that were considered to be differentiators and those that weren't for each of the focus areas. Differentiators are those criteria where an effects rating between two options is expected to be different. Non-differentiators are those where the rating is expected to be the same for both options. It is acknowledged that removing the non differentiators does not provide a full evaluation of the effects of both options. However as the purpose of this exercise was to identify the differences between the two options, and because the MCAT exercise is used to facilitate decision making (not to make the decision) the exclusion of non differentiators was justified and supported in a review by the planning team.

The primary and secondary criteria included in the MCAT are listed in Table 7.1 (full descriptions are included in Table 11.1 of the Scoping Report). Those that were excluded from this assessment on the basis that their effects are expected to be similar are highlighted in yellow within the MCAT tables in Appendix B and a justification is provided.

For the differentiator topics, the relevant social or environmental specialist completed an assessment of the effects of each option.

The specialists were asked to:

1. Describe any elements of the existing environment not already captured in their scoping report.
2. Assess the broad level of potential positive or negative effects in their particular area of expertise associated with each of the alignment options. The effects assessment was made in terms of considering the effect that each option has against the 'do minimum' option (existing situation).
3. Consider Part II of the Resource Management Act (RMA) in making their assessment.
4. Rate each effect using the MCAT rating table (table 11.2 of the Scoping Report).

These assessments were reviewed and the ratings were input into the MCAT during a workshop with NZTA and KCDC on the 4th May 2011. The outcomes from the MCAT workshop were then shared with key stakeholders at a stakeholder briefing on the 11th May 2011.

Table 7.1 MCAT Criteria

Primary Criteria	Secondary Criteria	Criteria explained
Transport Outcomes	Road user safety	Level of safety provided by option including consideration of emergency response times (includes SH1 expressway and local roads)
	Traffic level of service	Significance of effect on congestion, trip reliability, travel times
	Integration with others modes	Significance of effect on public transport users, cyclist and pedestrian trips
	Strategic fit with RoNS	Significance of fit with RoNS objectives and consistency / integration with neighbouring RoNS projects
	SH / Local Road integration (Otaki Inter-regional access)	Significance on ability to achieve the optimal balance between utilisation of the SH infrastructure; and keeping local trips off the SH.
Social/Community Outcomes	Severance	Significance of effect of physical severance and legibility of options on community connectivity and access to community services.

	Economic effects / business activity	Significance of effect on local economy / business activity particularly as related to KCDC plans / strategies including the Otaki Vision document.
	Support for current and future land use	Significance of effect on support for current and future land use plans - including consideration of strategic growth management, effect on productive land use, and retention of rural character.
	Improve connectivity to key regional services / facilities	Significance of effect on connectivity to key regional services and facilities for both local community and for those in communities north and south of project.
	Recreational activity	Significance of effect on amenities and public areas available for recreation, including access.
	Disturbance to community during construction	Significance of effect on the local community and road users during construction
Environmental Outcomes	Urban Form	Significance of effects on the local urban form and on urban design aspects such as connectivity, context and character, with emphasis on Otaki township and Te Horo and on the Otaki Railway Hub in particular.
	Landscape and Visual	Significance of the effects on the local landscape, being landform, landcover and landuse and the extent of change the project/expressway will bring to these. The extent to which the visual effects of the expressway, its earthworks construction, road form, structures and noise and landscape mitigation measures will impact upon the local community and the travelling public.
	Flood risk	Significance and extent of the effects on flood plain patterns and pathways.
	Heritage/Archaeology	Significance of effects on archaeological sites, identified heritage including buildings, structures and features.
	Iwi / cultural	Significance of the effect on matters of importance to iwi including but not limited to cultural sites.
	Ecology (terrestrial and aquatic)	Significance and extent of the effects on wildlife and habitat and natural processes and systems.
	Water Quality	Significance and extent of effects on surface water resources, and on ground water and underground aquifers.
	Air Quality	Significance and extent of effects on air quality from changes in fuel consumption levels.
	Noise	Significance and extent of effects on noise levels in relation to urban villages, residential and public amenity locations.
Economic Value	Capital investment	Significance of effect on capital required for project implementation (including constructability considerations and property acquisition).

	Whole of life costs	Significance of effect on the whole of life costs of the infrastructure asset.
	Achieving RMA Approval	Significance of effect on ability to achieve RMA approvals i.e. consentability of option.
	Timeliness of project completion	Significance of effect on project completion and hence timeliness of releasing the economic benefits of the project to the community.

Following the MCAT workshop on the 4th May the design team explored further options around Mary Crest and developed and improved Western 2 alignment, with specialists undertaking their assessments following this on the 10th of May 2011 prior to the stakeholder briefing workshop on the 11th May 2011.

The MCAT was used to highlight differences between the options to support the judgement of the team and has not been used as a scoring exercise to provide definitive results.

While the team utilised MCAT outputs as a tool to assist the decision process, applied judgement and the experience of the team have been applied to arrive at a recommendation on which options should be taken forward for further scheme consideration.

Weightings have not been applied to the primary criteria (i.e. all equal), however differing numbers of secondary criteria within each primary criteria does mean that some of the primary criteria are less influenced by individual secondary criteria weightings.

A key point is that the MCAT is being used purely as a tool to assist the decision making process - the tool will not be used to provide definitive scores, or answers, merely to provide a comparison across the various primary and secondary criteria for each option. In viewing the MCAT outcomes it is also important to look back across the relative option differences for each of the primary and secondary criteria before forming a view.

7.3 MCAT Outcomes

7.3.1 Outputs

A graphical "radar plot" was adopted to represent the assessment and screening process outputs for each option as illustrated in Figure 7.1 below.

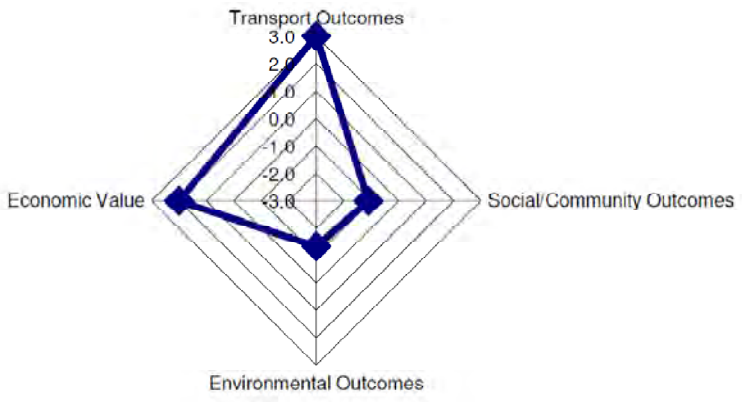


Figure 7.1 Example Radar Diagram

The centre of the radar plot represents the least-desirable outcome, while the outer edge represents the best outcome. The mid-point of each radar arm represents a neutral position. This roughly equates to the existing situation, except in the case of "Economic Value" where the as-consulted option was adopted as the base comparison. Each arm of the radar plot represents one of the primary criteria shown in Table 7.1. The

evaluation process entailed scoring each of the sub-criteria relative to the existing situation. An overall score for the primary criteria was then decided. The primary criteria score was decided based on individual sub-criteria scores and an overall relative view of the option. In the example shown above, the transport outcomes of the option are considered to be "Significant positive" compared to the existing situation. Radar plots provide a ready means of option comparison, with options that enclose a large radar plot area generally considered preferable to options enclosing a small area.

To further assist in the decision process the primary criteria were presented in bar chart form and in a tabular form with the average and comparative scores for each primary criteria.

Refer to Appendix B for a copy of the MCAT summary tables and graphs.

7.3.2 Otaki East-West

Figure 7.2 summarises the resulting MCAT radar plots for the options at Otaki:

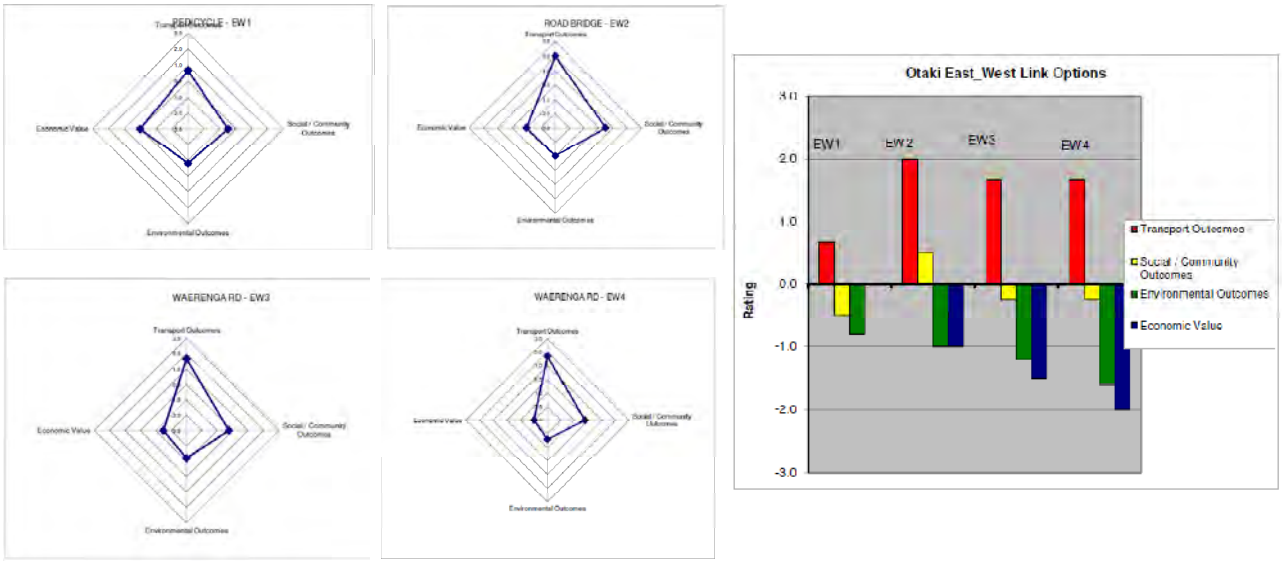


Figure 7.2 MCAT Summary for Otaki E-W Options

Outcomes from Assessment:

- Elevation of the bridge has been optimised to reduce heights from circa 10m to circa 8.5m, with the high point moved closer to the expressway. In addition the embankments have been shifted further from the dairy factory.

- A refined Rahui Road bridge (road, pedestrian and cycle) delivered overall better outcomes across all primary criteria, and the majority of secondary criteria when compared with a Waerenga Rd linkage. Key differentiators are:
  - Transportation – improved level of service and elimination of the existing at-grade rail crossing.
  - Social/Community – reduced severance, consistency with the District Plan and support for current and future land use.
  - Environmental – visual impacts for the Rahui Rd option were assessed as more localised/contained relative to the Waerenga Rd options which would also retain a pedestrian/cycle bridge linkage at Rahui Rd.
  - Cost – Estimated cost differences (construction & property) relative to a pedestrian/cycle bridge at Rahui Rd have been assessed as:
    - EW2 (Rahui Rd Road bridge) = +$2M to $6M (depending on quality of pedestrian/cycle base comparison)
    - EW3 (Waerenga Rd link under expressway) = +$11M to $12M
    - EW4 (Waerenga Rd link over expressway) = +$15M to $16M

- The enhanced transport and social/community outcomes for a Rahui Road bridge connection, together with the opportunity to receive KCDC and wider community support are considered justifiable given

that the additional cost premium is only of a moderate nature (estimated difference of $2M to $6M given an enhanced pedestrian/cycle bridge concept).

- The incremental BCR for the Rahui Rd bridge is 3.5, compared with 0.5 to 0.7 for a Waerenga Rd linkage [all c/f an enhanced pedestrian/cycle linkage].

7.3.3 Old Hautere Road

Figure 7.3 summarises the resulting MCAT radar plots for the options at Old Hautere Road:

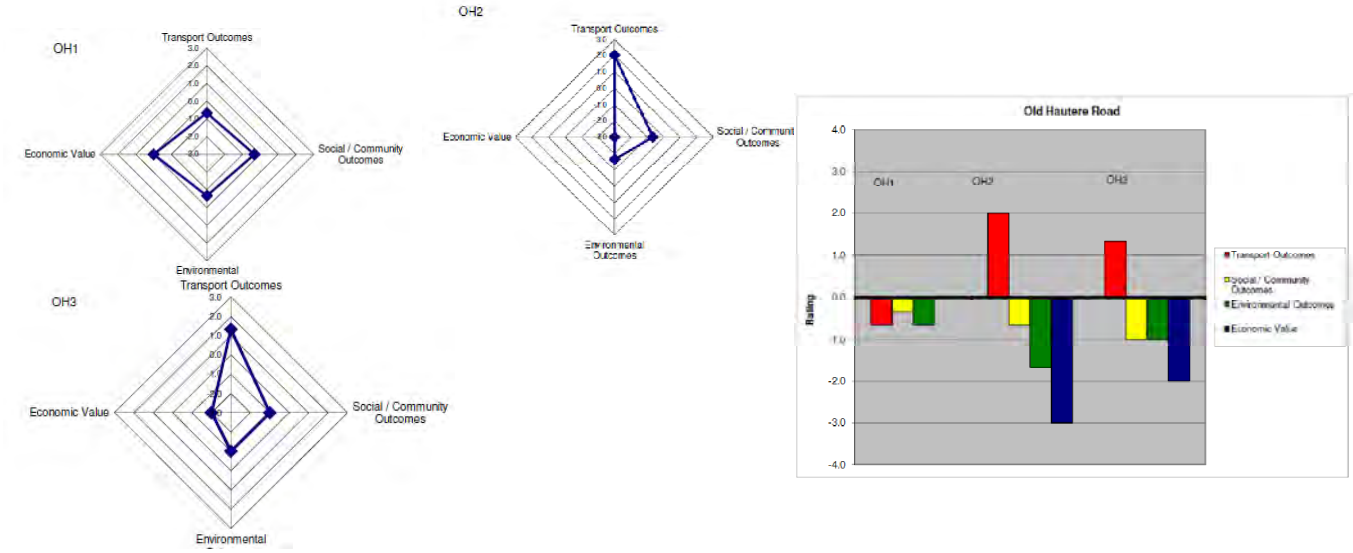


Figure 7.3 MCAT Summary for Otaki E-W Options

Outcomes from Assessment:

- Two options were assessed to provide for improved connectivity including a grade separated linkage to the existing SH1 and an at-grade link to Otaki Gorge Rd. The MCAT assessment did not provide a clear outcome, however the decision needs to balance value for money, the increased local visual impact of a grade separated link, and the slight reduction in connectivity afforded by an Otaki Gorge Rd link. Key differentiators are:
  - Physical environmental outcome - The local linkage to Otaki Gorge road had a lower effect compared to a grade separated option (dominated by negative landscape effects of a grade separated linkage).
  - Social/Community outcomes – The grade separated and link to Otaki Gorge Road rated similarly overall. If the importance of severance was elevated then the grade separated option rates above the alternative.
  - Transport Outcomes - Both the grade separated solution and link road to Otaki Gorge Rd were assessed as providing enhanced transport outcomes compared with the cul-de-sac option for the approx 500 road users that use the link on a daily basis (year 2026). The difference between the two linkage options is not hugely significant, however the level of difference in connectivity relates primarily to non vehicular modes (small numbers).
  - Capital Investment/Value for money – There is a significant difference between the two linkage options with the at-grade link to Otaki Gorge Rd being approx $6-7M cheaper ($3-$4M for at-grade link, relative to $10-$11M for grade separated link).

- Quantified traffic assessment has highlighted that 70% of trips (17 ph/hr) are to/from the south and 30% of trips are to/from the north (Peak Periods). Previous modelling work assumed that approx 80% of southbound trips (12 ph/hr) utilise the expressway. Sensitivity testing of this last assumption has been undertaken to assess impacts on traffic benefits and the incremental BCR.

- The incremental BCRs for the two options are 1.3 for a linkage to Otaki Gorge Rd, and 0.5 for a grade separated linkage. More than 40% of southbound trips (more than a doubling of the current

assessment) would be required to use the local arterial before the grade separated linkage returned an incremental BCR of 1.0.

- Based on consultation feedback and experience at Te Horo (with proposal A), local residents are likely to raise significant concerns around visual effects with introduction of a grade separated link.

7.3.4 Te Horo

Following further flood assessment and consideration of the public consultation feedback the various specialists were asked to review the assessments and ratings completed during the scoping phase. No material change in the assessments resulted from this review and the MCAT outputs summarised in Section 11.3 of the PP2O Scoping Report (January 2011) remain valid.

Outcomes from Assessment:
The MCAT and assessments suggest that Proposal A could present improved outcomes over Proposal B, primarily due to perceived improvements in pedestrian/cycling linkages and urban form. However, feedback from the local community, OCB and KCDC suggests that the local community would accept a reduction in pedestrian/cycle connectivity (increased length of travel) in return for placing any visual and physical effects further to the north and away from residences and the Red Café.

7.3.5 Mary Crest

Figure 7.4 summarises the resulting MCAT radar plots for the options at Mary Crest:

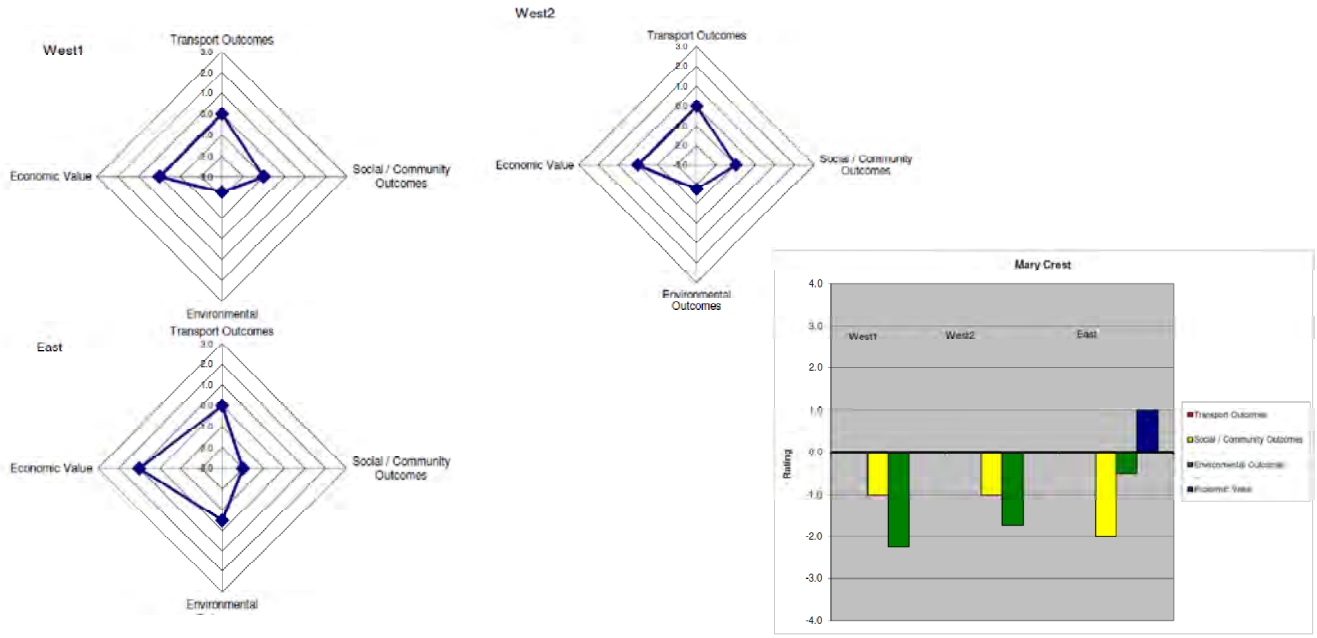


Figure 7.4 MCAT Summary for Mary Crest Alignments

Outcomes from Assessment:

- The West2 option was assessed as better than the West1 option across all criteria. Given credible alternatives it is unlikely that West1 would be consentable due to the significance of identified ecological impacts (J. Turner advice). The decision is therefore whether the West2 or Eastern option provides the best overall outcome. On balance, the MCAT assessment highlights that the Eastern option may provide a better overall outcome, however this is primarily because the ecological and heritage ratings have scored moderate negative relative to neutral for the eastern option.

- Key physical and landscape differences between the Eastern and West2 option are a larger (up to approx 15m high from the adjacent low ground) but more localised embankment for the eastern option, compared with localised dune cuttings and lower embankment fills with the West2 option.

- Technical review has confirmed that both options are technically feasible. However, the West2 option is likely to require KiwiRail to curve ease towards the east.

- Old sea cliff remnants provide a back drop/context for the eastern option southern approach embankment, but will be impacted by the eastern option.

- Key differentiators between the West2 and Eastern option are:
  - Social/community – land to the east is possibly of higher productive value (moderate versus minor effect).
  - Environmental – Eastern option avoids the ecological issues and has a significant reduction in the impact on the dunes and potential cultural sites. Visual impacts have both been assessed as moderate negative, however David McKenzie (landscape specialist) considers the eastern options to be more localised with the higher embankment in context with the old sea cliff escarpment to the east. KCDC has cited concerns around the scale and potential visual effect south of Mary Crest for an eastern option.
  - Capital Investment/Value for money – Based on further design development (including modelling of the local arterial for each option) the options have similar base costs, however the eastern option has been assessed as approximately $3M cheaper than the western options (a minor positive). The range of costs between Te Hapua and Te Waka Rd is $65M to $69M (base).

Further cost savings may be possible for the eastern option by depressing the alignment north of the proposed railway crossing.

- The eastern option will impact on property owners who are otherwise unaffected by the as-consulted alignment and conversely some of those currently affected would become unaffected.

- While the Eastern has been assessed in the MCAT as potentially providing the better overall outcomes, the West2 option is considered consentable, achieves a significant reduction in effects over West1, avoids a large fill embankment, and is more consistent with the historic corridor.

8. Preliminary Conclusions and Recommendations

8.1 Core Management Team Review

Following the option assessment and MCAT process the outcomes from the assessments and stakeholder briefing (11th May 2011) were considered further by the core team to arrive at a decision on the preferred options to be recommended to NZTA and key stakeholders.

The matters considered in forming a view on the options to recommend included:

- The MCAT process outcomes
- Capital and property costs
- Property and dwelling impacts
- Key stakeholder views (particularly KCDC)

The following table provides an overall summary picture of the options compiled at the above meeting for the key focus areas:

	MARY CREST			TE HORO		OLD HAUTERE RD			OTAKI E-W			
	West1	*West2*	*East*	*A*	*B*	*OH1*	*OH2*	*OH3*	*EW1*	*EW2*	*EW3*	*EW4*
MCAT SCORE	-3.3	-2.8	-1.5	No change		-1.7	-3.3	-2.7	-0.6	+0.5	-1.3	-2.2
CAPITAL COST	$67.9M	$67M	$64.9M	-	+$1.5M	-	$10-11M	$3-4M	-	$2-6M	$11-12M	$15-16M
PROPERTY IMPACT (DWELLINGS)	16 (3)	14 (1)	10 (0)	3 (1)	2 (0)	0	2 (0)	0 (0)	2 (2)	3 (3)	5 (2)	9 (4)
PROPERTY COSTS	$4.8M	$3.5M	$4.1M	$1.1M	$0.9M	-	$0.6M	$0.5M	$0.3M	$0.4M	$0.5M	$2.4M
STAKEHOLDER VIEWS	No	Yes	Yes	Maybe	Yes	No	Yes	Yes	No	Yes	Maybe	No

Table 8.1 Summary of option comparisons

The conclusions and preliminary recommendations are summarised in the following section.

8.2 Preliminary Conclusions

Otaki East-West:

- Further engineering and flood assessment has confirmed that an improved road bridge profile and height can be achieved at Rahui Rd; however approach grades cannot be practicably reduced below 8%. A bridge height of approximately 8.5m compared with approximately 10m assessed at the scoping phase helps to reduce the visual impact.

- KCDC and OCB feedback did not support a pedestrian/cycle bridge at Rahui Rd that incorporated switchback ramps. As a result the base option utilised for comparison of the options was a pedestrian cycle bridge with straightened approaches.

- The visual effects of a providing a road connection at Rahui Road are reasonably contained given the localised topography and surrounding vegetation, whereas road crossing options at Waerenga Rd either result in larger elevated structures, or an elevated expressway, in conjunction with a pedestrian/cycle bridge at Rahui Rd.

- Assessment to date confirms that an improved Road bridge at Rahui Road has the opportunity to provide improved transport, social and environmental outcomes than alternatives at Waerenga Road.

- The incremental BCR for the Rahui Rd bridge confirms that it delivers improved benefits over a pedestrian cycle link only.

Based on a comparison of the options and consideration of all factors the team identified the Rahui Road option as the preferred outcome for addressing the connectivity concerns raised by KCDC and the OCB.

Old Hautere Road:

- Further assessment has confirmed that there is justification for providing an improved level of connectivity at Old Hautere Road. While approximately 50% of submissions supported a cul-de-sac option these may be influenced by concerns around anti social driver behaviour.
- The visual/landscape effect of introducing a further grade separated crossing at this location (1.7km from the Te Horo underpass and 1.2km from the south Otaki underpass) together with associated localise property impacts has been identified as a disadvantage at this location.
- A grade separated option provides the best overall transport connectivity; however there is little difference between the at-grade link option and grade separated option given that the at-grade link option only disadvantages a relatively small proportion of drivers who travel south to Te Horo, rather than further south via the expressway.
- Quantified traffic assessment has highlighted that approximately 70% of trips (17 ph/hr) travel to/from the south and 30% of trips travel to/from the north (in Peak Periods).
- The incremental BCRs for the two options are 1.3 for an at-grade link to Otaki Gorge Rd, and 0.5 for a grade separated linkage. From a review of the model information it is evident that most trips have an origin/destination in Waikanae, Paraparaumu or further south, with only 3 to 4 trips per hour occurring to or from Te Horo.
- There is accessibility, community, transport, and economic justification for the retention of a linkage from Old Hautere Rd in favour of a cul-de-sac. However, based on the incremental benefits being significantly higher for the at-grade option and the decisions that came out of the MCAT process, the Old Hautere Link to Otaki Gorge Road is considered to be the most suitable option.
- Consideration of appropriate speed control measures as well as provision of a walking/cycle path along the Old Hautere link road will be important considerations for further discussion with KCDC.

Te Horo:

- While the MCAT and assessments suggest that Proposal A could present improved outcomes over Proposal B, feedback from the local community, OCB and KCDC identifies strong local support for Proposal B given that it reduces direct impact on local residences and the Red Café.

Mary Crest:

- Both the West2 and Eastern options provide significantly improved environmental outcomes compared to the West1 option. This is primarily due to the avoidance of significant bush remnants and reduced impact on sites of cultural significance.
- The eastern alternative will affect a lower number of dwellings but a greater number of land parcels. These land parcels may be more productive than those affected in the West1 Option and this was reflected in a moderate negative impact for the alternative and minor negative.
- While the MCAT indicated that the Eastern option may provide an improved environmental outcome it involves a significant height of embankment (approximately 15m) over a reasonable length on the southern approach to the rail crossing. Despite this the landscape specialist assessed this to have a reduced landscape impact relative to Western options as the northern approach is able to utilise the natural topography.
- The assessment completed and MCAT has confirmed that the Mary Crest Western 2 and Eastern alignments are likely to deliver improved environmental and economic outcomes while delivering similar social and transport outcomes as the West1 Option.

When considering all factors a preference was identified for the West2 alignment in that it significantly reduces impacts relative to West1, avoids the very significant southern fill embankment, limits impact on more properties to the east, and is more consistent with the historic corridor.

8.3 Recommendations

The following are the proposed recommendations resulting from this scheme phase technical and specialist assessment of the options at Otaki E-W, Old Hautere Rd, Te Horo, and Mary Crest:

Otaki E-W:

- It is recommended that the improved bridge option at Rahui Road is taken forward to scheme design and for further assessment and design of mitigation measures.
- The outcomes of this assessment were shared with key stakeholders at a workshop on the 11th of May, together with further follow up meetings during June 2011. KCDC have expressed support for this recommendation, however their final opinion on this will be influenced by further engagement with the Otaki Community Board (preliminary feedback from the OCB on 4th July suggests support for this option over the alternatives). KiwiRail have stated a strong preference for this option over the Waerenga Rd alternatives given that it eliminates safety and operational concerns around an at-grade railway crossing.
- Further focused consultation should be undertaken with landowners and the local community to explain modifications made to this proposal, and to provide visual perspectives of how the proposal sits in the local environment.

Old Hautere Rd:

- It is recommended that an at-grade link road is provided between Old Hautere Road and the Otaki Gorge Road. This is considered to provide an appropriate level of connectivity; meets value for money criteria in providing a positive incremental benefit cost (over a cul-de-sac) and avoids the introduction of a significant grade separated crossing in the vicinity of Old Hautere Rd.
- A walking/cycle path should be provided on the west side of the local linkage through to the south Otaki interchange and measures to provide for speed control should be explored further with KCDC.
- KCDC officers retain a preference for a grade separated crossing at Old Hautere Rd to provide the highest level of connectivity. Further discussion with KCDC and the OCB will be required; however preliminary feedback from OCB on the 4th July does highlight potential concerns around the scale and visual impact of a grade separated alternative.

Te Horo:

- It is recommended that Proposal B is adopted at Te Horo based on the fact that this proposal aligns with the local community and Council feedback. Technical aspects such as mitigation of flood effects can be addressed with this option, and feedback from KCDC's bio diversity manager suggests that the proposal provides for some stream value enhancements within the loop of the proposed local road.

Mary Crest:

- It is recommended that the Mary Crest West2 improved option is taken forward to scheme design and for further assessment and design of mitigation measures.
- The outcomes of this assessment were shared with key stakeholders at a workshop on the 11th of May, together with further follow up meetings during June 2011. KCDC have expressed support for this recommendation and based on recent feedback KiwiRail are accepting of the modifications and fact that the option requires any future rail easing to occur to the east.
- Further focused consultation (at least directly affected parties) should be undertaken around the Mary Crest area given that, while mitigating effects, the alternative impacts on different landowners.

Appendix A
Transport Assessment

Prepared By:	**Sam Thornton**
Reviewed By:	**David Dunlop**
Released By:	**Tony Coulman**
Date:	**14 September 2011**
Title:	**SARA Option Considerations – Transportation Assessment**

The following note provides the background information for the PP2O Management Team to make decisions about the outstanding local access issues, exiting SH1 speed environment and the provision of pedestrian and cycle facilities on the existing SH1.

Otaki East / West Connection

During consultation, KCDC, OCB, the Maori Racing Club and the local community raised particular concern over the loss of connectivity and resilience at Rahui Road. As a result, further work has been done to look at improvements and other options to address the problems identified.

Options Considered Include:

- EW1: Pedestrian/cycle bridge at Rahui Rd (as consulted preferred proposal)
- EW2: Road and pedestrian bridge at Rahui Rd (as consulted other proposal)
- EW3: Road link at Waerenga Rd (underpass) and pedestrian/cycle link at Rahui Rd (EW1)
- EW4: Road link at Waerenga Rd (overbridge) and pedestrian/cycle link at Rahui Rd (EW1)

Each of the options considered has been modelled in SATURN the number of vehicles using the different routes in the 2026 PM peak is shown table 1 below.

Table 1 – 2026 PM traffic flows by link (e/w connectivity)

Option	Waerenga	Rahui	County
EW1	-	-	622
EW2	-	567	6
EW3/4	505	-	77

The table above shows that under EW1 everything uses County Road, under EW2 everything uses Rahui Road (as existing), and EW3 & 4 result in significant increases in traffic diverting and high volumes on County Road.

Each of the options considered has been modelled in SATURN and a cost estimate prepared. This information has been used to calculate the incremental BCR for each option as shown in table 2 below.
Models EW3 and EW4 have been modelled in the same run (not 100% accurate), however the costs are different.

Table 2 – Incremental BCR's for each option (e/w connectivity)

East - West Link Options	Cost Difference	Benefits Difference	Incremental BCR
EW1 - Pedestrian/Cycle bridge at Rahui Rd	Base Option		
EW2 - Road at Rahui Rd	+ $2 M	+ $7 M	3.50
EW3 - Waerenga Rd link under expressway with at-grade rail	+ $11 - 12M	+ $8 M	0.67
EW4 - Waerenga Rd link grade separated	+ $15 - 16 M	+ $8 M	0.50

The results show that both EW3 and EW4 have the same amount of benefit over the current preferred option (EW1). EW2 has slightly lower benefits than both EW3 and EW4. However, the EW2 has a significantly lower cost than both EW3 and EW4 thus has a better BCR. Also as the incremental BCR for the link to EW2 is greater than one, the BCR is better than current preferred option (EW1).

Pedestrian and cycle counts undertaken by KCDC show that approximately 100 users per day currently travel along Rahui Road east of Te Roto Road. It is unknown what proportion of these users continue along Rahui Road and what proportion use County Road. However as a pedestrian / cycle link is proposed across the expressway under all options, there should be little difference between the options.

Old Hautere Road Connection

During consultation, KCDC and the OCB raised particular concern over the loss of connectivity and resilience at Old Hautere Road. The consultation feedback was mixed on the proposed cul-de-sac with more than 50% supporting this proposal.

Options Considered Include:

- OH1: Cul-de-sac option (as consulted preferred proposal for alignment)
- OH2: Grade separated option providing connection to former SH1
- OH3: Link to Otaki Gorge Rd

The surveyed turning information at Old Hautere Road from 22 July 2010 is summarised to table 3 below:

Table 3 – 2010 Actual traffic volumes to and from Old Hautere Road.

Peak	From South	To South	To North	From North
AM	5	17	7	6
IP	2	5	4	2
PM	11	4	6	5

It has been estimated that 80% of the traffic travelling to / from the south would use the expressway.

Each of the options considered has been modelled in SATURN and a cost estimate prepared. This information has been used to calculate the incremental BCR for each option as shown in the table 4 below.

Table 4 – Incremental BCR's for each option (Old Hautere)

Old Hautere Road Connection Options	Cost Difference	Benefits Difference	Incremental BCR
OH1 - Cul-de-sac	Base Option		
OH2 - Grade separated Connection	+ $10 - 11 M	+ $5 M	0.45
OH3 - Link to Otaki Gorge Road	+ $3 - 4 M	+ $5 M	1.25

The results show that both the grade separated connection (OH2) and the link to Otaki Gorge Road (OH3) both have the same amount of benefit over the current

preferred cul-de-sac option (OH1). However, the link to Otaki Gorge Road (OH3) has a significantly lower cost than the grade separated connection (OH2) thus has a better BCR. Also as the incremental BCR for the link to Otaki Gorge Road (OH3) is greater than one, the BCR is better than current preferred cul-de-sac option (OH1).

Following concerns raised by KCDC officers in relation to the use of the Existing SH1 v the proposed Expressway, further modelling was undertaken using the combined M2PP and O2PP models to assess the demands to and from Old Hautere Rd, as presented in Table 5 below.

Table 5 – 2026 PM Peak Traffic Volumes from the Kapiti Combined SATURN model (Old Hautere Road).

Option	Direction	Total Trips	Towards or from Otaki (over the Otaki River bridge)	To /from South via Expressway	To /from South via Existing SH1 (100km/hr)	To /from South via Existing SH1 (80km/hr)
Link Road	In	31	13	11	6	6
	Out	16	5	5	5	5
Old Hautere Overbridge	In	31	13	5	11	-
	Out	16	5	3	6	-

It is noted that there are differences between the recorded and modelled traffic data which is largely due to the very low volumes of demand and the origin/destination information provided in the prior matrices used for the traffic model. Irrespective of these small differences, the relative change is very small and the movements to and from the south are relatively consistent. Looking at these trips to the south in more detail, it can be confirmed that the location of the access point does influence which corridor motorists choose to travel in a northbound direction, with a drop or Expressway users for 11 in the link option to 5 in the over-bridge option, however there is only a reduction of 2 in a southbound direction.

Looking at the select link information from the model, it is evident that most trips have an origin/destination in Waikanae, Paraparaumu or further south, with only 3 to 4 trips per hour occurring to or from Te Horo.

There is accessibility, community, transport, and economic justification for the retention of a linkage from Old Hautere Rd in favour of a cul-de-sac. Based on the incremental benefits being significantly higher for this option and the decisions

that came out of the MCAT process, the Old Hautere Link to Otaki Gorge Road is considered to be the most suitable option.

There are a number of potential issues and opportunities that need to be considered:

- Communication with the community and stakeholders – making it clear why the decision has been made and the justification for it.
- Management of land development – this may be a concern for KCDC; however it would help with surveillance of the link and management of speed.
- Pedestrian and cycle provision – there would be a need to a local pedestrian and cycle linkage – suggested that on road cycle provision should be provided in both directions through a shoulder (min 1.2m), while a walkway be incorporated into the design of the link road.
- Seeking to address the safety concerns which exist now that might be exacerbated with the proposed option. It is suggested that speed control devises are used to control traffic and speed on the strait between Old Hautere Rd and Otaki Gorge Rd. Examples are included in figure 1 below.

Figure 1: Traffic Management Examples.

Figure 2: Possible Road Narrowing Example.

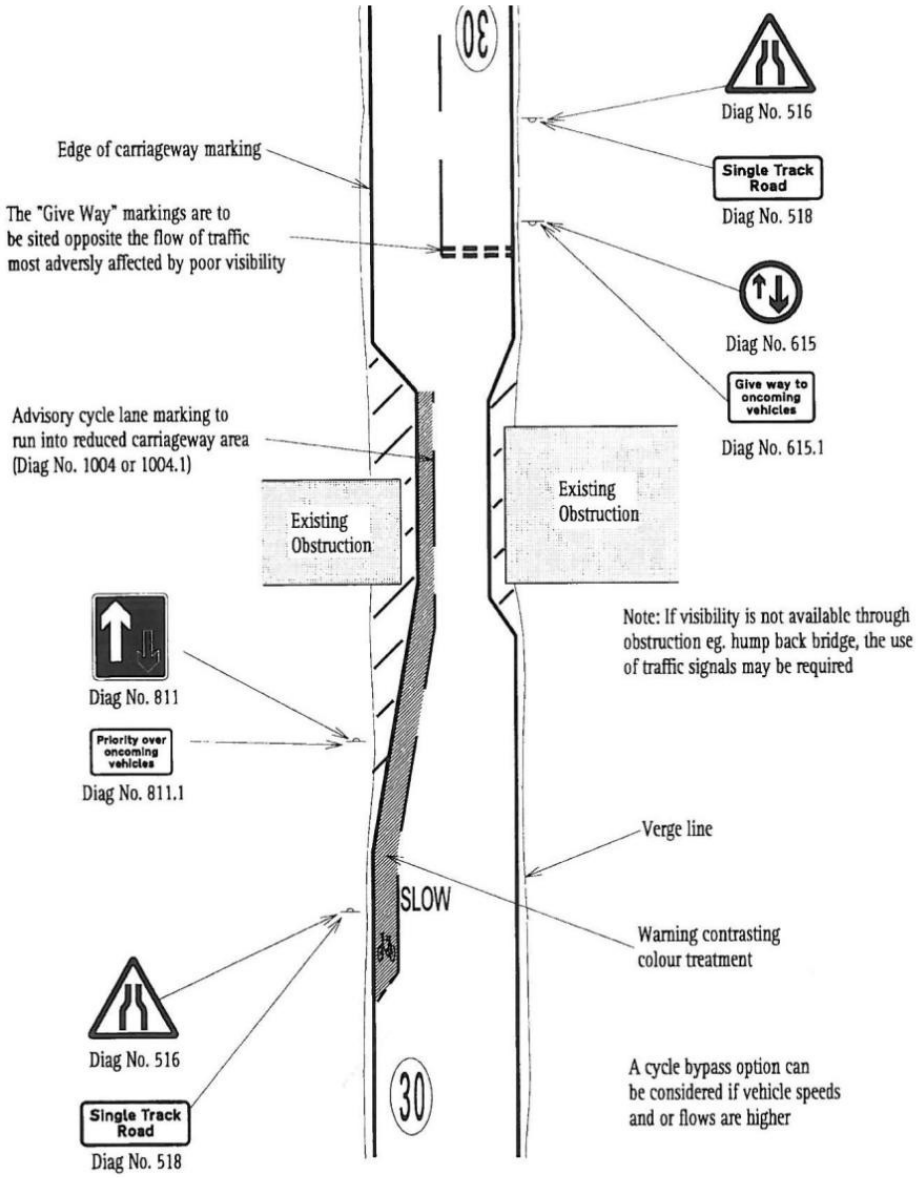
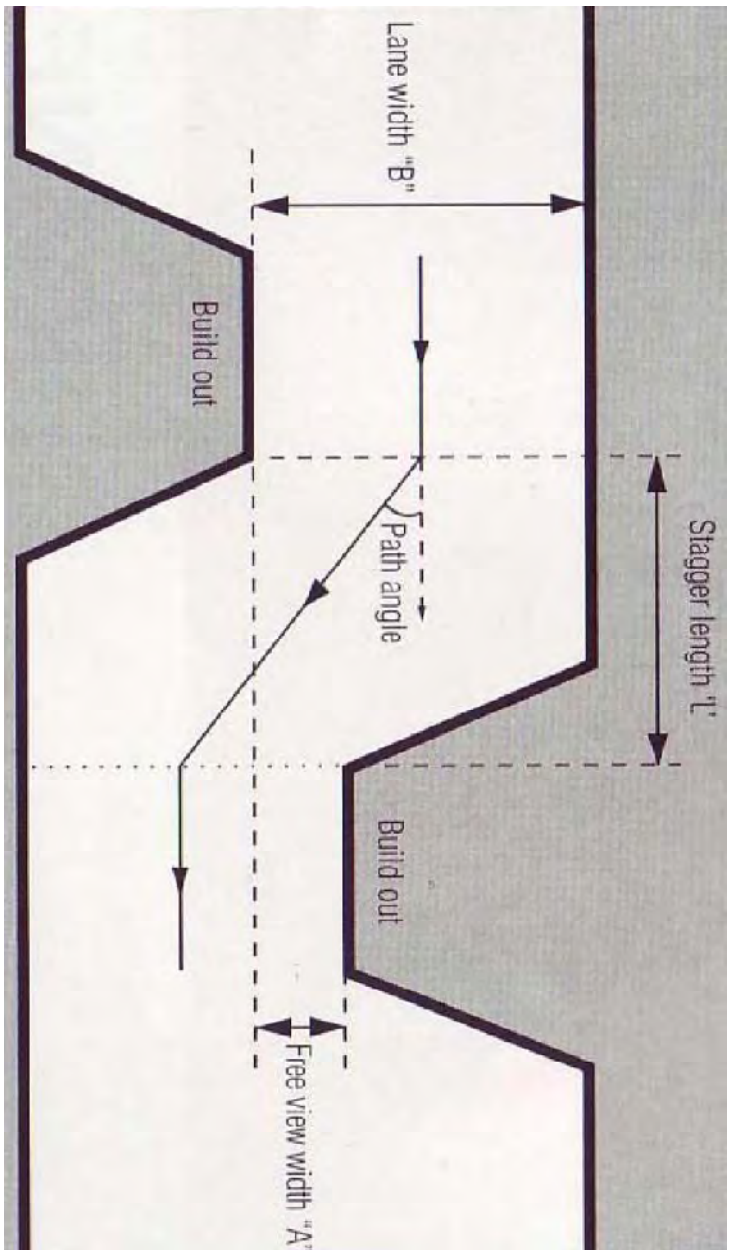


Figure 3: Possible Road Chicane Example.



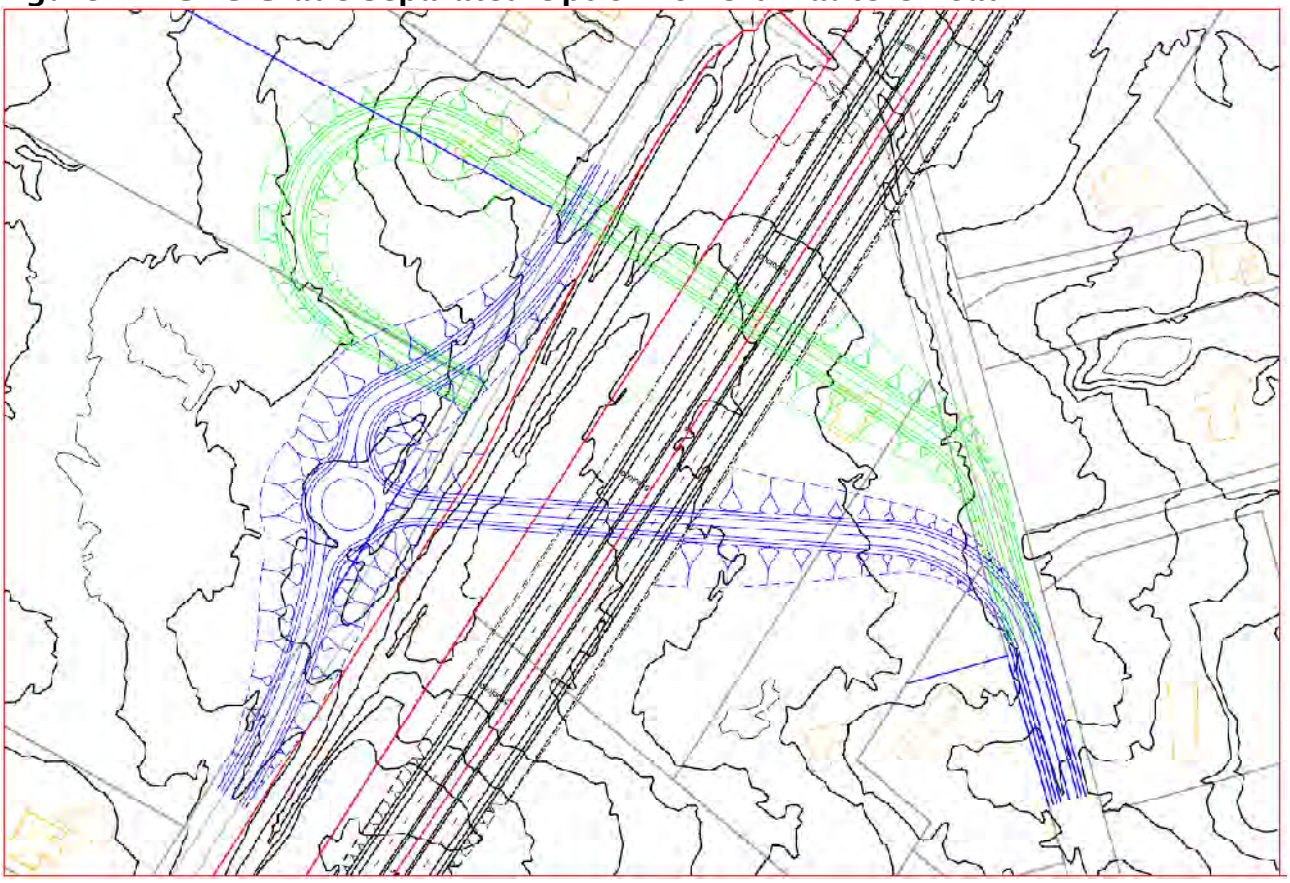
KCDC also recently proposed a potential alternative option for grade separation of Old Hautere Road as shown in the figure 4 below.

This alternative option proposed by KCDC has a number of potential benefit and dis-benefits from a traffic and transportation point of view as listed below:

- Direct access between existing SH1 and Old Hautere Road.
- Increase level of priority for Old Hautere Road and access to Te Horo for motorists, pedestrians and cyclists.
- Introduces delays (geometric and congestion) to traffic on the existing SH1 which will have to give way to traffic using Old Hautere Road and not take the most efficient route.

- Increased crash risk due the introduction of a raised intersection with undesirable sight distances and deflections.
- Similar costs and benefits to the previously considered G/S option which would result in a low incremental BCR and value for money option.
- Other environmental impacts similar to those identified for the previously discussed OH2 option.

Figure 4: KCDC Grade Separated Option for Old Hautere Road



Te Horo Off Ramp

The desire to have a Te Horo off ramp in a northbound direction came as a result of public feedback and the OCB's submission to the consultation phase. The aim of this aspiration was to improve access to businesses and trade activities in Te Horo and north to Otaki.

Previous plans for a full interchange at Te Horo and Peka Peka had been discarded due to feedback from KCDC and the OCB, while also considering impacts on land use pressure/demand, proximity to alternative interchange options, relatively low vehicular demands, design and environmental issues, and the fact that such a facility would offer poor value for money.

In response to the public consultation Opus have investigated options for a northbound off ramp only (thus seeking to reduce the impact of points identified above as prior reasons for removing an interchange). Viable locations for such an option include Peka Peka and south of the Mary Crest curve. As a result, traffic modelling was completed in order to understand the demand and usage of such a facility as displayed in table 6 below.

Table 6 – 2026 PM Peak Traffic Volumes from the Kapiti Combined SATURN model – Te Horo Off Ramp Options.

Scenario 2026 PM Peak	Direction	North of Peka Peka	North of Mary Crest	North of Te Horo	South of Otaki	Expressway south of Otaki south
V4 Option (Otaki South off ramp only)	N/B	279	241	191	369	696
	S/B	199	208	222	394	569
Mary Crest Off-Ramp	N/B	173	251	201	369	686
	S/B	203	208	222	394	569
Peka Peka Off Ramp	N/B	327	279	229	369	658
	S/B	199	208	222	394	569

Based on the traffic demands for the 2 different options tested there will be approximately 119 veh/hr in the PM peak using an off ramp at Mary Crest, while this number increases to 181 veh/hr at Peka Peka. Without this off ramp, vehicles either travel up the existing SH1 to their destination or travel north on the Expressway to the Otaki South interchange and then come back towards Te Horo. Modelling confirms that without an off ramp, the split between vehicles travelling north to Otaki South interchange or using the existing SH1 is approximately Beach Road, Te Horo.

Based on the numbers using the off ramp options and the design issues, it is evident that Peka Peka is the most appropriate location for an off ramp should one be provided. However, the reasons as to why a full interchange was removed from Peka Peka and/or Te Horo remain valid for a northbound ramp and as such it is recommended that if a ramp is not provided at Peka Peka, then the option of an off ramp between Peka Peka and Otaki South be considered unsuitable, with other mitigation considerations given to the effects on businesses in Te Horo.

Other options to provide an off ramp north of Mary Crest have been considered, however they either have significant cost or environmental implications, and as such are not considered appropriate for further progression.

Existing SH1 (local road) Design Speed

Previous scoping phase work assumed that the speed limit on the existing SH1 would be 80km/hr once the expressway was built, based on initial discussions with KCDC. However more recently KCDC have requested that that speed environment be considered further due to the impact changes in speed may have on safety, design, private access, attraction of the route for other road users (tourists, cyclists etc), and the overall vehicle operating cost and time penalty associated with increased distance travelled or travel time.

The following key points aim to address questions raised by Don Wignall working on behalf of KCDC in his memo dated 16 May 2011.

The design speed of existing SH1
SH1 Peka Peka to the Otaki River has a design speed of 100km/h except through Mary Crest where the design speed drops to 80km/h. Te Horo also has an 80km/h speed limit, but this is related to the community being located at this point not the actual geometry of the road.

Travel time surveys
We have not completed any speed surveys during wet weather for this segment of road. A travel time survey was completed on 20 July 2010 from which travel speeds for various road segments can be derived. The table 7 below summarises the average travel speed between each of the specified cross streets.

Table 7: Average travel speed by link and direction

Link	Direction	AM Peak Speed (km/hr)	PM Peak Speed (km/hr)
Peka Peka Rd to Te Kowhai Rd	N/B	77	69
	S/B	74	100
Te Kowhai Rd to Te Hapua Rd	N/B	95	100
	S/B	89	86
School Road to Te Horo Beach Rd	N/B	74	77
	S/B	87	74
Old Hautere Rd to Addington Rd	N/B	82	84
	S/B	81	79
Addington Rd to Otaki Gorge Rd	N/B	82	84
	S/B	81	79
Peka Peka Rd to Otaki Gorge Rd	**N/B**	**84**	**84**
	S/B	**82**	**84**

The amount of traffic expected to use the Existing SH1 versus the expressway if the existing SH1 is reduced to 80km/h has been presented in table 8 below.

Table 8: Traffic Flows 2026 PM peak for the Existing SH1 and Expressway

Scenario 2026 PM Peak	Direction	North of Peka Peka	North of Mary Crest	North of Te Horo	South of Otaki	Expressway south of Otaki south
Preferred Option	N/B	279	241	191	369	696
	S/B	199	208	222	394	569
Existing SH1 = 80km/h	N/B	184	146	96	368	790
	S/B	138	148	161	394	630

It is evident from the traffic modelling that significantly more traffic will use the existing SH1 to gain direct access to properties and businesses in the area between Peka Peka and Otaki if the speed environment is retained at 100km/hr, with an approximate 50% increase in traffic demand northbound and 45% increase southbound during the PM peak.
To further understand the reasons behind the shifts in traffic if the speed environment changes, Table 9 below provides a summary of travel time in seconds under the 80km/hr and 100km/hr options. As can be seen, the change equates to a modelled travel time change of approximately 47 seconds between Otaki Gorge Road and Peka Peka.

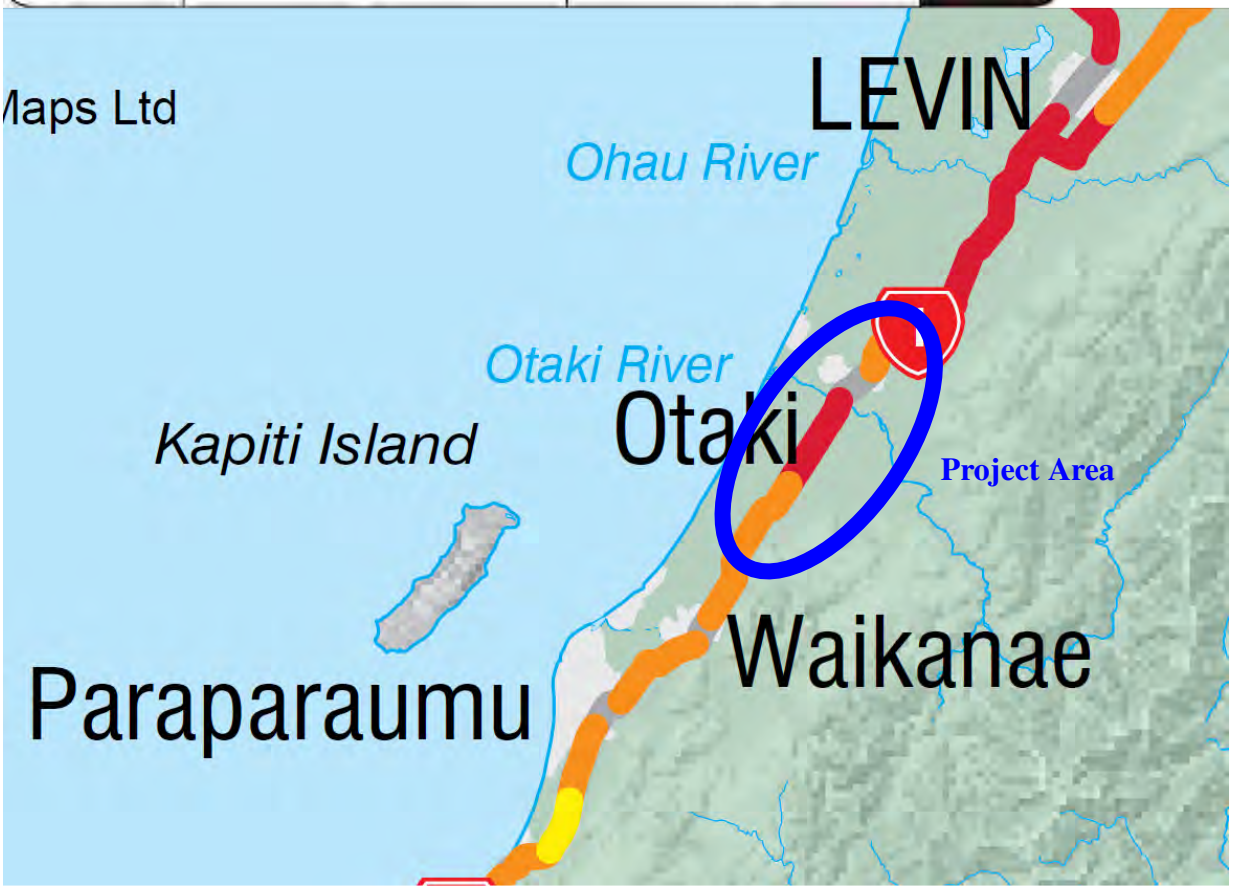
Table 9: Travel times between Otaki Gorge Road and Peka Peka Road on the Existing SH1

Speed Limit	Direction	AM Travel Time (seconds)	PM Travel Time (seconds)
100km/h	N/B	363	363
	S/B	362	362
80 km/h	N/B	410	410
	S/B	409	410
Average travel time dis-benefits from changing to 80km/hr	Actual	47 sec	47.5 sec
	%	13.0%	13.1%
Average speed dis-benefits from changing to 80km/hr	Actual	10.9 km/h	11.0km/h
	%	11.5%	11.6%

Existing Road Safety & KiwiRAP

SH1 from Paraparaumu to Levin is ranked fifth in New Zealand for collective risk under the KiwiRAP system. The section of SH1 from Peka Peka Road to Taylors Road is rated as a medium/medium high risk as shown in the figure below.

RISK RATING	COLLECTIVE RISK Average annual fatal and serious injury crashes per km	PERSONAL RISK Average annual fatal and serious injury crashes per 100 million vehicle-km	COLOUR
Low	≤0.039	<4	
Low-medium	0.04 ≤ 0.069	4 ≤ 4.9	
Medium	0.07 ≤ 0.10	5 ≤6.9	
Medium-high	0.11 ≤ 0.189	7 ≤ 8.9	
High	0.19+	9+	



For the 5 year period 1 Jan 2005 to 31 Dec 2009:

- Otaki River to Te Horo -total of 24 crashes (2 serious, 4 minor, 18 non-injury)
- SH1/Otaki Beach Road intersection –total of 5 crashes (1 serious, 2 minor, 2 non-injury)
- SH1/School Rd intersection –total of 7 crashes (1 serious, 3 minor, 3 non-injury)
- Te Horo to Peka Peka Rd –total of 37 crashes (3 fatal, 7 serious, 6 minor, 21 non-injury)

To accurately predict the safety implications of reducing the speed limit of the local arterial from 100km/h to 80km/h the crash model would need to be updated which requires the SATURN traffic model to be updated to reflect this latest option.

Without doing this, it can be confirmed that when the speed was reduced to 80km/hr and traffic volumes shifted to the expressway, this results in crash savings. However, it is anticipated that the crash costs associated with the project will increase with a 100km/h local arterial speed limit compared to an 80km/h local arterial speed limit. Generally increased vehicle speeds results in increased crash severity resulting in higher crash costs. While the expressway has a 100km/h speed limit there is a central median and grade separated interchanges to reduce crash severity whereas these features are not part of the local arterial. Additionally, the 100km/hr speed limit on the local arterial will most likely attract slightly more traffic which would otherwise use the expressway thus slightly increasing the crash risk. Conversely, when the speed environment is 80km/hr on the local road, vehicles travel longer distances, which in turn increases the crash cost.

Summary

It can be concluded that the retaining the 100km/hr speed environment on the existing SH1 once it becomes a local arterial will provide the best solution of local residents, businesses and vehicle operating costs. However it should be noted that this corridor will also be used by locals for pedestrian and cycle access, therefore it will be important to ensure safe and effective access to/from the dedicated pedestrian and cycle facility (discussed below) and also ensure safe provision for on road cycles along this corridor.

Pedestrian and Cycle Provision

Scoping phase preference was for an off road pedestrian and cycle facility to be located on the eastern side of SH1. Meetings with KCDC have confirmed that a facility is best located adjacent to the existing SH1; however they had a preference to be located on the western side based on the location of residents and land use activity.

The table below presents the pros and cons of these two options.

West side of Existing SH1	East side of Existing SH1
• furthest from higher volume expressway traffic (noise, local air quality problems) • cannot be provided within expressway footprint and could require additional land unless possible to provide within verge of old SH1 • path will cross numerous private	• closer to higher volume expressway traffic (noise, local air quality problems) • could be provided within expressway footprint or in safety zone between old SH1 and railway requiring no additional land • easy to access the local road network from the path, however there will still

access creating a potential vehicular conflict • easy to access the local road network from the path • pedestrians and cycles will be required to give way to side road traffic (i.e. Te Kowhai Rd, Te Hapua Rd, Te Horo Beach Rd, Te Waka and Addington Road) • no bridges required	be a requirement to cross between the main population on the west and the old SH1 (with much lower volumes) • continuous route avoiding the need for pedestrians and cycles to give way to side road traffic • no bridges required (except those linkages to the east which will be provided for east/west movements in all options)

There are a number significant problems associated with the western option that make it very difficult, wasteful and costly to utilise the western side of the Existing SH1 corridor. It is proposed that an option which seeks to provide facilities on the eastern side would need to provide careful consideration to the following design issues:

- Ensure pedestrians and cyclists are safely protected from adjust transport corridor activities e.g. Rail north of Mary Crest and the Expressway south of Mary Crest. Consideration also needs to be given to the passing motorists on the Existing SH1 corridor.
- Ensure safe and defined crossing points are located at key side road and areas of residential activity. This can be incorporated into threshold treatments where appropriate or specific facilities designed at defined crossing points.
- Provide adequate surveillance to ensure users are not hidden.
- Provide appropriate landscaping and drainage to ensure a pleasant and uninterrupted experience for users.

Consideration has been given to the ability to provide an underpass / overbridge at Mary Crest to shift pedestrians and cyclists towards the west side through this area, however the options are limited and a dedicated at grade crossing facility would appear to be the most appropriate facility should the use of the west side be a desirable outcome for KCDC. It is recommended that this point is discussed further with KCDC and the project team.

Given the constraints associated with the west side crossing location, the implications on areas of vegetation and the additional property requirement, it is recommended that the dedicated pedestrian and cycle facility remain on the east side as far south as the Peka Peka interchange. At this point, it may be possible for the M2PP team to also provide a G/S link under the Hadfield Rd / Peka Peka Rd link bridge. Clearly providing a facility adjacent to the Expressway will require careful consideration of safety and mitigation, however due to the grade differences, it considered that an effective solution could be developed.

Appendix B
MCAT Summary Tables

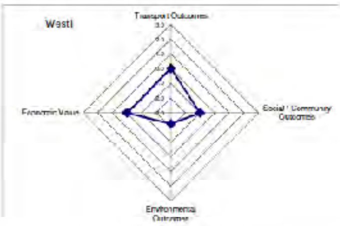
Mary Crest
Alignments
Results from 04.05.11 Workshop - Interchange Options
Further updated on 23 May to remove weighting, average scores for each primary criteria and sum averages for each option.

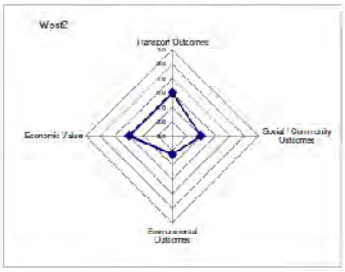
Blue comment cells had revised ratings relative to earlier West1 assessment (Board Preferred). Otherwise ratings + comments left unchanged

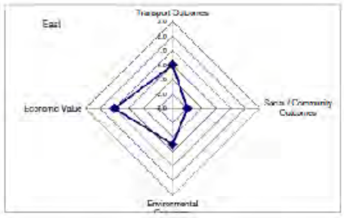
Secondary Criteria assessed as key differentiators in high level MCA
Secondary Criteria not included in high level MCA (not key differentiation)

Mary Crest

Primary Criteria	Secondary Criteria	Criteria explained	Relative to	% of Primary (P)	West1 (Cul-de-sac option) Score (S)	West2 (Grade separated option) Score (S)	East (Link to Otaki Gorge Rd) Score (S)	Comments:
Transport Outcomes	Road user safety	Level of safety provided by option including consideration of emergency response times (includes SH1 expressway and local roads)	Existing situation		0.0	0.0	0.0	Board Preferred and Alternative neutral as both have the same provisions as existing
	Traffic level of service	Significance of effect on congestion, trip reliability, travel times	Existing situation		0.0	0.0	0.0	
	Integration with others modes	Significance of effect on public transport users, cyclist and pedestrian trips	Existing situation		0.0	0.0	0.0	
	Strategic fit with RoNS	Significance of fit with RoNS objectives and consistency / integration with neighbouring RoNS projects	Existing situation		0.0	0.0	0.0	
	SH / local road integration (balance)	Significance on ability to achieve the optimal balance between utilisation of the SH infrastructure; and keeping local trips off the SH.	Existing situation		0.0	0.0	0.0	
	Transport Outcomes				0.0	0.0	0.0	
Social / Community Outcomes	Severance	Significance of effect of physical severance and legibility of options on community connectivity and access to community services	Existing situation		0.0	0.0	0.0	Included during workshop but not rated - similar effects
	Economic effects / business activity	Significance of effect on local economy / business activity particularly as related to KCDC plans / strategies including the Otaki Vision document.	Existing situation		0.0	0.0	0.0	
	Support for current and future land use	Significance of effect on support for current and future land use plans including consideration of strategic growth management, effect on productive land use, and retention of rural character	Existing situation		-1.0	-1.0	-2.0	Board Preferred and West2 rated minor negative as impacts on equestrian centre and lifestyle blocks. Alternative moderate negative (changed from minor negative during workshop) as impacts productive market gardens and winery.
	Improve connectivity to key regional services / facilities	Significance of effect on connectivity to key regional services and facilities for both local community and for those in communities north and south of project.	Existing situation		0.0	0.0	0.0	
	Recreational activity	Significance of effect on amenities and public areas available for recreation, including access.	Existing situation		0.0	0.0	0.0	
	Disturbance to community during construction	Significance of effect on the local community and road users during construction	Existing situation		0.0	0.0	0.0	
	Social / Community Outcomes				-1.0	-1.0	-2.0	
Environmental Outcomes	Urban Form	Significance of effects on the local urban form and on urban design aspects such as connectivity, context and character, with emphasis on Otaki township and Te Horo and on the Otaki Railway Hub in particular.	Existing situation		-1.0	-1.0	0.0	Board Preferred minor negative as results in residual land locked parcels. Alternative neutral (changed from minor positive during workshop). Discussion around how urban form related to
	Landscape and Visual	Significance of the effects on the local landscape, being landform, landcover and landuse and the extent of change the project/expressway will bring to these. The extent to which the visual effects of the expressway, its earthworks construction, road form, structures and noise and landscape mitigation measures will impact upon the local community and the travelling public.	Existing situation		-3.0	-2.0	-2.0	Alternative moderate negative as it follows the natural topography on the eastern side of NIMTL. West 2 has greater impact than eastern, but less impact than West 1 (Board preferred option)
	Flood risk	Significance and extent of the effects on flood plain patterns and pathways.	Existing situation		0.0	0.0	0.0	
	Heritage / Archaeology	Significance of effects on identified heritage including buildings, structures and features, and on archaeological sites.	Existing situation		0.0	0.0	0.0	
	Iwi / cultural/Heritage	Significance of the effect on matters of importance to iwi including but not limited to cultural sites.	Existing situation		-2.0	-2.0	0.0	Board Preferred potential effect on hill dune area and Maori occupation remnants including possible pa and burial sites. Alternative neutral as does skirts edge of potential Maori sites of significance
	Ecology (terrestrial and aquatic): terrestrial only	Significance and extent of the effects on wildlife and habitat and natural processes and systems.	Existing situation		-3.0	-2.0	0.0	West2 assessed as moderate negative due to effect on important ecological area (historic bush remnants). It is a significant improvement over West 1 resulting in far less habitat loss and no habitat fragmentation being. Alternative neutral as no effects on any important ecological areas.
	Water Quality	Significance and extent of effects on surface water resources, and on ground water and underground aquifers	Existing situation		0.0	0.0	0.0	
	Air Quality	Significance and extent of effects on air quality from changes in fuel consumption levels.	Existing situation		0.0	0.0	0.0	
	Noise	Significance and extent of effects on noise levels in relation to urban villages, residential and public amenity locations.	Existing situation		0.0	0.0	0.0	
	Environmental				-2.3	-1.8	-0.5	
Economic Value	Capital investment	... required for project implementation (including constructability considerations and property acquisition).	Cul de sac option		0.0	0.0	1.0	Latest costs and modelling of local road links suggest relatively minor cost differences with East rated as +1 minor positive relative to the western options.
	Whole of life costs	Significance of effect on the whole of life costs of the infrastructure asset.	2009 scheme		0.0	0.0	0.0	
	Achieving RMA Approval	Significance of effect on ability to achieve RMA approvals i.e. consentability of option.	2009 scheme		0.0	0.0	0.0	No rating recorded.
	Timeliness of project completion	Significance of effect on project completion and hence timeliness of releasing the economic benefits of the project to the community	2009 scheme		0.0	0.0	0.0	
	Economic Value				0.0	0.0	1.0	
	TOTAL				-3.3	-2.8	+1.5	





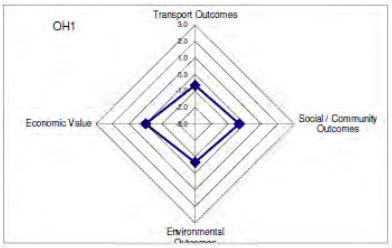


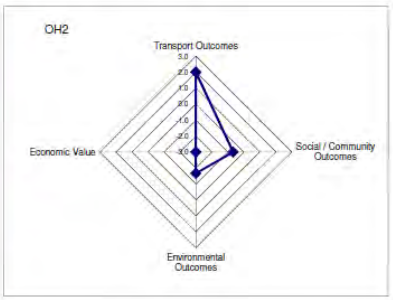
Old Hautere
Results from 04.05.11 Workshop - Interchange Options
Further updated on 23 May to remove weighting, average scores for each primary criteria and sum averages for each option.

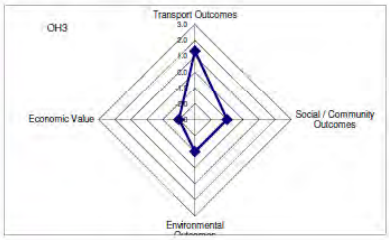
Secondary Criteria assessed as key differentiators in high level MCA
Secondary Criteria not included in high level MCA (not key differentiator)

Old Hautere Road

Primary Criteria	Secondary Criteria	Criteria explained	Relative to	% of Primary(P)	Cul-de-sac option OH1 Score (S)	Grade separated option OH2 Score (S)	Link to Otaki Gorge Rd OH3 Score (S)
Transport Outcomes	Road user safety	Level of safety provided by option including consideration of emergency response times (includes SH1 expressway and local roads)	Existing situation		1.0	2.0	2.0
	Traffic level of service	Significance of effect on congestion, trip reliability, travel times	Existing situation		-2.0	2.0	1.0
	Integration with others modes	Significance of effect on public transport users, cyclist and pedestrian trips	Existing situation		-1.0	2.0	1.0
	Strategic fit with RoNS	Significance of fit with RoNS objectives and consistency / integration with neighbouring RoNS projects	Existing situation		0.0	0.0	0.0
	SH / local road integration (balance)	Significance on ability to achieve the optimal balance between utilisation of the SH infrastructure; and keeping local trips off the SH.	Existing situation		0.0	0.0	0.0
	Transport Outcomes				**-0.7**	**2.0**	**1.3**
Social / Community Outcomes	Severance	Significance of effect of physical severance and legibility of options on community connectivity and access to community services.	Existing situation		-1.0	1.0	0.0
	Economic effects / business activity	Significance of effect on local economy / business activity particularly as related to KCDC plans / strategies including the Otaki Vision document.	Existing situation		0.0	0.0	0.0
	Support for current and future land use	Significance of effect on support for current and future land use plans - including consideration of strategic growth management, effect on productive land use, and retention of rural character.	Existing situation		0.0	-1.0	-2.0
	Improve connectivity to key regional services / facilities	Significance of effect on connectivity to key regional services and facilities for both local community and for those in communities north and south of project.	Existing situation		0.0	0.0	0.0
	Recreational activity	Significance of effect on amenities and public areas available for recreation, including access.	Existing situation		0.0	0.0	0.0
	Disturbance to community during construction	Significance of effect on the local community and road users during construction	Existing situation		0.0	-2.0	-1.0
	Social / Community Outcomes				**-0.3**	**-0.7**	**-1.0**
Environmental Outcomes	Urban Form	Significance of effects on the local urban form and on urban design aspects such as connectivity, context and character, with emphasis on Otaki township and Te Horo and on the Otaki Railway Hub in particular.	Existing situation		-1.0	-2.0	-1.0
	Landscape and Visual	local landscape, being landform, landcover and landuse and the extent of change the project/expressway will bring to these. The extent to which the visual effects of the expressway, its earthworks construction, road form, structures and noise and landscape mitigation measures will impact upon the local community and the travelling public.	Existing situation		0.0	-2.0	-1.0
	Flood risk	Significance and extent of the effects on flood plain patterns and pathways.	Existing situation		0.0	0.0	0.0
	Heritage / Archaeology	Significance of effects on identified heritage including buildings, structures and features; and on archaeological sites.	Existing situation		0.0	0.0	0.0
	Iwi / cultural	Significance of the effect on matters of importance to iwi including but not limited to cultural sites.	Existing situation		0.0	0.0	0.0
	Ecology (terrestrial and aquatic); terrestrial only	Significance and extent of the effects on wildlife and habitat and natural processes and systems.	Existing situation		0.0	0.0	0.0
	Water Quality	Significance and extent of effects on surface water resources, and on ground water and underground aquifers.	Existing situation		0.0	0.0	0.0
	Air Quality	Significance and extent of effects on air quality from changes in fuel consumption levels.	Existing situation		0.0	0.0	0.0
	Noise	Significance and extent of effects on noise levels in relation to urban villages, residential and public amenity locations.	Existing situation		-1.0	-1.0	-1.0
	Environmental				**-0.7**	**-1.7**	**-1.0**
Economic Value	Capital investment	required for project implementation (including constructability considerations and property	Cul de sac option		0.0	-3.0	-2.0
	Whole of life costs	Significance of effect on the whole of life costs of the infrastructure asset.	2009 scheme		0.0	0.0	0.0
	Achieving RMA Approval	Significance of effect on ability to achieve RMA approvals i.e. consentability of option.	2009 scheme		0.0	0.0	0.0
	Timeliness of project completion	Significance of effect on project completion and hence timeliness of releasing the economic benefits of the project to the community.	2009 scheme		0.0	0.0	0.0
	Economic Value				**0.0**	**-3.0**	**-2.0**
	TOTAL				**-1.7**	**-3.3**	**-2.7**







Otaki E-W

Results from 04.05.11 Workshop - Interchange Options

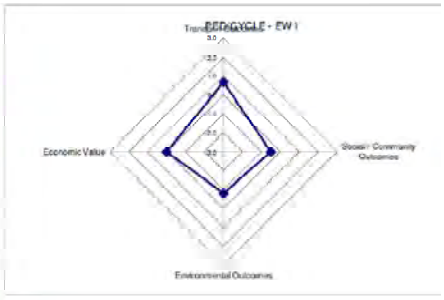
Further updated on 23 May to remove weighting, average scores for each primary criteria and sum averages for each option.

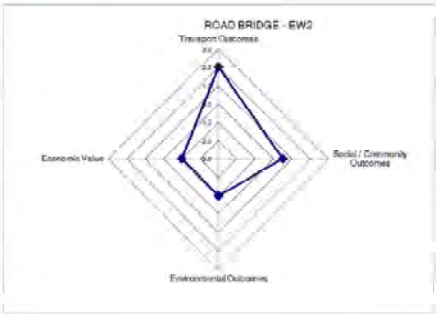
Secondary Criteria assessed as key differentiators in high level MCA

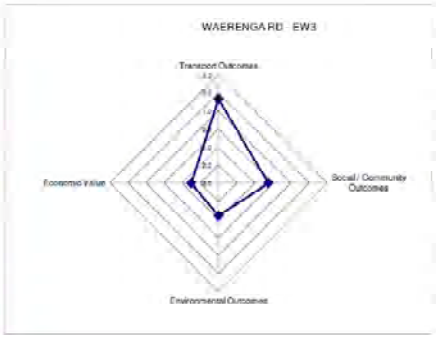
Secondary Criteria not included in high level MCA (not key differentiator)

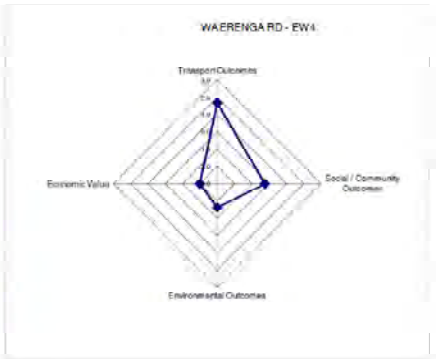
Otaki: East-West Link

Primary Criteria	Secondary Criteria	Criteria explained	Relative to	Ped/cycle bridge EW1 Score	Road and ped bridge at Rahui Rd EW2 Score (S)	Road link at Waerenga Rd (underpass) EW3 Score (S)	Road link at Waerenga Rd (overbridge) EW4 Score (S)
Transport Outcomes	Road user safety	Level of safety provided by option including consideration of emergency response times (includes SH1 expressway and local roads)	Existing situation	2.0	3.0	1.0	2.0
	Traffic level of service	Significance of effect on congestion, trip reliability, travel times	Existing situation	-1.0	2.0	2.0	1.0
	Integration with others modes	Significance of effect on public transport users, cyclist and pedestrian trips	Existing situation	1.0	1.0	2.0	2.0
	Strategic fit with RoNS	Significance of fit with RoNS objectives and consistency / integration with neighbouring RoNS projects	Existing situation	0.0	0.0	0.0	0.0
	SH / local road integration (balance)	Significance on ability to achieve the optimal balance between utilisation of the SH infrastructure and feeding local trips off the SH.	Existing situation	0.0	0.0	0.0	0.0
	Transport Outcomes			0.7	2.0	1.7	1.7
Social / Community Outcomes	Severance	Significance of effect of physical severance and legibility of options on community connectivity and access to community services.	Existing situation	-1.0	1.0	1.0	1.0
	Economic effects / business activity	Significance of effect on local economy / business activity particularly as related to KCDC plans / strategies including the Otaki Vision document.	Existing situation	0.0	1.0	-1.0	-1.0
	Support for current and future land use	Significance of effect on support for current and future land use plans - including consideration of strategic growth management, effect on productive land use, and retention of rural character.	Existing situation	0.0	0.0	-2.0	-2.0
	Improve connectivity to key regional services / facilities	Significance of effect on connectivity to key regional services and facilities for both local community and for those in communities north and south of project.	Existing situation	0.0	0.0	0.0	0.0
	Recreational activity	Significance of effect on amenities and public areas available for recreation, including access.	Existing situation	-1.0	0.0	1.0	1.0
	Disturbance to community during construction	Significance of effect on the local community and road users during construction	Existing situation	0.0	0.0	0.0	0.0
	Social / Community Outcomes			-0.5	0.5	-0.3	-0.3
Environmental Outcomes	Urban form	Significance of effects on the local urban form and on urban design aspects such as connectivity, context and character, with emphasis on Otaki township and Te Horo and on the Otaki Railway Hub in particular.	Existing situation	-1.0	0.0	0.0	-2.0
	Landscape and visual	Significance of the effects on the local landscape, being landform, landcover and landuse and the extent of change the project/expressway will bring to these. The extent to which the visual effects of the expressway, its earthworks construction, road form, structures and noise and landscape mitigation measures will impact upon the local community and the travelling public.	Existing situation	-1.0	-1.0	-2.0	-2.0
	Flood risk	Significance and extent of the effects on flood plain patterns and pathways.	Existing situation	0.0	-1.0	-1.0	0.0
	Heritage / Archaeology	Significance of effects on identified heritage including buildings, structures and features; and on archaeological sites.	Existing situation	-1.0	-2.0	-1.0	-1.0
	Iwi / cultural	Significance of the effect on matters of importance to iwi including but not limited to cultural sites.	Existing situation	0.0	0.0	0.0	0.0
	Ecology (terrestrial and aquatic); (terrestrial only)	Significance and extent of the effects on wildlife and habitat and natural processes and systems.	Existing situation	0.0	0.0	0.0	0.0
	Water Quality	Significance and extent of effects on surface water resources, and on ground water and underground aquifers.	Existing situation	0.0	0.0	0.0	0.0
	Air Quality	Significance and extent of effects on air quality from changes in fuel consumption levels.	Existing situation	0.0	0.0	0.0	0.0
	Noise	Significance and extent of effects on noise levels in relation to urban villages, residential and public amenity locations.	Existing situation	-1.0	-1.0	-2.0	-2.0
	Environmental			-0.8	-1.0	-1.2	-1.6
Economic Value	Capital investment	Significance of effect on capital required for project implementation (including constructability considerations and property acquisition).	EW1	0.0	-2.0	-3.0	-3.0
	Achieving RMA Approval	Significance of effect on ability to achieve RMA approvals i.e. consentability of option	Relative to one another	0.0	0.0	0.0	-1.0
	Economic Value			0.0	-1.0	-1.5	-2.0
	TOTAL			-0.8	-0.5	-1.0	-2.4









NZ TRANSPORT AGENCY
WAKA KOTAHI

Roads of national significance

1 Wellington Northern Corridor

Peka Peka to Otaki Expressway

Preferred Option Alternative Alignments Working Paper

March 2011

DRAFT V2

NZ TRANSPORT AGENCY
WAKA KOTAHI

OPUS

Peka Peka to Otaki Expressway Preferred Option Alternative Alignments Working Paper

March 2011

NZ Transport Agency

DRAFT V2

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Quality Assurance Statement

NZTA Project Manager: Andrew Quinn
Prepared by: Simon de Rose
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Approved for issue by: Tony Coulman

Revision Schedule

Rev. No	Date	Description	Prepared by	Reviewed by	Approved by
1	4/03/2011	DRAFT	Simon de Rose	Gareth McKay	Tony Coulman
2	29/03/2011	DRAFT V2	Simon de Rose	Gareth McKay	Tony Coulman

Contents

1 Introduction

During the scoping study of the Board Preferred Option a number of alternative alignment options were identified within the corridor. These alternative alignments maintain the expressway within proximity of the existing SH1 transport corridor. However, they focus on an alternative railway overpass location at Mary Crest and an alternative expressway alignment through Te Horo to explore potential effects on environmental and cultural aspects, together with potential urban and engineering design inputs.

At the time of completing the initial scoping phase investigations insufficient data around baseline environmental and geotechnical investigations was available to make a reliable assessment and firm recommendation on the preferred options. Geotechnical investigations and baseline environmental assessments have since been completed in early 2011 for input to further consideration of these alternatives. The Board Preferred alignment and two alternatives are shown in Figure 1.1 below.

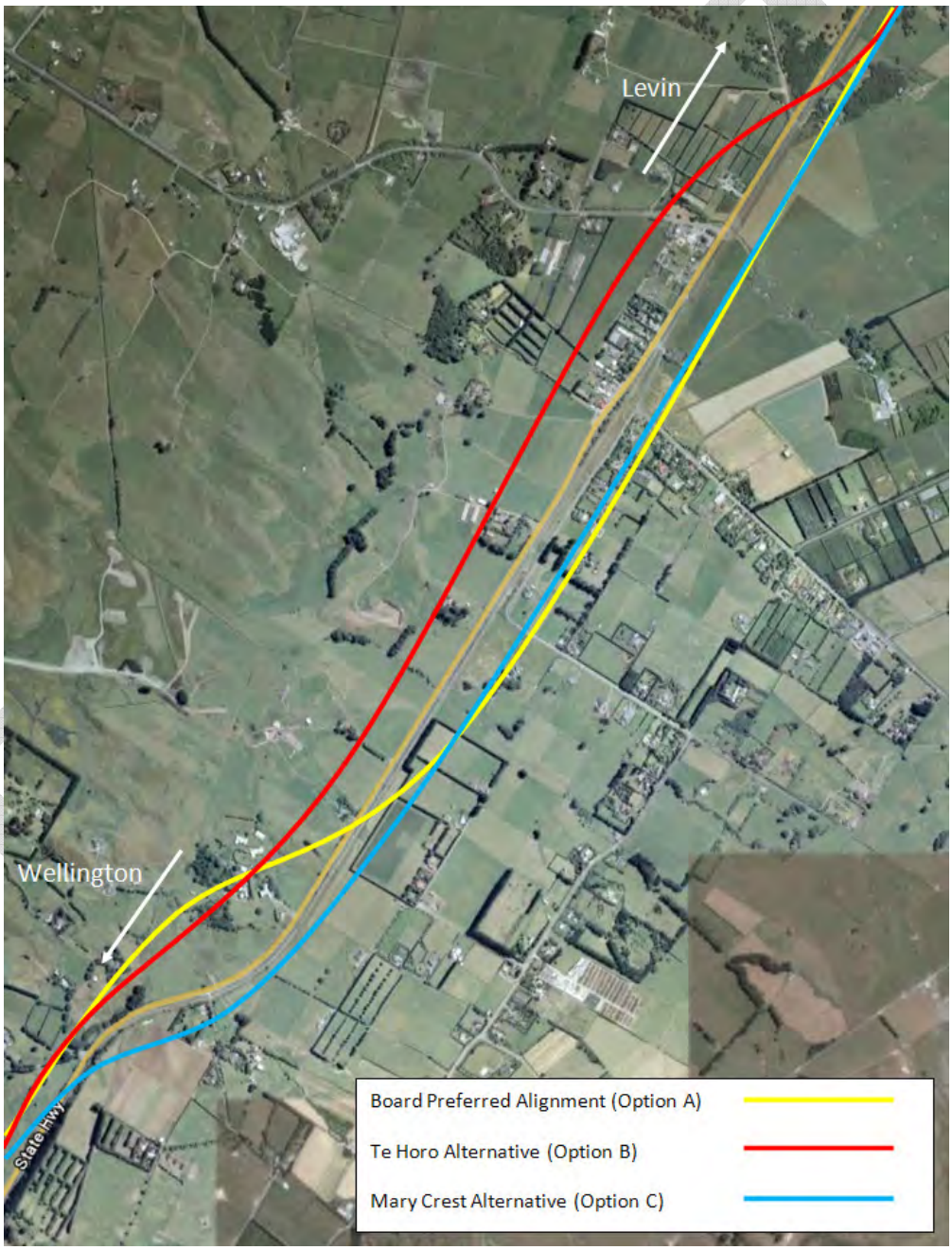


Figure 1.1 Board Preferred Option Alternatives

2 Alternatives Identified

2.1.1 Te Horo Alternative

An alternative rail crossing location north of Te Horo was suggested by the Otaki Community Board (OCB) in their 2009 submission to the NZTA. No diagram of the route was provided however from interpretation of their submission the route would continue north from Mary Crest on the western side of SH1 and then through a defined corridor behind the existing settlement and then crossing to the east on the northern side of Te Horo, approximately adjacent to Te Waka Road. This is shown in Figure 2.1.

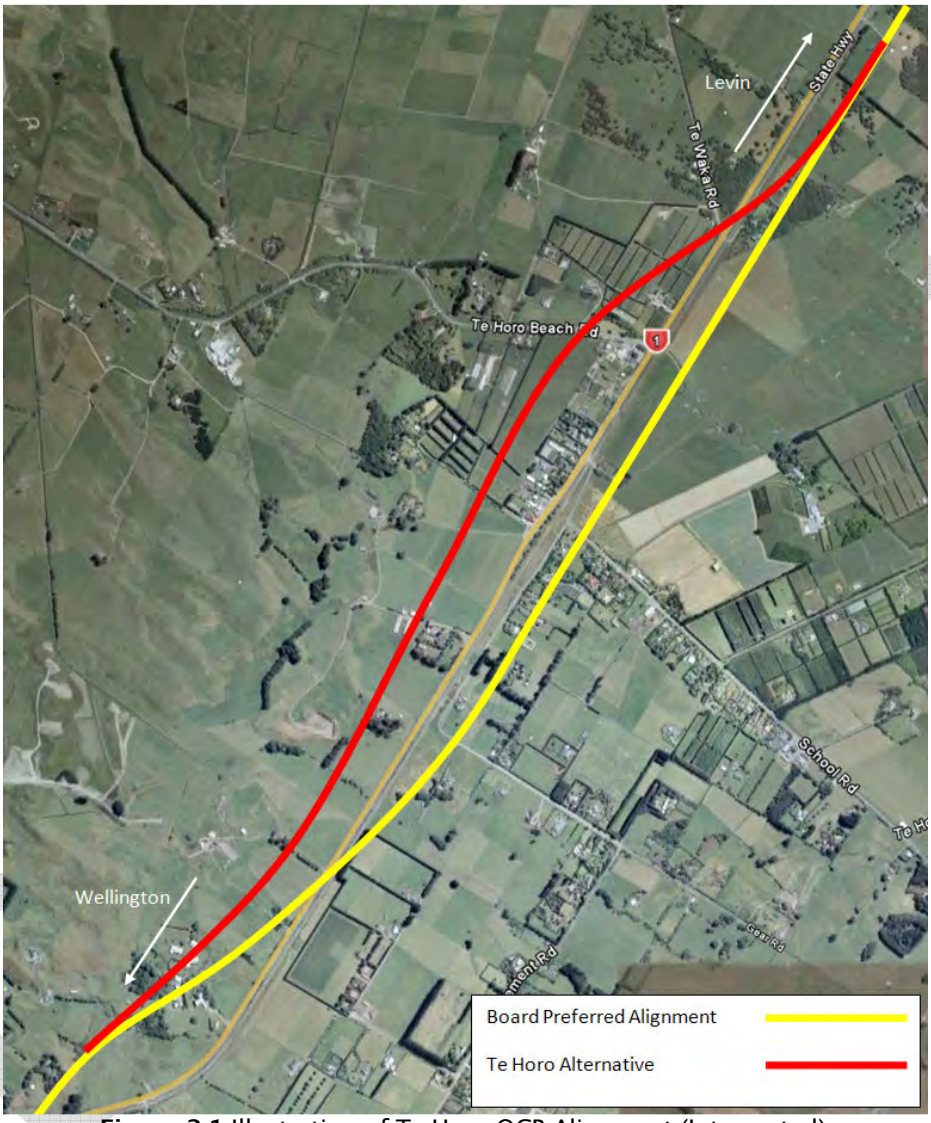


Figure 2.1 Illustration of Te Horo OCB Alignment (Interpreted)

The Te Horo Alternative does not affect properties along Gear Road and maintains the existing intersection arrangement for access onto SH1 from the eastern areas of Te Horo. This also results in the existing School Road level crossing being maintained.

Local connectivity is maintained through a local arterial overbridge at Mary Crest while an overbridge maintains the Te Horo Beach Road connection and there is provision beneath the expressway overbridge for the Te Waka Road intersection with SH1 to be maintained. Refer to Appendix A for a scheme drawing of the Te Horo Alternative and an illustration of these local connections.

2.1.2 Mary Crest Alternative

Through the scoping and consultation process an alternative location was suggested for crossing the rail and local road corridor near Mary Crest. This alignment is indicated in Figure 2.2.

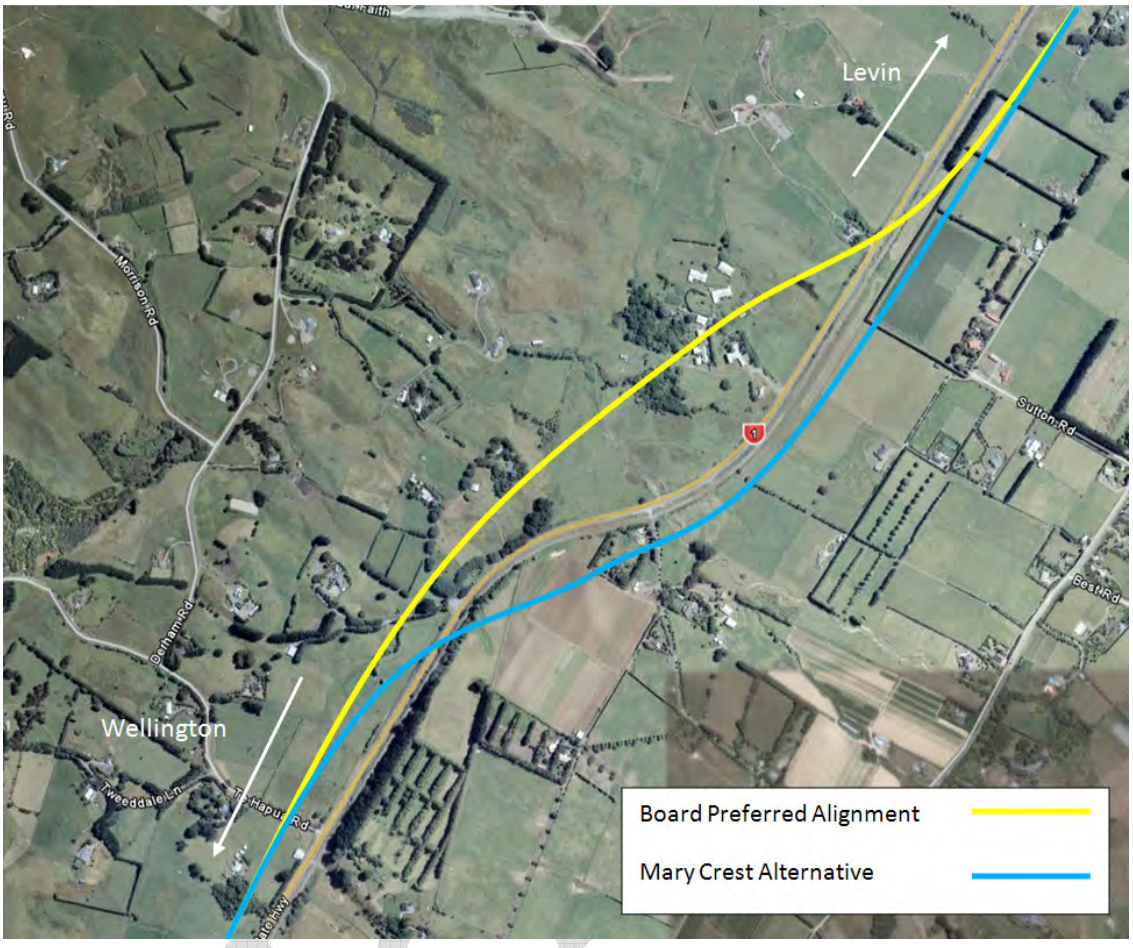


Figure 2.2 Alternative Alignment at Mary Crest

The crossing location makes use of the existing plateau on the eastern side of the North Island Main Trunk Line (NIMTL) to create a natural embankment for the northern approach of the overbridge. The crossing occurs approximately 300m North of Te Hapua Road. The expressway then utilises the natural topography for the northern approach ramp and rejoins the Board Preferred option just to the north of Mary Crest.

The alternative avoids most of the anticipated peat areas on the western side of the NIMTL and also avoids the Mary Crest bush remnants. The alternative will not affect as many dwellings as the Board Preferred Option and will avoid the equestrian centres at Mary Crest. The alternative also allows a larger portion of the existing SH1 to be used as a local road. Refer to Appendix A for scheme drawings of the Mary Crest Alternatives.

A crossing point even further to the south than the one in Figure 2.2 was investigated (refer to section 12.4 of the 2011 Scoping Report) however crossings further south have raised the following issues;

- Cutting through areas of regionally significant native bush.
- Crossing of more deeply incised natural drainage channels.
- It would complicate the proposed Peka Peka interchange and the connection to Hadfield Road, increasing cost.
- Property accesses would be required either under or over the expressway to gain access to the local road.

3 Engineering Assessment of Technical Feasibility

3.1 Structures

3.1.1 Te Horo Alternative

The Te Horo Alternative will involve an expressway overbridge structure (over the rail and existing SH1) similar to that in the Board Preferred Option. The over bridge would be in the form of either a concrete or steel bridge supported by mechanically stabilised earth (MSE) walls on each abutment. There is a negligible capital cost difference between the concrete and steel structures however long term maintenance costs of a steel bridge may be higher. The concrete bridge option also results in a thinner deck, which will give cost advantages in terms of the fill required for the approach embankments. The Te Horo overbridge is slightly longer due to the extra skew of the structure.

The Te Horo Alternative will also include two local road overbridges (rather than one with the Board Preferred), one to connect Te Horo Beach Road and another to cross the local arterial (existing SH1) over the expressway. These bridges are likely to be similar to the Te Horo Overbridge in the Board Preferred Option where a 'Super T' bridge is proposed.

3.1.2 Mary Crest Alternative

The Mary Crest Alternative is able to make use of the topography on the eastern side of the rail for the northern approach ramp. The structural form of the bridge will be similar to that of the Board Preferred Option and will either be a concrete or steel bridge supported by MSE walls on each abutment. However the northern approach will require minimal fill as the existing ground is able to be utilised. Figure 3.1 details this below.

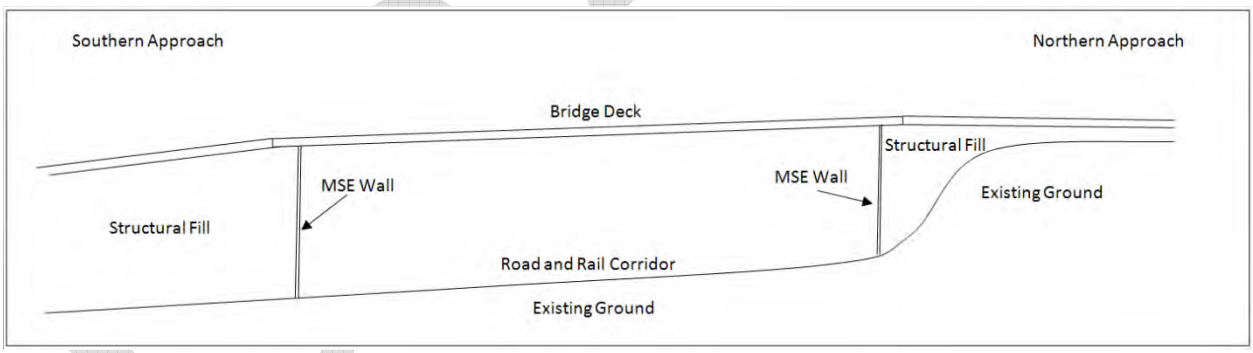


Figure 3.1 Mary Crest Alternative Bridge Section

The Mary Crest Alternative maintains the same Te Horo connectivity options as the Board Preferred Options and therefore has the same bridging requirements for the Te Horo Overbridge.

3.2 Geotechnical Considerations

3.2.1 Background

A desktop study has been undertaken of the two alternative alignments and is summarised below. At the time of writing this report geological mapping has been undertaken together with limited site investigations. The final results of the site investigations may impact significantly on the design outcomes and costs of the two alternatives, but based on the sensitivity analysis undertaken through this assessment it is unlikely to influence the preferred option.

3.2.2 Te Horo Alternative

A preliminary desktop review of available geotechnical information suggests that the ground conditions along the Te Horo Alternative alignment may encounter more inter-dunal peat deposits than on the eastern side of SH1 along the board Preferred alignment.

Refer to the Site Geological Maps in Appendix B for further detail.

3.2.3 Mary Crest Alternative

Limited site specific geotechnical field data is available to identify the appropriateness of this alternative location for construction of a bridge structure. It is believed that the eastern side of the NIMTL consists of much better ground conditions than those on the western side and the alignment would be expected to cross a significantly smaller number of peat deposits given the expected presence of alluvial fan deposits. The Mary Crest Alternative may encounter areas of weathered Wellington Greywacke/alluvial fan deposits with far better engineering characteristics thant those on the west side.

Investigations are currently being undertaken on the Board Preferred Alignment in areas of suspected peat to confirm peat depths, preliminary bore and test pit results indicate pockets of peat up to approximately 5m in depth. Peats are not expected on the eastern side of the NIMTL based on geological mapping.

Refer to the Site Geological Maps in Appendix B for further detail.

3.3 Earthworks

3.3.1 Earthwork Quantities

Table 3.1 Board Preferred and Alternative Alignment Earthworks Volumes

	Cut	Fill
Board Preferred Option	190,000m^3	575,000m^3
Te Horo Alternative	180,000m^3	635,000m^3
Mary Crest Alternative	25,000m^3	300,000m^3

Note: The above table does not include local road, local access, or estimated peat volumes.

3.3.2 Te Horo Alternative

The Te Horo Alternative has a similar cut and fill balance to the Board Preferred Option over the same length. Both options have a shortage of fill material and this contributes to the significant cost of the option as fill material would need to be imported from elsewhere. It is important to note that even when considering this option as a part of the entire scheme there is still a significant shortage of fill and all options should be estimated on the basis of imported fill for any deficit.

3.3.3 Mary Crest Alternative

The Mary Crest Alternative has a lower fill requirement than the Board Preferred Option as it does not require a significant volume of fill material due to the use of the topography for the northern bridge approach. The alignment does however still have a shortage of fill material as there is minimal cut material as the alignment avoids the dunescape at Mary Crest.

3.4 Local Linkages

3.4.1 Te Horo Alternative

The Te Horo Alternative requires local linkages to maintain Te Horo Beach Road link across the expressway, connect properties who will lose their access onto local roads and to connect the new local arterial to the existing SH1. These new local arterials and local roads would be constructed to appropriate levels taking into account the speed environments and also the environment the roads will be constructed in. Pedestrian and cyclist provision will be made on the local arterial and where required on the local roads.

3.4.2 Mary Crest Alternative

The Mary Crest Alternative will require local roads to provide property access to those properties who have lost access. The Mary Crest Alternative would have the same Te Horo connection as in the Board Preferred Option.

See Appendix A for scheme drawings of the two alternatives.

3.5 Property

3.5.1 Te Horo Alternative

The Te Horo Alternative will affect less land parcels and less dwellings than the Board Preferred Option. This is due to the larger parcels on the western side of the NIMTL and also due to the reduced local road requirements. A comparison of the property effects of the two options is shown below in Table 3.2.

Table 3.2 Te Horo Property Effects Comparison

Proposal	Parcels Affected	Dwellings Affected
Board Preferred Option	42	15
Te Horo Alternative	40	13

3.5.2 Mary Crest Alternative

The Mary Crest Alternative affects a greater number of land parcels than the Board Preferred Option but also affects less dwellings. A comparison of the property affects of the two options is shown below in Table 3.3.

Table 3.3 Mary Crest Property Effects Comparison

Proposal	Parcels Affected	Dwellings Affected
Board Preferred Option	42	15
Mary Crest Alternative	46	12

3.6 Risks

3.6.1 Background

A formal risk workshop has not been undertaken for either of the two alternatives. High level risks have been identified and allowed for in the cost estimates produced. A brief analysis of the risks associated with the options has been done in order to ascertain the uncertainty associated with the estimate.

3.6.2 Te Horo Alternative

Risks associated with the Te Horo Alternative include;

- Potential issues with newly affected property owners
- Potential cost implications of increased areas of peat
- The effects of greater impacts on KCDC district plan identified areas
- Impacts of flood requirements on the alignment

3.6.3 Mary Crest Alternative

Risks associated with the Mary Crest Alternative include;

- Potential issues with newly affected property owners
- Potential issues with forming the overbridge embankment on peat deposits
- Ground on the eastern side of the NIMTL isn't as favourable as anticipated
- Potential effects on established businesses and more fertile land to the east

3.7 Rail Relocation

3.7.1 Background

As part of the continued upgrade of the NIMTL, KiwiRail have identified the curves at Mary Crest as being below standard and have indicated that they may wish to ease these curves at some stage in the future. Both the alternatives allow for this curve realignment to happen as the expressway would be in a position to give sufficient space for the curves to be eased. This work is not at this stage expected to occur at the same stage as the expressway is constructed.

3.7.2 Te Horo Alternative

The Te Horo Alternative keeps the expressway to the west of the existing SH1 and NIMTL allowing the Mary Crest rail curve to be eased to a greater radius. Provision has been made for the local arterial to leave sufficient space for the curve easing whilst still being able to maintain an appropriate geometric form (NB: the local roads shown on Sheet 40 are indicative only and have not been fully designed, there is however sufficient space to achieve the geometric standards required). Property access on the eastern side of the rail can be maintained by a local access connecting into either Sutton Road or Gear Road. This would result in the closure of the existing Mary Crest Level Crossing.

3.7.3 Mary Crest Alternative

The Mary Crest Alternative crosses to the east of the NIMTL prior to Mary Crest. A new local arterial would need to be constructed on the western side of the existing SH1 to provide sufficient space for the rail curve to be eased. If the curve was not going to be eased then the existing SH1 can be used for the new local arterial which would result in cost savings for the project. A new local access for properties on the eastern side of the NIMTL and expressway would be provided giving a connection into either Sutton Road or Gear Road. This would result in the closure of the existing Mary Crest Level Crossing.

3.8 Transportation

No further transportation assessment has been undertaken for the two alignment alternatives as it is thought that there will be negligible change in the transportation benefits or effects. There will be a small change in detour lengths along the local roads however these are expected to be minor and would not affect the option choice.

4 Feasibility Cost Estimation

4.1 General

The estimate produced has generally been prepared and reviewed in accordance with NZTA's 'Cost Estimate Manual' (SM014), bearing in mind the level of preliminary design and investigation undertaken.

4.2 Methodology

The estimate has been prepared using the same parameter rate method as used for the PP20 'Draft' Scoping Report. The parameter rates have been developed based on previous projects of a similar nature. Where quantities have been used, for example earthworks volumes and local access road lengths, these have been measured from CAD drawings or taken from MX design outputs.

In some instances low, medium and high parameter rates have been derived for the same activity to reflect the different nature of the work. For example, a higher rate for temporary traffic management has been used in urban areas and a lower rate in rural areas.

The property costs for the alternatives are based on NZTA supplied Land Valuations for the Wellington Region for the relevant affected parcels.

4.3 Assumptions and Exclusions

4.3.1 General

The following section identifies the assumptions and exclusions used during the estimating process. The estimates have been prepared based on a preliminary feasibility design, minimal site and general information about the type of construction and the scope of the work.

The two alternatives have been compared against the Board Preferred Option over approximately 5.5km, from Te Waka Road in the north to Te Kowhai Road in the south.

4.3.2 Assumptions

In forming the estimates a number of assumptions have been made to form a complete estimate.

- NZTA managed costs have allowed for costs associated with the project but managed by the NZTA. No provision has been made for extraordinary circumstances such as High Court appeals etc. An allowance of 1% of the Physical Works costs has been allowed for NZTA managed costs for each phase of the project.
- The cost estimates are based on the feasibility designs shown on drawing series 5/2664/2/5504 sheets 40-41 R1, and Scoping Drawings 105-107 R1.

4.3.3 Exclusions

The following items are excluded from the project estimate:

- GST
- Escalation beyond the time the estimate was prepared, namely 3rd quarter 2010
- Sunk costs
- Operation and maintenance costs once the project is constructed

4.4 Risk

4.4.1 Quantitative Risk Assessment

The quantitative risk assessment has been used to derive the:

- Mean or Expected Estimate to determine the NZTA managed contingency.
- 95%ile estimate to determine the appropriate funding risk.

A project estimate consists of scoped work (the Base Estimate) and uncertainty (the risk element). At the beginning of a project, the level of knowledge is limited and there is a high level of uncertainty. With an increasing level of knowledge the uncertainty reduces.

The percentage range of uncertainty in the Base Estimate has been determined on a section-by-section basis. Individual risks have not been quantified.

4.5 Outputs

4.5.1 Estimates

The expected and 95th%ile estimates for the three options are shown below in Table 4.1. Estimate summary and detail sheets are included in Appendix C.

	Board Preferred Option	Te Horo Alternative	Mary Crest Alternative
Expected Estimate	$140	$177	$131M
95th%ile Estimate	$222M	$295M	$213M

Table 4.1 Board Preferred and Alternative Alignment Estimates

4.5.2 Te Horo Alternative

The Te Horo Alternative is more expensive than the Board Preferred Option. The main reasons for this are;

- Earthworks – due to the additional peat areas the expressway crosses (refer section 4.6.1)
- Property Costs – due to the higher value land on the western side of the NIMTL
- Bridging – due to the extra local road bridge required and additional length of Rail Overpass at Te Waka and SH1

4.5.3 Mary Crest Alternative

The Mary Crest Alternative, when compared with the Board Preferred Option, is cheaper due to;

- Earthworks – lower quantities of imported fill required due to the topography on the eastern approach
- Property Costs – due to the lower number of dwellings affected
- Bridges – due to a smaller deck area and the topography of the approach on the eastern side

4.6 Cost Sensitivity

4.6.1 Peat Depth

Peat maps have been prepared and are attached in Appendix B. These maps were used to determine the amount of peat areas the Board Preferred and alternative alignments traverse.

As there is only a limited amount of geotechnical information the estimate has taken a conservative approach to the quantity of peat which may be encountered. It has been assumed that on average the peat depth would be approximately 4m. To test the sensitivity of the estimates to the depth of peat, estimates were compared for peat depths of 0m, 1m and 4m assuming that the peat would need to be excavated and backfilled with a suitable material.

The Te Horo Alternative is more sensitive to the depth of peat due to the amount of peat ground the expressway will cross as opposed to the Board Preferred Option. The current difference in expected estimates, assuming the peat is 4m deep, is $37M, a reduction in peat depth to 0m will reduce this differential by $8M.

The Mary Crest Alternative is far less sensitive to the depth of peat due to the route utilising the better ground on the eastern side of the NIMTL and hence avoiding a number of the peat deposits. The current difference in expected estimates assuming the peat is 4m deep is $9M, a reduction in peat depth to 0m will reduce this differential by $2M.

Although the depth and extent of peat will have a significant effect on the overall project cost it will not influence the option decision from a cost perspective.

4.6.2 Other Variables

There are a number of variables that will affect the cost differential between the options. These aspects may increase or reduce the cost differential but will not influence which option is the most cost effective.

These variables include:

Rail Crossing Approach Grade
The option cost comparison assessment has been undertaken assuming that the crossing approach grade is approximately 1%. This requires an increased amount of fill material when compared to steeper grades, of say 3%, that could be used and would also fit within the RoNS geometric design guidelines.

Earthworks Rates
The rate of imported fill could potentially vary considerably depending on the source of material. Any variance in these rates would have a large impact on the cost differential. As part of the scheme assessment phase of the project this will be investigated further enabling a more robust rate and better understanding of risk to be developed.

Ground Conditions
In addition to peat material the subgrade suitability may be different between the two routes (due to varying ground conditions). Any variability in this respect is likely to have a minimal effect on the cost comparison. The results of ground investigations will be available through the scheme assessment phase.

5 Specialist Assessment

5.1 Introduction

This section describes the views of the relevant specialists on the Preferred Alignment Alternatives. While all specialists assessed the options, general comments that apply to all options have not been provided and only commentary that influences the decision making process is included. This means that the alternatives have been compared with the Board Preferred Option only over the length of the expressway that the route differs. This does not therefore provide an assessment of effects for each alternative, this would be undertaken during the Scheme Assessment process should the NZTA board approve one of the alternative alignments.

The rating assessment adopted by the specialists and team are those documented in section 11.2 of the 2011 Scoping Report.

5.2 Transport Outcomes

5.2.1 Road User Safety

The Te Horo Board Preferred alignment has a minor positive effect due to grade separation of the rail crossing (local benefit only). The Te Horo Alternative has a minor negative due to the retention of the at grade rail crossing, however it is only a minor negative due to low usage and relatively good visibility for road users of the NIMTL crossing.

The Board Preferred and Alternative Mary Crest alignments are both assessed as neutral in that they provide minor improvements over the short length of consideration. However, it is noted that the alternative actually removes a rail crossing servicing a small number of properties, which could be considered a minor positive effect.

5.3 Social and Environmental Results

Appendix D contains the social and environmental assessments completed.

A short summary paragraph of key findings for each assessment is provided below. When assessing the Te Horo Alternative, specialists were asked to focus on the alignment at Te Horo only and to disregard the alignment shown at the Mary Crest end and vice versa.

5.3.1 Terrestrial ecology

There are no significant differences between the options at Te Horo; the Board Preferred is noted as neutral as there is no significant effect, whereas the Alternative is rated as minor negative due to some effects on very small (1-2) stands of mature totara in two locations (opposite Gear and Te Waka Roads).

There is a significant difference in effects between the Mary Crest options. The Board Preferred alignment was rated as a highly significant negative due to potential loss and fragmentation of an area of wetland and forest habitat potentially including some of the largest kahikatea in the District, possibly considered to be regionally significant. It may be possible to avoid some of the largest tree specimens with further design, however the values of this habitat will still be significantly compromised. The Alternative rated as neutral with no significant effect expected.

5.3.2 Landscape and Visual

Both options at Te Horo rated overall as having moderate negative effects due to the visual effects of embankments and bridge structures.

The Mary Crest Board Preferred option rated as a significant negative effect due to large areas of cut and fill that would not follow the natural topography. The Mary Crest Alternative rated as a moderate negative as cut and fill is still required, but with lower volumes and the bridge structure better utilises existing topography therefore having a lower overall visual impact.

5.3.3 Urban Design

The Te Horo Board Preferred option was rated as having neutral effect as natural connectivity desire lines are followed with a direct connection to Te Horo Beach Road, but with some minor impacts resulting from the location of structures. The Te Horo Alternative rated as a moderate negative effect due to separation of the NIMTL, expressway and existing SH1/expressway corridors creating marginal residual land.

The Mary Crest Board Preferred option was rated as a moderate negative effect due to creation of residual spaces between corridors, large cut and fill volumes and deviation from natural topography. The Mary Crest Alternative option rated as a neutral effect due to maintenance of existing access, better utilisation of topography and minimisation of residual spaces.

5.3.4 Archaeology, heritage and cultural

The Te Horo Board Preferred option rated as a minor negative effect due to effects on the former Mirek Smisek property, noted as a feature of social value but not thought to be of interest to Historic Places Trust. The Te Horo Alternative rated as neutral as no effects are anticipated beyond social effects on the Red House Café.

The archaeological specialist also rated the Te Horo alternative as shown at the Mary Crest end; however in the MCAT assessment this was disregarded to provide consistency across all specialist assessments.

The Mary Crest Board Preferred option was rated as a moderate negative effect due to the impacts on the hill dune area from Te Hapua Road north toward Mary Crest as a focus of pre European / mid 19th century Maori occupation. This includes a possible pa site between Mary Crest and Te Hapua Road on the higher hills (western side of existing road), plus possible burial sites. The area behind Mary Crest (to the west) is considered waahi tapu (spiritually or culturally important). More information on this is required from tangata whenua as to the exact location and extent.

The Mary Crest Alternative rated as neutral as the alignment largely avoids the area and effects noted above.

5.3.5 Rural land use

The Te Horo Board Preferred option rated as a minor negative effect due to the alignment cutting through a number of rural life style properties. The Te Horo Alternative rated as moderate negative due to the alignment cutting through a number of productive rural properties.

The Mary Crest Board Preferred option rated as a minor negative effect due to the alignment cutting through what appears to be productive rural properties. The Mary Crest Alternative rated as a moderate negative due to the alignment cutting through what appears to be a working productive unit. Note this rating was changed from minor negative to moderate negative in the workshop as the option was noted to impact on winery and horticultural units.

5.4 Economic Value

5.4.1 Capital Investment

See section 4 for discussion around the capital investment implications of each alternative.

5.4.2 Achieving RMA Approval

The Te Horo Alternative is was assessed as a minor negative as it has not been consulted on previously which may delay achieving RMA approval. The Board Preferred option, was assessed as neutral as it has been previously consulted on and when considering the Te Horo section does not have any significant issues which may affect consenting.

The Mary Crest Board Preferred alignment is a minor negative due to the issues related to terrestrial ecology and heritage with the Mary Crest bush remnants. The alternative is neutral as the effects identified are able to be mitigated.

6 MCAT Results

6.1 Introduction

The team used the Multi Criteria Analysis Tool (MCAT) created during the scoping stage of the project to assist in the evaluation of the positive and negative effects of each option. Refer to the Peka Peka to Otaki Scoping Report (section 11.2) for a description of how the MCAT was created, it's purpose, and its primary and secondary criteria.

6.2 Method

The project team met to review all secondary criteria in the MCAT and together identified those that were considered to be differentiators and those that weren't. Differentiators are those criteria where an effects rating between two options is expected to be different. Non-differentiators are those where the rating is expected to be the same for both options. It is acknowledged that removing the non differentiators does not provide a full evaluation of the effects of both options. However as the purpose of this exercise was to identify the differences between the two options, and because the MCAT exercise is used to facilitate decision making (not to make the decision) the exclusion of non differentiators was justified and supported in a review by the planning team.

The primary and secondary criteria included in the MCAT are listed in Table 1 (full descriptions are included in Table 11.1 of the Scoping Report). Those that were excluded from this assessment on the basis that their effects are expected to be similar are highlighted in bold and a justification is provided.

For the differentiator topics, the relevant social or environmental specialist completed an assessment of the effects of each option, i.e. the Mary Crest Board Preferred, the Mary Crest Alternative, the Te Horo Board Preferred and the Te Horo Alternative.

The specialists were asked to:

1. Describe any elements of the existing environment not already captured in their scoping report.
2. Assess the broad level of potential positive or negative effects in their particular area of expertise associated with each of the alignment options. The effects assessment was made in terms of considering the effect that each option has against the 'do minimum' option (existing situation).
3. Consider Part II of the Resource Management Act (RMA) in making their assessment.
4. Rate each effect using the MCAT rating table (table 11.2 of the Scoping Report).

Appendix D contains the brief provided to specialists together with the specialists assessment.

These assessments were reviewed and the ratings were input into the MCAT during a workshop.

Table 1: Justification for exclusion of secondary criteria

Primary criteria	Secondary criteria	Justification for exclusion
Transport outcomes	Road user safety	Included
	Traffic level of service	Overall similar level of service provided by each option.
	Integration with other modes	Each option provides the same facilities for other transport modes.
	Strategic fit with RoNS	Each option fits within the RoNS strategic framework.
	SH/ Local Road integration	Each option provides the same connectivity and integration with local roads with some minor positive and negatives for each option.

Social/community outcomes	Severance	Included
	Support for current and future land uses	Included
	Economic effects/business activity	No difference in effect on local economy as related to KCDC plans/strategies expected between each option.
	Improve connectivity to key regional services/facilities	Local connectivity effects only, no difference in regional connectivity expected.
	Recreational activity	Limited areas of recreational activity in the two study areas.
	Disturbance to community during construction	Disturbance expected to be similar for both options in each location.
Environmental outcomes	Urban form	Included
	Landscape and visual	Included
	Heritage/archaeology/cultural	Included
	Terrestrial ecology	Included
	Flood risk	Options not expected to have differing effects on flood risk based on current flood risk knowledge.
	Water quality	No significant water quality receptors in either location.
	Air quality	Overall similar air quality effects expected for all options, some minor positives and negatives for each option.
	Noise	Overall similar noise effects expected for all options based on a preliminary review by the project noise specialist, some minor positives and negatives for each option.
Economic value	Capital investment	Included
	Achieving RMA approval	Included
	Whole of life costs	Maintenance costs of the options are not expected to differ significantly.
	Timeliness of projection completion	Construction programmes of each alternative are not expected to differ significantly, the environmental and social effects of the alternatives and their impact on the project completion are reflected in the RMA approval criteria.

A workshop was held on the 8th of March with NZTA to review the outcomes of the specialist assessments. At the workshop the assessments and ratings were challenged and then incorporated into the MCAT tool to assist in the option comparison and decision process.

The MCAT was used to highlight differences between the options to support the judgement of the team and has not been used as a scoring exercise to provide definitive results.

While the team utilised MCAT outputs as a tool to assist the decision process, applied judgement and the experience of the team have been applied to arrive at a recommendation on which options should be taken forward for further scheme consideration.

6.3 MCAT Outcomes

6.3.1 Outputs

A graphical "radar plot" was adopted to represent the assessment and screening process outputs for each option as illustrated in Figure 6.1 below.

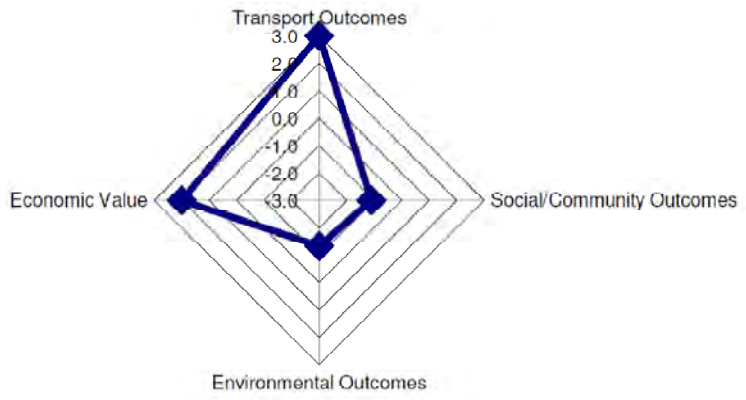


Figure 6.1 Example Radar Diagram

The centre of the radar plot represents the least-desirable outcome, while the outer edge represents the best outcome. The mid-point of each radar arm represents a neutral position. This roughly equates to the existing situation, except in the case of "Economic Value" where the Board Preferred option was adopted as the base comparison. Each arm of the radar plot represents one of the primary criteria shown in Table 12.1. The evaluation process entailed scoring each of the sub-criteria relative to the existing situation. An overall score for the primary criteria was then decided. The primary criteria score was decided, based on individual sub-criteria scores and an overall relative view of the option. In the example shown above, the transport outcomes of the option are considered to be "Significant positive" compared to the existing situation. Radar plots provide a ready means of option comparison, with options that enclose a large radar plot area generally considered preferable to options enclosing a small area.

6.3.2 Te Horo

Figure 6.2 summarises the resulting MCAT radar plots for the Board Preferred Te Horo alignment and the Alternative Te Horo alignment.

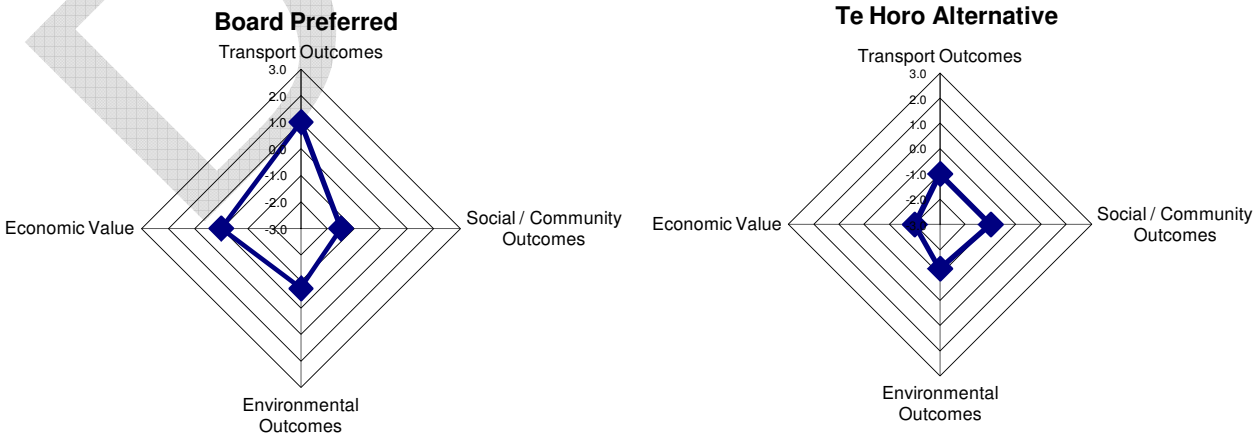


Figure 6.2 Radar Plots for Te Horo Alignments

The Board Preferred Alignment delivers equal or better outcomes in relation to transport, environmental and economic criteria, while social and community outcomes have been assessed as marginally better for the Te Horo Alternative due primarily to potential severance effects.

The key assessed differences between the options are:

- Less favourable urban design outcomes with the Te Horo Alternative due to adverse residual land parcels and a widening of the overall transport corridor.
- Retention of the at-grade rail crossing with the Te Horo Alternative compared with grade separation in the Board Preferred option.
- Increased ecological impacts (minor negative) on bush remnants with the Te Horo Alternative option.
- A significant difference in capital investment between the options given the need for additional linkages/local bridge crossings.

It was also noted that the Te Horo Alternative could not occur in conjunction with the Mary Crest Alternative, however this was not specifically factored into the above assessment.

On balance the team concluded that the Board Preferred Option delivered better overall transport and environmental outcomes while providing similar social and community outcomes. On this basis the team re-confirmed that a recommendation should be made to continue to progress the NZTA Board Preferred Alignment at Te Horo.

6.3.3 Mary Crest

Figure 6.3 summarises the MCAT radar plots for the Board Preferred Mary Crest alignment and the alternative Mary Crest alignment.

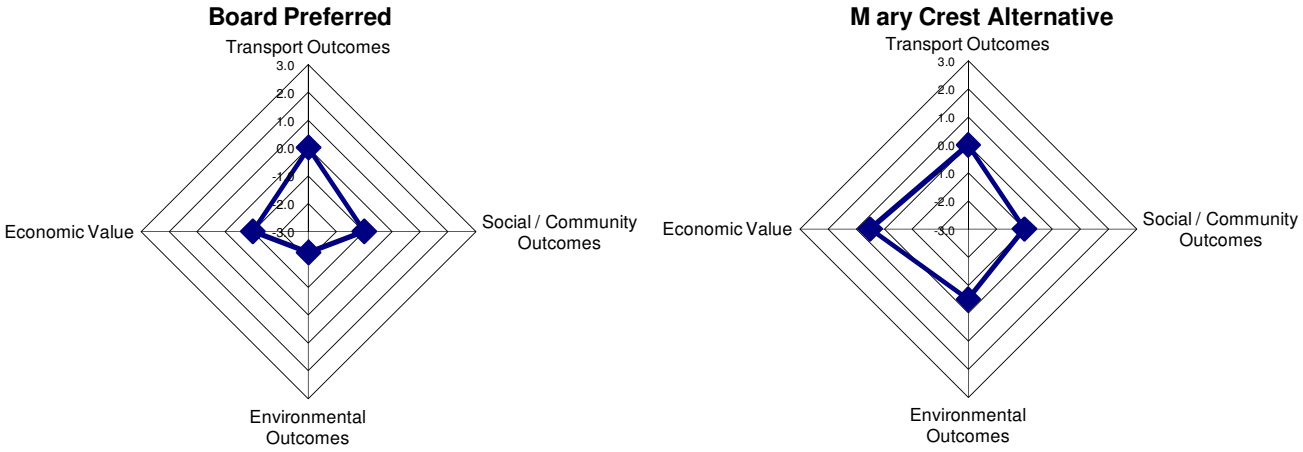


Figure 6.3 Radar Plots for Mary Crest Alignments

The Mary Crest assessment and MCAT outcomes highlight that there are clear environmental and economic benefits for the Mary Crest alternative while the social and transport outcomes are similar.

The key benefits identified with the Mary Crest Alternative include:

- Avoidance of native bush/wetland remnant areas identified as having potential regional significance.
- Significant reduction in the potential impact on sites of cultural significance.
- Improved landscape effects due to a reduction in the extent of cuts and fills by better utilising the existing terrain.

- Potential for reduced capital investment as the option better utilises the natural topography.

The outcomes from this assessment highlight that there is opportunity to enhance the project environmental outcomes by considering the Mary Crest Alternative.

7 Preliminary Conclusions and Recommendations

7.1 Preliminary Conclusions

From a technical feasibility view point both the Mary Crest and Te Horo Alternatives are feasible. The specific findings from each are;

Te Horo;

- The suggested alternative is considered technically feasible. Geotechnical consideration introduce more risk and cost than the route to the east of the railway.
- The Te Horo Alternative has greater earthworks volumes than the Board Preferred Option due to the topography on the western side of the expressway.
- The Te Horo Alternative would affect slightly fewer dwellings but a greater number of land parcels.
- Specialist assessment including an urban design review has identified that the Board Preferred option delivers better environmental outcomes primarily due to the compromised residual land parcels and overall widened transport corridor that result from the Te Horo Alternative Option.
- Social and community outcomes were assessed as similar, but marginally better for the Te Horo Alternative due to some reduction in physical severance.
- The cost of the alternative is potentially $15M to $30M more than the Board Preferred Option.

Based on the assessment completed by specialists and the outcomes of the MCAT workshop it is considered that the Board Preferred Option provides the overall best outcomes from a transport, social and environmental perspective.

Mary Crest:

- The alternative is considered technically feasible, geotechnical considerations appear better than the board preferred route which may result in reduced costs. Further geotechnical information is required to confirm comparative costs.
- The alternative will affect a lower number of dwellings but a greater number of land parcels. These land parcels may be more productive than those affected in the Board Preferred Option and this was reflected in a moderate negative impact for the alternative and minor negative for the Board Preferred route.
- The alternative has lower earthworks volumes and a reduced landscape impact relative to the Board Preferred Option as the northern approach is able to utilise the natural topography.
- The Mary Crest alternative potentially provides significantly improved environmental outcomes compared to the Board Preferred option. This is primarily due to the avoidance of significant bush remnants and reduced impact on sites of cultural significance.

The assessment completed and MCAT process has confirmed that the Mary Crest Alternative option is likely to deliver improved environmental and economic outcomes while delivering similar social and transport outcomes as the Boar Preferred Option.

7.2 Recommendations

The following are the proposed recommendations resulting from this scheme phase technical and specialist assessment:

Te Horo:

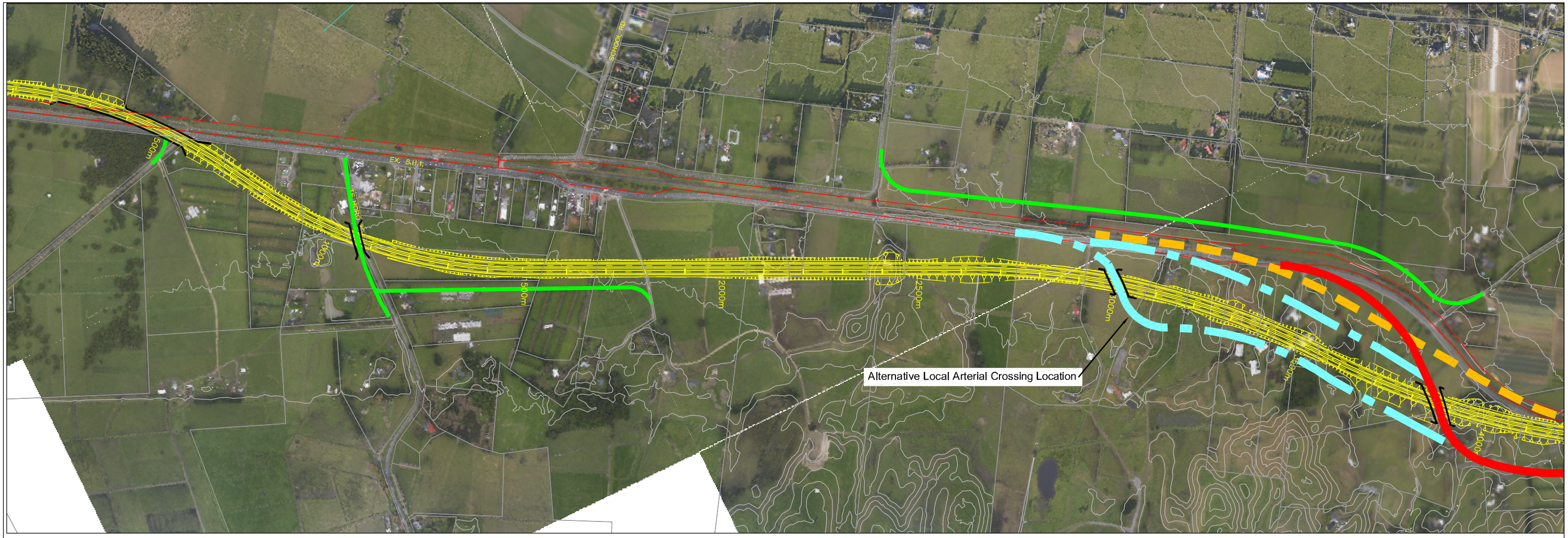
- It is recommended that the Board Preferred Option is adopted at Te Horo given that this delivers the best overall outcomes when considering transport, social, environmental and economic criteria.
- Scheme design and further specialist assessment should continue for the Board Preferred Te Horo alignment to develop mitigation proposals.

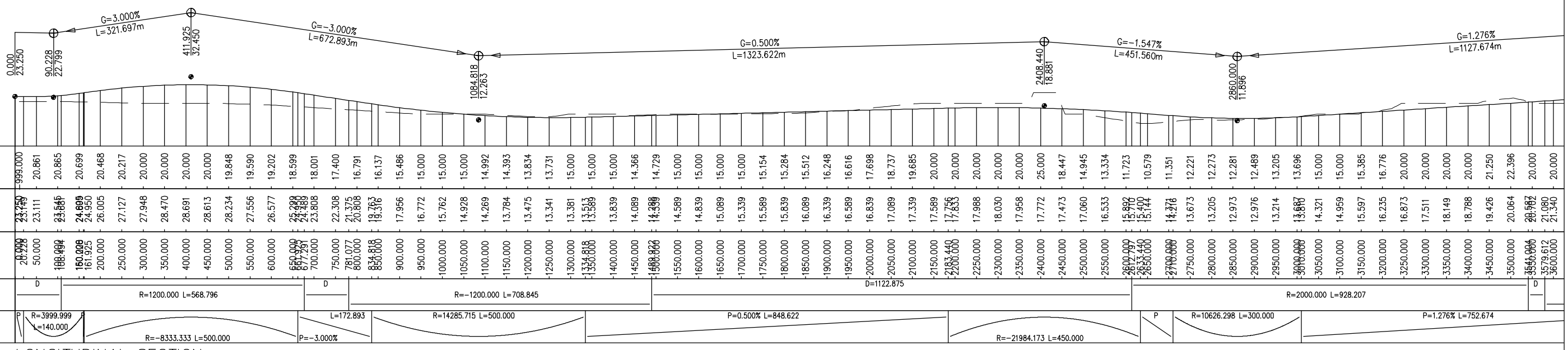
Mary Crest:

- It is recommended that the Mary Crest Alternative is taken forward to scheme design and for further assessment and design of mitigation measures.
- The outcomes of this assessment should be workshopped with key stakeholders to ensure all factors have been addressed.
- Further focused consultation (at least directly affected parties) should be undertaken around the Mary Crest area given that, while mitigating effects, the alternative impacts on different landowners.

Appendix A

Scoping Drawings





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150.000	20.468	24.950
161.925	20.217	26.005
200.000	20.000	27.127
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350.000	20.000	28.691
400.000	20.000	28.613
450.000	20.000	28.234
500.000	19.848	27.556
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2900.000	12.976	13.214
2950.000	13.214	13.696
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3050.000	14.321	14.959
3100.000	14.959	15.597
3150.000	15.597	16.235
3200.000	16.235	16.873
3250.000	16.873	17.511
3300.000	17.511	18.149
3350.000	18.149	18.788
3400.000	18.788	19.426
3450.000	19.426	21.250
3500.000	21.250	22.396
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3579.612	20.582	21.080
3600.000	21.080	21.340

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LONGITUDINAL SECTION

HORIZONTAL SCALE 1:5000
VERTICAL SCALE 1:1000

KEY
- LOCAL ACCESS
- POSSIBLE RAIL REALIGNMENT
- LOCAL ARTERIAL
- LOCAL ACCESS CONNECTION
- FARM ACCESS CONNECTION
- POSSIBLE FUTURE OPTION
- BRIDGE

1:1 @ A1 — 0 10 20 30 40 50 60 70 80 90 100 mm

Revision	Amendment	Approved	Revision Date

NZ TRANSPORT AGENCY WAKA KOTAHI

OPUS URS

Drawn	Designed	Approved	Revision Date
NM / BRC	NM / BRC	AJC	JAN 2011

Project No.	Scale
5c1814.64	1:5000 (A1) , 1:10000 (A3)

Project
NEW ZELAND TRANSPORT AGENCY
PEKA PEKA TO OTAKI EXPRESSWAY
CORRIDOR FEASIBILITY STUDY

Sheet
OCB TE HORO ALTERNATIVE

Drawing No.	Sheet No.	Revision
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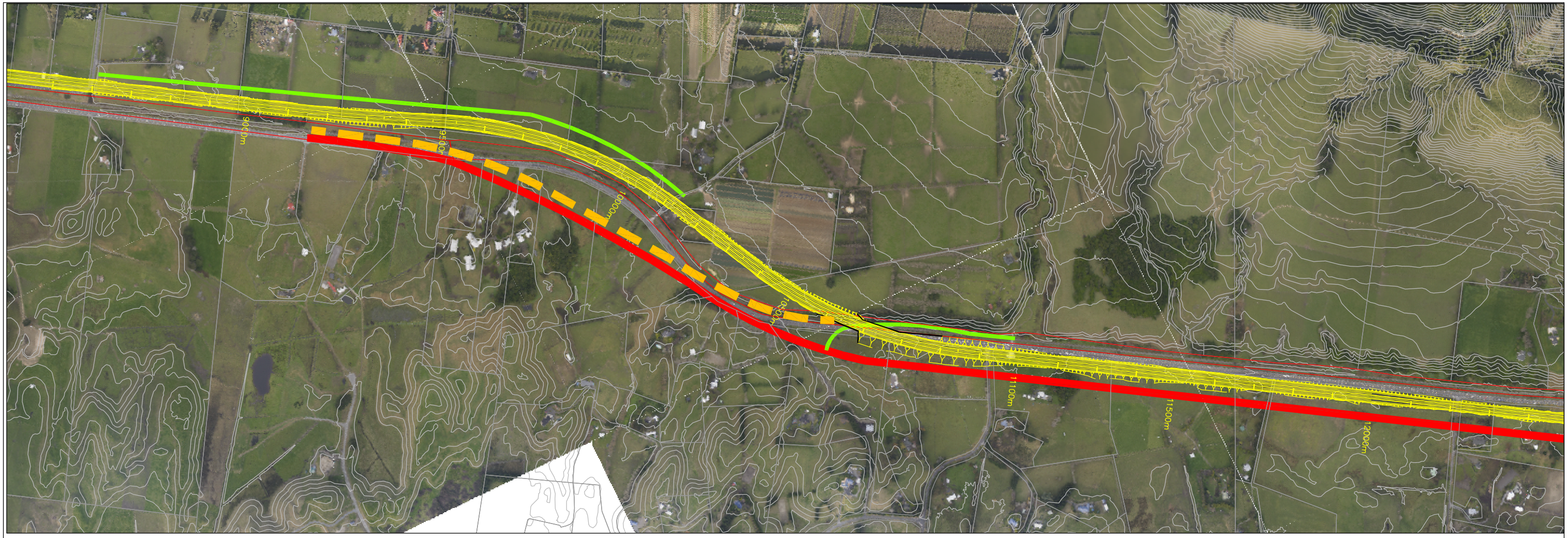

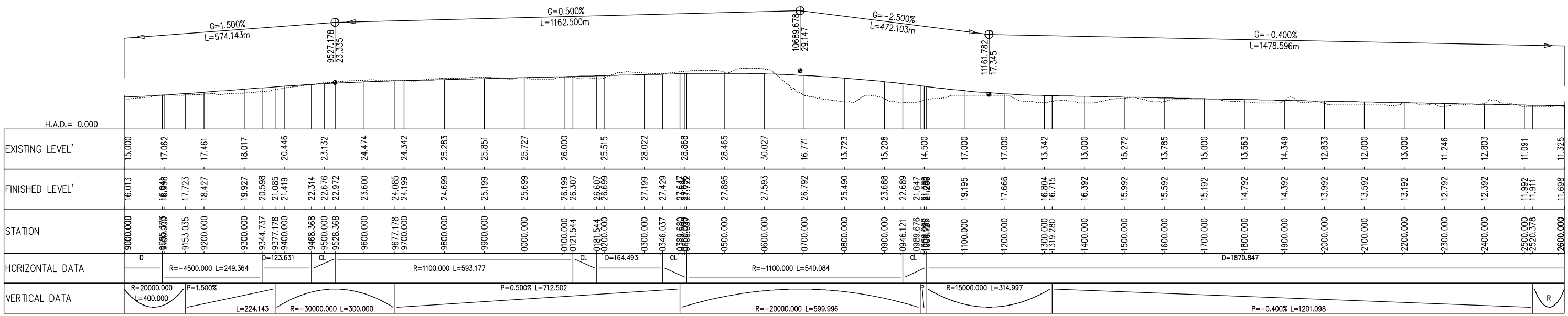

LONGITUDINAL SECTION

HORIZONTAL SCALE 1:5000
VERTICAL SCALE 1:1000

KEY

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- POSSIBLE RAIL REALIGNMENT
- LOCAL ARTERIAL
- LOCAL ACCESS CONNECTION
- FARM ACCESS CONNECTION
- POSSIBLE ALTERNATIVE ALIGNMENT
- BRIDGE

1:1 @ A1 — 0 10 20 30 40 50 60 70 80 90 100 mm

Revision	Amendment	Approved	Revision Date

NZ TRANSPORT AGENCY
WAKA KOTAHI

OPUS URS

Drawn	Designed	Approved	Revision Date
NM / BRC	NM / BRC	AJC	JAN 2011

Project No.	Scale
5c1814.64	1:5000 (A1) , 1:10000 (A3)

Project
NEW ZELAND TRANSPORT AGENCY
PEKA PEKA TO OTAKI EXPRESSWAY
CORRIDOR FEASIBILITY STUDY

Sheet
MARYCREST ALTERNATIVE

Drawing No.	Sheet No.	Revision
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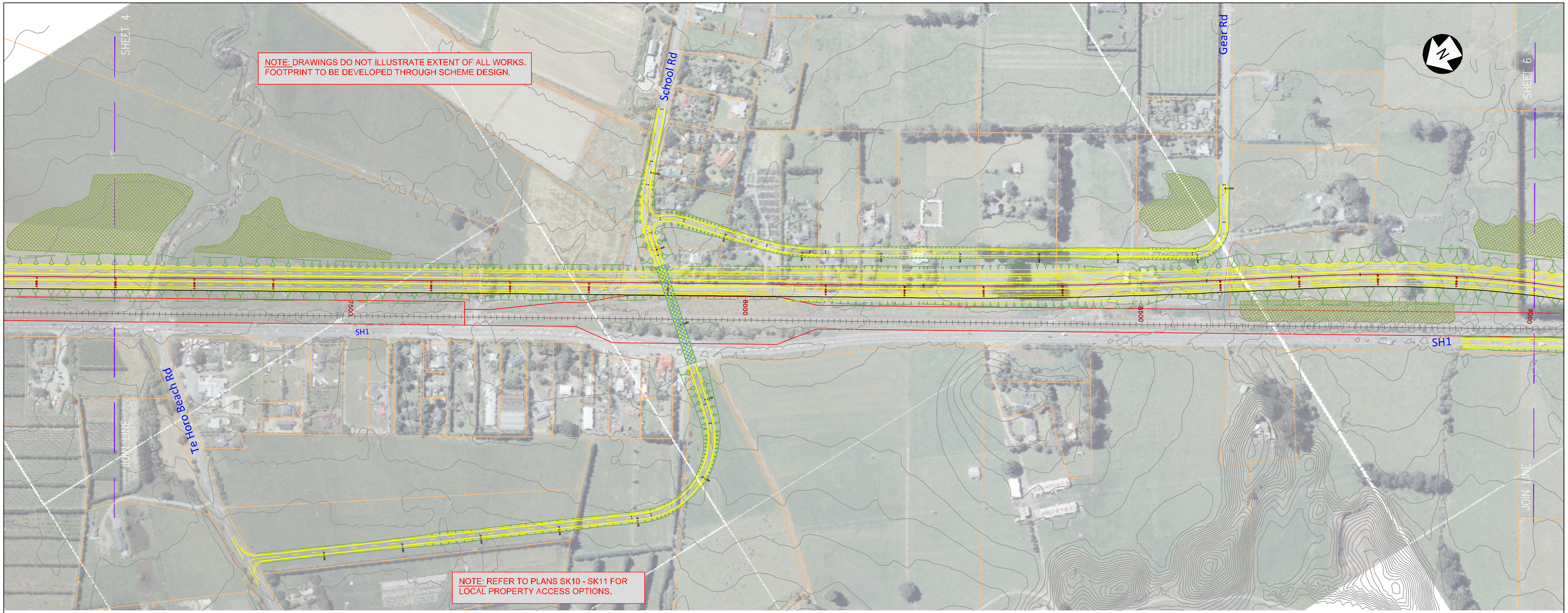

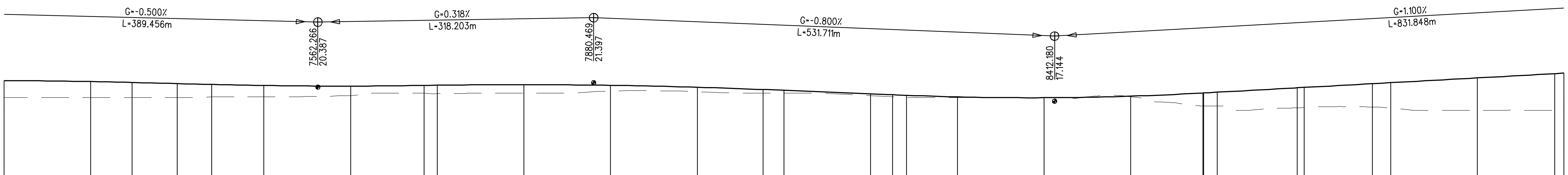

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7400.000	21.198
7439.634	21.000
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7700.000	20.821
7800.000	20.952
7900.000	20.798
8000.000	20.358
8076.040	19.833
8100.000	19.641
8200.000	18.841
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8800.000	21.410
8900.000	22.510
8989.028	23.489

HORIZONTAL DATA: R=-6500.000 L=359.045; D=107.659; CL=87.000

VERTICAL DATA: R=-35000.000 L=350.001; L=91.824; P=-0.500%; R=30000.000 L=245.264; R=-35000.000 L=391.142; P=-0.800% L=165.140; R=18000.000 L=341.999; P=1.100% L=405.848

KEY

- EXISTING RAIL CORRIDOR DESIGNATION
- EXTENT OF RAIL REALIGNMENT
- NEW BRIDGE
- POSSIBLE STORMWATER DEVICE
- POTENTIAL NEW LOCAL PROPERTY ACCESS

1:2500 @ A1 — 0 40 80 120 160 200 240 m

Revision	Amendment	Approved	Revision Date
R1	DESIGN AMENDMENTS	AJC	11/10

NZ TRANSPORT AGENCY
WAKA KOTAHI

OPUS URS

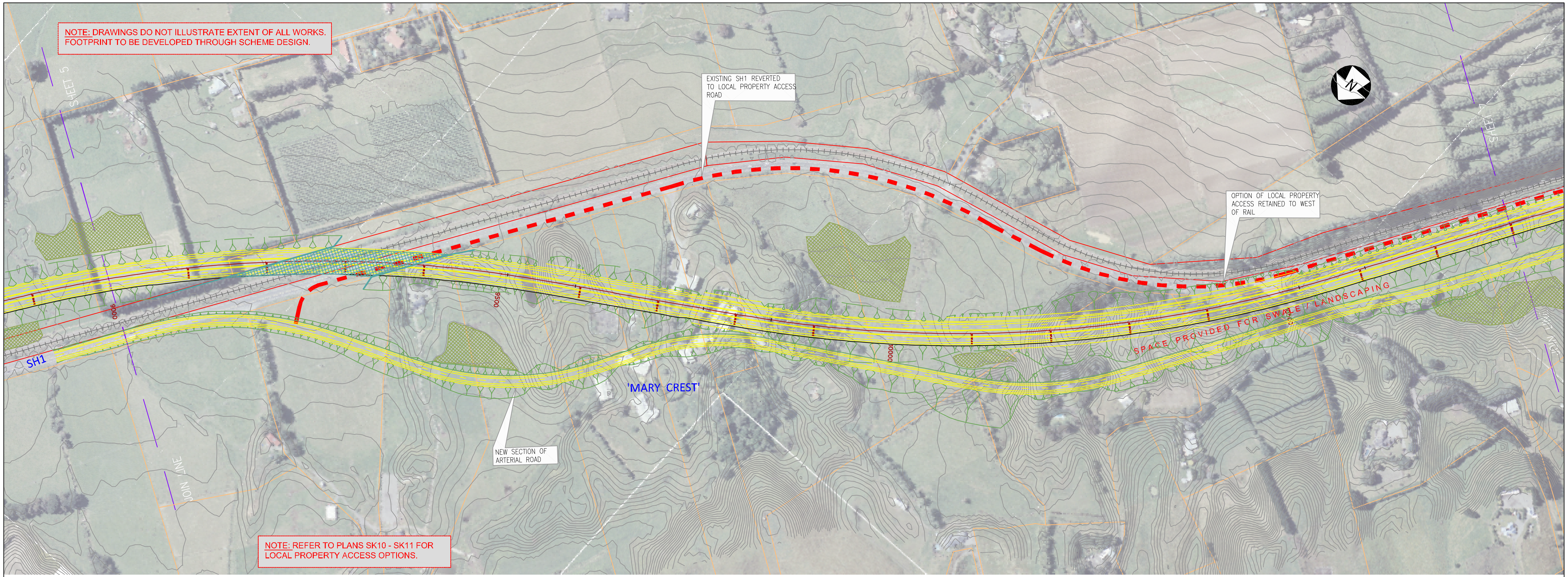
Project: NEW ZEALAND TRANSPORT AGENCY
PEKA PEKA TO NORTH OTAKI EXPRESSWAY
SCOPING STUDY

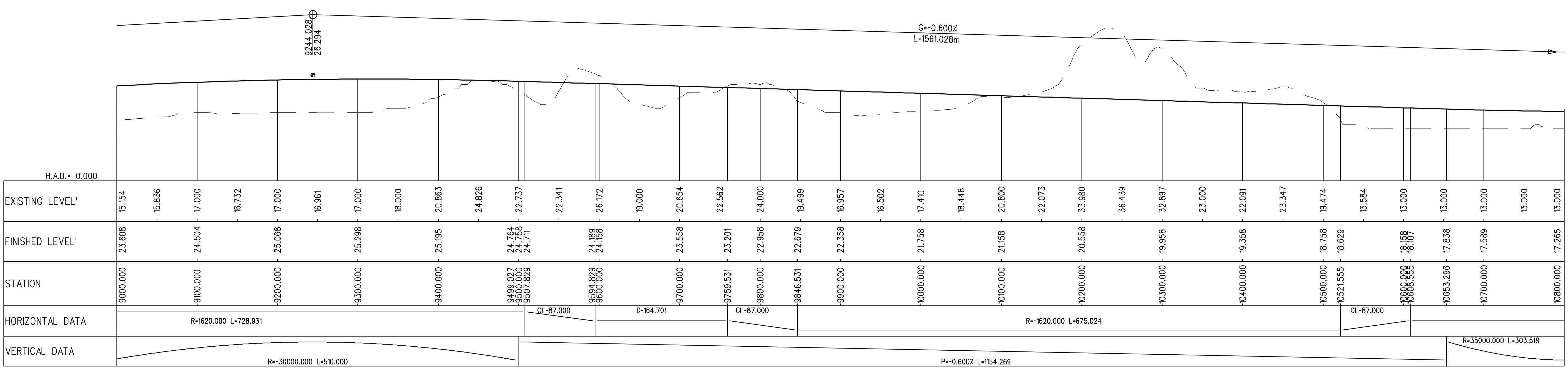
Sheet: ROAD DESIGN - PREFERRED PROPOSAL
SHEET 5 OF 8

Drawn	Designed	Approved	Revision Date
NM / BC	NM / BC	T.COULMAN	10/10

Project No.	Scale	Drawing No.	Sheet No.	Revision
5C1814.00	1:2500(A1), 1:5000(A3)	5/2664/1/5504	105	R1

Original Sheet Size A1 [841x594] Plot Date 11/11/10 @ 17:10 p:\projects\5-c1814.00 peka peka to north otaki 440pn\800 drawings\910 cad\5504_scoping study\5_2664_1_5504_101-108 r1.dwg





KEY

- EXISTING RAIL CORRIDOR DESIGNATION
- EXTENT OF RAIL REALIGNMENT
- NEW BRIDGE
- POSSIBLE STORMWATER DEVICE
- POTENTIAL NEW LOCAL PROPERTY ACCESS

1:2500 @ A1 — 0 40 80 120 160 200 240 m

Revision	Amendment	Approved	Revision Date
R1	DESIGN AMENDMENTS	AJC	11/10

NZ TRANSPORT AGENCY
WAKA KOTAHI

OPUS URS

Drawn	Designed	Approved	Revision Date
NM / BC	NM / BC	T.COULMAN	10/10

Project No. 5C1814.00
Scale 1:2500(A1), 1:5000(A3)

Project
NEW ZEALAND TRANSPORT AGENCY
PEKA PEKA TO NORTH OTAKI EXPRESSWAY
SCOPING STUDY

Sheet
ROAD DESIGN - PREFERRED PROPOSAL
SHEET 6 OF 8

Drawing No. 5/2664/1/5504
Sheet No. 106
Revision R1

Original Sheet Size A1 [841x594] Plot Date 11/11/10 @ 17:10 p:\projects\5-c1814.00 peka peka to north otaki 440pn\800 drawings\910 cad\5504_scoping study\5_2664_1_5504_101-108 r1.dwg

Appendix B

Site Investigation Maps

Engineering Geological Map Key Sheet


Fill


SD = Sand Dune


ID = Inter Dune Deposits (swamp, peat)


FD = Fan Deposits


TA = Terrace Alluvium


RA = Recent Alluvium


Geological Boundary


Inferred Geological Boundary


Borehole


Trial Pit


CPT

133
134
131
125
142
143
144
145
201
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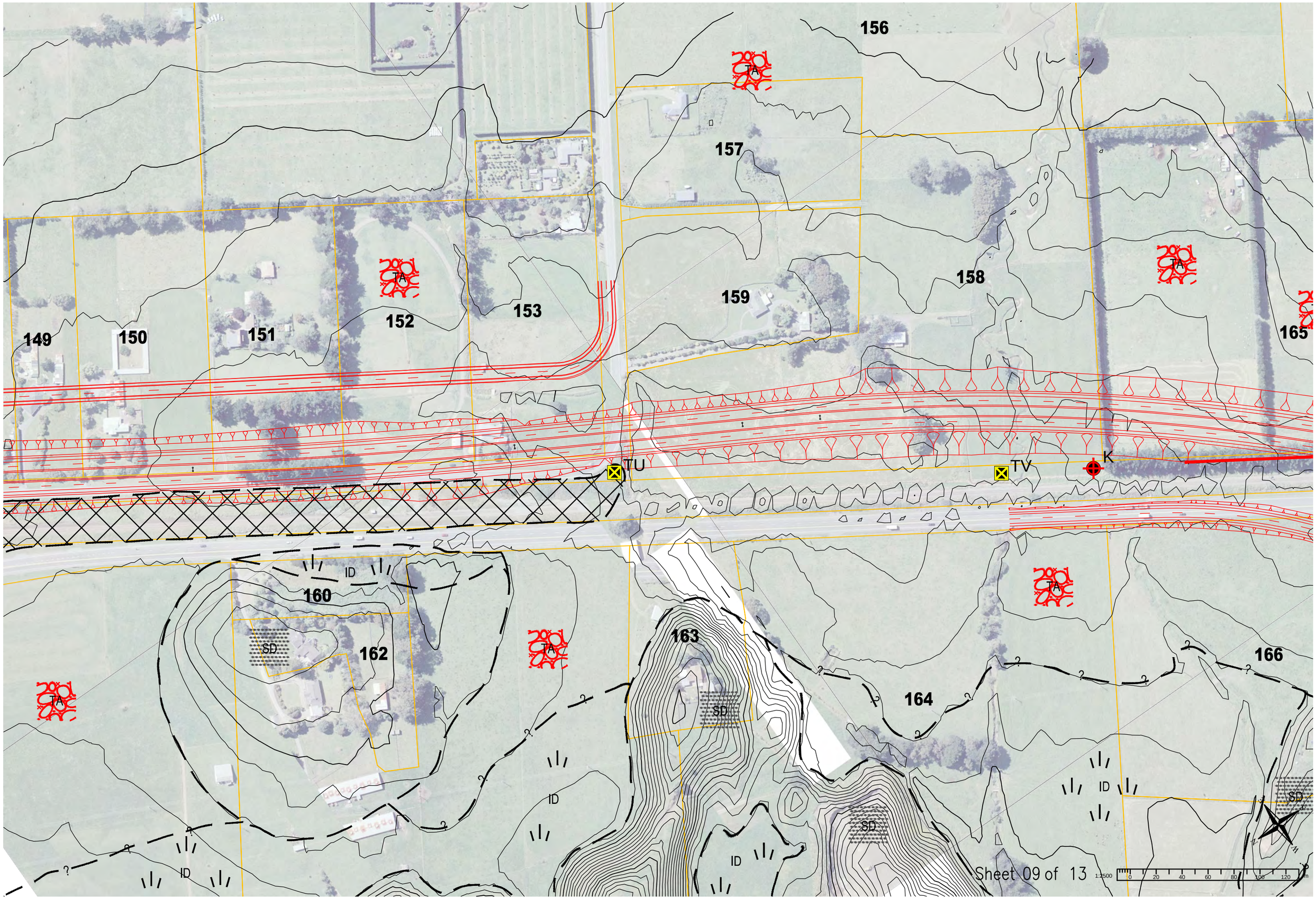
147
148
149
140
139
TA
TR
TS
TT
Sheet 08 of 13
1:2500
0 20 40 60 80 100 120 m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149
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Sheet 09 of 13
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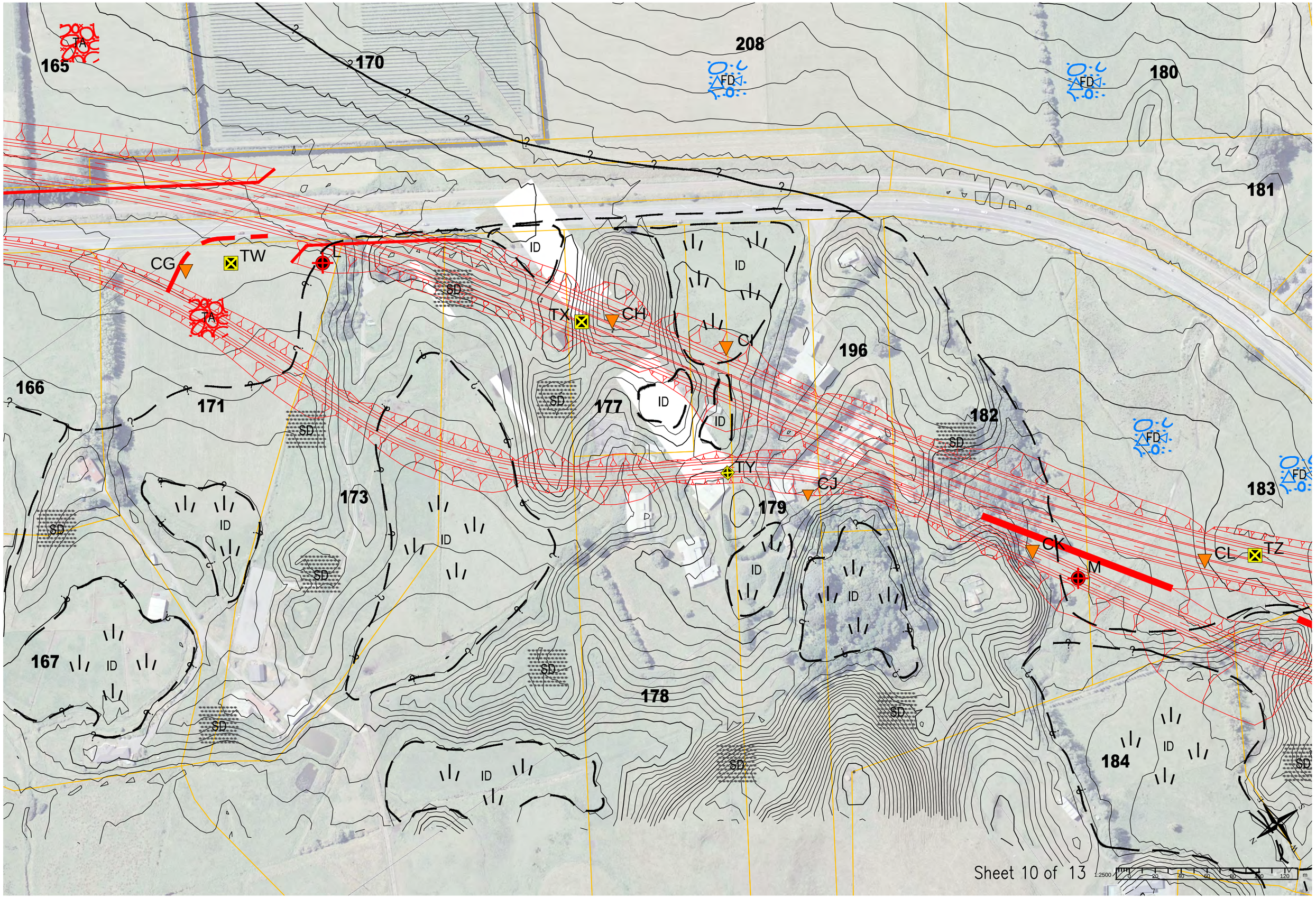
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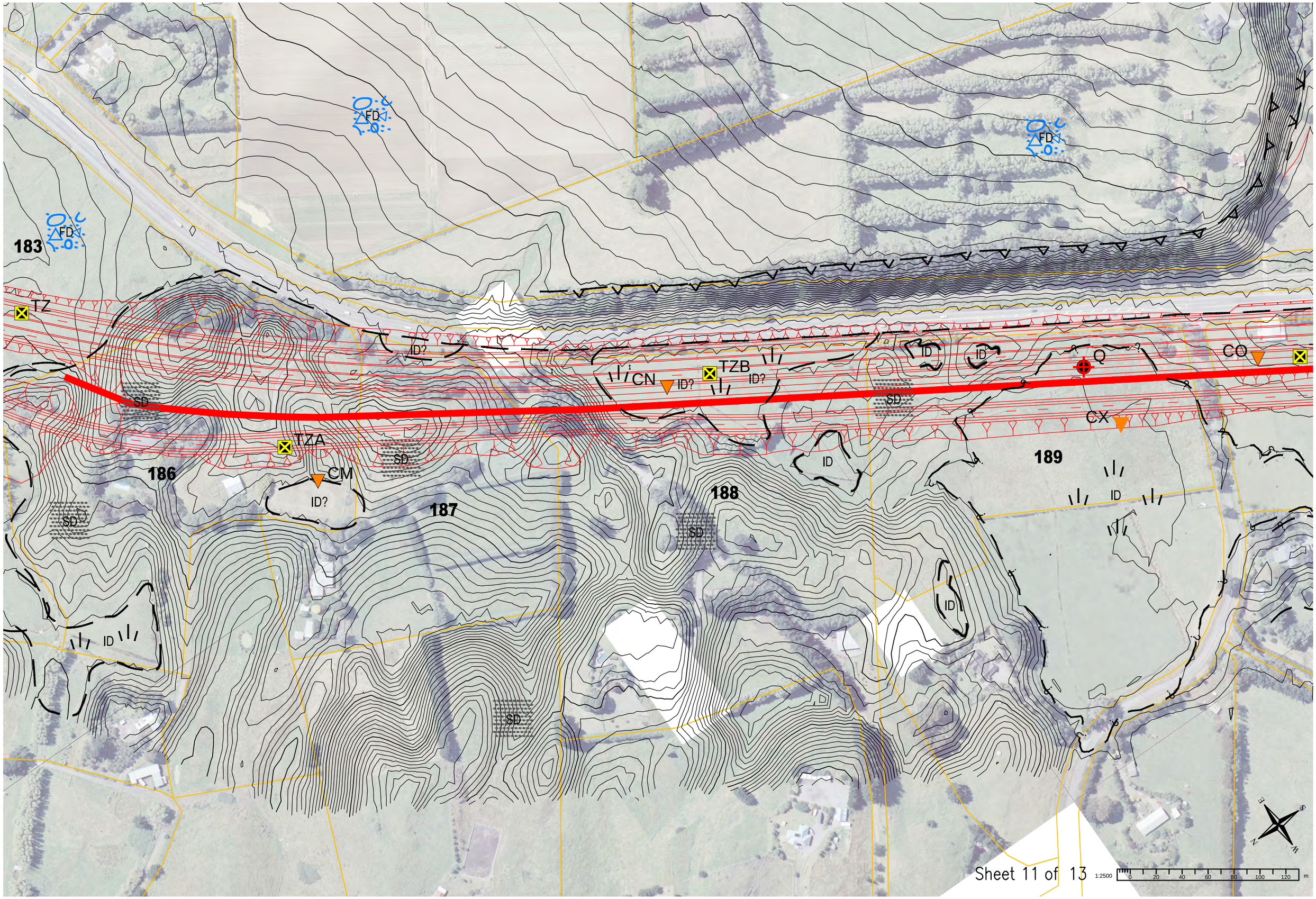

Sheet 11 of 13

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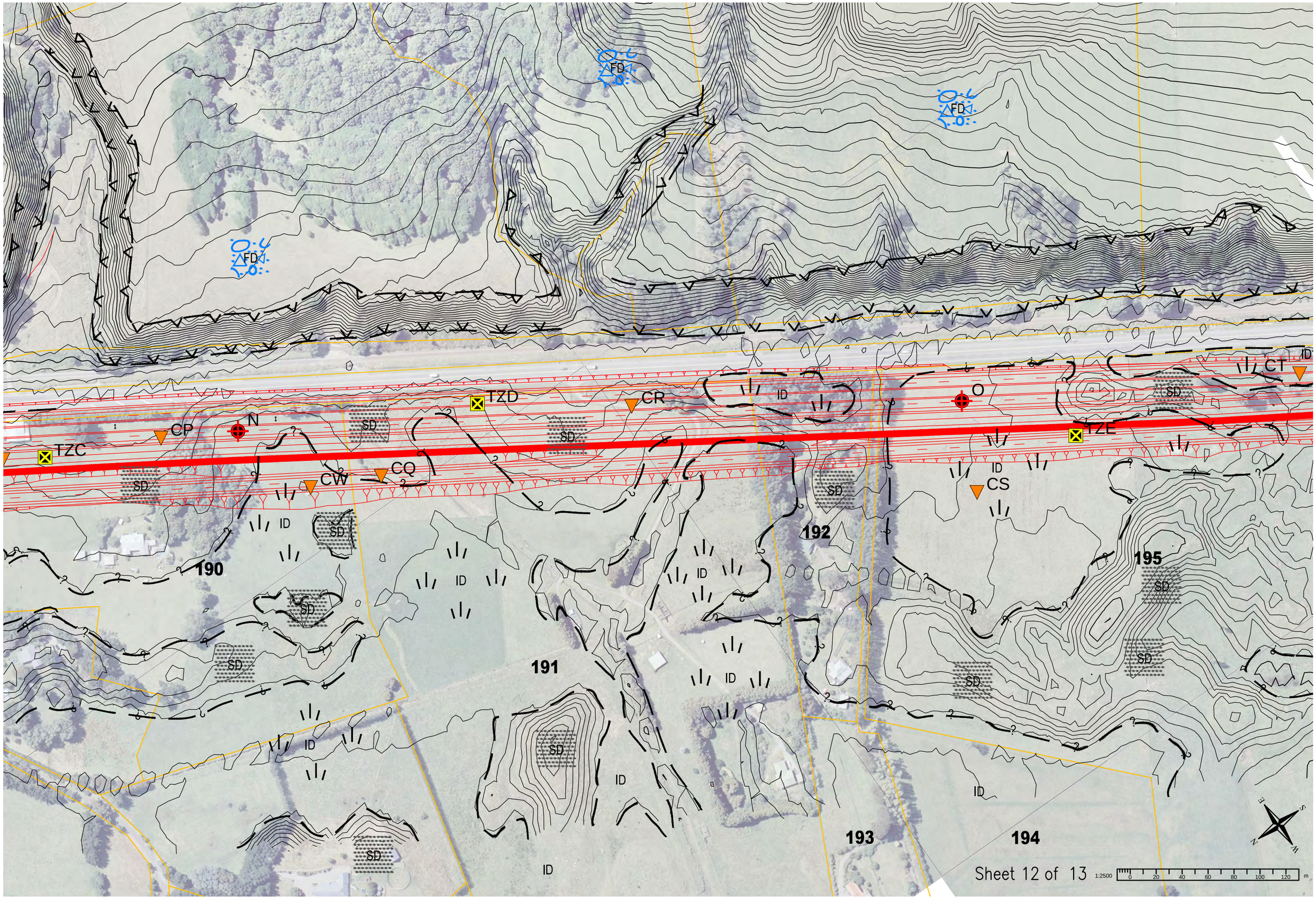
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193
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195
Sheet 12 of 13
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60
80
100
120
m

Appendix C

Feasibility Cost Estimates

Project Estimate

Peka Peka to Otaki - Marycrest Alternative

FE

Item	Description	Preferred Option Base Estimate	Mary Crest Alternative Base Estimate	Te Horo Alternative Base Estimate
A	**Nett Project Property Cost**	**17,100,000**	**16,700,000**	**21,200,000**
	Investigation and Reporting			
	- Consultancy Fees	4,000,000	3,600,000	4,500,000
	- NZTA Managed Costs	400,000	400,000	500,000
B	**Total Investigation and Reporting**	**4,000,000**	**4,000,000**	**5,000,000**
	Design and Project Documentation			
	- Consultancy Fees	4,000,000	3,600,000	4,800,000
	- NZTA Managed Costs	400,000	400,000	500,000
C	**Total Design and Project Documentation**	**4,000,000**	**4,000,000**	**5,000,000**
	Construction			
	MSQA			
	- Consultancy Fees	3,500,000	3,200,000	4,300,000
	- NZTA Managed Costs	700,000	600,000	800,000
	- Consent Monitoring Fees	200,000	200,000	300,000
	Sub Total Base MSQA	**4,400,000**	**4,000,000**	**5,400,000**
	Physical Works			
1	Environmental Compliance	200,000	200,000	200,000
2	Earthworks	29,600,000	21,900,000	36,500,000
3	Ground Improvements	2,800,000	2,800,000	5,200,000
4	Drainage	5,400,000	5,400,000	5,500,000
5	Pavement and Surfacing	15,000,000	15,900,000	16,600,000
6	Bridges	13,300,000	12,400,000	18,100,000
7	Retaining Walls	2,000,000	1,800,000	2,100,000
8	Traffic Services	1,600,000	1,300,000	1,600,000
9	Service Relocations	1,400,000	1,400,000	1,500,000
10	Landscaping	3,200,000	2,800,000	3,300,000
11	Traffic Management and Temporary Works	900,000	900,000	900,000
12	Preliminary and General	13,200,000	11,700,000	16,000,000
13	Extraordinary Construction Costs	0	0	0
	Sub Total Base Physical Works	**88,600,000**	**79,000,000**	**107,000,000**
D	**Total Construction**	**93,000,000**	**83,000,000**	**113,000,000**
E	**Project Base Estimate** (A+B+C+D)	**119,000,000**	**107,000,000**	**145,000,000**
F	**Contingency** (Assessed/~~Analysed~~)	**21,000,000**	**24,000,000**	**32,000,000**
G	**Project Expected Estimate** (E+F)	**140,000,000**	**131,000,000**	**177,000,000**
	% of Base	**118%**	**122%**	**122%**
H	**Funding Risk** (Assessed/~~Analysed~~)	**82,000,000**	**82,000,000**	**118,000,000**
I	**95th percentile Project Estimate** (G+H)	**222,000,000**	**213,000,000**	**295,000,000**
	% of Base	**187%**	**199%**	**203%**

Date of Estimate	**25 - March - 2011**	**Cost Index, December 2010**	
Estimate prepared by	**Simon de Rose**		
Estimate internal peer review by	**Keith Atkinson**		
~~Estimate external peer review by~~			
~~Estimate accepted by NZTA~~			

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

PEKA PEKA TO OTAKI — OE
Te Horo Option Estimate - Preferred Option

Date of estimate:	**25-Mar-11**	**Cost Index:**	**Dec-10**
Estimate prepared by:	Simon de Rose	**Signed:**	
Estimate internal peer review by:	Keith Atkinson	**Signed:**	
Estimate external peer review by:		**Signed:**	

Item	Description	Unit	Quantity	Rate	Amount	Subtotals	Comment/Assumptions
A	**Project Property Cost**		1.00	17,058,787	17,058,787	**17,058,787**	
B	**INVESTIGATION & REPORTING**		0.05	88,589,217	4,429,461	**4,429,461**	
C	**DESIGN & PROJECT DEVELOPMENT**		0.05	88,589,217	4,429,461	**4,429,461**	
D	**Construction**						
1...	**MSQA & CLIENT MANAGED COSTS**		0.05	88,600,000	4,430,000	**4,400,000**	Assumed 5% of physical works costs,consisting of 4% MSQA & 1% Client/Consent fees
	Physical Works				0		
					0		
2...	**ENVIRONMENTAL COMPLIANCE**				0	**205,200**	
	Environmental Compliance (Medium)	km	5.40	38,000	205,200		
3...	**EARTHWORKS**					**29,638,808**	
3.1..	CUT TO FILL/UNDERCUT FOR TYPE 'A' MATERIAL	cu.m	174,366	8	1,307,745		Assume 90% Suitable Material
3.2..	IMPORTED FILL (Prov. Item)	cu.m	398,392	25	9,959,800		
3.3..	CUT TO WASTE (on-site)	cu.m	19,374	10	193,740		10% of Cut as Unsuitable
3.4..	Embankment Fill	cu.m	19,600	25	490,000		
3.5..	CUT TO WASTE (Peat)	cu.m	129,600	15	1,944,000		Assuming 4m peat depth
3.6..	Backfill Peat Areas	cu.m	129,600	30	3,888,000		Assuming 4m peat depth
...	E/O for other earthworks items	LS	29,638,808	40%	11,855,523		
					0		
4...	**GROUND IMPROVEMENTS**				0	**2,763,200**	
	Ground Improvements (Low)	km	0.00	503,000	0		
	Ground Improvements (Medium)	km	3.20	628,000	2,009,600		
	Ground Improvements (High)	km	0.80	942,000	753,600		
					0		
5...	**DRAINAGE**				0	**5,400,000**	
5...	Parameter Drainage Rate (Low)	km	0.00	400,000	0		
5...	Parameter Drainage Rate (Medium)	km	5.40	1,000,000	5,400,000		
5...	Parameter Drainage Rate (High)	km	0.00	1,500,000	0		
					0		
6...	**PAVEMENT & SURFACING**				0	**15,000,000**	
6...	Expressway Pavement	km	5.40	1,250,000	6,750,000		Pavement only
6...	New Local Arterial	km	2.60	2,000,000	5,200,000		Inclusive of EW etc
6...	Existing SH1 modifications	km	2.30	500,000	1,150,000		Inclusive of EW etc
...	New Local Access	km	1.90	1,000,000	1,900,000		Inclusive of EW etc
7...	**BRIDGES**					**13,300,000**	
7...	Te-Horo Expressway and Rail Local Road Over-Bridge	m2	1,600	3,000	4,800,000		
7...	Marycrest Expressway Over-Bridge	LS	1	8,500,000	8,500,000		
8...	**RETAINING WALLS**					**1,957,500**	
8...	Retaining Walls (Low)	km		150,000	0		
8...	Retaining Walls (Medium)	km	5.40	300,000	1,620,000		
8...	Retainging Walls (High)	km		800,000	0		
8...	E/O Interchange Embankment Walls	sq.m	225	1,500	337,500		
					0		
9...	**TRAFFIC SERVICES**				0	**1,609,200**	
9...	Traffic Services (low)	km		238,400	0		
9...	Traffic Services (Medium)	km	5.40	298,000	1,609,200		
	Traffic Services (High)	km		447,000	0		
					0		
10...	**SERVICE RELOCATIONS ~~(& PROTECTION)~~**				0	**1,425,600**	
10...	Service Relocations (Low)	km		211,200	0		
10...	Service Relocations (Medium)	km	5.40	264,000	1,425,600		
10...	Service Relocaitons (High)	km		528,000	0		
					0		
11...	**LANDSCAPING & URBAN DESIGN**				0	**3,177,570**	
11...	LANDSCAPING				0		
11...	Rural Landscaping	%	57,774,007	0.03	1,733,220		80% of expressway assumed to be rural, therefore 3% of 80% of PW costs excluding items 11 & 13
11...	Urban Landscaping	%	14,443,502	0.10	1,444,350		20% of expressway assumed to be rural, therefore 10% of 20% of PW costs excluding Items 11 & 13
					0		
12...	**TRAFFIC MANAGEMENT & TEMPORARY WORKS**				0	**918,000**	
12...	Traffic Management (Low)	km		136,000	0		
12...	Traffic Management (Medium)	km	5.40	170,000	918,000		
	Traffic Management (High)	km		340,000	0		
					0		
13...	**PRELIMINARY & GENERAL**				0	**13,194,139**	
13...	Preliminary & General	%	75,395,079	0.175	13,194,139		17.5% of Physical Works Cost (Items 2-12 & 14)
					0		
14...	**EXTRAORDINARY CONSTRUCTION COSTS**				0	**0**	
14...	Relocate railway tracks - single track	km		3,000,000	0		
14...	Relocate railway tracks - double track	km		5,000,000	0		
...	Relocated Otaki Railway Station	LS		750,000	0		
...							
					0		
Total Project Estimate					**118,936,927**	**118,906,927**	
				Say	**118,900,000**	**118,900,000**	

PEKA PEKA TO OTAKI — OE
Te Horo Option Estimate - Alternative Optio

Date of estimate:	**25-Mar-11**	**Cost Index:**	**Dec-10**
Estimate prepared by:	Simon de Rose	**Signed:**	
Estimate internal peer review by:	Keith Atkinson	**Signed:**	
Estimate external peer review by:		**Signed:**	

Item	Description	Unit	Quantity	Rate	Amount	Subtotals	Comment/Assumptions
A	**Project Property Cost**		1.00	21,183,699	21,183,699	**21,183,699**	
B	**INVESTIGATION & REPORTING**		0.05	107,472,556	5,373,628	**5,373,628**	
C	**DESIGN & PROJECT DEVELOPMENT**		0.05	107,472,556	5,373,628	**5,373,628**	
					0		
D	**Construction**				0		
1...	**MSQA & CLIENT MANAGED COSTS**		0.05	107,500,000	5,375,000	**5,400,000**	Assumed 5% of physical works costs,consisting of 4% MSQA & 1% Client/Consent fees
	Physical Works				0		
					0		
2...	**ENVIRONMENTAL COMPLIANCE**				0	**209,000**	
	Environmental Compliance (Medium)	km	5.50	38,000	209,000		
3...	**EARTHWORKS**					**36,534,513**	
3.1..	CUT TO FILL/UNDERCUT FOR TYPE 'A' MATERIAL	cu.m	161,655	8	1,212,413		Assume 90% suitable material
3.2..	IMPORTED FILL (Prov. Item)	cu.m	471,227	25	11,780,675		
3.3..	CUT TO WASTE (on-site)	cu.m	17,962	10	179,620		10% of Cut as Unsuitable
3.5..	CUT TO WASTE (Peat)	cu.m	194,400	15	2,916,000		Assuming 4m peat depth
3.6..	Backfill Peat Areas	cu.m	194,400	30	5,832,000		Assuming 4m peat depth
3.7..	E/O for other earthworks items	LS	36,534,513	40%	14,613,805		
4...	**GROUND IMPROVEMENTS**					**5,181,000**	
	Ground Improvements (Low)	km		503,000	0		
	Ground Improvements (Medium)	km	0.00	628,000	0		
	Ground Improvements (High)	km	5.50	942,000	5,181,000		
					0		
5...	**DRAINAGE**				0	**5,500,000**	
5...	Parameter Drainage Rate (Low)	km		400,000	0		
5...	Parameter Drainage Rate (Medium)	km	5.50	1,000,000	5,500,000		
5...	Parameter Drainage Rate (High)	km		1,500,000	0		
5...					0		
6...	**PAVEMENT & SURFACING**				0	**16,552,000**	
6...	Expressway Pavement	km	5.50	1,250,000	6,875,000		Pavement only
6...	New Local Arterial	km	2.60	2,000,000	5,200,000		Inclusive of EW etc
6...	Existing SH1 modifications	km	3.20	500,000	1,600,000		Inclusive of EW etc
6...	New Local Access	km	2.88	1,000,000	2,877,000		Inclusive of EW etc
7...	**BRIDGES**					**18,100,000**	
7...	Expressway Over-Bridge	LS	1	8,500,000	8,500,000		
7...	Te-Horo Expressway and Rail Over-Bridge	m2	1,600	3,000	4,800,000		
7...	Mary Crest Expressway and Rail Over-Bridge	m2	1,600	3,000	4,800,000		
8...	**RETAINING WALLS**			0	0	**2,100,000**	
8...	Retaining Walls (Low)	km		150,000	0		
8...	Retaining Walls (Medium)	km	5.50	300,000	1,650,000		
8...	Retainging Walls (High)	km		800,000	0		
8...	E/O Interchange Embankment Walls	sq.m	300	1,500	450,000		
					0		
9...	**TRAFFIC SERVICES**				0	**1,639,000**	
	Traffic Services (low)	km		238,400	0		
	Traffic Services (Medium)	km	5.50	298,000	1,639,000		
	Traffic Services (High)	km		447,000	0		
					0		
10...	**SERVICE RELOCATIONS ~~(& PROTECTION)~~**				0	**1,452,000**	
	Service Relocations (Low)	km		211,200	0		
	Service Relocations (Medium)	km	5.50	264,000	1,452,000		
	Service Relocaitons (High)	km		528,000	0		
					0		
11...	**LANDSCAPING & URBAN DESIGN**				0	**3,263,493**	
11...	LANDSCAPING				0		
11...	Rural Landscaping	%	79,382,261	0.03	2,381,468		90% of expressway assumed to be rural, therefore 3% of 90% of PW costs excluding items 11 & 13
11...	Urban Landscaping	%	8,820,251	0.10	882,025		10% of expressway assumed to be rural, therefore 10% of 10% of PW costs excluding Items 11 & 13
					0		
12...	**TRAFFIC MANAGEMENT & TEMPORARY WORKS**				0	**935,000**	
	Traffic Management (Low)	km		136,000	0		
	Traffic Management (Medium)	km	5.50	170,000	935,000		
	Traffic Management (High)	km		340,000	0		
					0		
13...	**PRELIMINARY & GENERAL**				0	**16,006,551**	
	Preliminary & General	%	91,466,005	0.175	16,006,551		17.5% of Physical Works Cost (Items 2-12 & 14)
					0		
14...	**EXTRAORDINARY CONSTRUCTION COSTS**				0	**0**	
14...							
14...							
					0		
Total Project Estimate					**144,778,511**	**144,803,511**	
				Say	**144,800,000**	**144,800,000**	

PEKA PEKA TO OTAKI — OE
Mary Crest Option Estimate - Alternative

Date of estimate:	**25-Mar-11**	**Cost Index:**	**Dec-10**
Estimate prepared by:	Simon de Rose	**Signed:**	
Estimate internal peer review by:	Keith Atkinson	**Signed:**	
Estimate external peer review by:		**Signed:**	

Item	Description	Unit	Quantity	Rate	Amount	Subtotals	Comment/Assumptions
					0		
A	**Project Property Cost**		1.00	16,749,140	16,749,140	**16,749,140**	
B	**INVESTIGATION & REPORTING**		1.00	4,000,000	4,000,000	**4,000,000**	Fees assumed approx 5% - same for both options
C	**DESIGN & PROJECT DEVELOPMENT**		1.00	4,000,000	4,000,000	**4,000,000**	Fees assumed approx 5% - same for both options
					0		
D	**Construction**				0		
1...	**MSQA & CLIENT MANAGED COSTS**		1.00	4,000,000	4,000,000	**4,000,000**	Assumed 5% of physical works costs,consisting of 4% MSQA & 1% Client/Consent fees
	Physical Works				0		
					0		
2...	**ENVIRONMENTAL COMPLIANCE**				0	**204,440**	
	Environmental Compliance (Medium)	km	5.38	38,000	204,440		
3...	**EARTHWORKS**					**21,913,158**	
3.1..	CUT TO FILL/UNDERCUT FOR TYPE 'A' MATERIAL	cu.m	21,722	8	162,915		Assume 90% suitable material
3.2..	IMPORTED FILL	cu.m	277,557	25	6,938,925		
3.3..	CUT TO WASTE (on-site)	cu.m	1,966	10	19,655		10% of Cut as Unsuitable
3.4..	CUT TO WASTE (Peat)	cu.m	133,920	15	2,008,800		Assuming 4m peat depth
3.5..	Backfill Peat Areas	cu.m	133,920	30	4,017,600		Assuming 4m peat depth
3.6..	E/O for other earthworks items	LS	21,913,158	40%	8,765,263		
4...	**GROUND IMPROVEMENTS**				0	**2,844,840**	
	Ground Improvements (Low)	km		503,000	0		
	Ground Improvements (Medium)	km	2.10	628,000	1,318,800		
	Ground Improvements (High)	km	1.62	942,000	1,526,040		
					0		
5...	**DRAINAGE**				0	**5,380,000**	
5...	Parameter Drainage Rate (Low)	km		400,000	0		
5...	Parameter Drainage Rate (Medium)	km	5.38	1,000,000	5,380,000		
5...	Parameter Drainage Rate (High)	km		1,500,000	0		
5...					0		
6...	**PAVEMENT & SURFACING**				0	**15,875,000**	
6...	Expressway Pavement	km	5.38	1,250,000	6,725,000		Pavement only
6...	New Local Arterial	km	3.00	2,000,000	6,000,000		Inclusive of EW etc
6...	Existing SH1 modifications	km	2.30	500,000	1,150,000		Inclusive of EW etc
6...	New Local Access	km	2.00	1,000,000	2,000,000		Inclusive of EW etc
7...	**BRIDGES**					**12,400,000**	
7...	Marycrest Expressway Over-Bridge	LS	1	7,600,000	7,600,000		
7...	Te-Horo Expressway and Rail Local Road Over-Bridge	m2	1,600	3,000	4,800,000		
8...	**RETAINING WALLS**			0	0	**1,839,000**	
8...	Retaining Walls (Low)	km		150,000	0		
8...	Retaining Walls (Medium)	km	5.38	300,000	1,614,000		
8...	Retainging Walls (High)	km		800,000	0		
8...	E/O Interchange Embankment Walls	sq.m	150	1,500	225,000		
					0		
9...	**TRAFFIC SERVICES**				0	**1,282,592**	
	Traffic Services (low)	km	5.38	238,400	1,282,592		
	Traffic Services (Medium)	km		298,000	0		
	Traffic Services (High)	km		447,000	0		
					0		
10...	**SERVICE RELOCATIONS ~~(& PROTECTION)~~**				0	**1,420,320**	
	Service Relocations (Low)	km		211,200	0		
	Service Relocations (Medium)	km	5.38	264,000	1,420,320		
	Service Relocaitons (High)	km		528,000	0		
					0		
11...	**LANDSCAPING & URBAN DESIGN**				0	**2,819,254**	
11...	LANDSCAPING				0		
11...	Rural Landscaping	%	51,259,160	0.03	1,537,775		80% of expressway assumed to be rural, therefore 3% of 80% of PW costs excluding items 11 & 13
11...	Urban Landscaping	%	12,814,790	0.10	1,281,479		20% of expressway assumed to be rural, therefore 10% of 20% of PW costs excluding Items 11 & 13
					0		
12...	**TRAFFIC MANAGEMENT & TEMPORARY WORKS**				0	**914,600**	
	Traffic Management (Low)	km		136,000	0		
	Traffic Management (Medium)	km	5.38	170,000	914,600		
	Traffic Management (High)	km		340,000	0		
					0		
13...	**PRELIMINARY & GENERAL**				0	**11,706,311**	
	Preliminary & General	%	66,893,204	0.175	11,706,311		17.5% of Physical Works Cost (Items 2-12 & 14)
					0		
14...	**EXTRAORDINARY CONSTRUCTION COSTS**				0	**0**	
14...	Relocate railway tracks - single track	km		3,000,000	0		
14...	Relocate railway tracks - double track	km		5,000,000	0		
	Relocated Otaki Railway Station	LS		750,000	0		
					0		
Total Project Estimate					**107,348,655**	**107,348,655**	
				Say	**107,300,000**	**107,300,000**	

Appendix D

Specialist Brief and Assessment Summary

PP20 Corridor Alternatives – Te Horo [& Mary Crest] - Specialists' Desktop Assessment & Working Paper Brief

1.1 Introduction

As part of the broader consideration of alternatives minor variants have been identified at Te Horo (based on a 2009 Otaki Community Board submission) and Mary Crest. The purpose of this brief is to request a desktop assessment of the alternatives against the existing environment for the core project team to then consider these options utilising the project MCAT tool.

Alternative options are being considered at two locations:

(a) OCB Te Horo Alternative – this option is illustrated in Attachment 1. The route option continues on the western side of the existing SH1, passes through existing farmland (some Dairy) on the west side and behind the block of properties currently located on the west side of SH1. The main expressway crossing of the rail and SH1 is transferred to a location just north of the main Te Horo settlement where it re-joins the NZTA Board approved corridor.

(b) Mary Crest Alternative – this option was illustrated in Section 12.4 of the Draft Scoping Report and in Attachment 2. This alternative crosses and cuts into the higher ground on the eastern side of the railway at a point further south of Mary Crest and re-joins the NZTA Board approved corridor just north of Mary Crest on the eastern side of the railway. This option needs to be considered in the context of KiwiRail's proposed future rail curve easing in this area which is illustrated in Attachment 3 – this realignment would pull the railway closer to the currently proposed expressway alignment.

At each location, we require the specialists to asses two options; (1) the option described above, and (2) the NZTA Board approved option as documented in the Draft Scoping Report Attachment 4. Both options are to be assessed against the existing environment.

Please use the attached working paper template to prepare a brief working paper that captures your desktop assessment. The areas of interest relate to the broad corridor considered in the earlier working papers for the PP2O Scoping report.

1.2 Scoping Task Brief

A template to use to complete the Working Paper is attached to this brief.

Please provide the final copy of your Working Paper to Vanessa Browne (vanessa_browne@urscorp.com) by 19 January 2010.

If you have any questions about preparing the Working Paper or want to clarify anything set out in this brief, please contact Vanessa on 04 4951482.

Tasks

Complete a concise Working Paper that:

1. Describes any elements of the existing environment not already captured in your scoping report.
2. Assesses the broad level of potential positive or negative effects in your particular area of expertise associated with each of the alignment options. The effects assessment is to be made in terms of considering the effect that each option has against the 'do minimum' option (existing situation).

   When considering the effects associated with each of the options, consider, amongst other things, the following:

   - Positive and negative effects.

- The importance of the feature (landscape, ecology) in terms of local, regional, national or international significance.
- How the effects vary with time including whether the impacts are temporary or permanent.
- How the effect varies spatially.
- Any cumulative effects.

When assessing the importance of any effect on the environment be mindful of the matters set out in Part II of the RMA:

- The purpose as set out in Section 5;
- The matters of national significant set out in Section 6;
- Other matters set out in Section 7
- Treaty of Waitangi matters set out in Section 8.

3. Describe the mitigation measures that would be reasonably be expected to be applied and where applicable to reduce effects to any relevant standard. Mitigation measures should be considered to mitigate any potential adverse effects or further enhance positive effects. Identify any measures that will have significant cost (over $250,000).

4. Rate the effects using the scale below.

5. Provide a preliminary recommendation as to the preferred option(s) in relation to your specialist area.

Effects Assessment and Rating

Once you have considered mitigation, please rate the effects as follows. The rating of the effect should be prior to, but cognisant of, the mitigation.

Rating	Explanation / Thresholds
+3 Highly Significant Positive	Of *significant* local, regional or national benefit
+2 Moderate Positive	Of local and/or regional benefit
+1 Minor	Of local benefit only
0 Neutral	No or negligible effects
-1 Minor	Of a local impact only – easily mitigated
-2 Moderate Negative	Moderate negative local and/or regional negative effects that can be mitigated
-3 Highly Significant	Of local, regional or national negative *significance*. Very difficult to mitigate.
FATAL FLAW (FF)	Will *stop* the project – of such national/regional/local significance, or technical constraint that it cannot be mitigated or consented.

Please assess effects on an **absolute** basis, rather than a relative basis. This means effects should be considered on their own, not relative to any other effects of the project. Use your knowledge of other similar projects to rate the potential effect.

Summary of Effects Assessment for Mary Crest and Te Horo Alternatives

3 March 2011

1.1 Options considered

Mary Crest Board Approved

Mary Crest Alternative

Te Horo Board Approved

Te Horo Alternative

1.2 Rating table used

Rating	Explanation / Thresholds
+3 Highly Significant Positive	Of *significant* local, regional or national benefit
+2 Moderate Positive	Of local and/or regional benefit
+1 Minor	Of local benefit only
0 Neutral	No or negligible effects
-1 Minor	Of a local impact only – easily mitigated
-2 Moderate Negative	Moderate negative local and/or regional negative effects that can be mitigated
-3 Highly Significant	Of local, regional or national negative *significance*. Very difficult to mitigate.
FATAL FLAW (FF)	Will *stop* the project – of such national/regional/local significance, or technical constraint that it cannot be mitigated or consented.

1.3 Ratings

1.3.1 Ecology

Option	Effect #	Description	Mitigation	Rating	Cost over $250K
Marycrest Board Approved	Loss and fragmentation of an area of significant indigenous vegetation.	Loss and fragmentation of an area of wetland and forest habitat potentially including some of the largest kahikatea in the District. May be possible to avoid some of the largest tree specimens however, the values of this habitat will still be significantly compromised. The "Possible Future Option" shown in the latest plan would exacerbate and compound the effect. Straightening of the railway line in future could also remove additional remaining mature trees.	Design to minimise loss of some of the largest trees. Create new wetland habitat to replace that lost. However, given the quality of the habitat, the scale of the impact, and the size and age of trees, full mitigation extremely difficult to achieve. If large trees lost it would take 100's of years for replacement to achieve comparable size.	-3	Yes
Marycrest Alternative	No significant effect on indigenous vegetation or habitat of indigenous fauna.	Note comment above re-effect of railway line realignment.		0	N/A
Te Horo Board Approved	No significant effect on indigenous vegetation or habitat of indigenous fauna.			0	N/A
Te Horo Alternative	Small scale effect on significant indigenous vegetation.	Possible loss of one or two mature totara from edge of native bush remnant (opp Gear Road?)and from the opposite side of Te Waka Road.	Minimise loss through detailed design process and plant new trees to replace those lost.	-1	No

1.4 Landscape and visual

Option	Effect #	Description	Mitigation	Rating	Cost over $250K
Mary Crest Board Approved	**Landform** The expressway itself follows a very elegant, wide sweeping curve. However has extensive cut and fill Alignment deviates from underlying topography boundary **Land cover** Expressway corridor contains various stands of woody vegetation **Landuse** New local arterial, and expressway, and existing rail do not follow parallel and adjacent alignments increasing footprint and residual land spaces with limited land use potential **Visual** Large cut and fill does not follow natural topography creating greater visual impact.		Limit height and extent of cut and fill batters. Shape and contour general expressway batters to a natural grade. Prepare landscape mitigation management plan that integrates buffer plantings, visual screen plantings, noise mitigation bunds and/or fences/walls, and stormwater management measures. Landscape management plan also needs to accommodate 'making-good' for loss of stands of remnant totara and other wetland/riparian habitat Refine roading design to minimise extent of expressway surface. Return severed/'land-locked' areas of land to long term amenity or productive use Combine roading, landscape and urban design to integrate expressway with its urban and rural surroundings	-2 Moderate	

Mary Crest Alternative	**Landform** A simple solution to the alignment following the existing route for the most part; Areas of cut and fill mainly related to local arterial and NIMT railway alignments/realignment **Landcover** Mainly in pasture, some woody vegetation at rail overbridge area, plus some native vegetation between ~sta 10300 - 10400 **Landuse** The footprint / width of combined corridor is generally kept close to existing highway/railway corridor , which limits the amount of unusable residual land areas **Visual** Long bridge structure at the cross over point from east to west better utilises the raised topography of the eastern foothill on one side	Limit height and extent of cut and fill batters. Shape and contour expressway batters to a natural grade Prepare landscape mitigation management plan that integrates buffer plantings, visual screen plantings, noise mitigation bunds and/or fences/walls, and stormwater management measures. Landscape management plan also needs to accommodate 'making-good' for loss of stands of remnant totara and other wetland/riparian habitat Refine roading design to minimise extent of expressway surface. Return severed/'land-locked' areas of land to long term amenity or productive use Combine roading, landscape and urban design to integrate expressway with its urban and rural surroundings	-2 Moderate -1 Minor	
Te Horo Board Approved	**Landform:** Expressway appears to be predominantly at grade; School Road underpass approach embankments obvious localised change to landform. **Landcover:** Much of expressway corridor is in pasture. Numerous sections of shelterbelt. Some stands of remanent totara/kanuka in Te Waka Road area. **Landuse:** Expressway will 'add' four lanes of road surface displacing areas of rural and rural-residential Landuse. **Visual:** Embankments and bridge structure could be visually intrusive to immediate neighbours unless well designed.	Limit height and extent of cut and fill batters. Shape and contour general expressway batters to a natural grade. Prepare landscape mitigation management plan that integrates buffer plantings, visual screen plantings, noise mitigation bunds and/or fences/walls, and stormwater management measures. Landscape management plan also needs to accommodate 'making-good' for loss of stands of remnant totara and other wetland/riparian habitat. Refine roading design to minimise extent of expressway surface. Return severed/'land-locked' areas of land to long term amenity or productive use Combine roading, landscape and urban design to integrate expressway with its urban and rural surroundings	-2 Moderate	

Te Horo Alternative	**Landform** Expressway appears to be close to grade; Te Waka Road overpass approach embankments obvious localised change to landform The approach embankments for the Te Horo Beach Road underpass will also create a change relative to landform **Landcover** Much of expressway corridor is in pasture. Various sections of shelterbelt. Some stands of remanent totara/kanuka in Te Waka Road area. There would some further removal of pasture relative to the local link run running south from Te Horo Beach Road. **Landuse** Expressway will 'add' four lanes of road surface displacing areas of rural and rural-residential landuse Separating the corridors of expressway, NMIT rail and existing SH1 / local arterial creates significant amount of marginal residual land and increases effective footprint Some additional local roading **Visual** Two sets of embankments and bridge structure could be visually intrusive to immediate neighbours unless well designed	Limit height and extent of cut and fill batters. Shape and contour general expressway batters to a natural grade. Prepare landscape mitigation management plan that integrates buffer plantings, visual screen plantings, noise mitigation bunds and/or fences/walls, and stormwater management measures. Landscape management plan also needs to accommodate 'making-good' for loss of stands of remnant totara and other wetland/riparian habitat. Refine roading design to minimise extent of expressway surface. Return severed/'land-locked' areas of land to long term amenity or productive use Combine roading, landscape and urban design to integrate expressway with its urban and rural surroundings	-2 Moderate	

1.5 Urban design

Option	Description	Mitigation	Rating	Cost over $250K
Mary Crest Board Approved	the expressway itself follows a very elegant, wide sweeping curve		-1 Minor	
	New local arterial, and expressway, and existing rail do not follow parallel and adjacent alignments increasing footprint and residual land spaces with limited land use potential			
	Large cut and fill does not follow natural topography creating greater visual impact.			
	Alignment deviates from underlying topography boundary			
	A number of local rural properties and accesses are directly affected by this western alignment.			
	No peri-urban form or street pattern to assess impact			
Mary Crest Alternative	a simple solution to the alignment broadly following the existing route		+1 Minor	
	would appear to maintain the existing SH1 as the local property access, thereby reducing duplication			
	the long bridge structure at the cross over point from east to west better utilises the raised topography of the eastern foothill on one side.			
	The footprint / width of combined corridor is generally kept tight , minimising unusable residual land areas			
	Areas of cut and fill are greatly reduced by following the contours on the eastern side and not disturbing the sand dune landform on the west. This reduces the overall visual impact.			
	Significantly fewer properties are effected with this revised alignment			
	No peri-urban form or street pattern to assess impact			
Te Horo Board Approved	Location of bridge, ramps and embankments has an impact on property/buildings on the western side		0 Neutral	
	Does follow natural desire line for more direct connection aligning with School Road and connecting with Te Horo Beach Road			

	Does include local connection to Gear Road but intersection is raised and may affect access to properties to the east			
	Embankments and bridge structure could be visually intrusive to immediate neighbours unless well designed			
	Direct connection to Te Horo beach Road and coastal community			
Te Horo Alternative	Reduced perception of severance between the east and west		-1 Minor	
	Does not provide an alternative to an at grade railway line crossing			
	Revised local link bridge utilising alignment of Te Horo Beach Road provides east west connectivity which is equivalent to existing condition			
	Separating the corridors of expressway, NMIT rail and existing SH1 / local arterial creates significant amount of marginal residual land and increases effective footprint			
	land use opportunities for this residual area			

1.6 Archaeology and Heritage

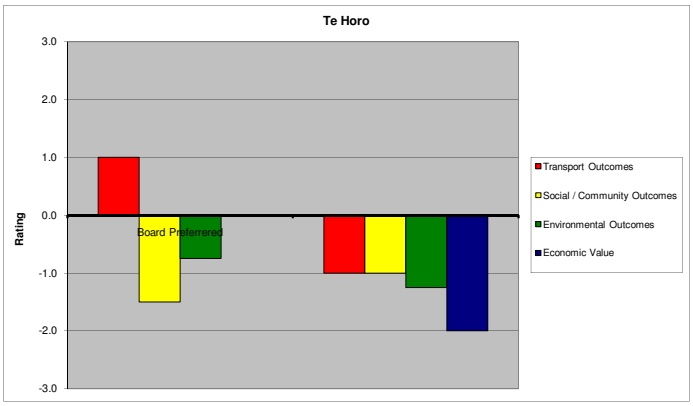
Option	Effect #	Description	Mitigation	Rating	Cost over $250K
Marycrest Board Approved		No heritage issues in relation to buildings at Mary Crest. Effects on hill dune area from Te Hapua Road north toward Mary Crest as a focus of pre Eup / mid 19th century Maori occupation. Includes possible pa site btw Mary Crest and Te Hapua Road on the higher hills (western side of existing road), plus possible burials. Area behind Mary Crest (water tank) is waahi tapu.		-3	
Marycrest Alternative		Same as above, but effects potentially less due to expressway and local road remaining much closer to existing SH1, therefore less footprint in the north Te Hapua Road area.		-2	
Te Horo Board Approved		No known issues at present		0	
Te Horo Alternative		No known issues at present Red barn café of concern?		0	

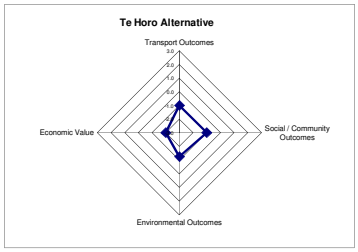
Outputs from 08/03.11 Workshop - Te Horo Alternatives

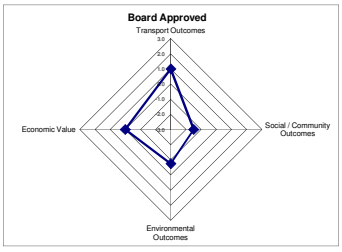
Te Horo

Primary Criteria	Secondary Criteria	Criteria explained	Relative to	Weighting (W)	Board Preferred Score (S)	Board Preferred WxS	Te Horo Alternative Score (S)	Te Horo Alternative WxS	Comments
Transport Outcomes	Road user safety	Level of safety provided by option including consideration of emergency response times (includes SH1 expressway and local roads)	Existing situation	1.0	1.0	1.0	-1.0	-1.0	Board Preferred minor positive due to grade seperation (local benefit only). Te Horo Alternative minor negative due to at grade rail crossing, only minor negative due to low usage and relatively good visibility.
	Transport Outcomes			**1.0**		**1.0**		**-1.0**	
Social / Community Outcomes	Severance	Significance of effect of physical severance and legibility of options on community connectivity and access to community services.		0.5	-2.0	-1.0	0.0	0.0	Rated by VB after the workshop. Board Preferred moderate negative due to expressway running through E/W areas, and requirement to travel over local road to connect back to old SH. Alternative neutral as connections retained.
	Landuse/productivity (support for current and future landuse)	Significance of effect on productive land use, and retention of rural character.	Existing situation	0.5	-1.0	-0.5	-2.0	-1.0	Board Preferred minor negative due to productive land, small lifestyle blocks etc the expressway crosses. Alternative moderate negative due to expressway bisecting viable rural properties. Note does not include Mary Crest Impacts common to both options.
	Social / Community Outcomes			**1.0**		**-1.5**		**-1.0**	
Environmental Outcomes	Urban Form	Significance of effects on the local urban form and on urban design aspects such as connectivity, context and character.	Existing situation	0.25	0.0	0.0	-2.0	-0.5	Board Preferred neutral as it allows for the natural desire lines between e/w of Te Horo, negative impacts mainly due to the visual impacts of the overbridges. Alternative moderate negative due to larger footprint and residual land (revised from a minor negative during workshop) Note does not include Mary Crest Impacts common to both options
	Landscape and Visual	Significance of the effects on the local landscape, being landform, landcover and landuse and the extent of change the project/expressway will bring to these. The extent to which the visual effects of the expressway, its earthworks construction, road form, structures and noise and landscape mitigation measures will impact upon the local community and the travelling public.	Existing situation	0.25	-2.0	-0.5	-2.0	-0.5	Board Preferred moderate negative due to height and extent of cut and fill batters, embankments for bridges and the expressways imprint on the land. Alternative moderate negative for same reasons as board preferred. Note does not include Mary Crest Impacts common to both options
	Terrestrial ecology	Significance and extent of the effects on wildlife and habitat and natural processes and systems.	Existing situation	0.25	0.0	0.0	-1.0	-0.3	Board Preferred neutral as no effect on indigenous flora or fauna. Alternative minor negative as impacts on native bush remnant opposite Gear Road. Note does not include Mary Crest Impacts common to both options
	Cultural/archaeolgy/heritage	Significance of the effect on archaeological and cultural sites.	Existing situation	0.25	-1.0	-0.3	0.0	0.0	Board Preferred minor negative as impact on former Mirek Smisek property, have social value but not important from HPT's point of view. Alternative neutral as no known issues at present (heritage impact on red house cafe not expected). Note does not include Mary Crest Impacts common to both options
	Environmental			**1.0**		**-0.8**		**-1.3**	
Economic Value	Capital investment	Significance of effect on capital required for project implementation (including constructability considerations and property acquisition).	2009 scheme	0.5	0.0	0.0	-3.0	-1.5	Alternative has +$30M cost premimum so is therefore a significant negative.
	Achieving RMA Approval	Significance of effect on ability to achieve RMA approvals i.e. consentability of option.	2009 scheme	0.5	0.0	0.0	-1.0	-0.5	Alternative minor negative as it has not been consulted on.
	Economic Value			**1.0**		**0.0**		**-2.0**	
	TOTAL			**4.0**		**-1.3**		**-5.3**	

Rating on scale of -3 to +3; relative scores using the existing SH as the point of comparison; for economic value 2009 scheme is the neutral point.







Outputs from 08/03.11 Workshop - Mary Crest Alternatives

Mary Crest

Primary Criteria	Secondary Criteria	Criteria explained	Relative to	Weighting (W)	Board Preferred Score (S)	Board Preferred WxS	Mary Crest Alternative Score (S)	Mary Crest Alternative WxS	Comments
Transport Outcomes	Road user safety	Level of safety provided by option including consideration of emergency response times (includes SH1 expressway and local roads)	Existing situation	1.0	0.0	0.0	0.0	0.0	Board Preferred and Alternative neutral as both have the same provisions as existing.
	Transport Outcomes			**1.0**		**0.0**		**0.0**	
Social / Community Outcomes	Severance	Significance of effect of physical severance and legibility of options on community connectivity and access to community services.	Existing situation	0.5	-1.0	-0.5	0.0	0.0	Rated by VB after the workshop. Board Preferred moderate negative due to expressway severing some access points. Alternative neutral as connections largely retained.
	Landuse/productivity (support for current and future landuse)	Significance of effect on productive land use, and retention of rural character.	Existing situation	0.5	-1.0	-0.5	-2.0	-1.0	Board Preferred minor negative as impacts on equestrian centres and lifestyle blocks. Alternative moderate negative (changed from minor negative during workshop) as impacts productive market gardens and winery.
	Social / Community Outcomes			**1.0**		**-1.0**		**-1.0**	
Environmental Outcomes	Urban Form	Significance of effects on the local urban form and on urban design aspects such as connectivity, context and character.	Existing situation	0.25	-1.0	-0.3	0.0	0.0	Board Preferred minor negative as results in residual land locked parcels, Alternative neutral (changed from minor positive during workshop). Discussion around how urban form related to this section as not in an urban context.
	Landscape and Visual	Significance of the effects on the local landscape, being landform, landcover and landuse and the extent of change the project/expressway will bring to these. The extent to which the visual effects of the expressway, its earthworks construction, road form, structures and noise and landscape mitigation measures will impact upon the local community and the travelling public.	Existing situation	0.25	-3.0	-0.8	-2.0	-0.5	Board Preferred significantly negative due to efffects on the landscape being 'very difficult to mitigate' (changed from moderate negative during workshop). Alternative moderate negative as it follows the natural topography on the eastern side of NIMTL.
	Terrestrial ecology	Significance and extent of the effects on wildlife and habitat and natural processes and systems.	Existing situation	0.25	-3.0	-0.8	0.0	0.0	Board Preferred signifcant negative due to effect on important ecological area (historic bush remnants) being very difficult to mitigate. Alternative neutral as no effects on any important ecologica areas
	Cultural/archaeolgy/heritage	Significance of the effect on archaeological and cultural sites.	Existing situation	0.25	-2.0	-0.5	0.0	0.0	Board Preferred potential effect on hill dune area and Maori occupation remnants including possible pa and burial sites. Alternative neutral as does skirts edge of potential Maori sites of significance.
	Environmental			**1.0**		**-2.3**		**-0.5**	
Economic Value	Capital investment	Significance of effect on capital required for project implementation (including constructability considerations and property acquisition).	2009 scheme	0.5	0.0	0.0	1.0	0.5	Alternative offers around $10M in savings therefore minor positive.
	Achieving RMA Approval	Significance of effect on ability to achieve RMA approvals i.e. consentability of option.	2009 scheme	0.5	-2.0	-1.0	0.0	0.0	Rating provided by VB after workshop. Board preferred minor negative due to significant issues related to terrestrial ecology and heritage. Alternative neutral as has effects identified can be mitigated.
	Economic Value			**1.0**		**-1.0**		**0.5**	
	TOTAL			**4.0**		**-4.3**		**-1.0**	

Rating on scale of -3 to +3; relative scores using the existing SH as the point of comparison; for economic value 2009 scheme is the neutral point.