WHAKATANE DISTRICT COUNCIL/
TRANSIT NEW ZEALAND

WHAKATANE TRANSPORTATION STUDY

STATE HIGHWAY 2 ALTERNATIVE ROUTES SCOPING STUDY REPORT

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Approved for Issue:_____ Date: _____

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EXECUTIVE SUMMARY

This report forms part of the Whakatane Transportation Study for Whakatane District Council (WDC) and Transit New Zealand (Transit). It identifies potential long term alternative State Highway 2 corridors to improve route security and efficiency between Matata and the State Highway 2/Wainui Road intersection. The site area is shown in Drawing 134960-P101. This is a scoping study only, and identifies preliminarily routes which could potentially be investigated in future.

I) The existing State Highway 2 route from Matata to the State Highway Two/Wainui Road intersection deviates significantly from a direct route, resulting in inefficiencies, and as a result use of local roads by state highway traffic.

II) In addition, the existing state highway route has route security issues arising from flooding and the stability of key bridges. Bridge insecurity resulting from scour, overturning, and seismic failure are considered to be significant risks for the Ontrack owned State Highway 2 crossing of the Whakatane River (Pekatahi Bridge). The only alternative crossing of the Whakatane River is on State Highway 30 (Landing Road Bridge).

III) While not directly related to the State Highway 2 route, commuter traffic on State Highway 30 and local adjoining roads is significant, and any relocation of State Highway 2 should take this into consideration.

IV) Eight alternative State Highway 2 corridors have been identified and assessed, and of the eight, two are considered to have potential for further investigation. These corridors:

- Include a new state highway Whakatane River crossing to the south of the existing township (Blacks Farm) area. A new bridge crossing is seen as desirable if route security and possible isolation of Whakatane are seen as strategic objectives;
- Can be built in stages;
- Address directly or indirectly both the current transportation issues on State Highways 2 and 30 to a greater or lesser degree.
- Impact on land ownership and land use.
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The options which are considered to have potential for further investigation are E/B and G/B. While these corridors are likely to have low Benefit/Cost ratios, there may be long term strategic, sustainability and community warrants for an alternative route which, with staged construction over a 20 to 30+ year timeframe, could potentially result in improved absolute Benefits/Cost ratios.

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1.0 INTRODUCTION

This report forms part of the Whakatane District Council/Transit New Zealand jointly funded Whakatane Transportation Study. The focus of this scoping report is the identification of potential alternative State Highway 2 corridors to improve route security and efficiency between Matata and the State Highway 2/Wainui Road intersection. Appended drawing 134960-P101 relates.

The study only seeks to identify corridors of interest which may potentially warrant further investigation. .

1.1 BACKGROUND

It would be desirable to identify a long term alternative route for State Highway 2 route that is shorter, more efficient, and more secure. The existing State Highway 2 route from Matata to the Wainui Road/State Highway 2 intersection deviates significantly from a direct route, resulting in higher travel times (for some users) and fuel costs than desirable. The length of State Highway 2 in the study area is approximately 60 km, whereas a direct route is just 43 km. Many inter-regional motorists travel via Whakatane and Ohope as this is shorter than the State Highway route, with current state highway directional sign posting advising eastbound motorists whose destination is Whakatane or Opotiki, and westbound motorists on State Highway 30 whose destination is Tauranga, to use the "coastal route" (Thornton Road). The current Annual Average Daily Traffic (AADT) volumes using Thornton Road and Wainui Rd exceed significantly the AADT alternative State Highway 2 route. It is undesirable for through traffic to use this alternative route through Whakatane and Ohope due to the adverse social and environmental consequences.

Route security is also a significant issue for the current State Highway 2 alignment. The principal security issues are flooding and bridge stability. Bridge security is a major issue, as scour, overturning and seismic failure could potentially occur to both the State Highway 2 crossing of the Whakatane River (Pekatahi Bridge) and the only alternative crossing on State Highway 30 (Landing Road Bridge). Even the temporary loss of one of these bridges would have a very significant impact on Whakatane, the Whakatane District, and the Eastern Bay of Plenty and Gisborne regions.

Congestion from commuter traffic currently occurs in Whakatane in the peak hours. Inter-regional traffic not using the State Highway network contributes to this congestion.

At present there is no usable rail network east of Edgecumbe, and an insufficient volume of freight to economically justify such a network. Therefore the movement of goods between the Bay of Plenty region and the East Coast region is solely dependant on the State Highway network. An improved State Highway 2 route could potentially benefit the major HCV dependent industries in the area such as forestry and dairy.

The Long Term Whakatane District Council Community Plan (LTCCP), indicates that while some solutions to the congestion issues into and through Whakatane are being considered, there is a need to consider if another bridge crossing is required and, if so, where it should be located. The Regional Land Transport Strategy lists the Whakatane western access as a key strategic project.

2.0 EXISTING ROUTE ISSUES

The two main issues with the existing State Highway 2 route are the route length and security. The existing route length is affected by a significant detour around the Whakatane Hills between Taneatua and the Wainui Road/State Highway 2 intersection. Route security is primarily at risk from bridge closure, flooding, slips and climate change. It is possible that a significant seismic or flood event could result in both the Pekatahi and Landing Road bridges becoming impassable. The existing route between Matata and Wainui Road/State Highway 2 intersection has been closed for four days in the last five years, this was due to one flooding event that affected Edgecumbe, the Waimana Gorge and the Matekerepu Bridge near the Wainui Road/State Highway 2 intersection. Slips also typically close the State Highway for one day every two years on average. These issues are discussed below.

2.1 ROUTE LENGTH

The length of State Highway 2 in the study area is approximately 60 km, whereas the Whakatane/Ohope/Wainui Road route is 47 km, and a more direct route of approximately 43 km may be possible with an alternative State Highway corridor. Other issues that increase the travel time on the existing State Highway include the traffic lights at the Pekatahi Bridge, the intersections at Awakeri and urban areas such as Taneatua, and the narrow and windy Waimana Gorge.

Anecdotal evidence is that motorists aware of the reduced travel distance of the Thornton Rd/Whakatane/Ohope/Wainui Road route use this route, or parts of this route, in preference to State Highway 2. HCV operators would prefer to use this route but are discouraged from doing so by a WDC Bylaw.

In 2001, WDC and Transit engaged Opus International Consultants to carry out a number plate survey of the HCV use of SH2 between Matata and Kawerau compared with the use made of the Thornton Rd, Whakatane, Ohope, Wainui Road alternative between Matata and Kutarere.

Some difficulty was experienced reading the plates on the HCV's, especially at night, but in brief summary the survey indicated, based on matches number plates that:

- 41 (80%) of HCVs were identified as travelling via the coastal route in the day time compared with 10 (20%) via SH2.
- 57 (68%) of HCV's were identified as travelling via the coastal route at night compared with 10 (32%) via SH2.
- The difference in travel distance between the SH2 and coastal route is about 11.5km and the survey indicated that the difference in HCV travel time averages 12 minutes.

In 1994 the WDC carried out an interview survey of heavy transport companies known to use the routes in question. 70% preferred to use the coastal route.

Both the above surveys were carried out prior to the WDC Bylaw restricting the use of District Council roads by HCV's which was introduced 14th November 2001.

Comparative travel time savings for light vehicles have not been measured. They are expected to be less than those for HCV's.

While travel distances haven't changes significantly since these surveys were carried out, there is anecdotal evidence to suggest travel time savings for all classes of vehicles have reduced because of increased congestion, and the imposition of a 80kph speed restriction on SH30 in front of The Hub development.

2.2 ROUTE SECURITY

Bridges

Provided the Rangitaiki River Flood Protection Scheme is effective, then the key bridges which pose potential risk on State Highway 2 in the study area are the combined Pekatahi road/rail bridge over the Whakatane River; the Reids Central Canal Bridge at Edgecumbe; and the Matekerepu Bridge near the intersection of State Highway 2 and Wainui Road.

In the recent past, channel clearing associated with the Matekerepu Bridge have been carried out to improve floodway efficiency, and Transit New Zealand is currently investigating improvements to Reids Canal bridge, which leaves Pekatahi as the principal risk.

In terms of maintaining access to Whakatane should Pekatahi Bridge be lost for any reason, the Landing Road Bridge over the Whakatane River at Whakatane needs to be included in this study when considering the matters of route security.

Pekatahi Bridge

The Pekatahi Bridge at Taneatua is a 367 m long steel and timber structure built in 1923. It is a single lane, traffic signal controlled, joint rail and road bridge controlled by the railway infrastructure owner, Ontrack. The rail branch line, of which the bridge is part, is currently closed and unlikely to reopen in the near future. Transit New Zealand pays an annual lease to Ontrack for use of this bridge. Transit New Zealand is responsible for maintenance of the bridge roadway. Maintenance costs are relatively high due to the timber deck and the difficulty of carrying out maintenance on this one lane bridge.

The Pekatahi Bridge is at risk from scour during large flood events. The river channel in the vicinity of the bridge has degraded over the years, with approximately half of some of the pile lengths now exposed. An initial scour investigation indicates that scour from a 1 in 100 year flood event could undermine the channel piers leading to bridge failure, and that if flood debris were allowed to accumulate against the piers and/or superstructure, overturning failure could occur. The security of the existing bridge is assisted markedly by the current practice of physically releasing floating debris that hangs up on the structure at times of flood. There have been several flood events of the level currently described as a "1 in 100 year event" in the past decade. The frequency and magnitude of large flood events is expected to increase in the future due to climate change, increasing the risk of bridge failure.

The structure is also at risk from a significant seismic event. Within the study area the Peketahi Bridge is ranked by Transit New Zealand as the second most vulnerable bridge structure. A significant amount of work would be required to reduce these risks to desirable levels.

There is no agreement between Transit New Zealand and Ontrack as to who pays for extra-ordinary maintenance on this bridge eg. repairs following a major seismic event or scouring out of a pier etc.
If the Pekatahi Bridge were closed, re-routed State Highway traffic would use the Landing Road Bridge in Whakatane. This would be detrimental to the environment through Whakatane. It is also likely that additional traffic volumes would then use the Wainui Road route instead of Taneatua Road and State Highway 2 east of the Pekatahi Bridge to access Opotiki. This could also have a detrimental impact in Ohope and the current HCV restriction bylaw may need to be retracted, further exacerbating the adverse effects of the re-routed traffic.

For these reasons the construction of a new State Highway bridge across the Whakatane River is desirable in the long term. It would be beneficial to identify a potential location for such a bridge that would be consistent with the growth strategy for Whakatane. Any new bridge would have to be designed for the seismic loading in this area, and potential increases in flood events due to climatic change.

Landing Road Bridge

The Landing Road Bridge at Whakatane is a two-lane bridge with footpaths on both sides. It is 242 m long and was built in 1961. The bridge piles were damaged in the 1987 Edgecumbe earthquake, placing this bridge at increased risk of failure during future significant seismic events. Within the study area, the Landing Road Bridge is ranked by Transit New Zealand as the most seismically vulnerable bridge structure.

A pier of the bridge was scoured out in 1983 resulting in extensive repairs.

No assessment of the current level of risk from scour, earthquakes or over turning loads has been undertaken as an input to this study.

Flooding

Flooding of the Rangitaiki Plains is an ongoing issue that is managed by the Bay of Plenty Regional Council and the Whakatane District Council through stop bank construction, pumping, and maintenance. Flood events where the stopbanks are breached have been generally increasing in frequency over recent times. The probability of, and frequency of failure is predicted to continue to increase over time due to climate change. The 2004 flood event closed State Highway 2 for up to five days at Edgecumbe. Replacement of the Reids Canal Bridge is currently being investigated to address the existing bridge damaged by flooding in 2004.

The risks associated with floodwaters up against stopbanking appear greater on the Rangitaki Plains than on the Whakatane River flood plains because of the geotechnical characteristics of the underlying soils.

The 2004 flood event also closed the Waimana Gorge and the Matekerepu Bridge near Wainui Road. There is no simple solution to prevent flooding from reoccurring in the Waimana Gorge, however improvements to the Matekerepu Bridge to resolve this issue may be possible. Any improvements should consider the long term strategy for the State Highway at this location.

Slope instability risk is greatest through the Waimana Gorge, but erosion could also affect the route between the Waimana Gorge and Wainui Road, and near White Pine Bush. Slips could affect all these areas, river undercut and rock falls could occur in the Waimana Gorge, and debris flows could occur in the Waimana Gorge and Matata.

Climate Change

Predicted future climate change is expected to result in reduced annual rainfall in the Bay of Plenty region. However, temperatures in this region are predicted to increase, allowing humidity levels to increase, allowing higher intensity rainfall events to occur. Increased rainfall intensity could increase the incidence of slope failure in the hill country, increase stormwater volumes, with increased rates of runoff leading to additional erosion, flooding and sedimentation of low lying areas.

Future sea level rise predictions (including seasonal continental shelf heating, La Nina, Pacific Oscillation and general sea level rises) are currently predicted to be in the order of 0.7 m over the next 100 years (Ministry for the Environment publication "Coastal hazards and climate change" 2004). Future sea level increases could affect the security of the existing State Highway 2 with the impact generally being greatest where the State Highway is located closest to the sea. Accordingly, a State Highway corridor behind the sand dunes and running essentially parallel to the coast is at a greater risk of flooding than more inland routes.

2.3 STATE HIGHWAY ROUTE SECURITY

While State Highway 2 will always have an important role within the Bay of Plenty itself, Transit New Zealand and the relevant Regional Councils agreed in 2005 the long-term route security focus for east-west movements and visa versa, outside of the BoP itself, should be the inland/upland corridor of State Highway 30 across the upper Rangitaiki Plains. Routes west of Awakeri or Whakatane are considered to be high risk, making the State Highway 2 corridor across the mid Rangitaiki Plains of secondary importance, but a state highway corridor east of Awakeri of high importance.

2.4 SUMMARY OF EXISTING ROUTE ISSUES

The issues that need to be addressed include the following:

- The length of the State Highway 2 route between Matata and the Wainui Road/State Highway 2 intersection is inefficient with regard to both length and travel time.
- Anecdotal evidence is the travel time and/or travel distance inefficiency of the existing State Highway 2 route results in a proportion of traffic using the Matata/Whakatane/Ohope/Wainui Road route, or parts of this route, with resulting social and environmental effects.
- The Ontrack owned Pekatahi Bridge over the Whakatane River is a significant risk to route security as is. The State Highway 30 Landing Road Bridge may also have a level of security risk although this has not yet been quantified.
- Flooding and instability along the route contribute to its unreliability and/or unavailability.
- Climate change will increase the risks of flooding, the frequency and quantum of flood events, and as a consequence, increase the risk of bridge scour and/or overturning.

3.0 TRANSPORT DEMANDS

3.1 STATE HIGHWAY TRAFFIC DEMANDS

The principal destinations in the study area include Whakatane, Edgecumbe, Kawerau, Ohope, and Opotiki. Main destinations outside the study area include Tauranga city and port, Rotorua, Gisborne, and the East Coast. State Highway Annual Average Daily Traffic counts (AADT's) and the average number of Heavy Commercial Vehicles (HCV) within the study area are shown in Table 1. Figure 1 illustrates both the key state highway and local road volumes.

Table 1: State Highway 2 Traffic Flows

SH	RP	Location	2005 AADT	2005 HCV's	HCV as % of AADT
2	225	Matata East	2,710	507	18.7
	241	West of SH 30	3,530	342	9.7
	242	Awakeri	9,390	751	8.0
	243	West of SH 30	1,960	412	21
	285	100m before Wainui Road	1,140	239	22.9
	286	100m past Wainui Road	3,490	405	11.6
30	206	South of SH 34 (Military Road)	2,450	211	8.6
	219	South of SH 2 (Awakeri)	5,880	529	9.0

	221	1120m after Angle Road	7,716	694	9
	229	West of Keepa Road (Whakatane)	15,307	1,378	9
34	0	South of SH 2	1,366	224	16.4
	11	South of SH 30 East	5,855	357	6.1
	25	East of SH 30 West	1,315	214	16.3

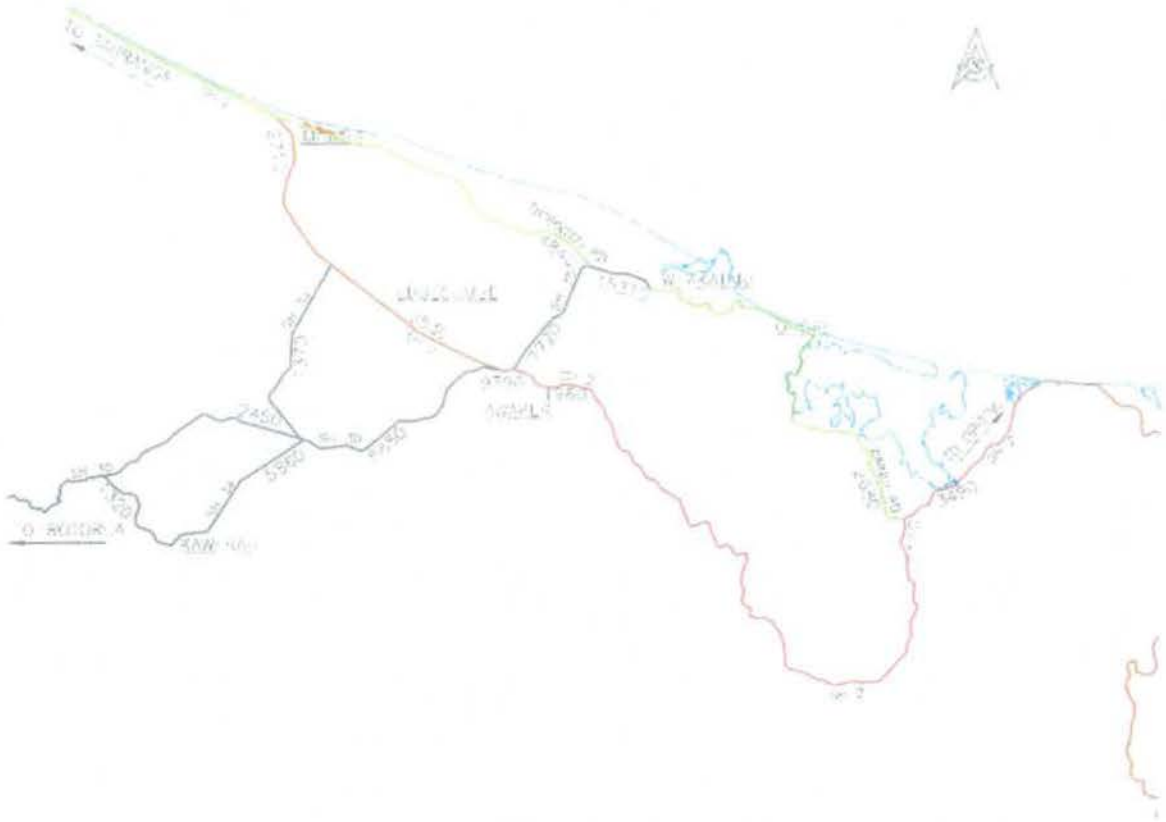

Figure 1: Major AADT Traffic Flows within the Study Area

Relevant characteristics arising from Table 1 and/or Figure 1 are:

- Generally speaking the state highway volumes are low to modest in quantum. The exception to this occurs where the volume is influenced by commuter traffic demands; (eg. SH30 between Awakeri and Whakatane) proximity to major employer or industry (eg. Edgecumbe/Kawerau); presence of industrial and/or retail development (eg. The Hub/Board Mills area).
- Anedotal evidence supported by consultation with WDC is Network Management Consultant suggest local roads such as Thornton Rd and Wainui Rd appear to carry an element of "through" or inter-sub regional traffic. The volume of traffic using same exceeds that using the state highway.

3.2 URBAN TRAFFIC DEMANDS

Notwithstanding that the focus of this report is on State Highway 2, it is considered prudent when considering potential alternative routes to have due regard to the proposed growth strategy for Whakatane.

Between Whakatane and Opotiki more traffic currently uses the shorter Wainui Road route (2,680 vpd) than State Highway 2 (1,140 vpd). As well as some inter-subregional and inter-regional traffic volumes using the Whakatane/Ohope/ Wainui Road route instead of State Highway 2, there is a proportion of motorists who use Thornton Road (the old State Highway 2 alignment to the west of Whakatane), with State Highway 30 traffic volumes dropping from an AADT of 15,310 to 7,720 to the south of Thornton Road.

In addition, the AADT includes a proportion of commuter traffic between Kawerau, Edgecumbe, Whakatane and Ohope utilising State Highway 2, 30, and Gorge Road. Some commuter traffic also

access Whakatane via Thornton Road to the west, and Valley Road/Taneatua Road to the south. Commuter congestion currently occurs within the central Whakatane business district, along Landing and Domain Roads through Whakatane, on State Highway 30, directly west of Whakatane, and on Gorge Road, directly east of Whakatane.

The traffic count data at Matata, west of State Highway 30, and Awakeri all show distinct am and pm weekday commuter peak flows. A graph of Awakeri traffic flows is shown in Figure 2 below, with weekday flows clearly showing commuter traffic peak flows compared with weekend flows. Only a small increase in State Highway 2 traffic flows in the commuter peak times occurs in the traffic count to the east of State Highway 30. No commuter traffic peak was observed in the State Highway 2 traffic count data from 100 m before Wainui Road (shown in Figure 3 below), with an increase in pm traffic volumes only observed in the traffic count data from 100 m past Wainui Road.

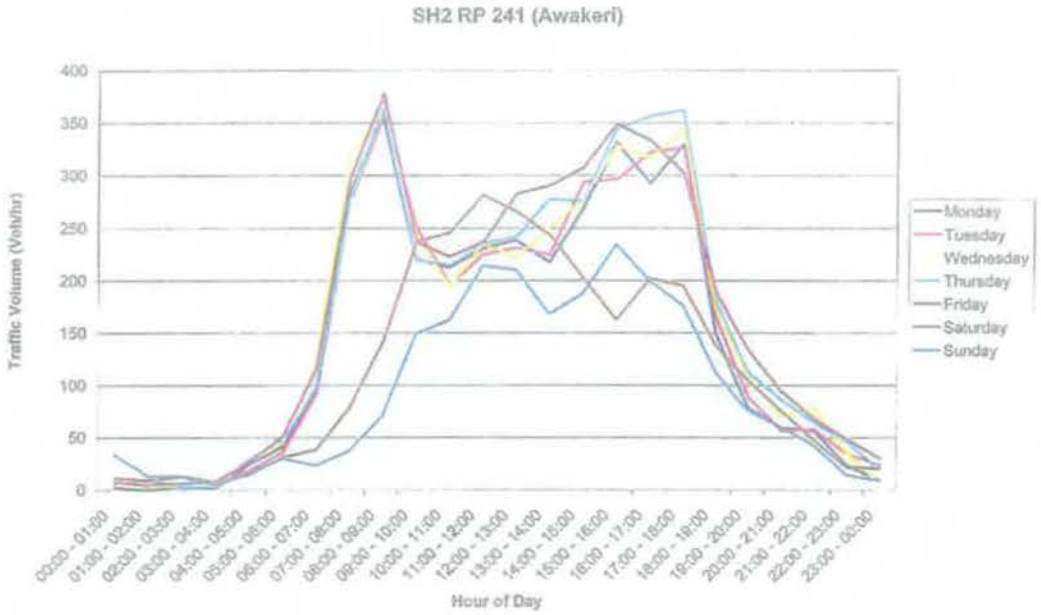

Figure 2: Traffic Flows at Awakeri

Figure 3: Traffic Flows 100m Before Wainui Road

3.3 TRAFFIC VOLUME GROWTH

Average State Highway 2 traffic growth in the study area has been 4.7% over the last 5 years and 7.9% over the last 10 years. Traffic Growth rate data is presented in Table 2 below.

Table 2: State Highway 2 Traffic Flows

RP	Location	Growth Rate (Last 5 Years)
225	Matata East	7.5%
241	West of SH 30	2.7%
242	Awakeri	5.2%
243	West of SH 30	5.2%
285	100m before Wainui Road	4.1%
286	100m past Wainui Road	3.7%
	Average	4.7%

Traffic growth is affected by general factors such as increased use of vehicles and tourism, and also by local factors such as population and economic activity. The rate of growth can vary for many reasons, but is not expected to vary significantly from a long term average growth rate in the order of 4%.
Tourism in the Whakatane District is mostly centred on coastal activities. There is also a summer influx of domestic travellers staying near beaches and visiting the East Coast, which results in holiday season peaks. Traffic count data relating to the holiday season peak is not available. The Whakatane Information Centre advise that anecdotal evidence is that the population of Ohope at least trebles in the peak holiday period, and that of Whakatane, at least doubles. Thornton Road, parts of SH30, Gorge Rd, Wainui Rd is the designated and sign posted Pacific Coast Highway through the area of interest. Tourism generated traffic is predicted to continue to increase in the future in line with national tourism increases.

The current estimated population of the Whakatane District is 33,900. While the Whakatane township population is increasing, the Whakatane district population has been decreasing in recent years at approximately 0.2% per year. Statistics New Zealand is predicting the Whakatane district population to continue to decrease, with an estimate of 1.0% decrease over the next 25 years. The current national population growth rate is approximately 0.8%, this is predicted to slow to approximately 0.1% per year from the year 2041.

The draft Whakatane District Council Industrial Land Strategy sees all heavy industrial activity being focused on Kawerau where appropriate areas of suitable land, rail access, and infrastructure already exist.

The Whakatane District Council Retail Strategy envisages bulk retail being located off State Highway 30, west of the Landing Road Bridge, with speciality and other outlets focused within Whakatane. The Whakatane District Council's Residential Land strategy is currently being formulated, and the outcome of this study will be an input to the Whakatane Transportation Study.

3.4 HEAVY COMMERCIAL VEHICLES (HCV'S)

The proportion of the State Highway 2 AADT volume made up of HCV's varies markedly and is principally influenced by forestry industry economics and the point of export (Tauranga or Gisborne). West of the State Highway 2/34 intersection HCV's represent approximately 15 to 22% of the AADT. East of State Highway 2/34 intersection and west of the State Highway 2/30 intersection, the proportion is typically 10 to 12%. East of the State Highway 2/30 intersection at Awakeri the proportion generally exceeds 20%. This proportion reflects both the absence of an effective railway and some through traffic not using the State Highway network.
Measured HCV numbers and HCV's as a percentage of the AADT for 2005 are recorded on Table 1.

A study carried out of the forestry production off the East Coast about ten years ago, and still considered essentially relevant today because the harvesting pattern predicted has not taken place due to the economics of the industry, suggests that the mean HCV percentage east of State Highway 2/34 could increase by about 2% with peaks of up to 5% in any one year.

Dairying, horticulture, and general goods movement typically result in a steady base load of HCV's punctuated by seasonal peaks at harvest time.

In summary, the proportion and number of HCV's using the State Highway network is high, and there are no effective alternatives to road transport east of Edgecumbe.

3.5 CHANGES IN LAND USE

Providing for a growing Whakatane is difficult given the physical constraints that exist, and Whakatane District Council is currently investigating the issues with a view to developing an urban land use growth strategy. Accordingly, this report seeks to identify potential alternaive routes for State Highway 2 that complement Whakatane District Council's growth plans and could potentially be built in stages as the town expands.

Changes to travel paths will occur as residential, commercial and industrial areas develop or reduce. Coastal areas at Ohope and Coastlands (on the west side of the Whakatane river) are expected to continue to develop. The rate of growth and type of growth may vary, and growth in general may be offset by planning restrictions in coastal areas, climate change, and flood risk impacts. Any further bulk retail/light industrial development are also likely to be focused west of the Whakatane River.

Alternative State Highway 2 corridors that reduce the volume of through traffic using the western access to Whakatane and/or reduce the volume of "through" traffic passing through Whakatane/Ohope on local roads would aid Whakatane's congestion problems.

3.6 TRAVEL DEMANDS SUMMARY

The key transport demand inputs to selecting an alternative to the existing State Highway 2 corridor are considered to be:

- Existing traffic volumes by State Highway standards are relatively low except where the network carries commuter traffic.
- Growth in the AADT is around 4%.
- The percentages and number of HCV's is significant and the absence of a sustainable rail network east of Edgecumbe means this situation is likely to continue.
- Through traffic using local roads instead of State Highway 2 can contribute to congestion of local roads.
- There is a need to understand and plan for future land use growth when identify a potential alternative route for the State Highway 2 corridor.
- Retail, light industrial, and residential development on the west side of the Whakatane River, coupled with the commuter traffic, is a major contributor to congestion within Whakatane, and at the eastern end of State Highway 30.
- The location of a potential new Whakatane River Bridge upstream of the existing Landing Road Bridge may have positive benefits for both the State Highway and local roads. A new bridge sited downstream is unlikely to offer the same benefits.
- Cyclist volumes on State Highway 2 are expected to be light because of the available scenic alternatives. Significant pedestrian traffic will only occur within or close to urban areas.

4.0 ALTERNATIVE TRANSPORT SOLUTIONS

Alternative transport solutions considered by the Regional Land Transport Strategy include rail, barging, buses, walking and cycling.

4.1 RAIL

The rail network allows goods to be transported to and from the west only, mostly to the Port of Tauranga. There are two railheads, one at Kawerau and one at Taneatua, these lines join to the west of the State Highway 2/State Highway 34 intersection. There is another line off the Kawerau line, which travels south to Murupara. Inter-regional use of the rail network is limited by the lack of a rail connection between Taneatua and Gisborne. This is significant due to the large volumes handled at the Gisborne port, especially forestry and horticultural exports.

Transport of goods from Taneatua to Kawerau is not an obvious origin-destination as the trip length is too short to justify the double handling incurred in loading trains. In recent years the rail line from the Carter Holt Harvey mill in Whakatane to Awakeri has been lifted, and the rail line from Taneatua to Edgecumbe is no longer used. Transport of goods from the Boardmill and Taneatua to the Port of

Tauranga are obvious origin-destination trips, however these routes have not been cost effective. The remaining line in current use is from Kawerau to Matata.

The current trend in this area of rail lines either being uplifted or abandoned is not expected to alter in the near future. The only industry in this area that could potentially require rail network expansion is forestry.

While there is potentially 10 to 15 million tonnes of forest product to be harvested in the East Coast region alone over the next several decades, the uncertainty as to when it will be harvested, where it will be exported from (assuming no further processing), at what rate it will be harvested, coupled with the forest owners private roading network requirements and possible competition from barging, all add up to a high level of uncertainly/risk for those responsible for rail provision. The principal current use of rail within the study area is from Kawerau to and from the Port of Tauranga. Consultation with both Ontrack and Toll indicates that the existing disused branch line east of Edgecumbe is not currently economic, and will not be reopened until it is.

In the meantime the rail corridor and infrastructure will be retained for possible reused at same future date.

4.2 BARGE

The economic of barging forestry products off the East Cape to the Port of Tauranga continued to be debated. A report on the proposal prepared for Environment Bay of Plenty in 2003 suggested that "there are considerable benefits in the proposal." However, when the report was peer reviewed for Land Transport NZ the reviewer questioned some of the assumptions behind the report's conclusions.

4.3 PUBLIC TRANSPORT

Regional and inter-regional bus services operate in the study area. Regional bus services travel from Whakatane to Ohope, Kawerau, and Opotiki. Inter-regional bus services travel from Whakatane to Tauranga, Gisborne and Rotorua. Public transport use in terms of selecting an alternative corridor for State Highway 2 is not pivotal, and the quantum and usage pattern is not expected to alter significantly in the near future. Use of public transport to manage the commuter traffic demand may warrant further investigation.

4.4 WALKING AND CYCLING

A walking and cycling strategy has been prepared as part of the Whakatane Transportation Study as a separate report. Walking and cycling are not considered to significantly impact on regional transport and/or the selection of an alternative corridor for State Highway 2. A Regional Walking and Cycling Strategy is currently being prepared.

4.5 ALTERNATIVE TRANSPORT SUMMARY

The principal current use of rail within the study area is from Kaweau to and from the Port of Tauranga. Consultation with both Ontack and Toll indicates that the existing disused branch line east of Edgecumbe is only currently economic, and will not be reopened until it is.

The economics of barging forestry products off the East Cape to the Port of Tauranga continues to be debated.

Public transport operates in the study area but its use in terms of selecting an alternative corridor for State Highway 2 is not pivotal, and the quantum and usage pattern is not expected to alter significantly in the near future.

Walking and cycling are not considered to significantly impact on regional transport and/or the selection of an alternative corridor for State Highway 2.

5.0 CORRIDOR CONSTRAINTS

Environmental, social and strategic factors, in addition to transportation demand, all impact on corridor selection. Environmental factors include topography, geotechnical considerations, stormwater, climate change, flooding, scour, native flora and fauna and historical sites. Social factors include noise, vibration and pollution in urban areas, and pedestrian and cycle requirements. Strategic factors include traffic flows, bridges, urban expansion and impacts on landowners. These factors are discussed below.

5.1 TOPOGRAPHY

A hill range runs north-south through the centre of the study area. Plains are located to the west of the hills, and rolling topography and plains are located to the east of the hills. The plains in the western part of the study area contain alluvial levees and ancient sand dunes that rise above the floodplains. Selection of a corridor on raised areas will minimise flooding risk and will typically provide soil foundations of improved strength.

The north-south aligned hill range is highest towards the south. The maximum height on corridor A is approximately 160 m, and the maximum height on corridor B is approximately 220 m. The frequency and size of incised gullies that must be crossed also increases towards the south. Therefore a corridor alignment that passes through the northern part of this range will minimise earthworks requirements.

All proposed corridors, except for corridor C, generally follow the existing Wainui Road corridor to the east of the hill range. Construction costs can generally be minimised by locating the road at the interface of the rolling hills and the alluvial plans. This strategy provides a competent road foundation with a good vertical alignment. However, additional work is likely to be necessary to provide an acceptable horizontal alignment.

5.2 GEOLOGY

The study area contains two main landforms, sedimentary hills and alluvial plains. The sedimentary hills are located to the east of Whakatane, they typically consist of Mesozoic greywacke mantled with Quaternary volcanic deposits up to 15 m thick. Faulting of the sedimentary rocks formed the Whakatane graben, the low-lying area west of Whakatane now infilled with sand dunes and overlain with Quaternary alluvial material forming plains in this area. Localised areas of alluvial material are also found adjacent to rivers that cut through the sedimentary hills. Geological information has been taken from Soil Bureau Bulletin 38, "Soils and land use of Whakatane Borough and environs, Bay of Plenty" NZDSIR (1978).

Significant geological issues affecting the study area include slope instability, seismic activity, debris flows, volcanism and tsunami. Slope instability issues are discussed in the 'hills' section below.

There are numerous active faults within the Whakatane Graben, six of which are onshore and close to the proposed State Highway 2 alignments. The average earthquake recurrence interval for these faults is approximately 3000 years. Averaged movement of approximately 13 mm per year occurs across the graben (G Lamarche et al, Tectonics Vol 25, 2006).

The last major event in the area occurred on the Edgecumbe fault, this was a magnitude 6.3 event in 1987. During this event liquefaction of recent alluvial soils occurred and surface ground movement of up to 2.0 m was observed. Damage to structures included toppling of unreinforced concrete block walls and damage to bridges in the area. Slumping also occurred on hill slopes. (S Christensen, NZ Geomechanics News, July 1994).

Recent debris flows occurred in Matata in 2005 as a result of intense rainfall. These flows blocked State Highway 2 for 12 days. The recurrence interval for such an event is estimated to be 500 years. Historical records indicate that four smaller debris flows may have occurred at Matata since 1860 (Institute of Geological and Nuclear Sciences, 2005).

Volcanism affecting the Whakatane area would most likely come from White Island to the north, or the Rotorua/Tarawera volcanic area to the southwest. Impacts from volcanism could include

tsunami, ashfall, lahars, or deposition of volcanic material. Most volcanic impacts would similarly impact on all proposed corridors, however a lahar in the Whakatane River could threaten the existing bridge over this river, affecting the security of the existing State Highway route.

Tsunami risks are greatest for routes near the coast. There have been at least six major tsunami events on the Bay of Plenty coast in the last 4,000 years over 5 m in height. Tsunami generated from volcanic or seismic movement directly offshore would pose the greatest danger to route availability/security, and motorists using the route at the time, as such events would have very short warning periods. Damage to roading routes close to the coast caused by a large tsunami could include erosion of roads and embankments, loss of bridges and culverts and debris blocking roads. Accordingly coastal or low lying corridors, or corridor sections, come with a level of additional tsunami risk, in addition to flooding, climate change and seismic (liquefaction) risks.

The Hills

The hills predominantly consist of sedimentary deposits of greywacke, overlaid with more recent sedimentary deposits and mantled with rhyolitic ash and lapilli deposits. On the current State Highway 2 alignment through the Waimana Gorge the overlying ash thickness has been observed to typically be between 0-4m in thickness. The hills are faulted, and incised and eroded by rivers. Steeper slopes have progressively less ashfall cover remaining. Soils developed in significant ash deposits include the Whakatane loamy sand and Whakatane hill soils (slopes between 0 to 30 degrees), soils in reduced ash deposits on slopes between 30 and 40 degrees consist Kawaka soils, and slopes over 40 degrees contain Kawaka precipitous soils (bare rock).

Significant differences occur between the ash and lapilli slopes. Ash slopes have good cohesion properties, but are prone to failure if oversteepened. Stable slopes were observed up to 50 degrees. Fine grained ash deposits can be sensitive to disturbance when reworked, requiring care when used in earthworks. Lapilli slopes have high friction angles, with stable cut faces observed at close to 90 degrees, but these slopes are prone to erosion by concentrated stormwater flows, either off roads causing erosion of the toe of slopes, or directly on the face of the slope causing rill erosion.

Slope instability issues found in the hill areas include slump failure of overlying ash deposits, rock fall and block failure of the greywacke, and river erosion in gorge areas. Slope instability could be triggered by seismic action. Construction of new roads through hill areas will require some significant cut and fill works. It is expected that a relatively high reuse of cut material in fills will be possible.

The Plains

All the plains west of the Whakatane River contain surficial relatively weak recent deposits likely to have potential settlement and liquefaction issues. The Rangitaiki Plains consist of predominantly of alluvial volcanic (mostly rhyolitic) material, with areas of peat soils and ancient sand dunes (loess soils). The Whakatane River plains (south of Whakatane), and localised plains to the east of Whakatane, predominately consists of alluvium from sedimentary sources. All plain deposits include, and are mantled by, layers of recent volcanic ash. Drainage is often poor, resulting in gleyed soils.

Most new roads on the Rangitaiki Plains will need to be constructed on embankments to provide foundation strength and to reduce flooding risk. Any second bridge over the Whakatane River would be founded on alluvial and colluvial sediments and will be located close to the Whakatane fault line.

Building roads and/or stop banks on the Whakatane River plains is a lower risk alternative to building same on the Rangitaiki Plains.

5.3 EARTHWORK AND STORMWATER

Potential earthwork and stormwater environmental impacts will occur where new roads are constructed. These impacts will be greatest for routes in hill country with significant lengths of new road. Earthwork volumes will be greatest in these areas, and stormwater has the most potential to harm the environment through greater velocities and impacts on slope stability. Significant earthworks will also be required to build new sections of road on the plains, as most sections of new road would have to be raised above the floodplain, and have appropriate stormwater provision across the embankment. Exceptions to this are where the route follows raised ancient sand dunes that are above the level of the plains. Sedimentation of the Ohiwa Harbour is a particular concern in this region. Any resource consent issued for earthworks inland of the Ohiwa Harbour is likely to include strict environmental requirements.

5.4 CLIMATE CHANGE

Predicted future climate change is expected to result in reduced annual rainfall in the Bay of Plenty region. However, temperatures in this region are predicted to increase, allowing humidity levels to increase, allowing higher intensity rainfall events to occur. Increased rainfall intensity could increase the incidence of slope failure in the hill country, stormwater volumes, general erosion, higher flood volumes and more extensive flooding and sedimentation of low lying areas. Future sea level rise predictions (including seasonal continental shelf heating, La Nina, Pacific Oscillation and general sea level rises) are currently predicted to be in the order of 0.7 m over the next 100 years (Ministry for the Environment publication "Coastal hazards and climate change" 2004).

Future sea level increases could put any works adjacent to the coast or Ohiwa Harbour at the risk of inundation, requiring works to raise the road level, and widen bridge waterway openings to cope with flatter hydraulic gradients and bed build up. At upstream sites, bridge waterway openings will also need to be larger to cope with increased flood flows, and scour and erosion provision will need to be more extensive than is currently best practice. Climate change will have a significant impact on the flood protection and drainage schemes that endeavour to keep the Rangitaiki Plains productive, which in turn could impact on State Highway 2.

5.5 FLOODING

Flooding of the Rangitaiki Plains is an ongoing issue that is managed by the Bay of Plenty Regional Council and Whakatane District Council through stop bank construction, pumping, and maintenance. Flood events where the existing stop banks have been breached have generally been increasing in frequency over recent times due to, in part, instability of the stop banks. Stop bank instability is due to the variable and poor quality soils the stop banks are made of and founded on. The stop banks are also sensitive to seismic disturbance. Typically the land closest to the coast is most at risk of inundation during large events, as the river gradients are flattest in this area.

The Whakatane Plains do not flood as frequently the Rangitaiki Plans, with the majority of flood events being contained within the existing stop banks, which appear to be built of, and founded on, better quality materials.

Low lying areas adjacent to the Ohiwa Harbour are also prone to flooding.

5.6 BRIDGE LOCATION

Bridges are an important part of route selection given their significant construction cost design life and vulnerability to natural phenomena. Any new bridge across the Whakatane River must consider fluvial factors such as river width, alignment, scour factors, and tidal impact. Scour risk is increased in areas with steep grades, high water velocities, fine graded bed material, at eroding outside corners of river meanders, tightly constrained sites, and alignments that put the bridge and piers at an angle to the river flow. River beds generally degrade at a distance from the coast, and aggrade near the coast. Meanders typically migrate upstream, and tidal areas typically require greater bridge widths.

An optimal location for bridges tends to be at the tidal limit. Such a location tends to reduce the bridge length required, have less scour, and often provides improved foundation conditions.

5.7 NATIVE FLORA AND FAUNA

Most native flora and fauna is found in the hill country. Native fauna would be adversely impacted by any route through areas of indigenous or exotic forest. The most notable native fauna in the hill country that could be adversely impacted by road construction is Kiwi. A Department of Conservation Kiwi zone exists in the Burma Road area. Investigation of any alternative State Highway 2 corridor involving the hill country or close proximity to the sea will require an ecological assessment.

5.8 HISTORICAL SITES

The Historical Places Trust recognises many pa, pit, and terrace sites within the study area, and several buildings in towns. The majority of the historical Maori sites are located in the hills directly east of Whakatane, and around the Rewatu Marae, south of Whakatane. It should be possible to locate any alternative State Highway corridor and bridge away from the key known sites, however

there will always be a high likelihood of discovering a historical site during construction works in this area. Detailed investigation of any alternative State Highway 2 corridor will require an archaeological assessment.

5.9 SOCIAL FACTORS

Social factors include noise, vibration and pollution in urban areas. Alternative State Highway 2 corridors should avoid existing or proposed urban areas and should be protected from adjacent urban development.

While most people welcome a safer and more efficient State Highway roading network, construction of a new route would I impact on land ownerships and the lives of many people. The greatest impact on landowners would occur if an extensive length of new road was built across the Rangatiki Plains. The location and extent of Iwi land ownership has not been established as this stage. Further investigation of any alternative State Highway 2 corridor would require a social impact assessment to be prepared, including a statement of Maori interests, and consideration of the outcomes from the current Whakatane District Council's Residential Growth Strategy Study.

5.10 PEDESTRIANS AND CYCLISTS

Any corridors that direct the State Highway through urban areas would adversely impact on pedestrian and cyclist safety, and are therefore undesirable from a safety, health and environmental perspective.

Cyclists require adequate shoulder provision on roads and bridges. The majority of the existing State Highway 2 corridor has limited provision for pedestrians and cyclists.

Generally commuting cyclists prefer direct routes and flatter grades, touring cyclists prefer scenic routes, and recreational cyclists prefer routes with low traffic volumes. Therefore only a proportion of cyclists will use a State Highway route. As sections of the existing State Highway to be retained come up for rehabilitation/reconstruction, the opportunity to provide for other road users needs to be taken.

5.11 STAGING

The length and cost of an alternative State Highway 2 corridor is significant, therefore it is desirable that any potential long term route could be built in stages and preferably be linked to the future growth of the town.. Staging should also ensure that the amount of rework be minimal, and that the staging does not result in more problems than it solves.

5.12 CORRIDOR CONSTRAINTS SUMMARY

The key constrains in selecting an alternative State Highway 2 corridor or corridors of interest for further investigation are considered to be:

- Avoid locating the State Highway near the coast.
- Avoid existing or proposed urban areas of development.
- Retain as much as is practical of the existing State Highway 2 corridor, accepting that there are risks associated with it.
- Seek to identify a potential replacement Whakatane River bridge in a location that makes best advantage of the natural characteristics of the Whakatane River, provides for staged construction, reduces the overall State Highway length, and fits in with Whakatane's long term land use growth strategy

5.13 ELIMINATION OF OPTIONS

Considering the problems, objectives, and constraints discussed in the preceding sections, it is evident that a number of the options shown on Drawing 134960/P101 do not warrant being considered further. Therefore the following options have been eliminated from further consideration:

- Corridor D is near the coast and may be affected by future sea level rises as well as increased flooding inundation risk.

- Corridor D will divert State Highway traffic into the centre of Whakatane. This is undesirable as it would result in a State Highway corridor with increased travel times and commuter congestion, decreased safety, and adverse social impacts.
- Corridor D requires a new bridge across the Whakatane River to be located across a relatively wide section of river. Such a location would have a relatively high construction cost, and may be founded in material prone to erosion and liquefaction.

6.0 OPTION DESCRIPTION

6.1 CORRIDOR OPTIONS

The brief for this study was to identify potential alternative State Highway corridors between Matata to the west and State Highway 2/Wainui Rd Intersection to the east. These alternatives are strongly constrained at or near these two locations by topography. Consequently, it has been concluded the nominated locations are satisfactory for the purpose of this scoping study.

Eight potential alternative State Highway corridors were selected based on previously identified corridors by Whakatane District Council, existing roads, shortest routes, and topographical characteristics. These corridors are shown in Drawing 134960-P101.

Previously identified state highway corridors have included routes to the west of Whakatane, passing through the Coastlands area and crossing the Whakatane River north of the existing State Highway 30 Landing Road Bridge. This is shown as corridor D and sub-options on Drawing 134960-P101. This corridor is no longer recommended as a sustainable option as it may be affected by climate change, and it will divert State Highway traffic into the centre of Whakatane.

The "ideal" corridor of interest warranting further investigation would:

- Be able to be constructed in "bankable" stages.
- Cross the Whakatane River upstream of the existing Landing Road Bridge.
- Allow a replacement bridge over the Whakatane River and its immediate approaches to be built as the first stage, at least cost, utilising as much as possible of the existing roading network, albeit with some upgrading and improvements.
- Provide a sustainable state highway corridor in which subsequent stages of construction can be carried out with minimal rework.
- Would be able to be protected from development and other impacts likely to adversely affect the viability of subsequent staged construction.
- Provide the basis for a long term state highway network strategy in the region and be a key input to Whakatane District Structure Planning.
- Would utilise the best available geotechnical characteristics such that under extreme events, the level of risk is at least satisfactory.
- Would result in through traffic not using local roads, nor passing through urban areas, in preference to using the state highway.

The following discussion is made with respect to the alternative options identifies with these objectives in mind.

6.2 EXISTING ALIGNMENT

Retaining the existing alignment is the "do minimum" option available for the State Highway 2 corridor. Route security and length are the two major issues with this alignment. Other issues include the transportation, social, and environmental impact on Whakatane, Ohope, and local roads of through traffic not using the State Highway 2 corridor.

Route security is primarily at risk from bridge closure, flooding, erosion and climate change. It is possible that a significant seismic or flood event could result in both the Pekatahi and Landing Road bridges becoming impassable. The existing route length is affected by a significant detour around the Whakatane Hills between Taneatua and the Wainui Road intersection.

The existing route between Matata and Wainui Road is closed for an average of four days each year due to flooding and slips. The likelihood and magnitude of future flooding and erosion events may increase due to climate change. Flooding on the existing route currently occurs either side of the Rangitaiki River and near the Wainui Road intersection. Any reduction in flooding on the Rangitaiki

Plains depends on the ability of the Bay of Plenty Regional Council to develop and construct an upgraded flood protection scheme. Such a scheme should be able to cope with climate change. It should be possible to address other flooding issues on the existing network with capital expenditure.

Slope stability risk is greatest through the Waimana Gorge, but slope stability could also affect the route between the Waimana Gorge and Wainui Road, and near White Pine Bush. Slips could affect all these areas, river undercut and rock falls could occur in the Waimana Gorge, and debris flows could occur in the Waimana Gorge.

Delays created by urban development at Matata, Edgecumbe, Awakere, Taneatua, as well as the signals on the Pekatahi Bridge contribute to route disbenefits. Between Matata and Taneatua the existing State Highway 2 route is essentially a former District Council road which was taken over as a State highway 1st July 1992. In a number of respects, the existing state highway over this length does not meet current Transit New Zealand standards, and is in general of a lesser standard than the adjoining lengths of purpose built state highways.

The existing route does not have significant congestion issues as current traffic volumes are well within link capacity limits. Consequently, route security and travel time/distance are the main issues for the existing alignment. .

6.3 CORRIDOR A

This option is shown in yellow on plan 134960/P101, appended. The most eastern section of the option is common with Option B shown in blue.

The westernmost section of corridor A crosses the plains between the existing State Highway 2 and Whakatane. Most of this section is expected to be new road, however parts of Rewatu, Station and Titoki Roads could be utilised. Constructing this section of the route above flood levels is not anticipated to present unsurmountable technical problems in this area. A new bridge crosses the Whakatane River south of Whakatane. A new section of road up the Whakatane escarpment and across to Burma Road is then required. This section crosses a 160 m high ridge and one major gully, before rising to join Burma Road at approximately 120 m height.

Burma Road is constructed to track standard only in the vicinity of corridor A. This road would require significant work to bring the alignment and grades up to State Highway standard.

A new road is indicated from Burma Road to the Nukuhou River. This section of the corridor would require a new bridge across the Waiotane Stream. Between the Waiotane Stream and Nukuhou River a series of relatively low hills must be crossed. From the Nukuhou River to the end of the study area a new bridge across the Nukuhou River is proposed, and a ridge approximately 80 m high is crossed.

It is possible for the State Highway corridor to join Wainui Road near the Waiotane Stream. This option would provide an opportunity to stage the construction and/or minimise construction costs, and still provide most of the travel time benefits of this corridor. If this option is adopted then some work will be required on Wainui Road to bring this road up to current State Highway standards.

Geotechnical

The soils on the plains on the western section of corridor A mostly consists of gleyed silts, with sandy soils present by the Waioho canal and more extensively either side of the Whakatane River. Weak subgrades and settlement issues are anticipated in this section. The new bridge across the Whakatane River is anticipated to require relatively deep piles into loosely compacted alluvial material, and the design must minimise potential liquefaction and earthquake risks. On the east side of the Whakatane River is an area of colluvium adjacent to the Whakatane fault line scarp. Ongoing erosion and deposition is anticipated in this area.

East of the Whakatane River the steep ridge and gully will require significant earthworks, and good design will be required to minimise future slope instability problems. Approximately half of this area is classified as Whakatane Hill soils, and the other half as Kaweka soils.

Burma Road would require significant work to bring the alignment and grades up to State Highway standard. Slope stability issues in this area are expected to include weak ash deposit failures and river erosion.

The eastern section of Burma Road from Maraetotara Road is on relatively low hills and alluvial valleys. This road is currently closed due to slips, and the low hills at the eastern end of Burma Road also appear to have stability issues with failed slopes over 40 degrees observed.

Between the Waiotane Stream and Nukuhou River a series of relatively low hills must be crossed. Significant geological issues are not anticipated in this area, however significant silt control measures on earthworks surrounding the Ohiwa Harbour will be required.

Road construction from the Nukuhou River to the end of the study area will require significant earthworks, with good design to minimise slope instability issues. Construction of this section would most likely occur in a staged manner, after the remainder of the route had been constructed.

Flooding

This option will require embankments to be constructed between the existing State Highway 2 route and the proposed Whakatane River crossing to prevent flooding.

Native Flora and Fauna

A significant length of new road will be constructed through native forest, affecting native flora and fauna. This corridor is in the vicinity of a Department of Conservation Kiwi zone near Burma Road.

Historical Sites

There are several historical sites, near where this alternative route passes. Detailed investigation of this corridor need to include investigation and assessment of this input.

Traffic

Corridor A is not the most efficient State Highway two route available, but it is the most practical route Corridor A may, however, pass close to residential development opportunities behind Ohope. Construction of this option would allow State Highway 30 between Awakeri and Whakatane to be reclassified as local road.

6.4 CORRIDOR B

Corridor B is shown in light blue on plan 134960/P101, appended.

Corridor B follows the same alignment as corridor A except for a more southern and direct route across the Whakatane Hills. Corridor B meets up with corridor A at the Waiotane Stream. This section of new road crosses several ridges up to 220 m in height, and not less than ten streams.

Geotechnical

The underlying soils on the plains along this route are typically gleyed silts, with well drained sands adjacent to the river. Construction of the new road across the Whakatane Hills will require significant earthworks.

Other Factors

The flooding, historical sites, and traffic implications of this route are similar to those for corridor A. One main point of difference is that this corridor avoids the Department of Conservation Kiwi zone.

6.5 CORRIDOR C

Corridor C is shown in purple on plan 134960/P101 appended.

Corridor C follows the existing State Highway 2 route to Taneatua. From there the corridor bypasses Taneatua and then generally follows Stanley Road, until this corridor joins back with the existing State Highway 2 at the Wainui Rd/State Highway 2 Intersection. Stanley Road is mostly metalled and approximately 5 m wide, except for the very east end where the road is sealed and approximately 6 m wide. Significant work would be required to bring this corridor up to State Highway standard. The terrain is very steep, and rises to approximately 200 m height in places.

Geotechnical

The first section of Stanley Road follows a tributary of the Waimana River, and river erosion is expected to be an issue in this area. The remainder of Stanley Road is not as steep, but is still expected to have slope instability issues. Concentrated stormwater flows on the existing road have lead to slope failures.

Exposed rock faces in this area vary from strong, relatively unweathered faces that appeared stable at approximately 80 degrees, to highly weathered faces with a stable angle of approximately 55 degrees.

The ash mantle at the west end of Stanley Road typically consists of orange clayey deposits that appears to be stable at approximately 60 degrees. The east section of Stanley Road typically follows the ridge line and both light grey lapilli and orange ashes are present. The lapilli slopes appeared to be stable at about 80 degrees, but were often eroded due to poor stormwater control on this road.

Traffic

This option does not pass near Whakatane, and will therefore not help reduce commuter traffic flows through Whakatane as corridors A and B would. This corridor is also unlikely to attract a high proportion of traffic currently using Wainui Road, as both routes are of a similar distance, but Corridor C is steeper. Corridor C does not assist reduce significantly west-east and visa versa through traffic passing through Whakatane, and/or using the local road between Matata and Whakatane.

Bridging

Corridor C would require replacement of the Peketai Bridge near its current site.

6.6 CORRIDORS E & F

Corridor E and F are shown in green on plan 134960/P101.

Corridor E and F traverse the Rangitaiki Plains in close proximity to the coast. As a consequence the corridors:

- Are subject to flooding and insecurity risks.
- Are likely to be affected by climate change more so than corridors that are further inland.
- Are likely to have high construction costs in order to address the above two bullet points:
  - Are likely to have high social impacts simply because of the development that exists in the corridor of interest already.

Corridor F only exists to provide a better linking alignment to Corridor A.

Detailed investigations of the corridors will need to carefully assess:

- The periodic disbenefits/risks of flooding route security vis the day to day benefits of a more direct route west of Whakatane given:
  - The uncertainty that presently exists as to the depth and extent of flood inundation with and without and affordable upgrade of the Rangitaki Flood Protection Scheme, and climate change effects, including sea level rise.
  - The relatively high cost to develop a corridor in this area given the relatively intense development that already exists. The cost will be in dollar terms as well as in social/cultural impact terms.

6.7 CORRIDOR G

Corridor G is shown in brown on plan 134960/P101, appended.

Corridor G utilises State Highway 30 and Te Rahu Road. Te Rahu Road has been constructed to a relatively high standard with regard to road width and alignment, being the pre Landing Road Bridge approach to Whakatane. East of the Whakatane River this corridor follows either option A or B. Te Rahu Road has been constructed on an elevated ancient sand dune, and is therefore does not have a high flooding risk. It also avoids the Rewatu Marae area, and therefore carries a reduced risk of encountering a historical site.

Corridor G will help relieve congestion in Whakatane by providing an alternative route to State highway 30 for commuter traffic from Ohope and Whakatane to Edgecumbe and Kawerau. Its construction would provide for the balance of State Highway 30 leading into Whakatane to be reclassified as local road.

6.8 CORRIDOR H

Corridor H is grey dashed line on plan 134960/P101, appended.

Corridor H is a proposal to construct a tunnel through the Whakatane Hills. This corridor has been assumed to follow corridor A on either side of the Whakatane Hills. This option would provide travel time, vehicle operating cost and accident benefits. Environmental benefits include minimal disturbance to native flora and fauna. Route security would benefit from a reduced risk of road closure due to slips, however a tunnel would still be vulnerable to seismic activity.

Siltstone will be the main rock encountered by tunnelling, this is expected to range from hard to very hard in strength and provide a reasonable medium for tunnelling. A significant proportion of the tunnelled material is expected to be reused in the site works along the plains.

Tunnel construction is expected to increase costs by approximately $160 M, approximately 50% greater than most of the other proposed options. The benefits gained from a tunnel are not expected to be significantly greater than for corridors A or B, as the route length is not significantly reduced, and the grades on corridors A and B are not excessive. Therefore this option has not been considered further in this report.

6.9 STAGING LINK

The "Staging Link" is shown in orange on plan 134960/P101, appended.

The staging like is the "old" State Highway 2 road between Whakatane and Taneatua and thus comprises an existing roadway built to reasonable geometric and other standards.

It is labelled the "staging link" because it can provide the link between a new bridge crossing the Whakatane River just south of Whakatane township in the west, and State Highway 2 at Taneatua in the east.
Given that funding the provision of a new State Highway 2 route up and over the Whakatane hills (corridors A & B) will probably not attract a high national priority, and given that replacement of the Peketahi Bridge should be physically closer to Whakatane township and south of same, and should be the priority strategic project, then the link provides an opportunity to stage the construction of the ultimate strategic corridor.

Depending on the elapsed time needed to stage construct the desired ultimate corridor, it may be worthwhile carrying out geometric improvements to the staging link route; implementing the Taneatua bypass and/or eliminating or replacing the Taneatua overbridge.

7.0 SUMMARY OF CORRIDORS

Corridors which may potentially warrant further consideration are considered to be A, B, E and G. Some of these corridors, or combination of corridors, do not result in the most direct link between Matata and Kutarere, which means one of the key objectives of getting through traffic to select a route other than via Whakatane and Ohope may be difficult to achieve with some options or combination of options.

8.0 STRATEGIC POLICY

The purpose of the Land Transport Management Act 2003 (LTMA) is to contribute to the aim of achieving an integrated, safe, responsive and sustainable land transport system. The objectives of the New Zealand Transport Strategy are:

- Assisting economic development
- Assisting safety and personal security
- Improving access and mobility
- Protecting and promoting public health
- Ensuring environmental sustainability.

The corridors described as potentially warranting further consideration in this report meet, in whole or in part, these objectives in the following ways:

- Economic development is assisted by reducing the State Highway 2 route length, resulting in time and fuel savings, by reducing the risk of road closure, and by reducing congestion exacerbated by through traffic travelling through Whakatane and Ohope.
- Safety is improved by reducing the route length, and removing some through traffic currently travelling through Ohope and Whakatane, onto the State Highway route. Shorter routes and routes that avoid urban areas generally have reduced accident rates.
- Access and mobility is improved through the reduced route length and improved route security.
- Public health is promoted by removing some through traffic currently travelling through Ohope and Whakatane, onto the rural State Highway route. This will reduce pollution in these urban areas. Reduced fuel consumption over this shorter route will also reduce pollution in general.
- Environmental sustainability is provided by the shorter routes reducing fuel costs and pollution, recommending alternative routes that can be constructed in a staged manner, and removing traffic from urban areas. Removing traffic from urban areas will improve the townscape, reduce noise, vibration, and pollution in these areas.

All potential options have been considered in accordance with s.171(1)(b) of the Resource Management Act (RMA).

9.0 CONSULTATION UNDERTAKEN

It is intended that this Scoping Study Report be used as the term of reference for Transits proposed Eastern Bay of Plenty Strategic Study. Consultation with all key stakeholders and the general public will be carried out:

- As part of the EBOP Strategic Study; and possibly
- In conjunction with the release by WDC of its Residential, Industrial and Retail Growth Strategies for public consultation, depending on relative timing.

10.0 OPTION ANALYSIS

10.1 COST BENEFIT RATIOS

An economic assessment of each option has been undertaken in general accordance with Section 4 *Simplified Procedures* of the *Land Transport New Zealand Project Evaluation Manual*. This assessment has assumed that the traffic volume on the alternative State Highway route will be similar to that on the existing State Highway route, with 4% growth per year assumed. This is expected to be a conservative assumption. While not all traffic using the existing State Highway route will use the new route, the new route is expected to attract a high proportion of traffic currently using Wainui Road and State Highway 30, and the reduced travel time is expected to generate new traffic flows. The assessment of option cost/benefit ranking does not:

- Include an assessment of the cost/benefit for discrete parts or stages of a project.
- Include an assessment of national strategic factors such as security of access. In general, the relevant national strategic factors affect all options to a similar degree, so while they may affect the quantum of the absolute benefit/cost ratio assigned to an option, same has limited affect on the relative ranking of an option.
- Include intangible benefits. Intangible benefits are provided by corridors that reduce traffic flows through, for example, Ohope and Whakatane, and by corridors that reduce isolation. Reduced traffic flows through Ohope and Whakatane are considered to result in a small decrease in air pollution, noise and vibration in these areas.

It is important that the selected corridor avoid future compromises. Selection of a corridor that is cheaper to construct, but is longer and has steeper grades than alternatives, may not be the most desirable choice in the long term, particularly if traffic volumes increase. The cost benefit ratio only considers traffic volumes over the next 25 years, however it is anticipated that the selected corridor will be in place long after this time period.

10.2 CONSTRUCTION COSTS

The 'do minimum' of retaining the existing State Highway 2 alignment will require significant maintenance costs, expected to total approximately $3.7 M over 25 years.

Alternative corridor construction costs have been based on recent costs per kilometre for similar projects, and a check on these costs has made by pricing the expected earthworks and pavement costs for each option. Earthworks have been taken from indicative cross sections of the corridors considered, these are shown on Drawings 134960-P112 and P113. Passing lanes and crawler lanes have been included in the earthworks assessment.

The all-in cost for option analysis purposes of a two lane state highway on flat to rolling topography has been taken as $2.5M/km, and in the hilly topography, $7M/km.

The construction cost for a new bridge across the Whakatane River without approach works is estimated to be $10 M.

The corridor construction costs listed in tables are thus the estimated cost to achieve current Transit standards. In practice it will be possible to use existing roads, with improvements as and where necessary being carried out over a period of time. Such comments relate particularly to:

- Corridor G.
- Wainui Rd.
- Staging link.
- Corridor E

No provision is included in the construction costs for upgrading of existing state highway 2 and 30

Route costs can be minimised by utilising existing roads and choosing alignments that minimise topological and geological constraints.

10.3 ACCIDENT SAVINGS

There were 107 accidents on State Highway 2 in the study area over the last five years (an average of 21 accidents per year). Of these, 35% occurred on bends, 71% occur in midblocks, and 18% involved trucks. The predicted accident rate for the existing route is 18 accidents per year. The accident rate calculation has been calibrated with the actual accident rate to determine accident savings for alternative routes.

The typical accident rate in hill areas was 0.057 accidents per 100 million driver kilometres per year, this has been taken from the accident rate through the Waimana Gorge (10 accidents in 5 years, 1,087 AADT, 7.19 km). The typical accident rate on the plains was 3.29 accidents per 100 million driver kilometres per year, this has been taken from Matata to Station Road (60 accidents in 5 years, 3,032 AADT, 24.75 km).

10.4 TRAVEL TIME AND FUEL SAVINGS

Travel times and fuel savings have been taken from the route length and grades provided on the highway information sheets for the existing route, and from indicative long sections of the corridors considered, these are shown on Drawings 134960-P106-P111.

10.4 INTANGIBLE EFFECTS

Intangible benefits are provided by corridors that reduce traffic flows through Ohope and Whakatane, and by corridors that reduce isolation. Reduced traffic flows through Ohope and Whakatane are considered to result in a small decrease in air pollution, noise and vibration in these areas. A significant reduction in isolation through improved route security will be provided by all corridors requiring a new bridge across the Whakatane River.

10.5 BENEFIT/COST RATIOS

The results of a rough order incremental Benefit/Cost assessment are presented in Tables 3 and 4 below. Reduced travel times are the greatest quantifiable benefit generated by the alternative routes considered.

Table 3: Rough Order Benefit/Cost Ratios

Corridor	Costs	Benefits					B/C
		Accident	Travel Time	Vehicle Operating	Intangible	Total	
A	158	28	30	15	10	83	0.5
B	188	51	69	46	10	176	0.9
G/A	145	35	43	27	10	115	0.8
G/B	161	48	62	46	10	169	1.0
E/B	165	50	73	50	10	183	1.1

Table 3 indicates that options G/B, E/B and B are the options most worth investigating from a cost vis benefit point of view. The rough order benefit/cost assessment indicates that the considered corridors are unlikely to be funded in their entirety in the near future based on their benefit/cost ratio alone.

However further investigation of a new Whakatane River bridge, as part of a staged route construction, may be worth considering as part of a strategic route security study for the Eastern Bay of Plenty sub-region.

10.6 POTENTIAL OPTIONS FOR FURTHER CONSIDERATION

The options which have the potential to be considered further are corridors E/B and G/B. While these corridors have low ranking Benefit/Cost ratios, there may be a long term strategic justification for an alternative route, and a staged construction over a 20 to 30+ timeframe may improve the absolute and ranking Benefit/Cost ratios. Plan 134960/P120 Rev A relates.

10.7 RISK ASSESSMENT

A risk assessment of the options considered has been undertaken in accordance with the General Approach as specified in Section 4.2 of *Transit's Risk Management Process Manual,* and a risk register is included in Appendix B. The risk assessment has considered significant risks to the project viability only. Most of the major risks to project viability cannot be actively managed, and the only possible treatment plan is to passively accept these risks. Active management of some risks may be possible as more information is obtained in the next phase of this investigation.

Significant risks to the construction of an alternative State Highway corridor currently include obtaining resource consent for large earthwork sites and sites in Department of Conservation reserves, funding, land purchase, accuracy of earthwork quantity estimates, geotechnical assumptions, and traffic flows.

11.0 AREAS NOT COVERED BY THIS SCOPING STUDY

Areas which have not been covered as part of this study include the following:

- Consultation with key stakeholders and the public.
- A full risk assessment.
- An archaeological assessment.
- A social impact assessment, including a statement of Maori interests.
- An ecological assessment for any investigation of alternative State Highway 2 corridors involving the hill country or close proximity to the coast.

12.0 CONCLUSIONS

The State Highway Two Alternatives Routes Scoping Study has:

- Identified two alternative state highway 2 routes. The alternatives are only potentially viable in a 30 year plus timeframe, with actual timing dependent on demand and population growth.

- Identified a preferred new Whakatane River bridge location which will, among other things, provide the Whakatane District Council the opportunity to develop their Growth Strategies having due regard to the location for such a potential bridge.

This will not only enable Whakatane to expand but also provide a potential long term vision for the state highway.

It is recommended that the preferred new Whakatane River Crossing only should be examined further as part of Transits forthcoming Eastern Bay of Plenty Security Study.

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APPENDIX A

DRAWINGS

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Key:

Existing SH2

Existing SH 30 & 34

PRELIMINARY

BLOXAM BURNETT OLLIVER

WHAKATANE TRANSPORTATON STUDY

EXISTING STATE HIGHWAYS

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- Corridor A
- Corridor B
- Corridor C
- Corridor D & Sub Options
- Corridor E
- Corridor F
- Corridor G
- Corridor H (Tunnel)
- Staging Link
- Existing SH 2
- Existing SH 30 & 34

no	date	issue/revision detail	by	chk	appr

design RB	checked RB
drawn JB	approved RB

drawing status
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project
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drawing title
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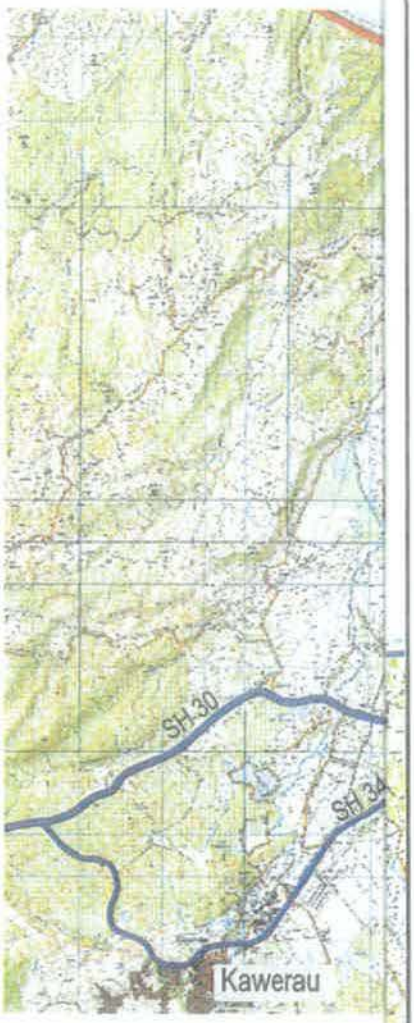

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drawn JB | approved RB

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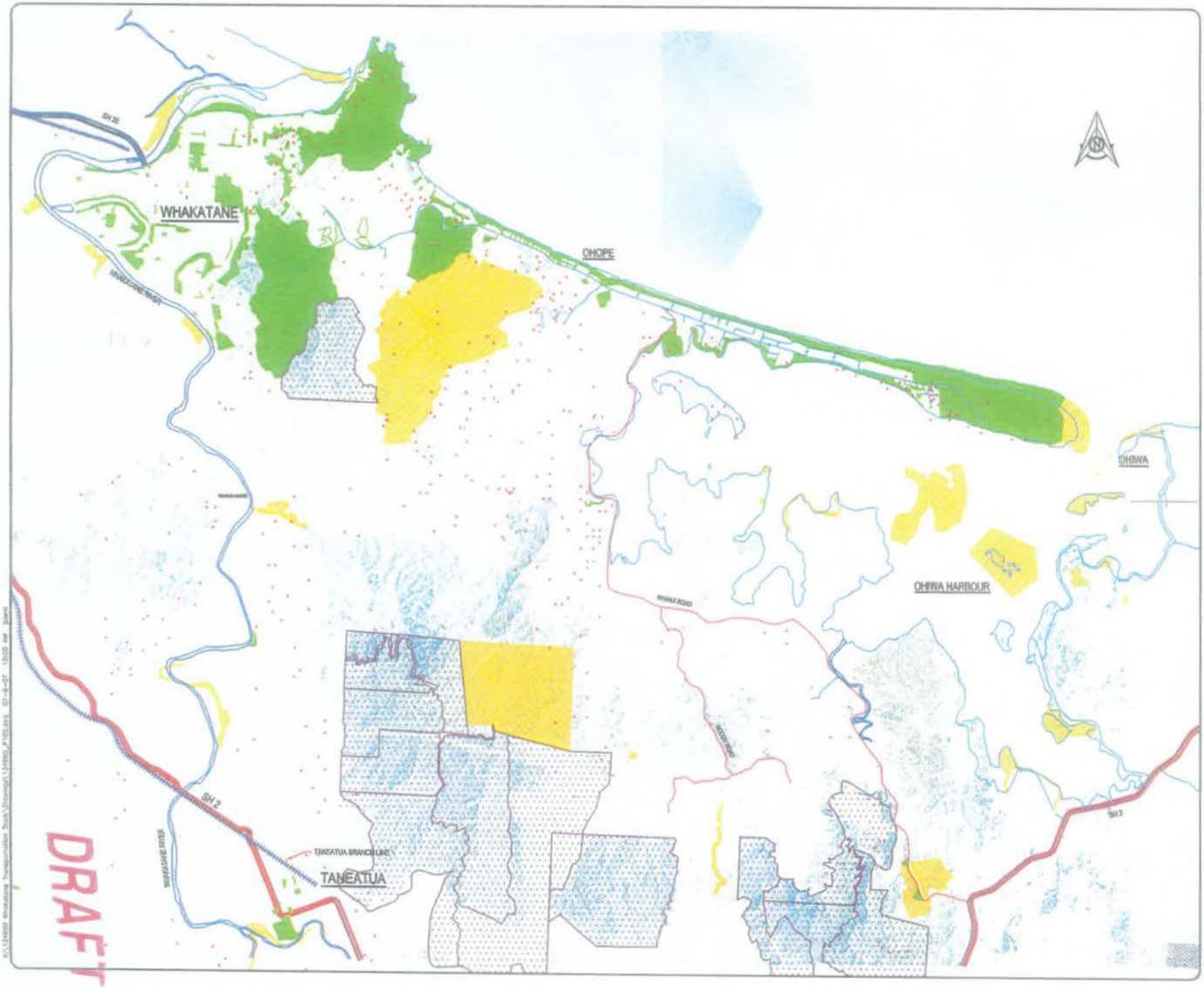

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- FORESTRY AREAS
- HISTORIC PLACES
- (WDC) WHAKATANE DISTRICT COUNCIL RESERVES
- EXISTING STATE HIGHWAY
- EXISTING RAILWAY

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HISTORIC PLACES, DOC & WDC RESERVES, FORESTRY

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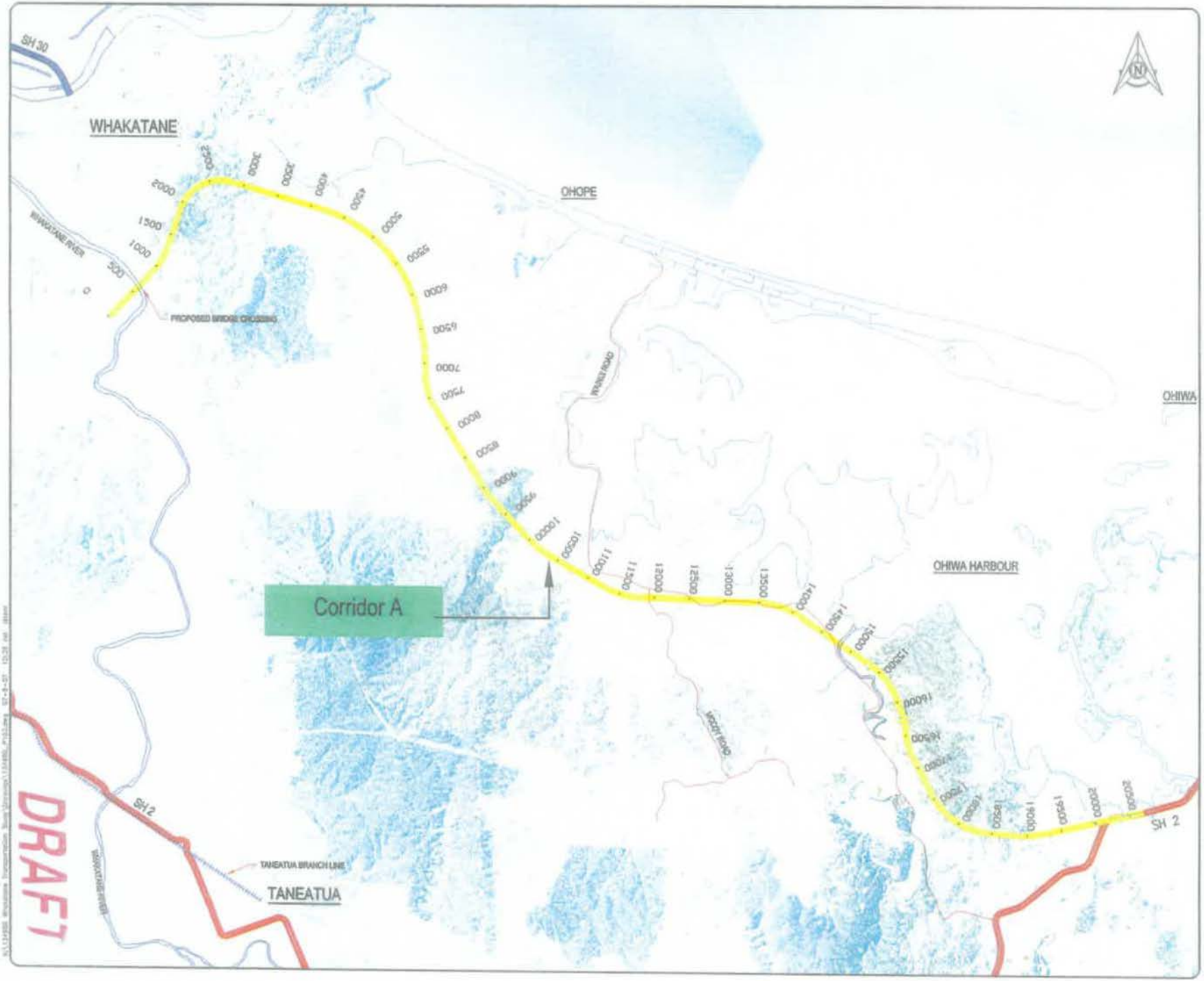

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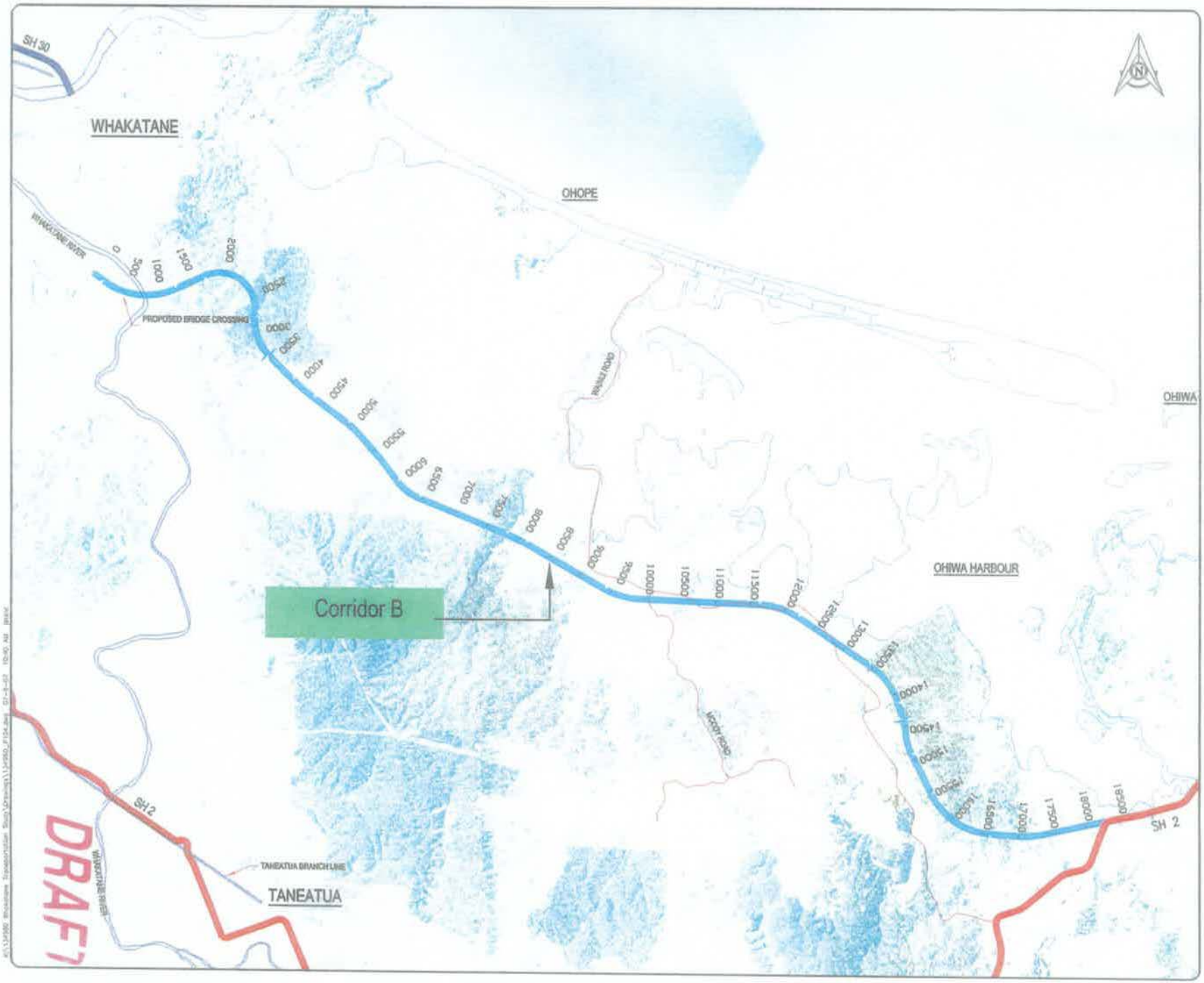

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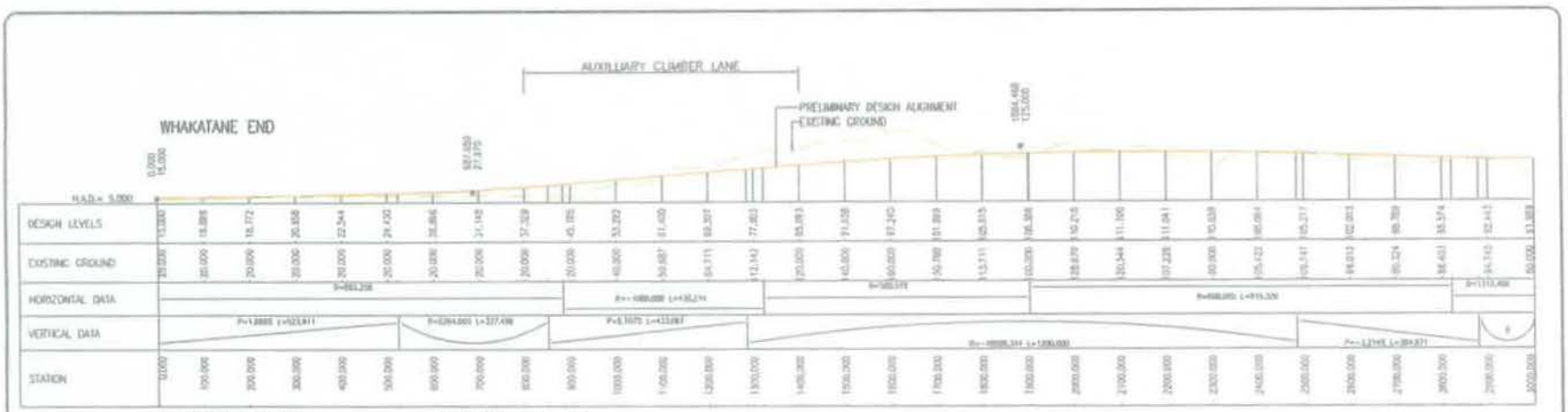

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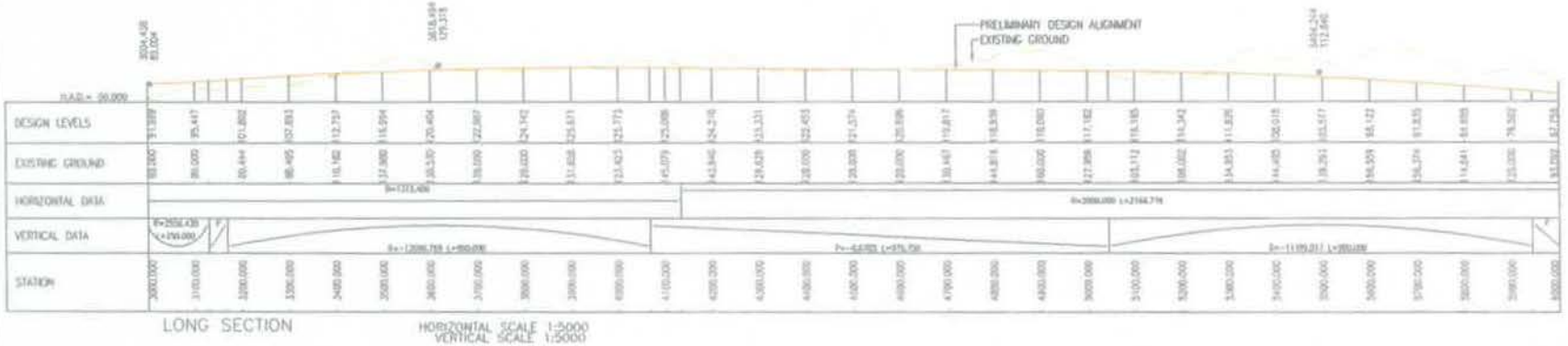

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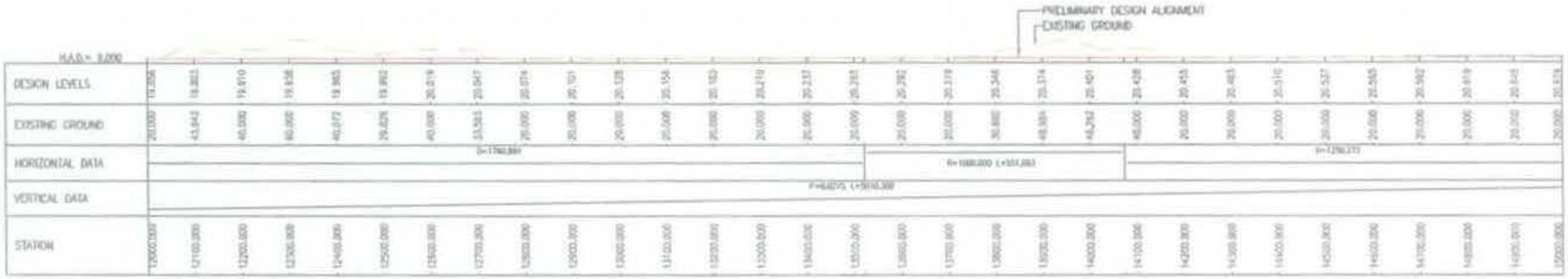

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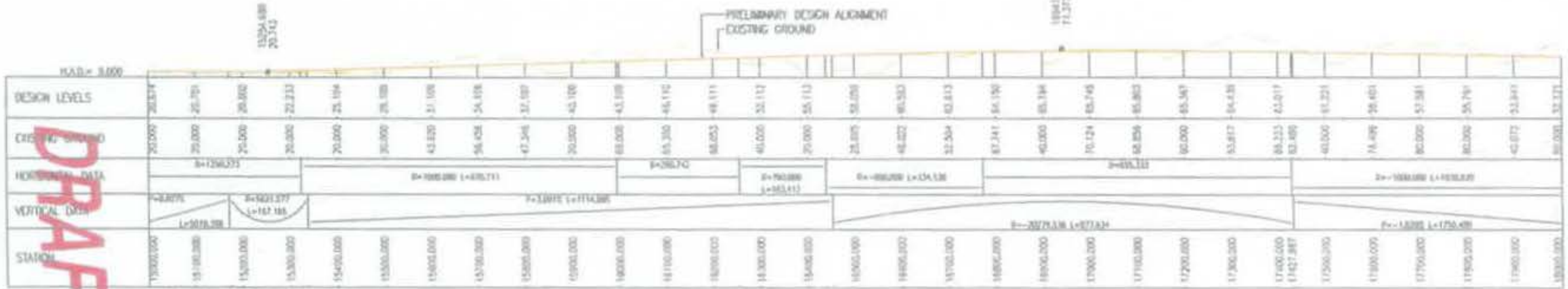

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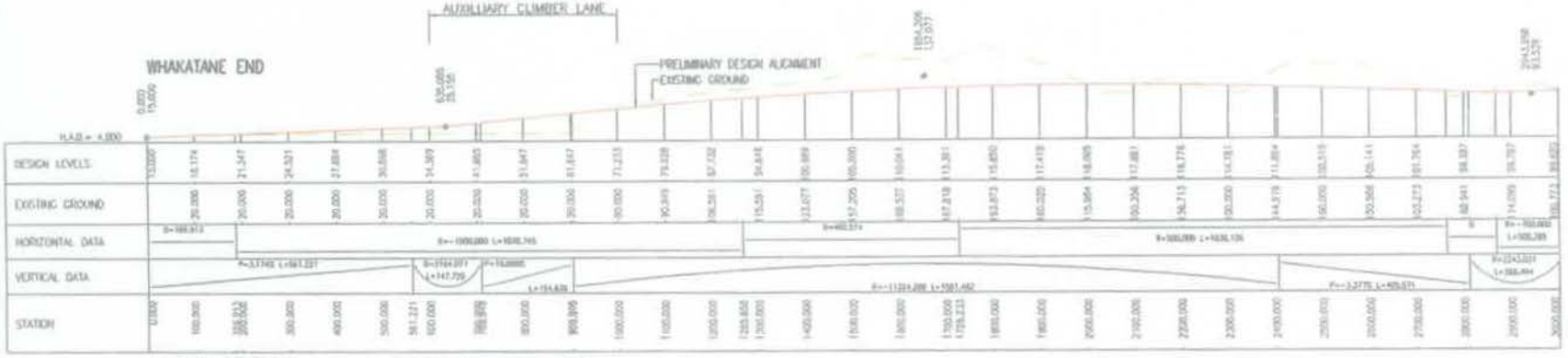

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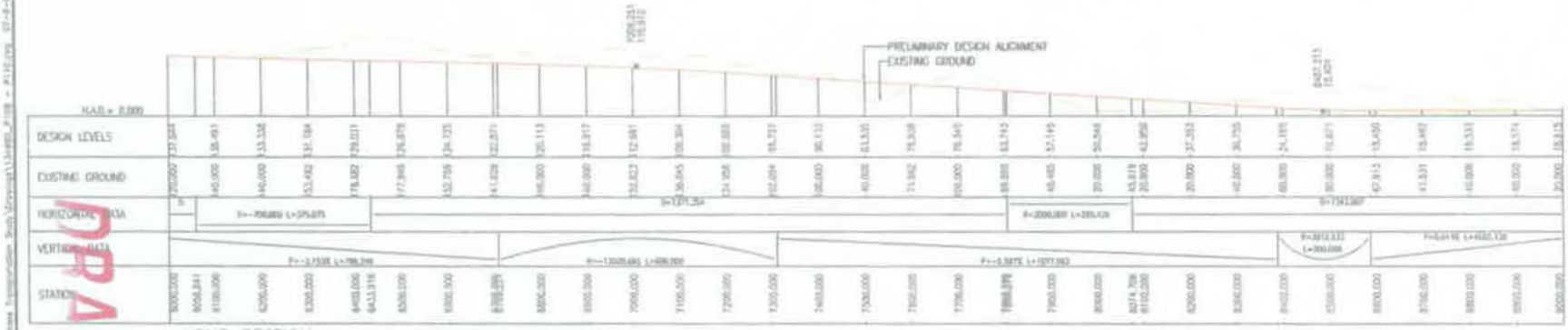

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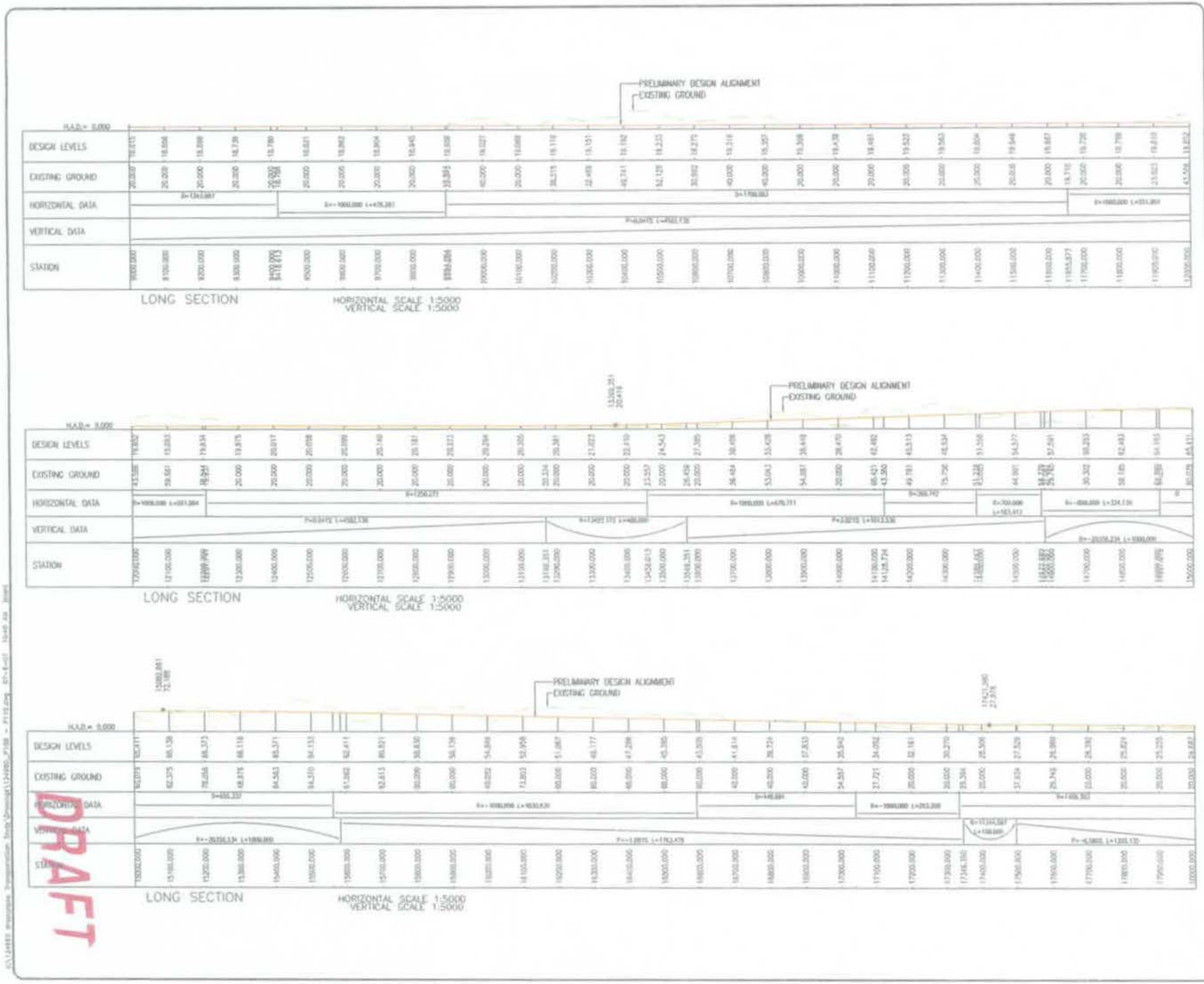

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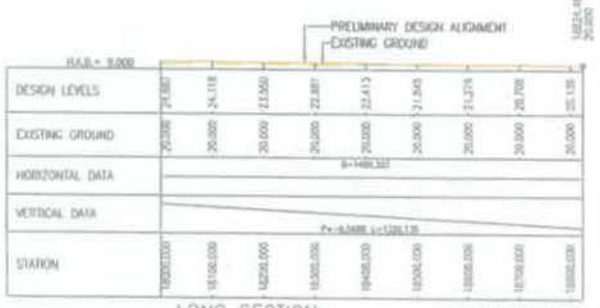

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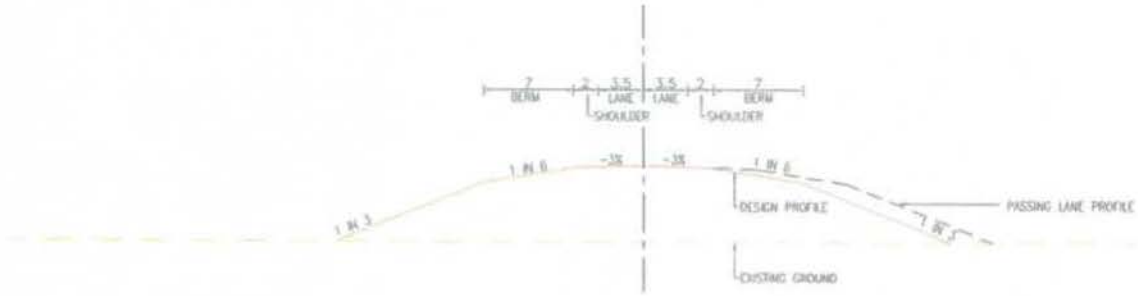

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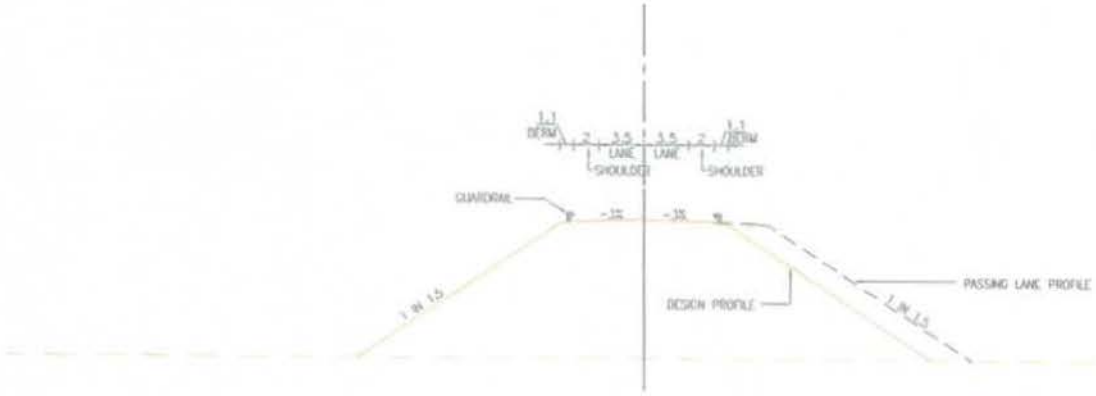

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project
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drawing title
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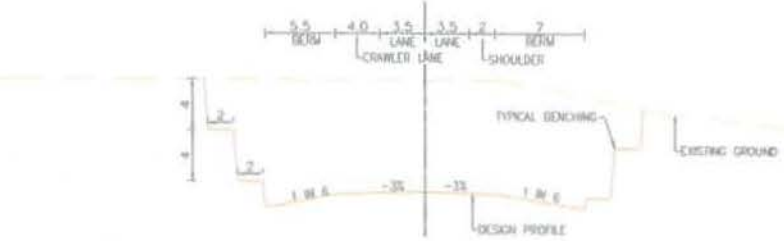
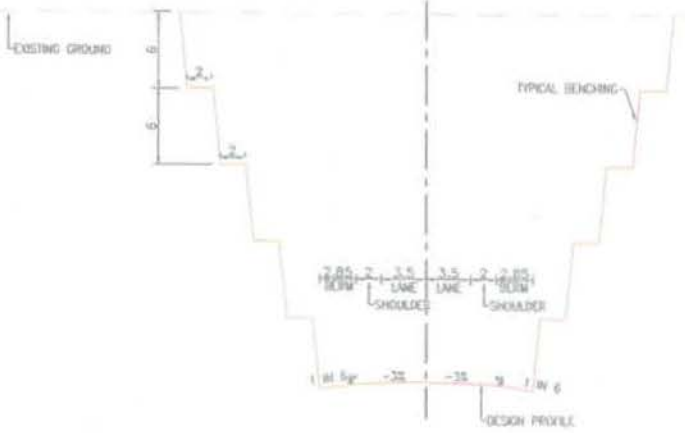


TYPICAL CROSS SECTION – WITH CRAWLER LANE



TYPICAL CROSS SECTION – WITHOUT CRAWLER LANE

DRAFT

4	03.07	DESIGN ISSUES	JB	RL	DB
3	01.07	PRELIMINARY	JB	RL	DB
no	date	issue/revision details	by	chk	appr

design JB | checked RB
drawn JC | approved

drawing status
PRELIMINARY

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client

project
WHAKATANE TRANSPORTATION STUDY

drawing title
TYPICAL CROSS SECTIONS SHEET 2

scale
A1 = 1:200

date
11.01.07

file: 134960_P112-.dwg
xrefs:

drawing number
134960/P112 | B

WHAKATANE TRANSPORTATION STUDY
ALTERNATIVE STATE HIGHWAY 2 CORRIDORS
RISK REGISTER

Activity	Alternative State Highway 2 Options	Analysts Name(s)	Tara Hills
Contract No.	Whakatane District Council 05/61	Reviewers Name(s)	Reece Burnett
Date	24/01/2007	Sources of Information	

No.	Name	Description	Status	Threat or Opportunity	Existing Controls	Consequence		Likelihood		Score = C x L'	Treatment Plan Summary	Rank
						Description	Rating (C)	Description	Rating (L)			
1	Base travel demand	Changes to travel paths or transport modes.	E	T/O	n/a	Years - Major	70	Quite common	4	280	Passively accept	3
2	Travel growth forecasts	Changes to predicted population growth/loss.	E	T/O	n/a	Years - Major	70	Quite common	4	280	Passively accept	3
3	Change in accident rates	The accident rate realised by the adoption option differs from that predicted.	E	T/O	n/a	Years - Major	70	Unlikely	3	210	Passively accept	4
4	Project funding not obtained	Funding not obtained due to insufficient funding, failure to meet funding criteria, lack of support from funders.	E	T	n/a	Many years - substantial	100	Quite common	4	400	Passively accept	1
5	Archaeological risks	Discovery of a historical site delays or prevents works.	E	T	n/a	Years - Major	70	Quite common	4	280	Passively accept	3
6	Community risks	Community (including stakeholders and iwi) issues not identified/resolved.	E	T	n/a	Years/national media - Major	70	Quite common	4	280	Passively accept	3
7	Ecological risks	Project has a significant effect on the environment i.e. protected flora/fauna found on site, earthworks consent not obtained.	E	T	n/a	Years/heavy environmental damage - Major	70	Quite common	4	280	Passively accept	3
8	Land and property	Land designation or purchase issues.	E	T	n/a	Years - Major	70	Quite common	4	280	Passively accept	3
9	Political	Changes in roading policy or strategy.	E	T/O	n/a	Many years - substantial	100	Quite common	4	400	Passively accept	1
10	Geotechnical risks	Unforeseen ground conditions encountered.	E	T	n/a	Years/$10M - Major	70	Quite common	4	280	Passively accept	3
11	Construction risks	Sufficient fill or pavement materials not available.	E	T	n/a	Years/$5M - Major	70	Quite common	4	280	Passively accept	3
12	Bridge risks	Complexity of bridge design or construction greater than predicted.	E	T	n/a	Years/$5M - Major	70	Quite common	4	280	Passively accept	3
13	Natural events	Events such as climate change, flooding, earthquake, volcanism, tsunami or land instability threaten the adopted route.	E	T	n/a	Years - Major	70	Quite common	4	280	Passively accept	3
14	Unknown risks	Further risks will be identified during project assessment, design and construction.	E	T	n/a	Years - Major	70	Likely	5	350	Passively accept	2

Exceptions Statement

Only very high or extreme risks to project viability have been listed. Excludes risks relating to typical project details such as procurement or MSQA issues.

LEGEND

L	Live
E	Emerging
P	Parked
C	Closed
T	Threat
O	Opportunity

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