

Requirements by
Transit New Zealand for
Designation of State Highway 2
(Tauranga Eastern Arterial)

and

Tauranga District Council for
Bell Road Interchange

Prepared for
Transit New Zealand and
Tauranga District Council

Beca Carter Hollings & Ferrier
Consulting Engineers

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AND

TAURANGA DISTRICT COUNCIL

By

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Final
9 August 1999
3602796/18
AOR87R02.DOC

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VOLUME 3 - OPTIONS REPORT - TAURANGA EASTERN ARTERIAL ROADING STUDY, 1998

EXECUTIVE SUMMARY

The purpose of this report is to gain consent to construct a new road between Domain Road in Papamoa and the existing State highway 2/State highway 33 highway intersection at Paengaroa. Transit New Zealand (Transit) has resolved to designate the route to secure it from future development and to provide some certainty for adjoining landowners on the possible impacts and land requirements of the route when it is eventually constructed.

Under the Resource Management Act, a requiring authority must undertake an Assessment of Environmental Effects (AEE) prior to notifying the requirement for a designation.

This report is the AEE which supports the designation for the Tauranga Eastern Arterial (TEA) by Transit and a designation for an interchange in the location of Bell Road by Tauranga District Council (TDC).

1. OVERVIEW

The Bay of Plenty, and particularly the sub-region surrounding Tauranga, continues to experience very rapid growth. Predictions are that it will be the fourth largest urban area in New Zealand by 2016. One of the major influences on this growth is the Port of Tauranga which is New Zealand's largest export port by volume. Throughput has increased from four million tonnes in 1989 to eight million tonnes (1997) and future predictions are that this will increase to nine million tonnes by 2000. The impact of the Port on the roading infrastructure is therefore significant. Heavy traffic as a component of overall traffic on SH2 is already above 12%.

Transit, TDC and Western Bay of Plenty District Council (WBOPDC) have combined to develop a sub-regional transportation strategy. This strategy includes the development of an arterial ring road system around central Tauranga and provides access to the Port of Tauranga. The proposed Tauranga Eastern Arterial (TEA) links to the arterial ring road from the east. See Figure 1.

As the main east coast highway, SH2 serves both as a national strategic route and, with the urban area expanding, as a primary arterial access road from Tauranga to Te Puke and Papamoa. Currently its primary function as a main strategic route, to move traffic and goods safely and efficiently, is compromised by its dual function.

As growth occurs in Papamoa East, it is becoming important to provide a safe and efficient link from there into Tauranga. An interchange midway along the TEA will provide this link to Tauranga without compromising the TEA's role as a main strategic route. This junction will be in addition to those at Domain Road and at Paengaroa.

FIGURE 1

THE BOSTONIAN

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For the purposes of the overall highway improvement strategy the TEA is considered to include the whole of the upgrading of the highway between Te Maunga and Paengaroa. This is in two portions, the first having been subject to a previously successful designation requirement by Transit for the widening of the highway between Te Maunga and Domain Road to accommodate a four lane divided facility. This Assessment of Environmental Effects covers only that portion of the TEA from Domain Road east to the junction of SH2 and 33 at Paengaroa.

Transit has for some time been considering various options for a bypass of Te Puke. In February 1992 a Te Puke bypass scoping report evaluated five options. That report provided some background information for this study's consideration in 1998 of a total six options. The determination of the favoured option followed an extensive option selection process which included wide ranging community consultation and consideration of the various effects.

2. CURRENT PROBLEMS ON STATE HIGHWAY 2

The section of SH2 to the east of Tauranga (see Figure 1), between Domain Road in Papamoa and Paengaroa and passing through Te Puke, has the following problems:

- The highway is currently providing a dual service of major arterial route and primary commuter road and causes problems as it passes through the built-up area of Te Puke and along other parts of the route due to the high volumes.
- Traffic volumes are increasing rapidly due to the large amount of development occurring in Tauranga. There are also large numbers of logging and timber product trucks using the highway as their only link from the production areas to the Port of Tauranga.
- The low level of service between Paengaroa and Te Maunga due to the highway being a two lane facility carrying approximately 14,000 vehicles per day with a 12% heavy commercial vehicle content.
- The large number of accesses from the highway causing conflicting traffic manoeuvres which are made more unsafe due to many having insufficient sight distances.
- There are vertical and horizontal geometric alignment deficiencies in and around Te Puke, around the area of Bell Road and at the intersection with Domain Road.

The SH2 Eastern Arterial designation is necessary to alleviate increasing traffic congestion and a poor crash record that is a product of mixing major arterial and commuter traffic flows. The traffic growth rate is currently predicted to be 5.7%

per annum (from 1997) and on this stretch of highway there is a particularly high (12%) proportion of heavy vehicles travelling to the Port of Tauranga.

The majority of those consulted during this project considered that the existing State highway was inadequate now in terms of its level of service to the motoring public, and that the growth rates predicted would simply exacerbate the degree of congestion and accidents. The preliminary modelled traffic flow predictions on the Eastern Arterial in 2011 is 9230.

It is anticipated that the traffic flows east of Te Puke will drop by 46% as a result of the new Eastern Arterial highway, and north of Te Puke by 40% (in 2011).

3. PROPOSED SOLUTION

The proposed TEA Route will be constructed as an “expressway”, a road which provides no property access and incorporates provision to be improved over time to full motorway standard while permitting full public rights of usage. It has been designed to provide an arterial road from the Domain Road intersection on State Highway 2 at Papamoa to the intersection of State Highways 2 and 33 just north of Paengaroa, a length of 16km. This will result in regional arterial traffic no longer having to pass through the townships of Waitangi and Te Puke on-route to or from Tauranga. There will be no access points other than at the interchanges and at the Bell Road interchange designated by TDC.

The geometric design has been based on Transit's guidelines which are the Austroads Rural Road Design Guide.

The consultant team and the community have considered six options for the Eastern Arterial project, with extensive consultation and analysis as is shown in the *Options Report - Tauranga Eastern Arterial Roading Study 1998*. The investigation methodology ensured that all environmental elements were given equal weighting in the decision to adopt the designation. The route chosen is one that was overall the better and it is one that better serves the long term strategic roading requirements for the urban area of Papamoa and the rural Te Puke/Paengaroa environment.

Transit's objective has been to find a balance between the costs and benefits of the road and the parameters of the Resource Management Act and the associated plans and statements.

4. DESCRIPTION OF THE ENVIRONMENT

- 4.1 The land to the east of Tauranga through which the TEA passes can be generally characterised by the very flat land consisting of both areas of pasture and areas of orchards.

Ecological

- 4.2 No notable vegetation, individual trees of any particular botanical value or habitats containing a significant native flora would be directly traversed by the TEA alignment. The nearest area of notable native vegetation is the remnant grove of kahikatea in the Department of Conservation grazing lease section of the Lower Kaituna Wildlife Management Reserve.

The crossing of the Kaituna River would be in an area which has moderate wildlife values but which is typical of this area.

The most notable wildlife habitat on the western side of the River adjacent to the alignment is the Niccol property section of the Bell Road oxbow which would be avoided.

On the eastern side of the River the most notable adjacent habitat is the Lower Kaituna Wildlife Management Reserve. Although the alignment would cross the western grazed area of the Reserve, it would avoid all areas of tall vegetation habitat including the remnant kahikatea stands.

The most significant downstream wildlife habitat is the Kaituna River mouth area which is c.5 km from the proposed River crossing.

Landscape

- 4.3 The landscape through which this option passes is sited on the coastal river flats east of Tauranga. The over riding quality of this landscape is its flatness, with, to the south, the Papamoa Range rising out of the very flat plain to heights of 200 - 300 metres above sea level. These landforms are the most visually obvious landscape features - rounded hills with both woodlots and clumps of mature trees on them, with some farm houses and rural residential properties in places. These hills are also peppered with pa sites particularly around Papamoa. State Highway 2 currently follows the base of these hills, and defines the point where the coastal flats meet the hills, and acts as the southern entry point into Tauranga District. A small portion of the State highway is slightly elevated and affords views north across the flats to the coastal sand dunes.

Another landscape feature, which is more difficult to discern in the wider landscape, is the Kaituna River which meanders through the area and has formed ox bow lakes in places around which willows, flax and other water loving vegetation has grown, and birds roost. The river finds its way to Maketu Estuary

and the coast to the north east. The Lower Kaituna Wildlife Management Reserve is sited along a previously straightened portion of this river and is a Department of Conservation reserve. There are remnant groups of mature kahikatea in places near the river, and in the DOC reserve.

East of Pah Road, north of Rangiuru, the character of the landscape changes from open pastoral grazed land to enclosed fruit growing areas, and the landform becomes slightly undulating. Further east from this the kiwi fruit areas become more intermittent and the landscape again becomes pastoral.

Archaeological

- 4.4 Recent archaeological monitoring and site surveys of Papamoa from Te Maunga to the end of Bell Road have revealed the coastal zone as an area of intensive occupation with large and smaller settlements sites (kainga), pa and extensive use of the Holocene dune soils for gardening. On the higher Papamoa hills there is a high density of pa and terraces, however this area is separated from the coast and Kaituna River by wetland. Not much is known along the TEA route from the Kaituna River to Rangiuru as no further archaeological work has been undertaken since the field surveys of the early 1980's.

The majority of the recorded sites along the TEA route between Young, Te Tumu, Maketu Roads, and along SH2 were recorded by personal communication with property owners rather than identification in the field and an assumption can be fairly made that these sites have a high probability of being disturbed or destroyed by farming or orchard activity. This form of recording can also indicate the potential of an area to contain archaeological sites in undisturbed ground. Absence of archaeological monitoring by excavation in an area limits the ability to predict or determine presence of sites.

Archaeological sites are common in wetland areas throughout the country because wetland areas have high economic values for food and material resources, however wetland archaeological sites or features have been more usually associated with pa and other settlement types, either built in the wetland itself or on the edge of the wetland. Archaeological signature is not readily discernible in the Kaituna or Kopuroa wetland, although wooden artefacts may be cached or structures remain preserved in waterlogged ground. However there is a virtual absence of sites along the TEA route along the edge of this wetland or swamp.

Sites that have been recorded to date along the Tauranga Eastern Arterial route are Pa, middens, terraces, made soil (garden soil), and artefact find spots which are common site types recorded in the Tauranga area.

Cultural

- 4.5 There are nine hapu groups which have an interest in the land area because of historical associations or because of current land ownership and which have been consulted - Ngati Pikiao, Ngati Makino, Ngati Whakaue, Tapuika, Waitaha, Ngaiterangi, Ngati Pukenga and Ngati Kapawa.

Noise

- 4.6 The area through which the proposed route passes is a typical rural noise environment with a very low background noise composed of various noise sources such as the nearby breaking surf, insects, birds, farm animals, wind and with occasional intruding noise from traffic on local roads, the railway, or farming machinery. The noise environment is relatively homogeneous, with an area of larger blocks and few dwellings from Domain Road to Pah Rd and an area of smaller blocks and closer spaced dwellings around Te Tumu Road. The typical noise environment of the area through which the route passes is low.

Social

- 4.7 The Tauranga and Western Bay of Plenty Districts have experienced significant growth in the recent past - from the early 1960's with the development of the Port and through the 1970's and 1980's as a result of the kiwifruit industry. Today the region has a diverse employment base and a mild climate which continues to attract significant numbers of new residents to the area.

During the intercensal period 1991 - 96, the Western Bay of Plenty District had 3.4% per annum growth and Tauranga District 3.3% per annum growth. The portion of growth attributable to migration was 13,150 people, or 11.5% of the total population.

The communities the Eastern Arterial Route by-passes - Papamoa and Te Puke - are both areas of growth, especially Papamoa. Te Puke had an overall population increase of just over 7% between 1991 and 1996 and Papamoa (east and west) of just over 34%.

The area through which the TEA passes is rural consisting of large farms, with a very low population density, especially between the Domain Road junction and Te Tumu Road. Around Te Tumu and Maketu Roads there is a slightly higher population density, with the landuse being predominantly smaller horticultural blocks.

5. ASSESSMENT OF EFFECTS

Transit has agreed to the effects of the designation as assessed in this report and has accepted and approved the mitigation measures proposed.

Ecological

- 5.1 Although the designation would be in close proximity to habitats of moderate to high value, it is well separated from the highest value ecological areas in the Lower Kaituna Wildlife Management Reserve. The areas traversed are dominated by grazed pasture to the east and west of Kaituna River and, except for the River itself, the aquatic habitats are of low ecological value.

There is an opportunity to isolate any potential roadway-derived stormwater effects from the Reserve, to provide wetland buffer areas on other parts of the alignment and to progress the revegetation of the grazed portion of the Reserve more rapidly than would have occurred otherwise.

There are areas of aquatic sediments on the western and eastern sides of the Kaituna River which contain moderate levels of contamination, and which would require isolation to prevent adverse effects on downstream habitats. No significant adverse effect on Kaituna River mainstem habitats would result.

Operation of the roadway is unlikely to diminish the ecological values of those areas of the Lower Kaituna Wildlife Management Reserve that are currently of high ecological value. The alignment is approximately 1100m from the eastern area of the Reserve which is the area of high ecological values. (Area 1 in the management agreement, see Figure 4.33A and Appendix 8.)

Further information on mitigation measures provided to protect the ecological and recreational values of the Reserve are in Section 5.6 Social.

Landscape

- 5.2 In general the proposed arterial has been designed to have a very low profile. It will be sited on a low embankment, and will be reasonably well integrated into its surroundings, without either significant cuts or fills. The potential adverse visual effects will occur at the main intersections and the bridge across the Kaituna River Corridor.

Overall of the 6 landscape units assessed, the arterial would have a low moderate effect on 2, moderate effects on 3, moderate high effects on 1 and a high effect on 1, without any landscape mitigation, with localised high effects around intersections initially. However, the potential for landscape amelioration in all landscape units is very good.

Archaeological

- 5.3 No archaeological sites with visible surface features will be impacted upon by the proposed construction of the Eastern Arterial route over the Domain Road to Waikakei Confiscation Boundary portion of the route.

For the remainder of the route, there is no major impact on the archaeological resource. Any potential impact on pa site U14/220 has been minimised by the

altered alignment. The impact on unrecorded sites in this area is not high as there is an uneven and extensive distribution of recorded sites.

Cultural

- 5.4 Advice to date is that there are no significant cultural sites affected by the designation.

Considerable difficulty has been experienced in trying to locate a recorded pa site on the western bank of the Kaituna River adjacent to the river crossing. Initial archaeological investigations could not find evidence of the pa, and later work and consultation with Waitaha representatives indicates that the pa is likely to be directly to the south-west of the existing alignment on the banks of the Kaituna River. The alignment has been shifted into its current position in response to the perceived location of the pa site in the locality.

There has been consultation with 8 hapu groups over the terms of this study. All hapu have been encouraged to be involved in all three stages of the project to ensure that they have the opportunity to implement kaitiakitanga or the ethic of stewardship over their ancestral lands. The comments above regarding the location of the pa site at Bell Road are indicative of this spirit of kaitiakitanga.

Noise

- 5.5 Without mitigation houses within 280 metres of the road would experience traffic noise levels of greater than 55 dBA (up to 65 dBA at 50 metres). However, with mitigation the noise level can be limited to 55 dBA (L_{eq} 24 hour) for all properties and the effects would be minor. For properties further than 280 metres from the road the noise level will be less than 55 dBA (L_{eq}) without mitigation and will reduce with distance until at distances of more than 1000 metres the traffic noise would be below the normal day time ambient noise and would be likely to be inaudible.

Mitigation work, bunding, fencing and quiet road surfaces, that will be carried out to reduce the overall noise level to Transit's guideline of 55 dBA (Leq) will also reduce the maximum levels to less than 65 dBA for all affected houses closer than 120 metres.

Social

- 5.6 The social effects of the proposed highway can be split into two groups. The first group includes the effects of the pre-designation process and the designation on landowners. Issues/effects include the stress of negotiating, having uncertainty as to the location of the road or whether it will actually happen, participating in an unknown planning process and being sure that all the available information is at hand. Transit has ensured a free flow of information to date and speedy investigation and resolution of issues and this will continue in the pre-Hearing

period. Transit has offered to provide Councils with information for distribution to the community as appropriate until the project is completed.

The second group of effects again brings emotional and financial stress but in a more tangible form as the true effects of the alignment become known. This includes issues such as the effect that the road will have on farmers, such as splitting farms, the upsetting of lifestyles, the displacement of families, the effect on Te Puke and Whakatane Highway businesses, loss of amenity, the effect on the Kaituna Drainage Scheme and the effect on the Lower Kaituna Wildlife Management Reserve. Many of these effects have been mitigated through landscaping and noise measures, and many others are things that will be dealt with at the negotiation stage.

Considerable attention has been paid to the maintenance and enhancement of the recreational and ecological values of the Lower Kaituna Wildlife Management Reserve and the crossing of the Kaituna River to the west. The mitigation measures recommended in this AEE, bunding, planting, stormwater, drainage, land compensation, noise monitoring and planting, are intended to enhance the land area available for public reserve purposes and the quality and quantity of vegetation in the reserve for future generations.

Public access along the Kaituna River will be maintained because the bridges will be designed with set back embankments which allow for the pedestrian access underneath.

Mitigation measures will help to ensure that amenity values and the quality of the environment in the Lower Kaituna Wildlife Management Reserve are maintained, and in some areas, enhanced. An extensive noise mitigation bund has been proposed along the edge of the reserve, with a noise monitoring programme. This will bring the noise experienced in the reserve to an acceptable level and will ensure that existing values are not significantly affected.

Five maimai may not be able to be utilised for shooting in their present orientation once the alignment is constructed due to the direction they face (i.e. towards the proposed road) and the proximity to the route. However, it is considered this is a small number of the total (33 or 15%) and is not significant and is a consequence of a safer, more efficient highway. An increased amount of developed land will be made available to compensate the reserve for the land directly affected by the designation. Five new/additional maimai can be provided in Area Two where it is greater than 350m from the carriageway. The land directly affected by the proposed road is not currently used for shooting as it is grazed.

6. CONCLUSION

The project aims to maintain the quality of the environment overall through the achievement of a limited access State highway which provides a safe and more efficient highway network and thereby a safer and more efficient local roading network. This in particular will enhance the amenity of the townships on the existing SH2, Te Puke and Waitangi.

In our opinion the proposal meets the principles and purposes of the Act (sustainable management). The designation is in the long term interests of the region and Tauranga District as well as the national State highway network.

The proposal, including the mitigation measures, does not threaten the life supporting capacity of the earth's resources.

**NOTICE OF REQUIREMENT FOR A DESIGNATION UNDER
SECTION 181 OF THE RESOURCE MANAGEMENT ACT 1991**

Notice is given of a requirement to alter the designation of State highway 2 between Domain Road in Papamoa and the existing State highway 2/State highway 33 intersection at Paengaroa. Transit proposes to construct, maintain and operate the road as a State highway in the manner described in the attached assessment of environmental effects. Pursuant to section 184(1)(c) RMA the period for which this designation is sought is 20 years.

1. (a) The reason why the Designation is needed is:

The designation technique is considered an appropriate planning tool in the context of the District Plan as it gives a clear indication to the public of the future location and scale of this arterial road. The public will be better able to make decisions that concern capital investment and lifestyle with the knowledge that this designation brings. If the resource consent technique was adopted, the application would have to be made 2 to 3 years prior to the construction occurring as a resource consent is only valid for 2 years. It is to be anticipated that if this course of action was taken that there would be significant development in the path of the alignment which would significantly increase the costs to Transit and to perhaps even make the attainment of the alignment impossible.

1. (b) The physical and legal descriptions (noting any distinguishing characteristics) of the site to which the Requirement applies are:

(i) The physical description of the sites

These are set out in detail in the Tauranga Eastern Arterial Assessment of Environmental Effects (AEE) Section 4.

The Requirement applies to a band of land between Domain Road, Papamoa and the intersection of the current State highway 2 and State highway 33 that has the following zones under the District Councils' Plans.

Tauranga District

Transitional District Plan

Rural G, Future Urban.

Proposed District Plan

Rural, Future Urban.

Western Bay of Plenty

Effectively Operative Proposed District Plan,

Rural G, Government Purposes Reserve

Physical details noting any other distinguishing characteristics are shown on the set of Designation drawings attached to this Requirement (P006 – P018). This set of drawings shows, from the preliminary design, the position, configuration, associated cut and fill batters, relative to existing property boundaries, existing topography (including streams, rivers, estuaries) and vegetation features.

- (ii) The legal descriptions of the sites and a schedule of owners of the land physically affected are as follows.

Owner's Name	Legal Title	Land Area Affected m ²
BP & LJ Riddell	Lot 1 DPS 36935	13058m ²
AR & HM Riddell	Pt Lot 2 DPS 36935	9201m ²
JR & MEA Wilson	Lot 2 DPS 45418	21683m ²
JR & MEA Wilson	Lot 1 DPS 54583	2354m ²
IJ Riddell	Lot 1 DPS 45418	9595m ²
TrustPower Ltd	Sec 44 SO 47398	614m ²
TrustPower Ltd	Sec 65M SO 47399	547m ²
BRF & SE Wallis	Lot 1 DPS 54529	888m ²
PAH & FE Johnson	Lot 4 DPS 54529	2860m ²
AEK & LJ Foster	Pt Lot 1 DP 11789	2035m ²
Education Farms Ltd	Lot 2 DPS 60939	46143m ²
Education Farms Ltd	Lot 3 DPS 60939	40217m ²
Education Farms Ltd	Lot 3 DP 31359	31550m ²
Education Farms Ltd	Lot 4 DP 31359	13554m ²

**Transit New Zealand
Tauranga Eastern Arterial - Assessment of Environmental Effects**

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Owner's Name	Legal Title	Land Area Affected m ²
Glen Ora Park Farms Ltd	Lot 1 DPS 60939	2224m2
DP & NE Hurst	Pt Sec 2 SO 6995	2537m2
NF & M Bruning	Lot 5 DP 31359	10625m2
KD & EF Chubb	Pt Lot 6 DP 31359	50904m2
PN & PM Tye	Lot 1 DPS 14276	1765m2
JH & S Pattie	R.O.W. Lots 1 & 2 DPS 79064	252m2
JH & S Pattie	Lot 2 DPS 79064	54114m2
RS & SR Steiner	Pt Lot 8 DP 22489	41659m2
RL & DM Taylor	Lot 2 DPS 79360	75555m2
DB Gordon, IM Young, MA Banks	Lot 1 DPS 8483	388m2
DG & J Thompson	Lot 2 DPS 8483	19380m2
DG & J Thompson	Lot 3 DPS 8483	9868m2
SR Taylor	Lot 3 DPS 54113	54438m2
Puketata (Tirau) Ltd	Pt Lot 1 DPS 10417	22399m2
J & JM by de Ley	Lot 3 DPS 65215	95503m2
J & JM by de Ley	Pt 1 LTS 10096	42968m2
J & JM by de Ley	Lot 1 DPS 66482	14419m2
RM Niccol & KL Faulkner	Pt Lot 1 DPS 61810	33184m2
DR & PA Pamment	Pt Lot 2 DP 10176	50750m2
Department of Conservation	Pt Lot 1 DP 10176	2163m2
Department of Conservation	Lot 1 DPS 37343	36972m2
Department of Conservation	Sec 9 SO 55798	9935m2
KN East	Pt Lot 1 DP 10176	634m2
DR & PA Pamment	Sec 9 Block V Te Tumu SD	23468m2
WJ & MJ Potter	Lot 1 DP 13918	14555m2
WJ & MJ Potter	Lot 2 DP 13918	42483m2
KP & DL Reynolds, BG Bennett, BA Carter	Lot 4 DP 31972	29906m2
KP & DL Reynolds	Lot 2 DPS 12413	15662m2
Black & White Ltd	Lot 3 DPS 12413	16239m2
Black & White Ltd	Lot 1 DP 9297	33476m2
Black & White Ltd	Lot 2 DP 9297	27773m2
Black & White Ltd	Lot 2 DPS 55860	10258m2
KP Candy	Lot 5 DP 9297	3491m2
KP Candy	Lot 1 DPS 75077	76778m2
Whakawhititi Trust	Lot 2 DPS 30179	14664m2
WB & NE Attwood	Lot 1 DPS 30179	13141m2
ND & RE Espin	Pt B10 Sec 5B ML 11756	10924m2
MJ & MC Attrill	Pt B10 Sec 5B ML 11756	14040m2
DC & CA Cotterill	Lot 1 DPS 38633	1202m2
RL & FP Parton	Lot 2 DPS 36594	14271m2

Owner's Name	Legal Title	Land Area Affected m ²
JW & CM Spratt	Lot 1 DPS 36594	14295m ²
MG & A Saunders	B26 ML 7467	34311m ²
Multiple ownership (Maori)	B18 ML 7467	16826m ²
R & C Stevenson	Lot 1 DPS 10164	9935m ²
R & C Stevenson	Pt Lot 2 DPS 10164	20203m ²
R & C Stevenson	Lot 1 DPS 38146	723m ²
R & C Stevenson	Lot 1 DPS 34975	1882m ²
BT & LI Plummer	Pt Lot 3 DPS 10164	31697m ²
Rotorua Mower Sales	Lot 1 DPS 34975	36700m ²
GJ & JL Illing	Pt Lot 1 DPS 29059	40300m ²
EG Craig	Lot 2 DPS 7919	51837m ²
EG Craig	Pt Lot 1 DPS 7919	19687m ²
NR & AL Lacey	Lot 1 DPS 13623	6892m ²
GJ & LA Thrupp	Lot 2 DPS 13623	9234m ²
Bravassa Investments Ltd	Lot 3 DPS 13623	9538m ²
Bravassa Investments Ltd	Lot 2 DPS 71267	7254m ²
GR Hopcraft	Lot 1 DPS 71267	531m ²
BH & DN Mends	Lot 5 DPS 13623	4943m ²
DH & ER Davies	Lot 6 DPS 13623	8729m ²
PH Rotherham	Lot 7 DPS 13623	8626m ²
GC Short	Lot 1 DPS 66792	2001m ²
KJB Prior	Lot 2 DPS 66792	1436m ²
MC & AF Maltby	Lot 1 DPS 43828	1705m ²
Kelly Engineering & Fur Co. Ltd	Lot 1 DPS 53345	6627m ²
Te Puke Golf Club Inc	Pt Sec 1 Block III Maketu SD So 5367	13262m ²
JA van Eekelen	Lot 1 DPS 44836	6293m ²
RJ & LP Rea	Lot 2 DPS 44836	1727m ²

Note: The alignment crosses the TranzRail East Coast Main Trunk line on overbridges at Domain Road and Paengaroa Junction.

1. (c) The nature of the work and any proposed restrictions are: the construction, operation and maintenance of State Highway 2 from its interchange with Domain Road, Papamoa eastwards to Paengaroa where the alignment rejoins the existing State highway at its intersection with State highway 33 as is described in the AEE and the *Options Report - Tauranga Eastern Arterial Roading Study 1998*. The design and construction of the proposal will be generally in accordance with the description of the proposal in the AEE which is in sufficient detail as to identify the nature of the work, the significant effects and the required mitigation.

The exact extent of works, construction methodology, possible staging and costs will be finalised as the design details are finalised. To date the design is at a preliminary stage.

1. (d) The effect that the proposed work will have on the environment and the proposed mitigation measures are:

(i) Effects

The effects that the proposed work will have on the environment can be summarised as follows:

- No significant effects on ecology, hydrology and water quality assuming mitigation measures set out below are actioned
- No significant noise and visual effects subject to mitigation measures set out below
- Positive traffic effects resulting from travel time and vehicle cost savings and an improved level of travel safety
- No significant archaeological effects.
- The effect of land-take on adjacent areas

These effects are described in Section 5 of the AEE.

(ii) Mitigation Measures

The following mitigation measures are general principles developed for the existing situation and will be carried through in principle to the final design stage. At the final design stage these principles will be refined to enable construction.

- Negotiated agreements with property owners for acquisition of land
- Pre-construction purchase of land directly affected by the Designation
- Careful planning and management of all construction works with particular emphasis on and use of mitigation techniques in regard to sediment control, construction noise and dust
- Use of appropriate and practical mitigation techniques in circumstances where protection of amenity in adjacent areas is warranted. These include the provision of noise bunds in particular localities, and the provision of landscaping to reduce the visual effect of the highway.
- The Kaituna River crossing to be constructed from stopbank to stopbank to maintain the existing waterway and to avoid disruption to River edge habitats.
- The Kaituna oxbow crossing at meterage 7800 to be designed to minimise instream works (e.g. single bank to bank span)

- If practicable the control gate below the proposed Kaituna oxbow crossing to remain closed throughout the construction period of that crossing if instream works are required.
- The By De Ley property stream channel and the Waimarae Stream to be isolated (i.e. blocked off) from the Kaituna River oxbow and mainstem respectively throughout the construction period for works in this area.
- Wetland treatment areas to be developed in the swales or similar to the west of Kaituna River from meterage 7200 to 8400 to receive roadway-derived stormwater runoff. Those areas should reflect the former vegetation of Te Parapara Swamp as far as practicable.
- Roadway-derived stormwater from the alignment section within the Reserve property to be isolated from the Reserve and directed to the constructed drains, adjacent to Pah Road, which flow into the large drain forming the south-eastern boundary of the Reserve.
- Wetland treatment areas to be developed in sections from meterage 8,400 to 11,000 to receive stormwater runoff from the roadway.
- Landscape mitigation and wetland development to involve locally-sourced plant material where practicable. A dominant vegetation type in the Kawa and Te Parapara Swamps is clearly flax; local iwi should also be consulted regarding the appropriate types of flax. Areas could be developed with a view to harvesting for cultural purposes.
- Kahikatea-dominated vegetation to be established on the sound berm from 8,400 to 10,000 and the new reserve land to the north of the present reserve.
- A sediment/soil quality survey to be undertaken prior to construction along the western perimeter of the vegetated area of the Reserve to provide benchmark data for any subsequent surveys in the longer term.
- A five-minute bird count and habitat use survey to be undertaken prior to construction in the meterage 8400 to 10,000 area in the February-March period to establish the species, relative numbers present and use of that habitat.
- That Transit contributes a fair and reasonable lump sum to the Kaituna Drainage Scheme that reflects both loan, operational and maintenance monies.
- The acquisition of 8.66ha of land from the Lower Kaituna Wildlife Management Reserve is to be compensated by the provision of 10.76ha of land to the north-west of the site
- The provision of Kaituna Road to the east of Pah Road be formed to provide a link to Te Tumu Road.
- preparation of a Stormwater Management Plan as part of the resource consent applications for earthworks, bridging etc.

These mitigation measures are described in Section 6 of the AEE.

1. (e) The following alternative sites, routes, and methods have been considered:

Works Consultancy evaluated five options plus the State highway upgrade in February 1992. In 1993 two further options were also considered by Works Consultancy. In 1995 a sixth option was considered by Bloxam Burnett & Olliver Ltd.

Following these initial studies, six alternative options were considered by BCHF and these are discussed briefly in Section 3 of the AEE and in full in the *Options Report - Tauranga Eastern Arterial Roading Study 1998*. The *Options Report* has been provided as part of this documentation.

1. (f) The following resource consents will be required in relation to the activity to which the application relates:

- Discharge permits (stormwater/contaminants) - Regional Council
- Land use consents (earthworks) - Regional Council
- Structures in rivers (bridge piles) - Regional Council
- Landuse consents (cleanfill, stormwater detention ponds and earthworks) - from Tauranga District Council

These consents will be sought when final design is complete and funding for construction is available. This may be eight to 15 years away.

1. (g) The following resource consents have been applied for: Nil.
2. The consultation undertaken with parties likely to be affected by the Designation, public work, project, or work is detailed in Section 4.6 of the AEE.
3. Additional information (*if any*) as required by Tauranga and Western Bay of Plenty District Plans is set out as follows:

(i) Relevant Provisions of National Policy Statements, Regional Plan, District Plans:

The proposed work and mitigation measures have been assessed and found consistent in terms of the provision of the following plans and policy statements:

- Bay of Plenty Proposed Regional Land Management Plan
- Bay of Plenty Regional Land Transport Strategy
- Bay of Plenty Proposed Regional Policy Statement
- Tauranga District Council Proposed District Plan
- Tauranga District Council Transitional District Plan (County Section)
- Western Bay of Plenty Proposed District Plan

(ii) Proposed Sequence and Implementation of the Work

Construction details are given in Section 3.3 of the attached AEE.

4. Miscellaneous Information

(i) Transit Objectives

Transit's principal objective under the Transit New Zealand Act 1989 is:

"to operate a safe and efficient State highway system" (*Section 5 Transit Act 1989*).

One of the principal ways Transit pursues this objective is through its responsibility to "control the State highway system including planning, design, supervision, construction and maintenance in accordance with this (the Transit New Zealand) Act" (Section 6(c)).

Transit considers that State highway 2 is of primary importance as the major strategic road link between Tauranga and destinations east and south. Accordingly, the maintenance and improvement of this road is a matter of national importance to the extent that its continued improvement provides for:

"sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations." (Section 5(a) (RMA).)

(ii) Orders in Council

A copy of the Orders in Council appointing Transit as a Requiring Authority for the purposes of the Resource Management Act 1991 (RMA) and empowering it to carry out the work the subject of this Requirement Notice are attached as Appendix 1.

(iii) Statement of Purpose of the Designation

The following statement of the purpose of the Designation should be included in the District Plan:

The Designation provides for Transit New Zealand, either through itself or its agents, to control, manage and improve the State highway including planning, design, research, construction, control of property access, operation and maintenance relating to all land within the State highway Designation.

Transit New Zealand

Tauranga Eastern Arterial - Assessment of Environmental Effects

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For and on behalf of
Transit New Zealand

Paul Knaggs
Colin Knaggs, Regional Manager,
pursuant to an authority by Transit New Zealand

Dated this 12th day of August 1999

Address for service:

c/- Beca Carter Hollings & Ferner Ltd
PO Box 903
TAURANGA

Telephone: (07) 578 0896

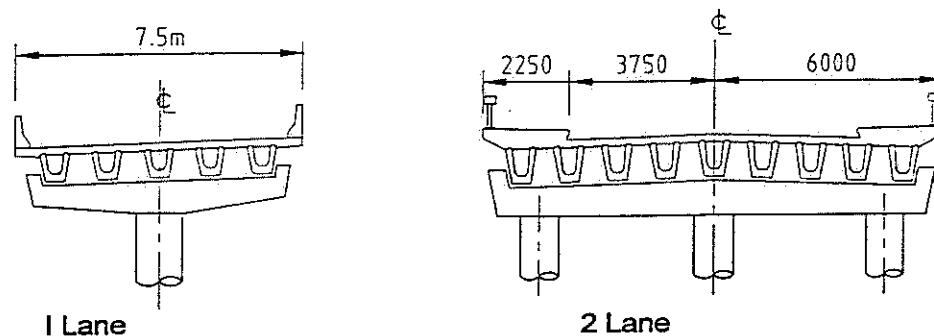
Fax.: (07) 578 2968

Contact Person: Christine Ralph

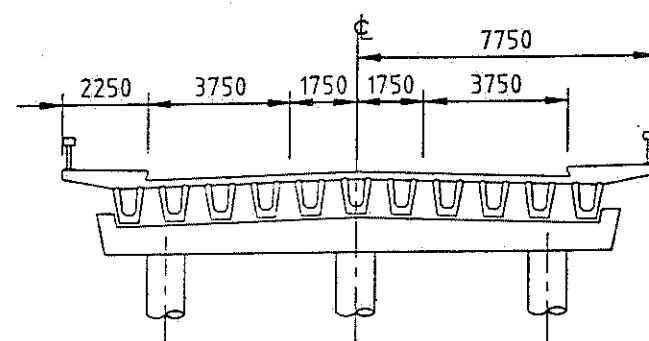
Route: TAURANGA EASTERN ARTERIAL

Route Location: TYPICAL BRIDGE WIDTHS

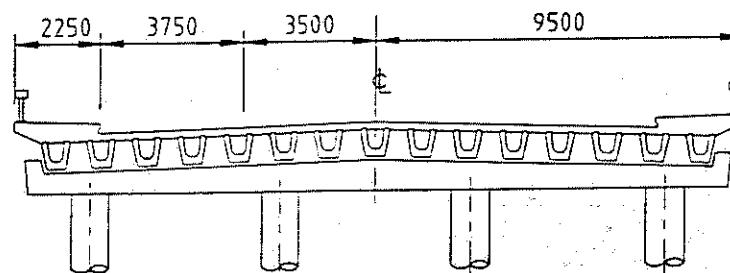
Proposed Deck Section 1 and 2 - Lane overpasses.



Proposed Deck Section 3-Lane overpass over TEA.



Proposed Deck Section 4 - Lane overpass over TEA.



Proposed Deck Section 4 - Lane TEA bridges.

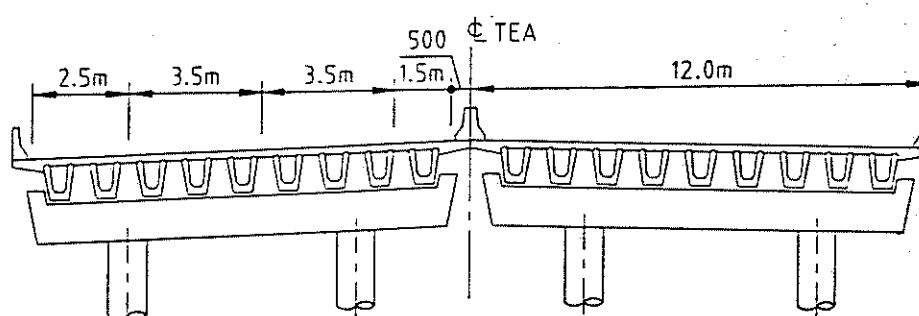


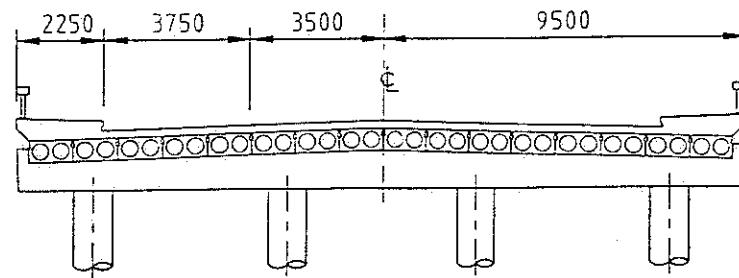
FIGURE 3.2

P:3602796/cad

Route: TAURANGA EASTERN ARTERIAL

Route Location: 4 - LANE OVERPASS OVER ECMT RAILWAY

Proposed Deck Section



Longsection / Bridge Elevation

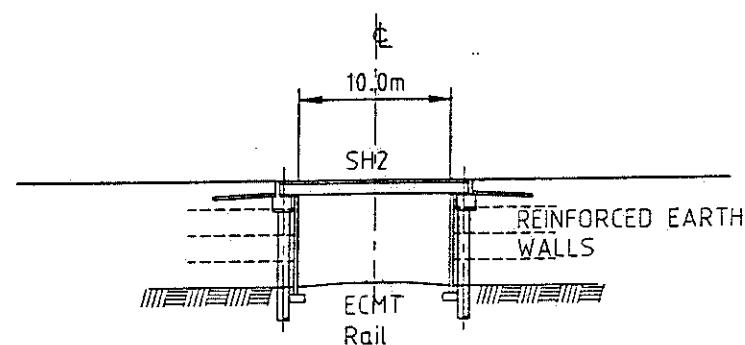
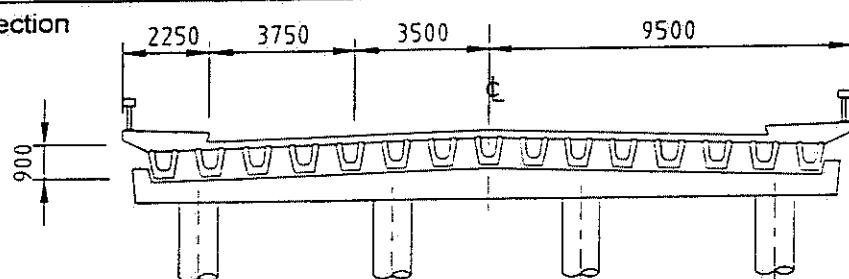


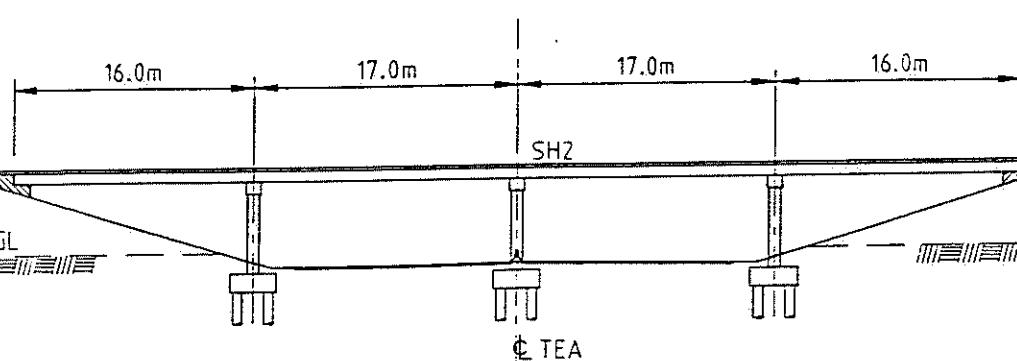
FIGURE 3.4

Route Location: 4 - LANE OVERPASS OVER TEA (1.0m MEDIAN)

Proposed Deck Section



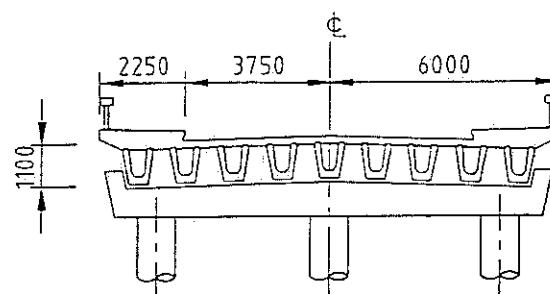
Longsection / Bridge Elevation



Route: TAURANGA EASTERN ARTERIAL

Route Location: 2 - LANE OVERPASS OVER TEA (9.0m MEDIAN)

Proposed Deck Section



Longsection / Bridge Elevation

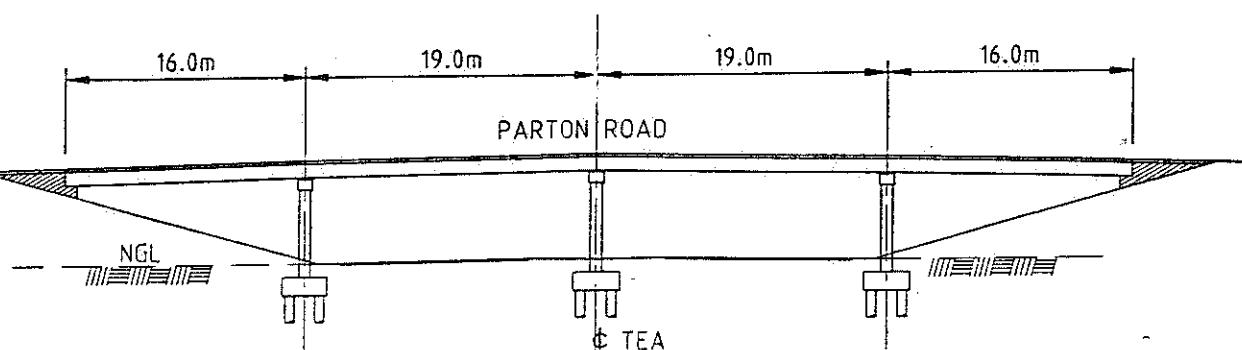
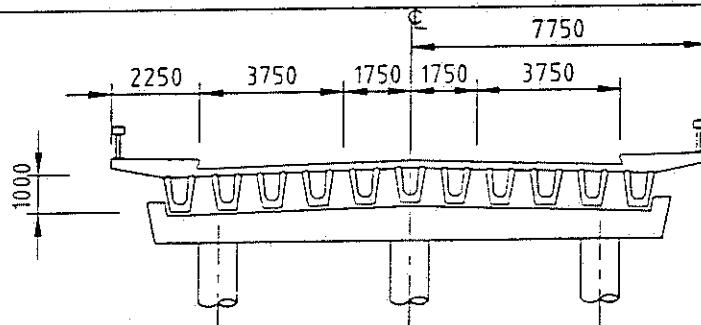


FIGURE 3.6

Route Location: 3 - LANE OVERPASS OVER TEA (1.0m MEDIAN)

Proposed Deck Section



Longsection / Bridge Elevation

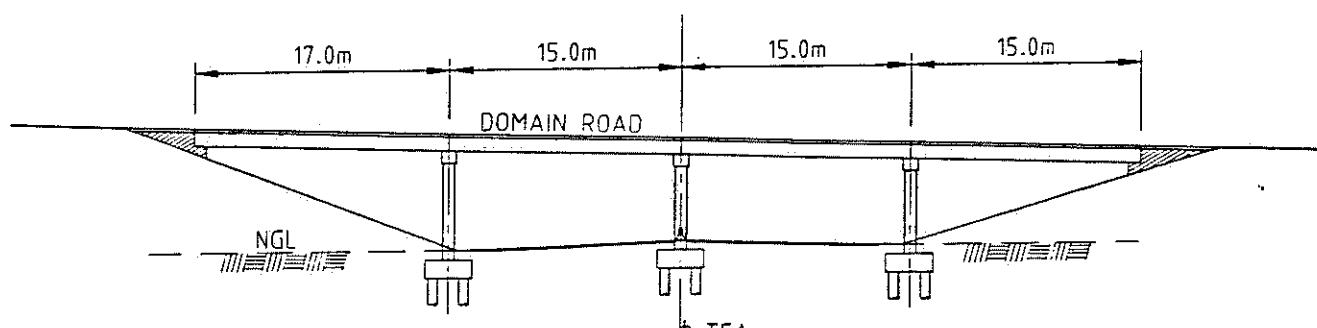


FIGURE 3.7

Route: TAURANGA EASTERN ARTERIAL

Route Location: 4- LANE TEA (1.0m MEDIAN) OVER KAITUNA RIVER

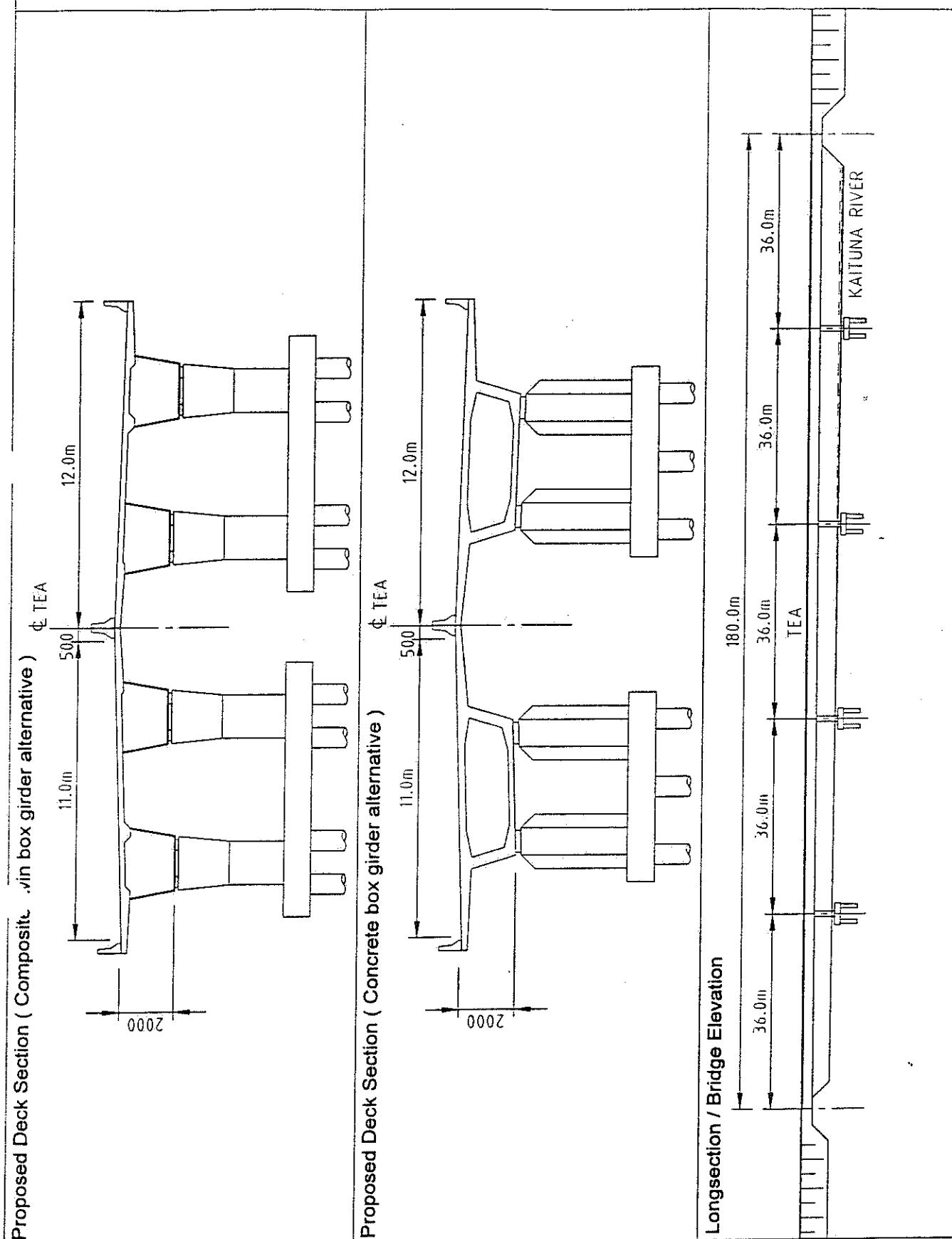


FIGURE 3.8

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NATION	Revision
2000	Date
<i>[Signature]</i>	



Beca Carter Hollings & Ferner Ltd.
Consulting Engineers

Project No.	Designation	Date of Completion
Ref. No.	Architectural	2000
Ref. No.	Structural	Reduced
Ref. No.	Electrical	2000
Ref. No.	Mechanical	1/1/01

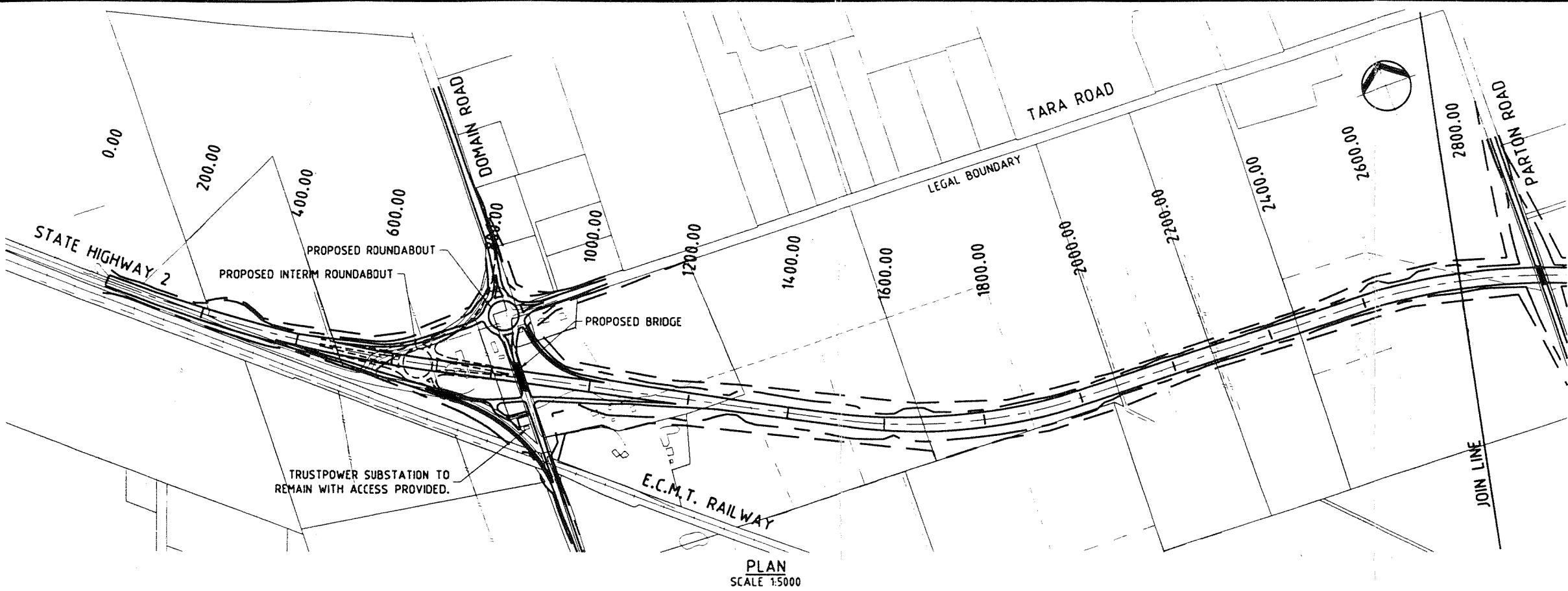


TAURANGA EASTERN
ARTERIAL
CIVIL

LAND & DESIGNATION
REQUIREMENT PLAN
INDEX SHEET

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9301240
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P006
Rev. A

Becca Carter Hollings & Ferner



LEGEND

- EDGE OF SEAL
 - EXTENT OF BATTERS
 - DESIGNATION REQUIREMENT
 - CENTRELINE OF ALIGNMENT
 - EXISTING FENCE
 - EXISTING RAILWAY TRACK
 - EXISTING DRAIN
 - EXISTING TRACK

LONG SECTION
HORIZONTAL SCALE 1:5000
VERTICAL SCALE 1:1000



Beca Carter Hollings & Ferner Ltd

Auckland, Wellington, Christchurch, New Plymouth, Tauranga,
Invercargill, Dunedin, Port Chalmers, Inverloch, Geelong, Melbourne

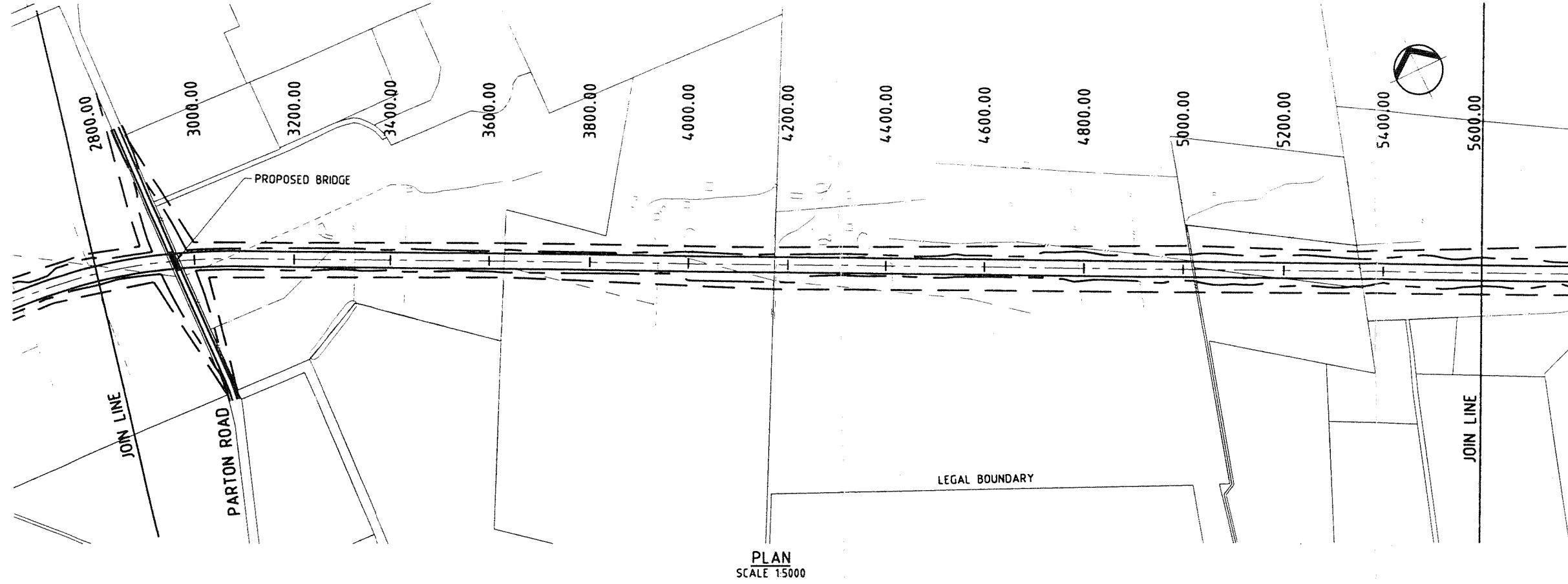
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TAURANGA
EASTERN ARTERIAL

**DESIGNATION
REQUIREMENT PLAN**

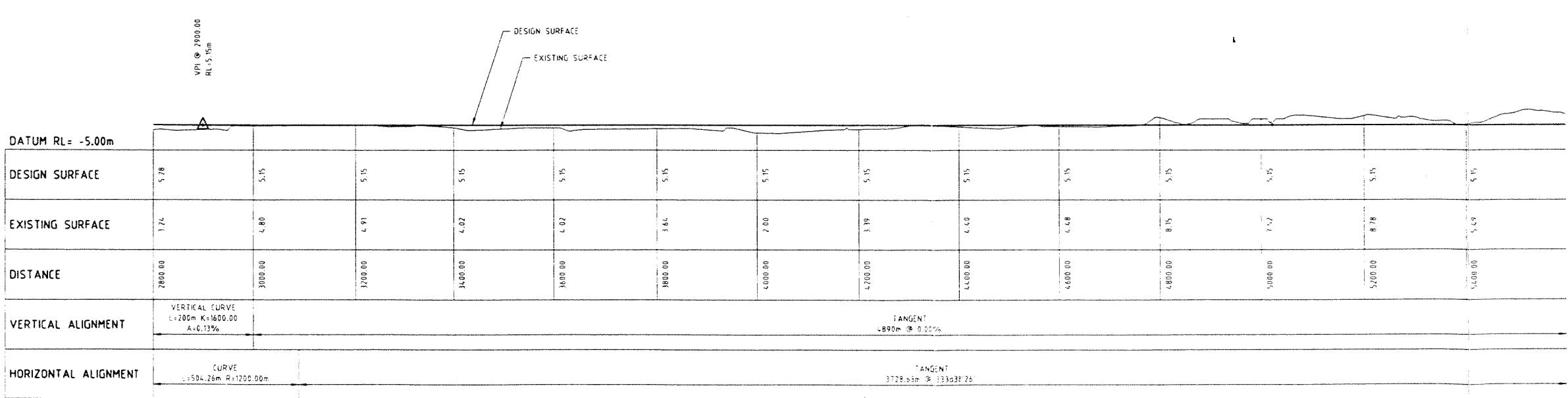
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P007

**LEGEND**

- EDGE OF SEAL
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- — — DESIGNATION REQUIREMENT
- — — CENTRELINE OF ALIGNMENT
- — — EXISTING FENCE
- — — EXISTING RAILWAY TRACK
- — — EXISTING DRAIN
- — — EXISTING TRACK

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LONG SECTION
HORIZONTAL SCALE 1:5000
VERTICAL SCALE 1:1000

FOR DESIGNATION	12/04/15
Revision	
Approved Date	
Approved By	



Beca Carter Hollings & Ferner Ltd.
Consulting Engineers

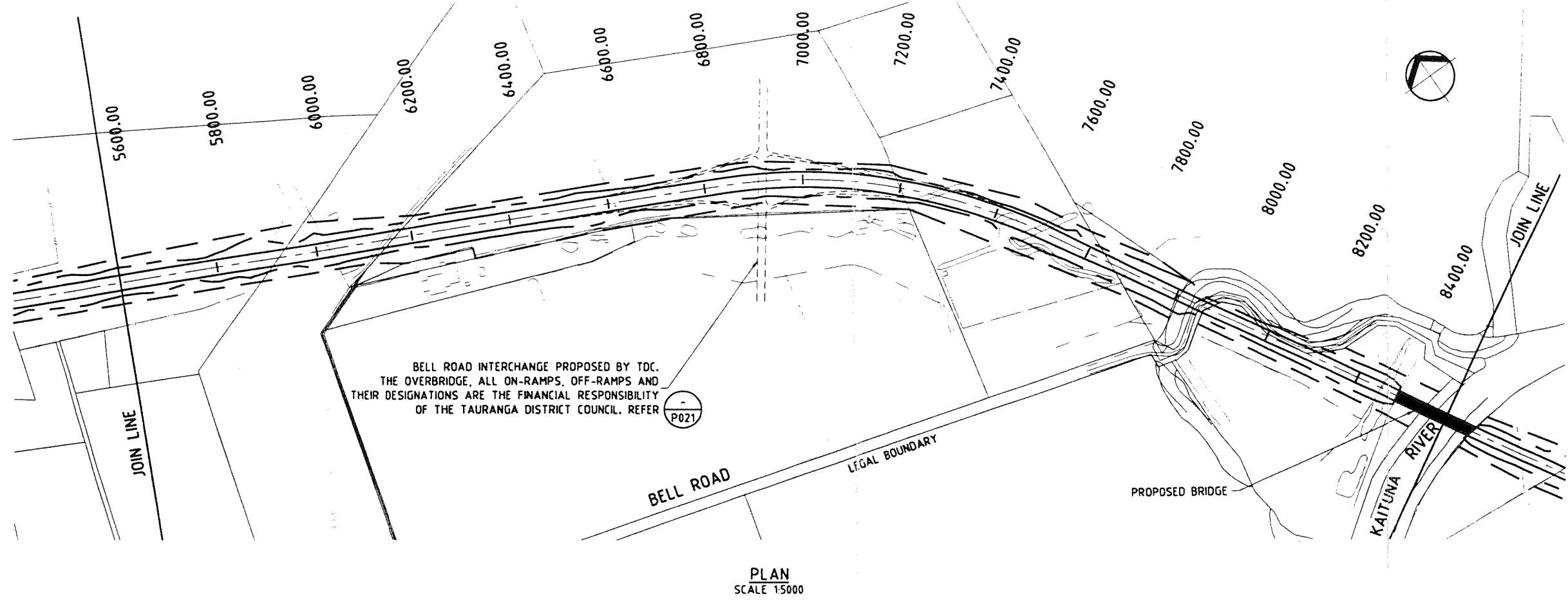
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Gas Check **JAU** Date **10/06/2015**
Drain Check **JAU** Date **10/06/2015**



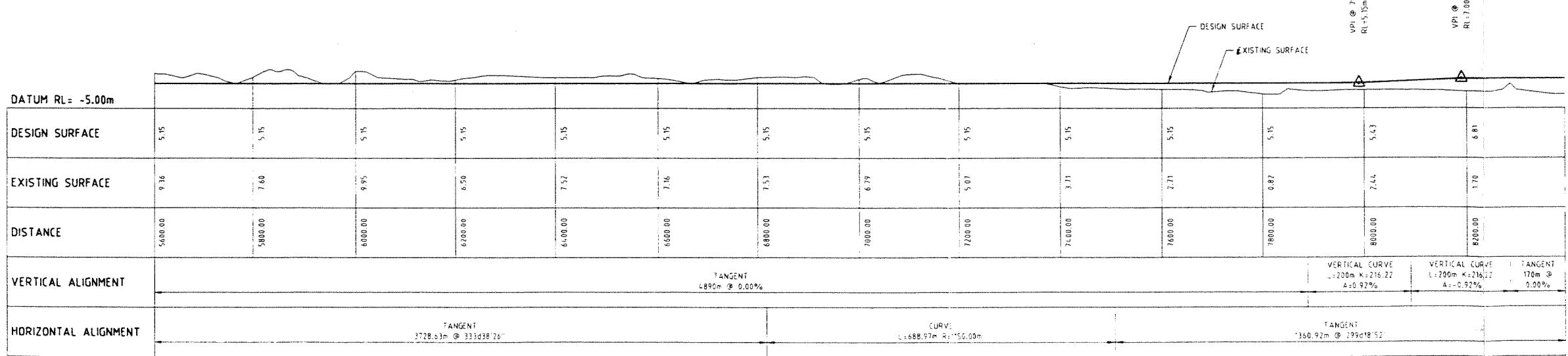
TAURANGA EASTERN ARTERIAL
CIVIL

DESIGNATION
REQUIREMENT PLAN
SHEET 2 OF 6

Job No. **9301240**
Drawing No. **P008**
Rev. No. **A**

LEGEND

- EDGE OF SEAL
- — — EXTENT OF BATTERS
- — — DESIGNATION REQUIREMENT
- — — CENTRELINE OF ALIGNMENT
- — — EXISTING FENCE
- — — EXISTING RAILWAY TRACK
- — — EXISTING DRAIN
- — — EXISTING TRACK



LONG SECTION
HORIZONTAL SCALE 1:5000
VERTICAL SCALE 1:1000

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Drawn by	10/01/2000
Desg. Check	Date



TAURANGA
EASTERN ARTERIAL
CIVIL

DESIGNATION
REQUIREMENT PLAN
SHEET 3 OF 6

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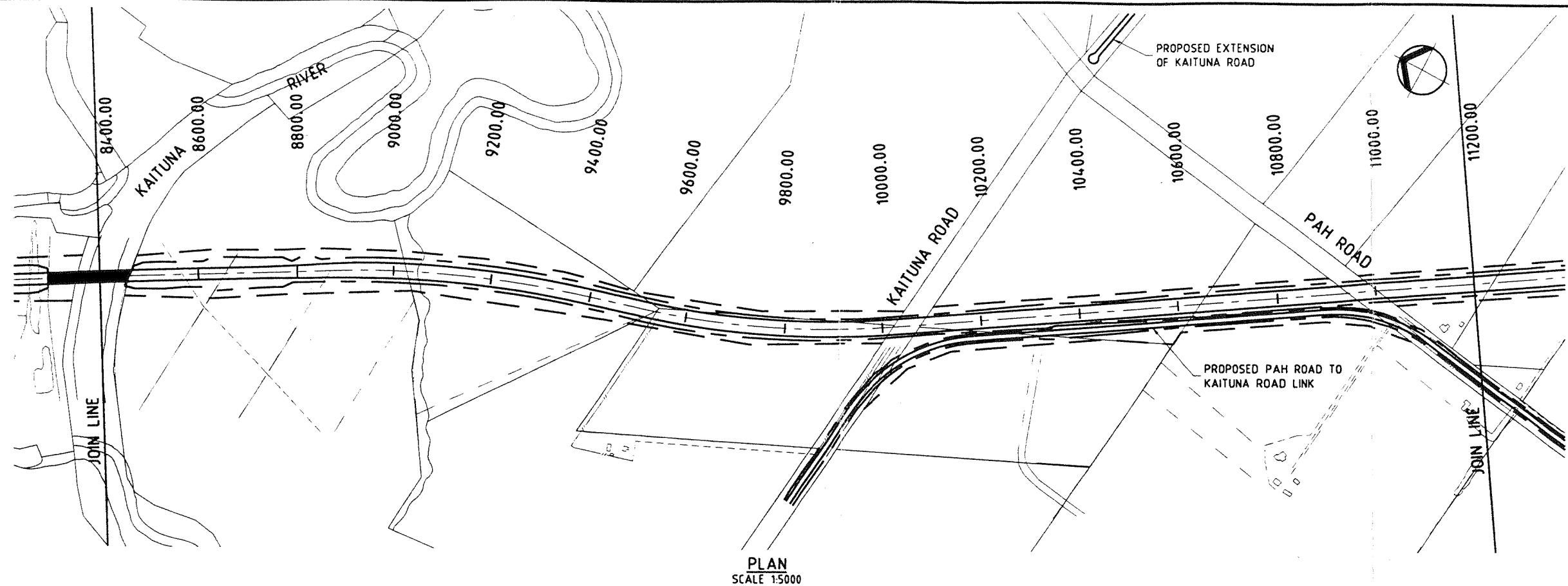


Beca Carter Hollings & Ferner Ltd.
Consulting Engineers

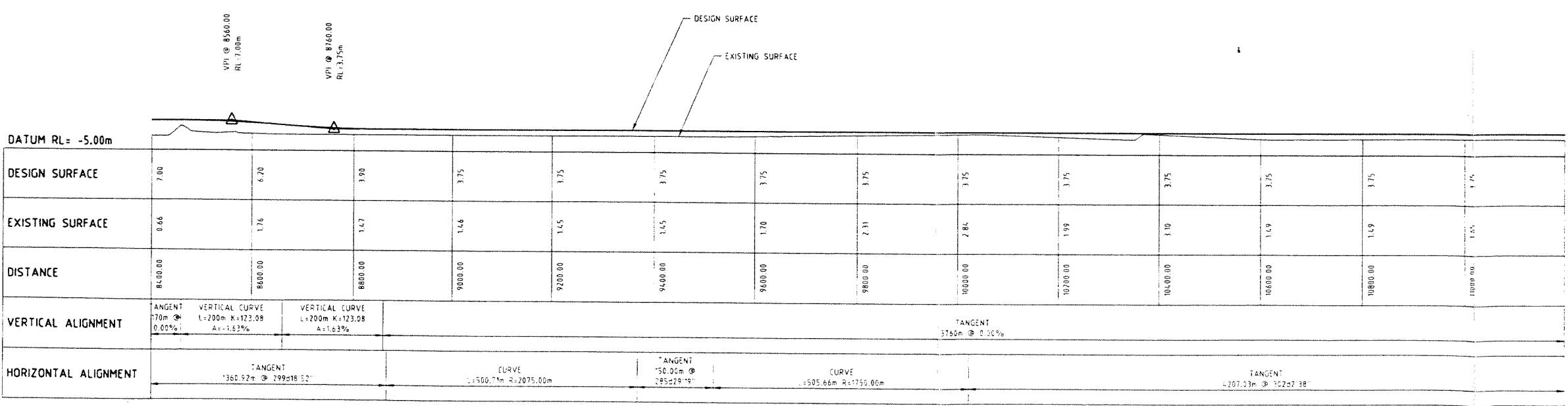
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Melbourne, Sydney, Port Moresby, Jakarta, Singapore, Brunei

FOR DESIGNATION	Approved Date
Revision No.	Appd. Date

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**LEGEND**

- EDGE OF SEAL
- EXTENT OF BATTERS
- DESIGNATION REQUIREMENT
- CENTRELINE OF ALIGNMENT
- EXISTING FENCE
- EXISTING RAILWAY TRACK
- EXISTING DRAIN
- EXISTING TRACK
- LEGAL BOUBDARY

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LONG SECTION
HORIZONTAL SCALE 1:5000
VERTICAL SCALE 1:1000

LEGAL BOUNDARY ADDED TO LEGEND	1
FOR DESIGNATION	2
Revision	3
Added Date	4
Reviewed Date	5



Beca Carter Hollings & Ferner Ltd.
Consulting Engineers

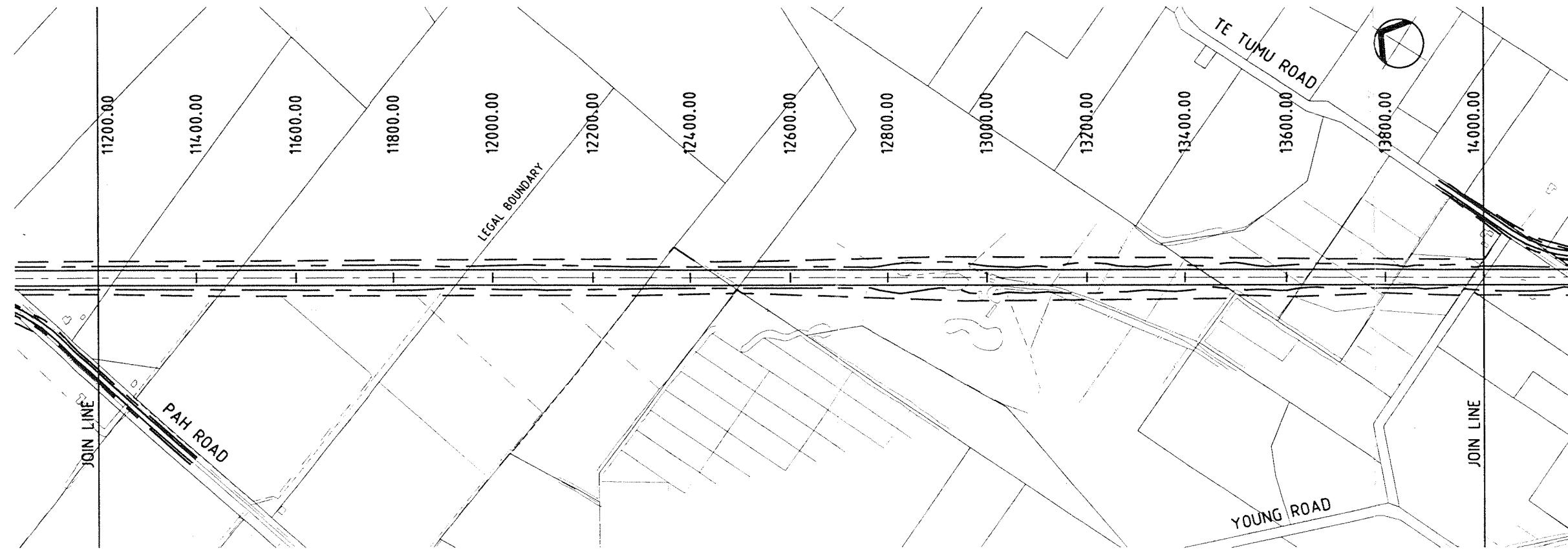
Designed Drawn Traced Dsg. Chkd. Dsg. Chkd.	Approved for Construction by Sgt Reduced Drawing by Sgt 10000/250
Date	Date



TAURANGA
EASTERN ARTERIAL
CIVIL

DESIGNATION
REQUIREMENT PLAN
SHEET 4 OF 6

Job No.
9301240
Org. No.
P010
Rev. B



PLAN
SCALE 1:5000

LEGEND

- EDGE OF SEAL
 - EXTENT OF BATTERS
 - DESIGNATION REQUIREMENT
 - CENTRELINE OF ALIGNMENT
 - EXISTING FENCE
 - EXISTING RAILWAY TRACK
 - EXISTING DRAIN
 - EXISTING TRACK

DATUM RL: -5.00m

DESIGN SURFACE

EXISTING SURFACE

DISTANCE

VERTICAL ALIGNMENT

HORIZONTAL ALIGNMENT

TANGENT 3750m @ 0.00%

EXISTING SURFACE

DESIGN SURFACE

VERTICAL CURVE L=250m K=Lst 53 A=0 55%

TANGENT 4207.83m @ 302d2 38

VERT. C. 1271 RL + 3.75m

TANGENT 1362.5 @ 0.55%

TANGENT 7.67 7.18

8.49 9.60

10.75

11700.00 1.54 3.75

11700.00 1.34 3.75

11800.00 1.10 3.75

11900.00 0.80 3.75

11900.00 0.49 3.75

11900.00 0.14 3.75

11700.00 2.13 3.75

11800.00 4.31 5.16

11900.00 6.11 6.21

12000.00 7.16 7.18

12100.00 7.75

12200.00 8.46

12300.00 9.11

12400.00 9.60

12500.00 10.75

LONG SECTION
HORIZONTAL SCALE 1:5000
VERTICAL SCALE 1:1000



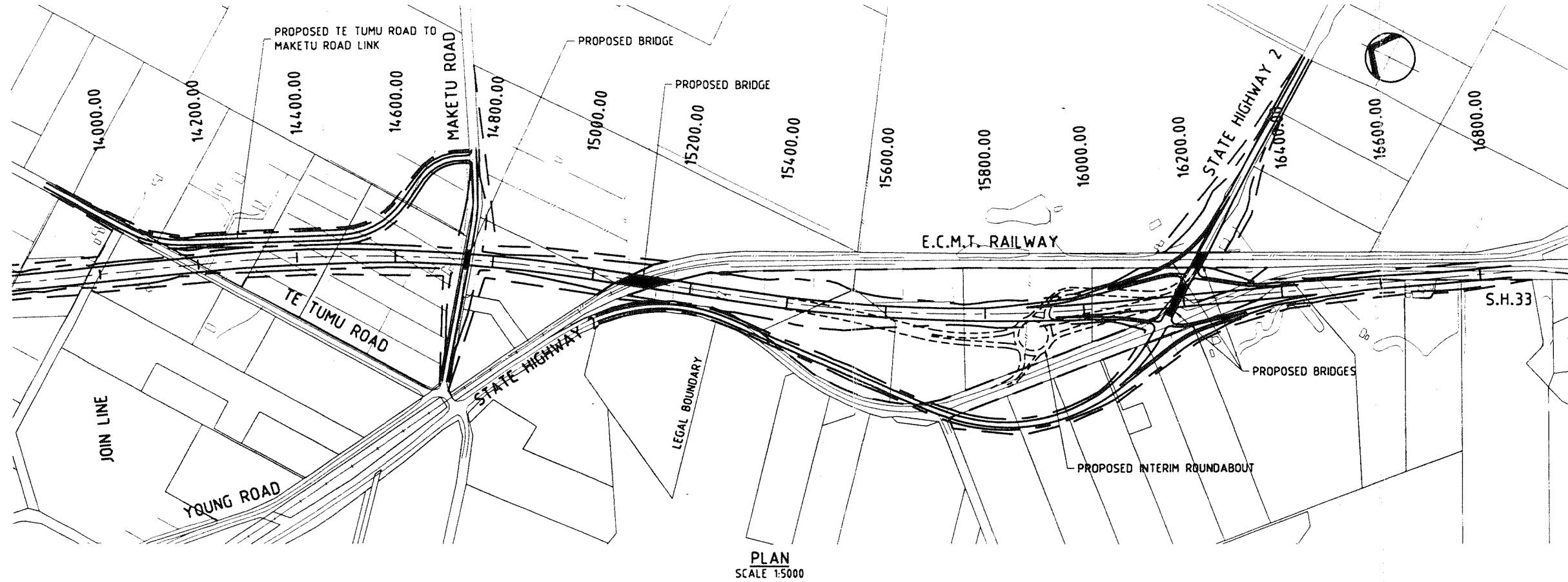
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Hamilton, Federated Pastoral Management Services, Palmerston North



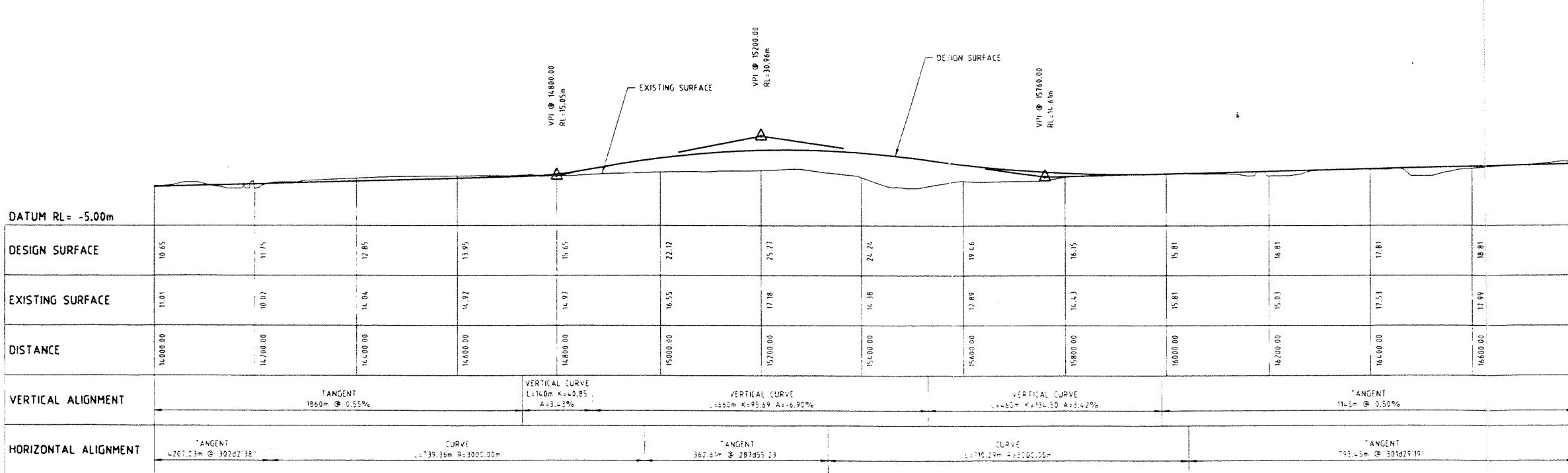
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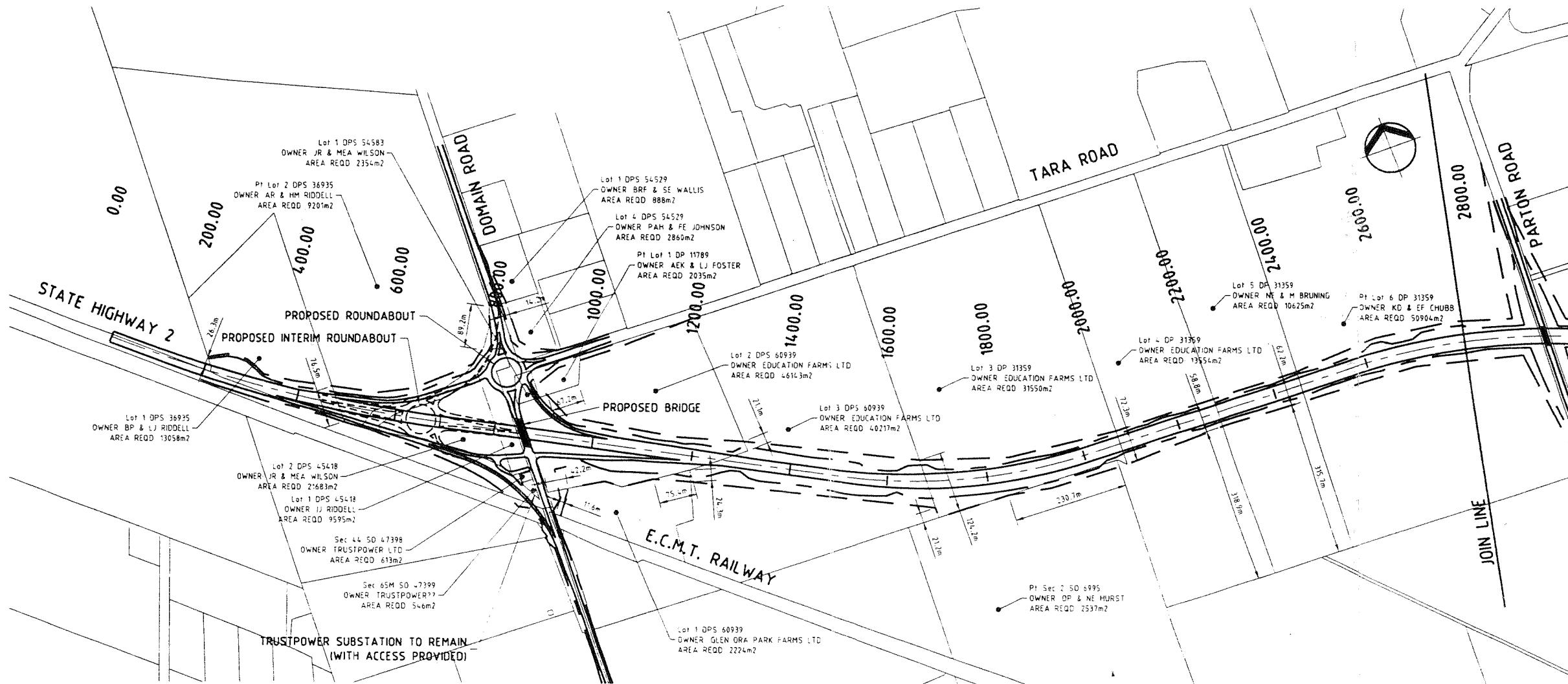
**DESIGNATION
REQUIREMENT PLAN**

Job No	9301240
Org No	P011

LEGEND

- EDGE OF SEAL
- — EXTENT OF BATTERS
- — — DESIGNATION REQUIREMENT
- — — CENTRELINE OF ALIGNMENT
- EXISTING FENCE
- EXISTING RAILWAY TRACK
- EXISTING DRAIN
- EXISTING TRACK





PLAN
SCALE 1:5000

LEGEND

- EDGE OF SEAL
- EXTENT OF BATTERS
- DESIGNATION REQUIREMENT
- CENTRELINE OF ALIGNMENT
- LEGAL BOUNDARY

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MINOR ADJUSTMENTS TO EXTENT OF BATTERS	✓
FOR DESIGNATION	✓
Revisor	Appd Date



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Designed by	Approved for Construction
Drawn by	Drawn by
Planned by	Planned by
Designated by	Designated by
Drawn check by	Drawn check by



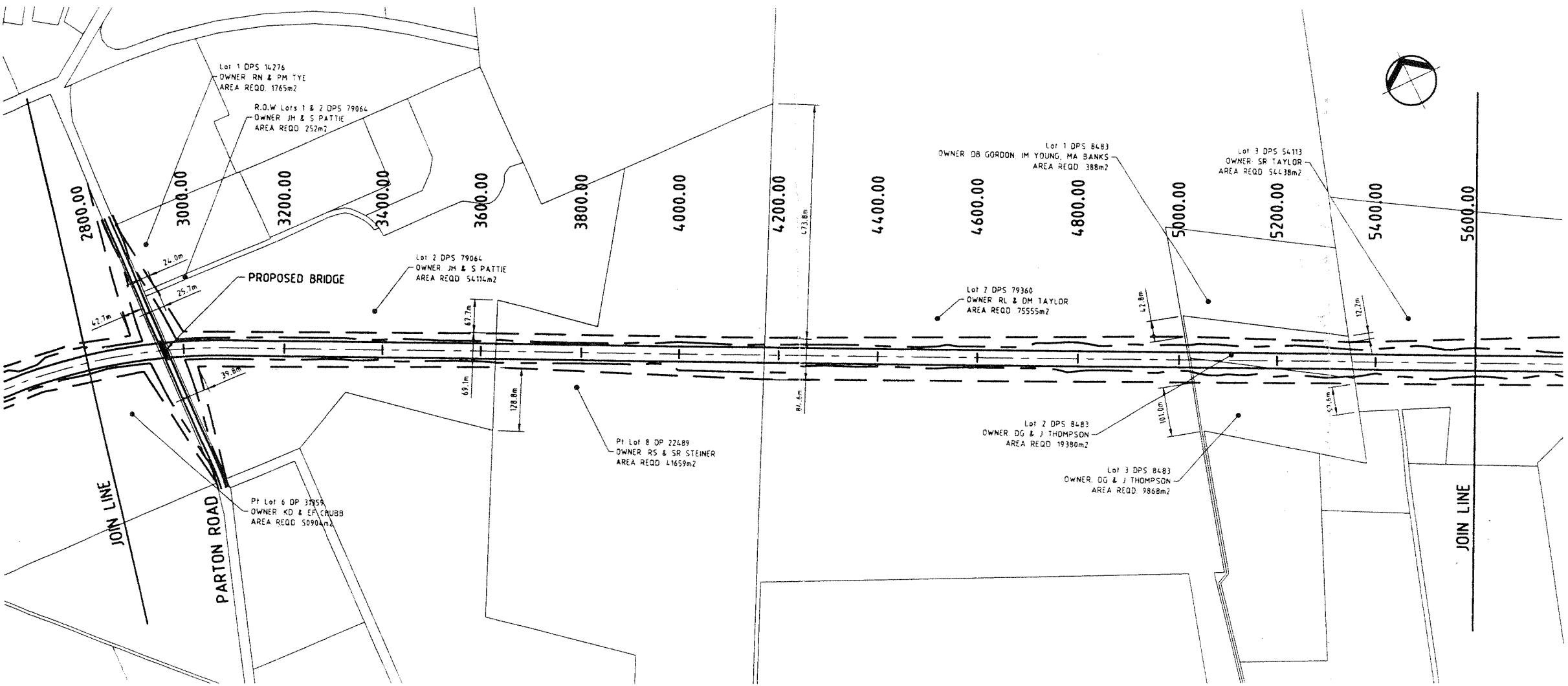
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EASTERN ARTERIAL

CIVIL

LAND REQUIREMENT
PLAN

SHEET 1 OF 6

JOB No 9301240
Drawing No P013
Page B



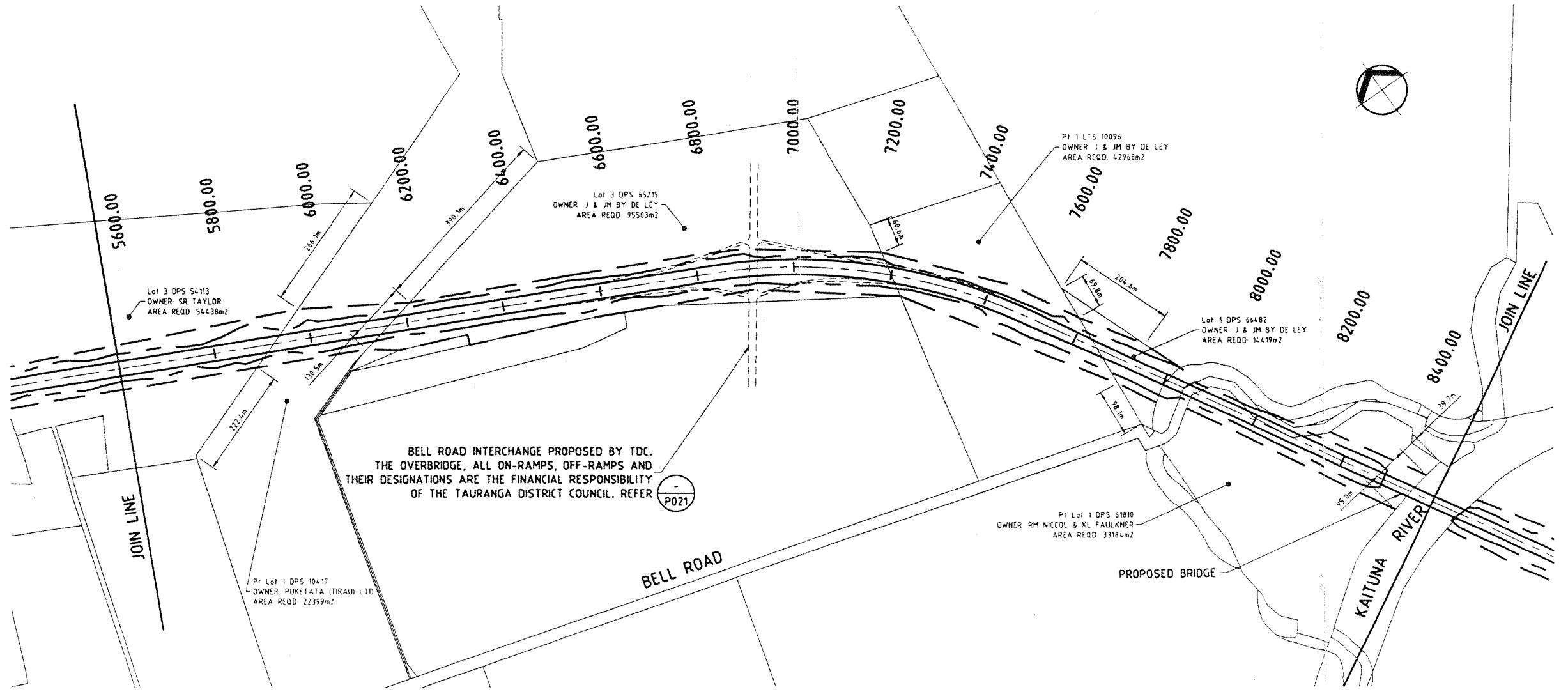
PLAN
SCALE 1:5000

LEGEND

- EDGE OF SEAL
- — EXTENT OF BATTERS
- — DESIGNATION REQUIREMENT
- — CENTRELINE OF ALIGNMENT
- — — LEGAL BOUNDARY

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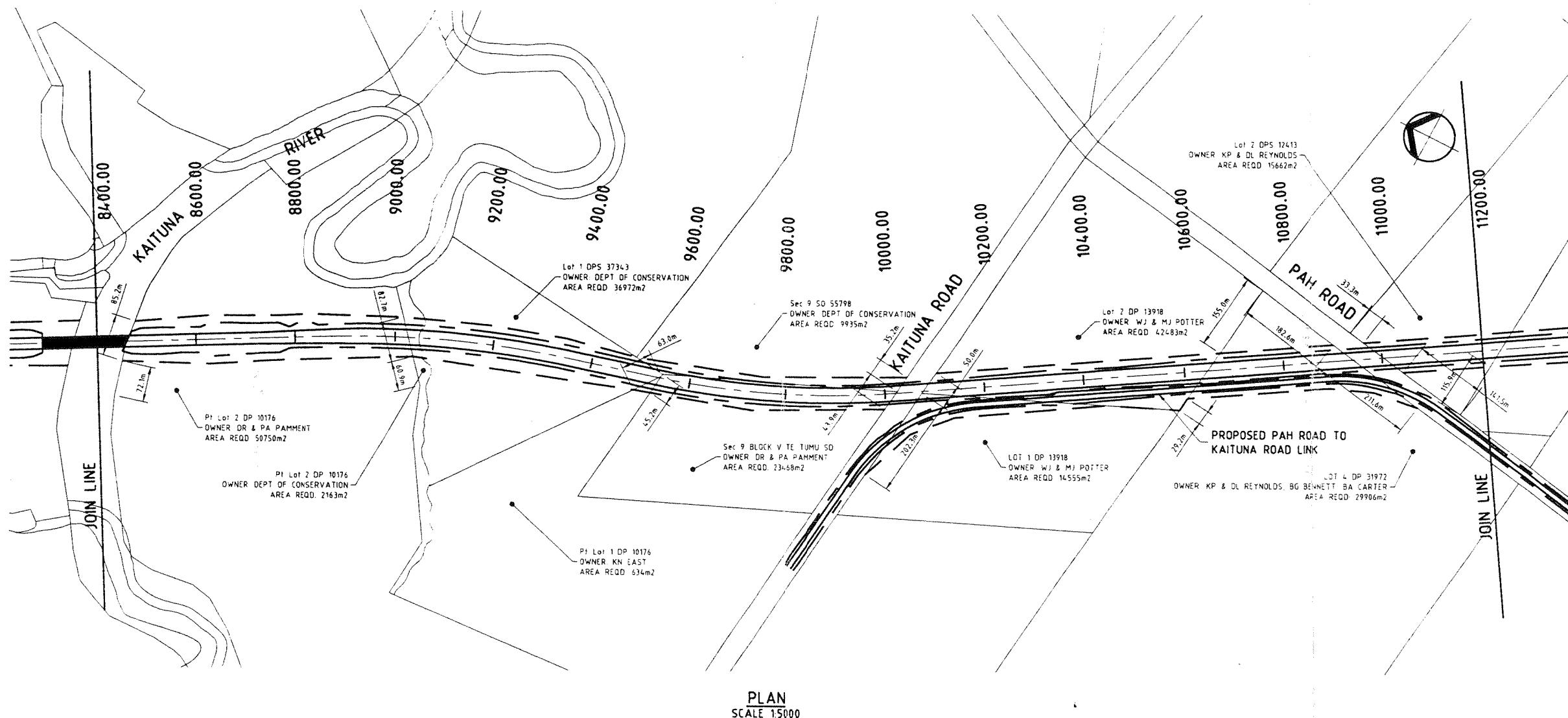
LEGEND

- EDGE OF SEAL
- — EXTENT OF BATTERS
- — — DESIGNATION REQUIREMENT
- — — — CENTRELINE OF ALIGNMENT
- — — — — LEGAL BOUNDARY

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3	LEGAL BOUNDARY AMENDED BELL ROAD	Drawn by	J.H. 1-5-98
A	FOR DESIGNATION	Approved by	Date
No.	Revision	Drawn Date	Approved Date

LEGEND

- EDGE OF SEAL
- — EXTENT OF BATTERS
- — — DESIGNATION REQUIREMENT
- - - CENTRELINE OF ALIGNMENT
- — — — LEGAL BOUNDARY

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FOR DESIGNATION	Approved for construction by
Rev. No.	Date
Revised	Approved
Added	Checked
Revised	Approved
Added	Checked



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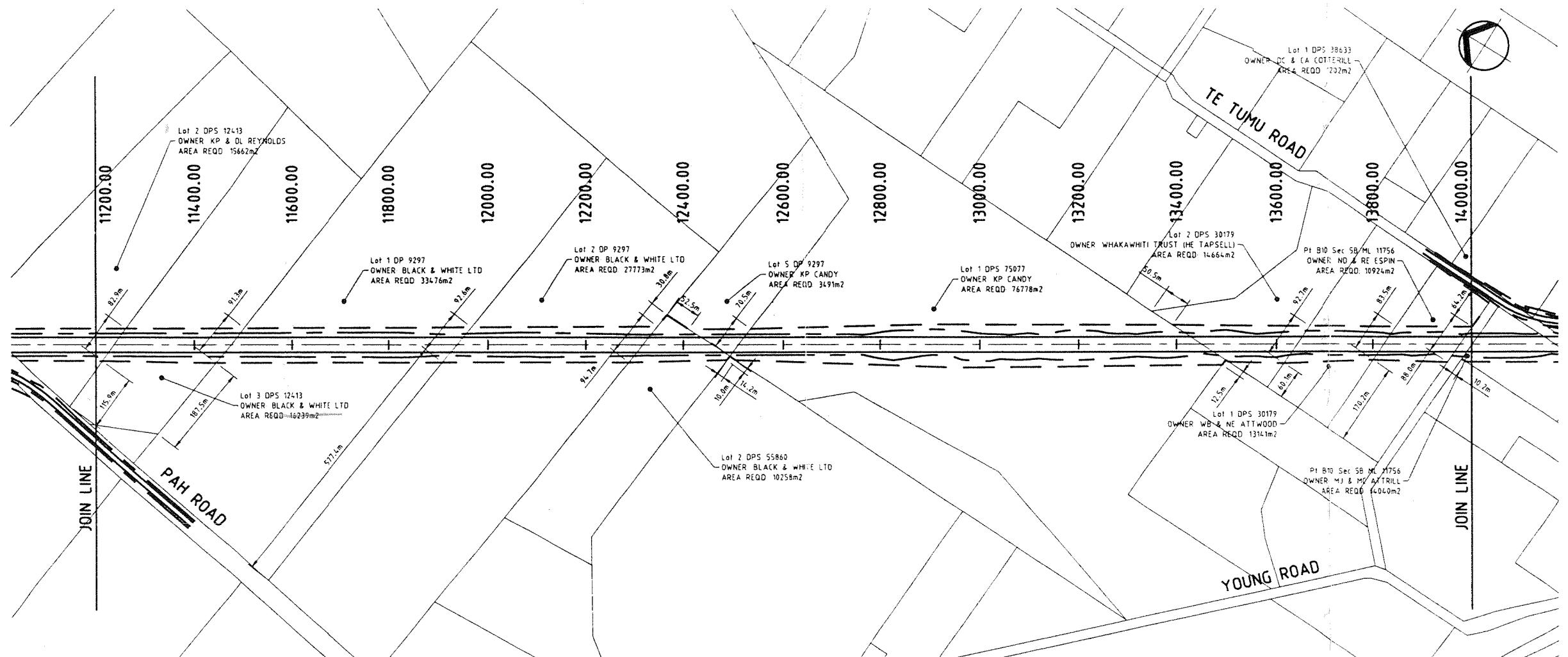
Designed by	Approved for construction by
Drawn	Approved
Planned	Approved
Drawn	Approved
Drawn	Approved
Drawn	Approved



TAURANGA
EASTERN ARTERIAL
CIVIL

LAND REQUIREMENT
PLAN
SHEET 4 OF 6

Ref. No. 9301240
Org. No. P016
Rev. A

LEGEND

- EDGE OF SEAL
- — EXTENT OF BATTERS
- — — DESIGNATION REQUIREMENT
- — — — CENTRELINE OF ALIGNMENT
- — — — — LEGAL BOUNDARY

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MINOR AMENDMENTS TO DESIGNATION BOUNDARY	<input checked="" type="checkbox"/>
A FOR DESIGNATION	<input checked="" type="checkbox"/>
No	Revisor



Beca Carter Hollings & Ferner Ltd.
Consulting Engineers

Auckland, Wellington, Christchurch, New Plymouth, Tauranga,
Melbourne, Sydney, Port Moresby, Jakarta, Singapore, Brunei

Designed by	Approved for construction by	Drawn as drawn
Drawn	Approved	Drawn as drawn
Drawn	Approved	Drawn as drawn
Date	Date	Date
Drawn	Approved	Drawn as drawn
Date	Date	Date

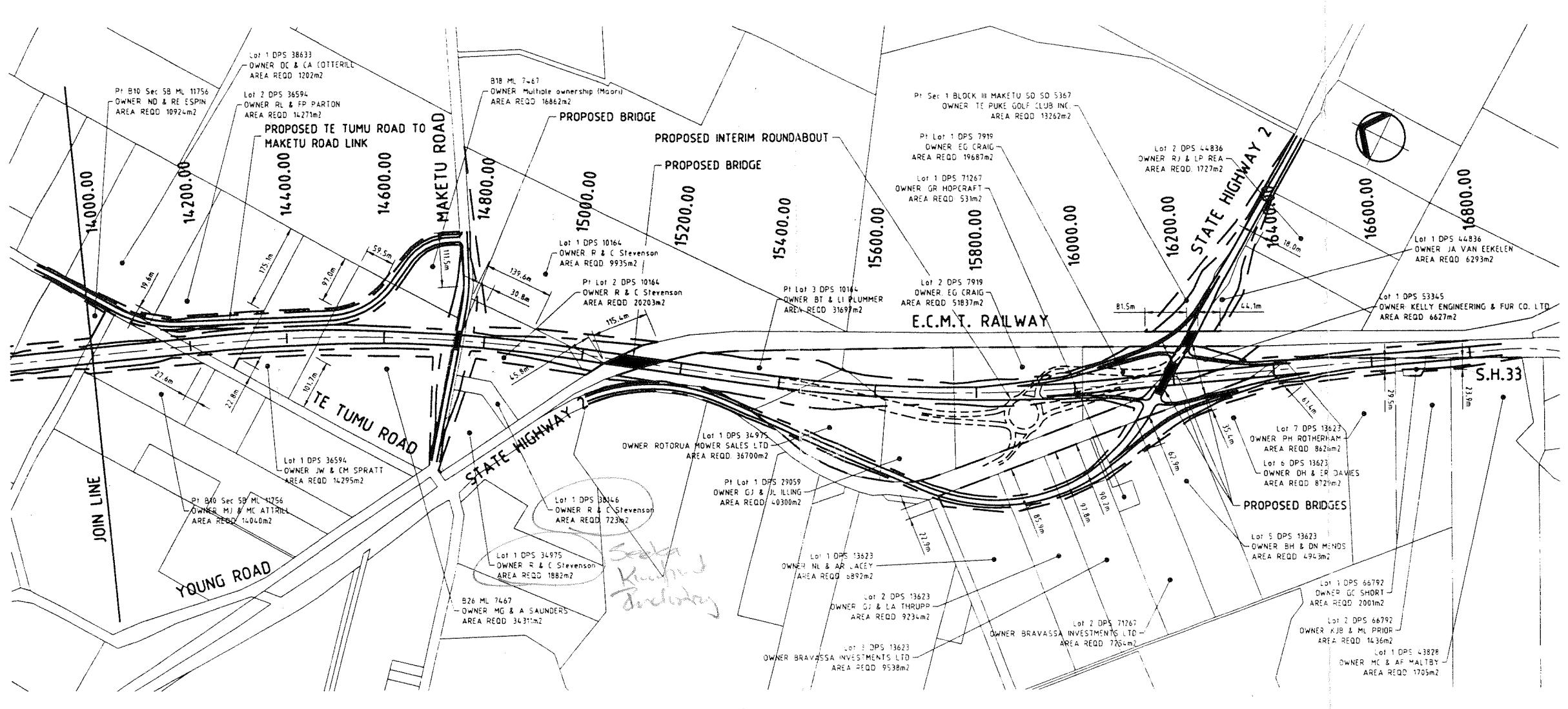


TAURANGA
EASTERN ARTERIAL

LAND REQUIREMENT
PLAN

SHEET 5 OF 6

Job No 9301240
Drawing No P017
Rev B



LEGEND

- EDGE OF SEAL
- EXTENT OF BATTERS
- DESIGNATION REQUIREMENT
- CENTRELINE OF ALIGNMENT
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B OWNERSHIP DETAILS CORRECTED, LOT 1 DPS 66792	D 1
A FOR DESIGNATION	D 1
No Revision	Date



Beca Carter Hollings & Ferner Ltd.
Consulting Engineers

Auckland, Wellington, Christchurch, New Plymouth, Tauranga,
Melbourne, Sydney, Port Moresby, Jakarta, Singapore, Brunei

Designed by J.W. Approved for construction
Drawn by J.W. Scale as drawn
Checked by J.W. 1:5000
Date Drawn 10/05/2003
Drawn Reduced
Date Checked 10/05/2003 Drawn 10/05/2003



TAURANGA
EASTERN ARTERIAL
CIVIL

LAND REQUIREMENT
PLAN
SHEET 6 OF 6

Ref No. P018
Rev B

**NOTICE OF REQUIREMENT FOR A DESIGNATION UNDER
SECTION 168 OF THE RESOURCE MANAGEMENT ACT 1991**

From: Tauranga District Council
Private Bag
Tauranga

Notice is given of a designation for an interchange on the proposed Tauranga Eastern Arterial in the location of Bell Road, Papamoa East. TDC proposes to construct, maintain and operate the junction in the manner described in the attached assessment of environmental effects. Pursuant to section 184(1)(c) RMA the period for which the designation is sought is 20 years.

1. (a) The reason why the Designation is needed is:

The designation technique is considered an appropriate planning tool in the context of the District Plan as it gives a clear indication to the public of the future location and scale of this arterial road. The public will be better able to make decisions that concern capital investment and lifestyle with the knowledge that this designation brings. If the resource consent technique was adopted, the application would have to be made 2 to 3 years prior to the construction occurring as a resource consent is only valid for 2 years. It is to be anticipated that if this course of action was taken that there would be significant development in the path of the alignment which would significantly increase the costs to TDC and to perhaps even make the attainment of the interchange impossible.

1. (b) The physical and legal descriptions (noting any distinguishing characteristics) of the site to which the Requirement applies are:

(i) The physical description of the sites:

These are set out in detail in the Tauranga Eastern Arterial Assessment of Environmental Effects (AEE) Section 4.

The Requirement applies to an area of land between along the proposed Tauranga Eastern Arterial, north of Bell Road and east of the Kaituna River that has the following zones under the District Councils' Plans.



Tauranga District

Transitional District Plan

Future Urban.

Proposed District Plan

Future Urban.

Western Bay of Plenty

Effectively Operative Proposed District Plan,

Rural G

Physical details noting any other distinguishing characteristics are shown on the set of Designation drawings attached to this Requirement (P021). This set of drawings shows, from the preliminary design, the position, configuration, associated cut and fill batters, relative to existing property boundaries, existing topography (including streams, rivers, estuaries) and vegetation features.

- (ii) The legal descriptions of the sites and a schedule of owners of the land physically affected are as follows.

Owner's Name	Legal Title	Land Area Affected m ²
J & JM by de Ley	Lot 1 DPS 65215	15049m ²
J & JM by de Ley	Lot 3 DPS 65215	30249m ²

1. (c) **The nature of the work and any proposed restrictions are:** the construction, operation and maintenance of an interchange on the proposed Tauranga Eastern Arterial, north of Bell Road and west of the Kaituna River. The design and construction of the proposal will be generally in accordance with the description of the proposal in the AEE which is in sufficient detail as to identify the nature of the work, the significant effects and the required mitigation.

The exact extent of works, construction methodology, possible staging and costs will be finalised as the design details are finalised. To date the design is at a preliminary stage.



1. (d) The effect that the proposed work will have on the environment and the proposed mitigation measures are:

(i) Effects

The effects that the proposed work will have on the environment can be summarised as follows:

- No significant effects on ecology, hydrology and water quality assuming mitigation measures set out below are actioned
- No significant visual effects subject to mitigation measures set out below
- Positive traffic effects resulting from travel time and vehicle cost savings and an improved level of travel safety
- No significant archaeological effects.
- The effect of land-take on adjacent areas

These effects are described in Section 5 of the AEE.

(ii) Mitigation Measures

The following mitigation measures are general concepts developed for the existing situation and will be carried through in principle to the final design stage. At the final design stage these principles will be refined to enable construction.

- Negotiated agreements with property owners for acquisition of land
- Careful planning and management of all construction works with particular emphasis on and use of mitigation techniques in regard to sediment control, construction noise and dust
- Use of appropriate and practical mitigation techniques in circumstances where protection of amenity in adjacent areas zones is warranted. These include the landscaping to reduce the visual effect of the highway.

These mitigation measures are described in Section 6 of the AEE.

1. (e) The following alternative sites, routes, and methods have been considered:

At grade alternatives such as T-junction, 'seagull' intersections and roundabouts were considered but not considered appropriate. Details of these and the reasons for their rejection are set out in the attached Assessment of Environmental Effects.



1. (f) The following resource consents will be required in relation to the activity to which the application relates:

- Earthworks consent - from the Regional Council and Tauranga District Council.

1. (g) The following resource consents have been applied for: Nil.

2. The consultation undertaken with parties likely to be affected by the Designation, public work, project, or work is detailed in Section 4.6 of the AEE.

3. Additional information (*if any*) as required by Tauranga and Western Bay of Plenty District Plans is set out as follows:

(i) Relevant Provisions of National Policy Statements, Regional Plan, District Plans:

The proposed work and mitigation measures has been assessed and been found consistent in terms of the provision of the following plans and policy statements:

- Bay of Plenty Proposed Regional Land Management Plan
- Bay of Plenty Regional Land Transport Strategy
- Bay of Plenty Proposed Regional Policy Statement
- Tauranga District Council Proposed District Plan
- Tauranga District Council Transitional District Plan (County Section)

(ii) Proposed Sequence and Implementation of the Work

Construction details are given in Section 3.3 of the attached AEE.

For and on behalf of
Tauranga District Council


.....
Paula Thompson, Chief Executive,
Tauranga District Council

Dated this 17th day of August 1999

**Transit New Zealand
Tauranga Eastern Arterial - Assessment of Environmental Effects**

n

Address for service:

c/- Beca Carter Hollings & Ferner Ltd
PO Box 903
TAURANGA

Telephone: (07) 578 0896

Fax.: (07) 578 2968

Contact Person: Christine Ralph



1. INTRODUCTION

1 INTRODUCTION

1.1 PURPOSE OF THE ASSESSMENT OF ENVIRONMENTAL EFFECTS

The purpose of this report is to gain consent to construct a new road between Domain Road in Papamoa and the existing State highway 2/State highway 33 highway intersection at Paengaroa. Transit New Zealand (Transit) has resolved to designate the route to secure it from future development and to provide some certainty for adjoining landowners on the possible impacts and land requirements of the route when it is eventually constructed.

Under the Resource Management Act, a requiring authority must undertake an Assessment of Environmental Effects (AEE) prior to notifying the requirement for a designation.

This AEE supports two Notices of Requirement as follows:

- the Alteration to Designation of the Tauranga Eastern Arterial (State highway 2) by Transit for a period of 20 years; and
- the Designation of Bell Road Interchange by TDC for a period of 20 years.

The Transit Designation starts at the Domain Road Papamoa intersection with the existing State highway and moves eastwards towards Paengaroa with an alignment that crosses the following existing local roads: Parton Road, Bell Road, Kaituna Road, Pah Road, Young Road, Te Tumu Road and Maketu Road. The proposed alignment bypasses Te Puke. There are interchanges at Domain Road, Bell Road east and where the proposed road links back in with State highway 2 just west of State highway 33.

The TDC Designation is at approximate meterage 6900, north of Bell Road, Papamoa and west of the Kaituna River.

The period of the designation is deliberately long to provide certainty, to reflect Transit's commitment to the long term strategic network, and to provide Transit and TDC with the flexibility to deal with the population growth, urbanisation of the Papamoa coastal strip and traffic growth that will necessitate the project being constructed. Transit cannot gain funding for the project at present but wishes to secure the route for future funding and construction.

Although there are two Notices of Requirement, both have been incorporated into, and considered in, the one AEE.

1.2 NOTICE OF REQUIREMENT

The Transit Notice of Alteration to Designation Requirement and the TDC Notice of Requirement are set out on the attached forms and the associated plans P006 - P023. The boundary of the Designation includes the batters, cuts and toe protection berms in swampy ground. The batters and cuts are at a slope of 3 horizontal to 1 vertical and the toe protection berms vary from 10 m to 20 m wide. These batter designs are based on preliminary geotechnical investigations. As part of the detailed design process prior to construction these batter slope parameters may alter. The extent of the Designation has been based on the likely worst case design scenario and includes allowances for the construction of stabilising bunds adjacent to the toe of the large fills as well as small allowances for working area adjacent to the top of the cut batters.

Following the final construction works it may be possible (by way of Section 182 of the Resource Management Act) to reduce the area of land which is required to remain as designated for road. This is because features such as the fill stabilising bunds, once constructed, can be used for pastoral farming purposes. The designation line is generally 5 m outside the extent of the cut batter and 10 m outside the fill and berm batters.

1.3 RESOURCE CONSENTS

It is expected that the full four lanes will be constructed within the 20 year period. It is possible that construction could be staged, with two lanes being built first, depending on roading organisation and funding at the time. Prior to construction final design plans in accordance with the confirmed designation will be completed.

Once final design plans are complete resource consents under the Resource Management Act 1991 (RMA) will be required. Typically consents are expected to include:

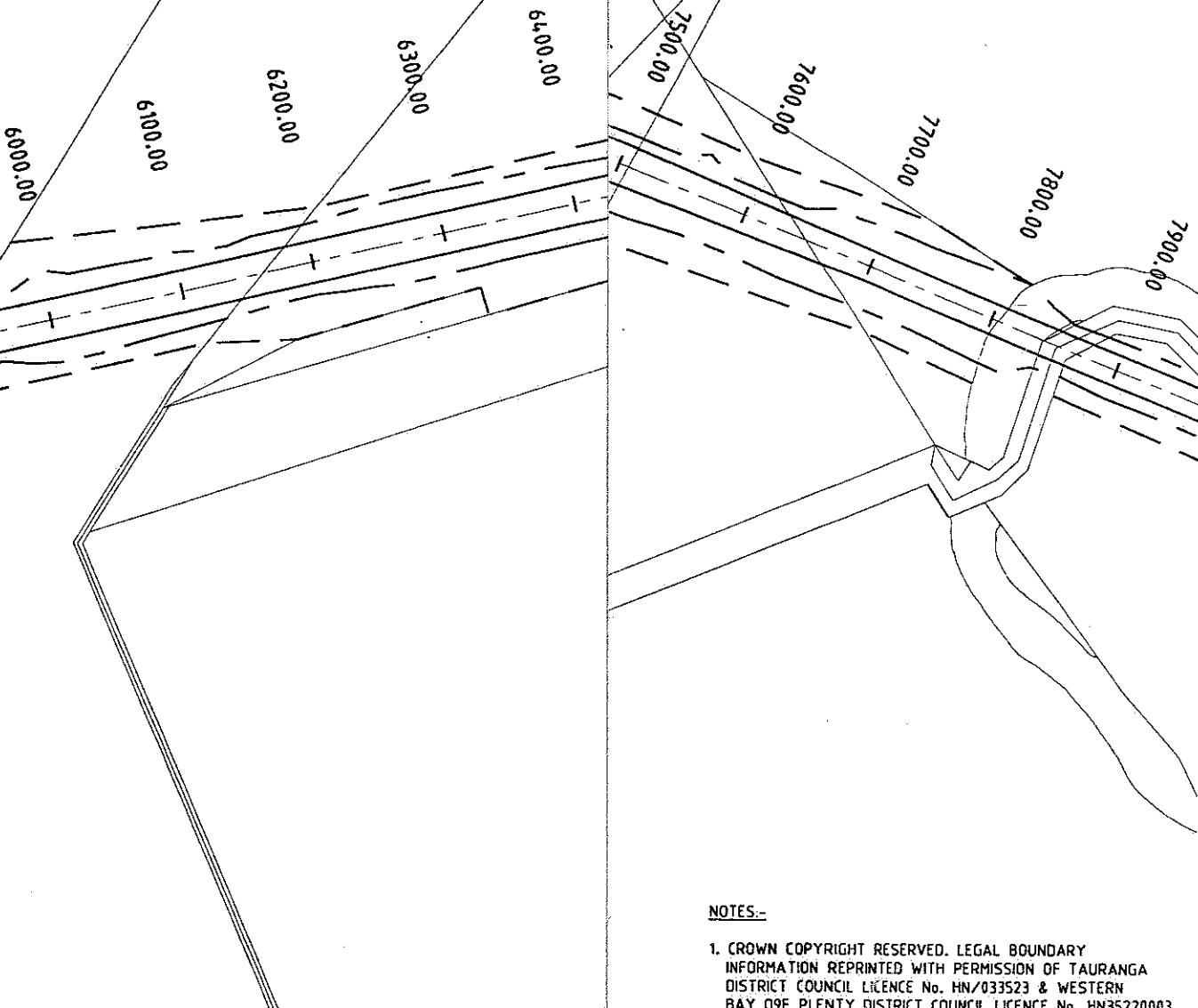
- | | |
|--|---|
| • Earthworks | from the Bay of Plenty Regional Council |
| • Stormwater | from the Bay of Plenty Regional Council |
| • Structures in a waterway
(bridge piles) | from the Bay of Plenty Regional Council |
| • Stormwater Detention Ponds | from Tauranga District Council |
| • Clean fill over 2000m ³
(in Future Urban zone) | from Tauranga District Council |
| • Earthworks | from Tauranga District Council |

These resource consents will be prepared when the final design is complete and will include further consultation with affected landowners and potentially the possibility of a notified consent process. We are advised by WBOPDC that consent for earthworks is not required under their District Plan.

In addition consent will be required for:

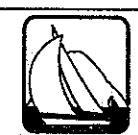


EXTENT OF TRANSIT NEW ZEALAND
DESIGNATION AREA.
REFER P009 P015



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TAURANGA
DISTRICT COUNCIL

APPROVED FOR
RELEASE

B.W.PETRENAS
Director of City Services
Tauranga District Council
RECOMMENDED

A FOR DESIGNATION	2/1/95
No.	Revised
Apod Date	



TAURANGA EASTERN
ARTERIAL
CIVIL

BELL ROAD INTERCHANGE
DESIGNATION & LAND
REQUIREMENT PLAN

Job No.
9301240
Drg No.
P021
Rev.
A

- Authority to modify; damage or destroy archaeological sites (should they be found during construction); from the New Zealand Historic Places Trust

1.4 BACKGROUND TO THIS DESIGNATION

Works Consultancy, in February 1992, prepared for Transit the *Te Puke Bypass Scoping Report*. This evaluated five options and the State highway upgrade with a view to relieving the traffic problems identified in Te Puke and on the State highway to the north and west of Te Puke. Following this a Project Investigation Report was completed, also by Works Consultancy, in October 1993 which added two more options.

Two corridors were identified from the options identified by Works Consultancy and these formed the basis of option identification for this designation.

Six alternative options were identified from within two corridors, chosen from a Resource Management perspective rather than an engineering perspective. These were considered by the study team and the community. A favoured option was determined following a detailed option selection process. The alternative options analysed are documented in the *Options Report - Tauranga Eastern Arterial Roading Study 1998*. **The report and supporting technical documents are attached and form part of this assessment of effects.**

1.5 FORMAT OF REPORT

The following sections of this report outline the proposal in more detail. Section 2 describes the problem, outlining current road and traffic issues in the context of the local strategic network. Section 3 provides a description of the proposal including geotechnical considerations, stormwater management, structures, construction, alternatives considered and funding. Section 4 is a description of the existing environment through which the proposed TEA will pass. Section 5 is an assessment of the effects the proposal will have on the environment.

The suggested mitigation measures / conditions of requirement that Transit and TDC propose are listed in Section 6.

**2. TAURANGA'S ROADING STRATEGY AND
THE NEED FOR THIS ROUTE**

2 TAURANGA'S ROADING STRATEGY AND THE NEED FOR THIS ROUTE

2.1 CURRENT PROBLEMS ON STATE HIGHWAY 2

State highway 2 is the main east coast highway between Waihi and Katikati to the north of Tauranga, and Whakatane to the south. The section of SH2 to the east of Tauranga, between Domain Road in Papamoa and Paengaroa and passing through Te Puke, has the following problems:

- The highway is currently providing a dual service of major arterial route and primary commuter road in this area. The local, generally slow moving and turning traffic accessing residential and commercial properties and other local access roads conflicts with long distance and through traffic, meaning delays are common for all vehicles. SH2 causes problems as it passes through the built-up area of Te Puke due to the high number of accesses, the on-street parking, pedestrian movements, intersections (two roundabouts), local traffic entering the highway and the general urban/commercial environment of the highway with the associated speed limit of 50 kph. These factors result in a poor level of service.
- Traffic volumes are increasing rapidly due to the large amount of development occurring in Tauranga, especially in the Papamoa area, and due to the increase in trunk road traffic. In addition to traffic volumes, there are large number of logging trucks using the highway. This affects both pedestrians and other highway traffic with the associated perceived safety concerns, especially with the pedestrians crossing and the environmental and social concerns of heavy vehicles using the main street through Te Puke.
- The general low level of service between Paengaroa and Te Maunga. This relates to the highway being a two lane facility carrying approximately 14,000 vehicles per day with a 12% heavy commercial vehicle content. A lack of passing opportunities, even with those currently under construction, results in a lower overall speed along the highway.
- Accesses from the highway causing conflicting traffic manoeuvres which are made more unsafe due to many having insufficient sight distances. The study area contains a wide range of land use, including residential and industrial/commercial in Te Puke, residential in Papamoa and Papamoa Beach, with the remainder being mainly rural. Many areas of Papamoa Beach have been recently developed with a significant amount of subdivision occurring.
- Vertical and horizontal geometric alignment deficiencies (i.e sharp corners, inadequate camber, uneven road surfaces and unsafe sight distances) in and around Te Puke, around the area of Bell Road and at the intersection with Domain Road.

- The high growth rate, occurring at present and predicted to continue, will have a significant effect on the need for improvements to the highway with the traffic volume being critical to when further capacity is required. Even if it were assumed that a certain proportion of the trucks were removed from the road network, it would mean that the options would still have the same relationship regarding each other albeit that it might be delayed for a few years. From an analysis on traffic growth volumes, if it were assumed that 40% of the trucks currently travelling on SH2 were transferred to rail as some people in the community have suggested, it would probably put back the project by only 1 to 2 years.

2.2 EXISTING TRAFFIC CONDITIONS

2.2.1 TRAFFIC FLOWS

Figure 2.2 indicates the daily traffic volumes which were observed between 1993 and 1997 in the study area. These traffic volumes provided by Transit New Zealand have growth rates determined from 5 years of historical data for each year.

The traffic count on SH2, north of Kopura Canal Bridge (Long Swamp) has been used to determine the profile of traffic throughout the day. Figure 2.1 indicates the profile of traffic during the week and also at the weekend.

The graph clearly indicates the morning peak period as 7am to 9am and the evening peak period as 4pm to 6pm during weekdays, indicating the influence of commuter traffic during week days.

2.2.2 COMPOSITION OF TRAFFIC STREAM

This section of SH2 also carries a large number and proportion of heavy vehicles. Over a typical day the proportion of heavy commercial vehicles is 14%, but this reaches nearly 16% during some periods of the day. This equates to nearly 150 heavy vehicles per hour, or, on average, one such vehicle every 24 seconds.

These proportions of heavy vehicles are similar to typical national averages on roads classed as "Rural Strategic" roads. This section of highway has a large proportion of commuter traffic and has both a 'Rural Strategic' and "Urban Arterial" function. This level of heavy vehicles is significantly above those typical for "Urban Arterial" type roads.

Such high proportions of heavy vehicles in a high-speed semi-rural environment high total traffic volumes and with limited passing opportunities leads to a high level of delay and driver frustration. A significant level of heavy commercial vehicles is also incompatible with the urban environments of Te Puke and Waitangi. This leads to a detrimental effect on the safety and amenity of these townships.

The significant and expanding role of the Port of Tauranga in the regional economy means that such a high level of heavy commercial vehicles can be expected to continue, if not grow in the future.

2.2.3 TRAFFIC PATTERNS

As well as carrying large volumes of through traffic between Tauranga and the wider eastern Bay of Plenty, this section of SH2 also carries a significant proportion of local and commuter traffic to and from Te Puke. For example, traffic surveys undertaken for this study indicate that as much as 50% of the traffic approaching Te Puke from the east on SH2 has a destination in Te Puke itself, with the other 50% with a destination west of Te Puke. Te Puke is a strong attractor and generator of trips in its own right and this will be recognised in the design of any roading network improvements.

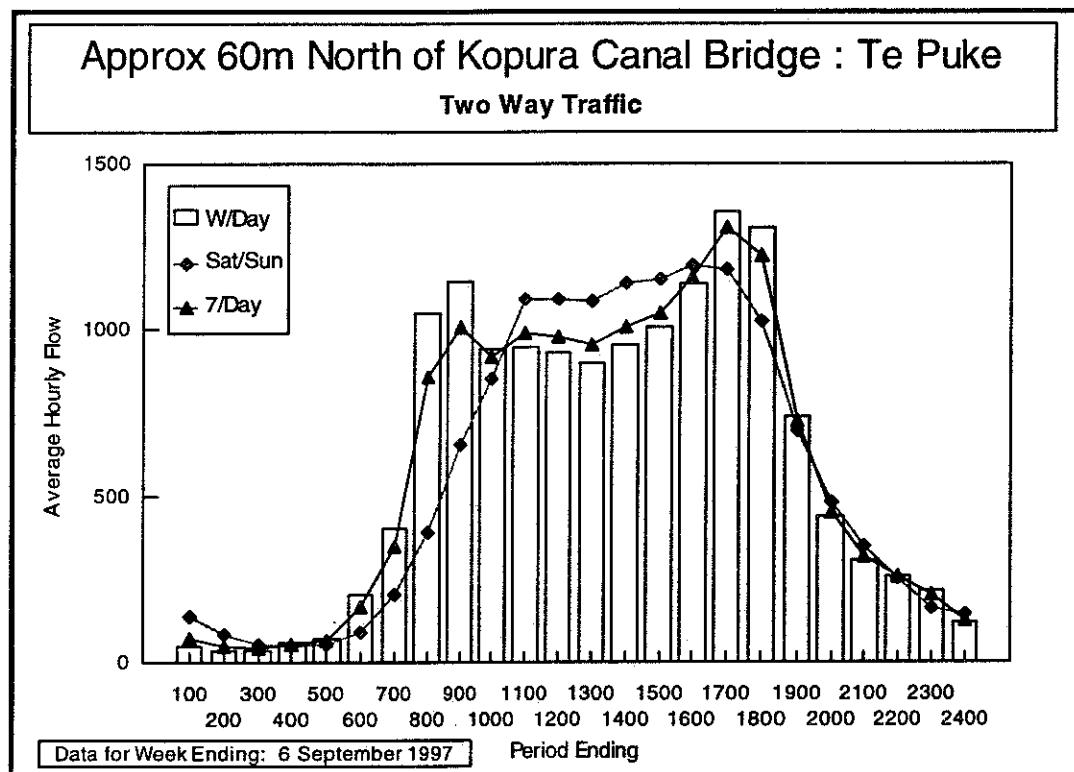
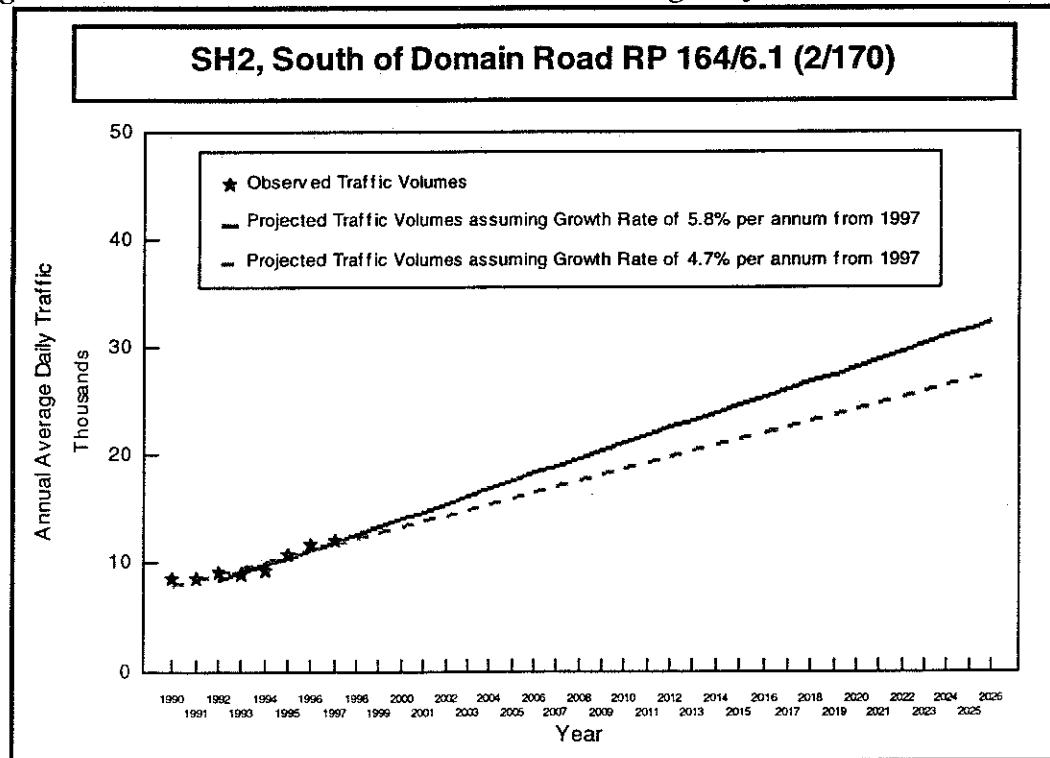
2.2.4 HISTORICAL TRAFFIC GROWTH

An analysis of the 1992 to 1997 traffic flows on SH2, south of Domain Road indicates that the traffic volumes have been increasing at a rate of 6.5% per annum since 1992. (Note: growth rates are quoted as arithmetic, not compounding rates). Using a regression analysis, this would relate to a 5.8% increase in growth from the projected 1997 traffic volume, assuming historical growth continues. An analysis of the traffic growth that occurred between 1990 and 1997 indicates a growth rate of 6.1% per annum since 1990, correlating to a lower predicted growth rate of 4.7% from 1997. This is illustrated in Figure 2.2 , which also shows the projection of traffic flows should either growth rate continue.

These growth rates could be considered to be the "low" and "high" growth scenarios with a "probable" scenario being the average of the growth rates based from 1997, ie 5.3% per annum.

2.2.5 ROAD CRASH HISTORY

This section of SH2 has a crash rate nearly double the national average for similar roads. Crash histories at different sites are compared by evaluation of the crash rate which are expressed as the number of reported injury crashes per 100-million vehicle-kilometres of travel. Analysis of the crash history between 1992 and 1996 indicates injury crash rates of 18 west of Te Puke, 25 east of Te Puke and 36 through Te Puke itself. These rates compare with national averages of 13, 13 and 18 respectively. These very high rates are believed to be due to the lack of passing opportunities, the very high traffic volumes through the township's and the driver frustration caused by the high number of heavy vehicles and the limited passing opportunities.

Figure 2.1 Profile of Existing Traffic on SH2, between Bell Road and Te Puke**Figure 2.2 : Historical Traffic Volumes on State Highway 2**

2.3 CAPACITY ANALYSIS

A "Level of service" criteria is often applied to highways is a qualitative measure describing the operational conditions within a traffic stream, and their perception by motorists and/or passengers.

A level of service definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience and safety. In general, there are six levels of service, designated from A to F, with level of service A representing the best operating condition (i.e. free flow) and level of service F the worst (i.e. forced or break-down flow). These criteria were originally developed in the US "Highway Capacity Manual". They been adopted in the Australia AUSTROADS "Roadway Capacity" guide and in common usage in New Zealand.

Using the flows recorded at the Kopura Canal Bridge in September 1997 provided a two-way service flow of 650 vph, 1200 vph and 2250 vph for level of service C, D and E. From the flows recorded in September 1997 the current level of service is detailed in Table 2.1.

Table 2.1 Level of Service, SH2 Kopura Canal

Period	Hourly Flow	Level of Service	
Morning Peak	1,070	D	Severely restricted speed and manoeuvring
Inter Peak	950	D	
Evening Peak	1,300	E	Unstable flow prone to complete break-down
Off Peak	520	C	Stable flow but declining convenience and comfort
ALL DAY	14,000	E	Unstable flow prone to complete break-down

As illustrated in Table 2.1, SH2 between Domain Road and Te Puke is nearing or at capacity in the evening peak.

2.4 TRAFFIC MODELLING

Traffic modelling is carried out to forecast the likely traffic volumes on the new road and the likely reduction in volume on the existing roads. This then assists in the economic viability of the new alignment being assessed.

Due to the complexity of the delays to through and local traffic within Te Puke and the number of options to be evaluated, a computer traffic model was used to determine the amount of traffic which would use a changed road network, to estimate the distance

which would be travelled, and also the time taken by motorists while travelling each of the options considered.

The modelled roading network extends from the Paengaroa Intersection to Te Maunga and includes SH2, Domain Road and Papamoa Beach Road, as shown in Table 2.1.

The *Technical Report 1 - Traffic Model Development and Validation Report, March 1998* (attached as Appendix 2) describes the development of the traffic model. The results of the traffic modelling and the economic evaluation are detailed in the report *Traffic Modelling and Economic Evaluation, June 1998*.

The traffic and economic modelling indicated that the optimal strategy was for a bypass between Domain Road and SH33 to be constructed within 8-12 years. On opening, the bypass is expected to carry in excess of 9,000 vehicles per day, representing a 40% reduction in volumes on SH2 west of Te Puke.

2.5 ALTERNATIVES CONSIDERED

2.5.1 TEA ALIGNMENT

Details of all of the various alternatives that were considered are set out in the *Options Report - Tauranga Eastern Arterial Roading Study* dated June 1998. This is attached as Volume III to this AEE.

In summary, six options were developed to avoid as many of the identified constraints as possible. These are shown in Newsletters 4 and 5 in Appendix 3. The "A" options involved four alternatives (A, A1 - A3) which utilised the sandhills along Bell Road to maximise the cheaper construction costs and minimise the peatlands to be traversed. Option B takes the most direct line across the Kaituna lowlands and attempts to get the greatest benefit from the shortest length. Option C consisted of an upgrade of the existing alignment of the SH to four lanes.

All of the options were assessed in terms of ecological, landscape, archaeological, cultural, social and noise impacts. All options were required to meet the Transit traffic design standards as identified in Section 3. A ranking of least preferred, next preferred and most preferred was given for each option. The two preferred options were then considered economically. The following is a brief description of the assessments of these six options:

Ecological

The predominant habitat traversed by all options, excluding C, is developed farmland with Options A, A1 and A2 passing through riparian and wetland habitat in close proximity to the Kaituna River. Option A3 would pass through part of the Lower Kaituna Wildlife Management Reserve, a part which has been modified as a result of grazing over many years. Options furthest from the Lower Kaituna Wildlife Management Reserve were favoured although Option A3 provides an opportunity to enhance through mitigation the wetland values previously in the locality.

Landscape

The A options would be sited on low embankments for much of their length which would blend in fairly well with the low lying landscape surrounding them. The main visual effects with all options will be in the Kaituna River corridor, where the river needs to be crossed, and the resulting visual effects on neighbouring fishing and reserve areas. The visual effects of A were preferred.

Archaeological

Options A1 and A2 were least preferred because they would traverse the East Homestead where archaeological sites have been identified. C was most preferred because it is located in a highly modified area. B was preferred over the A options because it avoids entirely the lower Kaituna River which has Pa and sites of high archaeological and cultural value, although neither impacts on archaeological sites with high cultural and scientific values.

Cultural

No consensus was received from hapu groups as to the preferred alignment. Option C was not favoured because of the severe impact on the Waitangi community.

Social

Option C, although preferable from a Te Puke commercial point of view and from a rural production point of view, had severe effects in terms of physical impact on properties along the existing highway. The A options provide an opportunity for an interchange for future urban development in Papamoa East. Options A1, A2 and A3 maximise the opportunities for future urban and rural development and minimise construction costs by being aligned on the edge of the sandhill country at Bell Road. It follows property boundaries more closely. Option A3 has the least impact on rural production in terms of annual productivity. Option B would affect the least number of commercial/rural buildings.

The A3 option is slightly favoured over other options because it has slightly less impact on rural properties and less rural production losses.

Noise

All options, except C, have the effect of reducing noise exposure of houses on the current SH2. Although the overall impact of the A and B options is similar, Option A3 emerged as the best option in terms of noise impact.

Economics

Two separate studies were undertaken as part of the economic evaluation, a "50 year strategic analysis" and a benefit/cost analysis. The 50 year strategic analysis was undertaken to investigate the timing of the different options based on a user benefit cost of four times the capital cost, i.e. when it becomes a fundable project under Transfund's criteria. The benefit/cost analysis was used to compare the benefits and costs of the options if construction was assumed to start as soon as possible.

The benefit/cost ratio for all A options is similar and therefore only one A option (A3) was compared to the B, C and sandhills routes (the sandhills route being an option from earlier studies). For the additional costs involved neither the Sandhill or Option B offer any additional benefits to Option A3. Option A3 has a preliminary estimated cost of \$100 million and a Benefit/Cost ratio (B/C ratio) of 1.8. Option B would cost \$112 million with a B/C ratio of 1.5. Option C would cost \$160 million and have a B/C ratio of 0.4.

CONCLUSION

The two favoured options from the assessment of environmental issues, A3 and B, were considered alongside the economic evaluation. This evaluation found that, while the B/C of the two options was close, Option A3 provided the cheaper solution and was therefore considered to be the most economical. This option is now known as the Tauranga Eastern Arterial.

2.5.2 BELL ROAD INTERCHANGE

At-grade alternatives such as T-junctions, 'seagull' intersections and roundabouts were considered as alternatives to the proposed junction. However, to maintain safety and efficiency on the TEA, a grade-separated junction is considered necessary. This removes both the hazards and delays associated with side traffic crossing main highways.

It is more economic to bridge the side road (as it is only two lanes) than to provide bridging for the TEA (as it is four lanes), and because of the high water table at the junction location, it is more appropriate to bridge the side road over the TEA.

Standard single lane on and off ramps have been provided to and from the TEA as this was also the most economic solution.

2.5.3 ALIGNMENT ADJUSTMENTS

Since selecting the preferred alignment, some changes have been made in response to consultation, further investigation and the results of the safety audit. These are outlined as follows:

- The removal of the two proposed bridges to carry Pah Road over the TEA. It was suggested during landowner consultation that Pah Road be realigned so that bridges were not required and Kaituna Road be formed to give access to those properties which could no longer use Pah Road.
- The realignment of the route in the location of Bell Road, just north west of the Kaituna River. This realignment was in response to the confirmed location of a Pa site. The route was moved north east in order to avoid the site.

- The realignment of the route to the north east between Parton Road and the Kaituna River to get the route further onto the sandhills to provide a better, and therefore more economic, ground for construction and for less long term settlement and to minimise title severance in this area.
- The removal of the bridge carrying Te Tumu Road over the TEA. This change was in response to the safety audit (and also for economic reasons). Te Tumu Road was realigned to join Maketu Road, which passes over the TEA on a bridge.

2.6 THE EASTERN ARTERIAL AS PART OF THE STRATEGIC NETWORK

The Bay of Plenty, and particularly the sub-region surrounding Tauranga, continues to experience very rapid growth. Predictions are that it will be the fourth largest urban area in New Zealand by 2016. One of the major influences on this growth is the Port of Tauranga which is New Zealand's largest export port by volume. Throughput has increased from four million tonnes in 1989 to eight million tonnes (1997) and future predictions are that this will increase to nine million tonnes by 2000. The impact of the Port on the roading infrastructure is therefore significant. Heavy traffic as a component of overall traffic on SH2 is already above 12%.

The total vehicle kilometres travelled in the Tauranga region is only exceeded by the Auckland, Manukau, North Shore, Wellington and Christchurch regions.

Transit, TDC and Western Bay of Plenty District Council (WBOPDC) have combined to develop a sub-regional transportation strategy. This strategy includes the development of an arterial ring road system around central Tauranga and provides access to the Port of Tauranga. The proposed Eastern Arterial links to the arterial ring road from the east. See Figure 2.3.

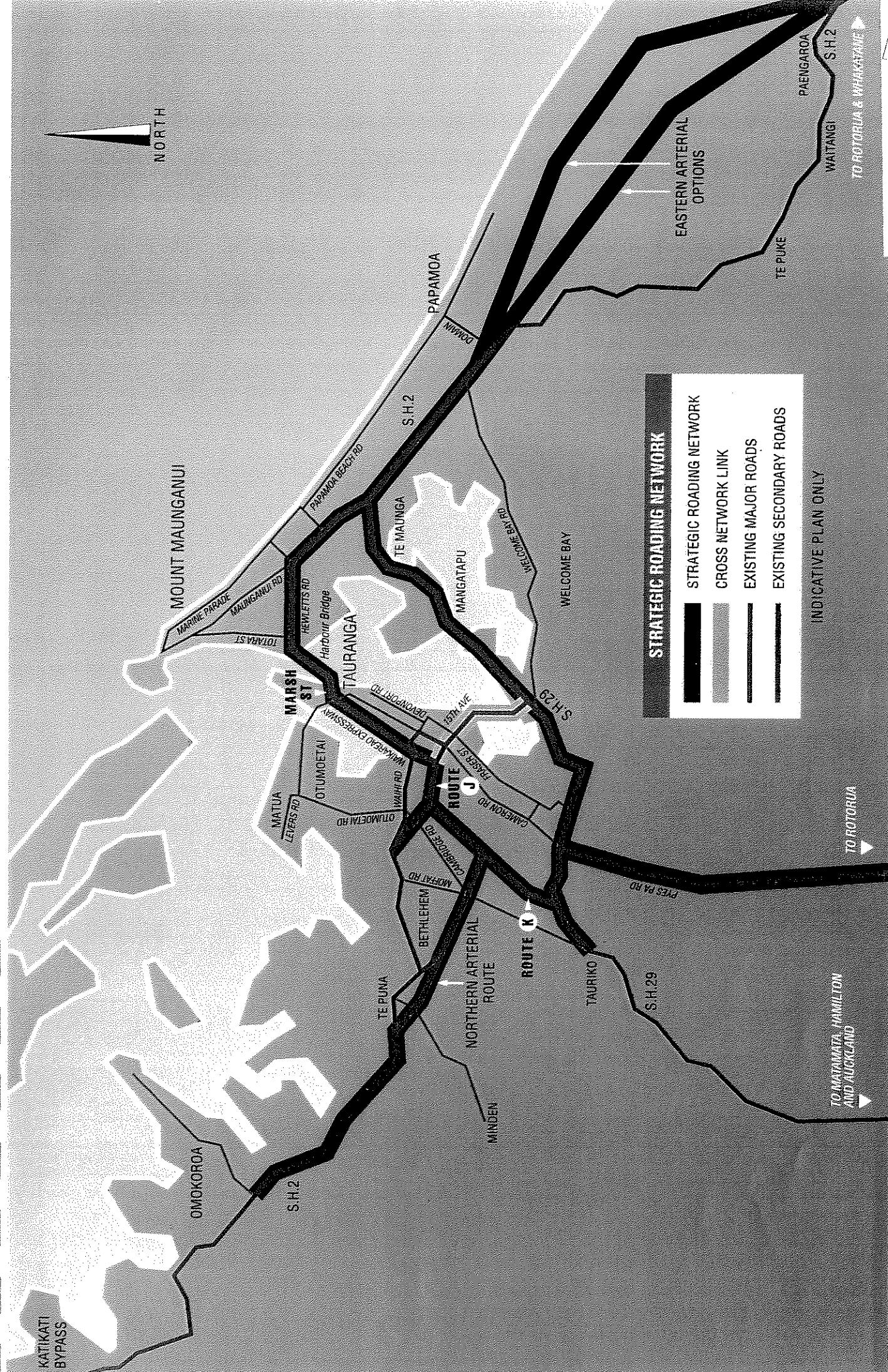
Approximately half of the traffic travelling on SH2 north of Te Puke is major arterial traffic to and from Rotorua and areas south, and Whakatane and areas east. The remaining traffic originates and terminates in Te Puke and its environs and comprises commuter traffic, generally between Te Puke and Tauranga, Mount Maunganui and Papamoa, and other local traffic. It is important that the increased residential development in this area is compatible with a safe and efficient arterial route. There is therefore a strong need for a separate, limited access through route to provide a national strategic arterial route and to retain a primary local access road acting as a safe and efficient local distributor road. A large portion of the through traffic is generated by trucks transporting wood based products from the central North Island plateau to the Port of Tauranga. Although rail cartage of these products is increasing there will always be a percentage carted by trucks. The impact of this traffic passing through Te Puke is very significant and affects the commercial and environmental conditions in the township.

For the strategic roading network to meet existing and future demands major improvements and additional facilities are urgently required on both the District Council's roads and Transit's State highways. This link from Tauranga towards the east via State highway 2 (SH2) is one of the most urgently needed improvements to this network. However, based on current funding constraints it is unlikely to proceed straight away.

As the main east coast highway, SH2 serves both as a national strategic route and, with urban areas expanding, as a primary arterial access road for Te Puke and Papamoa. Currently its primary function as a main strategic route, to move traffic and goods safely and efficiently, is compromised by its dual function. Similarly, the ability to provide a safe and efficient link with a high access function between Papamoa, Te Puke and Tauranga is compromised by the need for a high speed limited access strategic function.

As growth occurs in Papamoa East, it is becoming more important to provide a safe and efficient link from here into Tauranga. An interchange in this location will provide this link to Tauranga without compromising the TEA's role as a main strategic route.

FIGURE 2.3



3. DESCRIPTION OF PROPOSAL

3 DESCRIPTION OF PROPOSAL

3.1 INTRODUCTION

The proposed TEA Route has been designed to provide an arterial road from the Domain Road intersection on State highway 2 at Papamoa to the intersection of State highways 2 and 33 just north of Paengaroa. This will result in regional arterial traffic no longer having to pass through the townships of Waitangi and Te Puke on-route to or from Tauranga.

Commencing from the north-east, the proposed alignment deviates to the north of the existing highway crossing between the railway and Tara Road. The route proceeds in an easterly direction under a new Parton Road overbridge towards the end of Bell Road where the TDC interchange will give access to Papamoa. The route turns to a south-easterly direction and crosses the Kaituna River on a bridge. The route continues south-east from the Kaituna River, cutting Kaituna Road and Pah Road which will be realigned along the southern side of the TEA. Te Tumu Road will cross the TEA on a new bridge but the route will pass over Maketu Road on a bridge structure that will also take it across the railway. South of the railway the route will join in with existing State highways 2 and 33 at the location of the present junction. See Figure 3.1.

It is proposed that this new route will ultimately have grade separated interchanges at three locations. These are:

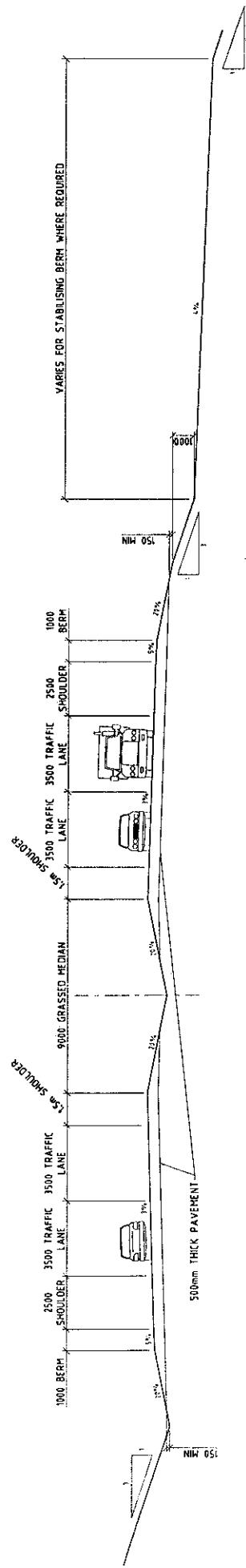
- In the location of the existing SH2/Domain Road intersection south of Papamoa.
- Near the Eastern end of Bell Road. This is to provide for the future residential growth. (TDC Designation)
- In the location of the existing SH2/SH33 intersection north of Paengaroa.

The geometric design has been based on Transit's guidelines which are the Austroads Rural Road Design Guide and NAASRA Grade Separated Interchanges Design Guide. In particular the following values have been adopted.

- Minimum speed value for all horizontal and vertical curves - 110km/hour (speed limit 100km/hour).
- Minimum radius of all horizontal curves - 500m.
- Maximum vertical gradients 12%.

The typical cross-section for the proposed route includes a 9 metre wide central median which is proposed to be grassed. This median will be reduced to a solid barrier provided where the route is on bridges (the Kaituna River crossing and the Maketu Road/railway crossing). The four lanes will be 3.5m wide with a 2.5m shoulder on the outer edge and a 1.5m shoulder adjacent to the central median.

All of these standards are generally in keeping with those currently being used by Transit for the construction of rural four-lane divided highways (see Figure 3.1).



TAURANGA EASTERN ARTERIAL TYPICAL CROSS SECTION

FIGURE 3.1

Beca Carter Hollings & Ferner Ltd.

Consulting Engineers

CIVIL

TRANSIT
INTERIOR DESIGN

TAURANGA EASTERN ARTERIAL		TYPICAL CROSS SECTION	
Tauranga		SK55	
Site Name	Engineering Services	Job No.	Rev.
Project Name	Client Name	Date	
Address	Address	Year	
City	City	Month	
Region	Region	Day	
Country	Country	Year	
Postcode	Postcode	Year	
Phone	Phone	Year	
Fax	Fax	Year	
E-mail	E-mail	Year	

Subject to detailed economic analysis closer to the time of actual construction, it is possible that only two lanes may be constructed as an interim approach until the four-lane facility is viable. This option will require careful consideration from economic, traffic capacity and safety viewpoints closer to the time when the project is economically viable.

3.2 BRIDGE STRUCTURES

3.2.1 GENERAL

It should be noted that two local roads that will be crossed by the Tauranga Eastern Arterial will not be provided with bridges. Pah Road will be realigned on the south western side of the alignment and Kaituna Road will be formed to provide access to properties on the north eastern side. Te Tumu Road will also be realigned to join Maketu Road, which will be provided with a bridge over the Tauranga Eastern Arterial.

The assessment of bridge structure configurations for the Tauranga Eastern Arterial alignment has been based on the following preliminary data:

- Other than for vertical clearances, the standard bridge deck cross sections and geometric standards are based on the Transit Bridge Manual (TBM), May 1994.
- For vertical clearances from the road surface to the underside of any overpass bridge, TBM indicates a minimum 4,900mm, while Austroads Bridge Design Code recommends a vertical clearance of 5,300mm or more. For the Tauranga Eastern Arterial bridges, a lane vertical clearance of 5,500mm has been adopted.
- The recommended clearances to the ECMT railway line of 5.0m horizontal clearance from track centreline to structures, and 5.5m vertical clearance above rail level have been adopted.
- All structures will be supported on a multiple pile arrangement with a rigid pile cap.
- All structures will be of insitu and precast concrete construction.

3.2.2 PROPOSED BRIDGES

A number of typical bridge crossings are illustrated in Figure 3.4 to Figure 3.8. The proposed crossings are described below, and are represented by the typical bridge crossing figures. The details of each bridge will need to be developed further in the Design Development phase. Typical Bridge widths are shown in Figure 3.2.

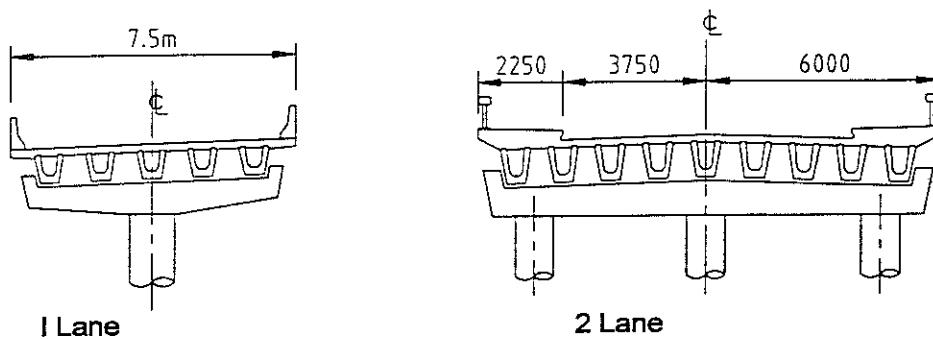
Bridges 1 & 3 (SH2 interchange)

Bridges 1 & 3 are located in close proximity and cross the ECMT railway line (see Figure 3.3). Since the embankments are high with converging fills it is proposed that the railway is spanned with a 10m clear span onto closed wall abutments. The proximity of the two structures requires the abutment walls to be connected between the bridges, effectively into one combined substructure.

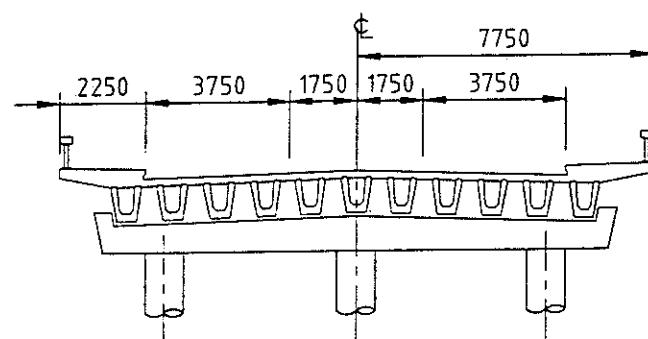
Route: TAURANGA EASTERN ARTERIAL

Route Location: TYPICAL BRIDGE WIDTHS

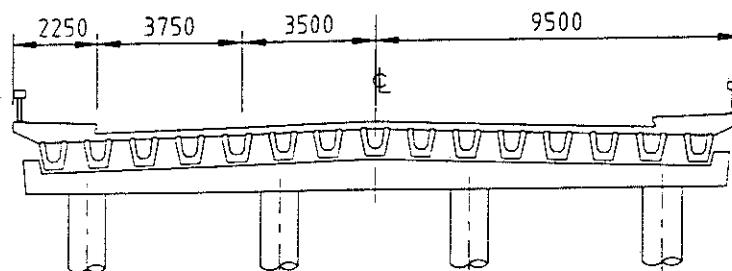
Proposed Deck Section 1 and 2 - Lane overpasses.



Proposed Deck Section 3-Lane overpass over TEA.



Proposed Deck Section 4 - Lane overpass over TEA.



Proposed Deck Section 4 - Lane TEA bridges.

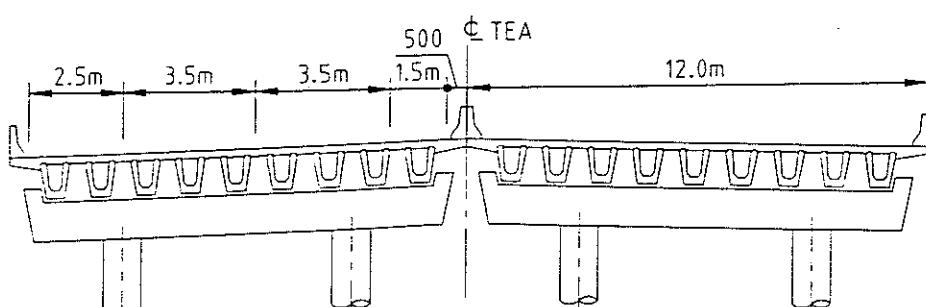
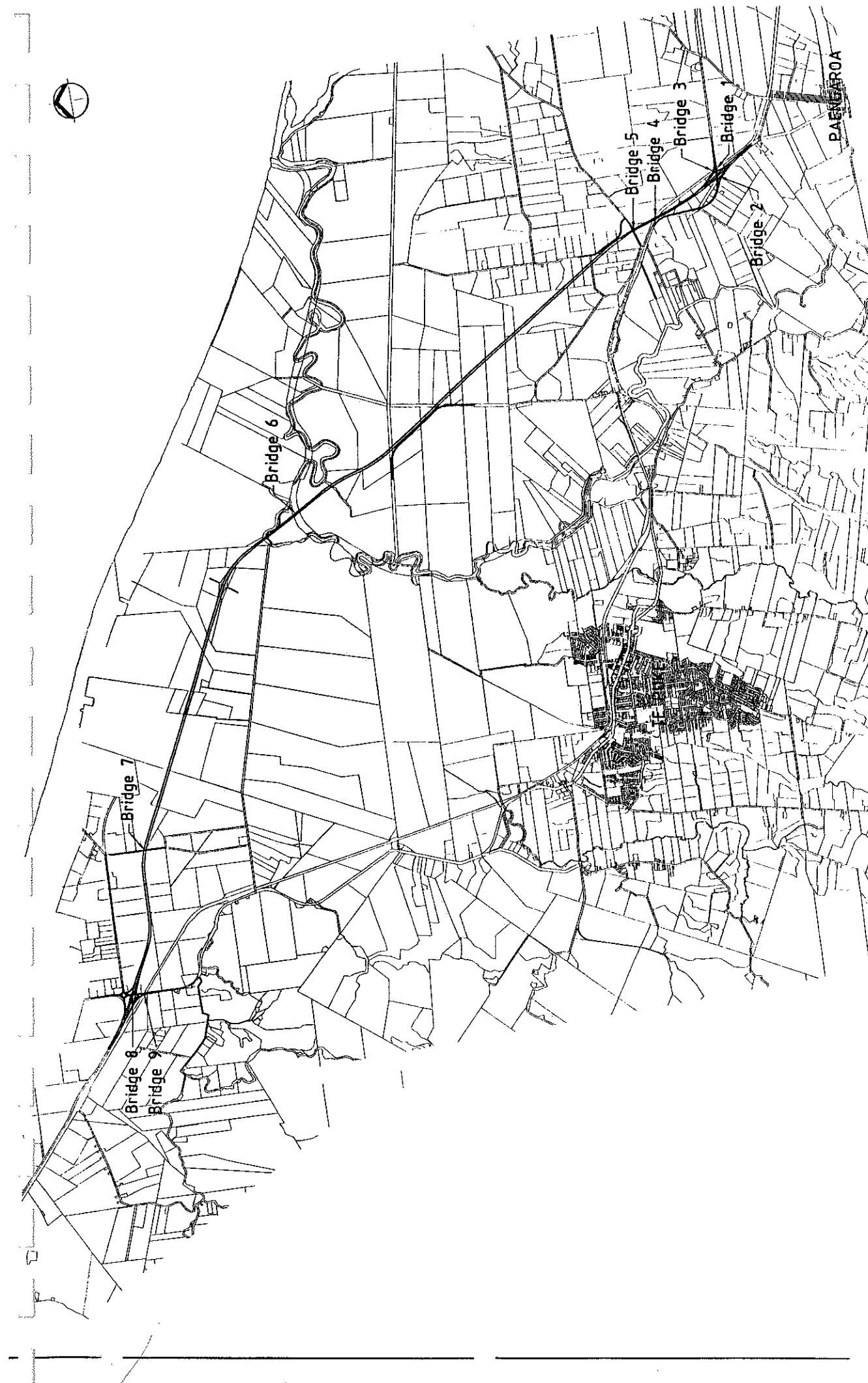


FIGURE 3. 2

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FIGURE 3.3



Beca Carter Hollings & Ferner Ltd.
Consulting Engineers

TRAFFIC
SURVEY
REPORT

TAURANGA EASTERN ARTERIAL CIVIL		BRIDGE LOCATIONS	P023
Bridge 1	Bridge 2	Bridge 3	Bridge 4

930120	1:50000
PAENARUA	PAENARUA

Bridge 1 is a 4-lane undivided bridge with footpaths carrying SH2 over the ECMT railway, crossing at a 61° intersection angle. The bridge comprises a single 12.5m span, and is 18.5 m wide between parapets (see Figure 3.4). The deck consists of precast concrete hollow core slab units with a cast in situ topping to provide a 800 mm deep section.

Bridge 3 is a single lane ramp connecting the TEA with SH2 crossing the ECMT railway at a 33° intersection angle. The bridge comprises a single 20.0 m span, and is 6.5 m wide between kerbs (see Figure 3.2). The deck consists of precast concrete U-beam units with a cast in situ slab to provide a 1100 mm deep section.

Bridge 2 (SH2 interchange)

Bridge 2 (see Figure 3.3) is a 4-lane undivided bridge with footpaths carrying SH2 over the TEA, crossing at a 55° intersection angle. The bridge is 66 m long and comprises a 4-span layout with 17.0 m spans over TEA with 1.0 m median, and side spans to retain an open approach aspect, and is 18.5 m wide between parapets (see).

The deck consists of precast concrete U-beam units with a cast in situ slab to provide a 900 mm deep section. The abutments comprise perched bearing beams supported on extended piles through the embankment, and the piers comprise a bearing beam on multiple columns supported on a piled foundation, founded at 15 m depth.

Bridge 4 (ECMT railway)

Bridge 4 (see Figure 3.3) is a 4-lane divided bridge carrying the TEA with 1.0 m median over the ECMT railway, crossing at a 27° intersection angle. The bridge comprises a single 12.0 m span layout spanning along the railway onto closed abutments to form a tunnel like structure, 72 m long. The effective bridge width is 23.0 m wide between parapets. This structure is wide enough to provide for the possible duplication of the rail (see Figure 3.2).

The deck consists of precast concrete hollow core units with a cast in situ topping to provide a 800 mm deep section. The abutments comprise a Reinforced Earth retaining wall system with a perched bearing beam supported on extended piles through the embankment, founded at 15 m depth.

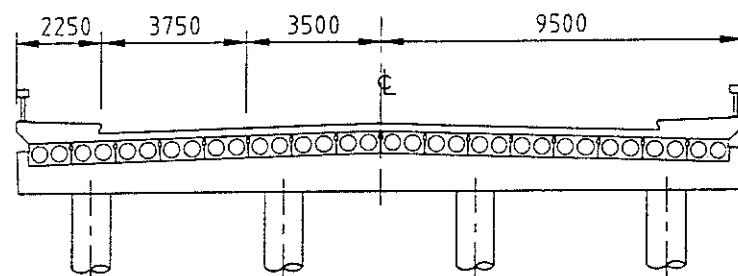
Bridge 5 (Maketu Road)

Bridge 5 (see Figure 3.3) is a 2-lane bridge carrying Maketu Road over the TEA. The bridge is 65 m long and comprises a 4-span layout with 16.5 m spans over the TEA with 4.0 m median and side spans to retain an open approach aspect, and is 11.5 m wide between parapets.

Route: TAURANGA EASTERN ARTERIAL

Route Location: 4 - LANE OVERPASS OVER ECMT RAILWAY

Proposed Deck Section



Longsection / Bridge Elevation

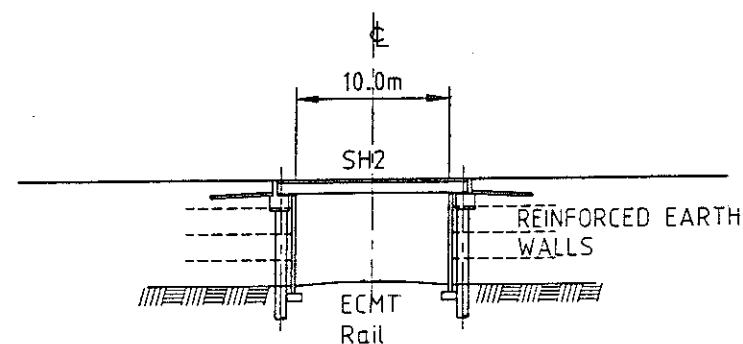
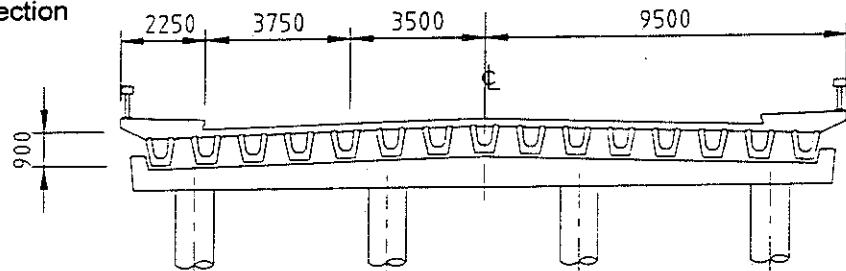


FIGURE 3.4

Route Location: 4 - LANE OVERPASS OVER TEA (1.0m MEDIAN)

Proposed Deck Section



Longsection / Bridge Elevation

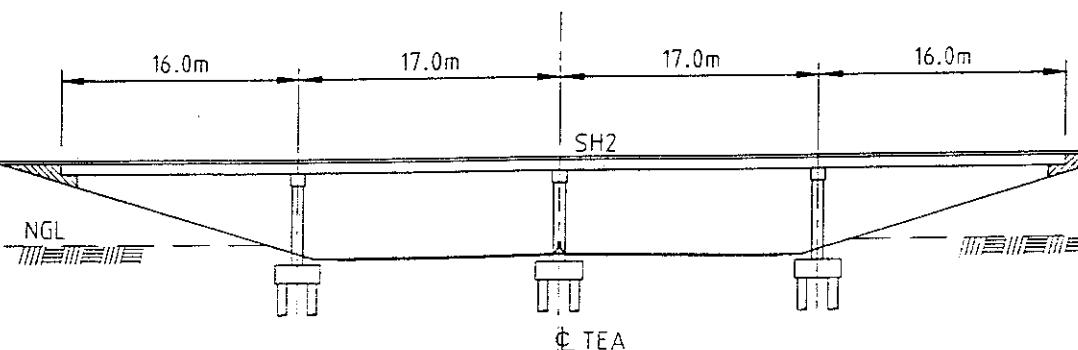


FIGURE 3.5

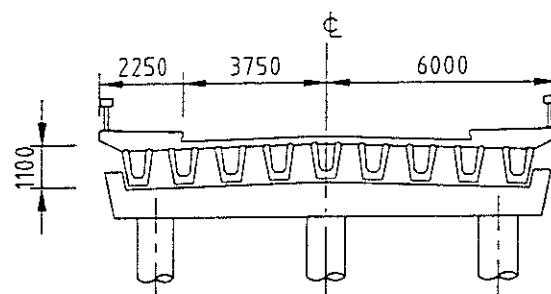


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Route: TAURANGA EASTERN ARTERIAL

Route Location: 2 - LANE OVERPASS OVER TEA (9.0m MEDIAN)

Proposed Deck Section



Longsection / Bridge Elevation

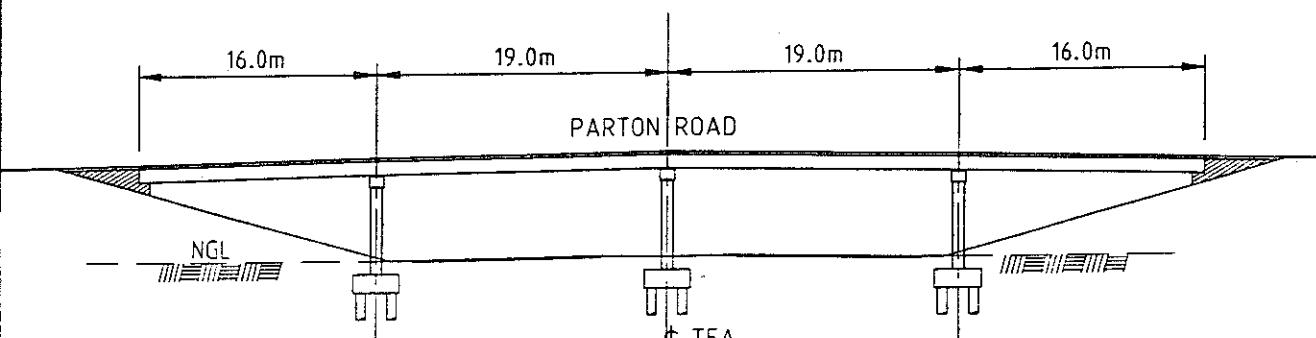
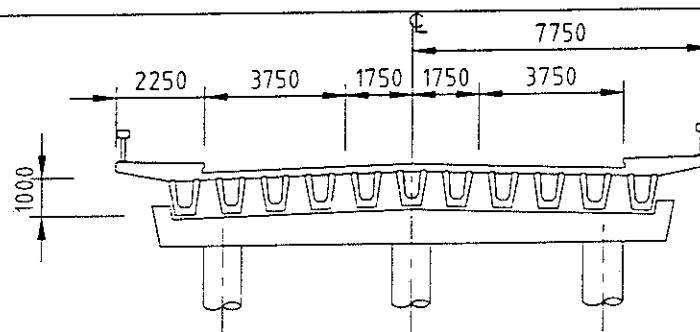


FIGURE 3.6

Route Location: 3 - LANE OVERPASS OVER TEA (1.0m MEDIAN)

Proposed Deck Section



Longsection / Bridge Elevation

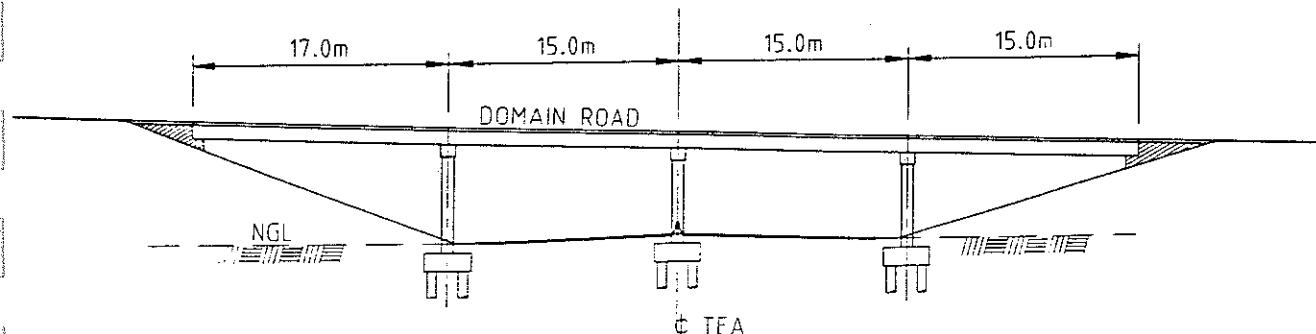


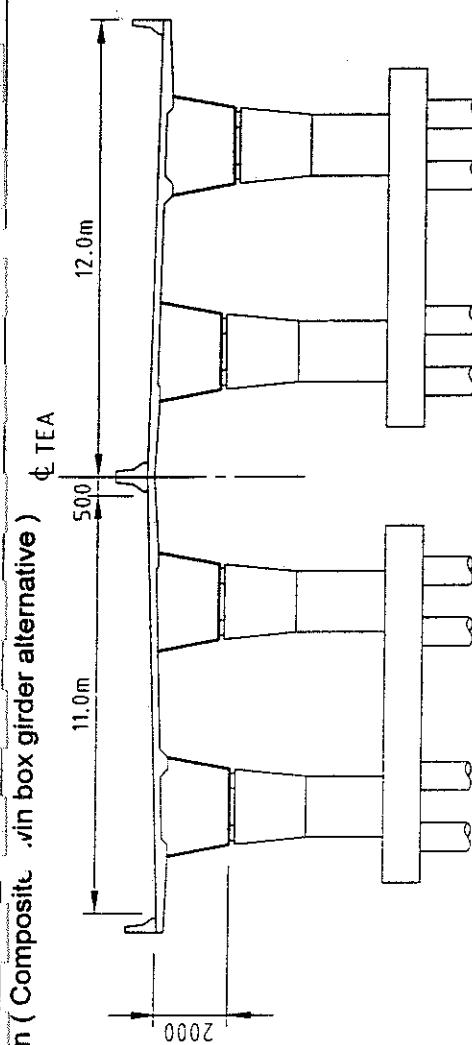
FIGURE 3.7



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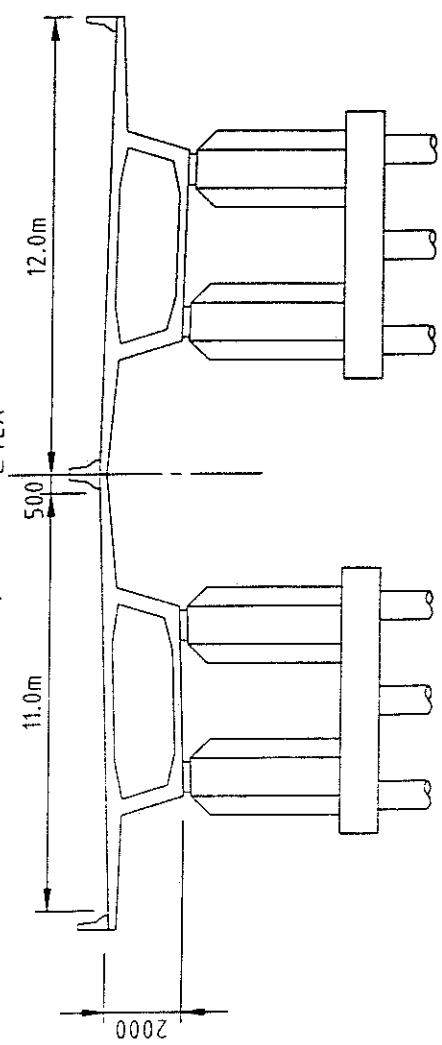
Route: TAURANGA EASTERN ARTERIAL

Route Location: 4-LANE TEA (1.0m MEDIAN) OVER KAITUNA RIVER



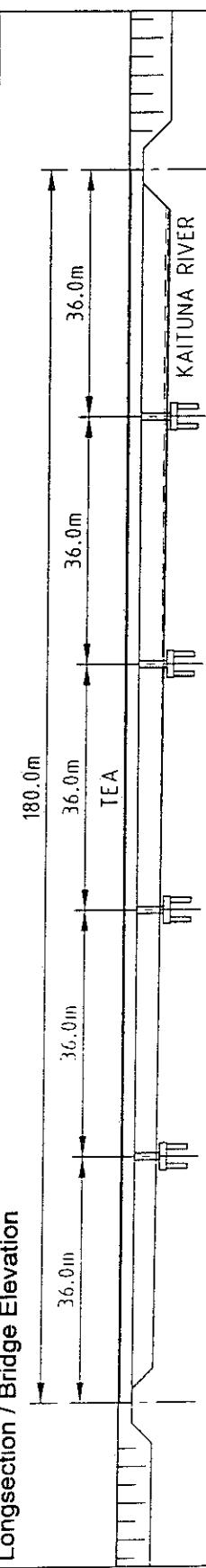
Proposed Deck Section (Composite girder alternative)

TEA



Proposed Deck Section (Concrete box girder alternative)

TEA



Longsection / Bridge Elevation

TEA

The deck consists of precast concrete U-beam units with cast in-situ slab to provide 900mm deep section. The abutments comprise perched bearing beams supported on extended piles through the embankment, and the piers comprise a bearing beam on multiple columns supported on a piled foundation, founded at 15 m depth (see Figure 3.6).

Bridge 6 (Kaituna River)

Bridge 6 (see Figure 3.3) is a 4-lane divided bridge carrying the TEA with 1.0 m median over the Kaituna river, crossing at a 64° intersection angle. The bridge is 180 m long and comprises a 5-span layout with 36.0 m spans, and is 23.0 m wide between parapets (see Figure 3.8).

Each carriageway deck consists of a composite section comprising twin, single cell, steel box girders with cast in situ concrete deck slab to provide a 2000 mm deep section. The abutments comprise perched bearing beams supported on extended piles through the embankment, and the piers comprise single columns under each box-girder spine supported on a piled foundation, founded at 10 m depth.

Alternatively, for a deck constructed by the incremental launch technique, the deck depth would have to increase significantly for a 5-span layout with a 40 m interior span. A continuous, prestressed concrete, single cell box-girder deck, 2.7 m deep is proposed.

Bridge 7 (Parton Road)

Bridge 7 (Figure 3.3) is a 2-lane bridge with footpaths carrying Parton road over the TEA, crossing at a 70° intersection angle. The bridge is 70 m long and comprises a 4-span layout with 19.0 m spans over TEA with 9.0 m median, and side spans to retain an open approach aspect, and is 11.5 m wide between parapets (see Figure 3.6).

The deck consists of precast concrete U-beam units with a cast in situ slab to provide a 1100 mm deep section. The abutments comprise perched bearing beams supported on extended piles through the embankment, and the piers comprise a bearing beam on multiple columns supported on a piled foundation, founded at 25 to 30 m depth.

Bridge 8 (Domain Road)

Bridge 8 (Figure 3.3) is a 3-lane bridge with footpaths carrying Domain road over the TEA, crossing at a 64° intersection angle. The bridge is 62 m long and comprises a 4-span layout with 15.0 m spans over TEA with 1.0 m median, and side spans to retain an open approach aspect, and is 15.0 m wide between parapets (see Figure 3.7).

The deck consists of precast concrete U-beam units with a cast in situ slab to provide a 900 mm deep section. The abutments comprise perched bearing beams supported on extended piles through the embankment, and the piers comprise a bearing beam on multiple columns supported on a piled foundation, founded at 25 to 30 m depth.

Bridge 9 (Widening existing ECMT railway overbridge)

The existing bridge on SH2 (see Figure 3.3) crossing over the ECMT railway at the proposed Domain Road junction needs to be widened by approximately 3 m. This to provide for left turning traffic travelling through to Tauranga on SH2. This will be achieved by widening and strengthening existing abutments with additional piling if necessary and providing precast concrete hollow core units with a cast insitu topping for the deck.

3.3 RAMPS AND INTERCHANGES

Provision for access onto this new arterial route is proposed at three locations along its length, namely at the ends of the alignment at Domain Road and Paengaroa, and also near the end of Bell Road (at approximate meterage 6900).

3.3.1 DOMAIN ROAD JUNCTION

Initially at this interchange an interim at-grade roundabout will be provided. The ultimate interchange will permit all turns and consist of an overbridge connecting SH2 to Domain Road, and have separate left and right turning entry/exit lanes between SH2, Domain Road and the new Eastern Arterial.

Domain Road will need to be raised to cross over the ECMT railway. To accommodate this and also the left turning exit from SH2 into Domain Road, the intersection of Domain Road and Tara Road has been changed to a small roundabout and relocated further to the north along Domain Road.

3.3.2 BELL ROAD JUNCTION (TDC DESIGNATION)

This is a simple interchange layout with standard exit and entry ramps enabling the Tauranga Eastern Arterial to join up to a proposed link catering for future growth east of Papamoa and also Bell Road.

3.3.3 PAENGAROA JUNCTION

This interchange is located at the existing intersection of SH2 and SH33 near Paengaroa. An at-grade roundabout, which will also provide for SH2 having an overbridge over the railway, will be provided. An ultimate grade-separated layout may be constructed in the future which would permit all turns and also require bridging for SH2 over the ECMT railway and the TEA.

SH2 immediately west of this junction has been realigned to accommodate the raising of the road over the TEA and the westbound traffic on SH33.

3.4 STORMWATER MANAGEMENT

3.4.1 CATCHMENT DESCRIPTION

For stormwater management purposes the proposed road alignment can be divided up into three sections:

- the section west of the Kaituna River
- the Kaituna River crossing
- the section east of the Kaituna River.

Almost all of the properties affected by the TEA are within the special rating boundary for the Kaituna Drainage Scheme, with the exception of four properties at the Domain Road Interchange.

The catchments and main drainage features are shown on Figure 3.9.

3.4.1.1 West of the Kaituna River

With the exception of a small catchment north of the railway near the Domain Road intersection which drains to the north and discharges via farm drains into the Papamoa main drain system, and a small pumped subcatchment near the Kaituna River, the entire alignment west of the Kaituna River lies within the Bell Road main drain catchment.

The Bell Road drain catchment stretches from the dune row in the north, to the northern Kopuroa Canal stopbank in the south and from the Papamoa Hill in the west to the Kaituna River in the east. In the lower part of the catchment the Bell Road drain is located adjacent to and along the northern side of Bell Road. The last 2.0 km (approximately) before the Kaituna River the drain is stopbanked and all inlets from side drains are flap-gated to prevent water from the main drain backflowing into the adjacent farm land. The height of the northern or left-hand side stop bank is considered, by Environment BOP, to be at a 10 year return period elevation. The Bell Road embankment forms the southern or right-hand stopbank and is higher than the northern stop bank. Embankment overtopping would therefore only take place towards the north into the Bell Road Pumpstation "B" subcatchment. The outlet of the Bell Road drain into the Kaituna River is a flap-gated culvert through the stopbank.

From the Domain Road intersection the road alignment traverses through the relatively flat areas both sides of Parton Road. Ground elevations vary typically between RL+3.5m and RL+4.5m. The predominant land use is dairying and a large number of farm drains cross the area. The direction of flow in this area is generally from north to south. The small farm drains flow towards a large collector drain which discharges into the Bell Road main drain. A major farm drain conveys water from a catchment north of Tara Road to the collector drain.

LEGEND

- CATCHMENT BOUNDARY
- SUBCATCHMENT BOUNDARY
- MAJOR DRAIN
- PROPOSED ROAD ALIGNMENT
- PROPOSED CULVERT (INDICATIVE)
-  DOC RESERVE

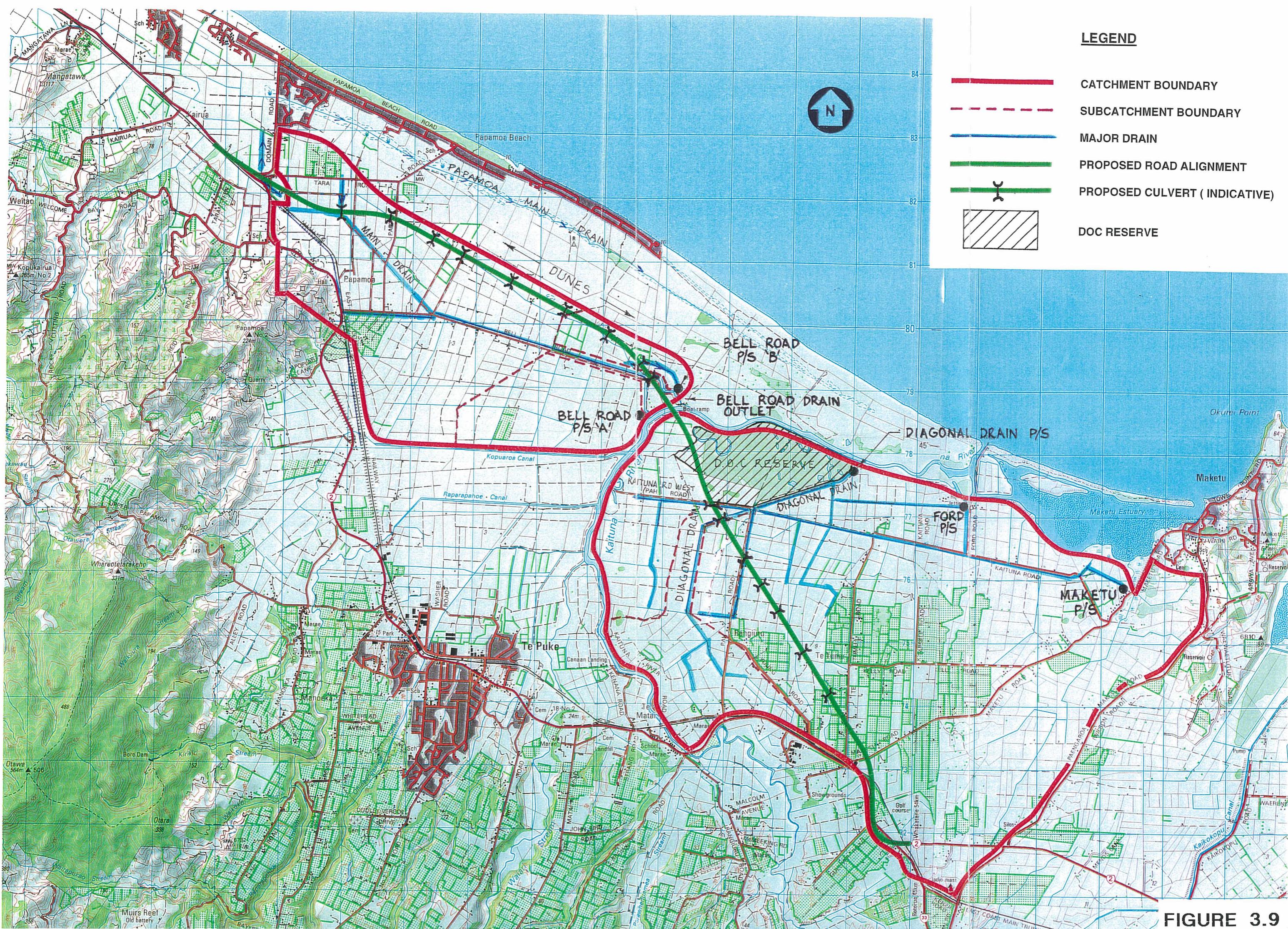


FIGURE 3.9

During heavy storms the drains in the area fill with stormwater which is then slowly released into the collector drains. Surface ponding may occur in extreme events but extensive flooding is not expected in this flat area of the top end of the catchment.

The next part of the alignment towards the Kaituna River runs along the foot of the dune row. This is the area in which the Bell Road Interchange is located. The dunes are typically 3.0m to 6.0m higher than the adjacent farm land to the south. Here the drainage from the southern edge of the dunes runs typically to the south into the flat areas of farm land adjacent to Bell Road. The dunes are undulating and sandy and therefore the yield of stormwater is likely to be low.

The eastern part of the proposed alignment from the dunes to the Kaituna River stopbank passes a low lying area with three sub-catchments. The first sub-catchment area (located between the dunes and the Bell Road drain, stretching as far west as the access road to the coolstores), is separated from the Bell Road drain by its northern stopbank. Normally this area drains into the Bell Road drain via flap-gated outlets through the stopbank. However, if the water level in the Bell Road drain is high the area is dewatered by means of pumping into the Kaituna River via a permanent pumpstation near the Kaituna River stopbank (Bell Road Pumpstation "B"). In the past, during heavy storms causing extremely high Bell Road drain levels, stormwater from the Bell Road drain has entered this semi-separate catchment by over-topping the access road along its western boundary.

The second catchment is the downstream end of the Bell Road drain catchment. Just upstream of the proposed alignment the stopbanked Bell Road drain flows into a redundant section of Kaituna River, which then discharges into the Kaituna River via a flap-gated gravity outfall through the river stopbank.

The third sub-catchment comprises the area between the redundant loop of the Kaituna River and the Kaituna River stopbank. This area drains via a small drain and culvert into the Bell Road drain just before the outlet structure.

3.4.1.2 The Kaituna River Crossing

The proposed road alignment crosses one major river, the Kaituna River, at a realigned section of the river. The river realignment has cut off the above mentioned loop of the river. The river is stopbanked on both sides with approximate stopbank heights of RL +5.00m (Moturiki Datum). The width between stopbanks in this area is larger than the upstream area due to the alignment of the left stopbank which moves away from the river bed towards some higher ground in the dune area. At this location the width between the stopbanks is in the order of 180m with flood plain width of approximately 80m on the left hand side and approximately 40m the right hand side. The river bed width is approximately 60m and the river is tidally affected at this location. The elevation of the flood plain is typically between RL+1.0m and RL+2.0m.

It is suggested by Environment BOP that stopbanks along the Kaituna River as well as along the Kopuroa and the Raparapahoe Canals have subsided since their construction and investigations into the extent of subsidence is being carried out by the Regional Council.

3.4.1.3 East of the Kaituna River

The proposed alignment east of the Kaituna River cuts through two areas with typically different drainage characteristics. Firstly, the flat low lying area near the Kaituna River, not dissimilar to the previously described flat areas near Parton Road in the west, and secondly a distinctly higher and undulating area from Te Tumu to the SH2/SIH33 intersection.

The entire alignment east of the Kaituna River lies within the catchment serviced by three pumpstations. Two of the pumpstations, the Diagonal Drain Pumpstation and the Ford Pumpstation, discharge into the Kaituna River, and the Maketu Pumpstation discharges into the Maketu Estuary. The drains leading up to the pumpstations interact and the combined pumpstations effectively service one catchment stretching from the Paengaroa- Maketu Road in the east, SH2 in the south and the Kaituna River on the west and north.

The predominant land use in the flat area is dairying and the area is dissected by a large number of minor and major farm drains and a small number of major drains which are maintained by the Regional Council. Surface ground elevation vary typically between RL+1.0m and RL+2.0m. The drainage system runs typically from west to east and from south to north except in the most northerly area between the Kaituna River and the Lower Kaituna Wildlife Management Reserve (DOC Reserve) where the drainage is directed towards the south to the drain along the south side of Kaituna Road west.

The DOC Reserve alongside the River and north east of the road alignment is independently managed as a wetland reserve. In May 1999 DOC constructed a new culvert in the Kaituna River stopbank to the north west of the Reserve. This allows high quality fresh water to enter the reserve and it is anticipated the water will maintain the wetland habitat. DOC and the Eastern Fish & Game Council are monitoring the effects of this recent inflow of water. The provision of this new culvert to the Kaituna River has enabled the pumps to be turned off at the culverts from the Diagonal Drain to the reserve.

The major water courses are the drain along the south side of Kaituna Road west, the Diagonal Drain between the above road and Pah Road, and the drain along the east side of Pah Road. Of these drains, the Diagonal Drain is the major watercourse with a catchment stretching as far back as SH2 in the south, Young Road in the east and the right hand Kaituna stopbank in the west. The Diagonal Drain has in the past been stopbanked along its eastern bank as a defence against Kaituna River floodwater prior to the stopbanking of the Kaituna River. The Diagonal Drain stopbank has been lowered in places and does not act as a (secondary) flood defence any longer. However, there are no physical drainage connections between the Diagonal Drain and the area east of the Diagonal Drain.

The Diagonal Drain catchment also includes a small catchment between the Kaituna River, SH2 and the East Coast Main Trunk Railway (ECMT) near the Tuhourangi Marae. This

catchment drains to the south via a 600mm diameter culvert below the railway embankment into the Diagonal Drain catchment. However, an approximately 80m long section of the Kaituna River right hand stopbank was never constructed and floodwater from the river could potentially flood the adjacent farm land and discharge through the culvert below the railway embankment.

Generally the larger Regional Council drains are cleaned of plant growth by means of a mowing boat. This boat passes through the larger culverts and is 3.0m wide, requires a draught of 1.0m and a headroom above the water of 1.5m.

The flat area between the Diagonal Drain and Pah Road flows towards Pah Road and discharges via the Pah Road drain to the north. The remaining flat area east of Pah Road generally drains to the north via minor and major farm drains which eventually discharge into Regional Council maintained drains.

The area from Te Tumu to the SH2/SH33 intersection consists of a rolling, undulating area with a predominant land use of dairy farming in the north and kiwifruit orchards in the south. Existing ground elevations rise typically from RL+6.0m to RL+20.0m. The southern catchment boundary is more or less along the present SH2 alignment and from there some major depressions run through the area, generally in a south to north direction. Some of the depressions have defined watercourses further downstream which eventually discharge via farm drains into Regional Council maintained drains. The soils are permeable and stormwater does not appear to pond very long in hollows and depressions, even where these have no outlets.

Near the SH2/SH33 intersection, part of the catchment is cut off by the ECMT embankment. Apart from one stormwater culvert (a 300mm diameter pipe with a later addition of two 110mm diameter pipes at a lower elevation) there do not appear to be any other stormwater culverts below the railway embankment. There are two more distinct depressions cut off by the railway embankment which rely on soakage for stormwater discharge.

3.4.2 DRAINAGE DESIGN ISSUES

3.4.2.1 General Design Philosophy

General

The stormwater design will be carried out with minimal interference with the major drains. All major flow paths will be maintained in the existing locations and be of sufficient capacity to have minimal impact on the upstream catchment flood levels.

General design issues were discussed with Environment BOP in August 1998, and the design philosophy adopts the issues which were discussed.

Unless otherwise stated in this report culverts passing under the proposed road embankment will be designed for the passage of 50 year return flood events or greater if

required for flood level balancing. Heading up (i.e. the rising of the water level) at culverts will not occur until a greater than 10 year return event.

It is understood that the existing drainage channels are generally designed for 10 year return flood events. Fifty year storm events will therefore pond extensively about these channels (but not about the proposed culverts) which will have an attenuating effect on the flood peaks downstream.

Indicative locations of proposed water course and culvert crossings are shown on Figure 3.9.

Flat Areas

In the flat areas, the roading embankment will be provided with drains, parallel to the road centreline, along the toe of the road embankment on the **upstream** side of the road. This drain will "collect" water from the minor farm drains and from the road and embankment, and convey it to the nearest culvert crossing below the embankment. These culverts will be located where there is an adequate drain downstream to convey the flow away.

On the **downstream** side of the road embankment a swale type drain will be provided. A swale is a shallow normally dry grassed channel only conveying stormwater during storm periods. These swales will convey the stormwater from the road and embankment to the nearest existing drains. They will also contribute to the treatment of stormwater.

The use of small bore culverts will be avoided in the flat catchments as these are prone to blockages, especially when long and affected by settlement. The minimum culvert size in the flat areas will therefore be 900mm diameter.

Existing major farm drains and all major Regional Council maintained drains will be culverted under the road embankment. Potential settlement of major culverts will be assessed and where required mitigating measures such as oversizing or piling will be considered to ensure the proper long term functioning of the culverts.

Undulating Areas

In undulating areas roadside drainage will generally be provided for by swale type drains at the toe of cuts and of fill embankments. Culvert crossings will be provided at all major depressions where there are existing water courses or flow paths. Major depressions without existing water courses will be directed towards the nearest depressions with a water course.

Minor depressions without existing water courses will remain unchanged and no roadside drainage will be provided in order not to concentrate the stormwater. In these areas stormwater will naturally discharge to soakage.

3.4.2.2 Major Drain Crossings (Regional Council Maintained Drains)

The drain to Bell Road Pumpstation "B" Drain

As this sub-catchment may be affected by occasional flooding, the flood water should be able to be discharged as fast as practically possible. The rate of discharge will largely depend on the existing capacity of Bell Road Pumpstation "B" or any (known) future capacity. The design of this culvert will therefore allow for the passage of water considering the above with minimal heading up at the culvert.

Bell Road Drain

The Bell Road Drain is stopbanked in the area of the proposed road crossing. During severe storms there is a threat of overtopping of the northern stopbank especially if any further improvement to the upstream drainage is implemented. Possible future improvement works (eg. raising of the embankments, widening of the channel and/or pumping) must be considered during the preliminary stage design. The rate of discharge through the proposed culvert will depend on the upstream channel capacity and on the downstream capacity of the outfall structure which in turn is affected by Kaituna River levels. Notwithstanding the above the culvert will be designed for the passage of the 50 year return rainfall event with minimal head loss through the culvert. The allowable head loss will need to be determined at the preliminary design stage but may be as little as 50mm.

Diagonal Drain and Kaituna Road West Drain

At low flows both the Kaituna Road West Drain and the Diagonal Drain cater for separate catchments. However, during high flow events these drains interact and will flow over into each other's catchment, balancing the flood levels. The design will consider this.

The culverts will be designed for the passage of the 50 year return period flood with a minimal head loss through the culvert but will not be smaller than the minimum dimensions required for the Regional Council's drain maintenance boat.

Pah Road Drain

The culvert in this drain will be designed for the passage of the 50 year return period flood with minimal headloss through the culvert but will be not smaller than the minimum dimensions required for the Regional Council's drain maintenance boat.

3.4.2.3 Kaituna River Crossing

The proposed river crossing will be a five span bridge between stopbanks with piers in the river and/or the flood plain. This will not significantly reduce the waterway area, and with appropriate design, is not expected to measurably effect upstream flood levels.

As the proposed crossing is in a tidally affected area storm surge levels will have an influence on flood levels. The highest occurrence of the following design cases are acceptable to Environment BOP:

- 1% AEP (100 year) flood combined with 5% AEP (20 year) storm surge
- 5% AEP (20 year) flood combined with 1% AEP (100 year) storm surge

Note: AEP = Annual Exceedance Probability

Storm surge levels must also contain allowances for expected sea level rises for the next 100 years (currently assessed at 0.49 m) and, if applicable, estuary effects (assessed at 0.33 m).

Bridge flow velocities will be considered when assessing the scour potential around piers and embankments.

Environment BOP is conducting a hydraulic model for the Kaituna River. The model will provide the expected river levels under varying flood conditions and the results will be incorporated in the Stormwater Management Plan done in conjunction with the preliminary design.

3.4.2.4 Future Land Use

The stormwater management (at final design stage) will recognise the future land use in the catchment areas upstream of the proposed road crossings. In accordance with the Proposed District Plans of both the TDC and the WBOPDC, the majority of the area is zoned rural except the Papamoa dune area to the north of the proposed alignment between approximately 1.0 km east of Parton Road and 1.0 km west of the Kaituna River which is zoned future urban.

3.5 GEOTECHNICAL CONSIDERATIONS

There is a large variation in the strength of the soils along the route, even though the terrain is gentle. The surface soils range from very weak peats to firm volcanic deposits and sands.

For some 2.5 kilometres from Domain Road to east of Parton Road, the alignment crosses over an extensive area of peat. The alignment then follows the sand dune boundary eastward to the Kaituna Bridge. In the section south-east from the Kaituna Bridge for approximately 3.5 km to north of Youngs Road (approx. meterage 12,000) there are fresh water and estuarine swamp soils, overlying sands or volcanic ashes. From meterage 12,000 to the Paengaroa junction the alignment encounters fingers of volcanic ash.

Cone penetration tests will have to be carried out at the detailed design stage to confirm the extent of the peat and the deep swamp deposits. Differential settlements along the road alignment may result from the varying depths and strengths of the underlying soils. Where the peat deposits are less than 2 metres, these should be excavated and replaced

with sound fill. For deeper deposits road strengthening methods will need to be considered. These should include the following:

- staged and preloading of construction areas
- using geogrid and geotextiles
- using stone columns and vertical drainage techniques
- using lightweight fills
- providing embankment toe stabilisation bunds

It should be noted that the on-going maintenance requirement for road embankments built on peat will be greater than for roads built on firmer foundations.

Volcanic soils extend from the Papamoa and Rotorua hills in various fingers towards the coast. SH2 skirts around the base of the hills and joins onto a finger extending from a large area of volcanic soil from Young Road to Paengaroa. Brown Road, Rangiuru Road, Te Tumu Road, Tapsell Road and Maketu Road are all located on fingers of this soil type. No particular difficulties with road building are expected in these soils.

There are two main groups of sand in the study area. The dune sands are found predominantly along the coast, but there are some isolated pockets inland in the Waitaha area and to the north of Kaituna Road. Reworked alluvial sands are found along the edges of the Kaituna River and in old stream flowpaths. The dune sands will provide good road foundations. The alluvial sands are slightly weaker as they can contain some silty and clay layers and can overlay weaker materials.

Construction of a road on this alignment is feasible provided it is accepted that special, and possibly expensive construction techniques will be required in areas of soft foundations and there will be higher than average on-going maintenance costs.

The following section describes some of the construction techniques.

3.6 CONSTRUCTION

3.6.1 EARTHWORKS

Where peat deposits are less than two metres deep, the peat should be excavated and replaced with free draining fill. Where the peat is greater than two metres deep, vegetation only should be removed and construction carried out using a combination of the techniques given in Section 3.5 above. The preloading operations should be carried out ahead of other earthworks.

Substantial quantities of fill are required for the project. Rock is available from the Papamoa hills or Maketu quarries for use as a granular free draining fill material. Considerable savings could accrue if sand and/or pumice mining operations were permitted in the area at the time of construction. Their use as alternative fill materials should be thoroughly investigated at the detailed design stage. Sand is an extremely

suitable fill and foundation drainage material and pumice is an excellent lightweight fill. Use of pumice fill would reduce the settlement of the underlying foundation and consequently the total amount of fill required.

The exposure of large areas of earth during construction will cause sediment contamination of local streams and rivers. This will be prevented by normal erosion and sediment control practices, such as the use of cutoff of drains, sediment retention ponds, and the filtering effects of the existing grassed surfaces. All cut and fill surfaces will be grassed or hydroseeded as soon as possible to reinstate natural surface protection. Prior to construction a comprehensive sediment control plan would be prepared.

Dust could also be a problem, with rubber tyred vehicles moving across exposed surfaces and along unsealed access roads. An earthworks management plan, including dust minimisation, would be devised to minimise the length of time these vehicle movements were required in any one area. In the short term water, possibly with a suitable additive, would be used to control the dust. This would have to be extracted from a local stream or river with sufficient flow to prevent damage to aquatic life. Designated pumping areas would be required. Use of sand fill would enable construction in the winter, however the high winter ground water level would reduce bearing capacity and increase excavation difficulties. Therefore summer construction will probably be preferred.

Fuel and oil storage, plant servicing and plant parking could lead to spillages of hydrocarbons. Storage facilities would have to be properly bunded and there would be designated plant servicing and parking areas away from flowing water. Environmental and construction management plans would be prepared as part of the resource consents to detail how this will be done.

Similar measures to control sediment contamination and dust will also have to be provided if quarrying operations were part of the project.

As has been stated in Section 1, resource consents for such works will be gained when funding is available for design and construction funding is likely.

3.6.2 CONSTRUCTION IN WATERWAYS

Drainage facilities and systems and bridges crossing waterways are described in more detail under Section 3.4 Bridge Structures and 3.6 Stormwater Management. The construction of bridges across waterways, or the placement of culverts in waterways could result in contamination. This can be minimised by the following means:

- the placement of concrete in fully encased conditions with no through flow of water
- use of only clean rockfill and backfill for culvert placement
- construction of silt traps downstream of culvert placement locations where the flow is small enough
- disposal of excavated material away from the stream bank

- care in locating fuel, plant and material storage areas

3.6.3 NOISE

Construction work would be restricted to reasonable hours such as 7.00am - 8.00pm Monday to Saturday, and 8.00am - 6.00pm on Sunday. It is not expected that any blasting would be required. Construction noise is discussed in greater detail under Section 5.5, and would be subject to a noise management plan.

3.6.4 LOCAL TRAFFIC/HEAVY TRAFFIC

The alignment and construction of the TEA is generally away from local roads and residential areas. Once the large construction machinery has been delivered to a location along the new alignment, there will be limited need for further movement of this plant along local roads. Other than the supply of fill material, the main daily traffic will be labour and fuel.

A large quantity of granular fill is required and this could be imported either from quarries in the Papamoa hills or Maketu, or if permissible at time of construction, from sand and/or pumice mining ventures. This could at times cause a large volume of truck and trailer traffic. Consideration will be given, prior to construction, of providing a temporary bridge crossing the existing State highways at either Domain Road or at Paengaroa to provide access for the fill material to the new alignment. Once on the new alignment. It is probable the construction traffic will mainly be on the new road formation or on specially constructed access roads within the alignment itself.

There will be some disruptions to local traffic while bridges are being constructed at Parton Road and Maketu Road. However access will always be maintained during construction. Similarly the interchanges at Paengaroa and at Domain Road will be programmed to permit two-way access along the State highways to be maintained.

3.6.5 STAGING

The Tauranga Eastern Arterial may not be built in one construction programme. The staging will depend on the economic benefits and the impact on the local roading network. The possible staging could see the earthworks being carried out for the full four lanes, but with only two lanes being completed. Also as an interim measure roundabouts at the junctions of Domain Road and Paengaroa could be provided before the ultimate full grade separated junctions are constructed.

Monitoring of traffic growth rates, crashes and the consequential benefit cost ratio will determine the appropriate staging of construction.

3.7 FUNDING

This Transit project is subject to Transfund New Zealand's current funding arrangements which require the ratio of economic benefits to costs to be equal to or greater than 4. The benefits include such things as savings in travel times, a reduction in vehicle crashes and accidents, and a reduction in vehicle operating costs. The costs amongst other matters include full design and construction costs, environmental mitigation costs, and land purchase costs. Based on the current economic funding regime and projected traffic volumes this project would attract funding from Transfund New Zealand in the year 2011.

The Sandhill Route (1993), Swamp Route (Option B) and Alternative Route (Option A3) were all analysed to determine the benefit cost ratios from an analysis period comprising 25 years from 1 July 1998 to 30 June 2023. Based on the costs of a 4 lane expressway with a 9m grassed median, the costs and benefit cost ratios of the options (excluding the Te Maunga to Domain Road section) are as follows:

Option	Cost \$ million	Indicative B/C Ratio	Incremental B/C Ratio Over Alternative Route
Widening of Existing Alignment (Option C)	160	0.2	N/A
Sandhill Route (4 lanes)	115	1.1	-5.2
Swamp Route (4 lanes)(B)	112	1.5	-1.2
Alternative Route (4 lanes)(A3)	100	1.8	

Note: B/C ratio includes intangible benefits from Te Puke WTP survey

This project is believed to have intangible benefits to the community such as improvements in :

- air quality
- traffic noise
- traffic vibrations
- community severance

These benefits were quantified by way of a Willingness To Pay (WTP) survey undertaken in Te Puke. This survey determined the amount people would pay to achieve such benefits and these results were included in the economic evaluation.

Compared to the Alternative Route (Option A3), the Sandhill Route and the Swamp Route (Option B) have incremental B/C ratios of -5.2 and -1.1 respectively. This means that for the additional costs, neither the Sandhill Route nor the Swamp Route (B) offer any additional benefits.

The net present value of benefits associated with Option A3 over the B/C analysis period was calculated to be \$148.26 million, 6% greater than the \$140.12 million associated with Option B. Whilst the benefit cost ratios of Option A3 and Option B are close, Option A3 provides the cheaper solution and is therefore considered to be the

most economical. With staged construction (construction 2 lanes initially) the indicative B/C for the chosen Option A3 is 2.0.

The benefits of this project are sensitive to the traffic flows, the proportion of heavy vehicles and the growth in traffic volumes. While the best attempt has been made to assess the likely future change in these items, they remain changeable and should be monitored.

The construction timing of this project will mostly be determined by its ability to attract funding from Transfund New Zealand. As it is clearly a beneficial project, it should be constructed immediately it meets the required criteria. This criteria is sensitive not just to the changes in traffic, but also to the evaluation procedures and criteria used by Transfund. As such it is believed to be essential that the ability of this project to meet the relevant funding criteria is monitored on a regular basis, with the full economic evaluation of the preferred option being reviewed at least every five years.

4. DESCRIPTION OF THE ENVIRONMENT

4 DESCRIPTION OF THE ENVIRONMENT

4.1 ECOLOGICAL CHARACTERISTICS

4.1.1 INTRODUCTION

The following is a summary of the Ecological Report carried out for the Tauranga Eastern Arterial. The full Report is attached as Appendix 4 in Volume II. This section focuses on the ecological aspects of the proposed alignment. It does not consider aspects such as recreational or amenity values, such as the use of some areas for waterfowl and "upland" game hunting. Recreational values are considered in Section 4.6. shows the ecological value of different areas along the TEA.

Subsequent to the original proposal for TEA, the proposed roadway alignment was moved to avoid all the areas of remnant kahikatea vegetation to the north of Kaituna Road, which are situated in an otherwise grazed area of the Lower Kaituna Wildlife Management Reserve (Figure 4.2). As a result of this modification the TEA alignment will traverse land which is comprised predominantly of grazed pasture.

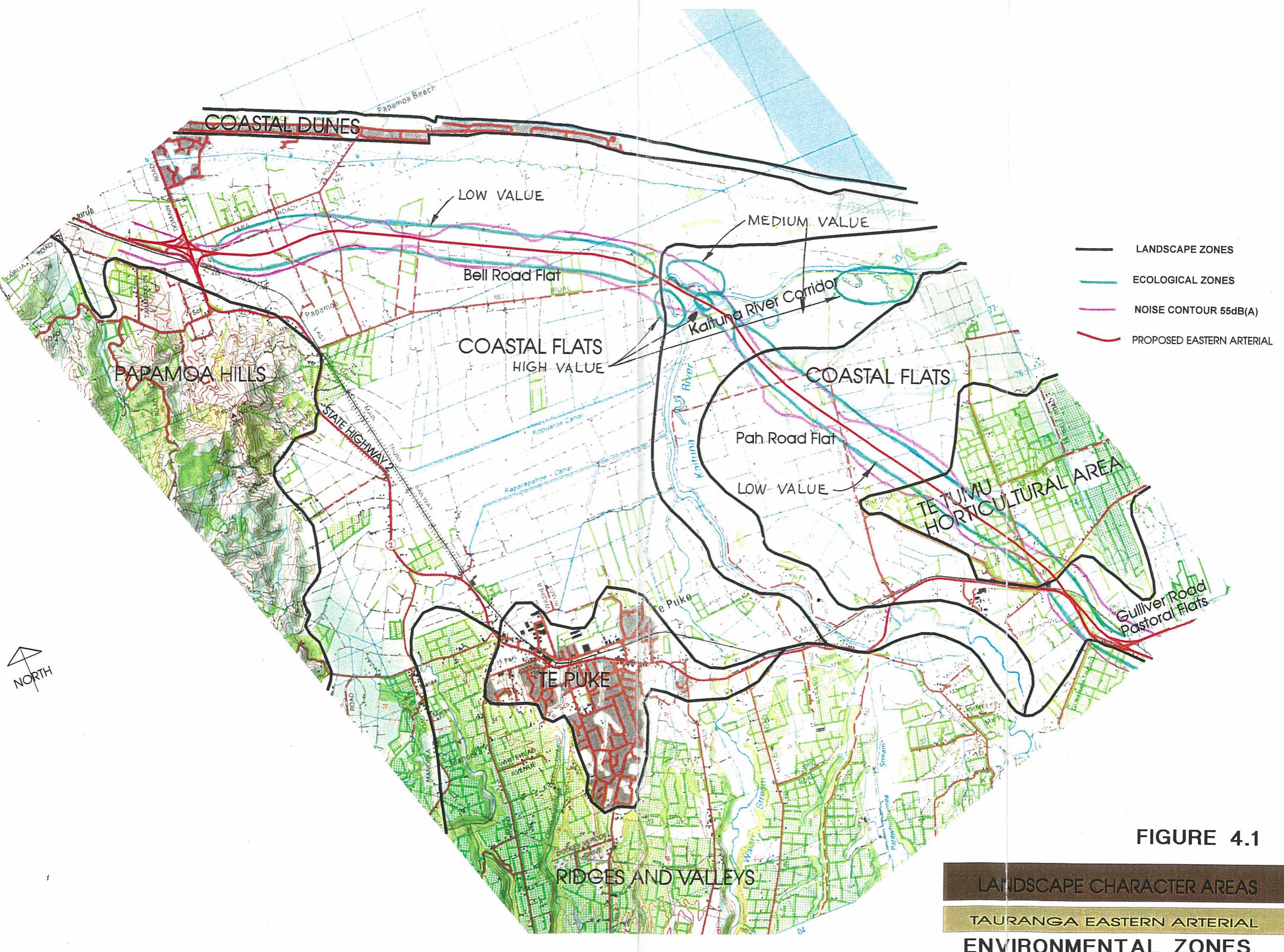
The TEA will cross several waterways as follows:

- a waterway draining into the Bell Rd oxbow of the Kaituna River
- the Bell Rd oxbow (itself to the north-east of the Niccol property entrance)
- the Kaituna River to the south-west of the present launching ramp and carpark
- the Waimarae Stream which flows into the western section of the Kaituna wetland
- several large constructed drains

A total of six sites were sampled for aquatic biota and five for water, sediment and elutriate quality prior to the installation of the new Kaituna River culvert (in 1999). Specific surveys to document the vegetation and wildlife features were also completed. An additional part of the brief for this survey was to provide comment on some areas of the Lower Kaituna Wildlife Management Reserve.

4.1.2 PREVIOUS INVESTIGATIONS

The Eastern Arterial roadway would lie in the Tauranga Ecological District, a summary of which is contained in Appendix 6.1 of the full Ecological Report attached in Appendix 4.





LOWER KAITUNA WILDLIFE
MANAGEMENT RESERVE

FIGURE 4.2

BIORESEARCHES

Irving, 1991 following the preliminary botanical survey of Miller, 1983 considered that the whole Lower Kaituna Management Reserve (“*apart from pasture and rough pasture areas*”) should be ranked as being of high botanical value (i.e. it is the last or one of the last few remaining areas of a vegetation type within an Ecological District in a modified condition but retaining the main elements of composition and structure.

Both Irving, 1991 and Beadel, 1994 use rankings for botanical conservation developed by Shaw 1988, 1994. Those rankings in descending order of significance are exceptional (=national importance), very high (= regional importance), high (= district importance) and moderate (= local importance). This scale is comparable with the NZ Wildlife (now DOC) ranking system for indigenous fauna. International botanical sites are those containing ecological processes, vegetation types or taxa that have significance beyond New Zealand because of (a) features so special that they have an international profile and (b) they are of importance for international research (e.g. comparable with similar features in other countries).

The Department of Conservation (DOC), 1996 describes the “Maketu-Waihi Estuaries and Kaituna River Mouth Complex” as a significant wetland habitat complex in an international context. That area of c.863 ha comprises the Waihi Estuary, Maketu Estuary and the adjacent Kaituna River mouth. The description in DOC, 1996 does not, however, include specific reference to the Lower Kaituna Wildlife Management Reserve which is adjacent to the proposed alignment (refer Appendix 6.2 of Ecological Report, attached as Appendix 4 of this report). It is understood that the Lower Kaituna Wildlife Management Reserve was too dry at the time of the comparative evaluation to be included in the wetland complex.

The Proposed Regional Coastal Environment Plan (Environment BOP, 1995) also lists the “Maketu/Waihi Estuaries and Okurei Point” as being an Area of Significant Conservation Value (ASCV) but the wetland area adjacent to the proposed alignment is excluded on the basis of its being beyond the coastal zone. The landward boundary of the Coastal Zone is defined as whichever is the lesser of -

- (i) “*1 km upstream from the mouth of the river; or*
- (ii) *the point upstream that is calculated by multiplying the width of the river mouth by 5.*”

The EBOP, 1995 Summary is shown in Appendix 6.3 of Ecological Report, attached as Appendix 4 of this report.

The proposed Bay of Plenty Regional Land Management Plan lists the “Kaituna River and Wetland/Lower Kaituna Wildlife Management Reserve” as being a significant wetland habitat. The listed habitats essentially follow Rasch, 1989.

Beadel, 1994 considered the botanical values of Kaituna River freshwater wetland, which is included in the “Maketu/Waihi Estuaries and Okurei Point” ASCV, to be of importance in the context of the District; it was not considered to be of Regional or National Significance. Maketu Spit and Waihi Estuary were also considered to contain vegetation of significance within the District (Appendix 6.4 of Ecological Report, attached as Appendix 4 Volume II) of this report).

Nearby areas of coastal vegetation of higher significance were the Kaituna sand dunes (National significance) and the Te Arawa freshwater (Maketu-Waihi) wetland which is of Regional significance (Appendix 6.2 of Ecological Report, attached as Appendix 4 of this report).

Badel, 1994 notes, however, that the “Kaituna River” vegetation is contiguous with a larger area (i.e. that closer to the proposed alignment) which is outside the coastal zone.

Rasch, 1989 (based on 1982-84 field surveys) rated the “Kaituna River and Wetland/Lower Kaituna Wildlife Management Reserve” (i.e. 22 km of river and 50 ha of wetland) as being of “High” wildlife value. The 50 ha area of wetland at the “Matakana Island Wildlife Refuge” was considered to be of “Outstanding” wildlife value (Appendix 6.5 of Ecological Report, attached as Appendix 4 Volume II).

The total area of the Lower Kaituna Wildlife Management Reserve is c.229 ha. Of that area c.56 ha are presently leased as grazing land by the Department of Conservation.

The comment in Rasch, 1989 regarding a 50 ha area of wetland having a “High” wildlife value appears to significantly underestimate the area of notable habitat within the Reserve relative to similar remaining areas in the District.

Garrick, 1990 summarised the natural features of the Reserve based on a description of the area prepared in 1980. Between 1980 and 1990 there had been no formal surveys undertaken within the Reserve although the area had been briefly inspected by a botanist in 1983. Garrick, 1990 concluded that *“on the basis of size alone then, the Lower Kaituna Wildlife Management Reserve is of considerable local and regional significance in terms of its existing and potential values as wildlife habitat. In terms of*

representativeness, that is, as an example of a freshwater wetland type which formerly characterised the area, the reserve is of lesser significance than some of the other wetlands which occur within the region due to the many unnatural and modifying influences which have acted on it and the future management undertakings which will be required to maintain it as a wetland. Nevertheless the area is still of some importance in this regard as an example of a 'landform' or ecosystem which has been severely reduced in extent elsewhere."

At present the Lower Kaituna Wildlife Management Reserve area is managed by the Department of Conservation with particular regard to high flora and fauna values of the northern portion. The Eastern Fish and Game Council manages, on a day-to-day basis, the remainder other than the pastoral land and has overseen the excavation of considerable areas of the wetland to create waterfowl habitat. That area, predominantly in the south-eastern section, as well as other areas, is utilised for waterfowl and "upland" gamebird hunting.

The Department of Conservation's Management Strategy lists the following regarding the Lower Kaituna Wildlife Management Reserve:-

Issue

"4 Joint management of the Lower Kaituna Wildlife Management Reserve is between two different agencies (the Department and Eastern Region Fish and Game Council) result in differing objectives for management of the Reserve."

Management

"4 Raise and maintain water levels (about 1 m above Moturiki datum) in the Lower Kaituna Wildlife Management Reserve in conjunction with the Environment BOP.

5 Divide the Lower Kaituna Wildlife Management Reserve into :

- areas essential for protecting representative ecosystems; and*
- areas which could be used for gamebird and waterfowl hunting.*

The latter areas would be managed by Eastern Region Fish and Game Council, through appointment to control and manage under the Reserves Act 1977.

Priority activity for Tauranga Management Area

- *Manage the freshwater wetlands on Matakana Island and Kaituna to ensure their long term viability."*

The management regime for the reserve is described in Section 4.6.4 and Appendix 8.

The Kaituna River provides habitat and a migratory pathway for a diversity of native fish (refer Section 2.3.2.3 of Ecological Report, attached as Appendix 4 Volume II) but was not considered to be a wetland area of national importance to fisheries (Davis, 1987). Maketu Estuary was considered to be of "significant" but not "outstanding" fisheries value; "*This estuary is important to the Maori people as a traditional fishing area, although it has been modified substantially by the local catchment board.*" (Davis, 1987).

Mitchell, 1990 identified whitebait spawning sites in the lower Kaituna River. Those sites are shown in Appendix 6.6 of Ecological Report, attached as Appendix 4 of this report, and are within the area identified by Beadel, 1994 as containing significant vegetation in the context of the District. That area is well beyond the proposed roadway alignment.

A whitebait survey of the Kaituna River was conducted by **Fisheries Research Division** (Saxton *et al*, 1987) in **1983** (August to November) which found that of 7973 whitebait analysed, 88.2% were inanga (*Galaxias maculatus*), 8.5% were banded kokopu (*G. fasciatus*) while 3.0% were koaro (*G. brevipinnis*). Of the total sample 0.3% were unidentified *Galaxias* species including giant kokopu (*Galaxias argenteus*) which was described as relatively insignificant in terms of the numbers present.

In general the Kaituna River was classified as an inanga-dominated whitebait river. On the basis of both mean and peak counts for the five main whitebaiting waterways in the Bay of Plenty (Rangitaiki, Waioeka, Whakatane, Kaituna Rivers and Pongakawa Stream) the Kaituna River was rated as the fourth in order of importance as listed respectively above.

Therefore the most significant habitat traversed by the TEA alignment would be the Kaituna River mainstem upstream from the existing boat ramp and carpark.

The most significant nearby habitat is the non-pasture area of the Lower Kaituna Wildlife Management Reserve. The ungrazed area of the Reserve, which consists of c.130ha of wetland habitat and c.43 ha of scrub/sand ridge habitat, represents about 74% of the remaining, but once extensive, Kawa Swamp i.e. is the only large remnant

of the swamp remaining. In the context of the eastern Tauranga Ecological District it is the largest area of heavily vegetated wetland habitat, and on an areal basis is similar to the lower and middle reaches of the Kaituna River (Table 4.1).

Within the context of the Bay of Plenty Conservancy area the Reserve represents less than 1% of the total area of wetland habitat. The reason for the Reserve's exclusion from the "Maketu-Waihi Estuaries and Kaituna Mouth Complex" wetland was that it was too dry (i.e. did not contain sufficient or sufficiently high wetland values) at the time of the comparative assessments (DOC pers. Comm.). The recent installation of a new culvert should alleviate that situation on a permanent basis.

Of the c.130 ha of wetland habitat in the Reserve all areas have been modified to varying degrees by drainage works which had commenced in the 1920's () and the more recent Kaituna River Catchment Scheme which resulted in realignment of the River's mainstem. The most recent modification to the area has occurred in its south-eastern portion; Eastern Region Fish and Game Council has excavated a number of shallow ponds and planted native vegetation for the purposes of wildfowl shooting and habitat enhancement and has constructed vehicle and pedestrian access tracks around some pond perimeters. A number of permanent maimais are present. The Council also owns and administers a 7 ha Wildlife Refuge on the southern side of Waihi Estuary.

The term "wetland" is used in the sense defined in the text of the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention). Thus, wetlands are "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres". (DOC, 1996).

The following tables indicate the total area of wetland which exists in the ex Kawa Swamp, Eastern Tauranga Ecological District, Bay of Plenty Conservancy and Western Bay of Plenty District Council areas respectively, and summarises ecological values ascribed by various authors.

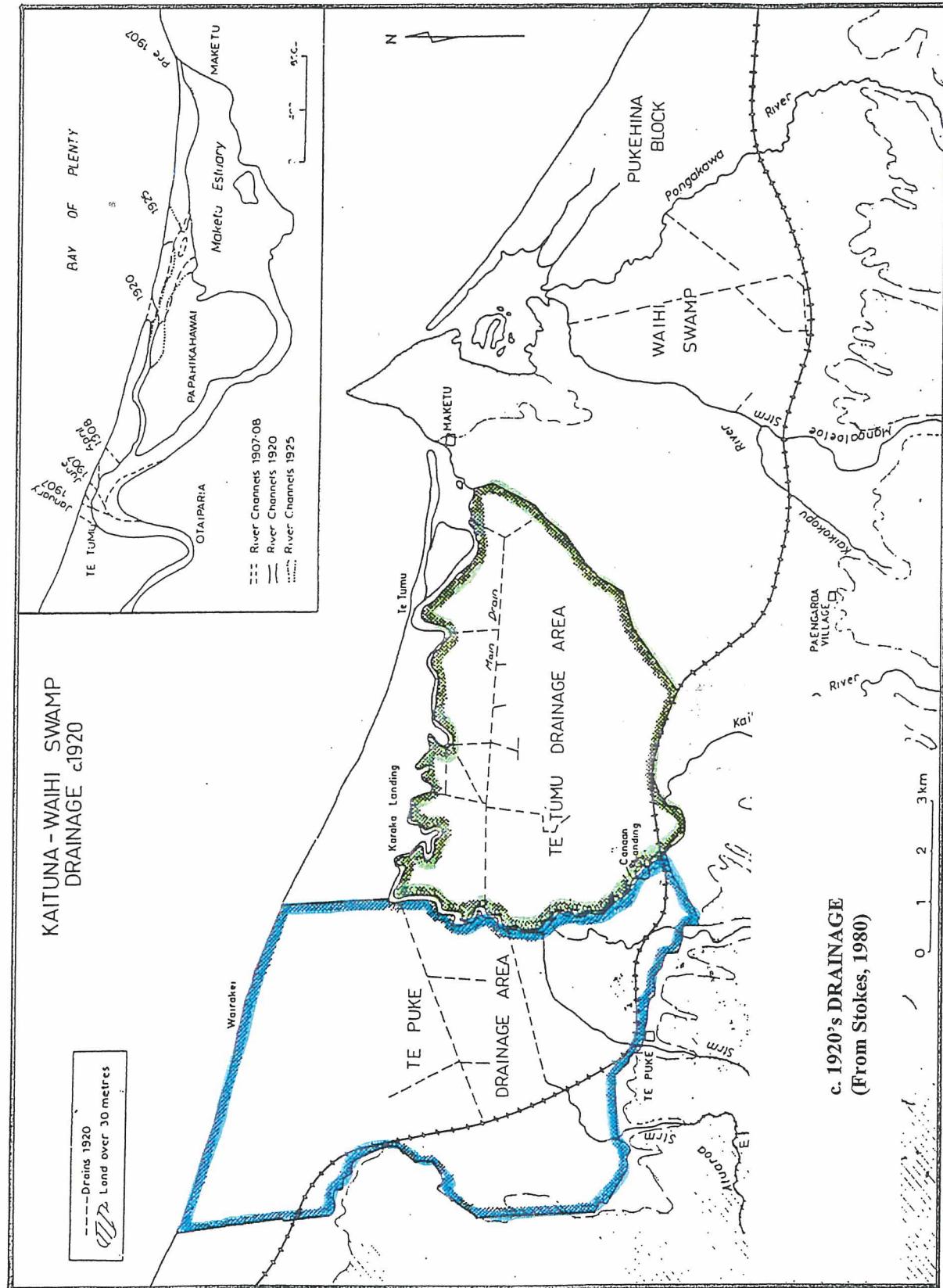


FIGURE 4.3

Table 4.1A Wetland Area Summary

KAWA SWAMP REMNANTS		
	ha approx	% total
Kaituna River (lower; Beadel, 1994)	34	19.3
Lower Kaituna Wildlife Management Reserve	130 (c)	73.9
Te Arawa wetland	12	6.8
TOTAL	176 ha	

EASTERN TAURANGA ECOLOGICAL DISTRICT (Mt Maunganui to Waihi Estuary)		
(notable wildlife and/or botanical freshwater wetlands; Rasch, 1989; Beadel, 1994)		
	ha approx	% total
Middle Kaituna River (10.5km)	32 (a)	9.3
Lower Kaituna River (22km)	110 (b)	32.0
Lower Kaituna Wildlife Management Reserve	130 (c)	37.8
Te Arawa wetland	12	3.5
Waewaetutuki (part)	60	17.4
TOTAL	344 ha	

- (a) 1.5km stated in Rasch, 1989 incorrect; based on nominal width of 30m
- (b) based on nominal width of 50m
- (c) total area: c.229ha
grazed c.56ha
75% remainder: c.130ha (25% scrub/sand ridge habitat).

BAY OF PLENTY CONSERVANCY (DOC, 1996)
(wetland sites of international importance)

Wetland Area	ha (approx)
• Tauranga Harbour	19554
• Maketu-Waihi Estuaries and Kaituna River Mouth Complex	863 (a)
• Ohiwa Harbour	2800
• Kaituna Catchment Lakes and Wetland Complex Lake Rotorua Lake Rototiti Lake Rotoehu Lake Rotoma	13253
• Upper Tarawera Catchment Lakes & Wetland Complex	7658
• Arahaki Lagoon	30
TOTAL	44158 ha

- (a) excludes Lower Kaituna Wildlife Management Reserve and Kaituna River areas.

The term "wetland" is used in the sense defined in the text of the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention). Thus wetlands are "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water the depth of which at low tide does not exceed six metres." (DOC, 1996).

Table 4.1B Wetland Area Values and Significance

KAWA SWAMP REMNANTS	Botanical	Wildlife
Kaituna River (lower; Beadel, 1994)	District Badel, 1994	High Rasch, 1989
Lower Kaituna Wildlife Management Reserve	High Irving, 1991	High Rasch, 1989 Local or Regional Garrick, 1990
Te Arawa wetland	Regional Badel, 1994	NR Rasch, 1989
EASTERN TAURANGA ECOLOGICAL DISTRICT (Mt Maunganui to Waihi Estuary)		
Middle Kaituna River	-	High Rasch, 1989
Lower Kaituna River	District Badel, 1994	High Rasch, 1989
Lower Kaituna Wildlife Management Reserve	As above	As above
Te Arawa wetland	As above	As above
Waewaetutuki (part)	District Badel, 1994	NR Rasch, 1989

NR = not rated

Also refer Appendix 6.4 of the Ecological Report (Appendix 8) – significant botanical sites in the Tauranga Ecological District.

Also refer Appendix 6.5 of the Ecological Report (Appendix 8) – significant freshwater wetland wildlife habitats.

Rankings (decreasing order of significance) : international, national, regional, district
: outstanding, high, moderate-high, moderate, potential

Garrick, 1990 stated that since 1980 "the wetlands have been subjected to prolonged periods in which inundation has been less frequent and extensive than was previously the case, and accordingly it is probable that there has been some change in the distribution and abundance, and possibly even presence, of certain flora and fauna. More extensive drying out of parts of the reserve during this period may also have resulted in some change to ground levels and contours through shrinkage and settling, and it is conceivable that the 1989 Edgecumbe earthquake may have had a similar net effect.

Evacuation and development of ponds in the vicinity of old river loops and water courses is likely to result in the creation of diverse and productive wetland bird habitat. However, much of the reserve elsewhere has an underlying peat horizon, and excavation in these areas may not produce the same diversity and quality of habitat. Bog or peat soils are more acidic and less fertile than mineralised soils and this should be borne in mind and investigated before development plans for the restoration and enhancement of the reserve are drawn up.

Currently resource information pertaining to the reserve is also inadequate. Prior to the formulation of any management or development plan, surveys of the distribution of flora and fauna within the area will be required. As previously indicated, flora of rare threatened status may be present within the reserve, as may be some vegetation associations not adequately protected elsewhere. Flora and fauna surveys would identify parts of the reserve that may require special attention; would assist with the design of an enhancement programme and management planning in general; and would enable a better assessment to be made of the reserve's significance to the Department of Conservation and to fish and game interests. Such information is needed to answer, amongst numerous other concerns, such questions as what weed management will be required, should certain areas be grazed, should a planting/revegetation programme be undertaken?"

The suggested courses of action of Garrick, 1990 which relate to the habitats of native flora and fauna were as follows:

- "7. *Undertake a botanical survey of the reserve to determine whether significant flora and/or vegetation associations are present within the area, and to provide such other resource information as may be required for management planning.*
8. *Undertake a wildlife survey to investigate the current distribution and abundance of species, and to describe and assess habitats."*

Plates of the sampling stations and general habitat are shown in Section 7 of Appendix 4.

4.1.3 VEGETATION AND FLORA

The TEA is situated in the low-lying coastal terrain c.5 km upriver from the mouth of the Kaituna River, on sandy alluvium or sandy peats. This ground was subject to intensive drainage projects near the beginning of this century, and the native vegetation, perhaps originally of flax/manuka scrub communities and kahikatea forest, is now found only on the wettest ground, towards the Kaituna River mouth.

No notable vegetation, individual trees of any particular botanical value or habitats containing a significant native flora would be traversed by the TEA alignment.

The nearest area of notable native vegetation is the remnant grove of kahikatea in the Department of Conservation grazing lease section of the Reserve (refer Plate 18 in Appendix 4). Restoration of kahikatea forest would be appropriate in this area, particularly if any replanted areas were contiguous with existing stands. Detailed descriptions of the nearby reserve vegetation are presented in Appendix 4.

4.1.4 WILDLIFE

Wildlife along the TEA alignment was documented by field survey, reference to Ornithological Society of NZ bird records , Garrick, 1990, the Department of Conservation's reptile and amphibian database. In general the wildlife values of the area which would be traversed by the proposed TEA alignment are low as a result of habitat modification, especially since 1980, for farming purposes.

The crossing of the Kaituna River would be in an area which has moderate wildlife values but which is typical of c.22 km (Rasch, 1989) of similar habitat.

The route would be adjacent to the western end of the Lower Kaituna Wildlife Management Reserve which has high wildlife values in the context of the ex Tauranga County (WBOPD), and upstream (by c. 5 km) from the Kaituna River mouth which is part of the "Maketu-Waihi Estuaries and Kaituna River Mouth Complex", considered to be a significant habitat in an international context. The Management Reserve adjacent to the proposed alignment was not included in the above wetland complex in DOC, 1996 because it was too dry at the time of the comparative evaluation.

The most notable wildlife habitat on the western side of the River adjacent to the alignment is the Niccol property section of the Bell Road oxbow which would be avoided.

On the eastern side of the River the most notable adjacent habitat is the Lower Kaituna Wildlife Management Reserve. Although the alignment would cross the western grazed area of the Reserve, it would avoid all areas of tall vegetation habitat including the remnant kahikatea stands. It is clear that the kahikatea-dominated area has been fragmented in the past but there is an opportunity to retire its surrounding grazed pasture and reinstate the former forest vegetation.

The most significant downstream wildlife habitat is the Kaituna River mouth area which is c.5 km from the proposed River crossing.

The Eastern Fish and Game Council constructed ponds within the Reserve provide feeding habitat for Australasian Bittern, but not breeding habitat; bittern were recorded in the Reserve in the 1982-84 wildlife survey. The ponds have increased habitat diversity in that area significantly.

In summary, although the TEA would be in close proximity to areas with a relatively high wildlife habitat value, no notable habitat would be traversed.

4.1.5 FRESHWATER HABITATS

4.1.5.1 Water, Elutriate and Sediment Quality

The TEA would traverse four natural waterways and a number of constructed drains, some of which are large.

Water, elutriate and sediment samples were collected at five sites - EA 1, EA 2N, EA 3, EA 4 and EA 5 (). Only the latter station was not directly on the proposed alignment but was sampled as a representative area of typical drainage habitat and because access could not be gained to the Pamment and Potter properties. Drains within those areas discharge to the Kaituna River via the Site EA 5 channel which forms the south-eastern boundary of the Reserve, and which is shown on the 1943 topographic map (refer) and as a distinct channel on the 1965 map () .

The aim was to determine whether any adverse effects would be likely, or whether there are any areas in which special measures in mitigation would be appropriate during the construction phase, because of a release of potential contaminants from the sediments.

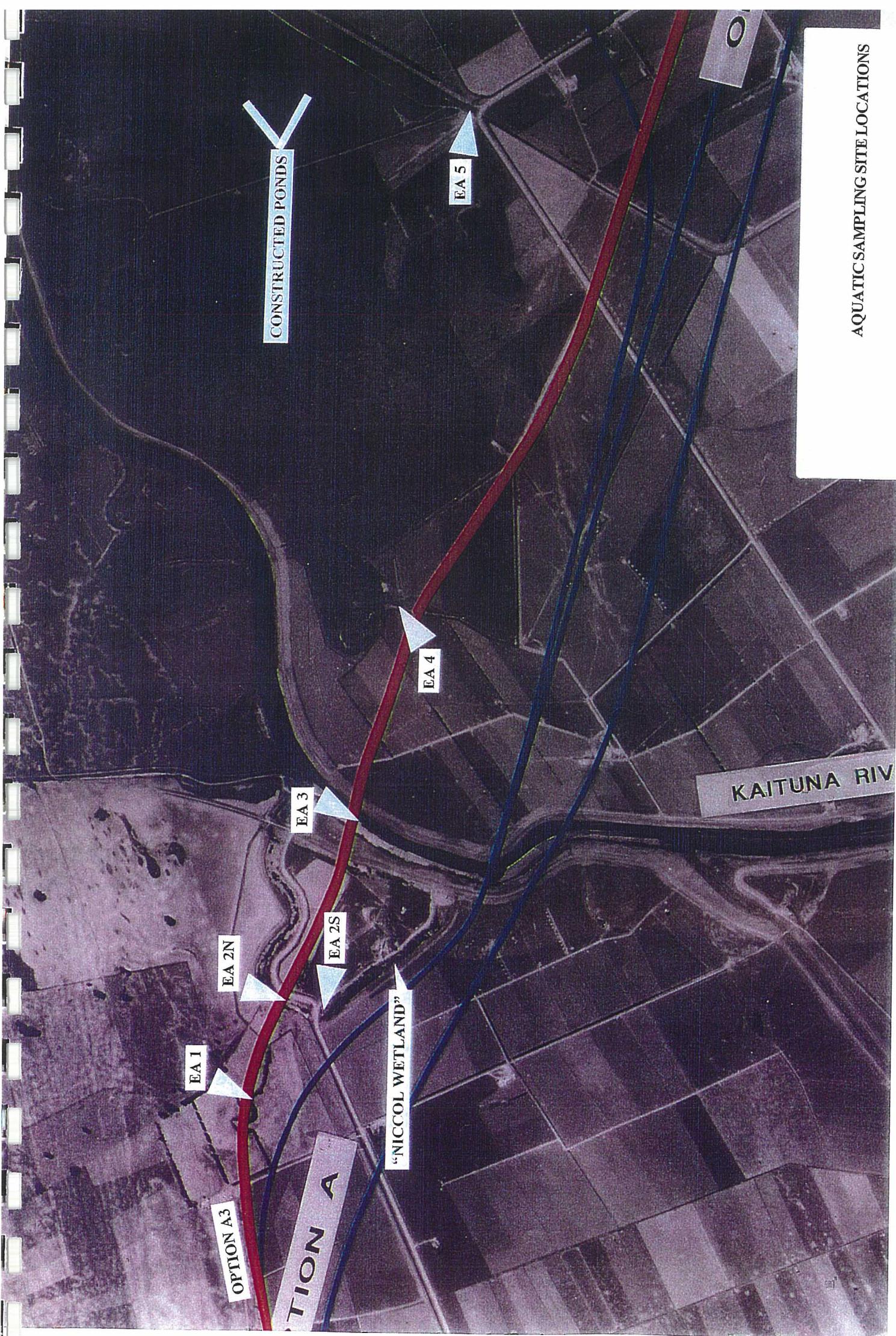
Samples were collected at the following sites shown in :

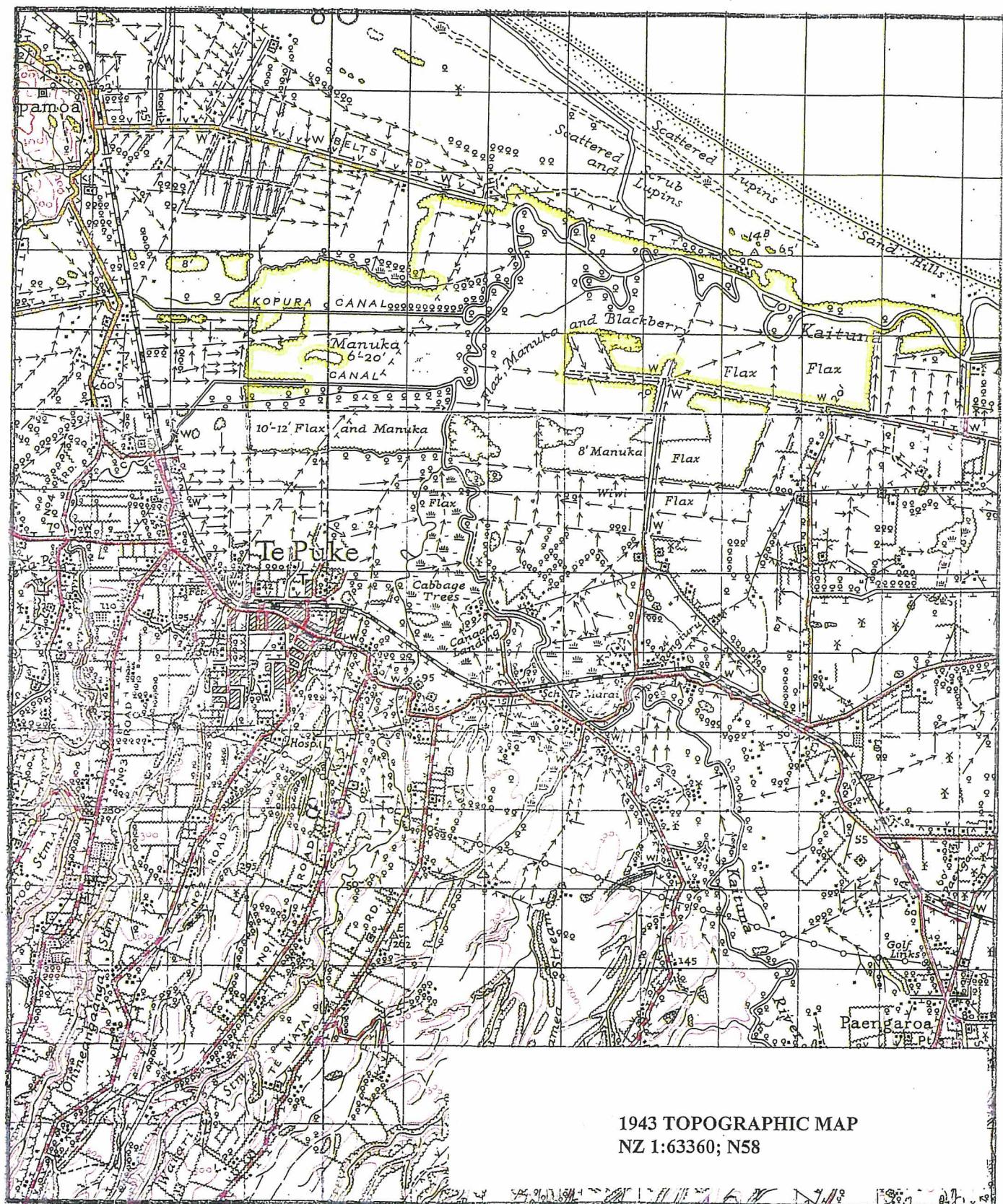
Site No ^(a)	Plate No.	Location
EA 1	1, 2, 3	By De Ley property north-west of Kaituna River oxbow.
EA 2N	5, 6, 7	Kaituna River oxbow on northern side end Bell Rd straight.
EA 3	9	Kaituna River mainstem upstream from carpark and boat ramp.
EA 4	10, 11, 12	Waimarae Stream in DOC Reserve.
EA 5	16	Main drain at Pah Rd right angled bend.

[(a) aquatic station numbers are constant for all following sections]

FIGURE 4.4

AQUATIC SAMPLING SITE LOCATIONS

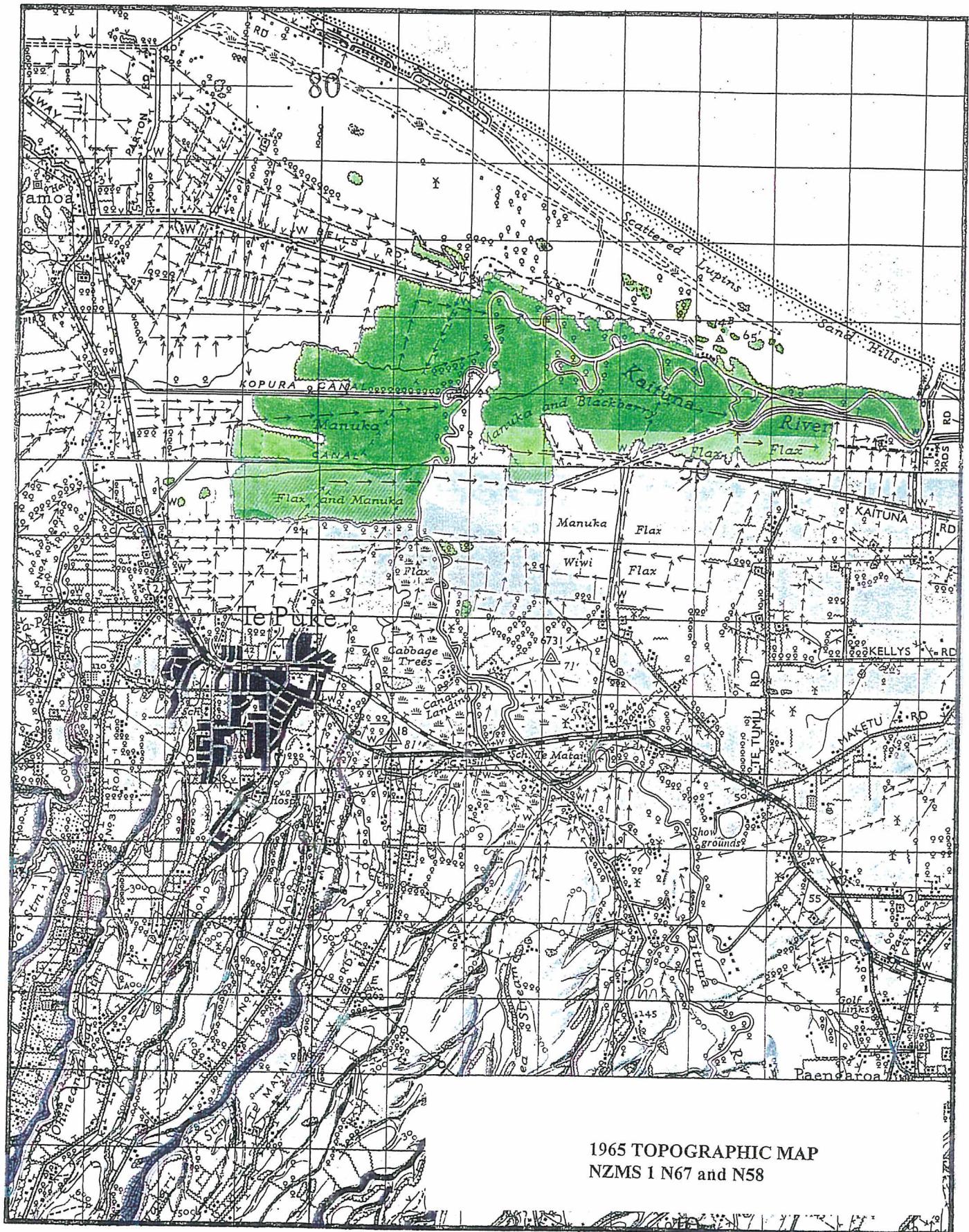




1943 TOPOGRAPHIC MAP
NZ 1:63360; N58

FIGURE 4.5

BIORESEARCHES



1965 TOPOGRAPHIC MAP
NZMS 1 N67 and N58

FIGURE

BIORESEARCHES

The constituents measured included a range of metals, total ammonia, sulphide, total petroleum hydrocarbons and a range of pesticides in recognition of the agricultural and horticultural use of the majority of the area.

Surface sediment samples were collected and analysed for grain size, copper, lead, zinc and total petroleum hydrocarbons. Those results better reflect the longer term influence of sources of contamination, enable the broad "contamination status" of the sediments to be established and can be compared with ten other sites which have been recently sampled in the same manner in the Bay of Plenty area (Bioresarches 1997(a), 1997(b), 1998).

All samples were collected on 3 August 1998.

Ambient Water and Elutriate Quality

Only total ammonia at the Kaituna River Site (EA 3) exceeded the chronic criterion for aquatic life protection in the elutriate. Concentrations of zinc in elutriate at both EA 3 and EA 4 (Waimarae Stream) were close to, but below, the chronic criteria, but the ambient concentration of zinc in Waimarae Stream was higher than the acute criterion. The relatively high elutriate levels (total ammonia, zinc) would require only minimal dilution to reduce their levels to those significantly below aquatic life protection criteria.

The presence of large quantities of organic matter in the Waimarae Stream may have buffered the potentially significant effect of the high zinc concentration as a reasonably diverse biota was present.

Sediment Grain Size

Sediments at EA 1 (By De Ley property) were reasonably well sorted but silts were dominant at EA 2N (Bell Rd oxbow) and the Waimarae Stream (EA 4).

The Kaituna River Site (EA 3) consisted of very fine sand and silt, while fine and medium sands dominated the Pah Rd Drain (EA 5) sediments.

The proportions of silts and clays at the five sites were as follows:-

		% silt & clay
EA 1	By De Ley property	10.2
EA 2N	Kaituna oxbow	41.3
EA 3	Kaituna River	40.5
EA 4	Waimarae Stream	44.6
EA 5	Pah Rd Drain	23.2

Based on results from other Bay of Plenty habitats (Table 9 of the full report) the proportions of silt and clay at EA 1 and EA 5 are relatively low while those at the remaining stations are about average.

Sediment Quality

The sediments in the proposed crossing areas have unexpectedly moderate levels of contaminants, with the exception of the Kaituna River mainstem as a possible result of a better flushing regime. Zinc levels are moderate-high at the By De Ley property site, Kaituna oxbow and Waimarae Stream; copper concentrations are moderate in the Kaituna oxbow and Waimarae Stream, and the lead level is also moderate in the Waimarae Stream. Petroleum hydrocarbons were recorded in the Pah Rd Drain.

Conclusions

Ambient waters at most of the proposed crossing sites are slightly acidic but Waimarae Stream has a very low pH. Concentrations of potential contaminants in ambient waters are generally low and within the chronic aquatic life protection criteria. An exception is zinc in the Waimarae Stream which is high and exceeds the acute criterion. Adverse effects may be buffered by the quantities of organic material present.

Elutriate concentrations of total ammonia increased at all stations but only exceeded the chronic aquatic life protection criterion at the Kaituna River site. Sulphide levels would present a potential threat to habitats, prior to any dilution occurring, at the Kaituna oxbow and Waimarae Stream sites. Dissolved oxygen levels were also low at both these sites (Refer Table 14; Section 2.3.2 of full report).

Although some constituent concentrations increased in the elutriate, as compared with background levels, no metal, pesticide or petroleum hydrocarbon would be expected to present a threat to adjacent habitats on disturbance of the sediments. Zinc concentrations at the Kaituna River and Waimarae Stream sites were close to the chronic criteria.

Sediments contained relatively low proportions of silts and clays at the By De Ley property and Pah Rd Drain sites, and average proportions at the remaining sites.

Sediment quality analyses for copper, lead, zinc and petroleum hydrocarbons, indicated that only zinc at the By De Ley property site exceeded the aquatic life protection guideline, but that zinc at the Kaituna oxbow site was also close to that guideline level. The highest copper-lead-zinc load was in the By De Ley property followed by the Waimarae Stream.

In comparison with results from other Bay of Plenty sites, zinc at the By De Ley property site, and copper at the Waimarae Stream and Kaituna oxbow sites are relatively high. Lead at the Waimarae Stream site is at a similar concentration to sites near State Highway 2. In general sediments at the proposed crossing sites contain unexpectedly moderate levels of copper, lead and zinc in particular, with the exception of the Kaituna River mainstem where relatively low levels were recorded.

4.1.5.2 Aquatic Biota

Aquatic macroinvertebrates were sampled at six locations, between Bell Road and Pah Road ().

The aquatic habitats at the sites surveyed were characterised by their low gradient flow, muddy substrate and lack of shading riparian vegetation. All sites were present in open, grazed paddocks. Sites EA1, EA2N, EA2S, EA4 and EA5 all had little or no visible flow, poor water clarity and very low oxygen levels (with the exception of Site EA5 with 8.3 g/m³; 80% saturation). Site EA3 on the Kaituna River mainstem had moderate clarity, and good dissolved oxygen levels (9.4 g/m³; 86% saturation).

Macroinvertebrate communities at most sites generally had low richness and moderate overall abundance. The two sites on the Kaituna River oxbow (Sites EA2S and EA2N) had the lowest taxa and overall abundance of the sites, with one and three taxa found respectively. Site EA3 on the Kaituna River mainstem had the highest overall abundance, due to a high abundance of freshwater shrimps (*Paratya curvirostris*) and high numbers of the snail *Potamopyrgus antipodarum*. The dominant taxon varied between the other sites; ostracods were abundant at Site EA1, chironomid larvae at Site EA4 and the red damselfly (*Xanthocnemis* sp) at Site EA5. Few sensitive EPT taxa were present; one caddisfly (Trichoptera) at Site EA2S (the only macroinvertebrate present at that site) and two mayflies (Ephemeroptera), one stonefly (Plecoptera), and one caddisfly at Site EA3 (Kaituna River mainstem). EPT taxa comprised only 1.8% of sample abundance at Site EA3. The poor habitat quality, slow flowing or still waters and muddy substrates at most sites are considered to be the limiting habitat characteristics for these macroinvertebrates.

Eels were recorded at four of the five sites surveyed, with no fish being recorded at Site EA4. The introduced mosquito fish (*Gambusia affinis*) was found at three sites and the giant bully (*Gobiomorphus gobiooides*) was found in the Kaituna River mainstem only (Site EA3). In general, all sites had a low diversity of fish species present during the survey. However, the diversity of fish in the Kaituna system is generally high. (Freshwater Fish Database; Young 1997).

This survey found that apart from the Kaituna River mainstem (Site EA3) the aquatic ecological values of the sites assessed were low. Degradation of the sites through farming practices and river diversion has resulted in conditions only suitable for a small range of fish and macroinvertebrates considered to be tolerant of conditions typical of low quality habitats, eg. poor water clarity, low dissolved oxygen and a mud substrate. However, the list of fish species in the river catchment (Table 15 of full report) highlights the importance of the lower Kaituna River as a pathway for the many diadromous native fish (that move between marine and freshwater) found in this catchment. The recent installation of the new culvert between the river and the reserve is expected to increase the use of the latter by fish.

4.2 VISUAL LANDSCAPE

4.2.1 INTRODUCTION

In carrying out a visual and landscape effects assessment two basic issues are addressed:

- (a) **The nature of the proposal and its existing visual environment.** The landscape context and the locality are described and an analysis of the present scene is carried out to ascertain those qualities and elements of the surroundings that might be affected by the development. The landscapes with similar homogenous qualities are identified.
- (b) **The specific effects that would be generated by the proposal.** In order for such change to be appreciated by the community, it must be visible from vantage points that offer some degree of public access. This means that the degree of visual effects will be greatly affected by the size and character of the viewing population. In this section the visual catchment and the viewing audience will be discussed. Landscape character areas and units will be defined and a number of viewpoints chosen, from which "before" and "after" photomontages have been prepared. The visual effects on the landscape units have been assessed, using both descriptive and analytical means.

Conclusions about the visual acceptability of the proposal are drawn, and the proposal is discussed in relationship to statutory provisions.

4.2.2 PREVIOUS LANDSCAPE STUDY

One landscape study has been undertaken in the past few years which covers a small part of the study area. Entitled Tauranga District Landscape Study Aug 1995¹, it divided Tauranga District into a number of landscape types and landscape character areas. There were two landscape types - Coastal Plain and Harbour (coastal hills and plateaux), and 25 landscape character areas which were defined by vegetation, land use and hydrological pattern.

The study only covered a small part of the area to be considered in this assessment ie the extreme western part. Part of one of the alignments passes through one of the landscape character areas identified. The description of this landscape character area was fairly general and suggested key issues for each of them. The landscape character area in which this option falls was identified as landscape character area 6 - Rural Flatlands. In describing this landscape character area the report states:

This area was typified by an extensive open flat pastoral landscape. Views are interrupted by willow shelter belts and small raised landforms on which many dwellings have been built in the past (Page 14).

¹Tauranga District Landscape Study . Boffa Miskell Ltd Auckland, for Tauranga District Council 1995

The study stated that parts of this area were undergoing rapid change from rural to suburban with the rapid encroachment of along the Papamoa Beach coastline.

Much of this area was once wetland fed by the Kaituna River and there are sand dunes along the coast. The landscape is crossed by a network of drainage channels.

In terms of this landscapes ability to absorb new developments the study states that:

The flat and relatively exposed nature of this landscape provides little immediate opportunity for the visual integration of new development. The study identifies urban encroachment as the most likely form of future development, and recommends that detailed assessments of landforms and vegetation should be carried out before any development is carried out.

The study goes on to say:

State Highway 2 which forms the southern edge of this unit, and southern entry to the district forms a significant viewing environment. The visual character of this important entry and the nature of the adjacent existing and future land use activity,needs to be considered with respect to creating an appropriate quality entry to the city.

The key recommendations from this study for this area were:

- the protection and management of the existing vegetation;
- provision and design of an open space network related to landform features;
- it is the “entry” point to District, and State Highway 2 is an important transport corridor.

No Outstanding Natural Features and Landscapes were identified in this area in this study.

4.2.3 THE WIDER LANDSCAPE CONTEXT

The landscape through which this option passes is sited on the coastal river flats east of Tauranga. The over riding quality of this landscape is its flatness, with, to the south, the Papamoa Range rising out of the very flat plain to heights of 200 - 300 metres above sea level. These landforms are the most visually obvious landscape features - rounded hills with both woodlots and clumps of mature trees on them, with some farm houses and rural residential properties in places. These hills are also peppered with pa sites particularly around Papamoa. State Highway 2 currently follows the base of these hills, and defines the point where the coastal flats meet the hills, and acts as the southern entry point into Tauranga District. A small portion of the State highway is slightly elevated and affords views north across the flats to the coastal sand dunes.

Another landscape feature, which is more difficult to discern in the wider landscape, is the Kaituna River which meanders through the area and has formed ox bow lakes in places around which willows, flax and other water loving vegetation has grown, and birds roost. The river finds its way to Maketu Estuary and the coast to the north east. The Lower Kaituna Wildlife Management Reserve is sited along a previously straightened portion of this river and is a Department of Conservation reserve. There are remnant groups of mature kahikatea in places near the river, and in the DOC reserve.

Back in the 1880's through to the 1930's the area between Maketu and Te Puke, particularly in the coastal flats, was a centre for flax production. At various times there were as many as eleven flax mills in the area. The *Phormium* flax species was used and was either harvested from naturally growing clumps alongside the rivers and streams, or was planted and harvested. In places the creeks or streams were dammed to provide sufficient water to provide water for processing the flax. *Phormium* species obviously grow well in this landscape as do cabbage trees and kahikatea.²

To the north is the coastline with its sand dunes, clumps of pine and scattered eucalyptus in places and wetland immediately to the south.

East of Pah Road, north of Rangiuru, the character of the landscape changes from open pastoral grazed land to enclosed fruit growing areas, and the landform becomes slightly undulating. Further east from this the kiwi fruit areas become more intermittent and the landscape again becomes pastoral.

South of Te Puke and Te Matai, outside the study area, the landform becomes more indented, with strongly defined valleys interspersed by flat ridges, which has been turned into a fruit growing area in the past 15 years.

The wider landscape therefore falls into 5 fairly distinct Landscape Character Areas:

1. Coastal sand dunes immediately south of the beach - Papamoa Beach;
2. Coastal pastoral (alluvial) flats;
3. Horticultural areas (predominantly kiwi fruit);
4. Papamoa Hills to the south
5. Area of strongly defined valleys interspersed by flat ridges south of Te Puke and Te Matai

The key landscape characteristics and features to be considered when looking at possible development are:

- The visual openness and visual exposure of the northern and western part of the study area ie the lack of landform or vegetation screening and the general lack of development through the area;
- Kaituna River and the ox bow lakes and vegetation surrounding them;

² *The Story of Te Puke* by Selwyn George Taylor. 1969. Chapter 14 - Flax Milling

- Kaituna Wetland Reserve;
- The historic use of flax in the area;
- The remnant kahikatea in places;
- The visually enclosed nature of the horticultural areas, with high shelter belts and some houses and shed development within it.
- The fact that this landscape forms the southern “entry” to Tauranga District

4.2.4 LANDSCAPE CHARACTER AREAS AND UNITS

The proposed arterial will affect two of the landscape character areas - the coastal pastoral flats and the enclosed kiwi fruit area. Within these two landscape character areas there are smaller landscape units as follows:

Landscape Character Area	Landscape Units
Coastal Flats	<ul style="list-style-type: none">• <i>Bell Road Flat</i>• <i>Kaituna River and immediate surroundings</i>• <i>Pah Road / Kaituna Road Flat</i>
Te Tumu Road Horticultural Area	<ul style="list-style-type: none">• <i>Te Tumu Horticultural Area</i>• <i>Gulliver Road Pastoral Flats</i>

Landscape character areas and units are identified in Figure 4.1. A full description of the landscape character and quality of these units follows.

4.2.4.1 Landscape Character Area - Coastal Flats

Bell Road / Pah Road /Kaituna Road Flats

These coastal flats comprise flat open exposed pastoral land, with the occasional hedge, poplar or willow shelter belt and drainage channels, and clumps of kahikatea to the east of Kaituna River. The landscape quality is generally low to moderate, as are the landscape heritage values from the pakeha perspective. There are farm houses in places though scattered fairly widely through the area, a few with mature trees around them. This unit is visually exposed because of its flatness. Bell Road area has a slightly more rural residential quality than the Kaituna Road flats which have a wilder more remote character. This is the area in which the Bell Road Interchange is located. Kaituna Road is backed by the Lower Kaituna Wildlife Management Reserve to the north.

Overall from the quality, pakeha heritage and numbers of people the landscape has a **moderate** sensitivity. However, its openness means that development of any height or prominence could be seen for a long distance.

Viewpoints 1 and 2 (shown in) illustrate the character of the coastal flats.

Kaituna River and Immediate Surroundings

The Kaituna River is lined with stop banks with walking tracks along the tops. The stop banks make the river hard to see from further afield. There are willows and rushes and flaxes alongside it in places. There are a number of ox bow lakes which have become detached from the river in past years. The river and the ox bow lakes are a significant landscape feature in the area, and are used extensively for recreational fishing and walking and a number of fishing boats are launched from the boat ramp at the end of Bell Road. Adjacent to the river there are a few remaining clumps of kahikatea.

The Lower Kaituna Wildlife Management Reserve is sited along part of the Kaituna River and incorporates some of the ox bow lakes used by local duck shooting groups. It is also characterised by large areas of native vegetation including cabbage trees, kahikatea, and a range of other native wetland plants.

The visual quality of this landscape unit is higher than the surrounding coastal flats, particularly because it is the only significant landscape feature on the flat plain. The visual catchment and permanent viewing audience is fairly small, though large numbers of recreational fisher people and duck shooters turn up at times. There are very few houses in the area. The key characteristic of this landscape is its "remoteness".

Overall this landscape unit has a **moderate** sensitivity.

Photographs 3, 4, 5, 6 and 7 (, and) illustrate the landscape character of the Kaituna River, the Wetland Reserve and the ox bow lakes.

4.2.4.2 Landscape Character Area - Te Tumu Horticultural Area

Te Tumu Horticultural Area

This landscape is divided into small enclosed spaces by shelter belts of Cryptomeria and others, containing kiwi and other fruit. Kiwi Fruit Country - a large retail outlet and tourist attraction - is sited on Young Road, just off the State Highway 2. The main landscape characteristic in this part of the study area is one of enclosure, with houses, gardens and sheds enclosed within the shelter belts.

COASTAL FLATS



Coastal Flats from Parton Rd

Photograph 1



Coastal Flats from Papamoa Hills

Photograph 2

The visual quality of this landscape unit is higher than the coastal flats. It has some cultural importance because of the local associations of fruit growing with the Tauranga area. The visual catchment is small because of the containment achieved by shelter belts. The viewing audience which currently passes through the area is small to moderate.

Overall this landscape unit has a **moderate** sensitivity.

Photograph 8 () illustrates the character of the Te Tumu horticultural area as seen from the Te Tumu Road.

SH33 / 2 Intersection / Gulliver Road

This landscape unit is rather disturbed visually. It contains the railway line, overhead power lines, a radio mast in the distance, and the intersection of State Highway 2 and 33. The visual quality is therefore fairly low. There are no landscape features which have endemic or cultural associations from the pakeha perspective. The landscape is fairly open, and a fairly large audience would see the proposals from the roads and railways in the immediate vicinity.

Overall the visual sensitivity of this landscape is fairly **low**.

4.2.4.3 Landscape Character Area - Papamoa Hills

Though this landscape character area is not directly affected by the Eastern Arterial, these hills are a distinctive feature in the area and views of the arterial will be gained from here.

This landscape character area comprises the rolling hills on the southern edge of the study area, which rise to heights of over 200 metres and form a prominent landform and landscape feature to the south. The hills are covered in pa sites, pastoral farms and exotic forestry. They command extensive views out across the coastal plains to the coast and the sea beyond. They also form a distinctive backdrop to the coastal plains. The hills have a **high** landscape quality.

Photograph 9 () shows part of Papamoa Hills from Parton Road.

Kaituna River



Kaituna River & stop banks from Kaituna River Road

Photograph 3



Oxbow lake at west end of Kaituna Road

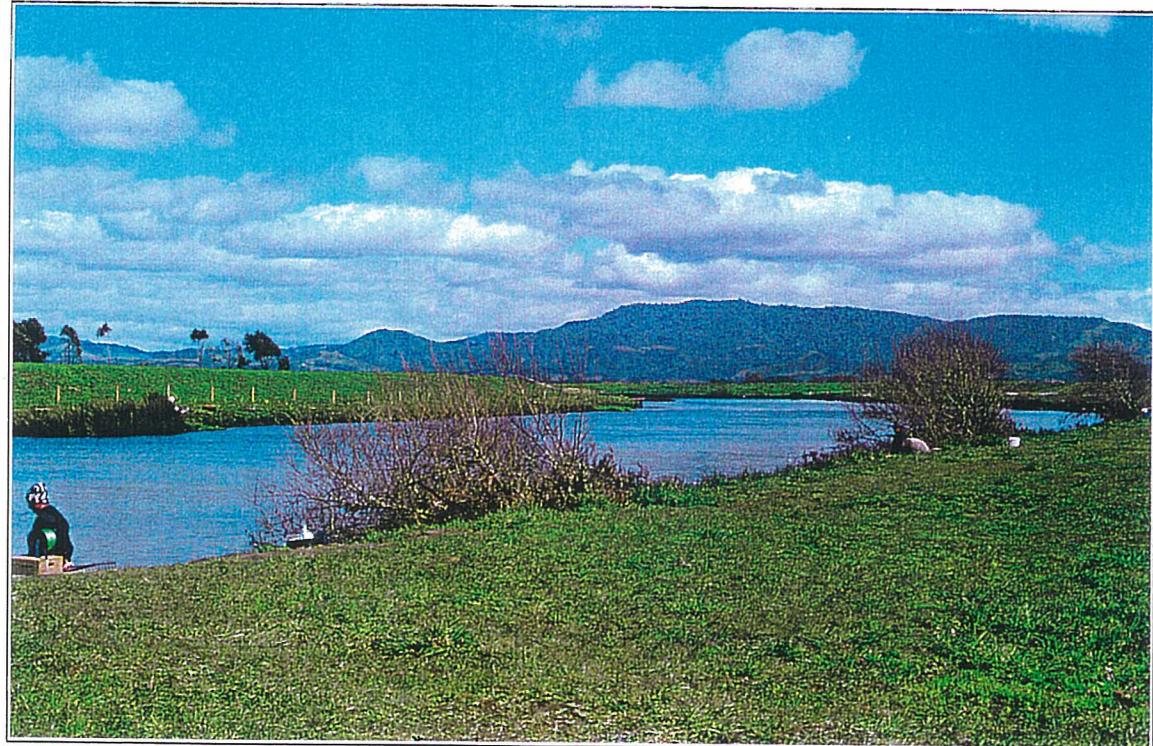
Photograph 4

Kaituna River



Remnant Kahikatea stand from Kaituna River Road

Photograph 5



Kaituna River & Papamoa Hills

Photograph 6

Kaituna River



Kaituna Wetland Reserve from Kaituna Road

Photograph 7

TE TUMU



Te Tumu Horticultural Area

Photograph 8

PAPAMOA HILLS



Papamoa Hills

Photograph 9

4.3 ARCHAEOLOGICAL ENVIRONMENT

4.3.1 INTRODUCTION

Two archaeologists completed investigations in the study area. Historic Resource Management Services worked in the area from Domain Road to the Wairakei Confiscation Boundary and Mr D Kahotea worked in the area from the Confiscation Boundary south-east to the termination of the proposed designation at the SH33 and SH2 junction. Each is reported in turn.

4.3.2 DOMAIN ROAD TO WAIRAKEI CONFISCATION BOUNDARY

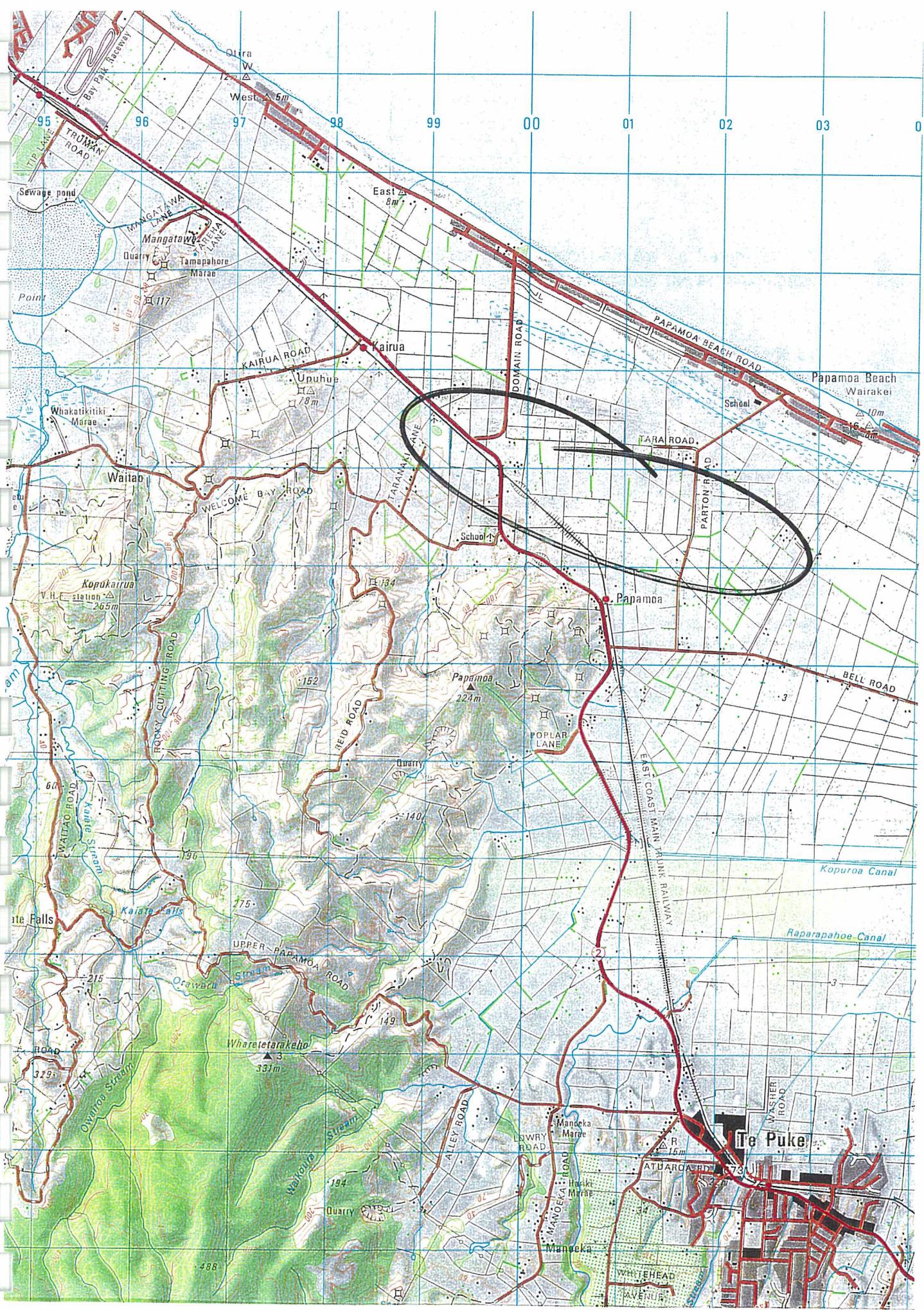
Historic Resource Management Services were commissioned to complete a ground based archaeological survey with a study area defined as the Domain Road Interchange travelling east to the Wairakei Confiscation Boundary () .

The archaeological field survey was completed by Lynda Bowers and Ken Phillips on 29 September 1998, accompanied by Taurewa Taepa of Nga Potiki hapu. An aerial photograph is included as 4.14. The extent of the study area is marked on this figure, which also illustrates current landuses.

4.3.2.1 Literature Review

Prior to the field inspection the records of the New Zealand Archaeological Association were inspected. The recorded archaeological sites in the general vicinity were plotted in relation to the route alignment and interchange area. It was determined that no recorded archaeological sites are likely to be affected by the construction of this portion of the route. The nearest recorded archaeological site is U14/2873 (terraces). This site was archaeologically investigated under the conditions of an Historic Places Trust authority issued in 1997 (HPT authority no. 1997/15).

The Papamoa area has been the focus of numerous geological, environmental and archaeological studies in recent years. Archaeological theses, surveys, excavations and research projects have provided a greater understanding of pre-European settlement within the Papamoa region and within specific environmental zones. The relationship and interaction between populations on the dune plain and the Papamoa hills, however, remains relatively poorly understood. The most recent large area archaeological survey



Location Map, NZMS 260 Sheet U14.

FIGURE 4.13

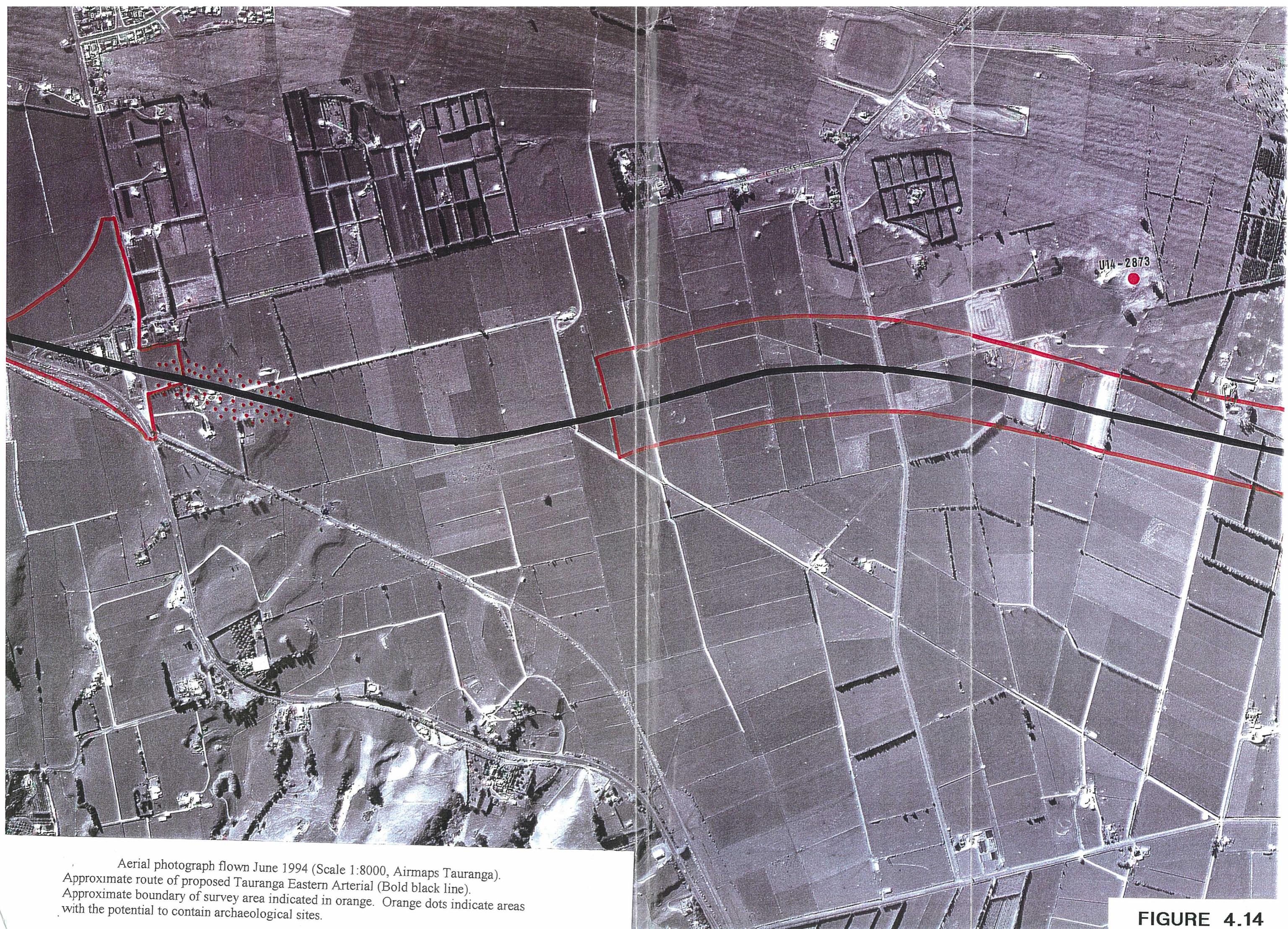


FIGURE 4.14

was undertaken by Frederickson, Kahotea and Felgate in 1996 on behalf of the Tauranga District Council. The survey extended approximately 1.5 km inland from the Papamoa coast, the southern boundary being the inland extent of the Papamoa dune system which is immediately north of the area proposed for the construction of the TEA.

4.3.2.2 Cultural Background

The surveyed area is within the rohe of Ngai Potiki hapu of Ngai Te Rangi iwi. A representative of Nga Potiki, Mr Taurewa Taepa, was present during the archaeological survey.

An assessment of the cultural significance of an area can only be competently made by the affected tangata whenua. It should be noted that an assessment of cultural significance may not necessarily correlate with an assessment of archaeological significance. A cultural assessment is included in Section 5.6 of this report.

4.3.2.3 Field Investigation

The survey area is located primarily on low lying (2-6m a.s.l) drained wetlands immediately south of the inland margin of the coastal belt of Holocene dune ridges. The lowlands, variously called the Kaituna swamp, Maketu swamp or Papamoa bog, are drained wetlands, peatlands, tidal flats, river terraces and flood plains formed between 3000 and 4000 years ago (Lowe & Wigley 1992:36). Pollen analysis in the immediate vicinity of the survey area indicates the establishment of a salt marsh or estuarine environment followed by a transition, by approximately 3000 b.p. to a low moor bog with margins covered in Kahikatea, cabbage tree, raupo and flaxes. Considerable reduction in wetland area occurred during the past 700 years (Nenham et al 1995:294).

Extensive drainage, particularly since implementation of the Kaituna River catchment scheme in the 1950's, has caused shrinkage of the bog's surface by up to 2 metres in places. The bog has been developed for agriculture and is today mostly covered by pasture grasses.

The portion of the TEA inspected is located on privately owned properties. Land owner permission was obtained prior to the archaeological survey. The property owned by Education Farms Ltd was excluded from the archaeological survey as access was not granted. Assessment for this portion of the route was made on the basis of views from the adjacent properties, and interpretation of aerial photograph.

The balance of the route was examined by ground survey and all exposed soil cross-sections were examined. The inspected portion of the route is currently in short to medium length pasture used for cattle grazing and ground surface visibility was excellent.

4.3.3 WAIRAKEI CONFISCATION BOUNDARY TO SH2/33 JUNCTION

The area examined was from the Wairakei to Otara Confiscation Boundary (Figure 4.15) to State Highway 33 section of the route. The archaeological field survey was completed by Des Kahotea accompanied by Waitaha and Tapuika representatives to identify recorded and unrecorded sites and make an assessment of effects and recommendations for mitigation of effects.

4.3.3.1 Cultural Context

This region is important to Te Arawa iwi as Maketu was the landing and initial settlement area for Te Arawa waka and ancestors associated with this waka. Tia and Hei ancestors of Ngati Tapuika and Waitaha claimed parts of the region, Otawa, Rangiuru, for themselves and descendants to occupy and Tamatekapua claimed Maketu. The descendants of Tamatekapua left Maketu for Pakotore on the Kaituna River not far from the present settlement of Paengaroa and then to the inland lake districts, forming the iwi of the Rotorua Lakes. Maketu was occupied by a Tapuika ancestor, Tatahau, when Ngaiterangi came to the area from coastal eastern Bay of Plenty. While this was the result, some say, of an invitation it was also because they were seeking new territory. Conflict then arose between Ngaiterangi, Tapuika, Waitaha and Ngati Ranginui of Tauranga with their supporting allies from the Rotorua lakes. Battles raged around Maketu but Ngaiterangi were not ousted, and the conflict was transferred to Tauranga where they eventually left Maketu for Tauranga.³ But their mana remained over Maketu leaving Tapuika and Waitaha to continue occupying the area along with other migrating groups such as Ngati Whakahinga and Ngati Pukenga.

The wetland area surrounding the lower Kaituna became an important resource area as flax became a commodity for trade for muskets in the 1820's. The use of muskets against Tauranga and Rotorua Lakes iwi by northern taua in the 1820's saw the establishment of traders in flax and muskets in Tauranga and eventually Maketu. Ngaiterangi hapu and Te Arawa iwi and hapu from the Rotorua Lakes located themselves on the lower Kaituna River. But tension quickly arose as Ngaiterangi hapu

³ Stafford 1967

(who owned and controlled the region) saw their mana over the lands being eroded by the more numerous Te Arawa iwi who were setting up communities to process the flax for trade. The tension between the two tribes quickly flared into a regional war between Ngaiterangi and their allies Waikato and Te Arawa from the inland lake districts during the 1830's. The Te Arawa sought to re-establish their mana over Maketu. The inland Te Arawa now occupied and dominated the Maketu region so Waitaha and Tapuika located themselves on the Kaituna at Kenana away from the Ngaiterangi boundary. Peace was established between Ngaiterangi and Te Arawa in 1845 and a boundary was established at Wairakei on the coast.

The operation of the Native Lands Court at Maketu in 1866 saw the Court awarding land in the area during the 1870's and 1880's to the inland lakes iwi for their part in extinguishing the mana of Ngaiterangi at Maketu through battle and occupation. The blocks they were awarded was Tumu Kaituna, Te Karangi, Pukaingataru and Paengaroa North blocks, which the TEA route traverses from the Kaituna River to Paengaroa. The Te Puke block was awarded to Waitaha and Rangiuru to Ngati Tapuika for their continued occupation since the founding ancestors. The Papamoa block on the Ngaiterangi side of the confiscation boundary was awarded to Nga Potiki hapu. The awarding of native title was followed by the purchase of land by the Government who then made these lands available for Pakeha settlement.

In 1872 a steam-powered flax mill began operation at Waihi near Maketu and by 1880s extensive operations began in the Te Puke-Maketu- Pongakawa districts.⁴ The number of mills fluctuated and mills were located on the Kaituna River at the end of Bell Road near the Pa site and Te Paroa. The banks of the Kaituna were considered some of the best flax growing areas in New Zealand but the mills closed down by the 1930s. The reduction of wetland and conversion to pasture and fires led to the closing of mills.

The flax industry did not have much impact on the landscape as the native flax was harvested from a naturally grown resource and the plant regrew after cutting.

The purchase of the Papamoa Block No.1 from Nga Potiki a hapu of Ngaiterangi was completed by the Government in 1893 and the Te Puke Block in 1878 from Waitaha and made a special settlement. Settlement of the Papamoa area was initiated by a group of local people from Te Puke and Tauranga who formed the Papamoa Homestead.

Association to purchase land. 1699 hectares was purchased in 1895 and divided into farms. By 1914 the BOP Times had described the land thus:

⁴ Stokes 1986

"Some thousands of acres northward of the main road, from the Waitao River to Kopuroa and out to the coast, consist mostly of rich swamp. This area known as Lower Papamoa...the expenditure of capital and labour in drainage and farming operations has converted it into the most fertile plain in the Tauranga County. Mixture of cattle and sheep farming with dairying."

Development of the area was hindered by lack of roading as the wetland was a natural barrier between Papamoa and Te Puke. The Kaituna River was utilised for the transport of goods to and from Te Puke. Alteration of the course of the lower Kaituna as part of the drainage of the wetlands was implemented in the 1920's and was finalised in the 1980's with wide channel created for sections. Draining of the wetland for pastoral farming created the biggest landscape change yet and the last area to be developed from wetland, the properties between the Kaituna Road and Kaituna River, occurred in the 1970's.

The more recent land activity, Kiwi fruit orchards, were established on properties along Young, Te Tumu and Maketu Roads in the late 1970's and 1980's.

4.3.3.2 Archaeological Landscape

There are three major physiographic zones (see Figure 4.16):

- (a) the coastal foredunes and Holocene dunes
- (b) wetland/riverine region of the Kaituna River (Kopuroa and Kaituna swamps) and,
- (c) inland lowland (Pukaingataru and Paengaroa, the northern extent of the Kaharoa Plateau).

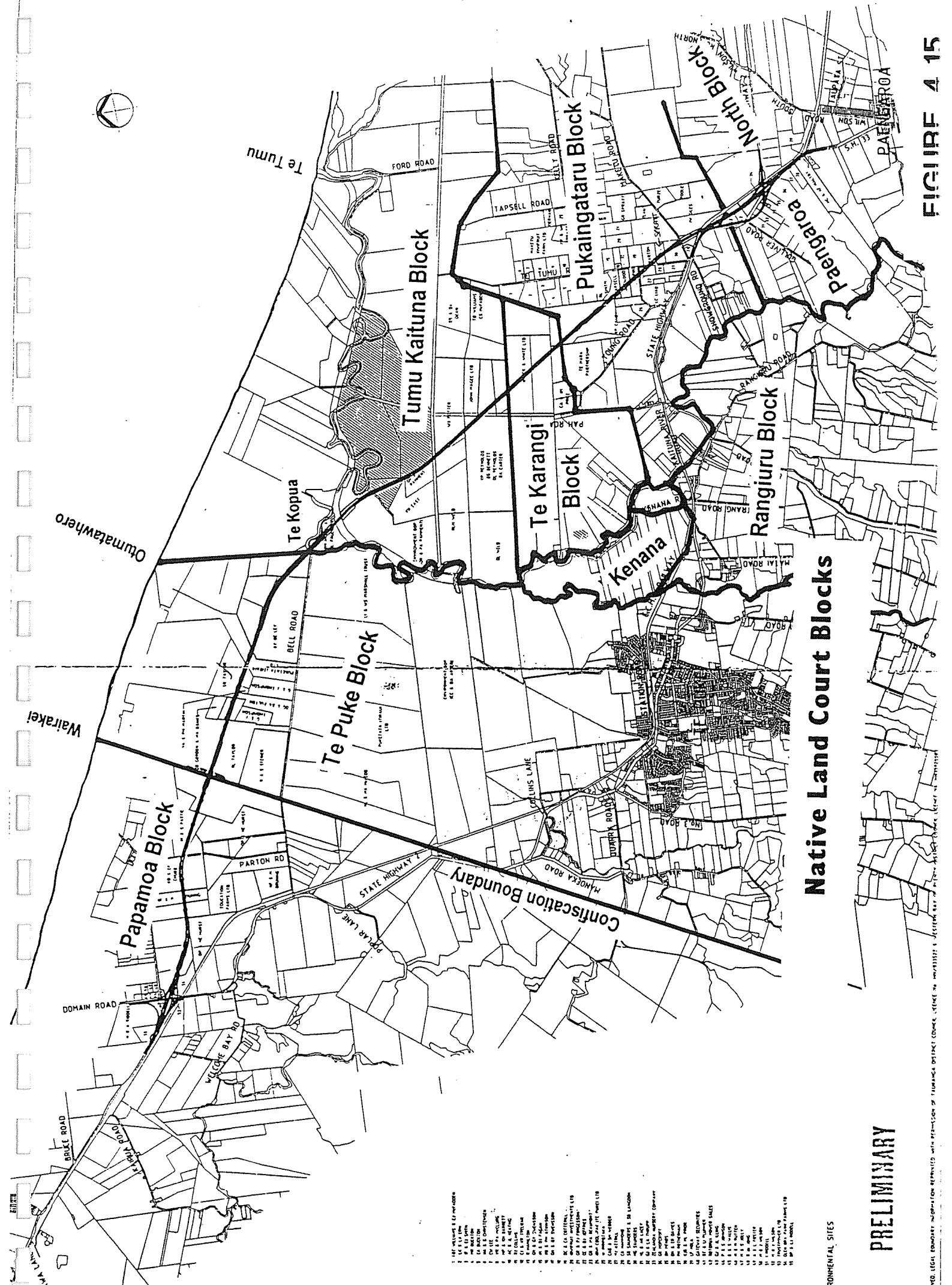
These areas generally have high archaeological site densities but in specific localities. Wrigley describes the area as Te Puke lowlands encompassing the area of land seaward of Te Puke extending from Papamoa Beach in the west to Maketu Estuary in the east. The northern part comprises a belt of coastal sand dunes aligned parallel to the coast and varying in width from 100 to 1350 m. Between these units is a low lying (2 - 6m a.s.l.) area comprising drained swampland, peatland, tidal flats, river terraces, and flood plains. These were all formed since the Holocene sea level attained its present position c. 6500 years ago⁵ and the bog forming 4600 years ago as the sea level fell or coastline prograded.⁶ Soils of the area consist of predominantly yellow brown sands and gley and organic soils.⁷ The yellow-brown soils are restricted to the coastal strip or old Holocene dunes and higher ground above the Kaituna swamp at Pukaingataru and Paengaroa. Gley and organic soils are swampland soils. There has been little vegetation studies but ancestral settlement and utilisation of the coastal strip had altered vegetation from what was possibly original coastal broadleaf-podocarp forests at first ancestor contact to a

⁵ Wrigley 1990

⁶ Newman et al 1995:284

⁷ Ministry of Works 1962:42

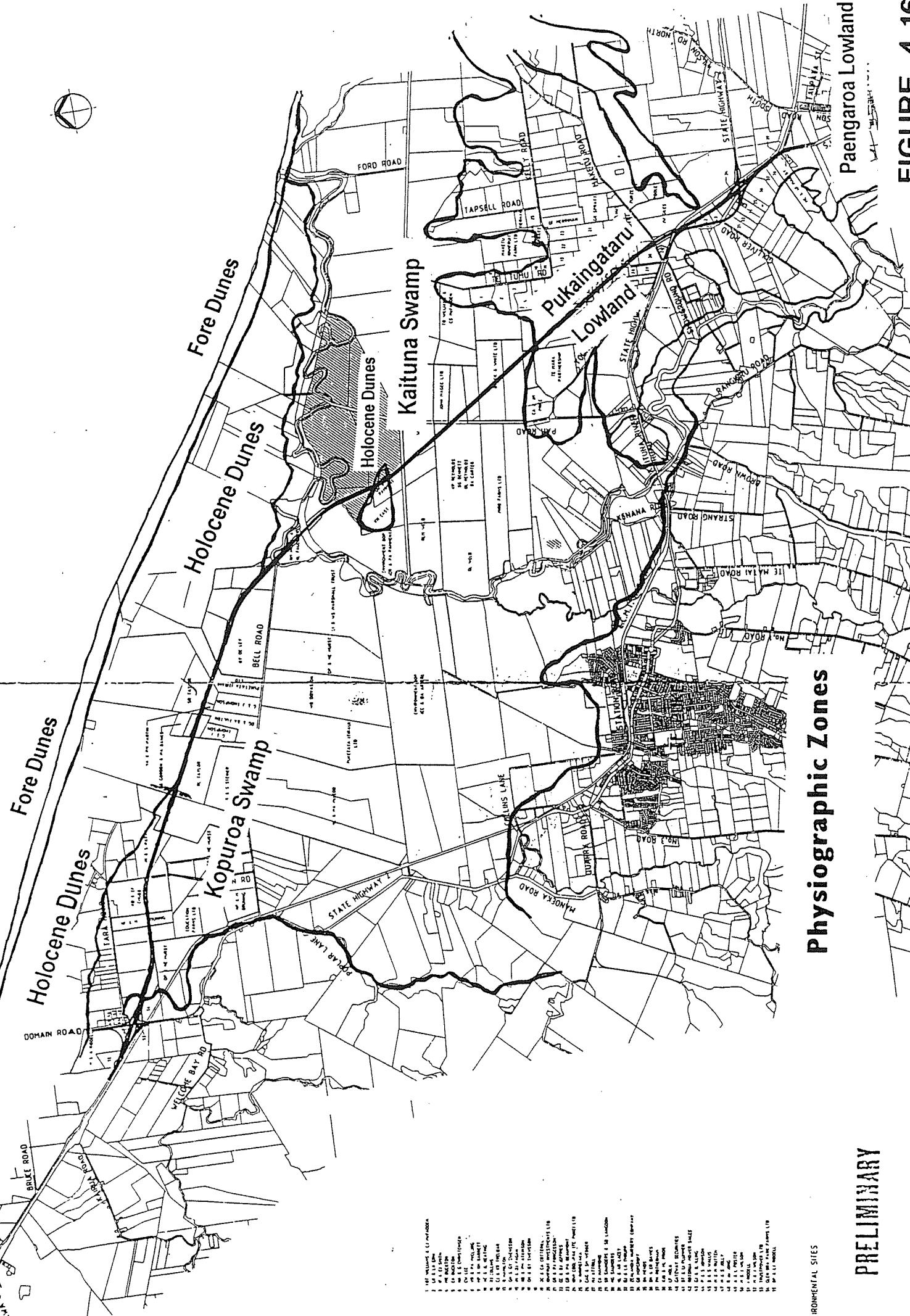
⁸ Wallace 1995



Physiographic Zones

PRELIMINARY

ENVIRONMENTAL SITES



period 500 B.P.(ca. 1500 AD) to native grasses and manuka dominated scrub a product of intensive occupation and use.⁹

Two occupation zones can be distinguished, both the coastal and the lowland surrounding the former Kaituna swamp. There is a distribution of archaeological sites along the entire coast line in the foredunes from Mauao (Maunganui) to Te Tumu which is intensive¹⁰. Natural resources are the soft shore, open ocean with fish and shellfish, Holocene soils for gardening and wetland associated with Holocene dunes which were high in natural resources, birds, freshwater fish and natural materials.

The riverine and wetland system of the Kaituna River, Kopuroa and Kaituna Swamps was another zone rich in food and natural material resources although occupation was restricted to the edge or high ground. The Kaituna River flowed through a former large wetland area with pa located along the coastal belt and inland. The river itself was an important system for communication.

Maketu is an important area with a tradition of intensive settlement and a high distribution of pa and archaeological sites. The higher ground at the former Pukaingataru Block (Young, Te Tumu and Maketu Roads) is separated from Maketu by drained wetland and is the edge of an important distribution of inland sites that follow the inland course of the Kaituna River with pa and other settlement types.

These three zones also have high cultural values in specific areas, the Papamoa and Te Tumu coastal belt, Kaituna River and higher ground above Kaituna Swamp from Te Puke to Rangiuru. These cultural values are associated with the tradition of occupation in the area by ancestors. There is today a concentration of Tapuika hapu communities between the Waiari and Kaituna River.

4.3.3.3 Previous archaeological surveys

In the 1960's and 1970's, archaeological site identification and recording was undertaken by amateur archaeologists for the purposes of recording important archaeological sites, (generally pa), for information and identification should the site be destroyed. The Tauranga County was systematically surveyed between 1980 and 1985 during a four-year site survey initiated by the NZ Historic Places Trust as a result of site destruction occurring with the establishment of kiwi fruit orchards. This focussed on Maketu and inland areas, while the coastal zone between Tauranga and Maketu was not examined in any detail. This survey recorded sites between Kaituna River and State Highway 33 of the TEA route. An intensive archaeological field survey was undertaken by the Tauranga District Council in 1996 of residential and future residential areas of Papamoa for Tauranga District Council and New Zealand Historic Places Trust due to the impact rapid residential development was having on archaeological sites in this area. As a result a site was recorded along the route and others in the vicinity of Kaituna River (Figure 4.17).

⁹ Wallace 1995

¹⁰ Kahotea 1995

Recent archaeological monitoring and site surveys of Papamoa from Te Maunga to the end of Bell Road have revealed the coastal zone as an area of intensive occupation with large and smaller settlements sites (kainga)¹¹, pa and extensive use of the Holocene dune soils for gardening.¹² On the higher Papamoa hills there is a high density of pa and terraces, however this area is separated from the coast and Kaituna River by wetland. Not much is known along the TEA route from the Kaituna River to Rangiuru as no further archaeological work has been undertaken since the field surveys of the early 1980's.

The majority of the recorded sites along the TEA route between Young, Te Tumu, Maketu Roads, and along SH2 were recorded by personal communication with property owner rather than identification in the field and an assumption can be fairly made that these sites have a high probability of being disturbed or destroyed by farming or orchard activity. This form of recording can also indicate the potential of an area to contain archaeological sites in undisturbed ground. Absence of archaeological monitoring by excavation in an area limits the ability to predict or determine presence of sites.

Archaeological sites are common in wetland areas throughout the country because wetland areas have high economic values for food and material resources, however wetland archaeological sites or features have been more usually associated with pa and other settlement types, either built in the wetland itself or on the edge of the wetland.¹³ Archaeological signature is not readily discernible in the Kaituna or Kopuroa wetland, although wooden artefacts may be cached or structures remain preserved in waterlogged ground. However there is a virtual absence of sites along the TEA route along the edge of this wetland or swamp.

Sites that have been recorded to date along the Tauranga Eastern Arterial route are: Pa, middens, terraces, made soil (garden soil), and artefact find spots which are common site types recorded in the Tauranga area (see Figure 4.18).

4.3.3.4 Survey Method

The method was a review of archaeological site information forms and a ground surface survey of a 50 metre corridor along the route. There was no testing of sites by test pits or other excavation methods and the survey was simply based on what surface or sub surface cultural features were exposed during the conduct of the survey. Factors such as pasture growth and level of property development would have influenced the ability to identify archaeological sites but former surveys and the extensiveness of survey would be enough to gauge the likelihood of unrecorded sites.

¹¹ Frederickson, Barber, Best 1995; Kahotea 1993; McGovern Wilson 1995; Gumley & McFadgen 1995; Frederickson, Kahotea, Felgate 1996

¹² Gumley & McFadgen 1995, Gumley 1997

¹³ Oruarangi at Koopu, Thames and Ngaroto at Te Awamutu.

T. E. A. - Archaeological Sites
Fredrikson, Kahotea and Felgate

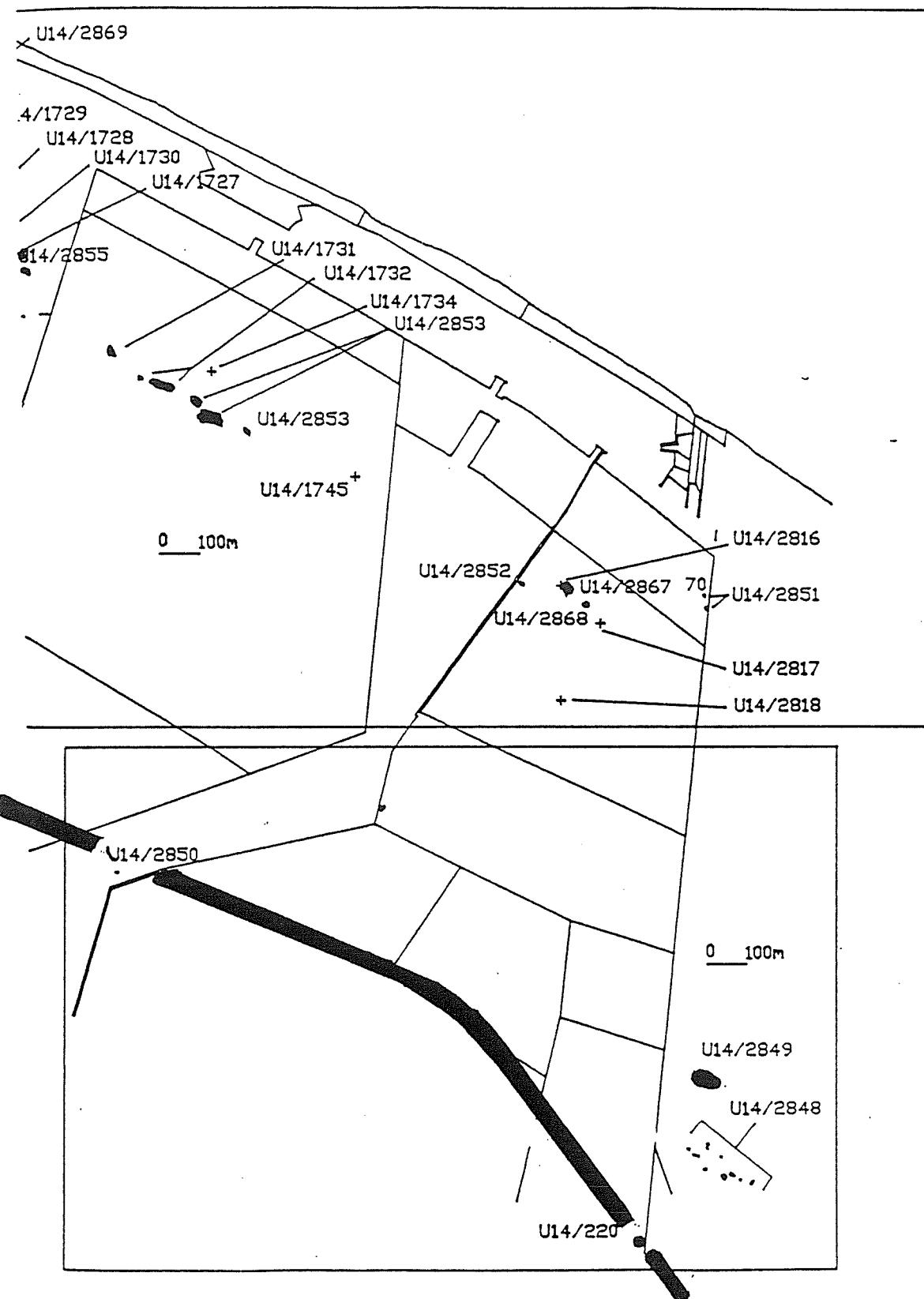


FIGURE 4.17

T. E. A. - Archaeological Sites

NZHPT Historic Places Inventory

Tauranga County 1986

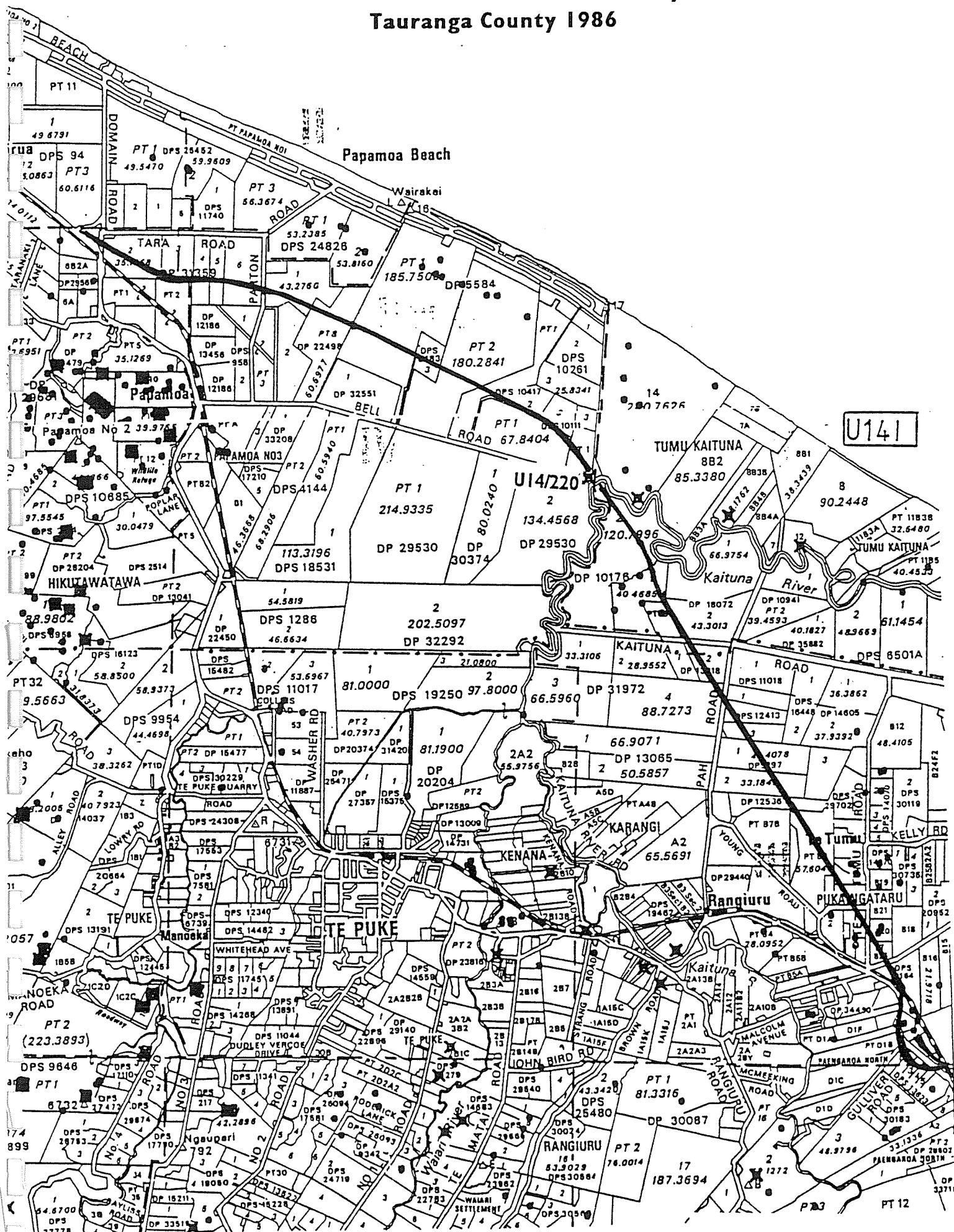


FIGURE 4.18

Recorded sites are in the following locations:

- Holocene dune edge
- Pa site U14/220 on the former Kaituna River at the end of Bell Road
- Former Pukaingataru Block, between Young and Maketu Roads
- Area between Railway and State Highway 2, Paengaroa.

4.3.3.5 Archaeological Survey

a. Wairakei Boundary to Kaituna

The route passes along the edge of the Holocene dunes and wetland. No sites were identified. There was confirmation of U14/220 as a site with shell, fire burnt stones and cultural soil layers (see Figure 4.19). U14/2850 could not be identified or located in the field.

b. Kaituna River to Te Tumu Road

This section of the route is drained wetland with a section of Holocene dune.

There were no sites identified along this section of the route which is former wetland except for small area of Holocene dunes (Figure 4.16). There are recorded sites on this area of Holocene dunes but the route bypasses these sites. The recorded oven and midden site (U14/1849) could not be located and extensive disturbed area of ground and drain did not indicate the presence of any subsurface cultural features (see Figure 4.18).

c. Te Tumu Road to Candy Property

This area is former wetland and no sites were identified.

d. Candy Property to Te Tumu Road

This area is the higher ground or lowland area on edge of former wetland. The Candy property is a dairy farm under pasture and no sites were identified on this property although there was a suitable coverage of eroded ground on the edge of the former wetland which would have revealed any subsurface cultural features. Sites have been recorded on neighbouring orchard areas but there has been extensive re-contouring for the orchard properties and no recorded sites were relocated. An exposed cultural soil profile with fire burnt stone and pumice was examined but it was difficult to ascertain whether the origin was prehistoric or associated with orchard activity.

e. Te Tumu to Maketu Roads

Pasture cover and the maturity of Kiwi fruit orchard were a factor in the non identification of recorded sites in this area. Because the ground in this area was naturally level, no modification of ground had been undertaken for Kiwi fruit development. Kiwi fruit replanting by property owner had revealed the subsurface

feature of hard pan, fire burnt stones, charcoal and dark soil. This was in a specific locality and it was difficult to gauge cultural origin without extensive testing. However it was in the vicinity of recorded sites and archaeological values were given to this feature (see Figure 4.20).

f. Maketu Road to State Highway 2

This is an area of both pasture and Kiwi fruit orchards with recorded sites along this locality. The Kiwi fruit orchards have been extensively re-contoured and the maturity of development would have either destroyed or covered sites. Ground depressions were located in a area of pasture, and the location, extent of area and number, tend to suggest that the sites are perhaps storage pits rather than relating to past farming activity (see Figure 4.20).

g. Paengaroa, State Highway 33

This is a mixture of pasture, orchards and a market garden area. No sites were located in this area.

4.3.3.6 U14/220 - Te Kopua (Figure 4.19)

The consultant has undertaken field examination and research in two previous reports to confirm location and existence of site. As a result further examination during this survey of TEA revealed archaeological features, as the former extent of the site was discernible to the consultant with growing familiarity with the area and research confirmed its cultural importance as a pa and hapu boundary. It was difficult to ascertain the location of the site in earlier ground survey examinations but research and examination of aerial photographs revealed the degree of modification the site has undergone. First, the placement of a flax mill right on top of the site which operated until the 1930's. Secondly, the area had undergone extensive modification where borrow from the Holocene dune or higher ground was pushed to the site and surrounding area, raising the ground level around the site to its height during the mid 1980's for the establishment of orchard on the property.

Drains for wetland had cut into the site and a flood bank on the edge of the old Kaituna River had been built with sand from an estuary or harbour shown by the pipi and tuangi shells it contained. All these factors had contributed to previous difficulty in locating the former site. Up to the mid 1980's U14/220 appeared to be a natural high ground next to the Kaituna River.

The cultural values for the site are as a pa, Te Kopua, and as an important boundary location for Waitaha and it also has historic significance as the site of a flax mill.

Te Kopua and Otaumatawhero are places on Waiari boundary. The latter place is on the beach.¹⁴

Field examination during September 1998 revealed the following:

- exposed cultural layers (30 - 50 cm) in section containing charcoal, cultural soil layers, shell fragments, fire burnt stones (cooking) in drain walls following an old boundary from river (7 metres).
- exposed surface shell midden- fragments (30 meter exposure along edge)
- shells were both ocean softshore¹⁵ and harbour¹⁶.
- metal parts of machinery

Figure 4.19 is a reconstruction of the likely extent of the site.

4.3.3.7 Depressions/storage pits (Figure 4.21)

Pits or depressions were located in paddocks between the railway line and the house with kiwi fruit orchard on its northern boundary. There are up to 16 pits which are generally circular in shape and measuring 2 metres in diameter and 50 cm deep. They are clustered in groups of two or more. The sites are located on a narrow level ridge with a shallow gully on the railway and separating the sites from the house.

4.3.3.8 Cultural (Figure 4.22)

- a. This site was an exposed cultural feature in a low bank of fire burnt stones with layer of pumice, 2 metres in length and a 50 cm stratigraphic layer from top soil.
- b. Profiles exposed in holes dug for kiwi fruit situated next to the northern property boundary. Dark black soil with small fire burnt stones (hangi), charcoal, pumice and hard pan layer at bottom are evident. There is a 30-40 cm stratigraphic layer.

¹⁴ Hemi Tarakawa - Ngati Ngaru, Waitaha MMB 3: 271

¹⁵ Kahitua Paphies subtriangulata (tuatua) Kaikaikaroro Struthiolaria papulosa

¹⁶ Pipi Tuangi Chione stuthburi (cockle)

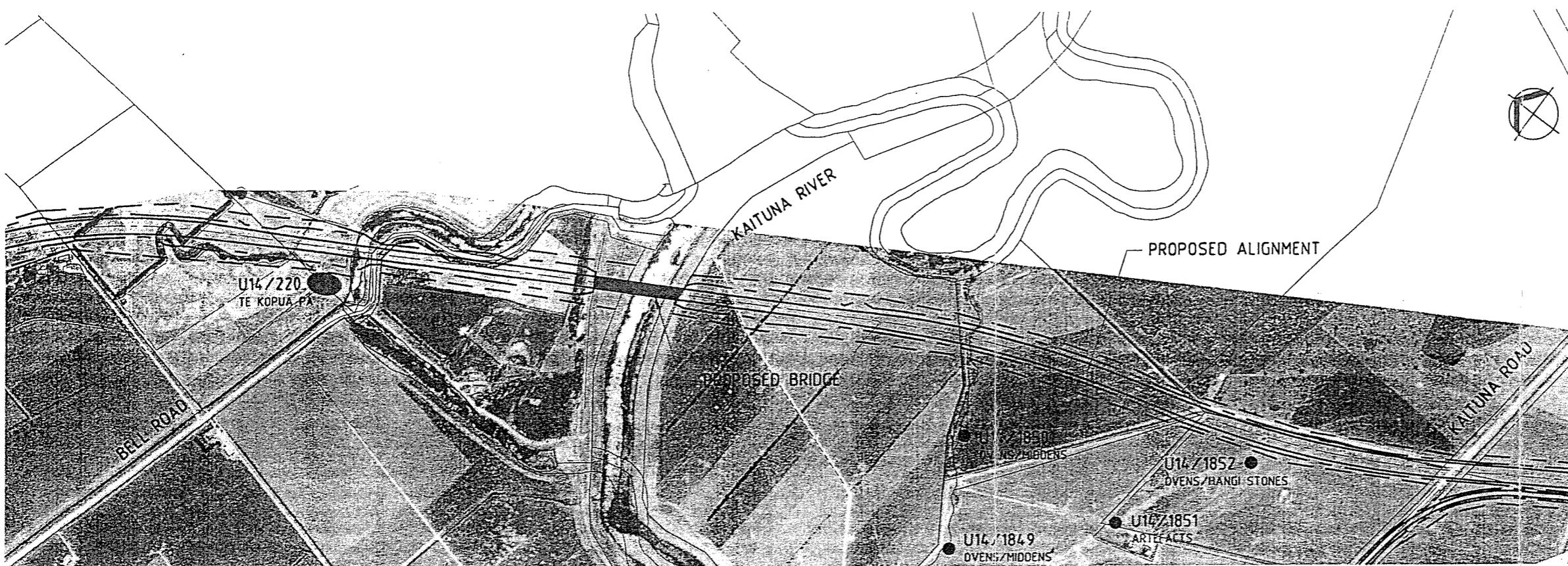
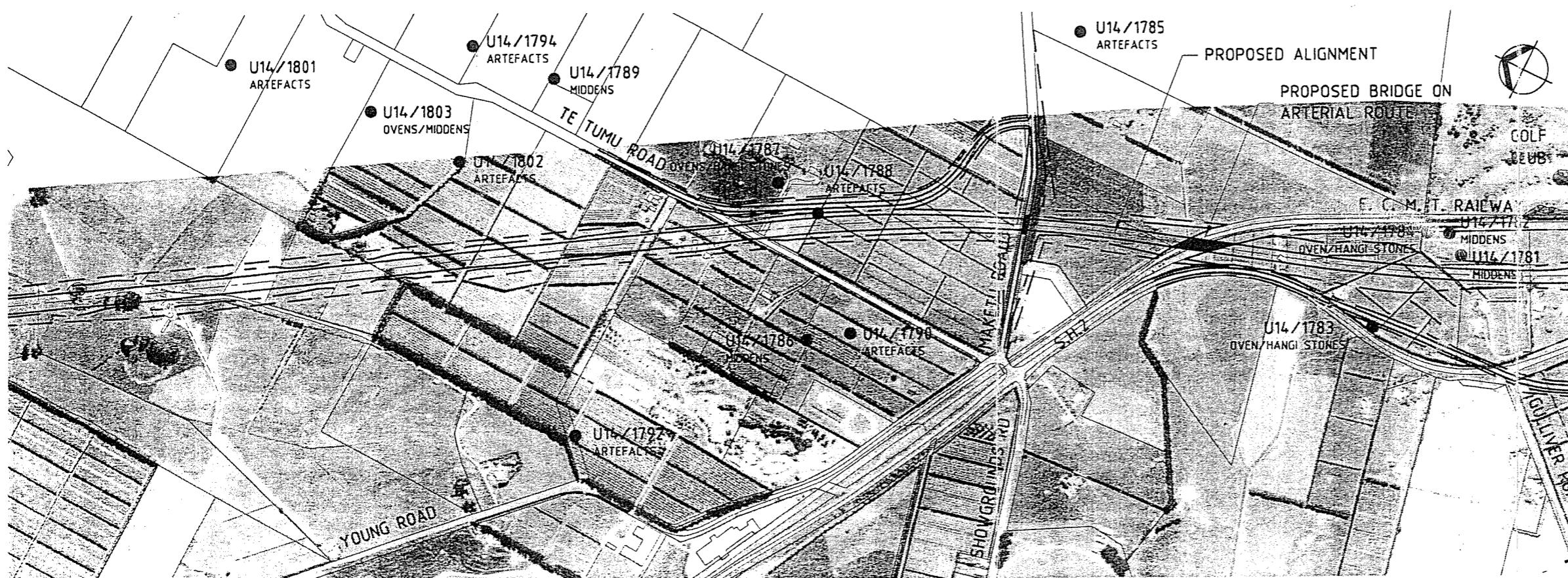


FIGURE 4.19



LEGEND

- CENTRELINE OF ALIGNMENT
- EDGE OF SEAL
- EXTENT OF BATTERS
- DESIGNATION REQUIREMENT
- ARCHAEOLOGICAL SITE & REGISTRATION NUMBER

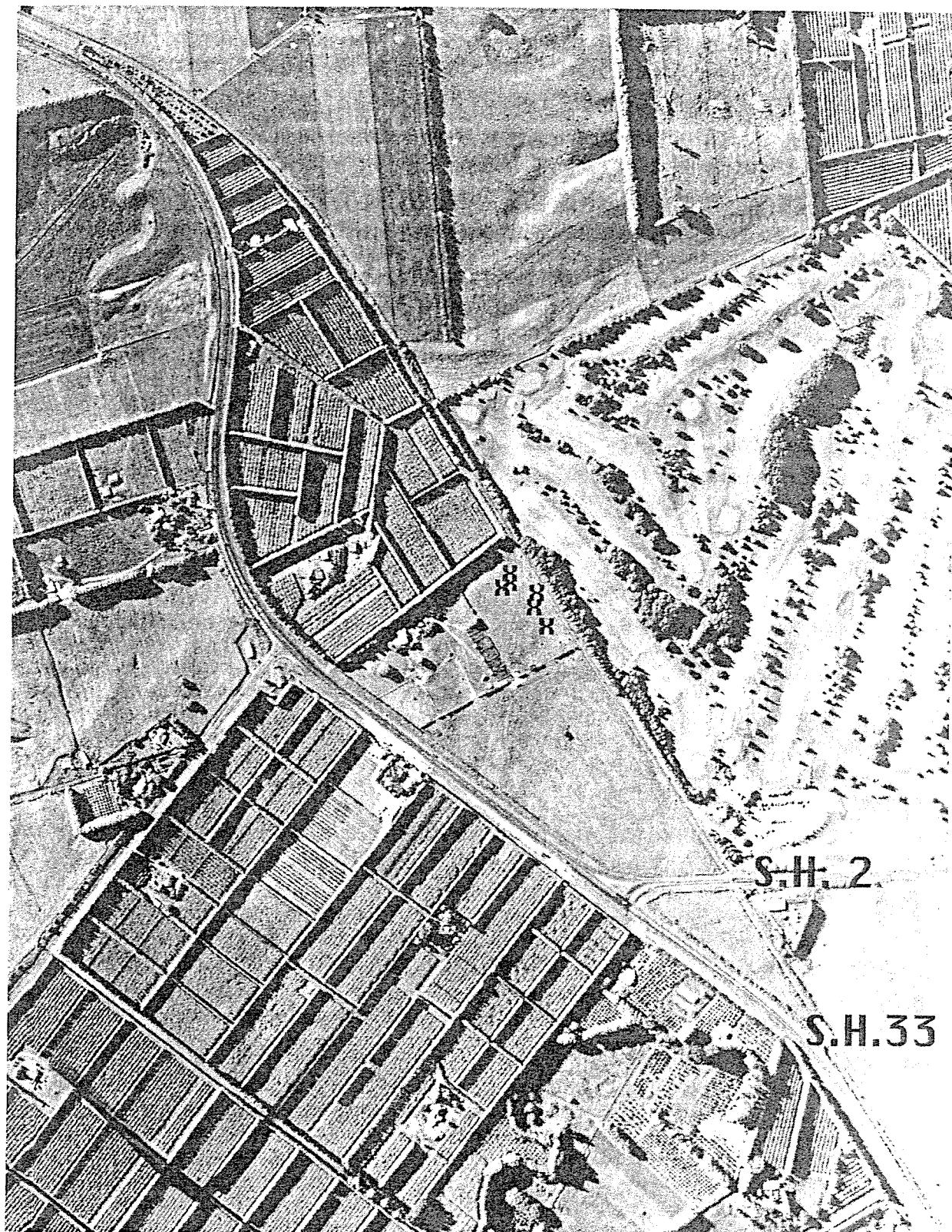
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3. FLOOD LEVEL DATA SUPPLIED BY ENVIRONMENT B.O.P.
4. LOCATIONS OF ARCHAEOLOGICAL SITES SUPPLIED BY DES KAHO TEA.

FIGURE 4.20

Job No.	9301240
Org. No.	P022
Rev.	A
LAU DRG No.	P 9310101240.CAD\124.DWG
FOR DESIGNATION	1/1/2008
Revision	1
Acad Date	1/1/2008
BECA	
Beca Carter Hollings & Ferner Ltd.	
Consulting Engineers	
Auckland, Wellington, Christchurch, New Plymouth, Tauranga Melbourne, Sydney, Port Moresby, Jakarta, Singapore, Brunei	
Designed <i>HC</i> Drawn <i>SH</i> Traced CAD Dwg Check <i>SH</i> Dwg Check <i>SH</i>	Approved for Construction Sign Reduced Drawing Scale as drawn 1:5000 1:10000
Archaeological Sites Rangiuru Area	Tauranga Eastern Arterial Civil

PLATE 5 TAURANGA EASTERN ARTERIAL
Storage Pits/surface depressions



xxx location of storage pits/surface depressions
xx

PLATE 6 TAURANGA EASTERN ARTERIAL
Cultural features - Te Tumu Road Orchards



X subsurface cultural feature Z exposed cultural feature

Candy - Candy property

4.4 TANGATA WHENUA

The study area from the Domain Road interchange with State Highway 2 to the Paengaroa intersection has a complex Maori cultural history. As such the iwi and hapu to be consulted on this project have been many.

There are four iwi groups which have an interest in the land area because of historical associations or because of current landownership.

Te Arawa tribal interests today are from the Wairakei Confiscation line to the eastern extent of the study area. The Confiscation line was defined by the New Zealand Settlements Act 1867 after the alleged tribal opposition to colonisation and is shown on Figure 4.15 in the archaeological section 4.3.3.

The iwi groups of Te Arawa that have been consulted with for the project are:

Ngati Pikiao
Ngati Makino
Ngati Whakaue
Tapuika
Waitaha

Ngati Pikiao and Makino have interests in the far east of the study area in the vicinity of the SH 33 and SH 2 intersection. Ngati Whakaue's interests are to the east of Te Tumu road and as such they are not directly affected by the alignment itself. Tapuika's interests are from Te Awa o te Atua ki Wairakei and it is their marae at Waitangi that has been adversely affected by the present location of State Highway 2.

Waitaha's area of interest is from the Kaituna River to the Confiscation line.

Ngaiterangi has interest in the western study area from Waitaha at the confiscation line. The Ngaiterangi hapu that have been consulted on this project are Nga Potiki and it is their marae at Te Maunga that has been adversely affected by the various Public Works in that locality. This issue is yet to be dealt with through their Waitangi Tribunal Claim Hearing.

Ngati Pukenga iwi have interests in the western end of the study area from Mauao along the Papamoa coast to Wairakei and inland to the Welcome Bay ranges and they have also been consulted.

Ngati Tuwharetoa are an iwi of Te Arawa waka and the Ngati Kapawa hapu have landholdings on the seaward side of the Kaituna River to the east of the Kaituna River.

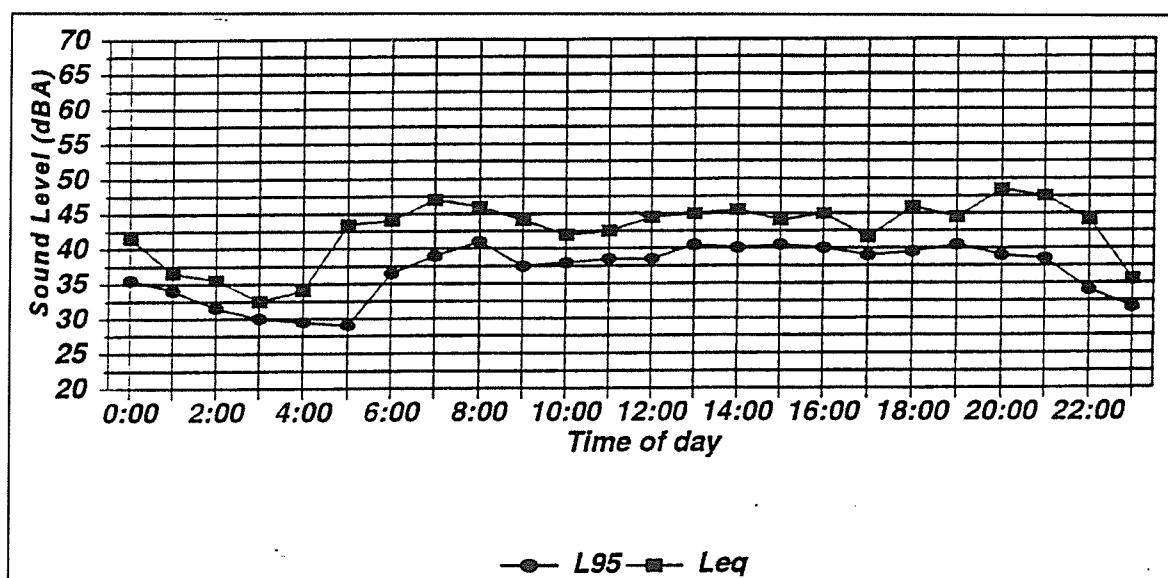
Consultation was also commenced with Ngati Hei but the group did not pursue the matter.

It should be understood that the above areas are those of interest to the hapu groups. They do not necessarily represent actual land ownership by hapu or hapu members.

4.5 NOISE ENVIRONMENT

The area through which the proposed route passes is a typical rural noise environment with a very low background noise composed of various noise sources such as insects, birds, farm animals, wind and with occasional intruding noise from traffic on local roads, or farming machinery. The noise environment is relatively homogeneous, with an area of larger blocks and few dwellings from Domain Road to Pah Rd and an area of smaller blocks and closer spaced dwellings around Te Tumu Road. To assist with the prediction of the impact of noise from the proposed route a noise survey of the existing environment was carried out. A noise monitor was placed on the Steiner property in Bell Road. This monitored noise continuously and recorded a summary each hour for a week (11-18 December 1997). A typical plot of noise level over a 24 hour period is shown in Figure 4.23. The noise levels are low, averaging 45dBA (L_{eq}) during the day and 30-35dBA at night. This would be a low noise environment according to Transit guidelines. This environment would be typical of the area the route passes through from Domain Road to Pah Road.

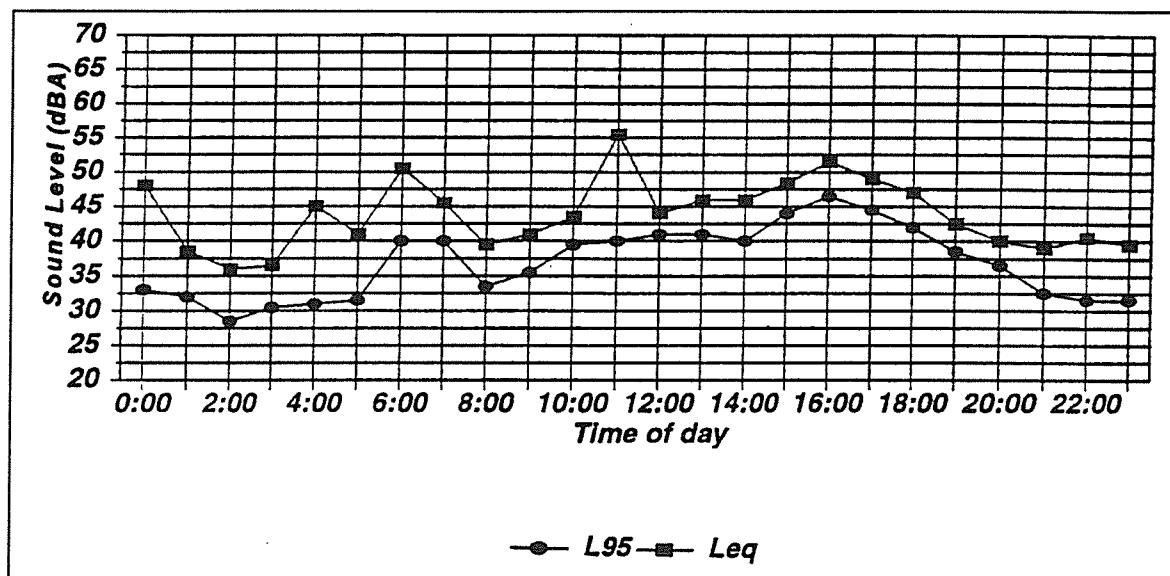
Figure 4.23 Ambient Noise Survey Te Puke - Steiner - Bell Road (17 December 1997)



A noise monitor was placed in the Espin property near the Paengaroa end of the route (18-23 December). A typical plot of noise levels over a 24 hour period is shown in Figure 4.24. The noise levels are still low, but a little higher than the Steiner site in Bell Road as would be expected for a higher population density. This location would also be classified as low noise environment according to Transit guidelines. The environment

would be representative of the environment in the Te Tumu Road area through to the junction with the existing SH2.

Figure 4.24: Ambient Noise Survey in Te Puke - Espin - Te Tumu Road (19 December 1997)



4.5.1 DISTRICT PLAN RULES

The Tauranga and Western Bay of Plenty District Plans do not contain any rules pertaining to noise from roads or highways except that the Western Bay of Plenty Plan, in clause 13.2.3(f), states that the Council shall have regard to the Transit guidelines. Both plans refer to NZS6803P for construction activities (see Section 5.5.3).

It is clear from the rules governing other noise sources that the area is regarded as a relatively quiet area requiring quite stringent control of noise. The Transit guidelines requiring a design level of 55dBA are consistent with this policy.

4.6 SOCIAL

4.6.1 BACKGROUND

The route is located in both the Tauranga and Western Bay of Plenty Districts. Beginning at the Domain Road interchange, the route is in Tauranga District and zoned Rural (see Figure 4.25). In the immediate vicinity are small scale lifestyle blocks, a large commercial enterprise, Wilson's Garden Centre and a substation.

From the interchange, heading south-east, the route moves into the Western Bay of Plenty District, up to Parton Road it is zoned Rural G (see Figure 4.29). From here it generally follows or moves between the District boundary (through Rural and Future Urban zones in Tauranga District and Rural G in the Western Bay of Plenty District), to the Kaituna River (see Figure 4.26 - Figure 4.30).

From the Kaituna River the route is wholly within the Rural G zone, except for a small area zoned Government Purpose Reserve which is part of the Lower Kaituna Wildlife Management Reserve (see Figure 4.30 and Figure 4.31). Once the TEA moves away from the Domain Road interchange the landuse is predominantly large scale dairy and dry-stock farming until the horticultural land around Te Tumu Road, which is predominantly kiwifruit blocks with a mix of those operated by owners resident on the property, and those operated by absentee owners or managers. There are very few lifestyle blocks along the route.

Around the SH2/33 interchange there is a mix of kiwifruit blocks and fruit stalls/nurseries taking advantage of the passing traffic and the Te Puke Golf Course.

4.6.2 DEMOGRAPHIC DESCRIPTION OF COMMUNITIES ALONG ROUTE

The Tauranga and Western Bay of Plenty Districts have experienced significant growth in the recent past - from the early 1960's with the development of the Port and through the 1970's and 1980's as a result of the kiwifruit industry.

Today the region has a diverse employment base and a mild climate which continues to attract significant numbers of new residents to the area.

Table 4.2 shows the total population and the estimated net migration component of growth for both Districts from 1981.

Table 4.2: Total Population and Estimated Net Migration

	Total Population				Estimated Net Migration		
	1981	1986	1991	1996	1981-86	1986-91	1991-96
Western BOP	23151	26619	29871	34971	2250	1940	3910
Tauranga	52887	59313	66738	77775	5280	5670	9240
TOTAL	78019	87918	98600	114742	7530	7610	13150

Source: Statistics New Zealand 1996 Census Base

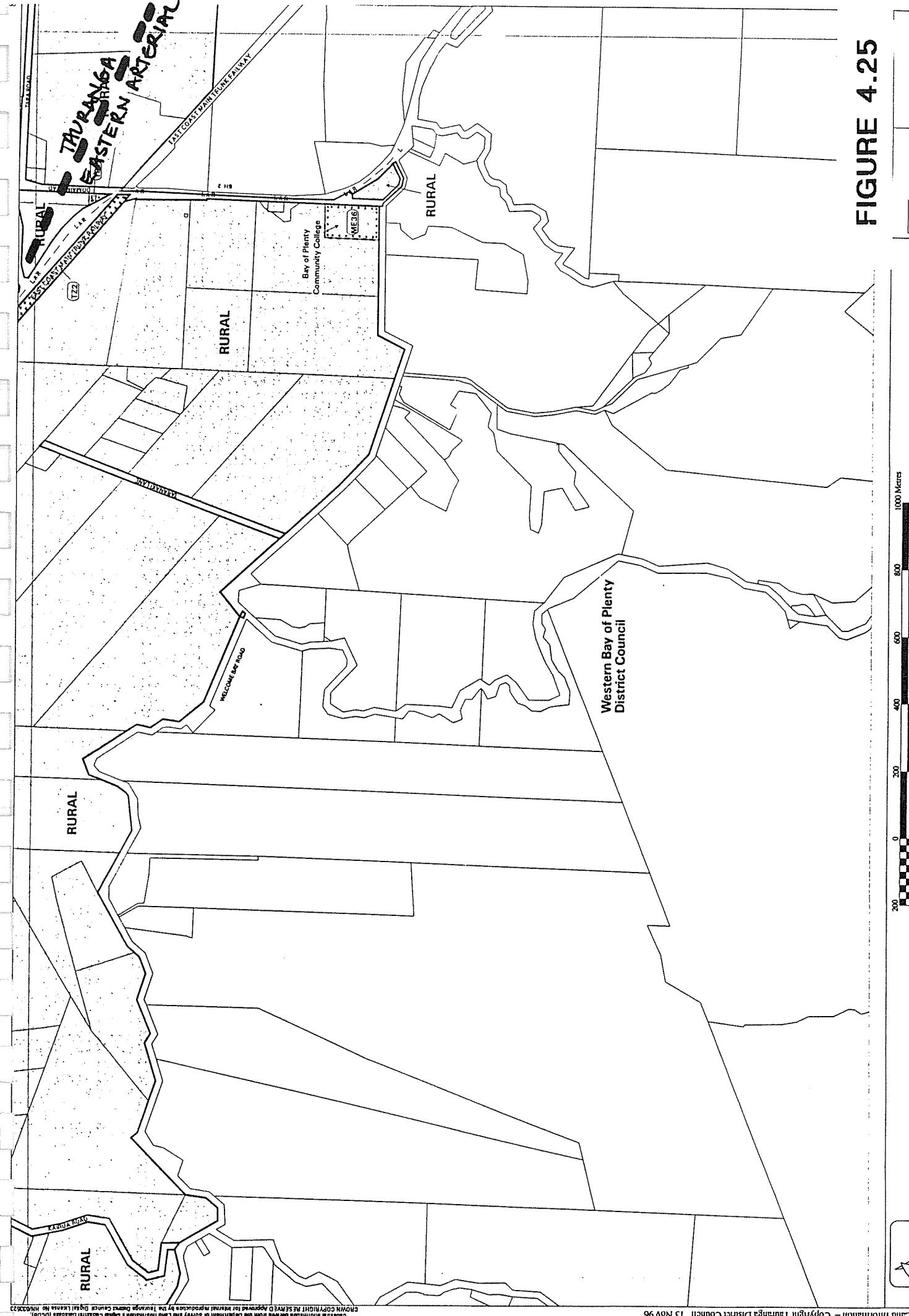
During the intercensal period 1991 - 96, the Western Bay of Plenty District had 3.4% per annum growth and Tauranga District 3.3% per annum growth. The portion of growth attributable to migration was 13,150 people, or 11.5% of the total population.

Statistics New Zealand projections indicate continued growth into the future (see Table 4.3).

FIGURE 4.25

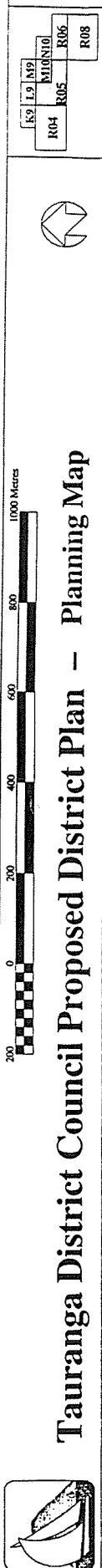
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Tauranga District Council Proposed District Plan – Planning Map



R05

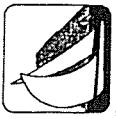
FIGURE 4.26



R06

FIGURE 4.27

Tauranga District Council Proposed District Plan – Planning Map

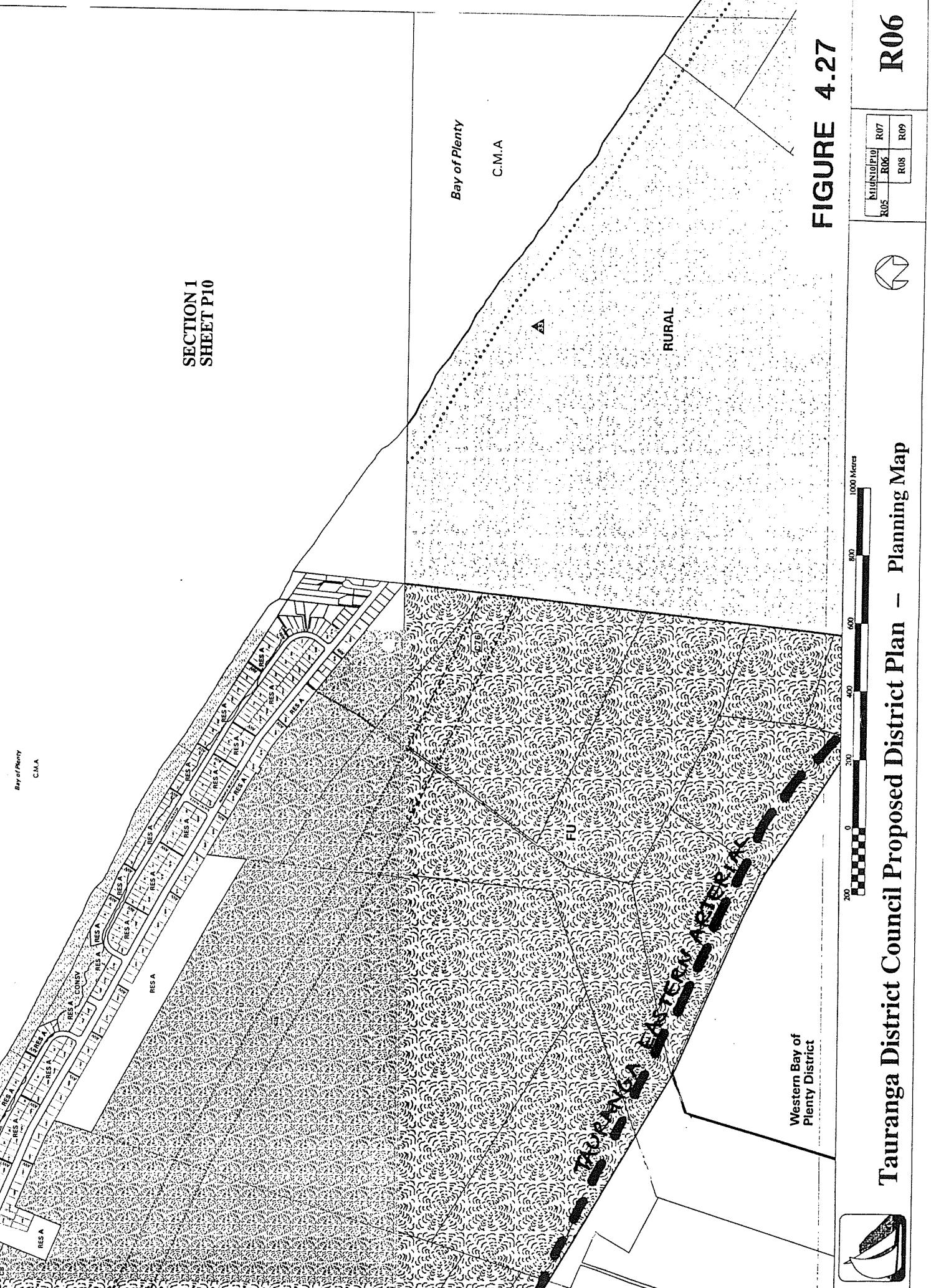


Western Bay of
Plenty District

200 0 300 400 500 600 700 800 900 1000 Metres

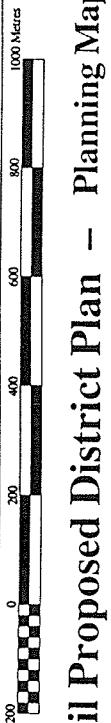
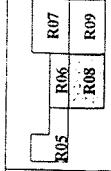
SECTION 1
SHEET P10

Bay of Plenty
C.M.A.



R08

FIGURE 4.28



Tauranga District Council Proposed District Plan – Planning Map



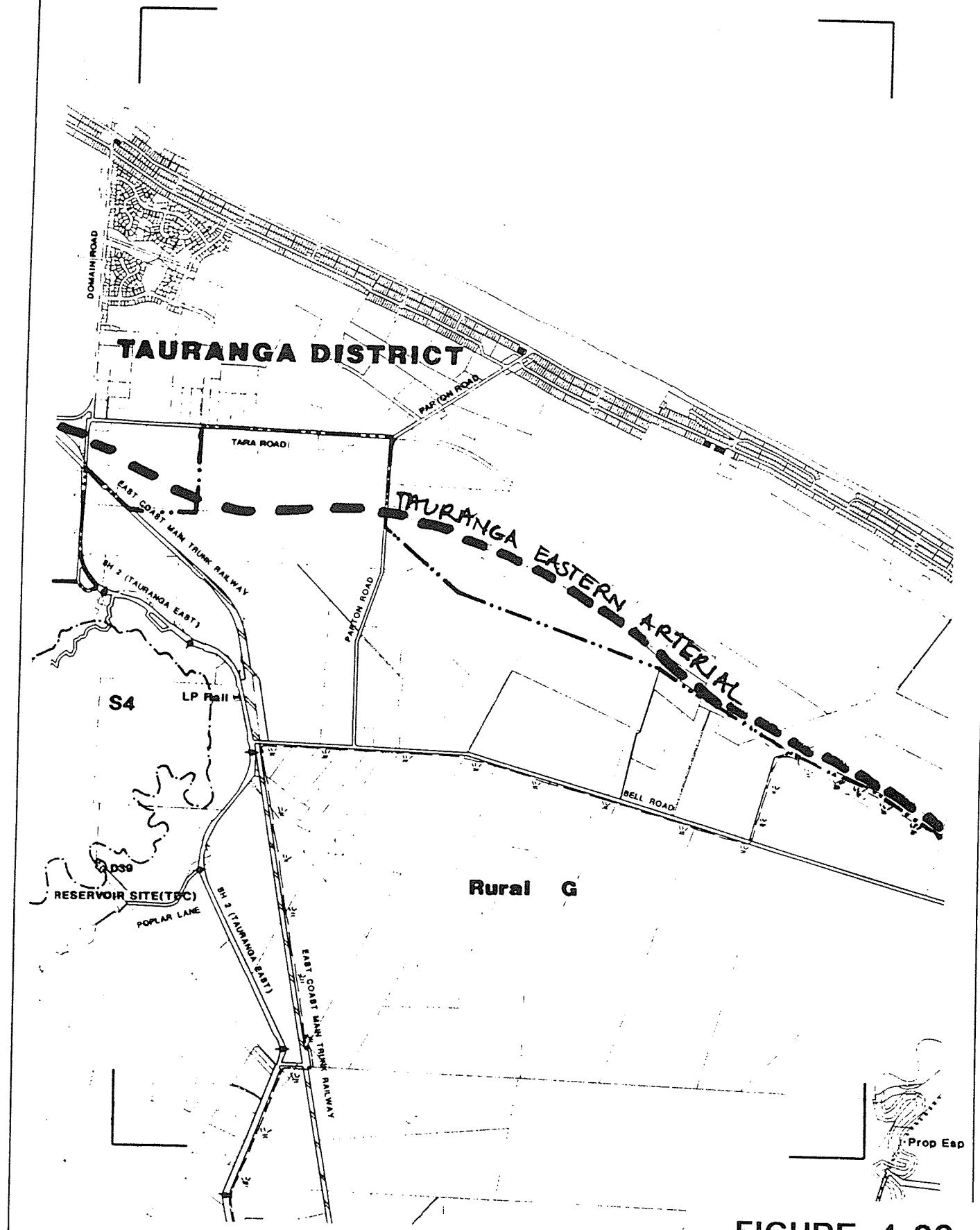


FIGURE 4.29

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ON 5 NOVEMBER 1991



E10 E11 E12
F10 F12
G10 G11 G12

Origin Scale
1 : 25000
Mod No
F11

WESTERN
BAY OF PLENTY
DISTRICT COUNCIL
DISTRICT PLAN



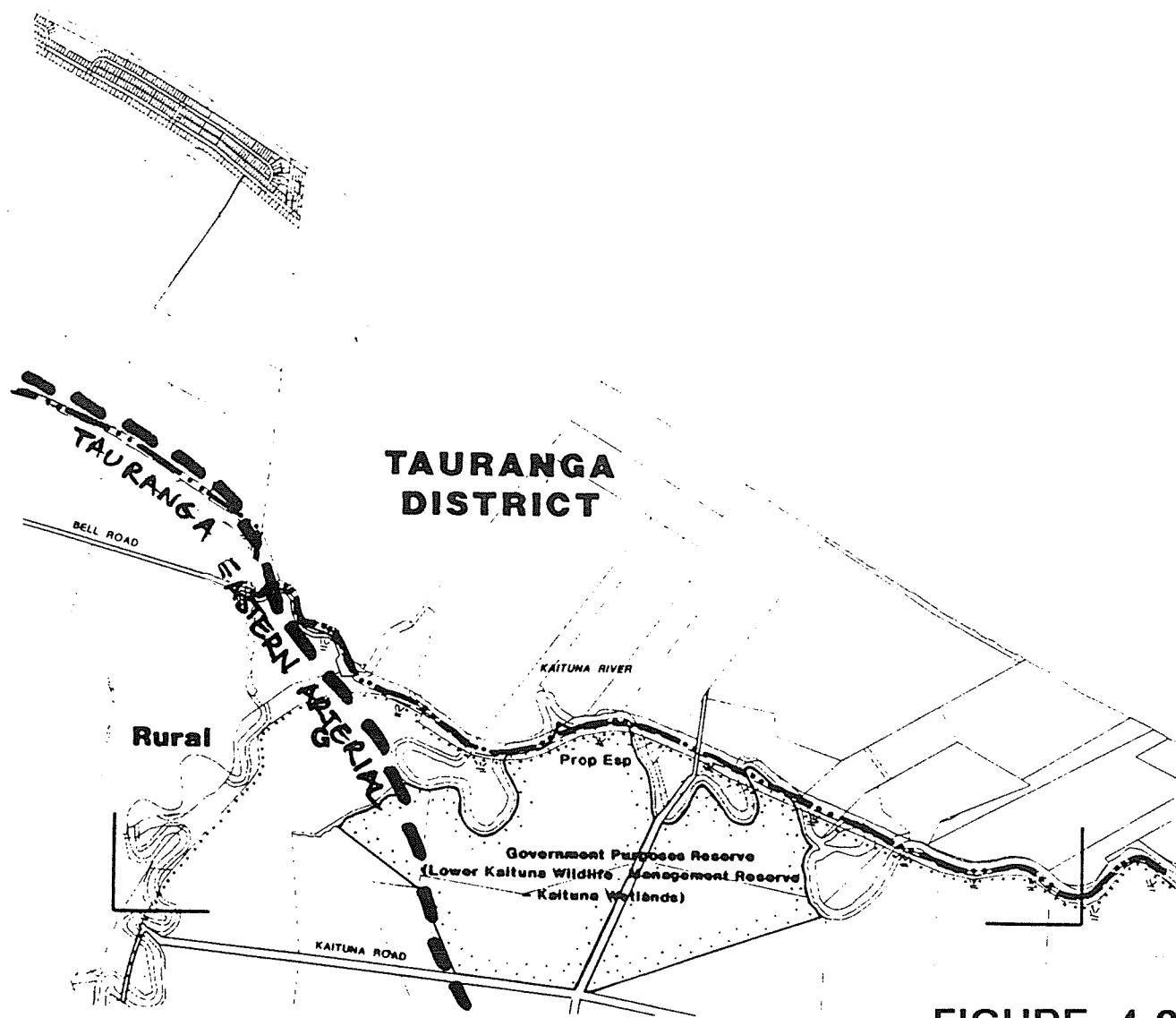
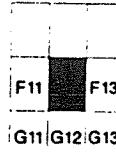


FIGURE 4.30

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Map No
F12

WESTERN
BAY OF PLENTY
DISTRICT COUNCIL
DISTRICT PLAN



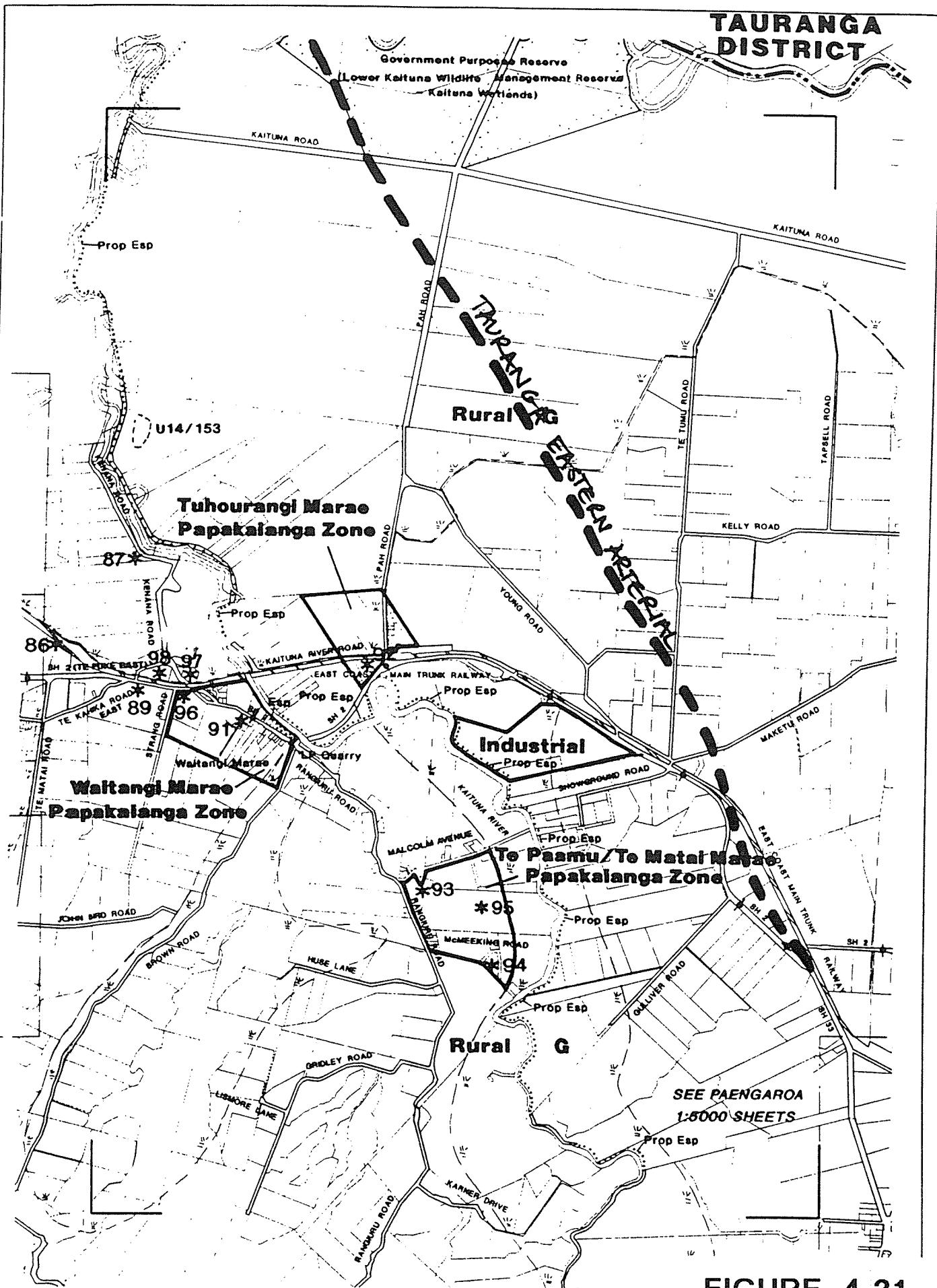


FIGURE 4.31



F11	F12	F13
G11		G13
H11	H12	H13

Original Scale
1 : 25000
Map No
G12

**WESTERN
BAY OF PLENTY
DISTRICT COUNCIL
DISTRICT PLAN**

Table 4.3: Population Projections

High Projection	Total Projected Population				
	2001	2006	2011	2016	2021
Western BOP	39500	43300	47000	50600	54100
Tauranga	88800	97600	106000	114400	122800
TOTAL	130301	142906	155011	167016	178921

Medium Projection	Total Projected Population				
	2001	2006	2011	2016	2021
Western BOP	38900	42000	45000	47800	50600
Tauranga	87200	94300	101000	107600	114100
TOTAL	128101	138306	148011	157416	166721

Source: Statistics New Zealand 1996 Census Base

The communities the Eastern Arterial Route by-passes - Papamoa and Te Puke - are both areas of growth, especially Papamoa. Te Puke had an overall population increase of just over 7% between 1991 and 1996 and Papamoa (east and west) of just over 34%.

Large areas of new residential land and future urban land have been proposed in Te Puke and this is expected to keep the growth rate at or about 1.5% per annum for 20-30 years. This will exacerbate the problems that currently exist on SH2.

Papamoa continues to grow at very high rates and this can be seen in the rate of subdivision occurring. For Papamoa East the population and dwelling growth rates from 1996 to 1998 (January) have been approximately 10½ to 11½ % per annum. For Papamoa West these rates have been approximately 20-21% per annum.

The area through which the TEA passes is rural consisting of large farms, with a very low population density, especially between the Domain Road junction and Te Tumu Road. Around Te Tumu and Maketu Roads there is a slightly higher population density, with the landuse being predominantly smaller horticultural blocks.

4.6.3 LOCATIONAL VALUES

There are 57 properties (landowners) directly affected by the TEA. Of these, approximately 18 are farms and approximately 17 are orchards. Of the remaining properties, there are lifestyle blocks, a golf course and a reserve.

Each landowner directly affected by the Designation has been interviewed and the residents' description of their neighbourhood and lifestyle are reported. The words in bold are quotes from those interviewed.

Over 70% of landowners affected by the route have lived on their properties for more than five years. Some have inherited their farms and want to pass them on to their children or have other long term plans. Of those interviewed five had never lived on their blocks, eight had been there less than 5 years, sixteen between 5 and 15 years and twenty over 16 years. Of these there was one 6th generation on the family farm.

There were many advantages to living in the area identified by landowners. Reasons given included the land being **family land**, the **climate** (particularly given the fact that the majority are in farming and horticulture), the quality of the land for farming, and because it was **affordable**. Some had bought bare blocks and developed the land into viable kiwifruit orchard or dairy farm.

Also mentioned was the **proximity to beaches, fishing** opportunities in the sea, river and lakes; the **proximity to the urban centres** of Tauranga, Rotorua, Whakatane and Hamilton and the amenities that these provided. They liked the **mix provided by living in a rural area** but with proximity to the amenities provided in nearby urban centres, and mentioned the **peace** associated with living there. **The block owners near the Whakatane turn-off that are affected by the railway and/or SH2 do not find the noise detracts from their enjoyment of their property.**

Whereas most people interviewed knew their neighbours and found their neighbours and surrounding community friendly and supportive, it was acknowledged that most of them are working farmers or orchardists and therefore there is **not much community involvement**. The only exception to this was the dairy farming community along Pah Road. Most of these residents had been there a similar length of time and had developed their land together through the Kaituna Drainage Scheme. They are a close knit community in contrast to those on the rest of the route.

Section 5.8 records the anticipated effect of the TEA on these values.

4.6.4 LOWER KAITUNA WILDLIFE MANAGEMENT RESERVE

A full chronological history of the Lower Kaituna Wildlife Management Reserve is provided in Appendix 8 (Garrick 1990). The following is an outline of how the reserve came into existence.

In 1952 a total of 478 acres of land adjacent to the lower Kaituna River were purchased by the Tauranga Acclimatisation Society. This land purchase was jointly funded by the Council of North Island Acclimatisation Societies and the Tauranga Society. In 1972 the Nature Conservation Council recommended that these and adjacent wetlands, comprising a total of 819 acres be gazetted as a wildlife management reserve under the day to day control of the Tauranga Acclimatisation Society. It was recommended by the Nature Conservation Council that the proposed stopbank scheme be amended to allow the area to be left free to flood as a ponding area of the Kaituna River. The Bay of Plenty Catchment Commission indicated (1973) that it was too late to modify the plans, but that an alternative that would lead to the ponding of a smaller area on privately owned land might be possible.

In 1975 a Notice of Requirement was issued by the Minister of Works and Development to place a designation of 'Proposed Public Reserve (wildlife)' over a substantial part of the wetland. The Department of Internal Affairs at this point provided its assurance to the BOP Catchment Commission that the proposed designation would not relieve the

department of its obligation to meet scheme rates associated with the Kaituna Drainage Scheme. An agreement was reached in 1977 that the Department of Internal Affairs would pay an annual grant in lieu of rates to the Commission on the understanding that the Commission would carry out and maintain works that would enhance the wildlife values of the designated area.

In 1980 the area gifted by the Acclimatisation Society was the subject of a new designation as 'Proposed Reserve for Government Purpose (Wildlife Management)' by the Ministry of Works and a draft development plan was completed. Discussion on the management of water levels continued for two years and in 1982 this land was vested as Government Purpose Reserve.

Today the Lower Kaituna Wildlife Management Reserve comprises numerous parcels of land that have been added to the original reserve primarily following the straightening of the adjacent stretch of the Kaituna River. The Management Agreement between Department of Conservation and Eastern Fish and Game Council shows the Lower Kaituna Wildlife Management Reserve is approximately 252 ha which comprises approximately 60 ha of high ecological value (Area One in Figure 4.32A).

The Lower Kaituna Wildlife Management Reserve is vested in the Crown and administered by the Department of Conservation. The Department and the Eastern Fish & Game Council (formerly the Tauranga Acclimatisation Society) have negotiated an agreement regarding management of the Reserve. (Refer Appendix 8.) While DOC is charged with overall management, the Fish & Game Council is responsible for daily management. There is no formal Management Plan for the Reserve and accordingly the Department oversees all works that the Council may wish to undertake.

The Agreement between DOC and Fish & Game provides for two management regimes on the reserve, habitat conservation in the east and wildfowl/game recreation in the west (refer Figure 4.32A and Appendix 8).

The Agreement defines the areas Fish & Game can manage for the benefit of recreational users. Though not formally ratified, the Council has prepared a draft Concept Plan of how the reserve might be enhanced (refer Figure 4.32B)

The Wildfowlers Association have, under the direction and management of the Eastern Fish & Game Council and DOC, undertaken excavation and other works to enhance the habitat. The Association has prepared a Waterfowl Habitat Improvement Strategy which provides a draft concept of how the reserve may be developed in the future. Refer Figure 4.32C. It is understood that there has been no formal adoption of an overall strategy for the management of the Reserve, but that a Management Plan may be prepared by DOC in the next two years.

The Reserve is currently used by a number of groups and individuals for varying activities.

The Royal Forest and Bird has approximately 200 local members some of which informally visit the reserve out of the shooting season. There is one official visit each year by the group to the Reserve. In addition there are usually six planting trips on the reserve per annum.

The north western end of the reserve adjacent to the designation is managed for wildfowl shooting and general appreciation of wetland habitat. (The ecological section of the AEE, Section 4.1, provides further detail on the reserve.) During consultation with the Department of Conservation, Royal Forest and Bird Society, Eastern Region Fish and Game Council and the Wildfowlers Association the recreation values of the reserve have been described particularly the seasonal shooting of ducks/pheasants. shows the locations of the maimai.

With regard to the matter of shooting, duck shooting occurs during the months of May to July and pheasants are shot in the months of May to August. There are approximately 33 maimai sites licensed by Eastern Region Fish and Game on the Reserve (10 in the development area and 23 in the non-development area) each able to take two shooters. There are 83 hunters who have access to the maimai. In addition, in excess of 100 permits are issued to hunters after the first two weeks of the season. These hunters can wander through the reserve to hunt. The maimai are all situated so that the direction of shooting is angular (i.e not shooting at each other).

The Kaituna River is also used for whitebaiting and fishing. There are no survey records available to give an indication to the number of people accessing the reserve to fish or whitebait.

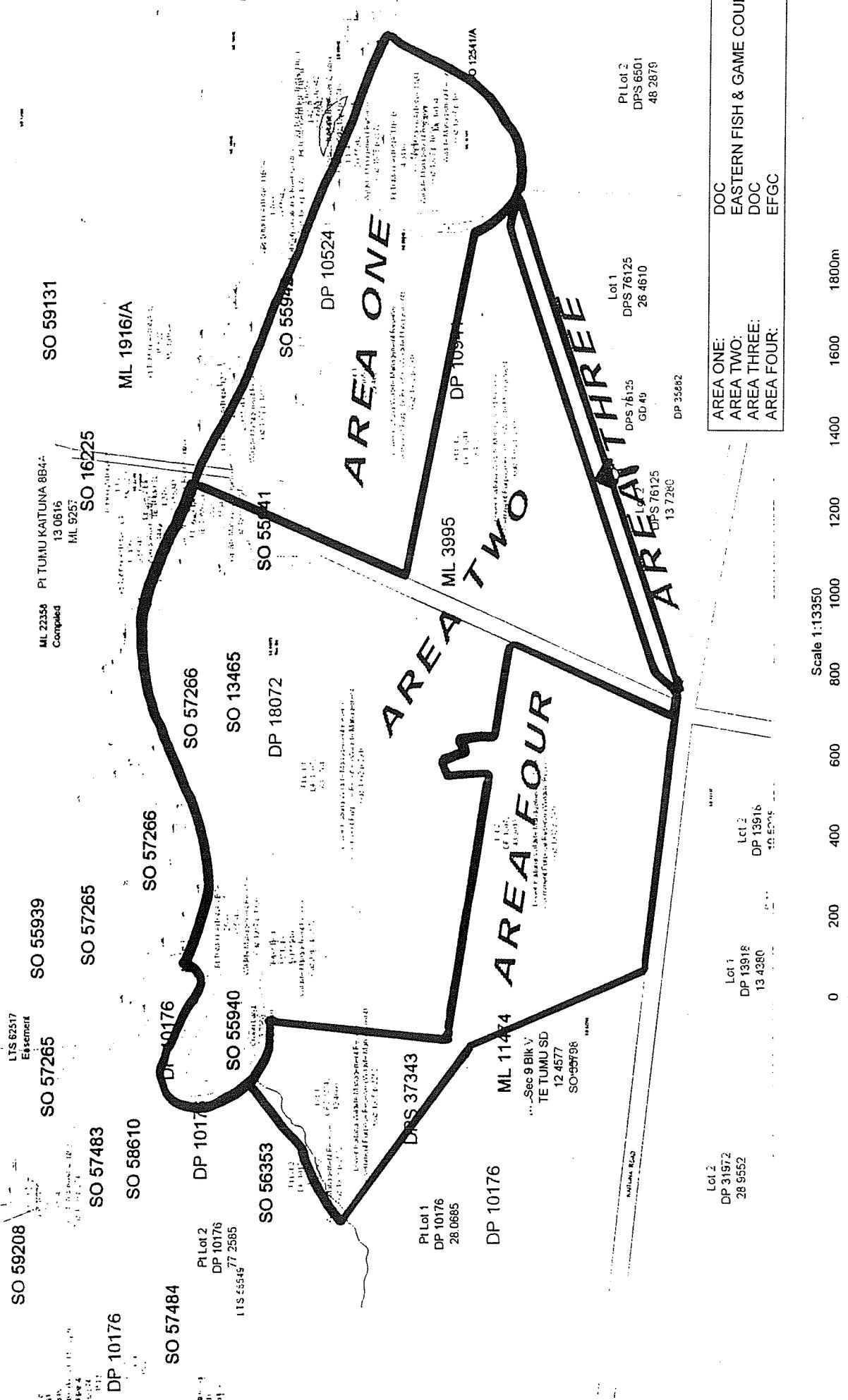


FIGURE 4.32A
MANAGEMENT AGREEMENT
KAITUNA RESERVE

Kaituna River
TERRALINK NZ LTD(Terraview)-DCDB Data as at 22.08.98 Title & VNZ data as at 18.07.98.
Cadastral Information from LINZ Digital Cadastral Database /DCDB/ CROWN COPYRIGHT RESERVED

NOT TO SCALE

PROPOSED FUTURE WORKS -
EASTERN FISH & GAME COUNCIL
(JULY 1999)

FIGURE 4.32B



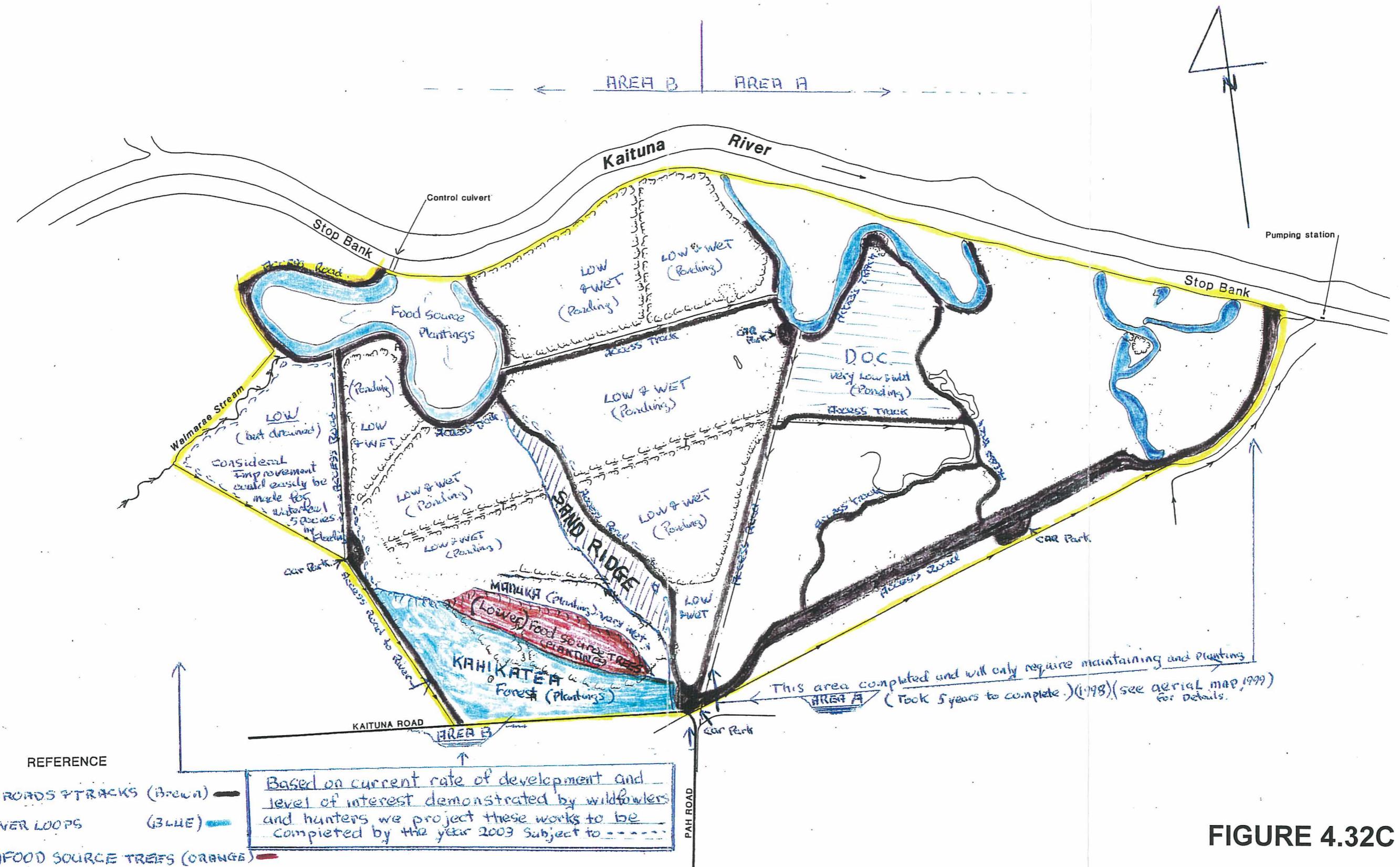


FIGURE 4.32C

PREPARED BY WILDFOWLERS ASSOCIATION
NEW ZEALAND, JULY 1999

(*"WATERFOWL HABITAT" IMPROVEMENT STRATEGY*) MAP OF LOWER KAITUNA WILDLIFE MANAGEMENT RESERVE.

0 500m
Approx scale

5. ASSESSMENT OF ENVIRONMENTAL EFFECTS

5 ASSESSMENT OF ENVIRONMENTAL EFFECTS

This assessment of environmental effects has been undertaken on the basis of a four lane expressway being constructed with all proposed interchanges. It is possible that this construction may be staged however.

5.1 ECOLOGICAL

No notable vegetation, special vegetation site or community of rare or endangered plants would be traversed by the TEA.

5.1.1 NATIVE VEGETATION

The TEA will not impact on any significant areas of indigenous flora, at any part of its alignment,

5.1.2 WILDLIFE

No notable wildlife habitats will be destroyed by the traverse of the TEA. On the western side of the Kaituna River, the Niccol property oxbow wetland would be avoided. The crossing of the Kaituna mainstem would be in an area of typical River habitat which is grazed to its edges, and has no particularly notable features relative to large similar areas both upstream and downstream.

5.1.3 LOWER KAITUNA WILDLIFE MANAGEMENT RESERVE

Within the grazed area of the Lower Kaituna Wildlife Management Reserve the route will avoid the truncated oxbow near Waimarae Stream and all taller vegetation habitat.

The TEA traverses Area Four of the Reserve which is managed by the Department of Conservation for grazing purposes at present (refer Appendix 8 and Figure 4.32A) The area of high ecological value is Area One and is in the north-eastern section of the Reserve (c.1100m from the alignment). The Eastern Fish & Game Council area (Area Two) for game bird hunting and game bird habitat is near the alignment in the north. On-going modification to those habitats is envisaged in accordance with the Management Agreement. It is understood that Area Two is a popular shooting area for both waterfowl and "upland" gamebirds (i.e. Waimarie oxbow and sand ridge habitat). Please refer to Section 5.6.11 for further information on recreational effects.

The alignment has been altered to avoid the small western stand of remnant kahikatea which is presently surrounded by grazed pasture. The traverse would be to the west of the pre-eminent remnant stand of kahikatea in the local area.

The areas of tall vegetation habitat immediately adjacent to the alignment are utilised by mainly common species of birds, including gamebirds. Some would be displaced from the area during the construction phase but, provided the habitat is retained, can be expected to utilise the area once construction activities have ceased. Most of the potentially affected species are also found in urban and urban fringe habitats, including gamebirds such as California quail, ring-necked pheasant and waterfowl. It is noted that both fernbird and Australasian Bittern have persisted in the south-eastern section of the Reserve despite the relatively recent construction activities and the significant use of firearms in that area in particular.

The presence of the TEA would not diminish the wildlife values of the adjacent area or the resource values of the higher ecological value habitats in the north-eastern section of the Reserve.

As a result of the 4 to 5 metre high vegetated bund (see Section 5.2 and 5.5) there is unlikely to be a significant adverse effect from vehicle noise and lights and vibrational effects would be negligible.

The presence of the bund may decrease the potential for road kill of wildlife in that area as birds would gain altitude to clear both the bund and vegetation along the bund crest. These aspects are discussed in more detail in Appendix 4.

As the final alignment for the TEA avoids intrusion into any tall vegetation (i.e. willow-dominated or kahikatea), any “edge effects” would be much reduced. It is likely that the major “edge effects” on the previously modified perimeters of the Reserve have already occurred as a result of land clearance which began in about the 1940’s. The alignment would not result in any habitat fragmentation as all the remaining habitat would be retained. The only possible barrier created would be to introduced mammals, some of which are significant predators of native wildlife; the presence of the road would not necessarily be negative in terms of the dispersal of those species, rather the opposite may apply. As no Management Plan has been finalised the intended level of predator control in the Reserve is not known.

The presence of the roadway could increase the quantity of vehicle-derived litter in this area. The public commonly uses bridges in particular as refuse disposal points. There are means of reducing the quantities of litter entering the Reserve area (refer Section 4 of Appendix 4).

The construction of the road past the Reserve will involve the formation of an embankment. This embankment will compress the underlying soils therefore potentially reduce the ability of the water from the wetlands travelling through these soils to the various farm drains which have been constructed. The road therefore could provide some additional benefits to the wetland by helping to retain the water in the area.

Although the state of the Reserve is likely to change between the present and the time at which road construction commences, its state in ten years hence is essentially unknown.

The future condition of the Reserve will depend on the final Management Plan, the effect of raising water levels from 1999 culvert, whether or not further consent is given for additional development of standing water bodies and the effect of additional planting both within the Reserve and associated with the 4.5 metre high noise mitigation bund which is likely to precede the roadway.

The proposed mitigation could, however, protect a Reserve with increased ecological values on the assumption that that trend will occur as a result of changes unassociated with this proposal. This mitigation would conserve and protect both the existing and future potential biodiversity values of the Reserve area.

5.1.4 AQUATIC HABITAT

No notable aquatic habitat would be destroyed by the TEA. The By De Ley property, Kaituna oxbow, Waimarae Stream and eastern drain habitats are all poor quality habitats with low dissolved oxygen levels, muddy substrates, low macroinvertebrate diversity and only moderate abundance, and with a low diversity of fishes. Construction works in those areas would not destroy any significant habitat.

The Kaituna River habitat is a higher quality area at the proposed crossing point and part of an important migration pathway for fish. A bridge with set back abutments would reduce adverse effects to the minimum practicable and there would be no disruption to migratory pathways or bird flight paths. At present the riparian edge areas at the proposed crossing point consist essentially of grazed pasture and have no significant habitat value; riparian planting would enhance the ecological values of this section of the River significantly.

The range of chemical analyses indicated that unexpectedly moderate levels of at least copper, lead and zinc contamination are present. Sediments generally contain low to moderate proportions of silts and clays but sediment disturbance would release concentrations of total ammonia (Kaituna River site) and sulphide (Kaituna oxbow, Waimarae Stream in particular), which have the potential to result in adverse downstream effects prior to reasonable mixing.

Rapid dilution is likely at the River site. Zinc concentrations at the By De Ley property, copper and lead in Waimarae Stream and copper at the Kaituna oxbow site are relatively high, and works areas would need to be isolated from the Kaituna River mainstem to mitigate against adverse downstream effects. Most of the areas crossed by the designation, with the exception of the River mainstem, could be physically isolated (i.e. By De Ley property, Waimarae Stream, eastern drains), while a control gate is present downstream from the Kaituna oxbow crossing. While any instream works in the latter are likely to result in adverse water quality effects, that area is a poor quality habitat relative to habitats in the River mainstem.

In general, and providing the contaminated areas can be isolated during the construction phase, any adverse effects would be minor and no worse than the effects of natural river flood flows.

5.1.5 STORMWATER RUNOFF

The completed roadway would be a source of contaminated runoff. To the west of the Kaituna River there is sufficient roadside land in which to develop wetland buffer areas for stormwater runoff. Those areas could also be developed to reflect the previous vegetation and habitat types of the former Te Parapara Swamp (Figure 4A of Appendix 4).

Similar areas of wetland could be developed on the eastern side of the River with the aim of providing buffers prior to stormwater being directed to the existing large drains (e.g. aquatic Site EA5). In this manner most of the stormwater from the eastern section of the roadway could be directed to the large drain forming the south-eastern boundary of the Reserve, thus avoiding any direct impingement of roadway-derived stormwater on the Reserve habitats. Attenuation of roadway-derived particulates could also be achieved by utilising the existing constructed drains as retention areas. It is understood that these large drains are separated from the hydraulic regime of the Reserve wetland habitats, which required the pumped addition of River water during the summer to maintain their wetland characteristics prior to commissioning of the new river culvert (1999).

It would not be appropriate to use roadway-derived stormwater for maintenance of the Reserve wetland areas or to use those areas for stormwater treatment. There is an opportunity, however, to isolate this operational effect of the roadway from the adjacent Reserve area which would further reduce the overall impact of the roadway on adjacent habitats.

If roadway-derived stormwater is able to be directed away from and/or around the present Reserve area via new and existing but modified drainage channels suitable for the retention of particulates, the adverse effect of roadway-derived stormwater runoff on the Reserve area would be negligible. Dilution of *treated* stormwater in the inland drains and in the Kaituna River mainstem is unlikely to result in a significant adverse effect on the wetland near the River mouth, or River mouth habitats themselves. See Section 5.10 for detail of proposed stormwater management at the Lower Kaituna Wildlife Management Reserve.

At present all runoff from Te Puke, Te Matai and State Highway 2 drains to the Kaituna River in an uncontrolled and untreated manner; that area includes approximately 6 road and 8 rail crossings of tributary streams, drains, and the main river.

5.1.6 VEGETATION RESTORATION

Although no tall vegetation habitat would be destroyed by the alignment, its "footprint" within the western section of the Reserve property, presently consisting of grazed and drained pasture, would remove an area which would otherwise be suitable for rehabilitation to kahikatea, flax and manuka habitat as occurred previously. The land is clearly suitable for kahikatea revegetation; remnant stands remain nearby and grazed paddocks, at least on the eastern side of the proposed alignment, contain stumps of old kahikatea trees. There is an opportunity to restore the previous vegetation types in some of the adjoining areas earlier than would probably have occurred under the existing land use situation in that part of the Reserve property. Therefore, development of the TEA may also enable the timetable for Reserve rehabilitation to be contracted significantly. The reduction in the total potential area which could be ultimately rehabilitated is likely to be compensated by revegetation of other areas adjacent to the alignment but beyond the existing Reserve boundaries.

5.1.7 ECOLOGICAL CONCLUSIONS

In summary, although the designation would be in close proximity to habitats of moderate to high value, it is well separated (by c.1100m) from the highest value ecological areas in the Lower Kaituna Wildlife Management Reserve. The areas traversed are dominated by grazed pasture to the east and west of Kaituna River and, except for the River itself, the aquatic habitats are of low ecological value. The area of tall vegetated habitat in the Lower Kaituna Wildlife Management Reserve (not kahikatea stands) closest to the alignment is managed by the Eastern Fish and Game Council for waterfowl and "upland" game shooting. The Council's existing constructed pond development would be well separated from the alignment.

There is an opportunity to isolate any potential roadway-derived stormwater effects from the Reserve, to provide wetland buffer areas on other parts of the alignment and to progress the revegetation of the grazed portion of the Reserve (including the 4.5m high noise bund) more rapidly than would have occurred otherwise.

The designation would not destroy any existing vegetation, wildlife habitat or aquatic habitat which is significant even on a local basis.

There are areas of aquatic sediments on the western and eastern sides of the Kaituna River which contain moderate levels of contamination, and which would require isolation to prevent adverse effects on downstream habitats. No significant adverse effect on Kaituna River mainstem habitats would result.

Operation of the roadway is unlikely to diminish the existing ecological values of the western vegetated area (i.e. sand ridge area) of the Lower Kaituna Wildlife Management Reserve administered by the Eastern Fish and Game Council which is to the east of the alignment. (Area Two in Figure 4.32A.) are even further to the east.

There is unlikely to be any significant adverse effect on the Reserve as a result of noise, light or vibration from the roadway based on existing wetland examples and because of the 4.5 metre vegetated bund proposed. (Refer Appendix 4, Section 3.16 for more details on potential noise effects).

There is an opportunity to establish wetland swales on the western side of the River to control stormwater which reflect the previous vegetation types of the area.

On the eastern side of the River, roadway-derived stormwater could be managed so that it is isolated from the Reserve area and generates no adverse effects.

Mitigation measures which would reduce any adverse ecological effects significantly appear practicable , and would conserve and protect both the existing and future potential biodiversity values of the adjacent Reserve area. (These are described in Section 7).At the Options evaluation stage of this appraisal, two recommendations were offered; that the final alignment avoid the Niccol property oxbow habitat, and that it also avoid the remnant kahikatea stands within the Lower Kaituna Wildlife Management Reserve property. Both those recommendations were accommodated and are reflected in the final alignment.

5.1.8 COMMENTARY ON PLANNING POLICY

The following objectives and policies are considered relevant to ecological issues:

Proposed Bay of Plenty Regional Policy Statement (incorporating decisions on submissions, August 1996)

Policy

6.3.1(b)(viii)

To protect, and enhance where practicable, the region's remaining wetlands.

Objective

8.3.1(a)

The quality of every water body is maintained and enhanced to a level sufficient to sustain the aquatic life naturally occurring there, is suitable for existing and reasonably foreseeable future needs, and does not adversely affect aesthetic, cultural or spiritual values.

Policy

8.3.1(b)(i)

To ensure that the adverse effects of contaminants on water are avoided, remedied and mitigated.

Policy

8.3.1(b)(iv)

To ensure that water quality is not adversely affected by inappropriate location and management of activities.

Objective

16.3.1(a)

The preservation of the natural character of the region, including the protection in perpetuity of significant indigenous habitats and ecosystems and the safeguarding of natural ecosystem processes and

intrinsic values.

Policy

16.3.1(b)(vi)

To recognise marine, lowland native forest and freshwater habitats and ecosystems, in particular, as being under-represented in the reserves network of the Bay of Plenty Region.

Proposed Bay of Plenty Regional Land Management Plan (incorporating decisions on submissions, March 1998)

Objective

6.6.2(a)

The appropriate management of riparian margins to protect and enhance where necessary the soil conservation and water quality values of the riparian margins and adjacent waterways.

Objective

7.4.2(a)

The retention and enhancement of the values of the remaining wetlands in the Bay of Plenty.

Western Bay of Plenty Proposed District Plan (incorporating proposed Variation N° 1 Change 1 and outstanding references, November 1997)

Objective

9.2.1

Protection of all significant native plant and animal habitats and ecosystems within the Western Bay of Plenty District.

Policy

9.2.2.3

Ensure protective measures account for the dynamics of water related effects on wetlands.

Policy

9.2.2.8

Activities should not adversely affect any significant native plant and animal habitats and ecosystems.

As mentioned above, there will be no significant indigenous habitats, ecosystems, native plants or animal habitats affected, as the alignment has already been altered to avoid a stand of Kahikateas and the oxbow.

The alignment avoids the part of the Lower Kaituna Wildlife Management Reserve with high ecological values and passes instead through an area which has been modified, and remains in pastoral use in order to pay Regional rates for the Drainage Scheme. Additional land will be made available to be converted into a wetland in the same way that the land being affected would presumably have been in the long term .

The impact of the TEA on the pathway of fish in the Kaituna River will be mitigated through the provision of set-back abutments. Riparian planting proposed at the crossing point of the riparian edge will enhance the ecological values of this section of the river

significantly. Water quality will be maintained by the provision of wetland buffers for stormwater runoff.

It is therefore considered that the proposal is in accordance with the provisions of the relevant Regional and District Plans.

5.2 VISUAL

The methodology used in this assessment is designed to assess whether or not the proposed arterial would have an appreciable effect on the nature and quality of its surroundings.

The process of analysing such effects involves:

1. identification of the physical area or catchment from which the new road would be visible;
2. identification of the different viewing audiences that would see the new road, followed by the allocation of viewpoints to positions which capture those audiences' perspective;
3. use of photos from each vantage point and, as appropriate, 'before' and 'after' photomontages to depict the nature of the change associated with the proposal;
4. application of a Visual Effects Matrix to methodically and consistently analyse the degree of visual effects associated with such change for each landscape unit;
5. the extent to which landscape mitigation is possible; and
6. evaluation of the proposal as a whole taking into account all the preceding analysis.

5.2.1 THE VISUAL CATCHMENT

The visual catchment is the physical area within which it would be possible to see the proposed new road, and this is illustrated in Figure 5.1.

Because of the exceptionally flat land in this area, there is very little natural screening. Only trees and shelter belts will block views of the arterial. The other mitigating factor is distance. The visual catchment will vary in width, widening out in the very flat areas with no shelter belts, and narrowing down as the road passes through horticultural areas surrounded by shelter belts.

The arterial will be visible from parts of Domain Road, Tara Road, parts of Parton Road, and Bell Road, at a distance of between a half and one kilometre. Distant views of the arterial may be able to be gained from parts of the coastal dune hills to the north.

As the arterial crosses the ox bow lake of Kaituna River, it will be fairly well screened by trees in the immediate vicinity, and the bridge across the river will be visible along the river and from the stop banks.

In Pah Road area the visual catchment will open up because of the flatness of the area and the lack of trees and shelter belts, though the vegetation in the Lower Kaituna Wildlife Management Reserve will block views from the north east.

Through the Te Tumu Horticultural area the proposed arterial will be well screened by shelter belts.

The visual catchment will open up once again to the south at the intersection of State Highway 2 and 33 because parts of the road will ultimately be elevated and there is less screening vegetation.

Views of the new arterial will be gained from the top slopes of the Papamoa Hills, though from here the new road would be very distant. Views of the western part of the proposal may also be gained from the Main Trunk Railway line.

Overall the visual catchment of the proposed arterial is of moderate size, because of its visual exposure over flat land. However because the proposed road is sited on fairly low embankments it will not be particularly intrusive. Visually it will be hard to detect as it passes through the horticultural areas.

5.2.2 THE VIEWING AUDIENCE

Based on the viewing catchment identified, the following groups comprise the main audience that would see parts of the Eastern arterial :

1. Motorists travelling on local roads including Bell Road, Parton Road, Tara Road, Pah Road, Kaituna Road, Te Tumu Road, Maketu Road, Reid Road and State Highway 2 and 33. These will include the land owners, commuters, tourists, visitors, workers and commercial vehicles.
2. Land owners through which the proposed arterial runs;
3. People who live in Tara, Parton, Bell, Pah, Kaituna, Maketu Roads who will be near enough to the proposed arterial to gain views of it;
4. People who live on the Papamoa Hills who overlook the western parts of the coastal flats (but distantly).
5. Recreational fishing people and people who use the Kaituna River for recreation either by boat or from land;
6. People who visit or work in the Te Tumu Horticultural area, and Kiwi County;

Overall the anticipated level of audience exposure would be fairly low, because of the low population levels of the area, and the remote character of parts of the landscape.

5.2.3 MITIGATION POTENTIAL

Though the final design for the Eastern Arterial has not yet been completed, LA4 Landscape Architects have used the currently available plans as a basis for preparing Concept Landscape and Mitigation proposals. This mitigation will assist in screening the proposal from the wider audience and also for each house or group of houses.

As part of this assessment, and in conjunction with the noise consultant Marshall Day Associates, houses which will be affected by the proposed arterial have been identified, mapped and numbered on the landscape mitigation plans. They are shown in red.

For those houses which are really close to the proposed arterial fences or earth bunds are to be used to mitigate sound. Because of the open exposed rural nature of the landscape, earth bunds would be preferable to fences. Stop banks are already a feature in the landscape and fences are harder to integrate visually. However, in some places fences have to be used, and in these cases we have suggested tree planting to reduce the visual effects.

Earth bunds are recommended to be 2.5 metres in height, with tree and shrub planting associated with parts of them. These will have a generally positive effect when viewed from the wider landscape, in that views of the road will be screened. They will have a more adverse effect when travelling along the new road itself, because views out across the landscape will not be available in places.

In the area around the Kaituna River where stop banks are already a feature, it has been possible to use earth bunds as a design feature, particularly on the south west side of the arterial to screen the house near Bell Road close to the river.

In view of the importance that this road will have in terms of creating an "entry" to Tauranga, identified in previous landscape studies and in this assessment, a range of design features have been included:

- retaining and creating views out into the surrounding countryside and if possible to the coast;
- using noise attenuation earth bunds with tree planting as a design feature particularly on the coastal flats and near the Kaituna River.
- re-creating wetland vegetation areas, and particularly areas of kahikatea, flax and cabbage trees removed by farming operations and grazing in past years.
- creating other planted features along the route, both to screen and highlight particularly for houses in the Bell Road and Pah Road areas;
- introducing shelter belt planting in the Te Tumu horticultural area to screen the highway. Almost total visual mitigation can be achieved by the use of shelter belts.;
- improving the landscape character of the SH33 /2 intersection by means of massed tree planting and highlighting views.

5.2.4 VISUAL EFFECTS MATRIX

For each landscape unit the visual effects of the proposed Eastern Arterial have been assessed using the Visual Effects Matrix (score sheet), which ensures that each unit and changes within each unit are evaluated thoroughly and consistently. The Visual Effects Matrix is shown in Appendix 5.

In order to illustrate some of the visual effects a number of viewpoints have been chosen and illustrated using a photograph with a photomontage below it, showing the Eastern Arterial superimposed into that view. This provides a basis for comparison of present and anticipated situations. The illustrations show the proposed arterial before any mitigation planting is carried out.

The following viewpoints are illustrated

Viewpoint 1: From Parton Road looking south

Viewpoint 2: From Bell Road looking north

Viewpoint 3: From the boat ramp on Kaituna River looking west

Viewpoint 4: From SH2 looking south towards SH33 intersection

Viewpoint 5: From Papamoa Hills (Reid Road) looking north east.

The positions for the photomontage viewpoints are shown on Figure 5.1 and the viewpoints are shown in Figure 5.2 to Figure 5.6. These are indicative only.

The total scores for each landscape unit which result from the visual effects assessment denote the overall visual effects rating, which has the following range of potential ratings and effects for each landscape unit. The definitions of these effects are as follows:

no effect	<i>no visual effects</i>
low effect	<i>minor visual effect under RMA</i>
moderate effect	<i>visual effects of some significance</i>
high effect	<i>high visual effect - large scale mitigation or redesign will be required.</i>
severe effect	<i>unacceptably high visual effects. Significant redesign and mitigation required</i>

In general terms, visual effects in the **no effect** to **moderate effect** range are acceptable in landscape and visual terms, provided mitigation is carried out for close up residents or workplaces, or for particularly intrusive elements. It may be necessary to discuss a redesign of some parts of proposal to try to reduce any adverse visual effects in some instances.

For those units where high effects result, significant mitigation is required, and/or a redesign of parts of the proposal. Where a severe effect is created, the effects would be

unacceptable in visual and landscape terms unless a significant amount of redesign or mitigation is carried out.

In very general terms the visual effects that could be expected in the various categories could be as follows:

No effect	<i>No visual effects</i>
Low effect	<i>A low effect rating could be attained because the new road is to be positioned in an already highly disturbed landscape - for example into an industrial or commercial landscape or into a landscape with very low existing quality, where the road would make very little visual impression. Or it could be because the existing landform, trees and vegetation would screen significant parts of the new road.</i>
Moderate effect	<i>A moderate effect is usually attained through a combination of factors such as the new road being visually prominent in the view, but because of the low quality of the landscape, or the fact that only a few people who would see the view, the overall rating would be moderate. A moderate rating means that the road would be quite significant in the view.</i>
High effect	<i>A high visual effect rating means that the new road would be highly prominent in the view, and is attained through a combination of factors including for example a large cutting and large scale earthworks through a skyline ridge, or a high long embankment across a high quality low lying landscape, with a fairly large number of people who would see the changes.</i>
Severe effect	<i>This effect could be attained for say an individual or group of residences which would have a large road cutting, or embankment very close to their house or directly in their close-up view. Or it could occur where there is a deep cutting through indigenous bush very close to an existing residence in areas which are currently undisturbed, fairly high quality landscapes.</i>

5.2.5 VISUAL AND LANDSCAPE EFFECTS ASSESSMENT

The following sections give a physical description of the arterial as it passes through each landscape unit, the visual effects of the arterial road and its construction, the potential that there is for amelioration and mitigation. These sections should be read in conjunction with the Concept Landscape and Mitigation Plans - Plans 1-5 (Figure 5.7 - Figure 5.11), which are included as part of this assessment. The mitigation plans show the positions of houses in the immediate vicinity of the eastern arterial. Each house has been given a number, for example A1, A2, A3, and these house numbers are the same as those referred to in Marshall Day Associates noise assessment.

Most of the mitigation planting will be concentrated inside the road designation, but in order to integrate the new road into the landscape successfully it may be necessary to carry out some tree planting in other places outside the designation.

5.2.5.1 Bell Road Flats

Physical Description of Arterial

The new arterial deviates from the existing State Highway at the Domain Road intersection. This intersection will comprise a high level roundabout at the junction of Tara Road and Domain Road with "on" and "off" ramps from these roads to the new arterial. There will also be ramps connecting to the existing State highway, and a bridge over the new arterial carrying Domain Road extension. This intersection will remove four houses and will significantly affect three others.

In this vicinity the new arterial will pass into a 4 metre deep cutting, and will then move out onto a 1.2 - 1.5 metre high embankment through parts of the area south of Tara Road. In other places the new road will be at ground level. Some shelter belts and individual trees may be removed in places. The new arterial gradually curves south towards Bell Road where it will be on a 3 metre high embankment.

East of Parton Road 5 houses will be within 100 metres of the proposed arterial. Parton Road will pass over the new arterial on a bridge with footpaths on both sides and railings. Further east again two houses will be within 100 metres of the alignment.

A new high level intersection will be positioned across the new arterial in the vicinity of Bell Road called the Bell Road interchange. This comprises a bridge over the arterial and "on" and "off" ramps to it.

Visual Effects

The landscape of this area has a low/ moderate quality. The land is flat, with drainage channels, hedges, shelter belts in places, and extensive views out over the whole landscape unit. However, because the new arterial is generally fairly low in elevation, it will appear to be sited on an embankment similar to stop banks in the area, and will therefore be accommodated quite well in the landscape.

The two areas where the visual effects of the new arterial are likely to be higher are the Domain Road interchange and the Bell Road interchange. These two high level bridges will have high visual effects in the immediate vicinity because they will be highly visible in the surrounding flat land.

Except for these two interchanges the legibility of the new road way be fairly low and overall it will have a moderate visual effect.

Refer to Viewpoint 1 - Parton Road looking south and Viewpoint 2 - Bell Road looking north (Figure 5.2 and Figure 5.3).

Amelioration Potential

Amelioration potential is good. The main aim of the mitigation in visual and landscape terms will be to break the line of the road with clumps of trees, shelter belts where possible, and coastal plants such as carex, toetoe and ice plants and flaxes where appropriate. It will also aim to reduce the visual effects of the Domain Road intersection and the Bell Road interchange by means of either large tree planting of Eucalyptus or pine trees to tie in with groups of trees in the immediate area. As these coastal flats are already criss-crossed by drainage channels, water tolerant plants such as kahikatea and cabbage trees will be used at some of the intersections.

For houses within 100 metres of the arterial, a 2.5 metre high earth bund, 400 metres long would be constructed between the houses and the arterial and this will be planted in trees and shrubs. This treatment would apply to houses A7, A9, A11, B5, B7, B8, B9 and B10, D1, D2 and D3. These bunds will reduce sound as well as reducing visual intrusion, and will be about 10 metres wide.

Where houses are between 100 and 200 metres away, the earth bund should be 2 metres high, and 200 metres long, and can be planted up with trees and shrubs thereby ensuring that views of the arterial are screened.

The visual effects of these bunds will be to screen parts of the road from the surrounding areas, and also to screen views out from the new arterial

Refer to Concept Landscape and Mitigation Plans 1, 2, and part 3 (Figure 5.7, Figure 5.8 and Figure 5.9).

5.2.5.2 Kaituna River and Immediate Surroundings

Physical Description of Arterial

The new arterial enters the Kaituna River Corridor near the ox bow lake at the end of Bell Road. In this area the lake is surrounded by trees and vegetation and there is one house within the area contained by the ox-bow. In general this area is fairly well screened. As it approaches the river the new arterial is on a 5 metre high embankment and crosses the river on a 5 span bridge, each span 36 metres long. The spans leap the stop banks on each side of the river. The bridge will be sited just south of the boat ramp at the end of Bell Road, an area used extensively for recreational fishing.

Visual Effects

The Kaituna River is a locally very important landscape feature, partly concealed in its stop banks. The landscape has a higher quality than surrounding landscapes, and the bridge across this river will be visually intrusive. The new bridge is positioned close to the recreational fishing boat ramp. The new arterial will therefore be visually intrusive, and will contrast with the surrounding landscape. Aesthetically it will also have a high

impact. Overall because of the existing landscape quality, the recreational importance and the intrusive nature of the bridge, the visual effects of the arterial through this unit are high.

Refer to Viewpoint 3 - Boat ramp on Kaituna River looking west (Figure 5.4)

In this landscape unit Bell Road will run alongside the new arterial and connect with the boat ramp by means of a road under the new bridge.

Amelioration Potential

On the day that LA4 visited this area there were at least 50 cars in the boat ramp car park and people fishing from the river bank all along the river. Bearing this in mind, a mixture of grass and native shrubs is suggested along the banks of the river to retain walkways and fishing spots. In visual terms, there is considerable opportunity not only to help to integrate the bridge into its landscape surroundings but also to actually improve and enhance the landscape of the river. The mitigation plans show revegetation within the ox bow lake, eucalyptus on the rising embankment to the bridge, a semi circular stop bank 2.5 metres high planted with kahikatea and native shrubs is recommended to block noise to house D6, and a 2.0 metre high barrier fence concealed by mass kahikatea tree planting to give some sound insulation to the Lower Kaituna Wildlife Management Reserve and duck shooting to the north. The extension of the Lower Kaituna Wildlife Management is also recommended into the narrow piece of land between the proposed arterial and the wetland. This wetland is Kahikatea dominated.

Refer to Concept Landscape and Mitigation Plan 3 (Figure 5.9).

5.2.5.3 Pah Road/Kaituna Road Flats

Physical Description of Arterial

This area is very similar in character to the Bell Road flats, though slightly more remote. The land is totally flat with views of the Papamoa Hills and Lower Kaituna Wildlife Management Reserve. There are very intermittent groups of trees in places.

The new arterial is on a 2 metre high embankment through this area, and Kaituna Road would be realigned to run parallel to it. 3 houses would be close to the proposed road, 2 of them within 100 metres of it and one between 100 and 200 metres.

Visual Effects

The landscape of this area has a low quality. Similar to the Bell Road area the land is flat, with drainage channels, some hedges, shelter belts in places, and extensive views out to the Papamoa Hills. The new arterial will be fairly low in elevation and for part of this area will be seen set against the Lower Kaituna Wildlife Management Reserve. It will visually be well accommodated in the landscape. The legibility of the new road will be fairly low and overall it will have a moderate visual effect.

Amelioration Potential

Again visual amelioration potential is good, and again the aim will be to break the line of the road with clumps of trees and shelter belts, and the improvement of the edge of the Lower Kaituna Wildlife Management Reserve if possible with wetland plants, flaxes, cabbage trees and kahikatea.

Where Kaituna Road is realigned alongside the new arterial fairly solid shelter belt planting, ground cover on the banks between the arterial and local road, and a 2.5 metre earth bund with shelter belts along the northern side to screen houses F1, F2, and F3 is suggested. This berm will also be effective for house F4 and F5 further south down Pah Road. An additional bund and tree planting will be erected to screen house F6.

Refer to Concept Landscape and Mitigation Plans 3 and 4 (Figure 5.9 and Figure 5.10).

5.2.5.4 Te Tumu Horticultural Area

Physical Description of Arterial

The landscape quality of this area is higher than the surrounding coastal flats. The 4 lane road slices obliquely through the patterns of small horticultural fields in this area. The road will be sited on a series of very low cuts and fills. Te Tumu Road and Maketu Road will be linked, and Maketu Road will cross the new arterial on a 2 lane bridge, and the proposed arterial will gradually rise on an embankment towards its eastern end to cross the railway line.

Visual Effects

The new arterial will not be visually prominent or particularly legible and it will integrate well into the surrounding shelter belts mainly because it will be screened by shelter belts. It will not intrude into any significant public views.

Three houses, F6, G12 and G13 will be close to the new alignment, and G5 and G11 will be removed by the arterial.

The main visual effect through this area will be the Maketu Road bridge over the proposed arterial.

Overall visual effects would be at the low end of the moderate scale.

Refer to Viewpoint 4 - Te Tumu Road looking south (Figure 5.5)

Amelioration Potential

The potential for both landscape and noise mitigation is very good. Almost the whole alignment through this area will be screened by shelter belts combined with a sound barrier fence in places close to houses. The aim will be to tie new shelter belts into existing ones. Where fencing is used, new shelter belts will be backed by a 2.5 metre high sound barrier fence, with a further shelter belt planting inside the fence, thereby ensuring a reasonable view both inside and outside the road corridor.

Refer to Concept Landscape and Mitigation Plans 4 and 5 (Figure 5.110 and Figure 5.11).

5.2.5.5 Gulliver Road Area / SH33 Intersection

Physical Description of Arterial

At the SH2 / SH33 intersection, SH2 will pass across the new arterial on a bridge which also crosses the railway line. There is a rising off-ramp on the northern side of the new arterial with an embankment which splits into two as it reaches SH2. The northern side of this ramp merges onto SH2 and crosses the railway on a bridge. These ramps and bridges will cross the arterial at a height of at least 5.5 metres. On the southern side of the new arterial there is an on ramp to the new arterial with an embankment. There is an off ramp from SH33 with an embankment that splits as it approaches SH2. The southern side of this ramp splits to a ramp merging onto SH2. SH2 then curves down to join the existing alignment of SH2 on an embankment. The new arterial is in very minor cuts and fills through this area.

Visual Effects

The combination of the Maketu Road bridge and the large intersection means that the roading through this area will be visually prominent, and will contrast with its

surroundings, and will be visually fairly intrusive in the landscape prior to mitigation. However because the landscape quality of this area is already fairly low, the overall visual effect of the proposal will be moderate high.

The Golf Club - H1 - will be very close to the new off-ramp. House H2 and H3 will be removed by the proposal.

Refer to Viewpoint 4 - SH2 looking towards SH33 intersection (Figure 5.5)

Amelioration Potential

Because of the height and extent of the proposed intersection, landscape mitigation is aimed at reducing the visual effects but will not be able to mitigate all of them. The landscape mitigation will break views of the intersection by using massed Eucalyptus planting, and shelter belts in places.

An earth bund plus tree planting is used between the arterial and the golf club. Native shrubs and ground cover plants will be used on embankments.

Refer to Concept Landscape and Mitigation Plan 5 (Figure 5.11).

5.2.5.6 Papamoa Hills

Visual Effects

The new arterial will not pass through the Papamoa Hills but will be distantly visible from parts of them. The landscape quality of the hills is high, and there are extensive screening elements such as land forms, trees and some mixture of land uses. The audience who would see the arterial from here would be small and people who do have views of it would be a long way from the arterial. The proposed arterial would hardly be legible from here, and would appear as a line across the plains. The arterial would not intrude into views in any significant way.

Overall the new arterial would have a visual effect at lowest end of the moderate scale.

Refer to Viewpoint 5 - From Papamoa Hill (Reid Road) looking north east (Figure 5.11).

Amelioration Potential

Amelioration potential from this landscape unit is very good. The landscape mitigation proposed will screen parts of the new road from here, particularly the intermittent groups of trees, and earth bunds proposed to screen nearer viewpoints.

5.2.6 ANALYSIS RESULTS AND CONCLUSIONS

As stated earlier the overall visual effects ratings have the following range of potential ratings and effects within each landscape unit as stated earlier: no effect, low effect, moderate effect, high effect, severe effect.

The total visual effect ratings are shown on the table below. The effects in the centre column show the effects without mitigation planting, and the column on the right show the visual effects once the landscape mitigation shown on the mitigation plans has had a chance to mature.

LANDSCAPE UNIT	EFFECTS ON LANDSCAPE UNIT	EFFECTS AFTER LANDSCAPE MITIGATION
Bell Road Flats	Moderate overall (high effects at interchanges)	Moderate
Kaituna River Corridor	High	Moderate/High
Pah/Kaituna Road Flats	Moderate	Low/Moderate
Te Tumu Horticultural Area	Low moderate	Low
Gulliver Road/ SH33	Moderate high (high effects at interchange)	Moderate
Papamoa Hills	Low moderate	Low

Over its 17.2 kilometre length, the proposed Eastern Arterial is sited in very flat coastal alluvial plains. These plains are criss crossed by drainage channels and stop banks are a feature in places. These landscapes are open and visually exposed and in places one can see for miles across them. The only parts of this landscape which differ from this character are the Kaituna River corridor, and the various horticultural fruit growing areas to the south and east.

In general the proposed arterial has been designed to have a very low profile. It will be sited on a low embankment, and will be reasonably well integrated into its surroundings, without either significant cuts or fills. The main adverse visual effects will occur at the various main intersections and the bridge across the Kaituna River Corridor.

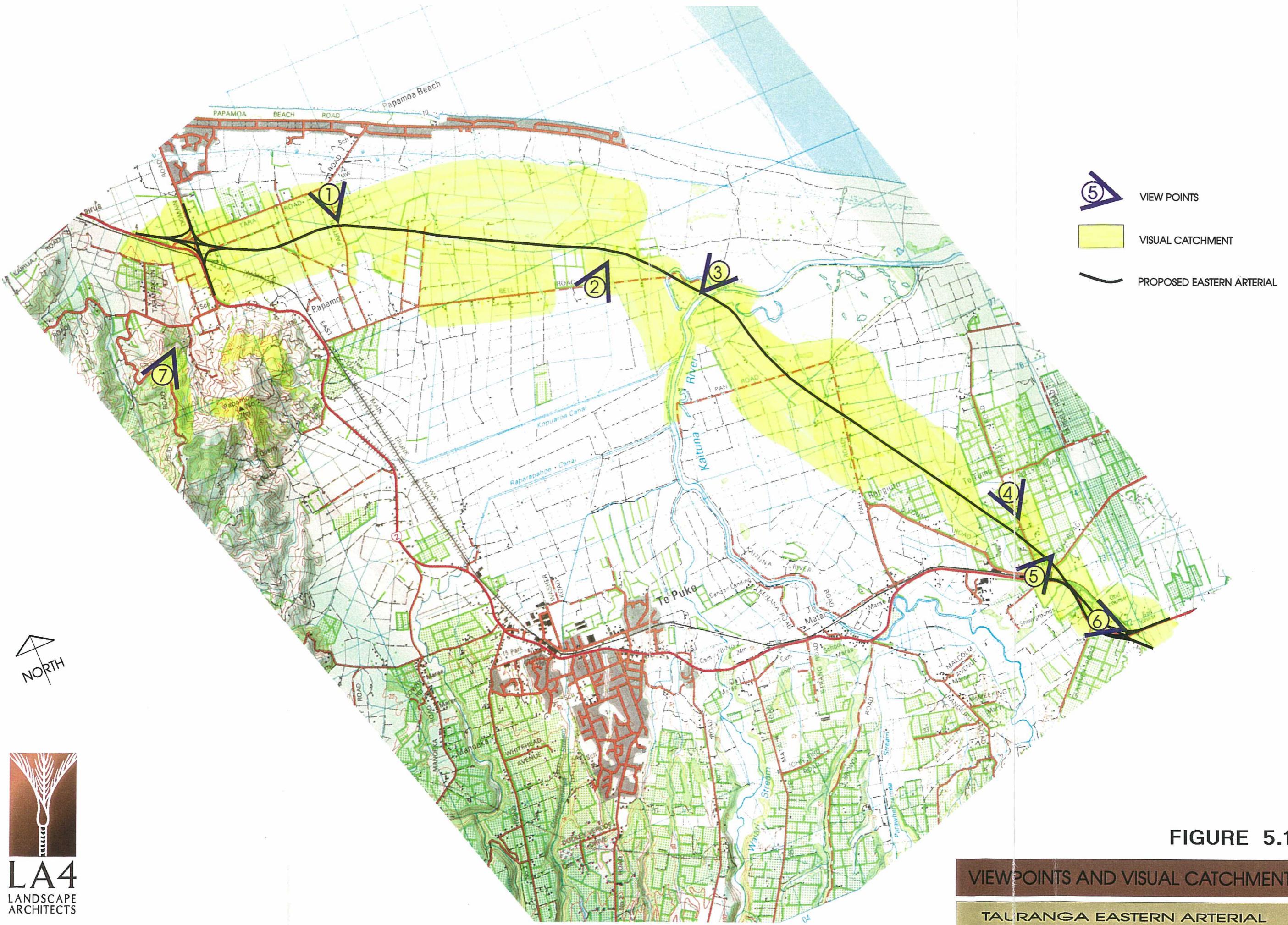
Overall of the 6 landscape units assessed, the arterial would have a low moderate effect on 2, moderate effects on 3, moderate high effects on 1 and a high effect on 1, without any landscape mitigation, with localised high effects around intersections initially. However, the potential for landscape amelioration in all landscape units is very good, with the introduction of groups of trees to break views of the arterial from local roads and houses, earth bunds and tree planting for close up houses, and groups of large trees

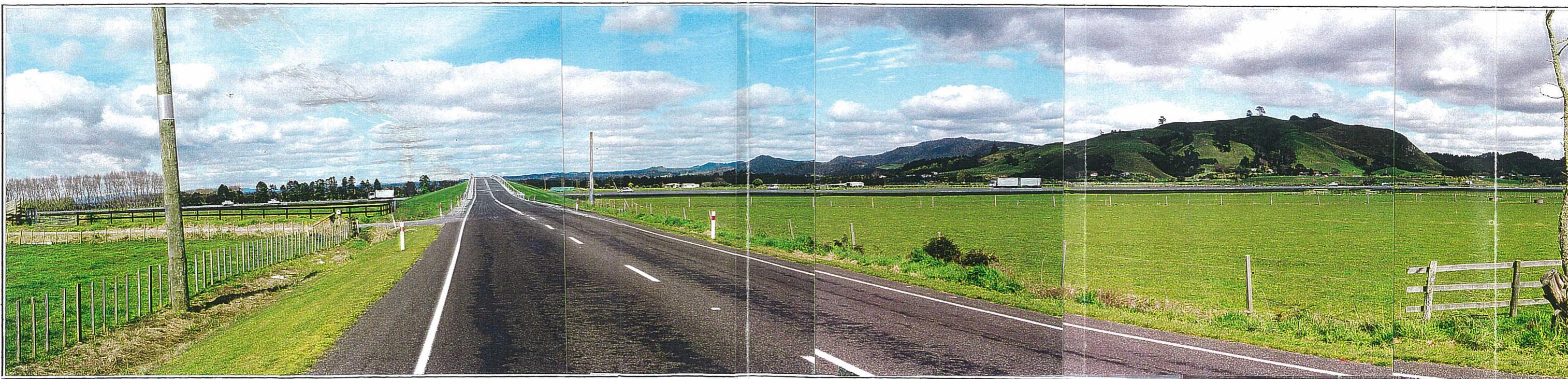
at the main intersections. Because some of this landscape is already in horticultural development, and the use of shelter belt planting is already a feature, shelter belts are excellent screening for roads.

The arterial fits very well into the fruit growing areas where the new road will be on low cuts and fills and will be screened by the existing trees and shelter belts. Where the arterial has adverse effects, for example the two main intersections, and crossing the Kaituna River, once the trees and mitigation planting have had a chance to mature, and provided that the Kaituna Bridge is well and simply designed, the visual effects will be acceptable. In some places, for example the Lower Kaituna Wildlife Management Reserve, the landscape will be enhanced once mitigation measures have been carried out.

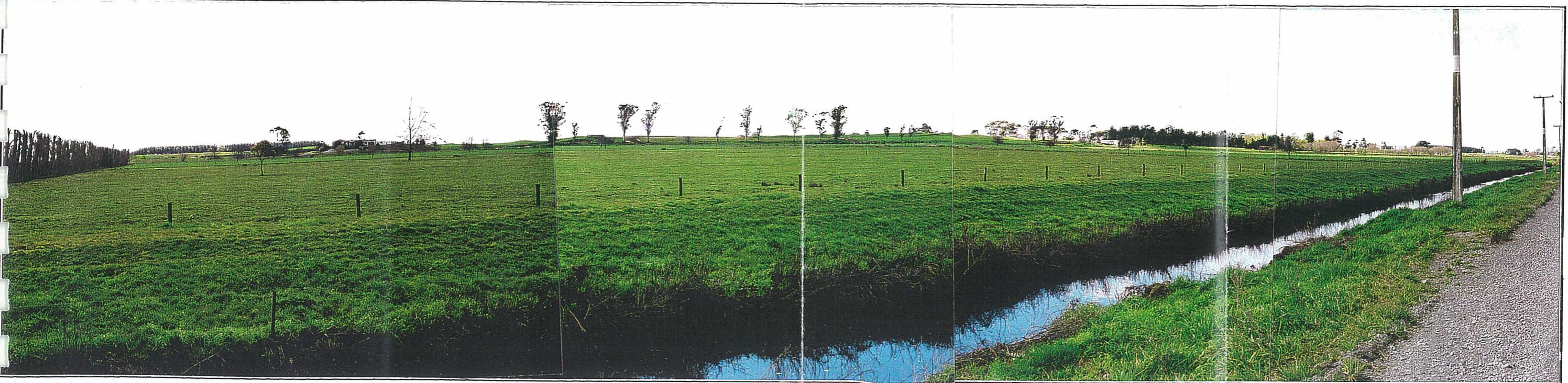
In terms of the key landscape characteristics and features identified earlier in this report, the visual openness and flatness of this landscape has been taken into account in the design of the road by keeping the profile low wherever possible. The importance of the Kaituna River, the ox bow lakes and Lower Kaituna Wildlife Management Reserve has been fully appreciated in the proposed design for the road, and landscape mitigation will enhance this area long term. Kahikatea and flax will be used as part of the landscape mitigation.

This new road will form the southern "entry" to Tauranga District, and will create a platform from which views out to the coast and back to the Papamoa Hills will be gained. From this point of view the new arterial will be an improvement on the existing road. The landscaping will result in a varied landscaped approach, with different types of planting interspersed with views out into the landscape. In some places for example through the Te Tumu horticultural area, once the mitigation planting has had some time to mature, the arterial will be quite hard to detect.





As Existing

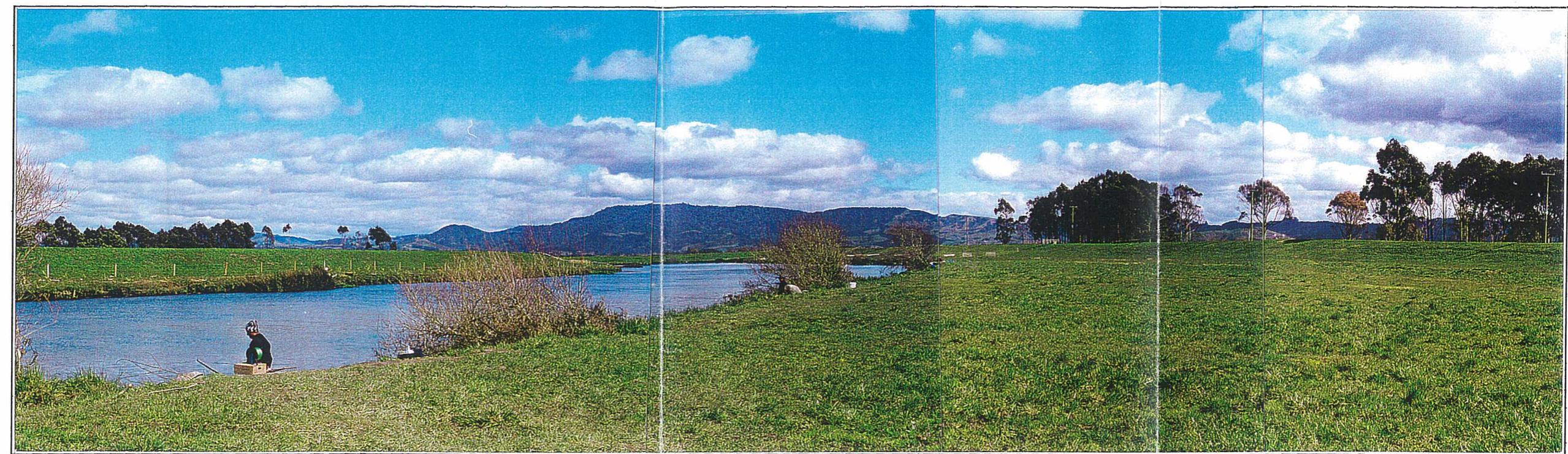


With the proposed Eastern Arterial



FIGURE 5.3
Bell Road looking north

As Existing



With the proposed Eastern Arterial

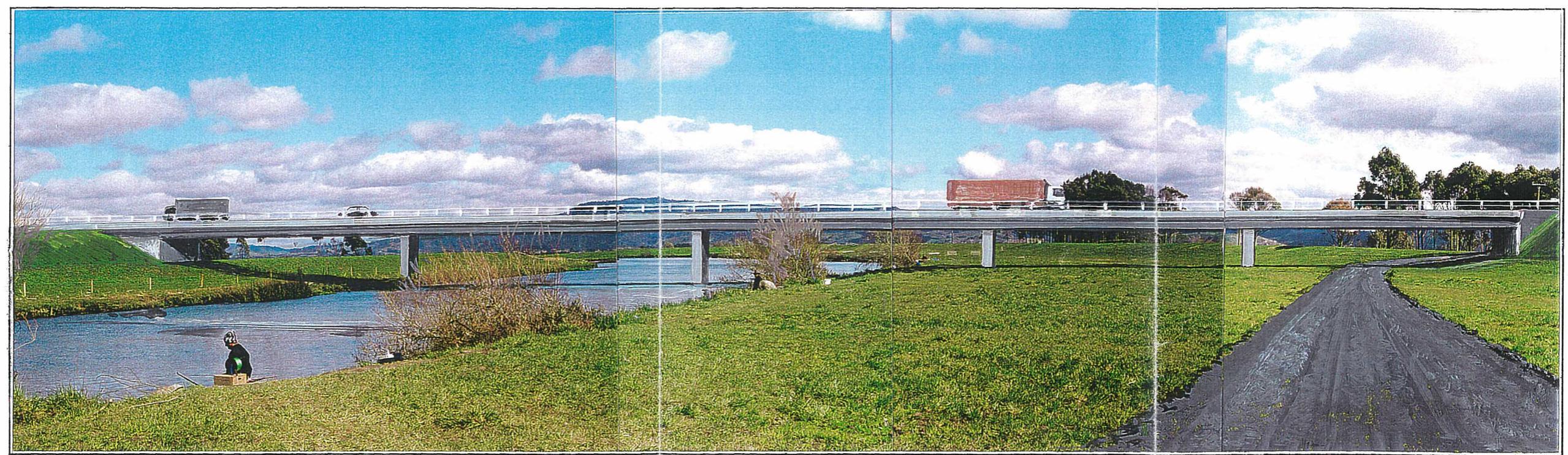


FIGURE 5.4
Boat ramp on Kaituna River looking west

As Existing



With the proposed Eastern Arterial



FIGURE 5.5
SH2 looking towards SH33 intersection

As Existing

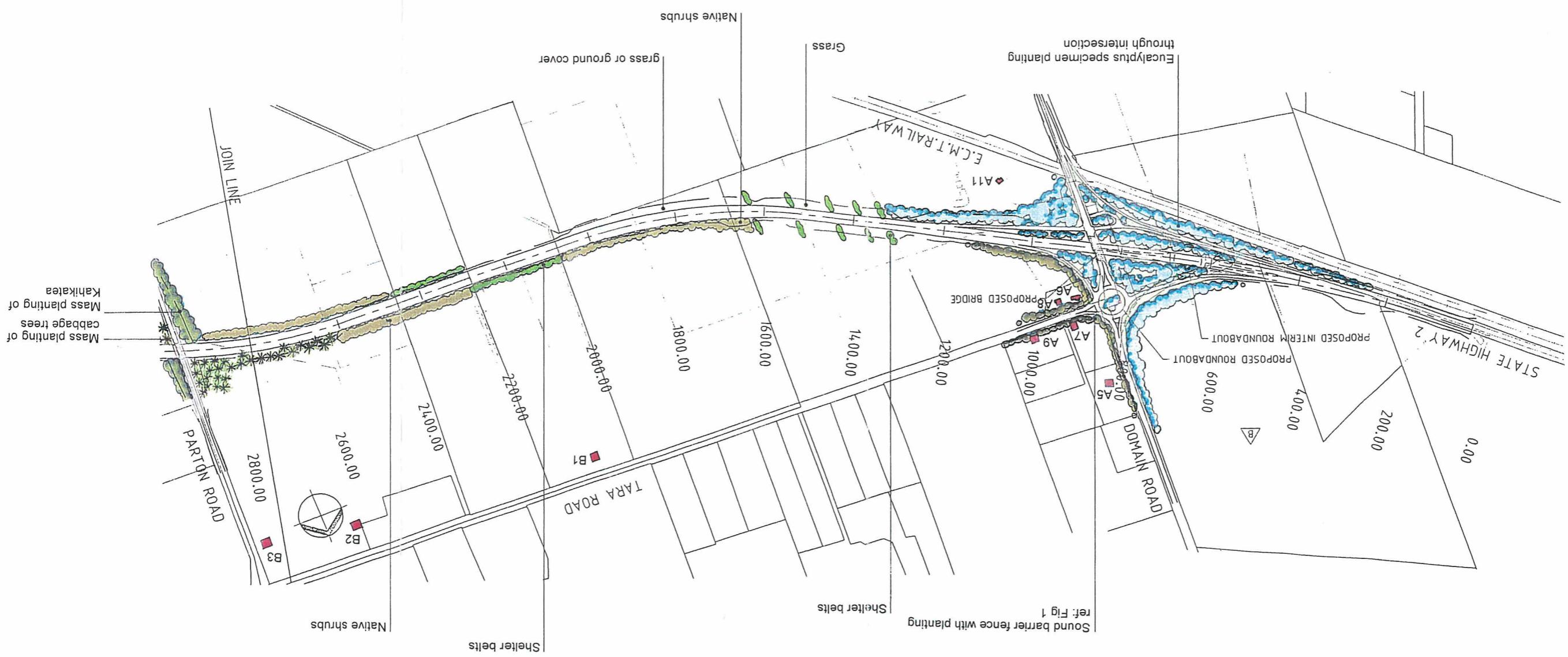
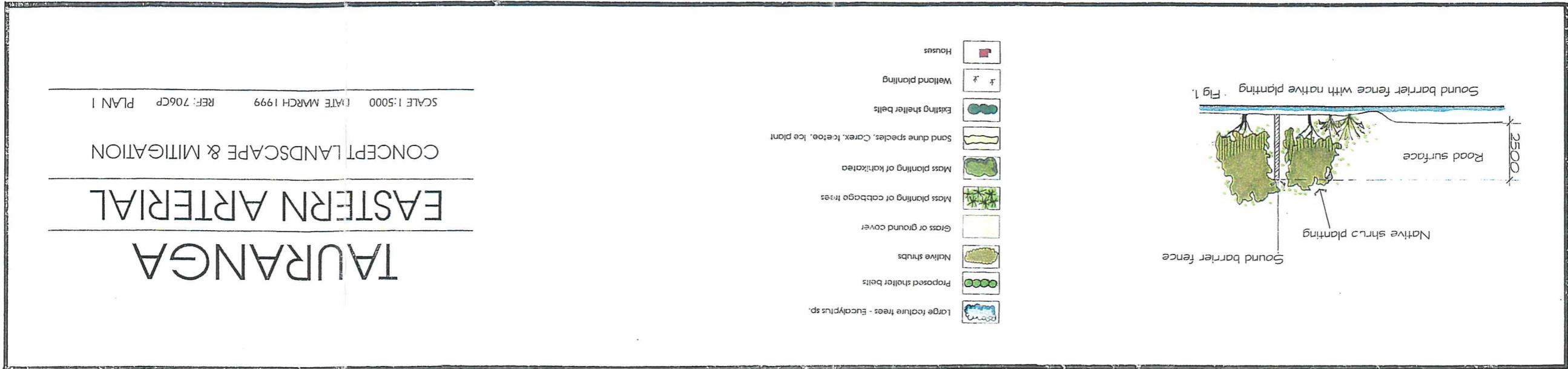


With the proposed Eastern Arterial



FIGURE 5.6
From Papamoa Hill (Reid Road) looking north east

FIGURE 5.7



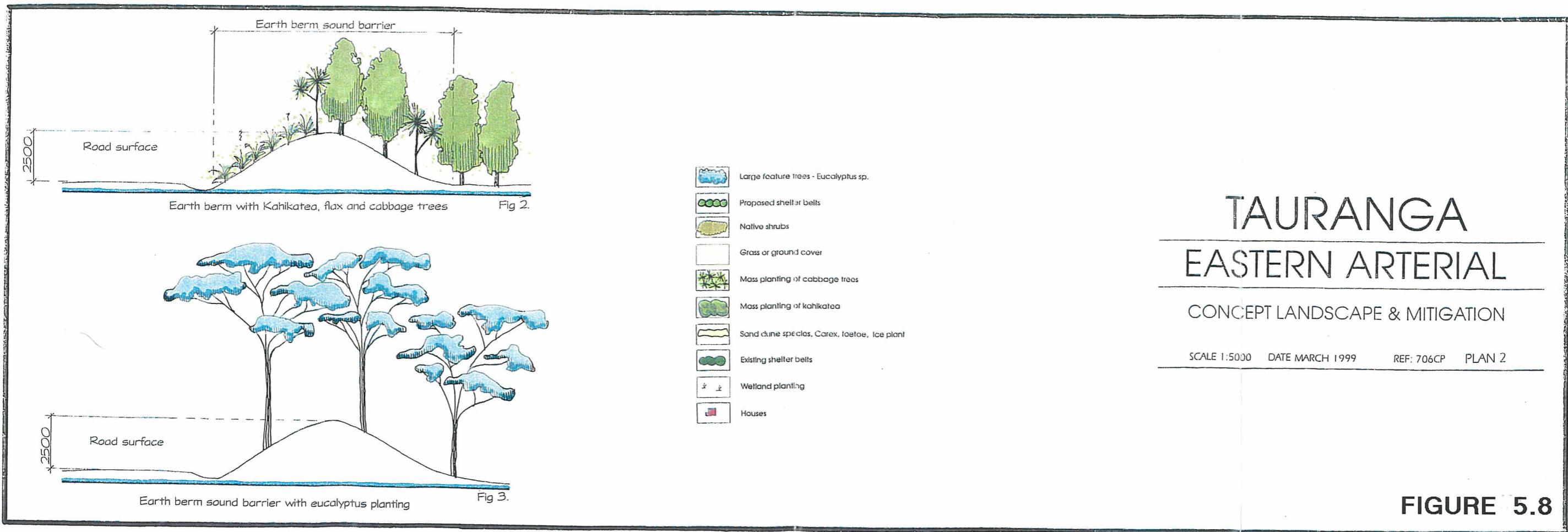
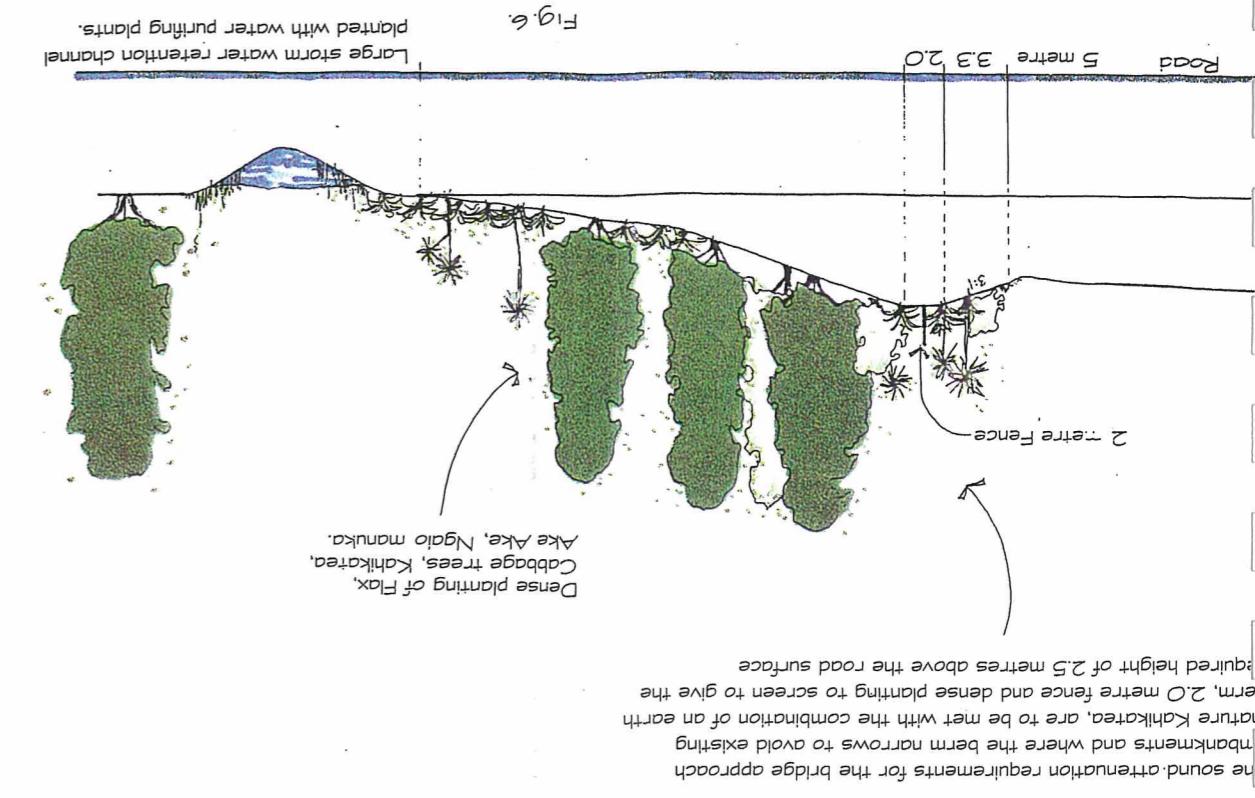
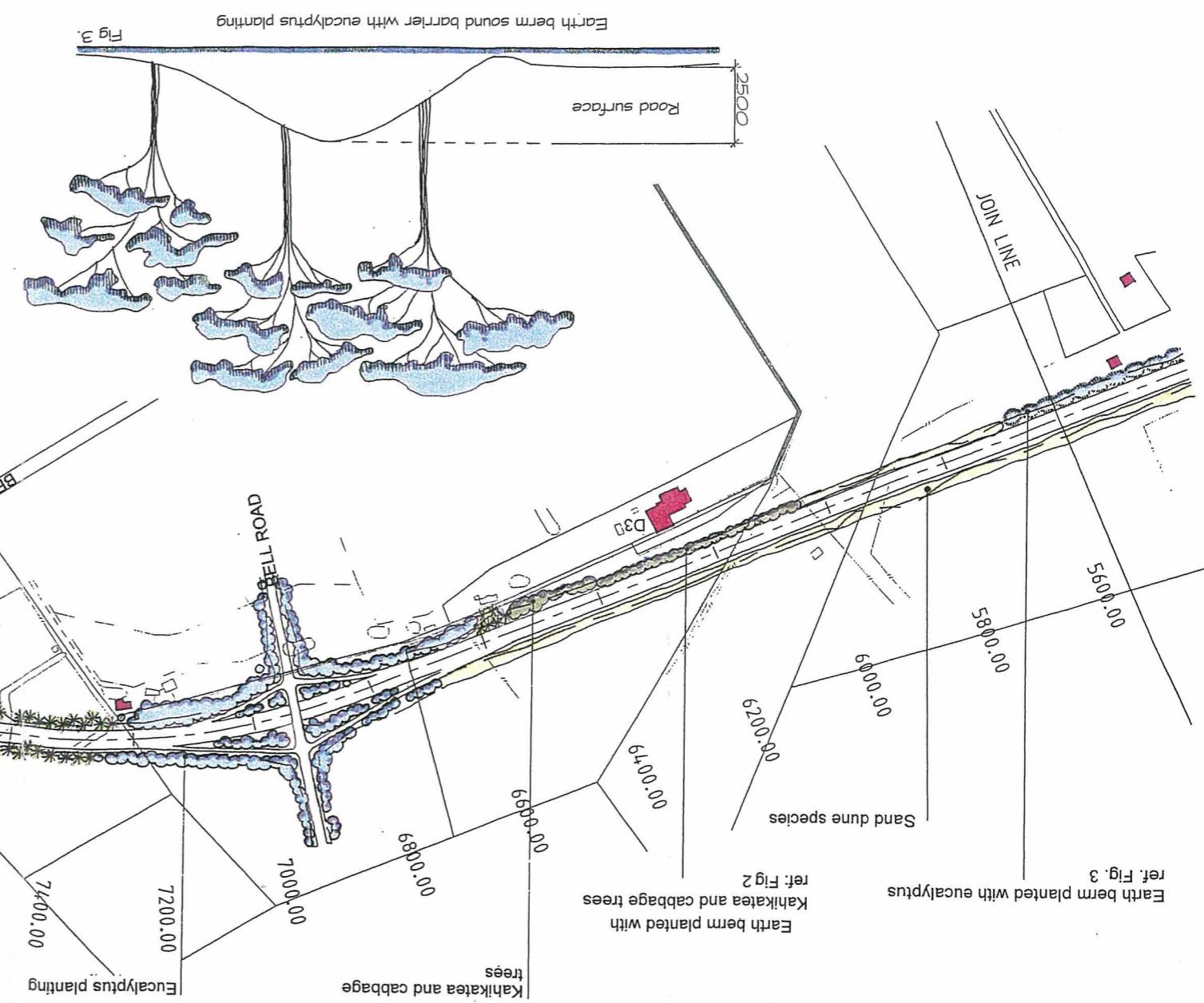
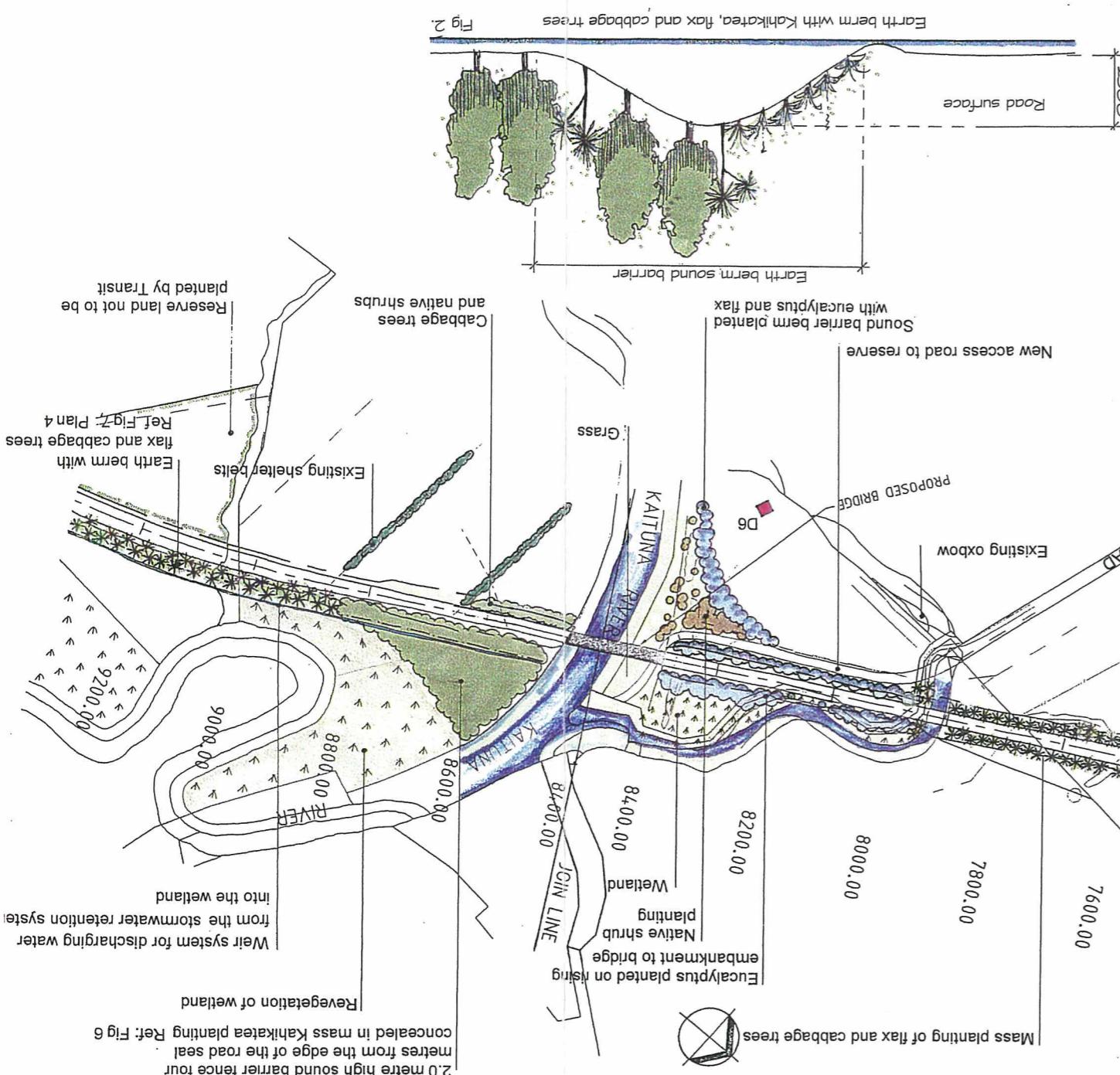
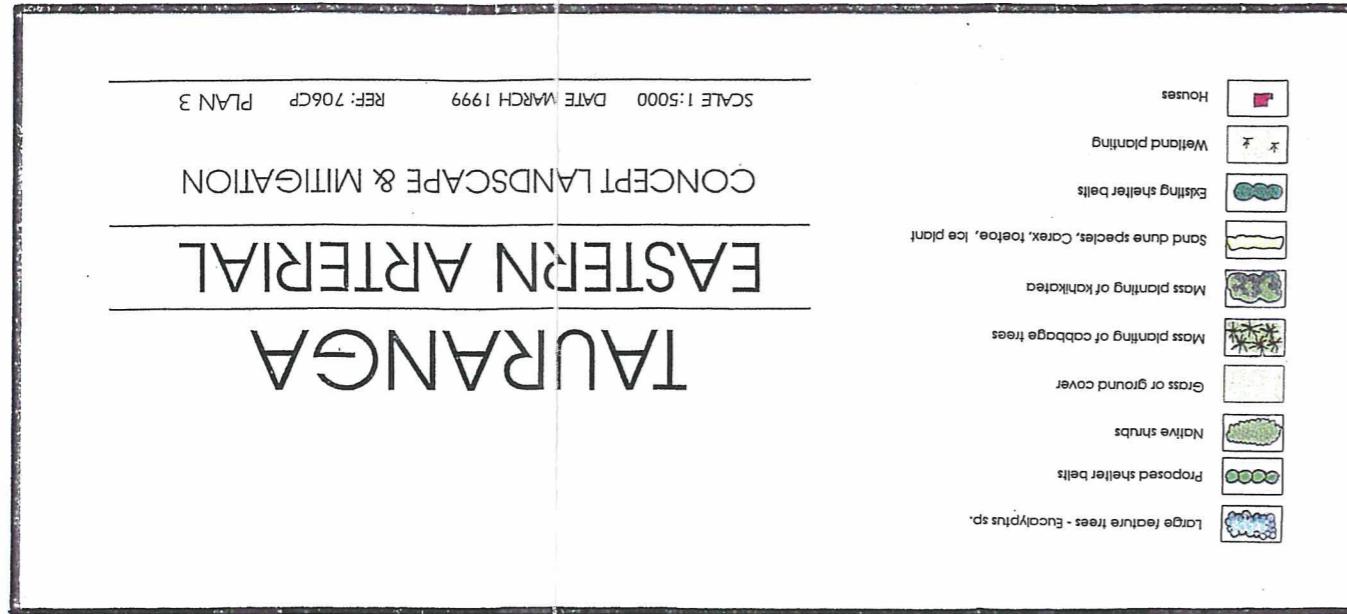


FIGURE 5.9



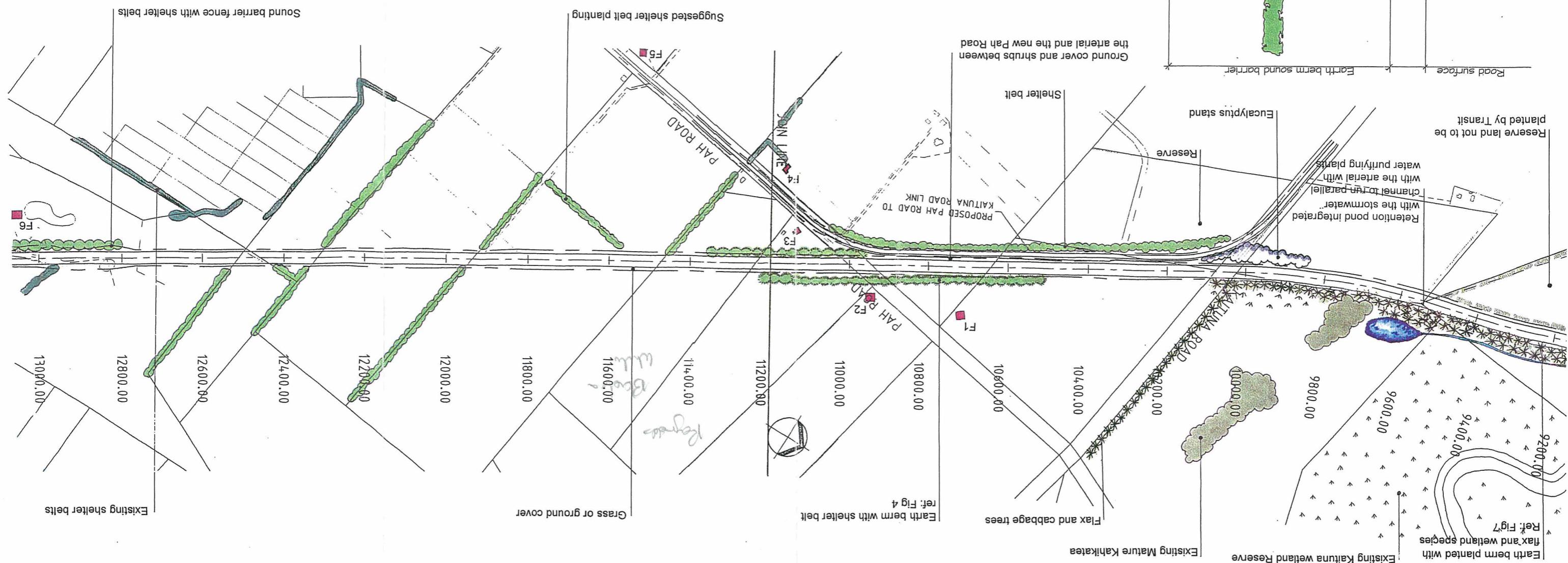
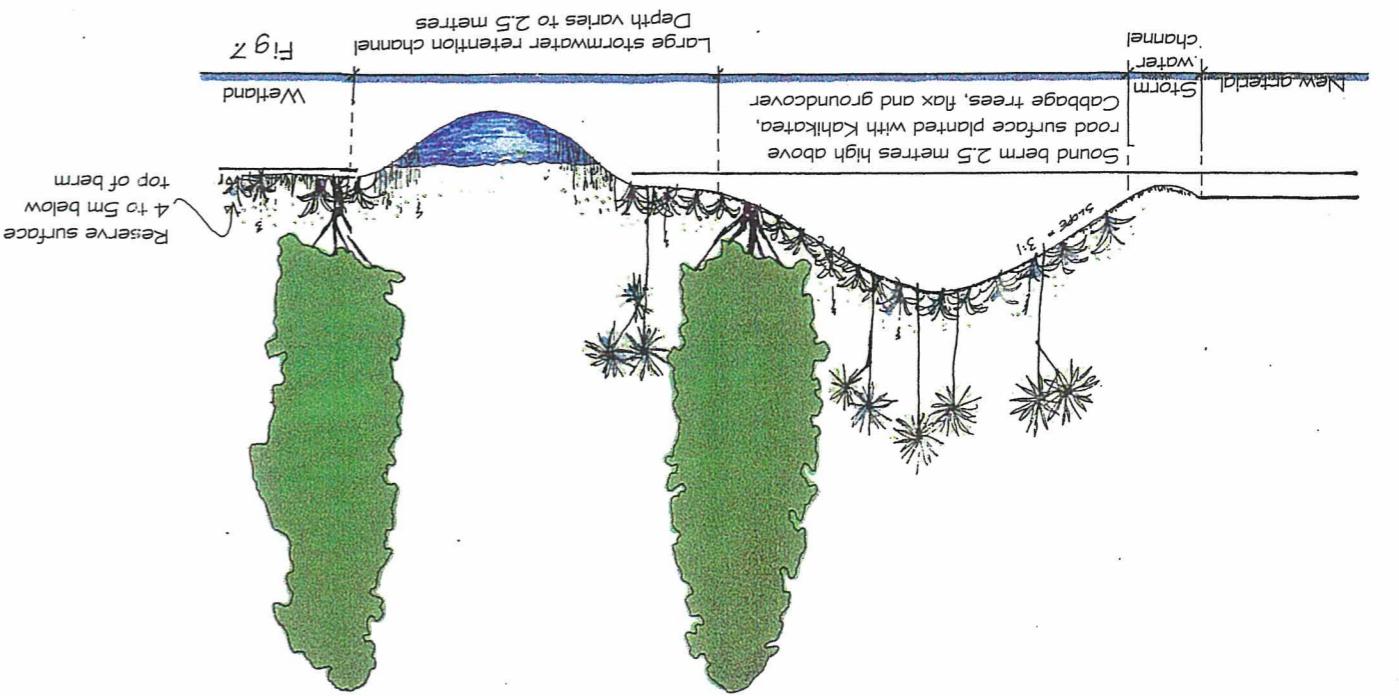
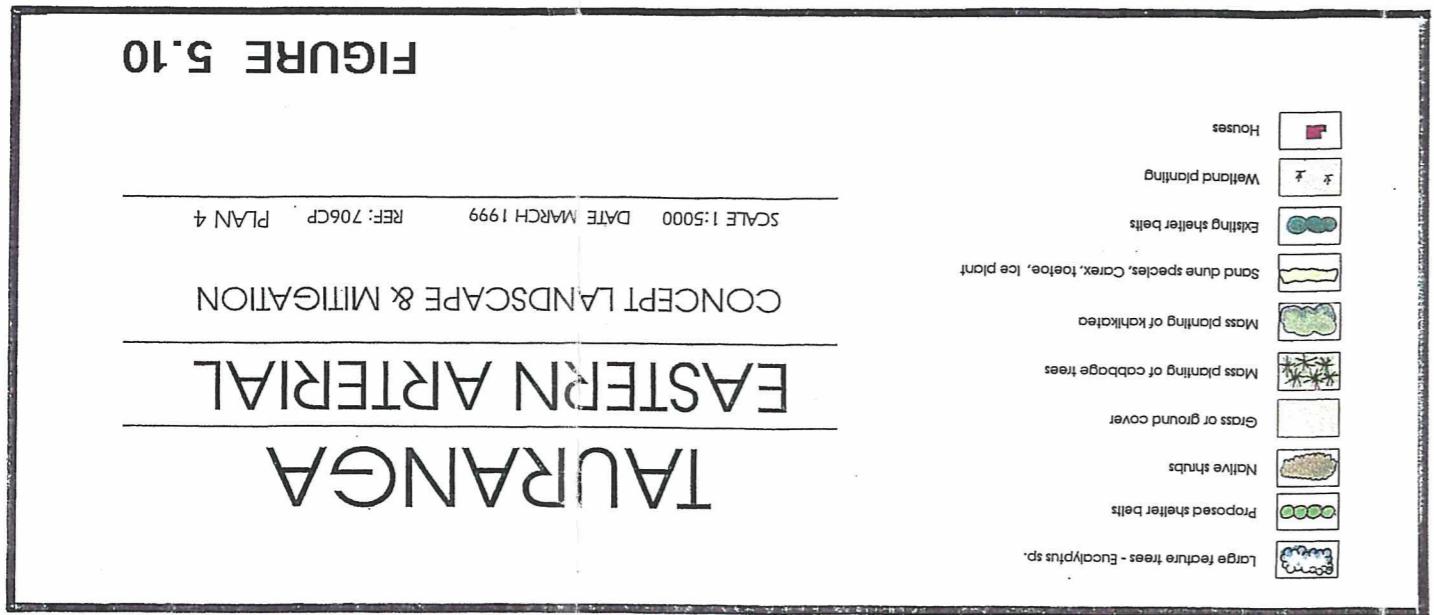


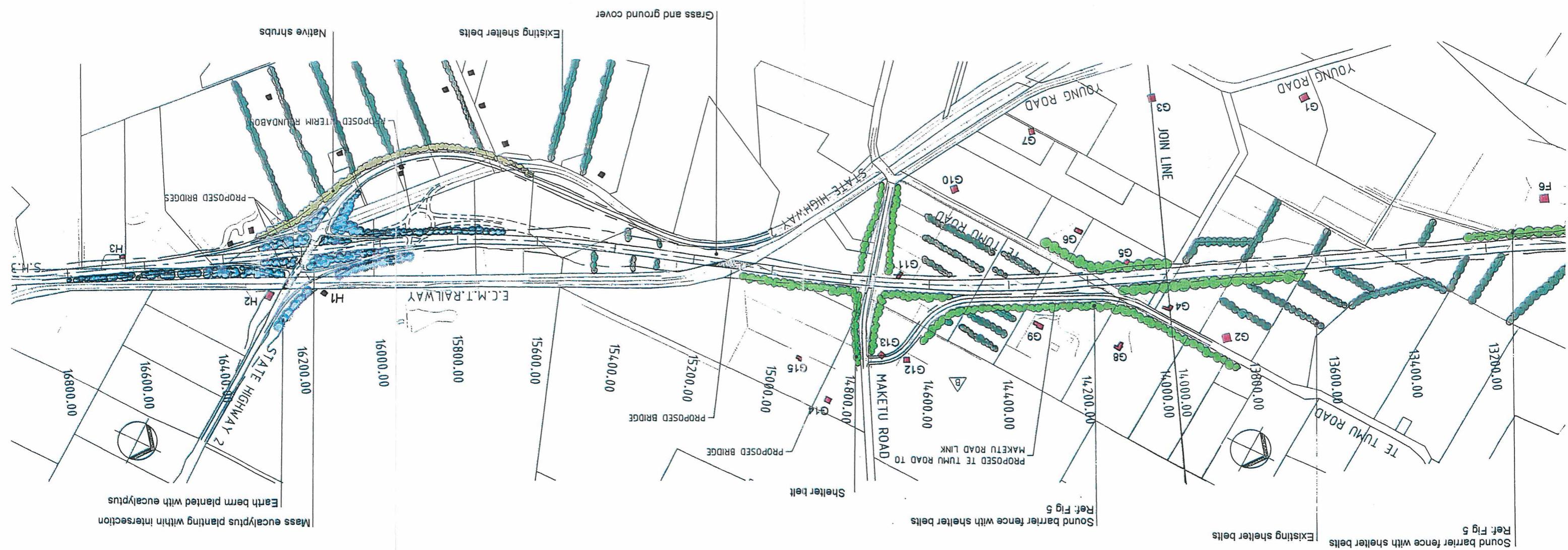
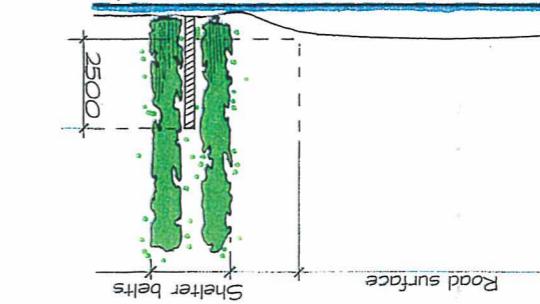
FIGURE 5.11

SCALE 1:5000 DATE MARCH 1999 REF: 706CP PLAN 5

Sound barrier fence with shelter belts Fig. 5.

CONCEPT LANDSCAPE & MITIGATION

EASTERN ARTERIAL TURANGA



5.2.7 STATUTORY FRAMEWORK FOR ASSESSMENT

With the emergence of the Resource Management Act (RMA) landscape matters were given statutory status equivalent to that of other environmental values.

Section 6 is specific in stipulating that all persons exercising functions and powers under the Act shall recognise and provide for **matters of national importance**. One of these matters is relevant to landscape assessment :

- "a. The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development."*

A significant requirement under the Act is therefore to assess the landscape of territorial areas, to specifically examine the character of coastal environments and to identify outstanding landscapes.

Section 7, addressing **other matters**, also requires those exercising functions and powers under the Act to have particular regard to a range of factors. Five of those matters have relevance to visual effects assessment:

- c. The maintenance and enhancement of amenity values:*
- e. Recognition and protection of the heritage values of sites, buildings, places, or areas:*
- f. Maintenance and enhancement of the quality of the environment:*
- g. Any finite characteristics of natural and physical resources.*

Therefore in relating these matters to the Eastern Arterial proposal the following comments can be made.

In terms of avoiding adverse effects, a range of alternative options have been considered including the upgrading of the existing State highway. Having considered those options, and having carried out a preliminary environmental assessment on all of them and chosen a preferred option, it does not appear possible to avoid all of the effects of this proposal. However, a range of landscape measures is suggested for mitigating the adverse effects and these have been detailed earlier in the report. Of particular importance is the restoring of vegetation to an area to be included in the Lower Kaituna Wildlife Management Reserve, and the enhancement of the Kaituna River landscape.

The matters in Section 7 of particular relevance are sections (c), (f) and (g).

All these matters relate to landscape and natural character, amongst other things, and in this context even though initially the new road will have impacts on some of these matters, once mitigation measures are put in place, and the bridge is sensitively and appropriately designed, this road could become a new and exciting visual and landscape "entry" to Tauranga District.

5.2.8 COMMENTARY ON PLANNING POLICY

The following objectives and policies are considered relevant to visual issues:

Western Bay of Plenty Proposed District Plan (incorporating proposed Variation N° 1 Change 1 and outstanding references, November 1997)

Objective

10.2.1

Protection and, where appropriate enhancement of the existing visual quality and character of the District's landscapes.

Policy

13.1.2.2(a)

Mitigate the potential adverse visual effects of activities particularly in visually sensitive localities, or where an activity is out of zone or out of character with the environment.

Objective

13.6.2.1

Avoidance or mitigation of the potential adverse visual effects of activities situated in prominent locations or adjacent to residential areas.

Policy

13.6.2.2

Ensure appropriate landscaping and screening is established in conjunction with activities so as to minimise potential adverse visual impact.

Policy

17.2.2(d)

Mitigate adverse environmental and amenity affects of State highways and the District's arterial roads by measures including landscape enhancement.

Tauranga District Council Transitional Plan - County Section

Policy

2.6.2.10

To encourage landscaping to enhance the visual amenity of developments in both the rural and urban areas. This includes provision for subdivider to set aside appropriate areas for street plantings in all new developments.

Wherever possible landscaping and appropriate screening and mitigation will be carried out to minimise adverse visual effects. Care has also been taken to minimise visual effects on both amenity and natural character of the proposed designation, both by its design and its proposed mitigation.

The local importance of the Kaituna River, the oxbows and the Lower Kaituna Wildlife Management Reserve as landscape features has been recognised. Proposed mitigation for this area will help to integrate the bridge into the landscape and to improve and enhance the landscape of the river. As the alignment passes along the Lower Kaituna

Wildlife Management it is proposed to mitigate with wetland plants, flaxes, cabbage trees and kahikatea which is likely to enhance the landscape in this area.

Proposed shelter belt screening will blend in with the surrounding landscape as much of the area in which the alignment passes is in horticulture with shelter belts already a feature.

5.3 ARCHAEOLOGICAL

5.3.1 DOMAIN ROAD TO WAIRAKEI CONFISCATION BOUNDARY

No archaeological sites with visible surface features, or evidence for the presence of buried archaeological deposits, were identified during the archaeological survey.

The lowland environment, in which the archaeological survey was undertaken, forms an intermediate area of low archaeological site concentration, separating the coastal dune ridges and the Papamoa hills where archaeological sites are numerous. Areas of raised terracing (up to 20m a.s.l), extending from the foot of the Papamoa hills north into the lowlands, provide a partial land bridge to the dune plain. These terraces extend into the western end of the survey area near the intersection of Domain Road and State highway 2. Areas of raised terracing within the lowlands clearly have the potential to contain archaeological features. Unmodified terracing within the survey area is primarily confined to the property of Education Farms Ltd, and this property was unable to be inspected.

No archaeological sites with visible surface features will be impacted upon by the proposed construction of the Eastern Arterial route over the portion of the route subject to the archaeological inspection. It is not possible to provide an accurate assessment of effect on the property owned by Education Farms Ltd as no ground survey was able to be completed on this property.

It is concluded that an authority to modify archaeological sites is not required in order to carry out earthworks associated with the construction of the Eastern Arterial route over the portion of the route subject to the archaeological inspection. This assessment is based on the result of the field inspection, however it is not possible to provide an absolute assurance that buried archaeological deposits will not be encountered during ground disturbance, without extensive subsurface testing.

Archaeological survey and mitigation deals solely with the scientific identification and recovery of the physical evidence of past human habitation. Archaeological methods can not usually identify or mitigate the spiritual or cultural values associated with that occupation.

5.3.2 WAIRAKEI CONFISCATION BOUNDARY TO PAENGAROA

The Tauranga Eastern Arterial does not have a major impact on the archaeological resource. Any impact on pa site U14/220 has been minimised by the altered alignment. U14/2850 is an isolated site and where the route passes over the former Pukaingatatu and Paengaroa North Block areas, there are a number of recorded sites. This area is a mixture of pasture and orchards with varying amounts of ground disturbance associated with these land use activities. These would have already impacted on recorded sites. The impact on unrecorded sites in this area is not high as there is a uneven and extensive distribution of recorded sites. Impact is higher in a locality if the distribution of sites was specific and significant in its physical location (such as environmental context and site types). The Holocene dune sites between Kaituna River and Roads is one such area. Ovens or hangi stones and midden indicate the presence of occupation sites.

There is a limitation in the field survey method to identifying recorded and unrecorded sites on the TEA route. Identification is dependent on the amount of exposure of subsurface or surface archaeological features at that particular time. Recommendations for archaeological monitoring and level of monitoring of the TEA route would be influenced by the survey method and the presence of recorded sites in the vicinity of the route, which can give some indication of the likelihood of sites on the route. In areas under pasture, there was a suitable amount of soil exposed by livestock to indicate any presence of cultural features in soil profiles along the Route from Wairakei boundary to Kaituna River. For the area from Candy's property on Young's Road to State highway 33, factors influencing site identification have been the degree of re-contouring of ground for orchard, establishment of orchard with the areas under pasture affecting the amount of exposed soils.

Archaeological monitoring and survey of the Papamoa Beach area since 1994 has revealed a high level of site distribution with extensive settlement sites and gardening soils. However this is concentrated on the coastal area from the foredunes and areas behind the foredunes surrounding a natural drainage area that runs parallel along the coast.

There is an absence of sites along TEA route from Wairakei boundary to Kaituna River except for U14/2895 and U14/220 which is the edge of the coastal Holocene dune and former Kopuroa swamp. This absence reflects the coastal edge focus for occupation along Papamoa. From Te Kopua to Te Tumu along the course of the Kaituna there is a distribution of sites on the edge of the Holocene dunes reflecting the influence or the economic importance of the river for settlement location. This distribution is indicated by sites U14/2849 and U14/2848 which is an extensive area of occupation immediately behind Te Kopua (U14/220) and recorded pa.

The intensity of site distribution at Papamoa is not repeated on the TEA route from Candy's property to SH33 where the environmental context is different but there is a

reasonably high distribution of recorded sites in the area surrounding the TEA route following the inland course of the Kaituna River.

This difference in site distribution between the coastal edge and the inland Pukaingataru and Paengaroa lowland areas should be reflected in the level of archaeological monitoring of route, especially for unrecorded sites. The recent experience in Papamoa and areas in Tauranga such as Ohauiti, is that many of the sites are not readily visible on the ground surface and while many could be located by probing because of the presence of shell this did not give any indication of the extent of the site. The coastal edge of Papamoa requires a high level of monitoring but the consultant does not consider this method necessary as the TEA route for site distribution is not as intense.

There are two methods to monitor the TEA route for unrecorded archaeological sites. Either, (a) the monitoring of all earthworks or (b) the monitoring of specific localities and extensive testing for presence of archaeological sites by qualified archaeologists. The monitoring of all earthworks and specific localities require an authority under S12 of the Historic Places Act 1993 and for extensive testing of specific areas, an authority under section 11 of the Act.

Sections 11(2) and 12(3) of the Historic Places Act 1993 specifies that applications for authority to destroy, damage or modify an archaeological site to contain certain information be obtained:

1. a description of the archaeological site or sites over which authority is sought
2. an assessment of the archaeological values which the site or sites contain.
3. an assessment of the effect which the proposed activity will have on those values.
4. consultation with tangata whenua has been conducted

If the sites do not have significant cultural or archaeological attributes for conservation then the consultant recommends a level of archaeological monitoring for specific sections of the route. The monitoring can either be following machinery to record sites that may be revealed (subsurface features) or as specific excavation in certain locations.

5.3.3 COMMENTARY ON PLANNING POLICY

The following objectives and policies are considered relevant to archaeological issues:

Proposed Bay of Plenty Regional Policy Statement (incorporating decisions on submissions August 1996)

Objective

15.3.1(a)

The protection of heritage places from inappropriate subdivision, use and development.

Policy*15.3.1(b)(vii)**To recognise the sensitivity associated with some heritage places.*

Western Bay of Plenty Proposed District Plan (incorporating proposed Variation N° 1 Change 1 and outstanding references, November 1997)

Objective*11.2.1**Protection and preservation of a unique or representative range of heritage items of value to the community and to the nation.***Policy***11.2.2(a)**Avoid, remedy or mitigate the adverse effects of activities on identified heritage items.*

The location of one significant archaeological site was confirmed during the site investigation work. This was site U14/220 (see Figure 4.20 19). Following the identification of the location of this site, consultation was undertaken with the relevant iwi and the alignment of the proposed route was altered to avoid the site. This action is in accord with the objectives and policies. The likely impact on unrecorded sites in this area is not high.

Finally, it is recommended that an application be made prior to earthworks commencing for a general authority to modify damaged or destroyed archaeological sites along the entire route.

5.4 TANGATA WHENUA

The assessment of effects has been largely based on the consultation undertaken with each group. The archaeological assessment was completed initially and copied to the hapu prior to consultation meetings. Wherever possible a representative of the hapu accompanied the archaeologist in the field survey so that the hapu could have the opportunity to learn about the sites.

Each group chose how the consultation would be conducted.

Ngati Pikaio and Makino

During the Options Selection phase of the study consultation with Ngati Pikaio and Makino was undertaken with the assistance of the Ngati Pikiao officers. At the AEE phase the consultation was undertaken with representatives of the Ngati Makino group who have a marae at Pongakawa.

Following the receipt of the archaeological report, the archaeologist contacted the hapu representative. A field survey with hapu members has not been conducted. The archaeologist advises that the hapu have no land areas directly affected but they wish to

continue to be informed of progress on the project. The hapu contact advised in July 1999 that the hapu had not expressed any concerns over the project.

Ngati Whakaue

Ngati Whakaue does not have direct interests in the land affected by the alignment. No formal hui were requested by the hapu representative. The matters of concern that were raised at the hui held at Whakaue Marae on the 7 May 1997 concerning the selection of Options included:

There is concern to avoid the alienation of Maori land titles.

The eastern arterial is considered to be a catalyst for further urbanisation along the Papamoa coast and as such the Maketu township will come under pressure for further development. This will change the social network and put pressure on the natural resources of the area. They don't want a "concrete jungle all the way from Papamoa".

Response

Urbanisation of the Papamoa coast is a matter for the Tauranga District Council to manage within the District Plan under the Resource Management Act. It is acknowledged that should urbanisation of the entire coastal strip be undertaken the interchange at Bell Road would assist in the area being readily accessible to the city. The arterial will reduce the travel time for Maketu residents to the city and as such the township may become a more desirable place to live.

Tapuika

Tapuika's prime concern has been to remove the State highway from its present location so that the village of Waitangi including the school, shop, marae and urupa can remain unaffected by high traffic volumes and heavy vehicles.

Again there was concern for the avoidance of Maori land. There was strong likelihood of significant sites at the confluence of the Kaituna and Waiari Rivers and along the sandhills because that is where many tribal battles were conducted. Areas to avoid are the swamp corridor from Pah Road (being the former Route 3 in the Works Report), and the wetlands and the urupa at the junction of the rivers.

A hui was held at the Moko Marae on the 1 November 1998 to discuss the designation and representatives met with the archaeologist on the 25th November to discuss the proposals.

Response

The hapu's authority to be collectors of artefacts is acknowledged and this will be borne in mind when the earthworks programme is planned. Transit New Zealand will establish protocols with all hapu groups affected by the alignment works to ensure that

representatives have the opportunity to be on-site with the archaeologist to ensure that the correct procedures are followed in the event of material being found.

Waitaha

Waitaha also support the removal of the highway from Waitangi. Significant sites are likely to be encountered in a band of land from Long Swamp (on State highway 2) through to the coast as this was the path taken by various battle groups. In addition the representative advised that significant sites are likely on the higher ground such as along the coast, in the Collins Lane and Partons Road areas.

The archaeologist completed the site survey with representatives of the hapu and the hapu received a copy of the report. The archaeologist advises that there is a recorded Pa Te Kopua to the west of the Kaituna River at the end of Bell Road. After site survey and research and a site meeting with hapu representatives on the 23 October 1998 the site location was confirmed and the alignment was moved in a northerly direction towards the coast.

The hapu advised on the 23 November 1998 that this change to the alignment was acceptable.

Response

A key approach in the planning of the designation has been the avoidance of significant cultural sites as is required by section 6 of the Resource Management Act. Consultation with hapu groups and the inclusion of archaeological surveys has assisted in this approach

Transit New Zealand agrees to the request by Waitaha in their letter the 23 November (see Appendix 6) that a representative of the hapu be present with the archaeologist when the topsoil is removed along the alignment. In the event that material is found they give approval for the processes under the Historic Places Act to be followed.

Nga Potiki

Two hui were held in Stage 2 of the programme at the two marae of this hapu. In the AEE stage meetings were held with the hapu committee and a representative of the hapu accompanied the archaeologist on the survey.

The hapu reported that there are no known sites of significance on the alignment between Domain Road and Paengaroa. However, there is a concern that there may be unrecorded sites affected by the proposal. To date, research for the Waitangi Tribunal Hearing has not revealed anything in regards to the proposed highway. The hapu have also advised that they oppose any highway development in their hapu area until their claim to the Waitangi Tribunal is resolved. There is significant anguish at the loss of lands and desecration of sites by various public works, including the road and rail lines,

sewage treatment ponds and reservoir. Urban growth and subdivision development continues to threaten a very sensitive cultural landscape.

Response

It is acknowledged that urbanisation and various public utilities supporting it, particularly in the form of various public works has had an adverse effect on the Tamapahore Marae environs. This designation relates to land well to the east and therefore there are likely to be minor direct effects on Tamapahore Marae. However it is acknowledged that the highway upgrade will facilitate further growth which will continue to place pressure on hapu lands throughout the district. It will be incumbent upon the local authority to address these issues through the district plan process.

With regards to the anticipated Waitangi Tribunal hearing/decision process it needs to be recognised that Resource Management Act matters can proceed in the interim period.

Ngati Pukenga

The iwi committee have indicated that there are no significant sites affected by the alignment.

No formal consultation was requested after the receipt of the archaeological report. The iwi did request representation during the earthworks phase of the project when the topsoil is removed. A joint hui with other groups was suggested, but this did not occur as there was not a common willingness to meet.

Response

Transit New Zealand will set up protocols with all hapu groups to enable their representatives to be on site during the removal of the topsoil.

Ngati Kapawa

Ngati Kapawa are concerned to avoid alienation of Maori land titles. There are significant cultural sites on their coastal lands to the north east of the Kaituna River. They also wish to ensure the protection of the wetlands and the Kaituna River from the potential of contamination from the construction and operation of the highway.

Response

The alignment of the designation avoids the wetland areas of the reserve and the bridging of the Kaituna is with bank to bank abutments at the advice of the ecologist to ensure that the in-stream and bank habitats are protected from potential adverse effects.

5.4.1 COMMENTARY ON PLANNING POLICY

The following objectives and policies are considered relevant to cultural issues:

Tauranga District Proposed District Plan (annotated with Council decisions October 1998)

Objective

5.1.1

To Recognise and Provide for Maori Relationships with Ancestral Land

To minimise the adverse effects of subdivision, development and land use on the cultural and traditional relationship of Maori with their ancestral lands.

Policy

5.1.1.2

Effects on Ancestral Land

Subdivision, use and development should avoid or mitigate adverse effects on significant landforms or landscape features of cultural or traditional importance to Maori where these have been identified.

Policy

5.1.1.3

Maori Owned Land

Identification of Maori owned land for urban use, subdivision or development should be avoided unless supported by tangata whenua.

Objective

5.1.3

Protection of Nga Waahi Tapu and Other Taonga

To avoid or minimise the adverse effects of subdivision, use and development on the cultural and traditional relationships of Maori with their sites, nga waahi tapu and nga taonga.

Western Bay of Plenty Proposed District Plan (incorporating proposed Variation N° 1 Change 1 and outstanding references, November 1997)

Objective

2.2.1 (9)

Fulfilment of the special relationship of Maori with their ancestral land.

The option selection and design of the TEA has minimised potential adverse effects on ancestral lands and areas of importance to Maori. The route avoids all areas of multiple owned land (except in the realignment of Te Tumu Road, which will only be used if agreement is reached). Consultation has been undertaken with the Tangata Whenua at all stages of the project to ensure adverse effects were avoided, remedied or mitigated. This in particular occurred when the location of a Pa site was confirmed near the Kaituna River. The route was realigned in consultation with the relevant hapu to avoid the site.

5.5 NOISE

5.5.1 INTRODUCTION

Noise from road traffic is experienced in all urban areas and within several hundred metres of major roads such as SH2. It has many effects including annoyance, interference with listening to conversation, TV or radio, disturbance of sleep and loss of sense of quietness. A table of effects developed from an OECD report on transportation noise [OECD Environmental Directorate] is given below. This summarises in a very shortened form the principal effects of traffic noise.

Table 5.1: Effects of Traffic Noise

Noise Level Exposure (L_{eq})	Description of Effects
> 65 dBA	Constrained behaviour patterns arise, symptomatic of serious damage caused by noise
60-65 dBA	Behaviour designed to reduce annoyance is exhibited, although this is not too constraining. However, the effects on sleep and especially the level of annoyance increase very appreciably.
55-60 dBA	Noise impact is limited but some disturbance is probably occasioned to more sensitive individuals, in particular older persons
< 55 dBA	Damage caused by noise is very slight, sound conditions enable the most noise sensitive activities to be carried on normally.

A graph showing the percentage of the population annoyed by different levels of transportation noise is shown in Figure 5.12

Transit has produced a set of draft guidelines [Transit] which set out the design criteria for State highway improvements. However, it must be noted that these are not assessment criteria, rather they define noise levels that must be achieved at the design stage. The design noise levels vary depending on the existing noise environment.

Figure 5.12: Community Response to Noise

[Schultz]

5.5.2 PREDICTION OF TRAFFIC NOISE

The generation and propagation of traffic noise is well understood and there are a number of established methods for predicting traffic noise. For freely flowing traffic the Department of Transport in Britain have published a detailed model [Department of Transport] which can be used to predict the L_{10} (18 hour) noise level. Transit has commissioned research to adapt this to New Zealand conditions [Transit]. These two models have been used to predict the noise contours for the TEA. The prediction models use the following variables:

- traffic flows
- traffic composition (heavy vehicle ratio)
- gradient and average speed
- distance from kerb
- height of receiver above ground
- type of ground between road and receiver
- acoustic screening (hills, earth bunds, noise barriers)
- road surface

The data used for the calculations were as follows:

traffic flow (year 2011): 9,230 vpd
15% heavy vehicles
100km/hr
Soft ground
Screening by required noise bunds and barriers
Road surfaces generally coarse chip except where necessary to meet Transit Design Guidelines

A graph showing the predicted noise level versus the distance from the edge of the road is given in Figure 5.13. Note that coarse chip is the normal road surface for such roads and the much higher cost of friction course would normally only be justified where there is a specific need. Figure 5.13 can be used to predict the noise levels of any particular residence before any mitigation work is carried out. It should be noted however, that Transit guidelines will require mitigation for houses adjacent to the proposed route to limit noise levels to 55dBA (L_{eq} 24 hour) including the facade correction.

**Figure 5.13: Noise Level as a Function of Distance from the Roadway (9230v/day
100kph)**

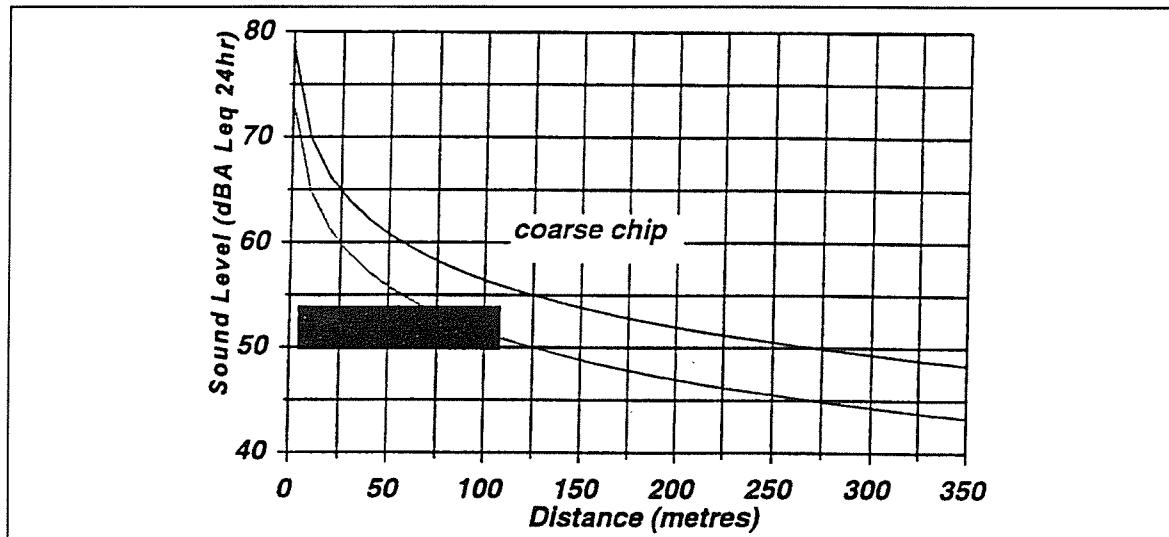
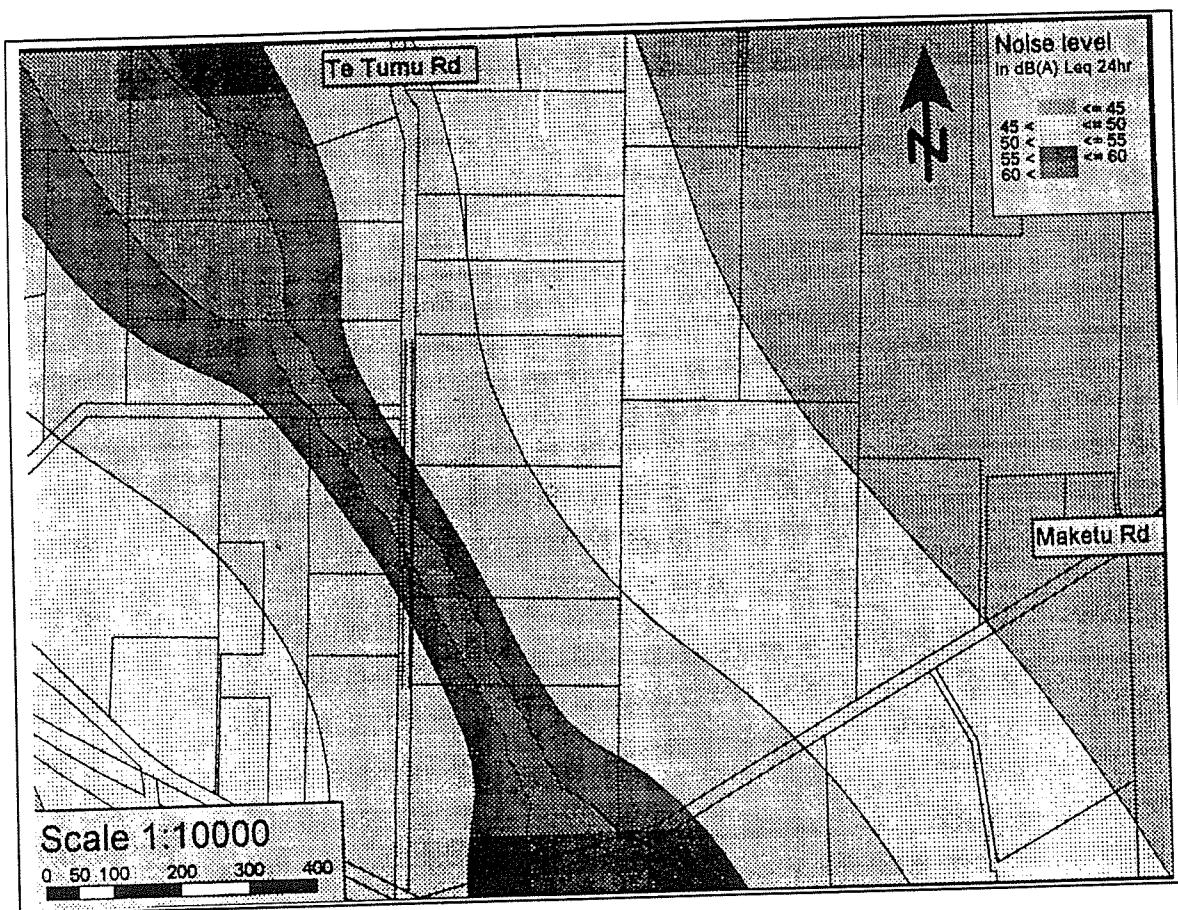


Figure 5.14 shows the noise contours either side of the route. For instance the contours narrow in the area of Te Tumu Road showing the effect of barriers in this section used to protect dwellings G2-G9 and G12-G15. These include the effects of mitigation required to meet the Transit design guidelines.

Figure 5.14 Noise Contours



5.5.3 EVALUATION OF IMPACT

As discussed previously, traffic noise has various effects. However in this environment it is possible with appropriate design of mitigation measures to reduce noise levels to a point where effects will be minor.

As part of the analysis of effects the noise levels have been predicted at various distances from the road, and then taking into account the draft Transit Design Guidelines, appropriate mitigation measures have been designed. The analysis of effects has then assumed that these mitigation works will be incorporated into the final highway design and construction.

Without mitigation houses within 280 metres of the road would experience traffic noise levels of greater than 55 dBA (up to 65 dBA at 50 metres). However, with mitigation as discussed in the next section the noise level can be limited to 55 dBA (L_{eq} 24 hour) for all properties. For properties further than 280 metres from the road the noise level will be less than 55 dBA (L_{eq}) without mitigation and will reduce with distance until at distances of more than 1000 metres the traffic noise would be below the normal day time ambient noise and would be likely to be inaudible. Thus at these distances there will be no effect from noise. For houses within 280 metres of the highway the residual effects after mitigation would be loss of quietness and some mild annoyance for some people at sometimes. There would not be any significant effects such as sleep disturbance, interference with listening or conversation, or significant risk of people being highly annoyed.

The situation at different parts of the route is now discussed separately.

5.5.3.1 Domain Road Environs

At the Domain Road end of the route (see Figure 5.7) there is a group of houses near the junction of Tara Road and Domain Road. Four of these are within the proposed designation and would need to be removed. Of the remainder there are approximately 5 (A5, A7-A9, A11) within 250 metres of the new road. The noise level will be mitigated to 55 dBA by a combination of a barrier fence along the eastern edge of the on ramp and use of a quiet road surface on the new road. Effects of traffic noise on these properties will be very minor.

5.5.3.2 Tara and Parton Roads

Moving south along the new route there are a group of properties (B1-B4) on Tara Road and Parton Road (see Figure 5.7 and Figure 5.8), these properties are further than 300 metres from the route and so will have less than 55 dBA. Effects on these properties will be very minor.

5.5.3.3 Bell Road

As the new route crosses Parton Road and continues on the northern side of Bell Road (see Figure 5.8) there are a number of houses close to the route (B5, B7-B10, D1-D2). Mitigation work will be necessary and will take the form of an earth bund approximately 2.5 metres high, and a quiet road surface. These noise bunds will extend approximately 200 metres each side of each house. For isolated houses such as B5 the bund would be

400 metres long, while for a group such as B7, B8, B9 and B10, the bund would be continuous and total about 800 metres in length.

As the route curves south to cross the Kaituna River there are two houses (D3 and D4) which are 50-70 metres away from the alignment and will require an earth berm or fence about 2 metres high and a quiet road surface for up to 200 metres either side of the properties. There are two houses which are further than 300 metres away and so subject to very minor effects and one house D6 about 200 metres from the route which will require a section of about 200 metres of quiet road surfacing to achieve 55 dBA. The effect on D6 will be very minor.

5.5.3.4 Lower Kaituna Wildlife Management Reserve

The route then passes through a reserve. The existing noise environment in the reserve is quiet and predominantly composed of natural noise sources such as wind, insects and birds. Measurements taken in the area show the ambient noise level to be as low as 36 dBA.

The approximate effects of different traffic noise levels on the reserve are as follows:

Less than 45 dBA - essentially no effect

45 - 50 dBA - Minor effect - traffic audible, but not obtrusive

50 - 55 dBA - Moderate effect - might obscure quiet birdcalls, or conversation over a distance, noticeable intrusion of non-natural sounds

55 - 60 dBA - Significant effect, natural sounds obscured, conversation only possible at close distances

60 - 65 dBA - Traffic noise very obtrusive, conversation even at close distances difficult

Transit guidelines do not require any mitigation treatment. However it is recommended that mitigation be proposed in recognition of the significant recreational and ecological values present on site.

Setting an acceptable noise level for the reserve is based on the use of the reserve. An acceptable level for a reserve dedicated to active sport (e.g. rugby fields) would be perhaps 55 dBA. Conversation over a distance of a metre or two would be possible, and the nature of the activity means that you are unlikely to be distracted by extraneous noise.

The objective for a reserve where the natural environment (trees, birds etc) is the main reason for the reserve would ideally keep intrusive noise to the ambient or less. The whole point of a nature reserve is that it is natural and any intrusion of the non-natural environment will severely degrade the perception of the reserve.

This reserve is partly an active recreation area (shooting etc), but it also has an important use as a natural reserve. It is therefore desirable to achieve a level of 45 dBA over the reserve. However it is impossible to completely achieve this with practical height barriers (such as fences). Therefore a balance between what is desirable and what is practical is being promoted. This process has resulted in a level of 50 dBA being chosen as the design criteria.

With no mitigation this design level (50 dBA) would be exceeded within 450 metres of the road, making a significant proportion of the reserve above the design limit. With a 2.5m high noise bund the noise levels would be reduced to 50dBA at about 200m from the road, thus reducing the negative effects of the traffic noise. Further mitigation would be possible by laying a low noise road surface such as friction course. This would reduce noise levels to 50dBA at about 70m from the road, thus restricting adverse effects to a relatively narrow strip along the edge of the reserve.

A concern has been raised by the Eastern Fish and Game Council that noise from traffic will affect twilight shooting in the reserve. Twilight is reported to be one of the best times for shooting and hunters rely on the noise of birds in flight to locate their targets. Because both flight noise and traffic noise are broad band noises without marked special characteristics traffic noise can mask flight noise if it is at a higher level than the flight noise. The potential for masking of flight noise has been considered by examining the traffic noise contours over the reserve. While no data is available on the strength of noise from bird flight, experience suggests that it is not loud and it would be masked by noise above the ambient noise level. Without mitigation of the noise there would be frequent masking of flight noise up to 500 metres from the road and occasional disturbance up to 800 metres away. With the proposed mitigation including an earth bund 2.5 metres high (above the road – Refer Figure 5.17) and use of a low noise road surface the frequent masking effects would be confined to a strip about 70 metres from the road. There would be some occasional disturbance up to 300 metres from the road. However there would not be a significant disturbance to shooters over the majority of the reserve. Initially the traffic flow will be below the design flow (which is the 10 year projected flow rate) and there may be only one carriageway each way rather than the dual carriageways each way, which may be added at a later stage. Thus noise levels at the time the road is opened will be less than the design levels discussed above. It would therefore be reasonable to carry out mitigation measures in stages as necessary, initially using just the 2.5m high bund (4.5m from reserve). The noise levels would then be monitored regularly to determine when it is necessary to provide further mitigation, at which point monitoring would cease.

Because the Kaituna bridge is elevated above the surrounding countryside the potential exists for noise of vehicles to propagate more widely. This potential has been allowed for in the assessment of noise discussed above in 5.5.3.3 and the analysis shows that there would not be any significant effect on nearby dwellings.

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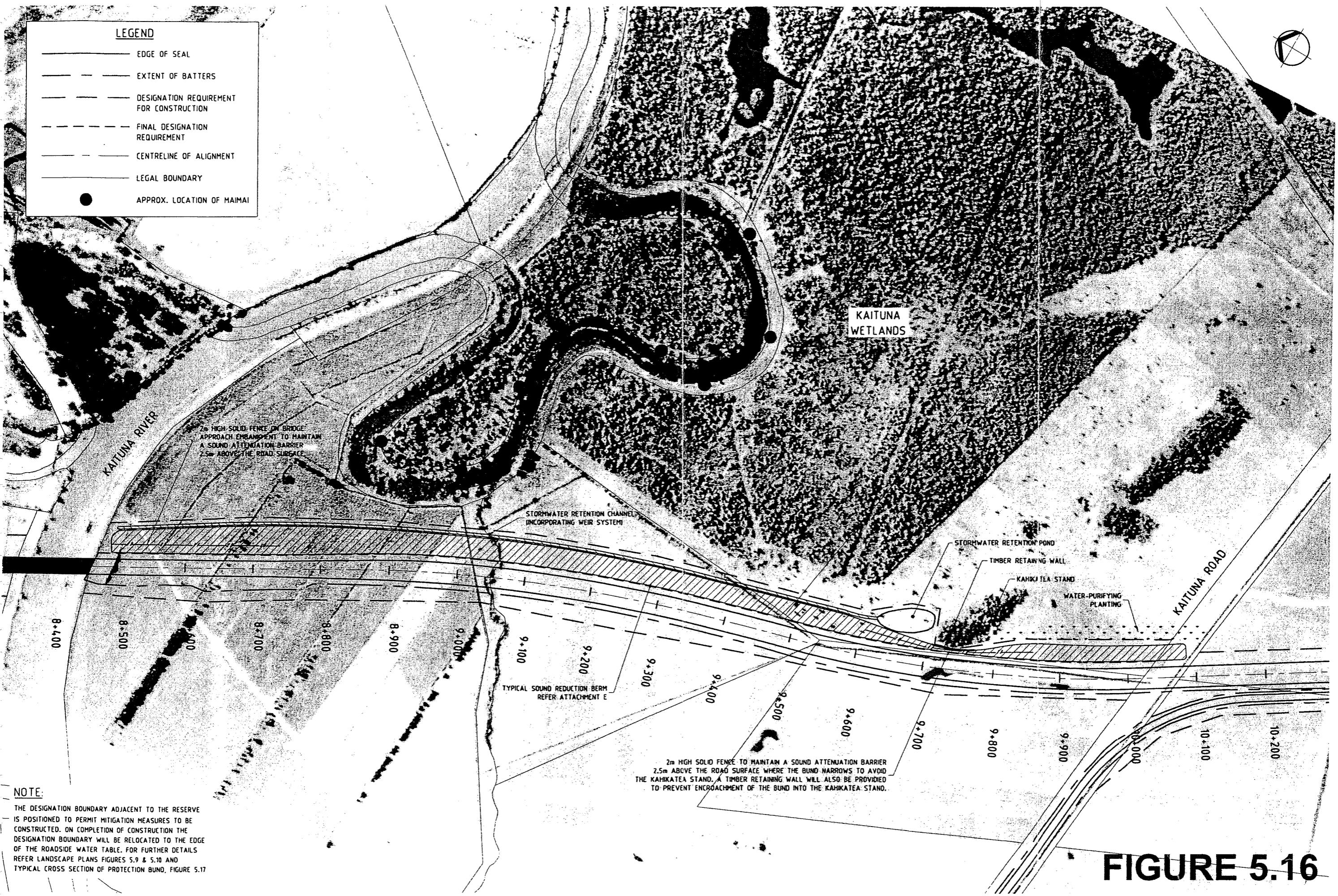


FIGURE 5.16



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Consulting Engineers

Auckland, Wellington, Christchurch, New Plymouth, Tauranga,
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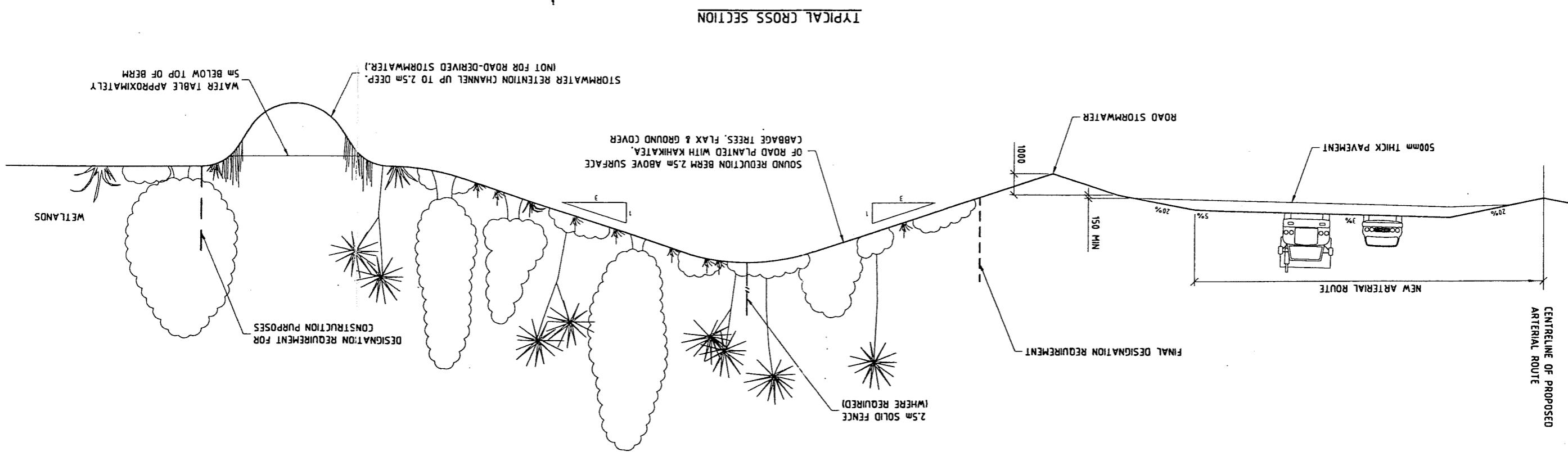
TURANGA
EASTERN ARTERIAL
CIVIL

KAITUNA WETLANDS
PROTECTION
MEASURES

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FIGURE 5.17



5.5.3.5 Pah Road

As the route crosses Pah Road, there are a few isolated houses (F1–F4, F6) that are between 50 and 200 metres from the new road. Mitigation will be required and would take the form of a length of quiet road surface about 750 metres long and 2.5 metre high barriers on the northern and southern sides of the road about 600 and 400 metres long respectively. Noise effects on these houses would be very minor.

5.5.3.6 Te Tumu Road

The route then passes through a horticultural area near Te Tumu Road. Mitigation will take the form of a stretch of quiet road surface up to 1km in length, with 2–2.5 metre barriers on both sides of the road near dwellings G2–G9 and G12–G15. Noise effects on these dwellings and dwellings further away would be very minor with these mitigation measures in place.

5.5.3.7 Paengaroa Interchange

The route then crosses the ECMT railway and joins into the existing SH2 alignment. Houses in this area are already exposed to noise from the existing SH2 alignment and Transit design guidelines require limiting the noise level to 62 dBA (L_{eq}) or the existing ambient noise + 3dBA (which ever is the higher). For all the houses in this area the design noise level will be achieved without any specific mitigation work. There will be only a minor increase in effects over the current situation.

5.5.3.8 Assessment of Night-time Effects

At night the major effect of traffic noise is disturbance of sleep. A considerable amount of research has been carried out on the effects of traffic noise on sleep and it has been found that it is the maximum noise levels which disturb sleep rather than the average noise levels. Thus it is the heavy vehicles which determine night-time noise effects since they produce the highest maximum noise levels, even though they may be a small proportion of the total vehicle flow.

Vallet has suggested noise limits of 50 dBA as the maximum noise level inside a bedroom to avoid sleep disturbance. An average New Zealand house will reduce noise levels by 20 dBA with closed windows, or 10-15 dBA with open windows, therefore an external noise limit of 60 to 65 dBA would be sufficient to avoid sleep disturbance even with open windows. From measurements carried out by Marshall Day Associates it can be shown that without mitigation the mean maximum noise level of heavy vehicles is 65dBA at a distance of 120m. However mitigation work that will be carried out to reduce the overall noise level to Transit's guideline of 55 dBA (L_{eq}) will also reduce the maximum levels to less than 65 dBA for all affected houses closer than 120 metres.

5.5.4 MITIGATION

5.5.4.1 Operational Noise

The proposed road has the potential to generate unacceptable levels of noise to nearby dwellings, and so mitigation measures must be incorporated into the design and construction of the road in order to reduce the noise to acceptable levels.

At vehicle speeds above about 60 km/hr the predominant source of noise radiation is tyre noise. The most effective methods of mitigation for this source are the use of quiet road surfaces and the use of acoustic barriers. Friction coarse paving can reduce noise levels by 5 dBA or more, while acoustic barriers such as solid fences or berms can reduce noise levels by 15 dBA (depending on height). Noise barriers can take many forms, from simple timber fences, to concrete fences, to earth bunds. There are three important factors, the height of the barrier, the sound transmission through the barrier and the transmission around the ends of the barrier. In practice it is found that a fence material of at least 12kg/m² provides sufficient sound transmission loss through the fence itself provided that there are no gaps in the fence. Thus timber fences of 20mm thick palings which are overlapped to allow for shrinkage will perform satisfactorily. Earth bunds likewise are very effective noise barriers, but require sufficient width of road reserve since in practice a maximum batter slope of 2:1 must be allowed for, with a crest width of 2m. Thus a 2.5 metre high bund would be 12 metres wide.

Noise barriers must be quite long to be effective since otherwise noise from unshielded portions of the road will dominate the overall received noise level. Typically the noise barrier must extend up to 200 metres either side of the receiver when substantial noise reductions are required.

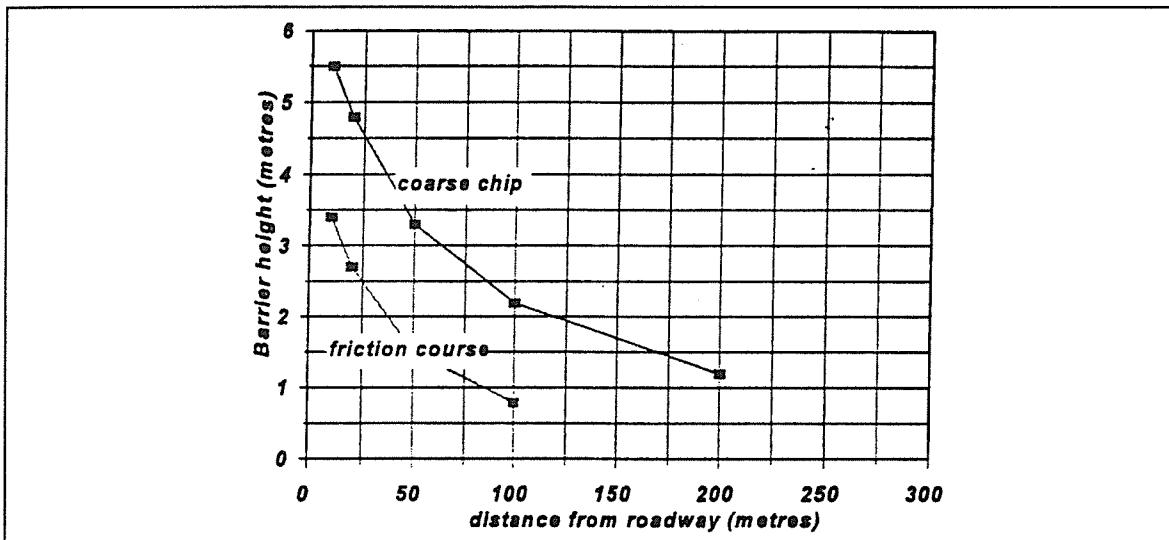
Noise barriers are also most effective when located close to either the source or receiver and less effective when located midway between.

While some reductions in noise can be achieved by redesigning tyres, there are significant restraints from safety and economic considerations. Thus the greatest scope for reducing tyre/road noise is redesign of the paving surface. The predominant factor governing noise generation is the roughness of the road surface, with both air pumping and tyre vibration being important mechanisms. Coarse chip surfaces generate high noise levels, with the noise being proportional to chip size, unfortunately in New Zealand relatively large chip sizes are normal. Smoother surfaces such as asphalted concrete or friction coarse can provide significant reductions in noise. There is some evidence that the type of friction course used in New Zealand is even quieter than similar surfaces overseas, thus emphasising the difference between chip and friction course surfaces.

It is sometimes assumed that trees or shrubs can mitigate noise, however research has shown that the attenuation of foliage is small, the range of observed attenuation being between 0.5-1.5 dBA per 10 metres depth of planting. Thus it would require a 50 metre

depth of planting to achieve a significant reduction in noise. Such planting depths are generally impractical, however planting is a very important component of softening the visual effect of noise barriers.

Figure 5.15: Required Barrier Height to achieve 55dBA (Leq24hr) 9239v/d 100kph



For houses closer than 100 metres to the edge of the road a noise barrier would have to be up to 5 metres high if chip seal was used for the road surface (see Figure 5.15). Barriers of this height would be unlikely to be acceptable from a visual point of view in this environment and so it is necessary to use a combination of a quiet road surface (such as friction coarse) and a moderate height barrier (maximum 2.5m) to achieve the required attenuation. This acoustic treatment would need to extend approximately 200 metres either side of the dwelling (total length 400 metres) in order for the noise from the visible section of highway either end of the barrier to be sufficiently reduced by distance and ground absorption so as to not add significantly.

For dwellings between 100 and 200 metres from the road the mitigation work would be similar but somewhat reduced, a length of quiet road surface 100 metres either side of the dwelling and a barrier of maximum height 2 metres the same length. For dwellings between 200 and 280 metres away the barrier could be omitted and just the quiet pavement used. For dwellings further than 280 metres away no acoustic mitigation would be required.

Section 5.7.3.1 has identified the exact locations where road surfacing will be required by referencing these to houses. These houses can be seen on the Concept Landscape and Mitigation Plans.

5.5.4.2 Construction Noise

The construction of the proposed route will involve powerful earthmoving machinery driven by large diesel engines which generate high noises. Table 5.2 shows the range of noise levels typically generated by earthmoving machinery.

Table 5.2: A Weighted Sound Power Levels of Earth Moving Machinery

Item	Sound Power Level (dBA re 1pW)
Compactors	105-120
Scrapers, graders	112-120
Trucks	102-113
Bulldozers	117-121

Using these sound power levels the noise levels at various distances and for different combinations of machinery can be calculated.

While accurate estimates can in theory be made for any particular arrangement of noise sources, the range of variability of positioning, operational load, mix of machines etc means that there is limited value in making very detailed calculations.

The noise level at any particular position can vary over a large range even over short periods of time. Therefore estimates of the average noise levels from a typical 2km long section of construction have been made based on typical construction activity. Actual measured noise levels at any particular time may well be a little greater or less than these estimates, but on average these estimates will give a reasonable indication of the construction noise exposure. These estimates agree well with actual levels measured on recent road construction projects and represent the upper range of noise levels typically measured.

Table 5.3: Predicted Average Construction Noise Levels

Distance from Centre of Activity	Noise Level (L_{10})
50m	70-75dBA
100m	60-65dBA
250m	
55-60dBA	

New Zealand Standard NZS 6803P “*Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work*” recommends the following upper levels of construction work noise received in residential areas.

Table 5.4: Recommended Upper Limits (dBA) for Levels of Construction Work Noise Received in Residential

Period	Noise Level (dBA)								
	Weekdays			Saturdays			Sundays and Public Holidays		
	L_{10}	L_{95}	L_{max}	L_{10}	L_{95}	L_{max}	L_{10}	L_{95}	L_{max}
0630-0730	60	45	70	**	**	**	**	**	**
0730-1800	75	60	90	75	60	90	**	**	**
1800-2000	70	55	85	**	**	**	**	**	**
2000-0630	**	**	**	**	**	**	**	**	**

** At these times the relevant provisions in the NZS 6802 shall apply. This may mean that no noisy construction work can take place during these hours

Referring to the predicted noise levels it can be seen that the recommended upper levels may not be met for distances of less than 50m from the construction activity to the nearest residential dwelling. Since the construction will generally centre on and move along the road alignment it can be taken that for a band 50m either side of the road, construction noise may exceed the recommendations of NZS6803P. There are two dwellings (B5 and B9) that are approximately 40 to 50 metres from the edge of the road and may therefore at times be exposed to noise levels slightly over the levels set out in the table above. There are other residences that lie within the road designation but it is assumed that these would be removed prior to construction commencing.

Mitigation would be necessary to reduce noise levels for these two close houses. Such mitigation would include selection of quiet machinery, construction of noise bunds at an early stage, programming of noisy work to suit residents activities, and selection of work techniques to minimise noise.

5.5.5 COMMENTARY ON PLANNING POLICY

The following objectives and policies are considered relevant to noise issues:

Tauranga District Proposed District Plan (annotated with Council decisions October 1998)

Objective

3.1.1

Noise and Vibration in all Zones

To avoid, remedy or mitigate unreasonable noise or vibration induced annoyance, disturbance or injury.

Western Bay of Plenty Proposed District Plan (incorporating proposed Variation N° 1 Change 1 and outstanding references, November 1997)

Objective

13.2.2.1

An environment free from intrusive noise and vibration.

Policy

13.2.2.2(a)

Ensure activities do not generate noise levels inconsistent with the amenity of the locality in which the generated noise can be discerned.

Policy

13.2.2.2(c)

Have regard to any relevant New Zealand standards, guidelines, or codes of practice in the assessment of applications for resource consents.

These policies deal with business activities, equipment and machinery, residences in commercial areas, rural activities, port and airport activities but not road noise.

The assessment is suggesting that different road surfaces, i.e friction course, be placed at particular points along the alignment. This, combined with noise bunds and fences, is considered to be the best practicable option to ensure the noise levels meet the design criteria.

5.6 SOCIAL EFFECTS

5.6.1 INTRODUCTION

The social impacts of the proposal have been determined in conjunction with the consultation programme. The key to effective consultation is the provision of relevant information to the public to assist them in providing informed responses.

The TEA evaluation process has provided seven newsletters to the residents in the study area since the preliminary investigations in 1996. To date newsletters have been mailed to approximately 720 households with the mail list open for additions at any time (see Appendix 3 Newsletter 1-7). In addition, Open Days in Papamoa, Te Puke and Paengaroa were held in November 1997 and July 1998, to display, in the first instance the various alignment options and in the second instance the favoured option. Approximately 260 persons attended the 1997 Open Days and 120 attended the 1998 Open Days. Submissions were received in November-December 1997 (104), March-April 1998 (43) and July-August 1998 (9). Cottage meetings were offered to anyone who was interested. Very few residents requested cottage meetings. In addition, a community liaison group was set up for regular meetings. This group included the following organisations:

- Tauranga District Council
- Western Bay of Plenty District Council

- Tapuika Iwi Authority
- Ngati Whakaue ki Maketu
- Te Runanga O Ngati Pikiao
- Ngati Makino
- Nga Potiki Runanga A Hapu
- Ngati Pukenga Iwi
- Te Runanga o Ngaiterangi Iwi
- Ngati Kapawa Hapu
- Te Arawa Maori Trust Board
- Automobile Association
- NZ Road Transport Association
- Port of Tauranga Ltd
- BOP Federated Farmers
- Environment BOP
- Focus Te Puke
- Te Puke Ratepayers Association
- Te Puke Community Board
- Department of Conservation
- Royal Forest & Bird Society
- Eastern Fish & Game Council
- NZ Police

During the AEE phase August-October 1998, all landowners directly affected were offered personal interviews with most taking up the opportunity (see Appendix 7). This not only recorded their views and concerns but also provided an introduction to the land purchase/compensation process that would occur in the event that the designation is successful. The detail of site mitigation will evolve as each landowner is ready to negotiate acquisition or compensation with the Transit representatives (Terralink) over the coming years leading up to construction.

The consultants continue their open line/open door policy at the Tauranga office of BCHF to provide information or if appropriate record responses. This service should continue throughout the term of the TEA/Hearing process and until such time as Transit's agents Terralink complete negotiations with all involved and construction begins.

In addition consultation with the tangata whenua was undertaken as recorded in Section 5.4.

Many of the perceived social effects are common across the study area and therefore they are not recorded by geographical neighbourhood.

The potential social impacts and issues identified by the residents during consultation are outlined below.

5.6.2 DISAGREEMENT WITH ROUTE ALIGNMENT

The TEA was originally referred to as the Te Puke Bypass. It was the subject of a scoping report in 1992 but local landowners talk of roading studies being around much earlier than the 1990's. In the early 1990's there were alternative roading options ranging from a longer option that went down Tara Road and followed the sandhills (Option 4 "sandhills route") coming in around the eastern edge of the Kaituna River and down Te Tumu Road to a shorter option that involved by-passing central Te Puke only. These are described in greater detail in the *Options Report - Tauranga Eastern Arterial Roading Study 1998*.

The "sandhills route" became the preferred route for many landowners especially those affected by the TEA options and it was often mentioned as a better alternative during consultation.

A number of landowners feel that they have been unfairly treated by Transit over the selection of options in that the "sandhills option" was not considered an option in the 1998 study. Firstly, they perceive that Transit was unwilling to pursue a route that affected Maori land titles but was quite happy to choose an alignment that passes through productive dairying land affecting their economic viability. Secondly, they perceive that Transit was willing to avoid Department of Conservation land as much as possible, again affecting the dairying land to a greater degree.

Response

The sandhills option is discussed in detail in the Options Report - Tauranga Eastern Arterial Roading Study 1998. In essence, this option is longer than the other options considered therefore making it more costly both in economic (construction) terms and in user terms (time savings etc). This additional cost means that the Benefit Cost ratio cut off for Transfund funding would take more years to be achieved. The sandhills option also has constraints in ecological terms in that it bisects the narrow coastal strip from the end of the urban area to the Kaituna cut and crosses very close to the more ecologically sensitive (eastern) part of the Lower Kaituna Wildlife Management Reserve. In addition to this it was likely to have a more significant adverse effect on Maori cultural values as the coastal area was the location of many tribal conflicts to which recognition is required to be given under the Resource Management Act. Transit have experienced difficulties in the past with the purchasing of multiple owned land and this results in uncertainty for the project. Because the sandhills route was longer more landowners would be affected by land take, noise and lost production.

Following public responses from the first open days and requests by local land owners, further options were considered that had less impact on individual dairy farms around the Kaituna River. One option, now the subject of this designation, crosses land leased for grazing by the Department of Conservation. By providing an option through this land it was considered that it was not having a significant ecological adverse effects but

was providing a compromise between the Department of Conservation interests and the interests of the dairy farmers.

5.6.3 CONTINUING UNCERTAINTY

For all the residents in the vicinity and particularly those with their land directly affected there is a great deal of anxiety and stress related to the location of the actual route and the long time period before construction is likely to commence. It was felt that there would be an effect on property values throughout this time period and a reduction in property sales.

Many farmers and orchardists have long term development plans. Kiwifruit, for instance, only provides a good return 6 - 8 years after planting and a kiwifruit orchardist would now have to weigh up the cost of planting more/new kiwifruit that would only have 2 - 4 years of return before possible development of the road.

There is unwillingness to invest capital in business and homes, improve the home and property, plant trees and fence when there is uncertainty as to whether these matters would be reasonably compensated under the Public Works Act or whether the alignment would require their removal in the future. There is a loss of enthusiasm for improvement and in fact for some a loss of enthusiasm for living there at all.

Response

Transit must provide clear and current information on the status of the project and construction time frames.

It is normal practice for Transit to negotiate for acquisition/compensation once the designation is confirmed. Hardship cases may be dealt with prior to designation on the basis of full Transit Authority approval.

5.6.4 COMMUNITY NETWORKING

Most property owners did not feel that the alignment would have any effect resulting in community severance. There were two exceptions to this. In the Pah Road area the alignment will mean that one family be separated from their neighbours and will have to make a significantly longer journey to visit them. By all accounts the community in this area was fairly close knit.

The second effect that the alignment will have is to reduce the community severance in Te Puke and Waitangi. The removal of significant amounts of traffic from the existing State highway and out of these towns will provide a more pleasant atmosphere in which the towns' residents can live. This is described in further detail in section 5.8.12.

Nine houses will require removal for the construction of the alignment. It is assumed that the majority of people affected in this way will move off their property. Some however want to stay by relocating their house.

Response

It is inevitable that a highway will have some impact on the community through which it passes.

The community itself suggested that bridges to take Pah Road over the alignment were not necessary. They considered the expense of the two bridges required to mitigate the severance was not justified. The properties on the northeastern side of Pah Road can get access through the formation of the remainder of Kaituna Road.

The effects of removing the State highway traffic through Waitangi and Te Puke are positive and will enhance the community's enjoyment of these towns.

Some property owners will by necessity be required to move from their properties. Transit will pay compensation under the Public Works Act for expenses related to this move. Other help, such as legal advice, may also be paid for.

5.6.5 STRESS OF NEGOTIATING

For those directly affected there is the stress of having to negotiate a fair and reasonable settlement through an unknown process with unknown people. There has been a lot of interest by local landowners in the land acquisition or land swapping that could result in viable farming units (there are 81 titles directly affected). Conversely there has been a feeling that the compensation will not enable people to acquire property with the same farming value elsewhere. Most landowners are not well prepared for this negotiation process which could continue for several years

Response

Ensuring that Transit's land purchase agents are available to discuss concerns with landowners will help to alleviate some of the concerns and problems.

5.6.6 RETHINKING RETIREMENT

In quite a few cases the land is the basis for the residents' retirement planning. It has also been regarded as an inheritance for the children providing an income, job and a residence for them and the parents.

Suddenly their retirement future needs to be re-thought. Where they will live, how they will acquire an income and how they will provide for their children.

Response

Residents would benefit from advice as to the options available with regard to compensation and acquisition. Transit's land acquisition consultants, Terralink, have been made available throughout the process to explain the Public Works Act process with landowners and to discuss future compensation options.

5.6.7 LOSS OF VIABLE RURAL FARMS

There are several orchard and farming units where the alignment bisects the productive unit. In these cases there would be severe disruption to the management of the unit. The mitigation measures perceived necessary to ensure continued viability of a block bisected by the road can range from the provision of new road access to re-racing, re-irrigation, re-fencing, new shelter belts, new cowsheds, hay sheds and the provision of bridges.

There has been a suggestion by various landowners that their residence could be moved on site so that they could stay on the block.

There was limited interest in landscaping measures. Concern were more related to the operation of blocks and in keeping these blocks economically viable.

Owners have brought up the possibility of land swapping and amalgamating land so that farming two separated units does not need to occur. The comment was made that a dairy or dry-stock unit along Bell Road/Tara Road needs access to both peat and sandhill land so that there is adequate feed for stock in winter.

In some cases the amount of land required for the TEA will render the block uneconomic. The remaining property may become a life-style unit or amalgamation may take place to ensure economic units remain in place. Residents were concerned that they did not have enough land as it is and that to remove any at all would have a severe detrimental effect on the viability of the farm. Many were concerned that they needed land replacement rather than monetary compensation. With a potential reduction in productive blocks there is concern that there will be a consequent potential loss of seasonal employment.

Response

Negotiations with all 57 individual affected landowners will determine the need for provision of access and other mitigation measures to ensure a continued management of a block. In some instances land swapping or amalgamation can occur.

It is estimated that the route will result in the loss of 57,000 kilograms of milk solids and 47,500 trays of kiwifruit production. The Options Report (Volume 3) analysed the agricultural and horticultural production losses and this alignment had the least effect.

5.6.8 LOSS OF AMENITY

There have been various concerns mentioned in relation to the road and the loss of amenity:

- noise - traffic noise near their residence, and on the dairy farms near their cowshed. Concern was also noted of increased noise at the Whakatane junction created by what

was expected would become a service centre between the Eastern Arterial and Te Puke Highway.

- view - especially a concern for Bell Road and Pah Road residents where there is a rural outlook that encompasses for some the sea, river and Papamoa hills. This was not such an issue for the horticultural blocks surrounded by shelter belts.
- lack of privacy - because of the proximity of the road and its height above ground level. This was an issue for most of the dairy farm owners who are used to living a reasonable way "off the beaten track" and will suddenly be in view of all passing motorists.
- theft - more traffic into and through a rural area and therefore an increased potential for theft.
- vibration - because of the traffic using the road.
- loss of peace - a peaceful rural environment would suddenly be in close proximity to a busy arterial route. This was not an issue for those already living close to the State highway at Domain Road and the SH 33/2 junction.

Response

There are noise and visual mitigation measures recommended in this report that are intended to maintain the amenity values of the farming areas. Any effects on "loss of peace" will be minor with the proposed mitigation measures in place. It is considered that the overall gain to others will far outweigh these minor impacts to the few affected. Motorways do not allow motorists to stop and therefore the risk of theft is considered to be minor. No service centre is proposed by Transit. This will be up to private enterprise to promote.

Vibration is generated by road traffic and can be felt in buildings close to the road. Vibration is produced by slight unevenness of the road surface and heavy vehicles are the predominant source. Vibration levels will increase with the age of the road as the surface becomes more uneven so the road must be maintained to avoid potholes or sharp bumps developing. However, vibration levels dissipate quickly with distance and are unlikely to be perceptible at more than 50 metres from the road. At closer distances vibration will be perceptible at times but based on the likely heavy vehicle traffic flow it is most unlikely to be an appreciable disturbance. Vibration levels produced by traffic will not cause any damage to buildings because the levels are well below any damage risk thresholds.

5.6.9 KAITUNA RIVER DRAINAGE SCHEME

The Kaituna River Drainage Scheme was instrumental in changing the Kaituna swamplands to highly productive dairy land. To pay for the scheme and its maintenance

the farms in the area are highly rated. Landowners are concerned that the Designation will take land out of the scheme area and consequently that rates will increase on the remaining land. There is also concern that if Transit do contribute it will be in the form of a one-off payment and will not therefore take account of ongoing maintenance to the scheme.

There is also concern that the road will adversely affect the drainage of the farmland which could have a disastrous effect on the farms.

Response

Consultation has been undertaken with those residents involved in the Kaituna River Drainage Scheme and Environment BOP. There is a Memorandum of Understanding between Transit and Environment BOP who administer the Scheme for the landowners. The memorandum records the fact that Transit is willing to contribute fair and reasonable compensation to the Scheme as it relates to loans, operational and maintenance costs to ensure that there are no adverse financial effects on all members of the Drainage Scheme as a result of Transit purchasing land for the project.

Section 3.6 and 5.10 describe the measures required to ensure that the drainage scheme continues to effectively operate.

5.6.10 WHAKATANE HIGHWAY BUSINESSES

The Te Puke Golf Club perceives that the new highway will provide easier access from the Papamoa suburb to the Golf Club and that their membership will increase. This is considered by them as a positive effect. The eastern arterial will not directly affect Paengaroa vegetable stalls and garden centre land until the junctions are constructed (which may be at a later date). The proposal will significantly affect the business trade as they will be directly accessible to local traffic only.

There was interest in a service centre in the block of land between the Eastern arterial and Te Puke highway where a vegetable stall/tearooms could be operated.

Response

Acquisition/compensation negotiations under the Public Works Act do take account of the effect on businesses. Businesses on land not directly affected by the designation do not have compensation rights from loss of trade.

A service centre is a matter for private enterprise to consider and possibly promote to Transit. It also may be something landowners can talk to Transit about during individual negotiations for land purchase.

5.6.11 LOWER KAITUNA WILDLIFE MANAGEMENT RESERVE

There is a general concern by environmental and recreational groups about the long term future and viability of the reserve in ecological and recreation terms and this is seen as a direct effect of building a road in the proposed location. It is anticipated that the road, particularly with the inclusion of the Bell Road interchange, would both facilitate residential development to move closer to the reserve and remove the protective buffer (i.e. farmland) surrounding the reserve.

There is concern that the highway will have an adverse impact on the ability to shoot within the reserve. It was suggested that a 300m buffer area between the road and the reserve would be prudent. It is perceived that public complaints about the proximity of shooting to the road would result in the eventual prohibition of shooting in the reserve. Information given during consultation was that the projectory of BB shot is 445 yards, a 22mm gauge is 900 yards with other gauges reaching 1-1.6km.

Another issue is the retrieval of game and how this would be done if birds have been shot. This could result in both hunters and retrieval dogs walking on the road.

The recreational shooters have requested that an access track be formed along the road bund to the river and this would also produce a similar effect.

Disruption to recreational patterns over the whole proposed four year construction period was an issue. Fish & Game advised that summer construction would be preferable.

There are concerns about the effects of the highway even with the planted earth bund 4.5m above the reserve in terms of noise, vibration, dust and car lights and the effects that these factors will have on the wildlife in the area, particularly the breeding of the wildfowl. The groups consulted felt that very little research in general had been done into the impacts of roads on reserves and that once the road is in place there is no turning back.

Concern was expressed over the effects of the stormwater entering the reserve, either directly through run-off or being pumped in via the Diagonal Drain which runs from Pah Road through the reserve. The Diagonal Drain is considered too polluted now to be ideally used as a source of water for the reserve and any further pollution would add to the problem.

Loss of wilderness values on the reserve is a concern for many of the reserves users.

Response

It is likely that the proposed road and interchange will have a flow on effect of facilitating development in eastern Papamoa. However, TDC have a substantial area of land in eastern Papamoa shown as residential and future urban in the proposed District

Plan. The eastern-most area, i.e the area between the end of Papamoa Beach Road and the Kaituna River remains as rural zoning at present. Development has however been moving eastward down this coastal strip for some time and it is likely that this would continue as land became available, regardless of whether the Eastern Arterial is located on the proposed route or not.

Construction is likely to be carried out in stages over separate lengths along the alignment so that construction through the reserve area will not occur for the whole construction period. Main earthworks and pavement construction would be carried out in the summer seasons. In addition it will be possible to put vegetation in place early (before construction begins) to give it a "head start" so as to provide some visual and physical protection.

It is not intended that road derived water will go directly into the Lower Kaituna Wildlife Management Reserve. It is proposed that water from the road will enter side swales on the road side of the proposed bund (which separates the road from the reserve). These side swales will then direct water into the Diagonal Drain.. The vegetation in the swales would treat the stormwater prior to discharge to the drain.

Run-off from the reserve side of the protection bund will enter into a stormwater retention channel into a retention pond and then through vegetated swale before entering the Diagonal Drain. There is then approximately a four-hour retention period in this drain prior to reaching the location from where it was being pumped into the reserve (before the new culvert through the stopbank was installed).

The ecological report advises that the proposed alignment "would not diminish the wildlife values of the adjacent area or the resource values of the higher ecological value habitat in the north-eastern section of the reserve". It goes on to say that although some of the birds present would be displaced from the area during construction, provided the habitat is retained (i.e the tall vegetation immediately adjacent to the alignment) these birds can be expected to utilise the area again. It is recommended that noise mitigation measures are provided to limit noise in the reserve.

The Firearms Act controls the use of firearms. Section 48 states that it is an offence to discharge a firearm etc in a public place "so as to endanger property or to endanger, annoy, or frighten any person". As such a shotgun cannot be fired across a road or near a dwelling on any property.

After researching the legislation and discussing the matter of buffers with the New Zealand Police and the New Zealand Mountain Safety Council who, it is understood, provides guidance on matters relating to firearms we are advised that there are no guidelines or rules that specify buffer distances for game shooting activities. Considering the layout of maimai in the reserve as advised by Eastern Fish & Game, it is likely that five maimai will fall within 300m of the road.

The location of the highway will require that shooters take due care if they are shooting westward from maimai or when free range shooting in a westerly direction. The formation of Kaituna Road (west) to the river or the development of a dwelling to the west of the reserve would have a similar impact on shooter behaviour.

The provision of the bund, some 4.5m above the reserve provides a physical barrier for direct shots to the road and will help reduce the likelihood of hunters and dogs from retrieving their kill from the road.

Wilderness values refer to the quiet noise environment and the feeling of being away from civilisation with its associated bustle and noise. The noise mitigation measures and the landscaping measures particularly the high earth/landscaped bund will assist in maintaining the feeling of remoteness. It is proposed to carry out regular monitoring of noise in the reserve to ensure there is no significant adverse effect (see Section 6).

5.6.12 TE PUKE BUSINESS ENVIRONMENT

Feedback from Focus Te Puke indicates that there are mixed feelings with regard to whether the TEA will be good or bad for Te Puke. Reasons given for it being bad are that the town would be isolated as people would not go there if SH2 did not go through it. There is concern that this will in turn kill off some business that rely on traffic, i.e petrol stations, cafe's etc. On the other hand, some people see the TEA as an opportunity to promote Te Puke differently. It would give Te Puke the chance to close off the Mainstreet and run promotions and it would create a safer, and therefore more enjoyable, environment in the main street in which to shop and wander around.

Focus Te Puke themselves consider that as long as there is the time to plan some strategies and have an advanced idea of timing, then the TEA will "only be another hurdle to jump over". They consider that with a positive attitude it may well be a very good thing for Te Puke.

Response

McDermott Fairgray, in their Economic Assessment of the Eastern Arterial (attached as an appendix to the Options Report - Tauranga Eastern Arterial Roading Study 1998) estimate that passing trade in Te Puke accounts for almost 11% of Te Puke's total retail sales. They estimate that around 95% of total current passing trade will be lost as a result of the TEA. This would result in a decrease in local retail sales in the order of \$8.5 million annually and a subsequent loss of around 69 jobs in the retail sector.

However, it is likely that there will be some offset to this loss of trade. The reduction of heavy traffic flows is expected to stimulate more local demand and reduce the amount of leakage (i.e the estimated retail demand exceeding the estimated retail sales). This leakage occurs for a number of reasons, e.g handy shopping in Tauranga, Mount Maunganui and Rotorua offering more choice and price competitiveness. However, it is likely that the reduction in heavy traffic flows would see this leakage reduced and McDermott Fairgray estimate this reversal in leakage would amount to around 15% of

the currently leakage (or \$4.8 million) and would sustain around 39 jobs. This means that the net impact of the TEA would see a drop in sales of \$3.7 million and an associated net employment loss of around 30 employees.

Transit would provide directional signs to Te Puke at each end of the proposed alignment.

5.6.13 CONSTRUCTION EFFECTS

The major concern is the dust created during construction that will affect the kiwifruit orchards and result in reject fruit. Kiwifruit is very susceptible to dust and any damage due to dust will seriously affect income.

Construction noise concerns dairy farmer with its effect on stock, resulting in lower yield and therefore a decreased income.

Response

Transit will, through the contractors, make every effort to ensure the dust nuisance is minimised. It will be appropriate to have a designated public liaison person during the construction phase to enable issues and complaints to be acted upon speedily.

5.6.14 CONCLUSION

The effects of the proposed highway can be split into pre-construction and construction/operation effects. In the case of the former there is the emotional and financial stress of negotiating, having uncertainty as to the location of the road or whether it will actually happen, participating in an unknown planning process and being sure that all the available information is at hand. Transit has ensured a free flow of information to date and speedy investigation and resolution of issues and this will continue in the pre-Hearing period.

The later period (construction – operation effects) again brings emotional and financial stress but perhaps in a more tangible form as the true effects of the alignment become known. The details of noise, visual, rates, reserve development, construction and access mitigation are detailed in Section 0.

5.6.15 COMMENTARY ON PLANNING POLICY

The following objectives and policies are considered relevant to social issues:

Proposed Bay of Plenty Regional Policy Statement (incorporating decisions on submissions August 1996)

Objective

5.3.6(a)

Adverse effects of activities on social, economic and cultural well-being are avoided, remedied or mitigated.

Policy

5.3.6(b)(i)

To take into account the effects of activities on social, economic and cultural well-being in plan preparation and in the consideration of applications for resource consents.

Proposed Tauranga District Plan (annotated with Council decisions October 1998)**Objective**

3.4.1

To protect the amenity values associated with rural areas and in particular to maintain a rural backdrop to the District's urban area.

Section 0 of this report details the mitigation measures that are recommended. It is appropriate that Transit maintains a comprehensive service informing the land owners of developments and conducting negotiations in a fair and reasonable manner. The key areas of potential effects on the rural character (noise, visual, ecological, archaeological/cultural) are dealt with in the respective subsections of this report.

Transit NZ could relocate or reorientate maimai which are considered to be too close to the alignment, at the advice of both DOC and the Eastern Fish and Game Council.

5.7 TRAFFIC EFFECTS

State highway 2 currently provides a dual service of major arterial route and primary commuter road in this area. The local, generally slow moving and turning traffic accessing residential and commercial properties and other local access roads conflicts with long distance and through traffic, meaning delays are common for all vehicles. SH2 passing through the built-up area of Te Puke causes problems due to the high number of accesses, the on-street parking, pedestrian movements, intersections (two roundabouts), local traffic entering the highway and the general urban/commercial environment of the highway with the associated speed limit of 50 kph results in a poor level of service.

Transit NZ could relocate/reorientate maimai which are considered to be too close to the roadway at the advice of both the Department of Conservation and Eastern Fish and Game Council.

In the last five years, traffic has been increasing on this section of SH2 at over 5% per annum. From an analysis of the growth in traffic on the SH2 over the past 5 years, the projected growth rate from 1997 is 5.7% per annum east of Domain Road and 6.2% through Rangiuru.

The rapid increase in traffic volumes is due to the large amount of development occurring in this region, especially in the Papamoa area, and due to the increase in trunk road traffic flows. In addition to traffic volumes, there are a large number of logging trucks using the highway. This concerns both pedestrians and other highway traffic with the associated perceived safety concerns, especially with crossing the main street and the

environmental and social concerns of heavy vehicles using the main street through Te Puke.

Accesses from the highway cause conflicting traffic manoeuvres which are made more unsafe due to many intersection having insufficient sight distances. The study area contains a wide range of land uses, including residential and industrial/commercial in Te Puke, residential in Papamoa and Papamoa Beach, with the remainder being mainly rural. Many areas of Papamoa Beach have been recently developed with a significant amount of subdivision occurring.

The effect of a predicted 61% increase (by year 2011) in traffic flow on SH2 would be detrimental to the local community and all road users. In addition to increased functional conflict, the predicted increase in intersection delay, travel time costs, and accidents would also be substantial.

Four laning the existing State Highway 2 between Paengaroa to Domain Road would not address all of the conflicts or problems identified above.

A realignment of SH2 would provide the opportunity for the north/south through traffic function to be removed from the existing SH2 and for the local access function to dominate through and approaching Te Puke. The physical characteristics of the bypass route with two lanes in each direction, limited access and a 100km/h speed environment coupled with route shortening would encourage through traffic to utilise the new road and gain travel time benefits.

Separating the long distance and through traffic from Te Puke main street would significantly reduce the effect of heavy trucks travelling through Te Puke, thereby reducing improving the conflicts at intersections, accessways and between on-street parking and pedestrian movements.

5.7.1 LOCAL ROADING NETWORK

The traffic effects on the local network due to the designation would be:

- to reduce the AADT in 2011 on SH2 east of Te Puke by 46% from some 19,900 to some 10,700 vehicles . This reduction increases to 51% by 2041, with SH2 carrying 16,700 vehicles. This should have a significant effect on the road environment through Waitangi. However this will still be a busy road of local strategic importance;
- to reduce the AADT in 2011 on SH2 north of Te Puke by 40% from 22,700 to 19,150. With the current AADT around 15,000 vehicles the bypass would not remove the need for passing lanes already identify between Domain Road and Manoexa Road; and

- that the provision of the bypass would not directly effect the traffic flows on Domain and Tara Roads. These two roads will experience significant growth in traffic volumes from the expected land use growth in this area. These roads will require high capacity and safe connections to SH2 and the Domain Road interchange proposed for the bypass route would provide for such connections. These would result in significant improvements over the existing connections.

5.7.2 INTERCHANGES

Domain Road

The existing intersection of Domain Road and SH2 has a poor safety record and there are plans to construct in the short term a seagull type channelised intersection to segregate the right turn movements from the westbound traffic to reduce potential conflicts. With the further residential development of Papamoa Beach East the traffic flow on Tara Road would require an improvement of the existing T intersection with Domain Road.

Ultimately Domain Road could be grade separated, but it has been established that this would not be required until 2016. In the interim this intersection would be controlled by a large roundabout. In addition, the intersection of Domain Road and Tara Road would be controlled by a roundabout. This would improve safety and cater for the increased traffic from the Papamoa Beach East development

Bell Road (TDC)

As part of the Designation design allowance has been made for a future grade separated interchange in the vicinity of Bell Road. It is proposed that this interchange will not be constructed until residential development at Papamoa Beach East justifies it. The Bell Road interchange will provide travel time saving for traffic travel between Papamoa Beach east and south. In addition, the Bell Road interchange could reduce the future flows using Tara Road by 33%.

Pah Road

The Bypass is proposed to sever Pah Road and Kaituna Road, with Pah Road realigned to connect with the western section of Kaituna Road. Vehicles travelling between the northern section of Pah Road and SH2 will have to use Kaituna Road via Te Tumu Road. This should have very little effect for vehicles travelling south, but would increase the average journey north on SH2 for only a 3 - 4 properties by approximately 4 km and encourage traffic to use the bypass. The disbenefits would be small compared to the cost savings of not providing a bridge on the bypass.

Te Tumu Road

Te Tumu Road would be realigned at its southern end to connect with Maketu Road. Users of the Tumu Road would not accrue a significant disbenefit. This would also improve the complex intersection of Te Tumu Road, Maketu Road and SH2.

Paengaroa Intersection

Similar with Domain Road this intersection of SH2, SH33 and the bypass will be controlled in the interim by a roundabout and then grade separated when justified in the future. The roundabout has been designed within the envelope of the grade separated interchange to facilitate later construction. The interim roundabout will address traffic conflicts, but as traffic volumes increase the grade separated interchange will be required to address both delays and accident, due to increased conflicts.

5.7.3 COMMENTARY ON PLANNING POLICY

The following objectives and policies are considered relevant to traffic issues:

Proposed Bay of Plenty Regional Policy Statement (incorporating decisions on submissions August 1996)

Policy

13.3.1(b)(ii)

To promote an efficient and safe land transport network.

13.3.1(b)(v)

To promote the efficient use and development of existing and future infrastructure and utility networks.

Bay of Plenty Regional Land Transport Strategy (September 1993)

Objective

3.2.1

To maintain the safety and efficiency of the existing State highway and district roading networks, to acceptable economic standards, having regard to their likely effect on the environment.

3.2.2

To pursue an ongoing programme of improvements to the strategic and arterial roading network, which eliminate identified deficiencies, reduce conflicts and bottlenecks, and improve safety.

5.2.1

To provide safe and efficient inter-regional transport corridors and to protect and maintain these corridors to an appropriate standard.

11.2.5

To recognise environmental constraints and concerns, and heritage values, where road upgrades or new roads are required.

Tauranga District Proposed District Plan (annotated with Council decisions October 1998)**Objective**

3.1.5

Traffic Management*To maintain safety and amenity levels adjacent to and on public roads.***Policy**

3.1.5.5

Roads*New roads and any alteration to existing roads must be designed, constructed and managed in a way that has regard to:*

- (a) *Vehicle air emissions and their effects on the environment;*
- (b) *The health of aquatic ecosystems in the vicinity of the site;*
- (c) *The health of the natural environment, particularly sites identified in Table 3, Part B where that is applicable;*
- (d) *Amenity values of residential and open-space areas;*
- (e) *Integration with safe and efficient pedestrian and cycle routes;*
- (f) *Any new potential adverse effects from road traffic noise including compliance with any relevant New Zealand standard on traffic noise;*
- (g) *Heritage and cultural values in the vicinity of the route and any downstream effects;*
- (h) *The ability, given existing or foreseeable traffic conditions, to implement traffic calming devices in residential streets.*

Objective

7.4.1

Transportation Safety and Efficiency*To maintain safety and efficiency in the movement of people and goods on the District's road, rail, air and shipping networks.***Policy**

7.4.1.1

Design and Use of Roads*New roads and activities within the road reserve must be designed, located and constructed in a way that ensures:*

- (a) *Safe movement of pedestrians, cyclists and vehicles around the District;*
- (b) *Physical integration with other transport routes, where appropriate;*
- (c) *Avoidance, remedy or mitigation of the impacts of noise and traffic movement on the amenity of surrounding sites, particularly from strategic or arterial routes.*

Western Bay of Plenty Proposed District Plan (incorporating proposed Variation N° 1 Change 1 and outstanding references, November 1997)**Objective**

2.2.1(7)

Safe and efficient operation of State highways.

Policy

2.2.2(6)

Protect the safety and efficiency of the District roading network (including State highways) from any potentially adverse effects resulting from increased development in rural areas.

Objective

17.2.1(a)

Appropriate provision of works and network utilities.

17.2.1(b)

A balance between the social and economic benefits derived from public works and network utilities with their special technical requirements and the need to minimise potential adverse effects.

Transits NZ's principal objective under the Transit Act is to operate a safe and efficient State highway system.

Transit considers that the State highway 2 link from Tauranga to the south and east is a major strategic link in the national highway network. Accordingly the maintenance and upgrade of this route is a matter of national importance. Without the upgrade the existing highway route will become increasingly congested and unsafe with the mixing of State highway and local urban traffic flows. The design proposed and the mitigation measures recommended will ensure that the designation is not contrary to the above objectives and policies.

5.8 STORMWATER EFFECTS

5.8.1 WATER QUALITY

Normal current practices for discharge and treatment of stormwater from both the earthworks construction and the new road surface are considered appropriate for this project.

5.8.1.1 Stormwater Runoff During Earthworks Construction

During the earthworks construction period existing flow paths will at all times be maintained. This will be provided by temporary flow paths in alternative locations or the early construction of permanently relocated drains.

Sediment runoff from construction surfaces is the primary source of contamination during this period. A combination of practices will need to be employed to minimise sediment contamination. Typical practices that apply to Transit works in other areas (such as the ALPURT project north of Auckland) as well as guidelines from "Erosion and Sediment Control Guidelines for Earthworks", Environment BOP's technical report No. 28 will be adopted for this project.

These practices include:

- Sediment retention ponds. All surface runoff must be accounted for and directed into these ponds.
- Sediment reduction practices. Examples include shaping earthworks to direct runoff and rolling the surface at the end of each day's work.

This needs to be looked at in detail at the time of resource consent application for earthworks construction. However, standard practices will be employed, which will ensure that the impact of these activities is kept to a reasonable minimum. The effects are therefore expected to be minor and temporary.

5.8.1.2 Stormwater Runoff from the New Road Surface

Stormwater volume and the contaminants associated with trafficked areas, (eg hydrocarbons and heavy metals), require treatment and satisfactory disposal from the carriageway.

Where the new road surface is on fill, the most practical form of treatment for carriageway runoff is to have sheet flow directed over vegetated batters. This is a simple solution and most efficient since stormwater does not have to be concentrated. Treatment will be effective because of the large surface area of fill batters. Runoff collected from the median swales (therefore already treated) will have to be piped to outlets into drains at the toe of the batter.

Contaminants will be retained in the roadside drains and grassed swales, which may need to be cleared to landfill occasionally as the soil becomes saturated with these contaminants (particularly metals and hydrocarbons).

Grassed swales will be constructed generally as described in "Stormwater Treatment Devices Design Guidelines Manual, Auckland Regional Council Technical Publication No. 10".

Water quality issues relating to the DOC reserve are separately discussed below.

5.8.2 STORMWATER STORAGE

5.8.2.1 Loss Of Storage

The loss of stormwater storage volume due to the loss of space occupied by the proposed road embankment will be insignificant as stormwater flooding in the flat areas will cover a large area and be of shallow depth. The area occupied by the road embankment is in the order of 5% and 2½% for the Parton Road and Pah Road areas respectively. The rise in flood water level due to the embankment construction will therefore be in the order of 15mm and 7.5mm in the respective areas for a 300mm depth of flooding.

5.8.2.2 Cutting Off Of Storage Areas

The proposed road embankment construction will cut through drainage areas effectively dividing them in two. In order to mitigate the effect of the division and minimise heading up at culverts, culverts of sufficiently large capacity will be constructed at suitable locations below the embankment. This will allow the floodwater level in the separated parts of the catchment to balance between sides.

The alternative to provide many smaller culverts in all existing drains is not considered feasible due to potential blockage of long small bore culverts.

5.8.3 INCREASED RUNOFF

The construction of the proposed embankment and road will increase the runoff from the affected area. The effect of this will vary. The roadway paved area is a relatively small percentage of the total catchment area (ie. in the order of 1.1% east of the Kaituna River and 1.7% west of the Kaituna River), and overall the effect will therefore be insignificant. However, in some smaller drains, where the pavement is a larger proportion of the subcatchment area, the effect may be much greater and some localised drain improvements may be necessary.

5.8.4 STOPBANK BREACHES

Major stopbank breaches would be very low probability, high impact events. Major stopbanks, which would affect the proposed road alignment if they were to breach, are :

1. The Kopuroa Canal Northern Stopbank And The Kaituna River Left-Hand Stopbank From The Kopuroa Canal To Bell Road.

A breach in this stopbank would cause extensive flooding in the lower Bell Road catchment. The outlets for this area are Bell Road pumpstation "A", Bell Road drain gravity outfall and Bell Road pumpstation "B". However, the Bell Road drain southern stopbank will contain the flood until this stopbank is over-topped at which time the Bell Road drain and Bell Road pumpstation "B" sub-catchment will be inundated. The construction of the proposed road embankment will only affect the Bell Road pumpstation "B" drain and the Bell Road drain. The culverts for these water courses will be designed to have a greater capacity than the capacity of the downstream pumpstation and the down stream gravity outfall which will mitigate the negative effect of the embankment construction. The effect of the road embankment on flood levels in a breach event will therefore be insignificant.

2. The Kaituna River Right-Hand Stopbank From The Railway Bridge At Te Matai To The Proposed Road Crossing.

A breach in this stopbank would cause flooding in the Diagonal Drain catchment area trapping floodwater between the Kaituna stopbank and the proposed road embankment.

The proposed road embankment in this area will act somewhat as a stopbank with the only outlets being the culverts in the major water courses. The culverts at these locations will be oversized (for mowing boat access) which will help relieve the floodwater in a situation like this, should it occur. The combined capacity of the culverts will also be much larger than the combined capacity of the downstream pumpstations, and the area will therefore not experience a significant increase in flood risk under this scenario.

3. The Kaituna River Right-Hand Stopbank Downstream Of The Proposed Road Crossing.

A breach in this stopbank would most likely be caused by sea inundation. In such a case, extensive flooding would occur east of the proposed road embankment, which would again act somewhat as a stopbank but the culverts would reverse flow and allow flood water to flow back to the south west side of the road. The extent of the flooding on the south west side would depend on the duration of the flood and the elevation of the flood waters. The oversized culverts will effectively balance floodwater levels on both sides of the road and it is therefore not expected that flood levels to the north east of the road will be significantly affected by the loss of storage (also refer Chapter 1.3.2.2 above).

The maximum flood level due to sea inundation is estimated by Environment BOP at RL + 2.33m for a 20 year event and RL + 2.88m for a 100 year event. The above figures allow for sea level rise due to the green house effect (0.49m) and estuary effect (0.33m). The proposed road embankment elevation in this area is RL + 3.75m and will therefore not over top due to sea inundation.

5.8.5 LOWER KAITUNA WILDLIFE MANAGEMENT DOC RESERVE

A DOC Reserve is located on the right-hand side of the Kaituna River just down stream of the proposed road crossing between the Kaituna River stopbank and the Diagonal Drain.

The Kaituna Drainage Scheme ensures that the Reserve The reserve is operated as a wetland and during high river levels (eg high tide levels) water from the Kaituna River is let into the Reserve via culvert pipes through the stopbank. DOC recently constructed a fourth culvert. The Reserve area is stopbanked along the Diagonal Drain and along the river boundary. The proposed road alignment cuts off a small (approximately 8.66 ha) section of the reserve. This area is presently farmed and is not affected by the wetland inundation. A larger piece of private farmland will become isolated on the eastern side of the proposed road alignment and subject to negotiation will be added to the reserve.

The proposed road alignment will then become the physical boundary between the farmland on the western side and the reserve on the eastern side of the road. This

proposed arrangement will also separate the “drained” farmland from the “inundated” reserve.

The subterranean water flows in deep aquifers flow generally eastwards from the hills behind Te Puke towards the sea. The surface waters in the existing drains on the reserve side of the proposed alignment however flow southwards away from the Kaituna river stopbank and the Reserve to the Diagonal Drain. There is approximately 2 to 5m depth of peat material overlying sandy lenses along the alignment adjacent to the Reserve. Construction of the road will compact the surface peat layers somewhat and reduce surface water flows, but will have no effect on the sandy layers or deeper material and thus not impede or effect subterranean water flows. The likely and beneficial effects of the embankment construction will be a reduction in the amount of near-surface water migration from the reserve into the adjacent farmland.

The proposed road alignment passes almost directly over an approximately 500m long section of farm drain on the boundary between the farmland and the reserve. This drain will need to be relocated along the western (farm) side of the road in order to maintain farmland drainage.

Water quality issues during the construction as well as long term will require specific liaison with DOC if the Management Agreement so requires, and the Eastern Fish and Game Council. During initial liaison it was suggested that a reasonably sized, deep channel constructed along the toe of the road embankment on the reserve side would probably be suitable. This channel would permanently hold water and be a retention/treatment device as well as a physical barrier to the reserve. During the construction phase the overflow from this channel would need to be connected to a retention pond and discharged onto the farm drainage system so as not to create any adverse environmental effect in the reserve area during this phase. Ultimately when construction has been completed, this channel along the toe of the bund on the Reserve side will not receive any road run-off stormwater and the overflow from the pond would then be redirected into the reserve area through water purifying vegetation. The drains and swales receiving road run-off would remain isolated from the reserve and continue to be discharged to the farm drainage system.

5.8.6 COMMENTARY ON PLANNING POLICY

The following objectives and policies are considered relevant to stormwater issues:

Proposed Bay of Plenty Regional Policy Statement (incorporating decisions on submissions August 1996)

Policy

11.3.1(b)(xii)

To maintain the integrity of existing flood protection works to the greatest extent practicable.

Western Bay of Plenty Proposed District Plan (incorporating proposed Variation N° 1 Change 1 and outstanding references, November 1997)

Objective

12.2.1.1

Minimisation of the threat of natural hazards to human life and the natural and physical environment.

A stormwater plan will be prepared at the time of final design and be submitted for approval to Environment Bay of Plenty. This will ensure that the existing flood protection works are not compromised.

6. CONCLUSION

6 CONCLUSION

6.1 STATUTORY FRAMEWORK

6.1.1 SECTION 171

The District Councils are to consider this designation under the terms of Section 171 of the Resource Management Act 1991 which states:

"(1) [Subject to Part II, when] considering a requirement made under section 168, a territorial authority shall have regard to the matters set out in the notice given under section 168 (together with any further information supplied under section 169), and all submissions, and shall also have particular regard to -

- (a) Whether the designation is reasonably necessary for achieving the objectives of the public work or project or work for which the designation is sought; and*
- (b) Whether adequate consideration has been given to alternative sites, routes, or methods of achieving the public work or project or work; and*
- (c) Whether the nature of the public work or project or work means that it would be unreasonable to expect the requiring authority to use an alternative site, route, or method; and*
- (d) All relevant provisions of national policy statements, New Zealand coastal policy statements, regional policy statements, regional plans, and district plans*
- (e) Repealed by s87(c) Resource Management Amendment Act 1993 (1993 No. 65)."*

By way of summary of the balance of this report, it is relevant to address the tests that this notice of requirement will be subject to as a series of questions.

Is the designation reasonably necessary?

The SH2 Eastern Arterial designation is necessary to alleviate increasing traffic congestion and a poor crash record that is a product of mixing major arterial and commuter traffic flows. The traffic growth rate is currently predicted to be 5.7% per annum (from 1997) and on this stretch of highway there is a particularly high (12%) proportion of heavy vehicles travelling to the Port of Tauranga.

The majority of those consulted during this project considered that the existing State highway was inadequate now in terms of its level of service to the motoring public, and that the growth rates predicted would simply exacerbate the degree of congestion and accidents. The preliminary modelled traffic flow predictions on the Eastern Arterial in 2011 is 9230.

It is anticipated that the traffic flows east of Te Puke will drop by 46% as a result of the new Eastern Arterial highway, and north of Te Puke by 40% (in 2011).

The designation technique is considered an appropriate planning tool in the context of the District Plan as it gives a clear indication to the public of the future location and scale of this arterial road. The public will be better able to make decisions that concern capital investment and lifestyle with the knowledge that this designation brings. If the resource consent technique was adopted, the application would have to be made 2 to 3 years prior to the construction occurring as a resource consent is only valid for 2 years. It is to be anticipated that if this course of action was taken that there would be significant development in the path of the alignment which would significantly increase the costs to Transit and to perhaps even make the attainment of the alignment impossible.

The period of the designation is deliberately long to provide Transit and Tauranga District Council with the flexibility to deal with the population growth, urbanisation of the Papamoa coastal strip and traffic growth that will necessitate the project being constructed. Transit cannot gain funding for the project at present but needs to secure the route for future funding and construction.

Has there been adequate consideration of alternatives?

The consultant team and the community have considered six options for the Eastern Arterial project, with extensive consultation and analysis as is shown in the *Options Report - Tauranga Eastern Arterial Roading Study 1998*. The investigation methodology ensured that all elements were given appropriate weighting in the decision to adopt the designation. The route chosen is one that was overall the better and it is one that better serves the long term strategic roading requirements for the urban area of Papamoa and the rural Te Puke/Paengaroa environment.

Would it be unreasonable to use an alternative route?

Transit's objective has been to find a balance between the costs and benefits of the road, the parameters of the Resource Management Act and the associated plans and statements. The analysis undertaken during the option selection process has been fair and reasonable and one in which the better option on balance has been chosen. The designation alignment has required the assessment and balancing of key ecological, cultural and social effects. The designated route is not one that is perfect in every respect, but it is one that reflects the mitigation of predicted effects to a practical level whilst achieving a roadway design that will be safe and effective and at a cost that will be achievable to Transit within a reasonable timeframe.

Have all relevant provisions been considered?

All relevant policy from the Regional and District Plans has been highlighted in each subsection in Section 5.

6.1.2 PART II MATTERS

The provisions of Section 171 are all subject to Part II of the Act which deals with the Sustainable Management (Section 5), Matters of National Importance (Section 6), Other Matters (Section 7) and the Treaty of Waitangi (Section 8).

6.1.2.1 Section 6

There are several matters of national importance from Section 6 that are directly relevant to this designation. The key issues with this project are considered to be:

- the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development (Section 6a).
- the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers (Section 6d).
- the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga (Section 6e).

Considerable attention has been paid to the maintenance and enhancement of the current and future potential recreational and ecological values of the Lower Kaituna Wildlife Management Reserve and the crossing of the Kaituna River to the west. The advice of the ecologist was to avoid, wherever possible, crossings of the Kaituna River because there was the risk of sedimentation and contamination of the waterway. This meant that five of the six options involved such a risk, and mitigation measures to avoid such impacts have been adopted for the designation as a result.

The encroachment onto the Lower Kaituna Wildlife Management Reserve has, as explained in Section 5.8, been undertaken in the knowledge that the land area affected is actually in pasture and has no significant ecological values. It does however have potential as a wetland. The mitigation measures recommended in this AEE are intended to enhance the land area available for public reserve purposes and the quality and quantity of vegetation in the reserve for future generations.

Transit NZ intends to provide new reserve lands to replace that which would be lost. Again it is land with potential, but there is vegetation programmed as part of the mitigation package.

Public access along the Kaituna River will be maintained because the bridges will be designed with set back embankments which allow for the pedestrian access underneath.

Considerable difficulty has been experienced in trying to locate a recorded pa site on the western bank of the Kaituna River adjacent to the river crossing. Initial archaeological

investigations could not find evidence of the pa, and later work and consultation with Waitaha representatives indicates that the pa is likely to be directly to the south-west of the existing alignment on the banks of the Kaituna River. The alignment has been shifted into its current position in response to the perceived location of the pa site in the locality.

The only area of significant indigenous vegetation (Section 6 (c)) is a stand of Kahikateas in the Lower Kaituna Wildlife Management Reserve, which the alignment avoids.

6.1.2.2 Section 7

With regard to Section 7 of the Act, the following matters are considered to have relevance to this project:

- kaitiakitanga (Section 7a)
- the efficient use and development of natural and physical resources (Section 7b).
- the maintenance and enhancement of amenity values (Section 7c).
- intrinsic values of ecosystems (Section 7d).
- recognition and protection of the heritage values of sites, buildings, places, or areas (Section 7e).
- maintenance and enhancement of the quality of the environment (Section 7f).

There has been consultation with 8 hapu groups over the term of this study. All hapu have been encouraged to be involved in all three stages of the project to ensure that they have the opportunity to implement kaitiakitanga or the ethic of stewardship over their ancestral lands. The comments above regarding the location of the pa site at Bell Road are indicative of this spirit of kaitiakitanga.

With regards to the maintenance and enhancement of amenity values, it will be evident from the mitigation measures listed below that considerable effort is being placed on the visual and noise aspects of the project to maintain the rural character of the study area as it is at present.

The project aims to maintain the quality of the environment overall through the achievement of a limited access State highway which provides a safe and more efficient highway network and thereby a safer and more efficient local roading network. This in particular will enhance the amenity of the townships on the existing SH2, Te Puke and Waitangi.

Mitigation measures will help to ensure that amenity values and the quality of the environment in the Lower Kaituna Wildlife Management Reserve are maintained, and in some areas, enhanced. Significant noise mitigation measures (beyond the Transit NZ guidelines) have been proposed along the edge of the reserve in conjunction with a noise monitoring programme for future traffic flow levels. This will bring the noise experienced in the reserve to a reasonable level and will ensure that 'wilderness' values

are not significantly adversely affected. Any effect that there will be is considered to be a reasonable compromise in the provision of a safer and more efficient State highway.

Landscaping, in the form of wetland planting will enhance, in habitat and recreational terms, areas of the reserve which are currently grazed. The additional new reserve land by the river will be developed in wetland species in accordance with the advice of the Department of Conservation. The 4% area of reserve lost will be mitigated by an increase in the total area of reserve and it will be planted in wetland species.

Five maimai may not be able to be utilised for shooting in their present form once the alignment is constructed due to the direction they face and the proximity to the route. However, it is considered this is a small number of the total (33) and is not significant. This is a consequence of a safer, more efficient highway. An increased amount of land will be made available to compensate for land lost from the reserve.

6.1.2.3 Section 5

In our opinion the proposal meets the principles and purposes of Section 5 of the Act (sustainable management). The designation for a safe and efficient State highway system is in the long term interests of the region and Tauranga District as well as the national State highway network.

Potential adverse effects have been mitigated, avoided or remedied particularly on residents in the area and those who use the Lower Kaituna Wildlife Management Reserve for recreation purposes. The proposal, including the mitigation measures, does not threaten the life supporting capacity of the earth's land, air and water resources.

6.2 MITIGATION MEASURES

The following sections detail the mitigation measures that Transit consider appropriate for the project. They are recommended to the consent agencies for consideration as conditions of the designation.

6.2.1 ECOLOGICAL

Construction

1. The Kaituna River crossing should be constructed from stopbank to stopbank to maintain the existing waterway and to avoid disruption to River edge habitats.

The Kaituna oxbow crossing at meterage 7800 should be designed to minimise instream works (e.g. single bank to bank span).

2. If practicable the control gate below the proposed Kaituna oxbow crossing should remain closed (subject to EBOP approval) throughout the construction period of that crossing if instream works are required.

3. The By De Ley property stream channel and the Waimarae Stream should be isolated (i.e. blocked off) from the Kaituna River oxbow and mainstem respectively throughout the construction period.

Wetlands

4. Wetland treatment/swale areas or similar should be developed to the west of Kaituna River from meterage 7,200 to 8,400 to receive roadway-derived stormwater runoff. Those areas should reflect the former vegetation of Te Parapara Swamp as far as practicable.

Lower Kaituna Wildlife Management Reserve Environs

5. Roadway-derived stormwater from the alignment section within the Reserve property should be isolated from the Reserve and directed to the constructed drains, adjacent to Pah Road, which flow into the large drain forming the south-eastern boundary of the Reserve.
6. Wetland/swale treatment areas or similar should also be developed in sections from meterage 8,400 to 11,000 to receive stormwater runoff from the roadway.

Revegetation

8. Landscape mitigation and wetland development should involve locally-sourced plant material where practicable. A dominant vegetation type in the Kawa and Te Parapara Swamps was clearly flax; local iwi should also be consulted regarding the appropriate types of flax. In the public reserve, areas could be developed with a view to harvesting for cultural purposes.
9. Kahikatea-dominated vegetation should be established on the sound berm from 8,400 to 11,000 and the new reserve land to the north of the present reserve.

Surveys and Plans

10. Comprehensive wetland development, sediment control and stormwater management plans should be finalised prior to the final design earthworks consent application stage.
11. A sediment/soil quality survey should be undertaken prior to construction along the western perimeter of the vegetated area of the Reserve to provide benchmark data for any subsequent surveys in the longer term.
12. A five-minute bird count and habitat use survey should also be undertaken prior to construction in the meterage 8400 to 10,000 area in the February-March period to establish the species, relative numbers present and use of that habitat.

6.2.2 VISUAL

1. That a planting plan and programme be prepared that reflects the mitigation plans Figure 5.7 to Figure 5.11 as discussed in Section 5.2.

6.2.3 ARCHAEOLOGICAL

Wairakei Confiscation Boundary to Paengaroa

1. Recorded Sites

a. U14.2850 - midden

Midden or subsurface shell was identified by probing. Monitoring of earthworks under section 12 of the Historic Places Act is required for this particular area and section 11 for the locality.

b. U14/220 - pa

Although the site has been highly modified it is recommended that the route avoids the site because of its cultural significance as a pa site, traditional boundary marker, and history associated with its location. This has been done as the designation alignment is to the north-west of the site.

2. Unrecorded Sites

a. Wairakei Boundary to Kaituna River

Monitoring of earthworks under section 12 of the Historic Places Act is not necessary unless under cultural direction.

b. Kaituna River to Kaituna Road

Monitoring of earthworks under section 12 is required on Holocene dunes.

c. Kaituna Road to Candy Property

Monitoring of earthworks under section 12 not necessary unless under cultural direction.

d. Candy Property to Te Tumu Road

Monitoring of earthworks is required under section 12 in areas under pasture and sections of orchards where the ground has been contoured. Site features may be occupation (such as cooking activity area).

6.2.5 NOISE

1. To provide a combination of specialised road surface and earth bunds to ensure compliance with the Transit guidelines as follows:
 - Domain Road Environs - The noise level will be mitigated to 55dBA by a combination of a barrier fence along the eastern edge of the on ramp and use of a quiet road surface on the new road.
 - Bell Road - For houses close to the route (B5-B10, D1-D2), mitigation work will be necessary and will take the form of an earth bund approximately 2.5 metres high, and a quiet road surface. These noise bunds will extend approximately 200 metres each side of each house. For isolated houses such as B5 the bund would be 400 metres long, while for a group such as B7, B8, B9 and B10, the bund would be continuous and total about 800 metres in length. House D7 about 200 metres from the route will require a section of about 200 metres of quiet road surfacing to achieve 55 dBA.
 - The Lower Kaituna Wildlife Management Reserve - It is recommended to provide a 2.5m/4.5m high noise bund along the edge of the reserve. Noise levels should be monitored at 6 monthly intervals at two points, 500m apart and 135 metres from the edge of the seal. Noise levels should be measured using an automated datalogger over a 24 hour period at each point. When the noise level (L_{eq} 24hr) exceeds 50dBA at both points then additional noise mitigation shall be incorporated to reduce the noise level by 4dBA, at which point monitoring will cease.
 - Pah Road - A few isolated houses (F1-F4, F16) are between 50 and 200 metres from the new road. Mitigation will be required and would take the form of a length of quiet road surface about 750 metres long and 2.5 metre high barriers on the northern and southern sides of the road about 600 and 400 metres long respectively.
 - Te Tumu Road - A stretch of quiet road surface up to 1 km in length, with 2 - 2.5 metre barriers on both sides of the road near dwellings G2 - G9 and G12 - G15 will be required.

All such measures are shown on the mitigation plans Figure 5.7 to Figure 5.11.

2. Construction Noise

Mitigation will include the selection of quiet machinery, construction of noise bunds at an early stage, programming of noise work to suit residents activities, and selection of work techniques to minimise noise.

e. Te Tumu Road to State Highway 2.

Monitoring of earthworks is required under section 12 in areas under pasture and in sections of orchards where the ground has not been contoured. Site features may be occupation (such as cooking activity area). Testing of area next to U14/1787 (Plate 6), using the same procedure as (f).

f. Storage Pit Depressions

It is recommended that these depressions be tested to verify the features as being archaeological. An appropriate testing method is trench, part aerial and section excavation and an authority to disturb an unrecorded or recorded site under section 11 will be required. If the test confirms the depressions as storage pits, the appropriate application for authority to destroy must be made.

g. State Highway 33

Monitoring of earthworks under section 12 is not necessary unless under cultural direction.

Domain Road to Wairakei Confiscation Boundary

1. It will be necessary to provide for the possibility of unrecorded buried archaeological sites being encountered during ground disturbance associated with the construction of the Eastern Arterial Route between the Domain Road Interchange and the Wairakei Confiscation Boundary. It is recommended that provision be made for archaeological monitoring of the initial stripping of top soil and sub soil layers in these areas in order to determine if buried archaeological sites are present.
2. Archaeological monitoring in conjunction with ground disturbance associated with construction of the route portion will ensure that any archaeological evidence that is encountered will be correctly investigated and recorded, and that the requirements of the Historic Places Act are satisfied. If buried archaeological deposits are encountered it will be necessary to cease earthworks in the vicinity until a strategy for the avoidance or investigation of the site has been agreed between the consent holder, tangata whenua, archaeologist and New Zealand Historic Places Trust.

6.2.3.1 Hapu Representation

It is recommended that a representative from the relevant hapu be present with the archaeologist when the topsoil is removed at the beginning of the construction phase.

6.2.4 CULTURAL

1. That a protocol is established with all hapu to confirm the procedures to protect archaeological sites and collect artefacts.

6.2.6 SOCIAL

1. That Transit pay a lump sum to the Bay of Plenty Regional Council as the proportionate share of the capital and maintenance costs of the Kaituna Drainage Scheme.
2. That Transit provide project information to the local authority for distribution to the community as appropriate until the project is constructed.
3. That Transit continue to provide ready contact between directly affected landowners and Transit's land purchase agents, to ensure that all information on the Public Works Act process is available to anyone who requests it.
4. Transit will produce a dust mitigation plan as a result of the earthworks resource consent. It will be appropriate to have a designated public liaison person during the construction phase to enable issues and complaints to be acted upon speedily.
5. The loss of (8.66 ha 4% of reserve lands) of land required from the Lower Kaituna Wildlife Management Reserve is to be compensated by the provision of 10.76ha of land to the north-west of the site. Such land is to be vested as Government Purpose and form part of the Lower Kaituna Wildlife Management Reserve. Transit NZ and DOC are considering the process of negotiating settlement and the possibility of a Heads of Agreement has been discussed.
6. Transit will provide directional signs to Te Puke at each end of the arterial.

6.2.7 TRAFFIC

1. That when appropriate, Transit facilitate with the WBOPDC the closure of Kaituna Road west of Pah Road.
2. That Kaituna Road to the east of Pah Road be formed by Transit to provide a link to Te Tumu Road and that it be operational prior to construction of the arterial through the existing Kaituna Road.
3. The existing western access of the Reserve shall be accessible to vehicular traffic throughout the construction phase.

6.2.8 STORMWATER

1. That a Stormwater Management Plan be prepared at the time of final design and be submitted to the Bay of Plenty Regional Council as part of the resource consent applications for earthworks, bridging etc.

The retention pond at the Lower Kaituna Wildlife Management Reserve required for earthworks purposes may be retained if DOC and Eastern Fish & Game Council consider it appropriate to the long term use of the reserve.

TAURANGA EASTERN ARTERIAL AEE

BIBLIOGRAPHY

- Badel, S M (1994) Significant indigenous vegetation of the Bay of Plenty coastal zone. (For Bay of Plenty Regional Council) 412pp.
- Bioresearches 1981 Nutrient Control Pipeline - Environmental Assessment. A1: Biological Assessment. 234pp (For Rotorua District Council)
- Bioresearches 1996 Proposed Huapai - Taupaki to Albany Pipeline - Biological Features of the Final Route and an Appraisal of Effects. 56pp + Appendices. (For Burton Consultants/Enerco Gas Auckland).
- Bioresearches 1997 (a) Tauranga northern Arterial - Biological features of the Alternative Routes and an Appraisal of Effects. 47pp + Appendices/Plates. (For Beca Carter Hollings & Ferner/Transit NZ)
- Bioresearches 1997 (b) Route K Ecological Characteristics. 36pp + Appendices/Plates. (For Beca Carter Hollings & Ferner/Transit NZ).
- Bioresearches 1998 Omokoroa to Te Puna Corridor Improvements - Biological Characteristics and Appraisal of Effects. 46 pp + Appendices/Plates. (For Beca Carter Hollings & Ferner/Transit NZ)
- Boffa Miskell Ltd Auckland Tauranga District Landscape Study, for Tauranga District Council 1995
- Davis, S F (1987) Wetlands of national importance to fisheries. N Z Freshwater Fisheries Rpt No. 90. MAF Fish, Christchurch. 48pp.
- Department of Conservation (DoC) 1996 A directory of wetlands in New Zealand . D A Scott (ed). 395pp.
- Department of Transport Calculation of Road Traffic Noise. HMSO London (1988)
- Frederickson, C. D. Kahotea, M. Felgate 1996 Archaeological Survey of the Papamoa Coastal Zone, Tauranga District Council. Unpublished report for TDC and NZHPT
- Frederickson, C. I. Barber and S. Best 1995 Pre-European occupation on the Papamoa dune ridges. Unpublished report to NZHPT
- Garrick, A S Lower Kaituna Wildlife Management Reserve: Its Past, Present and Future - A Discussion Paper. 1990
- Gumley, W. and B. McFadgen 1995 L S Johnson Trust residential subdivision, Papamoa. Unpublished report to NZHPT.
- Kahotea, D 1995 Archaeological/cultural assessment of Hopukiore, Moturiki.

- Coastal Reserves. Report for Tauranga District Council.
- Lowe D. J., Wigley
G.N.A., Dahm J., 1992 Late Quaternary tephrostratigraphy and Holocene dune development in the Papamoa - Te Puke area, Bay of Plenty. Field trip guide, N.Z. Society of Soil Science Conference, Rotorua.
- Maketu Minute Book 3.
- McDowall, R M (1990) New Zealand Freshwater Fishes - A Natural History and Guide. Heinemann Reed/MAF Publishing Group. 553 p.
- McEwen, W M (ed)
1987 Ecological Regional and Districts of New Zealand. Department of Conservation Publication No. 5.
- McGovern-Wilson, R 1995 Archaeological investigations and monitoring for Stage 4 of the development at Royal Palm Beach Estate, Papamoa. Unpublished report to NZHPT
- Mitchell, C P (1990) Whitebait spawning grounds in the Bay of Plenty. N Z Freshwater Fisheries Miscell. Rpt. No. 40.
- National Resources Survey, 1962 Part II Bay of Plenty Region. Govt. Printer. 348 pp.
- New Zealand Historic Places Trust. 1986 Tauranga County Historic Inventory.
- Newnham R M, Lowe D J, & Wiglen G N A 1995 Late Holocene palynology and palaeovegetation of tephra-bearing mires at Papamoa and Waihi Beach, Western Bay of Plenty, North Island, New Zealand. Journal of the Royal Society of New Zealand, Volume 25
- OECD Environmental Directorate Strengthening Noise Abatement Policies (85) 23.
- OSNZ (1985) The atlas of bird distribution in New Zealand. Ornithological Society of New Zealand Inc.
- Rasch, G (1989) Wildlife and wildlife habitat in the Bay of Plenty Region. Regional Report Series No. 11. Department of Conservation. 136pp.
- Saxton, B A; Rowe, D K and Stancliff, A G 1987 Species Composition and relative importance of whitebait fisheries in 13 Bay of Plenty rivers. Fisheries Environmental Report No. 79. 63pp
- Schultz, T J Synthesis of Social Surveys on Noise Annoyance. Journal of the Acoustical Society of America 64, (1978)
- Smith, S L; MacDonald D D; Keenleyside, K A; Gaudet, C L (1996) The Development and Implementation of Canadian Sediment Quality Guidelines. Development and Progress in Sediment Quality Assessment; Rationale, Challenges, Techniques and Strategies. Pp 233 - 249
- Spellenberg, I F & The ecological effects of new roads - a literature review. Department of

- Morrison, T 1998 Conservation. Science for Conservation. 84 - 55 pp.
- Stafford, D.M. 1967 Te Arawa: a History of the Arawa People. Reed, Auckland.
- Stokes, E 1986 History of Tauranga County Dunmore Press 1980
- Stokes, E (1980) A History of Tauranga County. Dunmore Press, Palmerston North.
- Taylor, S G 1969 The History of Te Puke. The Te Puke Times Ltd. 252pp.
- Taylor, Selwyn George The Story of Te Puke, 1969. Chapter 14 - Flax Milling
- Transit New Zealand Traffic Noise from uninterrupted traffic flows Research Report No. 28
- Transit New Zealand "Guidelines for the Management of Road Traffic Noise - State Highway Improvements". A draft working document, November 1994
- USEPA (1991) Evaluation of dredged material proposed for ocean disposal. Testing Manual. USEPA 503/8 - 91/001.
- Vallet, M Long Term Sleep Disturbance due to Traffic Noise. et al. Journal of Sound and Vibration, 90, (1983)
- Wallace, R 1993 In Kahotea, D.T. Papamoa Main Drain Outlet. Archaeological investigation of Grant Place stormwater pipeline foredune route. Unpublished report for T.D.C.
- Wigley, G.N.A. 1990 Holocene tephrochronology and evolution of the Te Puke lowlands, Bay of Plenty, New Zealand. Unpublished M. Sc. thesis, University of Waikato