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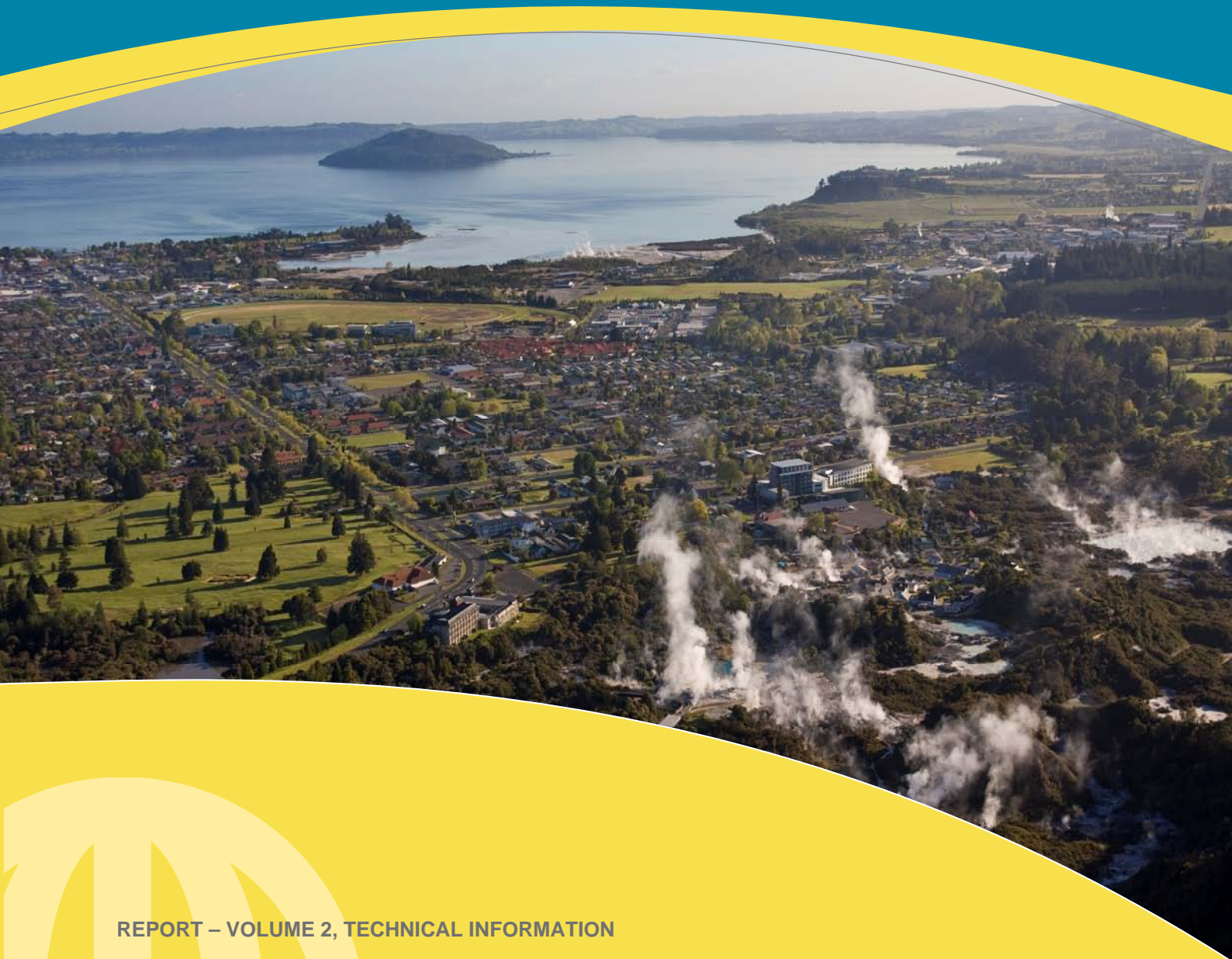
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REPORT – VOLUME 2, TECHNICAL INFORMATION

Rotorua Basin Structure Plan

Prepared for Rotorua District Council

May 2010

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Rotorua Basin Structure Plan

Rotorua District Council

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This document contains information about MWH, particularly about the culture of our organisation and our approach to In line with our Quality System, this document has been prepared by Carolyn Wratt and signed off by Amy Clore.

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1 Purpose of Volume 2

The purpose of Volume 2 is to support the Rotorua Basin Structure Plan with technical detail. Volume 2 contains:

- Integrated Transport Assessment
- Development Contributions
- Potential subdivision yields and infrastructure allowances
- Summary of feedback from the community on the Eastern and Western Structure Plans

While this information does not constitute the Rotorua Basin Structure Plan, it contains information gathered and analysed during the course of the project and provides a high level of technical detail.

2 Integrated Transport Assessment

Executive Summary

Introduction

This document provides an assessment of the transport effects of the Rotorua Structure Plan. The new Structure Plan (2010) is a replacement of two previous Structure Plans (east and west) and is based on new land use yields prepared by Rotorua District Council officers.

The Structure Plan focuses on new development to the east of Lake Rotorua (centred around Te Ngae Road) and west of Lake Rotorua (in the vicinity of Ngongotaha / Hamurana).

Existing Conditions

The SH5 Fairy Springs Road / Ngongotaha Road corridor and SH30 Te Ngae Road corridor both experience queuing and delay during peak periods and have limited capacity available to accommodate future growth. Projects planned to mitigate these conditions include the four-laning of Fairy Springs Road and the development of the Rotorua Eastern Arterial (two lanes by 2008 and 4 lanes by 2021).

Future Conditions

The anticipated transport impacts of Structure Plan development include an additional:

- 23,470 vehicle trips per day generated by the eastern structure plan area by 2051
- 32,200 vehicle trips per day generated by the western structure plan area by 2051

The current capacity of Te Ngae Road and SH5 Ngongotaha Road will not be able to cater for this demand.

For the eastern side of Lake Rotorua it is clear that the implementation of the Rotorua Eastern Arterial (REA) will establish a road network that will support this growth. Te Ngae Road can be retained for local transport functions while the REA will predominantly accommodate strategic trips.

Intersection upgrades will be required on Te Ngae Road in the short term to support Plan Change 34 and Structure Plan development. Demand management measures such as increased passenger transport and walking and cycling opportunities should be undertaken in conjunction with the traffic relief offered on Te Ngae Road by the REA.

For the western side of Lake Rotorua intersection upgrades will offer operational and safety benefits that support the future development of the Structure Plan. Capacity upgrades to SH5 Ngongotaha Road will be required together with demand management measures including increased passenger transport services and walking and cycling opportunities including cycle lanes and a dedicated path following the rail corridor.

Travel demand management and travel behaviour change measures to be implemented on a city-wide basis should include more restrictive parking policies, bus and transit lanes, promotion of ridesharing, walking and cycling, park-and-ride / park and share schemes, passenger transport services on dedicated facilities and travel planning (for businesses and schools).

Improvement Measures

The following improvement measures are recommended, (numbered 1 – 8 as shown on Figure 5).

1. SH5 Ngongotaha Road four-laning
2. SH36 Hamurana Road / SH36 Tauranga Direct Road / Hamurana Road roundabout
3. SH36 Ngongotaha Road / Western Road signalised intersection
4. SH30 Te Ngae Road / Iles Road signalised intersection
5. SH30 Te Ngae Road / Wharenui Road signalised intersection OR roundabout
6. SH30 Te Ngae Road / Rotokawa Road intersection demand management
7. SH5 / SH36 Ngongotaha Road dual lane circulating roundabout and southbound slip lane
8. SH30 Te Ngae Road / Lee Road / Gee Road future proof site for four-way signalised intersection
9. Strategy and Policy to support travel demand management
10. Passenger Transport improvements such as increased service frequencies and priority measures
11. Park-and-ride future proof sites at Ngongotaha and Te Ngae
12. Walking and cycling improvements between Ngongotaha / Rotorua CBD and Rotokawa / Rotorua CBD
13. Eastern Suburbs Link Road between Wharenui Road and Gee Road

The planned projects of the SH5 Fairy Springs Road four-laning and development of the REA are assumed as part of the established future conditions.

Staging

The Structure Plan should be staged development in line with planned and recommended transport projects e.g. the REA and the SH5 Fairy Springs Road four-laning will be required to be in place prior to Structure Plan development – excluding Ngati Whakaue Stage 1. Detail on staging is provided in **Table 3**.

Conclusion

SH30 Te Ngae Road and SH5 Fairy Springs Road / Ngongotaha Road strategic corridors are currently experiencing traffic congestion and delay during peak periods. Future development of the Structure Plan will place increased pressure on both corridors.

Short term available capacity on Te Ngae Road will be taken up by development traffic associated with the Ngati Whakaue Plan Change 34. Any further development as a result of the Ngati Whakaue Plan Change 34 or the Structure Plan will require the REA. With the REA in place Te Ngae Road will facilitate local traffic movements and provide further opportunities to improve passenger transport services and new walking and cycling facilities.

Current planned projects are expected to increase the efficiency of the SH5 Fairy Springs Road / Ngongotaha Road corridor. Additional traffic associated with the Structure Plan development is expected to require capacity upgrades. Travel demand measures such as improvements to passenger transport services and new walking and cycling facilities are recommended to extend the life of existing infrastructure.

The overall cost of transport improvements to facilitate the Structure Plan development is estimated to be \$3,700,000¹.

¹ excluding I&R and land costs and including 20% cost contingency and 30% risk adjusted cost

2.1 Context

Purpose

The purpose of this study is to provide an assessment of the potential transport implications of the Rotorua Structure Plan. This document provides details of the potential transport effects and interventions required to manage additional traffic as a result of future development identified within the Structure Plan. This document also identifies inconsistencies between required infrastructure under the Structure Plan and that currently planned for under the Rotorua Transport Strategy.

This transport assessment has been prepared in general accordance with NZTA's guidelines for Integrated Transport Assessment and 'Quality Planning', The Resource Management Act planning resource which states:

*"transport provisions should be prepared in such a way as to provide certainty over the general routes that are to be followed to link proposed land uses, but retain enough discretion to allow flexibility in the final design and layout of the links"*²

Study Area

The study area is presented in Figure 1.



Figure 1: Location Plan and Study Area

(Source: Google Maps)

² www.qualityplanning.org.nz/plan-topics/structure-planning.php

The eastern side of Lake Rotorua encapsulates the eastern basin from Tarawera Road and Lynmore in the south to Mourea and the SH33 / Hamurana Road area in the north, and is bound by Lake Rotorua to the west. The growth areas include Lynmore, Owkata, Rotokawa, Te Ngae / Brunswick Road and the eastern section of Hamurana Road. This includes the Ngati Whakaue tribal lands which are currently subject to Plan Change 34 to the Rotorua District Plan.

The western side of Lake Rotorua encapsulates the western basin from SH5 / SH36 intersection to Hamurana Road. The two key growth areas comprise Ngongotaha and the western section of Hamurana Road.

A single Structure Plan has been prepared for both development areas for which this assessment is based. The Rotorua CBD and the northern link between Hamurana and Mourea is not included in the assessment.

Background and Rationale for the Study

Two separate Structure Plans were prepared for the eastern and western development areas. The new Structure Plan (2010) is a replacement of the previous Structure Plans with new land use yields as prepared by Rotorua District Council officers.

The underlying philosophy of the Structure Plans is that people should generally be able to work and enjoy their leisure time close to where they live. As well as creating a vibrant community the transport benefits of the Structure Plans include achieving energy efficiency through less kilometres travelled and encouraging walking and cycling opportunities and the basis for leading a healthy lifestyle.

The previous Structure Plans are summarised in **Appendix A**.

2.2 Planning and Policy Framework

2.2.1 Introduction

This section establishes the wider context for the development areas. It focuses on whether the Structure Plan, from a transport perspective, supports national, regional and local planning, strategies and policies.

2.2.2 Strategic Context

2.2.2.1 New Zealand Transport Strategy 2008

The New Zealand Transport Strategy (NZTS) sets the direction for transport in New Zealand to 2040. It provides the strategic context for the development of the Government Policy Statement, which will establish the government's funding policy and priorities for land transport development on a three yearly cycle. The government's vision for transport in 2040 is that:

"people and freight in NZ have access to an affordable, integrated, safe, responsive and sustainable transport system".

As part of the New Zealand Transport Strategy the government has launched a set of defined targets for the transport sector and actions to achieve these targets over the next 30 years. Targets of relevance to this Project include:

Ensuring environmental sustainability
1. Halve per capita greenhouse gas emissions from domestic transport by 2040.
2. Reduce the kilometres travelled by single occupancy vehicles, in major urban areas on weekdays, by ten percent per capita by 2015 compared to 2007.
3. Reduce the rated carbon dioxide (CO ₂) emissions per kilometre of combined average new and used vehicles entering the light vehicle fleet to 170 grams CO ₂ per kilometre by 2015, with a corresponding reduction in average fuel used per kilometre.
Assisting economic development
4. For identified critical routes: improve reliability of journey times, and reduce average journey times.
Assisting safety and personal security
5. Reduce road deaths to no more than 200 per annum by 2040.
6. Reduce serious injuries on roads to no more than 1,500 per annum by 2040.
Improving access and mobility
7. Increase use of public transport to seven percent of all trips by 2040 (i.e. from 111 million boardings in 2006/7 to more than 525 million boardings in 2040).
8. Increase walking, cycling and other active modes to 30 percent of total trips in urban areas by 2040.
Protecting and promoting public health
9. Reduce the number of people exposed to health endangering noise levels from transport.
10. Reduce the number of people exposed to health endangering concentrations of air pollution in locations where the impact of transport emissions is significant.

The key themes for preparing transport intervention measures include reducing vehicle kilometres travelled, improving the reliability of travel times, reducing accidents, increasing use of public transport and walking and cycling, and reducing vehicle environmental effects.

2.2.2.2 Government Policy Statement 2009

The Government Policy Statement provides more immediate targets than the NZTS. The Minister of Transport in May 2009 amended the GPS 2009/10 – 2014/15 to align investment in the land transport sector more closely with the new government's priorities of national economic growth and productivity. The Minister's main reasons for changing the GPS are:

- To reflect the government's priority of investment in transport infrastructure for economic growth and productivity.
- To reflect the modal choices that are realistically available to New Zealanders.

The GPS emphasises improvements in the provision of infrastructure and services that enhance transport efficiency, better access to markets and employment areas and a secure and resilient transport network. Other impacts include a reduction in road deaths and injuries, more transport choice, reductions in adverse environmental effects from land transport and positive health outcomes.

This government policy statement lends support to projects such as the Rotorua Eastern Arterial and other projects that contribute to economic efficiency such as reducing journey times for commuters and freight trips. Te Ngae Road and Fairy Springs Road / Ngongotaha Road are seen as key corridors to this extent.

2.2.2.3 Operative Bay of Plenty Regional Policy Statement

The Bay of Plenty Regional Policy Statement (RPS) promotes the sustainable management of the Bay of Plenty Region's natural and physical resources. The RPS states that before adopting plan provisions, Councils are obliged to have regard to alternatives, evaluating their benefits and costs and likely effectiveness, and to be satisfied that the provisions are necessary and the most appropriate of the alternatives.

Relevant objectives of the RPS include:

- Objective 13.3.1(a), A built environment that enables efficient use, development and protection of natural and physical resources while avoiding, remedying and mitigating adverse effects on the environment.
- Objective 13.3.1(b)(ii), To promote an efficient and safe land transport network.
- Objective 13.3.1(b)(v), To promote the efficient use and development of existing and future infrastructure and utility networks.
- Objective 13.3.1(b)(vi), To avoid or reduce the adverse effects on the environment, relating to the use and development of the built environment and the construction, operation, and decommissioning of physical resources and infrastructure.

This Structure Plan will provide consistency towards the RPS through providing a transport network that will meet the reasonable transport needs of significantly developing populations over the next 50 years. The key message for the study is to promote projects that will create opportunities for passengers transport services, walking and cycling.

2.2.2.4 Bay of Plenty Regional Land Transport Strategy 2007

The Bay of Plenty Regional Land Transport Strategy (RLTS) was adopted in June 2007. The RLTS identifies the region's future transport needs and outlines how they might be met. The region has developed key transport priorities to:

- Improve travel times and reliability on key routes to support economic development.
- Reduce casualties on the region's road network.
- Optimise use of the existing network by improving provision for public transport, walking and cycling.
- Improve route security throughout the region.
- Reduce the social and environmental effects of heavy vehicles.

As part of the development and evaluation of future strategic options for demand management in the RLTS a number of "packages" have been developed. The CBD access package provides for transport strategy (including walking and cycling) and local, regional and long distance public transport improvements (including a public transport centre) within the initial 10-year period. This is followed by public transport infrastructure improvements in the following 10 year period. The Rotorua – Tauranga linkage package includes transport strategy (including walking and cycling) for the Rotorua urban area, Ngongotaha and Hamurana areas in the initial 10 year period and public transport service enhancements for these areas in the following 10 year period. These strategies should be consistent with those developed in the Rotorua Transport Strategy documents.

The strategy prefers a “package” approach to transport projects that meet the overall objectives of the RPS. In this regard all land transport funding should consider passenger transport, walking and cycling opportunities. Any proposed upgrades to the Te Ngae Road and Fairy Springs / Ngongotaha Road corridors should be considered as a package to include walking, cycling and passenger transport.

2.2.2.5 Rotorua District Plan 1996

The Rotorua District Plan contributes the following provisions that are considered to be relevant to the transportation aspects of this proposal.

Resource Management Objective: The avoidance or minimisation of adverse effects from the transport network and the maintenance of environmental quality.

- Policy; To pursue and adopt measures to reduce traffic growth in the District and to reduce the need to travel.
- Policy; To avoid, reduce or mitigate the adverse effects of road traffic on other activities in the District.
- Policy; To ensure that requirements for new roads and road widenings are justifiable and reasonably necessary.
- Policy; To actively pursue the acquisition, formation and control of the Central Business District service lane network.

Resource Management Objective: Activities, which do not adversely affect the safe and efficient operation of the transportation infrastructure.

- Policy; To ensure that activities do not adversely affect the safe and efficient operation and maintenance of the roading infrastructure and to respond to requirements for its expansion and upgrading.

Land use is one of the single most important aspects of minimising the impacts of traffic on communities therefore it is critical that future alterations in land use as regulated through the District Plan are carefully considered in relation to the Structure Plan. One of the current land use changes is being prepared through Plan Change 34 – the development of the Ngati Whakaue land in the proximity of Wharenui Road.

Plan Change 34 to the Rotorua District Plan

The “Wharenui Road Area Integrated Transport Assessment” (Beca, November 2008) provided a transport assessment of the likely impacts of the proposed Plan Change 34. The report identified that the main traffic related restriction on the Wharenui Road development is the Te Ngae Road corridor, which currently experiences traffic delay and congestion during peak times. It concludes that “by 2016 with no intervention the route will experience delays and congestion resulting from decreased LOS” (Beca, 2008).

Based on our initial assessment Te Ngae Road, south of Wharenui Road does not have sufficient spare capacity during peak times without the Rotorua Eastern Arterial to efficiently cater for additional traffic as a result of the Ngati Whakaue development. The addition of further traffic to this corridor will result in longer travel times and increased delay for peak hour traffic. The decision for Council is whether it is willing to accept the increase in traffic, longer travel times and greater delay during peak periods on Te Ngae Road from the development in the short to medium term, on the expectation that an alternative route such as the Rotorua Eastern Arterial will be provided to negate through-traffic travelling on Te Ngae Road.

A summary of our key conclusions are:

- Our findings are generally consistent with the Beca Report (Beca 2008), in that trip generation rates and other assumptions used in the derivation of forecast traffic flows appear reasonable.
- In the absence of the Rotorua Eastern Arterial, the identified intersection works would need to be carried out in order to cater for the first stage of development.
- The proposed Rotorua Eastern Arterial will relieve Te Ngae Road of through-traffic by providing an intra-regional arterial route, thereby allowing Te Ngae Road to cater for local traffic and access.
- While some passive and active traffic mitigation measures would cater for some relief along Te Ngae Road, further interventions would be required to provide an improved level of service along Te Ngae Road.

The outcome of Plan Change 34 will be critical to the staging opportunities afforded to the development of the Structure Plan. The infrastructure recommended by the Plan Change transport assessment provides limited development potential prior to the Rotorua Eastern Arterial. One of the key questions is – would this infrastructure then become void once the Rotorua Eastern Arterial is in place? Furthermore, what alternative development opportunities are there if the Plan Change was unsuccessful? These aspects will be covered in the transport assessment section.

2.2.2.6 Rotorua Urban Transportation Study 2003 (Updated 2006)

The Rotorua Urban Transportation Study looks to manage the impact of roads and traffic on adjacent land uses and road users. Importantly the study identifies:

- Baseline traffic data and predicted growth rates
- A road hierarchy based on road function (note this has more recently been reviewed and updated as part of Plan Change 33 to the Rotorua District Plan)
- Road designations required to meet network demand to 2011
- Road network upgrades to 2021

Traffic Growth Rates

Demographic and travel data was analysed to establish baseline conditions for traffic growth. Total network travel in the Rotorua urban area was modelled and the resultant growth in traffic volumes was between 1 – 2% per annum over the following 25 year period. For 2021 the following traffic volumes were recorded:

- Te Ngae Road, at Puarenga Stream: 50,600 vpd
- Fairy Springs Road, north of Koutu intersection: 32,300 vpd
- Ngongotaha Road, at SH5 roundabout): 23,600 vpd

Road Hierarchy

A road hierarchy was established according to route function and roads classified as National routes (highest access control), Major regional arterials (strict access control), Minor district arterials (some access control), Collectors roads (balanced movements and land access), and Local roads (movement secondary to access).

Network Demand to 2011

The study identifies two significant capacity concerns within the Structure Plan study area, being the SH5 Fairy Springs Road / Ngongotaha Road corridor and the Te Ngae Road corridor (Sala Street section). Existing projects predicted to overcome the capacity issues were identified as 4-laning of Fairy Springs Road and the development of the Rotorua Eastern Arterial (two lanes by 2008 and 4 lanes by 2021). Further network upgrades suggested included a roundabout at the SH30 / Te Ngae Road intersection and 4'laning Ngongotaha Road from SH5 to the railway crossing. Designations were identified as the preferred method of requiring land for future road upgrades. The exception to this was the Eastern Arterial which would be investigated by NZTA (then Transit NZ). A summary map of the key projects mentioned is shown in **Figure 2**.

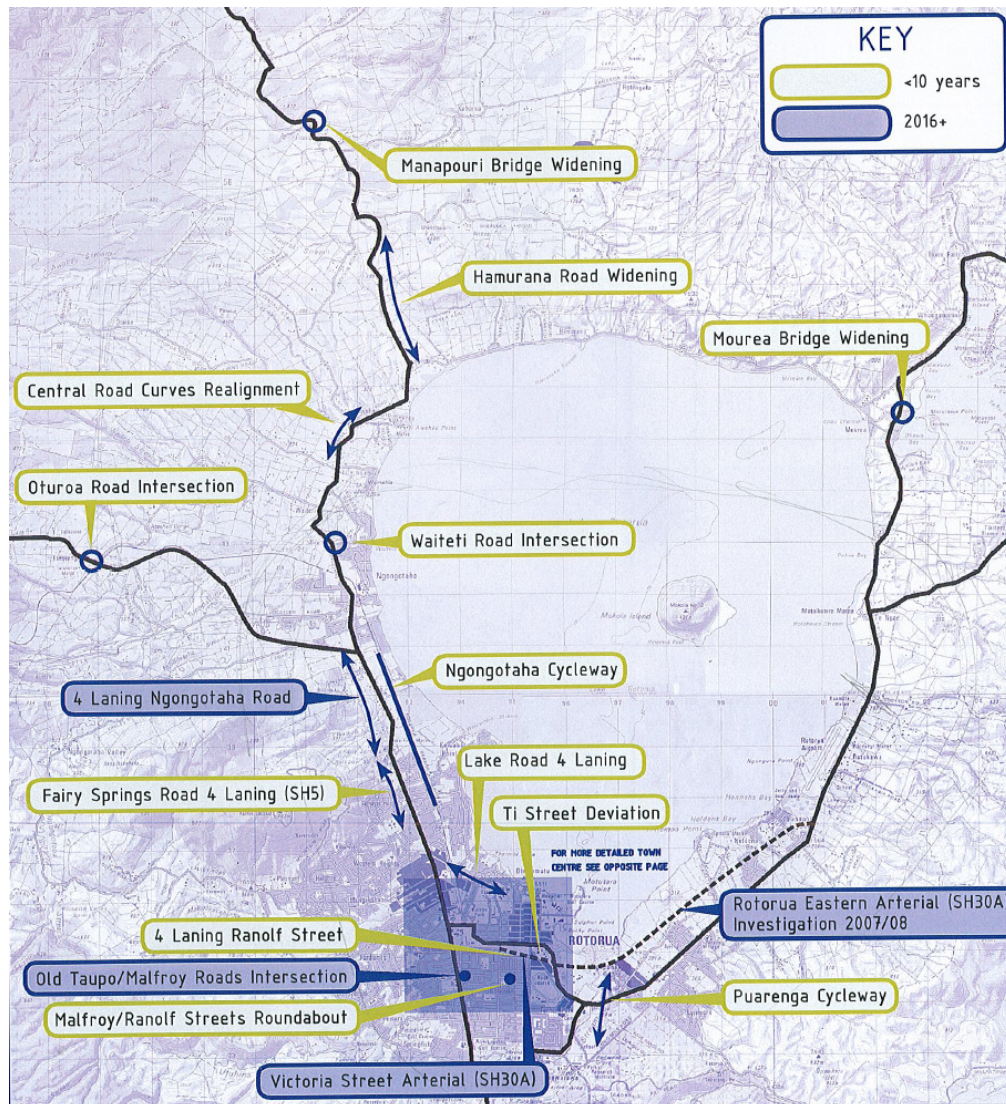


Figure 2: Summary of Transport Projects (Rotorua Transport Strategy 2006)
 Source: Rotorua Transport Strategy, Summary Document, 2006

For the current study the key projects include four-laning Ngongotaha Road (Fairly Springs Road has been completed), the Ngongotaha cycleway (rail corridor), and the Rotorua Eastern Arterial. The overall message to be taken from RUTS is to integrate any required future road projects with opportunities to improve passenger transport, walking and cycling. The transport assessment should also be consistent with the performance indicators and road hierarchy confirmed through RUTS.

2.2.2.7 Rotorua Transport Demand Management Strategy 2008

The Rotorua Transport Demand Management strategy was adopted by Council in 2008. The strategy is about providing people with options for travel that reduce reliance on the inefficient use of motor vehicles and the need to construct more roads. Essentially it covers a broad range of techniques that can be categorised under:

- Transport Demand Management – a transport system approach which seeks to achieve modal shift to low impact modes such as walking, cycling and passenger transport
- Traffic Demand Management – roading infrastructure changes that can be made to optimise transport sustainability
- Travel Demand Management – focuses on the individual traveller and seeks to change travel behaviour through various initiatives such as education and marketing

The strategy focuses on five key outputs.

1. Passenger Transport Actions (in conjunction with EBoP)

- Plan and construct the CBD Passenger Transport Terminal in 2010-2013
- Improve bus reliability, frequency and performance in partnership with EBoP by implementing bus priority measures, where feasible
- Build bus shelters to make it safer and more comfortable for passengers
- Coordinate with EBoP to establish a CBD circular bus route, which will provide transport for people to 'Park N Ride' to CBD

2. Policy Actions

- Providing incentives for a reduction in on-site parking where TDM measures are implemented, e.g. travel plans, cycle parking, showers, etc.
- Requiring residential developments to use TDM principles including requiring cycle and pedestrian linkages where appropriate.
- Developing bylaws/policies to enable all parking revenue to be used for TDM activities.
- Promotion of a district Walking Strategy.

3. Parking Actions

- Establish a CBD Parking Zone to enable improved management of car parks.
- Establish a CBD Parking Zone Management Plan, including Government Gardens.

4. Travel Behaviour Change

- Coordinate spending on walking and cycling, developing new routes for commuting, off-road where feasible.

5. Walking and Cycling Actions

- Require the provision of a high standard of cycle and pedestrian facilities.

The key messages from these actions to be used in the transport assessment is the importance of passenger transport, walking and cycling to manage transport demand and assist in meeting mode share targets. These measures are also complemented by other strategy and policy measures which would be implemented on a city-wide basis.

2.2.2.8 Passenger Transport Infrastructure Strategic Assessment 2006

The study objectives included an assessment of passenger transport including rail and bus feasibility, the long term options for a transport terminal, and the urban design options of the options proposed.

Bus and Rail Options

Bus investigations recommend a new transport centre that recognises the needs of local, regional and tourist bus users. Growth in bus patronage beyond the 3% - 8% predicted over the next 5 to years would require significant changes in parking policy, and growth in residential and employment densities.

The assessment concludes that passenger and freight rail services are unlikely to be commercially feasible to and from Rotorua. However future proofing should protect the option of introducing rail services in the future. While the transport assessment is unlikely to provide rail services this demand should be managed through passenger transport services, and walking and cycling.

2.2.2.9 Bike Rotorua: Rotorua Cycling Strategy (2005)

Bike Rotorua provides the strategy objectives, analysis and development of the cycling network in Rotorua. The strategy provides a series of actions to encourage and achieve a greater mode share of cycling over time. It also proposes a cycle network comprising of existing facilities and future routes.

The network plan includes existing and proposed cycle facilities at the following locations:

- SH 5 between SH30A (Pukuatua Street) and SH36 (Ngongotaha Road), plus a proposed cycle route along the railway line parallel to SH5 between Kawaha Point Road and Beaumont Road.
- SH36 (Ngongotaha Road) between SH5 and Waiteti Road.
- SH30A between SH5 and SH30 (Pukuatua Street and Amohau Street).
- SH30 (Te Ngae Road) between SH30A (Amohau Street) and Rotokawa Road.

Cycle facilities developed within the study area in response to the cycling strategy include cycle lanes along Te Ngae Road (both directions) between Sala Street and Rotokawa Road. The provision of cycle facilities along Te Ngae Road and Fairy Springs Road / Ngongotaha Road should be included in all assessed options to develop road infrastructure in response to the Structure Plan.

2.2.2.10 Summary of Strategic Context

The assessment of transport projects and mitigation measures will need to demonstrate consistency with all strategy and policy documents summarised in this section. In particular the criteria used to assess the transport options should include consistency with:

- Reducing vehicle kilometres travelled
- More reliable journey times
- Ensuring road safety for all users
- Increasing passenger transport patronage
- Increasing walking and cycling
- Providing mode choice realistically available
- Promoting efficient use of existing and future infrastructure

2.2.3 Related Projects and Studies

2.2.3.1 Victoria Street Upgrade (NOR Hearing Approved)

This project proposes to upgrade Victoria Street to an arterial road. The objective is to provide an alternative route for east west traffic to cross the southern end of the CBD and remove through traffic from Amohau Street. This will alter the distribution of traffic within and through the CBD. A Council hearing on the Notice of Requirement to designate was held in early 2009, which was approved by the Commissioner.

2.2.3.2 Te Ngae / Ti Street Intersection (Report by Opus, 2005)

This upgrade relates to the Victoria Street Arterial project in that it proposes options for the eastern end of Victoria Street and its potential connections to Te Ngae Road (SH30A). A roundabout is proposed at Ti Street extension and Te Ngae Road. The roundabout would intercept with the Victoria Street Arterial and Rotorua Eastern Arterial. Five options were investigated. All options would alter the distribution of traffic through the CBD in conjunction with one or both of the Victoria Street and REA projects proceeding.

2.2.3.3 Ngongotaha Roundabout Tidal Flow (Scheme Assessment Report by MWH, 2008)

The roundabout operates at the intersection of SH5 / SH36. Due to unbalanced flow, particularly during the morning peak period, queues form back to Ngongotaha along SH36. Two options to improve capacity and efficiency were investigated. The first option was to two-lane the SH36 approach and departures. The second option conducted a trial using roundabout metering signals to create gaps in the major traffic stream from the SH5 western approach. While both options improve capacity and result in less queuing the signals option was recommended as the preferred option due to its cost benefits.

Upon implementation it is recommended that on-going monitoring is established to assess the corridor impacts along Ngongotaha Road. This project is likely to negate future capacity upgrades along Ngongotaha Road north of SH5 in the short to medium term.

2.2.4 Other Relevant Studies

Other relevant studies and strategies are:

- Twin City Link Function and Form Study – To develop an overall strategy and long term investment plan for development of SH33 and SH36, linking Tauranga and Rotorua, given the strategy for the levels of service on SH36. The study area extends north along the western side of Lake Rotorua and links with the western Bay of Plenty Southern Corridor via SH36. Contains Rotorua's northern growth area.

- State Highway Optimisation Strategies – A Package forming a programme of small scale network optimisation investigations targeted at identifying low cost high impact performance improvements from the existing State Highway network.
- Eastern Bay of Plenty Network Form – A study focused at identifying the long term form of the State Highway network in the Eastern Bay of Plenty.

2.3 Current Conditions

2.3.1 Introduction

This section provides a summary of the characteristics of the existing transport conditions and identifies any known areas of concern.

2.3.2 Road Network

The transport performance of the current network has been derived from traffic modelling outputs, crash analysis and discussions with Council officers. A summary of current road network conditions is presented in **Error! Reference source not found.** The location of the network links and intersections are shown in **Appendix B.** The analysis is included in **Appendix C.**

The topography of Rotorua, particularly Lake Rotorua, has shaped the transport network. Two of the key routes into the city are included in this study being SH5 / SH36 Ngongotaha Road / Fairy Springs Road west of Lake Rotorua; and SH30 Te Ngae Road east of Lake Rotorua. Given the population of Rotorua, these two roads carry significant traffic volumes. Fairy Springs Road carries over 21,000 vehicles per day and Te Ngae Road carries over 35,000 vehicles per day. Current key issues requiring consideration from a transport perspective are:

- Land use changes in the northwest and eastern areas as identified in the new Structure Plan and the effects this will have on travel demand and traffic volumes.
- East-west heavy commercial traffic flows.
- Pedestrian and cyclist facilities, including crossing locations.
- Growth in tourism. The knock-on effect will increase travel demand and traffic flows in Rotorua, particularly as more international flights are scheduled.
- Commuting between Rotorua, Tauranga and Whakatane is likely to increase as more people take up lifestyle opportunities throughout the wider region.
- Access to new employment opportunities in Te Puke and Rangiuru.
- Traffic safety, particularly with increased traffic volumes.

2.3.3 Road Safety

Crash data (CAS 2009) for the previous full 5 year period (2004 – 2008) is specified for the critical intersections in as shown in **Appendix C.** The most serious crash locations are identified as follows and shown in **Figure 3.**

- SH30 / Tarawera Road: 57 recorded crashes
- SH30 / Owhata Road: 24 recorded crashes
- SH5 / SH36: 15 recorded crashes

2.4 Walking and Cycling

2.4.1 Cycling

Bike Rotorua identifies the development of a cycling network, of which existing and proposed routes are on the state highway networks as previously identified. The strategy identifies a decreasing trend in the level of cycling over recent years.

“The number of people cycling to work in Rotorua has halved over the last 15 years”

“The decline in cycle trips to schools has been even more dramatic than the decline in commuting by bike to work. In just eight years, between 1996 and 2004, the number of students cycling to school declined by about two thirds.”

From a regional perspective Rotorua is well regarded in terms of recreational cycling opportunities such as mountain biking or road biking. In terms of on-road cycle facilities cycle lanes have been implemented along Te Ngae Road between Sala Street and Rotokawa Road. Wide shoulders and marked cycle lanes exist along Ngongotaha Road between Fairy Springs Road and SH5. Further strategic cycle routes have been identified for implementation in the short to medium term including a cycle path between Ngongotaha and Rotorua along the rail corridor.

Cycling facilities could be improved along the Fairy Springs Road / Ngongotaha Road corridor, as shown in **Figure 3**. The rail corridor presents an opportunity that should be taken in order to complement any new facilities along Fairy Springs Road / Ngongotaha Road.

2.4.2 Walking

The promotion of local and regional walking opportunities is apparent through the development of the 26 km Rotorua Walkway and other recreational attractions such as the Redwoods & Whakarewarewa Forest walking trails. Further walkways should be encouraged.

Existing pedestrian facilities within the Structure Plan study area are generally deemed to meet minimum standards, i.e. footpaths generally provided adjoining local roads. However, as traffic demand increases the pedestrian environment can deteriorate particularly as a result of traffic noise and longer delay periods when crossing at traffic signals and across busy corridors. All new urban roads should have good quality footpaths along both sides with paths provided through parks and reserves where possible. Pedestrian crossing facilities should be provided at all signalised intersections and across busy arterial roads at regular intervals.



Figure 3: Summary of Existing Transport Conditions

2.5 Passenger Transport Services

The 'Cityride Rotorua' bus service is run by Reesby Buses. All routes start/end at the Pukuatua Street Terminal in the centre of Rotorua. The Cityride service operates ten routes as shown in **Figure 4**. Services operate along SH5 to Ngongotaha and SH30 to Rotorua Airport.

Discussions with Environment Bay of Plenty³ (EBoP) revealed a significant increase in patronage on Cityride services. Between 2003/04 and 2008/09 passenger numbers increased from 160,000 to 640,000 representing an annualised increase of over 70%. The first quarter figures for 2009/10 increased 8% over the corresponding 2008/09 quarter. EBoP's 10-year passenger transport plan recommends service frequency increases in response to demand, which is reviewed annually.



Figure 4: Cityride Rotorua Bus Services

(Source: Cityride Website)

The service catchment appears to cover a significant proportion of the residential population. It is noted that there is no centralised transport centre that would otherwise cater for full range of bus service users including domestic and tourist bus services.

³ Pers Comms Emlyn Hatch, Environment Bay of Plenty, 19 January 2010

2.6 Future Conditions

2.6.1 Introduction

This section sets out the potential changes that will be required to avoid or mitigate the impacts generated by the Structure Plan proposal. The planned transport improvements (Do Minimum) are noted below.

2.7 Planned Transport Improvements (Do Minimum)

2.7.1 Development of Road Network

Fairy Springs Road Four-Laning

This project involves four-laning of Fairy Springs Road between the current two-lane four-lane threshold and Ngongotaha Road outside Rainbow Springs. The project is currently being commenced and is due for completion in 2010.

Rotorua Eastern Arterial (Secondary Investigation Study to be let in 2010)

The Rotorua Eastern Arterial (REA) proposes a strategic route running parallel to Te Ngae Road (SH30) between the current intersection of SH30 / SH30A and the southern side of Rotorua Airport. The project will remove interregional traffic from Te Ngae Road and provide improved opportunities to Te Ngae Road to facilitate pedestrian and cycle facilities and public transport infrastructure. It would also improve the level of amenity along Te Ngae Road, particularly for residents to maintain local access. The REA will provide improved access to Rotorua Airport and also improve access to the industrial employment area on the east side of Lake Rotorua. The project will alter traffic conditions significantly around the eastern side of Lake Rotorua.

The project is identified in the Bay of Plenty Regional Land Transport Programme 2009 – 2012 as one of the region's top ten transport priorities. The project has approved funding for the investigation phase over the funding years 2009/10 and 2010/11. The first design year is programmed for 2011/12.

Due to the REA receiving committed funding Rotorua District Council has advised that the REA be included in all future traffic assessments within this study.

2.7.2 Development of Walking and Cycling Network

Rotorua District Council is continuing to progress walking and cycling networks throughout the local area. These include:

- On road cycling provision to cater for school related trips.
- On road commuter routes for CBD access, including along SH5 (Ngongotaha) and SH30 (Te Ngae Road).

The Regional Land Transport Strategy has identified the CBD to Ngongotaha route as an "approved activity not yet completed" (RLTS, 2009/10 and 2010/11). Funding has been included in the RLTP to undertake this work and the outcomes of this study can be used to identify projects for funding in future RLTPs and also to provide an overview of the network to provide the opportunity to better integrate works.

2.7.3 Development of Passenger Transport Services

Plans for a Transport Centre in Rotorua are still being investigated by Rotorua District Council. With regard to route services and frequency, Cityride Rotorua should consider route and service improvements in response to population changes and demand for passenger transport services.

2.7.4 Travel Demand Management and Travel Behaviour Change

Active traffic mitigation measures can reduce the impact of traffic growth over time. This can occur through strategy and policy changes to transport as Travel Demand Management (TDM) measures including Travel Behaviour Change (TBhC).

Travel Demand Management is a generic term for strategies used to reduce demand for road-based travel and improve efficiency in the transport sector. For regional centres such as Rotorua, changes in strategy and policy can include more restrictive CBD parking policies, improvements to passenger transport services and walking and cycling.

Travel Behaviour Change programmes aim to encourage a more voluntary change in travel behaviour by providing incentives for people to utilise sustainable modes of travel and reducing the overall requirement for travel. Travel Behaviour Change measures for Rotorua could include workplace travel plans, flexible working hours, marketing and education programmes, and school travel initiatives.

2.7.5 Future Land Use Scenario

The land use yields were provided by Rotorua District Council for future years 2021 and 2051 (also referred to as Model GA08). Details of the Structure Plan land use yields are included in **Appendix D**. The subsequent number of trips generated by the Structure Plan is presented in **Table 1**.

Table 1 Structure Plan Trip Generation for 2021 and 2051

Land Use / Location	2021 Additional Trips (vehicles per day)	2051 Additional Trips (vehicles per day)	Total Additional Trips (vehicles per day)
Western Side			
Rotorua North Residential 555 new household units	2,300	3,250	5,550
Rotorua West – Hamurana Residential 510 new household units	1,200	2,880	4,080
Rotorua West – Ngongotaha Residential 330 new household units	720	1,920	2,640
Ngongotaha Employment Land 3 ha gross developable area	2,770	1,430	4,200
Rural Employment Land 5 ha gross developable area	4,200	2,800	7,000
Total Trips	11,190	12,280	23,470
Eastern Side			
Rotorua Eastern Suburbs Residential 1935 new household units	17,250	2,100	19,350
Rotorua East Employment Land 5 ha gross developable area	4,200	2,800	7,000

Land Use / Location	2021 Additional Trips (vehicles per day)	2051 Additional Trips (vehicles per day)	Total Additional Trips (vehicles per day)
Western Side			
Rotokawa Employment Land 3 ha gross developable area	2,770	1,430	4,200
Rotokawa – Brunswick Residential 165 new household units	750	900	1,650
Total Trips	24,970	7,230	32,200

2.8 Assessment of Transport Impacts

2.8.1 Methodology

The methodology used to assess the traffic impacts involved the following steps:

- Identify the trips generated by the land use yields (GA08) identified in the Structure Plan for years 2021 and 2051 (Table 1 identifies an additional 32,200 vehicle trips per day generated by the western structure plan area by 2051 and 23,470 vehicle trips per day generated by the eastern structure plan area by 2051.)
- Distribute traffic across the road network – using a spreadsheet / assumptions approach (including modal split).
- Capacity analysis for mid-block sections and intersections.
- Validation of future traffic volumes and impacts against TRACKS modelling outputs (using GA08).

Trip generation was estimated using published traffic generation rates including the Transfund NZ Report 210 Trips and Parking Related to Land Use, New South Wales Road and Traffic Authority Guide to Traffic Generating Developments.

The trip rates used were compared to those used by Beca⁴. Link volumes along Te Ngae Road and Ngongotaha Road were compared to the GA08 TRACKS model updated by Gabites Porter. No significant inconsistencies were found.

2.8.2 Impact on Future Road Network (Do Minimum Scenario)

A summary of the future road network conditions using a base (Do Minimum) scenario is shown in **Figure 5**. Further details of the analysis are shown in **Appendix E**. This scenario assumes that the planned transport interventions identified in **Section 4.2.1** will be in place.

For the mid-block locations capacity issues occur at:

- SH36 Ngongotaha Road, between Ngongotaha and SH5 - link approaching capacity with 100% of development traffic.
- SH5 Ngongotaha Road south of SH5 - link currently approaching capacity and will be at or over capacity with 100% of development traffic.
- Te Ngae Road east of Sala Street and north of Iles Road – link approaching capacity with 100% of development traffic.

⁴ Wharenui Road Area Integrated Transport Assessment (Beca, November 2008)



Figure 5: Summary of 2051 Transport Conditions with new Structure Plan Development (Do Minimum Scenario)

Note: The numbers 1 – 8 on Figure 5 correspond to the interventions suggested in the following section

The analysis shows that Ngongotaha Road north of SH5 will be approaching the theoretical capacity of the route during peak periods, however traffic conditions are not considered to cause excessive delays, particularly with the interim upgrade of the Ngongotaha Road / SH5 roundabout.

Ngongotaha Road, south of SH5 is currently approaching the theoretical capacity of the route, therefore suitable mitigation measures are recommended with the application of likely development traffic. The current four-laning of Fairy Springs Road is expected to move the ‘bottle-neck’ north to Ngongotaha Road. The interim upgrade of the Ngongotaha Road / SH5 roundabout is not likely to significantly improve traffic conditions south of the roundabout.

Te Ngae Road, between Sala Street and Iles Road, currently experiences congestion and travel delay during peak times. However these conditions will be improved through the implementation of the REA. The application of 2051 development traffic will result in decreased level of service however not to the extent that the theoretical capacity of Te Ngae Road is exceeded. The REA will allow opportunities to improve passenger transport, walking and cycling facilities on Te Ngae Road.

All intersections issues are shown in **Appendix E**.

2.8.3 Interventions and Mitigation Measures (Do Something Scenario)

An assessment was undertaken to identify interventions required to provide for transport efficiency and safety under the full development scenario. The analysis is included in **Appendix E**. A summary of interventions are shown in **Figure 6**.

Capacity and Intersection Interventions

1. SH5 Ngongotaha Road

Future Condition: Link capacity issues along the existing two lane section of Ngongotaha Road north of Fairy Springs Road. The current four-laning project of Fairy Springs Road will extend the four lane section to the Rainbow Springs entrance and will likely move the 'bottle-neck' to Ngongotaha Road.

Recommendation: Upgrade Ngongotaha Road between SH5 and Fairy Springs Road (current four lane section upgrade) to four lanes.

Development Staging

Analysis was undertaken on the staging of development to determine the threshold development that could be catered for within the existing road capacity. The analysis is included in **Appendix E**.

Notwithstanding the need to consider alternative mitigation measures the results show that upgrading of Ngongotaha Road south of SH5 would be required prior to about 60% of development if over-saturated traffic conditions are to be avoided. However, as a strategic route and the main entrance to Rotorua from Hamilton and the north, it is recommended that four-laning is considered during the early stages of Structure Plan development.

2. SH36 Hamurana Road / SH36 Tauranga Direct Road / Hamurana Road (Priority)

Future Condition: Queuing will occur on the Tauranga Direct Road approach during AM and PM peak periods. The assessment included reversing the priority of the intersection, however future development traffic would place pressure on the Hamurana Road approach. Both signalised and roundabout options were assessed as appropriate however the roundabout option resulted in an improved level of service.

Recommendation: Upgrade to single circulating roundabout

3. SH36 Ngongotaha Road / Western Road (Priority)

Future Condition: Queuing will occur on the Western Road approach during AM and PM peak periods. Both signalised and roundabout options were assessed as appropriate and both options had a balance of benefits during the AM and PM peak periods. Signals would require less land take and would be an appropriate option in the short to medium term. Travel demand management measures also must be considered.

Recommendation: Signalise and demand management

4. SH30 Te Ngae Road / Iles Road (Priority)

Future Condition: Queuing will occur on the Iles Road approach left turn and right turn movements during the AM peak period plus queuing on the Iles Road approach right turn movement during the PM peak period. Infrastructure improvement options were not considered necessary at this intersection due to the heavy, but not excessive delay (average of about 45 seconds during AM and PM peak periods). Signals were assessed as an ideal short to medium term solution together with provision for passenger transport, and walking and cycling.

Recommendation: Signalise and demand management

5. SH30 Te Ngae Road / Wharenui Road (Priority)

Future Condition: Queuing will occur on the Wharenui Road approach left and right turn movements during the AM peak and PM peak periods and queuing on the Te Ngae Road right turn during the PM peak period. Mitigation measures assessed included signalised and roundabout options plus an internal link road connecting to Gee Road. Without the internal link road a roundabout option was assessed as offering an improved level of service over signals. With the internal link road a signalised intersection was assessed to be offer a satisfactory level of service.

Recommendation: Scenario 1 Without Link Road: Roundabout and demand management
Scenario 2 With Link Road: Signalised and demand management

6. SH30 Te Ngae Road / Rotokawa Road (Priority)

Future Condition: Queuing will occur on the Te Ngae Road right turn during the AM peak period and queuing on the Rotokawa Road left turn and right turn movements during the PM peak period. Infrastructure improvement options were not considered necessary at this intersection due to the heavy, but not excessive levels of delay. The turning movements at Rotokawa Road experience a highest average delay of 65 seconds, which is deemed acceptable and would be mitigated through mode shift to passenger transport, walking and cycling.

Recommendation: Travel Demand Management measures

Operational and Safety Interventions

The Structure Plan proposal has the potential to result in greater safety implications at the following intersections:

- SH5 / SH36 Ngongotaha Road
- SH30 Te Ngae Road / Tarawera Road
- SH30 Te Ngae Road / Iles Road
- SH30 Te Ngae Road / Wharenui Road
- SH30 Te Ngae Road / Owhata Road
- SH30 Te Ngae Road / Lee Road / Gee Road

It is considered that network improvements from the REA will improve safety and operational issues at the Te Ngae Road intersections with Tarawera Road, Iles Road and Wharenui Road. While the anticipated operational issues at the intersections of Lee Road and Gee Road as isolated intersections are likely to be mitigated by the REA the addition of development traffic is likely to result in safety and operational issues due to the close proximity of the intersections. Therefore an assessment of these intersections as a combined intersection is carried out below.

7. SH5 / SH36 Ngongotaha Road (Roundabout)

Future Condition: Queuing will occur on the Ngongotaha Road north approach during the AM peak. The short term solution for SH5 / SH36 roundabout includes the installation of signals on SH5 to create gaps for the Ngongotaha Road approach during the AM peak (as per MWH report). While this is an acceptable solution in the short term the application of development traffic to Ngongotaha Road in the long term may lead to excessive delays at one or both approaches.

Recommendation: Upgrade the intersection to a full dual lane circulating roundabout and provide a dedicated southbound lane from SH 36 to SH5.

8. SH30 Te Ngae Road / Lee Road / Gee Road (Priority)

Future Condition: Increased turning movements to Te Ngae Road at both intersections as a result of Structure Plan traffic has the potential to create operational issues at the SH30 Te Ngae Road / Lee Road / Gee Road priority intersections due to their close proximity on Te Ngae Road. Any upgrade would be difficult due to the off-set nature of the intersections. A long term option would be to integrate the intersections as a single four-way intersection. Roundabout or signalised options should be explored. In the short term land take must be future proofed.

Recommendation: Secure land at SH30 Te Ngae Road / Lee Road / Gee Road in order to integrate as a four way signalised intersection or roundabout in the long term.

Public Strategy and Policy

Passive traffic mitigation measures that can occur within congested road networks include peak hour spreading, increasing vehicle occupancy and network reassignment to alternative (less congested) routes. With the constraints of the existing road network conditions it is likely that traffic mitigating impacts will result from increased congestion which can complement the travel demand management strategies outlined below.

9. Strategy and Policy

Future Condition: The integration of land use and transport policy can significantly influence travel patterns, trip generation and mode share. The Structure Plan will be one of the key documents used to maximise the integration of land use and transport to achieve key strategic outcomes. In order to support these outcomes the land use and transport relationship in existing key employment areas such as the Rotorua CBD should be investigated and appropriate demand management policies implemented. This will be a continual process over the life of the Structure Plan. The current Rotorua CBD parking review will be a good start however further opportunities should be explored in the short to medium term.

Recommendation: Explore opportunities to influence travel demand using changes to strategy and policy throughout the life of the Structure Plan.

Travel Demand Management and Travel Behaviour Change

Typical TDM and TBhC measures can include more restrictive parking policies, managed lanes (transit lanes, etc) promotion of ridesharing, walking and cycling, park-and-ride / park and share schemes, passenger transport services on dedicated facilities and travel planning (for businesses and schools). Should Rotorua District Council actively pursue and implement these measures over time a reduction in travel demand is likely to result. While new development can be used as a trigger to implement TDM the overall policy / strategy must be aimed at the district rather than just areas of new development.

Previous traffic capacity analysis undertaken by AECOM along a congested corridor⁵ suggests that the application of travel demand management measures can reduce peak hour traffic volumes by an average of about 5 - 10%. This can increase the effective 'life' of existing infrastructure.

In order to maximise TDM opportunities in Rotorua the following measures are recommended to be investigated. These measures may require additional road infrastructure to operate efficiently and maximise travel benefits for users. However, even with TDM measures implemented in the short term the REA would still be required.

10. Passenger Transport

Future Condition: A significant increase in Cityride patronage over the last five years indicates increasing demand for passenger transport services. In response to population growth in development areas Citywide should increase services appropriately. Monitoring of travel times by bus services should also ensure that travel times do not increase with congestion on the urban corridors. Priority measures such as bus / transit lanes / high occupancy vehicle lanes, signal pre-emption should be used in the future to ensure travel time benefits over private car use. Thresholds can be used to ensure maintaining and enhancing passenger transport services over time.

- Recommendations:**
1. Monitor passenger transport demand with the aim of increasing passenger transport services between Ngongotaha and Rotorua CBD and between Rotorua Eastern Suburbs and Rotorua CBD.
 2. Investigate a 'threshold' approach to improving services, such as:
 - Implement priority lanes on routes with service frequencies over eight per hour; or
 - Implement signal pre-emption where services are delayed by an average time of more than 120s.
 3. Promote passenger transport through travel behaviour change policies.

11. Transport Centre and Park and Ride

Future Condition: A new transport centre in the Rotorua CBD should be complemented by park-and-ride stations on the urban peripheries. Sites central to Ngongotaha and the Te Ngae Road development areas should be selected and future proofed.

Recommendation: Future proof locations for park-and-ride stations in Ngongotaha and the central section of Te Ngae Road.

⁵ Western Corridor Study (SH1 between Kapiti and SH2 interchange), Maunsell Ltd, 2005

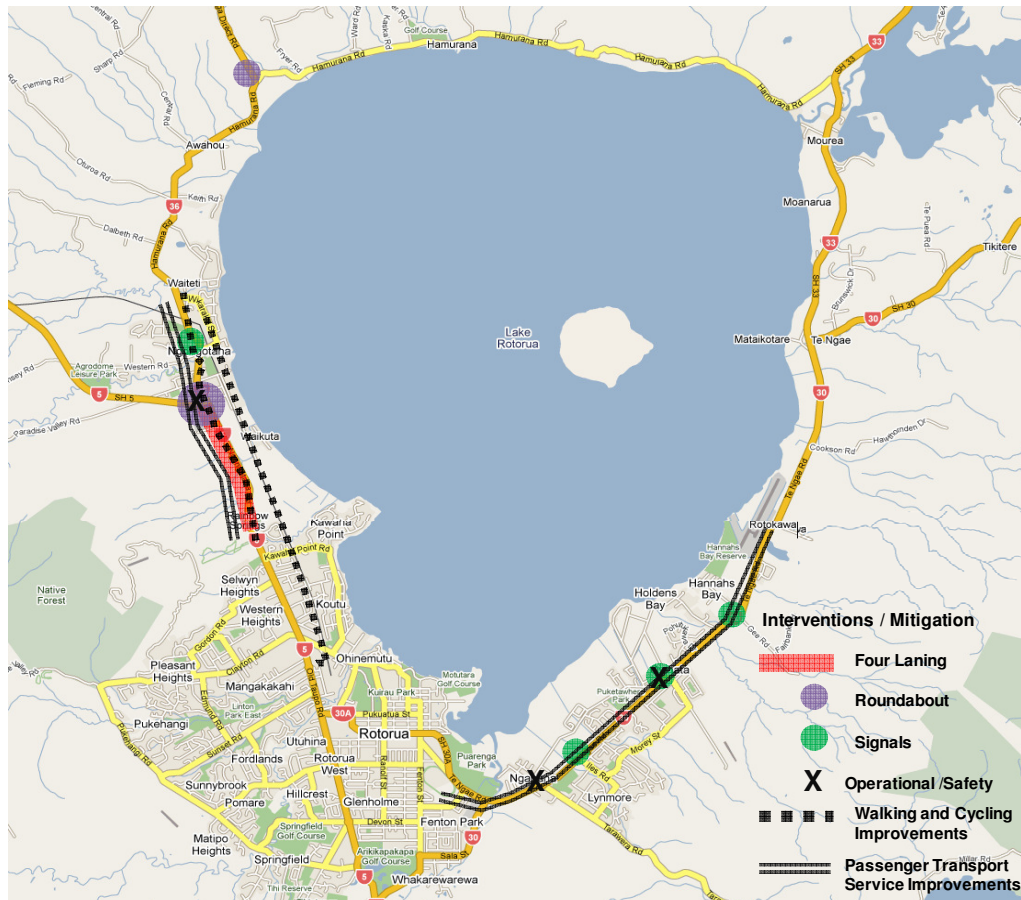


Figure 6: Summary of 2051 Transport Interventions (Do Something Scenario)

12. Walking and Cycling

Future Condition: Traffic mitigation measures include an opportunity to increase the mode share of walking and cycling for a range of users from less experienced cyclists such as school-aged children to more experienced cyclists such as recreational and commuter cyclists. This should include the provision of direct, connected and safe cycle and pedestrian facilities throughout key corridors. The first key corridor would include maintaining and upgrading cycle lanes along Te Ngae Road, particularly given the opportunity to upgrade facilities once a significant proportion of through traffic has been removed to the REA. The second key corridor would include additional cycle lanes or cycle paths between Ngongotaha and Rotorua CBD. This should be complemented by a high quality dedicated or shared facility along the rail corridor between Ngongotaha and Rotorua.

- Recommendations:**
1. Improve cycle facilities along the Te Ngae Road corridor, with a specific focus on upgraded facilities in response to the Rotorua Eastern Arterial.
 2. Construct and maintain cycle facilities along SH36 and SH5 between Ngongotaha and Rotorua, including shared walking and cycling facilities along the rail corridor.
 3. Promote walking and cycling trips through travel behaviour change policies.

Rotorua Eastern Suburbs Link Road

The provision of a link road between Rotorua eastern suburbs and the employment area to the north (essentially connecting Wharenui Road and Gee Road) would relieve the Te Ngae Road / Wharenui Road intersection of some traffic however an upgrade would be required to cater for left turning movements out and right turning movements in. The recommended long term solution is to investigate the link road and upgrade the Te Ngae Road intersection as assessed in **Section 4.3.2**. It is noted that the link road is described in Plan Change 34 to the District Plan. The implementation of the link road is recommended to be planned under this Plan Change.

2.9 Analysis of Measures

2.9.1 Qualitative Analysis

A broad analysis was undertaken to determine the consistency of the recommended measures with the objectives of national, regional and local strategy and policy (refer to **Section 2**). The analysis is shown in **Table 2**.

Table 2 Analysis of Strategic Consistency

Project / Measure	Consistency with Key Strategy							
	Assist Economic Efficiency	Reduce vehicle kilometres travelled	Improve travel time reliability	Reduce accidents	Increase passenger transport use	Increase walking and cycling	Minimise environmental effects	Efficient use of infrastructure
1. SH5 Ngongotaha Road upgrade to four lanes	X	n/a	X	X	n/a	X	n/a	X
2. SH36 Hamurana Road / SH36 Tauranga Direct Road / Hamurana Road Roundabout	n/a	n/a	X	X	n/a	n/a	n/a	X
3. SH36 Ngongotaha Road / Western Road Signalised Intersection	n/a	n/a	X	X	n/a	n/a	n/a	X
4. SH30 Te Ngae Road / Iles Road Signalised Intersection	n/a	n/a	X	X	n/a	n/a	n/a	X
5. SH30 Te Ngae Road / Wharenui Road Signalised Intersection OR Roundabout	n/a	n/a	X	X	n/a	n/a	n/a	X
6. SH30 Te Ngae Road / Rotokawa Road Intersection demand management	n/a	n/a	X	n/a	n/a	n/a	n/a	n/a
7. SH5 / SH36 Ngongotaha Road Roundabout dual lane circulating roundabout	n/a	n/a	X	X	n/a	n/a	n/a	X
8. SH30 Te Ngae Road / Lee Road / Gee Road Future Proof Site	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9. Strategy and Policy	X	X	X	n/a	X	X	n/a	n/a
10. Passenger Transport Improvements	X	X	X	n/a	X	n/a	X	n/a
11. Park-and-ride	n/a	X		n/a	X	X	n/a	n/a

Project / Measure	Consistency with Key Strategy							
	Assist Economic Efficiency	Reduce vehicle kilometres travelled	Improve travel time reliability	Reduce accidents	Increase passenger transport use	Increase walking and cycling	Minimise environmental effects	Efficient use of infrastructure
12. Walking and Cycling Improvements	X	X	X	n/a	X	X	X	n/a
13. Eastern Suburbs Link Road	X	X	X	n/a	n/a	X	X	X

The analysis indicates that the measures are generally consistent with national and regional transport policy objectives. The area's most consistent with policy objectives include passenger transport, walking and cycling as these are consistent with both national and regional policy as well as forming key parts of the Rotorua Transport Strategy. Many of the road infrastructure projects are relatively minor and therefore not key projects within regional or local transport documents.

Recommended Implementation Plan

A summary of the mitigation measures recommended is included in **Table 3**.

Table 3 Summary of Recommended Mitigation Measures

Location / Service	Measure	Timing
Western Structure Plan Area		
SH5 Ngongotaha Road	Upgrade to 4 lanes	Prior to 60% of development ⁶
SH36 Hamurana Road / SH36 Tauranga Direct Road	Roundabout	Before 2021 depending on NZTA strategic network advice
SH36 Ngongotaha Road / Western Road Intersection	Signalise and demand management	Before 2021
SH5 / SH36 Ngongotaha Road Roundabout	Dual lane circulating roundabout with dedicated southbound slip lane	After 2021
SH30 Te Ngae Road / Iles Road Intersection	Signalise and demand management	With REA
Eastern Structure Plan Area		
SH30 Te Ngae Road / Wharenui Road Intersection	With Link Road: Signalise and demand management Without Link Road: Roundabout and demand management	With REA
SH30 Te Ngae Road / Lee Road / Gee Road	Future proof the site to integrate as a four way signalised intersection or roundabout	After 2021
SH30 Te Ngae Road / Rotokawa Road Intersection	Demand Management	On-going
Eastern Suburbs Link Road	Links road between Wharenui Road and Gee Road	With Plan Change 34

⁶ As a strategic route Council, in conjunction with the NZTA, may decide to upgrade the route earlier

Demand Management Measures		
Passenger Transport	Monitor passenger transport demand with the aim of increasing passenger transport services between Ngongotaha and Rotorua CBD and between Rotorua Eastern Suburbs and Rotorua CBD	On-going
Park and Ride	Future proof locations for park-and-ride stations in Ngongotaha and the central section of Te Ngae Road	Before 2021
Walking and Cycling	Improve cycle facilities along the Te Ngae Road corridor	On-going and with REA
	Construct and maintain shared walking and cycling facilities along SH36 and SH5 between Ngongotaha and Rotorua, including facilities along the rail corridor	On-going
Strategy and Policy	Explore opportunities to influence travel demand using changes to strategy and policy throughout the life of the Structure Plan	On-going

All infrastructure upgrades recommended must consider opportunities for passenger transport services, walking and cycling. The two strategic corridors of SH5 Ngongotaha Road and SH30 Te Ngae Road provide opportunities to improve passenger transport services through the provision of dedicated bus lanes and park-and-ride stations. While the northern section of Te Ngae Road is not recommended for four-laning, this section could be justified through the provision of dedicated bus lanes connecting from a future park-and-ride station if service demands and travel times warrant such provision.

2.10 Gap Analysis

The following consists of directly relevant projects to the study area identified as part of local or regional strategy that were not identified as part of this study.

- **Southern Connection between Structure Plan locations (RUTS):** A number of city projects are mentioned including the Victoria Street Arterial which would influence traffic between the Structure Plan areas but would not necessarily mitigate traffic conditions on Te Ngae Road or SH5 Fairy Springs Road and Ngongotaha Road.
- **Northern Connection between Structure Plan Locations:** The northern area excluded from the Structure Plan comprises the Hamurana Road connection between Hamurana and Mourea. Topographical constraints and relative remoteness would largely restrict densification of this area in the short to medium term as alternative sites within the Structure Plan areas would be more viable. The prioritisation of Hamurana Road for increased movement function is therefore unlikely in the short to medium term.
- **Wharenui Road ITA (Beca, November 2008):** For the first stage of the Ngati Whakaue Plan Change to proceed this study recommends improvements to Te Ngae Road / Basely Road (traffic signals); Te Ngae Road / Brent Road (left in left out); Te Ngae Road / Coulter Road (left-in left-out).

2.11 Development Staging

In the short term any development staging in the east should be consistent with the findings of the Beca report (November, 2008). This is currently progressing through Council as part of the Ngati Whakaue Plan Change 34. Findings from the Beca report state that relatively minor intersection upgrades are recommended to support the development of 879 housing equivalents prior to the Rotorua Eastern Arterial. These include signalling the intersections of Te Ngae / Iles Road and Te Ngae Wharenuui Road. Our assessment supports this infrastructure in that these measures would be required after the Rotorua Eastern Arterial in order to accommodate the growth of the Structure Plan. While our assessment does not include the more minor intersections the Beca recommendations appear reasonable.

The assessment undertaken for the long term (full development scenario) considers that a reasonable level of service is maintained with the application of full development traffic providing the Rotorua Eastern Arterial is operational.

In the event that all or part of the Ngati Whakaue Plan Change did not proceed and other Structure Plan areas developed, apart from continued pressure on Iles Road, the main issue would be the intersections of Te Ngae Road / Gee Road and Rotokawa Road / Te Ngae Road. The intersection of Te Ngae Road / Gee Road would be an issue as its priority layout with development traffic is dependent on the internal link road with Wharenuui Road, plus conflict with the Lee Road intersection. If either one of these intersections require signalisation their integration is likely to be required (to a four way intersection). Rotokawa Road would also require further investigations as its operation with development traffic is marginal.

2.12 Developer Contributions

Cost estimates were undertaken for the recommended interventions as shown in **Table 4**.

Table 4 Ball Park Cost Estimates

Item	Mitigation Measure	95 th %ile Estimate
Item 1	SH5 Ngongotaha Road Fariry Springs Road Mid Block 4 Laning	18,514,628
Item 2	SH36 Ngongotaha Road / Hamurana Road Roundabout	1,161,801
Item 3	SH36 Ngongotaha Road / Western Road Signals	787,184
Item 4	SH36 Ngongotaha Road SH5 Dual Lane Roundabout	3,961,095
Item 5	SH30 Te Ngae Road / Iles Road Signals	875,411
Item 6	SH30 Te Ngae Road /Wharenuui Road Signals	875,411
Item 7	SH30 Te Ngae Road /Lee Road / Gee Road Integrated Signals	1,797,000

Note: The estimates exclude I&R and property costs and include 20% cost contingency and 30% risk adjusted cost.

These figures can be used to establish the transport component of development contributions. As Council operate on a 10-year funding schedule only projects expected to be required within the next ten years are to be included. In this case items 1, 4 and 7 are unlikely to be required in this time frame. The estimate to be put forward for the transport component of development contributions is therefore \$3,700,000.

2.13 Parking Requirements

The GA08 land use yields propose an additional three hectares of employment land by 2021 plus two hectares of employment land by 2051 at Rotokawa on both sides of Te Ngae Road. This section provides first principles analysis of car parking requirements for this development.

Using developable area principles of approximately 70% gross floor area (GFA) the development is anticipated to result in about 21,000m² GFA by 2021 plus 14,000m² GFA by 2051. Parking requirements in the Rotorua District Plan vary according to employment densities and customer turnover however a typical business park would include a mix of offices (at 1 parking space per 100m² GFA) to commercial / retailing etc (about 1 space per 20m² GFA).

Using, say 50% office and 50% commercial / retail would result in a broad parking requirement of about 1000 parking spaces. The actual space required for at grade parking including manoeuvring would be about 25,000m²⁷ which would indicate that parking dispensation should be sought or parking should be provided as grade separated.

2.14 Conclusions

2.14.1 Introduction

The transport assessment has investigated the transport impacts of the Rotorua Structure Plan. The document provides details of the potential transport effects and interventions required to manage additional traffic as a result of future development identified within the Structure Plan.

2.14.2 Current Conditions

The SH5 Fairy Springs Road / Ngongotaha Road corridor and SH30 Te Ngae Road corridor both experience queuing and delay during peak periods and have limited capacity available to accommodate future growth. Projects planned to mitigate these conditions include the four-laning of Fairy Springs Road and the development of the Rotorua Eastern Arterial (two lanes by 2008 and 4 lanes by 2021).

2.14.3 Future Conditions

The anticipated transport impacts of Structure Plan development include an additional:

- 32,200 vehicle trips per day generated by the western structure plan area by 2051; and
- 23,470 vehicle trips per day generated by the eastern structure plan area by 2051.

The additional vehicles on the road network will result in congestion and greater travel times during peak periods, along SH30 Te Ngae Road and SH5 Ngongotaha Road.

The REA will provide long term relief to traffic conditions along Te Ngae Road and will complement the intersection upgrades required to facilitate Structure Plan development - also required as part of the Ngati Whakaue Plan Change. The REA will also provide opportunities to improve passenger transport services together with provision for improved and new walking and cycling facilities.

Travel demand management and travel behaviour change measures to be implemented on a city-wide basis should include more restrictive parking policies, managed lanes (transit lanes, etc) promotion of ridesharing, walking and cycling, park-and-ride / park and share schemes, passenger transport services on dedicated facilities and travel planning (for businesses and schools). Should Rotorua District Council actively pursue and implement these measures over time a reduction in travel demand is likely to result.

⁷ using published guidance which states an average parking space including manoeuvring and access equates to 25m²

2.14.4 Recommended Improvement Measures

The assessment identifies the following improvement measures, (numbers 1 – 8 are shown on Figure 5).

- SH5 Ngongotaha Road four-laning
- SH36 Hamurana Road / SH36 Tauranga Direct Road / Hamurana Road roundabout
- SH36 Ngongotaha Road / Western Road signalised intersection
- SH30 Te Ngae Road / Iles Road signalised intersection
- SH30 Te Ngae Road / Wharenui Road signalised intersection OR roundabout
- SH30 Te Ngae Road / Rotokawa Road intersection demand management
- SH5 / SH36 Ngongotaha Road dual lane circulating roundabout and southbound slip lane
- SH30 Te Ngae Road / Lee Road / Gee Road future proof site for four-way signalised intersection
- Strategy and Policy to support travel demand management
- Passenger Transport improvements such as increased service frequencies and priority measures
- Park-and-ride future proof sites at Ngongotaha and Te Ngae
- Walking and Cycling improvements between Ngongotaha / Rotorua CBD and Rotokawa / Rotorua CBD
- Eastern Suburbs Link Road between Wharenui Road and Gee Road

2.14.5 Conclusion

The conclusions are:

East of Lake Rotorua

- SH30 Te Ngae Road is currently experiencing traffic congestion and delay during peak periods
- Future development of the Structure Plan will place increased pressure on the corridor
- Short term available capacity on Te Ngae Road will be taken up by development traffic associated with the Ngati Whakaue Plan Change 34
- Any further development through Ngati Whakaue Plan Change 34 or the Structure Plan will require the REA
- With the REA in place Te Ngae Road will facilitate local traffic movements and provide further opportunities to improve passenger transport services and new walking and cycling facilities

West of Lake Rotorua:

- SH5 Fairy Springs Road / Ngongotaha Road is currently experiencing traffic congestion and delay during peak periods, however current planned projects are expected to increase the efficiency of the corridor
- Future development of the Structure Plan will place increased pressure on the corridor
- Additional traffic associated with Structure Plan development will require capacity upgrades. Travel demand measures such as improvements to passenger transport services and new walking and cycling facilities are recommended to be implemented to extend the life of existing infrastructure

The overall cost of transport improvements to facilitate the Structure Plan development is estimated to be \$3,700,000⁸.

⁸ excluding I&R and land costs and including 20% cost contingency and 30% risk adjusted cost

3 Development Contributions Calculations

3.1 Current contribution methods

The current contribution methods available under the Local Government Act 2002 and Resource Management Act 1991 (RMA) to Rotorua District Council (RDC) for cost recovery purposes relating to infrastructure requirements (including transportation) include:

- Development contributions
- Financial contributions under the RMA (include service upgrading contributions)
- General Rates
- Targeted Rates (include water rates, sewerage rates, refuse rates, roading rates)
- Uniform annual general charge
- User charges
- Lump sum contributions
- Council fees and charges

Funding Allocation

According to RDC's funding impact statement within their Ten Year Plan 2009-2019, the forecast revenue for 2009/10 will be \$145,050,000; a figure that is ultimately predicted to decrease to \$126,735,000 by 2018/19. These forecasted figures are derived from the revenue streams mentioned above as well as other sources such as subsidies and grants, general rates and investment revenue.

To assess funding allocation against what revenue is recouped, we have analysed RDC's the total revenue and predicted operating expenses within the respective activity plans for each infrastructure area. The results are below:

Water Supply

Total revenue 2009/10:	\$7,147,000
Proportion of total 2009/10 infrastructural revenue (\$46,549,000):	15.353%
Total operating expenses 2009/10:	\$7,302,000
Proportion of total 2009/10 infrastructural operating expenses (\$40,295,000):	18.121%
Proportion of revenue to be spent	102.168%

Wastewater

Total revenue 2009/10:	\$17,764,000
Proportion of total 2009/10 infrastructural revenue (\$46,549,000):	38.161%
Total operating expenses 2009/10:	\$10,572,000
Proportion of total 2009/10 infrastructural operating expenses (\$40,295,000):	26.236%
Proportion of revenue to be spent	59.593%

Transport

Total revenue 2009/10:	\$16,346,000
Proportion of total 2009/10 infrastructural revenue (\$46,549,000):	35.115%
Total operating expenses 2009/10:	\$15,199,000
Proportion of total 2009/10 infrastructural operating expenses (\$40,295,000):	37.719%
Proportion of revenue to be spent	98.982%

Waste Management

Total revenue 2009/10:	\$5,292,000
Proportion of total 2009/10 infrastructural revenue (\$46,549,000):	11.368%
Total operating expenses 2009/10:	\$7,492,000
Proportion of total 2009/10 infrastructural operating expenses (\$40,295,000):	18.592%
Proportion of revenue to be spent	141.572%

Based on the figures above the following assumptions and statements can be made:

- Wastewater (38%) and transport (35%) are the two main infrastructural areas for which the most revenue was gathered by RDC.
- Although significantly less revenue was gathered for water supply (15%) and waste management (11%), these are the two infrastructure areas where the operating expenses exceeded the allocated revenue.

Methods for recouping development costs

The RDC's Ten Year Plan 2009-2019 (Part C – Financial Statements and Supporting Information) has been analysed to establish fair and equitable methods for recouping development costs.

As outlined in section 8.1 of this report, there is a range of current contribution methods available to RDC for cost recovery purposes. Some suggestions for obtaining higher contribution amounts by using current and equitable mechanisms are:

- Increasing user pays charges. Examples include:
 - Increased cost of additional refuse bags for collection. Similar schemes in other North Island cities charge up to \$2.00 per bag.
 - Charge for inorganic collection from the roadside. Fines imposed on illegal dumping/non payment to Council.
 - Charging for Council collection of recyclable materials from the roadside.
 - Pay and display for public car parks located within a 10 minute walking span of main centres.
 - Toll road charges on any future roading connections which reduce travel time throughout the District.
 - Create charge for property owners to view own property file – currently no charge.

- Wider use of water metering for residential properties so that targeted rates could be charged on a usage basis as opposed to a uniform rate. This option has been suggested by RDC in their Ten Year Plan.
- Targeted rates for rural properties with no access available to sewer reticulation.
- Privatisation of certain Council activities currently funded under the uniform annual general charge (i.e. animal control).
- A rate levied on business sector properties in the town centre/growth nodes used to help fund beautification of these areas.
- New capital facilities provided by developers/applicant through incentives to offset the public amenities component of development contributions (i.e. developer/applicant paying for the park infrastructure within a new subdivision).
- Consideration of remissions to development contributions based on the utilisation of approved mechanisms which reduce the growth impact on public infrastructure (i.e. low-flow devices).

4 Potential Subdivision Yields and Infrastructure Allowances

Description	Sum of area (m2)	Number of lots	Allowance for Infrastructure	Average size of site	Total potential number of sites
Hamurana - Lakeside Settlement	293391.422	80	10%	2000m2	104
Hamurana - Fryer Road extension	281252.97	10	10%	8000m2	32
Hamurana - Mid slope	2113671.732	223	Assumed doubling of density	8000m2	223
Hamurana - Lake edge	279372.14	11	10%	8000m2	31
Hamurana - Rahui Road	685276.16	9	30%	half 400m2, half 1200m2	600
Hamurana - Waiteti Stream	160795.8	1	50%	min 400m2	201
Ngongotaha - Western gateway	482768.47	3	30%	2000m2	193
Rural - Pukehangi Road	275451.89	5	20% to allow for planting	average 5000m2	44
Eastern - Wharenui Road Residential	586566.19	4	50%	min 400m2	733
Eastern - Medium density	269026.46	1	40%	min 300m2	538
Eastern - Residential Lifestyle	1695574.33	19	20%	average 6000m2	226
Rotokawa - Brunswick	2008183.709	248		4000m2, doubling the density	496
Hamurana - Lower slopes	277675.042	81	40%	1200m2	167

5 Summary of Community Feedback

Main issues raised during the April 2008 consultation on the Eastern Basin Structure Plan were:

Main Issues:	Response of Structure Plan and Rationale
Support for the concept of Neighbourhood Hubs.	Neighbourhood hubs are supported with Te Ngae and Ngongotaha being strengthened and a new small hub recommended for Hamurana. A neighbourhood hub is proposed to accompany residential development in the Wharenui Road area.
Concern that the structure plan is encouraging urban sprawl	The structure plan removes back rural cluster along Te Ngae Road. Residential growth is located around neighbour centres.
Increased density around convenience / employment areas / public transport	Residential growth is located around neighbourhood centres, with medium density proposed for Wharenui Road area and Ngongotaha to increase population density.
Support for increased employment opportunities	Increased area of industrial land proposed, including the airport, extensions to Eastgate and Fairy Springs Road.
Environmental constraints at Ngapuna including geotechnical, geothermal, inundation.	The reverse sensitivity issues experienced at Ngapuna are recognised. The structure plan acknowledges this historical situation and recommends that the industrial area be transitioned to a lighter form of industrial.
Future of land adjacent to the lake zoned for resort purposes	The structure plan recognises the significant natural constraints to use of the land including geotechnical issues. Ultimately this land would be suited for public open space to preserve physical links and views to the lake.
Concerns about the extension of Brunswick in terms of traffic impacts and diverging from a contained urban form.	Whilst Brunswick is more rural in form, the land is more urban in function. The structure plan recommends that Brunswick be intensified rather than expanding its footprint. A doubling of density is recommended.
Difficulties with servicing some of the development, particularly at higher elevations.	There are servicing issues for the higher elevations of Pukehangi Road and Kaharoa. For this reason, residential development is not proposed.
Potential impacts of the proposed Rotorua Eastern Arterial either progressing or not	Based on discussions with NZ Transport Agency, it is assumed that the REA will proceed. Land uses such as the airport business park will benefit from improved transport links. The REA will be required to facilitate development in the Wharenui Road area.
Future of the unformed Whakapoungakau Road parallel to Te Ngae Road (south of Eastgate).	This road is proposed for forming to provide alternative transport routes to Te Ngae Road and improve connectivity.
The future form and function of Te Ngae Road	With the construction of the REA, the form and function of Te Ngae Road should change to reflect the decrease in through traffic trips.
Development opportunities around Cookson Rd / Hawthornden Road	A collaborative approach between Environment Bay of Plenty, Te Arawa Lakes Trust and Rotorua District Council is being undertaken to look at methods of influencing land use change in areas where high nutrient discharges are an issue. This will include areas around Cookson Road / Hawthornden Road.

Main Issues:	Response of Structure Plan and Rationale
Development around Fairbank and Gee Roads	Although landowners want residential development in this area, there is merit in this area being rural-residential. This area provides a soft edge to the urban environment, reducing potential for potential reverse sensitivity from the adjacent future business zone and rural activities carried out on rural zoned land.
Support for reduced minimum lot sizes for rural residential	This concept is supported in Brunswick, Pukehangi Road and Hamurana. By allowing an average lot size, the subdivision design can be more responsive to the physical features of the parent site.
Insufficient consideration to the effects of Rule 11.	A collaborative approach between Environment Bay of Plenty, Te Arawa Lakes Trust and Rotorua District Council is being undertaken to look at methods of influencing land use change in areas where high nutrient discharges are an issue.

Main issues raised during the April 2008 consultation on the Western Basin Structure Plan were:

Main Issues:	Response of Structure Plan and Rationale
Rural Lifestyle Zone to be determined by topographical and landscape considerations.	A collaborative approach between Environment Bay of Plenty, Te Arawa Lakes Trust and Rotorua District Council is being undertaken to look at methods of influencing land use change in areas where high nutrient discharges are an issue.
Uncertainty and implications of potential four-laning through Ngongotaha	It is assumed that 4-laning through Ngongotaha will occur at some time in the future and recommendations for Ngongotaha Village take this into consideration.
Support for the reserves and public access to streams.	By increasing the length and continuity of esplanade reserves along the length of the major streams, this will provide a network of walking / cycling trails and improve access to the streams.
Support for the walkway / cycleway corridor adjacent to the railway line	The structure plan promotes active cycle and pedestrian linkages to the CBD and the Okataina walkway system
Need for redevelopment and redesign of the Village to be aligned with four-laning through the village	At present, Ngongotaha Village is split by the main road, with parallel parking on both sides. Widening the main road will further separate the two sides and detract from the “village heart” role that the commercial area has. It is recommended that the Ngongotaha village centre relocate to the eastern side of Ngongotaha Road to capitalise on the Ngongotaha Stream and proximity to the lakefront.
Above Fryer Road to have increased development potential	The Fryer Road extent of rural residential zoning has been revisited and extended slightly up towards the caldera rim. The northern side of Fryer Road has a similar contour to that on the southern side and the visual impacts of extending the zoning slightly will have little impact. It is important that residential development extend no higher than this as it will start to have a significant visual impact on the caldera when viewed from other vantage points around and across the lake.
Larger Rural Lifestyle Zone.	A collaborative approach between Environment Bay of Plenty, Te Arawa Lakes Trust and Rotorua District Council is being undertaken to look at methods of influencing land use change in areas where high nutrient discharges are an issue. Areas around Waiteti and Awahou Streams will be considered, including some of the larger dairy farms.

Main Issues:	Response of Structure Plan and Rationale
Support for reduction in minimum lot sizes of rural residential zones	This concept is supported in Brunswick, Pukehangi Road and Hamurana. By allowing an average lot size, the subdivision design can be more responsive to the physical features of the parent site.
Support for relaxation of development and subdivision rules where significant land uses will result in major environmental protection and enhancement.	A collaborative approach between Environment Bay of Plenty, Te Arawa Lakes Trust and Rotorua District Council is being undertaken to look at methods of influencing land use change in areas where high nutrient discharges are an issue.
Greater consideration of lake water quality	<p>Lake water quality is addressed through the Rural Incentive area and encouraging residential uses around existing settlements. This enables development to be serviced by existing public reticulation networks.</p> <p>A collaborative approach between Environment Bay of Plenty, Te Arawa Lakes Trust and Rotorua District Council is being undertaken to look at methods of influencing land use change in areas where high nutrient discharges are an issue.</p>
Increased consideration of traffic impacts	Traffic implications of the structure plan are assessed in the Integrated Transport Assessment.
Supports higher density housing being located near Village	As established by the Guiding Principles, a range of densities are an important feature of a successful community. For this reason and to establish a vibrant, walkable neighbourhood centre, medium density housing has been indicated around the Ngongotaha and Wharenui Road area.
Concerns about the proposed business park located on the State highway 5/36 intersection	This has been identified for rural purposes.
Requests for more development flexibility in response to Rule 11.	A collaborative approach between Environment Bay of Plenty, Te Arawa Lakes Trust and Rotorua District Council is being undertaken to look at methods of influencing land use change in areas where high nutrient discharges are an issue.
Further consideration required for Pukehangi Road properties and those on the south-western edge of the CBD.	The slopes of Pukehange have both residential development and rural residential, with rural in between. The rural residential zone has an average lot size of around 1 hectare and a requirement for significant native planting. Because the rural residential zone was applied to a discrete parcel of land, the extent of planting clearly delineates the original property boundaries. The area adjoining area to the south is recommended for rural residential development similar that existing. If the boundaries were contour based, this would better integrate the existing development and enable retirement of land currently used for grazing. Retaining the high level of native planting is recommended.



Appendix A: Existing Structure Plan Land Use Data

Eastern Basin Structure Plan, Beca, 2008

Structure Plan Land Use Parameters

The Eastern Structure Plan included the preparation of an Options, Opportunities and Constraints report that outlined the basic parameters for development in the Structure Plan area. As a result of the submissions process Option 2, Balanced Growth, was adopted for further development as the Structure Plan.

Land use development comprises a mix of lifestyle opportunities, reserves, employment opportunities and compact residential catchments around neighbourhood hubs. The neighbourhood hubs include commercial, community and service centres within walking distance from the majority of residential catchments.

The total number of new households projected in the area is 1,503 to 2021 and 1,756 to 2051. The rate of increase is assumed to be at about 100 households per year to 2021. A summary of the land use projected growth is shown in **Table 5**.

Table 5 Eastern Structure Plan Growth Projections

Area	Type	Av Density	Year 2021	Year 2051
Lynmore/Owhata	Infill	450m ²	400	50
Lynmore	Urban expansion	450m ²	700	
Gee Road	Rural Cluster	3,000m ²	200	
Rotokawa/Cookson	Rural Cluster	3,000m ²	150	150
Brunswick/Te Puea	Rural Residential	3 – 5,000m ²	50	50-100
TOTAL			1500	250 - 300

New employment opportunities are proposed to be developed to the south of the Eastgate Business Park and around the Airport – possibly to the south around Robinson Avenue. Of the 38 ha of land available the Structure Plan assumes about 130,000m² of gross floor area. This would provide employment for up to 4,000 people.

Structure Plan Road Network Parameters

The existing road network through the Structure Plan area includes Te Ngae Road (SH30) bisected by a series of local roads. The potential development of the Rotorua Eastern Arterial would alter traffic patterns in the area significantly. While the route is designated the timeframe for construction is probably 10 years away. The current option for Te Ngae Road is envisaged to be one traffic lane in each direction plus a cycle lane and car parking. Central medians would be provided to cater for the significant local access requirements.

The key to the Structure Plan area will be the ability for walking and cycling access for both internal and external trips. The Rotorua Eastern Arterial must allow for pedestrian and cyclist crossing movements for easy access to the lake front and open space areas. Accessibility must also include the adjoining walking and cycling trails.

Structure Plan Summary

The Structure Plan was developed from the ‘Balanced Growth’ option. The transport related components of the Structure Plan include:

- 1,503 new households to 2021
- 1750 new households to 2051
- 38.7 hectares of new employment land (30 ha at Eastgate and 7.2 ha at Airport South) totalling 130,000m² GFA
- Construction of the Rotorua Eastern Arterial
- Development of Te Ngae Road as a boulevard
- Provide a link between Rotokawa Road and Cookson Road
- Provide pedestrian and cyclist links along Te Ngae Road and east-west connecting Lake Rotorua and surrounding forests
- Integration with public transport via a park-and-ride facility at Te Ngae

Western Basin Structure Plan, MWH, 2008

The Western Basin Structure Plan identifies areas to accommodate population growth around Ngongotaha, Hamurana, plus a defined area of rural lifestyle.

Four basic scenarios were developed on the basis of distribution of future population, each with a similar population projection. The scenarios included:

- The status quo (development as per District Plan provisions),
- Compact distribution of population
- Mixed distribution of population
- Dispersed distribution population.

Based on the outcome of a consultation process, an evaluation matrix and infrastructure implications a preferred Structure Plan was developed from the Mixed model with components of the Compact model. Current and future trip generation and transport characteristics are described in the following sections.

Structure Plan Land Use Parameters

The preferred growth pattern comprises the expansion of Ngongotaha village towards the north to northwest. A small amount of additional residential development was identified for areas on the northern side of Hamurana Road at Hamurana. A summary of the current and future property and population data as derived from the report is shown in **Table 6**.

Table 6 Western Structure Plan Growth Projections

	Current		Future	
	Lots	Population	Lots	Population
Ngongotaha				
Residential Sites	1,575	4,250	600	1,620
Northern Extension			286	770
Dalbeth Road				
With 4,000m ² lots OR			224	604
With 450m ² lots (not included)			(1,642)	(4,435)
Medium Density around village			50	135
TOTAL			1,160	3,129
Hamurana				
Rural B Sites	316	853	39	105
Lower Slopes			277	747
Rural B by lakefront			22	59
Upper expansion of Rural B			10	27
TOTAL			348	938
General				
Rural A Sites	973		489	
Rural E Sites	195		73	

It is noted that the potential yield of the appropriate lots size for the rural living area has not been calculated as part of this study and is therefore no included in the trip generation data.

The Compact model also identifies a potential business park complex at the intersection of SH5 and SH36. At this stage the potential business park does not appear to be included in the preferred Structure Plan.

Structure Plan Road Network Parameters

The western Structure Plan report provides details of road network performance and requirements under each land use scenario. A summary of the two preferred scenarios and estimated trip generation is shown in **Table 7**.

Table 7 Preferred Scenario Traffic Growth Models

Model	Additional Lots	Vehicles – peak hour	Vehicles – per day
Mixed Model	1,970	1,647	17,730
Compact Model	1,661	1,412	14,949

A 'high level' capacity assessment was undertaken using existing mid-block traffic data and future scenarios based on the traffic growth models. The relevant information is summarised in **Table 8**.

Table 8 High Level Capacity Assessment

	2005 Base Scenario		Future Mixed Model		Future Compact Model	
	Peak Flow (1-way)	V/C ratio	Peak Flow (1-way)	V/C ratio	Peak Flow (1-way)	V/C ratio
Hamurana Rd - between Unsworth Rd and SH33	99	0.6	175	0.11	166	0.10
Hamurana Rd – between SH36 and Unsworth Rd	225	0.14	301	0.19	428	0.27
SH36 - south of Hamurana Rd intersection	450-630	0.28-0.39	730	0.46	872	0.55
SH36 – north of Hamurana Rd intersection	270-315	0.17-0.2	486	0.30	566	0.35
SH36 – north of SH36 / SH5 roundabout	630-990	0.39-0.62	1811	1.13	1767	1.10

Future road network upgrades within the Structure Plan area include:

- Ngongotaha roundabout improvements, which will add southbound capacity to the intersection during the AM peak period;
- Waitehi intersection improvements;
- Hamurana Road / SH 36 intersection improvements, which would add capacity through priority changes.

A broad assessment of the mixed model and compact model scenarios can be summarised as:

- Mixed model generates approximately 17,800 vehicles per day; 10,600 in Ngongotaha, 6,500 west of Ngongotaha (rural lifestyle) and 450 at the Kaharoa development
- Compact model generates approximately 15,000 vehicles per day; 4,400 in Hamurana and 10,600 in Ngongotaha;
- Section between Ngongotaha and the SH5 / SH36 roundabout will be over capacity;
- Opportunities to provide for public transport (ferry and bus) through the density of development at Ngongotaha; the compact model provides additional development density at Hamurana.

Public Transport, Walking and Cycling

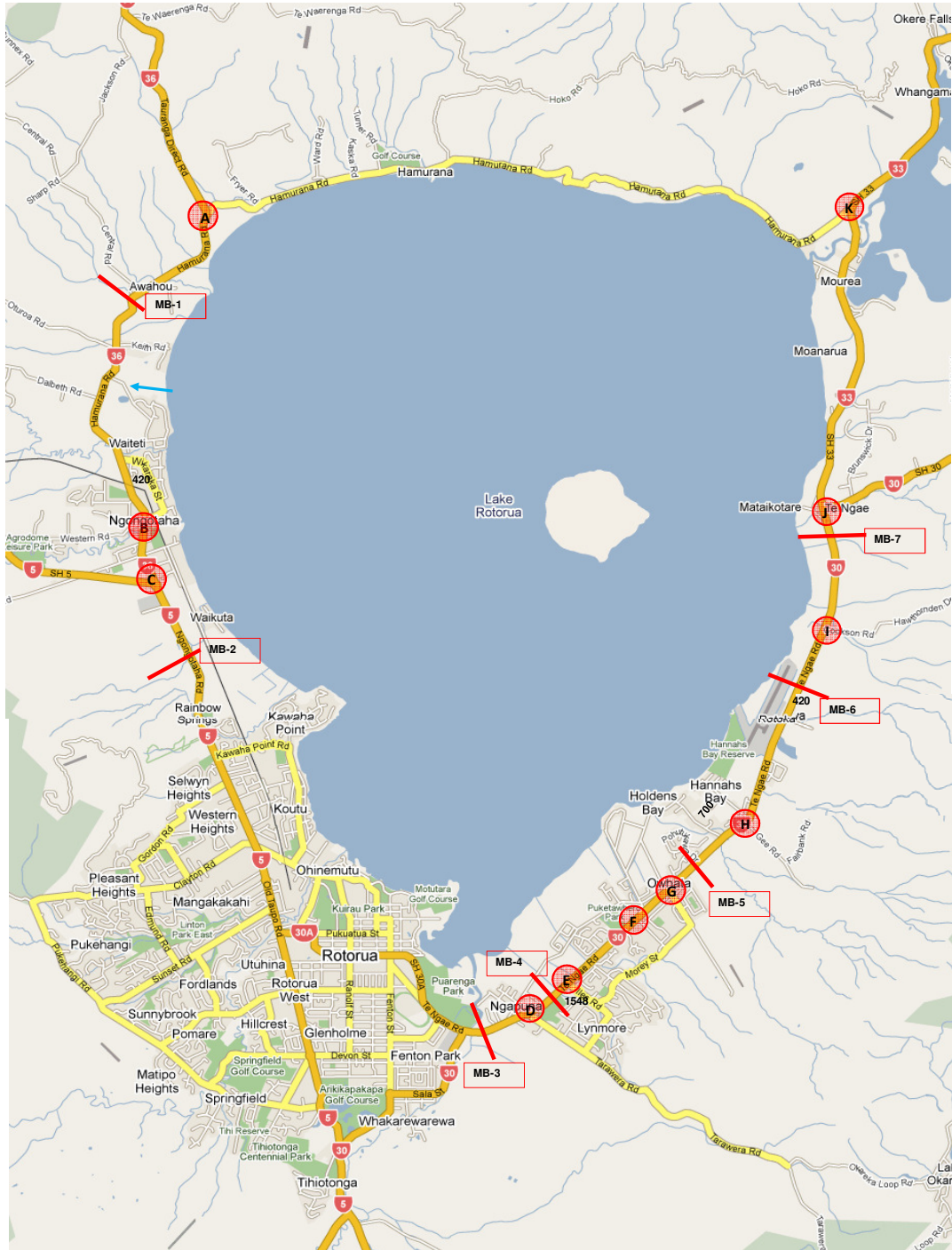
The report notes that the “consolidation of development in Ngongotaha with a small amount in Hamurana makes public transport more viable for both of these areas and needs to be further considered, especially in light of the predicted capacity deficit of SH36 through Ngongotaha” (Page 41, MWH 2008).

With regard to walking and cycling the report states that these opportunities would be facilitated through the provision of esplanade reserves alongside Lake Rotorua and streams plus walkways / cycleways through reserves. A further opportunity is the current rail link between Mamaku, through Ngongotaha to Rotorua CBD, which could be used in the future for alternative forms of transport.



Appendix B: Structure Plan Road Network

Structure Plan Road Network





Appendix C: Base Network Conditions

Performance Indicators

The Rotorua Urban Transport Study (RUTS) identifies performance indicators for the proposed road hierarchy. The indicators are based on “Level of Service” (LOS) using the Gabites Porter LOS boundaries for links and the delay parameter from the SIDRA 5 manual for intersections.

For consistency this study will use the same indicators of network performance for link volumes and intersections. RUTS states the aim of the Rotorua road network is to maintain levels of service at or above D for peak times and above C for normal traffic conditions. RUTS notes that it may not be economically viable to maintain the desired level of service for minor road approaches to signalised intersections because of the excess delay introduced to main road traffic.

Mid-block Analysis

A volume / capacity (v/c) analysis⁹ was undertaken for the mid-block locations using the AM peak as the critical peak period on the network (identified through TRACKS model using 2006 network flows). Using the desired performance indicators identified in the RUTS, which specifies LOS D or better for peak times, the desired v/c for mid block locations is 0.80 or better. Any v/c above 0.80 indicates increasing levels of congestion and unstable flows. The results are shown in **Figure 8**

Movements	Location	Through Volume		No of Lanes/Link Capacity(veh/hr)		V/C ratio	
		2008				2008	
		NB	SB	NB V/C	SB V/C		
Midblock 1	SH36 at Awahou, approximately 50m South of Central Road	300	600	1 lane each direction	1400	0.21	0.43
Midblock 2	SH5 Fairy Springs Road, approximately 500m North of Barnard Road	700	1150	1 lane each direction	1400	0.50	0.82
Midblock 3	SH30A Te Ngae Rd, approximately 200m East of Sala Street	1170	2365	2 lane each direction	2400	0.49	0.99
Midblock 4	SH30A Te Ngae Rd, approximately 200m North of Iles Street	650	1350	1 lane each direction	1400	0.46	0.96
Midblock 5	SH30A Te Ngae Rd, approximately 200m South of Robinson Avenue	550	900	1 lane each direction	1400	0.39	0.64
Midblock 6	SH30A Te Ngae Rd, approximately 300m North of Rotokawa Road	360	520	1 lane each direction	1400	0.26	0.37
Midblock 7	SH30A Te Ngae Rd, approximately 600m South of SH33	300	520	1 lane each direction	1400	0.21	0.37

Figure 7: Mid Block v/c Analysis 2006 (AM peak 1 hour period)

The analysis identifies current capacity issues at three midblock locations being:

- Fairy Springs Road south of SH5
- Te Ngae Road east of Sala Street
- Te Ngae Road north of Iles Road

The analysis indicates that peak period traffic experiences congestion leading to longer travel times and delays at these locations. The addition of further traffic to these links will result in greater levels of congestion and delay. While the analysis covers the AM peak period similar conditions are also expected to occur during the PM peak period in the opposite direction.

⁹ v/c is the volume / capacity ratio whereby a v/c > 1 identifies traffic volumes in excess of theoretical road capacity. The desired v/c for Rotorua urban areas is 0.80 or less.

Anecdotal evidence also identifies current congestion on SH36 Ngongotaha Road, north of SH5, particularly during the AM peak period. This is known to originate from levels of delay at the SH5 roundabout. A current project has identified this issue and short term solutions have been identified. Longer term solutions will be investigated as part of this report.

Intersection Analysis

Level of service (LOS) analysis¹⁰ was undertaken using aaSIDRA modelling software for the intersections using 2006 data for the AM and PM peak periods. The results are shown in 9.

Intersections	Location	LOS AM	LOS PM
Intersection A	SH36/Hamurana Road	D	F
Intersection B	SH36/Western Road	E	D
Intersection C	SH36/SH5	A	A
Intersection D	SH30(Te Ngae Rd)/Tarawera Rd	B	A
Intersection E	SH30(Te Ngae Rd)/Iles Rd	F	F
Intersection F	SH30(Te Ngae Rd)/Owhata Rd	A	A
Intersection G	SH30(Te Ngae Rd)/Wharenui Rd	F	F
Intersection H	SH30(Te Ngae Rd)/Gee Rd	D	E
Intersection I	SH30(Te Ngae Rd)/Rotokawa Rd	C	C
Intersection J	SH33/SH30	B	C
Intersection K	SH33/Hamurana Road	A	B
Intersection L	SH30(Te Ngae Rd)/Lee Rd	F	F

Figure 8: Intersection analysis 2006 (AM and PM peak 1 hour periods)

The analysis indicated level of service issues at the following intersections for the 2006 base year:

- SH36 Hamurana Road / SH36 Tauranga Direct Road / Hamurana Road (Priority): LOS F during PM peak
- SH36 Ngongotaha Road / Western Road (Priority): LOS E during AM peak
- SH30 (Te Ngae Road) / Iles Road (Priority): LOS F during AM and PM peak periods
- SH30 (Te Ngae Road) / Wharenui Road (Priority): LOS F during AM and PM peak periods
- SH30 (Te Ngae Road) / Gee Road (Priority): LOS E during PM peak
- SH30 (Te Ngae Road) / Lee Road (Priority): LOS F during AM and PM peak periods

While other intersections appear to operate satisfactory further analysis of other performance indicators such as queuing identified potential issues at the following locations:

- SH36 Ngongotaha Road / SH 5 (Roundabout): Queuing at the northern approach during the AM peak period
- SH30 (Te Ngae Road) / Tarawera Road (Roundabout): Queuing at the Tarawera Road approach during the AM peak period

¹⁰ Level of Service (LOS) for intersections range from LOS A (good operation) to LOS F (oversaturated conditions and excessive delay). LOS C/D are standard design conditions supported by RUTS.

Road Safety

Crash Data (CAS 2009) for the previous full 5 year period (2004 – 2008) is specified for the critical intersections in as shown below.

SH5 / SH36 (Ngongotaha Road)

Year	Fatal	Serious	Minor	N-I
2004	0	0	0	3
2005	0	0	0	5
2006	0	0	1	1
2007	0	0	1	1
2008	0	0	0	3
Total	0	0	2	13

SH36 (Ngongotaha Road) / Western Road

Year	Fatal	Serious	Minor	N-I
2004	0	0	1	1
2005	0	0	0	0
2006	0	0	0	1
2007	0	0	0	1
2008	0	0	1	1
Total	0	0	2	4

SH36 (Hamurana Road) / SH36 (Tauranga Direct Road) / Hamurana Road

Year	Fatal	Serious	Minor	N-I
2004	0	0	0	0
2005	0	0	0	2
2006	0	0	0	1
2007	0	0	0	0
2008	0	0	1	0
Total	0	0	1	3

SH33 / Hamurana Road

Year	Fatal	Serious	Minor	N-I
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	1
2007	0	0	0	0
2008	0	0	0	0
Total	0	0	0	1

SH33 / SH30 (Te Ngae Road) / SH30

Year	Fatal	Serious	Minor	N-I
2004	0	0	0	2
2005	0	1	1	0
2006	0	0	0	0
2007	0	0	1	1
2008	0	1	0	0
Total	0	2	2	3

SH30 (Te Ngae Road) / Owhata Road

Year	Fatal	Serious	Minor	N-I
2004	0	0	0	2
2005	0	0	0	7
2006	0	0	1	6
2007	0	0	1	5
2008	0	0	0	2
Total	0	0	2	22

SH30 (Te Ngae Road) / Tarawera Road

Year	Fatal	Serious	Minor	N-I
2004	0	1	1	9
2005	0	0	0	16
2006	0	0	1	6
2007	0	0	2	8
2008	0	0	0	13
Total	0	1	4	52

Source: CAS Data 2009

The crash data shows that no fatal crashes occurred over the last 5 year period. The intersection of SH30 / Tarawera Road had the highest recorded crash rate by a significant level with a total of 57 crashes, one of which resulted in a serious injury and 4 in a minor injury. The intersection of SH30 and Owhata Road had a total of 24 recorded crashes, 22 of which were non-injuries and 2 minor injury crashes. The intersection of SH5 and SH36 had a total of 15 recorded crashes, 13 of which were non-injuries and 2 minor injuries.

At the SH30 / Tarawera Road intersection, 37 crashes occurred at the Tarawera Road approach and 17 crashes occurred at the SH30 south approach. Of the Tarawera Road crashes over 50% resulted from crossing/turning movements and over 25% resulted from rear end/obstructions. Of the SH30 south approach crashes over 50% resulted from rear end/obstructions and about 25% resulted from crossing/turning movements.

At the SH30 / Owhata Road intersection, 18 crashes occurred at the Owhata Road approach to SH30. The remaining 6 crashes occurred on SH30 at a greater distance from the intersection. Of the 18 crashes over 75% resulted from rear end/obstructions.



Appendix D: Structure Plan Development Yields (GA08)

Hamurana Land Use Yields

	2009	2021		2051	
	Households	Additional	Total	Additional	Total
Hamurana (Growth Assumption 2008)	520	150	670	360	1,030
Lakeside Settlement	80	24	104		104
Fryer Road extension	10	22	32		32
Mid slope	223		223	223	446
Lower slopes	81		81	127	208
Lake edge	11	20	31		31
Waiteti Stream	1	100	101	100	201
Rahui Road	9			128	137

Ngongotaha Land Use Yields

	2009	2021		2051	
	Households	Additional	Total	Additional	Total
Ngongotaha (Growth Assumption 2008)	1,545	90	1,635	240	1,875
Infill of current Residential extent	1,372	33	1,405	83	1,488
Infill of current Rural Residential (assuming 6000m ² average)	58	16	74	41	115
Medium density node around the town centre	10		10	84	94
Northern extension	2		2	101	102
Western extension	3		3	190	193

Rural Land Use Yields

	2009	2021		2051	
	Households	Additional	Total	Additional	Total
Rural (Growth Assumption 2008)	2,621	180	2,801	240	3,041
Infill		36		91	
Pukehangi Road (K)	5	39	44		44

Rotorua Eastern Suburbs Land Use Yields

	2009	2021		2051	
	Households	Additional	Total	Additional	Total
Eastern (Growth Assumption 2008)	3,646	1,725	5,371	210	5,581
Infill of current Residential	3,167	64	3,231	160	3,391
Gee Road Residential Lifestyle	19	207	226		226
Wharenui Road Residential	4	225	229		229
East Wharenui Road – Medium density	1	218	219	100	319
Wharenui Road Residential Lifestyle	4	312	316		316
Wharenui Residential (between Coulter and Gee Roads)	1	443	443		443
Wharenui residential development		206	206		

Rotokawa Land Use Yields

	2009	2021		2051	
	Households	Additional	Total	Additional	Total
Rotokawa (Growth Assumption 2008)	490	75	565	90	654
Brunswick	248	75	248	27	248
Rural Enhancement	17		17	63	80

Northern Land Use Yields

	2009	2021		2051	
	Lots	Additional	Total	Additional	Total
Northern (Growth Assumption 2008)	479	225	704	330	1,034
Rural Infill	759	20	779	50	829
Rural Enhancement (Awahou Stream)	72	71	143	179	322
Rural Enhancement (Kaharoa)	7		7	17	24
Rural Enhancement (Waiteti Stream)	24	73	97		97



Appendix E: Future Traffic Conditions

Mid Block Analysis

The results of the mid block analysis for the full Structure Plan development are shown in **Figure 9** for the PM peak analysis the AM peak link volumes were reversed as the AM period was identified using the TRACKS model as the critical peak.

Movements	Location	No of Lanes/Link Capacity(veh/hr)		V/C ratio AM Peak	
				100% Dev	
				NB V/C	SB V/C
Midblock 1	SH36 at Awahou, approximately 50m South of Central Road	1 lane each direction	1400	0.39	0.82
Midblock 2	SH5 Fairy Springs Road, approximately 500m North of Barnard Road	1 lane each direction	1400	0.75	1.00
Midblock 3	SH30A Te Ngae Rd, approximately 200m East of Sala Street	2 lane each direction	2400	0.31	0.83
Midblock 4	SH30A Te Ngae Rd, approximately 200m North of Iles Street	1 lane each direction	1400	0.40	0.90
Midblock 5	SH30A Te Ngae Rd, approximately 200m South of Robinson Avenue	1 lane each direction	1400	0.70	0.36
Midblock 6	SH30A Te Ngae Rd, approximately 300m North of Rotokawa Road	1 lane each direction	1400	0.54	0.48
Midblock 7	SH30A Te Ngae Rd, approximately 600m South of SH33	1 lane each direction	1400	0.29	0.44

Figure 9: Mid Block Analysis 2051

Note: NB = Northbound; SB = Southbound

Mid-block section 1, 3 and 4 are not considered to warrant infrastructure interventions. The intervention recommended for SH5 Ngongotaha Road is to complete the four lane section through the SH36. This reduces the v/c ratio from 1.00 to 0.58.

Mid Block Analysis for Staging

A staging analysis was undertaken to determine the threshold development potential for mid block capacity upgrades. **Figure 10** shows that the recommended four laning of SH5 Ngongotaha Road is only gradually affected by development traffic. The recommended timing for the upgrade is between 60 – 80% of full development.

Movement	Location	V/C ratio AM Peak											
		No Development		20% Dev		40% Dev		60% Dev		80% Dev		100% Dev	
		NB V/C	SB V/C	NB V/C	SB V/C	NB V/C	SB V/C	NB V/C	SB V/C	NB V/C	SB V/C	NB V/C	SB V/C
Midblock 1	SH36 at Awahou, approximately 50m South of Central Road	0.21	0.43	0.25	0.51	0.29	0.59	0.32	0.66	0.36	0.74	0.39	0.82
Midblock 2	SH5 Fairy Springs Road, approximately 500m North of Barnard Road	0.50	0.82	0.55	0.86	0.60	0.89	0.65	0.93	0.70	0.96	0.75	1.00
Midblock 3	SH30A Te Ngae Rd, approximately 200m East of Sala Street	0.24	0.49	0.26	0.56	0.27	0.63	0.28	0.69	0.29	0.76	0.31	0.83
Midblock 4	SH30A Te Ngae Rd, approximately 200m North of Iles Street	0.26	0.54	0.29	0.61	0.32	0.68	0.35	0.75	0.37	0.83	0.40	0.90
Midblock 5	SH30A Te Ngae Rd, approximately 200m South of Robinson Avenue	0.13	0.21	0.24	0.24	0.36	0.27	0.47	0.30	0.59	0.33	0.70	0.36
Midblock 6	SH30A Te Ngae Rd, approximately 300m North of Rotokawa Road	0.26	0.37	0.31	0.39	0.37	0.41	0.43	0.44	0.49	0.46	0.54	0.48
Midblock 7	SH30A Te Ngae Rd, approximately 600m South of SH33	0.21	0.37	0.23	0.39	0.24	0.40	0.26	0.41	0.27	0.43	0.29	0.44

Figure 10: Mid Block Analysis for Staging

Intersection Analysis

The intersection analysis for the 2051 – full development scenario and with recommended interventions is shown in **Figure 11**.

Intersection	Location	LOS AM 100% Dev	LOS AM Mitigation	LOS PM 100% Dev	LOS PM Mitigation	Intervention
Intersection A	SH36/Hamurana Road	F	B	F	B	Roundabout
Intersection B	SH36/Western Road	F	C	F	C	Signals
Intersection C	SH36/SH5	C	–	B	–	n/a
Intersection D	SH30(Te Ngae Rd)/Tarawera Rd	A	–	A	–	n/a
Intersection E	SH30(Te Ngae Rd)/Iles Rd	E	C	E	C	Signals
Intersection F	SH30(Te Ngae Rd)/Owhata Rd	A	–	B	–	n/a
Intersection G	SH30(Te Ngae Rd)/Wharenui Rd	F	C	F	C	Signals
Intersection H	SH30(Te Ngae Rd)/Gee Rd	B	–	B	–	n/a
Intersection I	SH30(Te Ngae Rd)/Rotokawa Rd	D	–	F	–	n/a
Intersection J	SH33/SH30	C	–	C	–	n/a
Intersection K	SH33/Hamurana Road	A	–	B	–	n/a
Intersection L	SH30(Te Ngae Rd)/Lee Rd	C	–	D	–	n/a

Figure 11: Intersection Analysis 2051 – Full Development and With Intervention

The interventions are taken from those analysed and recommended in the body of the report.



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