Post Implementation Review

Welcome Bay Road (5.90-7.92)

Western Bay of Plenty District Council

August 2014

The purpose of NZ Transport Agency Post Implementation Reviews are to:

- assess how well a project (or package) has delivered its expected benefits
- explain any variation between actual results and expected benefits and costs
- identify any lessons learned that can be used to improve future projects

Executive summary

Project description

This project made improvements to a section of Welcome Bay Road in the Bay of Plenty as part of a long-term overall route improvement strategy. Features included road reconstruction, curve realignments, seal widening and safety improvements designed to improve travel conditions for existing and future traffic volumes.

Summary assessment of project outcomes

This Post Implementation Review found the project did not achieve forecast travel time reductions or anticipated vehicle operating cost savings. These and other project outcomes are listed below and discussed in more detail in *Section 1: Project Benefits* of this report:

- Savings on vehicle operating costs and emissions were achieved, but were lower than forecast due to only phase 1 of the project being completed, and due to lower than anticipated traffic growth.
- Travel time savings were not achieved, mainly due to post-implementation reductions in speed limits, subsequently requested by the community.
- Increased road-seal widths, improvements in forward visibility and reductions in speed limits (post-implementation), have all been beneficial for walking and cycling.
- A post implementation reduction in the number of road crashes has been recorded, although this is over a relatively short period and is not large enough to be statistically significant.

Project delivery and cost

This project was meant to be delivered in two phases. Phase 1 was completed as planned within seven months, for a cost precisely the same as the estimated total cost for both phases, namely: $1,785,904. This means that the outturn costs for the full project will be substantially higher than originally anticipated.

Phase 2 of the project has been delayed for several years and it is not known when any further progress to obtain the required land and consents will be made. Furthermore, there is no NZ Transport Agency budget remaining from the originally approved total for phase 2 of the project.

Lessons learned

Lessons with relevance for other future projects are listed below and discussed in more detail in *Section 4: Lessons Learned* of this report:

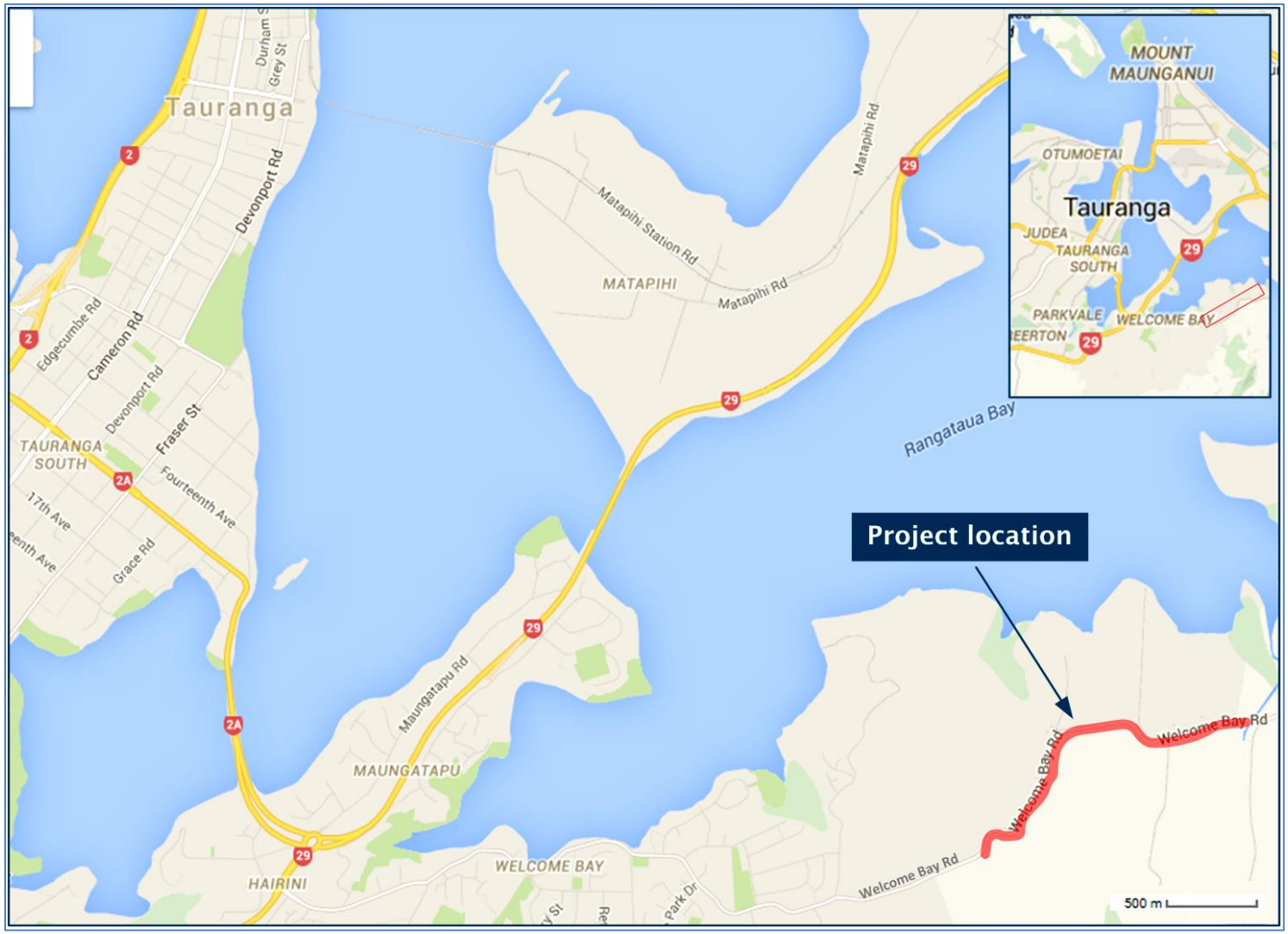
- A number of key problems could have been anticipated and addressed in advance with more realistic planning.
- Use of the sub-regional model would have improved forecasting accuracy.
- Methodology improvements are needed for a more robust assessment of future projects.
- Outturn costs for project phases and any associated outstanding works need to be explicitly stated and recorded in Transport Investment Online.
- Cost estimates need to be realistic and any increases clearly accounted for.
- Post-implementation monitoring is required to determine whether predicted benefits have been achieved.

Recommendations

This review recommends that:

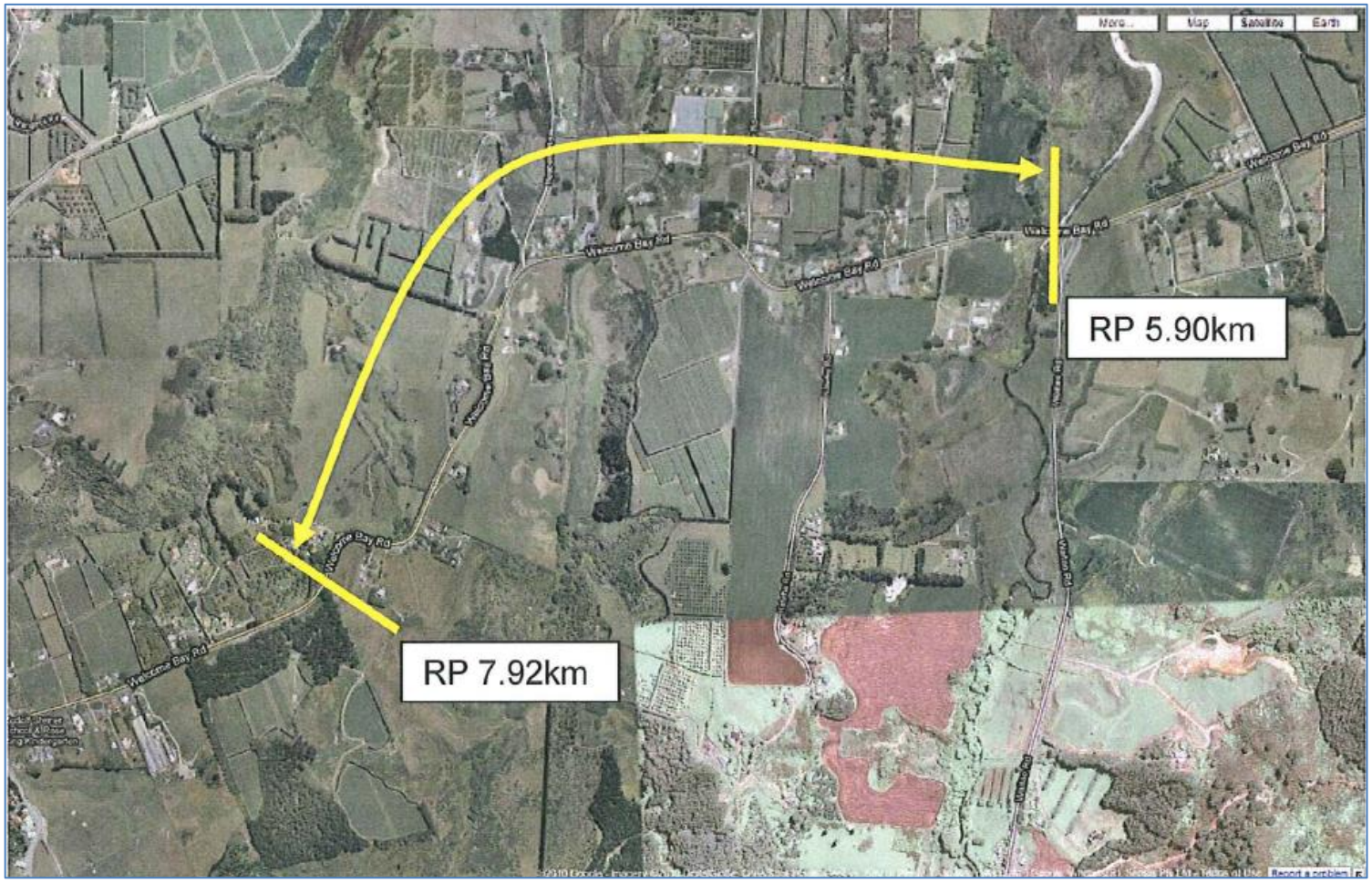
- Western Bay of Plenty District Council review their assessment processes to ensure future business cases are based on robust and realistic assumptions.
- Should Western Bay of Plenty District Council seek to vary the scope of a project in the future, the Transport Agency must be advised and the financial impact clearly documented.

Figure 1: Welcome Bay Road (5.90–7.92) improvements project – location



Map data © 2015 Google

Figure 2: Welcome Bay Road extent of project work



Map data © 2015 Google

1. Project benefits

Introduction

The Welcome Bay Road project is a single carriageway road improvement. For most of its length, the centreline of Welcome Bay Road acts as the district boundary between Tauranga City and Western Bay of Plenty. However, by agreement, the road is managed and administered by Western Bay of Plenty District Council.

The project reference points (5.90–7.92) indicate the project start and end distances measured in kilometres from the intersection with State Highway 2 (SH2) at the eastern end of Welcome Bay Road.

Phase 1 of the project completed to date is a 1.6 km on-line (ie within the road reserve) improvement between the western S-bend and the Waitao Stream Bridge at the eastern end of the project. The works undertaken in phase 1 included corner easing, increased seal width and better surfacing.

Phase 2 involved the realignment of the difficult S-bend over 0.4km at the western end of the project, intended to reduce travel times and improve safety. The funding application indicated phase 2 would not be progressed for some time, due to property acquisition procedures in the Maori Land Court.

Figure 1 on page 4 shows the project location, while figure 2 on page 5 shows the extent of both phases of the project works.

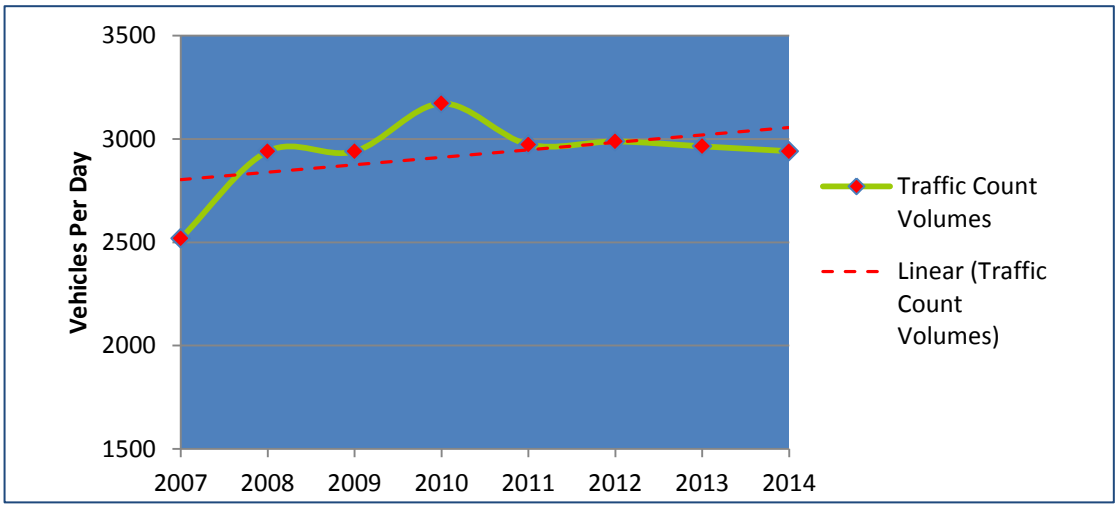
The project sought to improve travelling conditions for the increased traffic flows expected to use the route in the future and to facilitate safer cycling.

The primary benefits of the project, as forecast in the economic evaluation, were: vehicle operating costs and emissions 38%, crash reduction 32 % and travel time savings 30 %.

Accuracy of forecasts

Comparison data shows that observed traffic volumes on the eastern phase 1 section of Welcome Bay Road have grown by an average of 2.2% p.a. between 2007 and 2014 as shown in figure 3 below.

Figure 3: Welcome Bay Road traffic volume counts



On the western (phase 2) section of Welcome Bay Road the observed annual growth rate between 2002 and 2014 is 2.7%.

These rates are both lower than the projected 4.4% annual traffic growth in the project evaluation.

The observed growth rates are generally consistent with the Western Bay of Plenty 'default' 2.5% annual growth rate (2010 Economic Evaluation Manual, Table A2.5) applicable at the time.

Longer term growth forecasts from the Tauranga Traffic Models along Welcome Bay Road include:

- 2001 Western Bay Road Strategy Report indicates 1.9% per annum (p.a.) growth between 2011 and 2026.
- Recent (2014) strategic modelling output[1] forecasts a growth rate of 1.0% p.a. between 2011 and 2031.

Travel times

The design improvements introduced in phase 1 of the project probably reduced travel times to some extent in the first year after opening (2012), although no pre- or post-implementation monitoring surveys are available to confirm this. The subsequent reductions in speed limits in 2013 are likely to have increased travel times through the project area, but again no monitoring data is available to verify this.

The intention of the 2001 Western Bay Road Strategy was to develop a consistent minimum driving environment of at least 70km/h. However, although the project increased speeds on bends, the actual design speeds vary down to 55km/h (Road Safety Audit Report, 2011).

Moving observer travel time surveys were undertaken as part of this review. Over the length of phase 1 (1.6km), observed average speeds were approximately 57km/h. Phase 2 (and as yet unimproved) 0.4km section was observed to operate at an average speed of approximately 50km/h.

The stated 65km/h average pre-implementation travel speed was not based on surveys, or modelled, and appears to have been assumed. Similarly, stated average post-implementation speed of 70km/h has also been assumed.

The reason given for lack of pre- or post-implementation travel time surveys was stated by the Council (during this review) to have been due to the cost of undertaking them. However, surveys could have been undertaken using simple and cost-effective moving observer techniques, especially as the route is rural in nature, and is not subject to significant variation in travel time during different time periods. It should also be noted that the cost of surveys is very small in comparison to the overall project cost. An alternative, but less satisfactory, approach to undertaking surveys would have been to calculate/or model travel times using 'before and after' design criteria. However, neither of these techniques was employed as part of the project evaluation.

Vehicle operating costs/emissions

Some vehicle operating cost savings were achieved as a result of road surfacing improvements, but these were much lower than forecast. This was partly due to only phase 1 of the project being completed, and partly because of the overestimation of traffic growth.

It should be noted that in this case, the difference between pre- and post-implementation traffic speeds is not a major factor in determining vehicle operating costs.

[1] Supplied by Western Bay of Plenty District Council for review purposes

Walking and cycling

Pedestrian movements are generally low, although there are some activities associated with a Marae and nearby housing.

Cycling is mainly touring or recreational in nature.

No pedestrian or cyclist usage data was available for the purpose of this review.

The increase in road-seal widths, improvements in forward visibility and post implementation reductions in speed limits were beneficial for pedestrians and cyclists by making it easier for drivers to see, and thereby to more safely avoid, vulnerable road users.

Safety

An examination of the Crash Analysis System database in terms of total recorded crashes indicates the project area experienced a reduction in annual crash rate of 37 percent (see figure 4 below). Over the same period, the region-wide crash rate fell by 17 percent. However, the reduction in crashes in the project area is not large enough to be statistically significant.

Figure 4: Record of Crashes

		Total Recorded Crashes		
	Before Period (June 2006 to May 2011)	**Between Period (June 2011 to Dec 2011)**	**Actual after period (Jan 2012 to Jan 2015)**	**Change (before vs after)**
	5 years	*7 months*	*3 years 1 months*	
Project Area (crash totals)	23	6	9	
Project Area (crash type)	0 fatal, 1 serious, 7 minor, 15 non-injury	1 fatal, 0 serious, 1 minor, 4 non-injury	0 fatal, 0 serious, 2 minor, 7 non-injury	
Project Area (crashes p.a.)	4.6	10.3	2.9	-37%
Region (crashes p.a.)	385	401	318	-17%

Six crashes occurred during the construction period, with a single crash involving a double fatality, three serious injuries and one minor injury. The fatal crash was caused by excessive speed in combination with alcohol impairment. Alcohol was a suspected factor in four crashes; excessive speed was a factor in four crashes and loss of control in two crashes.

Given the relatively short post-implementation period reviewed, the lack of statistical significance and the poor safety record during the construction period, it is not possible to be definitive on the overall safety impact of the project. As safety was one of the core benefits of this project, we will complete a follow up review five years after opening to measure the impact more accurately.

Cost Benefit Analysis

As part of the review a re-estimation of the forecast benefit cost ratio (BCR) was undertaken and this indicated the BCR reduced from 4.0 to 1.9.

The main reasons for this reduction were traffic levels being lower than forecast and the absence of travel time savings. Considering that only phase 1 has been completed, actual cost would have been much higher if both phases of the project had been completed.

2. Project implementation (scope, cost, and timeframe)

Project scope

The Welcome Bay Road project is a single carriageway road improvement including:

- carriageway reconstruction
- increased road-seal width to provide two 3.5 metre lanes and a 1 metre shoulder on either side
- curve realignments
- junction improvements to improve turning facilities
- installation of guard rail at some locations
- sight distance improvements requiring substantial retaining structures, and
- signage upgrades.

Welcome Bay Road needs to be considered in the context of the wider transportation network and associated future demands. Relevant to these considerations are relationships between Welcome Bay Road and other routes within the eastern corridor, especially the Tauranga Eastern Link (TEL) and the existing SH2 route. Wider issues affecting future traffic demand on Welcome Bay Road also include the potential effect of TEL tolling and effects associated with the post-revocation treatment of SH2 which will be replaced by the TEL. There have also been other improvement projects completed on separate sections of Welcome Bay Road.[2]

Phase1 of the project completed to date is for a 1.6km section between the Ngapeke Hill S-bend at the western end of the project location and the Waitao Stream Bridge at the eastern end. Phase 1 was progressed ahead of phase 2 as no land was required, and there was a need for carriageway reconstruction due to deteriorating pavement condition.

Phase 2 was to realign the S-bend, which required a property acquisition process through the Maori Land Court. The funding application for this project referred to the fact that a 0.4km section at the western end (phase 2) would not be progressed for some time due to land acquisition problems. At the time of the review, phase 2 of the project was no longer being actively progressed due to difficulties in identifying the trustees responsible for the required land. The properties in question are in two districts (Tauranga City and Western Bay of Plenty), are associated with treaty settlements. Western Bay of Plenty District Council had advised they intend to pursue the property acquisition to complete the project.

In the post-implementation period, the speed regime has changed significantly from that envisaged at the time of project evaluation and implementation. In particular, 80km/h limit sections were changed to 60km/h limit, and the remaining sections of the project changed from a derestricted 100km/h to 80km/h. The speed limit changes occurred in 2013. The reason for the changes was community pressure due to the perception of increased vehicle speed following project completion and Western Bay of Plenty District Council's acceptance of the community's concerns.

Longer term Western Bay of Plenty District Council aspirations for Welcome Bay Road include full implementation of the Welcome Bay Road Strategy. This considered the implications of developing a consistent driving environment along the remainder of the 9km route between the District Boundary in the west and the intersection with SH2 in the east.

[2] In 2003, a 1.56km section of SH2 to Reid Road/RP 0.44-2.00km, and in 2013, a 0.83km section of Rocky Cutting Road/RP 3.24-4.07km.

Project cost and timeframe

Phase 1 of the project was delivered at a cost of $1.79m, precisely the same as the total estimated cost in the funding application for both phases of the project. This means that (should phase 2 proceed) the outturn costs for the full project will be substantially higher than originally anticipated.

There is no specific reference to project phasing in Transport Investment Online (TIO) and the costs and economic benefits were described for the whole 2km project (ie for both phases).

The costs claimed to date are for the 1.6km reconstruction section only. The costs for this section were stated by Western Bay of Plenty District Council to be higher than initially anticipated in the funding estimate for the following reasons:

- Service relocation quotes were significantly higher than originally anticipated in the funding estimate.
- A large tied-back timber retaining wall was required to minimise impact on a private property. This cost was not identified in the funding estimate.
- A gabion wall not identified in the design was required to stabilise the toe of a relic slip threatening the road.
- There were minor changes to quantities identified in the design stage.

Cost information relating to the scale of these items and the cost element of the S-bend were requested but were not provided.

The timeframe for project implementation was over the period June to December 2011.

Figure 5: Budgeted and actual cost comparison

Description of cost	Date	Project cost
Project cost estimate (phase 1 plus phase 2) when funding approved	January 2011	$1,785,904
Actual cost of phase 1 (only) of the project	December 2011	$1,785,904
Timing/Cost of phase 2 and variance (over budget)	Uncertain	Unknown

3. Good practice identified

Good practice aspects identified include:

- The project was undertaken as part of a planned strategy. The 2001 Welcome Bay Road Strategy is well structured, although it remains in draft form, is in need of updating and adjusting in the light of changed circumstances.
- Traffic counts and photographic records along Welcome Bay Road have been comprehensively collected.
- Post-implementation community safety concerns were addressed responsively, through the reduction of speed limits.
- The Council coordinated the need for pavement renewal with roading improvements.

4. Lessons learned

The post implementation review identified some lessons with relevance for other future projects.

Realistic planning

A number of key problems could have been anticipated and addressed in advance with more realistic planning.

These include:

- Extensive delays relating to land and property acquisition and other aspects affecting the ability to deliver phase 2 of the project within the originally envisaged timeframe
- prediction of community concerns regarding increased speeds as a result of the project
- the need for design changes and cost increases during the course of project implementation.

Accuracy of forecasting techniques

Observed growth rates, including some post implementation data indicate annual traffic growth rates on Welcome Bay Road between 2.2% and 2.7% p.a.

The projected growth rate used in the project evaluation was 4.4% p.a.

The model results, reported in the 2001 Welcome Bay Road Strategy indicated an expected growth rate of 1.9% p.a. over the period 2011 to 2026.

On the basis of more recent modelling supplied by Western Bay of Plenty District Council for this review, accounting for the TEL and associated tolling, a long term growth rate of 1% p.a. over the period 2011-2031 is now forecast.

Assessment methodology

Methodology improvements are needed for a more robust assessment of future projects.

This post implementation review has identified a number of issues with this project which indicate that inadequate procedures have been used, including:

- assumed 'before speeds' of 65km/h and assumed 'after speeds' of 70 km/h giving a speed difference of exactly 5km/h. Observed speeds post implementation speeds

were found to be well below these assumed speeds. It is important that existing speeds are measured where possible and otherwise calculated or modelled to ensure that an appropriate quality of analysis and forecasting is maintained.

- traffic growth assumptions used have proven (from post-implementation observations) to be optimistic and unrealistically high.
- forecast benefit cost ratio for the project was exactly 4.0 (and identical to two other Welcome Bay Road projects) indicating evaluations are aimed at reaching a perceived funding threshold, rather than being more accurately calculated.

It is recognised that these are not isolated examples of approximate road planning practice, and clearly the techniques used need to be proportionate to the scale of the project. However, on this project the simplistic use of assumptions is not satisfactory.

Proper recording in Transport Investment Online (TIO)

Outturn costs for project phases and any outstanding works need to be explicitly stated and recorded in TIO.

It appears that at some point the project changed from a single-phase to a two-phase project but this was not clearly recorded, scheduled or explained in TIO.

Realistic cost estimate

Cost estimates need to be realistic and any increases clearly accounted for.

The outturn cost for phase 1of the project was precisely that of the estimated cost in the evaluation and funding application for the full project. This was despite having a very significant element, namely the entirety of phase 2, removed from the scope of works.

This approach lacks accountability, and it means that the outturn costs for the full project will be substantially higher than originally anticipated.

Monitoring of benefits

Post-implementation monitoring is required to determine whether predicted benefits have been achieved.

We were disappointed that, apart from traffic counts, the Council has not undertaken any post implementation monitoring for this project. The NZ Transport Agency expects approved organisations to monitor the impacts of their investments, as documented in the Planning & Investment Knowledge Base:

"The NZ Transport Agency (Planning & Investment) expects that Approved Organisations and the NZ Transport Agency (State Highways) will monitor the impacts of their land transport investments. This is good business practice and an important part of the delivery of any project".[3]

Greater value would have been obtained from this review if project related monitoring data had been available, for example with respect to changes in: traffic volumes, travel time reductions and changes in pedestrian/cyclist usage. It is very difficult to determine project performance without appropriate post implementation project related monitoring data.

[3] Planning and Investment Knowledge Base: Benefits Realisation

Recommendations

This review recommends that:

- Western Bay of Plenty District Council review and improve their assessment processes to ensure future business cases are based on robust and realistic assumptions.
- Should Western Bay of Plenty District Council seek to vary the scope of a project in the future, the Transport Agency must be advised and the financial impact clearly documented.

5. Western Bay of Plenty District Council's response to findings

Western Bay of Plenty District Council was provided a draft of this report and specific comments were received from the Transportation Infrastructure Manager. Amendments were made to the report where relevant.

6. Before and after photos

Below are photographic records of portions of the improved section, as provided by WBoP for this review. The photos on the left are 'before' photos, with corresponding 'after' photos on the right.

- Example of improved carriageway with widened shoulder

- Example of installation of guard rail at some locations

- Example of improved curve realignment