Post Implementation Review

SH20 Manukau Harbour Crossing

Auckland Highways and Network Operations

December 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

The SH20 Manukau Harbour Crossing project consisted of motorway widening and bridge duplication over Manukau Harbour. This project is part of a wider strategy to develop a continuous alternative western motorway route between SH1 and SH16.

Figure 1 on page 3 shows the extent of project works.

Summary assessment of project outcomes

This Post Implementation Review (PIR) found the project significantly reduced travel times. This and other project outcomes are summarised below and discussed in more detail in *Section 1: Project Benefits* of this report.

- Travel times on the section of SH20 directly affected by the project reduced by 37 percent despite daily traffic volumes increasing by 14 percent over the same period. The project therefore achieved improvements in operational conditions.
- It is likely that congestion has reduced and that travel time reliability has improved on the section of SH20 widened by the project, but no specific evidence to confirm this was available.
- Crash rates for the project area were marginally lower in the post implementation period than expected.

Project delivery and cost

The final cost of the project was $218 million, which was 19 percent less than the $268 million estimate at the time of funding approval.

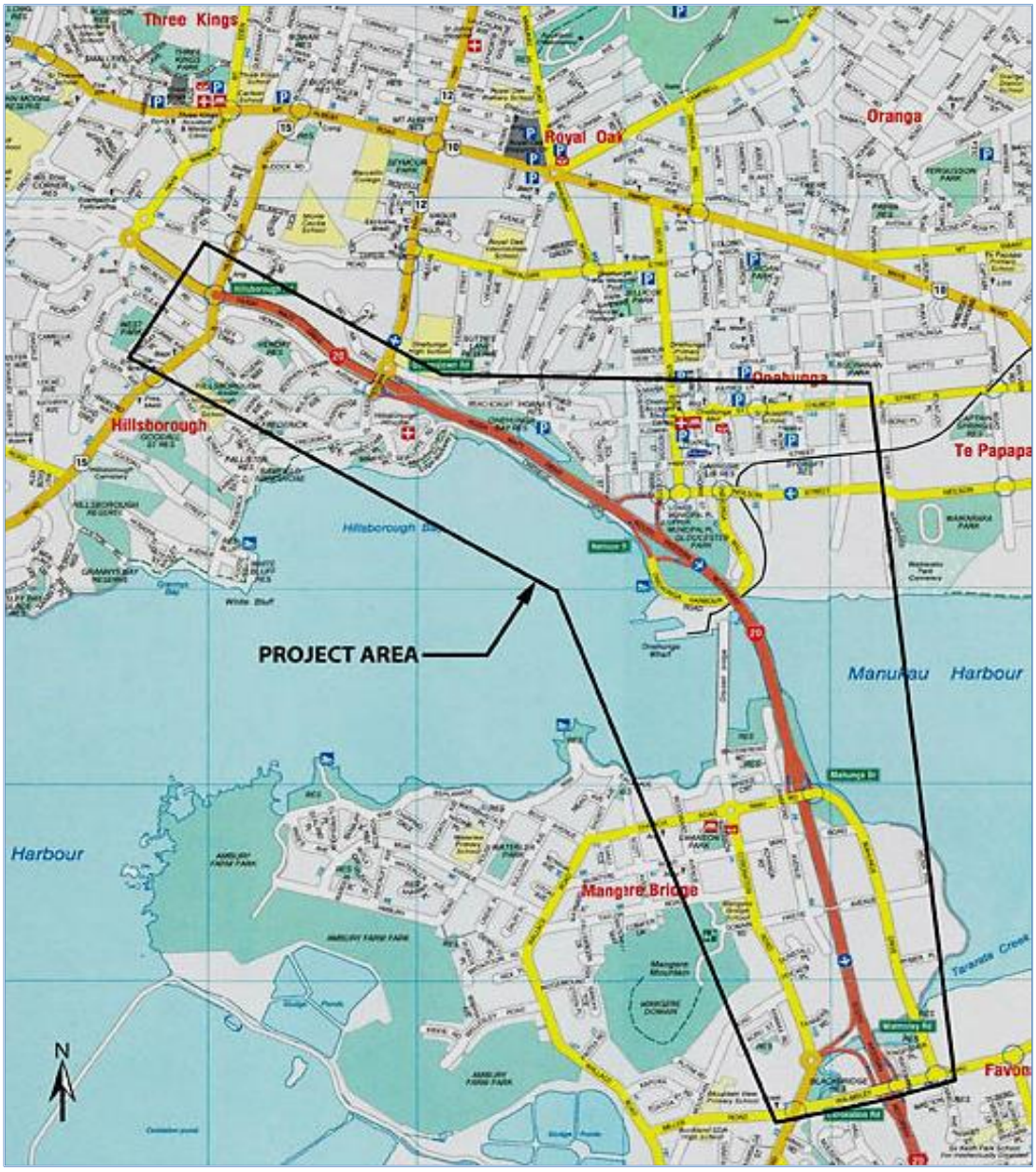
The timeframe for project implementation was June 2008 to August 2010. The project was completed seven months ahead of the originally estimated completion date.

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:

- Post implementation monitoring indicates that forecast SH20 traffic demand did not materialise and that more accurate forecasting methods are needed.
- Improvements in project specific post implementation monitoring and associated reporting for major projects are needed.
- Final cost was less than estimate mainly due to the Alliance procurement method and the incentivisation of early completion.

Figure 1: Manukau Harbour Crossing project area



Sourced from Manukau Harbour Crossing project files

Figure 2: Network plan

Sourced from Manukau Harbour Crossing project files

1. Project benefits

Project description

The SH20 Manukau Harbour Crossing project consisted of motorway widening and bridge duplication over Manukau Harbour. The 4.7 km project is located between Queenstown Road and Walmsley Road interchanges.

The scope of the Manukau Harbour Crossing works included:

- Widening of SH20 between Queenstown Road and Walmsley Road interchanges from four to six lanes
- Duplication of the Manukau Harbour Bridge to provide eight lanes plus 2 bus priority shoulders.
- Associated merge, diverge and local road crossings and grade separated junction improvements with Queenstown Road, Neilson Street, Rimu Road and Walmsley Road
- Ramp metering on accesses with priority bypass lanes for bus, T2 vehicles and trucks at selected points
- Replacement of existing footbridges
- Provision of off road footpaths and cyclepaths on the old Mangere Bridge parallel to the motorway
- Provision of local road crossings at Walmsley Road, Rimu Road, Onehunga Harbour Road and Queenstown Road
- Provision of dedicated pedestrian and cycling crossing facilities at Hastie Avenue, Onehunga Mall and Beachcroft Avenue across the motorway

The project is part of an overall package of measures to develop a continuous alternative western motorway route between SH1 and SH16.

Other major projects closely associated with the Manukau Harbour Crossing project include:

- The Mount Roskill Extension project (completed 2009) and PIR completed in 2014,
- The Manukau Extension project connecting with SH1 (completed 2010) and PIR scheduled for 2015, and
- The Waterview Connection project (estimated completion in 2017).

The construction period for the Manukau Harbour Crossing project partly overlapped with construction of the adjacent Mount Roskill project and with the Manukau Extension project.

The overall network is shown in Figure 2 on page 4.

The Manukau Harbour Crossing project created additional capacity in a (formerly) constrained and congested section of the strategic road network. The expected benefits from the project included: improved SH20 travel times, reduced impact on alternative routes and improved safety.

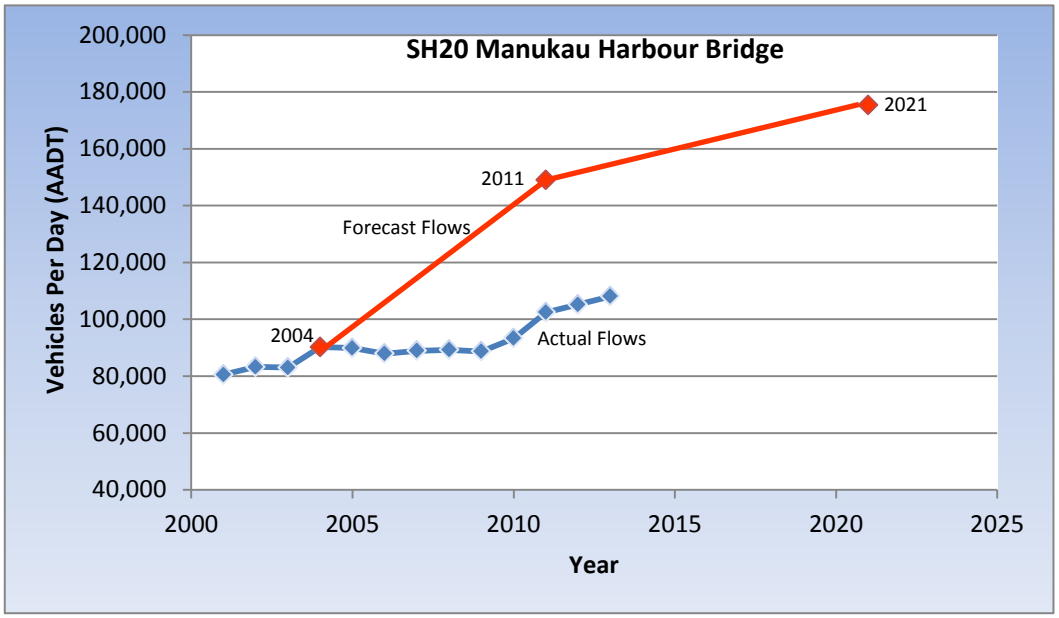
The economic evaluation for the project forecast that travel time cost savings would account for 97% of total benefits, crash reduction 1.6%, vehicle operating cost savings 1.3% and emissions reduction 0.1%.

This review found the project had the following impacts on outcomes:

Accuracy of forecasts

The 2011 forecast traffic volume on the Harbour Bridge was 148,950 vehicles per day (vpd), which was 45 percent higher than the actual recorded post implementation flow of 102,442 vpd in 201 (see Figure 3 below).

Figure 3: Actual and forecast traffic volumes



A number of potential reasons for the large difference between actual and forecast growth were considered in this review.

The following factors appear likely to have had a relatively small effect on forecast accuracy:

- Difficulties in accessing the project from connecting routes (including the non-availability of the SH20 Waterview link)
- Lower than anticipated capacity at project interchanges such as Gloucester Park, and the introduction of ramp metering
- Differences in annualisation methodologies
- Lower than expected recorded traffic growth rates in recent years due to economic and/or social factors

At this stage, however, the primary reason for the scale of the overestimated growth appears more likely to be due to one or both of the following factors:

- Land use and traffic generation assumptions associated with the regional Auckland Regional Transport (ART) model. These assumptions may have overestimated the location, scale or timing of planned development.
- Assumptions used in constructing the project SATURN traffic model. Regional growth forecasts may not have been sufficiently calibrated against more detailed localised conditions in the project area network.

In terms of potential relief to the wider strategic road network, an alternative route via SH1 (south of Mt. Wellington Highway) experienced a reduction in traffic between 2009 and 2011 of 4.5 percent (5,300 vpd), and a reduction of 1.1 percent (1,300 vpd) between 2009 and 2013. However, this correlation is not a proven causal relationship. A small reduction in SH1 flows is also forecast when the final SH20 section of Waterview is operational.

No substantial traffic reductions were forecast for local roads and none were detected by this review. Traffic volumes on the Queenstown, Neilson and Rimu on/off ramps increased by 7 percent immediately following project opening (between 2009 and 2011), considerably less than the increase of 15 percent over the bridge on SH20 itself.

Travel Times

Travel times between Auckland International Airport and Hillsborough Road were forecast by the project evaluation to reduce by 43 percent. It is not possible to precisely replicate this route from the monitoring data available. However, a comparison was made between the Transport Agency's March travel time surveys for 2004 and 2011 in order to exclude the SH20 Mt Roskill Extension and Manukau Harbour Crossing construction periods. This shows that travel times on the section of SH20 directly affected by the project reduced over this period by 37 percent despite daily traffic volumes increasing by 14 percent. The project therefore achieved substantial improvements in operational conditions on the sections of SH20 improved by the project.

Site observations as part of this review generally confirmed the primary travel time survey data, although in some short periods of heavy flow, lower speeds (down to 60 km/h) were observed over the harbour bridge. Some queuing on diverges was also observed, including the northbound Nielsen Street diverge, at peak times.

On external approaches to the project area, some very low speeds (less than 40 km/h) were observed in the evening peak period on SH20, especially northbound between Massey Road and Walmsley Road.

It is therefore likely that congestion reduced on the section of SH20 widened by the project, but no specific evidence to confirm this was available, for example, in terms of the incidence and frequency of low speeds and queuing delays.

It is likely that travel time reliability on the network affected by the project has improved as a result of the project, but no specific evidence to confirm this was available.

It is likely that bus travel times have also improved in keeping with general traffic time improvements, however, no specific data to confirm this was available. Although Auckland Transport currently collects very good data on bus travel times and reliability, they do not have similar 'before' data for the network affected by the project. The audit recommends that Auckland Transport ensures good baseline data that is recorded for future projects to enable better measurement of success.

From site observations, bus services are infrequent and the bus priority lanes on motorway shoulders did not appear to be utilised.

Pedestrian and Cycling Facilities

Off road footpaths and cyclepaths were provided on the old Mangere Bridge parallel to the motorway and appeared to be well used.

Local road crossings were provided at Walmsley Road, Rimu Road, Onehunga Harbour Road and Queenstown Road.

Dedicated pedestrian and cycling crossing facilities at Hastie Avenue, Onehunga Mall and Beachcroft Avenue were provided across the motorway.

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 28 percent (see Figure 4 below). Over the same period, the region-wide crash rate fell by 24 percent. It

should be noted that in comparison with background trends, the project area crash reduction is not statistically significant and the post implementation period is relatively short.

As the project was not a safety initiative, we are satisfied that it has not created safety issues.

Figure 4: Record of Crashes

	Total Recorded Crashes			
	Before Period (May 2005 - Apr 2010)	**Between Period (Jan 2006-Apr 2008)**	**Actual after period (Oct 2010 – Mar 2014)**	**Change**
	5 years	*2 years 2 months*	*3 years 6 months*	
Project Area (crash totals)	1,128	467	559	
Project Area (crash type)	6 fatal, 34 serious, 189 minor, 899 non-injury	0 fatal, 9 serious, 105 minor, 353 non-injury	0 fatal, 13 serious, 123 minor, 423 non-injury	
Project Area (crashes p.a.)	226	216	160	-28%
Region (crashes p.a.)	14,103	14,917	10,976	-24%

2. Project implementation (cost and timeframe)

Project cost and timeframe

The final cost of the project was $218 million, which was 19 percent less than the $268 million estimate at the time of funding approval and immediately prior to the commencement of construction as shown in Figure 5 on page 9.

Project construction began in June 2008 and was completed in August 2010, seven months ahead of the originally estimated timescale.

This was mainly due to the Alliance procurement method involving an integrated and collaborative approach, advanced pre-planning and design, the encouragement of innovation through the implementation process and the incentivisation of early completion.

Figure 5: Budgeted and actual cost comparison

Description of cost	Date	Project cost
Project cost estimate when funding approved	August 2007	$268,000,000
Actual cost at project completion		$218,000,000
Variance (under budget)		-$50,000,000 -18.65%

3. Good practice identified

This review identified a couple of good practice aspects:

- The project was delivered seven months ahead of time, partly because of initiatives taken through the alliance procurement method, which encouraged and rewarded innovation.
- The project was constructed for $218 million, 19 percent less than the originally estimated cost of $268 million. This was achieved partly because of the shortened time frame and also because of the extent of pre-planning and design undertaken which minimised the risk of unknown costs arising.

4. Lessons learned

Lessons with relevance for other future projects were identified as follows:

- **Post implementation monitoring indicates that forecast SH20 traffic demands did not materialise and that more accurate forecasting methods are needed.** Forecast traffic volumes over the Manukau Harbour Bridge were 45 percent higher than the recorded daily flows immediately post-opening. An initial review of potential reasons for the overestimated growth was not able to clearly establish the primary cause of the forecasting error.
- **Good baseline data is needed to enable post implementation monitoring.**
- **Improvements in project specific post implementation monitoring and associated reporting for major projects are needed.** Regular state highway traffic volume counts, state highway travel time surveys and network crash data were available for this review. However, no specific post implementation monitoring data was available. In particular, given the scale of the project, better information is needed on traffic volumes, travel delays, queues and travel time reliability.

The Transport Agency now requires the setting and monitoring of performance measures for all improvement projects costing $10 million or more.[1] It is acknowledged that when the project was approved for funding there were no such requirements. However, the above points all reflect good practice and if integrated with project development, construction and operational activities, should not require significant additional resources. These lessons should be incorporated into project development for future funding applications.

5. Auckland Highways & Network Operation's response to findings

This report was provided to Auckland Highways & Network Operations for comment. The feedback received was that they are happy with the report.

[1] This requirement was introduced in March 2013 and applies retrospectively to all improvement activities approved since 1 July 2012 costing $10 million or more. Relevant projects need to have agreed performance measures and targets set as a condition of funding.

6. Post construction photos

- Duplication of Manukau Harbour Bridge to provide eight lanes

- Replacement of existing footbridges

- Provision of parallel walk/cycle facilities along the Old Mangere Bridge