Implementation of a Network Operating Plan for the Hewletts Road (SH2) Corridor in Tauranga

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ABSTRACT

Hewletts Road is a National High Volume State Highway with multiple conflicting functions; a major commuter route with bus and cycle facilities and a strategically important freight connection. With several signalised intersections the corridor experiences congestion and travel time variability throughout the day.

Rather than investigating ways to only increase vehicular capacity in order to address delays along the corridor, the Transport Agency and Tauranga City Council saw benefit in developing a multimodal Network Operating Plan (NOP) to define an optimal solution for all transport modes.

Beca assisted the Agency and TCC in the development of the NOP for Hewletts Road. A NOP is a multimodal transport plan that defines a strategic objective for network operations and seeks to address 'operating gaps' (the difference between priority and level of service by mode, location and time of day).

The outcome of this work was an agreement to prioritise through movement during peak periods with changes to traffic signal phasing, extensions to bus lanes, bus pre-emption and a Port traffic management plan. In the longer term, rationalised property access, parallel routes, express bus services and High Occupancy Vehicle provision will be considered.

This paper will provide an overview of the NOP development, the measures implemented on site and the effectiveness of these measures in achieving the desired outcomes for the corridor.

INTRODUCTION

This paper describes the development and implementation of a Network Operating Plan (NOP) prepared for the Hewletts Road corridor in Tauranga by Beca, the New Zealand Transport Agency (Transport Agency) and Tauranga City Council (TCC) during 2015.

Hewletts Road is part of State Highway 2 (SH2), a National High Volume State Highway under the One Network road classification. It is a busy commuter route and important freight corridor in that it provides HGV access to the Port of Tauranga. The Hewletts Road section of SH2 has several signalised intersections over a short distance with conflicting cross / turning movements, in contrast with the Takitimu Drive expressway and recently completed Tauranga Eastern Link (TEL) toll road which feed high volumes of traffic into Hewletts Road from the west and east respectively.

Austroads (2015) note that Governments and communities have a vision for their places and that transport plays a key role in this vision. It is also recognised that there are often competing priorities between transport and land use. The aim of a NOP is described as to "*guide the operation and development of the transport network towards contributing to this vision by setting out how the competing priorities are to be managed*"

The key planning principles in a NOP are described by Austroads as (among others):

- Moving people and goods instead of vehicles,
- Balancing competing demands of various road users for limited road space,
- Stakeholder consultation as key to the planning process,
- Operational intent determines the priority, design and scale of transport network projects.

The Hewletts Road NOP aims to set out an operating framework for the corridor that is both a plan for the future operation of the network and a strategy for the implementation of measures that will contribute to a successful network outcome.

This is the first implementation of the NOP framework in Tauranga and the key learning's from the process will guide the development of future NOP projects in the region.

The paper is set out in the following structure:

- Background to the site and context of land use in the area,
- Methodology and key findings,
- Implementation of key measures and their effectiveness,
- A summary of lessons learnt and proposed future studies.

CONTEXT & KEY ISSUES

Hewletts Road has between two and three traffic lanes in each direction and shared bus / cycle lanes in places. The speed limit along the corridor is 70km/h. There are several signalised intersections along the corridor including:

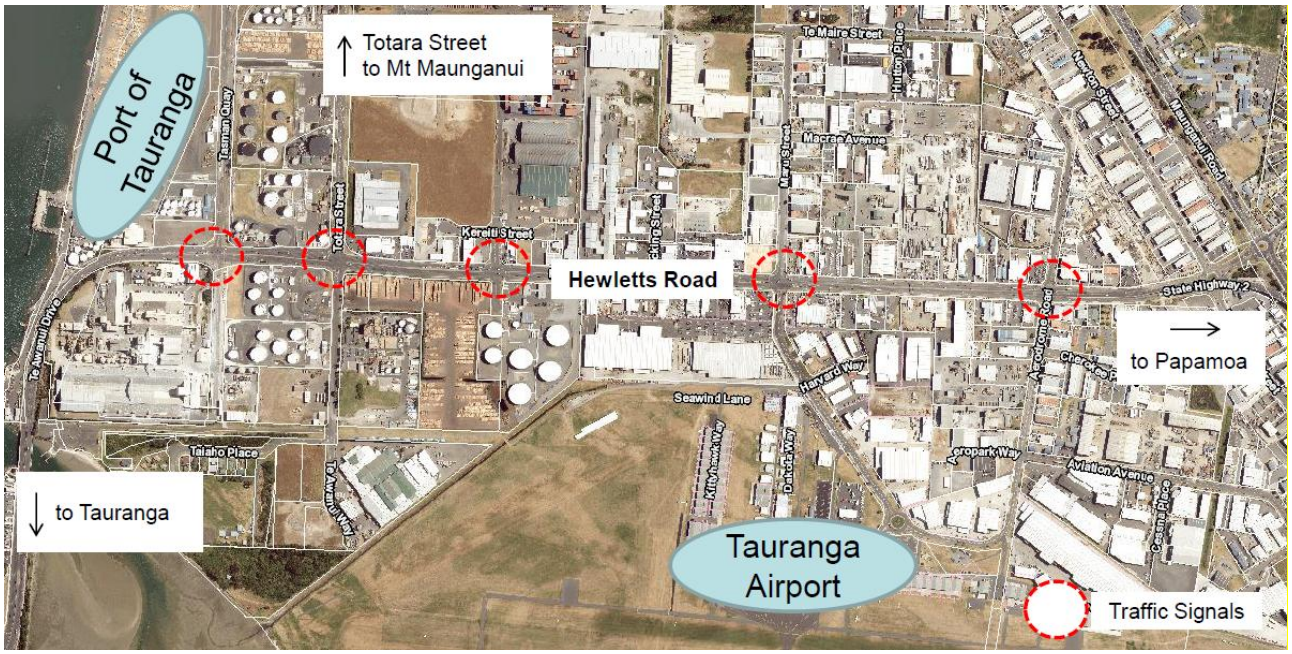
- Tasman Quay; access to Port of Tauranga,

- Totara Street, access to Mt Maunganui,
- Jean Batten Drive, access to Bunnings and Tauranga Airport, and
- Aerodrome Road, access to industrial land north and south of Hewletts Road.

The road carries approximately 44,000 vehicles per day[1] (vpd) between the Harbour Bridge and Totara Street, reducing to approximately 30,000vpd to the east of Totara Street which is primarily due to Mt Maunganui traffic joining or leaving the corridor. Traffic volumes have increased between 3% and 4% per year since 2010, gaining over 1,000vpd every year. These traffic volumes include some 7% to 9% heavy goods vehicles (HGV).

Land surrounding the Hewletts Road corridor is primarily occupied by commercial / industrial activities and Port related land use. There are a number of car, truck and boat sales yards, petrol stations and small commercial type activities. There are a number of key traffic generators such as the Port, Bunning's Warehouse and Tauranga Airport which have differing times of high demand, e.g. weekday / weekend, peak and off peak. Major land uses are shown in the following figure.

Figure 1: Land Use Context



The Tauranga Eastern Link (opened August 2015) reduces travel times from locations east of Tauranga and therefore could influence the operation of Hewletts Road in peak hours by increasing the volume of traffic entering the corridor during the peak. However, growth in residential land use within the Papamoa region enabled by TEL, and the resulting increase in commuter vehicle trips, is expected to have a greater effect by adding additional demand to the network.

The upcoming Bayfair to Baypark (B2B) project, which includes a flyover of the Girven Road / Maunganui Road intersection (an existing source of delay on the network), will also affect the operation of Hewletts Road by enabling more traffic to enter the corridor during the peak period.

According to travel time surveys carried out for the past five years, the average travel time

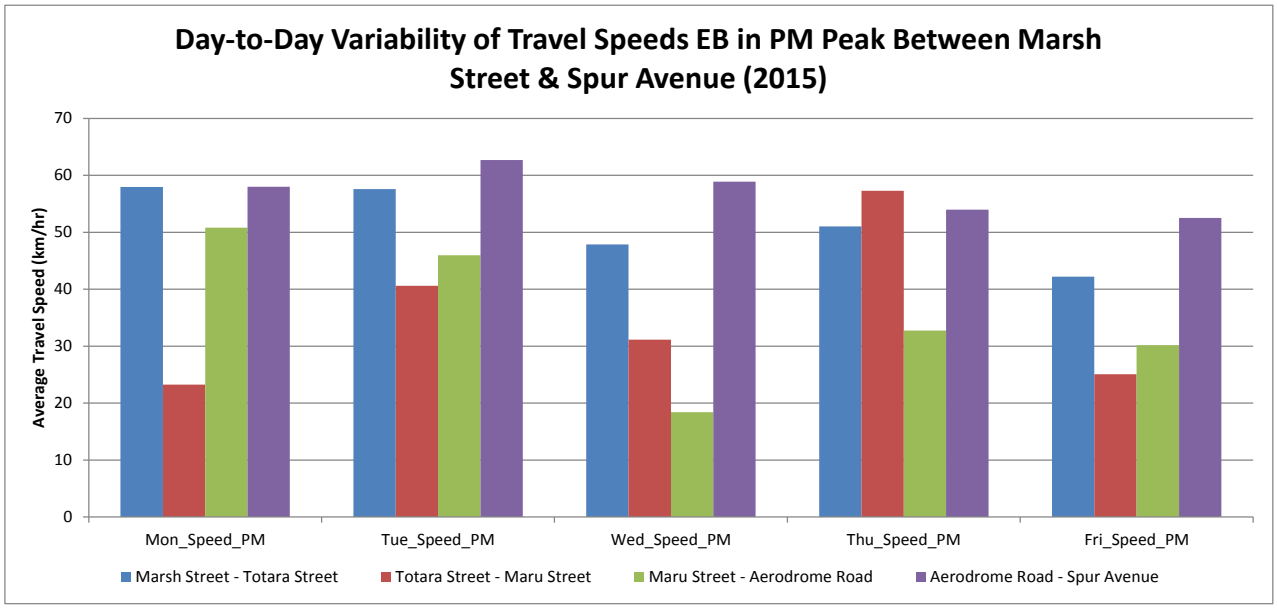
[1] http://www.nzta.govt.nz/resources/state-highway-traffic-volumes

westbound along Hewletts Road (toward Tauranga) has increased by two minutes in the AM peak period. In the PM peak, the average travel time eastbound (from Tauranga) has increased by one minute.

Figure 2 shows the location of Hewletts Road and context of land use in the area. **Figure 3** shows travel speed variability along Hewletts Road travelling eastbound in the PM peak hour.

Figure 2: Site Location and Area Context

Figure 3: Travel Survey Results



METHODOLOGY AND KEY FINDINGS

The development of the NOP for Hewletts Road involved the following key activities:

- Stakeholder workshop to define objectives, network extent and mode priorities (e.g. bus, cycle, freight, private car and pedestrian routes),
- Development of network, volume allocation and definition of existing Level of Service by mode, location and time of day within the Smartroads Network Fit Assessment (NFA) tool,
- Identification of Operating Gaps (difference between Mode Priority and Level of Service),
- Stakeholder workshop to define the strategy and options to address Operating Gaps,
- Assessment of short term options within the NFA tool, and
- Stakeholder workshop to agree final options and development of an implementation strategy.

A key aim of a NOP is to balance Level of Service and Priority for each transport mode at different locations on the network and at different times of day. For example, where a cycle route exists, cyclist priority is high and Level of Service for cycle trips should also be high. Operating Gaps exist where Priority and Level of Service do not balance.

The assessment of existing conditions within the NFA tool found large operating gaps for private cars, freight and buses at the western end of the corridor (Totara Street and Tasman Quay intersections) with smaller gaps at Jean Batten Drive (access to Tauranga Airport) during the AM and PM peak periods. There were no significant Operating Gaps during the Inter-peak and only small gaps for cyclists.

The overarching strategy for the NOP was agreed to prioritise through movement for all modes of travel along the corridor during the AM and PM peaks, inbound during the AM and outbound during the PM.

As part of this, the NOP seeks to achieve a high Level of Service for bus transport along the corridor by extending bus lanes and implementing priority measures (head-start and pre-emption) at traffic lights. With over 40,000 cars travelling on Hewletts Road daily these measures will be highly visible and will help to promote public transport and encourage mode shift.

Private vehicle and freight transport will be supported through traffic signal prioritisation and synchronisation at key intersections along the corridor in peak periods. In the longer term, intersection rationalisation or movement restrictions (left in / left out), may be necessary to reduce delay to through traffic.

Existing walking and cycling facilities will be maintained and upgraded and cyclists will benefit from bus lane extensions which also cater for cyclists.

IMPLEMENTATION OF KEY MEASURES

The NOP identified the following key recommendations for implementation as short term / low cost interventions:

- Traffic signal phasing changes to prioritise through traffic during the AM and PM peaks,
- Extension of bus lanes in both directions to provide continuity for bus travellers.

- Bus priority measures at signalised intersections.

Discussion on the above key measures is provided in the following sections. Other recommendations included consulting with the Port of Tauranga to encourage heavy vehicle transport outside of peak periods, monitoring turning movements at some intersections to inform future decisions on rationalisation of intersection / left in left outs, and considering High Occupancy Vehicle (HOV) integration within bus lanes.

Traffic Signal Phasing Changes

Prior to May 2015, the traffic signal phasing at the Hewletts Road / Jean Batten Drive / Maru Street intersection provided a reasonably balanced level of priority for each arm with a slight bias for Hewletts Road through movements. In late May 2015, changes were made to the intersection phasing as a result of the NOP with the intention of prioritising through traffic on Hewletts Road (Phases A and F), by sacrificing the green time allocated to vehicles approaching from the side roads (Phases D and E).

The initial changes meant that the side arm phases were only called on every second cycle. This skipping of Phases D and E increased the time between the side road phases to approximately three minutes. The resulting delays led to complaints being received by TCC from drivers who were experiencing delays and felt that these delays were significantly longer than previously experienced. Prior to the changes, with each phase operating during every cycle, the time between phases was approximately 1.5 minutes.

In response to these issues, changes were made in August (running Phase E in every cycle but continuing to skip Phase D on every second cycle) and traffic observations were undertaken to review the resulting impact of the changes. The findings were:

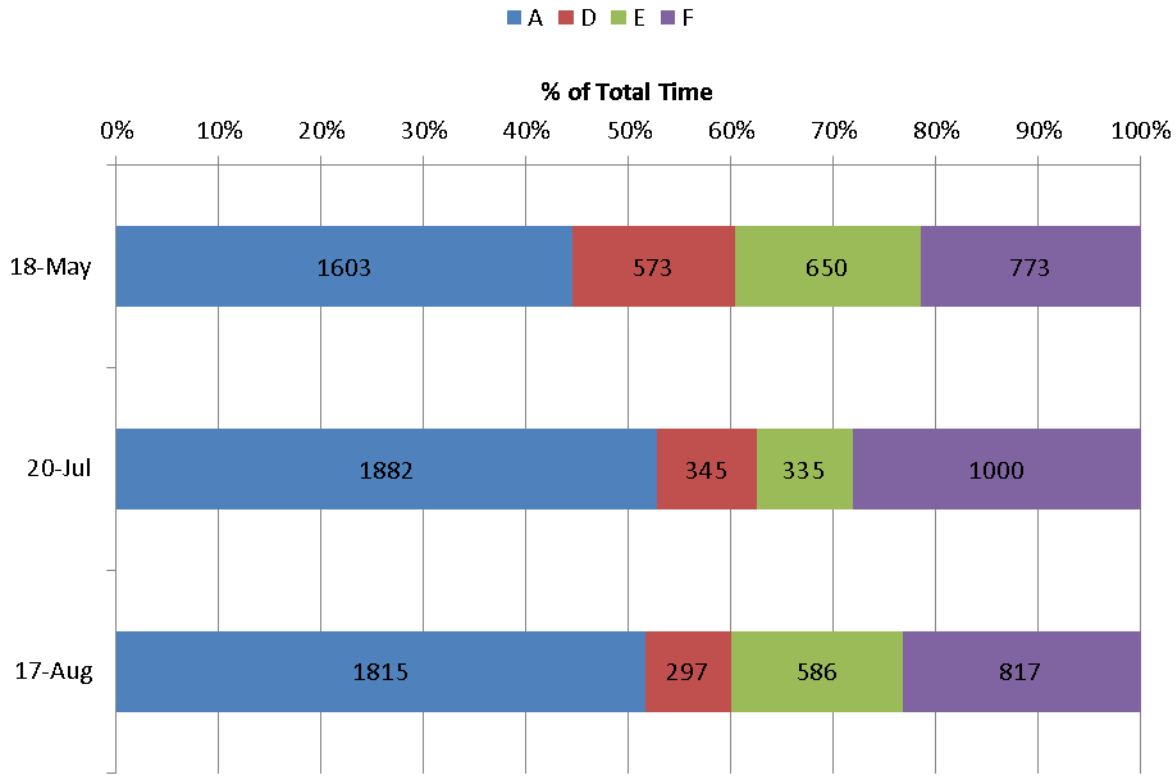
- The amount of green time now available to the Jean Batten approach appeared to be greater than required, resulting in an opportunity to redistribute time to another approach.
- The Maru Street approach still experienced queuing, with queues reaching approximately 20 vehicles while only clearing 5-8 vehicles per phase.
- Typically drivers at Maru Street were required to wait two or more phases to enter the intersection. However this was influenced by a high number of heavy vehicles.

As there was excess green time identified at Phase “D”, this time was redistributed to other approaches, allowing more time to be provided to the Maru Street approach. These changes were found to:

- Despite reduced green time, only two occurrences were identified where vehicles queuing on the Jean Batten approach were required to wait more than one phase to enter the intersection.
- Delays at Maru Street appeared to be less significant, with vehicles typically waiting only one to two phases to enter the intersection.

The following figure shows the changes to the proportion of phase time allocated to each approach after each adjustment. Phases A and F provide green lights on the through movement along Hewletts Road.

Figure 4: Traffic Signal Green Time Allocation Changes



It can be seen in Figure 4 that the changes implemented in late May led to the side arm phases receiving a very small allocation of green time. Once this was adjusted the phasing achieved on the 17th of August provides more green time for the through movement, but maintains sufficient priority for the side arms.

Pre and post study travel time data indicates that travel times along Hewletts Road reduced after the signal phasing changes were implemented. However throughput did not significantly increase due to the platooning effect of upstream signalised intersections.

Bus Lane Extensions

At present, travelling from east to west, the corridor provides two lanes in each direction across the Tauranga Harbour Bridge and onto Hewletts Road, the corridor then expands to three lanes in each direction for a short distance before reducing to two lanes in each direction plus bus lanes. This means that bus travellers are disadvantaged when buses have to merge with traffic and also creates a safety issue resulting from traffic using the short additional third lane to undertake and then merge in front of other vehicles, there is evidence of higher crash rates in this location.

The existing lane configuration is displayed in **Figure 5**.

Figure 5: Existing Lane Configuration

One of the short term initiatives in the NOP is to address this lane discontinuity and extend bus lanes through the three lane section, maintaining a consistent two traffic lanes in each direction plus bus lanes. This strategy fits with the objective of the NOP as it will prioritise through movement of buses along the corridor and is not expected to have significant impact on vehicle movement as indications are that the third traffic lane is underutilised. Current expectations are that this initiative will be tested through traffic modelling and vehicle tracking analysis before implementation in 2016. This strategy will be supported by bus priority initiatives as described in the following section.

Bus Priority

The provision of bus priority at intersections also supports the objective of moving people through the corridor during the peak periods. Bus priority will be achieved in two ways:

- In the short term there are two intersections where bus head start aspects at the traffic lights will allow buses to move through the intersection ahead of traffic and therefore merge in front of traffic where the corridor reduces to two traffic lanes. This is shown indicatively in **Figure 6**.

- In the longer term it is envisaged that bus pre-emption technology could be used successfully along the corridor to force traffic signal phasing to change to green when a bus is approaching. It is felt that this will work well in this location as the corridor is relatively short and straight with few bus stops (so passengers are likely to experience a non-stop journey through this section of road with the signal priority).

The extensions to bus lanes and the use of technology to speed up bus journeys will improve the situation for existing bus passengers but will also be a highly visible example of best practice support for bus transport. It is considered that the visibility of the additional bus lanes and technology supporting bus movement will help to promote bus use, and in turn encourage modal shift – thereby also helping to reduce congestion in the traffic lanes. The corridor will be seen as an example of best practice in public transport planning and design locally and help to inform the implementation of similar strategies at other locations on the network

Figure 6: Tasman Quay Bus Priority Measure

LESSONS LEARNT AND NEXT STEPS

As the first NOP project implemented in Tauranga the project will be used to inform the development of other NOPs in the future. The key lessons learn during the project were as follows:

- Development of a NOP requires input from various stakeholders and achieving buy-in through the workshop process is essential. In this case it was necessary for the Agency as operators of the State Highway network to collaborate with TCC and the Bay of Plenty Regional Council as operators of the local road network and bus services respectively. As a result the NOP delivered a Plan that meets the needs and objectives of each authority.

- It is important to have a good knowledge of the site and the existing provisions for all road users in order to accurately define the existing Level of Service for each mode. It is also necessary to agree with stakeholders at the outset of the project how Level of Service, particularly for non-car modes, will be defined.

- The Network Fit Assessment tool is useful in that the outputs can aid and direct discussion among stakeholders, but in this case the operating gaps were fairly obvious and solutions were derived through past experience and knowledge of the network rather than on any new evidence provided by the 'impact rating' tool within the NFA analysis.

The Agency and TCC plan on developing five additional NOPs to cover the majority of the Tauranga City strategic road network over the next two to three years. The outcomes of each will be dependent on the characteristics of the area and road network and the conflicts identified. The lessons learnt through the development of the NOP for Hewletts Road will help in achieving valued and beneficial operating strategies to guide network operations and land use decisions within Tauranga in the future.

REFERENCES

Austroads Gudie to Traffic Management Part 4 (2015)

Austroads Level of Service Metrics (for Network Operation Planning)