

Route Optimisation - 2012-2013

Recommendation(s)

That the Board:

- i. Receive the report.

Executive summary

The Route Optimisation Programme has completed its second year of a four year programme. This report provides a summary of the results for 2012-2013 and outlines the planned 2013-2014 and 2014-2015 programme.

The results for the 2nd year of the programme for 2012-2013 are:

- 30% of the urban arterial roads (29 routes and 100km) optimised
- Of the 29 routes there are estimated first year savings on 15 routes using journey time measurements:
 - 251 thousand litres fuel savings
 - 206 thousand hours of travel time savings
 - 558 tonnes of CO2 emissions reduction
 - An estimated first year savings of \$3.65m at a cost of \$0.66m resulting in a first year BCR of 5.5 (based on traffic signal improvements implemented on these routes).
- Of the 29 routes traffic signals have been optimised on a further 11 routes without specific start and finish through routes. These routes have significant intersections with delays to side roads and pedestrian activity. Benefits quantified on these routes include reductions in queue length, reductions in network congestion level, improvements to pedestrian levels of service and reduction in cycle times at intersections.
 - An economic evaluation of these routes using simplified procedures was not cost or time effective
 - An estimated first year savings of between \$1.6m and \$3.2m at a cost of \$0.4m based on evaluation of similar types of optimisation projects using a conservative BCR range of between 4 and 8.
- Three routes still to be measured when physical works completed.
- Capital works to the value of \$1.47m progressed with seven projects completed resulting in improvements to network operations, public transport and safety and work in progress on a further 11 capital works projects.

In 2011-2012 the cities routes with obvious congestion were improved and this resulted in large benefits relative to expenditure. In 2012-2013 the relative benefits were less as some of the routes were already operating relatively efficiently. Some routes have network wide benefits which are not directly measurable. Capital works projects are in progress which will have network, public transport and safety benefits. Work is being done to develop other metrics consistent with the goals of improving efficiencies for all road users.

This year the programme is targeting the inner city and some external routes. The programme will link to the strategy of making the best use of existing infrastructure and increased access for a wider range of transport choices.

Strategic context

Route optimisation is an established programme to provide network efficiency through traffic signal route optimisation in conjunction with corridor operational assessment and minor improvements. It will directly improve the efficiency and flow of vehicles, public transport, pedestrians and cyclists on the arterial roads of the Auckland region. The region-wide signal optimisation programme will provide a coordinated approach and regular review of the signal performance and operation on strategic routes throughout the wider region on a four year cycle.

The four year programme strategy is:

Year	Years	Strategy
1	2011-2012	Build up resources and processes and achieve optimisation on 10% of the arterial network (achieved)
2	2012-2013	Achieve optimisation on 30% of the arterial network (achieved and subject of this report)
3	2013-2014	Achieve optimisation on 30% of the arterial network
4	2014-2015	Complete the optimisation of the arterial network and review on-going optimisation needs

In the first year of programme the routes with known inefficiencies close to the central city were optimised and a programme developed for the following year. Year two picked up on the optimisation process and a selection of routes around the city was chosen based on criteria for effective route optimisation. The 2013-2014 programme is focussed on the inner city as it contains many signalised intersections and has not been reviewed for some time. The review will also facilitate informed planning decisions on major initiatives in the inner city. The last year of the programme will focus on routes that have not yet been optimised in the programme.

The long term projected outcome of the route optimisation programme is to maximise use of the existing arterial network by ensuring the traffic signals are working as efficiently as possible as well as give a full understanding of the operational issues on all of the arterial routes. This programme will also identify quick wins of a minor capital nature that will further contribute to optimising the existing network.

Travel demand on the network constantly changes and the routes will need to be reviewed on a three year cycle to accommodate changing land-uses, travel patterns and give effect to strategic direction to ensure optimal use of existing infrastructure.

Background

The route optimisation programme has completed its second year of a 4 year cycle. 2011/2012 was the first year of a four year programme and achieved route optimisation on 10% (34 km) of the urban arterial road network. Results were reported to the Board in September 2012.

The 2012-2013 programme was based on the provisional programme developed in April 2012 amended by removing routes where disruption was expected due to major works from either transport or utility projects, as reported in September 2012. Some routes have been deferred till later in the programme and some routes were brought forward. Route optimisation was completed on a further 30% (100km) of the urban arterial road network.

The 2012-2013 traffic signal optimisation component of the programme is completed. We have completed route optimisation on 29 routes, 15 routes had clear and measurable start to finish (A-B) type travel savings, four routes have A-B travel type savings which will be measured when physical works are completed. The summary results for the measured 15 routes are a first year savings of:

- 251 thousand litres fuel savings
- 206 thousand hours of travel time savings
- 558 tonnes of CO2 emissions reduction
- An estimated first year savings of \$3.65m at a cost of \$0.66m resulting in a first year BCR of 5.5 (based on traffic signal improvements implemented on these routes).

A detailed summary of the results for each route is shown in Table 1 - Attachment 1.

Route optimisation has been completed on a further 11 routes at a cost of \$0.4m and traffic signal amendments have been implemented and their effect reviewed. These are routes where there is no clear start to finish (A-B route benefit) but there are overall network benefits such as reduction in queues, increased level of service to pedestrians, improvements to bus movements, improvements to safety and general network improvements.

The size of these segments and nature of the strategic objectives to be achieved did not fit the standard NZTA economic evaluation manual methodology using simplified procedures. The work required to do a full economic analysis would not be commensurate with the cost or time required to do the actual optimisation work.

The monetary benefit of these improvements is therefore difficult to quantify but the cumulative benefit in terms of reduction in network travel time across all modes and safety would be consistent with the pilot study and scheme assessment findings that has demonstrated that the BCR for this type of improvement can be evaluated between 10 and 55.

At a cost of \$0.4m based on evaluation using a conservative BCR range of between 4 and 8 the estimated first year savings are between \$1.6m and \$3.2m for this portion of the work. The cost of surveying, analysing and reporting on these benefits for these types of routes would not be cost effective in relation to the overall cost of the optimisation work.

Detail of these routes is shown in Table 2 – Attachment 2 and the key operational improvement for each route is noted.

The completed 2012-2013 programme is shown on the GIS map Attachment 5.

A summary of the measured results of the programme to date is:

Year		Network Optimised		Savings (per annum)				Cost \$	FY BCR
		%	Km	Fuel (l)	Time (hrs)	CO2 tonnes	\$ Value		
1	11/12	10	34	761,000	818,689	1844	14.08m	1.24m	11,4
2	12/13	30	100	250,741	205,958	558	3.65m	0.66m	5.5
Total		40	134	1,011,741	1,024,647	2402	17.73	1.90m	9.3
Notes									
i	Measured results for 2012-2013 are for 15 routes								
ii	Three additional routes to be measured when physical works are completed								
iii	Additional work to value of \$0.4m completed on 11 routes with network operational improvements with conservative savings of between \$1.6 to \$3.2m.								

Issues and options

Capital works

Following the traffic signal optimisation work, Auckland Transport has commenced various Capital Works projects identified in the 2011-2012 and 2012-2013 programme. These projects identified improvements to the network which included key stakeholders from Traffic Operation, Joint Transport Operations Centre, Public Transport, Road Safety and Community Transport groups

In 2012-2013 Capital work projects have been completed on seven projects (Table 3 Attachment 3) and work is in progress on a further 11 projects (Table 4 Attachment 4). These are slightly larger projects and take more time to implement for planning, design, consultation, procurement and construction reasons. These projects incorporate various network improvements to enhance operational efficiency, public transport movement, safety for pedestrians and cyclists and provide minor operational improvements towards public transport operations.

These complementary projects have been progressed or completed at a cost of \$1.47m in 2012-2013. These projects will deliver further benefits of efficiency and safety which will be measured using journey times where there is a clear A-B route improvement.

Programme for 2013-2014

For the 2013-2014 Route Optimisation programme the primary focus will be in the Central area of Auckland with a focus on the inner city. This will align network operations to accommodate recent changes to the Public Transport services and land use changes that have occurred in the Central City. The proposed routes are shown in attachment 6 and 7.

To optimise these routes, it is necessary to understand the strategic intent of the network in terms of its multi-modal demands from general traffic, public transport, pedestrian, cycle and freight transport requirements. The route optimisation process incorporates the Smart Roads approach (April 2012 Report). Such an approach will assist in ensuring that operational performance optimisation of the Auckland network is aligned with strategic intent giving effect to the Integrated Transport Programme (ITP) and the Auckland Plan (AP).

The Smart Roads approach therefore provides a framework in which road user hierarchy is established for the network, based on strategic intent, enabling the development of Network Operating Plans (NOP) for routes within a defined geographical area. Application of the Smart Roads approach effectively implies the need to capture the operational performance of each mode, particularly where these are of significance relative to the NOP's. The outcomes associated with the route optimisation will therefore include multi-modal benefits. The performance measures for the inner city will need to take into account improvements to pedestrians, cyclists and public transport.

Programme for 2014-2015

For the final 4th year of the Route Optimisation Programme, the list of routes to be undertaken in 2014-2015 is shown in Attachment 8.





Next steps

Complete the programme of work for 2013-2014 and provide a summary report in September 2014.

Attachments

Number	Description
1	Table 1 Route optimisation quantified results 2012-2013 (15 routes)
2	Table 2 Route optimisation network improvements (11 routes)
3	Table 3 Capital work projects – completed in 2012-2013
4	Table 4 Capital work projects – in progress
5	GIS map – Route Optimisation programme 2012 -2013
6	GIS map of proposed 2013-2014 programme
7	GIS map of proposed 2013-2014 programme : detail central area
8	GIS map of proposed 2014-2015 programme

Document ownership

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Glossary

Acronym	Description	Business Unit
AC	Auckland Council	
AP	Auckland Plan	
AT	Auckland Transport	
BCR	Benefit Cost Ratio	
FY	First Year	
ITP	Integrated Transport Plan	
JTOC	Joint Transport Operations Centre	
LOS	Level of Service	
NOP	Network Operating Plan	
NZTA	New Zealand Transport Agency	
PT	Public Transport	
SOI	Statement of Intent	

Attachment 1

Table 1 - Route Optimisation Results (efficiencies) route with measured start to finish journey times July 2012 to June 2013

Route	Travel time savings (hours)	CO ₂ emission reduction (tonnes)	Fuel savings (litres)	First year benefits (\$m)
1.Great South Road/Cavendish Drive/Te Irangi Drive	9,991	44.49	19,899	0.19
2.Great North Road – Cowley Street to Rosebank Road	53,661	53.99	24,150	0.86
3.Remuera Road – Market Road to Broadway	1,851	7.60	3,383	0.03
4.Richardson Road/Stoddard/Maioro Street*	714*	-44.9*	-19,986*	0.03*
5.Walmsley/Salesyard/Portage Road – Mangere Road to Great South Road -	See Note 1 below			
6.Great North Road – Premier Avenue to Ponsonby Road	Physical works underway see Note 2 below			
7.Gillies Avenue / The Drive – Greenlane West to SH1 Interchange	Physical works underway see Note 2 below			
8.Albany Expressway & Greville Road – Oteha Valley Road Extension to Hugh Green Drive	23,380	88	39,673	0.4
9.Taharoto Road-Dominion to Auburn	2,926	31	13,956	0.08
16.New North Road: Symonds St to Ketenui Ave	8,045	29	13,118	0.15
17.New North Road: Blockhouse bay Rd	41,525	82	36,459	0.7

to Ketenui Ave				
20.Carbine Road - Panama Road to Waipuna Road & South Eastern Highway – Carbine to Waipuna	13,584	58	25,863	0.26
21.Walmsley Road - Robertson to McKenzie Road	Physical works underway see Note 3			
22.Atkinson Ave - Princes Street to Mangere Road	10308	45.7	20,605	0.19
23.Massey Road West - George Bolt Memorial Drive to Buckland Road	4,567	36	16,378	0.1
23.Massey Road East - Buckland Road to Great South Road	10,609	61	27,386	0.22
25.Mt Albert Road - New North to Pah Road	10,818	23	10,207	0.19
26.West Coast Road	8,303	25	11,186	0.15
28.Whangaporoa Road - SH17 to Whangaporoa Town Centre	5,676	19	8,464	0.1
Total for 2012-2013	205,958	558.88	250,741	3.65

Note 1 - Route 5 was removed from the programme as preliminary investigations identified little benefit would be achieved in undertaking a full optimisation assessment. Individual signal controlled intersections were reviewed and minor signal timings were adjusted to reflect operational demands.

Note 2 - Route 6 and Route 7 optimisation was undertaken prior to the commencement of this programme. They were included in the 2012/2013 programme year, to commence the capital improvements identified to complement the signal operation improvements already implemented. Physical widening of the carriageway is still in progress and travel time surveys have yet to be completed.

Note 3 - Physical widening of the carriageway is still in progress and travel time surveys have yet to be completed.

* Although a slightly negative result, in terms of a single network, the motorway off ramp flow is over 3 times that of Maioro Street so the priority had to be retained for this movement. This meant a slight sacrifice was required on Maioro Street. The priority of safety over operation is important here as one of the objectives has not been to increase the queuing on SH20 off ramp, as this poses a safety concern in a high speed environment.

Attachment 2

Table 2 – Route Optimisation Results (efficiencies) 11 Routes with no specific start to finish journey.

These route improvements have been made at a cost of \$0.4m and based on a conservative BCR range of between 4 and 8 the estimated first year savings are between \$1.6m and \$3.2m for this portion of the work.

Route	Queue Length (m)		% Congestion Level Reduction		Pedestrian Delay (Level of Service and indicative delay in seconds)		% Reduction in Average Cycle Time (seconds)
	Pre Optimisation	Post Optimisation	AM	PM	Pre Optimisation	Post Optimisation	
10.Onewa / Mokoia Road – Mokoia Pedestrian Crossing to Sylvan Avenue	300	125	7%	0%	-	-	10%(11)
11.Constellation Drive / Upper Harbour Drive – East Coast Road to Paul Mathews Road	*	*	18% EB 9% WB	2% EB 1% WB	D(54)	D(50)	7%(4)
12. Lunn Avenue – Abbots Way to Ellerslie Panmure Highway	*	*	-	-			-
13.Albany Highway – Rosedale Road to Albany Expressway	AM - SH16 (306)	AM - SH16 (155) 49% reduction	40%	49%	-	-	-
14.Albany Highway – Rosedale Road to Upper Harbour Drive	PM - Bush (224)	PM - Bush (77) 66% reduction			-	-	-
15.Wairau /Taharoto / Northcote Road – Forrest Hill to Sunnybrae Road	-	-	20%	20%	E(72)	D/E(57)	21%(15)

18.Trafalgar Road / Onehunga Mall – Manukau to Mt Smart Road	Intersection operation has been modified to address pedestrian safety issues. No immediate data available. Crash data will be accumulated over time to measure the safety performance of the intersection.						
19.Church Street – Neilson to Selwyn Street	Intersection operation has been modified to address pedestrian safety issues. No immediate data available. Crash data will be accumulated over time to measure the safety performance of the intersection.						
24.Station Road / St George Street – Hillcrest to Wallace Road	-	-	2%	8%	E(60)	D(45)	25%(15)
27.Hibiscus Coast Highway – SH1 to West Hoe Road	-	-	39%	26%	-	-	-
29.Blockhouse Bay Road – Hillsborough Road to Great North Road	Did not warrant any traffic signal optimisation as the intersections along this corridor traversed two other key arterials namely Great North Road and New North Road. The traffic operations team will be investigating further opportunities to identify physical corridor improvements along this route.						

Attachment 3

Table 3 – Capital work projects – completed in 2012 – 2013

Route	Roadway improvements		Public Transport improvements		Safety Improvements		
	Mid block upgrades	Carriageway Upgrades	Clearway	Bus stop Improvements	Ped	Cycle	Lighting
Broadway: Khyber Pass Road to Manukau Road	Broadway / Khyber Pass pedestrian refuge upgraded to accommodate improved lane merge	Improved lane merge, tracking and Line marking median upgrade	Loading Bay AM & PM peak	Improved bus bay	Traffic island, Footpath, Pram crossings, Tactile pavers, Push buttons, Signage	Advance Cycle boxes, Control loops	Improved lighting at pedestrian crossing
Gillies Avenue / The Drive: Greenlane West to SH1 Interchange-Review	Improved lane merge and lane configuration	Removal or on street parking	NSAAT Lines	Improved access for bus bays – lead in/out		Advanced cycle boxes control loops	-
Albany Expressway & Greville Road: Old Oteha Valley Road to Hugh Green Drive	-	Removal of on street parking at Oteha Valley Road Extension intersection to reduce congestion and improve safety.	NSAAT Lines	-	-	-	-
New North Road: Blockhouse Bay Road to Symonds Street	Improved lane merge and lane configuration -	-	NSAAT Lines	Improved access for bus bays – lead in/out		Advanced cycle boxes control loops	-
Walmsley Road: McKenzie Road to Robertson Road	NSAAT Lines	Carriageway Widening from 1 from one lane in each direction to 2. Improved Lane configuration at intersection.	AM & PM peak	-	-	-	-

Route	Roadway improvements		Public Transport improvements		Safety Improvements		
	Mid block upgrades	Carriageway Upgrades	Clearway	Bus stop Improvements	Ped	Cycle	Lighting
West Coast Road: Janet Clews Road to Rosier Road	Improved turning guidelines	Additional lane arrow markings	NSAAT Lines	-	Traffic island, Footpath, Pram crossings, Tactile pavers, Push buttons, Signage Re-grade foot paths and build outs.	-	-
Remuera Road: Market Road to Broadway	-	-	-	-	Align the pedestrian push buttons to correct alignment with the crossing. -	-	combining signals onto light pole but retaining pedestrian crossing push button-

Attachment 4

Table 4 – Capital work projects – in progress

2012/13 Routes (Investigations/Scheme Design)
<p>Onewa Road / Mokoia Road: Mokoia Road Pedestrian Crossing to Sylvan Avenue.</p> <ul style="list-style-type: none"> ○ Further investigations are underway to widen the left turn slip lane from Birkenhead Avenue into Pupuke Road. ○ Investigating changing the existing eastbound shared through and right turn lane on Mokoia Road into Mokoia Road into a dedicated right turn lane. ○ Improving the street lighting at the intersection of Glenfield Road and Eskdale Road intersection.
<p>Constellation Drive / Upper Harbour: East Coast Road to Paul Matthews Road</p> <ul style="list-style-type: none"> ○ Implementing queue loops for both the west and east approach along Upper Harbour Highway and for the north bound off ramp at the interchange with SH1. ○ Investigating a new clearway operation between 4-6pm on the eastern side of Parkway Drive along Constellation Drive between Home Place and Vega Place. ○ Investigate the provision of a flush median along Apollo Drive to remove right turning vehicles into and out of accesses from blocking the single lane northbound on Apollo Drive or alternatively to minimise queuing on Constellation Drive from the heavy right turn demand a clearway is also being considered. ○ Investigate operating the intersections of Constellation Drive with Parkway Drive and Upper Harbour Drive with Caribbean Drive with fixed time control.
<p>Trafalgar Street / Onehunga Mall: Manukau Road to Mt Smart Road</p> <ul style="list-style-type: none"> ○ Install cycle boxes and detectors to improve cyclist amenity.
<p>Massey Road / Mangere Road: Great South Road to George Bolt Drive</p> <ul style="list-style-type: none"> ● At the intersection of Massey Road and Robertson Road: <ul style="list-style-type: none"> ○ Investigate new phase movements to improve intersection efficiency. ○ Investigate providing additional eastbound lane on Massey Road to assist merging traffic. ● At the intersection of Massey Road and Buckland Road: <ul style="list-style-type: none"> ○ Investigate new phase movements to improve intersection efficiency. ○ Investigate cycle demand for improved cyclist facilities and amenity.
<p>Albany Highway: Albany Expressway to Upper Harbour Drive:</p> <ul style="list-style-type: none"> ○ Investigate providing two continuous lanes between Albany Expressway and to SH18 Upper Harbour Drive. ○ Review long northbound left turn slip lane on Albany Highway into SH18 Upper Harbour Drive. ○ Investigate intersection alignment to improve pedestrian amenity.
<p>Lunn Avenue: Abbots Way to Eilerslie Panmure Highway</p> <ul style="list-style-type: none"> ● Lunn Avenue / Ngahue Drive / Abbots Way intersection:

<ul style="list-style-type: none"> ○ Review intersection design. ● Lunn Avenue / Mc Donald's / New World entrance: <ul style="list-style-type: none"> ○ Investigate revised lane assignment from McDonalds approach. ○ Review right turn pocket into New World entrance. ● Lunn Avenue / Marua Road / Harding Avenue: <ul style="list-style-type: none"> ○ Investigate revised lane assignment on the Marua Road approach. ○ Investigate private access near intersection.
<p>2012-13 – (Routes at detailed design stage)</p>
<p>Richardson Road / Stoddard Road / Maioro Road: New North Road to May Road to New Windsor Road</p> <ul style="list-style-type: none"> ○ Investigate implementation of pedestrian refuge island to improve pedestrian safety and amenity
<p>Taharoto Road: Forest Hill Road to Sunnybrae Road</p> <ul style="list-style-type: none"> ● Taharoto Road / Shakespeare Road / Wairau Road Intersection: <ul style="list-style-type: none"> ○ Remove Bus Lane from Shakespeare Road approach. Remark lane to provide an additional right turn lane. ○ Add additional advance SCATS loop on Taharoto Road for the right turn lanes into Shakespeare Road. ● Northcote Road / The Boulevard / Takapuna Normal Intermediate School: <ul style="list-style-type: none"> ○ Install a median island adjacent to the right turn pocket into the School entrance to prevent westbound traffic queuing across the opposing right turn pocket.
<p>Atkinson Avenue: Princess Street to Mangere Road</p> <ul style="list-style-type: none"> ○ Introduce Clear Way 3-6pm Eastbound on Princes Street ○ Introduce Clear Way 7-9am Westbound on Princes Street ○ Proposing to prohibit right turns into Gordon Road to increase capacity of Atkinson Avenue / Princes Street intersection.
<p>Mt Albert Road / Carrington Road: Dominion Road to Point Chevalier Road</p> <ul style="list-style-type: none"> ○ Introduce Clear Ways from 7-9am and 3-6pm along Mt Albert Road for both directions. ○ Lengthen the Left Turn lane on Hillsborough Road at its intersection with Mt Albert Road. ● Prohibit the right turn from Sandringham Road north bound approach into Mt Albert Road. ● Redesign existing traffic island to improve pedestrian amenity at the Carrington Road intersection with the Unitec Entrance.
<p>Walmsley Road: McKenzie Road to Robertson Road:</p> <ul style="list-style-type: none"> ● Road widening at the Walmsley Road / Favona Road intersection to accommodate a two lane merge taper.