Buttai Gravel Pty Ltd (Daracon)

Martins Creek Quarry,
Martins Creek NSW

Traffic Impact Assessment

August 2016

SECA solution

Martins Creek Quarry

Traffic and Access Assessment

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1 Introduction

1.1 Background

Seca Solution was commissioned by Site R+D on behalf of Buttai Gravel Pty Ltd to prepare a Traffic Impact Assessment for the proposed on-going use and increase extraction capacity of the existing quarry known as Martins Creek Quarry, Martins Creek, NSW. This report will form part of an Environmental Impact Statement (EIS) being prepared for the project to support a submission to the Department of Planning and Infrastructure. The report is based upon:

- a review of the historic and current operations of the quarry;
- a review of the transport operation for the quarry based upon historic data provided by the quarry operators;
- the collection of traffic data along the primary traffic routes associated with the transport of quarry product;
- extensive consultation with the road authorities, and
- site visits to the location, surrounding road network and analysis by Seca Solution.

This assessment has been prepared in accordance with Austroads Guidelines and the "RTA Guide to Traffic Generating Developments" published by the Roads and Maritime Services (RMS).

1.2 Scope of Report

The scope of this report is to review the external traffic impacts of the on-going operation of the quarry and provides advice on the capacity, efficiency and safety issues associated with the road network. This includes a road safety review of the proposed routes and a review of access into the quarry.

1.3 Issues and Objectives of the study

The issues as they relate to the proposal are:

- Assess the impact on the local road network due to the additional traffic flows associated with an expansion of the quarry from the current extraction rate of 900,000 tonnes per annum to 1,500,000 tonnes per annum;
- To review the access arrangements for the development; and
- Assess any capacity, efficiency and safety impacts associated with the development.

The objective of the report is to document the impacts of the proposed development and provide advice on any measures to be implemented as part of the development.

1.4 Planning Context

In preparing this document, the following guides and publications were used:

- RTA Guide to Traffic Generating Developments, Version 2.2 Dated October 2002;
- RMS TDT 2013/04 "Update Traffic surveys August 2013".
- Austroads Guide to Traffic Management – Part 12 Traffic Impacts of Developments

1.5 Authority Requirements

The Department of Planning and Environment have provided a set of SEAR's (Secretary's Environmental Assessment Requirements) that provide advice on what is to be assessed for the project and the information that is required to be provided. Relevant to traffic are the following sections:

Table 1-1 – Department of Planning and Environment SEARs

Requirement	Relevant Section of Seca Solution report
Accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products, the public roads in the Dungog Shire, Maitland City and Port Stephens LGAs likely to be so used and the times during which those roads would be so used.	Section 4.1
A detailed assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road network (as identified above), having regard to the requirements of the RMS, Dungog Shire, Maitland City and Port Stephens Councils (see Attachment 2);	Section 4.2, Section 4.3, Section 4.4
A detailed assessment of the existing railway siding facility at the site as an alternative transport option for delivering quarry products and avoiding potential impacts associated with road delivery.	Undertaken by others
A detailed description of the measures or works (including concept plans) that would be used and/or implemented to upgrade, maintain and improve the capacity, efficiency and safety of the road network used by the development.	Undertaken by others

The Roads and Maritime Services have provided separate details on their requirements for the project and are provided below:

Table 1-2 – Roads and Maritime Services requirements

Requirement	Relevant Section of Seca Solution report
Identify all relevant vehicular traffic routes and intersections for access to / from the subject site and any connections to the classified state road network.	Section 2.5 Section 4.2
The anticipated additional vehicular traffic likely to be generated as a result of the subject development.	Section 4.1
The distribution on the road network of the trips generated by the proposed development.	Section 4.2
Consideration of the traffic impacts on existing intersections and the capacity of the intersections to safely and efficiently cater for additional vehicular traffic generated by the proposed development. The traffic impact shall also include the cumulative traffic impact of other proposed developments in the area if any.	Section 4.4

Identify any necessary road network infrastructure upgrades that are required to maintain existing levels of service as a result of the development. In this regard, preliminary concept drawings shall be submitted with the EA for any identified road infrastructure upgrades. Any road upgrades will need to be to the satisfaction of the RMS and Council.	Section 5
Traffic analysis of the affected intersections, using Sidra or similar modelling and include: • Current traffic counts and 10 year traffic growth projections • With and without development scenarios • 95th percentile back of queue lengths • Delays and level of service on all legs for the relevant intersections • Electronic data for RMS review	Section 4.4

2 Existing Situation

2.1 Site Description and Proposed Activity

Martins Creek Quarry is located on the northern boundary of Martins Creek, 25 kms north of Maitland. The site has been operating as a quarry since approximately 1915 and has been managed by a number of different operators. The quarry is now leased and operated by the Daracon Group and has been under their control since December 2012 with a 25 year agreement.

The proposal is to continue with the existing quarry activities on the site and to:

- Extract up to 1.5 million tonnes of hard rock material per annum;
- Expand into new extraction areas, clearing approximately 36.8 hectares of vegetation;
- Increasing hours of operation for quarrying to 6am to 6pm (Monday to Saturday), processing to 6am to 10pm (Monday to Saturday), mixing and binding to 4.30am – 10pm (Monday to Friday) and 4.30am to 6pm (Saturdays), stockpiling, loading and dispatch of road transportation to 5.30am-7pm (Monday to Saturday) and train loading to 24 hours per day, 7 days per week;
- Consolidating existing operations and approvals;
- Rehabilitating the site

2.2 Site Location

The site is located on the northern edge of the township of Martins Creek, some 4 kms north of Paterson and 25 kms north of Maitland. It is located within the Dungog Local Government Area. The site currently gains access via Station Street through Martins Creek and along Grace Avenue to connect with the external road network (Dungog Road).

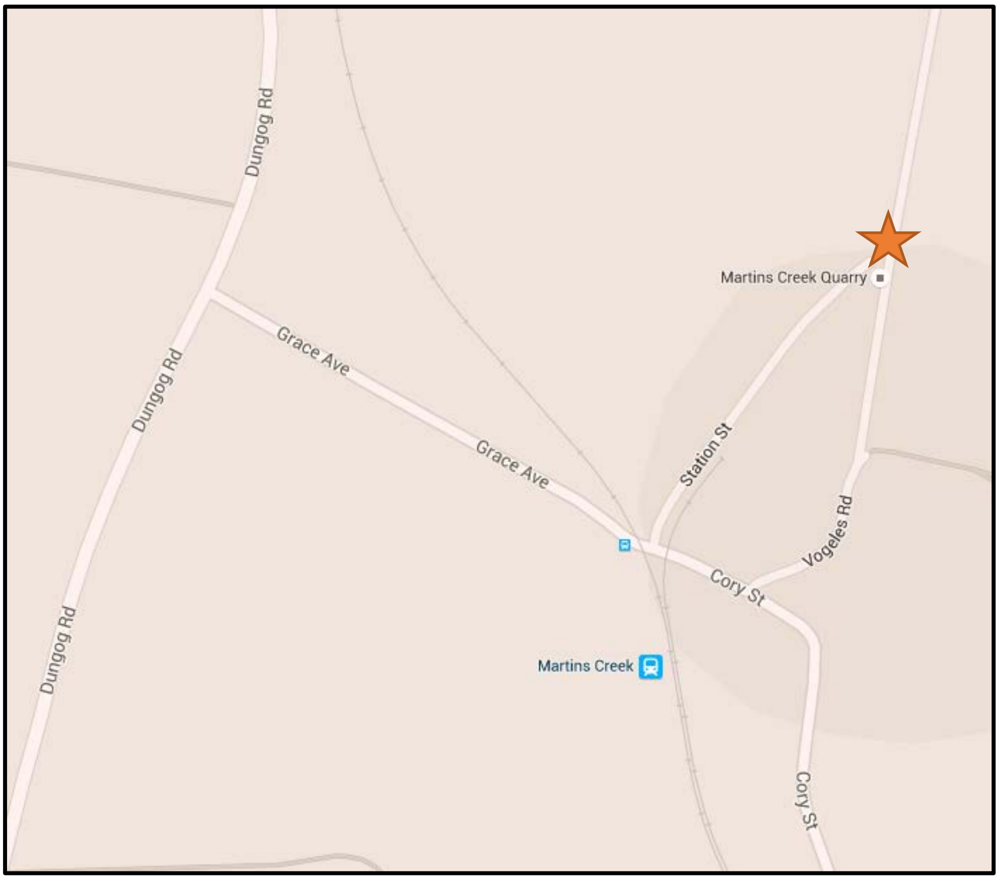


Figure 2-1 Martins Creek Quarry site in the local context *Source: Google maps*

The location of the site is shown below in Figure 2-2.

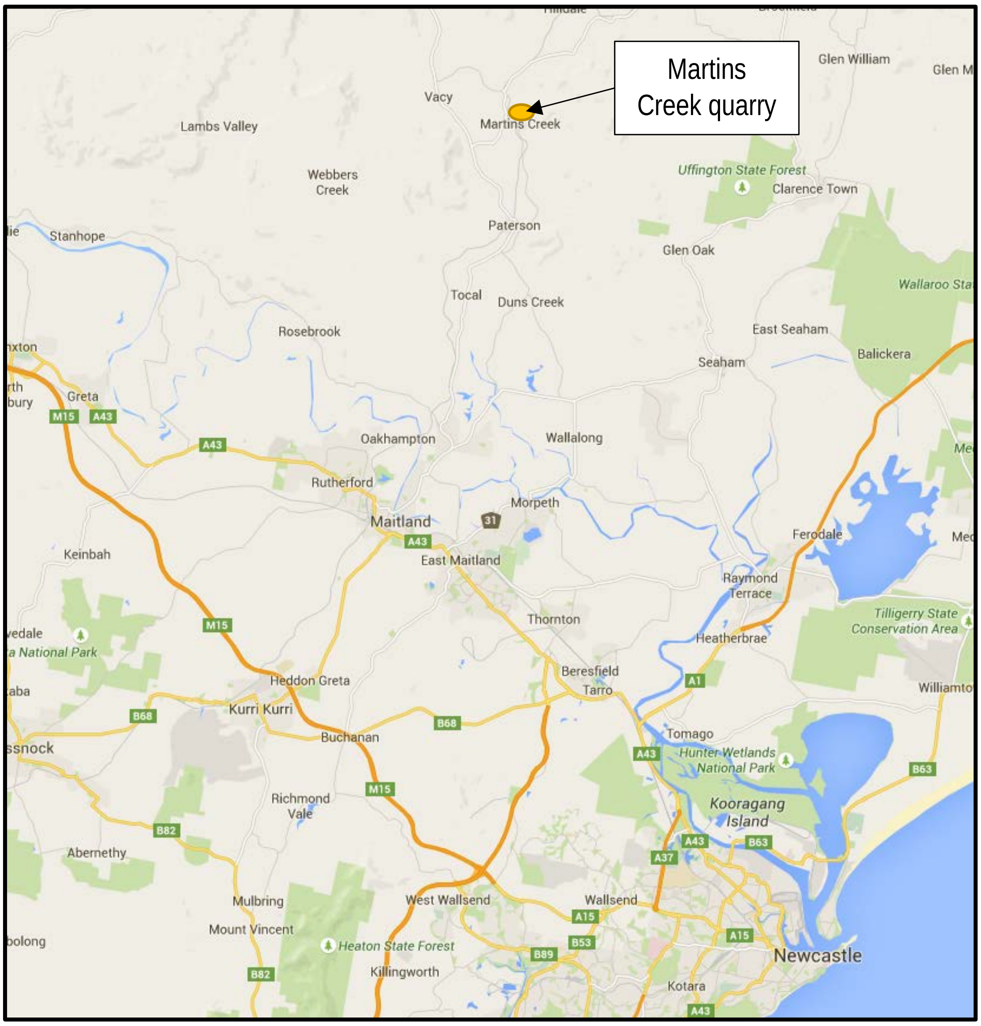


Figure 2-2 - Site Location in the regional context *Source: Google maps*

2.2.1 Zoning and Adjacent Land Use

Existing land use adjacent to the site is generally rural residential and urban residential together with rural grazing land. The quarry site is currently zoned as primary production.

2.3 Site Access

Site access is available via a number of different access points that connect to the local road network. The primary site access is via Station Street that then connects with Grace Avenue and Dungog Road to provide a route through to Gresford Road, which is the primary road connection.

The site access at this location caters for both the trucks entering and exiting the site as well as light vehicles associated with staff movements.

A second access is also available via Vogeles Road to the east of Station Street.

There is a railway line running along the western boundary of the site that stops vehicle access connecting directly with Dungog Road to the west of the site.

2.4 Existing Traffic Conditions

2.4.1 Road Hierarchy

The major route through the locality is the regional road (number 101) that's connects from West Maitland (at the New England Highway) via Bolwarra, Paterson, Wallarobba, Wirragulla, Dungog, Dingadee and Walshpool Bridge to The Bucketts Way. The current route follows Belmore Road at its southern end, then Paterson Road and Tocal Road through to Paterson before changing to Gresford Road north of Paterson and Dungog Road as it passes through Martins Creek. This is the primary access route to the quarry with vehicles travelling either along Belmore Road through Lorn or along Flat Road. It has been determined that the future route will be via Flat Road, including Glenarvon Road and Pitnacree Road, and its characteristics are summarised in Table 2-1 below.

2.4.1.1 Route One

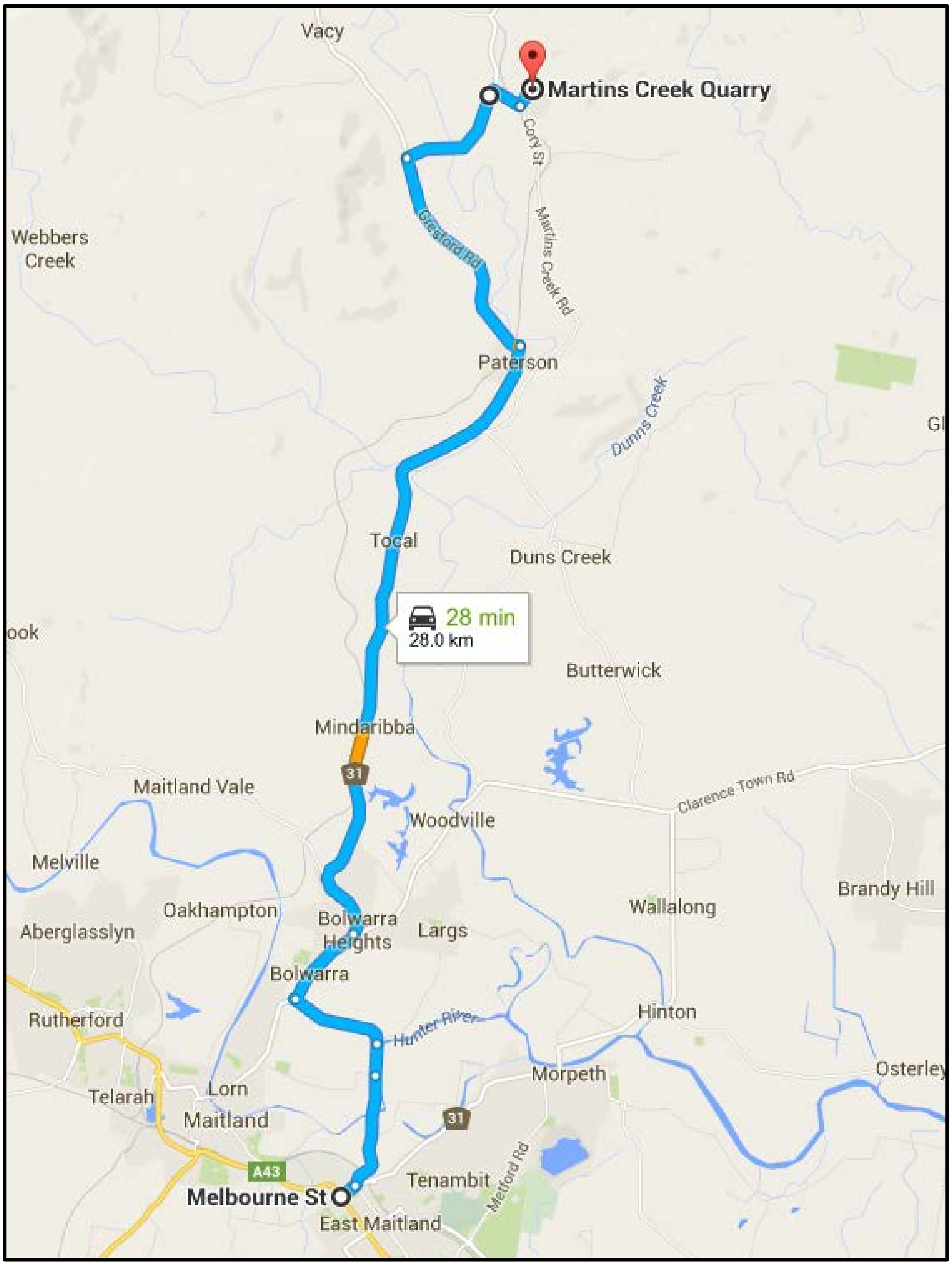


Figure 2-3 Quarry Haulage Route 1

Table 2-1 Characteristics of Route 1

Section	Length	Characteristics
Dungog Road between Grace Avenue and Gresford Road	2.4 kms	Single lane of travel in both directions, no shoulders and formed verges. Posted speed limit of 80 km/h, provides access to a number of rural holdings. Has a width restriction over the Paterson River which permits a single lane of travel only over a heritage wooden bridge. It provides a reasonably straight alignment with a noticeable curve with speed reduction sign (35 km/h advisory) on the northern approach to the bridge over the Paterson River. There are no overtaking lanes provided.
Gresford Road between Dungog Road and Paterson	4.3 kms	Single lane of travel in both directions; no shoulders nor formed verges. Posted speed limit of 80 km/h, provides access to a number of rural holdings and rural residential lots. This section of the road provides a very good alignment with a single curve with an advisory speed limit of 65 km/h. The speed limit reduces to 50 km/h at the southern end of this section of the road when it passes through the village of Paterson. There are no overtaking lanes provided.
Gresford Road / Tocal Road through Paterson	1.2 kms	This section of road provides a single lane of travel in both directions with additional road pavement to both sides to permit on-street parking. It provides access to the local facilities within Paterson as well as residential lots fronting directly onto this road. It also allows for connection to a number of side roads for the residential area of Paterson. It operates under a posted speed limit of 50 km/h and there are limited pedestrian paths except in the centre of the village. The connection of Gresford Road and Tocal Road is a right angle requiring vehicles to slow down and large vehicles e.g. semi-trailer or truck and dog combination are required to use all of the provided road pavement width to complete the turn within their lane. It provides a minimum width of 7.0 metres with 12 metres provided in the centre of the village to accommodate the on-street parking.
Tocal Road between Paterson and Dungog / Maitland LGA boundary	3.3 kms	This section of the road provides a single lane of travel in both directions with a narrow shoulder over much of its length. Where it crosses Webbers Creek there is no shoulder and the width between the kerbs is 7 metres. There are no footpaths along this section of the road and the bridge over Webbers Creek creates a pinch point. This section of the road has a posted speed limit of 100 km/h with an advisory speed limit of 65 km/h for the bend on the northbound approach to Webbers Creek.
Tocal Road between Dungog / Maitland LGA boundary and Lang Drive	6.4 kms	This section of road provides a good alignment with sealed shoulders to both sides of the road, operating under a posted speed limit of 100 km/h reducing to 80 km/h at its southern end. There are no footpaths and the overall width is 9 metres.
Tocal Road between Lang Drive and Bolwarra Heights	1.0 km	Over this length of the road, the alignment has several tighter bends, which encourage drivers approaching the built up area to reduce their vehicle speeds in line with the posted speed limit of 60 km/h through Bolwarra Heights. There is no shoulder over the majority of the length of the road and no footpaths. At its southern end it connects with Maitland Vale Road and enters the urban area of Bolwarra Heights.
Tocal Road between Maitland Vale Road and Paterson Road	1.3 kms	Provides a single lane of travel in each direction and operates under the posted speed limit of 60 km/h. There is a partial pedestrian footpath along the eastern side of the road and there are individual residential lots with driveway access direct onto the road at this location. There are a number of street lights reflective of the urban

		road environment in this locality. The road alignment is reflective of the urban built form and the posted speed limit, with a curved alignment.
Paterson Road between Tocal Road and Flat Road	1.7 kms	Provides a single lane of travel in both directions with a marked parking lane to both sides over the majority of its length. Allows for direct driveway access to residential lots and operates under the posted speed limit of 60 km/h. No footpaths are provided along the majority of its length and limited street lights. Provides an overall pavement width of 12.5 metres for the majority of its length. Generally a straight alignment.
Flat Road between Paterson Road and Melbourne Street	4.9 kms	This road forms part of the 3rd Hunter River Project completed by the RMS. This section of the road has been built to current design standards, providing a single lane of travel in both directions with a wide sealed shoulder to both sides to cater for breakdowns and cyclists. It operates under the posted speed limit of 80 km/h and provides a good alignment. There are no pedestrian paths along this road.
Melbourne Street between Flat Road and the New England Highway	350 metres	This road forms part of the State Road network and provides two lanes of travel in both directions, with additional turn lanes at the key intersections. It connects with Flat Road and the New England Highway via 4-way traffic signals. There is kerb side parking permitted along the majority of its length together with footpaths to both sides. It operates under the posted speed limit of 60 km/h.
New England Highway (State Highway)		This road forms part of the state highway network and provides a minimum of 2 lanes of travel in both directions. Additional lanes are provided at the key intersections and there are parking lanes to both sides for the majority of its length in this location. In this location it operates under the posted speed limit of 60 km/h.

From the New England Highway, trucks can access both local and regional markets. These routes can utilise the New England Highway as well as the Hunter Expressway to access areas including the Upper Hunter Valley, Greater Newcastle and its surrounds, the M1 towards the Central Coast and Sydney as well as areas in the immediate locality e.g. Gillieston Heights, Rutherford, Thornton etc.

2.4.1.2 Route Two

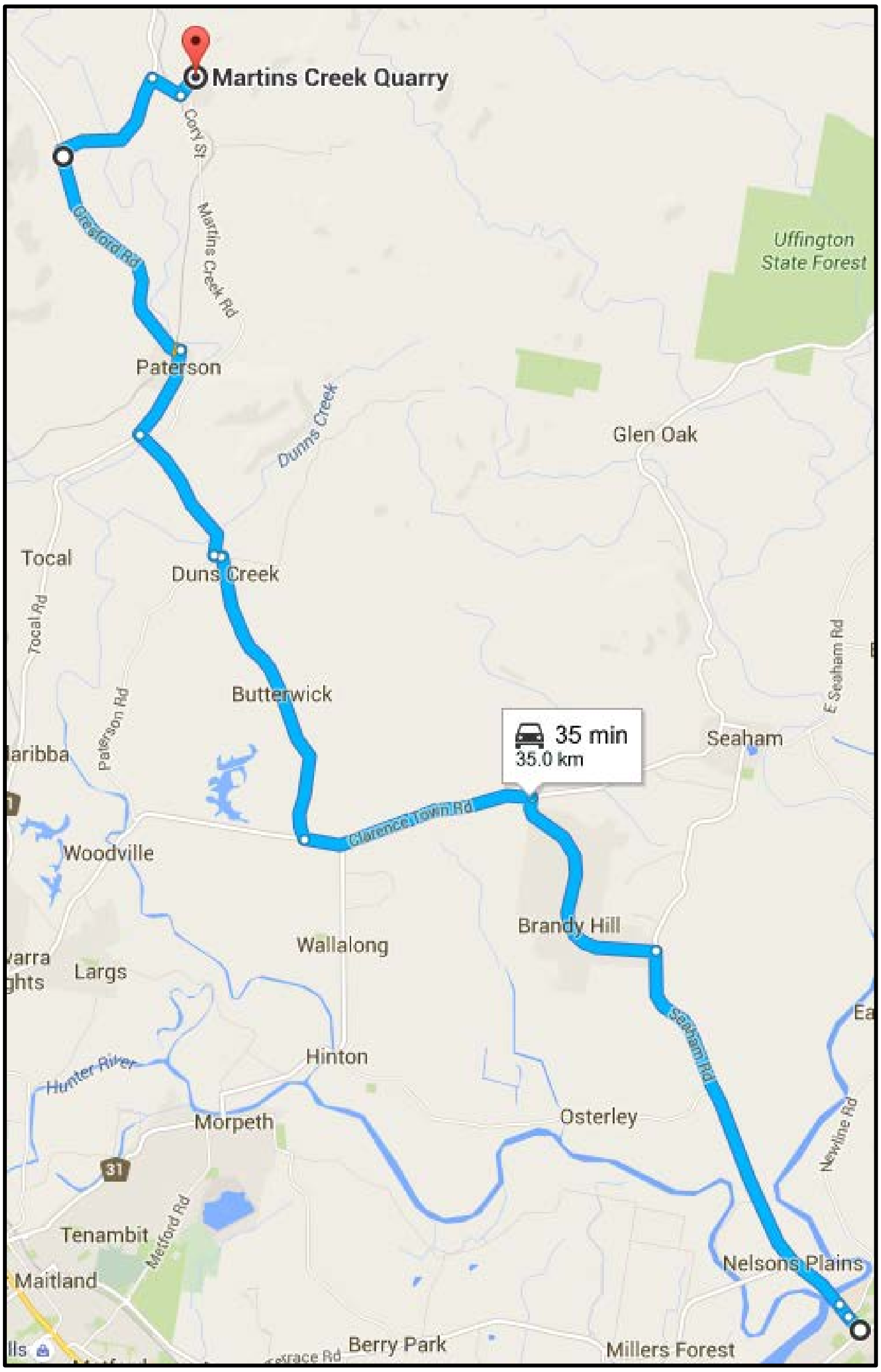


Figure 2-4 Quarry Haulage Route 2

Route Two allows for access to the east of the site, for areas within the Port Stephens LGA as well as access to the north along the Pacific Highway. This route allows for direct access to Raymond Terrace and then a connection to the greater road network from there.

Table 2-2 - Characteristics of Route 2 via Butterwick, Brandy Hill and Raymond Terrace

Section	Length	Characteristics
Paterson Road between Tocal Road and Duns Creek Road	2.7 kms	Provides a single lane of travel in both directions with a narrow sealed shoulder to both sides. It connects with Tocal Road via a simple give way controlled intersection. It operates under the posted speed limit of 80 km/h and provides a relatively level terrain but with limited over taking opportunities.
Duns Creek Road between Paterson Road and Butterwick Road	140 metres	This short length of the route provides a single lane of travel in both directions with a narrow sealed shoulder to both sides. It connects with Paterson Road at its western end and Butterwick Road at its eastern end via simple give way controlled intersections. It operates under the posted speed limit of 80 km/h.
Butterwick Road between Duns Creek Road and Clarence Town Road	5.6 kms	Provides a single lane of travel in both directions and over a long section of its length does not provide any shoulder or edge lines. There are edge lines provided over the remainder of the road length with sealed narrow shoulders. The road provides a reasonably straight alignment with a number of vertical curves which reduce driver's visibility and discourage speeding. There are a number of minor roads along its length which connect with Butterwick Road via simple give way control.
Clarence Town Road between Butterwick Road and Brandy Hill Drive	4.3 kms	Provides a single lane of travel in both directions and a sealed shoulder of varying width for the majority of its length. There is a painted edge line along the full length of this road and it operates under the posted speed limit of 100 km/h.
Brandy Hill Drive	4.5 kms	Provides a single lane of travel in both directions and operates under the posted speed limit of 80 km/h. For the majority of its length there is a solid double white line stopping vehicles overtaking. There are large lot semi-rural residential developments off both sides of the road with driveway connections to Brandy Hill Drive. It connects at both ends via simple give way controlled intersections.
Seaham Road between Brandy Hill Drive and Port Stephens Street	7.7 kms	Provides a single lane of travel in both directions and provides an edge line for the full length of the road. It provides a sealed shoulder of varying width along its full length and operates under the posted speed limit of 80 / 100 km/h until it crosses over the Hunter River where the speed limit reduces to 60 km/h reflective of the urban area of Raymond Terrace on the south-eastern side of the Hunter River. There are no footpaths provided along the majority of its length although there are footpaths provided on the bridge over the Hunter River. Seaham Road connects with William Bailey Street via a 4-way roundabout controlled intersection.
William Bailey Street	360 metres	Provides a single lane of travel in both directions and operates under the posted speed limit of 60 km/h. It provides a carriageway width in the order of 10 metres and does not provide any footpaths. It connects with Adelaide Street at its southern end via a 3-way signal controlled intersection that allows for all turning movements as well as caters for pedestrian crossing movements.
Adelaide Street (State Highway)		Adelaide Street forms part of the State Highway network and provides a mixture of 1 and 2 lanes of travel in each direction. This road used to form part of the Pacific Highway and as such is built to a high standard and now carries significantly lower traffic flows than prior to the construction of the Raymond Terrace bypass which formed part of the Pacific Highway upgrade in this location. It provides a footpath along the eastern side of the road and one along the western side of the road for the majority of its length within

		Raymond Terrace. It connects with the Pacific Highway to the north and south of this location as well as Richardson Road to the north that provides a connection through to Port Stephens.

Martins Creek quarry provides material for local Councils in the Lower Hunter Valley as well as other projects requiring access at times via other routes. The volume of material transported along these other routes is much lower and sporadic and include:

- The use of Dungog Road to access projects within Dungog and the Dungog LGA
- The use of Gresford Road north to East Gresford and beyond
- The on-going use of Belmore Road through Lorn to access the local market in Lorn and Maitland

The major intersections along Route One, where trucks associated with the haulage are required to give way are:

- Dungog Road and Gresford Road- give way control with Gresford Road being the priority road
- Paterson Road and Flat Road – three way roundabout
- Pitnacree Road and Melbourne Street – four way traffic signal control;
- Melbourne Street and New England Highway- four way traffic signal control

The major intersections along Route Two where trucks associated with the haulage are required to give way are:

- Dungog Road and Gresford Road- give way control with Gresford Road being the priority road
- Tocal Road and Paterson Road – give way control with Tocal Road the priority road
- Paterson Road and Duns Creek Road – give way control with Paterson Road being the priority road
- Duns Creek Road and Butterwick Road – give way control with Duns Creek Road being the priority road
- Butterwick Road and Clarence Town Road- giveway control with Clarence Town Road being the priority road
- Clarence Town Road and Brandy Hill Drive – 4-way give way control with Clarence Town Road being the priority road
- Brandy Hill Drive and Seaham Road – giveway control with Seaham Road being the priority road
- William Bailey Street and Newline Road / Port Stephens Street – 4-way roundabout control
- William Bailey Street and Adelaide Street – 3 way traffic signals

2.4.2 Roadworks (Current and Proposed)

Discussion with the road authorities (various Councils and the RMS) indicates that there are no proposed road network changes along either of the major transport routes used by Martins Creek Quarry nor other roads works that will be impacted upon by the proposed expansion.

The RMS has completed the construction of the Hunter Expressway and this has significantly altered the traffic patterns along the New England Highway. In particular, it has reduced the through traffic movements along the length of the New England Highway which has improved the capacity of the side roads, which at Melbourne Street provides a benefit for the project. The RMS is currently upgrading the intersection of the New England Highway and Cessnock Road, which suffers from significant delays and congestion during the traditional peak periods. This part of the road network is used by haulage trucks from Martins Creek that travel along Cessnock Road to link with the Hunter Expressway to the south of this location.

The various Councils have indicated that other than routine maintenance, there are no planned road upgrades within the general vicinity of the subject site or along the haul routes.

Discussion has also been held with the RMS with regards to the heritage listed wooden bridge on Dungog Road over the Paterson River. The RMS has indicated that this bridge is subject to on-going maintenance and has been approved for on-going use by heavy vehicles which include the truck and dog combinations utilised at Martins Creek Quarry.

2.4.3 Traffic Management Works

There are currently no traffic management works occurring in the vicinity of the subject site.

It is noted that during the project study period there has been repair work completed on the wooden bridge on Dungog Road. During this time, when the bridge was closed in association with on-going maintenance works, a temporary diversion was installed to direct vehicles north along Dungog Road and then west along Horns Crossing Road to connect with Gresford Road. These vehicles then headed south along Gresford Road through Vacy to continue south via Paterson.

2.4.4 Pedestrian and Cycling Facilities

There are no pedestrian or cyclist's facilities provided along the majority of the length of the local roads along either of the major haulage routes. This is typical of the rural setting for the project and is reflective of the low traffic volumes and the very low demand for pedestrians or cyclists along these routes. Through Paterson there are footpaths provided in a non-continual manner. These paths are in the centre of the town where there are some pedestrian demands.

A footpath to the eastern side of Tocal Road is provided through Bolwarra Heights which ensures pedestrian safety is maintained through the narrow section of the road reserve. There are no footpaths provided on Paterson Road further south, including the recently upgraded section to the north of Flat Road.

Footpaths are provided within East Maitland, reflective of the much higher pedestrian demands and the urban development. Similarly there are footpaths within Raymond Terrace along the main road network.

For other minor routes utilised by the Martins Creek quarry, the majority of the roads are in rural areas with no footpaths or cyclist facilities, reflective of the low traffic flows and demands by pedestrians or cyclists. Within the local town centres e.g. Dungog there are footpaths provided within the central business district only, reflective of the higher demands in these areas.

2.5 Traffic Flows

2.5.1 Peak Hour Flows

The proposed development is for an expansion of the current quarry activities. The quarry is open over extended hours and creates higher truck movements during the morning period, due to the demands of construction work.

As part of the project work, Seca Solution has collected extensive traffic data along Routes One and Two utilised by the project traffic. Tube counters were installed in week beginning 17th July 2015. These traffic surveys have involved using automatic tube counts, which collect data over a 24 hour period over a minimum of 7 days. These traffic counters also provide the split in traffic movements by direction as well as a breakdown of vehicle numbers by class as defined by Austroads. A summary of the peak hour traffic volumes by location is provided below.

Table 2-3 – Summary of hourly traffic flows by direction and two-way

Location	AM Peak			PM peak		
	Inbound Direction	Outbound Direction	2-way	Inbound Direction	Outbound Direction	2-way
Dungog Road, midway between Grace Ave and Gresford Road	57	77	134	71	60	131
Gresford Road north of Paterson	111	181	292	168	126	294
Paterson Road at Bolwarra	369	744	1113	669	400	1069
Flat Road midway between Paterson Road and Melbourne Street	263	507	770	487	318	805
Melbourne Street	637	852	1489	862	662	1524
Butterwick Road midway between Tocal Road and Clarence Town Road	47	83	130	86	51	137
Clarence Town Road, midway between Butterwick Road and Brandy Hill	124	184	308	170	143	313
Brandy Hill Drive	62	90	152	94	68	162
Seaham Road, midway between Brandy Hill Drive and Port Stephens Street	199	363	562	366	231	597

Note: Inbound direction equates to vehicle movements heading towards the Martins Creek quarry project whilst outbound is vehicles heading away from the Martins Creek quarry project.

2.5.2 Daily Traffic Flows

The traffic data for existing daily traffic flows via the tube counts also provides details on the Annual Average Daily Traffic flow (AADT) and the AADT for the various sections of the major transport routes is provided below.

Table 2-4 – Daily traffic volumes

Location	Daily traffic flows
Dungog Road, midway between Grace Ave and Gresford Rd	1,445
Gresford Road north of Paterson	3,078
Tocal Road, midway between Paterson and Bolwarra Heights	3,616
Paterson Road at Bolwarra	11,688
Flat Road midway between Paterson Rd and Melbourne St	8,659
Melbourne Street	9,007
Butterwick Road midway between Tocal Rd and Clarence Town Rd	1,423
Clarence Town Road, midway between Butterwick Rd and Brandy Hill	3,389
Brandy Hill Drive	1,816
Seaham Road, midway between Brandy Hill Dr and Port Stephens St	6,623

2.5.3 Daily Traffic Flow Distribution

The daily traffic volumes are reasonably balanced in both directions, with the above data indicating a slight bias in movements southbound (outbound) in the AM peak towards Maitland and the New England Highway and towards Raymond Terrace. These would be reflective of commuter type trips to the major centres such as Maitland and Newcastle for work and education requirements. During the PM peak periods, the traffic flows with a bias for northbound (inbound) movements. These would be reflective of reverse commuter trips heading home after work, educational and retail requirements, with these centres all being to the south of Martins Creek.

2.5.4 Vehicle Speeds

The traffic data collected by the automatic tube counters also included the collection of vehicle speeds. A summary of the vehicle speeds from the surveys is provided below.

Table 2-5 – Summary of 85th percentile speeds and posted speed limits

Location	85th percentile speed	Posted speed limit
Dungog Road, midway between Grace Avenue and Gresford Road	93 km/h	80 km/h
Gresford Road north of Paterson	95 km/h	80 km/h
Tocal Road, midway between Paterson and Bolwarra Heights	98 km/h	100 km/h
Paterson Road at Bolwarra	68 km/h	60 km/h
Flat Road midway between Paterson Road and Melbourne Street	87 km/h	80 km/h
Melbourne Street	56 km/h	60 km/h
Butterwick Road midway between Tocal Road and Clarence Town Road	105 km/h	100 km/h
Clarence Town Road, midway between Butterwick Road and Brandy Hill	105 km/h	100 km/h
Brandy Hill Drive	88 km/h	80 km/h
Seaham Road, midway between Brandy Hill Drive and Port Stephens Street	102 km/h	100 km/h

The 85th percentile speed is the speed at or below which 85% of all vehicles travelled.

The above data shows that in the more rural areas of the transport routes the 85th percentile vehicles speeds exceed the posted speed limit by a reasonable margin, but within the more residential areas the vehicle speeds are nearer to the posted speed limit.

Additional data was extrapolated from the tube counters to determine the vehicle speeds by vehicle class (as defined by Austroads Standards). A summary of the results of the data is provided below.

Table 2-6 – Summary of speeds by vehicle class (cars and quarry haulage vehicles) for typical working day

Location	Light vehicle speeds	Quarry haulage vehicle speeds	Posted speed limit
Gresford Road, north of railway crossing at Paterson	46.3 km/h	37.2km/hr	50 km/h
Paterson Road, Bolwarra to immediate south of Tocal Road	66.8 km/h	63.0 km/h	60 km/h
Flat Road	87.9 km/h	87.0 km/h	80 km/h
Butterwick Road southbound	103.3 km/h	97.7 km/h	100 km/h
Butterwick Road northbound	104.6 km/h	98.7 km/h	100 km/h

The above results demonstrate that the trucks associated with the quarry haulage travel slower than the light vehicles. Trucks typically travel within the posted speed limit except on Paterson Road (Bolwarra to the immediate south of Tocal Road) and along Flat Road. It can be seen that Flat Road provides a high standard of road design and construction which leads to all drivers regularly driving over the posted speed limit of 80 km/h.

2.5.5 Existing Site Flows

The site is currently an operational quarry with associated truck and light vehicle movements in and out of the site. All vehicle access is currently via the main access point on Station Street. This access connects with Grace Avenue to then provide access to the greater road network. The historic tonnage removed from Martins Creek and associated truck movements, based on 32.5 tonnes per truck load, associated with Martins Creek quarry are shown below.

Table 2-7 – Historic haulage values (Tonnes) and associated truck movements for Martins Creek Quarry (Source: Daracon)

Martins Creek Quarry Sales (Financial Year Tonnes)						
Operator	**Financial Year**	**Sales for Financial Year**	**Truck Movements per Year**	**Per Wk (50 wks/pa)**	**Trucks per day Monday-Friday**	**Trucks per day Saturday**
RailCorp	2003/2004	772,984.00	23,784	476	86	43
	2004/2005	652,991.00	20,092	402	73	37
	2005/2006	828,684.00	25,498	510	93	46
	2006/2007	609,487.00	18,753	375	68	34
	2007/2008	687,287.00	21,147	423	77	38
	2008/2009	633,397.00	19,489	390	71	35
	2009/2010	645,821.00	19,871	397	72	36
	2010/2011	569,930.00	17,536	351	64	32
	2011/2012	834,254.00	25,669	513	93	47
Railcorp/ Buttai Gravel	2012/2013	940,326.00	28,933	579	105	53
Buttai Gravel	2013/2014	1,152,228.76	35,453	709	129	64
	2014/2015	906,524.12	27,893	558	101	51
Summary	**Average**	**769,492.82**	**23,677**	**493**	90	45
	Median	**730,135.50**	**22,466**	**468**	85	43

Note that the above values are for *average* outbound truck movements only based on tonnes. For every outbound laden truck there is a corresponding inbound un-laden truck movement.

The above values represent the average truck movements per day, but operations on site vary considerably by day and also by hour through the normal working day. The operational characteristics of the quarry allows a maximum throughput of up to 40 trucks per hour outbound. The table below shows the average weekday haulage of material for the years 2013 and 2014 by month, based upon the data provided from the weighbridge on site.

Table 2-8 – Average weekday demand by month for 2013 and 2014 for existing operations at Martins Creek quarry (Source: Daracon)

Year	2013 weekday average (tonnes)	2013 weekday average (trucks)	2014 weekday average (tonnes)	2014 weekday average (trucks)
January	1362	42	3330	103
February	2959	91	5985	184
March	2771	85	6720	207
April	2168	67	4821	148
May	3045	94	5671	175
June	2556	79	3958	122
July	4467	138	3270	101
August	3159	98	3190	98
September	3967	122	4162	128
October	3408	105	3330	103
November	2050	63	3742	116
December	2849	88	unavailable	unavailable
Average	2897	90	4380	136

Note that the above values are for outbound truck movements only. For every outbound laden truck there is a corresponding inbound un-laden truck movement.

In reviewing the data in Table 2-8 related to the current and historic operation of the quarry (2013/2014), it is noted that there can be significant variation in demands, based upon the end market demands and weather conditions i.e. reduced or no operations within the quarry during periods of prolonged heavy rain. March 2014 was an absolute peak month for the quarry operations which coincided with peak demands at a number of major projects in the Lower Hunter. There was an average daily outbound flow of 6,720 tonnes corresponding to 207 outbound truck movements per day. The absolute peak demand occurred on Monday 17th of March 2014 with 9,449 tonnes which equates to 291 outbound truck movements, giving 582 two-way truck movements on that day. During the week commencing Monday 17th March, on average 8212 tonnes of material was supplied per day over the full working week, some 22% higher than the average per week for that month and 87% higher than the overall average weekly flow for 2014.

Overall this data for the two years 2013/2014 shows that:

- Average number of daily truck movements 111 inbound, 111 outbound
- 85th percentile of daily truck movements 159 inbound, 159 outbound
- Actual peak of daily truck movements 291 inbound, 291 outbound
- Theoretical daily peak of truck movements 400 inbound, 400 outbound (based on 10 hour working day)

The data provided for the quarry for 2013 and 2014 also shows the material demands for a Saturday morning, when the quarry works a half day. The Saturday average for 2013 was 765 tonnes which equates to 24 laden trucks whilst for 2014 the Saturday average was 997 tonnes which equates to 31 laden trucks.

2.5.6 Heavy Vehicle Flows

The traffic data collected by Seca Solution included a break down in vehicle classification as per the Austroads Guidelines. The traffic data shows that north of the town of Paterson the truck numbers as a percentage of the total flows is higher, but then as the analysis moves south along the route, the truck numbers remain near constant but the overall volume of traffic increases and hence the number of trucks as a percentage of the overall flow decreases. A summary of the heavy vehicle flows is given below.

Table 2-9 – Summary of the heavy vehicle flows along the transport routes from tube counters

Location	Total daily flow	Heavy vehicle daily flows	Heavy vehicle - percentage of daily flows
Dungog Road, midway between Grace Ave and Gresford Road	1,445	113	7.8%
Gresford Road north of Paterson	3,078	182	5.9%
Tocal Road, midway between Paterson and Bolwarra Heights	3,616	209	5.8%
Paterson Road at Bolwarra	11,688	386	3.3%
Flat Road midway between Paterson Road and Melbourne Street	8,659	268	3.1%
Melbourne Street	9,007	405	4.5%
Butterwick Road midway between Tocal Road and Clarence Town Road	1,423	51	3.6%
Clarence Town Road, midway between Butterwick Road and Brandy Hill	3,389	122	3.6%
Brandy Hill Drive	1,816	91	5.0%
Seaham Road, midway between Brandy Hill Drive and Port Stephens Street	6,623	265	4.0%

Heavy vehicles shown above are vehicles from medium rigid upwards, classes 3 to 12 inclusive as per Austroads Vehicle Classifications.

A closer examination of the survey results show that the percentage of heavy vehicles is greater in the morning and gradually decreases through the working day and from 5.00 PM the percentage of heavy vehicles drop off significantly.

2.5.7 Current Road Network Operation

Observations on site during the peak periods show that the road network, along the major transport routes associated with the Martins Creek quarry operations, all operate well with minimal delays and congestion, with the exception of the length of Melbourne Street on the approach to the New England Highway. Observations show that in the morning peak in particular, the queue back from the traffic lights at the New England Highway and Melbourne Street extends back beyond the traffic signals at Pitnacree Road / Lawes Street which creates significant delays and congestion for traffic on Melbourne Street. This is created by the high volume of traffic using the New England Highway in this location. Whilst the Hunter Expressway has provided some relief along this road corridor, the local demands along the New England Highway in this location remain high, hence the delays and queues created at this signal controlled intersection.

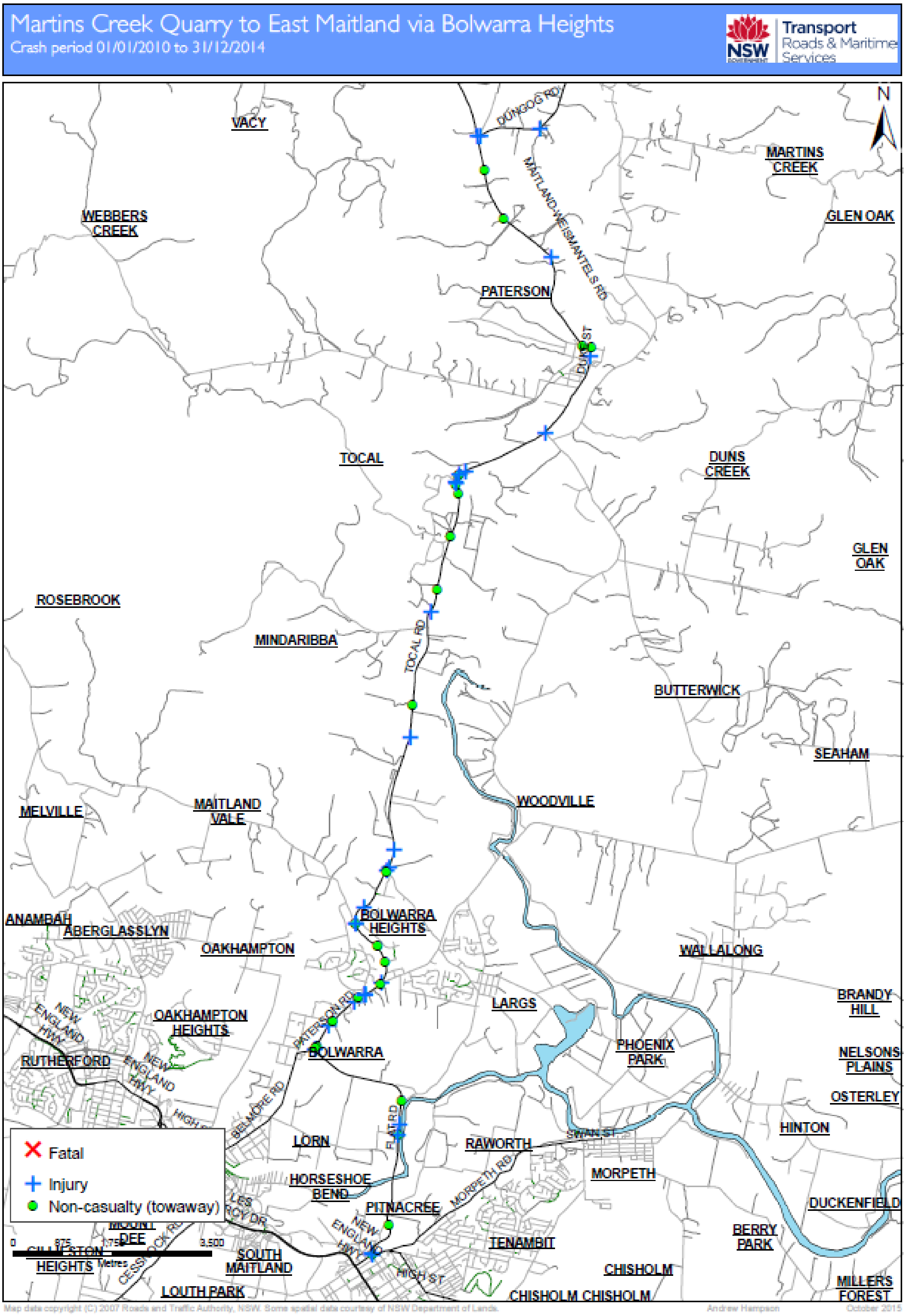
Other delays occur on the current haulage route via Belmore Road, Lorn. This is created by the traffic signals within Maitland at High Street as well as the more intense residential development in this area. As part of the approval process for the expansion of Martins Creek quarry, the operator of the quarry has stated that future truck movements will be directed to use the route via Flat Road and Melbourne Street to access the New England Highway and will not continue to use Belmore Road through Lorn. This route through Lorn will however be used to service the local markets in Maitland and its environs as required.

2.6 Traffic Safety and Accident History

The length of the two major haulage routes for the quarry operations have been reviewed as part of the project under the guidelines for the preparation of Road Safety Audits published by Austroads. The RMS has also provided accident data along the full length of the two haul routes over the last 5 years, which provides details on the accidents types as well as the type of vehicles involved.

Advice from the study team indicates that there have been no recorded accidents along the two major haulage routes associated with trucks working for the existing Martins Creek quarry.

A summary of the accident data is provided below.


Martins Creek Quarry to East Maitland via Bolwarra Heights
Crash period 01/01/2010 to 31/12/2014
Transport Roads & Maritime Services
NSW
N
VACY
MARTINS CREEK
WEBBERS CREEK
GLEN OAK
PATERSON
DUNGOG RD
MAITLAND-WEISMANTELS RD
TOCAL
DUNS CREEK
ROSEBROOK
MINDARIBBA
TOCAL RD
BUTTERWICK
SEAHAM
MELVILLE
MAITLAND VALE
WOODVILLE
ANAMBAH
ABERGLASSLYN
OAKHAMPTON
BOLWARRA HEIGHTS
WALLALONG
OAKHAMPTON HEIGHTS
LARGS
BRANDY HILL
RUTHERFORD
BOLWARRA
PHOENIX PARK
NELSONS PLAINS
OSTERLEY
LORN
RAWORTH
HINTON
HORSESHOE BEND
MORPETH
PITNACREE
DUCKENFIELD
TENAMBIT
BERRY PARK
SOUTH MAITLAND
CHISHOLM
LOUTH PARK
MILLERS FOREST
Fatal
Injury
Non-casualty (towaway)
Metres
Map data copyright (C) 2007 Roads and Traffic Authority, NSW. Some spatial data courtesy of NSW Department of Lands.

Summary Crash Report

# Crash Type		
Car Crash	45	83.3%
Light Truck Crash	9	16.7%
Rigid Truck Crash	1	1.9%
Articulated Truck Crash	2	3.7%
'Heavy Truck Crash	(3)	(5.6%)
Bus Crash	0	0.0%
"Heavy Vehicle Crash	(3)	(5.6%)
Emergency Vehicle Crash	0	0.0%
Motorcycle Crash	2	3.7%
Pedal Cycle Crash	0	0.0%
Pedestrian Crash	1	1.9%

' Rigid or Artic. Truck " Heavy Truck or Heavy Bus
These categories are NOT mutually exclusive

Location Type		
*Intersection	22	40.7%
Non intersection	32	59.3%

* Up to 10 metres from an intersection

Collision Type		
Single Vehicle	23	42.6%
Multi Vehicle	31	57.4%

Road Classification		
Freeway/Motorway	0	0.0%
State Highway	0	0.0%
Other Classified Road	47	87.0%
Unclassified Road	7	13.0%

Contributing Factors		
Speeding	16	29.6%
Fatigue	5	9.3%

Weather		
Fine	37	68.5%
Rain	11	20.4%
Overcast	5	9.3%
Fog or mist	1	1.9%
Other	0	0.0%

Road Surface Condition		
Wet	16	29.6%
Dry	38	70.4%
Snow or ice	0	0.0%

Natural Lighting		
Dawn	3	5.6%
Daylight	38	70.4%
Dusk	1	1.9%
Darkness	12	22.2%

Crash Movement		
Intersection, adjacent approaches	5	9.3%
Head-on (not overtaking)	5	9.3%
Opposing vehicles; turning	4	7.4%
U-turn	1	1.9%
Rear-end	10	18.5%
Lane change	0	0.0%
Parallel lanes; turning	0	0.0%
Vehicle leaving driveway	1	1.9%
Overtaking; same direction	1	1.9%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Hit pedestrian	1	1.9%
Permanent obstruction on road	0	0.0%
Hit animal	0	0.0%
Off road, on straight	2	3.7%
Off road on straight, hit object	3	5.6%
Out of control on straight	1	1.9%
Off road, on curve	3	5.6%
Off road on curve, hit object	14	25.9%
Out of control on curve	0	0.0%
Other crash type	3	5.6%

Speed Limit					
40 km/h or less	1	1.9%	80 km/h zone	24	44.4%
50 km/h zone	5	9.3%	90 km/h zone	0	0.0%
60 km/h zone	16	29.6%	100 km/h zone	8	14.8%
70 km/h zone	0	0.0%	110 km/h zone	0	0.0%

~ 07:30-09:30 or 14:30-17:00 on school days | ~ 40km/h or less 0 0.0% | ~ School Travel Time Involvement 14 25.9%

Day of the Week											
Monday	6	11.1%	Wednesday	6	11.1%	Friday	11	20.4%	Sunday	5	9.3%
Tuesday	7	13.0%	Thursday	14	25.9%	Saturday	5	9.3%			

WEEKEND	10	18.5%
WEEKDAY	44	81.5%

CRASHES	54	
Fatal	0	0.0%
Serious inj.	8	14.8%
Moderate inj.	12	22.2%
Minor/Other inj.	6	11.1%
Uncategorised inj.	3	5.6%
Non-casualty	25	46.3%
Self Reported Crash	1	1.85%

Time Group			% of Day
00:01 - 02:59	0	0.0%	12.5%
03:00 - 04:59	2	3.7%	8.3%
05:00 - 05:59	1	1.9%	4.2%
06:00 - 06:59	2	3.7%	4.2%
07:00 - 07:59	3	5.6%	4.2%
08:00 - 08:59	3	5.6%	4.2%
09:00 - 09:59	4	7.4%	4.2%
10:00 - 10:59	1	1.9%	4.2%
11:00 - 11:59	3	5.6%	4.2%
12:00 - 12:59	4	7.4%	4.2%
13:00 - 13:59	4	7.4%	4.2%
14:00 - 14:59	3	5.6%	4.2%
15:00 - 15:59	4	7.4%	4.2%
16:00 - 16:59	7	13.0%	4.2%
17:00 - 17:59	2	3.7%	4.2%
18:00 - 18:59	0	0.0%	4.2%
19:00 - 19:59	2	3.7%	4.2%
20:00 - 21:59	5	9.3%	8.3%
22:00 - 24:00	4	7.4%	8.3%

Street Lighting Off/Nil				% of Dark
7	of	12	in Dark	58.3%

CASUALTIES	39	
Killed	0	0.0%
Seriously inj.	12	30.8%
Moderately inj.	16	41.0%
Minor/Other inj.	8	20.5%
Uncategorised inj.	3	7.7%
^ Unrestrained	0	0.0%

^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn

Crashes		Casualties
8	2014	3
13	2013	10
8	2012	11
12	2011	7
13	2010	8

McLean Periods			% Week
A	8	14.8%	17.9%
B	3	5.6%	7.1%
C	15	27.8%	17.9%
D	1	1.9%	3.5%
E	3	5.6%	3.6%
F	4	7.4%	10.7%
G	12	22.2%	7.1%
H	2	3.7%	7.1%
I	2	3.7%	12.5%
J	4	7.4%	10.7%

#Holiday Periods																	
New Year	0	0.0%	Easter	0	0.0%	Queen's BD	1	1.9%	Christmas	1	1.9%	Easter SH	0	0.0%	Sept./Oct. SH	1	1.9%
Aust. Day	1	1.9%	Anzac Day	0	0.0%	Labour Day	1	1.9%	January SH	3	5.6%	June/July SH	2	3.7%	December SH	1	1.9%

Crashid dataset Martins Creek Quarry to East Maitland via Bolwarra Heights - crash data from 01/01/2010 to 31/12/2014

Note: Crash self reporting, including self reported injuries began in Oct 2014. Trends from 2014 are expected to vary from previous years. More unknowns are expected in self reported data. Reporting years 2014 onwards contain uncategorised injury crashes.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

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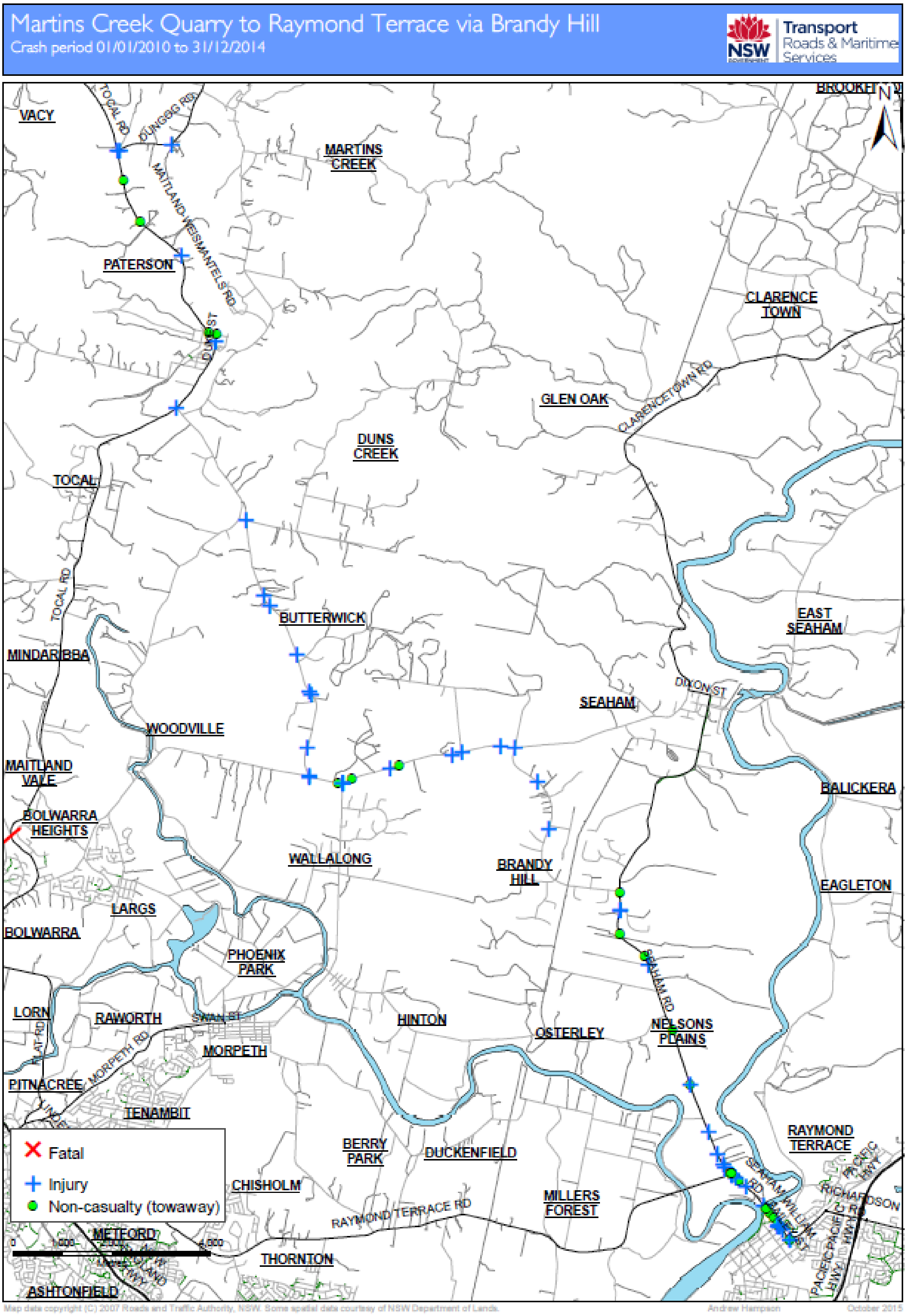

Martins Creek Quarry to Raymond Terrace via Brandy Hill
Crash period 01/01/2010 to 31/12/2014
Transport Roads & Maritime Services
NSW
VACY
TOCAL RD
DUNGOG RD
MARTINS CREEK
MAITLAND-WEISMANTELS RD
PATERSON
DUNS ST
CLARENCE TOWN
GLEN OAK
CLARENCETOWN RD
DUNS CREEK
TOCAL
TOCAL RD
BUTTERWICK
EAST SEAHAM
MINDARIBBA
DIXON ST
SEAHAM
WOODVILLE
MAITLAND VALE
BALICKERA
BOLWARRA HEIGHTS
WALLALONG
BRANDY HILL
EAGLETON
LARGS
BOLWARRA
PHOENIX PARK
SEAHAM RD
LORN
RAWORTH
SWAN ST
HINTON
OSTERLEY
NELSONS PLAINS
MORPETH RD
MORPETH
PITNACREE
TENAMBIT
RAYMOND TERRACE
BERRY PARK
DUCKENFIELD
CHISHOLM
MILLERS FOREST
RAYMOND TERRACE RD
RICHARDSON RD
PACIFIC HWY
METFORD
THORNTON
ASHTONFIELD
BROOKFIELD
Fatal
Injury
Non-casualty (towaway)
Map data copyright (C) 2007 Roads and Traffic Authority, NSW. Some spatial data courtesy of NSW Department of Lands.
Andrew Hampson
October 2015

Summary Crash Report

Transport for NSW
Centre for Road Safety

# Crash Type		
Car Crash	71	89.9%
Light Truck Crash	18	22.8%
Rigid Truck Crash	1	1.3%
Articulated Truck Crash	0	0.0%
'Heavy Truck Crash	(1)	(1.3%)
Bus Crash	0	0.0%
"Heavy Vehicle Crash	(1)	(1.3%)
Emergency Vehicle Crash	0	0.0%
Motorcycle Crash	7	8.9%
Pedal Cycle Crash	1	1.3%
Pedestrian Crash	2	2.5%

' Rigid or Artic. Truck " Heavy Truck or Heavy Bus
These categories are NOT mutually exclusive

Location Type		
*Intersection	39	49.4%
Non intersection	40	50.6%

* Up to 10 metres from an intersection

Collision Type		
Single Vehicle	29	36.7%
Multi Vehicle	50	63.3%

Road Classification		
Freeway/Motorway	0	0.0%
State Highway	0	0.0%
Other Classified Road	55	69.6%
Unclassified Road	24	30.4%

Contributing Factors		
Speeding	14	17.7%
Fatigue	12	15.2%

Weather		
Fine	60	75.9%
Rain	11	13.9%
Overcast	6	7.6%
Fog or mist	2	2.5%
Other	0	0.0%

Road Surface Condition		
Wet	14	17.7%
Dry	65	82.3%
Snow or ice	0	0.0%

Natural Lighting		
Dawn	5	6.3%
Daylight	48	60.8%
Dusk	2	2.5%
Darkness	24	30.4%

Crash Movement		
Intersection, adjacent approaches	12	15.2%
Head-on (not overtaking)	2	2.5%
Opposing vehicles; turning	10	12.7%
U-turn	4	5.1%
Rear-end	17	21.5%
Lane change	0	0.0%
Parallel lanes; turning	0	0.0%
Vehicle leaving driveway	1	1.3%
Overtaking; same direction	0	0.0%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Hit pedestrian	2	2.5%
Permanent obstruction on road	0	0.0%
Hit animal	3	3.8%
Off road, on straight	2	2.5%
Off road on straight, hit object	8	10.1%
Out of control on straight	1	1.3%
Off road, on curve	2	2.5%
Off road on curve, hit object	7	8.9%
Out of control on curve	1	1.3%
Other crash type	7	8.9%

Speed Limit					
40 km/h or less	1	1.3%	80 km/h zone	30	38.0%
50 km/h zone	10	12.7%	90 km/h zone	3	3.8%
60 km/h zone	16	20.3%	100 km/h zone	18	22.8%
70 km/h zone	1	1.3%	110 km/h zone	0	0.0%

~ 07:30-09:30 or 14:30-17:00 on school days					
~ 40km/h or less	0	0.0%	~ School Travel Time Involvement	11	13.9%

CRASHES	79	
Fatal	0	0.0%
Serious inj.	17	21.5%
Moderate inj.	19	24.1%
Minor/Other inj.	6	7.6%
Uncategorised inj.	9	11.4%
Non-casualty	28	35.4%

Self Reported Crash	1	1.27%

Time Group			% of Day
00:01 - 02:59	1	1.3%	12.5%
03:00 - 04:59	1	1.3%	8.3%
05:00 - 05:59	1	1.3%	4.2%
06:00 - 06:59	4	5.1%	4.2%
07:00 - 07:59	2	2.5%	4.2%
08:00 - 08:59	4	5.1%	4.2%
09:00 - 09:59	5	6.3%	4.2%
10:00 - 10:59	4	5.1%	4.2%
11:00 - 11:59	3	3.8%	4.2%
12:00 - 12:59	4	5.1%	4.2%
13:00 - 13:59	7	8.9%	4.2%
14:00 - 14:59	2	2.5%	4.2%
15:00 - 15:59	7	8.9%	4.2%
16:00 - 16:59	4	5.1%	4.2%
17:00 - 17:59	7	8.9%	4.2%
18:00 - 18:59	7	8.9%	4.2%
19:00 - 19:59	6	7.6%	4.2%
20:00 - 21:59	4	5.1%	8.3%
22:00 - 24:00	6	7.6%	8.3%

Street Lighting Off/Nil			% of Dark	
12	of	24	in Dark	50.0%

CASUALTIES	75	
Killed	0	0.0%
Seriously inj.	20	26.7%
Moderately inj.	32	42.7%
Minor/Other inj.	9	12.0%
Uncategorised inj.	14	18.7%
^ Unrestrained	0	0.0%

^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn

Crashes		Casualties
11	2014	14
16	2013	10
14	2012	9
16	2011	22
22	2010	20

McLean Periods			% Week
A	9	11.4%	17.9%
B	3	3.8%	7.1%
C	18	22.8%	17.9%
D	3	3.8%	3.5%
E	4	5.1%	3.6%
F	17	21.5%	10.7%
G	12	15.2%	7.1%
H	4	5.1%	7.1%
I	4	5.1%	12.5%
J	5	6.3%	10.7%

Day of the Week														
Monday	13	16.5%	Wednesday	17	21.5%	Friday	12	15.2%	Sunday	10	12.7%	WEEKEND	18	22.8%
Tuesday	9	11.4%	Thursday	10	12.7%	Saturday	8	10.1%	WEEKDAY	61	77.2%			

#Holiday Periods																	
New Year	0	0.0%	Easter	1	1.3%	Queen's BD	1	1.3%	Christmas	1	1.3%	Easter SH	4	5.1%	Sept./Oct. SH	5	6.3%
Aust. Day	0	0.0%	Anzac Day	0	0.0%	Labour Day	2	2.5%	January SH	7	8.9%	June/July SH	6	7.6%	December SH	3	3.8%

From the accident data above, the following points are made:

- The vast majority of the accidents involved light vehicles and light trucks only, which excludes the size / type of vehicle associated with haulage of quarry material;
- Speed and fatigue represent over 30% of the cause of the accidents along the two routes;
- The majority of accidents involve rear end accidents, turning traffic and at the approach to intersections. These are typically created at driveways and intersections where there are no sheltered right turn lanes, to protect traffic waiting to turn right off the road.

The road safety review undertaken along the length of the two major haulage routes identified a number of safety concerns with the existing layout of intersections and roads. It is noted that these concerns do not have a nexus to the haulage vehicles associated with quarry use at Martins Creek (or Brandy Hill). These are existing safety issues on the road network that do not comply with current design standards. A summary of the safety concerns is provided below.

Table 2-10 – Summary of findings of Road Safety review along the two key haulage routes

Issue	Potential safety concern	Suggested upgrade	Comment
Lack of space between intersection of Station Street and railway crossing and road alignment across railway crossing	Could lead to driver confusion over traffic controls leading to blockage of railway crossing	1 - Remove railway crossing with grade separation 2 - Upgrade level crossing and alignment	ARTC has prepared plan for upgrade but no timeframe for works.
One-way bridge operation on Dungog Road	Could lead to head on collisions due to drivers not giving way	1 – Widen bridge 2 – Provide new wider bridge	RMS has stated that the current bridge can continue to operate as one-way.
Lack of sheltered right turn lane on Gresford Road for drivers turning right into Dungog Road	Could lead to rear end type crashes	Upgrade intersection to provide a dedicated sheltered right turn lane	Existing traffic demands warrant this road upgrade
Tight road alignment on 90-degree bend at Gresford Road / Duke Street in Paterson	Could lead to drivers cutting the corner and resulting in head on collisions	Provide physical guidance for vehicles to reinforce traffic manoeuvre around the bend	
Lack of pavement width on Tocal Road at Bolwarra Heights	Could lead to safety concerns for cyclists and potential issue for vehicles stopping	1 - Widen road pavement or 2 – Provide an off road footway / cycleway Provide No Stopping signage along length of the road	Council has recently completed works in this section to improve delineation
Lack of shoulders along Butterwick Road	No run off area or space for cyclists	Provide shoulder widening in both directions along affected length	Existing traffic volumes require this road upgrade
Lack of sheltered right turn lane on Clarence Town Road for drivers turning right into Butterwick Road	Could lead to rear end type accidents	Upgrade intersection to provide a dedicated sheltered right turn lane	Existing traffic demands warrant this road upgrade

Issue	Potential safety concern	Suggested upgrade	Comment
Lack of sheltered right turn lane on Clarence Town Road for drivers turning right into Brandy Hill Drive	Could lead to rear end type accidents	Upgrade intersection to provide a dedicated sheltered right turn lane	Existing traffic demands warrant this road upgrade. May require upgrade due to Brandy Hill quarry

Overall, it is considered that the road network is generally satisfactory for road safety issues, with the major concerns being the lack of sheltered right turn lanes at the key intersections identified above.

2.7 Parking Supply and Demand

2.7.1 On-street Parking Provision

Currently, vehicles can be parked on both sides of the local roads in the vicinity of the site. However, on-site observations indicate that current on street demands are negligible with the majority of local residents having off street parking available.

2.7.2 Off-Street Parking Provision

There is adequate off-street parking in the general locality of the subject site to satisfy the local demand.

2.7.3 Parking Demand and Utilisation

There was no on-street parking noted in the general vicinity of the site. All parking was accommodated within the private properties.

2.7.4 Short term Set down or pick up areas

There are no set down or pick up areas in the locality of the site.

2.8 Public Transport

2.8.1 Rail Station Locations

Martins Creek railway station is less than 500m from the subject site. It is located on the Hunter railway line providing a link to Newcastle and beyond through to Sydney to the south and to Dungog to the north. Maitland station, located on the Hunter line 27 kms to the south of the site provides access to services to the west towards Singleton and beyond.

2.8.2 Bus Routes and Associated Facilities

Local bus services are limited. Linq Buslines provides a local school run for Martins Creek public school, as well as for students travelling to Dungog High School. Shelton Services of Dungog operate local school bus runs and connect with Busways and Hunter Valley Buses.

There are no bus stops within the general locality of the subject site.

2.8.3 Rail and Bus Service Frequencies

There are five northbound rail services and five southbound rail services daily, Monday to Friday, with less frequent services of a weekend.

Northbound	Southbound
5.25	7.11
9.25	10.33
11.25	12.49
16.21	17.24
18.25	19.49

The local school bus services only operate on school days.

2.9 Pedestrian Network

There are very limited pedestrian facilities within the general locality of the subject site, reflective of the rural setting and the combination of low traffic flows and low pedestrian demands.

Within the major urban centres e.g. Paterson, Bolwarra Heights, Lorn, Maitland and Raymond Terrace footpaths are provided which allow for safe and appropriate pedestrian movements.

2.10 Other Proposed Developments

The other major development proposed within the general locality of the subject site is the expansion of the Brandy Hill Quarry. Brandy Hill Quarry is proposing to expand their operations to allow for the extraction of 1.5 million tonnes of hard rock per year for 30 years, which will allow for 24 hour operations, sales and despatch. The Environmental Impact Assessment (EIS) for the project has been produced to assess the development, the SEARs have been issued and addressed and the project has been submitted to the Department of Planning for a test of adequacy prior to the formal submission of the EIS.

Further information on this project with regard to routes for trucks, split of demand for the end products or details on truck movements generated by this project has not been made available by Hansen to the study team for Martins Creek.

3 Proposed Development

3.1 The Development

The project seeks to continue existing operations to complete the extraction of material in existing areas in conjunction with expansion into the proposed new areas to maximise the utilisation of the resource. Mining methods are expected to remain the same as currently used with rock being broken by Drill and Blast techniques in the pit with Run of Mine (ROM) material being trucked to the crushing plant for further processing before being stockpiled and loaded on to road trucks for delivery to market.

The components of the development comprise:

- extracting up to 1.5 million tonnes of hard rock material per annum;
- expanding into new extraction areas and clearing of vegetation;
- increasing the hours of operation,
    - for quarrying to 6am-6pm (Monday to Saturday)
    - processing to 6am -10pm (Monday to Saturday)
    - mixing and binding to 4.30am – 10pm (Monday to Friday) and 4.30-6pm (Saturdays),
    - train loading retained at 24 hours per day, 7 days per week,
    - maintenance works retained at 24 hours per day, 7 days per week,
- consolidating existing operations and approvals; and
- rehabilitating the site

3.1.1 Projected number of employees

The proposal may generate the requirement for additional staffing levels which will increase over time as the output of material increases. The extent of additional staffing levels is not know at this time.

3.1.2 Hours and days of operations

A summary of the operational hours for Martins Creek quarry is provided below increasing the hours of operation to:

- for quarrying to 6am-6pm (Monday to Saturday)
- processing to 6am -10pm (Monday to Saturday)
- mixing and binding to 4.30am – 10pm (Monday to Friday) and 4.30-6pm (Saturdays),
- train loading retained at 24 hours per day, 7 days per week,
- maintenance works retained at 24 hours per day, 7 days per week,

3.1.3 Phasing and Timing

The proposed expansion of the quarry to the full annual output of 1.5 million tonnes will be driven by market demand. The timing and phasing of the expansion will therefore be reliant upon market forces.

3.1.4 Selection of appropriate design vehicles for access and circulation requirements

The development will generally need to accommodate both light vehicles and heavy vehicles with the largest vehicle being a truck and dog combination. Light vehicles will include staff vehicles as well as small trucks associated with general maintenance for the works on site. The majority of the current material hauled by road from the site utilise a truck and dog combination. Other product is moved using semi-trailers.

Daracon also have need for the occasional larger vehicle, including low loader floats for moving heavy machinery on and off site as required.

3.2 Access

3.2.1 Driveway Location

All vehicle access to the subject site will be via the existing access on Station Street. Station Street then connects with Grace Avenue to allow for connection to the greater road network. The existing access on Station Street has been the single vehicle access to the quarry for the majority of the life of the quarry and allows for safe and appropriate two-way traffic movements.

As part of the on-going development of the quarry, a new access option has been identified that will allow for direct vehicle access between the quarry and Dungog Road, to the north of Grace Avenue which involves a bridge crossing over the railway line. Once this new access has been constructed, all heavy vehicle movements will be via this new access. This new road access will be designed and constructed in accordance with Council standards and will allow for a sheltered right turn lane on Dungog Road to ensure that the new access can operate in a safe and appropriate manner. The bridge works will be designed and constructed in accordance with ARTC standards.

When this new access is constructed, the existing access on Station Street will remain as per the current layout, allowing for emergency access as well as light vehicle movements in and out of the site. This current layout is sufficient to continue to allow for this use.

3.2.2 Sight Distances

The connection of the current site access to the road network is via the intersection of Grace Avenue and Station Street. This intersection is a simple T-intersection with Stop sign control with the roads connecting at 90 degrees. Visibility is good in both directions, especially when taking into account the raised seating position for drivers of trucks. Visibility to the right for drivers exiting Station Street is impacted upon by the vertical alignment of the road over the level crossing, but there remains adequate distance for drivers to determine a suitable gap for exiting Station Street.

For the posted speed limit of 50 km/h the sight distance requirement is 80 metres. This distance has been assessed on site and exceeds 100 metres in both directions. It is noted that whilst the posted speed limit is 50 km/h n this location, the actual vehicle speeds are lower due to the interaction with the at-grade train level crossing to the immediate west of the intersection.

Figure 3-1 – Aerial photo showing intersection of Station Street and Grace Avenue

Photo 1 – View west along Cory Street on approach to level crossing. Note Station Street is to right of photo

3.2.3 Service Vehicle Access

The proposed expansion of the quarry may generate additional servicing requirements for plant and vehicles with all maintenance carried out on site. Typical service vehicles include light to medium trucks and these vehicles can all be accommodated on site as appropriate. Currently, all of these vehicles gain access via Station Street but in the future will be able to gain access via the new connection direct onto Dungog Road. The current site access allows for access for all vehicles including the truck and dog combinations and thus cater for the swept path movement associated with service vehicles.

The new access on Dungog Road will be designed in accordance with Council requirements and will be designed to accommodate the normal vehicle access requirements for the project, which will include the service vehicles.

3.2.4 Queuing at entrances

Given the overall traffic flows along Grace Avenue, it is considered that there will be minimal queuing associated with the traffic movements in and out of the subject site. Observations of the current operation show that there is very limited delays for trucks accessing the site, with the major delays occurring when trains are travelling through the location causing hold ups across the at-grade level crossing. However, there is a limited train service in this location and accordingly the delays are minimal.

With the construction of the future access direct onto Dungog Road, the delays at the existing site access at Station Street will be significantly reduced. The new access on Dungog Road will allow for a safe and appropriate connection and will provide a sheltered right turn lane for traffic entering the site. The delays for the through traffic movements will be minimal and any delay for exiting traffic will result in a queue located within the site.

3.2.5 Current access compared with proposed access

Vehicle access to the subject site will be the same as the existing access to the site, via Station Street.

Access will be improved with the construction of new access road and connection to Dungog Road. At this stage, all heavy vehicles will be able to access the site via the new access and will not need to use Station Street. The Station Street access will remain as per the current layout and will allow for heavy vehicle access if required.

3.2.6 Access to Public Transport

There will be no need for public transport to access the site.

3.3 Circulation

3.3.1 Pattern of circulation

The size of the site and the layout of the internal roads allows for vehicles to enter and exit the site in a forward direction.

3.3.2 Internal Road width

The width of the internal roads is in accordance with normal design standards for quarries and allow for two way traffic movements as appropriate. All internal traffic movements are governed by mining rules and regulations and Daracon have a drivers' code of conduct to manage internal traffic movements. There is no public access within the quarry site.

3.3.3 Internal Bus Movements

It is considered that there will be neither internal bus movements nor a requirement for a bus to travel within the development site.

3.3.4 Service Area Layout

Servicing is completed across the site as required adjacent to the various equipment and plant. Vehicles associated with maintenance and servicing park within the site adjacent to the plant as required. A separate maintenance shed is provided that allows for vehicle maintenance.

3.4 Parking

3.4.1 Proposed Supply

All parking for this proposed development will be contained within the site.

Due to the unique nature of the proposed expanded project it is not covered by Council's parking code. The existing parking provision will be retained and expanded on site to meet the potential future expansion of the staffing needs.

3.4.2 Parking provision per State Government policy

No specific provision required.

3.4.3 Council code and local parking policies and plans

No specific provision required.

3.4.4 Parking Layout

The site layout will allow for the safe parking of vehicles within the site. This will include a stand over area for the trucks parked on site overnight. These parking areas are typically informal and located within the quarry footprint as appropriate and will alter as the quarry expands.

3.4.5 Projected peak demand

Peak parking demand will be reliant upon staffing levels. The site area allows for all staff parking to be provided on site. The site allows for trucks to be stored on site over-night and staff arrive and depart from the site in their own vehicles.

3.4.6 Service Vehicle Parking

The site area allows for all service vehicle parking to be provided on site as required.

3.4.7 Pedestrian and Bicycle Facilities

There are no specific pedestrian and bicycle facilities proposed.

4 Transportation Analysis

4.1 Traffic Generation

The quarry expansion is proposed to allow for a maximum annual allowance of 1.5 million tonnes. Currently it is proposed that the majority of the material will be removed from the site via road haulage, due to the operation restrictions associated with the use of the rail siding and rail network. Use of the railway sidings will continue at similar levels to the current use, which is in the order of 50,000 tonnes per annum.

Based upon the typical truck and dog combination used at the quarry carrying 32.5 tonnes per load, the future expansion to 1.5 million tonnes could generate:

- 46,153 laden truck movements per year;
- Corresponding 46,153 empty truck movements accessing the site.

Based upon the current operation, allowing 50 weeks per year and 5.5 days per week operation, this will generate 923 truckloads per week on average and 168 truckloads per day Monday to Friday. This gives a typical daily two-way rate of 336 trucks per day. Based on a half day for the Saturday the quarry could generate up to 84 truckloads on a Saturday, however it is noted that demands for major construction material is much lower on a Saturday morning and as such, the normal Saturday demands are much lower than 84 loads. Data from the Martins Creek weighbridge indicates that for year 2013 – 2014 the average Saturday tonnage was 765 which equates to less than 25 trucks.

Advice from the study team indicates that the operational characteristics of the quarry allow for a maximum sales throughput of 40 trucks loading and exiting the site per hour. This is consistent with the current hourly operations of the site however the total daily throughput is dependent upon the throughput capacity of the quarry as well as market demands. Market demands require that the majority of product be delivered early within the working day and as such must leave the quarry between 5.30-8am, after this the hourly truck movements reduce, dropping off significantly after 11am and further again at 3pm. The timeline for quarry product deliveries are shown below in Figure 4-1.

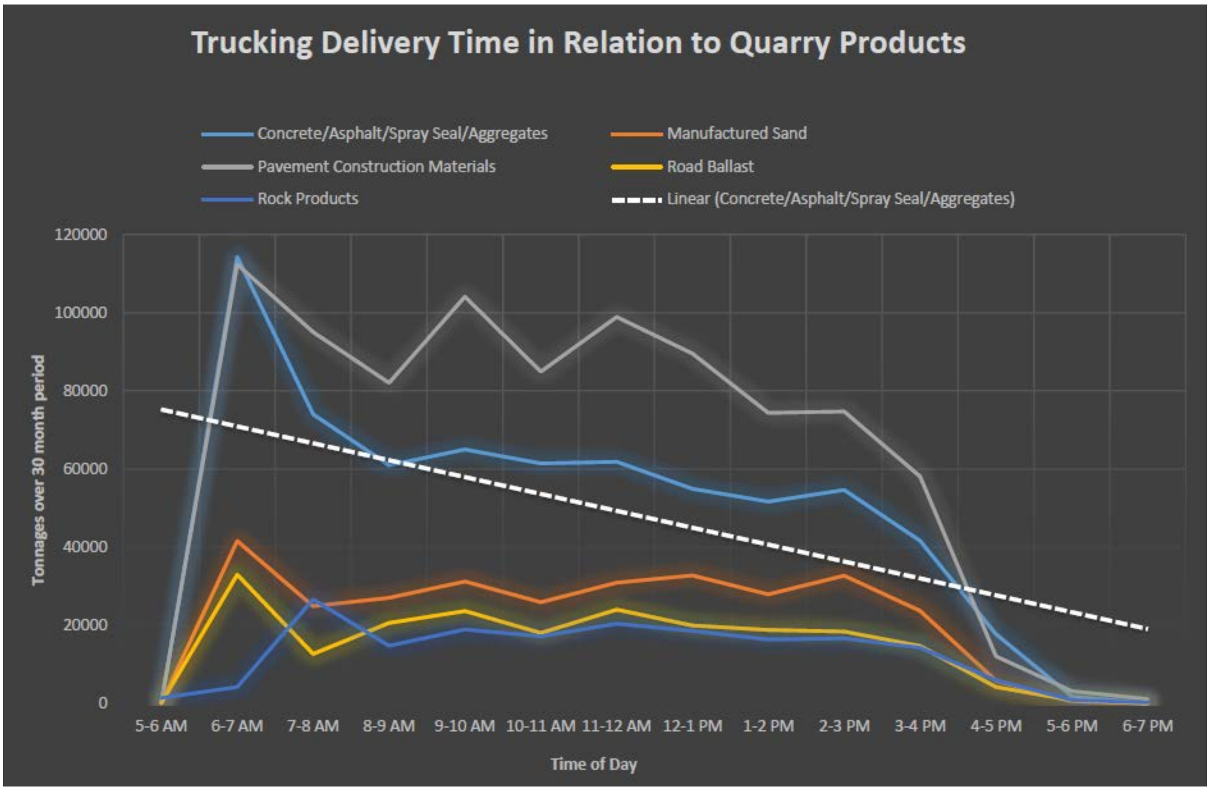


Figure 4-1 Truck movements associated with outbound quarry products (Source: Daracon)

The development could generate some 40 inbound and 40 outbound trucks per hour at its peak when the site is working at maximum capacity. Based on 8 hours for deliveries of outbound product demand per working day, as a worst case scenario this would equate to an absolute peak daily demand of 320 trucks entering and exiting the site per day, 640 two way truck movements. However it is important to note that this type of demand is dependent upon Daracon working concurrently on a number of major projects and all of these projects requiring quarry product all at the same time. A review of the weighbridge data shows that the absolute peak demand for 2013/2014 was 291 trucks on the 17th March 2014, which would have generated 582 two-way truck movements. For the following Monday (24th March) the weighbridge records show 179 truckloads were removed from the site whilst the average for the entire year for 2014 was 136 truckloads per day.

In reviewing data related to the current and historic operation of the quarry (2013/2014) overall:

- Average number of daily truck movements 111 inbound, 111 outbound
- 85th percentile of daily truck movements 159 inbound, 159 outbound
- Peak of daily truck movements 291 inbound, 291 outbound
- Theoretical daily peak of truck movements 320 inbound, 320 outbound

This fluctuation in deliveries by year over the last 12 years is shown below in Figure 4-2.

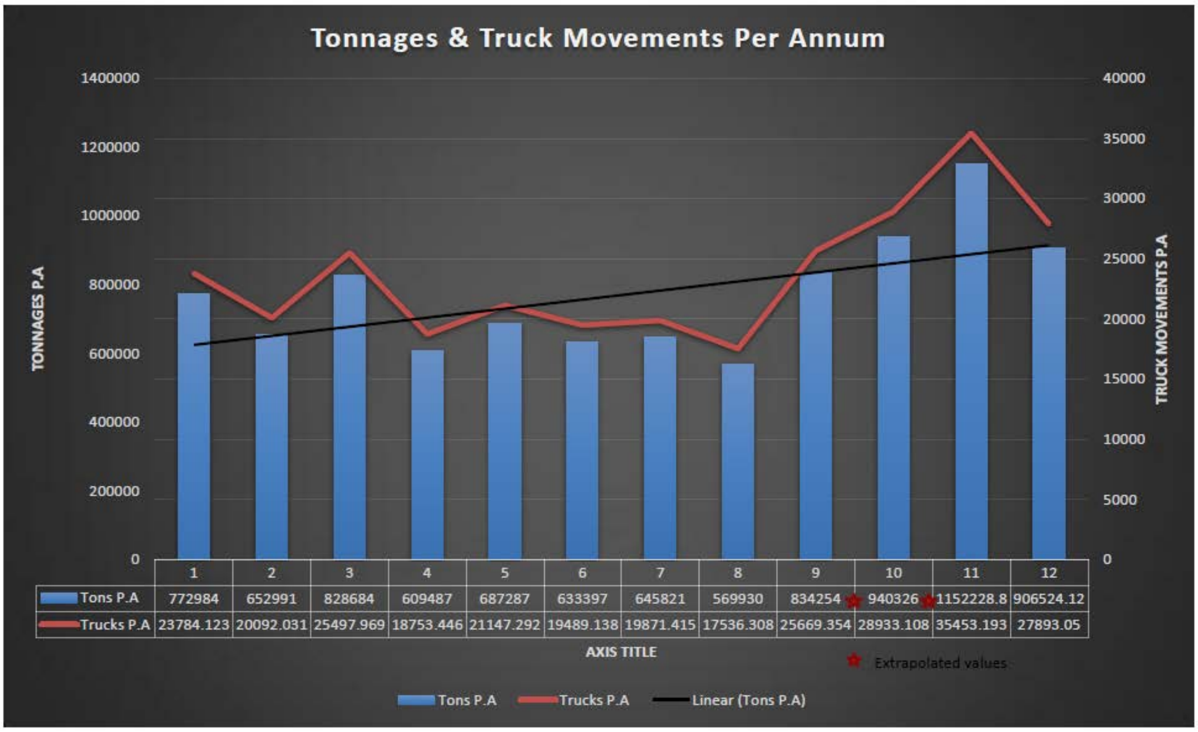


Figure 4-2 Demonstrating the fluctuations in tonnage and associated truck movement over last 12 years of operation (Source: Daracon)

In addition, there will be traffic movements associated with staff and maintenance vehicles, which will be similar to the existing operations on site.

4.1.1 Daily and Seasonal Factors

The nature of the development can lead to significant variations in daily traffic flows, with additional variation created by market demands. Daily flows will vary due to market demands as well as weather conditions. These are typically outside of the control of the quarry management.

The major impact upon the traffic flows generated by the development is created by the demands of the end market.

Daracon' s external customer base includes, but is not limited to, government and major industry players including RMS, ARTC, Local Government, Sydney Trains, Lend Lease, Thiess, Leightons, Boral, Hanson, Holcim, Fulton Hogan and Metromix. Supply to these customers occurs for various reasons but mainly due to the quality and availability of aggregates and road pavement materials produced at Martins Creek that readily meet the rigorous requirements of State Government and associated geotechnical specifications. Whilst Martins Creek Quarry primarily produces aggregates, Daracon also focus on the design and manufacture of high quality road pavement materials, in particular Stabilbase (RMS Dense Graded Base) and Stabilstone (RMS Heavily Bound Base). For the past 15 years (approximately) Stabilstone has been one of only two products that meet RMS heavily bound specification. Heavily Bound Base is critical to road infrastructure for state and local government roads subjected to increased traffic volume and heavy loading. Recent changes to RMS specifications has seen a small increase of suppliers in the Heavily Bound Base (HBB) market, however due to some specific site requirements they do not always comply. The extensive experience of Daracon staff and a history of 15 years designing these materials means that Stabilstone readily meets all site and specification requirements. Both Stabilstone and Stabilbase produced at Martins Creek Quarry incorporate a percentage of flyash. Flyash is a by-product (waste) of the combustion of pulverised coal in thermal power plants, Martins Creek Quarry uses approximately 10-15kt per annum of flyash which is delivered to the Martins Creek quarry in 19.0 metre semi-trailer combinations.

The Lower Hunter Regional Strategy represents an agreed NSW government position on the future of the Lower Hunter, the current strategy applies to the period 2006 – 2031. The primary purpose of the regional strategy is to ensure that adequate land is available and appropriately located to sustainably accommodate the projected housing and employment needs of the Region's population over the 25 year period. The strategy aims to provide for up to an additional 115 000 new dwellings ensuring that housing can accommodate the projected 160 000 additional people that is forecasted to populate the Region over the period. In 2011, the Government established the HIIF to promote economic growth and enhance the liveability of the Hunter region. The Government initially committed $350 million to the HIIF over four years. Of this amount $332 million has now been allocated to projects, including $60 million towards the revitalisation of the Newcastle CBD.

NSW State Government has committed $60 billion to rebuilding state infrastructure in the 2014-2015 budget. The budget has an allowance of $43 million allocated to road infrastructure upgrades in the Hunter Region consisting of;

Hunter Roads – Major Projects ▪ Cormorant Road, Industrial Drive to Stockton Bridge (planning) ▪ Nelson Bay Road, Bobs Farm to Anna Bay (Stage 3) ▪ Newcastle Inner City Bypass, Rankin Park to Jesmond (planning) ▪ New England Highway, Belford to Golden Highway duplication (planning) ▪ New England Highway, Gowrie Gates, widen Rail Underpass (planning) ▪ New England Highway, Singleton Bypass (planning) ▪ New England Highway, Scone Bypass and Rail Level Crossing removal (planning) ▪ New England Highway, Upgrade of Maitland roundabouts ▪ Pacific Motorway (M1) Extension to Raymond Terrace (planning)	$43 million (2014-15 financial year)	Planning and investment for works to address localised impact of mining related activity and population growth. A corridor study on Hillsborough Road, Warners Bay will commence in 2014-15. Some projects include Commonwealth Government funding contributions.

This forecasted growth within the Hunter, and government commitment to upgrading infrastructure, will increase market need for hard rock quarry products in the region including from Martins Creek, to service the demand for building and construction materials.

Martins Creek Quarry is critical to the ongoing development and growth of the Hunter area and the Regional market. It is anticipated that it will have a significant place in the state market due to the rail siding and the limited number of hard rock quarries in NSW that are forecast to have major road and rail infrastructure upgrades completed. In particular, it is anticipated that the Pacific Highway Upgrade in Northern NSW will require quarry materials in excess of volume and quality available locally to meet project demands. There have been early suggestions that material may be sourced from distant locations using rail freight for transport. In addition to the Pacific Highway Upgrade the State's infrastructure program has a particular focus on transport projects designed to reduce the costs of Sydney's road congestion, which costs the State economy an estimated $5.1 billion each year. Due to the close proximity to Sydney, and the advantage of the rail siding, Daracon are currently assessing locations that are suitable to unload trains into the Sydney area that can be used as a transfer point where re-loading onto trucks for delivery to projects is achievable.

All of these future projects, as well as other projects yet to be commissioned or determined, will impact upon the end market demands for quarry products from Martins Creek quarry.

4.1.2 Pedestrian Movements

Pedestrian access to the site will be available using the local road network, but with the site locality pedestrian movements will be low.

4.2 Traffic Distribution and Assignment

4.2.1 Hourly Distribution of Trips

The information provide above shows that for the proposed annual production of 1.5 million tonnes, the daily number of truck loads will be 168 loads per day. This is an *average* volume per day and will vary both up and down. In addition, the end user demands for material from the quarry are guided by standards for material and their application on site. This has a direct bearing upon the flow of trucks outbound from the site, with the majority of the demand for road base material for example occurring at the beginning of the working day at the quarry, so that it can be laid and spread within the normal working day on the construction site. This leads to a demand for typically 40 outbound trucks from the site per hour within the first three or more hours of operation within the quarry and a significant drop off in the supply of material in the afternoon period. The hourly distribution of existing trips is discussed and shown in Figure 4-1 above.

4.2.2 Origin / destinations assignment

The haulage routes to and from the quarry are reliant upon the end user demands, but within the immediate locality of the subject site there are three primary access routes that are currently being used by Daracon and account for more than 95% of the product haulage. These are:

- Martins Creek Quarry – Grace Avenue – Dungog Road – Gresford Road – Tocal Road – Paterson Road – Flat Road (Route 1)
- Martins Creek Quarry – Grace Avenue – Dungog Road – Gresford Road – Butterwick Road – Clarence Town Road – Brandy Hill Drive – Seaham Road (Route 2)
- Martins Creek Quarry – Grace Avenue – Dungog Road – Gresford Road – Tocal Road – Paterson Road – Belmore Road (Route 3)

Daracon have stated that as part of the approval process for the expansion of Martins Creek Quarry, all trucks will be diverted away from the route via Lorn (Route 3) and will use Flat Road instead, unless they have a destination in Lorn or the Maitland city centre or emergency related projects. Therefore, the future expansion will require the vast majority of the traffic to use Route 1 and Route 2 identified above.

With regard to the distribution of product from the site, a review has been completed by the study team of the product deliveries over the twelve months from November 2013 to October 2014. This is considered reflective of normal operation demands and can be used to predict the future expansion of the quarry. The approximate volume for the period totalled 1.1 million tonnes.

A distribution of percentages to each LGA are included in the table below. Consideration should be given to the major projects that Daracon supplied over this period, which generated short term increased volumes and indicates a larger market than would normally be expected. Major projects during this period included;

1. Hexham Rail upgrades – Newcastle
2. Nelson Bay Road Upgrade – Port Stephens
3. Inner City Bypass – Newcastle

Table 4-1 – Distribution of material from Martins Creek quarry by LGA areas

Market By Local Government Area	% of total volume
Newcastle	40.2%
Port Stephens	18.2%
Lake Macquarie	15.4%
Maitland	12.6%
Cessnock	3.6%
Singleton	1.7%
Gosford / Wyong	1.6%
Dungog	0.7%
Muswellbrook	0.6%
Upper Hunter	0.1%
Gloucester	0.1%
Sydney (Botany)	0.1%
Other	
Ex Bin / COD's with no Address	2.6%
Ballast Trains	2.5%

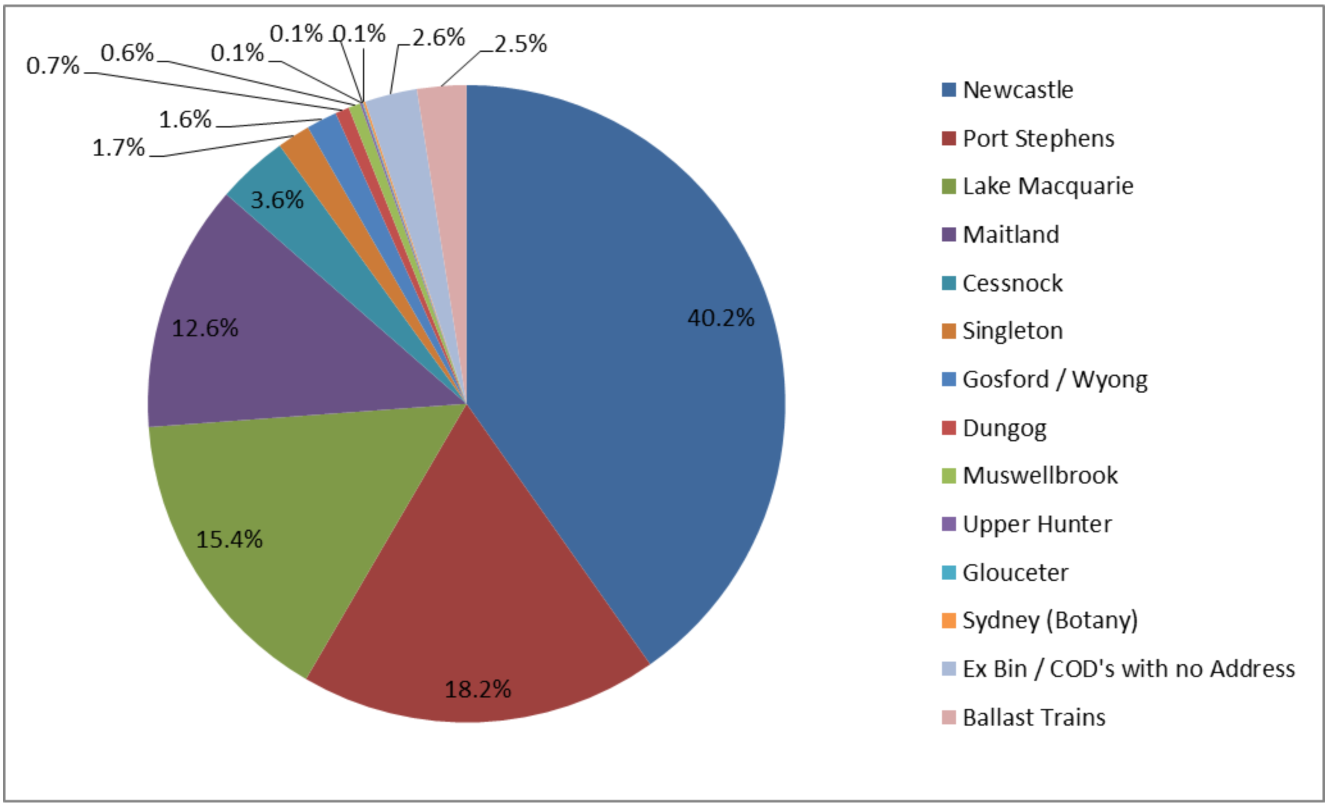


Figure 4-3 – Distribution of material from Martins Creek quarry by LGA areas

Daracon conducted a study of haulage routes based on heavy vehicles leaving the quarry for a period of 88 days from August 2014. The study involved the weighbridge personnel discussing and documenting each driver's intended route. The data collected and recorded was primarily based on the 3 major routes identified above, with vehicles not using these routes being recorded as other. The table below summarises the findings.

Table 4-2 – Identified trips generated by Martins Creek quarry (August to December 2014)

Month	Flat Road	Lorn	Brandy Hill	Other	Flat Road via Vacy	Lorn via Vacy	Brandy Hill via Vacy
Aug-14	24.7%	11.0%	18.0%	17.6%	12.2%	5.9%	10.6%
Sep-14	38.4%	14.6%	20.6%	9.7%	8.6%	2.9%	5.2%
Oct-14	52.0%	19.1%	21.5%	7.4%	0.0%	0.0%	0.0%
Nov-14	38.2%	29.8%	13.7%	18.3%	0.0%	0.0%	0.0%
Dec-14	55.5%	28.3%	10.4%	5.8%	0.0%	0.0%	0.0%

Due to the temporary closure of Gostwyck Bridge by the Roads and Maritime Services (RMS) for maintenance work, routes above also include the detour via Vacy that was implemented for the duration of each bridge closure.

The method used to breakdown the distribution of the Other destinations shown above was from data provided from Apex, Daracon's operational system that tracks quotes, orders and supply information. Data was extracted for the survey period (27th August 2014 – 9th December 2014) and was assessed by Daracon transport staff with haul routes determined based on job locations.

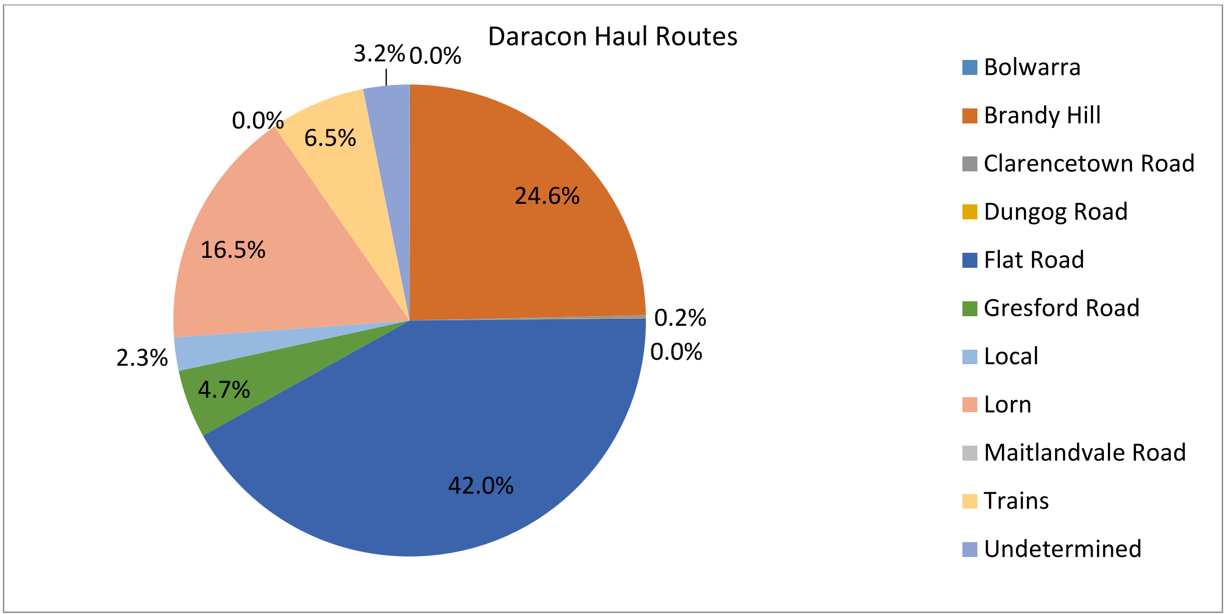


Figure 4-4 – Distribution of addition "other" trips based upon Daracon sales

Metromix haul routes were assessed separately (shown separately below) as they are a significant customer that has their own transport and picks material up directly from the quarry. Daracon's Apex system doesn't track the location of Metromix jobs and therefore the same method could not be used to determine the haul routes. Metromix previously provided an estimated distribution of materials supplied to each Local Government Area (LGA), determination of haul routes were therefore assumed based on the percentages provided.

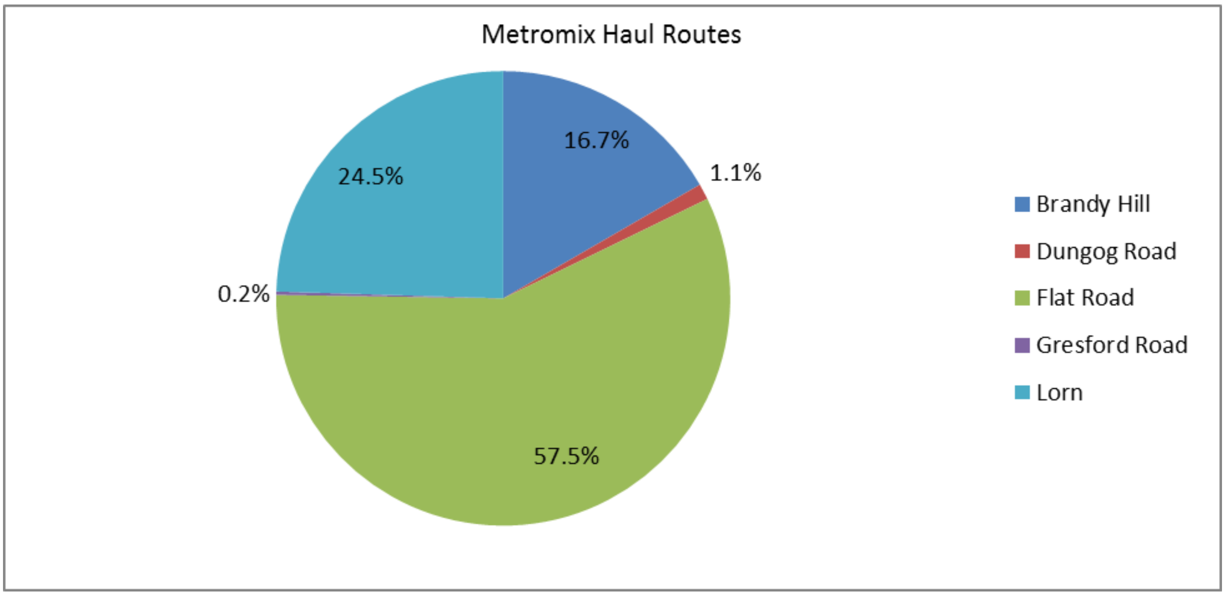


Figure 4-5 – Distribution of Metromix Haul Routes

Based upon the historic data for the quarry sales the following split of traffic volumes are given:

- 61.1% via Flat Road
- 25.1% via Brandy Hill
- 6.6% via train
- 2.4% local market
- 4.8% north

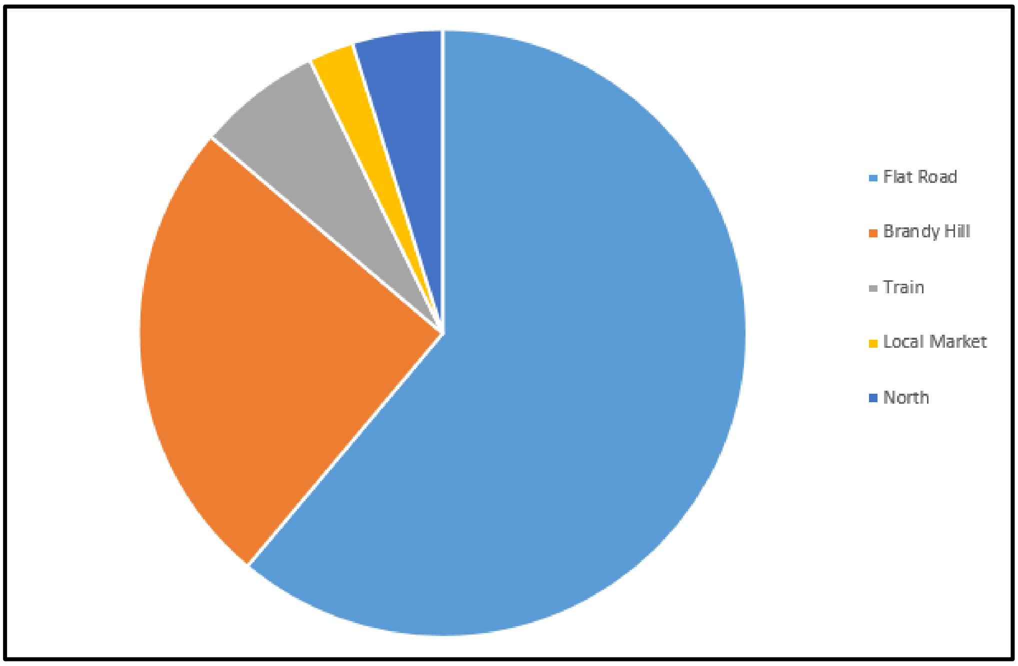


Figure 4-6– Distribution of material from Martins Creek Quarry

Figure 4-7 – Distribution of material from Martins Creek Quarry by route (Map)

Based upon the full development allowing for 1.5 million tonnes per annum the volume of traffic for each route specified above is provided below.

Table 4-3 – Volume of traffic based upon existing distribution demands

Route	Percentage %	Average daily one way truck movements	Average hourly one way truck movements
Gresford Road via Paterson	86.2	145	18-19
Route via Flat Road	61.1	103	13
West along New England Highway towards Hunter Expressway	40.7	69	8-9
East along New England Highway from Melbourne Street	20.3	34	4-5
Route via Brandy Hill	25.1	42	5-6
Route north	4.8	8	1

Note the above values represent the outbound truck movements – there is a corresponding inbound truck movement per loaded truck.

It is worth noting that the maximum number of trucks per hour on any one route would be 40 outbound and 40-50 inbound. There can be a higher number of inbound trucks, as some truck drivers can arrive early on the site (especially when it is the second run for the day) and will have a break on site prior to being loaded and exiting the site. All outbound movements provide a maximum of 40 trucks per hour, due to the operational characteristics on site.

4.3 Impact on Road Safety

The review of the existing road network has highlighted a number of locations where there is an existing road safety concern relating to the layout of the road network which are not directly related to the existing activities of Martins Creek Quarry. These safety issues are due to the existing road system being built to historic rather than current design standards. These can be summarised as:

- Lack of space between intersection of Station Street and railway crossing and road alignment across railway crossing
- One-way bridge operation at Gostwyck Bridge on Dungog Road
- Lack of sheltered right turn lane on Gresford Road for drivers turning right into Dungog Road
- Tight road alignment on 90 degree bend at Gresford Road / Duke Street in Paterson
- Lack of pavement width on Tocal Road at Bolwarra Heights
- Lack of shoulders along Butterwick Road
- Lack of sheltered right turn lane on Clarence Town Road for drivers turning right into Butterwick Road
- Lack of sheltered right turn lane on Clarence Town Road for drivers turning right into Brandy Hill Drive

As part of the project, it is proposed to provide a new access that will provide direct access onto Dungog Road. This will remove the safety issues currently occurring at the railway crossing adjacent to Station Street. However, this new access to Dungog Road, requiring a new bridge to be constructed over the railway line, will require extensive planning and design prior to construction and the existing access to the quarry via Station Street will remain in operation to service the site. A review of the accident data provided by the RMS shows that the intersection of Station Street and Grace Avenue operates well and that there are no recorded of accidents at this intersection. Whilst the intersection does not comply with current best practice, it can be seen that it continues to operate in a safe manner, mainly due to the high level of familiarity with drivers using this section of the road together with the low traffic flows on Grace Avenue. Visibility at this location also allows drivers in trucks exiting the quarry to safely determine suitable gaps in the through traffic movements along Grace Avenue to exit Station Street.

Plans have been previously prepared by ARTC to upgrade the existing level crossing at Grace Avenue but there is no planned date for this upgrade work to commence. In the meantime, it is appropriate to consider that ARTC have reviewed the existing operation of the level crossing and have determined that it is suitable for on-going use. It is considered that whilst the project will increase the daily traffic flows over this level crossing, there will be minimal impacts upon road safety created by this. The existing controls for the level crossing will continue to advise vehicle drivers of approaching trains which enhances road safety.

For the one-way bridge on Dungog Road, discussion with the RMS has not highlighted any specific safety concerns with this one-way operation and the RMS has not identified the requirement to upgrade or bypass this bridge. The RMS has indicated that the bridge can continue to cater for the traffic demands associated with the expansion of the Martins Creek Quarry. Given the lack of accidents at this location it is proposed that the increased use of this route by trucks associated with the expansion of the quarry will not have a significant impact upon the safety at this location.

As part of the project, it has been recognised that the intersection of Gresford Road for drivers turning right into Dungog Road will be upgraded to provide a sheltered right turn lane in accordance with RMS and Austroads Guidelines.

As part of the project, it has been identified that the 90 degree bend at Gresford Road / Duke Street in Paterson can be upgraded to provide a raised central median which will direct vehicle movements and reduce the potential for collisions whilst also providing for a pedestrian crossing at this location.

Recent work completed by Council on Tocal Road through Bolwarra Heights has improved the road surface and line markings along this section of the road. However this has not increased the running width of the road. Given the apparent existing width constraint of the road reserve in this location, Council are not able to widen the road beyond the current alignment. The accident data at this location does not highlight any specific concerns and there have been no recorded incidents involving heavy vehicles in this location or any accidents resulting in injuries. Whilst the proposal will increase the total number of trucks passing along this section of the road, the intensity of truck movements will remain at similar levels to the existing operations and therefore there will be a minimal impact upon the road safety at this location.

For Butterwick Road, it can be seen that the existing width of the sealed road pavement does not comply with Austroad Guidelines, based upon the daily volume of traffic using this length of the road. It can be seen that the upgrade of the section of Butterwick Road with no sealed shoulders is required irrespective of the expansion of Martins Creek Quarry, due to the current traffic volumes. Whilst the expansion of Martins Creek Quarry will increase the volume of traffic using this road, there is no specific road safety concern raised by the increasing flows with the accident data indicating there is no specific accident location.

The lack of sheltered right turn lanes on Clarence Town Road at Butterwick Road and Brandy Hill Drive have been identified and are required for the current traffic movements, irrespective of the development of Martins Creek Quarry (and Brandy Hill Quarry). The current layout of these two intersections does not comply with the requirements of the RMS's Road Design Guide or Austroads requirements, which require the provision of a sheltered right turn lane.

4.4 Impact of Generated Traffic (Capacity and Level of service)

The impact of the development has being assessed against the requirements of the Authorities against the road capacity for both hourly flows and daily flows. The impact on the hourly flows has been checked against the traffic volume collected as part of the project and has covered the critical morning and afternoon peak hours. It can be seen that outside of the peak hours, the background traffic flows are much lower. At this time there is significant spare capacity in the road network which can cater for additional traffic demands without creating any capacity issues at intersections or on the road links.

4.4.1 Impact on daily Traffic Flows

The daily traffic flows for the site, based upon historic data, are given as:

- Average number of daily truck movements 111 inbound, 111 outbound
- 85th percentile of daily truck movements 159 inbound, 159 outbound
- Peak of daily truck movements 291 inbound, 291 outbound
- Theoretical daily peak of truck movements 320 inbound, 320 outbound

The impact of these flows on the daily traffic numbers is provided below. For the results below, this has presented an absolute worst case scenario by allowing:

1. ALL trucks from Martins Creek to use one route only. This maybe applicable if the quarry is only servicing one site, however normal practice allows for delivery of material to more than one site per day and using more than one route accordingly;
2. Allows for the quarry to run at full capacity for the full day

When determining the daily impact below, the traffic data at Dungog Road to the south of Martins Creek showed a daily heavy vehicle flow of 152 trucks (Monday-Friday 5am-5pm associated with the operational hours of Martins Creek quarry). It is assumed that 100% of these Class 9 vehicles relate to Martins Creek quarry. The difference between this and the potential two way peak flow of 640 truck movements has been applied to the balance of the route to assess the potential daily impact on the daily flows. At full operating capacity these 640 trucks give additional daily two-way flows of 488 trucks over those operating during the survey period.

Similarly, the traffic data breakdown per hour at Dungog Road provides details on the truck numbers per hour associated with Martins Creek quarry. The difference between these and the predicted peak flows of 80 trucks two way have been applied through each route and is presented in Table 4-4 and Table 4-5 below.

Table 4-4 Hourly and Daily impact of the Martins Creek quarry proposal by road segment – Route 1

Time	Current Traffic Flows (7 Days)	Weekly Quarry Flows (Class 9 - 7 Day)	Daily Average Quarry Flows (Class 9)	Expansion to Martins Creek	Gresford Rd, North of Paterson		Tocal Rd, South of Paterson		Paterson Rd, Bolwarra		Flat Rd	
					Current Flows (Class 9)	Future Flows (Class 9)	Current Flows (Class 9)	Future Flows (Class 9)	Current Flows (Class 9)	Future Flows (Class 9)	Current Flows (Class 9)	Future Flows (Class 9)
Midnight - 1am	6	2	1	0	0	0	0	0	1	1	0	0
1am - 2am	12	2	1	0	1	1	1	1	1	1	1	1
2am - 3am	13	2	1	0	1	1	1	1	1	1	1	1
3am - 4am	5	2	1	0	1	1	1	1	1	1	1	1
4am - 5am	8	1	1	0	1	1	1	1	1	1	1	1
5am - 6am	67	18	4	6	5	11	6	12	8	14	4	10
6am - 7am	169	115	20	60	20	80	14	74	15	75	7	67
7am - 8am	236	72	14	66	16	82	13	79	19	85	7	73
8am - 9am	317	77	14	66	16	82	11	77	15	81	5	71
9am - 10am	350	82	14	66	16	82	14	80	19	85	6	72
10am - 11am	333	94	19	61	20	81	13	74	18	79	6	67
11am - Midday	329	88	16	64	17	81	14	78	18	82	7	71
Midday - 1pm	336	75	15	65	19	84	14	79	19	84	7	72
1pm - 2pm	334	64	13	17	13	30	11	28	15	32	5	22
2pm - 3pm	358	54	11	9	13	22	12	21	17	26	5	14
3pm - 4pm	450	59	12	8	15	23	10	18	11	19	4	12
4pm - 5pm	438	7	2	0	2	2	3	3	5	5	2	2
5pm - 6pm	371	2	1	0	1	1	1	1	2	2	1	1
6pm - 7pm	228	4	1	0	1	1	1	1	1	1	0	0
7pm - 8pm	144	1	1	0	0	0	0	0	1	1	1	1
8pm - 9pm	86	2	1	0	0	0	0	0	0	0	0	0
9pm - 10pm	84	5	1	0	1	1	0	0	1	1	0	0
10pm - 11pm	42	0	0	0	0	0	0	0	0	0	0	0
11pm - Midnight	29	1	1	0	0	0	0	0	0	0	0	0
Totals	**4745**	**829**	**165**	**488**	**179**	**667**	**141**	**629**	**189**	**677**	**71**	**559**

Table 4-5 – Hourly and Daily impact of the Martins Creek quarry proposal by road segment – Route 2

Time	Current Traffic Flows (7 Days)	Weekly Quarry Flows (Class 9 - 7 Day)	Daily Average Quarry Flows (Class 9)	Expansion to Martins Creek	Gresford Rd, North of Paterson		Tocal Rd, South of Paterson		Butterwick Rd		Clarence Town Rd, between Butterwick Rd & Brandy Hill Dr		Brandy Hill Dr		Seaham Rd, North of William River	
					Current Flows (Class 9)	Future Flows (Class 9)	Current Flows (Class 9)	Future Flows (Class 9)	Current Flows (Class 9)	Future Flows (Class 9)	Current Flows (Class 9)	Future Flows (Class 9)	Current Flows (Class 9)	Future Flows (Class 9)	Current Flows (Class 9)	Future Flows (Class 9)
Midnight - 1am	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1am - 2am	12	2	1	0	1	1	1	1	0	0	0	0	0	0	0	0
2am - 3am	13	2	1	0	1	1	1	1	0	0	0	0	0	0	1	1
3am - 4am	5	2	1	0	1	1	1	1	0	0	0	0	0	0	0	0
4am - 5am	8	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0
5am - 6am	67	18	4	6	5	11	6	12	1	7	1	7	7	13	7	13
6am - 7am	169	115	20	60	20	80	14	74	2	62	6	66	18	78	18	78
7am - 8am	236	72	14	66	16	82	13	79	3	69	5	71	12	78	15	81
8am - 9am	317	77	14	66	16	82	11	77	5	71	6	72	13	79	15	81
9am - 10am	350	82	14	66	16	82	14	80	4	70	4	70	16	82	16	82
10am - 11am	333	94	19	61	20	81	13	74	4	65	4	65	14	75	17	78
11am - Midday	329	88	16	64	17	81	14	78	6	70	5	69	13	77	16	80
Midday - 1pm	336	75	15	65	19	84	14	79	4	69	5	70	13	78	15	80
1pm - 2pm	334	64	13	17	13	30	11	28	4	21	5	22	9	26	9	26
2pm - 3pm	358	54	11	9	13	22	12	21	2	11	4	13	8	17	11	20
3pm - 4pm	450	59	12	8	15	23	10	18	4	12	3	11	8	16	9	17
4pm - 5pm	438	7	2	0	2	2	3	3	1	1	2	2	3	3	5	5
5pm - 6pm	371	2	1	0	1	1	1	1	0	0	1	1	1	1	1	1
6pm - 7pm	228	4	1	0	1	1	1	1	0	0	0	0	0	0	1	1
7pm - 8pm	144	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
8pm - 9pm	86	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
9pm - 10pm	84	5	1	0	1	1	0	0	0	0	0	0	0	0	0	0
10pm - 11pm	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11pm - Midnight	29	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	**4745**	**829**	**165**	**488**	**179**	**667**	**141**	**629**	**40**	**528**	**51**	**539**	**135**	**623**	**156**	**644**

4.4.2 Peak Hour Impacts on Intersections

As part of the assessment for the proposed development, the intersection capacity analysis program Sidra has been used. The Sidra analysis has reviewed the impact of the generated traffic at the key intersections of Pitnacree Road / Melbourne Street and Melbourne Street / New England Highway. Both of these intersections are controlled by traffic signals and form part of the regional road network. The traffic signals are controlled by the RMS.

As part of the project work, the current traffic flows at these two intersections were surveyed during the typical morning and afternoon peak periods. The surveys were completed on Thursday 26th February 2015. A summary of the results of these surveys is provide in Appendix B to this report.

The surveys show that the AM peak was generally 8.15 to 9.15 AM when the Martins Creek quarry is busy, as is the surrounding road network, and 4.30 to 5.30 PM when the traffic movements associated with Martins Creek are minimal, due to the significant drop off in material delivery beyond 4 PM.

The performance of these two intersections has been modelled with the Sidra Network modelling program, a standard computer program utilised by the RMS, Councils and consultants across the world. The modelling allows for an assessment of the operation of the intersections and provides details on the performance of the intersection against standard criteria applied by the RMS and Council.

A summary of the results of the Sidra analysis, for the current situation is provided below.

Table 4-6 – Sidra results, current operation of New England Highway and Melbourne Street

Approach	Level of service	Delay (seconds)	Queue (metres)
NEH from Newcastle	F / C	72.8 / 39.9	394.8 / 220.5
Melbourne St from Morpeth	F / D	72.1 / 54.9	228.8 / 123.1
NEH from Maitland	C / F	35.5 / 73.7	243.1 / 522.8
Melbourne St	D / E	53.9 / 65.3	95.7 / 115.6
Overall	E / E	57.0 / 60.7	394.8 / 522.8

Note – results above are for AM / PM peak

From the above results, it can be seen that the intersection of the New England Highway and Melbourne Street suffers from delays and congestion during both the morning and afternoon peak periods. Outside of the peak periods this intersection works reasonably well with minimal delays and congestion for the majority of the movements. Whilst the opening of the Hunter Expressway has removed a large volume of through traffic movements in this section of the New England Highway, there is still a high local demand for traffic along this road which creates some delays and congestion during the traditional peak periods. In particular, the traffic flows from Maitland / Rutherford towards Newcastle in the afternoon are very high, leading to a lengthy queue on the approach to the traffic signals on the New England Highway.

It is noted that during the surveys, Martins Creek quarry was fully functional (based on the weighbridge information provided for the same period as the surveys) and as such haulage trucks from this quarry as well as Brandy Hill Quarry were observed using this intersection, especially during the morning peak. During the afternoon peak (4.30 to 5.30 PM) there were minimal large trucks associated with quarry material haulage observed, reflective of the low demands generated by the quarry at this time.

A review of the intersection layout shows that the capacity of this intersection is constrained, due to established development on each corner. There is limited scope for any upgrades at this intersection to increase capacity, other than fine tuning of the traffic signal operation. These signals are vehicle actuated and respond to vehicle demands / queues and as such provide the maximum capacity available at this location. The operation of these traffic signals is monitored by the RMS and refined as appropriate.

The total flows through this intersection were 4,300 in the AM peak and 4,515 during the PM peak. Trucks movements associated with Martins Creek quarry could be a maximum of 80 trucks per hour, which represents 1.9% of the morning peak hour flows and 1.8% of the afternoon peak hour flows. It can thus be seen that the delays and congestion at this intersection cannot be directly linked to this quarry's operations.

Table 4-7 - Sidra results, current operation of Pitnacree Road and Melbourne Street

Approach	Level of service	Delay (seconds)	Queue (metres)
Melbourne St from NEH	C / C	34.6 / 38.6	165.5 / 286.8
Lawes Street	D / D	48.3 / 51.9	64.9 / 95.7
Melbourne St from Morpeth	C / C	38.0 / 32.2	217.8 / 124.7
Pitnacree Road	D / D	53.3 / 66.1	147.1 / 115.8
Overall	C / D	42.4 / 43.6	217.8 / 286.8

Note – results above are for AM / PM peak

From the above results, it can be seen that the intersection of Melbourne Street and Pitnacree Road suffers from delays and congestion during both the morning and afternoon peak periods. Outside of the peak periods this intersection works reasonably well with minimal delays and congestion for the majority of the movements.

It is noted that during the surveys, Martins Creek quarry was fully operational and as such haulage trucks from this quarry (as well as Brandy Hill Quarry) were observed using this intersection, especially during the morning peak. During the afternoon peak (4.30 to 5.30 PM) there were minimal large trucks associated with quarry material haulage observed, reflective of the low demands generated by the quarry at this time.

A review of the intersection layout shows that the capacity of this intersection is constrained, due to established development on each corner. There is limited scope for any upgrades at this intersection to increase capacity, other than fine tuning of the traffic signal operation. These signals are vehicle actuated and respond to vehicle demands / queues and as such provide the maximum capacity available at this location. The operation of these traffic signals is monitored by the RMS and refined as appropriate.

The total flows through this intersection are 2,216 in the AM peak and 2,303 during the PM peak. Trucks movements associated with Martins Creek quarry could be a maximum of 80 trucks per hour, which represents 3.6% of the morning peak hour flows and 3.5% of the afternoon peak hour flows. It can thus be seen that the delays and congestion at this intersection cannot be directly linked to this quarry's operations.

The intersection was then assessed with the potential additional traffic movements associated with Martins Creek quarry. When assessing the potential additional numbers, the following points have been taken into consideration:

- The trucks associated with Martins Creek quarry will be directed to avoid Lorn and use Flat Road. These outbound trucks will turn right from Pitnacree Road into Melbourne Street then right from Melbourne Street onto the New England Highway;
- There will be a corresponding reverse movement of trucks, turning left off the highway into Melbourne Street and then left into Pitnacree Road
- As a worst case scenario, a project may require all of the material to be delivered to a site west of Maitland and would thus all turn right out of Pitnacree Road then right from Melbourne Street into the New England Highway.

For the scenario below, we have assumed the worst case scenario above and have NOT discounted the existing flows to remove the Martins Creek quarry traffic that was turning right into Melbourne Street off the New England Highway and the reverse traffic movement. The results of this assessment are presented below.

Table 4-8 - Sidra results, AM peak current volumes plus Martins Creek quarry worst case scenario, New England Highway and Melbourne Street

Approach	Level of service	Delay (seconds)	Queue (metres)
NEH from Newcastle	F	83.2	422.4
Melbourne St from Morpeth	F	80.4	259.9
NEH from Maitland	C	36.7	251.5
Melbourne St	D	53.8	95.7
Overall	E	62.5	422.4

The results above indicate that the intersection will operate to a similar level as the existing, with a minor increase for the traffic heading along the highway from Newcastle. This will have a small impact upon the queue length of this approach. It can be seen that this worst case scenario overall would have a minimal impact upon the operation of this intersection and that overall it will continue to operate to similar levels of delay and congestion as the current scenario.

Note that the PM peak period between 4.30 and 5.30 PM has not been assessed, as at this point the traffic movements associated with the Martins Creek quarry are negligible.

Table 4-9 - Sidra results, AM peak current volumes plus Martins Creek quarry, Melbourne Street and Pitnacree Road

Approach	Level of service	Delay (seconds)	Queue (metres)
Melbourne St from NEH	C	34.5	165.5
Lawes Street	D	48.3	64.9
Melbourne St from Morpeth	C	38.0	217.8
Pitnacree Road	D	54.3	147.1
Overall	D	42.7	217.8

The Sidra results above demonstrate that the potential additional truck movements associated with the worst case scenario with the trucks from Martins Creek quarry would have an acceptable impact upon the overall operation of this intersection, with minor increases in delays but reduced overall queues, due to the slight change in balance of the traffic movements.

4.4.3 Impact of Construction Traffic

There will be minimal construction work associated with the proposed expansion of the quarry, with all works located on site utilising the existing equipment and plant on site. Therefore, there will be no impact upon the external road network.

4.4.4 Background traffic and other developments

Advice from Council indicates that there is limited growth expected within the general study area north of Bolwarra and through the Brandy Hill area. Some development is occurring in Morpeth which may impact upon the traffic signals along Melbourne Street. However, it is noted that a significant portion of this is aged care and retirement village development which generates very low traffic flows during the traditional peak periods.

The major development in the locality is associated with the proposed expansion of Brandy Hill quarry. The quarry has been operating at an average yearly output of 620,000 tonnes which equates to approximately 150 truck movements per day. The proposal allows for this quarry to increase production to around 1.5 million tonnes per year, with the associated increase in truck movements on the road network. Whilst details of the proposed increase and changes to the operations at Brandy Hill have been requested from the proponent, these details have not been provided.

As per the normal requirement of the RMS (and as stated by the RMS) the operation of the key intersections on Melbourne Street have been assessed for the future design year of 2026, allowing for background traffic growth to occur over this 10 year timeframe. Normal background traffic growth in the locality of the Lower Hunter Valley is 2% per annum giving some 20% over 10 years. This value has been allowed for growth along the New England Highway corridor, reflective of growth expected to occur along this corridor. As per the advice above from Council limited growth is expected to be generated by development in the Bolwarra, Brandy Hill and Morpeth area. Accordingly, a growth value of 5% has been applied over a 10 year timeframe along Melbourne Street.

The results of the future design year 2026 is shown below:

Table 4-10– Future design year, 2026 intersection of New England Highway and Melbourne Street (base data plus background growth)

Approach	Level of service	Delay (seconds)	Queue (metres)
NEH from Newcastle	F / D	126.2 / 46.8	621.5 / 303.1
Melbourne St from Morpeth	F / E	125.4 / 61.0	320.1 / 138.6
NEH from Maitland	D / F	44.7 / 140.5	337.4 / 860.5
Melbourne St	F / F	71.2 / 93.5	113.7 / 145.3
Overall	F / F	90.6 / 98.5	621.5 / 860.5

Note – results above are for AM / PM peak

The above results demonstrate that the intersection will start to suffer from increased delays and congestion, during both the AM and the PM peaks when the predicted levels of service for each approach are F. During the critical PM peak period, the traffic movements associated with Martins Creek Quarry (and Brandy Hill Quarry) would be minimal as the output of material is negligible at this time of the working day for Martins Creek Quarry. Similarly, for Brandy Hill Quarry their Preliminary Environmental Assessment indicates that 80% of the daily activities occur between 6AM and 12 PM.

Based upon the assessment above and the analysis above for the current design year (2016) plus development flows it is considered that the traffic movements associated with Martins Creek Quarry will continue to have a minimal and acceptable impact upon the overall operation of these two traffic signal controlled intersections. Whilst this intersection is predicted to suffer from increasing delays, this is due to the continual traffic growth along the New England Highway in this location rather than a direct impact of the proposal. The RMS will continue to monitor the operation of this intersection and the New England Highway road corridor and implement upgrades as required. The upgrade of the intersection of the New England Highway and Cessnock Road / Church Street to the west of this intersection demonstrates the RMS commitment to upgrade this road as required to accommodate continual traffic growth along this corridor.

4.5 Public Transport

4.5.1 Options for improving services

Minimal, if any demand for public transport will be generated by the new site proposal.

4.5.2 Pedestrian Access to Bus Stops

No specific pedestrian access to any bus stops need be provided.

4.6 Pedestrian and Cyclists

The development is not considered to be a major attractor for pedestrians or cyclists. Local access is available via the existing road network as appropriate. No changes are proposed.

5 Improvement Analysis

5.1 Improvements to Accommodate Existing Traffic

The following road safety concerns have been identified as being required to bring the road network up to current design standards to accommodate the existing traffic flows along the two key routes for the project:

- Lack of space between intersection of Station Street and railway crossing and road alignment across railway crossing
- One-way bridge operation on Dungog Road
- Lack of sheltered right turn lane on Gresford Road for drivers turning right into Dungog Road
- Tight road alignment on 90 degree bend at Gresford Road / Duke Street in Paterson
- Lack of pavement width on Tocal Road at Bolwarra Heights
- Lack of shoulders along Butterwick Road
- Lack of sheltered right turn lane on Clarence Town Road for drivers turning right into Butterwick Road
- Lack of sheltered right turn lane on Clarence Town Road for drivers turning right into Brandy Hill Drive

However, discussion with the relevant authorities shows that the above issues have been reviewed and the following advice has been provided:

- The railway crossing on Grace Avenue has been reviewed by ARTC and they have no plans to upgrade this crossing. The layout is considered acceptable given the volume and frequency of trains and the alignment of the road and the approaches;
- The RMS has stated that the bridge on Dungog Road is adequate and they have no plans to upgrade or replace this bridge.
- Council has identified and constructed upgrades to the alignment of Tocal Road at Bolwarra Heights to improve the delineation and have upgraded the road surface.

Whilst the width of Butterwick Road does not comply with current design standards, a review of the accident data shows that there are no specific safety concerns raised by the alignment and there are no recorded accidents along this road associated with trucks from Martins Creek Quarry.

These issues relate to existing traffic issues along the road network impacted upon by the development.

The review of the performance of the signal controlled intersections on Melbourne Street highlight there are capacity issues currently occurring along this length of the road, due to the volume of traffic in this location. As part of the regional road network, the RMS will continue to monitor the performance of this intersection and upgrade this intersection if required.

5.2 Improvements to Accommodate Background Traffic

Advice from Council indicates that there is no expected increase in traffic flows along the key routes due to other developments in the general locality of the subject site.

5.3 Additional Improvements to Accommodate Development Traffic

To allow for the on-going use of the major routes utilised by the trucks for Martins Creek quarry, the following road upgrades are put forward for consideration with the relevant road authority:

1 - Upgrade intersection to provide a dedicated sheltered right turn lane at Dungog Road and Gresford Road

2 - Provide physical guidance for vehicles to manoeuvre around the 90 degree bend in Paterson

3 - Upgrade intersection to provide a dedicated sheltered right turn lane at Butterwick Road and Clarence Town Road

4 - Upgrade intersection to provide a dedicated sheltered right turn lane at Clarence Town Road and Brandy Hill Drive. However this intersection is impacted upon by the Brandy Hill quarry and any upgrade works at this intersection must take into account upgrade works required as part of the expansion of this quarry with appropriate cost sharing.

The proposed road works detailed above will provide the following benefits.

- Providing a sheltered right turn lane on Gresford Road at Dungog Road will improve road safety, by reducing or eliminating the potential for rear end type accidents. The current layout (Rural Type AUR) can lead to drivers of through vehicles on Gresford Road running into the rear of a vehicle propped on Gresford Road waiting to turn right into Dungog Road. The upgrade will direct all through traffic to steer to the left of any vehicle waiting to turn right at this location. This upgrade is in line with RMS policy which no longer permits Rural Type CHR intersection controls and requires a Rural CHR type intersection.
- The upgrade at the 90 degree bend in Paterson will ensure that all vehicles drive on the correct side of the road and do not cross over the centre line. The upgrade also allows for a raised central pedestrian median to assist pedestrian crossing the road in this location and improve road safety for these pedestrians.
- The upgrade at the intersection of Butterwick Road and Clarencetown Road is similar to the upgrade at Gresford Road at Dungog Road and is in line with current RMS design requirements. It will allow for safety improvements for through traffic on Clarencetown Road.
- The upgrade at Clarencetown Road and Brandy Hill Drive will allow for an improvement to road safety for through traffic movements on Clarencetown Road, with the provision of a sheltered right turn lane.

5.4 Alternative Improvements

No other alternatives are put forward for consideration.

6 Summary and Recommendations

6.1 Summary

The proposed development of Martins Creek Quarry allows for the continual use of the quarry and for the output of the quarry to increase to 1.5 million tonnes per annum. Whilst the volume of material extracted over the year is proposed to increase, the hourly number of trucks associated with the development will not increase and will remain at the current rate of 40 trucks per hour inbound and outbound.

Traffic data along the key routes associated with the haulage of material has been collected at mid-block locations as well as at the key intersections impacted upon by the project. This data shows that the current road network impacted upon by the project currently carries traffic flows well within their capacity, reflective of the rural setting for the majority of the haulage length. In the urban settings for the haulage routes the capacity of the road, as determined by the RMS, is higher and the operation of these roads is well within their capacity. With the traffic movements associated with the Martins Creek Quarry remaining at similar hourly levels, these roads will continue to operate within acceptable limits.

As part of the development, it is proposed to divert the haulage trucks away from the existing haulage route via Lorn and to divert this traffic along Flat Road and then via Melbourne Street to connect with the New England Highway. Whilst improving the road environment through Lorn, this will impact upon the operation and capacity of the signal controlled intersection of Pitnacree Road and Melbourne Street as well as the New England Highway with Melbourne Street. As part of the project work, traffic surveys have been completed at these two intersections and a Sidra intersection analysis has been completed for each of the intersections. This analysis confirms the operation of the existing intersection and has determined that the potential impacts of the Martins Creek Quarry haulage trucks is minimal and that the delays and congestion at both of these intersections will remain at similar levels to the existing operations.

As part of the project work, a safety review has also been completed along both of the key haulage routes associated with Martins Creek Quarry as well as a review of the accident data for these routes provided by the RMS. This review shows that the existing accident rates along the two key routes are reasonable low. The road authority has not noted any particular areas of concern with regard to road safety and have no plans to upgrade any of the existing road network in the locality of the site or along the two key access routes. The road authority have provided comment with regard to lack of shoulders in some locations along the haul routes as well as intersection controls, and the safety audit noted these upgrade requirements are required to bring the road network up to current design standards.

From the project work completed for Martins Creek Quarry, it can be seen that the proposed changes and increases to the output of the quarry will have an acceptable impact upon the local road network, as the hourly traffic volumes will remain similar to the existing levels. The increased output will be market driven and demands will be met by the more efficient use of the quarry and consistent transportation of product over time.

6.2 Recommendations

From the study work, the following road upgrades are put forward for discussion with the relevant road authority to cater for the continual use of the key haulage routes for the quarry:

1 - Upgrade intersection to provide a dedicated sheltered right turn lane at Dungog Road and Gresford Road

2 - Provide physical guidance for vehicles to manoeuvre around the 90 degree bend in Paterson

3 - Upgrade intersection to provide a dedicated sheltered right turn lane at Butterwick Road and Clarence Town Road

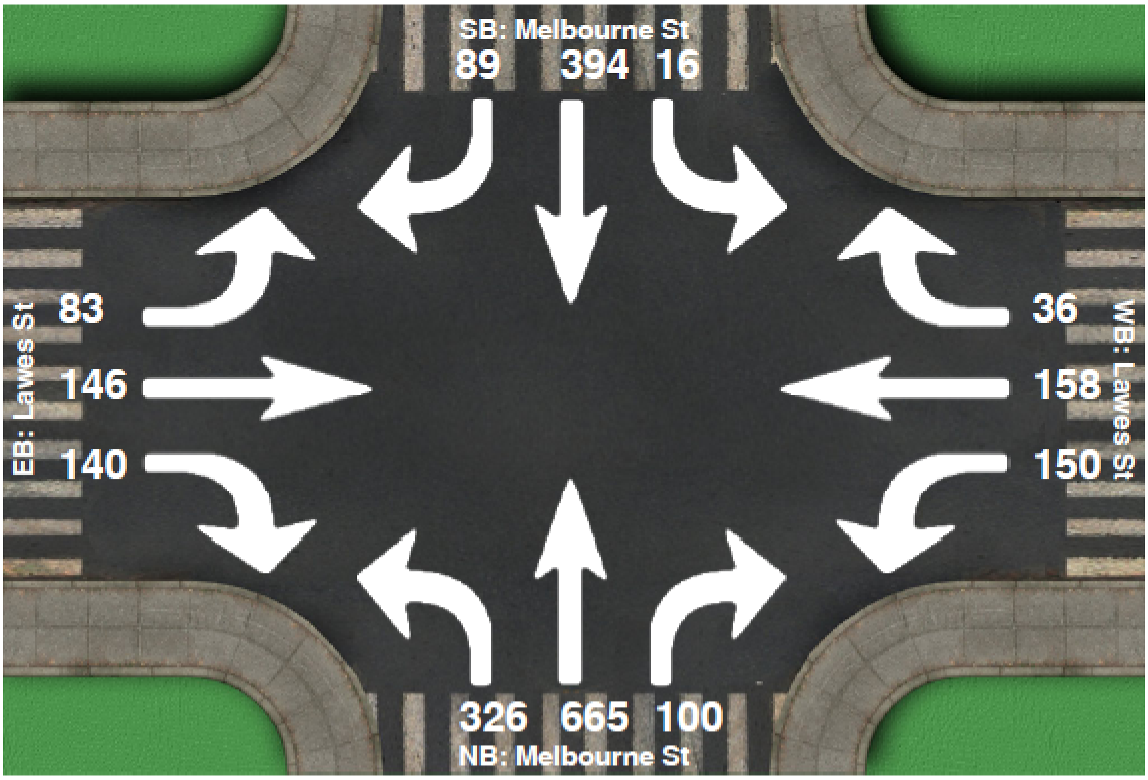
4 - Upgrade intersection to provide a dedicated sheltered right turn lane at Clarence Town Road and Brandy Hill Drive. This will also need to take into account upgrades associated with the Brandy Hill quarry expansion with appropriate cost sharing.

Based upon our project work, it is considered that the proposed ongoing use of Martins Creek Quarry and its expansion to allow for 1.5 million tonnes per annum for extraction should be approved on traffic and access grounds.

Appendix A – Intersection survey data

Intersection Peak Hour

Location: Melbourne St at Lawes St, East Maitland
GPS Coordinates:
Date: 2015-02-26
Day of week: Thursday
Weather:
Analyst: BM



Intersection Peak Hour

16:30 - 17:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	16	394	89	150	158	36	326	665	100	83	146	140	2303
Factor	0.50	0.80	0.82	0.85	0.90	0.75	0.89	0.90	0.81	0.72	0.78	0.88	0.99
Approach Factor	0.85			0.91			0.90			0.80			

Appendix B – Tube Count data

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One Page Summary

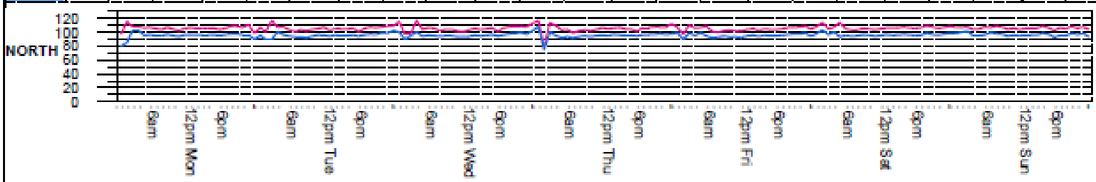
Count Number	2357	Lat/Long : S32 44.228 / E151 43.815	GOOGLE
Street	SEAHAM ROAD, SEAHAM : Between PORT STEPHENS STREET & CLARENCE TOWN ROAD (bidirectioı		
Location	Site 9, Mid-way between the Williams River (Raymond Terrace) and Brandy Hill Drive, on Tree.		

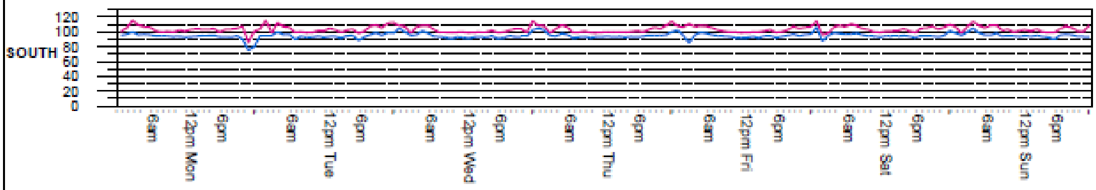
Start Date	17-JUL-15
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Speed Limit 100	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	95	94	94
Weekly 85th Percentile Speed	105	102	102
Five Day AADT	3280	3343	6623
Seven Day AADT	3046	3108	6153

	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	105.5	102.3	104.2	104.8	101.2	103.3	104.9	100.3	103.1	104.8	100.0	102.9
50%ile	95.7	94.2	94.9	95.0	93.3	94.1	95.1	93.1	94.1	95.1	93.3	94.2
> "" k	123	73	196	111	69	180	125	73	198	126	68	194
%age	4.0	2.3	3.1	3.5	2.1	2.8	3.8	2.2	3.0	3.8	2.0	2.9
> 120 k	0	0	0	0	0	0	0	0	0	0	0	0
%age	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

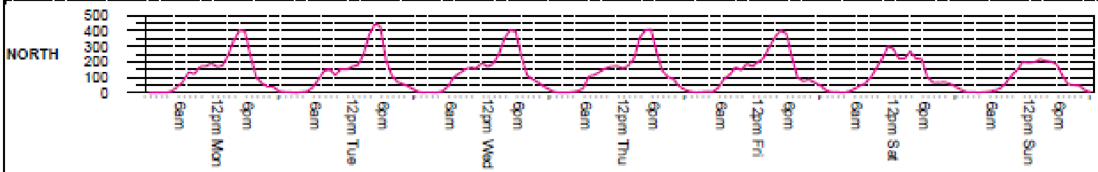
	FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	104.1	102.0	103.2	105.9	103.2	104.8	105.9	102.7	104.6	105.1	101.7	103.7
50%ile	94.7	94.0	94.3	95.8	94.4	95.0	95.8	94.1	94.9	95.3	93.8	94.5
> "" k	83	80	163	133	93	226	89	45	134	112.9	71.57	184.4
%age	2.4	2.4	2.4	4.8	3.3	4.1	4.2	2.1	3.1	3.8	2.3	3.1
> 120 k	0	0	0	0	0	0	0	0	0	0	0	0
%age	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

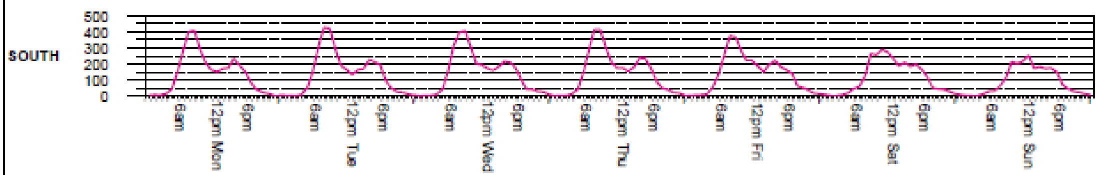




	MON N	MON S	MON BIDIr	TUE N	TUE S	TUE BIDIr	WED N	WED S	WED BIDIr	THU N	THU S	THU BIDIr
Short %	92.0	88.6	90.3	91.7	88.7	90.2	89.5	86.8	88.1	91.9	88.6	90.3
Med %	4.9	7.5	6.2	5.0	8.1	6.6	6.0	8.5	7.3	4.7	7.3	6.0
Long %	3.1	3.9	3.5	3.2	3.2	3.2	4.5	4.7	4.6	3.4	4.0	3.7
AM Pk Vo	190	409	534	154	428	569	192	408	555	172	416	552
PM Pk Vo	404	232	589	443	226	655	404	217	611	409	238	634
7-7pm	2744	2628	5372	2769	2686	5455	2786	2726	5512	2744	2760	5504
24Hr Tot	3132	3236	6368	3229	3324	6553	3291	3400	6691	3316	3390	6706
Class 0	20	38	58	29	31	60	17	41	58	8	17	25
Class 1	2808	2787	5595	2865	2861	5726	2859	2851	5710	2966	2934	5900
Class 2	54	41	95	68	58	126	68	59	127	75	54	129
Class 3	119	191	310	128	218	346	129	227	356	118	194	312
Class 4	28	50	78	31	48	79	65	58	123	34	51	85
Class 5	7	2	9	4	2	6	5	3	8	3	4	7
Class 6	9	22	31	12	21	33	10	17	27	4	18	22
Class 7	2	17	19	7	18	25	3	23	26	5	20	25
Class 8	7	10	17	4	7	11	13	10	23	9	10	19
Class 9	73	74	147	71	57	128	104	102	206	78	83	161
Class 10	5	4	9	10	3	13	18	9	27	16	5	21
Class 11	0	0	0	0	0	0	0	0	0	0	0	0
Class 12	0	0	0	0	0	0	0	0	0	0	0	0
Class 13	0	0	0	0	0	0	0	0	0	0	0	0

	FRI N	FRI S	FRI BIDIr	SAT N	SAT S	SAT BIDIr	SUN N	SUN S	SUN BIDIr	AVG N	AVG S	AVG BIDIr
Short %	92.3	88.8	90.6	96.8	94.5	95.6	97.3	94.8	96.0	92.8	89.8	91.3
Med %	4.7	7.5	6.1	2.3	4.0	3.1	1.9	3.5	2.7	4.4	6.9	5.6
Long %	2.9	3.6	3.3	1.0	1.5	1.2	.8	1.7	1.2	2.8	3.4	3.1
AM Pk Vo	187	375	529	297	290	567	200	218	415	199	363	532
PM Pk Vo	402	222	583	285	232	514	217	253	445	366	231	576
7-7pm	2883	2706	5589	2379	2512	4891	1872	1990	3862	2597	2573	5169
24Hr Tot	3432	3366	6798	2794	2836	5630	2125	2202	4327	3046	3108	6153
Class 0	15	25	40	15	23	38	8	17	25	16	27	43
Class 1	3088	2929	6017	2605	2594	5199	1983	2008	3991	2739	2709	5448
Class 2	66	36	102	84	63	147	77	62	139	70	53	124
Class 3	129	197	326	53	83	136	38	58	96	102	167	269
Class 4	29	52	81	9	30	39	2	20	22	28	44	72
Class 5	5	5	10	1	1	2	0	0	0	4	2	6
Class 6	12	15	27	7	2	9	3	4	7	8	14	22
Class 7	5	21	26	2	19	21	0	17	17	3	19	23
Class 8	0	14	14	1	0	1	0	2	2	5	8	12
Class 9	73	66	139	15	19	34	10	10	20	61	59	119
Class 10	10	6	16	2	2	4	4	4	8	9	9	14
Class 11	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0			





Data displayed has been compiled from pneumatic traffic count processes and is subject to the documented limitations

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One Page Summary

Count Number 2356 Lat/Long : S33 55.232 / E151 07.139 GOOGLE

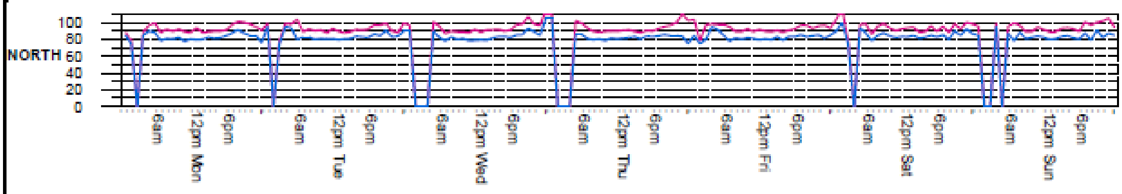
Street BRANDY HILL DRIVE, BRANDY HILL : Between SEAHAM ROAD & CLARENCE TOWN ROAD (bidirectior

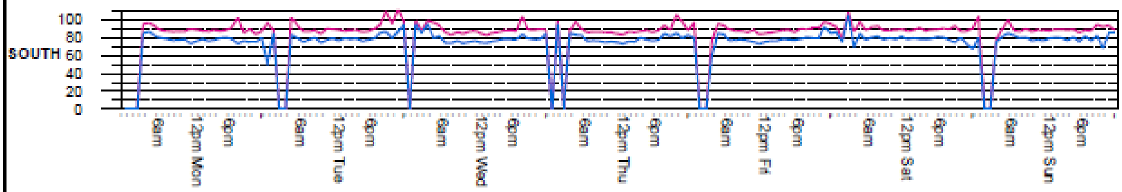
Location Site 8, Mid-way between Seaham Road and Clarence Town Road, ELP JQ77081

Start Date 17-JUL-15
Start Time 100
Duration 7 DAYS
Interval 1 HOUR

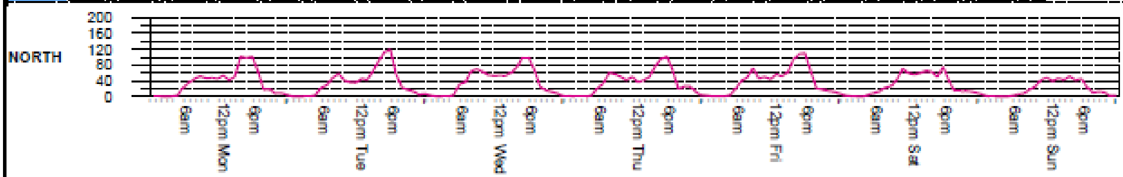
Speed Limit 80	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	83	78	78
Weekly 85th Percentile Speed	92	88	88
Five Day AADT	914	902	1816
Seven Day AADT	830	820	1650

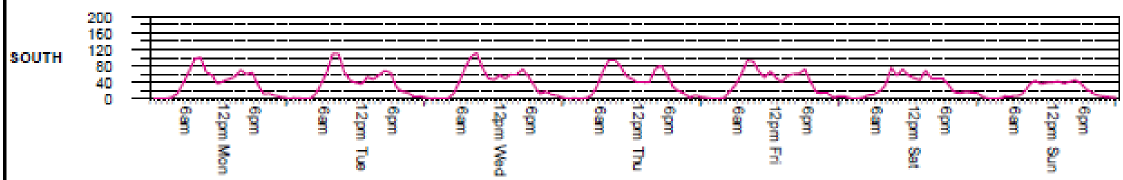
	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15			FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	92.4	88.0	89.6	92.5	88.5	89.9	91.7	87.0	89.2	91.3	87.2	89.1	91.7	87.9	89.5	93.7	88.9	91.0	93.5	88.6	90.4	92.4	88.0	89.8
50%ile	82.5	78.2	80.5	82.7	78.2	80.6	82.3	76.4	79.2	82.5	76.9	79.7	82.3	77.3	79.9	83.7	79.3	81.7	82.9	78.7	80.9	82.7	77.9	80.4
> 90 k	164	71	235	165	89	254	165	65	230	149	57	206	168	78	246	163	82	245	103	49	152	153.9	70.14	224
%age	18.7	8.1	13.4	18.8	10.1	14.4	17.2	6.9	12.1	16.8	6.4	11.6	17.5	8.5	13.1	22.1	11.0	16.5	20.7	10.1	15.5	18.8	8.7	13.8
> 100 k	32	11	43	30	15	45	38	6	44	29	14	43	30	12	42	21	8	29	23	7	30	29	10.43	39.43
%age	3.6	1.3	2.4	3.4	1.7	2.6	4.0	.6	2.3	3.3	1.6	2.4	3.1	1.3	2.2	2.8	1.1	2.0	4.6	1.4	3.1	3.6	1.3	2.4





	MON N	MON S	MON BIDIr	TUE N	TUE S	TUE BIDIr	WED N	WED S	WED BIDIr	THU N	THU S	THU BIDIr	FRI N	FRI S	FRI BIDIr	SAT N	SAT S	SAT BIDIr	SUN N	SUN S	SUN BIDIr	AVG N	AVG S	AVG BIDIr
Short %	87.1	85.8	86.5	88.5	87.7	88.1	81.9	81.5	81.7	85.7	84.7	85.2	87.0	85.2	86.1	95.1	96.0	95.6	97.2	97.1	97.1	88.1	87.4	87.8
Med %	5.0	5.5	5.2	5.2	5.6	5.4	6.1	6.9	6.5	5.0	6.1	5.5	4.9	5.4	5.1	1.9	2.1	2.0	1.4	2.1	1.7	4.5	5.1	4.8
Long %	7.8	8.8	8.3	6.2	6.7	6.5	12.0	11.6	11.8	9.3	9.2	9.3	8.1	9.4	8.7	3.0	1.9	2.4	1.4	.8	1.1	7.4	7.5	7.5
AM Pk Vol	52	101	153	58	110	166	70	112	182	60	94	154	72	93	163	71	75	143	49	44	87	62	90	150
PM Pk Vol	102	70	172	118	68	182	100	72	172	102	81	176	110	72	182	75	69	135	52	46	93	94	68	159
7-7pm	752	725	1477	752	720	1472	816	768	1584	733	729	1462	809	749	1558	635	632	1267	438	426	864	705	678	1383
24Hr Tot	879	878	1757	882	881	1763	962	947	1909	888	888	1776	961	914	1875	738	748	1486	498	483	981	830	820	1650
Class 0	4	5	9	6	5	11	6	9	15	0	3	3	5	5	10	2	2	4	2	3	5	4	5	8
Class 1	741	730	1471	760	745	1505	762	746	1508	739	732	1471	811	754	1565	673	685	1358	467	446	913	708	691	1399
Class 2	21	18	39	15	23	38	20	17	37	22	17	39	20	20	40	27	31	58	15	20	35	20	21	41
Class 3	36	37	73	32	38	70	44	46	90	35	43	78	35	39	74	11	13	24	6	8	14	28	32	60
Class 4	8	11	19	14	11	25	14	18	32	7	10	17	12	9	21	3	3	6	1	2	3	8	9	18
Class 5	0	0	0	0	0	0	1	1	2	2	1	3	0	1	1	0	0	0	0	0	0			1
Class 6	3	1	4	4	6	10	2	5	7	0	4	4	2	7	9	2	1	3	0	2	2	2	4	6
Class 7	2	2	4	3	0	3	0	1	1	3	0	3	4	2	6	7	1	8	7	1	8	4	1	5
Class 8	3	2	5	0	1	1	14	1	15	5	0	5	2	0	2	1	0	1	0	0	0	4	1	4
Class 9	61	72	133	44	48	92	91	92	183	68	70	138	64	71	135	12	12	24	0	1	1	49	52	101
Class 10	0	0	0	4	4	8	8	11	19	7	8	15	6	6	12	0	0	0	0	0	0	4	4	8
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





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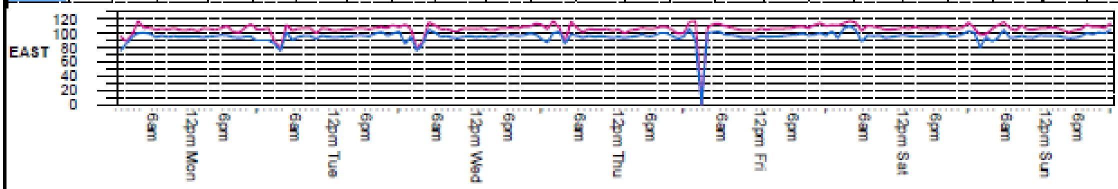
One Page Summary

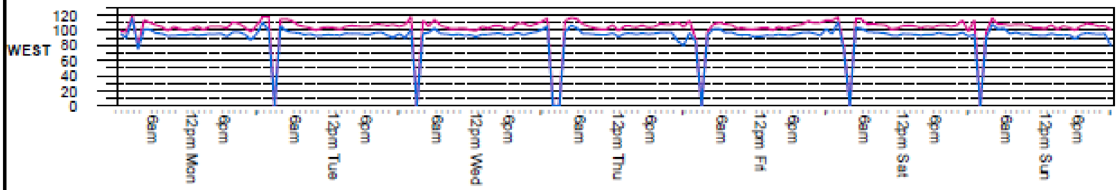
Count Number	2355	Lat/Long : S32 40.516 / E151 39.917	GOOGLE
Street	CLARENCE TOWN ROAD : Between PATERSON ROAD & QUEEN STREET (bidirectional)		
Location	Site 7, Mid-way between Butterwick Road and Brandy Hill Drive, opposite House No.784 on Guardrail.		

Start Date	17-JUL-15
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

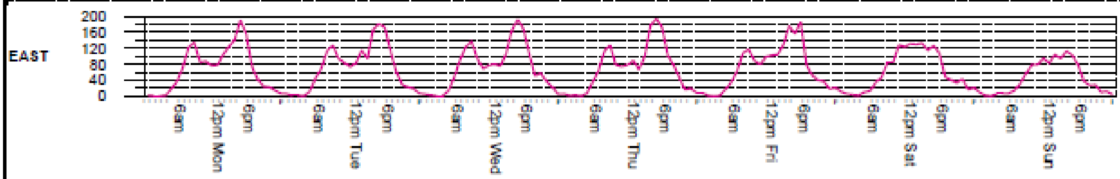
Speed Limit 100	EAST	WEST	COMBINED
Weekly 50th Percentile Speed	96	94	94
Weekly 85th Percentile Speed	107	105	105
Five Day AADT	1684	1705	3389
Seven Day AADT	1571	1602	3173

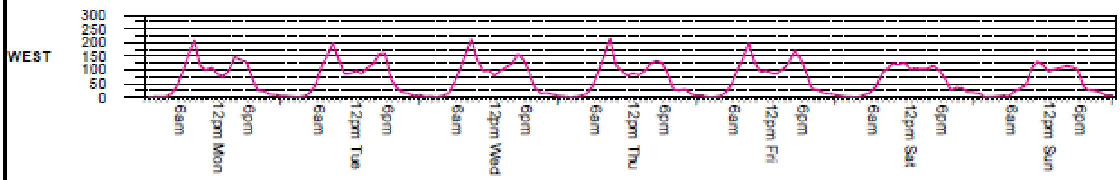
	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15			FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir
85%ile	106.0	103.9	105.1	106.4	104.7	105.6	106.6	104.2	105.6	106.1	105.1	105.7	107.2	104.7	106.1	107.4	105.7	106.6	106.4	104.5	105.6	106.6	104.7	105.7
50%ile	96.5	94.2	94.8	95.6	94.5	95.1	95.7	94.4	95.0	95.8	94.9	95.3	96.1	94.0	95.0	96.1	94.7	95.4	95.3	93.6	94.4	95.7	94.3	95.0
> ** k	85	58	143	105	84	189	111	80	191	84	89	173	132	75	207	120	87	207	66	65	131	100.4	76.86	177.3
%age	5.3	3.5	4.4	6.3	4.9	5.6	6.6	4.6	5.6	5.1	5.4	5.3	7.8	4.4	6.1	8.1	6.0	7.1	6.2	5.3	5.7	6.5	4.9	5.7
> 120 k	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
%age	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0





Short %	87.1	87.5	87.3	88.8	88.0	88.4	92.0	90.1	91.0	91.5	91.7	91.6	93.0	92.3	92.7	93.4	94.7	94.1	94.3	95.9	95.1	91.3	91.2	91.3
Med %	9.2	9.7	9.4	8.7	9.7	9.2	5.2	6.9	6.1	6.1	6.3	6.2	4.3	5.6	4.9	3.4	3.2	3.3	3.3	3.3	3.3	5.9	6.6	6.2
Long %	3.8	2.8	3.3	2.5	2.3	2.4	2.8	3.0	2.9	2.4	2.0	2.2	2.7	2.1	2.4	3.1	2.1	2.6	2.4	.8	1.6	2.8	2.2	2.5
AM Pk Vo	135	209	337	128	198	324	137	211	342	128	215	339	117	197	312	129	125	249	95	131	210	124	184	302
PM Pk Vo	191	147	326	181	162	340	192	157	347	194	134	326	186	170	326	133	115	241	113	114	226	170	143	309
7-7pm	1373	1430	2803	1418	1462	2880	1397	1493	2890	1373	1391	2764	1425	1458	2883	1261	1254	2515	956	1098	2054	1315	1369	2684
24Hr Tot	1615	1661	3276	1692	1730	3422	1730	1754	3484	1659	1655	3314	1722	1726	3448	1496	1459	2955	1083	1226	2309	1571	1602	3173
Class 0	13	12	25	15	12	27	16	14	30	13	4	17	14	8	22	9	5	14	12	13	25	13	10	23
Class 1	1353	1373	2726	1445	1468	2913	1540	1526	3066	1476	1463	2939	1541	1526	3067	1340	1297	2637	960	1092	2052	1379	1392	2771
Class 2	40	69	109	43	43	86	35	41	76	29	50	79	47	59	106	49	80	129	49	71	120	42	59	101
Class 3	73	79	152	72	87	159	65	90	155	72	76	148	61	82	143	40	39	79	29	35	64	59	70	129
Class 4	74	78	152	75	78	153	23	28	51	29	27	56	12	14	26	11	6	17	7	5	12	33	34	67
Class 5	1	4	5	0	2	2	2	3	5	1	2	3	1	0	1	0	1	1	0	0	0	1	2	2
Class 6	6	9	15	9	9	18	5	0	5	5	4	9	7	14	21	4	8	12	4	7	11	6	7	13
Class 7	17	4	21	8	3	11	15	6	21	14	3	17	13	0	13	23	3	26	20	0	20	16	3	18
Class 8	3	4	7	2	2	4	3	2	5	2	3	5	1	3	4	1	1	2	1	2	3	2	2	4
Class 9	34	29	63	22	23	45	25	43	68	18	21	39	24	20	44	19	19	38	1	1	2	20	22	43
Class 10	1	0	1	1	3	4	1	1	2	0	2	2	1	0	1	0	0	0	0	0	0	1	1	1
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





One Page Summary

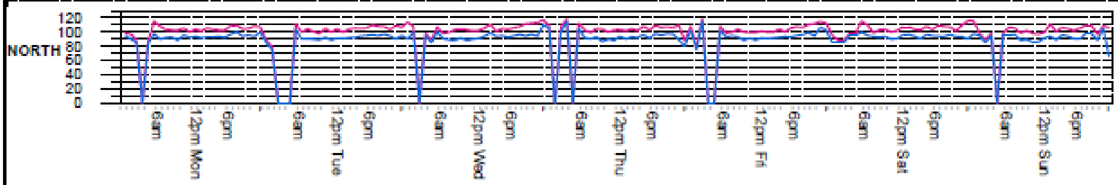
Count Number	2354	GOOGLE
Street	BUTTERWICK ROAD, BUTTERWICK : Between CLARENCE TOWN ROAD & PATERSON ROAD (bidirecti	
Location	Site 6, Mid-way between Clarence Town Road and Duns Creek Road, 200M North of Green Wattle Creek Road	

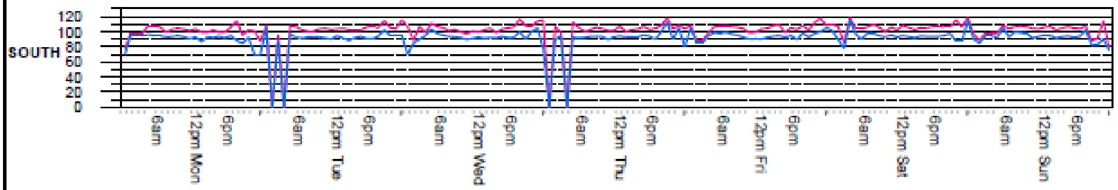
Start Date	17-JUL-15
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Speed Limit 100	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	93	94	94
Weekly 85th Percentile Speed	105	105	105
Five Day AADT	722	701	1423
Seven Day AADT	670	649	1320

	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15		
	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir
85%ile	104.2	102.6	103.5	105.0	103.8	104.4	104.7	103.6	104.2	105.1	104.3	104.7
50%ile	93.3	93.1	93.2	92.8	92.7	92.7	92.9	93.3	93.1	93.3	93.4	93.4
> [illegible] k	29	23	52	41	30	71	43	34	77	40	35	75
%age	4.2	3.6	3.9	5.8	4.1	4.9	5.6	4.6	5.1	5.6	4.9	5.2
> 120 k	0	0	0	0	0	0	0	0	0	0	0	0
%age	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

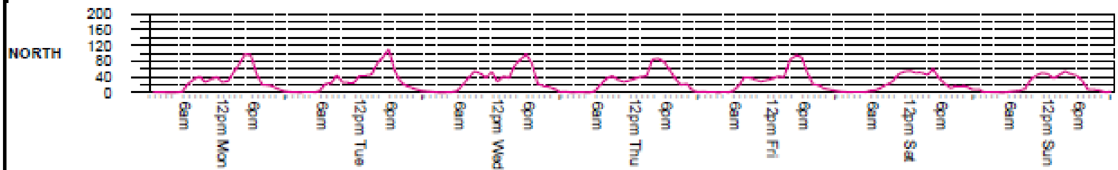
	FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir
85%ile	103.6	105.7	104.7	105.6	106.0	105.8	103.2	105.6	104.7	104.5	104.5	104.6
50%ile	93.0	94.5	93.7	93.6	94.3	94.0	91.3	94.3	92.9	92.9	93.7	93.3
> [illegible] k	34	40	74	39	39	78	27	21	48	36.14	31.71	67.86
%age	4.9	6.2	5.5	6.8	7.2	7.0	5.5	4.4	5.0	5.5	5.0	5.2
> 120 k	0	0	0	0	0	0	0	0	0	0	0	0
%age	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

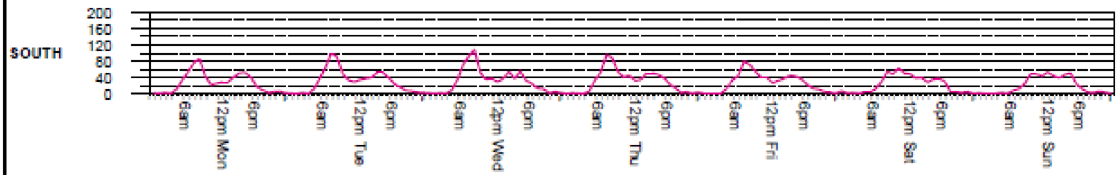




	MON N	MON S	MON BIDir	TUE N	TUE S	TUE BIDir	WED N	WED S	WED BIDir	THU N	THU S	THU BIDir
Short %	91.9	90.6	91.3	89.9	88.8	89.4	88.5	88.1	88.3	91.7	89.2	90.4
Med %	5.5	5.3	5.4	5.5	6.0	5.8	6.0	6.7	6.3	6.5	8.0	7.3
Long %	2.6	4.1	3.3	4.6	5.2	4.9	5.6	5.2	5.4	1.8	2.8	2.3
AM Pk Vo	41	86	125	45	99	136	55	109	164	43	95	131
PM Pk Vo	98	52	150	110	52	149	97	55	139	87	51	134
7-7pm	598	512	1110	617	580	1197	668	594	1262	600	603	1203
24Hr Tot	695	641	1336	723	735	1458	771	748	1519	720	725	1445
Class 0	2	6	8	2	7	9	2	4	6	0	2	2
Class 1	617	565	1182	622	626	1248	660	641	1301	641	630	1271
Class 2	20	10	30	26	20	46	20	14	34	19	15	34
Class 3	29	27	56	28	31	59	30	36	66	33	41	74
Class 4	9	7	16	12	12	24	13	11	24	13	16	29
Class 5	0	0	0	0	1	1	3	3	6	1	1	2
Class 6	3	2	5	1	3	4	2	2	4	0	1	1
Class 7	0	2	2	0	3	3	1	4	5	0	5	5
Class 8	0	0	0	0	0	0	0	2	2	0	1	1
Class 9	15	22	37	27	27	54	39	31	70	12	12	24
Class 10	0	0	0	5	5	10	1	0	1	1	1	2
Class 11	0	0	0	0	0	0	0	0	0	0	0	0
Class 12	0	0	0	0	0	0	0	0	0	0	0	0
Class 13	0	0	0	0	0	0	0	0	0	0	0	0

	FRI N	FRI S	FRI BIDir	SAT N	SAT S	SAT BIDir	SUN N	SUN S	SUN BIDir	AVG N	AVG S	AVG BIDir
Short %	92.2	90.6	91.4	97.4	93.9	95.7	98.2	94.4	96.3	92.4	90.5	91.5
Med %	5.6	6.4	6.0	1.9	3.4	2.6	1.6	3.7	2.6	4.9	5.8	5.3
Long %	2.3	3.0	2.7	.7	2.7	1.7	.2	1.9	1.0	2.7	3.7	3.2
AM Pk Vo	38	79	115	54	63	108	51	49	91	47	83	124
PM Pk Vo	94	45	136	60	49	104	55	53	101	86	51	130
7-7pm	609	528	1137	493	503	996	452	448	900	577	538	1115
24Hr Tot	701	657	1358	583	555	1138	500	483	983	670	649	1320
Class 0	0	2	2	2	5	7	2	2	4	1	4	5
Class 1	628	572	1200	535	493	1028	461	441	902	595	567	1162
Class 2	18	21	39	31	23	54	28	13	41	23	17	40
Class 3	27	34	61	9	16	25	4	15	19	23	29	51
Class 4	12	8	20	2	3	5	4	3	7	9	9	18
Class 5	0	0	0	0	0	0	0	0	0	1	1	1
Class 6	4	4	8	1	3	4	1	0	1	2	2	4
Class 7	0	3	3	2	11	13	0	8	8		5	6
Class 8	0	1	1	0	0	0	0	0	0		1	1
Class 9	12	12	24	1	1	2	0	1	1	15	15	30
Class 10	0	0	0	0	0	0	0	0	0	1	1	2
Class 11	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0			





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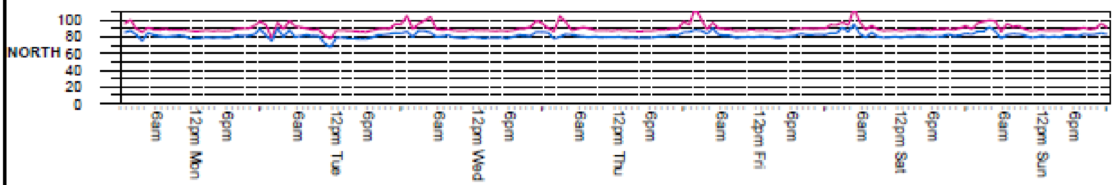
One Page Summary

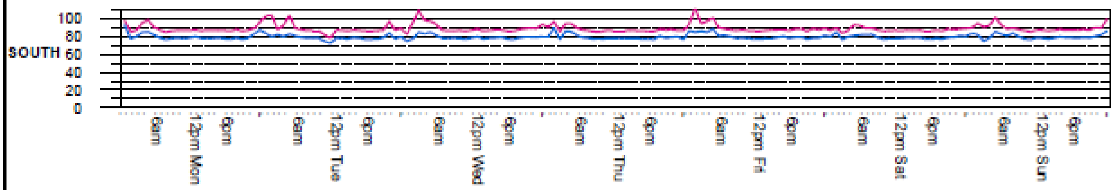
Count Number	2353	GOOGLE
Street	FLAT ROAD, BOLWARRA : Between PITNACREE ROAD & PATERSON ROAD (bidirectional)	
Location	Site 5, Mid-way between Melbourne Street (East Maitland) and Paterson Road, on Guardrail.	

Start Date	17-JUL-15
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

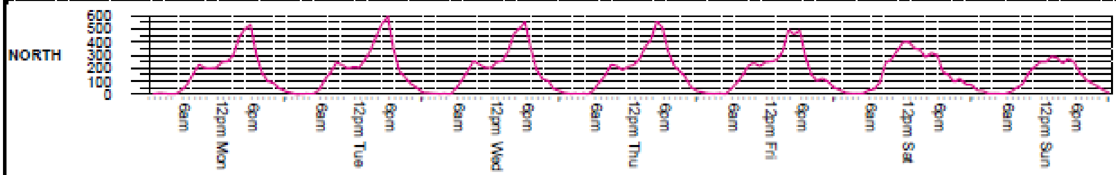
Speed Limit 80	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	80	78	78
Weekly 85th Percentile Speed	88	87	87
Five Day AADT	4356	4302	8659
Seven Day AADT	4122	4085	8207

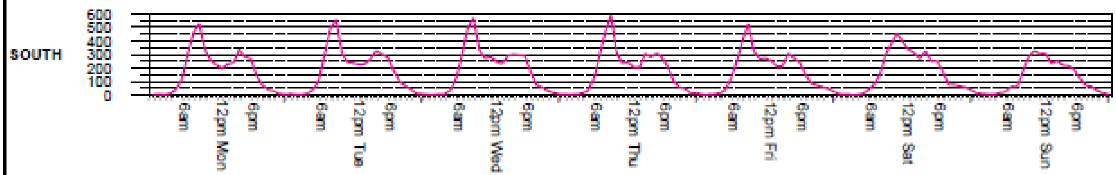
	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15			FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	87.9	87.0	87.5	87.5	86.9	87.2	87.9	87.2	87.6	87.9	86.8	87.4	88.1	87.6	87.9	88.5	87.1	87.9	88.7	87.5	88.1	88.1	87.2	87.7
50%ile	79.5	78.2	78.8	78.4	77.7	78.0	79.3	78.3	78.8	79.5	77.9	78.7	80.4	78.7	79.5	80.7	78.3	79.4	81.2	78.5	79.7	79.9	78.2	79.0
> 90 k	255	179	434	261	196	457	299	217	516	269	169	438	282	248	530	344	180	524	254	173	427	280.6	194.6	475.1
%age	6.2	4.3	5.2	5.9	4.5	5.2	6.7	4.9	5.8	6.1	3.9	5.0	6.5	6.0	6.2	8.3	4.5	6.4	8.7	5.7	7.2	6.9	4.8	5.9
> 100 k	31	32	63	31	32	63	37	37	74	30	34	64	39	37	76	48	23	71	31	31	62	35.29	32.29	67.57
%age	.8	.8	.8	.7	.7	.7	.8	.8	.8	.7	.8	.7	.9	.9	.9	1.2	.6	.9	1.1	1.0	1.0	.9	.8	.8





	MON N	MON S	MON BIDIr	TUE N	TUE S	TUE BIDIr	WED N	WED S	WED BIDIr	THU N	THU S	THU BIDIr	FRI N	FRI S	FRI BIDIr	SAT N	SAT S	SAT BIDIr	SUN N	SUN S	SUN BIDIr	AVG N	AVG S	AVG BIDIr
Short %	94.7	93.9	94.3	94.0	93.7	93.9	93.7	93.2	93.5	94.7	94.4	94.5	95.2	95.4	95.3	96.7	96.5	96.6	98.2	97.4	97.8	95.2	94.8	95.0
Med %	3.5	4.4	4.0	4.4	4.3	4.4	4.3	4.6	4.5	3.8	4.3	4.1	3.4	3.4	3.4	2.6	3.0	2.8	1.4	2.4	1.9	3.5	3.9	3.7
Long %	1.8	1.7	1.7	1.6	1.9	1.8	1.9	2.2	2.1	1.5	1.3	1.4	1.4	1.1	1.3	.8	.5	.7	.4	.2	.3	1.4	1.3	1.4
AM Pk Vo	229	528	754	243	557	797	255	569	824	227	586	812	246	526	744	395	457	786	246	327	551	263	507	753
PM Pk Vo	533	337	804	591	327	865	550	300	839	556	308	862	490	307	796	401	337	736	286	307	551	487	318	779
7-7pm	3560	3507	7067	3773	3650	7423	3759	3779	7538	3655	3624	7279	3627	3441	7068	3494	3597	7091	2482	2689	5171	3479	3470	6948
24Hr Tot	4133	4158	8291	4423	4388	8811	4446	4460	8906	4443	4329	8772	4337	4177	8514	4160	4060	8220	2912	3022	5934	4122	4085	8207
Class 0	46	29	75	44	32	76	52	44	96	35	30	65	28	30	58	47	33	80	37	19	56	41	31	72
Class 1	3814	3798	7612	4060	4012	8072	4051	4042	8093	4122	3996	8118	4047	3896	7943	3892	3787	7679	2774	2863	5637	3823	3771	7593
Class 2	52	78	130	55	69	124	64	70	134	50	60	110	55	59	114	82	97	179	49	62	111	58	71	129
Class 3	127	163	290	157	166	323	156	167	323	143	165	308	119	127	246	87	111	198	35	70	105	118	138	256
Class 4	15	17	32	31	19	50	33	37	70	26	19	45	24	17	41	15	6	21	6	2	8	21	17	38
Class 5	4	4	8	6	5	11	4	0	4	2	2	4	4	0	4	5	4	9	0	1	1	4	2	6
Class 6	18	17	35	10	25	35	6	17	23	9	13	22	12	8	20	5	9	14	1	2	3	9	13	22
Class 7	13	9	18	13	6	19	13	4	17	11	3	14	11	4	15	8	3	11	7	0	7	11	4	14
Class 8	11	[illegible]	16	19	[illegible]	24	15	[illegible]	17	21	4	25	9	[illegible]	11	5	3	8	1	1	0	11	3	14
Class 9	28	38	66	26	47	73	49	66	115	22	34	56	21	24	45	15	6	21	1	2	3	23	31	53
Class 10	5	4	9	[illegible]	[illegible]	4	3	11	14	6	3	9	7	10	17	[illegible]	[illegible]	2	0	0	0	[illegible]	[illegible]	8
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0





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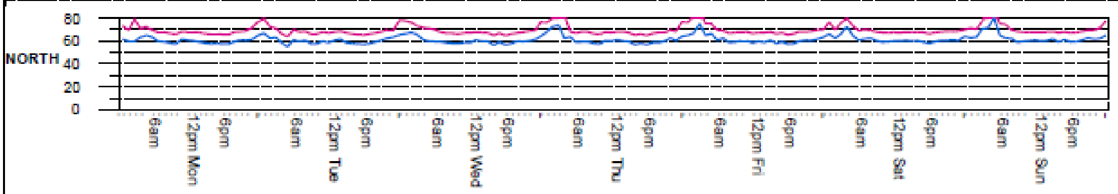
One Page Summary

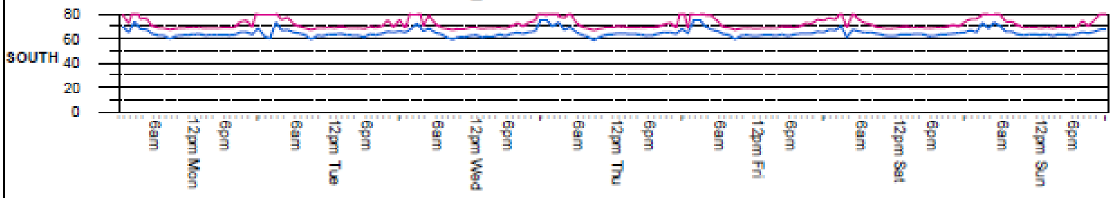
Count Number	2352	Lat/Long : S32 42.437 / E151 34.575	GOOGLE
Street	PATERSON ROAD, BOLWARRA : Between EKERT LANE & WALLALONG ROAD (bidirectional)		
Location	Site 4, Mid-way between Flat Road and Bolwarra Heights, opposite House No.102 on Bike sign / fencepost.		

Start Date	17-JUL-15
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

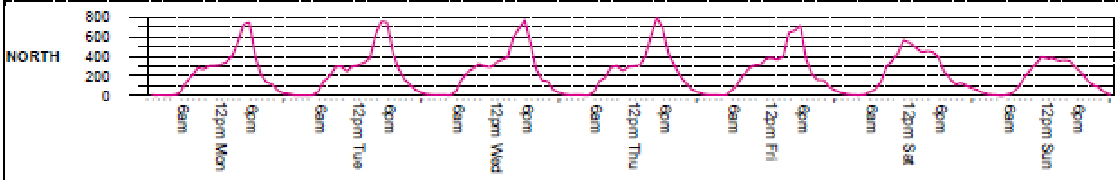
Speed Limit 60	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	59	63	61
Weekly 85th Percentile Speed	67	69	68
Five Day AADT	5868	5820	11688
Seven Day AADT	5586	5568	11154

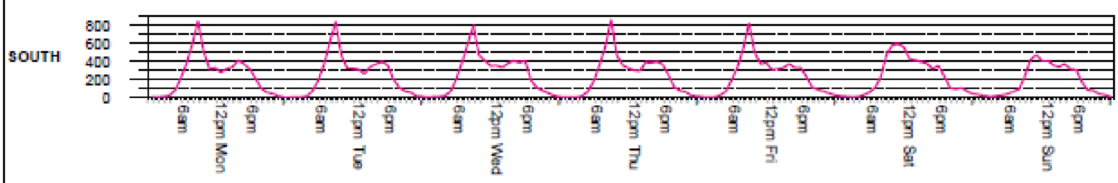
	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15			FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	67.0	68.7	68.0	67.1	68.8	68.1	66.9	68.6	67.9	67.1	68.9	68.2	67.4	68.9	68.2	67.8	69.0	68.5	68.1	69.3	68.8	67.3	68.9	68.3
50%ile	58.6	62.7	60.9	58.5	62.8	60.8	58.4	62.3	60.4	58.5	62.8	60.8	59.1	62.8	61.1	60.1	63.3	62.0	60.7	63.5	62.3	59.1	62.9	61.2
> 70 k	191	425	616	225	447	672	196	443	639	224	511	735	261	492	753	279	509	788	245	461	706	231.6	469.7	701.3
%age	3.4	7.4	5.4	3.9	7.8	5.8	3.2	7.4	5.3	3.8	8.7	6.3	4.4	8.5	6.4	5.0	9.1	7.0	5.9	10.8	8.4	4.2	8.5	6.4
> 80 k	13	35	48	25	44	69	18	47	65	17	62	79	20	52	72	15	48	63	27	54	81	19.29	48.86	68.14
%age	.2	.6	.4	.4	.8	.6	.3	.8	.5	.3	1.1	.7	.3	.9	.6	.3	.9	.6	.6	1.3	1.0	.4	.9	.6





	MON N	MON S	MON BIDIr	TUE N	TUE S	TUE BIDIr	WED N	WED S	WED BIDIr	THU N	THU S	THU BIDIr	FRI N	FRI S	FRI BIDIr	SAT N	SAT S	SAT BIDIr	SUN N	SUN S	SUN BIDIr	AVG N	AVG S	AVG BIDIr
Short %	93.1	91.9	92.5	93.9	92.4	93.2	92.9	91.0	92.0	93.8	92.5	93.2	94.0	92.5	93.2	97.0	95.7	96.4	98.4	96.6	97.5	94.5	93.1	93.8
Med %	4.7	6.1	5.4	4.2	5.5	4.8	4.2	5.7	4.9	4.3	5.6	5.0	3.9	5.4	4.6	2.0	3.2	2.6	1.4	3.1	2.3	3.6	5.0	4.3
Long %	2.2	2.0	2.1	1.9	2.1	2.0	2.9	3.3	3.1	1.9	1.8	1.9	2.1	2.1	2.1	1.0	1.1	1.1	.2	.3	.2	1.8	1.9	1.9
AM Pk Vo	309	841	1125	301	836	1128	326	794	1073	308	855	1143	377	818	1092	566	591	1123	397	470	808	369	744	1070
PM Pk Vo	743	408	1095	753	393	1146	768	406	1174	788	394	1182	711	370	1042	538	419	957	379	410	787	669	400	1055
7-7pm	4867	4804	9671	4936	4789	9725	5106	5044	10150	4873	4925	9798	5028	4820	9848	4818	4940	9758	3606	3862	7468	4748	4741	9488
24Hr Tot	5634	5725	11359	5825	5724	11549	6040	5997	12037	5886	5859	11745	5955	5793	11748	5608	5586	11194	4157	4289	8446	5586	5568	11154
Class 0	20	43	63	29	35	64	19	55	74	12	35	47	12	42	54	26	41	67	19	37	56	20	41	61
Class 1	5114	5100	10214	5318	5149	10467	5464	5297	10761	5413	5300	10713	5478	5216	10694	5265	5164	10429	3965	4002	7967	5145	5033	10178
Class 2	112	118	230	122	106	228	127	107	234	96	86	182	106	99	205	149	143	292	107	106	213	117	109	226
Class 3	218	308	526	188	251	439	207	279	486	221	290	511	187	270	457	94	155	249	53	121	174	167	239	406
Class 4	34	31	65	51	53	104	41	53	94	27	38	65	37	40	77	10	16	26	5	12	17	29	35	64
Class 5	10	10	20	8	9	17	6	8	14	4	2	6	7	4	11	6	5	11	0	0	0	6	5	11
Class 6	18	16	34	16	26	42	9	17	26	9	13	22	10	17	27	6	10	16	3	7	10	10	15	25
Class 7	3	3	6	2	3	5	2	7	9	5	1	6	4	2	6	0	4	4	0	0	0	2	3	5
Class 8	6	6	12	1	4	5	5	4	9	4	6	10	4	5	9	1	2	3	0	2	2	3	4	7
Class 9	86	78	164	81	82	163	140	150	290	89	81	170	85	74	159	49	45	94	3	0	3	76	73	149
Class 10	13	12	25	9	6	15	20	20	40	6	7	13	25	24	49	2	1	3	2	2	4	11	10	21
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





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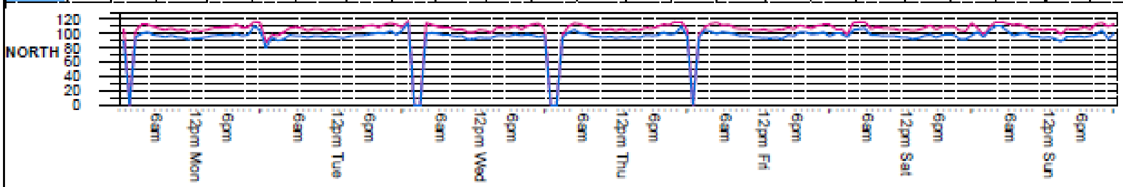
One Page Summary

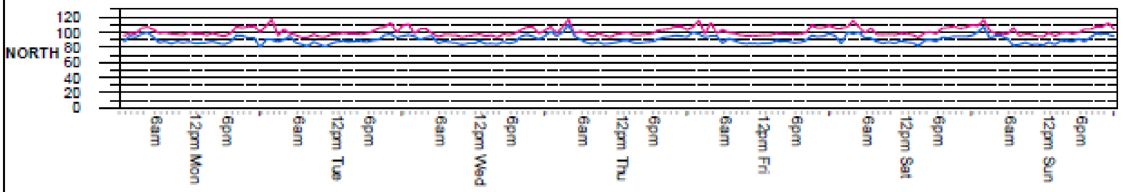
Count Number	2351	Lat/Long : S32 39.518 / E151 35.268	GOOGLE
Street	TOCAL ROAD, TOCAL : Between PATERSON ROAD & ALBERT STREET (bidirectional)		
Location	Site 3, Mid-way between Bolwarra Heights and Patterson township, House No.532 on Guardrail.		

Start Date	17-JUL-15
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

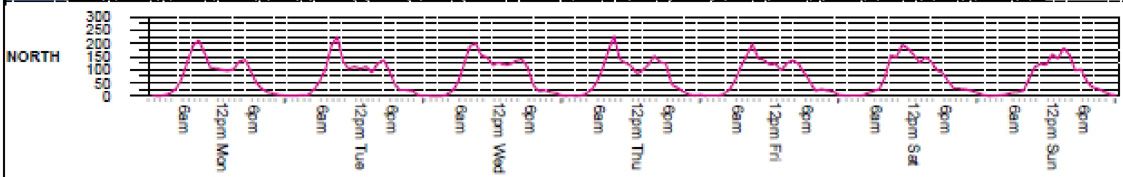
Speed Limit 100	NORTH	NORTH	COMBINED
Weekly 50th Percentile Speed	96	87	87
Weekly 85th Percentile Speed	107	98	98
Five Day AADT	1795	1821	3616
Seven Day AADT	1740	1742	3482

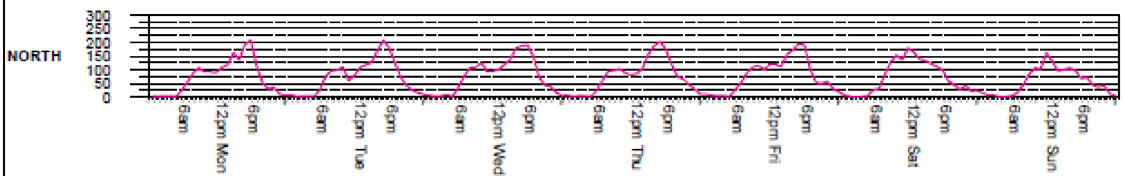
	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15			FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	NORTH	NORTH	BIDIr	NORTH	NORTH	BIDIr	NORTH	NORTH	BIDIr	NORTH	NORTH	BIDIr	NORTH	NORTH	BIDIr	NORTH	NORTH	BIDIr	NORTH	NORTH	BIDIr	NORTH	NORTH	BIDIr
85%ile	106.9	98.2	103.8	107.2	98.3	103.9	106.8	97.4	103.0	107.2	98.5	103.9	107.6	98.2	104.3	107.3	98.7	104.2	106.9	99.3	104.4	107.1	98.4	103.9
50%ile	96.0	86.9	92.0	96.3	87.4	92.3	95.9	86.5	91.5	96.0	87.8	92.2	96.7	87.4	92.2	95.9	87.8	92.2	95.1	87.0	91.5	96.0	87.3	92.0
> ** k	127	36	163	133	38	171	126	26	152	142	43	185	141	36	177	144	41	185	117	41	158	132.9	37.29	170.1
%age	7.3	2.1	4.7	7.8	2.2	4.9	6.9	1.4	4.1	8.1	2.4	5.2	8.1	1.9	4.9	8.5	2.4	5.4	8.1	3.1	5.7	7.8	2.2	5.0
> 120 k	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
%age	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0





	MON N	MON N	MON BIDIr	TUE N	TUE N	TUE BIDIr	WED N	WED N	WED BIDIr	THU N	THU N	THU BIDIr	FRI N	FRI N	FRI BIDIr	SAT N	SAT N	SAT BIDIr	SUN N	SUN N	SUN BIDIr	AVG N	AVG N	AVG BIDIr
Short %	90.1	85.3	87.7	90.0	86.5	88.2	86.3	83.1	84.7	90.9	87.0	89.0	91.2	87.1	89.1	94.7	90.4	92.6	97.7	94.4	96.1	91.4	87.4	89.4
Med %	5.0	9.0	7.0	5.1	8.4	6.8	5.0	8.6	6.8	5.7	8.6	7.2	4.0	7.9	6.0	2.7	5.9	4.3	2.1	4.4	3.2	4.3	7.7	6.0
Long %	4.9	5.7	5.3	4.9	5.2	5.0	8.8	8.3	8.5	3.4	4.3	3.9	4.8	5.0	4.9	2.6	3.7	3.1	.2	1.3	.7	4.4	4.9	4.6
AM Pk Vo	211	107	315	225	110	319	199	125	306	227	103	320	198	118	305	195	179	355	122	161	277	197	129	314
PM Pk Vo	139	209	329	137	208	343	140	190	323	152	204	336	136	194	312	155	163	316	183	131	289	149	186	321
7-7pm	1491	1506	2997	1473	1478	2951	1598	1589	3187	1530	1494	3024	1493	1574	3067	1548	1503	3051	1333	1168	2501	1495	1473	2968
24Hr Tot	1786	1733	3519	1744	1766	3510	1873	1899	3772	1783	1822	3605	1789	1885	3674	1732	1737	3469	1470	1353	2823	1740	1742	3482
Class 0	11	13	24	4	9	13	9	17	26	9	7	16	3	9	12	8	8	16	21	9	30	9	10	20
Class 1	1561	1440	3001	1530	1485	3015	1568	1526	3094	1578	1547	3125	1601	1607	3208	1595	1528	3123	1366	1236	2602	1543	1481	3024
Class 2	37	25	62	35	33	68	39	35	74	34	32	66	28	26	54	38	34	72	49	32	81	37	31	68
Class 3	81	134	215	62	117	179	68	135	203	84	136	220	51	126	177	35	90	125	28	57	85	58	114	172
Class 4	7	17	24	25	27	52	24	28	50	15	17	32	19	21	40	9	12	21	3	2	5	15	17	32
Class 5	2	5	7	2	4	6	1	3	4	2	4	6	1	2	3	2	1	3	0	0	0	1	3	4
Class 6	7	13	20	5	8	13	7	13	20	3	8	11	5	8	13	1	10	11	0	0	0	4	9	13
Class 7	3	11	14	6	14	20	3	9	12	4	14	18	3	11	14	4	14	18	1	11	12	3	12	15
Class 8	3	8	11	3	7	10	4	8	12	2	5	7	1	5	6	4	2	6	0	0	0	2	5	7
Class 9	61	60	121	67	59	126	131	118	249	45	47	92	55	55	110	35	36	71	0	3	3	56	54	110
Class 10	13	7	20	5	3	8	19	9	28	7	5	12	22	15	37	1	2	3	2	3	5	10	6	16
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





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One Page Summary

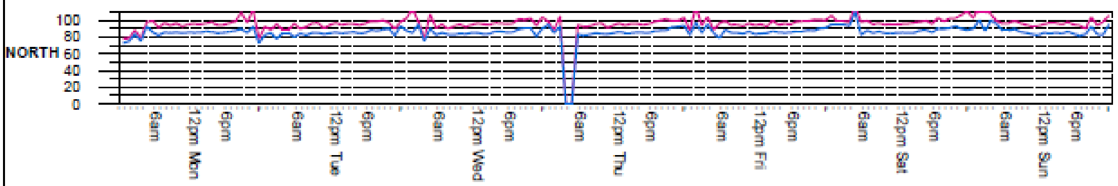
Count Number	2350	Lat/Long : S32 34.945 / E151 36.365	GOOGLE
Street	GRESFORD ROAD, PATERSON : Between TOCAL ROAD & PARK ROAD (bidirectional)		
Location	Site 2, Mid-way between Patterson township (Tocal Road) and Dungog Road, House No.250 on Tree.		

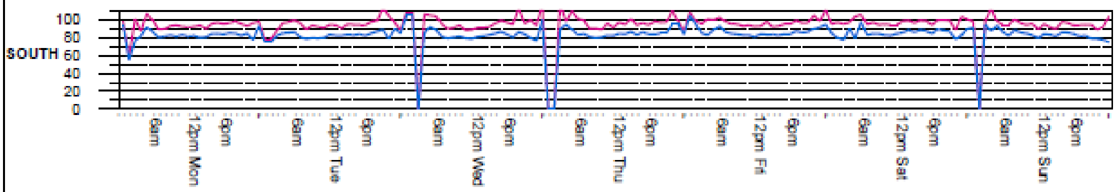
Start Date	17-JUL-15
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Speed Limit 80	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	85	83	83
Weekly 85th Percentile Speed	96	95	95
Five Day AADT	1541	1537	3078
Seven Day AADT	1482	1498	2980

	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15		
	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir
85%ile	95.9	94.1	95.1	95.8	94.3	95.2	96.1	94.4	95.4	96.2	94.9	95.6
50%ile	85.4	82.8	84.2	85.1	81.9	83.7	85.2	82.1	83.8	85.3	83.1	84.3
> 90 k	411	326	737	409	330	739	444	350	794	438	350	788
%age	28.2	21.6	24.8	27.6	22.0	24.8	27.8	21.7	24.7	28.6	23.0	25.8
> 100 k	87	81	168	88	87	175	107	106	213	100	100	200
%age	6.0	5.4	5.7	5.9	5.8	5.9	6.7	6.6	6.6	6.5	6.6	6.6

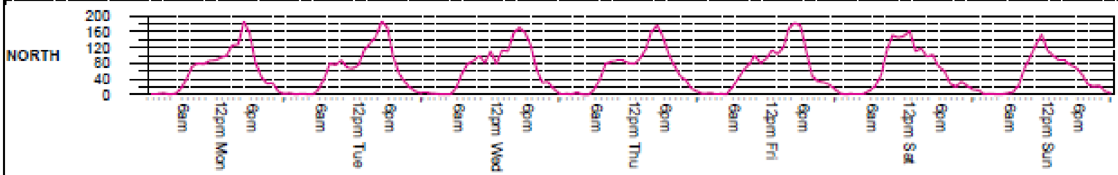
	FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir	NORTH	SOUTH	BIDir
85%ile	96.2	95.9	96.1	97.2	97.0	97.1	95.8	94.7	95.3	96.2	95.0	95.7
50%ile	85.6	84.5	85.1	86.1	85.3	85.7	84.6	83.7	84.1	85.3	83.3	84.4
> 90 k	456	425	881	511	471	982	310	312	622	425.6	366.3	791.9
%age	28.4	28.4	28.4	34.3	31.8	33.1	26.5	23.7	25.0	28.8	24.6	26.7
> 100 k	108	88	196	112	115	227	79	68	147	97.29	92.14	189.4
%age	6.7	5.9	6.3	7.5	7.8	7.6	6.8	5.2	5.9	6.6	6.2	6.4

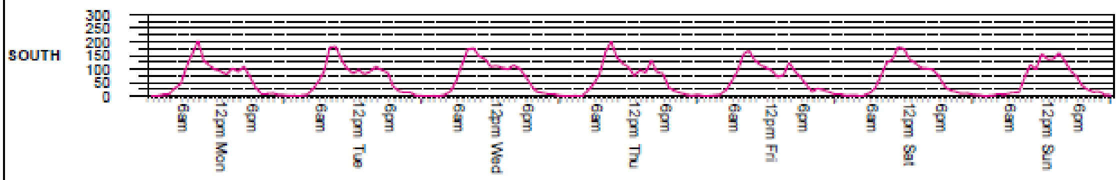




	MON N	MON S	MON BIDir	TUE N	TUE S	TUE BIDir	WED N	WED S	WED BIDir	THU N	THU S	THU BIDir
Short %	87.4	86.1	86.8	87.3	85.9	86.6	83.0	81.3	82.2	88.2	86.0	87.1
Med %	5.9	6.7	6.3	5.0	6.2	5.6	5.4	6.8	6.1	6.9	8.6	7.8
Long %	6.7	7.1	6.9	7.7	7.9	7.8	11.6	11.8	11.7	4.9	5.4	5.1
AM Pk Vo	88	203	281	88	183	258	110	177	263	87	201	283
PM Pk Vo	186	110	296	186	109	279	171	114	272	176	131	290
7-7pm	1277	1278	2555	1300	1277	2577	1367	1387	2754	1291	1324	2615
24Hr Tot	1465	1514	2979	1487	1507	2994	1601	1630	3231	1541	1524	3065
Class 0	6	13	19	11	14	25	7	19	26	3	7	10
Class 1	1235	1260	2495	1240	1245	2485	1288	1275	2563	1307	1277	2584
Class 2	40	31	71	47	35	82	34	32	66	49	27	76
Class 3	73	92	165	55	72	127	59	86	145	80	99	179
Class 4	11	9	20	18	20	38	26	25	51	25	31	56
Class 5	2	1	3	1	2	3	2	0	2	2	1	3
Class 6	5	8	13	4	6	10	4	6	10	3	4	7
Class 7	1	8	9	3	6	9	2	7	9	3	17	20
Class 8	1	4	5	2	5	7	0	6	6	1	4	5
Class 9	77	75	152	94	93	187	160	155	315	60	50	110
Class 10	14	13	27	12	9	21	19	19	38	8	7	15
Class 11	0	0	0	0	0	0	0	0	0	0	0	0
Class 12	0	0	0	0	0	0	0	0	0	0	0	0
Class 13	0	0	0	0	0	0	0	0	0	0	0	0

	FRI N	FRI S	FRI BIDir	SAT N	SAT S	SAT BIDir	SUN N	SUN S	SUN BIDir	7-DAY AVG N	7-DAY AVG S	7-DAY AVG BIDir
Short %	88.4	85.8	87.1	93.7	91.9	92.8	97.9	95.6	96.7	89.1	87.3	88.2
Med %	5.3	7.4	6.3	3.1	4.1	3.6	1.4	3.4	2.4	4.8	6.2	5.5
Long %	6.3	6.8	6.6	3.1	4.0	3.6	.8	1.0	.9	6.1	6.5	6.3
AM Pk Vo	100	167	244	151	182	326	153	156	308	111	181	280
PM Pk Vo	182	123	293	161	134	293	112	158	246	168	126	281
7-7pm	1383	1240	2623	1327	1363	2690	1052	1217	2269	1285	1298	2583
24Hr Tot	1611	1508	3119	1497	1486	2983	1172	1320	2492	1482	1498	2980
Class 0	8	7	15	9	12	21	10	23	33	8	14	21
Class 1	1375	1260	2635	1334	1308	2642	1094	1196	2290	1268	1260	2528
Class 2	41	27	68	60	46	106	43	43	86	45	34	79
Class 3	58	80	138	36	49	85	15	40	55	54	74	128
Class 4	26	29	55	10	11	21	1	5	6	17	19	35
Class 5	1	2	3	1	1	2	0	0	0	1	1	2
Class 6	5	7	12	2	7	9	2	0	2	4	5	9
Class 7	1	10	11	3	15	18	1	10	11	2	10	12
Class 8	1	2	3	0	3	3	0	0	0	1	3	4
Class 9	71	64	135	41	34	75	3	1	4	72	67	140
Class 10	24	20	44	1	0	1	3	2	5	12	10	22
Class 11	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0			





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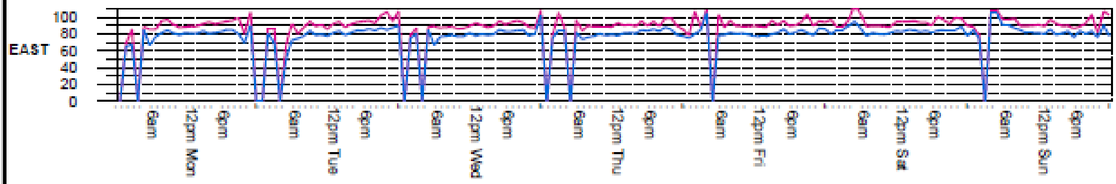
One Page Summary

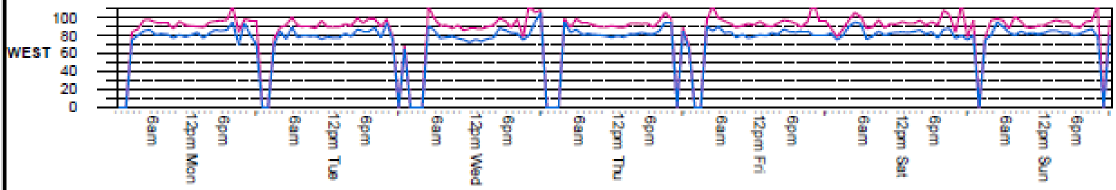
Count Number	2349	Lat/Long : S32 33.615 / E151 36.616	GOOGLE
Street	DUNGOG ROAD, MARTINS CREEK : Between GRESFORD ROAD & CLARENCE TOWN ROAD (bidirectic		
Location	Site 1, Mid-way between Gresford Road and Cory Street, on Tree.		

Start Date	17-JUL-15
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

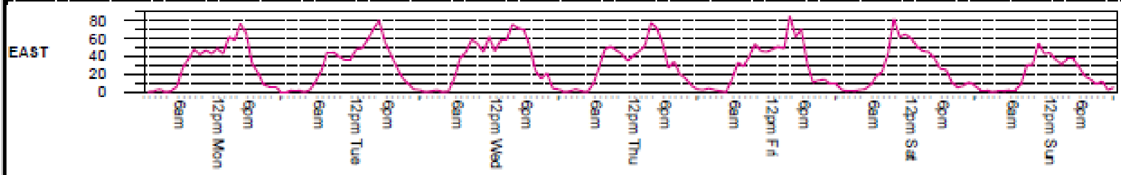
Speed Limit 80	EAST	WEST	COMBINED
Weekly 50th Percentile Speed	81	81	81
Weekly 85th Percentile Speed	92	93	93
Five Day AADT	730	721	1451
Seven Day AADT	678	677	1355

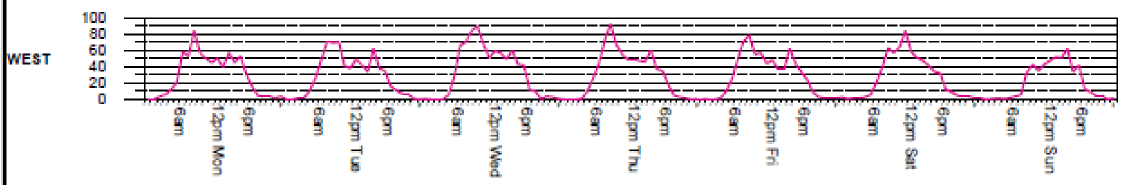
	MON 20-JUL-15			TUE 21-JUL-15			WED 22-JUL-15			THU 23-JUL-15			FRI 17-JUL-15			SAT 18-JUL-15			SUN 19-JUL-15			SEVENDAY AVERAGE		
	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir	EAST	WEST	BIDir
85%ile	92.3	93.8	93.1	92.2	92.6	92.4	89.7	91.5	90.3	90.7	92.1	91.4	91.5	94.2	93.0	93.2	94.3	93.8	90.6	93.7	92.5	91.5	93.2	92.4
50%ile	81.7	81.6	81.7	81.8	80.3	81.1	80.1	78.0	79.2	81.3	81.1	81.2	80.6	82.2	81.4	82.7	82.9	82.8	82.0	83.3	82.7	81.5	81.3	81.4
> 90 k	124	153	277	129	128	257	113	136	249	113	129	242	122	152	274	128	145	273	71	106	177	114.3	135.6	249.9
%age	18.1	21.8	20.0	18.3	18.8	18.5	13.8	17.0	15.4	15.9	18.0	17.0	16.9	21.9	19.3	19.9	22.5	21.2	15.8	21.4	18.7	16.9	20.2	18.6
> 100 k	29	28	57	24	28	52	30	29	59	20	25	45	31	38	69	30	33	63	17	19	36	25.86	28.57	54.43
%age	4.2	4.0	4.1	3.4	4.1	3.8	3.7	3.6	3.6	2.8	3.5	3.2	4.3	5.5	4.9	4.7	5.1	4.9	3.8	3.8	3.8	3.8	4.2	4.0





Short %	80.3	78.9	79.6	77.1	74.6	75.9	70.6	68.1	69.3	80.4	78.7	79.6	78.6	77.7	78.2	89.1	87.8	88.4	97.6	96.6	97.0	80.7	79.3	80.0
Med %	6.6	8.7	7.7	8.6	9.8	9.2	9.7	9.9	9.8	9.4	12.4	10.9	9.5	10.2	9.9	3.9	6.0	5.0	1.6	3.0	2.3	7.5	8.9	8.2
Long %	13.2	12.4	12.8	14.3	15.5	14.9	19.7	22.0	20.8	10.2	8.9	9.6	11.9	12.1	12.0	7.0	6.2	6.6	.9	.4	.6	11.8	11.8	11.8
AM Pk Vo	48	84	132	45	71	116	62	89	143	51	92	142	54	78	118	82	84	149	55	43	90	57	77	127
PM Pk Vo	77	57	130	80	62	133	76	60	133	78	60	138	85	62	147	60	58	118	44	62	99	71	60	128
7-7pm	604	581	1185	607	565	1172	697	684	1381	595	627	1222	611	591	1202	567	583	1150	399	461	860	583	585	1167
24Hr Tot	684	701	1385	707	682	1389	822	805	1627	715	719	1434	723	696	1419	643	645	1288	451	494	945	678	677	1355
Class 0	1	5	6	8	5	13	4	9	13	1	2	3	0	2	2	3	1	4	6	10	16	3	5	8
Class 1	528	522	1050	526	494	1020	563	524	1087	554	544	1098	557	526	1083	551	543	1094	423	453	876	529	515	1044
Class 2	20	26	46	11	10	21	13	15	28	20	20	40	11	13	24	19	22	41	11	14	25	15	17	32
Class 3	37	56	93	43	53	96	55	60	115	41	60	101	44	55	99	18	34	52	6	14	20	35	47	82
Class 4	8	3	11	17	13	30	25	18	43	25	28	53	24	16	40	6	5	11	1	1	2	15	12	27
Class 5	0	2	2	1	1	2	0	2	2	1	1	2	1	0	1	1	0	1	0	0	0	1	1	1
Class 6	3	5	8	3	5	8	5	10	15	3	2	5	1	4	5	1	4	5	0	1	1	2	4	7
Class 7	5	1	6	7	2	9	9	3	12	5	4	9	6	3	9	7	0	7	0	0	0	6	2	7
Class 8	12	5	17	15	1	16	25	1	26	1	0	1	5	3	8	11	3	14	0	0	0	10	2	12
Class 9	59	67	126	67	89	156	111	151	262	57	52	109	57	59	116	25	33	58	2	0	2	54	64	118
Class 10	11	9	20	9	9	18	12	12	24	7	6	13	17	15	32	1	0	1	2	1	3	8	7	16
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





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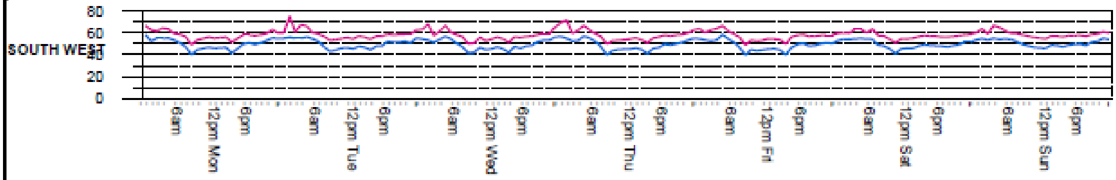
One Page Summary

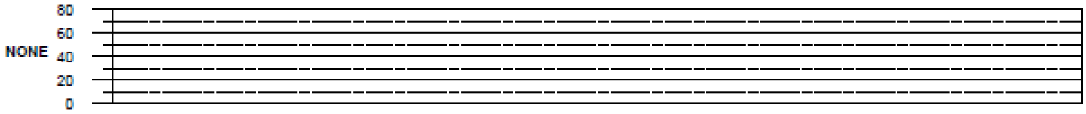
Count Number	1263	Lat/Long : S32.74602 / E151.58285	UBD 51 A-5
Street	MELBOURNE STREET, EAST MAITLAND : Between WALLIS STREET & JOHN STREET (bidirectional)		
Location	Combined Counts 1261 and 1262 Southwest, north of Tyrell Street		

Start Date	30-OCT-14
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

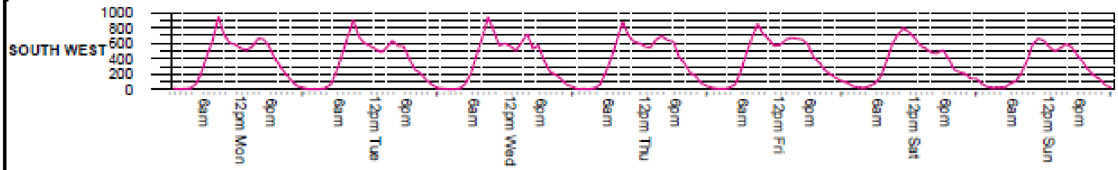
Speed Limit 60	SOUTH WEST	NONE	COMBINED
Weekly 50th Percentile Speed	47	47	47
Weekly 85th Percentile Speed	56	56	56
Five Day AADT	9007		9007
Seven Day AADT	8617		8617

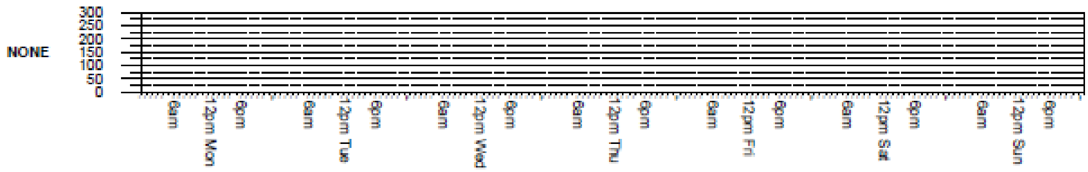
	MON 03-NOV-14			TUE 04-NOV-14			WED 05-NOV-14			THU 30-OCT-14			FRI 31-OCT-14			SAT 01-NOV-14			SUN 02-NOV-14			SEVENDAY AVERAGE		
	SOUTH	NONE	BIDIr	SOUTH	NONE	BIDIr	SOUTH	NONE	BIDIr	SOUTH	NONE	BIDIr	SOUTH	NONE	BIDIr	SOUTH	NONE	BIDIr	SOUTH	NONE	BIDIr	SOUTH	NONE	BIDIr
85%ile	56.3		56.3	56.8		56.8	55.8		55.8	56.0		56.0	55.9		55.9	56.5		56.5	57.3		57.3	56.4		56.4
50%ile	46.5		46.5	47.2		47.2	46.0		46.0	45.9		45.9	45.9		45.9	47.1		47.1	48.5		48.5	46.7		46.7
> 70 k	35		35	42		42	39		39	39		39	25		25	26		26	35		35	34.43		34.43
%age	.4		.4	.5		.5	.4		.4	.4		.4	.3		.3	.3		.3	.5		.5	.4		.4
> 80 k	5		5	8		8	6		6	4		4	3		3	5		5	1		1	4.571		4.571
%age	.1		.1	.1		.1	.1		.1	.0		.0	.0		.0	.1		.1	.0		.0	.1		.1





Short %	92.1		92.1	92.7		92.7	92.4		92.4	93.3		93.3	92.4		92.4	95.0		95.0	95.8		95.8	93.3		93.3
Med %	6.8		6.8	6.1		6.1	6.3		6.3	5.8		5.8	6.4		6.4	4.5		4.5	4.0		4.0	5.8		5.8
Long %	1.2		1.2	1.2		1.2	1.3		1.3	.9		.9	1.2		1.2	.5		.5	.1		.1	.9		.9
AM Pk Vo	942		942	895		895	938		938	875		875	854		854	796		796	663		663	852		852
PM Pk Vo	660		660	633		633	720		720	692		692	672		672	670		670	590		590	662		662
7-7pm	7359		7359	7129		7129	7419		7419	7581		7581	7649		7649	6833		6833	5978		5978	7135		7135
24Hr Tot	8850		8850	8583		8583	8872		8872	9193		9193	9537		9537	8291		8291	6993		6993	8617		8617
Class 0	50		50	75		75	51		51	73		73	50		50	30		30	75		75	58		58
Class 1	7956		7956	7759		7759	7999		7999	8377		8377	8604		8604	7692		7692	6438		6438	7832		7832
Class 2	141		141	125		125	151		151	126		126	158		158	156		156	188		188	149		149
Class 3	519		519	451		451	473		473	463		463	524		524	337		337	263		263	433		433
Class 4	71		71	66		66	78		78	62		62	74		74	26		26	19		19	57		57
Class 5	11		11	4		4	6		6	8		8	13		13	7		7	0		0	7		7
Class 6	37		37	23		23	29		29	25		25	35		35	17		17	6		6	25		25
Class 7	6		6	9		9	8		8	4		4	5		5	2		2	0		0	5		5
Class 8	2		2	8		8	12		12	4		4	4		4	2		2	2		2	5		5
Class 9	51		51	59		59	59		59	46		46	62		62	19		19	2		2	43		43
Class 10	6		6	4		4	6		6	5		5	8		8	3		3	0		0	5		5
Class 11	0		0	0		0	0		0	0		0	0		0	0		0	0		0			
Class 12	0		0	0		0	0		0	0		0	0		0	0		0	0		0			
Class 13	0		0	0		0	0		0	0		0	0		0	0		0	0		0			





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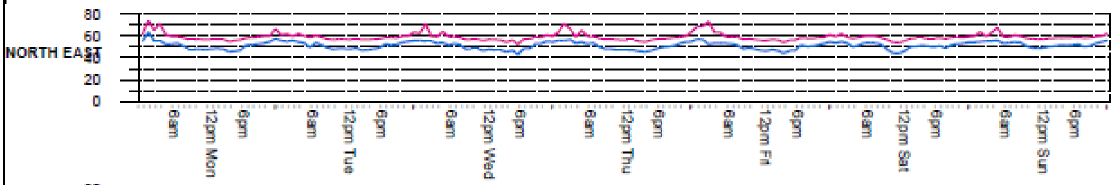
One Page Summary

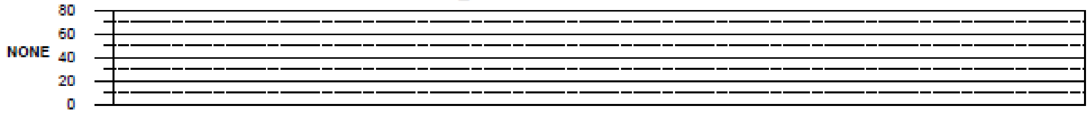
Count Number	**1260**	**Lat/Long : S32.74577 / E151.58265**		**UBD 51 A-5**	
Street	**MELBOURNE STREET, EAST MAITLAND : Between WALLIS STREET & JOHN STREET (bidirectional)**				
Location	Combined Counts 1258 and 1259 Northeast, north of Tyrell Street				

Start Date	30-OCT-14
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

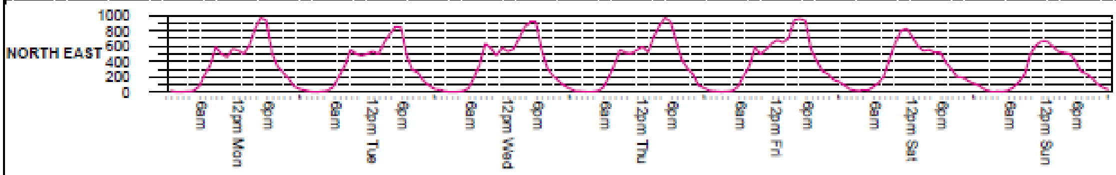
Speed Limit 60	NORTH EAST	NONE	COMBINED
Weekly 50th Percentile Speed	49	49	49
Weekly 85th Percentile Speed	57	57	57
Five Day AADT	8900		8900
Seven Day AADT	8454		8454

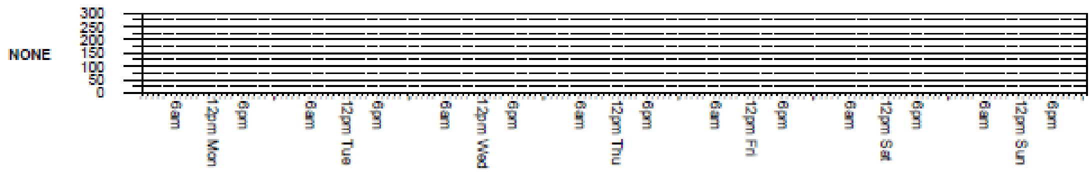
	MON 03-NOV-14			TUE 04-NOV-14			WED 05-NOV-14			THU 30-OCT-14			FRI 31-OCT-14			SAT 01-NOV-14			SUN 02-NOV-14			SEVENDAY AVERAGE		
	NORTH	NONE	BIDir	NORTH	NONE	BIDir	NORTH	NONE	BIDir	NORTH	NONE	BIDir	NORTH	NONE	BIDir	NORTH	NONE	BIDir	NORTH	NONE	BIDir	NORTH	NONE	BIDir
85%ile	57.3		57.3	57.6		57.6	56.8		56.8	57.1		57.1	57.1		57.1	57.5		57.5	58.2		58.2	57.4		57.4
50%ile	48.4		48.4	49.4		49.4	47.6		47.6	48.1		48.1	48.1		48.1	49.1		49.1	51.0		51.0	48.8		48.8
> 70 k	29		29	24		24	29		29	32		32	28		28	30		30	29		29	28.71		28.71
%age	.3		.3	.3		.3	.3		.3	.3		.3	.3		.3	.4		.4	.4		.4	.3		.3
> 80 k	3		3	1		1	4		4	1		1	2		2	4		4	2		2	2.429		2.429
%age	.0		.0	.0		.0	.0		.0	.0		.0	.0		.0	.0		.0	.0		.0	.0		.0





	MON NORTH	MON NONE	MON BIDir	TUE NORTH	TUE NONE	TUE BIDir	WED NORTH	WED NONE	WED BIDir	THU NORTH	THU NONE	THU BIDir	FRI NORTH	FRI NONE	FRI BIDir	SAT NORTH	SAT NONE	SAT BIDir	SUN NORTH	SUN NONE	SUN BIDir	AVG NORTH	AVG NONE	AVG BIDir
Short %	92.0		92.0	91.9		91.9	92.3		92.3	92.5		92.5	92.2		92.2	94.6		94.6	95.7		95.7	92.9		92.9
Med %	6.8		6.8	6.9		6.9	6.4		6.4	6.5		6.5	6.5		6.5	4.8		4.8	4.1		4.1	6.1		6.1
Long %	1.2		1.2	1.2		1.2	1.3		1.3	1.0		1.0	1.2		1.2	.6		.6	.2		.2	1.0		1.0
AM Pk Vo	586		586	553		553	632		632	555		555	635		635	831		831	664		664	637		637
PM Pk Vo	965		965	855		855	909		909	967		967	953		953	721		721	667		667	862		862
7-7pm	7357		7357	6994		6994	7640		7640	7733		7733	8028		8028	6779		6779	5633		5633	7166		7166
24Hr Tot	8626		8626	8215		8215	8820		8820	9191		9191	9646		9646	8146		8146	6535		6535	8454		8454
Class 0	59		59	53		53	59		59	54		54	61		61	54		54	56		56	57		57
Class 1	7729		7729	7375		7375	7965		7965	8317		8317	8666		8666	7481		7481	6038		6038	7653		7653
Class 2	145		145	119		119	118		118	131		131	170		170	169		169	160		160	145		145
Class 3	535		535	514		514	487		487	524		524	563		563	364		364	256		256	463		463
Class 4	43		43	51		51	70		70	54		54	58		58	25		25	11		11	45		45
Class 5	9		9	4		4	9		9	16		16	9		9	5		5	0		0	7		7
Class 6	28		28	23		23	28		28	30		30	32		32	19		19	11		11	24		24
Class 7	4		4	4		4	4		4	3		3	1		1	1		1	0		0	2		2
Class 8	6		6	3		3	5		5	6		6	6		6	1		1	0		0	4		4
Class 9	65		65	64		64	63		63	52		52	68		68	23		23	3		3	48		48
Class 10	3		3	5		5	12		12	4		4	12		12	4		4	0		0	6		6
Class 11	0		0	0		0	0		0	0		0	0		0	0		0	0		0			
Class 12	0		0	0		0	0		0	0		0	0		0	0		0	0		0			
Class 13	0		0	0		0	0		0	0		0	0		0	0		0	0		0			





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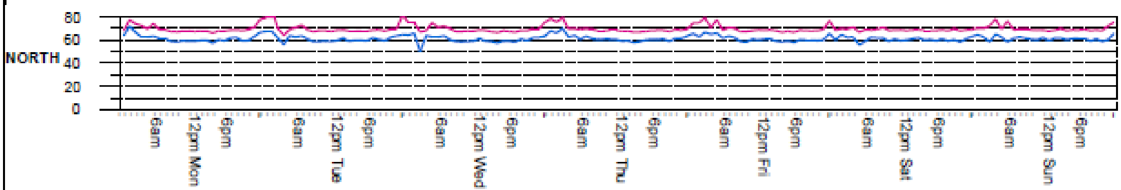
One Page Summary

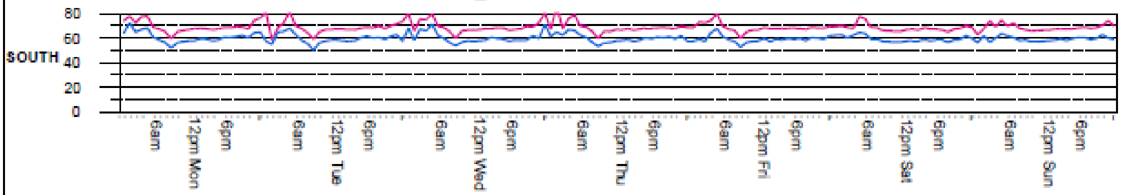
Count Number	1257	Lat/Long : S32.74250 / E151.58637	GOOGLE
Street	PITNACREE ROAD, EAST MAITLAND : Between MELBOURNE STREET & GLENARVON ROAD (bidirecti		
Location	At the railway crossing, On Guardrail.		

Start Date	30-OCT-14
Start Time	1700
Duration	7 DAYS
Interval	1 HOUR

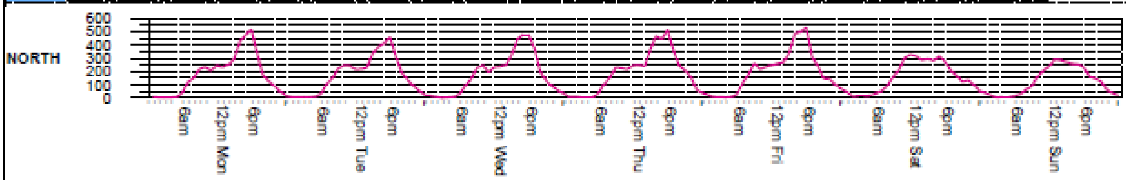
Speed Limit 60	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	60	58	59
Weekly 85th Percentile Speed	68	67	68
Five Day AADT	4401	4465	8866
Seven Day AADT	4131	4199	8329

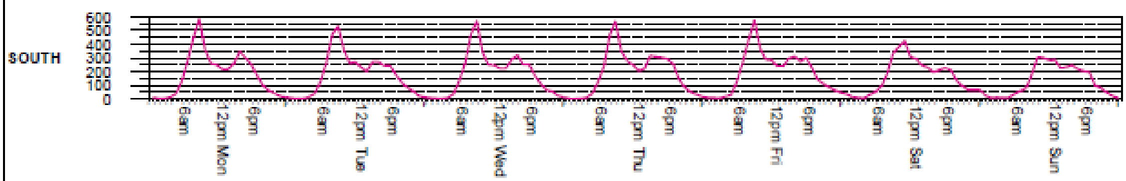
	MON 03-NOV-14			TUE 04-NOV-14			WED 05-NOV-14			THU 30-OCT-14			FRI 31-OCT-14			SAT 01-NOV-14			SUN 02-NOV-14			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	67.9	67.1	67.6	68.2	67.2	67.8	67.9	67.2	67.6	68.1	67.2	67.7	68.1	67.2	67.7	68.5	67.2	67.9	68.7	67.5	68.2	68.2	67.2	67.8
50%ile	59.7	57.6	58.6	60.1	57.5	58.7	59.2	57.7	58.4	60.1	57.7	58.8	59.7	57.7	58.7	60.5	57.8	59.0	61.1	58.4	59.7	60.1	57.8	58.8
> 70 k	257	246	503	300	259	559	292	256	548	296	269	565	341	273	614	334	219	553	272	188	460	298.9	244.3	543.1
%age	6.1	5.6	5.8	7.3	6.0	6.6	6.8	5.9	6.3	6.4	5.9	6.2	7.2	5.8	6.5	8.6	5.6	7.1	8.9	6.0	7.4	7.3	5.8	6.6
> 80 k	24	26	50	33	29	62	25	30	55	29	39	68	34	28	62	30	25	55	24	13	37	28.43	27.14	55.57
%age	.6	.6	.6	.8	.7	.7	.6	.7	.6	.6	.9	.7	.7	.6	.7	.8	.6	.7	.8	.4	.6	.7	.6	.7





	MON N	MON S	MON B	TUE N	TUE S	TUE B	WED N	WED S	WED B	THU N	THU S	THU B	FRI N	FRI S	FRI B	SAT N	SAT S	SAT B	SUN N	SUN S	SUN B	AVG N	AVG S	AVG B
Short %	93.3	93.1	93.2	94.1	93.4	93.7	93.3	92.8	93.1	94.5	94.5	94.5	94.2	93.4	93.8	97.0	96.6	96.8	97.6	97.7	97.6	94.7	94.3	94.5
Med %	4.1	4.6	4.3	3.0	3.6	3.3	3.9	4.6	4.2	3.4	4.2	3.8	3.8	4.7	4.2	2.0	2.6	2.3	2.0	2.1	2.0	3.2	3.9	3.6
Long %	2.7	2.3	2.5	2.9	3.0	3.0	2.8	2.5	2.7	2.1	1.3	1.7	2.0	1.9	2.0	1.0	.8	.9	.5	.3	.4	2.1	1.8	1.9
AM Pk Vo	244	585	802	246	532	755	246	572	799	245	568	798	263	578	841	327	426	728	241	307	523	259	510	749
PM Pk Vo	516	344	773	457	274	701	478	321	761	514	316	805	530	312	832	316	294	610	291	285	576	443	307	723
7-7pm	3581	3665	7246	3432	3535	6967	3614	3609	7223	3709	3813	7522	3824	3831	7655	3071	3243	6314	2519	2749	5268	3393	3492	6885
24Hr Tot	4232	4385	8617	4119	4292	8411	4303	4344	8647	4616	4566	9182	4736	4739	9475	3865	3912	7777	3043	3152	6195	4131	4199	8329
Class 0	51	51	102	46	50	96	47	52	99	37	57	94	39	38	77	57	29	86	45	53	98	46	47	93
Class 1	3833	3960	7793	3774	3887	7661	3907	3912	7819	4242	4183	8425	4350	4311	8661	3625	3662	7287	2857	2939	5796	3798	3836	7635
Class 2	63	71	134	56	72	128	61	69	130	83	77	160	71	79	150	66	88	154	67	86	153	67	77	144
Class 3	137	171	308	104	125	229	127	160	287	127	156	283	144	178	322	61	85	146	50	55	105	107	133	240
Class 4	29	25	54	15	25	40	35	39	74	25	33	58	35	40	75	16	11	27	10	8	18	24	26	49
Class 5	6	5	11	4	4	8	4	2	6	6	2	8	1	3	4	2	5	7	0	2	2	3	3	7
Class 6	12	9	21	9	22	31	10	12	22	12	6	18	12	17	29	7	8	15	6	7	13	10	12	21
Class 7	9	2	11	9	5	14	9	3	12	18	5	23	13	8	21	5	0	5	6	0	6	10	3	13
Class 8	5	0	5	1	7	8	6	9	15	6	6	12	2	3	5	1	0	1	0	1	1	3	4	7
Class 9	81	80	161	95	90	185	88	82	170	51	35	86	58	53	111	22	21	43	2	1	3	57	52	108
Class 10	6	11	17	6	5	11	9	4	13	9	6	15	11	9	20	3	3	6	0	0	0	6	5	12
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





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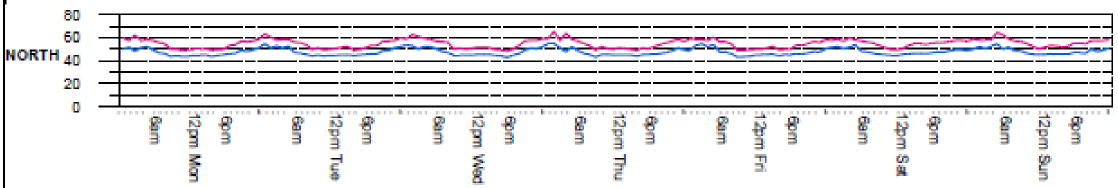
One Page Summary

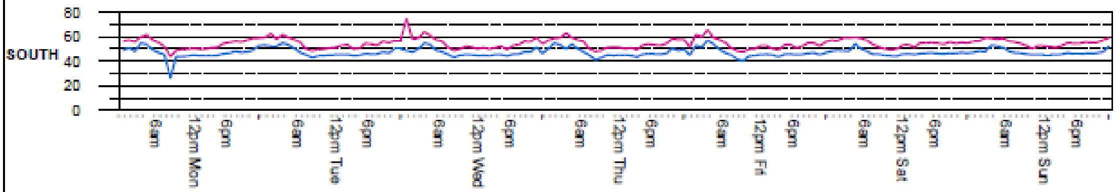
Count Number	**1256**	**Lat/Long : S32.72921 / E151.55559**	**GOOGLE**
Street	**BELMORE ROAD, LORN : Between HIGH STREET & EKERT LANE (bidirectional)**		
Location	Northern side of the bridge over the Hunter River, No RHT Sign		

Start Date	30-OCT-14
Start Time	1700
Duration	7 DAYS
Interval	1 HOUR

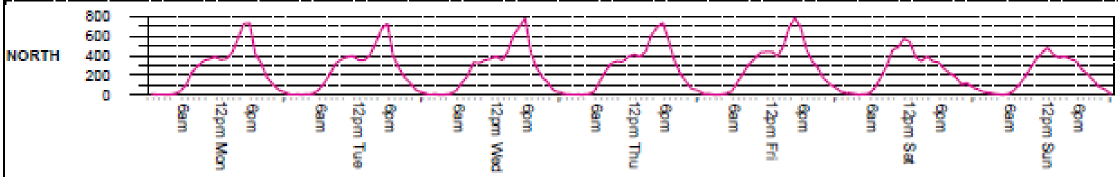
Speed Limit 50	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	45	45	45
Weekly 85th Percentile Speed	53	53	53
Five Day AADT	6359	6339	12698
Seven Day AADT	5999	6004	12002

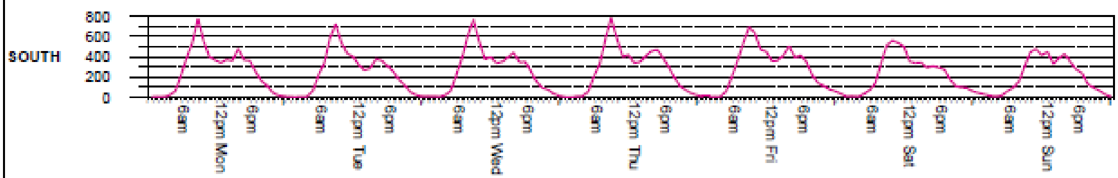
	MON 03-NOV-14			TUE 04-NOV-14			WED 05-NOV-14			THU 30-OCT-14			FRI 31-OCT-14			SAT 01-NOV-14			SUN 02-NOV-14			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	51.5	52.0	51.7	52.0	52.4	52.2	51.7	52.4	52.1	52.0	52.1	52.1	51.9	51.5	51.7	54.3	53.5	53.9	54.5	53.9	54.2	52.6	52.5	52.6
50%ile	45.0	44.6	44.8	45.2	45.3	45.3	45.1	45.3	45.2	45.3	45.0	45.1	45.2	44.8	45.0	46.1	45.8	46.0	46.3	46.0	46.2	45.5	45.3	45.4
> 60 k	44	84	128	51	69	120	46	95	141	42	86	128	53	99	152	59	80	139	62	76	138	51	84.14	135.1
%age	.7	1.4	1.0	.8	1.2	1.0	.7	1.5	1.1	.6	1.3	1.0	.8	1.4	1.1	1.1	1.5	1.3	1.3	1.6	1.5	.9	1.4	1.1
> 70 k	10	15	25	7	22	29	10	21	31	6	26	32	7	30	37	7	22	29	10	22	32	8.143	22.57	30.71
%age	.2	.2	.2	.1	.4	.2	.2	.3	.2	.1	.4	.2	.1	.4	.3	.1	.4	.3	.2	.5	.3	.1	.4	.3





	MON N	MON S	MON BIDIr	TUE N	TUE S	TUE BIDIr	WED N	WED S	WED BIDIr	THU N	THU S	THU BIDIr	FRI N	FRI S	FRI BIDIr	SAT N	SAT S	SAT BIDIr	SUN N	SUN S	SUN BIDIr	AVG N	AVG S	AVG BIDIr
Short %	91.0	91.6	91.3	92.0	92.6	92.3	92.3	92.4	92.3	92.0	92.5	92.2	92.1	92.3	92.2	95.5	95.1	95.3	95.8	96.3	96.0	92.8	93.1	92.9
Med %	7.4	6.2	6.8	6.4	5.5	6.0	5.6	5.2	5.4	6.0	5.6	5.8	6.5	5.9	6.2	3.7	3.6	3.7	3.5	3.1	3.3	5.7	5.1	5.4
Long %	1.6	2.3	1.9	1.7	1.9	1.8	2.1	2.4	2.3	2.0	1.9	2.0	1.4	1.7	1.6	.8	1.3	1.1	.7	.6	.7	1.5	1.8	1.6
AM Pk Vo	388	771	1066	397	720	1039	368	764	1098	391	782	1105	439	685	1005	571	559	1069	424	476	838	425	680	1031
PM Pk Vo	731	477	1093	722	376	1033	778	439	1128	733	470	1155	779	503	1191	541	350	891	482	449	930	681	438	1060
7-7pm	5238	5148	10386	5124	4846	9970	5271	5154	10425	5465	5464	10929	5725	5566	11291	4607	4633	9240	3972	4237	8209	5057	5007	10064
24Hr Tot	6149	6202	12351	6014	5875	11889	6167	6248	12415	6517	6532	13049	6947	6840	13787	5526	5483	11009	4670	4847	9517	5999	6004	12002
Class 0	61	58	119	67	62	129	51	59	110	61	57	118	49	70	119	60	57	117	73	108	181	60	67	128
Class 1	5449	5508	10957	5356	5277	10633	5533	5595	11128	5814	5858	11672	6198	6118	12316	5081	5021	10102	4294	4414	8708	5389	5399	10788
Class 2	85	114	199	109	100	209	108	118	226	119	127	246	153	128	281	134	137	271	106	144	250	116	124	240
Class 3	277	277	554	253	250	503	258	266	524	267	302	569	313	319	632	162	171	333	130	132	262	237	245	482
Class 4	170	94	264	125	73	198	84	52	136	116	58	174	111	67	178	39	21	60	31	19	50	97	55	151
Class 5	9	11	20	4	3	7	3	8	11	7	8	15	26	20	46	4	5	9	2	0	2	8	8	16
Class 6	14	28	42	17	26	43	25	27	52	30	24	54	19	27	46	14	25	39	17	16	33	19	25	44
Class 7	10	19	29	6	14	20	13	29	42	8	15	23	5	16	21	2	10	12	7	8	15	7	16	23
Class 8	6	7	13	10	4	14	5	6	11	14	3	17	6	3	9	3	0	3	0	2	2	6	4	10
Class 9	62	80	142	61	63	124	80	82	162	73	76	149	61	70	131	26	35	61	7	1	8	53	58	111
Class 10	6	6	12	6	3	9	7	6	13	8	4	12	6	2	8	1	1	2	3	3	6	5	4	9
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





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One Page Summary

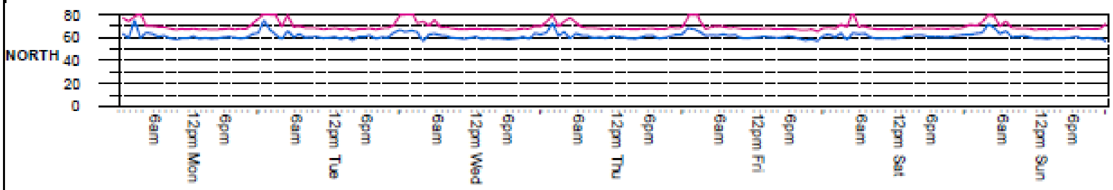
Count Number	1255	Lat/Long : S32.70295 / E151.58215	GOOGLE
Street	PATERSON ROAD, BOLWARRA : Between EKERT LANE & TOCAL ROAD (NORTH INTERSECTION) (bid		
Location	South of Tocal Road (south intersection), Bolwarra Heights, Scenic Lookout Sign, Opposite House 169.		

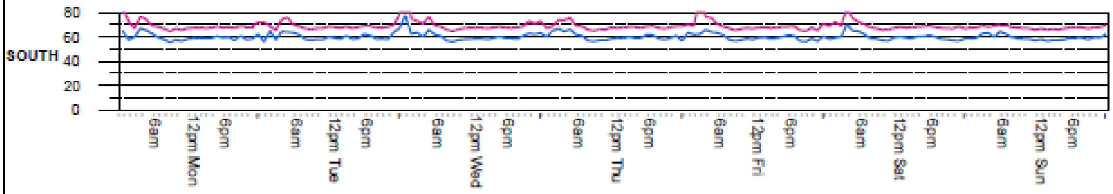
Start Date	30-OCT-14
Start Time	1700
Duration	7 DAYS
Interval	1 HOUR

Speed Limit 60	NORTH	SOUTH	COMBINED
Weekly 50th Percentile Speed	60	59	59
Weekly 85th Percentile Speed	68	68	68
Five Day AADT	5156	5110	10266
Seven Day AADT	4865	4856	9721

	MON 03-NOV-14			TUE 04-NOV-14			WED 05-NOV-14			THU 30-OCT-14		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	67.6	67.3	67.5	68.0	67.9	67.9	67.6	67.4	67.5	67.9	67.5	67.7
50%ile	59.8	58.3	59.1	60.4	59.2	59.8	59.5	58.3	58.9	60.7	58.6	59.6
> 70 k	210	263	473	270	309	579	234	275	509	243	276	519
%age	4.2	5.2	4.7	5.6	6.5	6.0	4.6	5.4	5.0	4.7	5.4	5.1
> 80 k	39	55	94	45	62	107	43	55	98	26	55	81
%age	.8	1.1	.9	.9	1.3	1.1	.8	1.1	1.0	.5	1.1	.8

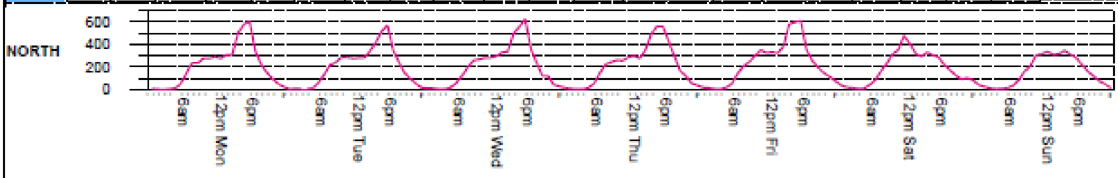
	FRI 31-OCT-14			SAT 01-NOV-14			SUN 02-NOV-14			SEVENDAY AVERAGE		
	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr	NORTH	SOUTH	BIDIr
85%ile	67.8	67.6	67.7	67.9	67.7	67.8	67.8	67.1	67.5	67.8	67.5	67.7
50%ile	60.4	58.8	59.6	60.7	58.9	59.8	60.0	58.2	59.0	60.2	58.6	59.4
> 70 k	260	310	570	225	264	489	187	181	368	232.7	268.3	501
%age	4.6	5.6	5.1	5.0	6.0	5.5	5.0	4.5	4.7	4.8	5.5	5.2
> 80 k	27	60	87	29	41	70	21	39	60	32.86	52.43	85.29
%age	.5	1.1	.8	.6	.9	.8	.6	1.0	.8	.7	1.1	.9

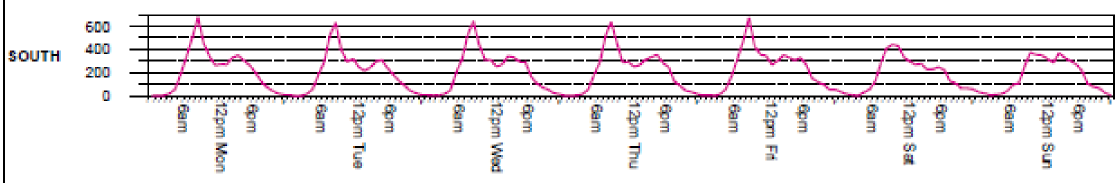




	MON N	MON S	MON BIDIr	TUE N	TUE S	TUE BIDIr	WED N	WED S	WED BIDIr	THU N	THU S	THU BIDIr
Short %	89.4	86.2	87.8	90.5	86.0	88.3	89.9	85.8	87.8	90.7	87.6	89.2
Med %	7.3	9.4	8.4	6.1	9.5	7.8	6.4	9.8	8.1	6.2	9.1	7.7
Long %	3.3	4.4	3.8	3.5	4.4	4.0	3.7	4.4	4.1	3.1	3.2	3.2
AM Pk Vo	288	674	912	286	628	868	282	643	902	287	634	877
PM Pk Vo	603	350	879	567	310	826	623	342	919	562	354	915
7-7pm	4237	4218	8455	4062	3895	7957	4290	4186	8476	4247	4239	8486
24Hr Tot	5013	5112	10125	4856	4757	9613	5081	5073	10154	5174	5105	10279
Class 0	148	86	234	110	92	202	130	76	206	108	81	189
Class 1	4256	4243	8499	4191	3927	8118	4355	4203	8558	4472	4310	8782
Class 2	78	79	157	92	73	165	83	73	156	114	82	196
Class 3	188	381	569	170	380	550	187	429	616	181	387	568
Class 4	153	74	227	111	67	178	121	57	178	128	71	199
Class 5	27	23	50	13	7	20	15	10	25	11	9	20
Class 6	17	34	51	19	32	51	15	24	39	15	27	42
Class 7	11	23	34	7	24	31	15	26	41	11	24	35
Class 8	9	4	13	16	8	24	15	3	18	10	4	14
Class 9	116	148	264	123	141	264	134	165	299	112	100	212
Class 10	10	17	27	4	6	10	11	7	18	12	10	22
Class 11	0	0	0	0	0	0	0	0	0	0	0	0
Class 12	0	0	0	0	0	0	0	0	0	0	0	0
Class 13	0	0	0	0	0	0	0	0	0	0	0	0

	FRI N	FRI S	FRI BIDIr	SAT N	SAT S	SAT BIDIr	SUN N	SUN S	SUN BIDIr	AVG N	AVG S	AVG BIDIr
Short %	91.5	87.4	89.5	94.0	90.5	92.3	95.7	92.1	93.8	91.5	87.8	89.6
Med %	6.0	9.5	7.7	4.4	7.0	5.7	3.7	6.5	5.2	5.8	8.8	7.3
Long %	2.5	3.1	2.8	1.6	2.5	2.0	.6	1.3	1.0	2.7	3.4	3.1
AM Pk Vo	350	671	913	476	443	809	318	373	668	327	581	850
PM Pk Vo	610	352	940	406	295	700	346	368	685	531	339	838
7-7pm	4598	4426	9024	3703	3677	7380	3202	3532	6734	4048	4025	8073
24Hr Tot	5654	5505	11159	4504	4385	8889	3773	4052	7825	4865	4856	9721
Class 0	135	105	240	127	85	212	110	144	254	124	96	220
Class 1	4909	4613	9522	3998	3790	7788	3378	3464	6842	4223	4079	8301
Class 2	132	91	223	108	95	203	121	125	246	104	88	192
Class 3	202	435	637	128	264	392	83	238	321	163	359	522
Class 4	114	59	173	63	35	98	55	26	81	106	56	162
Class 5	23	29	52	6	8	14	3	1	4	14	12	26
Class 6	10	38	48	11	22	33	2	21	23	13	28	41
Class 7	13	17	30	10	32	42	8	23	31	11	24	35
Class 8	5	3	8	6	4	10	5	2	7	9	4	13
Class 9	100	104	204	45	47	92	7	5	12	91	101	192
Class 10	11	11	22	2	3	5	1	3	4	7	8	15
Class 11	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0			





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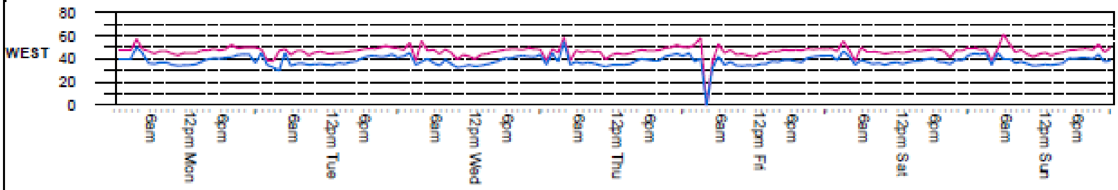
One Page Summary

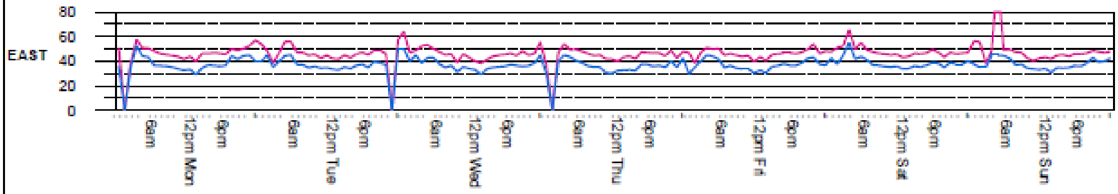
Count Number	1254	Lat/Long : S32.59903 / E151.61764	GOOGLE
Street	GRESFORD ROAD, PATERSON : Between TOCAL ROAD & PARK ROAD (bidirectional)		
Location	Near the Paterson railway crossing, ELP 010033		

Start Date	30-OCT-14
Start Time	1700
Duration	7 DAYS
Interval	1 HOUR

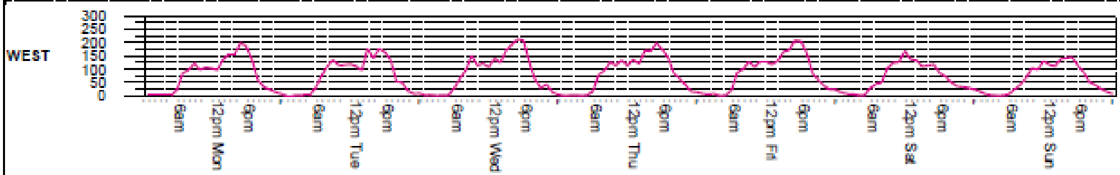
Speed Limit 50	WEST	EAST	COMBINED
Weekly 50th Percentile Speed	37	35	36
Weekly 85th Percentile Speed	47	46	46
Five Day AADT	1968	1915	3883
Seven Day AADT	1849	1819	3668

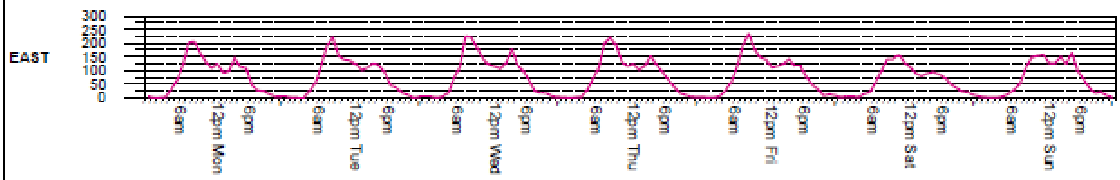
	MON 03-NOV-14			TUE 04-NOV-14			WED 05-NOV-14			THU 30-OCT-14			FRI 31-OCT-14			SAT 01-NOV-14			SUN 02-NOV-14			SEVENDAY AVERAGE		
	WEST	EAST	BIDir	WEST	EAST	BIDir	WEST	EAST	BIDir	WEST	EAST	BIDir	WEST	EAST	BIDir	WEST	EAST	BIDir	WEST	EAST	BIDir	WEST	EAST	BIDir
85%ile	47.3	46.3	46.9	46.9	46.0	46.5	46.4	45.0	45.8	46.5	45.5	46.1	46.6	45.7	46.2	46.6	46.6	46.6	46.6	45.0	45.9	46.7	45.7	46.3
50%ile	37.8	35.8	36.8	37.1	35.7	36.4	36.6	34.9	35.8	36.9	34.9	36.0	36.9	35.2	36.1	37.2	36.4	36.8	37.1	34.9	36.0	37.1	35.4	36.3
> 60 k	19	11	30	21	6	27	21	7	28	13	7	20	13	9	22	7	2	9	3	2	5	13.86	6.286	20.14
%age	1.0	.6	.8	1.1	.3	.7	1.0	.4	.7	.6	.4	.5	.6	.4	.5	.4	.1	.3	.2	.1	.2	.7	.3	.5
> 70 k	12	7	19	17	2	19	15	3	18	10	4	14	7	3	10	3	0	3	0	1	1	9.143	2.857	12
%age	.7	.4	.5	.9	.1	.5	.7	.2	.5	.5	.2	.4	.3	.1	.2	.2	.0	.1	.0	.1	.0	.5	.2	.3





Short %	83.5	84.4	84.0	81.9	83.6	82.7	82.3	83.2	82.8	83.3	83.6	83.5	85.1	85.5	85.3	91.8	92.0	91.9	94.6	96.2	95.5	85.6	86.6	86.1
Med %	7.9	6.4	7.2	8.3	6.7	7.5	8.5	7.3	7.9	8.0	6.8	7.4	7.6	6.7	7.2	4.9	4.4	4.6	4.4	3.4	3.9	7.2	6.1	6.7
Long %	8.6	9.2	8.9	9.8	9.7	9.8	9.2	9.5	9.3	8.7	9.6	9.1	7.3	7.8	7.5	3.3	3.6	3.4	.9	.4	.6	7.1	7.4	7.2
AM Pk Vo	122	206	327	134	221	355	151	226	371	133	220	345	128	235	362	169	157	297	130	158	288	138	203	339
PM Pk Vo	198	147	309	178	126	295	213	176	368	198	153	320	208	142	322	137	111	248	144	167	311	182	146	310
7-7pm	1590	1536	3126	1595	1554	3149	1765	1691	3456	1691	1642	3333	1752	1689	3441	1344	1285	2629	1292	1479	2771	1576	1554	3129
24Hr Tot	1846	1831	3677	1844	1831	3675	2021	1975	3996	2018	1931	3949	2112	2008	4120	1618	1530	3148	1486	1624	3110	1849	1819	3668
Class 0	26	20	46	28	17	45	31	19	50	30	11	41	30	22	52	39	15	54	39	61	100	32	24	55
Class 1	1470	1481	2951	1435	1473	2908	1582	1579	3161	1608	1559	3167	1701	1634	3335	1381	1335	2716	1307	1422	2729	1498	1498	2995
Class 2	46	44	90	47	41	88	51	46	97	44	44	88	66	61	127	66	58	124	60	80	140	54	53	108
Class 3	98	87	185	108	88	196	121	108	229	116	96	212	106	94	200	67	59	126	55	44	99	96	82	178
Class 4	44	27	71	42	30	72	47	35	82	40	32	72	46	35	81	9	6	15	11	11	22	34	25	59
Class 5	4	3	7	3	4	7	4	1	5	5	4	9	8	6	14	3	2	5	0	0	0	4	3	7
Class 6	7	10	17	10	13	23	17	12	29	9	10	19	13	3	16	5	6	11	9	2	7	9	8	17
Class 7	4	0	4	12	3	15	5	3	8	3	5	8	5	6	11	2	2	4	3	1	4	5	3	8
Class 8	6	3	9	2	7	9	2	2	4	0	2	2	1	4	5	1	1	2	0	0	0	2	3	4
Class 9	133	148	281	152	152	304	150	155	305	156	162	318	130	139	269	43	45	88	3	3	6	110	115	224
Class 10	8	8	16	5	3	8	11	15	26	7	6	13	6	4	10	2	1	3	3	0	3	6	5	11
Class 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Class 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





Appendix C – Sidra output

INTERSECTION SUMMARY

Site: NEH and Melbourne St AM base

AM existing flows
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values			
Performance Measure	**Vehicles**	**Pedestrians**	**Persons**
Travel Speed (Average)	30.0 km/h	2.0 km/h	29.7 km/h
Travel Distance (Total)	4361.6 veh-km/h	3.3 ped-km/h	5237.3 pers-km/h
Travel Time (Total)	145.3 veh-h/h	1.7 ped-h/h	176.1 pers-h/h
Demand Flows (Total)	4526 veh/h	84 ped/h	5432 pers/h
Percent Heavy Vehicles (Demand)	6.7 %		
Degree of Saturation	0.967	0.035	
Practical Spare Capacity	-7.0 %		
Effective Intersection Capacity	4679 veh/h		
Control Delay (Total)	71.71 veh-h/h	0.99 ped-h/h	87.04 pers-h/h
Control Delay (Average)	57.0 sec	42.4 sec	57.7 sec
Control Delay (Worst Lane)	81.9 sec		
Control Delay (Worst Movement)	81.8 sec	54.2 sec	81.8 sec
Geometric Delay (Average)	2.4 sec		
Stop-Line Delay (Average)	54.6 sec		
Idling Time (Average)	48.9 sec		
Intersection Level of Service (LOS)	LOS E	LOS E	
95% Back of Queue - Vehicles (Worst Lane)	52.9 veh		
95% Back of Queue - Distance (Worst Lane)	394.8 m		
Queue Storage Ratio (Worst Lane)	0.50		
Total Effective Stops	4554 veh/h	70 ped/h	5535 pers/h
Effective Stop Rate	1.01 per veh	0.83 per ped	1.02 per pers
Proportion Queued	0.93	0.83	0.95
Performance Index	484.3	2.1	486.4
Cost (Total)	4724.33 $/h	41.97 $/h	4766.30 $/h
Fuel Consumption (Total)	583.3 L/h		
Carbon Dioxide (Total)	1391.3 kg/h		
Hydrocarbons (Total)	0.130 kg/h		
Carbon Monoxide (Total)	1.447 kg/h		
NOx (Total)	3.459 kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: NEH and Melbourne St AM base

AM existing flows
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: NEH Newcastle											
1	L2	33	3.0	0.967	78.9	LOS F	52.9	394.8	1.00	1.20	26.9
2	T1	1277	8.0	0.967	73.3	LOS F	52.9	394.8	1.00	1.21	27.3
3	R2	123	5.0	0.458	66.0	LOS E	3.6	26.6	1.00	0.76	26.1
Approach		1433	7.6	0.967	72.8	LOS F	52.9	394.8	1.00	1.17	27.2
East: Melbourne St Morpeth											
4	L2	191	8.0	0.296	34.5	LOS C	7.9	58.9	0.75	0.77	35.2
5	T1	78	2.0	0.952	75.9	LOS F	28.4	210.3	1.00	1.10	23.7
6	R2	706	8.0	0.952	81.8	LOS F	30.6	228.8	1.00	1.08	23.3
Approach		975	7.5	0.952	72.1	LOS F	30.6	228.8	0.95	1.02	24.9
North: NEH Maitland											
7	L2	449	4.0	0.404	12.0	LOS A	7.4	53.6	0.55	0.74	47.4
8	T1	1086	8.0	0.828	40.3	LOS C	32.5	243.1	0.95	0.91	36.2
9	R2	123	3.0	0.903	78.8	LOS F	8.4	60.1	1.00	0.99	25.8
Approach		1659	6.5	0.903	35.5	LOS C	32.5	243.1	0.85	0.87	37.1
West: Melbourne St											
10	L2	271	3.0	0.812	37.6	LOS C	10.2	73.6	1.00	0.89	36.4
11	T1	129	3.0	0.929	75.5	LOS F	13.3	95.7	1.00	1.07	24.2
12	R2	60	3.0	0.929	81.1	LOS F	13.3	95.7	1.00	1.07	26.3
Approach		460	3.0	0.929	53.9	LOS D	13.3	95.7	1.00	0.97	30.9
All Vehicles		4526	6.7	0.967	57.0	LOS E	52.9	394.8	0.93	1.01	30.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	32.3	LOS D	0.1	0.1	0.73	0.73
P3	North Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	21	28.7	LOS C	0.0	0.0	0.69	0.69
All Pedestrians		84	42.4	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: SECA SOLUTION | Processed: Wednesday, 10 February 2016 12:43:24 PM
Project: C:\Sidra folders\Martins Creek.sip6

INTERSECTION SUMMARY

Site: Melbourne St and Pitnacree Rd AM

Melbourne and Pitnacree AM base
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values

Performance Measure	Vehicles		Pedestrians		Persons	
Travel Speed (Average)	35.1	km/h	1.9	km/h	34.5	km/h
Travel Distance (Total)	2366.5	veh-km/h	2.8	ped-km/h	2842.6	pers-km/h
Travel Time (Total)	67.5	veh-h/h	1.5	ped-h/h	82.4	pers-h/h
Demand Flows (Total)	2333	veh/h	84	ped/h	2799	pers/h
Percent Heavy Vehicles (Demand)	4.0	%				
Degree of Saturation	0.814		0.035			
Practical Spare Capacity	10.5	%				
Effective Intersection Capacity	2865	veh/h				
Control Delay (Total)	27.50	veh-h/h	0.86	ped-h/h	33.86	pers-h/h
Control Delay (Average)	42.4	sec	36.8	sec	43.5	sec
Control Delay (Worst Lane)	70.5	sec				
Control Delay (Worst Movement)	70.5	sec	54.2	sec	70.5	sec
Geometric Delay (Average)	2.3	sec				
Stop-Line Delay (Average)	40.1	sec				
Idling Time (Average)	35.7	sec				
Intersection Level of Service (LOS)	LOS C		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	30.1	veh				
95% Back of Queue - Distance (Worst Lane)	217.8	m				
Queue Storage Ratio (Worst Lane)	0.31					
Total Effective Stops	1950	veh/h	65	ped/h	2405	pers/h
Effective Stop Rate	0.84	per veh	0.77	per ped	0.86	per pers
Proportion Queued	0.92		0.77		0.94	
Performance Index	296.1		1.8		298.0	
Cost (Total)	2073.12	$/h	36.08	$/h	2109.20	$/h
Fuel Consumption (Total)	260.6	L/h				
Carbon Dioxide (Total)	618.4	kg/h				
Hydrocarbons (Total)	0.055	kg/h				
Carbon Monoxide (Total)	0.665	kg/h				
NOx (Total)	1.052	kg/h				

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: Melbourne St and Pitnacree Rd AM

Melbourne and Pitnacree AM base
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Melbourne St											
1	L2	131	8.0	0.178	29.1	LOS C	4.8	35.6	0.67	0.74	39.7
2	T1	498	4.0	0.708	29.5	LOS C	22.9	165.5	0.85	0.75	40.4
3	R2	91	2.0	0.742	70.5	LOS E	5.7	40.4	1.00	0.85	27.4
Approach		719	4.5	0.742	34.6	LOS C	22.9	165.5	0.83	0.76	38.0
East: Lawes Street											
4	L2	231	2.0	0.795	38.6	LOS C	9.1	64.9	1.00	0.88	36.1
5	T1	92	4.0	0.783	63.2	LOS E	8.4	60.5	1.00	0.89	29.0
6	R2	43	2.0	0.783	68.7	LOS E	8.4	60.5	1.00	0.89	28.6
Approach		365	2.5	0.795	48.3	LOS D	9.1	64.9	1.00	0.89	33.1
North: Melbourne St											
7	L2	18	2.0	0.806	39.7	LOS C	30.1	217.8	0.91	0.85	37.7
8	T1	568	4.0	0.806	34.1	LOS C	30.1	217.8	0.91	0.85	38.4
9	R2	73	2.0	0.595	68.1	LOS E	4.4	31.4	1.00	0.78	27.9
Approach		659	3.7	0.806	38.0	LOS C	30.1	217.8	0.92	0.84	36.8
West: Pitnacree Rd											
10	L2	143	2.0	0.814	58.0	LOS E	20.7	147.1	1.00	0.94	31.1
11	T1	202	2.0	0.814	52.5	LOS D	20.7	147.1	1.00	0.94	31.6
12	R2	244	8.0	0.618	51.3	LOS D	13.0	97.5	0.96	0.83	32.0
Approach		589	4.5	0.814	53.3	LOS D	20.7	147.1	0.98	0.89	31.7
All Vehicles		2333	4.0	0.814	42.4	LOS C	30.1	217.8	0.92	0.84	35.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	24.7	LOS C	0.0	0.0	0.64	0.64
P3	North Full Crossing	21	43.4	LOS E	0.1	0.1	0.85	0.85
P4	West Full Crossing	21	24.7	LOS C	0.0	0.0	0.64	0.64
All Pedestrians		84	36.8	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: SECA SOLUTION | Processed: Friday, 20 November 2015 2:39:20 PM
Project: C:\Sidra folders\Martins Creek.sip6

INTERSECTION SUMMARY

Site: Melbourne St and Pitnacree Rd PM

Melbourne and Pitnacree AM base
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values						
Performance Measure	Vehicles		Pedestrians		Persons	
Travel Speed (Average)	34.7	km/h	1.9	km/h	34.1	km/h
Travel Distance (Total)	2459.3	veh-km/h	2.8	ped-km/h	2953.9	pers-km/h
Travel Time (Total)	70.9	veh-h/h	1.5	ped-h/h	86.6	pers-h/h
Demand Flows (Total)	2424	veh/h	84	ped/h	2909	pers/h
Percent Heavy Vehicles (Demand)	4.3	%				
Degree of Saturation	0.900		0.035			
Practical Spare Capacity	0.0	%				
Effective Intersection Capacity	2692	veh/h				
Control Delay (Total)	29.37	veh-h/h	0.87	ped-h/h	36.11	pers-h/h
Control Delay (Average)	43.6	sec	37.1	sec	44.7	sec
Control Delay (Worst Lane)	75.4	sec				
Control Delay (Worst Movement)	75.4	sec	54.2	sec	75.4	sec
Geometric Delay (Average)	2.3	sec				
Stop-Line Delay (Average)	41.3	sec				
Idling Time (Average)	36.7	sec				
Intersection Level of Service (LOS)	LOS D		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	39.6	veh				
95% Back of Queue - Distance (Worst Lane)	286.8	m				
Queue Storage Ratio (Worst Lane)	0.54					
Total Effective Stops	2073	veh/h	65	ped/h	2552	pers/h
Effective Stop Rate	0.85	per veh	0.77	per ped	0.88	per pers
Proportion Queued	0.88		0.77		0.90	
Performance Index	294.4		1.8		296.2	
Cost (Total)	2185.99	$/h	36.30	$/h	2222.29	$/h
Fuel Consumption (Total)	275.0	L/h				
Carbon Dioxide (Total)	652.8	kg/h				
Hydrocarbons (Total)	0.059	kg/h				
Carbon Monoxide (Total)	0.697	kg/h				
NOx (Total)	1.168	kg/h				

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: Melbourne St and Pitnacree Rd PM

Melbourne and Pitnacree AM base
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Melbourne St											
1	L2	343	8.0	0.419	28.2	LOS B	13.2	98.6	0.71	0.79	40.1
2	T1	700	4.0	0.877	38.2	LOS C	39.6	286.8	0.91	0.92	36.8
3	R2	105	2.0	0.862	75.4	LOS F	6.9	49.4	1.00	0.94	26.4
Approach		1148	5.0	0.877	38.6	LOS C	39.6	286.8	0.86	0.88	36.4
East: Lawes Street											
4	L2	158	2.0	0.450	33.5	LOS C	5.9	42.2	0.93	0.79	38.0
5	T1	166	4.0	0.866	65.2	LOS E	13.3	95.7	1.00	0.99	28.8
6	R2	38	2.0	0.866	70.7	LOS F	13.3	95.7	1.00	0.99	28.3
Approach		362	2.9	0.866	51.9	LOS D	13.3	95.7	0.97	0.90	32.1
North: Melbourne St											
7	L2	17	2.0	0.564	29.1	LOS C	17.2	124.7	0.74	0.66	42.3
8	T1	415	4.0	0.564	23.5	LOS B	17.2	124.7	0.74	0.66	43.2
9	R2	94	2.0	0.767	71.1	LOS F	5.9	42.1	1.00	0.86	27.2
Approach		525	3.6	0.767	32.2	LOS C	17.2	124.7	0.79	0.69	39.1
West: Pitnacree Rd											
10	L2	87	2.0	0.900	73.8	LOS F	16.3	115.8	1.00	1.04	27.5
11	T1	154	2.0	0.900	68.3	LOS E	16.3	115.8	1.00	1.04	27.9
12	R2	147	8.0	0.592	59.1	LOS E	8.3	62.3	0.99	0.81	30.0
Approach		388	4.3	0.900	66.1	LOS E	16.3	115.8	0.99	0.95	28.5
All Vehicles		2424	4.3	0.900	43.6	LOS D	39.6	286.8	0.88	0.85	34.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	21.0	LOS C	0.0	0.0	0.59	0.59
P3	North Full Crossing	21	52.3	LOS E	0.1	0.1	0.93	0.93
P4	West Full Crossing	21	21.0	LOS C	0.0	0.0	0.59	0.59
All Pedestrians		84	37.1	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: SECA SOLUTION | Processed: Friday, 20 November 2015 10:29:19 AM
Project: C:\Sidra folders\Martins Creek.sip6

INTERSECTION SUMMARY

Site: Melbourne St and Pitnacree Rd AM 2026

Melbourne and Pitnacree AM base 2026 allowing for background growth
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values						
Performance Measure	Vehicles		Pedestrians		Persons	
Travel Speed (Average)	34.8	km/h	1.9	km/h	34.2	km/h
Travel Distance (Total)	2419.8	veh-km/h	2.8	ped-km/h	2906.6	pers-km/h
Travel Time (Total)	69.5	veh-h/h	1.5	ped-h/h	84.9	pers-h/h
Demand Flows (Total)	2385	veh/h	84	ped/h	2862	pers/h
Percent Heavy Vehicles (Demand)	4.0	%				
Degree of Saturation	0.842		0.035			
Practical Spare Capacity	6.9	%				
Effective Intersection Capacity	2833	veh/h				
Control Delay (Total)	28.66	veh-h/h	0.86	ped-h/h	35.25	pers-h/h
Control Delay (Average)	43.2	sec	36.8	sec	44.3	sec
Control Delay (Worst Lane)	70.5	sec				
Control Delay (Worst Movement)	70.5	sec	54.2	sec	70.5	sec
Geometric Delay (Average)	2.3	sec				
Stop-Line Delay (Average)	41.0	sec				
Idling Time (Average)	36.4	sec				
Intersection Level of Service (LOS)	LOS D		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	33.7	veh				
95% Back of Queue - Distance (Worst Lane)	243.7	m				
Queue Storage Ratio (Worst Lane)	0.33					
Total Effective Stops	2032	veh/h	65	ped/h	2504	pers/h
Effective Stop Rate	0.85	per veh	0.77	per ped	0.87	per pers
Proportion Queued	0.93		0.77		0.95	
Performance Index	309.3		1.8		311.1	
Cost (Total)	2142.30	$/h	36.08	$/h	2178.38	$/h
Fuel Consumption (Total)	268.1	L/h				
Carbon Dioxide (Total)	636.1	kg/h				
Hydrocarbons (Total)	0.057	kg/h				
Carbon Monoxide (Total)	0.683	kg/h				
NOx (Total)	1.083	kg/h				

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: Melbourne St and Pitnacree Rd AM 2026

Melbourne and Pitnacree AM base 2026 allowing for background growth
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Melbourne St											
1	L2	131	8.0	0.178	29.1	LOS C	4.8	35.6	0.67	0.74	39.7
2	T1	522	4.0	0.739	30.1	LOS C	24.4	176.7	0.86	0.77	40.1
3	R2	91	2.0	0.742	70.5	LOS E	5.7	40.4	1.00	0.85	27.4
Approach		743	4.5	0.742	34.8	LOS C	24.4	176.7	0.85	0.77	37.9
East: Lawes Street											
4	L2	231	2.0	0.795	38.6	LOS C	9.1	64.9	1.00	0.88	36.1
5	T1	92	4.0	0.783	63.2	LOS E	8.4	60.5	1.00	0.89	29.0
6	R2	43	2.0	0.783	68.7	LOS E	8.4	60.5	1.00	0.89	28.6
Approach		365	2.5	0.795	48.3	LOS D	9.1	64.9	1.00	0.89	33.1
North: Melbourne St											
7	L2	18	2.0	0.842	43.2	LOS D	33.7	243.7	0.93	0.90	36.3
8	T1	597	4.0	0.842	37.7	LOS C	33.7	243.7	0.93	0.90	37.0
9	R2	73	2.0	0.595	68.1	LOS E	4.4	31.4	1.00	0.78	27.9
Approach		687	3.7	0.842	41.0	LOS C	33.7	243.7	0.94	0.89	35.7
West: Pitnacree Rd											
10	L2	143	2.0	0.814	58.0	LOS E	20.7	147.1	1.00	0.94	31.1
11	T1	202	2.0	0.814	52.5	LOS D	20.7	147.1	1.00	0.94	31.6
12	R2	244	8.0	0.618	51.3	LOS D	13.0	97.5	0.96	0.83	32.0
Approach		589	4.5	0.814	53.3	LOS D	20.7	147.1	0.98	0.89	31.7
All Vehicles		2385	4.0	0.842	43.2	LOS D	33.7	243.7	0.93	0.85	34.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	24.7	LOS C	0.0	0.0	0.64	0.64
P3	North Full Crossing	21	43.4	LOS E	0.1	0.1	0.85	0.85
P4	West Full Crossing	21	24.7	LOS C	0.0	0.0	0.64	0.64
All Pedestrians		84	36.8	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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INTERSECTION SUMMARY

Site: Melbourne St and Pitnacree Rd PM 2026

Melbourne and Pitnacree AM base 2026 with allowance for background growth
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values						
Performance Measure	Vehicles		Pedestrians		Persons	
Travel Speed (Average)	33.9	km/h	1.9	km/h	33.4	km/h
Travel Distance (Total)	2515.8	veh-km/h	2.8	ped-km/h	3021.8	pers-km/h
Travel Time (Total)	74.2	veh-h/h	1.5	ped-h/h	90.5	pers-h/h
Demand Flows (Total)	2480	veh/h	84	ped/h	2976	pers/h
Percent Heavy Vehicles (Demand)	4.3	%				
Degree of Saturation	0.916		0.035			
Practical Spare Capacity	-1.7	%				
Effective Intersection Capacity	2708	veh/h				
Control Delay (Total)	31.71	veh-h/h	0.87	ped-h/h	38.92	pers-h/h
Control Delay (Average)	46.0	sec	37.1	sec	47.1	sec
Control Delay (Worst Lane)	75.4	sec				
Control Delay (Worst Movement)	75.4	sec	54.2	sec	75.4	sec
Geometric Delay (Average)	2.2	sec				
Stop-Line Delay (Average)	43.8	sec				
Idling Time (Average)	39.0	sec				
Intersection Level of Service (LOS)	LOS D		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	46.5	veh				
95% Back of Queue - Distance (Worst Lane)	336.7	m				
Queue Storage Ratio (Worst Lane)	0.63					
Total Effective Stops	2190	veh/h	65	ped/h	2693	pers/h
Effective Stop Rate	0.88	per veh	0.77	per ped	0.90	per pers
Proportion Queued	0.89		0.77		0.91	
Performance Index	309.5		1.8		311.3	
Cost (Total)	2299.17	$/h	36.30	$/h	2335.47	$/h
Fuel Consumption (Total)	284.9	L/h				
Carbon Dioxide (Total)	676.2	kg/h				
Hydrocarbons (Total)	0.061	kg/h				
Carbon Monoxide (Total)	0.720	kg/h				
NOx (Total)	1.208	kg/h				

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: Melbourne St and Pitnacree Rd PM 2026

Melbourne and Pitnacree AM base 2026 with allowance for background growth
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Melbourne St											
1	L2	343	8.0	0.419	28.2	LOS B	13.2	98.6	0.71	0.79	40.1
2	T1	735	4.0	0.916	47.0	LOS D	46.5	336.7	0.94	1.01	33.8
3	R2	105	2.0	0.862	75.4	LOS F	6.9	49.4	1.00	0.94	26.4
Approach		1183	5.0	0.916	44.1	LOS D	46.5	336.7	0.88	0.94	34.5
East: Lawes Street											
4	L2	158	2.0	0.450	33.5	LOS C	5.9	42.2	0.93	0.79	38.0
5	T1	166	4.0	0.866	65.2	LOS E	13.3	95.7	1.00	0.99	28.8
6	R2	38	2.0	0.866	70.7	LOS F	13.3	95.7	1.00	0.99	28.3
Approach		362	2.9	0.866	51.9	LOS D	13.3	95.7	0.97	0.90	32.1
North: Melbourne St											
7	L2	17	2.0	0.588	29.4	LOS C	18.3	132.7	0.75	0.67	42.1
8	T1	436	4.0	0.588	23.8	LOS B	18.3	132.7	0.75	0.67	43.0
9	R2	94	2.0	0.767	71.1	LOS F	5.9	42.1	1.00	0.86	27.2
Approach		546	3.6	0.767	32.1	LOS C	18.3	132.7	0.79	0.70	39.1
West: Pitnacree Rd											
10	L2	87	2.0	0.900	73.8	LOS F	16.3	115.8	1.00	1.04	27.5
11	T1	154	2.0	0.900	68.3	LOS E	16.3	115.8	1.00	1.04	27.9
12	R2	147	8.0	0.592	59.1	LOS E	8.3	62.3	0.99	0.81	30.0
Approach		388	4.3	0.900	66.1	LOS E	16.3	115.8	0.99	0.95	28.5
All Vehicles		2480	4.3	0.916	46.0	LOS D	46.5	336.7	0.89	0.88	33.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	21.0	LOS C	0.0	0.0	0.59	0.59
P3	North Full Crossing	21	52.3	LOS E	0.1	0.1	0.93	0.93
P4	West Full Crossing	21	21.0	LOS C	0.0	0.0	0.59	0.59
All Pedestrians		84	37.1	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: SECA SOLUTION | Processed: Tuesday, 9 February 2016 2:40:45 PM
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INTERSECTION SUMMARY

Site: NEH and Melbourne St AM base 2026

AM existing flows allowing for background growth to 2026
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values						
Performance Measure	Vehicles		Pedestrians		Persons	
Travel Speed (Average)	23.3	km/h	2.0	km/h	23.2	km/h
Travel Distance (Total)	4906.7	veh-km/h	3.3	ped-km/h	5891.4	pers-km/h
Travel Time (Total)	210.3	veh-h/h	1.7	ped-h/h	254.0	pers-h/h
Demand Flows (Total)	5072	veh/h	84	ped/h	6086	pers/h
Percent Heavy Vehicles (Demand)	6.9	%				
Degree of Saturation	1.062		0.035			
Practical Spare Capacity	-15.3	%				
Effective Intersection Capacity	4775	veh/h				
Control Delay (Total)	127.59	veh-h/h	0.96	ped-h/h	154.07	pers-h/h
Control Delay (Average)	90.6	sec	41.0	sec	91.1	sec
Control Delay (Worst Lane)	148.5	sec				
Control Delay (Worst Movement)	147.2	sec	54.2	sec	147.2	sec
Geometric Delay (Average)	2.3	sec				
Stop-Line Delay (Average)	88.3	sec				
Idling Time (Average)	81.4	sec				
Intersection Level of Service (LOS)	LOS F		LOS E			
95% Back of Queue - Vehicles (Worst Lane)	83.2	veh				
95% Back of Queue - Distance (Worst Lane)	621.5	m				
Queue Storage Ratio (Worst Lane)	0.76					
Total Effective Stops	6054	veh/h	69	ped/h	7333	pers/h
Effective Stop Rate	1.19	per veh	0.82	per ped	1.20	per pers
Proportion Queued	0.94		0.82		0.95	
Performance Index	689.2		2.1		691.2	
Cost (Total)	6956.67	$/h	41.17	$/h	6997.83	$/h
Fuel Consumption (Total)	737.1	L/h				
Carbon Dioxide (Total)	1757.1	kg/h				
Hydrocarbons (Total)	0.177	kg/h				
Carbon Monoxide (Total)	1.816	kg/h				
NOx (Total)	4.309	kg/h				

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: NEH and Melbourne St AM base 2026

AM existing flows allowing for background growth to 2026
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: NEH Newcastle											
1	L2	33	3.0	1.060	135.1	LOS F	83.2	621.5	1.00	1.52	19.0
2	T1	1533	8.0	1.060	131.0	LOS F	83.2	621.5	1.00	1.53	19.1
3	R2	129	5.0	0.542	67.7	LOS E	3.9	28.5	1.00	0.76	25.7
Approach		1695	7.7	1.060	126.2	LOS F	83.2	621.5	1.00	1.47	19.4
East: Melbourne St Morpeth											
4	L2	200	8.0	0.333	37.1	LOS C	8.7	64.8	0.79	0.78	34.2
5	T1	78	2.0	1.062	144.0	LOS F	40.8	302.0	1.00	1.34	15.6
6	R2	741	8.0	1.062	147.2	LOS F	42.8	320.1	1.00	1.30	15.7
Approach		1019	7.5	1.062	125.4	LOS F	42.8	320.1	0.96	1.21	17.5
North: NEH Maitland											
7	L2	472	4.0	0.412	11.6	LOS A	7.6	55.1	0.53	0.74	47.7
8	T1	1303	8.0	0.907	50.1	LOS D	45.1	337.4	0.98	1.04	33.0
9	R2	123	3.0	1.016	115.2	LOS F	10.4	74.8	1.00	1.15	20.5
Approach		1898	6.7	1.016	44.7	LOS D	45.1	337.4	0.87	0.97	33.9
West: Melbourne St											
10	L2	271	3.0	0.893	46.7	LOS D	12.2	87.4	1.00	0.96	33.4
11	T1	129	3.0	1.007	104.4	LOS F	15.8	113.7	1.00	1.21	19.8
12	R2	60	3.0	1.007	110.0	LOS F	15.8	113.7	1.00	1.21	21.8
Approach		460	3.0	1.007	71.2	LOS F	15.8	113.7	1.00	1.06	26.8
All Vehicles		5072	6.9	1.062	90.6	LOS F	83.2	621.5	0.94	1.19	23.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	29.4	LOS C	0.1	0.1	0.70	0.70
P3	North Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	21	26.0	LOS C	0.0	0.0	0.66	0.66
All Pedestrians		84	41.0	LOS E			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: SECA SOLUTION | Processed: Wednesday, 10 February 2016 1:03:00 PM
Project: C:\Sidra folders\Martins Creek.sip6

INTERSECTION SUMMARY

Site: NEH and Melbourne St PM base 2026

AM existing flows with background growth to 2026
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values						
Performance Measure	Vehicles		Pedestrians		Persons	
Travel Speed (Average)	22.1	km/h	2.0	km/h	22.0	km/h
Travel Distance (Total)	5151.0	veh-km/h	3.3	ped-km/h	6184.5	pers-km/h
Travel Time (Total)	232.7	veh-h/h	1.7	ped-h/h	280.9	pers-h/h
Demand Flows (Total)	5332	veh/h	84	ped/h	6398	pers/h
Percent Heavy Vehicles (Demand)	6.7	%				
Degree of Saturation	1.138		0.035			
Practical Spare Capacity	-20.9	%				
Effective Intersection Capacity	4685	veh/h				
Control Delay (Total)	145.82	veh-h/h	0.93	ped-h/h	175.92	pers-h/h
Control Delay (Average)	98.5	sec	40.0	sec	99.0	sec
Control Delay (Worst Lane)	197.2	sec				
Control Delay (Worst Movement)	194.0	sec	54.2	sec	194.0	sec
Geometric Delay (Average)	2.2	sec				
Stop-Line Delay (Average)	96.2	sec				
Idling Time (Average)	89.2	sec				
Intersection Level of Service (LOS)	LOS F		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	115.0	veh				
95% Back of Queue - Distance (Worst Lane)	860.5	m				
Queue Storage Ratio (Worst Lane)	1.05					
Total Effective Stops	6608	veh/h	68	ped/h	7997	pers/h
Effective Stop Rate	1.24	per veh	0.80	per ped	1.25	per pers
Proportion Queued	0.94		0.80		0.95	
Performance Index	660.8		2.0		662.9	
Cost (Total)	7714.74	$/h	40.59	$/h	7755.33	$/h
Fuel Consumption (Total)	791.4	L/h				
Carbon Dioxide (Total)	1885.6	kg/h				
Hydrocarbons (Total)	0.192	kg/h				
Carbon Monoxide (Total)	1.945	kg/h				
NOx (Total)	4.554	kg/h				

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: NEH and Melbourne St PM base 2026

AM existing flows with background growth to 2026
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: NEH Newcastle											
1	L2	32	2.0	0.864	45.5	LOS D	40.6	303.1	0.98	0.96	35.6
2	T1	1275	8.0	0.864	39.6	LOS C	40.6	303.1	0.95	0.94	36.4
3	R2	274	5.0	0.916	80.3	LOS F	9.5	69.0	1.00	1.02	23.3
Approach		1580	7.4	0.916	46.8	LOS D	40.6	303.1	0.96	0.95	33.5
East: Melbourne St Morpeth											
4	L2	156	8.0	0.280	38.6	LOS C	6.8	51.0	0.79	0.77	33.7
5	T1	76	2.0	0.874	62.1	LOS E	18.8	138.6	1.00	0.99	26.5
6	R2	494	8.0	0.874	67.9	LOS E	18.8	138.6	1.00	0.98	25.9
Approach		725	7.4	0.874	61.0	LOS E	18.8	138.6	0.96	0.93	27.3
North: NEH Maitland											
7	L2	739	5.0	0.668	13.8	LOS A	15.2	110.9	0.70	0.81	46.1
8	T1	1733	8.0	1.138	194.0	LOS F	115.0	860.5	1.00	1.85	14.4
9	R2	162	2.0	1.062	146.9	LOS F	15.8	112.5	1.00	1.23	17.4
Approach		2634	6.8	1.138	140.5	LOS F	115.0	860.5	0.92	1.52	17.6
West: Melbourne St											
10	L2	189	2.0	0.564	33.2	LOS C	6.9	49.3	0.96	0.80	38.1
11	T1	142	2.0	1.072	148.0	LOS F	20.4	145.3	1.00	1.35	15.5
12	R2	61	2.0	1.072	153.6	LOS F	20.4	145.3	1.00	1.35	17.3
Approach		393	2.0	1.072	93.5	LOS F	20.4	145.3	0.98	1.09	22.8
All Vehicles		5332	6.7	1.138	98.5	LOS F	115.0	860.5	0.94	1.24	22.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	27.4	LOS C	0.0	0.0	0.68	0.68
P3	North Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	21	24.1	LOS C	0.0	0.0	0.63	0.63
All Pedestrians		84	40.0	LOS D			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: SECA SOLUTION | Processed: Wednesday, 10 February 2016 1:04:15 PM
Project: C:\Sidra folders\Martins Creek.sip6

INTERSECTION SUMMARY

Site: NEH and Melbourne St AM base+40 trucks

AM existing flows plus allowance for ALL trucks turning right out of Melbourne Street
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values						
Performance Measure	Vehicles		Pedestrians		Persons	
Travel Speed (Average)	28.6	km/h	2.0	km/h	28.4	km/h
Travel Distance (Total)	4434.8	veh-km/h	3.3	ped-km/h	5325.1	pers-km/h
Travel Time (Total)	154.9	veh-h/h	1.7	ped-h/h	187.6	pers-h/h
Demand Flows (Total)	4611	veh/h	84	ped/h	5533	pers/h
Percent Heavy Vehicles (Demand)	6.7	%				
Degree of Saturation	0.989		0.035			
Practical Spare Capacity	-9.0	%				
Effective Intersection Capacity	4663	veh/h				
Control Delay (Total)	80.03	veh-h/h	1.00	ped-h/h	97.04	pers-h/h
Control Delay (Average)	62.5	sec	42.7	sec	63.1	sec
Control Delay (Worst Lane)	91.8	sec				
Control Delay (Worst Movement)	91.7	sec	54.2	sec	91.7	sec
Geometric Delay (Average)	2.5	sec				
Stop-Line Delay (Average)	60.0	sec				
Idling Time (Average)	54.1	sec				
Intersection Level of Service (LOS)	LOS E		LOS E			
95% Back of Queue - Vehicles (Worst Lane)	56.6	veh				
95% Back of Queue - Distance (Worst Lane)	422.4	m				
Queue Storage Ratio (Worst Lane)	0.52					
Total Effective Stops	4796	veh/h	70	ped/h	5825	pers/h
Effective Stop Rate	1.04	per veh	0.84	per ped	1.05	per pers
Proportion Queued	0.93		0.84		0.95	
Performance Index	515.0		2.1		517.1	
Cost (Total)	5056.34	$/h	42.17	$/h	5098.52	$/h
Fuel Consumption (Total)	605.9	L/h				
Carbon Dioxide (Total)	1444.8	kg/h				
Hydrocarbons (Total)	0.137	kg/h				
Carbon Monoxide (Total)	1.501	kg/h				
NOx (Total)	3.578	kg/h				

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: NEH and Melbourne St AM base+40 trucks

AM existing flows plus allowance for ALL trucks turning right out of Melbourne Street
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: NEH Newcastle											
1	L2	33	3.0	0.989	90.3	LOS F	56.6	422.4	1.00	1.27	24.8
2	T1	1277	8.0	0.989	84.7	LOS F	56.6	422.4	1.00	1.27	25.1
3	R2	123	5.0	0.458	66.0	LOS E	3.6	26.6	1.00	0.76	26.1
Approach		1433	7.6	0.989	83.2	LOS F	56.6	422.4	1.00	1.23	25.2
East: Melbourne St Morpeth											
4	L2	191	8.0	0.289	33.7	LOS C	7.8	58.1	0.74	0.77	35.5
5	T1	78	2.0	0.977	85.9	LOS F	31.7	234.7	1.00	1.15	22.0
6	R2	748	8.0	0.977	91.7	LOS F	34.7	259.9	1.00	1.12	21.7
Approach		1017	7.5	0.977	80.4	LOS F	34.7	259.9	0.95	1.06	23.4
North: NEH Maitland											
7	L2	492	4.0	0.441	12.2	LOS A	8.3	60.4	0.56	0.75	47.2
8	T1	1086	8.0	0.846	43.0	LOS D	33.6	251.5	0.96	0.94	35.3
9	R2	123	3.0	0.903	78.8	LOS F	8.4	60.1	1.00	0.99	25.8
Approach		1701	6.5	0.903	36.7	LOS C	33.6	251.5	0.85	0.89	36.6
West: Melbourne St											
10	L2	271	3.0	0.812	37.4	LOS C	10.1	72.4	1.00	0.89	36.5
11	T1	129	3.0	0.929	75.5	LOS F	13.3	95.7	1.00	1.07	24.2
12	R2	60	3.0	0.929	81.1	LOS F	13.3	95.7	1.00	1.07	26.3
Approach		460	3.0	0.929	53.8	LOS D	13.3	95.7	1.00	0.97	30.9
All Vehicles		4611	6.7	0.989	62.5	LOS E	56.6	422.4	0.93	1.04	28.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	33.0	LOS D	0.1	0.1	0.74	0.74
P3	North Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	21	29.4	LOS C	0.1	0.1	0.70	0.70
All Pedestrians		84	42.7	LOS E			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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INTERSECTION SUMMARY

Site: Melbourne St and Pitnacree Rd AM+40 trucks

Melbourne and Pitnacree AM base plus allowance for all trucks to turn left off Flat Road to access highway
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Intersection Performance - Hourly Values						
Performance Measure	Vehicles		Pedestrians		Persons	
Travel Speed (Average)	35.0	km/h	1.9	km/h	34.4	km/h
Travel Distance (Total)	2452.0	veh-km/h	2.8	ped-km/h	2945.3	pers-km/h
Travel Time (Total)	70.1	veh-h/h	1.5	ped-h/h	85.6	pers-h/h
Demand Flows (Total)	2417	veh/h	84	ped/h	2900	pers/h
Percent Heavy Vehicles (Demand)	4.1	%				
Degree of Saturation	0.814		0.035			
Practical Spare Capacity	10.5	%				
Effective Intersection Capacity	2969	veh/h				
Control Delay (Total)	28.67	veh-h/h	0.86	ped-h/h	35.26	pers-h/h
Control Delay (Average)	42.7	sec	36.8	sec	43.8	sec
Control Delay (Worst Lane)	70.5	sec				
Control Delay (Worst Movement)	70.5	sec	54.2	sec	70.5	sec
Geometric Delay (Average)	2.4	sec				
Stop-Line Delay (Average)	40.3	sec				
Idling Time (Average)	35.8	sec				
Intersection Level of Service (LOS)	LOS D		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	30.1	veh				
95% Back of Queue - Distance (Worst Lane)	217.8	m				
Queue Storage Ratio (Worst Lane)	0.31					
Total Effective Stops	2028	veh/h	65	ped/h	2498	pers/h
Effective Stop Rate	0.84	per veh	0.77	per ped	0.86	per pers
Proportion Queued	0.92		0.77		0.94	
Performance Index	304.9		1.8		306.8	
Cost (Total)	2158.13	$/h	36.08	$/h	2194.21	$/h
Fuel Consumption (Total)	272.0	L/h				
Carbon Dioxide (Total)	645.5	kg/h				
Hydrocarbons (Total)	0.058	kg/h				
Carbon Monoxide (Total)	0.693	kg/h				
NOx (Total)	1.126	kg/h				

Level of Service (LOS) Method: Delay (RTA NSW).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: Melbourne St and Pitnacree Rd AM+40 trucks

Melbourne and Pitnacree AM base plus allowance for all trucks to turn left off Flat Road to access highway
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Melbourne St											
1	L2	173	8.0	0.236	29.7	LOS C	6.5	48.4	0.69	0.75	39.4
2	T1	498	4.0	0.708	29.5	LOS C	22.9	165.5	0.85	0.75	40.4
3	R2	91	2.0	0.742	70.5	LOS E	5.7	40.4	1.00	0.85	27.4
Approach		761	4.7	0.742	34.5	LOS C	22.9	165.5	0.83	0.76	38.0
East: Lawes Street											
4	L2	231	2.0	0.795	38.6	LOS C	9.1	64.9	1.00	0.88	36.1
5	T1	92	4.0	0.783	63.2	LOS E	8.4	60.5	1.00	0.89	29.0
6	R2	43	2.0	0.783	68.7	LOS E	8.4	60.5	1.00	0.89	28.6
Approach		365	2.5	0.795	48.3	LOS D	9.1	64.9	1.00	0.89	33.1
North: Melbourne St											
7	L2	18	2.0	0.806	39.7	LOS C	30.1	217.8	0.91	0.85	37.7
8	T1	568	4.0	0.806	34.1	LOS C	30.1	217.8	0.91	0.85	38.4
9	R2	73	2.0	0.595	68.1	LOS E	4.4	31.4	1.00	0.78	27.9
Approach		659	3.7	0.806	38.0	LOS C	30.1	217.8	0.92	0.84	36.8
West: Pitnacree Rd											
10	L2	143	2.0	0.814	58.0	LOS E	20.7	147.1	1.00	0.94	31.1
11	T1	202	2.0	0.814	52.5	LOS D	20.7	147.1	1.00	0.94	31.6
12	R2	286	8.0	0.724	53.8	LOS D	16.0	120.0	0.98	0.86	31.4
Approach		632	4.7	0.814	54.3	LOS D	20.7	147.1	0.99	0.90	31.4
All Vehicles		2417	4.1	0.814	42.7	LOS D	30.1	217.8	0.92	0.84	35.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	South Full Crossing	21	54.2	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	21	24.7	LOS C	0.0	0.0	0.64	0.64
P3	North Full Crossing	21	43.4	LOS E	0.1	0.1	0.85	0.85
P4	West Full Crossing	21	24.7	LOS C	0.0	0.0	0.64	0.64
All Pedestrians		84	36.8	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Appendix D – Interpreting Sidra output

1-Level of Service (LoS)

LoS	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Good	Good
B	Good, with acceptable delays and spare capacity	Acceptable delays and spare
C	Satisfactory	Satisfactory, but requires accident study
D	Operating near capacity	Near capacity and requires accident study
E	At capacity, excessive delay: roundabout requires other control method	At capacity, requires other control mode
F	Unsatisfactory, requires other control mode or additional capacity	Unsatisfactory, requires other control mode

2-Average Vehicle Delay (AVD)

The AVD is a measure of operational performance of an intersection relating to its LoS. The average delay should be taken as a guide only for an average intersection. Longer delays may be tolerated at some intersections where delays are expected by motorists (e.g. those in inner city areas or major arterial roads).

LoS	Average Delay / Vehicle (secs)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28 to 42	Satisfactory	Satisfactory but accident study required
D	42 to 56	Operating near capacity	Near capacity, accident study required
E	56 to 70	At capacity, excessive delays: roundabout requires other control mode	At capacity; requires other control mode
F	Exceeding 70	Unsatisfactory, requires additional capacity	Unsatisfactory, requires other control mode

3-Degree of Saturation (D/S)

The D/S of an intersection is usually taken as the highest ratio of traffic volumes on an approach to an intersection compared with the theoretical capacity, and is a measure of the utilisation of available green time. For intersections controlled by traffic signals, both queues and delays increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its D/S is kept below 0.75. When D/S exceeds 0.9, queues are expected.