

APPENDIX H

TRAFFIC IMPACT ASSESSMENT

FINAL

TRAFFIC IMPACT ASSESSMENT

FOR

STOCKTON SAND QUARRY DREDGING

32 COXS LANE

FULLERTON COVE

VOLUME 1 REPORT

Ref. 17139R

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EXECUTIVE SUMMARY

1. *This report documents the assessment of the traffic impacts for Stockton Sand Quarry Dredging (The Project) at 32 Coxs Lane Fullerton Cove.*
2. *Boral operates a quarry at this site that extracts and transports up to 500,000tpa of sand product under the existing windblown sand extraction area development consent (DA 140-5-2006), which will cease operation in 2028.*
3. *Due to current and future demand for sand in the local Hunter and Sydney regions, Boral is seeking approval for continued and expanded operations at the site. The Project involves the extraction of sand from the inland vegetated dunes by front-end loader/excavator to a depth of 4m AHD and subsequent dredging from 4m AHD to 15m below sea level (-15m AHD).*
4. *The Project would seek to permit a site wide increase on the despatch limit to 750000tpa (i.e. the windblown sand extraction area and the Project operations combine) up until 2028. As part of the Project, 70,000tpa of VENM will be imported to the quarry by road.*
5. *After 2028 extraction of sand on the windblown dunes would cease and transportation will reduce to a maximum of 500,000tpa.*
6. *Vehicle access to the quarry is via Coxs Lane, which has on/off ramps to/from Nelson Bay Road. Other principal intersections adjacent Stockton Quarry include the intersections of Nelson Bay Road/Cabbage Tree Road/Lavis Lane and Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road, which are two lane roundabouts in Nelson Bay Road, north and south of Coxs Lane.*
7. *The quarry currently employs 5 people at the site which will increase to 9 people with the Project. Boral also employs truck drivers and associated support personnel.*
8. *The principal transport routes include:*
 - *Coxs Lane, Nelson Bay Road (south of Coxs Lane) and Tourle Street/Cormorant Road; and*
 - *Coxs Lane, Nelson Bay Road between Cabbage Tree Road and Seaside Boulevard and Cabbage Tree Road/Tomago Road.*
9. *Nelson Bay Road, north of Cabbage Tree Road and Medowie Road are minor transport routes and account for approximately 5% of product transport.*
10. *All of the above roads are approved 25-26 metres B-double routes.*
11. *The NSW Government has been, and is currently, upgrading sections of Nelson Bay Road at and north of Williamtown and has recently completed upgrades to the Tourle Street/Cormorant Road route. The section of Nelson Bay Road between Cabbage Tree Road and Fullerton Street is currently in the planning stage.*

12. *Boral's sand product trucks are 19 metre long truck and dog combinations with average loads of 34 tonne. The VENM trucks will be a mixture of 19 metre long truck and dog combinations (34 tonne load) and rigid trucks (12 tonne load).*
13. *The quarry will have the highest traffic generation on weekdays. The Project at 750,000tpa, including the importation of 70,000tpa of VENM will generate the following sand product and VENM truck volumes:*
 - *100 truck loads (200 two way truck movements) on an average day; and*
 - *142 truck loads (284 two way truck movements) on a maximum day.*
14. *When compared to the existing development consent (DA 140-5-2006) this will be an increase of:*
 - *42 truck loads (84 two way truck movements) on an average day; and*
 - *66 truck loads (132 two way truck movements) on a maximum day.*
15. *During a maximum hour the Project will generate 30 sand product and VENM truck loads (60 two way truck movements).*
16. *The total number of Boral's sand product and VENM trucks with the Project in place, using the road network on an average weekday, will make up a very small proportion of the total volumes using the road network, representing between 0.34% to 1.35% of total traffic volumes.*
17. *The assessment of the traffic impacts of the additional trucks associated with the operation of the Project on the adjacent road network including the principal intersections adjacent the quarry has found that the impacts will be satisfactory.*
18. *The assessment of the cumulative impacts for the future 2029 year with the Project also concludes that the traffic impacts on the principal intersections will be satisfactory.*
19. *Construction traffic impacts are also assessed as satisfactory, as the number of construction vehicles are relatively low in number and less than what has been assessed for the operational impacts.*
20. *The Project is not expected to have any negative impacts on other road users including pedestrians, cyclists and public transport vehicles (buses), and or on road safety.*
21. *After 2028, sand product and VENM truck numbers generated by the Quarry will reduce. When compared to the existing development consent (DA 140-5-2006), the additional truck volumes will be 14 truck loads (28 two way truck movements) on an average day and 28 truck loads (56 two way truck movements) on a maximum day. These truck movements will be spread over the road network.*

GLOSSARY

ADT	- Average Daily Volume (7 day average)
AWT	- Average Weekday Volume (5 day average)
AUL	- Auxiliary left turn lane treatment
AUR	- Auxiliary right turn lane treatment
AVD	- Average vehicle delay per vehicle in seconds
BAL	- Basic left turn treatment
BAR	- Basic right turn treatment
CHR	- Channelised right treatment/lane
DPIE	- Department of Planning, Infrastructure and Environment
DS	- Degree of Saturation, a measure of intersection performance based on the ratio of demand flow to capacity
Light Vehicles	- Austroads 1 and 2 vehicle classifications and motorbikes
LS	- Level of Service, a measure of intersection performance based on vehicle delay. There are six levels of service from A to F, where Level of Service A represents very good conditions and spare capacity and Level of Service F represents oversaturated conditions.
Heavy Vehicles	- Austroads 3-12 vehicle classifications
RMS	- Roads and Maritime Services, NSW (previously RTA)
SEARs	- Secretary's Environmental Assessment Requirements
SIDRA	- SIDRA Intersection Traffic Model
SSD	- State Significant Development
vpd	- Vehicles per day
vph	- Vehicles per hour
95 th % queue	- 95 th percentile queue length in metres

1.0 INTRODUCTION

1.1 Overview

Boral Resources (NSW) Pty Ltd (Boral) owns and operates the Stockton Sand Quarry (hereafter referred to as the 'site' or the 'quarry'), a long standing operation that currently extracts sand from the windblown (transgressive) sand dunes of Stockton Bight and transports up to 500,000 tonnes of sand product per year for use in the building, landscaping and construction markets.

Due to current and future demand for sand in the lower and upper Hunter and Sydney regions, Boral is seeking approval for continued and expanded operations at the site through a State Significant Development (SSD) application. The proposed development (hereafter referred to as the 'Project') involves the extraction of sand from the inland vegetated dunes by front-end loader/excavator to a depth of 4 metres (m) Australian Height Datum (AHD) and subsequent dredging from 4 m AHD to 15 m below sea level (-15 m AHD). The Project would seek to permit a site wide increase on the dispatch limit to 750,000 tpa (i.e. the windblown sand extraction area and the Project operations combined) up until 2028 after which the site wide limit would reduce to no more than 500,000 tpa. The Project would be for a period of up to 25 years.

This report documents the traffic impacts of the Project.

1.2 Authority Requirements

The Project's Secretary's Environmental Assessment Requirements (SEAR's) for traffic and road transport are summarised in Table 1.1, together with where each requirement is addressed in this report or elsewhere in the EIS documentation.

TABLE 1.1

TRAFFIC AND ROAD TRANSPORT SEARS

Stakeholder	EIS Requirement Traffic and Road Transport	Comment
Department of Planning, Industry and Environment	(i) 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;	See Sections 2 and 3
	(ii) A detailed assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road network, paying particular attention to the intersections of Nelson Bay Road (MR108)/Coxs Lane (local road) and Nelson Bay Road/Seaside Boulevard (local road) (using SIDRA or similar traffic model) including a road safety audit.	See Section 5 for Traffic Impact Assessment See Sections 4.4 and 5.7 of this report for road safety and Volume 2 report for road safety audit.
	(iii) A description of the measures that would be implemented to mitigate any impacts.	No mitigation measures are required for the Project.

TABLE 1.1 continued

TRAFFIC AND ROAD TRANSPORT SEARS

Stakeholder	EIS Requirement Traffic and Road Transport	Comment
Roads and Maritime Services (RMS)	1. RMS recommends that the EIS refer to the following guidelines with regard to the traffic and transport of the proposed development. <ul style="list-style-type: none"> - Road and Related Facilities within the Department of Planning EIS Guidelines; and - Section 2 Traffic Impact Studies of Roads and Maritime's <i>Guide to Traffic Generating Developments 2002</i>. 	These guidelines have been referenced in the preparation of the Traffic Assessment Report.
	2. A traffic and transport study shall be prepared in accordance with the Roads and Maritime's <i>Guide to Traffic Generating Developments 2002</i> and is to include (but not limited to) the following.	See Section 1.3
	a) Assessment of all relevant vehicular traffic routes and intersections for access to/from the subject properties.	See Sections 4.3, 5.3 & 5.4
	b) Current traffic counts for all of the traffic routes and intersections.	See Section 4 and Figures 8, 9 & 10.
	c) The anticipated additional vehicular traffic generated from both the construction and operational stages of the Project.	See Sections 3.9, 5.2, 5.3 & 5.5
	d) The distribution on the road network of the trips generated by the proposed development. It is requested that the predicted traffic flows are shown diagrammatically to a level of detail sufficient for easy interpretation.	See Figure 11 and Sections 5.2 & 5.3
e) Consideration of the traffic impacts on existing and proposed intersections, in particular the intersections of Nelson Bay Road (MR108)/Coxs Lane (local road) and Nelson Bay Road/Seaside Boulevard (local road) and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicular traffic generated by the proposed development during both the construction and operational stages. The traffic impact shall also include the cumulative traffic impact of other	See Section 5	

Stakeholder	EIS Requirement Traffic and Road Transport	Comment
	<p>proposed or approved developments in the area.</p> <p>f) Identify the necessary road network infrastructure upgrades that are required to maintain existing levels of service on both the local and classified road network for the development. In this regard, preliminary concept drawings shall be submitted with the EIS for any identified road infrastructure upgrades. However, it should be noted that any identified road infrastructure upgrades will need to be to the satisfaction of Roads and Maritime and Council.</p> <p>g) Traffic analysis of any major/relevant intersections impacted, using SIDRA or similar traffic model including;</p> <ul style="list-style-type: none"> - 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 Roads and Maritime review (i.e. SIDRA 8 model). <p>h) Any other impacts on the regional and state road network including consideration of pedestrian, cyclist and public transport facilities and provision for service vehicles.</p> <p>3. RMS recommends that the following matters should be considered by the DPIE in determining this development;</p> <p>a) Roads and Maritime have no proposal that requires any part of the property.</p> <p>b) The property has a common boundary with Nelson Bay Road (MR108) which is classified as a State Road corridor. The property has alternative access via a local road network known as Coxs Lane. Accordingly, direct access to Nelson Bay Road is restricted and access to the property is permitted via Coxs Lane only.</p>	<p>No road network infrastructure upgrades are required by the Project.</p> <p>See Section 4.3 & Section 5.3</p> <p>SIDRA electronic files will be supplied to RMS</p> <p>See Sections 4.4, 4.5, 4.6, 5.6, 5.7 & 5.8</p> <p>Noted</p> <p>Noted</p> <p>Noted</p>

Stakeholder	EIS Requirement Traffic and Road Transport	Comment
Port Stephens Council	<p>(i) The proponent must prepare a traffic impact assessment, identifying the impacts of any increase in truck movements on the road network as a result of the proposed development and associated mitigation measures.</p> <p>(ii) Any production cap needs to be based on maximum annual tonnage extracted, not on a number of truck movements, which was previously the case;</p> <p>(iii) For the life of the Project, the proponent shall pay Council \$0.04 per tonne of extractive material transported from the site on a quarterly basis, in accordance with the Port Stephens Council Development Contributions Plan for the maintenance of Coxs Lane, Fullerton Cove. Each payment shall be;</p> <p>a) Based on weighbridge records of the quantity of extractive material transported from the site quarterly. These records are to be provided to Council within 14 days of the end of the relevant quarter;</p> <p>b) Paid within 21 days of receipt of the invoice receive from Council; and</p> <p>c) Adjusted in line with the Consumer Price index calculated from the date of approval and applied annually from the first day of operation.</p>	<p>This report documents the traffic impact assessment of the Project.</p> <p>Noted</p> <p>These matters are addressed in the Environmental Impact Statement.</p>

1.3 Structure of this Report

Structure of Report

This report has been prepared to assess the traffic impacts associated with the project and will inform the preparation of the Environmental Impact Statement (EIS).

The assessment has been undertaken in accordance with the requirements of Roads and Traffic Authority now Roads & Maritime Services (RMS) *Guide to Traffic Generating Developments October 2002*.

Other technical standards/publications referenced in this assessment include:

- Austroads Guide to Road Design and RMS supplements.
- Austroads Guide to Traffic Management and RMS supplements.
- Austroads Guide to Traffic Management Part 12. Traffic Impacts of Developments.

The remaining sections of this report address the following;

- Section 2 – provides an overview of the existing operations at the sand quarry;
- Section 3 – describes the Project;
- Section 4 – examines the existing traffic conditions on the road network;
- Section 5 – evaluates the traffic impacts of the proposed continued operations of the sand quarry including any cumulative impacts; and
- Section 6 – presents conclusions.

2.0 EXISTING OPERATIONS

2.1 Site

The site (**Figure 1**) is located in Fullerton Cove, approximately 9.8 kilometres (km) north north-east of the Newcastle Central Business District (CBD), within the Port Stephens Local Government Area.

Access to the site is via Nelson Bay Road and Coxs Lane.

Coxs Lane is a local roadway which terminates at the entrance to the quarry at its eastern end. Nelson Bay Road is a major arterial roadway which links the Newcastle CBD to Newcastle Airport, Nelson Bay and the wider Port Stephens area to the north. The site is owned and operated by Boral and covers an approximate area of 246 ha (**Figure 2**). Boral's land holding is identified as:

- Lot 1 DP 1006399 comprising 234 ha and located predominantly on the eastern side of Nelson Bay Road, with a small portion also situated on the western side of Nelson Bay Road;
- Lot 2 DP 1006399 comprising 10.4 ha and located predominantly on the western side of Nelson Bay Road, with a small portion also positioned on the eastern side of Nelson Bay Road (formerly Part Lot 167, Part Portion 167); and
- Lot 3 DP 664552 comprising 1.619 ha and located wholly on the eastern side of Nelson Bay Road, and within which the existing depot and weighbridge are located (formerly within Part Lot 3, Part Portion 3).

Access to the site is via Crown land title (Lot 7300 DP1130730) under licence agreement with the NSW Department of Planning, Industry and Environment (DPIE) – Crown Lands

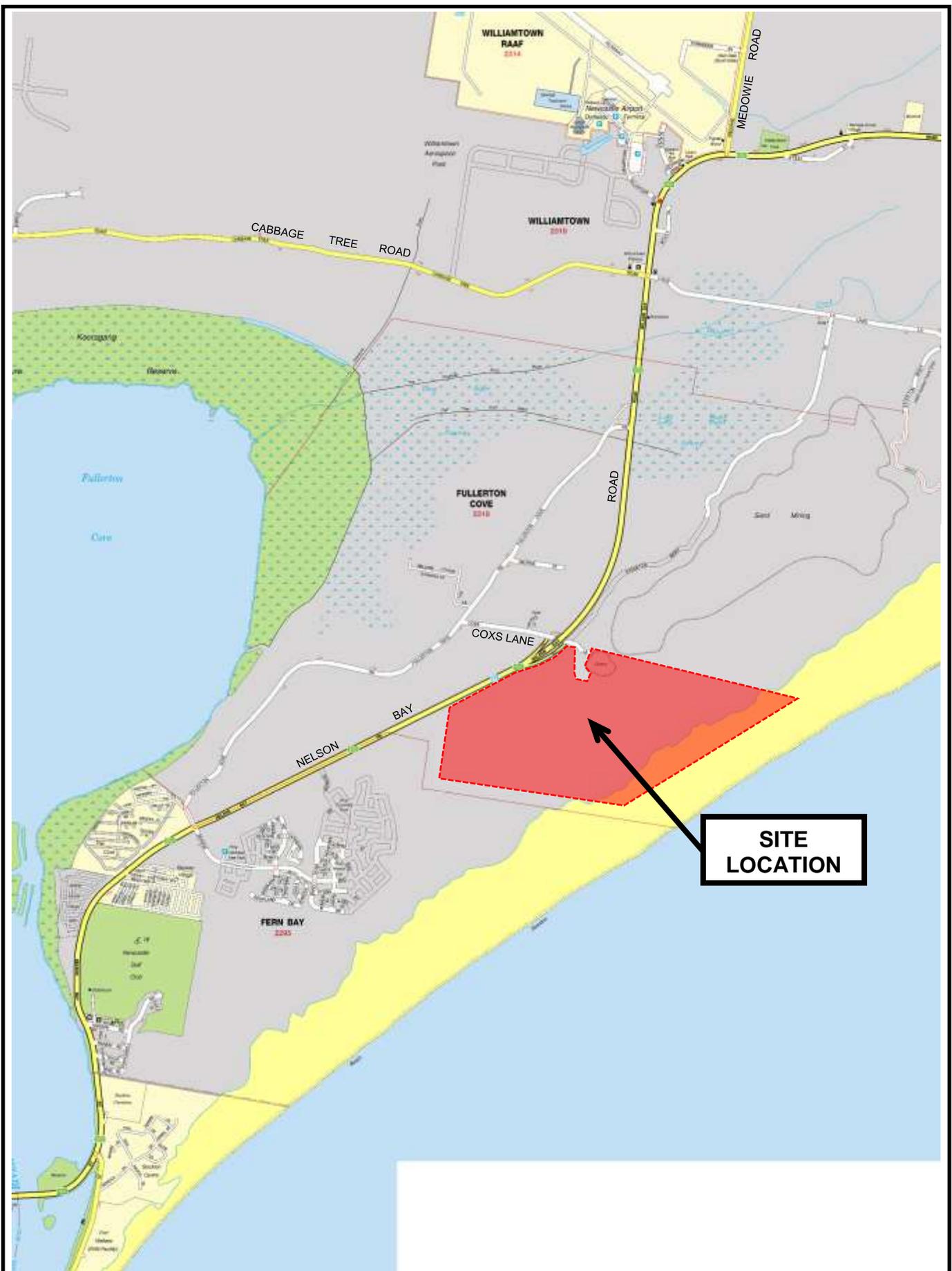
Land use surrounding the site is a mixture of rural, residential, public recreation, and environmental conservation areas.

2.2 Existing Operations

Existing and approved operations at the site include:

- extraction of up to 500,000 tonnes of sand annually through regular harvesting of transgressive sand and dry excavation of the dune mass. This is referred to as the 'windblown sand extraction area';
- processing at the pit face by mobile power screen;
- maintenance of the haul road transport sand from extraction area;
- haulage of product from existing depot/weighbridge to Nelson Bay Road and the wider road network; and
- progressive rehabilitation of extracted areas.

The existing operations were approved under DA140-05-2006. Operations commenced in 2008 and in accordance with the conditions of consent will cease operations in 2028.



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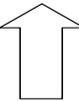
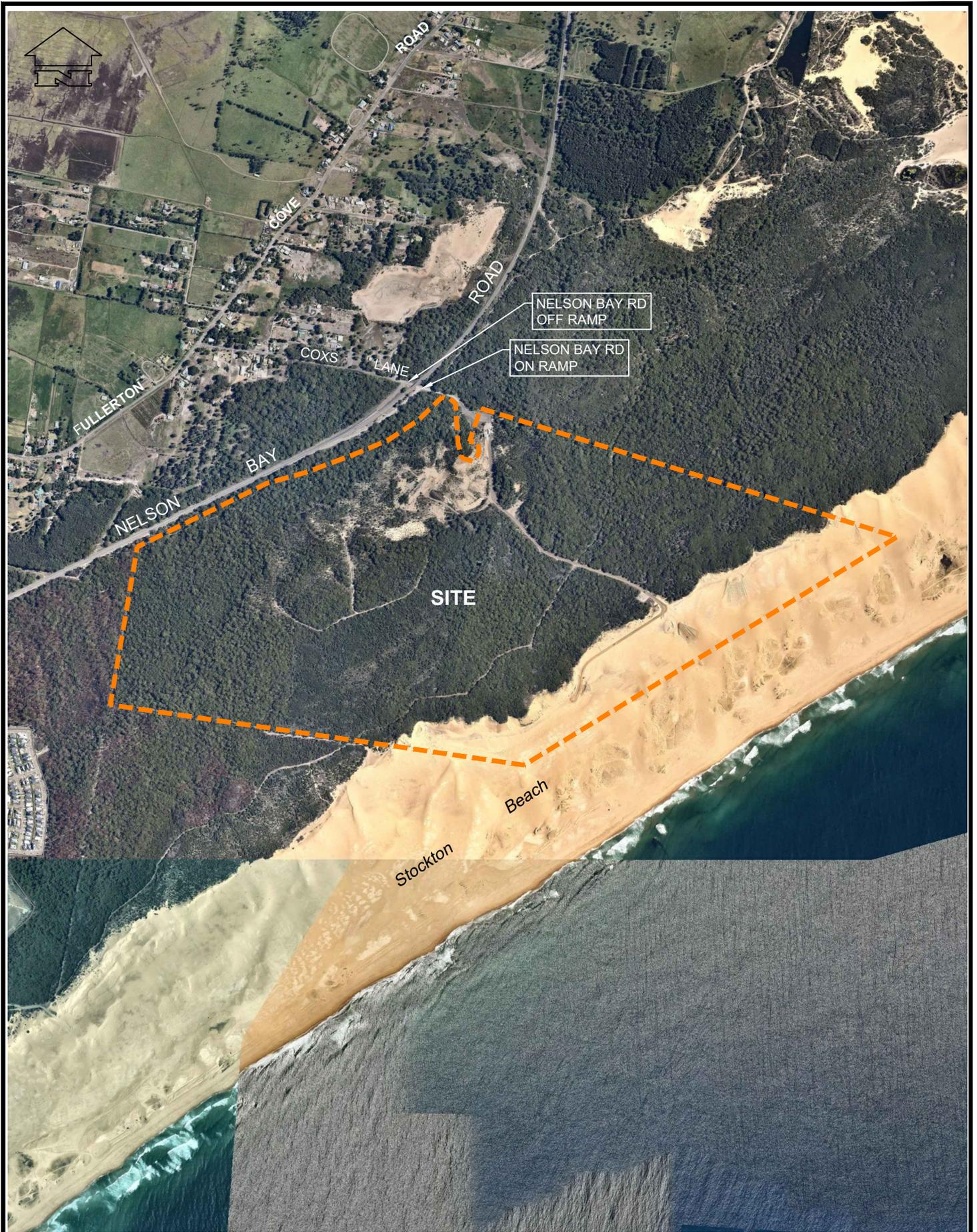
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 NOT TO SCALE

FIGURE 1
STOCKTON SAND QUARRY
LOCATION

JOB NO. 17139

16/07/19



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FIGURE 2
STOCKTON SAND QUARRY
SITE

2.3 Infrastructure and Equipment

The existing and approved operation includes a fenced depot at the site containing:

- an amenities/office building providing an office, lunchroom, toilet and shower;
- weighbridge;
- designated parking area for employees and visitors; and
- maintenance shed for the front-end loader and 4,200 L above ground bunded fuel tank.

Power and telecommunications are connected to the depot, whilst water is collected in rainwater tanks and wastewater is collected via a septic system.

Mobile equipment currently in operation at the site comprises:

- 2 x front end loader (capacity nine tonnes);
- a dozer (part time);
- a water truck (13,000 L capacity); and
- a mobile screen (20 mm mesh screen and a 5 cubic metre (m³) capacity receiving bin).

All product trucks are parked off site overnight at Boral's Seaham depot and arrive and depart Stockton Quarry at the start and end of the working day.

2.4 Employment

The quarry employs four full time staff along with one casual staff member. The quarry also provides employment opportunities for numerous Boral and customer truck drivers and associated service personnel.

2.5 Hours of Operation

The approved hours of operation are:

- Monday to Friday – 6:15am to 5:00pm;
- Saturday – 6:15am to 12 noon; and
- no operation on Sundays or Public Holidays.

The site is also approved to operate extended hours during major supply contracts as follows:

- Monday to Friday – 6:15am to 6:00pm;
- Saturday – 6:15am to 3:00pm; and
- no operation on Sundays or Public Holidays.

2.6 Transport Routes

There are two major transport routes and two minor routes.

Coxs Lane, Nelson Bay Road, (south of Coxs Lane) and Tourle Street/Cormorant Road forms the principal transport route to the Newcastle supply areas. Boral's records show that this route accounts for 45% of sand product.

Coxs Lane, Nelson Bay Road between Cabbage Tree Road and Seaside Boulevard and Cabbage Tree Road/Tomago Road forms the principal transport route to the Central Coast, Sydney and Hunter Valley supply contracts. This route accounts for 50% of sand product.

Nelson Bay Road, north of Cabbage Tree Road and Medowie Road form the separate transport routes for the supply areas of Port Stephens and the North Coast. However, these are minor transport routes and carry approximately 5% of sand product from the quarry, with Nelson Bay Road to Port Stephens accounting for 2% of sand product and Medowie Road route 3% of sand product.

All product trucks accessing the quarry are required to arrive from and depart to the south along Nelson Bay Road. As such, Coxs Lane and the section of Nelson Bay Road between Cabbage Tree Road and Seaside Boulevard forms the main section of all the transport routes and this section carries the highest number of product trucks generated by Stockton Quarry.

Figure 3 shows the transport routes.

2.7 Truck Size and Approved Transport Levels

Boral's product trucks are typically 19.0 metre long truck and dog combinations which have average loads of 34 tonnes.

Trucks used by local customers and for ex bin sales range in size between rigid trucks (small and heavy rigid trucks) and 19.0 metre articulated vehicles.

The current development consent (DA 140-5-2006) permits the transport of up to 500,000tpa. The underlying assumption used in the EIS for this development consent was based on a maximum of 152 heavy vehicle movements per day which is 76 loads per day. (i.e. 76 in/76 out per day).

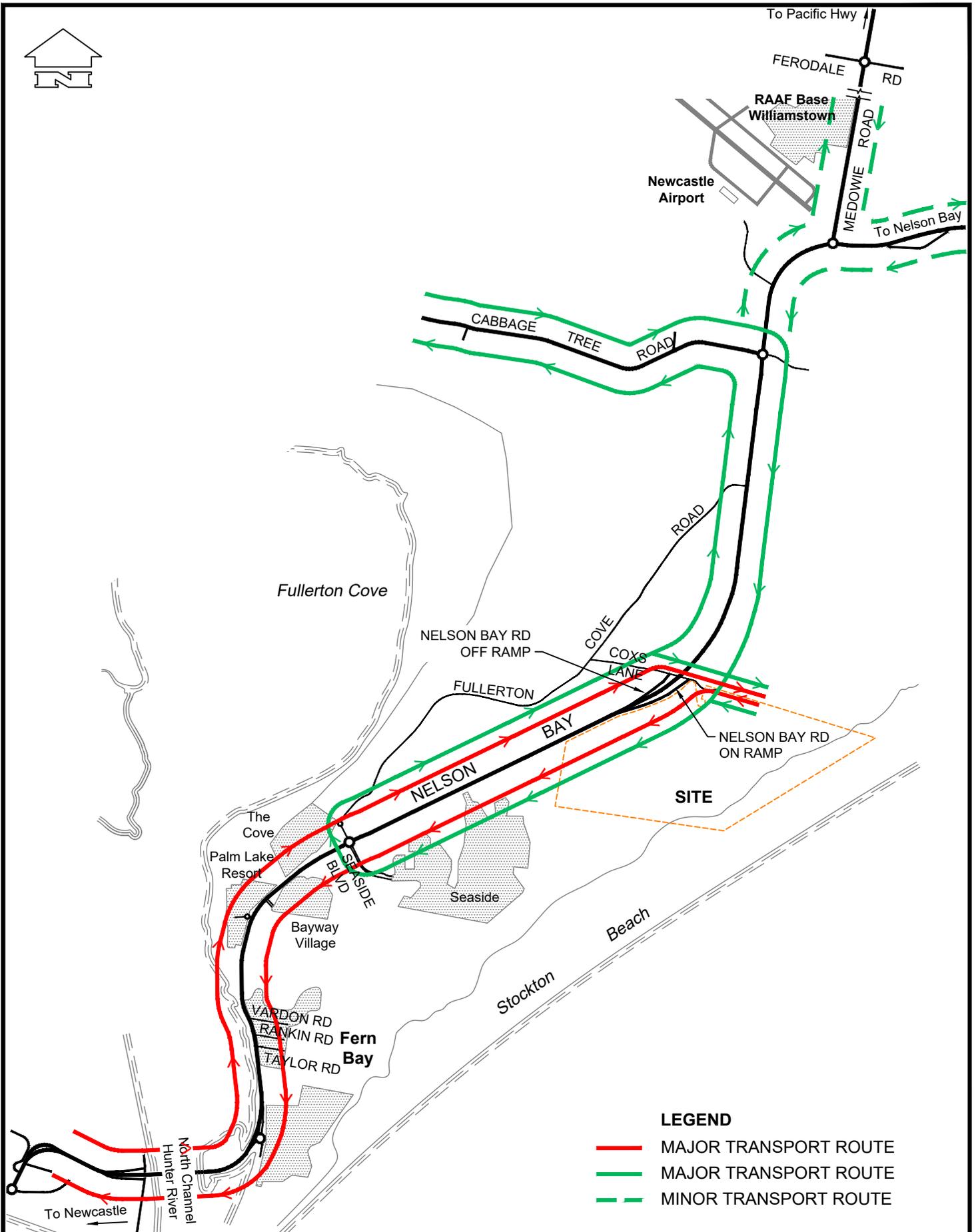
2.8 Traffic Generation

The traffic generation of the existing operation includes:

- light vehicle trips associated with employees and any visitors estimated as up to 24 two way trips per day based on 12 in/12 out per day (NB this allows for some off site trips to get lunch etc).
- sand product transport which is estimated to be a maximum of 152 two way heavy vehicle movements based on 76 truck loads per day. (NB. There is no limit on truck volumes generated by the quarry on a day or per hour).

Sand product transport varies from day to day based on sales. For the month of November 2018, which was a busy month, product truck loads on a weekday ranged between 31-71 truck loads (i.e. 62-142 two way heavy vehicle movements) Saturday had lower sales with between 2-5 truck loads (i.e. 4-10 two way heavy vehicle trips) for the month.

For the week of traffic counts between 4-10 December 2018 average number of sand product truck loads on a weekday was 58 loads (i.e. 116 two way heavy vehicle trips). There were no sales/product transport on the Saturday in this week.



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FIGURE 3
STOCKTON SAND QUARRY
TRANSPORT ROUTES

Other vehicles that come to the Quarry include:

- Water tankers which range between 4 in/4 out movements per day in winter and up to 8 in/8 out in the summer months (i.e. total range of 8-16 trips per day).
- Fuel trucks which average 1 in/1 out per week (i.e. total of 2 trips per week).
- Waste pick up trucks which average 2 in/2 out per month (i.e. Total of 4 two way trips per month).
- Servicing and maintenance vehicles which are light vehicles and average 1 in/1 out per month (i.e. Total 2 two way trips per month).
- Septic system pump out trucks which average 1 in/1 out every 7 weeks (i.e. 2 two way trips every 7 weeks).

3.0 THE PROJECT

3.1 Project Description

The site contains an existing operation located approximately 375 m south east of the Project site, referred to as the 'windblown sand extraction area'. The windblown sand extraction area is approved to operate until 2028 and dispatch up to 500,000 tpa from the site (refer to condition 6 of DA 140-6-2005).

The Project involves the extraction of sand from the inland dunes from the existing ground level of 5 m AHD to a depth of 15 m below sea level (-15 m AHD). As extraction will intercept the groundwater table (at approximately 1 m AHD) the primary method of sand extraction will involve dredging.

There is an estimated 9 million tonnes of sand resource within the Project extraction area. The Project would seek to permit a site wide increase on the dispatch limit to 750,000 tpa (i.e. the windblown sand extraction area and the Project operations combined) up until 2028 after which the site wide limit would reduce to no more than 500,000 tpa. The increase in the site wide dispatch limit is sought to permit maximum flexibility across the two projects areas (located on the same site).

Mobile plant and equipment utilised at the site would operate across both project areas and a docket system at the weighbridge would monitor outgoing product as a site total.

To account for market fluctuations in demand, Boral are seeking a development consent period of 25 years for the SSD approval.

The sand extraction will be undertaken in 6 stages across the site.

3.2 Site Establishment

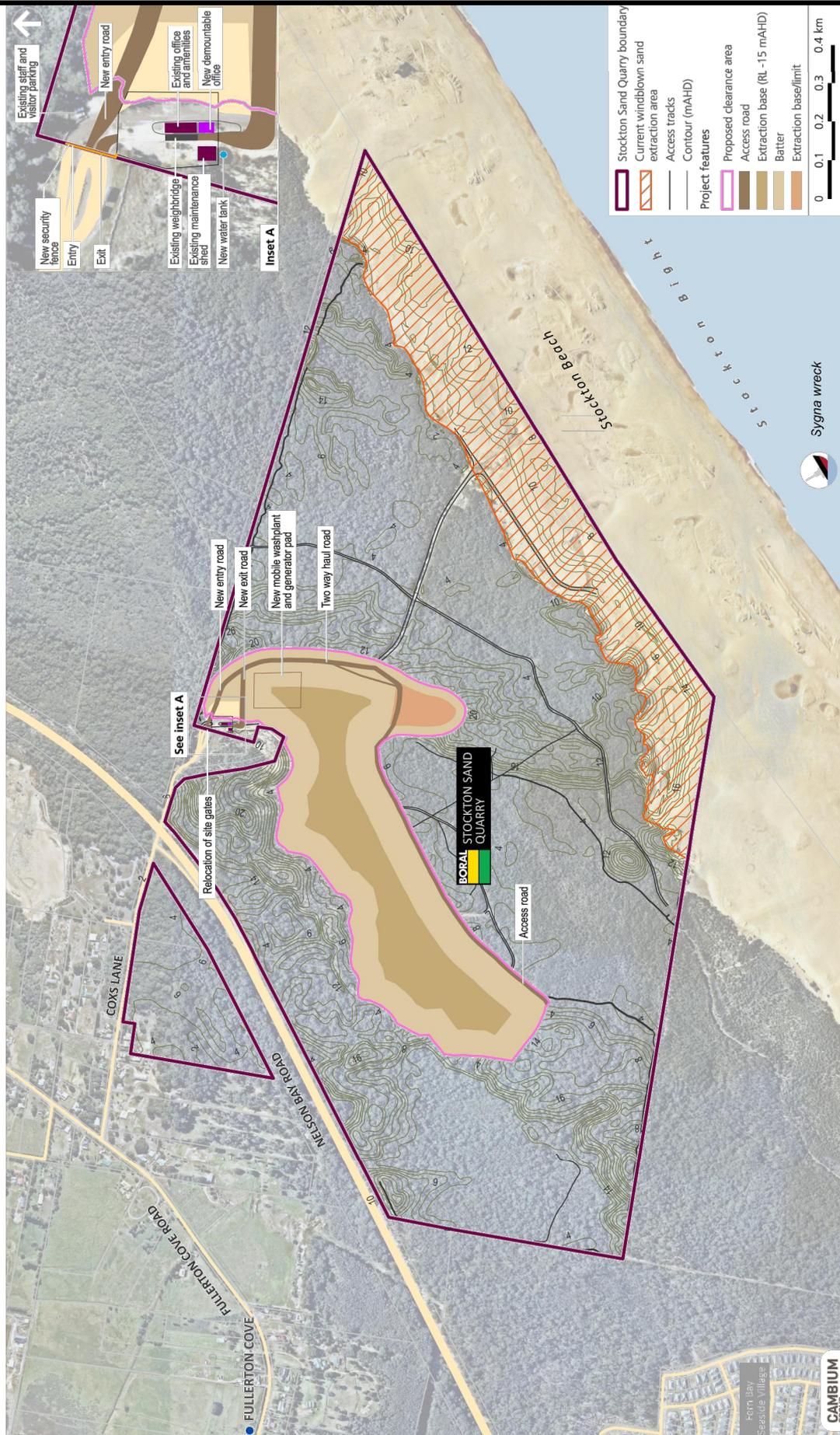
Where new or augmented infrastructure is required this will be delivered as part of Stage 1 of the Project and will include:

- Construction of new haul roads combined with a separated entry and exit points;
- a pad for the wash plant and diesel generators will be constructed as soon as practicable after vegetation removal and sand extraction in the northern portion of Stage 1; and
- The docketing kiosk registering vehicles entering the site will also be relocated.

The existing site depot will also be reconfigured to support the Project and include the following:

- installation of a new prefabricated office building;
- relocation of light vehicle parking;
- relocation of entry gates (inside Boral's boundary); and
- relocation of onsite of storage facilities.

Figure 4 shows the Project.



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FIGURE 4
 STOCKTON SAND QUARRY
PROJECT

3.3 Internal Access Roads

During site establishment works in Stage 1, a new site entry exit and haulage route will be constructed that will extend around the north, east and southern perimeter of Stage 1 and link to the existing haul road to the windblown sand extraction area. The new road will create a one way entry and exit from the site, the balance of the road will support two way vehicle movements.

The construction of the perimeter haul road around the southern edge of the formed Stage 2 to 5 dredge pond would be progressive in line with the progress of sand extraction. A turning head will be constructed at progressive stages at the end of the perimeter haul road to allow vehicles to turn and travel in a forward direction back along the perimeter haul road and out of the site via the newly constructed exit road, which will proceed out of the site via the existing depot and weighbridge.

The perimeter haul road will be up to 10 m wide and when complete (at the end of Stage 5) the road will support movement of vehicles around the southern perimeter of the dredge pond and be used to support access for rehabilitation works and future site management.

3.4 Plant and Equipment

The plant and equipment currently operated at the site would be retained and used during the Project.

In addition, the following plant and equipment would be utilised for the Project:

- suction dredge;
- an additional front-end loader;
- wash plant; and
- diesel generators.

3.5 Employment

The Project would provide employment opportunity for an additional two full time personnel and two casual employees, bringing the total employment for the quarry to six full time and three casual employees. The quarry would continue to also provide flow on employment opportunities for numerous Boral and customer truck drivers and associated service personnel.

3.6 Hours of Operation

The Project will continue to operate with the existing approved hours of operation;

- Monday to Friday – 6:15am to 5:00pm;
- Saturday – 6:15am to 12 noon; and
- no operation on Sundays or Public Holidays.

The site is also approved to operate extended hours during major supply contracts as follows:

- Monday to Friday – 6:15am to 6:00pm;
- Saturday – 6:15am to 3:00pm; and
- no operation on Sundays or Public Holidays.

3.7 Transport

The Project seeks to transport up to 750,000tpa of sand products from the Quarry, subject to market demand up until 2028. This will be an increase of 250,000tpa over the current approval.

After 2028 the product transport will reduce to a maximum of 500,000tpa.

Also, as part of the Project, it is proposed to import up to 70,000tpa of virgin excavated natural material (VENM) material by road for use in stabilisation works as required.

3.8 Transport Routes

The transport routes for the Project will be the same as the existing transport routes (**Figure 3** refers).

Boral expects the split between the routes to be similar to the existing split with;

- 45% travelling south via Nelson Bay Road to the Newcastle market;
- 50% travelling north and west via Nelson Bay Road, Cabbage Tree Road and Tomago Road to the Central Coast, Hunter and Sydney Markets; and
- 5% travelling north via Nelson Bay Road and via Medowie Road for the Port Stephens and North Coast Markets.

Trucks importing the VENM are expected to use the same transport routes as used by the sand product trucks with a similar split.

3.9 Truck Size and Product and VENM Transport

Boral will continue to use 19.0 metre truck and dog combination trucks with average loads of 34 tonnes.

Trucks importing the VENM material will be truck and dog combinations with average loads of 34 tonnes (75% of VENM) and heavy rigid trucks with average load of 12 tonnes (25% of VENM). On an average day these will total 14 truck loads per day (i.e. 14 in/14 out) with an average of 2 truck loads per hour (i.e. 4 two way heavy vehicle trips per hour). On a busy/maximum day VENM importation is estimated at 28 truck loads per day (28 in/28 out) with 56 two way heavy trips per day. During a busy hour VENM importation is estimated as 4 truck loads per hour (8 two way heavy vehicle trips per hour).

The traffic generation of the product trucks is estimated to be a maximum of 228 two way heavy vehicle movements per day which is 114 truck loads per day (i.e. 114 in/114 out per day). The maximum hourly traffic generation for product transport is estimated as 52 two way heavy vehicle trips (i.e. 26 truck loads per hour or 26 in/26 out per hour).

The total traffic generation of product trucks and VENM importation on a maximum day and during a maximum hour until 2028 is estimated to be

- 284 two way heavy vehicle movements per day, which is 142 truck loads per day (i.e. 142 in/142 out); and
- 60 two way heavy vehicle movements per hour, which is 30 truck loads per hour (i.e. 30 in/30 out).

3.10 Traffic Generation

The traffic generation of the Project includes:

- Light vehicle trips associated with employees/visitors and miscellaneous trips (i.e. trips for lunch etc) which is estimated as up to 34 two way trips per day (i.e. 17 in/17 out). This is an increase of 10 two way vehicle trips per day;
- Product transport trucks which is a maximum of 114 truck loads per day (228 two way heavy vehicle movements per day). This is an increase of 38 truck loads per day, up until 2028. After 2028, product transport reduces to 500,000tpa which is a maximum of 76 loads per day (152 two way heavy vehicle movements per day) and is the same traffic generation as the existing consent;
- Importation of VENM material which is estimated as 14 truck loads per day (28 two way heavy vehicle movements per day). On a busy/maximum day VENM importation is estimated at 28 truck loads per day (28 in/28 out) with 56 two way heavy trips per day;
- Other light vehicle and heavy vehicle trips associated with deliveries and maintenance which are:
 - Water tankers – between 4-8 in/4-8 out per day (8-16 two way trips per day);
 - Fuel truck – 1-2 in/1-2 out per week (2-4 two way trips per week);
 - Waste pick up truck – 2 in/2 out per month (4 two way trips per month);
 - Servicing and maintenance (light vehicles) – 1-2 in/1-2 out per month (2-4 two way trips per month); and
 - Septic pump out truck – 1 in/1 out every 7 weeks (2 two way trips every 7 weeks).

4.0 EXISTING TRAFFIC CONDITIONS

4.1 Principal Road Network

The principal road network that serves Stockton Sand Quarry includes;

- Coxs Lane (East section);
- Nelson Bay Road;
- Teale Street/Cormorant Road;
- Cabbage Tree Road/Tomago Road; and
- Medowie Road.

Coxs Lane, Nelson Bay Road, (south of Coxs Lane) and Tourle Street/Cormorant Road forms the principal transport route to the Newcastle supply areas.

Coxs Lane, Nelson Bay Road between Cabbage Tree Road and Seaside Boulevard and Cabbage Tree Road/Tomago Road forms the principal transport route to the Central Coast, Sydney and Hunter Valley supply contracts.

Nelson Bay Road north of Cabbage Tree Road and Medowie Road form the separate transport routes for the supply areas of Port Stephens and the North Coast. However, these are minor transport routes and carry approximately 5% of sand product from the quarry.

4.2 Description of Roads

4.2.1 Coxs Lane

Coxs Lane is an east west local road with northbound off and southbound on ramps that connect to Nelson Bay Road. Coxs Lane is grade separated from Nelson Bay Road by a bridge that takes Nelson Bay Road over Coxs Lane.

East of Nelson Bay Road, Coxs Lane serves the Stockton Sand Quarry. West of Nelson Bay Road, Coxs Lane intersects with Fullerton Cove Road and serves a number of rural and semi rural/residential properties.

The northbound off ramp from Nelson Bay Road to Coxs Lane is approximately 360 metres long including taper with a variable sealed road with between 3.5 metres and 7.5 metres.

The southbound on ramp from Coxs Lane to Nelson Bay Road is 460 metres long. The ramp continues in its own lane providing for two southbound lanes in Nelson Bay Road for approximately 1,100 metres before it merges into one (1) lane. The southbound on ramp has a variable width up to 7.5 metres wide.

East of Nelson Bay Road, Coxs Lane has a sealed road pavement 8.0-9.0 metres wide and caters for two way traffic. The sand quarry entrance is approximately 150 metres east of southbound on ramp intersection with Coxs Lane.

4.2.2 Nelson Bay Road

Nelson Bay Road is a state arterial road that links between Tourle Street/Cormorant Road at Koorang Island in the south and Nelson Bay in the north.

Nelson Bay Road is an approved 25 metre/26 metre B-double route.

In the section between Cabbage Tree Road and Seaside Boulevard it is mostly a two lane road with a section of four lanes, just south of Coxs Lane. Approximately 1.65km south of Seaside Boulevard Nelson Bay Road becomes a four lane divided road and connects to Cormorant Road/Teale Street.

The section of Nelson Bay Road between Cabbage Tree Road and Medowie Road at Williamstown is also a four lane divided road. North of Medowie Road, Nelson Bay Road is predominantly a two lane undivided road.

As a state road, Nelson Bay Road has a high level of traffic management with centre line marking, edgelines, guideposts and sealed shoulders in the two lane sections and auxiliary lanes for turning vehicles at minor intersections. Major intersections typically have roundabout treatments and or traffic signals. The four lane sections also have a high level of traffic management.

Speed limits vary as follows;

- At and north of Cabbage Tree Road, near Williamstown – 80km/h;
- Between south of Cabbage Tree Road and just north of Seaside Boulevard including at the Coxs Lane Ramps – 100km/h;
- Between north of Seaside Boulevard and Fullerton Street – 70km/h;
- Between south of Fullerton Street and Teale Street/Cormorant Road – 80km/h

Traffic management at principal intersections include;

- A two lane roundabout at Nelson Bay Road/Medowie Road;
- Traffic signals at Nelson Bay Road/Williamstown Drive;
- A two lane roundabout at Nelson Bay Road/Cabbage Tree Road/Lavis Lane;
- South facing ramps in Nelson Bay Road at Coxs Lane, providing a northbound off ramp and a southbound on ramp at Cox Lane;
- A two lane roundabout at Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road.

South of Seaside Boulevard the traffic management at intersections include;

- Channelised CHR and AUL right and left turn treatments in Nelson Bay Road at;
 - Palm Lake Resort Access Road (NB left turn out only from Palm Lake Resort); and
 - Bayway Village Access Road;
- Right turn bay in Nelson Bay Road at Vardon Road and at Taylor Street;
- Left in/left out at Rankin Street; and
- Two lane roundabout with northbound slip lanes in Nelson Bay Road at Fullerton Street.

Figure 5 shows the traffic management and traffic controls on this section of Nelson Bay Road and on Coxs Lane.

NSW Government is currently upgrading strategic sections of Nelson Bay Road and further details are provided in Section 4.7.

4.2.3 Teale Street/Cormorant Road

Teale Street/Cormorant Road/Tourle Street are state arterial roads that form part of the route to Nelson Bay between Stockton Bridge and Industrial Drive at Mayfield. This route is an approved 25 metre/26 metre B-double route.

Tourle Street/Cormorant Road/Teale Street travel through the industrial area of Koorang Island and link to Nelson Bay Road at Stockton Bridge. The roads are generally four lane divided roads with auxiliary lanes at minor intersections and a high level of traffic management. The roads generally have 80km/h speed limit.

Traffic management at major intersections includes;

- Two lane roundabout at the Cormorant Road/Teale Street intersection; and
- Traffic signals at the Tourle Street/Industrial Drive intersection.

An at grade rail level crossing is located in Cormorant Road, west of Tourle Street.

Tourle Street/Cormorant Road, including Stockton Bridge has recently been upgraded by the NSW Government to improve traffic flow and cater for future traffic growth.

NSW Government is currently upgrading the Tourle Street/Industrial Drive intersection to increase the capacity at the intersection.

4.2.4 Cabbage Tree Road/Tomago Road

Cabbage Tree Road/Tomago Road is a state arterial road that links between Nelson Bay Road near Williamtown and Pacific Highway at Tomago. Cabbage Tree Road/Tomago Road is an approved 25 metre/26 metre B-double route.

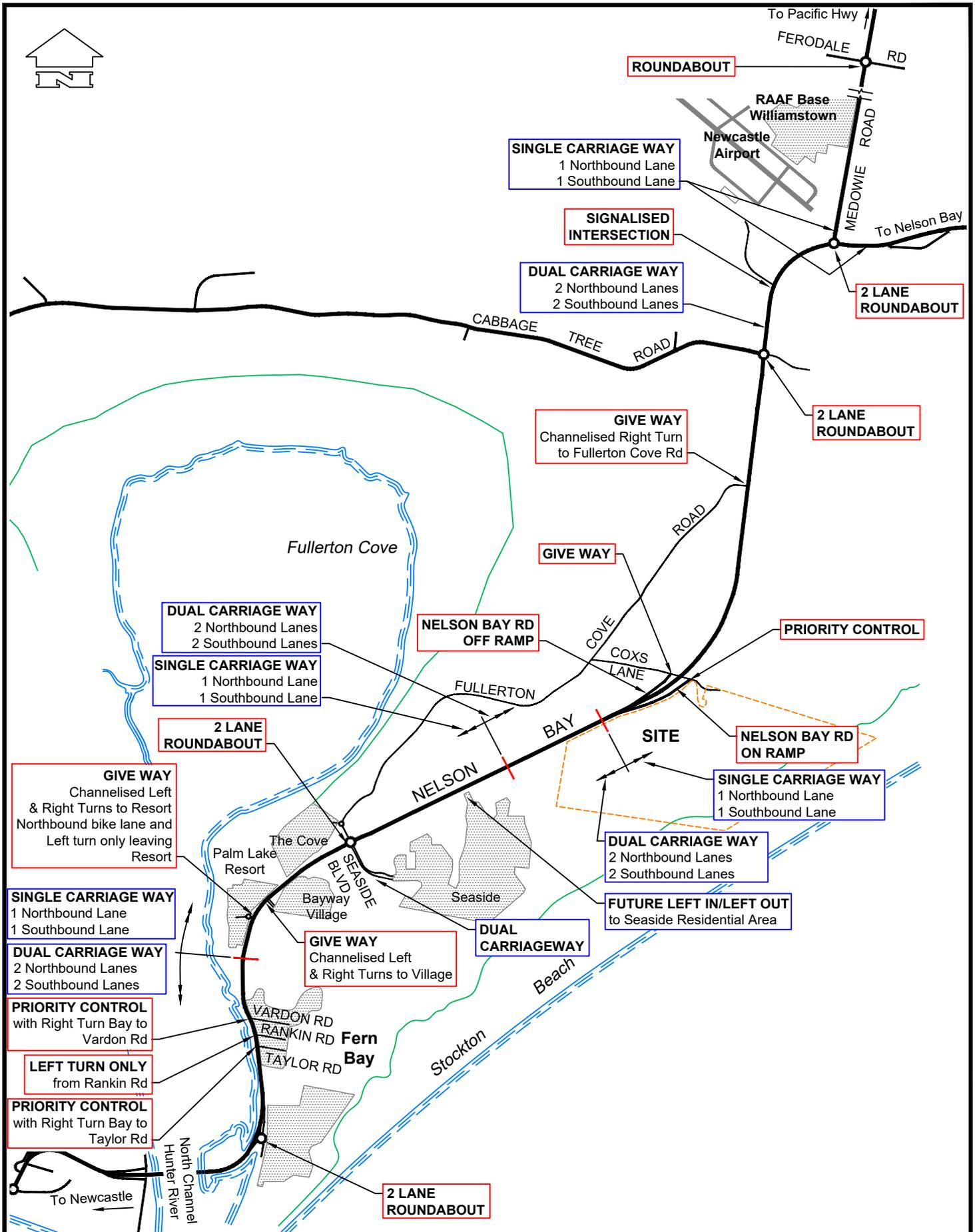
The road is generally a two lane road with a high level of traffic management including centreline and edgeline road marking, sealed shoulders, guide posts and channelised treatments and auxiliary lanes at principal intersections.

The eastern section of the route generally has rural and semi rural residential land uses fronting the road.

The western section between Masonite Road and Pacific Highway generally has industrial uses adjacent the road.

Traffic management at principal intersections include;

- Two lane roundabout at Nelson Bay Road/Cabbage Tree Road/Lavis Lane;
- CHR and AUL right and left turn treatments at Cabbage Tree Road/Tomago Road/Masonite Road;
- Traffic signals at the intersection of Tomago Road/Westrac Access Road;



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**FIGURE 5
STOCKTON SAND QUARRY
ROAD NETWORK AND
TRAFFIC CONTROLS**

- CHR and AUL right and left turn treatments in Tomago Road at the;
 - Access Road to 606-608 Tomago Road; and
 - Tomago Aluminium Entrance Road.
- Two lane roundabout at Tomago Road/Old Punt Road; and
- Traffic signals at Tomago Road/Pacific Highway.

The speed limit in Cabbage Tree Road/Tomago Road is 80km/h, with a section of 60km/h between Old Punt Road and Pacific Highway.

4.2.5 Medowie Road

Medowie Road is a regional road and links between Nelson Bay Road near Williamtown and the Pacific Highway near Euwylong. Medowie Road passes Newcastle Airport/Williamtown RAAF air base and the township of Medowie.

It is predominantly a two lane road with a high level of traffic management including centerline, edgeline road markings, guide posts, sealed road shoulders. Principal intersections have channelised CHR and AUL right and left turn treatments, roundabouts and or traffic signals.

The speed limit along Medowie Road varies with 80km/h between Williamtown and the Medowie township, 50km/h in the township and 80 and 100km/h north of the Medowie township.

Medowie Road is an approved 25 metre/26 metre B-double route.

4.3 Existing Traffic Conditions on Road Network

4.3.1 Existing Traffic Volumes

Daily volumes including vehicle classification counts were undertaken on the road network adjacent Stockton Quarry between 4-10 December 2018.

The volume and vehicle classification count locations included Nelson Bay Road at several locations, Coxs Lane including the on and off ramps to/from Nelson Bay Road and Cabbage Tree Road.

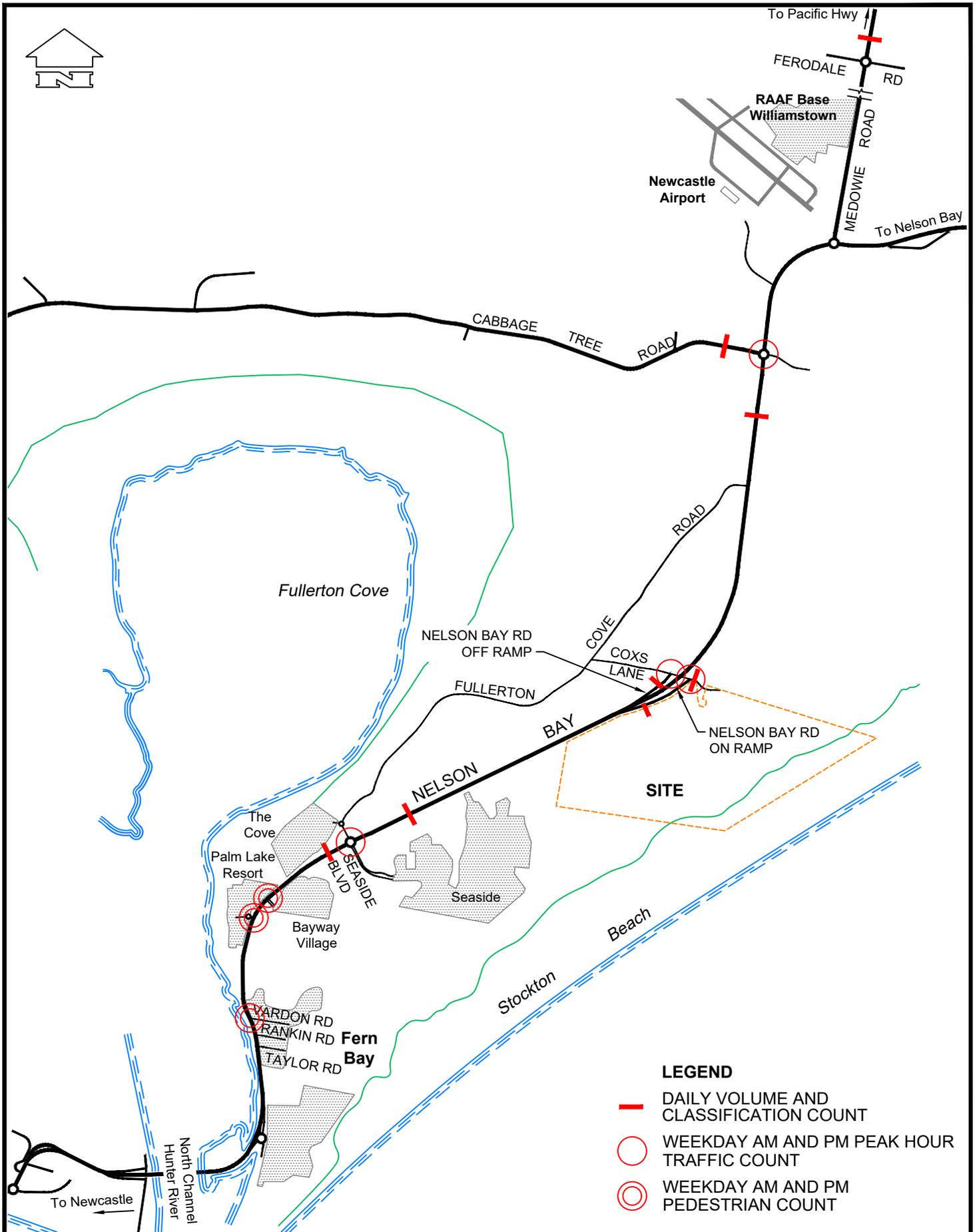
Figure 6 shows the count locations and **Figure 7** shows a summary of daily volume and vehicle classification counts.

In addition, weekday AM and PM peak period intersection counts were undertaken on the 4th and 5th of December 2018 at the principal intersection adjacent to the Stockton Sand Quarry. **Figure 6** shows the count locations.

Weekdays have the highest traffic generation of Stockton Sand Quarry and AM and PM peak hours represent those periods with the highest traffic volumes using the road network.

4.3.2 Daily Volumes on Road Network

Table 4.1 and **Figure 7** shows the daily traffic volumes and the proportion of heavy vehicles using the road network in the area.



LEGEND

- DAILY VOLUME AND CLASSIFICATION COUNT
- WEEKDAY AM AND PM PEAK HOUR TRAFFIC COUNT
- ⊙ WEEKDAY AM AND PM PEDESTRIAN COUNT

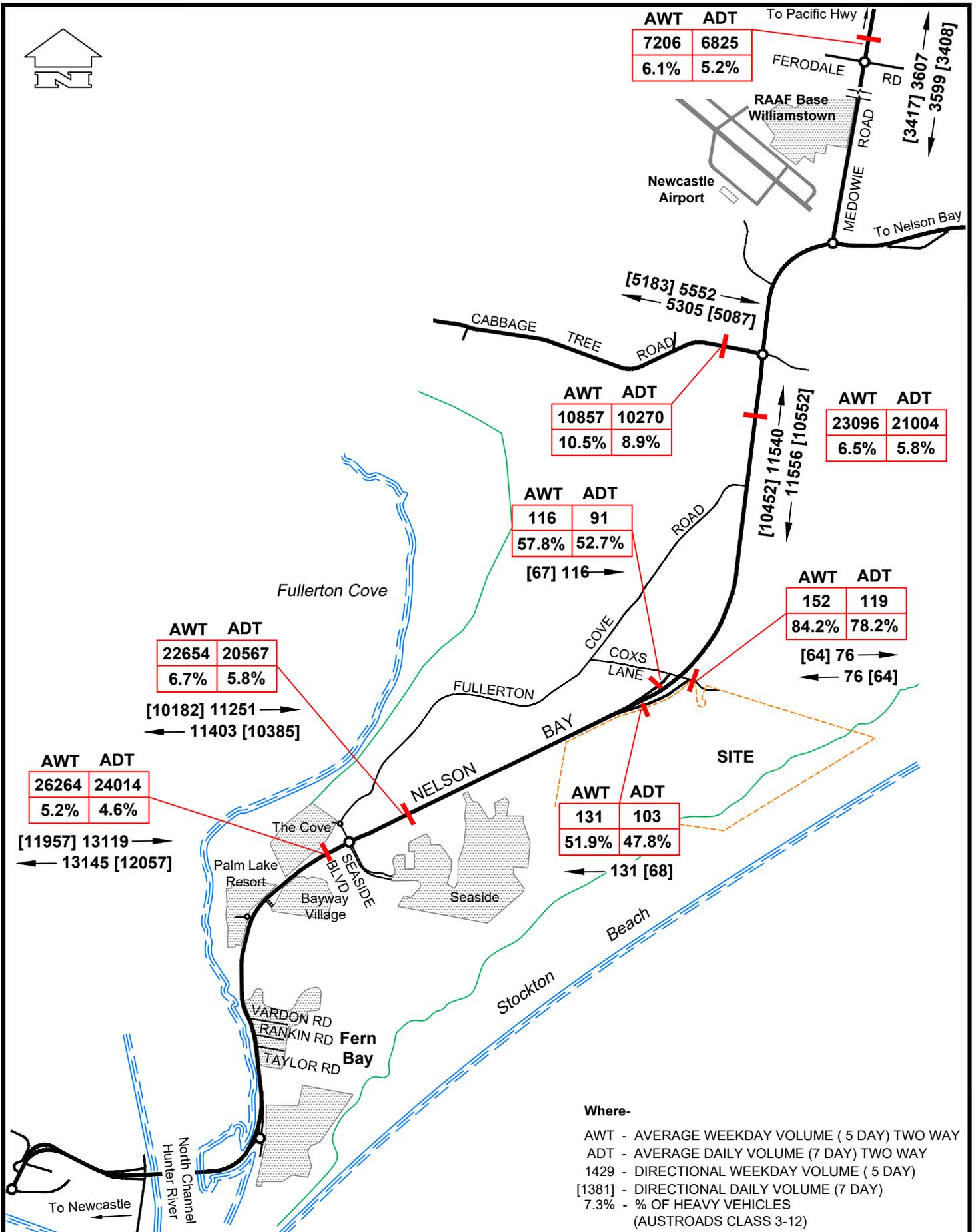
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FIGURE 6
STOCKTON SAND QUARRY
TRAFFIC COUNT LOCATIONS



Where-

AWT - AVERAGE WEEKDAY VOLUME (5 DAY) TWO WAY
 ADT - AVERAGE DAILY VOLUME (7 DAY) TWO WAY
 1429 - DIRECTIONAL WEEKDAY VOLUME (5 DAY)
 [1381] - DIRECTIONAL DAILY VOLUME (7 DAY)
 7.3% - % OF HEAVY VEHICLES
 (AUSTROADS CLASS 3-12)

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FIGURE 7

STOCKTON SAND QUARRY

WEEKDAY & DAILY TRAFFIC VOLUMES

Reference to Table 4.1 shows that on a typical weekday two way volumes in Nelson Bay Road between north of Coxs Lane and south of Seaside Boulevard range between 22,654 and 26,264 vehicles per day (vpd). The proportion of heavy vehicles (Austroad Class 3-12) represent around 5.2% to 6.7% of the total volumes using Nelson Bay Road.

Two way volumes in Coxs Lane east of Nelson Bay Road on an average weekday number 152 vpd with 84.2% being heavy vehicles (Austroads Class 3-12). Heavy vehicles include sand product trucks and water tankers used by the quarry.

The northbound off and southbound on ramps to/from Coxs Lane carry two way traffic volumes on an average weekday of 116 vpd and 131 vpd respectively.

Heavy vehicles (Austroads Class 3-12) represented 57.8% and 51.9% of total vehicles using the ramps.

Two way traffic volumes on an average weekday using other parts of the road network included:

- Cabbage Tree Road, west of Nelson Bay – 10,857 vpd of which 10.5% are heavy vehicle (Austroads Class 3-12)
- Medowie Road, north of Ferodale Road – 7,206 vpd of which 6.1% are heavy vehicles (Austroads Class 3-12)

TABLE 4.1

TWO WAY 5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES AND VEHICLE CLASSIFICATIONS USING ROAD NETWORK

Location	5 Day Average (Weekday) Traffic Volumes			7 Day Average (ADT) Traffic Volumes		
	Total	No. of Heavy Vehicles ¹	% of Heavy Vehicles	Total	No. of Heavy Vehicles	% of Heavy Vehicles
Coxs Lane East of Nelson Bay Road	152	128	84.2%	119	93	78.2%
Northbound Off Ramp to Coxs Lane	116	67	57.8%	91	48	52.7%
Southbound On Ramp from Coxs Lane	131	68	51.9%	103	49	47.8%
Nelson Bay Road, north of Coxs Lane	23096	1512	6.5%	21004	1218	5.8%
Nelson Bay Road south of Coxs Lane	22654	1508	6.7%	20567	1192	5.8%
Nelson Bay Road south of Seaside Boulevard	26264	1368	5.2%	24014	1104	4.6%
Cabbage Tree Road, west of Nelson Bay Road	10857	1141	10.5%	10270	914	8.9%
Medowie Road, north of Ferodale Road	7206	442	6.1%	6825	354	5.2%

Source: Traffic Counts 4-10 December 2018

1. Austroad Class 3-12

4.3.3 Weekday AM and PM Peak Hour Traffic Volumes

AM Peak Hour

Figure 8 shows existing AM peak hour traffic volumes at the intersections on the road network adjacent Stockton Quarry. The AM peak hour generally occurred between 7.15am to 8.15am, although slightly higher volumes occurred at the Coxs Lane on/off ramp intersections during the 6.45am to 7.45am hour. Reference to **Figure 8** shows the following.

The principal intersections of Nelson Bay Road/Cabbage Tree Road/Lavis Lane and Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road have the highest intersection volumes. Both of these intersections are two lane roundabouts.

At the Cabbage Tree Road roundabout, approach volumes in Cabbage Tree Road and in Lavis Lane entering the roundabout number 198 vehicles per hour (vph) and 279 vph respectively. Approach volumes in the northern southern approaches of Nelson Bay Road at this roundabout number 1161 vph and 1021 vph respectively.

At the Seaside Boulevard roundabout approach volumes in Seaside Boulevard and in Fullerton Cove Road number 330 vph and 43 vph, respectively. The approach volumes in Nelson Bay Road number 1205 vph in the northern approach and 1032 vph in the southern approach.

Traffic volumes using the Coxs Lane off ramp and on ramp intersections, which provide vehicle access to Stockton Quarry are very low and number less than 20 vph in the AM peak hour.

PM Peak Hour

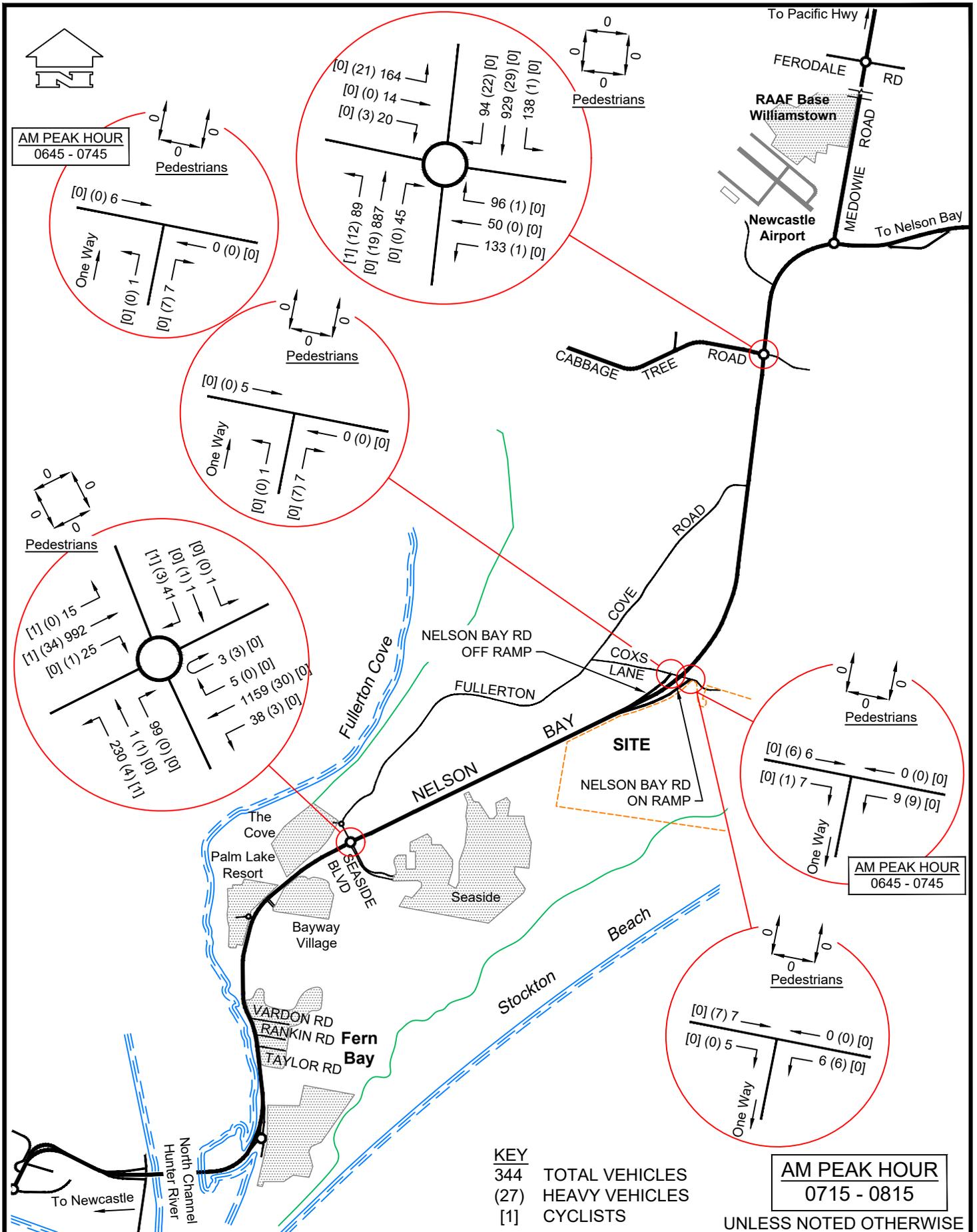
Figure 9 shows the existing traffic volumes using the intersections during the PM peak hour. Reference to **Figure 9** shows the following.

For the roundabout intersections of Nelson Bay Road with Cabbage Tree Road/Lavis Lane and with Seaside Boulevard/Fullerton Cove Road, the PM peak hour occurred between 4.00pm – 5.00pm.

For the Coxs Lane intersections with the on and off ramps to/from Nelson Bay Road, the PM peak occurred between 3.00pm to 4.00pm. The traffic volumes using the Coxs Lane intersections are very low in PM peak hour and number less than 20 vph at both intersections.

At the Cabbage Tree Road roundabout approach vehicles in Cabbage Tree Road and Lavis Lane in the PM peak hour using the roundabout number 145 vph and 230 vph respectively. The approach volumes in the northern and southern approaches of Nelson Bay Road at this roundabout number 1366 vph and 1116 vph, respectively.

The approach volumes in Seaside Boulevard and in Fullerton Cove Road at the roundabout intersection with Nelson Bay Road in the PM peak hour number 102 vph and 37 vph respectively. The approach volumes in Nelson Bay Road in the northern and southern approaches of this roundabout number 1293 vph and 1254 vph.



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FIGURE 8

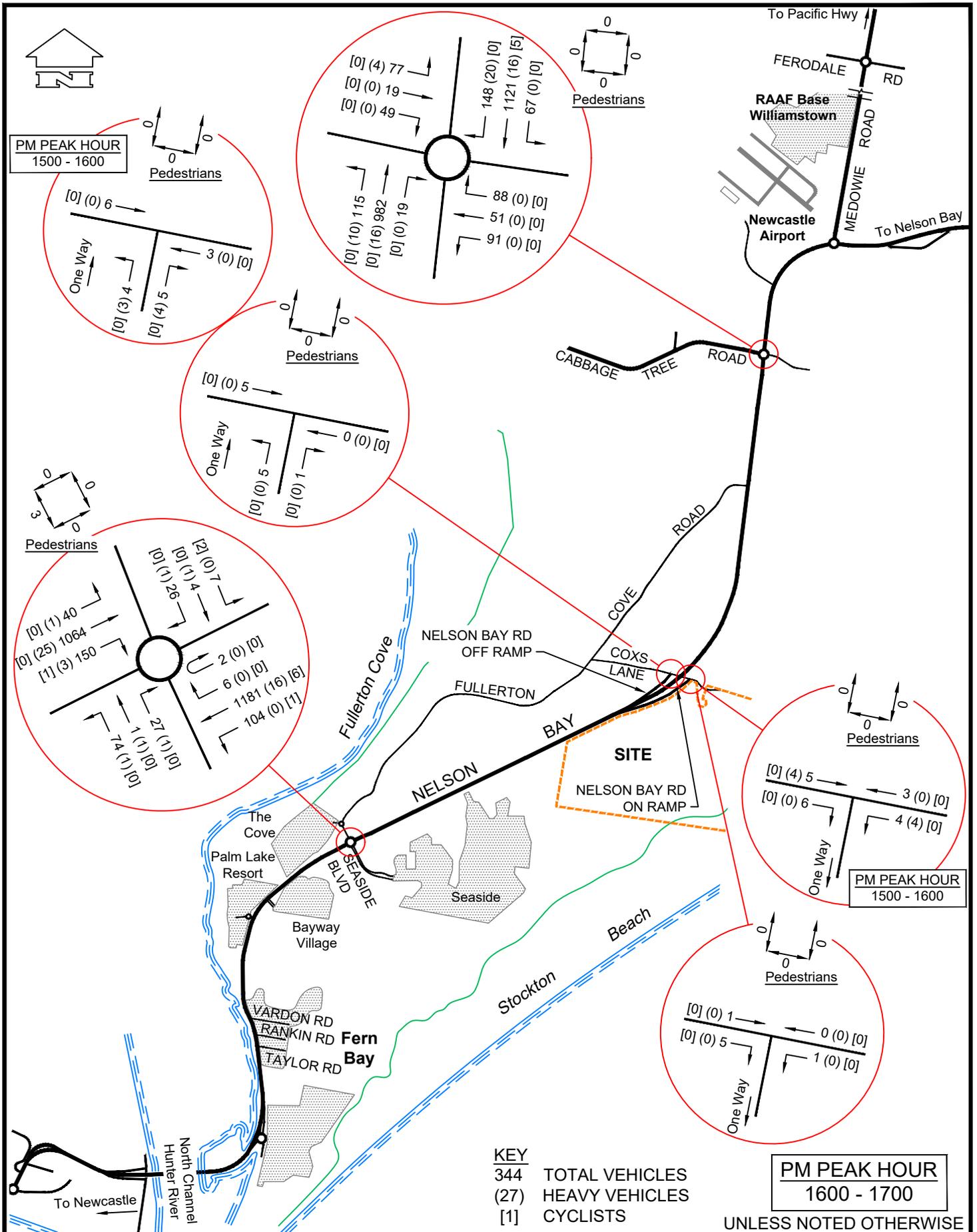
STOCKTON SAND QUARRY

EXISTING AM PEAK HOUR TRAFFIC VOLUMES

**NELSON BAY RD & SEASIDE BLVD; NELSON BAY RD
NORTHBOUND ON & OFF RAMP & COX'S LANE; NELSON
BAY RD & CABBAGE TREE RD**

JOB NO.17139

01/07/19



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FIGURE 9

STOCKTON SAND QUARRY
EXISTING PM PEAK HOUR TRAFFIC VOLUMES
NELSON BAY RD & SEASIDE BLVD; NELSON BAY RD
NORTHBOUND ON & OFF RAMP & COX'S LANE; NELSON
BAY RD & CABBAGE TREE RD

JOB NO.17139

01/07/19

4.3.4 Traffic Conditions on the Road Network

As part of the review of traffic conditions on the road network, the operational capacity of the principal intersections on the road network has been assessed using the SIDRA 8 traffic model.

SIDRA is a suitable model to assess the operational performance of intersections. Criteria for interpreting an intersections operation are Level of Service (LS), Degree of Saturation (DS) and Average Vehicle Delay (AVD). For intersections under Priority/Stop Sign control and Roundabout Control, Average Vehicle Delay for Individual Movements (HMD) is relevant.

Table 4.2 below is reproduced from the RTA's Guide to Traffic Generation Developments (October 2002) and provides an explanation of the various levels of service for intersections.

A Level of Service D or better (i.e. A, B, C or D) is generally considered to be minimum design requirement for intersections. The level of service for intersections controlled by Give Way/Stop Signs or under Roundabout Control is determined from the movement with highest average vehicle delay (HMD). For intersections controlled by traffic signals the level of service is determined by the Average Vehicle Delay for all vehicles using the intersection (AVD).

TABLE 4.2

LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Intersection is oversaturated	Oversaturated, requires other control mode

SIDRA models have been developed for the existing conditions in the AM and PM peak hours using the traffic volumes shown on **Figures 8** and **9** and the existing traffic management at the intersections and calibrated against observed traffic conditions at the intersections.

The results of the modelling are shown in Tables 4.3 to 4.6 and that;

- The principal intersections used by the Boral trucks namely the Coxs Lane Off and On Ramp intersections (Tables 4.3 and 4.4) and the two roundabout intersections of Nelson Bay Road/Cabbage Tree/Lavis Lane (Table 4.5) and Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road (Table 4.6) all operate at a very good level of service with a Level of Service A operation in the AM and PM peak hours with low vehicle delays.

Traffic conditions at these intersections, as well as on the road network are considered to be satisfactory.

Extracts of the SIDRA traffic modelling outputs are contained in Appendix 1.

TABLE 4.3

SIDRA MODELLING RESULTS FOR COXS LANE/OFF RAMP INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Off Ramp One Way								
Left	0.009	5.5	A	0.3	0.009	6.4	A	0.4
Right	0.009	6.2	A	0.3	0.009	6.6	A	0.4
East Coxs Lane								
Left	-	-	-	-	-	-	-	-
Through	0.001	0.0	A	0.0	0.002	0.0	A	0.0
West Coxs Lane								
Through	0.002	0.0	A	0.0	0.003	0.0	A	0.0
Right	-	-	-	-	-	-	-	-
TOTAL - All Vehicles	0.009	3.5	A	0.3	0.009	3.3	A	0.4

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 4.4

**SIDRA MODELLING RESULTS FOR COXS LANE/ON RAMP INTERSECTION IN
WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS –
PRIORITY CONTROL**

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South On Ramp One Way								
Left	-	-	-	-	-	-	-	-
Right	-	-	-	-	-	-	-	-
East Coxs Lane								
Left	0.006	6.1	A	0.0	0.005	6.1	A	0.0
Through	0.006	0.0	A	0.0	0.005	0.0	A	0.0
West Coxs Lane								
Through	0.008	0.0	A	0.2	0.006	0.0	A	0.2
Right	0.008	5.5	A	0.2	0.006	5.5	A	0.2
TOTAL - All Vehicles	0.008	3.4	A	0.2	0.006	3.2	A	0.2

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 4.5

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/CABBAGE TREE ROAD/LAVIS LANE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS FOR EXISTING CONDITIONS – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Nelson Bay Road								
Left	0.400	6.5	A	19.0	0.449	6.7	A	21.7
Through	0.400	6.6	A	19.0	0.449	6.9	A	21.7
Right	0.400	13.6	A	17.7	0.449	13.9	A	20.4
East Lavis Lane								
Left	0.341	6.8	A	11.8	0.323	7.8	A	11.4
Through	0.341	6.6	A	11.8	0.323	7.6	A	11.4
Right	0.341	13.2	A	11.8	0.323	14.2	A	11.4
North Nelson Bay Road								
Left	0.285	5.6	A	10.2	0.329	5.6	A	13.3
Through	0.509	5.9	A	25.4	0.588	5.9	A	35.6
Right	0.509	13.1	A	25.4	0.588	13.0	A	35.6
West Cabbage Tree Road								
Left	0.176	5.6	A	7.2	0.082	5.4	A	2.9
Through	0.054	6.0	A	1.8	0.092	5.7	A	2.8
Right	0.054	13.2	A	1.8	0.092	12.3	A	2.8
TOTAL - All Vehicles	0.509	6.9	A	25.4	0.588	7.2	A	35.6

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 4.6

**SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/SEASIDE
BOULEVARD/FULLERTON COVE ROAD INTERSECTION IN WEEKDAY AM AND
PM PEAK HOURS FOR EXISTING CONDITIONS – ROUNDABOUT CONTROL**

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Nelson Bay Road								
Left	0.285	4.8	A	12.1	0.312	4.5	A	13.7
Through	0.447	5.0	A	24.1	0.490	4.6	A	28.0
Right	0.447	11.5	A	24.1	0.490	11.2	A	28.0
East Seaside Boulevard								
Left	0.236	6.6	A	8.9	0.083	6.5	A	3.2
Through	0.139	10.5	A	4.4	0.045	10.5	A	1.7
Right	0.139	13.4	A	4.4	0.045	13.5	A	1.7
North Nelson Bay Road								
Left	0.266	4.8	A	10.1	0.314	5.4	A	11.3
Through	0.544	4.8	A	30.8	0.643	5.5	A	36.7
Right	0.544	11.3	A	30.8	0.643	12.1	A	36.7
U-turn	0.544	13.1	A	30.8	0.643	13.0	A	36.7
West Fullerton Cove Road								
Left	0.060	6.5	A	2.1	0.054	6.9	A	1.8
Through	0.060	6.5	A	2.1	0.054	7.8	A	1.8
Right	0.060	13.1	A	2.1	0.054	13.4	A	1.8
TOTAL - All Vehicles	0.544	5.6	A	30.8	0.643	5.7	A	36.7

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

4.4 Road Safety

4.4.1 Crash Statistics

Road crash data was obtained from the RMS for the section of Nelson Bay Road between Cabbage Tree Road at Williamtown and Fullerton Street at Fern Bay.

The review of the RMS crash data for the 3 year period between 1 July 2015 and 30 June 2018 shows that there was a total of 21 crashes in the section of Nelson Bay Road between Cabbage Tree Road and Fullerton Street, including at the intersections in this section.

Twelve (12) of the crashes were casualty crashes and nine (9) non casualty crashes.

Seven (7) of the crashes occurred at or near the Nelson Bay Road/Cabbage Tree/Lavis Lane roundabout, three (3) of which were casualty crashes. There were a combination of different crash types including rear end, side swipe, same direction, right/through and right/far with no treatable pattern.

Five (5) crashes occurred at or near the Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road roundabout, three (3) of which were casualty crashes. Crash types included rear end (3 crashes), off road and adjacent direction crashes, with no treatable pattern at the intersection.

The remainder of the crashes were spread along the 9.5km length of Nelson Bay Road and included two pedestrian crashes at different locations, rear end and run off road crashes.

One (1) of the pedestrian crashes was a fatal crash and involved an elderly pedestrian walking along Nelson Bay Road at night facing traffic, 1.6kms north of Seaside Boulevard. The other pedestrian crash involved a pedestrian crossing Nelson Bay Road 600 metres north of Vardon Road (adjacent a bus stop), at night.

An examination of the crash types and locational spread of the crashes indicates that there is no treatable pattern that could be addressed by specific remedial measures.

4.4.2 Road Safety Audit

A Stage 5 Road Safety audit, which is an audit of the existing roads, was undertaken on the section of Nelson Bay Road between Cabbage Tree Road at Williamstown and Fullerton Street, Fern Bay. The audit was undertaken on the existing road and traffic management along the route. The purpose of the audit was to examine the features of the existing road network which may affect road user safety and identify potential safety hazards.

The audit examined the existing road alignment, cross sections, road shoulders, intersections, delineation/signage, bridges and culverts, pavement, provision for heavy vehicles and other miscellaneous matters and assessed these against current road practice guidelines and standards, with the objective of identifying any real or potential road safety hazards.

While not normally part of a road safety audit, the most recent 3 year crash statistics for the route were also analysed.

The audit findings identified a number of minor maintenance issues along the route. The audit did not identify any specific road safety issues that required follow up.

A separate road safety audit report has been prepared and is presented as Volume 2.

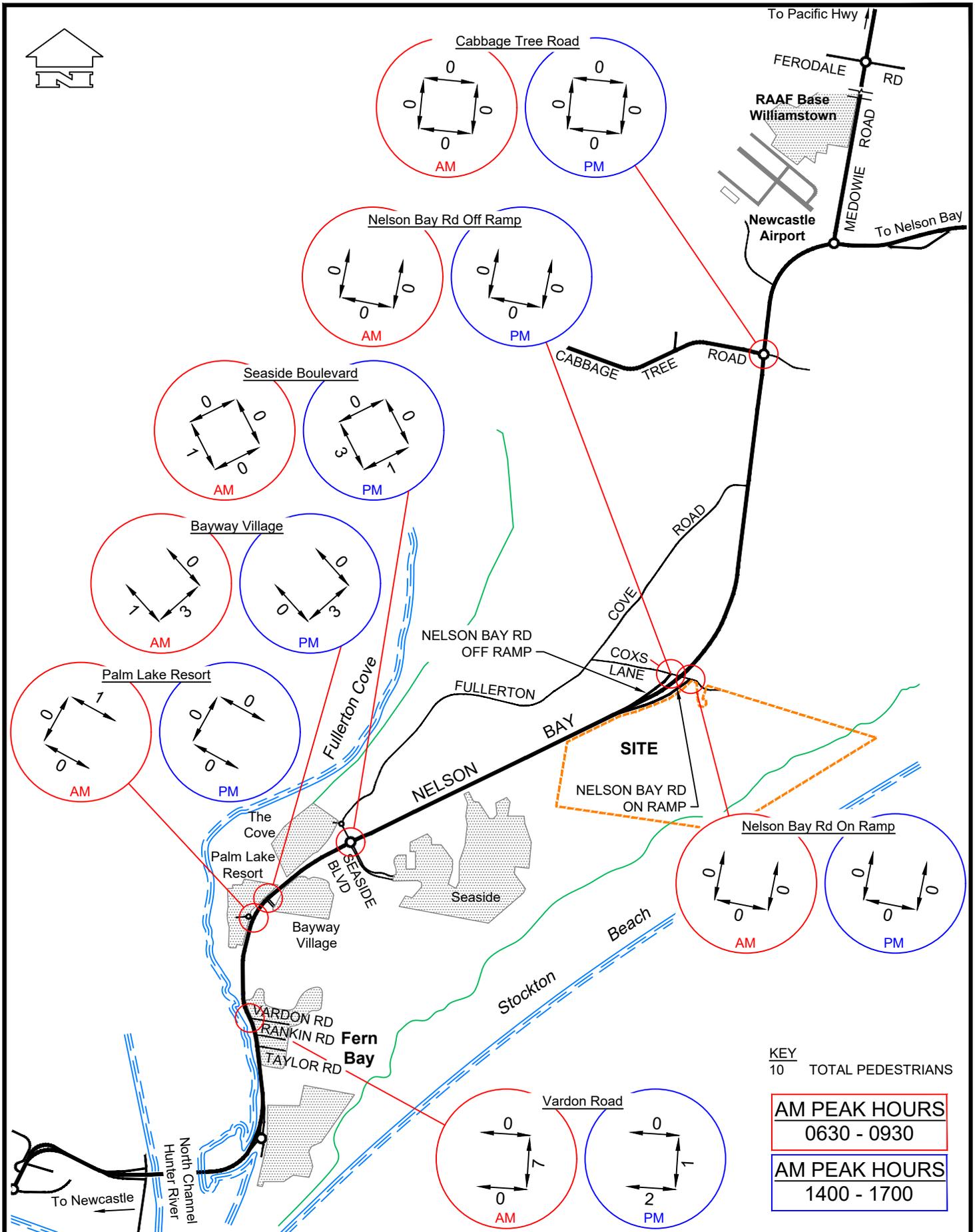
4.5 Pedestrians and Cyclists

The frontage development of Nelson Bay Road between Cabbage Tree Road and Seaside Boulevard does not generate pedestrian activity. The development, south of Seaside Boulevard, generates small amounts of pedestrian activity associated with people going to and from bus stops.

There are no formal pedestrian crossing facilities along Nelson Bay Road between Cabbage Tree Road at Williamstown and Fullerton Street at Fern Bay.

The traffic counts undertaken for weekday AM and PM periods showed only minimal pedestrian activity crossing Nelson Bay Road at/near any of the intersections. **Figure 10** shows the pedestrian crossing volumes.

All of the pedestrian crossing movements are located in the section of Nelson Bay Road south of Seaside Boulevard. The pedestrian volumes shown in **Figure 10** are



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FIGURE 10

STOCKTON SAND QUARRY

**EXISTING AM & PM PEAK 3 HOUR
PEDESTRIAN VOLUMES**

for the 3 hour AM and PM periods between 6.30am – 9.30am and 2.00pm – 5.00pm on a weekday.

The sealed road shoulders of Nelson Bay Road have sufficient room for cyclists to use. Recent channelisation work at the Palm Lake Resort Access Road provides a cyclist lane as part of the channelisation. The roundabout at Seaside Boulevard/Fullerton Cove Road also provides for cyclists with off path crossing opportunities.

The bridge over Coxs Lane in Nelson Bay Road is a pinch point for cyclists.

Port Stephens Council is proposing a future shared path along Fullerton Cove Road from Seaside Boulevard and rejoining Nelson Bay Road south of Cabbage Tree Road, which would be an alternative route to the section of Nelson Bay Road, adjacent Cox Lane.

The weekday AM and PM traffic counts indicates that small numbers of cyclists use sections of Nelson Bay Road.

4.6 Buses

Several bus routes use Nelson Bay Road including routes 131, 132, 136 and 138.

The 136 and 138 services use the section of Nelson Bay Road, south of Seaside Boulevard and at the section north of Fullerton Cove Road (north intersection) and have a number of bus stops south of Seaside Boulevard.

The 130 and 131 services have one stop in Nelson Bay Road which is the Bayway Village, south of Seaside Boulevard.

Pull off areas and bus bays are provided in sections of Nelson Bay Road between Fullerton Street and Seaside Boulevard.

4.7 Planned Road Upgrades

The NSW Government has undertaken recent road upgrades in Nelson Bay Road at Williamtown and is currently undertaking additional works to upgrade the Nelson Bay Corridor, north of Williamtown by way of intersection upgrades and widening to accommodate a four lane road in Nelson Bay Road for these works. Some \$275 million is budgeted. This includes duplicating the road from Williamtown to Bobs Farm, together with the early intersection upgrades to Nelson Bay Road/Medowie Road and Nelson Bay Road and Lemon Tree Passage Road.

The section of Nelson Bay Road south of Cabbage Tree Road to Fern Bay which includes Coxs Lane is currently in the planning stages, so no details are available at this time regarding the future upgrading works in this section.

As noted in Section 4.1 recent road upgrades have been completed for the Tourle Street/Cormorant Road route and the Tourle Street/Industrial Drive intersection is currently being upgraded by the NSW government.

Other works planned in Nelson Bay Road is for a new northern intersection from the Fern Bay Seaside Village residential subdivision. This intersection which will be left in/left out at Nelson Bay Road is located between Seaside Boulevard and Coxs Lane. Further details are contained in Section 4.8.

4.8 Recent Approved Land Uses Adjacent Stockton Quarry

4.8.1 Quarries

Recent approvals to other quarries in the general area to Stockton Quarry are listed below.

Fullerton Cove Quarry

This sand quarry is located off Coxs Lane west of Nelson Bay Road at Fullerton Cove. Its most recent modification was to extend the quarry's operation for another 4 years to June 2020. Transport is limited to 20 laden trucks from the site per hour when averaged over a working week.

These trucks use Coxs Lane and Nelson Bay Road when accessing the quarry.

The traffic counts undertaken on the road network during 4-10 December 2019 would have captured the traffic generation of this quarry.

Maccas Sand Quarry

Maccas Sand Quarry is located at Lot 218 Nelson Bay Road, Salt Ash which is located 3.5km north of the Nelson Bay Road/Medowie Road roundabout.

The quarry's most recent modification (Modification 2 dated 15 March 2016) permits the following product transport during the weekday peak hours.

- AM (6am – 9am) – 8 laden trucks; and
- PM (9am – 10pm) – 24 laden trucks.

The traffic counts undertaken on the road network during 4-10 December 2019 would have captured the traffic generation of this quarry.

Cabbage Tree Quarry

This future quarry is located at 282 Cabbage Tree Road, Williamtown, which is located some 4 km west of the Nelson Bay Road intersection with Cabbage Tree Road.

The quarry is yet to be developed (i.e. currently not in operation). The quarry Traffic Impact Assessment (TIA) report by Intersect Traffic dated October 2015 identified the following traffic generation.

- AM peak hour (7am – 9am) – 20 truck movements i.e. 10 in/10 out; and
- PM peak hour (4pm – 5pm) – 20 truck movements i.e. 10 in/10 out.

(NB. 5pm – 6pm period has an additional 6 employee light vehicle trips).

The proposed site entrance will be restricted to left in/left out restrictions and the TIA identified the following additional truck movements at the Cabbage Tree Road/Nelson Bay Road/Lavis Lane roundabout in the AM and PM peak hours.

- 3 trucks turning right from Cabbage Tree Road to Nelson Bay Road to travel south; and

- 7 eastbound trucks in Cabbage Tree Road U-turning at the roundabout to travel west.

Salt Ash Quarry

Salt Ash Quarry is an existing quarry and is located off Janet Parade approximately 1.9km north of Lemon Tree Passage Road, Salt Ash. Its current operation is 3 laden trucks per hour.

Modification 4 approved 10/10/2018 requires the upgrading of the Janet Parade/Nelson Bay Road intersection and allows for 4 laden trucks per hour.

While this quarry is located 12.7km north of Stockton Quarry its existing traffic generation would have been captured in the traffic counts of 4-10 December 2018.

4.8.2 Fern Bay Seaside Village

Fern Bay Seaside Village is located to the south of Stockton Quarry and is accessed via Seaside Boulevard from Nelson Bay Road.

Its current consent and most recent modification, approved on 30 April 2019, allows up to 411 lots, including 370 residential lots, 38 super lots, 2 commercial lots and one (1) community lot.

The subdivision is currently around 80% completed and occupied.

As noted above its main access road is via Seaside Boulevard from Nelson Bay Road. A northern access intersection with left in and left out restrictions is to be constructed in Nelson Bay Road, some 1.14km north of the Seaside Boulevard intersection. This new intersection will be approximately 2.2km south of Coxs Lane.

The timing of this new intersection is expected to be in late 2019 or early in 2020.

5.0 ASSESSMENT OF TRAFFIC IMPACTS OF PROJECT

5.1 Traffic Increases

While there will be a small increase in light vehicles attending the quarry site as well as in the number of fuel and maintenance vehicles with the Project, the largest increase will be in product transport vehicles (heavy vehicles) associated with the additional 250,000 tonnes of sand product until 2028.

VENM importation of 70,000tpa will also increase heavy vehicle movements entering and exiting the quarry.

5.2 Increase in Heavy Vehicle Movements with Project

Currently the highest traffic generation of the quarry occurs on weekdays and this is expected to continue with the Project, given that on Saturdays the quarry normally operates for half a day and on some Saturdays there is no sand product transportation.

Table 5.1 and 5.2 shows the increase in heavy vehicle trips generated by the quarry with the Project for an average weekday and the maximum day, respectively until 2028.

For the average weekday shown in Table 5.1 it is assumed that limited sand product transport occurs on Saturdays, with an average of 10 truck loads for the existing operations and 20 truck loads with the Project on Saturdays.

Reference to Table 5.1 shows that the increase in two way heavy vehicles on an average weekday with the Project until 2028, is estimated as 84 two way heavy vehicle trips (i.e. 42 in/42 out).

On a maximum day (Table 5.2) the increase in two way heavy vehicles with the Project until 2028, is estimated as 132 two way heavy vehicle trips (i.e. 66 in/66 out).

TABLE 5.1

HEAVY VEHICLE MOVEMENTS ON AN AVERAGE WEEKDAY UNTIL 2028

	Existing 500,000tpa		Project 750,000tpa		Increase	
	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips
Product Transport	58	116	86	172	+28	+56
VENM Importation	-	-	14	28	+14	+28
Total	58	116	100	200	+42	+84

TABLE 5.2

HEAVY VEHICLE MOVEMENTS ON MAXIMUM DAY UNTIL 2028

	Existing 500,000tpa		Project 750,000tpa		Increase	
	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips
Product Transport	76	152	114	228	+38	+76
VENM Importation	-	-	28	56	+28	+56
Total	76	152	142	284	+66	+132

After 2028, sand product transport reduces to 500,000tpa which is the same as the existing consent and the only increase will be the importation of the VENM.

Tables 5.3. and 5.4 show the increase in heavy vehicle trips generated by the quarry with the Project after 2028 for an average weekday and maximum day, respectively.

When compared to the existing development consent (DA 140-5-2006), the increases in heavy vehicle trips, after 2028, are estimated as

- 28 two way heavy vehicle trips (14/ in/14 out) on an average day; and
- 56 two way heavy vehicle trips (28 in/28 out) on a maximum day

TABLE 5.3

HEAVY VEHICLE MOVEMENTS ON AN AVERAGE WEEKDAY AFTER 2028

	Existing 500,000tpa		Project 500,000tpa		Increase	
	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips
Product Transport	58	116	58	116	-	-
VENM Importation	-	-	14	28	+14	+28
Total	58	116	72	144	+14	+28

TABLE 5.4

HEAVY VEHICLE MOVEMENTS ON MAXIMUM DAY AFTER 2028

	Existing 500,000tpa		Project 500,000tpa		Increase	
	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips	Truck Loads	Two Way Trips
Product Transport	76	152	76	152	-	-
VENM Importation	-	-	28	56	+28	+56
Total	76	152	104	208	+28	+56

5.3 Assessment of Traffic Impacts

5.3.1 Impact on the Road Network

Before 2028

As noted in Table 5.1 total sand product and VENM trucks will number 200 two way truck movements based on 100 truck loads on an average weekday under the Project. When assigned to the road network sand product and VENM trucks on an average weekday will number:

- 110 two way truck movements in Nelson Bay Road north of Coxs Lane, which is an increase of 46 truck movements from an average day under the existing development consent.
- 310 two way truck movements in Nelson Bay Road, south of Coxs Lane. This figure is higher due to the required U-turn at the roundabout intersection in Nelson Bay Road at Seaside Boulevard, for those trucks traveling to and from the north and

north west. This will be an increase of 130 two way truck movements from an average day under the existing development consent.

- 90 two way truck movements in Nelson Bay Road south of Seaside Boulevard. This will be an increase of 38 two way truck movements from an average weekday under the existing development consent.
- 100 two way truck movements in Cabbage Tree Road, which is an increase of 42 two way truck movements from an average weekday under the existing development consent.
- 10 two way truck movements in Nelson Bay Road north of Cabbage Tree Road, which is an increase of 2 two way truck movements from an average weekday under the existing development consent.

Boral's sand product and VENM trucks will represent a small proportion of total vehicles using the road network on an average weekday, as detailed below:

- Nelson Bay Road, north of Coxs Lane – 0.47% of total weekday volumes and 6.8% of heavy vehicles.
- Nelson Bay Road, south of Coxs Lane – 1.35% of total weekday volumes and 17.1% of heavy vehicles.
- Nelson Bay Road, south of Seaside Boulevard – 0.34% of total weekday volumes and 6.2% of heavy vehicles.
- Cabbage Tree Road, west of Nelson Bay Road – 0.91% of total weekday volumes and 8.1% of heavy vehicles.

Sand product and VENM truck volumes on a maximum day will be higher, with a total of 284 two way truck movements (i.e. 142 truck loads) generated on maximum days. However maximum days are only expected to occur on approximately 5% of transport days, and typically when Boral is supplying major works/contracts.

After 2028

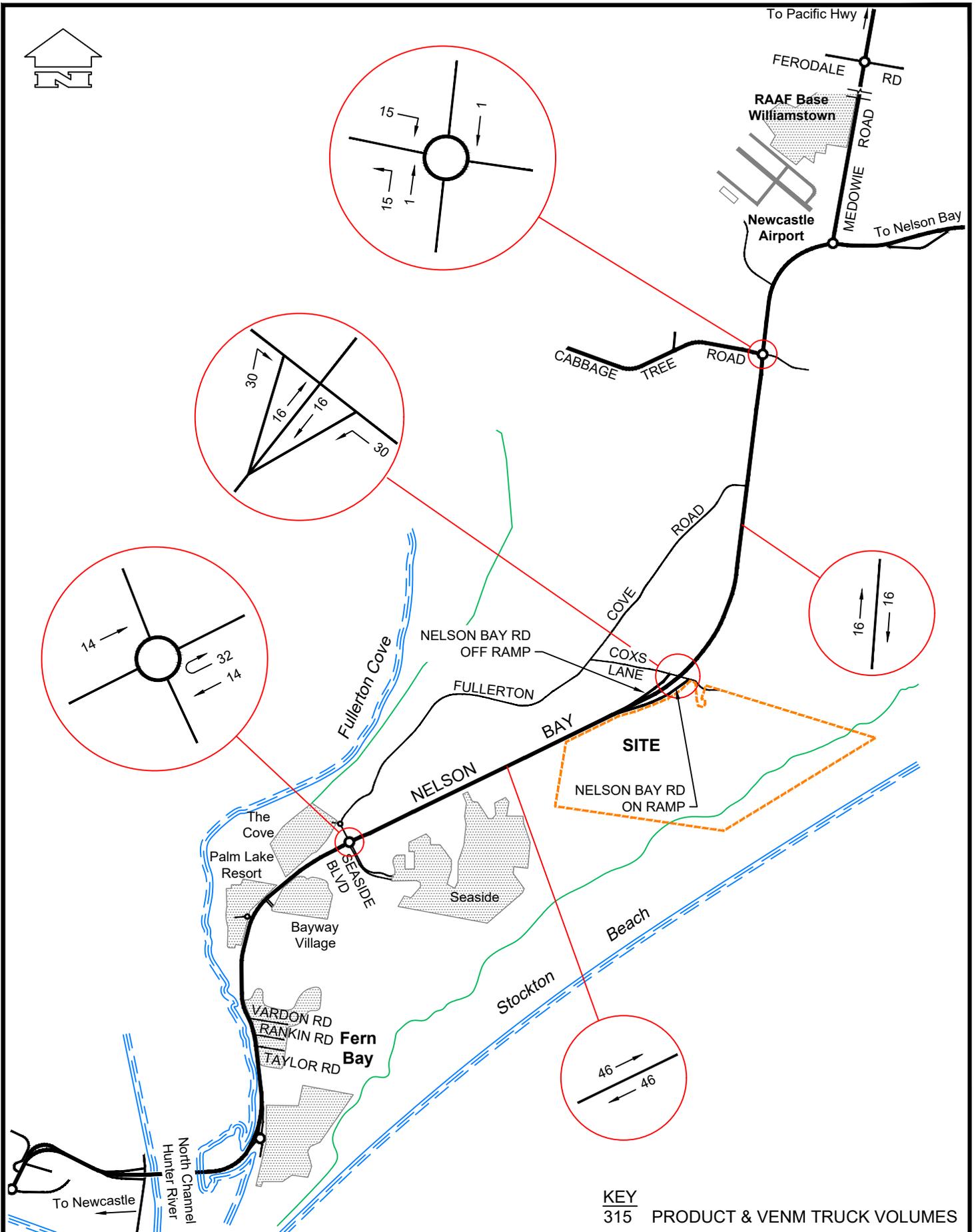
After 2028 the quarry will generate a lower volume of sand product trucks and the only increase, when compared to the existing development consent, will be 28 two way heavy vehicle movements (14 in/14 out) on an average day and up to 56 two way truck movements (28 in/28 out) on a maximum day.

These trucks will be spread over the road network.

5.3.2 Impact on Principal Intersections

The Project during the maximum one hour is expected to generate 30 inbound heavy vehicle trips and 30 outbound heavy vehicle trips associated with product transport and VENM importation (60 two way heavy vehicle trips).

Figure 11 shows the truck movements assigned to the road network based on the traffic assignment outlined in Section 3.7 with 45% to and from the south along Nelson Bay Road, 50% to the north west via Cabbage Tree Road and 5% to and from the north via Nelson Bay Road and Medowie Road.



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FIGURE 11
STOCKTON SAND QUARRY
**PRODUCT & VENM TRUCK VOLUMES
IN MAXIMUM HOUR**

To examine the impact at the principal intersections of the additional traffic from the Project during the weekday AM and PM peak hour, SIDRA traffic modelling has been undertaken.

The modelling has adopted the maximum hour traffic volumes (**Figure 11**) overlaid onto the existing AM and PM peak hours, shown in **Figures 8 and 9**.

The results of the modelling are shown in Tables 5.5 to 5.8.

Reference to Tables 5.5 and 5.6 shows that the Coxs Lane/Off Ramp and Cox Lane/On Ramp intersection will continue to operate at a very good level of service (Level of Service A operation) with low vehicle delays, with the Project.

Reference to Tables 5.7 and 5.8 which shows the modelling results for the roundabout intersections of Nelson Bay Road/Cabbage Tree Road/Lavis Lane (Table 5.7) and Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road (Table 5.8) shows that both these intersections will also continue to operate a very good level of service (Level of Service A operation) with low vehicle delays, with the Project.

This indicates that the additional traffic from the Project will have satisfactory traffic impacts on these intersections.

Extracts of the SIDRA traffic modelling outputs are contained in Appendix 1.

TABLE 5.5

SIDRA MODELLING RESULTS FOR COXS LANE/OFF RAMP INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Off Ramp One Way								
Left	0.036	5.5	A	1.5	0.040	6.4	A	1.6
Right	0.036	6.2	A	1.5	0.040	6.8	A	1.6
East Coxs Lane								
Left	-	-	-	-	-	-	-	-
Through	0.001	0.0	A	0.0	0.002	0.0	A	0.0
West Coxs Lane								
Through	0.002	0.0	A	0.0	0.003	0.0	A	0.0
Right	-	-	-	-	-	-	-	-
TOTAL - All Vehicles	0.036	5.2	A	1.5	0.040	5.4	A	1.6

Where: DS - Degree of Saturation
 AVD - Average Vehicle Delay in Seconds
 LS - Level of Service
 95th% Queue Length - 95th% Queue Length in Metres

TABLE 5.6

SIDRA MODELLING RESULTS FOR COXS LANE/ON RAMP INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South On Ramp One Way								
Left	-	-	-	-	-	-	-	-
Right	-	-	-	-	-	-	-	-
East Coxs Lane								
Left	0.027	6.1	A	0.0	0.027	6.1	A	0.0
Through	0.027	0.0	A	0.0	0.027	0.0	A	0.0
West Coxs Lane								
Through	0.026	0.0	A	0.3	0.026	0.0	A	0.4
Right	0.026	5.6	A	0.3	0.026	5.6	A	0.4
TOTAL - All Vehicles	0.027	3.2	A	0.3	0.027	3.1	A	0.4

Where: DS - Degree of Saturation
 AVD - Average Vehicle Delay in Seconds
 LS - Level of Service
 95th% Queue Length - 95th% Queue Length in Metres

TABLE 5.7

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/CABBAGE TREE ROAD/LAVIS LANE INTERSECTION IN WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Nelson Bay Road								
Left	0.409	6.8	A	20.6	0.458	6.9	A	23.5
Through	0.409	6.6	A	20.6	0.458	6.9	A	23.5
Right	0.409	13.6	A	18.4	0.458	13.9	A	21.1
East Lavis Lane								
Left	0.349	7.0	A	12.5	0.334	8.1	A	12.2
Through	0.349	6.8	A	12.5	0.334	7.9	A	12.2
Right	0.349	13.4	A	12.5	0.334	14.5	A	12.2
North Nelson Bay Road								
Left	0.292	5.7	A	10.7	0.337	5.7	A	13.7
Through	0.522	6.0	A	26.8	0.337	6.0	A	37.0
Right	0.522	13.2	A	26.8	0.603	13.2	A	37.0
West Cabbage Tree Road								
Left	0.177	5.6	A	7.3	0.108	6.2	A	3.6
Through	0.091	6.0	A	4.5	0.095	5.0	A	4.2
Right	0.091	14.9	A	4.5	0.095	12.2	A	4.2
TOTAL - All Vehicles	0.522	7.0	A	26.8	0.603	7.3	A	37.0

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 5.8

**SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/SEASIDE
BOULEVARD/FULLERTON COVE ROAD INTERSECTION IN WEEKDAY AM AND
PM PEAK HOURS WITH PROJECT – ROUNDABOUT CONTROL**

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Nelson Bay Road								
Left	0.301	5.1	A	12.7	0.336	4.8	A	14.3
Through	0.472	5.2	A	25.2	0.528	4.9	A	29.6
Right	0.472	11.7	A	25.2	0.528	11.4	A	29.6
East Seaside Boulevard								
Left	0.245	6.9	A	9.4	0.089	6.8	A	3.5
Through	0.144	11.0	A	4.6	0.048	11.0	A	1.8
Right	0.144	13.7	A	4.6	0.048	13.9	A	1.8
North Nelson Bay Road								
Left	0.279	4.8	A	10.9	0.332	5.4	A	12.5
Through	0.571	4.8	A	35.1	0.679	5.6	A	43.7
Right	0.571	13.2	A	35.1	0.679	12.1	A	43.7
U-turn	0.571	13.2	A	35.1	0.679	15.1	A	43.7
West Fullerton Cove Road								
Left	0.063	6.8	A	2.3	0.059	7.3	A	2.1
Through	0.063	6.8	A	2.3	0.059	8.2	A	2.1
Right	0.063	13.4	A	2.3	0.059	13.8	A	2.1
TOTAL - All Vehicles	0.571	5.8	A	35.1	0.679	6.0	A	43.7

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

5.3.3 Impact on Saturdays

Normal hours of operation on Saturdays are 6.15am to 12 noon and product transport is lower than for weekdays. This is expected to continue under the Project.

During major supply contracts Boral can extend the hours of operation and operate between 6.15am to 3.00pm which would increase the product transport on such days.

Daily traffic volumes using the road network adjacent Stockton Quarry on Saturdays are significantly lower than for weekdays, based on the traffic counts undertaken between 4-10 December 2018.

In this regard Saturday's traffic volumes in Nelson Bay Road near the quarry are between 29% - 34% lower on Saturdays compared to weekdays.

In Cabbage Tree Road, west of Nelson Bay Road, Saturday traffic volumes are 21% lower than weekday traffic volumes.

Therefore, the impacts on the road network of higher product transport on Saturdays would be less than what occurs on weekdays, due to the lower traffic volumes using the road network.

5.4 Assessment of Cumulative Impacts

As part of the SEARs the cumulative impacts for a future 10 year time frame are required to be examined.

Section 4.8 detailed recently approved developments and or changes to approved developments which may impact on future traffic volumes using the road network.

There has been considerable traffic growth in Nelson Bay Road over the last 10 years due to the level of new development in the area, and the historical traffic growth is a good indication of the likely future traffic growth.

The RMS traffic counting station in Nelson Bay Road, 310 metres east of Greenleaf Road on Stockton Bridge (Station ID 05962) shows that between 2008 and 2018 there was a 24% increase in daily traffic volumes using Nelson Bay Road in this 10 year period. The RMS counting station (ID 05191) which is located in Nelson Bay Road, 70 metres north of Moxley Close, Williamstown shows that for the 8 year period between 2008 and 2016 the traffic growth in daily traffic volumes was 20.2%, which is similar to the growth at the Stockton Bridge counting station.

Adopting this growth rate (i.e. a lineal increase of 2.4% per year) in Nelson Bay Road and at the principal intersections, will account for the future traffic growth associated with development in the area, including the remainder of the Fern Bay Seaside Village.

Future 2029 traffic volumes using the principal intersections in Nelson Bay Road adjacent the quarry have been calculated based on the 2.4% lineal increase per year.

As the Cabbage Tree Quarry is not operating as yet, the traffic volumes as described in Section 4.8 for this quarry, have been added at the Nelson Bay Road/Cabbage Tree Road/Lavis Lane roundabout.

The proposed new northern left in/left out intersection in Nelson Bay Road associated with Fern Bay's Seaside Village should be operating in 2029. However, the calculation of the 2029 base case volumes at the Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road intersection has assumed, that all access to the subdivision will be via this roundabout intersection (i.e. no or limited use of the northern intersection). This will ensure a conservative or worse case is modelled for the roundabout.

The operation of the principal intersections in 2029 for the base case and with the additional traffic from the Project in the maximum hour, has been modelled using the SIDRA model. It is assumed that the traffic generation of the maximum hour for the Project will be the same for the life of the Project (i.e. before and after 2028).

The results of the modelling for the AM and PM peak hours in 2029 with the base case volumes, as well as with the Project, are shown in Tables 5.9 to 5.16.

Reference to Tables 5.9 to 5.12 which show the operation of the Coxs Lane/Off Ramp and Coxs Lane/On Ramp show that these intersections in 2029 with and without the Project will continue to operate a Level of Service A operation with very low vehicle delays. This indicates that the very good level of service will be maintained at these intersections in 2029, with the Project in place.

Tables 5.13 and 5.14 show the modelling results in 2029 with and without the Project, for the roundabout intersection of Nelson Bay Road/Cabbage Tree Road/Lavis Lane. Reference to these tables indicates that the intersection will retain a good operation with a Level of Service A operation, with little difference in terms of vehicle delay due to the Project's traffic volumes. The increase in the total average vehicle delay due to the Project will be 0.2 seconds in the AM peak hour and 1.0 second in the PM peak hour, which is a very small increase.

Tables 5.15 and 5.16 show the modelling results for 2029 with and without the Project for the roundabout intersection of Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road. Reference to these tables indicates that the intersection will retain a Level of Service A operation with relatively low total average vehicle delays. The increase in the total average vehicle delay in 2029 due to the Project will be 0.3 seconds per vehicle in the AM peak hour and 0.8 seconds per vehicle in the PM peak hour, which is a very small increase.

Most of the increase in vehicle delay in 2029 as compared to 2019 conditions will be due to the growth in the background traffic at both the above roundabout intersections.

In summary, the assessment of the cumulative impacts at the principal intersections adjacent the quarry indicates that the cumulative impacts in the year 2029 will be satisfactory.

Extracts of the SIDRA traffic modelling outputs are contained in Appendix 1.

TABLE 5.9

SIDRA MODELLING RESULTS FOR COXS LANE/OFF RAMP INTERSECTION IN 2029 WEEKDAY AM AND PM PEAK HOURS BASE – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Off Ramp One Way								
Left	0.012	5.5	A	0.5	0.014	6.3	A	0.6
Right	0.012	6.2	A	0.5	0.014	6.7	A	0.6
East Coxs Lane								
Left	-	-	-	-	-	-	-	-
Through	0.001	0.0	A	0.0	0.003	0.0	A	0.0
West Coxs Lane								
Through	0.003	0.0	A	0.0	0.004	0.0	A	0.0
Right	-	-	-	-	-	-	-	-
TOTAL - All Vehicles	0.012	3.4	A	0.5	0.014	3.4	A	0.6

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 5.10

SIDRA MODELLING RESULTS FOR COXS LANE/ON RAMP INTERSECTION IN 2029 WEEKDAY AM AND PM PEAK HOURS BASE – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South On Ramp One Way								
Left	-	-	-	-	-	-	-	-
Right	-	-	-	-	-	-	-	-
East Coxs Lane								
Left	0.008	6.1	A	0.0	0.007	6.1	A	0.0
Through	0.008	0.0	A	0.0	0.007	0.0	A	0.0
West Coxs Lane								
Through	0.010	0.0	A	0.3	0.008	0.0	A	0.3
Right	0.010	5.6	A	0.3	0.008	5.5	A	0.3
TOTAL - All Vehicles	0.010	3.4	A	0.3	0.008	2.8	A	0.3

Where: DS - Degree of Saturation
 AVD - Average Vehicle Delay in Seconds
 LS - Level of Service
 95th% Queue Length - 95th% Queue Length in Metres

TABLE 5.11

SIDRA MODELLING RESULTS FOR COXS LANE/OFF RAMP INTERSECTION IN 2029 WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – PRIORITY CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Off Ramp One Way								
Left	0.043	6.3	A	1.7	0.041	5.5	A	1.6
Right	0.043	6.8	A	1.7	0.041	6.7	A	1.6
East Coxs Lane								
Left	-	-	-	-	-	-	-	-
Through	0.003	0.0	A	0.0	0.001	0.0	A	0.0
West Coxs Lane								
Through	0.004	0.0	A	0.0	0.003	0.0	A	0.0
Right	-	-	-	-	-	-	-	-
TOTAL - All Vehicles	0.043	5.0	A	1.7	0.041	5.3	A	1.6

Where: DS - Degree of Saturation
 AVD - Average Vehicle Delay in Seconds
 LS - Level of Service
 95th% Queue Length - 95th% Queue Length in Metres

TABLE 5.12

**SIDRA MODELLING RESULTS FOR COXS LANE/ON RAMP INTERSECTION IN
2029 WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – PRIORITY
CONTROL**

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South On Ramp One Way								
Left	-	-	-	-	-	-	-	-
Right	-	-	-	-	-	-	-	-
East Coxs Lane								
Left	0.027	6.1	A	0.0	0.030	6.6	A	0.0
Through	0.027	0.0	A	0.0	0.030	0.0	A	0.0
West Coxs Lane								
Through	0.028	0.0	A	0.4	0.028	0.0	A	0.4
Right	0.028	5.6	A	0.4	0.028	5.6	A	0.4
TOTAL - All Vehicles	0.028	3.1	A	0.4	0.028	3.3	A	0.4

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 5.13

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/CABBAGE TREE ROAD/LAVIS LANE INTERSECTION IN 2029 WEEKDAY AM AND PM PEAK HOURS BASE – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Nelson Bay Road								
Left	0.539	7.1	A	30.2	0.610	8.0	A	39.7
Through	0.539	7.3	A	30.2	0.610	8.4	A	39.7
Right	0.539	14.3	A	28.4	0.610	15.6	B	38.1
East Lavis Lane								
Left	0.550	11.7	A	27.9	0.591	16.6	B	31.2
Through	0.550	11.5	A	27.9	0.591	16.4	B	31.2
Right	0.550	18.1	B	27.9	0.591	23.0	B	31.2
North Nelson Bay Road								
Left	0.372	5.8	A	14.9	0.430	5.9	A	19.6
Through	0.667	6.2	A	42.9	0.769	6.3	A	66.7
Right	0.667	13.5	A	42.9	0.769	13.6	A	66.7
West Cabbage Tree Road								
Left	0.264	6.4	A	12.2	0.127	6.1	A	5.1
Through	0.113	6.6	A	4.6	0.182	6.8	A	6.6
Right	0.113	14.3	A	4.6	0.182	13.5	A	6.6
U-turn	0.113	20.6	B	4.6	0.182	20.7	B	6.6
TOTAL - All Vehicles	0.667	7.9	A	42.9	0.769	8.7	A	66.7

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 5.14

SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/CABBAGE TREE ROAD/LAVIS LANE INTERSECTION IN 2029 WEEKDAY AM AND PM PEAK HOURS WITH PROJECT – ROUNDABOUT CONTROL

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Nelson Bay Road								
Left	0.550	7.4	A	32.5	0.621	8.4	A	43.2
Through	0.550	7.4	A	32.5	0.621	8.5	A	43.2
Right	0.550	14.4	A	29.7	0.621	15.7	B	39.9
East Lavis Lane								
Left	0.576	12.6	A	30.4	0.629	18.7	B	34.7
Through	0.576	12.4	A	30.4	0.629	18.5	B	34.7
Right	0.576	19.0	B	30.4	0.629	25.1	B	34.7
North Nelson Bay Road								
Left	0.382	5.9	A	15.5	0.440	6.0	A	20.2
Through	0.683	6.3	A	45.3	0.788	6.5	A	69.6
Right	0.683	13.7	A	45.3	0.788	13.8	A	69.6
West Cabbage Tree Road								
Left	0.267	6.4	A	12.4	0.179	7.4	A	6.5
Through	0.159	6.7	A	8.2	0.165	5.7	A	8.2
Right	0.159	15.6	A	8.2	0.165	13.0	A	8.2
U-turn	0.159	20.6	B	8.2	0.165	17.9	B	8.2
TOTAL - All Vehicles	0.683	8.1	A	26.8	0.788	9.7	A	69.6

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 5.15

**SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/SEASIDE
BOULEVARD/FULLERTON COVE ROAD INTERSECTION IN 2029 WEEKDAY AM
AND PM PEAK HOURS BASE – ROUNDABOUT CONTROL**

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Nelson Bay Road								
Left	0.371	5.1	A	17.7	0.400	4.6	A	20.2
Through	0.582	5.2	A	38.5	0.628	4.8	A	46.8
Right	0.582	11.8	A	38.5	0.628	11.3	A	46.8
East Seaside Boulevard								
Left	0.386	9.6	A	18.5	0.156	9.0	A	7.4
Through	0.230	14.1	A	8.5	0.087	14.1	A	4.0
Right	0.230	15.8	B	8.5	0.087	16.2	B	4.0
North Nelson Bay Road								
Left	0.343	5.0	A	14.4	0.410	5.8	A	16.5
Through	0.702	5.1	A	53.3	0.839	7.6	A	91.1
Right	0.702	11.6	A	53.3	0.839	14.6	B	91.1
U-turn	0.702	13.5	A	53.3	0.839	15.5	B	91.1
West Fullerton Cove Road								
Left	0.100	8.1	A	4.1	0.091	8.9	A	3.5
Through	0.100	12.6	A	4.1	0.091	10.4	A	3.5
Right	0.100	14.7	B	4.1	0.091	15.6	B	3.5
TOTAL - All Vehicles	0.702	6.2	A	53.3	0.839	6.8	A	91.1

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

TABLE 5.16

**SIDRA MODELLING RESULTS FOR NELSON BAY ROAD/SEASIDE
BOULEVARD/FULLERTON COVE ROAD INTERSECTION IN 2029 WEEKDAY AM
AND PM PEAK HOURS WITH PROJECT – ROUNDABOUT CONTROL**

Approach	AM Peak				PM Peak			
	DS	AVD	LS	95 th % Queue Length	DS	AVD	LS	95 th % Queue Length
South Nelson Bay Road								
Left	0.390	5.3	A	18.0	0.429	4.9	A	21.4
Through	0.612	5.5	A	39.6	0.673	5.1	A	50.9
Right	0.612	12.1	A	39.6	0.673	11.6	A	50.9
East Seaside Boulevard								
Left	0.415	10.8	A	21.2	0.177	9.7	A	8.8
Through	0.245	15.1	A	9.3	0.097	15.1	A	4.6
Right	0.245	16.5	B	9.3	0.097	17.0	B	4.6
North Nelson Bay Road								
Left	0.358	5.0	A	15.5	0.430	5.8	A	18.3
Through	0.733	5.1	A	62.3	0.880	8.6	A	121.7
Right	0.733	11.6	A	62.3	0.880	15.8	B	121.7
U-turn	0.733	14.2	A	62.3	0.880	19.8	B	121.7
West Fullerton Cove Road								
Left	0.107	8.6	A	4.5	0.102	9.7	A	4.1
Through	0.107	13.4	A	4.5	0.102	11.3	A	4.1
Right	0.107	15.3	B	4.5	0.102	16.3	B	4.1
TOTAL - All Vehicles	0.733	6.5	A	62.3	0.880	7.6	A	121.7

Where:

DS	-	Degree of Saturation
AVD	-	Average Vehicle Delay in Seconds
LS	-	Level of Service
95 th % Queue Length	-	95 th % Queue Length in Metres

5.4 Construction Impacts

The construction of new infrastructure associated with the Project will be undertaken in Stage 1 and will include:

- A new entry road and haul road;
- A separated exit road to allow trucks exiting the site to use the weighbridge;
- Installation of a new prefabricated office building;
- Relocation of light vehicle parking;
- Relocation of entry gates (inside Boral's boundary);
- Relocation of onsite storage facilities; and
- Relocation of the docketing kiosk.

Construction vehicles will include low loaders delivering earth working equipment, semi trailers and truck and dog trailers delivering road pavement and hard stand materials, concrete agitator trucks and light vehicles associated with the workforce.

Light vehicles are expected to number up to 6 vehicles per day (6 in/6 out). Heavy vehicles are expected to number between 5-15 vehicles per day (i.e. 5-15 in/5-15 out). All construction vehicles will access the site via Coxs Lane and Nelson Bay Road.

The number of construction vehicles accessing the quarry site per hour and on a daily basis will be less than what has been assessed for the operational impacts.

Therefore, the traffic impacts associated with construction are assessed as satisfactory.

5.6 Pedestrian, Cyclist and Public Transport

The Project is not expected to have any negative impacts on pedestrians, cyclists and buses that use Nelson Bay Road and the other roads that form the transport routes.

Boral's trucks already use these roads and the increase in the number of trucks would not negatively impact on other road uses.

Pedestrian crossing volumes on the transport routes are relatively low. Similarly, cyclist numbers are also low. Nelson Bay Road has road shoulder areas suitable for cyclists to use except at the bridge over Coxs Lane. Port Stephens Council is proposing a new shared path in Fullerton Cove Road which will be an alternative route to Nelson Bay Road between Seaside Boulevard and south of Cabbage Tree Road, for cyclists to use.

It would be expected that future upgrades to Nelson Bay Road will include suitable measures for cyclists.

5.7 Road Safety

The Project is not expected to have any negative impacts on road safety. The section of Nelson Bay Road adjacent Stockton Quarry, as well as the other roads that form the transport routes are all approved 25/26 metre B-double routes. The traffic modelling shows that the principal intersections used by Boral's product trucks will have sufficient capacity to cater for background traffic growth as well as the Project's traffic for the next 10 years.

As previously noted, NSW Government has upgraded sections of the road network in the area and is continuing to upgrade the section of Nelson Bay Road at and north of Williamtown. The section of Nelson Bay Road between Cabbage Tree Road and Fullerton Street is currently being investigated by the NSW Government for future road upgrades, and it would be expected that road upgrades will occur within the medium term (4-10 years).

5.8 Internal Site Changes

Boral will make changes to the internal operation of the quarry and upgrade/supplement the existing infrastructure as described in Section 3.2.

New internal roads will be designed and constructed to AS2890.2 requirements for one way or two way flow as appropriate to cater for the quarry's heavy vehicles.

The new parking area for the light vehicles will be designed and constructed to AS2890.1 requirements.

Sufficient parking will be provided for employees and visitors.

In concluding, all the internal changes to the quarry on site operation for the Project will be designed and constructed to AS2890.1 and AS2890.2, as appropriate.

6.0 CONCLUSIONS

This report documents the assessment of the traffic impacts for the Project at 32 Coxs Lane Fullerton Cove.

Boral operates a quarry at this site that extracts and transports up to 500,000tpa of sand product under the existing windblown sand extraction area development consent (DA 140-5-2006), which will cease operation in 2028.

Due to current and future demand for sand in the local Hunter and Sydney regions, Boral is seeking approval for continued and expanded operations at the site. The Project involves the extraction of sand from the inland vegetated dunes by front-end loader/excavator to a depth of 4 m AHD and subsequent dredging from 4 m AHD to 15 m below sea level (-15 m AHD).

The Project would seek to permit a site wide increase on the dispatch limit to 750,000 tpa (i.e. the windblown sand extraction area and the Project operations combined) up until 2028. As part of the Project, 70,000tpa of VENM will be imported to the quarry by road.

After 2028 and extraction of sand on the windblown dunes would cease and transportation associated with the Project will reduce to a maximum of 500,000tpa.

Vehicle access to the quarry is via Coxs Lane, which has on/off ramps to/from Nelson Bay Road. Other principal intersections adjacent Stockton Quarry include the intersections of Nelson Bay Road/Cabbage Tree Road/Lavis Lane and Nelson Bay Road/Seaside Boulevard/Fullerton Cove Road, which are two lane roundabouts in Nelson Bay Road, north and south of Coxs Lane.

The quarry currently employs 5 people at the site which will increase to 9 people with the Project. Boral also employs truck drivers and associated support personnel.

The assessment of the traffic impacts of the additional trucks associated with the operation of the Project on the adjacent road network including the principal intersections adjacent the quarry has found that the impacts will be satisfactory.

The assessment of the cumulative impacts for the future 2029 year with the Project also concludes that the traffic impacts on the principal intersections will be satisfactory.

Construction traffic impacts are also assessed as satisfactory, as the number of construction vehicles are relatively low in number and less than what has been assessed for the operational impacts.

The Project is not expected to have any negative impacts on other road users including pedestrians, cyclists and public transport vehicles (buses), and or on road safety.

After 2028, total sand product and VENM truck numbers generated by the Quarry will reduce.

REFERENCES

1. Austroads Guide to Road Design
2. RMS Guide to Traffic Generating Development October 2002
3. Austroads Guide to Traffic Management
4. RMS Austroads Guide Supplements – Austroads Guide to Traffic Management
5. RMS Supplement to Austroads Guide to Road Design
6. Austroads Guide to Traffic Management Part 12 – Traffic Impact of Developments
7. RMS Crash Data for Nelson Bay Road between Cabbage Tree Road Williamtown and Fullerton Street Fern Bay for period 1 July 2015 to 30 June 2018
8. RMS Website
 - Traffic Volume Viewer
 - Road Upgrades

APPENDIX 1

Extracts of SIDRA Modelling Outputs

MOVEMENT SUMMARY

▽ Site: 101 [Cox Lane & On Ramp -Ex AM]

Ex AM

Site Category: (None)

Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand	Flows	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		veh	m				km/h
East: Cox Lane												
4	L2	6	100.0	0.006	6.1	LOS A	0.0	0.0	0.00	0.53	0.00	52.1
5	T1	1	0.0	0.006	0.0	LOS A	0.0	0.0	0.00	0.53	0.00	55.7
Approach		7	85.7	0.006	5.6	NA	0.0	0.0	0.00	0.53	0.00	52.6
West: Cox Lane												
11	T1	7	100.0	0.008	0.0	LOS A	0.0	0.2	0.04	0.15	0.04	57.7
12	R2	5	0.0	0.008	5.5	LOS A	0.0	0.2	0.04	0.15	0.04	55.8
Approach		12	58.3	0.008	1.5	NA	0.0	0.2	0.04	0.15	0.04	56.9
All Vehicles		19	68.4	0.008	3.4	NA	0.0	0.2	0.02	0.29	0.02	55.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

▽ Site: 101 [Cox Lane & On Ramp -Ex PM]

Ex PM
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Cox Lane												
4	L2	4	100.0	0.005	6.1	LOS A	0.0	0.0	0.00	0.42	0.00	53.3
5	T1	3	0.0	0.005	0.0	LOS A	0.0	0.0	0.00	0.42	0.00	57.0
Approach		7	57.1	0.005	4.4	NA	0.0	0.0	0.00	0.42	0.00	54.9
West: Cox Lane												
11	T1	5	80.0	0.006	0.0	LOS A	0.0	0.2	0.04	0.32	0.04	55.6
12	R2	6	0.0	0.006	5.5	LOS A	0.0	0.2	0.04	0.32	0.04	53.9
Approach		11	36.4	0.006	3.0	NA	0.0	0.2	0.04	0.32	0.04	54.6
All Vehicles		18	44.4	0.006	3.2	NA	0.0	0.2	0.03	0.36	0.03	54.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [Cox Lane & Off Ramp -Ex PM]

Ex PM

Site Category: (None)

Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Off Ramp												
1	L2	4	75.0	0.009	6.4	LOS A	0.0	0.4	0.03	0.58	0.03	50.5
3	R2	5	80.0	0.009	6.6	LOS A	0.0	0.4	0.03	0.58	0.03	49.4
Approach		9	77.8	0.009	6.5	LOS A	0.0	0.4	0.03	0.58	0.03	49.9
East: Cox Lane												
5	T1	3	0.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		3	0.0	0.002	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Cox Lane												
11	T1	6	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		6	0.0	0.003	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		18	38.9	0.009	3.3	NA	0.0	0.4	0.02	0.29	0.02	54.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

▽ Site: 101 [Cox Lane & Off Ramp -Ex AM]

Ex AM

Site Category: (None)

Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Off Ramp												
1	L2	1	0.0	0.009	5.5	LOS A	0.0	0.3	0.02	0.60	0.02	53.5
3	R2	7	100.0	0.009	6.2	LOS A	0.0	0.3	0.02	0.60	0.02	50.7
Approach		8	87.5	0.009	6.2	LOS A	0.0	0.3	0.02	0.60	0.02	51.0
East: Cox Lane												
5	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		1	0.0	0.001	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Cox Lane												
11	T1	5	0.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		5	0.0	0.002	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		14	50.0	0.009	3.5	NA	0.0	0.3	0.01	0.34	0.01	54.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

 Site: 101 [Nelsons Bay Rd & Cabbage Tree Rd - Ex AM]

Ex AM
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	90	13.3	0.400	6.5	LOS A	2.5	19.0	0.45	0.53	0.45	59.8
2	T1	887	2.1	0.400	6.6	LOS A	2.5	19.0	0.46	0.54	0.46	67.8
3	R2	45	0.0	0.400	13.6	LOS A	2.4	17.7	0.47	0.56	0.47	63.0
Approach		1022	3.0	0.400	6.9	LOS A	2.5	19.0	0.46	0.54	0.46	66.8
East: Lavis Lane												
4	L2	133	0.8	0.341	6.8	LOS A	1.7	11.8	0.68	0.82	0.69	57.2
5	T1	50	0.0	0.341	6.6	LOS A	1.7	11.8	0.68	0.82	0.69	54.6
6	R2	96	1.0	0.341	13.2	LOS A	1.7	11.8	0.68	0.82	0.69	59.1
Approach		279	0.7	0.341	9.0	LOS A	1.7	11.8	0.68	0.82	0.69	57.3
North: Nelsons Bay Rd												
7	L2	138	0.7	0.285	5.6	LOS A	1.4	10.2	0.23	0.47	0.23	61.6
8	T1	929	3.1	0.509	5.9	LOS A	3.5	25.4	0.26	0.47	0.26	69.0
9	R2	94	23.4	0.509	13.1	LOS A	3.5	25.4	0.27	0.48	0.27	63.4
Approach		1161	4.5	0.509	6.4	LOS A	3.5	25.4	0.26	0.47	0.26	67.6
West: Cabbage Tree Rd												
10	L2	164	12.8	0.176	5.6	LOS A	0.8	7.2	0.63	0.67	0.63	56.9
11	T1	14	0.0	0.054	6.0	LOS A	0.2	1.8	0.61	0.75	0.61	53.8
12	R2	20	15.0	0.054	13.2	LOS A	0.2	1.8	0.61	0.75	0.61	55.0
Approach		198	12.1	0.176	6.4	LOS A	0.8	7.2	0.63	0.69	0.63	56.5
All Vehicles		2660	4.1	0.509	6.9	LOS A	3.5	25.4	0.41	0.55	0.41	65.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

Site: 101 [Nelsons Bay Rd & Cabbage Tree Rd - Ex PM]

Ex PM
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	115	8.7	0.449	6.7	LOS A	2.9	21.7	0.51	0.55	0.51	59.6
2	T1	982	1.6	0.449	6.9	LOS A	2.9	21.7	0.52	0.56	0.52	67.6
3	R2	19	0.0	0.449	13.9	LOS A	2.8	20.4	0.53	0.57	0.53	62.8
Approach		1116	2.3	0.449	7.0	LOS A	2.9	21.7	0.52	0.56	0.52	66.6
East: Lavis Lane												
4	L2	91	0.0	0.323	7.8	LOS A	1.6	11.4	0.74	0.86	0.75	56.4
5	T1	51	0.0	0.323	7.6	LOS A	1.6	11.4	0.74	0.86	0.75	53.7
6	R2	88	0.0	0.323	14.2	LOS A	1.6	11.4	0.74	0.86	0.75	58.3
Approach		230	0.0	0.323	10.2	LOS A	1.6	11.4	0.74	0.86	0.75	56.5
North: Nelsons Bay Rd												
7	L2	67	0.0	0.329	5.6	LOS A	1.9	13.3	0.27	0.46	0.27	61.3
8	T1	1126	1.4	0.588	5.9	LOS A	4.9	35.6	0.32	0.48	0.32	68.8
9	R2	148	13.5	0.588	13.0	LOS A	4.9	35.6	0.34	0.49	0.34	63.1
Approach		1341	2.7	0.588	6.7	LOS A	4.9	35.6	0.32	0.48	0.32	67.7
West: Cabbage Tree Rd												
10	L2	77	5.2	0.082	5.4	LOS A	0.4	2.9	0.63	0.65	0.63	58.6
11	T1	19	0.0	0.092	5.7	LOS A	0.4	2.8	0.64	0.77	0.64	53.4
12	R2	49	0.0	0.092	12.3	LOS A	0.4	2.8	0.64	0.77	0.64	57.8
Approach		145	2.8	0.092	7.7	LOS A	0.4	2.9	0.63	0.71	0.63	57.6
All Vehicles		2832	2.3	0.588	7.2	LOS A	4.9	35.6	0.45	0.56	0.45	65.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

Site: 101 [Nelsons Bay Rd & Seaside Blve - Ex AM]

Ex AM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	16	0.0	0.285	4.8	LOS A	1.6	12.1	0.30	0.43	0.30	58.7
2	T1	993	3.4	0.447	5.0	LOS A	3.2	24.1	0.33	0.44	0.33	63.9
3	R2	25	4.0	0.447	11.5	LOS A	3.2	24.1	0.34	0.44	0.34	61.3
Approach		1034	3.4	0.447	5.1	LOS A	3.2	24.1	0.33	0.44	0.33	63.8
East: Seaside Blvde												
4	L2	231	1.7	0.236	6.6	LOS A	1.2	8.9	0.69	0.78	0.69	57.1
5	T1	1	100.0	0.139	10.5	LOS A	0.6	4.4	0.65	0.86	0.65	51.3
6	R2	99	0.0	0.139	13.4	LOS A	0.6	4.4	0.65	0.86	0.65	54.3
Approach		331	1.5	0.236	8.6	LOS A	1.2	8.9	0.68	0.80	0.68	56.2
North: Nelsons Bay Rd												
7	L2	38	7.9	0.266	4.8	LOS A	1.4	10.1	0.23	0.41	0.23	59.0
8	T1	1159	2.6	0.544	4.8	LOS A	4.3	30.8	0.27	0.41	0.27	64.5
9	R2	5	0.0	0.544	11.3	LOS A	4.3	30.8	0.28	0.41	0.28	62.0
9u	U	3	100.0	0.544	13.1	LOS A	4.3	30.8	0.28	0.41	0.28	62.2
Approach		1205	3.0	0.544	4.9	LOS A	4.3	30.8	0.27	0.41	0.27	64.3
West: Fullerton Cove Rd												
10	L2	1	0.0	0.060	6.5	LOS A	0.3	2.1	0.64	0.80	0.64	52.9
11	T1	1	0.0	0.060	6.5	LOS A	0.3	2.1	0.64	0.80	0.64	52.2
12	R2	41	7.3	0.060	13.1	LOS A	0.3	2.1	0.64	0.80	0.64	53.3
Approach		43	7.0	0.060	12.8	LOS A	0.3	2.1	0.64	0.80	0.64	53.2
All Vehicles		2613	3.0	0.544	5.6	LOS A	4.3	30.8	0.35	0.48	0.35	62.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

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.

Roundabout Capacity Model: SIDRA Standard.

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 SUMMARY

Site: 101 [Nelsons Bay Rd & Seaside Blve - Ex PM]

Ex PM
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	40	2.5	0.312	4.5	LOS A	1.9	13.7	0.17	0.39	0.17	59.5
2	T1	1065	2.3	0.490	4.6	LOS A	3.8	28.0	0.18	0.42	0.18	64.5
3	R2	151	2.0	0.490	11.2	LOS A	3.8	28.0	0.19	0.44	0.19	61.6
Approach		1256	2.3	0.490	5.4	LOS A	3.8	28.0	0.18	0.42	0.18	63.9
East: Seaside Blvde												
4	L2	74	1.4	0.083	6.5	LOS A	0.4	3.2	0.71	0.72	0.71	57.0
5	T1	1	100.0	0.045	10.5	LOS A	0.2	1.7	0.68	0.80	0.68	51.2
6	R2	27	3.7	0.045	13.5	LOS A	0.2	1.7	0.68	0.80	0.68	53.5
Approach		102	2.9	0.083	8.4	LOS A	0.4	3.2	0.70	0.74	0.70	55.9
North: Nelsons Bay Rd												
7	L2	105	0.0	0.314	5.4	LOS A	1.6	11.3	0.37	0.50	0.37	58.4
8	T1	1187	1.3	0.643	5.5	LOS A	5.2	36.7	0.47	0.49	0.47	63.1
9	R2	6	0.0	0.643	12.1	LOS A	5.2	36.7	0.49	0.48	0.49	60.6
9u	U	2	0.0	0.643	13.0	LOS A	5.2	36.7	0.49	0.48	0.49	62.8
Approach		1300	1.2	0.643	5.6	LOS A	5.2	36.7	0.46	0.49	0.46	62.7
West: Fullerton Cove Rd												
10	L2	7	0.0	0.054	6.9	LOS A	0.2	1.8	0.64	0.78	0.64	53.5
11	T1	4	25.0	0.054	7.8	LOS A	0.2	1.8	0.64	0.78	0.64	52.5
12	R2	28	3.6	0.054	13.4	LOS A	0.2	1.8	0.64	0.78	0.64	54.7
Approach		39	5.1	0.054	11.6	LOS A	0.2	1.8	0.64	0.78	0.64	54.3
All Vehicles		2697	1.9	0.643	5.7	LOS A	5.2	36.7	0.34	0.47	0.34	62.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

▽ Site: 101 [Cox Lane & Off Ramp - AM Prop]

AM with Boral Proposal
 Site Category: (None)
 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Off Ramp												
1	L2	1	0.0	0.036	5.5	LOS A	0.1	1.5	0.04	0.60	0.04	53.5
3	R2	30	100.0	0.036	6.2	LOS A	0.1	1.5	0.04	0.60	0.04	50.6
Approach		31	96.8	0.036	6.2	LOS A	0.1	1.5	0.04	0.60	0.04	50.7
East: Cox Lane												
5	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		1	0.0	0.001	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Cox Lane												
11	T1	5	0.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		5	0.0	0.002	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		37	81.1	0.036	5.2	NA	0.1	1.5	0.03	0.50	0.03	52.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

▽ Site: 101 [Cox Lane & Off Ramp -PM Prop]

PM with Boral Proposal
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Off Ramp												
1	L2	4	75.0	0.040	6.4	LOS A	0.1	1.6	0.04	0.59	0.04	50.4
3	R2	31	96.8	0.040	6.8	LOS A	0.1	1.6	0.04	0.59	0.04	48.7
Approach		35	94.3	0.040	6.8	LOS A	0.1	1.6	0.04	0.59	0.04	48.9
East: Cox Lane												
5	T1	3	0.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		3	0.0	0.002	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Cox Lane												
11	T1	6	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		6	0.0	0.003	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		44	75.0	0.040	5.4	NA	0.1	1.6	0.03	0.47	0.03	50.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [Cox Lane & On Ramp - AM Prop]

AM with Boral Proposal
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Cox Lane												
4	L2	30	100.0	0.027	6.1	LOS A	0.0	0.0	0.00	0.56	0.00	51.7
5	T1	1	0.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.56	0.00	55.1
Approach		31	96.8	0.027	6.0	NA	0.0	0.0	0.00	0.56	0.00	51.8
West: Cox Lane												
11	T1	30	100.0	0.026	0.0	LOS A	0.0	0.3	0.04	0.05	0.04	59.1
12	R2	5	0.0	0.026	5.6	LOS A	0.0	0.3	0.04	0.05	0.04	57.2
Approach		35	85.7	0.026	0.5	NA	0.0	0.3	0.04	0.05	0.04	58.8
All Vehicles		66	90.9	0.027	3.2	NA	0.0	0.3	0.02	0.29	0.02	55.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [Cox Lane & On Ramp -PM Prop]

PM with Boral Proposal
 Site Category: (None)
 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Cox Lane												
4	L2	30	100.0	0.027	6.1	LOS A	0.0	0.0	0.00	0.54	0.00	51.9
5	T1	3	0.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.54	0.00	55.4
Approach		33	90.9	0.027	5.8	NA	0.0	0.0	0.00	0.54	0.00	52.2
West: Cox Lane												
11	T1	31	96.8	0.026	0.0	LOS A	0.0	0.4	0.04	0.10	0.04	55.6
12	R2	6	0.0	0.026	5.6	LOS A	0.0	0.4	0.04	0.10	0.04	53.9
Approach		37	81.1	0.026	0.9	NA	0.0	0.4	0.04	0.10	0.04	55.3
All Vehicles		70	85.7	0.027	3.1	NA	0.0	0.4	0.02	0.31	0.02	53.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

 Site: 101 [Nelsons Bay Rd & Cabbage Tree Rd - AM Prop]

AM with Proposal
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	103	26.2	0.409	6.8	LOS A	2.6	20.6	0.46	0.53	0.46	59.4
2	T1	888	2.3	0.409	6.6	LOS A	2.6	20.6	0.47	0.54	0.47	67.7
3	R2	45	0.0	0.409	13.6	LOS A	2.5	18.4	0.48	0.56	0.48	63.0
Approach		1036	4.5	0.409	7.0	LOS A	2.6	20.6	0.47	0.54	0.47	66.6
East: Lavis Lane												
4	L2	133	0.8	0.349	7.0	LOS A	1.8	12.5	0.70	0.83	0.72	57.0
5	T1	50	0.0	0.349	6.8	LOS A	1.8	12.5	0.70	0.83	0.72	54.5
6	R2	96	1.0	0.349	13.4	LOS A	1.8	12.5	0.70	0.83	0.72	58.9
Approach		279	0.7	0.349	9.2	LOS A	1.8	12.5	0.70	0.83	0.72	57.2
North: Nelsons Bay Rd												
7	L2	138	0.7	0.292	5.7	LOS A	1.5	10.7	0.27	0.48	0.27	61.4
8	T1	930	3.2	0.522	6.0	LOS A	3.7	26.8	0.31	0.49	0.31	68.6
9	R2	94	23.4	0.522	13.2	LOS A	3.7	26.8	0.32	0.49	0.32	63.1
Approach		1162	4.6	0.522	6.5	LOS A	3.7	26.8	0.30	0.49	0.30	67.2
West: Cabbage Tree Rd												
10	L2	164	12.8	0.177	5.6	LOS A	0.8	7.3	0.63	0.68	0.63	56.9
11	T1	14	0.0	0.091	6.0	LOS A	0.4	4.5	0.64	0.81	0.64	53.5
12	R2	33	54.5	0.091	14.9	LOS B	0.4	4.5	0.64	0.81	0.64	47.6
Approach		211	18.5	0.177	7.1	LOS A	0.8	7.3	0.63	0.71	0.63	54.9
All Vehicles		2688	5.2	0.522	7.0	LOS A	3.7	26.8	0.43	0.56	0.44	64.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

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.

Roundabout Capacity Model: SIDRA Standard.

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 SUMMARY

 Site: 101 [Nelsons Bay Rd & Cabbage Tree Rd - PM Dev]

PM with Boral Proposal
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	128	19.5	0.458	6.9	LOS A	3.0	23.5	0.52	0.56	0.52	59.3
2	T1	983	1.7	0.458	6.9	LOS A	3.0	23.5	0.52	0.56	0.52	67.6
3	R2	19	0.0	0.458	13.9	LOS A	2.9	21.1	0.53	0.57	0.53	62.8
Approach		1130	3.7	0.458	7.1	LOS A	3.0	23.5	0.52	0.56	0.52	66.4
East: Lavis Lane												
4	L2	91	0.0	0.334	8.1	LOS A	1.7	12.2	0.76	0.88	0.79	56.2
5	T1	51	0.0	0.334	7.9	LOS A	1.7	12.2	0.76	0.88	0.79	53.6
6	R2	88	0.0	0.334	14.5	LOS A	1.7	12.2	0.76	0.88	0.79	58.1
Approach		230	0.0	0.334	10.5	LOS A	1.7	12.2	0.76	0.88	0.79	56.3
North: Nelsons Bay Rd												
7	L2	67	0.0	0.337	5.7	LOS A	1.9	13.7	0.31	0.48	0.31	61.1
8	T1	1127	1.5	0.603	6.0	LOS A	5.1	37.0	0.37	0.50	0.37	68.4
9	R2	148	13.5	0.603	13.2	LOS A	5.1	37.0	0.39	0.51	0.39	62.7
Approach		1342	2.8	0.603	6.8	LOS A	5.1	37.0	0.37	0.50	0.37	67.3
West: Cabbage Tree Rd												
10	L2	77	5.2	0.108	6.2	LOS A	0.5	3.6	0.65	0.75	0.65	58.5
11	T1	19	0.0	0.095	5.0	LOS A	0.4	4.2	0.64	0.74	0.64	53.5
12	R2	62	24.2	0.095	12.2	LOS A	0.4	4.2	0.64	0.74	0.64	52.9
Approach		158	12.0	0.108	8.4	LOS A	0.5	4.2	0.64	0.75	0.64	55.5
All Vehicles		2860	3.4	0.603	7.3	LOS A	5.1	37.0	0.48	0.57	0.48	65.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

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.

Roundabout Capacity Model: SIDRA Standard.

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 SUMMARY

 Site: 101 [Nelsons Bay Rd & Seaside Blve - AM Prop]

AM with Boral Proposal
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	16	0.0	0.301	5.1	LOS A	1.6	12.7	0.35	0.46	0.35	58.4
2	T1	1005	4.8	0.472	5.2	LOS A	3.3	25.2	0.38	0.46	0.38	63.5
3	R2	25	4.0	0.472	11.7	LOS A	3.3	25.2	0.39	0.46	0.39	61.0
Approach		1046	4.7	0.472	5.4	LOS A	3.3	25.2	0.38	0.46	0.38	63.3
East: Seaside Blvde												
4	L2	231	1.7	0.245	6.9	LOS A	1.3	9.4	0.71	0.80	0.71	57.0
5	T1	1	100.0	0.144	11.0	LOS A	0.6	4.6	0.68	0.87	0.68	51.0
6	R2	99	0.0	0.144	13.7	LOS A	0.6	4.6	0.68	0.87	0.68	54.1
Approach		331	1.5	0.245	8.9	LOS A	1.3	9.4	0.70	0.82	0.70	56.0
North: Nelsons Bay Rd												
7	L2	38	7.9	0.279	4.8	LOS A	1.5	10.9	0.23	0.41	0.23	58.9
8	T1	1171	3.8	0.571	4.8	LOS A	4.7	35.1	0.28	0.42	0.28	64.0
9	R2	5	0.0	0.571	11.3	LOS A	4.7	35.1	0.30	0.43	0.30	61.5
9u	U	32	100.0	0.571	13.2	LOS A	4.7	35.1	0.30	0.43	0.30	61.7
Approach		1246	6.3	0.571	5.3	LOS A	4.7	35.1	0.28	0.42	0.28	63.8
West: Fullerton Cove Rd												
10	L2	1	0.0	0.063	6.8	LOS A	0.3	2.3	0.67	0.81	0.67	52.6
11	T1	1	0.0	0.063	6.8	LOS A	0.3	2.3	0.67	0.81	0.67	51.9
12	R2	41	7.3	0.063	13.4	LOS A	0.3	2.3	0.67	0.81	0.67	53.0
Approach		43	7.0	0.063	13.1	LOS A	0.3	2.3	0.67	0.81	0.67	53.0
All Vehicles		2666	5.1	0.571	5.8	LOS A	4.7	35.1	0.38	0.49	0.38	62.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

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.

Roundabout Capacity Model: SIDRA Standard.

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 SUMMARY

 Site: 101 [Nelsons Bay Rd & Seaside Blve - PM Prop]

PM with Boral Proposal
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	40	2.5	0.336	4.8	LOS A	1.9	14.3	0.26	0.42	0.26	58.9
2	T1	1077	3.6	0.528	4.9	LOS A	3.9	29.6	0.29	0.45	0.29	63.7
3	R2	151	2.0	0.528	11.4	LOS A	3.9	29.6	0.30	0.47	0.30	61.0
Approach		1268	3.4	0.528	5.7	LOS A	3.9	29.6	0.29	0.45	0.29	63.2
East: Seaside Blvde												
4	L2	74	1.4	0.089	6.8	LOS A	0.5	3.5	0.74	0.74	0.74	56.9
5	T1	1	100.0	0.048	11.0	LOS A	0.2	1.8	0.71	0.81	0.71	51.0
6	R2	27	3.7	0.048	13.9	LOS A	0.2	1.8	0.71	0.81	0.71	53.2
Approach		102	2.9	0.089	8.7	LOS A	0.5	3.5	0.73	0.76	0.73	55.8
North: Nelsons Bay Rd												
7	L2	105	0.0	0.332	5.4	LOS A	1.8	12.5	0.39	0.50	0.39	58.3
8	T1	1199	2.5	0.679	5.6	LOS A	6.0	43.7	0.50	0.50	0.50	62.7
9	R2	6	0.0	0.679	12.1	LOS A	6.0	43.7	0.54	0.50	0.54	60.3
9u	U	34	94.1	0.679	15.1	LOS B	6.0	43.7	0.54	0.50	0.54	58.8
Approach		1344	4.6	0.679	5.9	LOS A	6.0	43.7	0.50	0.50	0.50	62.3
West: Fullerton Cove Rd												
10	L2	7	0.0	0.059	7.3	LOS A	0.3	2.1	0.68	0.80	0.68	53.2
11	T1	4	25.0	0.059	8.2	LOS A	0.3	2.1	0.68	0.80	0.68	52.2
12	R2	28	3.6	0.059	13.8	LOS A	0.3	2.1	0.68	0.80	0.68	54.4
Approach		39	5.1	0.059	12.0	LOS A	0.3	2.1	0.68	0.80	0.68	54.0
All Vehicles		2753	4.0	0.679	6.0	LOS A	6.0	43.7	0.41	0.49	0.41	62.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

▽ Site: 101 [Cox Lane & Off Ramp -2029 AM Base]

2029 AM Base
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Off Ramp												
1	L2	2	0.0	0.012	5.5	LOS A	0.0	0.5	0.03	0.60	0.03	53.5
3	R2	9	100.0	0.012	6.2	LOS A	0.0	0.5	0.03	0.60	0.03	50.7
Approach		11	81.8	0.012	6.2	LOS A	0.0	0.5	0.03	0.60	0.03	51.1
East: Cox Lane												
5	T1	2	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		2	0.0	0.001	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Cox Lane												
11	T1	7	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		7	0.0	0.003	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		20	45.0	0.012	3.4	NA	0.0	0.5	0.02	0.33	0.02	54.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

▽ Site: 101 [Cox Lane & Off Ramp -2029 PM Base]

2029 PM base
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m			km/h	
South: Off Ramp												
1	L2	6	66.7	0.014	6.3	LOS A	0.0	0.6	0.04	0.58	0.04	50.8
3	R2	8	87.5	0.014	6.7	LOS A	0.0	0.6	0.04	0.58	0.04	49.1
Approach		14	78.6	0.014	6.6	LOS A	0.0	0.6	0.04	0.58	0.04	49.8
East: Cox Lane												
5	T1	5	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		5	0.0	0.003	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Cox Lane												
11	T1	8	0.0	0.004	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		8	0.0	0.004	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		27	40.7	0.014	3.4	NA	0.0	0.6	0.02	0.30	0.02	54.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

▽ Site: 101 [Cox Lane & Off Ramp -2029 AM Prop]

2029 AM with Proposal
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	m				km/h
South: Off Ramp												
1	L2	2	0.0	0.041	5.5	LOS A	0.1	1.6	0.04	0.59	0.04	53.5
3	R2	35	85.7	0.041	6.7	LOS A	0.1	1.6	0.04	0.59	0.04	49.2
Approach		37	81.1	0.041	6.6	LOS A	0.1	1.6	0.04	0.59	0.04	49.4
East: Cox Lane												
5	T1	2	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		2	0.0	0.001	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Cox Lane												
11	T1	7	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		7	0.0	0.003	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		46	65.2	0.041	5.3	NA	0.1	1.6	0.03	0.48	0.03	51.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

▽ Site: 101 [Cox Lane & Off Ramp -2029 PM Prop]

2029 PM with Proposal
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Off Ramp												
1	L2	6	66.7	0.043	6.3	LOS A	0.1	1.7	0.05	0.59	0.05	50.7
3	R2	33	90.9	0.043	6.8	LOS A	0.1	1.7	0.05	0.59	0.05	48.9
Approach		39	87.2	0.043	6.7	LOS A	0.1	1.7	0.05	0.59	0.05	49.2
East: Cox Lane												
5	T1	5	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		5	0.0	0.003	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
West: Cox Lane												
11	T1	8	0.0	0.004	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		8	0.0	0.004	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
All Vehicles		52	65.4	0.043	5.0	NA	0.1	1.7	0.04	0.44	0.04	51.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

▽ Site: 101 [Cox Lane & On Ramp -2029 AM Base]

2029 AM Base
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		veh	m				km/h
East: Cox Lane												
4	L2	8	100.0	0.008	6.1	LOS A	0.0	0.0	0.00	0.51	0.00	52.4
5	T1	2	0.0	0.008	0.0	LOS A	0.0	0.0	0.00	0.51	0.00	55.9
Approach		10	80.0	0.008	5.4	NA	0.0	0.0	0.00	0.51	0.00	53.0
West: Cox Lane												
11	T1	9	100.0	0.010	0.0	LOS A	0.0	0.3	0.05	0.16	0.05	57.5
12	R2	7	0.0	0.010	5.5	LOS A	0.0	0.3	0.05	0.16	0.05	55.7
Approach		16	56.3	0.010	1.6	NA	0.0	0.3	0.05	0.16	0.05	56.7
All Vehicles		26	65.4	0.010	3.4	NA	0.0	0.3	0.03	0.30	0.03	55.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [Cox Lane & On Ramp -2029 PM Base]

2029 PM Base
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Cox Lane												
4	L2	5	100.0	0.007	6.1	LOS A	0.0	0.0	0.00	0.38	0.00	53.6
5	T1	5	0.0	0.007	0.0	LOS A	0.0	0.0	0.00	0.38	0.00	57.4
Approach		10	50.0	0.007	4.1	NA	0.0	0.0	0.00	0.38	0.00	55.4
West: Cox Lane												
11	T1	7	85.7	0.008	0.0	LOS A	0.0	0.3	0.04	0.27	0.04	55.5
12	R2	6	0.0	0.008	5.5	LOS A	0.0	0.3	0.04	0.27	0.04	53.8
Approach		13	46.2	0.008	2.6	NA	0.0	0.3	0.04	0.27	0.04	54.7
All Vehicles		23	47.8	0.008	2.8	NA	0.0	0.3	0.03	0.32	0.03	55.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

▽ Site: 101 [Cox Lane & On Ramp -2029 AM Prop]

2029 AM with Proposal
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Cox Lane												
4	L2	30	100.0	0.027	6.1	LOS A	0.0	0.0	0.00	0.55	0.00	51.8
5	T1	2	0.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.55	0.00	55.3
Approach		32	93.8	0.027	5.9	NA	0.0	0.0	0.00	0.55	0.00	52.0
West: Cox Lane												
11	T1	33	90.9	0.028	0.0	LOS A	0.0	0.4	0.04	0.11	0.04	56.3
12	R2	7	0.0	0.028	5.6	LOS A	0.0	0.4	0.04	0.11	0.04	54.5
Approach		40	75.0	0.028	1.0	NA	0.0	0.4	0.04	0.11	0.04	56.0
All Vehicles		72	83.3	0.028	3.1	NA	0.0	0.4	0.02	0.31	0.02	54.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [Cox Lane & On Ramp -2029 PM Prop]

2029 PM with Proposal
 Site Category: (None)
 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Cox Lane												
4	L2	33	90.9	0.030	6.6	LOS A	0.0	0.0	0.00	0.49	0.00	52.4
5	T1	5	0.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.49	0.00	58.0
Approach		38	78.9	0.030	5.7	NA	0.0	0.0	0.00	0.49	0.00	53.1
West: Cox Lane												
11	T1	33	90.9	0.028	0.0	LOS A	0.0	0.4	0.04	0.10	0.04	56.4
12	R2	6	0.0	0.028	5.6	LOS A	0.0	0.4	0.04	0.10	0.04	54.7
Approach		39	76.9	0.028	0.9	NA	0.0	0.4	0.04	0.10	0.04	56.2
All Vehicles		77	77.9	0.030	3.3	NA	0.0	0.4	0.02	0.29	0.02	54.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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 SUMMARY

Site: 101 [Nelsons Bay Rd & Cabbage Tree Rd - 2029 AM Base]

2029 AM Base
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	113	13.3	0.539	7.1	LOS A	4.0	30.2	0.60	0.58	0.60	58.8
2	T1	1122	2.1	0.539	7.3	LOS A	4.0	30.2	0.61	0.60	0.62	66.6
3	R2	57	0.0	0.539	14.3	LOS A	3.9	28.4	0.62	0.62	0.63	61.9
Approach		1292	3.0	0.539	7.6	LOS A	4.0	30.2	0.61	0.60	0.62	65.6
East: Lavis Lane												
4	L2	168	1.2	0.550	11.7	LOS A	3.9	27.9	0.85	1.03	1.15	53.3
5	T1	64	0.0	0.550	11.5	LOS A	3.9	27.9	0.85	1.03	1.15	51.2
6	R2	122	1.6	0.550	18.1	LOS B	3.9	27.9	0.85	1.03	1.15	55.0
Approach		354	1.1	0.550	13.9	LOS A	3.9	27.9	0.85	1.03	1.15	53.5
North: Nelsons Bay Rd												
7	L2	175	1.1	0.373	5.8	LOS A	2.1	14.9	0.32	0.50	0.32	61.1
8	T1	1175	3.1	0.667	6.2	LOS A	5.9	42.9	0.40	0.51	0.40	67.9
9	R2	119	22.7	0.667	13.5	LOS A	5.9	42.9	0.43	0.51	0.43	62.3
Approach		1469	4.5	0.667	6.7	LOS A	5.9	42.9	0.40	0.51	0.40	66.5
West: Cabbage Tree Rd												
10	L2	208	13.0	0.264	6.4	LOS A	1.4	12.2	0.75	0.77	0.75	56.4
11	T1	18	0.0	0.113	6.6	LOS A	0.5	4.6	0.71	0.87	0.71	52.5
12	R2	29	24.1	0.113	14.3	LOS A	0.5	4.6	0.71	0.87	0.71	51.9
12u	U	7	100.0	0.113	20.6	LOS B	0.5	4.6	0.71	0.87	0.71	53.4
Approach		262	15.6	0.264	7.7	LOS A	1.4	12.2	0.74	0.79	0.74	55.5
All Vehicles		3377	4.4	0.667	7.9	LOS A	5.9	42.9	0.55	0.62	0.59	63.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

Site: 101 [Nelsons Bay Rd & Cabbage Tree Rd - 2029 AM Prop]

2029 AM with Proposal

Site Category: (None)

Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	128	23.4	0.550	7.4	LOS A	4.1	32.5	0.62	0.59	0.62	58.6
2	T1	1123	2.2	0.550	7.4	LOS A	4.1	32.5	0.62	0.61	0.63	66.5
3	R2	57	0.0	0.550	14.4	LOS A	4.1	29.7	0.63	0.62	0.64	61.9
Approach		1308	4.2	0.550	7.7	LOS A	4.1	32.5	0.62	0.60	0.63	65.4
East: Lavis Lane												
4	L2	168	1.2	0.576	12.6	LOS A	4.2	30.4	0.88	1.05	1.21	52.7
5	T1	64	0.0	0.576	12.4	LOS A	4.2	30.4	0.88	1.05	1.21	50.5
6	R2	122	1.6	0.576	19.0	LOS B	4.2	30.4	0.88	1.05	1.21	54.3
Approach		354	1.1	0.576	14.7	LOS B	4.2	30.4	0.88	1.05	1.21	52.8
North: Nelsons Bay Rd												
7	L2	175	1.1	0.382	5.9	LOS A	2.2	15.5	0.36	0.51	0.36	60.9
8	T1	1176	3.2	0.683	6.3	LOS A	6.2	45.3	0.46	0.52	0.46	67.4
9	R2	119	22.7	0.683	13.7	LOS A	6.2	45.3	0.49	0.53	0.49	61.9
Approach		1470	4.6	0.683	6.9	LOS A	6.2	45.3	0.45	0.52	0.45	66.1
West: Cabbage Tree Rd												
10	L2	208	13.0	0.267	6.4	LOS A	1.4	12.4	0.75	0.77	0.75	56.4
11	T1	18	0.0	0.159	6.7	LOS A	0.7	8.2	0.72	0.88	0.72	52.1
12	R2	44	50.0	0.159	15.6	LOS B	0.7	8.2	0.72	0.88	0.72	47.3
12u	U	7	100.0	0.159	20.6	LOS B	0.7	8.2	0.72	0.88	0.72	53.0
Approach		277	20.2	0.267	8.3	LOS A	1.4	12.4	0.74	0.80	0.74	54.2
All Vehicles		3409	5.3	0.683	8.1	LOS A	6.2	45.3	0.58	0.63	0.62	63.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

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.

Roundabout Capacity Model: SIDRA Standard.

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 SUMMARY

 Site: 101 [Nelsons Bay Rd & Cabbage Tree Rd - 2029 PM Base]

2029 PM Base
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	146	8.9	0.610	8.0	LOS A	5.3	39.7	0.68	0.68	0.74	58.5
2	T1	1242	1.7	0.610	8.4	LOS A	5.3	39.7	0.69	0.70	0.76	66.2
3	R2	24	0.0	0.610	15.6	LOS B	5.3	38.1	0.70	0.73	0.78	61.5
Approach		1412	2.4	0.610	8.5	LOS A	5.3	39.7	0.69	0.70	0.76	65.2
East: Lavis Lane												
4	L2	115	0.0	0.591	16.6	LOS B	4.5	31.2	0.93	1.10	1.34	49.9
5	T1	65	0.0	0.591	16.4	LOS B	4.5	31.2	0.93	1.10	1.34	47.9
6	R2	112	0.0	0.591	23.0	LOS B	4.5	31.2	0.93	1.10	1.34	51.5
Approach		292	0.0	0.591	19.0	LOS B	4.5	31.2	0.93	1.10	1.34	50.0
North: Nelsons Bay Rd												
7	L2	85	0.0	0.430	5.9	LOS A	2.8	19.6	0.38	0.50	0.38	60.6
8	T1	1417	1.5	0.769	6.3	LOS A	9.3	66.7	0.52	0.53	0.52	67.2
9	R2	187	13.4	0.769	13.6	LOS A	9.3	66.7	0.58	0.54	0.58	61.5
Approach		1689	2.7	0.769	7.1	LOS A	9.3	66.7	0.52	0.52	0.52	66.2
West: Cabbage Tree Rd												
10	L2	98	5.1	0.127	6.1	LOS A	0.7	5.1	0.75	0.74	0.75	58.1
11	T1	24	0.0	0.182	6.8	LOS A	0.8	6.6	0.75	0.87	0.75	52.3
12	R2	65	4.6	0.182	13.5	LOS A	0.8	6.6	0.75	0.87	0.75	55.5
12u	U	7	100.0	0.182	20.7	LOS B	0.8	6.6	0.75	0.87	0.75	53.1
Approach		194	7.7	0.182	9.3	LOS A	0.8	6.6	0.75	0.81	0.75	56.2
All Vehicles		3587	2.6	0.769	8.7	LOS A	9.3	66.7	0.63	0.66	0.69	63.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

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.

Roundabout Capacity Model: SIDRA Standard.

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 SUMMARY

Site: 101 [Nelsons Bay Rd & Cabbage Tree Rd - 2029 PM Prop]

2029 PM with Proposal
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	161	17.4	0.621	8.4	LOS A	5.6	43.2	0.70	0.69	0.76	58.2
2	T1	1243	1.8	0.621	8.5	LOS A	5.6	43.2	0.70	0.72	0.78	66.1
3	R2	24	0.0	0.621	15.7	LOS B	5.5	39.9	0.71	0.74	0.80	61.5
Approach		1428	3.5	0.621	8.6	LOS A	5.6	43.2	0.70	0.72	0.77	65.0
East: Lavis Lane												
4	L2	115	0.0	0.629	18.7	LOS B	5.0	34.7	0.95	1.13	1.43	48.6
5	T1	65	0.0	0.629	18.5	LOS B	5.0	34.7	0.95	1.13	1.43	46.6
6	R2	112	0.0	0.629	25.1	LOS B	5.0	34.7	0.95	1.13	1.43	50.1
Approach		292	0.0	0.629	21.1	LOS B	5.0	34.7	0.95	1.13	1.43	48.7
North: Nelsons Bay Rd												
7	L2	85	0.0	0.440	6.0	LOS A	2.9	20.2	0.41	0.51	0.41	60.4
8	T1	1418	1.6	0.788	6.5	LOS A	9.7	69.6	0.58	0.54	0.58	66.8
9	R2	187	13.4	0.788	13.8	LOS A	9.7	69.6	0.65	0.55	0.65	61.1
Approach		1690	2.8	0.788	7.3	LOS A	9.7	69.6	0.58	0.54	0.58	65.8
West: Cabbage Tree Rd												
10	L2	98	5.1	0.179	7.4	LOS A	0.8	6.5	0.75	0.85	0.75	57.7
11	T1	24	0.0	0.165	5.7	LOS A	0.8	8.2	0.76	0.84	0.76	52.8
12	R2	80	22.5	0.165	13.0	LOS A	0.8	8.2	0.76	0.84	0.76	52.5
12u	U	7	100.0	0.165	17.9	LOS B	0.8	8.2	0.76	0.84	0.76	53.7
Approach		209	14.4	0.179	9.8	LOS A	0.8	8.2	0.75	0.85	0.75	54.8
All Vehicles		3619	3.5	0.788	9.1	LOS A	9.7	69.6	0.67	0.67	0.73	63.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

Site: 101 [Nelsons Bay Rd & Seaside Blve - 2029 AM]

2029 AM Base
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	19	0.0	0.371	5.1	LOS A	2.4	17.7	0.39	0.46	0.39	58.1
2	T1	1254	3.4	0.582	5.2	LOS A	5.1	38.5	0.44	0.46	0.44	63.1
3	R2	32	6.2	0.582	11.8	LOS A	5.1	38.5	0.47	0.46	0.47	60.4
Approach		1305	3.4	0.582	5.4	LOS A	5.1	38.5	0.44	0.46	0.44	62.9
East: Seaside Blvde												
4	L2	291	1.7	0.386	9.6	LOS A	2.5	18.5	0.86	0.95	0.94	54.7
5	T1	2	100.0	0.230	14.1	LOS A	1.2	8.5	0.79	0.92	0.79	49.6
6	R2	125	0.0	0.230	15.8	LOS B	1.2	8.5	0.79	0.92	0.79	52.5
Approach		418	1.7	0.386	11.4	LOS A	2.5	18.5	0.84	0.94	0.90	54.0
North: Nelsons Bay Rd												
7	L2	48	8.3	0.343	5.0	LOS A	2.0	14.4	0.29	0.43	0.29	58.6
8	T1	1465	2.6	0.702	5.1	LOS A	7.4	53.3	0.40	0.44	0.40	63.5
9	R2	7	0.0	0.702	11.6	LOS A	7.4	53.3	0.43	0.44	0.43	61.0
9u	U	5	60.0	0.702	13.5	LOS A	7.4	53.3	0.43	0.44	0.43	60.8
Approach		1525	3.0	0.702	5.1	LOS A	7.4	53.3	0.39	0.44	0.39	63.3
West: Fullerton Cove Rd												
10	L2	2	0.0	0.100	8.1	LOS A	0.5	4.1	0.74	0.88	0.74	51.7
11	T1	2	100.0	0.100	12.6	LOS A	0.5	4.1	0.74	0.88	0.74	50.6
12	R2	52	7.7	0.100	14.7	LOS B	0.5	4.1	0.74	0.88	0.74	52.1
Approach		56	10.7	0.100	14.2	LOS A	0.5	4.1	0.74	0.88	0.74	52.0
All Vehicles		3304	3.1	0.702	6.2	LOS A	7.4	53.3	0.47	0.52	0.48	61.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

 Site: 101 [Nelsons Bay Rd & Seaside Blve - 2029 PM Base]

2029 PM Base
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	51	3.9	0.400	4.6	LOS A	2.7	20.2	0.23	0.40	0.23	59.1
2	T1	1345	2.4	0.628	4.8	LOS A	6.4	46.8	0.27	0.43	0.27	63.9
3	R2	190	2.6	0.628	11.3	LOS A	6.4	46.8	0.29	0.44	0.29	61.0
Approach		1586	2.5	0.628	5.5	LOS A	6.4	46.8	0.27	0.43	0.27	63.4
East: Seaside Blvde												
4	L2	94	2.1	0.156	9.0	LOS A	1.0	7.4	0.89	0.87	0.89	55.2
5	T1	2	100.0	0.087	14.1	LOS A	0.5	4.0	0.83	0.90	0.83	49.5
6	R2	34	5.9	0.087	16.2	LOS B	0.5	4.0	0.83	0.90	0.83	51.2
Approach		130	4.6	0.156	10.9	LOS A	1.0	7.4	0.87	0.88	0.87	54.0
North: Nelsons Bay Rd												
7	L2	132	0.0	0.410	5.8	LOS A	2.3	16.5	0.47	0.54	0.47	57.8
8	T1	1493	1.3	0.839	7.6	LOS A	12.9	91.1	0.71	0.65	0.79	61.3
9	R2	8	0.0	0.839	14.6	LOS B	12.9	91.1	0.77	0.68	0.87	58.7
9u	U	3	0.0	0.839	15.5	LOS B	12.9	91.1	0.77	0.68	0.87	60.8
Approach		1636	1.2	0.839	7.5	LOS A	12.9	91.1	0.69	0.65	0.77	61.0
West: Fullerton Cove Rd												
10	L2	12	0.0	0.091	8.9	LOS A	0.4	3.5	0.75	0.87	0.75	52.2
11	T1	6	33.3	0.091	10.4	LOS A	0.4	3.5	0.75	0.87	0.75	51.2
12	R2	33	6.1	0.091	15.6	LOS B	0.4	3.5	0.75	0.87	0.75	52.9
Approach		51	7.8	0.091	13.4	LOS A	0.4	3.5	0.75	0.87	0.75	52.5
All Vehicles		3403	2.0	0.839	6.8	LOS A	12.9	91.1	0.50	0.56	0.54	61.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

 Site: 101 [Nelsons Bay Rd & Seaside Blve - 2029 AM Prop]

2029 AM with Proposal
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	19	0.0	0.390	5.3	LOS A	2.4	18.0	0.44	0.48	0.44	57.8
2	T1	1270	3.7	0.612	5.5	LOS A	5.2	39.6	0.50	0.49	0.50	62.7
3	R2	32	6.2	0.612	12.1	LOS A	5.2	39.6	0.53	0.49	0.53	60.0
Approach		1321	3.7	0.612	5.7	LOS A	5.2	39.6	0.50	0.49	0.50	62.5
East: Seaside Blvde												
4	L2	291	1.7	0.415	10.8	LOS A	2.9	21.2	0.90	0.99	1.03	53.7
5	T1	2	100.0	0.245	15.1	LOS B	1.3	9.3	0.82	0.93	0.82	49.2
6	R2	125	0.0	0.245	16.5	LOS B	1.3	9.3	0.82	0.93	0.82	52.1
Approach		418	1.7	0.415	12.5	LOS A	2.9	21.2	0.87	0.97	0.96	53.2
North: Nelsons Bay Rd												
7	L2	48	8.3	0.358	5.0	LOS A	2.1	15.5	0.30	0.43	0.30	58.5
8	T1	1479	3.5	0.733	5.1	LOS A	8.4	62.3	0.42	0.44	0.42	63.3
9	R2	7	0.0	0.733	11.6	LOS A	8.4	62.3	0.47	0.45	0.47	60.7
9u	U	37	94.6	0.733	14.2	LOS A	8.4	62.3	0.47	0.45	0.47	59.2
Approach		1571	5.8	0.733	5.4	LOS A	8.4	62.3	0.42	0.44	0.42	63.0
West: Fullerton Cove Rd												
10	L2	2	0.0	0.107	8.6	LOS A	0.5	4.5	0.77	0.90	0.77	51.3
11	T1	2	100.0	0.107	13.4	LOS A	0.5	4.5	0.77	0.90	0.77	50.2
12	R2	52	7.7	0.107	15.3	LOS B	0.5	4.5	0.77	0.90	0.77	51.7
Approach		56	10.7	0.107	14.8	LOS B	0.5	4.5	0.77	0.90	0.77	51.6
All Vehicles		3366	4.5	0.733	6.5	LOS A	8.4	62.3	0.51	0.53	0.52	61.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 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.
 Roundabout Capacity Model: SIDRA Standard.
 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 SUMMARY

Site: 101 [Nelsons Bay Rd & Seaside Blve - 2029 PM Prop]

2029 PM with Proposal
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nelsons Bay Rd												
1	L2	51	3.9	0.429	4.9	LOS A	2.9	21.4	0.33	0.44	0.33	58.4
2	T1	1359	3.4	0.673	5.1	LOS A	6.8	50.9	0.39	0.47	0.39	63.0
3	R2	190	2.6	0.673	11.6	LOS A	6.8	50.9	0.43	0.48	0.43	60.2
Approach		1600	3.3	0.673	5.9	LOS A	6.8	50.9	0.40	0.47	0.40	62.5
East: Seaside Blvde												
4	L2	94	2.1	0.177	9.7	LOS A	1.2	8.8	0.93	0.91	0.93	54.6
5	T1	2	100.0	0.097	15.1	LOS B	0.5	4.6	0.86	0.92	0.86	49.0
6	R2	34	5.9	0.097	17.0	LOS B	0.5	4.6	0.86	0.92	0.86	50.8
Approach		130	4.6	0.177	11.6	LOS A	1.2	8.8	0.91	0.91	0.91	53.4
North: Nelsons Bay Rd												
7	L2	132	0.0	0.430	5.8	LOS A	2.6	18.3	0.49	0.54	0.49	57.7
8	T1	1507	2.3	0.880	8.6	LOS A	16.7	121.7	0.80	0.71	0.92	60.7
9	R2	8	0.0	0.880	15.8	LOS B	16.7	121.7	0.88	0.75	1.04	58.1
9u	U	35	91.4	0.880	19.8	LOS B	16.7	121.7	0.88	0.75	1.04	56.8
Approach		1682	3.9	0.880	8.7	LOS A	16.7	121.7	0.77	0.70	0.89	60.4
West: Fullerton Cove Rd												
10	L2	12	0.0	0.102	9.7	LOS A	0.5	4.1	0.79	0.89	0.79	51.7
11	T1	6	33.3	0.102	11.3	LOS A	0.5	4.1	0.79	0.89	0.79	50.7
12	R2	33	6.1	0.102	16.3	LOS B	0.5	4.1	0.79	0.89	0.79	52.4
Approach		51	7.8	0.102	14.2	LOS A	0.5	4.1	0.79	0.89	0.79	52.0
All Vehicles		3463	3.7	0.880	7.6	LOS A	16.7	121.7	0.60	0.60	0.66	60.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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 Roundabout Capacity Model: SIDRA Standard.
 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.

