

## **APPENDIX 7**

### **Traffic Assessment Report**

**TRAFFIC ASSESSMENT REPORT**

**FOR**

**PROPOSED**

**SAND**

**EXTRACTION**

**NELSON BAY ROAD**

**SALT ASH**

**27 OCTOBER 2008**

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## 1.0 INTRODUCTION

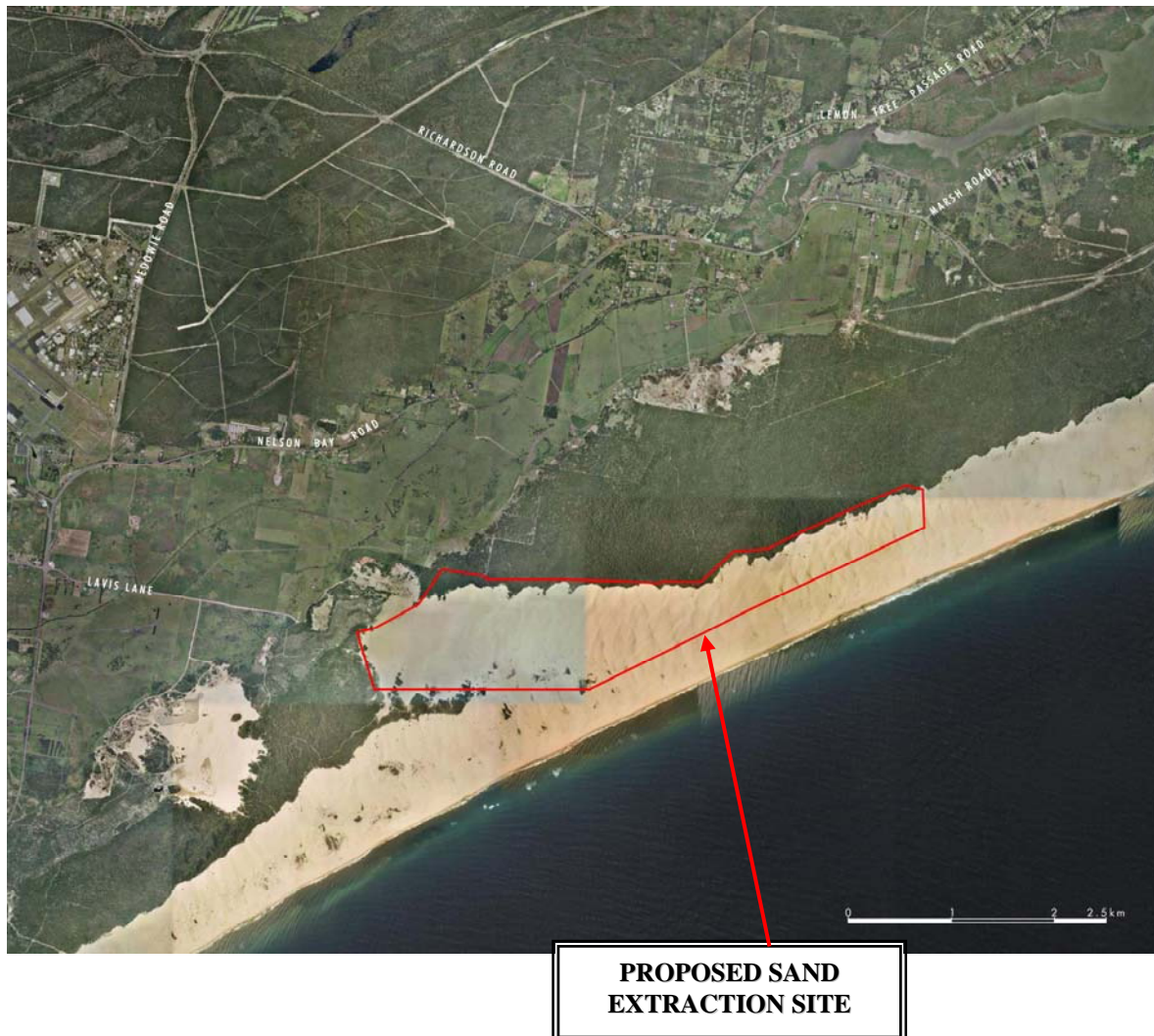
The purpose of this Traffic Assessment Report is to examine the potential traffic impacts of a proposed development to extract sand from two locations at Salt Ash.

The two locations are separate allotments and therefore require separate access.

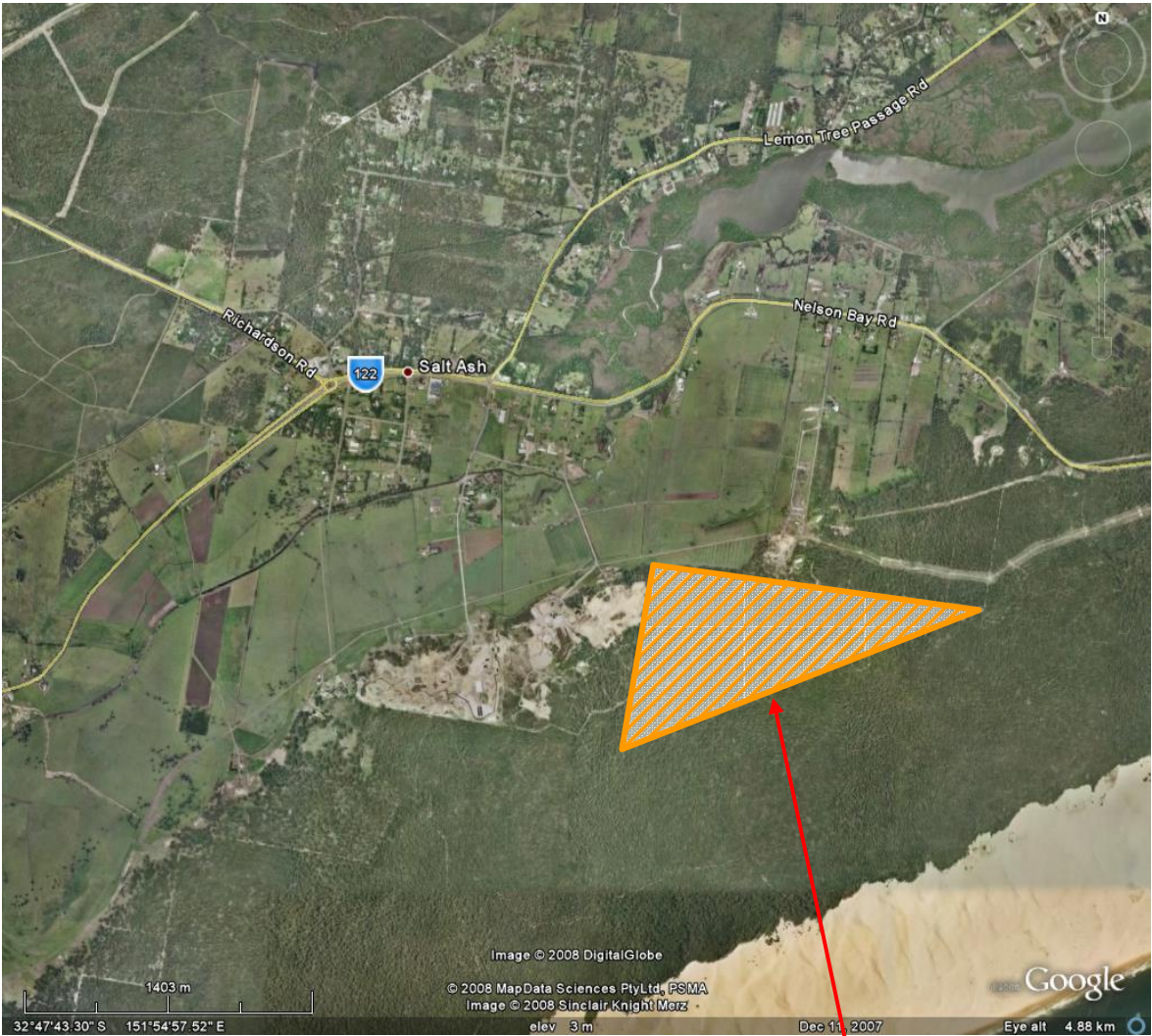
The two locations for sand extraction are adjacent to existing sand mining operations that are now declining.

## 2.0 LOCALITY DIAGRAMS

### Lot 218 DP 1044608 – Salt Ash



Lot 220 DP 1049608 – Salt Ash



**PROPOSED SAND  
EXTRACTION SITE**

## **3.0 EXISTING CONDITIONS**

### ***3.1 Existing Site Usage***

The existing sites consist of vacant land.

Lot 218 DP 1044608 is surrounded by developed rural land, undeveloped bushland, an existing sand mining lease and adjacent coastal sand dunes.

Lot 220 DP 1049608 is surrounded by developed rural land, undeveloped bushland and an existing sand mining lease.

### ***3.2 Adjacent Developments***

The area surrounding Lot 218 DP 1044608 is essentially rural in nature with existing sand mining operations on adjacent lots past the end of Lavis Lane. There are two residential properties on larger rural blocks near the eastern end of Lavis Lane and four residential properties closer to Nelson Bay Road.

There is a Metro service station development located on the north-eastern corner of Nelson Bay Road and Lavis Lane, generally north of the subject site.

There is residential and commercial development north of Lavis Lane towards Williamtown.

There is an existing sand-mining business at the end of Lavis Lane.

Williamtown Primary School is located on the north-western corner of Nelson Bay Road and Cabbage Tree Road.

The area surrounding Lot 220 DP 1049608 is also rural in nature with areas of bushland. There are existing sand mining operations on land immediately west of the site.

There are two tourist developments on Oakvale Drive – Oakvale Farm and Fauna World, and Dizzyland. Oakvale Farm and Fauna World is located approximately 480 metres south of Nelson Bay Road just south of the junction of Oakvale Drive and the private access road to the existing sand mining operations. Dizzyland is located approximately 120 metres south of Nelson Bay Road.

There are two residential dwellings on Oakvale Drive close to Nelson Bay Road and two residential dwellings adjacent to Oakvale Farm.

### 3.3 Traffic Volumes on Nelson Bay Road

Nelson Bay Road is a classified State Road which is the responsibility of the RTA.

The AADT on Nelson Bay Road is recorded at the RTA permanent counting station 05.191 approximately 200 metres north of Cabbage Tree Road as follows:

<b>AADT Year</b>	<b>AADT</b>
<b>1992</b>	10,745
<b>1995</b>	13,364
<b>1998</b>	14,893
<b>2001</b>	15,401
<b>2004</b>	17,174

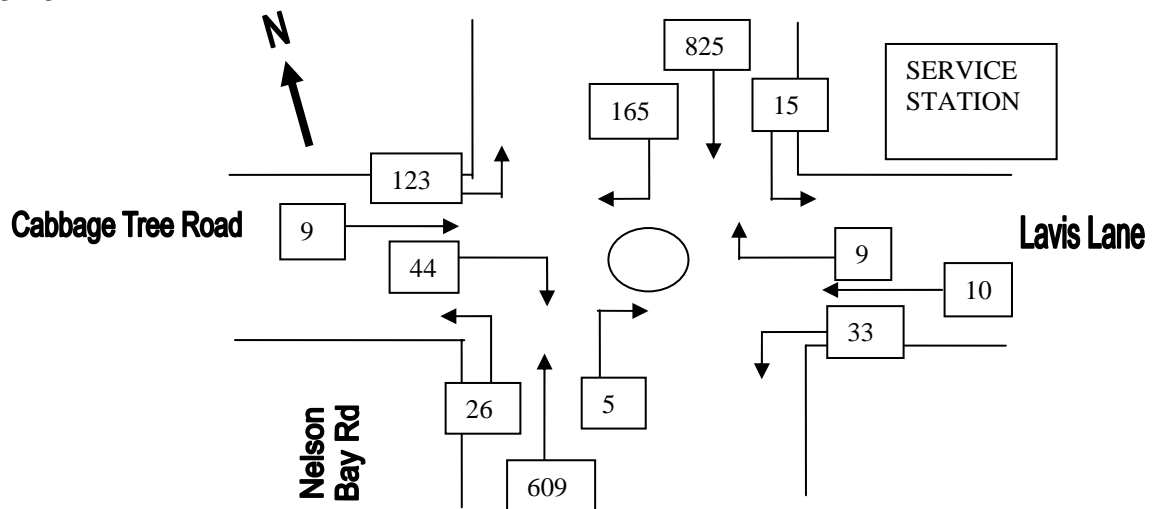
The AADT data indicates that traffic volumes on Nelson Bay Road north of Cabbage Tree Road increased by approximately 3.8% per annum between 2001 and 2004. The average traffic growth rate between 1992 and 2004 was approximately 5% per annum. The growth of Williamstown domestic airport in recent years will tend to increase traffic volumes on Nelson Bay Road in coming years, in addition to residential development in the general area.

Manual traffic surveys have been previously undertaken at the roundabout at Nelson Bay Road, Lavis Lane and Cabbage Tree Road on Thursday 27 May 2004. The counts were undertaken between 7.00 am and 9.00 am, and also between 3.45 pm and 6.00 pm. Additional traffic surveys have been undertaken at the roundabout on 31 July 2008 between 7.00 am and 9.00 am, and also between 3.45 pm and 5.45 pm.

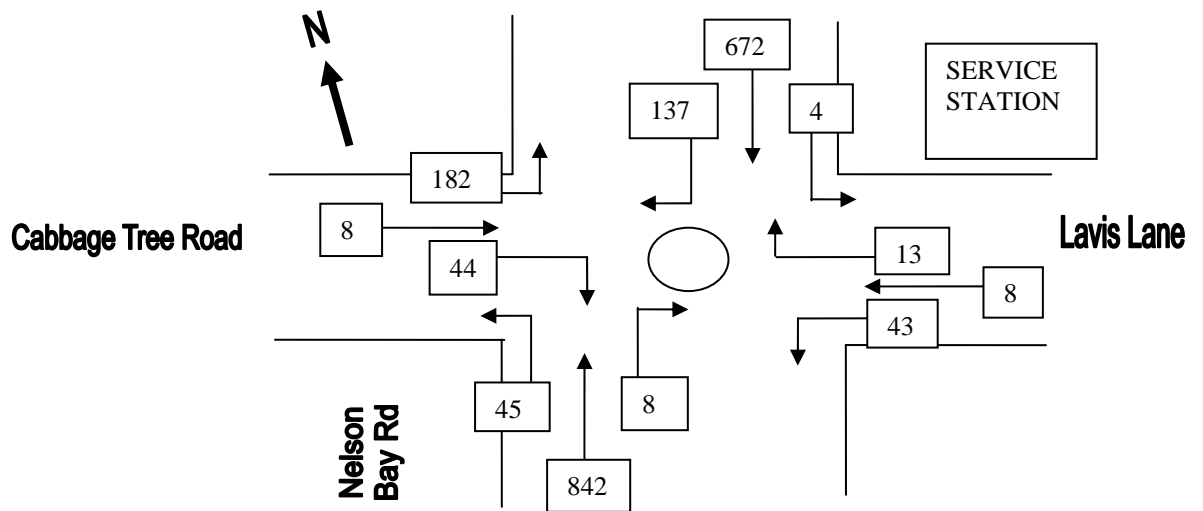
Peak hourly volumes were recorded between 7.15 am and 8.15 am, and also between 4.30 pm and 5.30 pm in 2004, and between 7.15 am and 8.15 am in 2008.

Peak traffic volumes recorded are as shown in the following diagrams.

**(2004 Survey)  
7.15-8.15 AM**

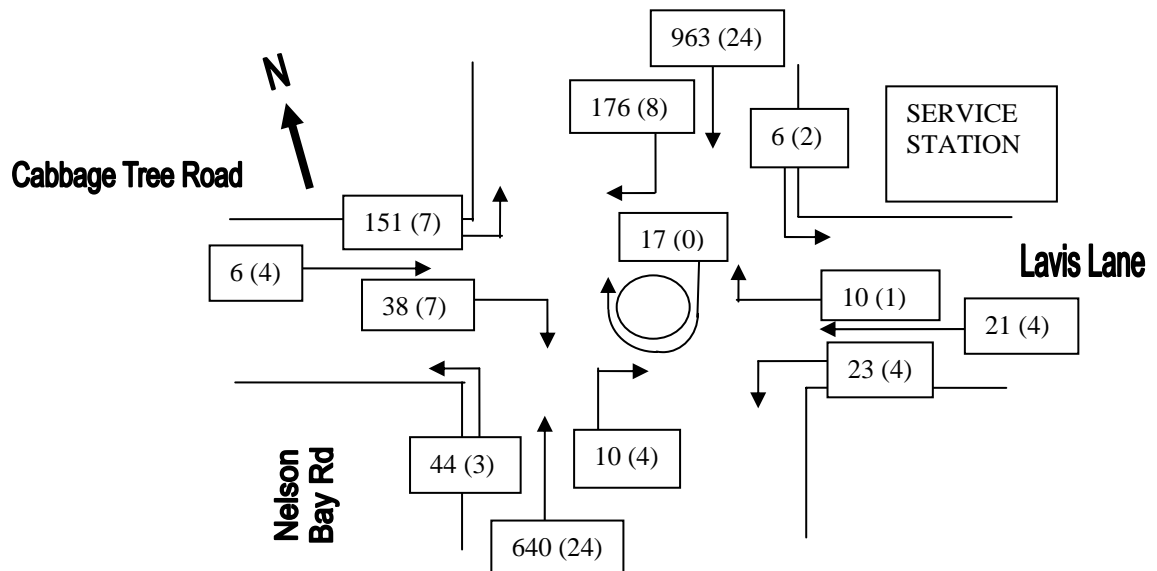


**(2004 Survey)**  
**4.30-5.30 PM**



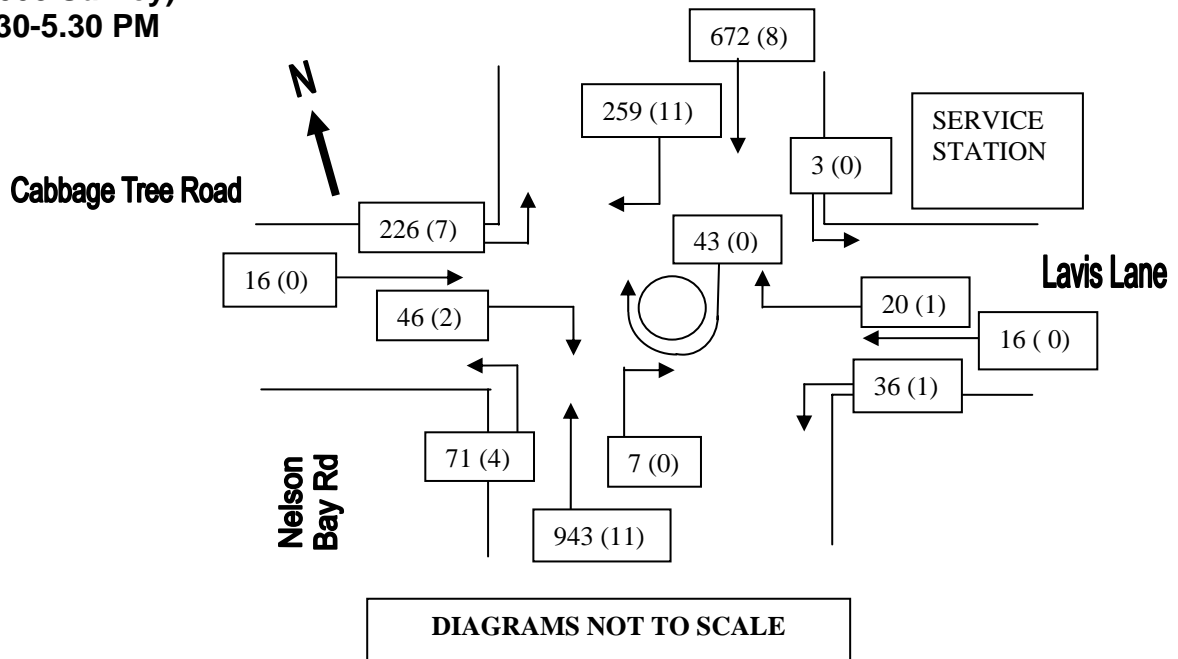
**DIAGRAMS NOT TO SCALE**

**(2008 Survey)**  
**7.15-8.15 AM**





(2008 Survey)  
4.30-5.30 PM



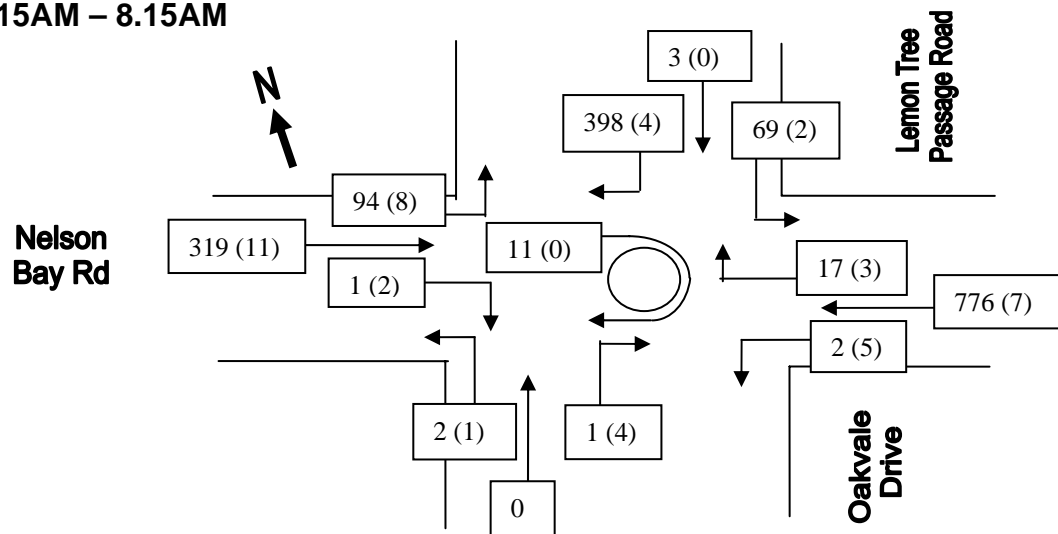
Note: U-turns were notable because the right-turn access into the Williamtown airport was blocked off to facilitate roadworks in conjunction with traffic signal installation at that junction.

U-turns have therefore not been considered in the analysis as they would not normally have occurred.

Traffic surveys have also been undertaken at the roundabout at Nelson Bay Road / Lemon Tree Passage Road / Oakvale Drive on 29 July 2008 between 7.00am and 9.00am, and also between 3.30pm and 5.45pm.

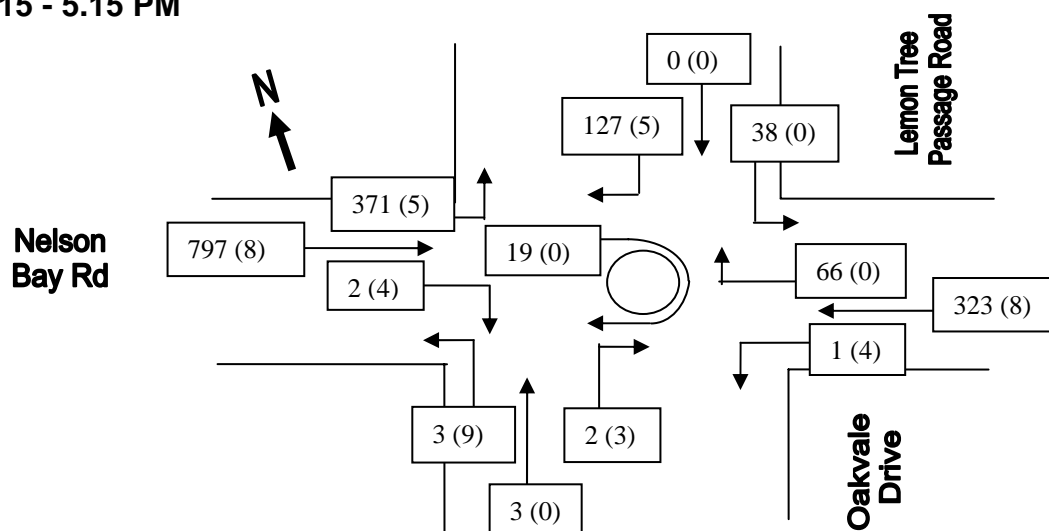
Peak hourly volumes were recorded between 7.15 am and 8.15 am, and also between 4.15 pm and 5.15 pm.

**7.15AM – 8.15AM**





#### 4.15 - 5.15 PM



NOTES: Numerals in brackets are heavy vehicle volumes.  
Eastbound U-turns at the roundabout were essentially associated with the Blinky Bills Early Child Care Centre.

### 3.4 Traffic Environment on Nelson Bay Road

Nelson Bay Road is State Road 108 and connects Industrial Highway at Mayfield and Nelson Bay. Nelson Bay Road has dual carriageways between Cabbage Tree Road and Medowie Road and also between Lemon Tree Passage Road to approximately 0.9km west of Richardson Road. There are also dual carriageways further north along Nelson Bay Road.

Nelson Bay Road has two southbound lanes exiting the roundabout at Lavis Lane merging into one lane approximately 100 metres south of the roundabout and prior to the start of the 100km/h speed zone.

The speed zone on Nelson Bay Road is 80km/h through Salt Ash and Williamtown, transitioning to 100km/h approximately 325 metres south of the roundabout at Cabbage Tree Road / Lavis Lane.

There is no kerb and gutter along Nelson Bay Road in the vicinity of Cabbage Tree Road / Lavis Lane or Lemon Tree Passage Road / Oakvale Drive roundabouts apart from kerb and gutter around the roundabout circles.

New traffic signals are currently being installed at the airport turnoff to replace a seagull junction.

There is a grassed median approximately 6 metres wide separating the two carriageways north Cabbage Tree Road / Lavis Lane.

### **3.5 Traffic Environment on Cabbage Tree Road**

Cabbage Tree Road is State Road No. 302, aligned generally east-west, connecting Nelson Bay Road at Williamtown and the Pacific Highway at Tomago.

Cabbage Tree Road has a relatively flat gradient near Nelson Bay Road and generally straight alignment with some large radius bends.

There is kerb and gutter along both sides including the frontage of the public school for approximately 0.35km west of Nelson Bay Road, but elsewhere the road has a rural type cross-section.

There is street lighting adjacent to the public school.

There is linemarking along the entire length of Cabbage Tree Road / Tomago Road.

### **3.6 Traffic Environment on Lavis Lane**

Lavis Lane is a local road aligned generally east-west connecting to Nelson Bay Road at its western end. Lavis Lane provides access for several residential dwellings in addition to the Worimi Conservation Lands and also sand mining operations.

Lavis Lane has a total length of approximately 2.5 km.

Lavis Lane has relatively flat gradients along its length.

Lavis Lane has two sealed sections in the vicinity of residential dwellings and a gravel pavement between the two sealed sections which is approximately 0.7km long.

The sealed width of Lavis Lane is quite variable, being approximately 12.5 metres near the service station at Nelson Bay Road, approximately 10 metres near the 80km/h signs, to approximately 6 metres at the eastern seal / gravel pavement interface.

The condition of the existing pavement is quite variable.

There is no linemarking or street lighting along Lavis Lane.

There are no footpaths along Lavis Lane.

### ***3.7 Traffic Environment on Lemon Tree Passage Road***

Lemon Tree Passage Road is a Regional Road aligned generally north-east / south-west.

The gradients along Lemon Tree Passage Road are relatively flat and the alignment generally straight except for several bends towards Nelson Bay Road and further north towards Lemon Tree Passage.

Lemon Tree Passage Road provides the only road link between residential and commercial areas on the Lemon Tree Passage peninsula.

There is no linemarking or street lighting along Lemon Tree Passage Road in the vicinity of Nelson Bay Road, except for lighting at the roundabout.

There are no footpaths along the majority of Lemon Tree Passage Road.

### ***3.8 Traffic Environment on Oakvale Drive***

Oakvale Drive is a short local street approximately 0.7km long aligned generally north-south.

The sealed width on Oakvale Drive varies from approximately 9.4 metres near the Dizzyland development to approximately 8.6 metres just north of the private Unimin mine access road junction. The seal width reduces to approximately 6.1 metres just south of that junction.

The Unimin access road has a sealed width of approximately 9.0 metres just east of Oakvale Drive, with a cattle grid at the property boundary.

There is no linemarking or street lighting along Oakvale Drive.

Oakvale Drive has a generally straight alignment and relatively level gradients.

### ***3.9 Access to the Sites***

Access for Lot 218 DP 1044608 will be via a private road and Lavis Lane onto Nelson Bay Road / Cabbage Tree Road.

Access for Lot 220 DP 1049608 will be via a private road and Oakvale Drive onto Nelson Bay Road / Lemon Tree Passage Road.

### ***3.10 Speed Zoning***

Nelson Bay Road has a speed zone of 80 km/h through Salt Ash and Williamtown transitioning to 100km/h approximately 325 metres south of the roundabout at Cabbage Tree Road.

The speed zone on Cabbage Tree Road is 60km/h, with a 40km/h school zone past the public school on the north-western corner of Cabbage Tree Road and Nelson Bay Road.

The speed zone on Lemon Tree Passage Road is 80km/h.

Lavis Lane is signposted for 80km/h.

Oakvale Drive is not signposted for speed zoning between Nelson Bay Road and the mine access road but would be 50km/h by default. A speed zone of 20km/h is indicated on Oakvale Drive just south of the junction with the mine access road.

### ***3.11 Pedestrian Activity***

Pedestrian activity is negligible in this area. There are no formed footpaths along either side of Nelson Bay Road, either side of Lemon Tree Passage Road, Lavis Lane or Oakvale Drive. There are no pedestrian attractions in the vicinity of the proposed development.

The two tourist facilities on Oakvale Drive, Dizzyland and also Oakvale Farm are quite isolated from nearby residential areas and pedestrian generation is not usual.

## 4.0 PROPOSED DEVELOPMENT

### 4.1 Development Components

The proposed development involves two separate areas at Salt Ash that are to be used for the extraction of sand.

The two areas are adjacent to existing sand extraction areas which are experiencing diminishing supply.

### 4.2 Traffic Generation

The RTA Guide to Traffic Generating Developments does not provide traffic generation data for sand mining. Traffic generation rates can be estimated from proposed maximum annual yield and operating hours.

The maximum annual sand extraction at each site will be 1,000,000 tonnes.

Each site will operate 24 hours a day, 7 days a week.

It is assumed that each site would close for 1 week over the Christmas period.

The average truck capacity will be 33 tonnes per load.

Average weekly traffic generation per site:

$$1,000,000 / 51 \qquad \qquad \qquad 19,608 \text{ tonnes per week}$$

Assuming that 80% of the average extraction will be Monday to Friday inclusive, the average weekday traffic generation would be:

$$15,686 / 5 = 3,137 \text{ tonnes per day}$$

Although both extraction sites will operate on a 24 hour basis, it is likely that demand will be higher during the day, say between 5am and 10pm. It is also intended that transport during peak traffic periods will be avoided where possible.

Assuming that 90% of sand extraction occurs between 5am and 10pm, with an average rate of 185 tonnes per hour.

$$\begin{array}{ll} \text{This rate translates to } 185 / 33 & = 5.6 \text{ trucks} \\ & \text{Say } 6 \text{ trucks} \end{array}$$

That is 6 trucks in and 6 trucks out at each site.

In the unlikely event that maximum demand may be greater than the average demand, the estimated maximum generation rate at each site has been increased by 33% to 8 trucks in and 8 trucks out during the peak hour on Nelson Bay Road.

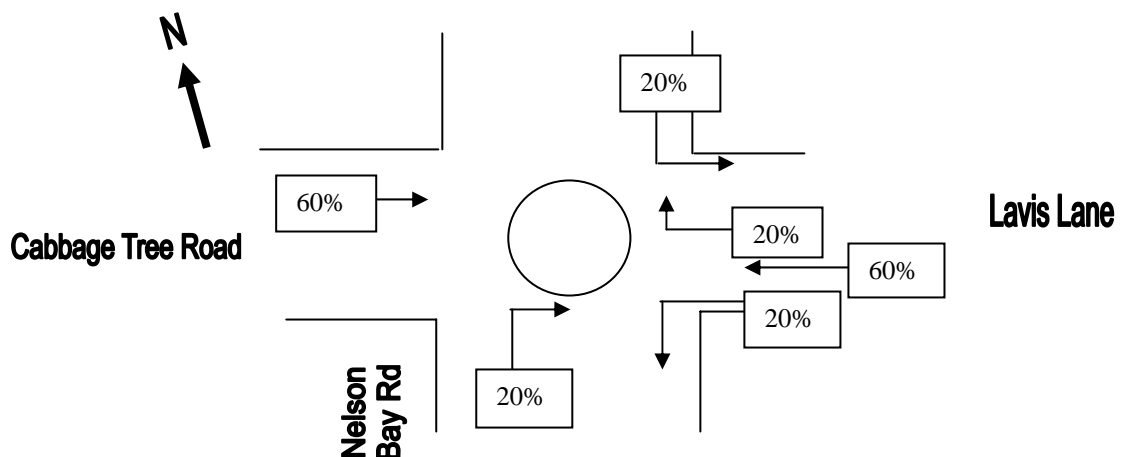
It is intended that transport in peak hours will be avoided as much as is possible because increased traffic congestion results in inefficient travel times and costs.

It is also unlikely that the potential maximum supply would be delivered on a constant basis due to fluctuations in demand.

#### **4.3 Origin / Destination Considerations**

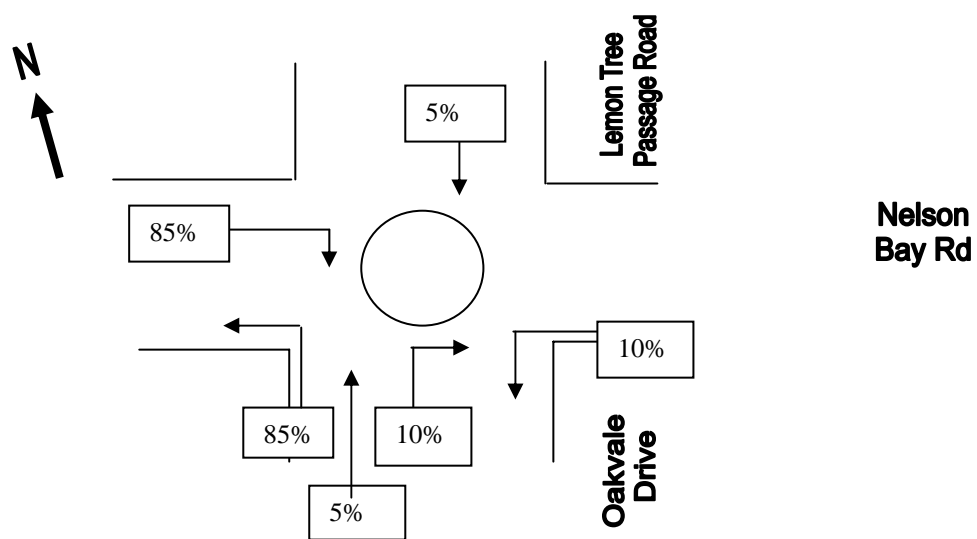
Based on the location of the site relative to major population centres and major road networks served by Tomago Road / Cabbage Tree Road, and also Nelson Bay Road, it is estimated that approximately 60% of the inward trips would be along Cabbage Tree Road (west) because of the link to the F3 Freeway, the New England Highway and developing residential areas to the west of Newcastle, 20% along Nelson Bay Road to the south and 20% along Nelson Bay Road to the north to link with Medowie Road, Richardson Road and the Pacific Highway for areas generally north.

The assumed traffic patterns are shown on the following diagrams:

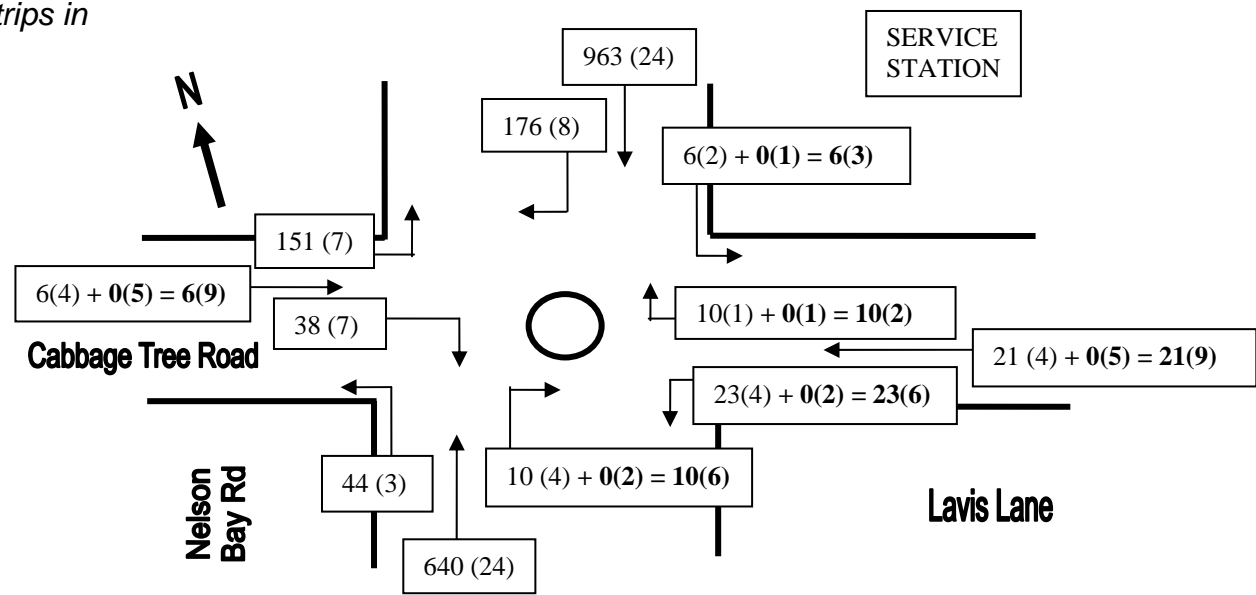


Based on the location of the site relative to major population centres and major road networks served by Lemon Tree Passage Road Nelson Bay Road, it is estimated that approximately 85% of trips would be along Nelson Bay Road towards Richardson Road and Cabbage Tree Road at Williamtown.

Lemon Tree Passage Road and Nelson Bay Road to the north would offer limited markets for sand because of the limited area for future development.



**7.15 – 8.15 AM**  
*8 trips out*  
*8 trips in*



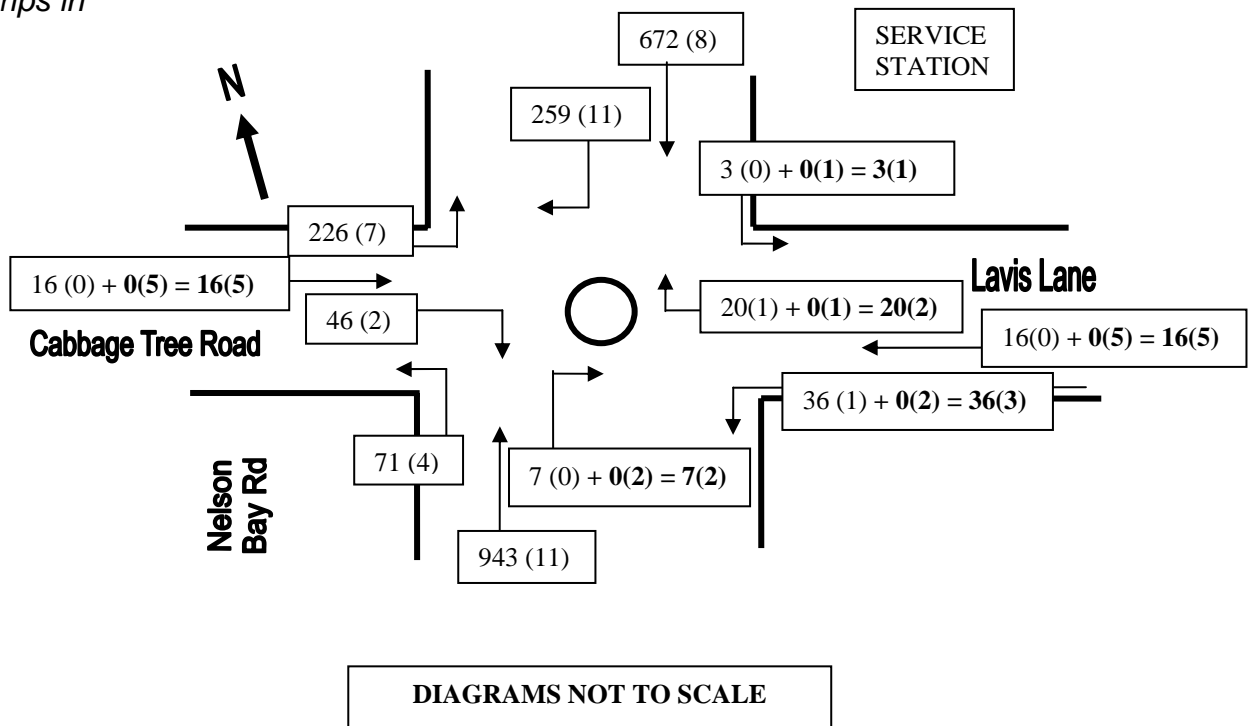
Numerals in bold font represent estimated maximum additional traffic generation from the proposed sand extraction development at Lot 218 DP 1044608.



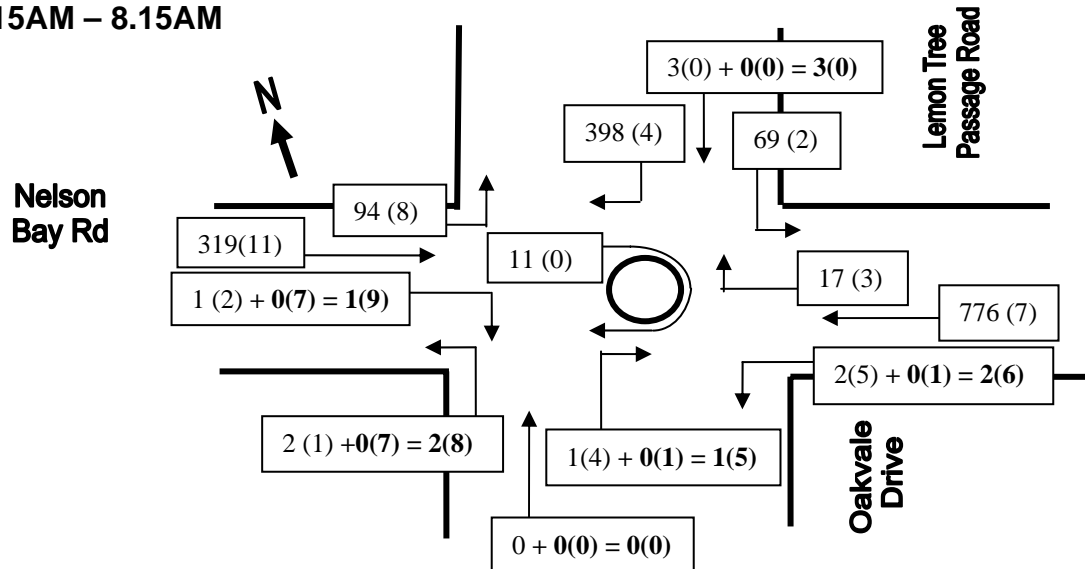
**4.30-5.30 PM**

8 trips out

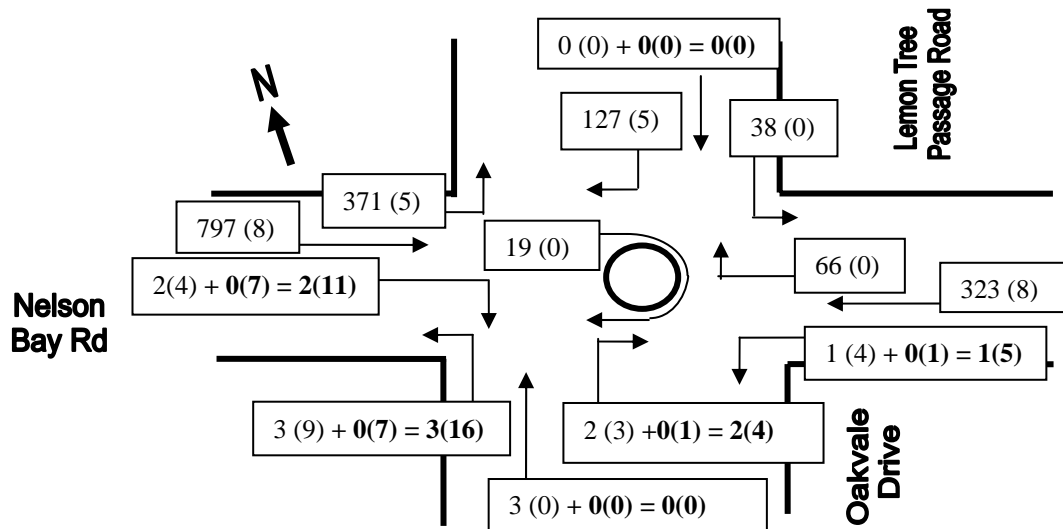
8 trips in



**7.15AM – 8.15AM**



#### 4.15 - 5.15 PM



Numerals in bold font represent estimated maximum additional traffic generation from the proposed sand extraction development at Lot 220 DP 1049608.

NOTES: Numerals in brackets are heavy vehicle volumes.  
Eastbound U-turns at the roundabout were essentially associated with the Blinky Bills Early Child Care Centre located approximately 230 metres west of Oakvale Drive.

#### 4.4 Projected Traffic Volumes on Nelson Bay Road in 2018

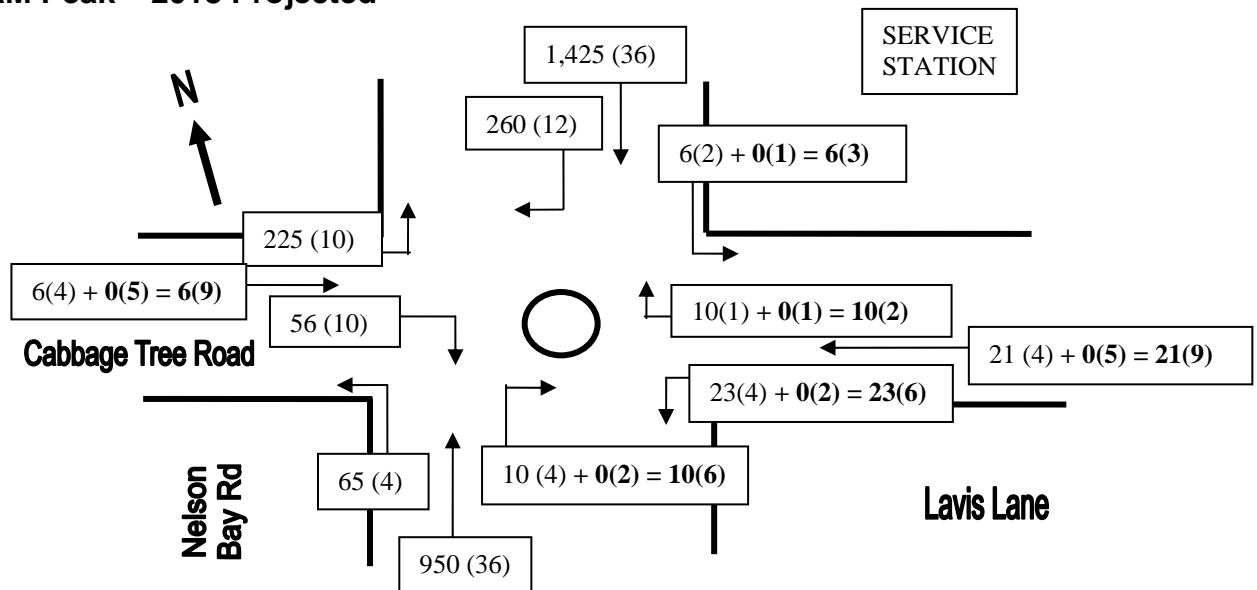
Based on the 2004 intersection surveys and the 2008 surveys at the Cabbage Tree Road / Nelson Bay Road / Lavis Lane roundabout, the morning peak increased by approximately 3.8% per annum and the evening peak increased by approximately 4.2% per annum. This is slightly higher than the average annual traffic growth rate north of the roundabout between 2001 and 2004.

I have therefore used an annual traffic growth rate of 4% per annum to project traffic volumes on Nelson Bay Road and Cabbage Tree Road for 2018, a total increase of approximately 48% on 2008 volumes.

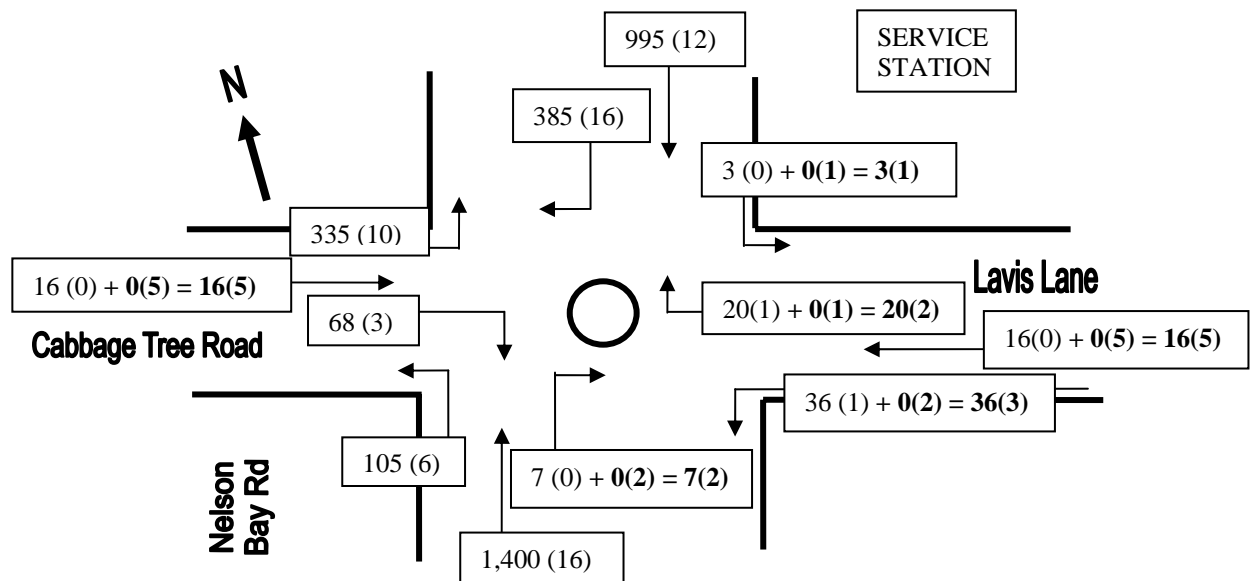
Traffic growth on Lemon Tree Passage Road is likely to be somewhat lower than the above rate because of the limited area that can be developed in future years and an average growth rate of 2% per annum has been used for Lemon Tree Passage Road, or a 22% increase on 2008 volumes.

The predicted traffic volumes at each roundabout in 2018 are shown in the following diagrams.

### AM Peak – 2018 Projected

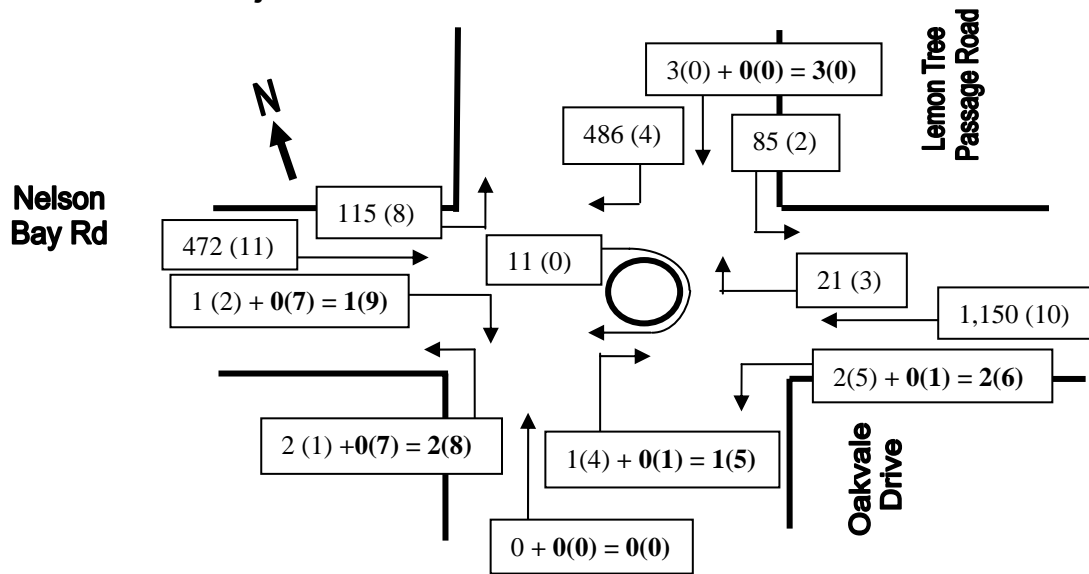


### PM Peak – 2018 Projected

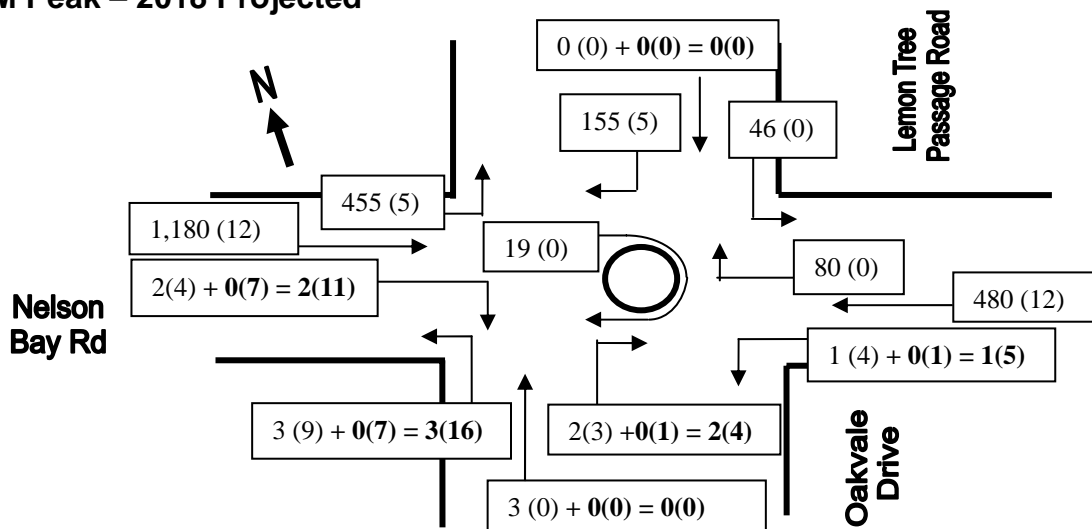


Numerals in bold font represent estimated maximum additional traffic generation from the proposed sand extraction development at Lot 218 DP 1044608.

### AM Peak – 2018 Projected



### PM Peak – 2018 Projected



Numerals in bold font represent estimated maximum additional traffic generation from the proposed sand extraction development at Lot 220 DP 1049608.

## **5.0 POTENTIAL TRAFFIC IMPACTS**

### ***5.1 Safety Issues – General***

Developments should be undertaken such that existing levels of service are not eroded and that the safety of motorists and pedestrians is not compromised.

The proposed Development involves the extraction of sand deposits and transportation to various sites depending on demand.

Lavis Lane already serves existing sand mining leases that have been operating for many years and it is anticipated that the existing leases will gradually be reduced in output.

Oakvale Drive also already serves an existing sand mining lease that has been operating for many years and it is anticipated that the existing lease will gradually be reduced in output.

### ***5.2 Turning Manoeuvres at Nelson Bay Road***

Nelson Bay Road intersects with Cabbage Tree Road and Lavis Lane on a relatively straight section with level grades and at a large multi-lane roundabout.

The impact of the proposed development at Lot 218 DP 1044608 is likely to result in a minor increase in several heavy vehicle movements at the roundabout at Nelson Bay Road / Cabbage Tree Road / Lavis Lane. The additional heavy vehicle manoeuvres can be safely accommodated because of the size of the roundabout and the good sight distance in all directions.

Nelson Bay Road intersects with Lemon Tree Passage Road and Oakvale Drive on a relatively straight section with level grades and at a medium-size multi-lane roundabout.

The impact of the proposed development at Lot 220 DP 1049608 is likely to result in a minor increase in several heavy vehicle movements at the roundabout at Nelson Bay Road / Lemon Tree Passage Road / Oakvale Drive. The additional heavy vehicle manoeuvres can be safely accommodated because of the size of the roundabout and the good sight distance in all directions.

### ***5.3 Pedestrian Safety***

There are presently no pedestrian facilities along Nelson Bay Road in the vicinity of Lavis Lane or along Lavis Lane.

The traffic surveys undertaken on Thursday 27 May 2004 and also 31 July 2008 indicated that there is no pedestrian activity along Nelson Bay Road in the vicinity Lavis Lane, or along Lavis Lane.

The proposed development will not generate any pedestrian activity along Nelson Bay Road because of the small population base close to the site. Some residents along Lavis Lane may walk to the convenience store at the nearby service station.

There are presently no pedestrian facilities along Nelson Bay Road in the vicinity of Lemon Tree Passage Road / Oakvale Drive or along Oakvale Drive. Children who attend the Dizzyland on weekends or the Oakvale Farm and Fauna World developments would be driven to those developments.

#### **5.4 SIDRA Analyses**

Simulations of the operation of the roundabouts at Nelson Bay Road / Cabbage Tree Road and Lavis Lane and also at Nelson Bay Road / Lemon Tree Passage Road / Oakvale Drive have been undertaken using the SIDRA Computer Program for 2008 traffic volumes, 2008 traffic volumes with the additional traffic generated by the proposed sand extraction developments, and also for projected 2018 traffic volumes with and without the additional traffic generated by the proposed sand extraction developments.

This enables examination of existing traffic delays and predicted traffic delays arising from the proposed sand extraction developments.

The SIDRA program was developed in conjunction with ARRB Transport Research Ltd to analyse the operation of intersections controlled by traffic signals, Give Way signs, Stop signs, conventional roundabouts and signal controlled roundabouts. It is widely used by consulting traffic engineers and is recognised and used by the Roads and Traffic Authority of NSW. SIDRA is now owned and developed by Akcelik & Associates Pty Ltd.

The parameters used in the SIDRA program are measured against the following performance standards developed by the Roads and Traffic Authority of NSW and the American Transportation Research Board.

**Table 5.5.1 - Level of Service for Roundabouts.**

<b>Average Delay per vehicle (secs)</b>	<b>Level of Service</b>	<b>Operational Conditions</b>
0 to 14	A	Good
15 to 28	B	Acceptable delays and spare capacity
29 to 42	C	Satisfactory
43 to 56	D	Near capacity
57 to 70	E	At capacity and requires other control mode
> 70	F	Unsatisfactory and requires other control mode

Average delays for each movement predicted by the SIDRA simulations are tabulated below.

**Table 5.5.2 - Average Delays for Movements at Nelson Bay Road / Cabbage Tree Road / Lavis Lane – AM Peak (2008)**

Movement	Average Delays (secs / veh) - Existing Traffic	Level of Service	Average Delays (secs / veh) – Existing Traffic + Development	Level of Service
	7.15 – 8.15 AM		4.30 – 5.30 PM	
Nelson Bay Road left into Cabbage Tree Road	8.5	A	8.5	A
Nelson Bay Road northbound through	9.7	A	9.7	A
Nelson Bay Road right into Lavis Lane	17.2	B	17.2	B
Lavis Lane left into Nelson Bay Road	12.0	A	12.1	A
Lavis Lane westbound through	9.5	A	9.5	A
Lavis Lane right into Nelson Bay Road	19.0	B	19.0	B
Nelson Bay Road left into Lavis Lane	9.1	A	9.1	A
Nelson Bay Road southbound through	8.8	A	8.8	A
Nelson Bay Road southbound right into Cabbage Tree Road	14.1	A	14.1	A
Cabbage Tree Road left into Nelson Bay Road	8.5	A	8.5	A
Cabbage Tree Road eastbound through	8.3	A	8.5	A
Cabbage Tree Road right into Nelson Bay Road	16.3	B	16.9	B
Overall Average Delays	9.8	A	9.8	A



**Table 5.5.3 - Average Delays for Movements at Nelson Bay Road / Lavis Lane / Cabbage Tree Road - PM Peak (2008)**

Movement	Average Delays – Existing Traffic (secs / veh)	Level of Service	Average Delays - Existing Traffic + Development (secs / veh)	Level of Service
	7.15 – 8.15 AM		4.30 – 5.30 PM	
Nelson Bay Road left into Cabbage Tree Road	9.1	A	9.1	A
Nelson Bay Road northbound through	9.6	A	9.6	A
Nelson Bay Road right into Lavis Lane	17.6	B	17.7	B
Lavis Lane left into Nelson Bay Road	10.7	A	10.8	A
Lavis Lane westbound through	8.3	A	8.4	A
Lavis Lane right into Nelson Bay Road	17.9	B	18.0	B
Nelson Bay Road left into Lavis Lane	8.9	A	8.9	A
Nelson Bay Road southbound through	8.1	A	8.1	A
Nelson Bay Road southbound right into Cabbage Tree Road	14.1	A	14.1	A
Cabbage Tree Road left into Nelson Bay Road	9.1	A	9.1	A
Cabbage Tree Road eastbound through	8.7	A	8.9	A
Cabbage Tree Road right into Nelson Bay Road	17.2	B	17.2	B
Overall Average Delays	9.9	A	9.9	A

The SIDRA simulations indicate that the performance of the roundabout at Nelson Bay Road, Cabbage Tree Road and Lavis Lane is not significantly affected by the proposed development at Lot 218 DP 1044608 in the morning peak or the evening periods.

The increase in average delays for all movements is negligible.

The Level of Service is unaffected for all movements.

**Table 5.5.4 - Average Delays for Movements at Nelson Bay Road / Lemon Tree Passage Road / Oakvale Drive – AM Peak (2008)**

Movement	Average Delays (secs / veh) - Existing Traffic	Level of Service	Average Delays (secs / veh) – Existing Traffic + Development	Level of Service
	7.15 – 8.15 AM		4.15 – 5.15 PM	
Oakvale Drive left into Nelson Bay Road	18.3	B	22.6	B
Oakvale Drive northbound through to Lemon Tree Passage Road	16.5	B	19.1	B
Oakvale Drive right into Nelson Bay Road	25.0	B	27.7	B
Westbound on Nelson Bay Road left into Oakvale Drive	18.9	B	19.9	B
Westbound through on Nelson Bay Road	17.3	B	18.2	B
Westbound on Nelson Bay Road right into Lemon Tree Passage Road	23.8	B	24.6	B
Lemon Tree Passage Road left into Nelson Bay Road	11.4	A	11.5	A
Lemon Tree Passage Road southbound through to Oakvale Drive	9.3	A	9.3	A
Lemon Tree Passage Road right into Nelson Bay Road	16.5	B	16.6	B
Nelson Bay Road left into Lemon Tree Passage Road	10.4	A	10.4	A
Eastbound through on Nelson Bay Road	9.3	A	9.3	A
Nelson Bay Road right into Oakvale Drive	16.8	B	16.5	B
Overall Average Delays	15.1	B	15.5	B

**Table 5.5.5 - Average Delays for Movements at Nelson Bay Road / Lemon Tree Passage Road / Oakvale Drive – PM Peak (2008)**

Movement	Average Delays (secs / veh) - Existing Traffic	Level of Service	Average Delays (secs / veh) – Existing Traffic + Development	Level of Service
	7.15 – 8.15 AM		4.15 – 5.15 PM	
Oakvale Drive left into Nelson Bay Road	12.9	A	13.9	A
Oakvale Drive northbound through to Lemon Tree Passage Road	9.5	A	10.2	A
Oakvale Drive right into Nelson Bay Road	17.5	B	18.4	B
Westbound on Nelson Bay Road left into Oakvale Drive	11.8	A	12.0	A
Westbound through on Nelson Bay Road	10.0	A	10.1	A
Westbound on Nelson Bay Road right into Lemon Tree Passage Road	15.6	B	15.7	B
Lemon Tree Passage Road left into Nelson Bay Road	14.7	B	14.8	B
Lemon Tree Passage Road southbound through to Oakvale Drive	12.6	A	12.8	A
Lemon Tree Passage Road right into Nelson Bay Road	20.3	B	20.5	B
Nelson Bay Road left into Lemon Tree Passage Road	10.3	A	10.5	A
Eastbound through on Nelson Bay Road	9.5	A	9.5	A
Nelson Bay Road right into Oakvale Drive	17.0	B	16.9	B
Overall Average Delays	11.0	A	11.1	A

The SIDRA simulations indicate that the performance of the roundabout at Nelson Bay Road, Lemon Tree Passage Road and Oakvale Drive will not be significantly affected by the proposed development at Lot 220 DP 1049608 in the morning peak or the evening periods.

The increase in average delays for all movements is negligible.

The Level of Service is unaffected for all movements.

**Table 5.5.6 - Average Delays for Movements at Nelson Bay Road / Cabbage Tree Road / Lavis Lane – AM Peak (2018)**

Movement	Average Delays (secs / veh) - 2018 Traffic	Level of Service	Average Delays (secs / veh) – 2018 Traffic + Development	Level of Service
	7.15 – 8.15 AM		4.30 – 5.30 PM	
Nelson Bay Road left into Cabbage Tree Road	10.6	A	10.6	A
Nelson Bay Road northbound through	12.5	A	12.6	A
Nelson Bay Road right into Lavis Lane	19.9	B	20.1	B
Lavis Lane left into Nelson Bay Road	19.6	B	19.9	B
Lavis Lane westbound through	17.2	B	17.5	B
Lavis Lane right into Nelson Bay Road	26.6	B	26.9	B
Nelson Bay Road left into Lavis Lane	9.7	A	9.8	A
Nelson Bay Road southbound through	10.2	A	10.2	A
Nelson Bay Road southbound right into Cabbage Tree Road	15.2	B	15.2	B
Cabbage Tree Road left into Nelson Bay Road	9.9	A	9.9	A
Cabbage Tree Road eastbound through	9.9	A	10.1	A
Cabbage Tree Road right into Nelson Bay Road	18.6	B	18.6	B
Overall Average Delays	11.7	A	11.7	A

**Table 5.5.7 - Average Delays for Movements at Nelson Bay Road / Lavis Lane / Cabbage Tree Road - PM Peak (2018)**

Movement	Average Delays – 2018 Traffic (secs / veh)	Level of Service	Average Delays - 2018 Traffic + Development (secs / veh)	Level of Service
	7.15 – 8.15 AM		4.30 – 5.30 PM	
Nelson Bay Road left into Cabbage Tree Road	15.7	B	15.7	B
Nelson Bay Road northbound through	17.1	B	17.2	B
Nelson Bay Road right into Lavis Lane	25.6	B	25.7	B
Lavis Lane left into Nelson Bay Road	12.8	A	12.9	A
Lavis Lane westbound through	10.4	A	10.5	A
Lavis Lane right into Nelson Bay Road	20.0	B	20.0	B
Nelson Bay Road left into Lavis Lane	9.2	A	9.2	A
Nelson Bay Road southbound through	8.6	A	8.6	A
Nelson Bay Road southbound right into Cabbage Tree Road	14.6	B	14.6	B
Cabbage Tree Road left into Nelson Bay Road	15.6	B	15.7	B
Cabbage Tree Road eastbound through	11.0	A	11.2	A
Cabbage Tree Road right into Nelson Bay Road	19.5	B	19.6	B
Overall Average Delays	14.1	A	14.1	A

The SIDRA simulations indicate that the performance of the roundabout at Nelson Bay Road, Cabbage Tree Road and Lavis Lane will not be significantly affected by the proposed development at Lot 218 DP 1044608 in the morning peak or the evening periods in 2018.

The increase in average delays for all movements is negligible.

The Level of Service is unaffected for all movements.

**Table 5.5.8 - Average Delays for Movements at Nelson Bay Road / Lemon Tree Passage Road / Oakvale Drive – AM Peak (2018)**

Movement	Average Delays (secs / veh) - 2018 Traffic	Level of Service	Average Delays (secs / veh) – 2018 Traffic + Development	Level of Service
	7.15 – 8.15 AM		4.15 – 5.15 PM	
Oakvale Drive left into Nelson Bay Road	22.4	B	27.2	B
Oakvale Drive northbound through to Lemon Tree Passage Road	20.5	B	23.7	B
Oakvale Drive right into Nelson Bay Road	29.1	C	32.3	C
Westbound on Nelson Bay Road left into Oakvale Drive	568.6	F	581.5	F
Westbound through on Nelson Bay Road	567.0	F	579.8	F
Westbound on Nelson Bay Road right into Lemon Tree Passage Road	573.3	F	586.1	F
Lemon Tree Passage Road left into Nelson Bay Road	12.2	A	12.3	A
Lemon Tree Passage Road southbound through to Oakvale Drive	10.1	A	10.1	A
Lemon Tree Passage Road right into Nelson Bay Road	17.4	A	17.4	A
Nelson Bay Road left into Lemon Tree Passage Road	10.3	A	10.3	A
Eastbound through on Nelson Bay Road	9.2	A	9.2	A
Nelson Bay Road right into Oakvale Drive	16.6	B	16.5	B
Overall Average Delays	287.4	F	292.8	F

The SIDRA simulations indicate that if the projected traffic growth rate eventuates on Nelson Bay Road and Lemon Tree Passage Road until 2018, the performance of the roundabout at Nelson Bay Road, Lemon Tree Passage Road and Oakvale Drive is likely to suffer undesirably high average delays in the morning peak period for all movements westbound on Nelson Bay Road.

Traffic growth rates on Lemon Tree Passage Road may prove to be less than the assumed 2% because of the limited area on that peninsula that can be developed.

The additional traffic generated by the proposed development at Lot 220 DP 1049608 will not have any significant impact on the roundabout in the 2018

morning peak if the roundabout is already subject to adverse average delays for westbound traffic on Nelson Bay Road.

The average delays for other movements in 2018 will still be acceptable.

**Table 5.5.9 - Average Delays for Movements at Nelson Bay Road / Lemon Tree Passage Road / Oakvale Drive – PM Peak (2018)**

Movement	Average Delays (secs / veh) - 2018 Traffic	Level of Service	Average Delays (secs / veh) – 2018 Traffic + Development	Level of Service
	7.15 – 8.15 AM		4.15 – 5.15 PM	
Oakvale Drive left into Nelson Bay Road	14.8	B	16.1	B
Oakvale Drive northbound through to Lemon Tree Passage Road	11.4	A	12.4	A
Oakvale Drive right into Nelson Bay Road	19.4	B	20.6	B
Westbound on Nelson Bay Road left into Oakvale Drive	12.1	A	12.3	A
Westbound through on Nelson Bay Road	10.2	A	10.4	A
Westbound on Nelson Bay Road right into Lemon Tree Passage Road	15.9	B	16.0	B
Lemon Tree Passage Road left into Nelson Bay Road	22.4	B	22.9	B
Lemon Tree Passage Road southbound through to Oakvale Drive	20.3	B	20.9	B
Lemon Tree Passage Road right into Nelson Bay Road	28.7	B	29.3	B
Nelson Bay Road left into Lemon Tree Passage Road	10.5	A	10.5	A
Eastbound through on Nelson Bay Road	9.9	A	9.9	A
Nelson Bay Road right into Oakvale Drive	17.4	B	17.3	B
Overall Average Delays	11.8	A	12.0	A

The SIDRA simulations indicate that the performance of the roundabout at Nelson Bay Road, Lemon Tree Passage Road and Oakvale Drive will not be significantly affected by the proposed development at Lot 220 DP 1049608 in the evening peak period in 2018.

The increase in average delays for all movements is negligible.

The Level of Service is unaffected for all movements.



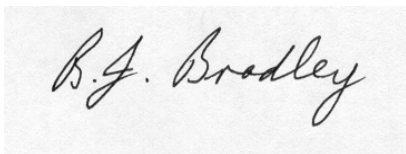
## 6.0 SUMMARY AND RECOMMENDATION

### 6.1 Summary

1. Nelson Bay Road is a State Road which provides an arterial function between Nelson Bay and Newcastle.
2. The subject sites are essentially un-developed and adjacent to existing sand mining leases.
3. The proposed development is to provide two separate sand extraction areas to cater for increasing demand for sand. Projected output at each site will be up to 1,000,000 tonnes of sand per annum.
4. Traffic generation rates used for SIDRA simulations are based on projected extraction quantities and hours of operation and are not expected to exceed 12 truck movements in the peak hours at each site.
5. SIDRA simulations for the proposed sand extraction developments indicate that potential additional delays on Nelson Bay Road, Cabbage Tree Road, Lemon Tree Passage Road, Oakvale Drive and Lavis Lane will be negligible, even using a traffic generation of 16 heavy vehicle movements at each site in each peak hour to represent a worst-case scenario.
6. The proposed developments will not generate pedestrian activity.
7. The proposed development on the two sites site are each estimated to generate a maximum of approximately 16 trips during the morning peak and during the evening peak. Average peak hour traffic generation is likely to be considerably lower than 16 trips per hour.

### 6.2 Recommendation

I recommend approval to the proposed sand extraction developments as they will not generate sufficient additional traffic to adversely impact on Nelson Bay Road, Cabbage Tree Road, Lavis Lane, Lemon Tree Passage Road or Oakvale Drive.



B J Bradley BE Grad Dip Man MIEAust CPEng

## **7.0 APPENDICES**

### **APPENDIX A – SITE PHOTOS**



Photo No. 1: Looking generally east along Lavis Lane from near the service station showing the existing traffic environment.



Photo No. 2: Looking generally west along Lavis Lane showing the interface between the eastern sealed section of pavement and the central section of gravel pavement.





Photo No. 3: Looking generally east at the end of Lavis Lane showing the existing access to a private sand mining access road.



Photo No. 4: Looking generally west along Lavis Lane showing the central section of gravel pavement.





Photo No. 5: Looking generally west along Lavis Lane western section of sealed pavement.



Photo No. 6: Looking generally south along Oakvale Drive from Nelson Bay Road showing the existing traffic environment





Photo No. 7: Looking generally south along Oakvale Drive showing the existing traffic environment and the turnoff to the Unimin mine access road on the left.



Photo No. 8: Looking generally east along the Unimin mine access road.



Photo No. 9: Looking generally north along Oakvale Drive showing the existing traffic environment and the turnoff to the Unimin mine access road on the right.

## **APPENDIX B**

### **SIDRA DATA**



## 1.0 Movement Summary

### Roundabout at Nelson Bay Rd, Cabbage Tree Rd, Lavis Lane

#### 2008 Traffic - AM Peak

##### Roundabout

##### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Nelson Bay Rd south</b>										
1	L	44	2.3	0.331	8.5	LOS A	18	0.41	0.57	57.4
2	T	640	24.1	0.331	9.7	LOS A	20	0.42	0.58	60.0
3	R	10	9.1	0.333	17.2	LOS B	20	0.44	0.71	52.1
<b>Approach</b>		<b>695</b>	<b>22.4</b>	<b>0.331</b>	<b>9.7</b>	<b>LOS A</b>	<b>20</b>	<b>0.42</b>	<b>0.58</b>	<b>59.7</b>
<b>Lavis Lane East</b>										
4	L	23	4.3	0.074	12.0	LOS A	3	0.63	0.80	57.0
5	T	21	4.8	0.074	9.5	LOS A	3	0.63	0.72	56.6
6	R	10	9.1	0.074	19.0	LOS B	3	0.63	0.82	51.0
<b>Approach</b>		<b>55</b>	<b>5.5</b>	<b>0.074</b>	<b>12.4</b>	<b>LOS A</b>	<b>3</b>	<b>0.63</b>	<b>0.77</b>	<b>55.4</b>
<b>Nelson Bay Rd north</b>										
7	L	6	14.3	0.368	9.1	LOS A	26	0.26	0.54	60.1
8	T	963	24.0	0.512	8.8	LOS A	43	0.27	0.49	61.5
9	R	176	8.0	0.512	14.1	LOS A	43	0.28	0.63	51.5
<b>Approach</b>		<b>1146</b>	<b>21.5</b>	<b>0.512</b>	<b>9.6</b>	<b>LOS A</b>	<b>43</b>	<b>0.27</b>	<b>0.51</b>	<b>59.8</b>
<b>Cabbage Tree Rd west</b>										
10	L	151	7.3	0.148	8.5	LOS A	6	0.57	0.66	50.4
11	T	6	14.3	0.069	8.3	LOS A	3	0.59	0.68	51.4
12	R	38	7.9	0.069	16.9	LOS B	3	0.59	0.82	45.9
<b>Approach</b>		<b>196</b>	<b>7.7</b>	<b>0.148</b>	<b>10.1</b>	<b>LOS A</b>	<b>6</b>	<b>0.58</b>	<b>0.69</b>	<b>49.5</b>
<b>All Vehicles</b>		<b>2092</b>	<b>20.1</b>	<b>0.512</b>	<b>9.8</b>	<b>LOS A</b>	<b>43</b>	<b>0.36</b>	<b>0.56</b>	<b>58.5</b>

## 2.0 Movement Summary

Roundabout at Nelson Bay Rd, Cabbage Tree Rd, Lavis Lane

2008 Traffic - PM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Nelson Bay Rd south</b>										
1	L	71	4.2	0.447	9.1	LOS A	28	0.54	0.64	56.3
2	T	943	11.0	0.446	9.6	LOS A	28	0.55	0.64	58.8
3	R	7	0.0	0.438	17.6	LOS B	27	0.56	0.76	51.5
<b>Approach</b>		<b>1021</b>	<b>10.5</b>	<b>0.447</b>	<b>9.6</b>	<b>LOS A</b>	<b>28</b>	<b>0.55</b>	<b>0.64</b>	<b>58.5</b>
<b>Lavis Lane East</b>										
4	L	36	2.7	0.084	10.7	LOS A	3	0.54	0.73	57.8
5	T	16	0.0	0.084	8.3	LOS A	3	0.54	0.64	57.5
6	R	20	4.8	0.084	17.9	LOS B	3	0.54	0.79	51.6
<b>Approach</b>		<b>74</b>	<b>2.7</b>	<b>0.084</b>	<b>12.2</b>	<b>LOS A</b>	<b>3</b>	<b>0.54</b>	<b>0.73</b>	<b>55.7</b>
<b>Nelson Bay Rd north</b>										
7	L	3	0.0	0.273	8.9	LOS A	16	0.25	0.54	60.2
8	T	672	8.0	0.381	8.1	LOS A	26	0.26	0.49	61.7
9	R	259	10.8	0.381	14.1	LOS A	26	0.27	0.64	51.6
<b>Approach</b>		<b>934</b>	<b>8.8</b>	<b>0.381</b>	<b>9.7</b>	<b>LOS A</b>	<b>26</b>	<b>0.26</b>	<b>0.53</b>	<b>58.5</b>
<b>Cabbage Tree Rd west</b>										
10	L	226	7.1	0.252	9.1	LOS A	12	0.69	0.71	49.7
11	T	16	0.0	0.103	8.7	LOS A	4	0.66	0.72	50.8
12	R	46	2.2	0.103	17.2	LOS B	4	0.66	0.89	45.6
<b>Approach</b>		<b>288</b>	<b>5.9</b>	<b>0.252</b>	<b>10.4</b>	<b>LOS A</b>	<b>12</b>	<b>0.68</b>	<b>0.74</b>	<b>49.0</b>
<b>All Vehicles</b>		<b>2317</b>	<b>9.0</b>	<b>0.447</b>	<b>9.9</b>	<b>LOS A</b>	<b>28</b>	<b>0.45</b>	<b>0.61</b>	<b>57.1</b>

### 3.0 Movement Summary

Roundabout at Nelson Bay Rd, Cabbage Tree Rd, Lavis Lane

2008 Traffic + Sand Extraction Traffic - AM Peak

Roundabout

#### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Nelson Bay Rd south</b>										
1	L	44	2.3	0.331	8.5	LOS A	18	0.41	0.57	57.4
2	T	640	24.1	0.331	9.7	LOS A	19	0.42	0.58	60.0
3	R	10	10.0	0.333	17.2	LOS B	19	0.44	0.71	52.1
<b>Approach</b>		<b>694</b>	<b>22.5</b>	<b>0.331</b>	<b>9.7</b>	<b>LOS A</b>	<b>19</b>	<b>0.42</b>	<b>0.58</b>	<b>59.7</b>
<b>Lavis Lane East</b>										
4	L	23	4.3	0.074	12.1	LOS A	3	0.63	0.80	57.0
5	T	21	4.8	0.074	9.5	LOS A	3	0.63	0.72	56.6
6	R	10	9.1	0.074	19.0	LOS B	3	0.63	0.82	51.0
<b>Approach</b>		<b>55</b>	<b>5.5</b>	<b>0.074</b>	<b>12.5</b>	<b>LOS A</b>	<b>3</b>	<b>0.63</b>	<b>0.77</b>	<b>55.4</b>
<b>Nelson Bay Rd north</b>										
7	L	6	14.3	0.368	9.1	LOS A	26	0.26	0.54	60.1
8	T	963	24.0	0.513	8.8	LOS A	43	0.27	0.49	61.5
9	R	176	8.0	0.513	14.1	LOS A	43	0.28	0.63	51.4
<b>Approach</b>		<b>1146</b>	<b>21.5</b>	<b>0.512</b>	<b>9.6</b>	<b>LOS A</b>	<b>43</b>	<b>0.28</b>	<b>0.51</b>	<b>59.7</b>
<b>Cabbage Tree Rd west</b>										
10	L	151	7.3	0.148	8.5	LOS A	6	0.57	0.66	50.4
11	T	6	16.7	0.068	8.5	LOS A	3	0.59	0.69	51.4
12	R	38	7.9	0.068	16.9	LOS B	3	0.59	0.82	45.9
<b>Approach</b>		<b>195</b>	<b>7.7</b>	<b>0.148</b>	<b>10.1</b>	<b>LOS A</b>	<b>6</b>	<b>0.58</b>	<b>0.69</b>	<b>49.5</b>
<b>All Vehicles</b>		<b>2090</b>	<b>20.1</b>	<b>0.513</b>	<b>9.8</b>	<b>LOS A</b>	<b>43</b>	<b>0.36</b>	<b>0.56</b>	<b>58.5</b>

## 4.0 Movement Summary

Roundabout at Nelson Bay Rd, Cabbage Tree Rd, Lavis Lane

2008 Traffic + Sand Extraction Traffic - PM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Nelson Bay Rd south</b>										
1	L	71	4.2	0.447	9.1	LOS A	28	0.54	0.64	56.3
2	T	943	11.0	0.447	9.6	LOS A	28	0.55	0.64	58.7
3	R	7	12.5	0.444	17.7	LOS B	27	0.56	0.77	51.5
<b>Approach</b>		<b>1022</b>	<b>10.6</b>	<b>0.447</b>	<b>9.7</b>	<b>LOS A</b>	<b>28</b>	<b>0.55</b>	<b>0.64</b>	<b>58.5</b>
<b>Lavis Lane East</b>										
4	L	36	2.8	0.084	10.8	LOS A	3	0.54	0.73	57.8
5	T	16	6.2	0.083	8.4	LOS A	3	0.54	0.64	57.5
6	R	20	4.8	0.083	18.0	LOS B	3	0.54	0.79	51.6
<b>Approach</b>		<b>73</b>	<b>4.1</b>	<b>0.083</b>	<b>12.4</b>	<b>LOS A</b>	<b>3</b>	<b>0.54</b>	<b>0.73</b>	<b>55.7</b>
<b>Nelson Bay Rd north</b>										
7	L	3	25.0	0.286	8.9	LOS A	16	0.25	0.55	60.2
8	T	672	8.0	0.381	8.1	LOS A	26	0.26	0.49	61.7
9	R	259	10.8	0.381	14.1	LOS A	26	0.27	0.64	51.5
<b>Approach</b>		<b>935</b>	<b>8.9</b>	<b>0.381</b>	<b>9.7</b>	<b>LOS A</b>	<b>26</b>	<b>0.26</b>	<b>0.53</b>	<b>58.5</b>
<b>Cabbage Tree Rd west</b>										
10	L	226	7.1	0.252	9.1	LOS A	12	0.69	0.71	49.7
11	T	16	6.2	0.104	8.9	LOS A	4	0.66	0.73	50.8
12	R	46	2.2	0.104	17.2	LOS B	4	0.66	0.89	45.5
<b>Approach</b>		<b>288</b>	<b>6.2</b>	<b>0.252</b>	<b>10.4</b>	<b>LOS A</b>	<b>12</b>	<b>0.68</b>	<b>0.74</b>	<b>49.0</b>
<b>All Vehicles</b>		<b>2318</b>	<b>9.1</b>	<b>0.447</b>	<b>9.9</b>	<b>LOS A</b>	<b>28</b>	<b>0.45</b>	<b>0.61</b>	<b>57.0</b>

## 5.0 Movement Summary

Roundabout at Nelson Bay Rd, Cabbage Tree Rd, Lavis Lane

2018 Traffic - AM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Nelson Bay Rd south</b>										
1	L	65	4.6	0.591	10.6	LOS A	55	0.71	0.71	54.8
2	T	950	36.0	0.591	12.5	LOS A	55	0.71	0.77	57.2
3	R	10	9.1	0.579	19.9	LOS B	55	0.72	0.82	50.2
<b>Approach</b>		<b>1026</b>	<b>33.7</b>	<b>0.591</b>	<b>12.5</b>	<b>LOS A</b>	<b>55</b>	<b>0.71</b>	<b>0.77</b>	<b>56.9</b>
<b>Lavis Lane East</b>										
4	L	23	4.3	0.169	19.6	LOS B	9	0.91	0.96	49.0
5	T	21	4.8	0.169	17.2	LOS B	9	0.91	0.95	48.4
6	R	10	9.1	0.169	26.6	LOS B	9	0.91	0.88	44.5
<b>Approach</b>		<b>55</b>	<b>5.5</b>	<b>0.169</b>	<b>20.1</b>	<b>LOS B</b>	<b>9</b>	<b>0.91</b>	<b>0.94</b>	<b>47.7</b>
<b>Nelson Bay Rd north</b>										
7	L	6	14.3	0.636	9.7	LOS A	66	0.47	0.54	58.2
8	T	1425	36.0	0.848	10.2	LOS A	156	0.64	0.52	57.8
9	R	260	11.9	0.847	15.2	LOS B	156	0.76	0.54	48.9
<b>Approach</b>		<b>1692</b>	<b>32.2</b>	<b>0.848</b>	<b>11.0</b>	<b>LOS A</b>	<b>156</b>	<b>0.66</b>	<b>0.52</b>	<b>56.3</b>
<b>Cabbage Tree Rd west</b>										
10	L	225	9.8	0.312	9.9	LOS A	16	0.79	0.76	49.1
11	T	6	14.3	0.135	9.9	LOS A	6	0.74	0.81	50.3
12	R	56	10.7	0.135	18.6	LOS B	6	0.74	0.93	44.7
<b>Approach</b>		<b>288</b>	<b>10.1</b>	<b>0.312</b>	<b>11.6</b>	<b>LOS A</b>	<b>16</b>	<b>0.78</b>	<b>0.80</b>	<b>48.1</b>
<b>All Vehicles</b>		<b>3061</b>	<b>30.2</b>	<b>0.848</b>	<b>11.7</b>	<b>LOS A</b>	<b>156</b>	<b>0.69</b>	<b>0.64</b>	<b>55.4</b>

## 6.0 Movement Summary

### Roundabout at Nelson Bay Rd, Cabbage Tree Rd, Lavis Lane

#### 2018 Traffic - PM Peak

##### Roundabout

##### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Nelson Bay Rd south</b>										
1	L	105	5.7	0.795	15.7	LOS B	108	0.92	0.99	50.0
2	T	1400	16.0	0.798	17.1	LOS B	108	0.93	1.04	52.3
3	R	7	0.0	0.778	25.6	LOS B	104	0.94	1.06	45.3
<b>Approach</b>		<b>1512</b>	<b>15.2</b>	<b>0.798</b>	<b>17.1</b>	<b>LOS B</b>	<b>108</b>	<b>0.93</b>	<b>1.03</b>	<b>52.1</b>
<b>Lavis Lane East</b>										
4	L	36	2.7	0.116	12.8	LOS A	5	0.71	0.87	56.3
5	T	16	0.0	0.115	10.4	LOS A	5	0.71	0.79	55.7
6	R	20	4.8	0.115	20.0	LOS B	5	0.71	0.85	50.1
<b>Approach</b>		<b>74</b>	<b>2.7</b>	<b>0.116</b>	<b>14.3</b>	<b>LOS A</b>	<b>5</b>	<b>0.71</b>	<b>0.85</b>	<b>54.1</b>
<b>Nelson Bay Rd north</b>										
7	L	3	0.0	0.429	9.2	LOS A	32	0.37	0.55	59.1
8	T	995	12.0	0.600	8.6	LOS A	57	0.40	0.51	60.2
9	R	385	16.1	0.601	14.6	LOS B	57	0.44	0.62	50.6
<b>Approach</b>		<b>1383</b>	<b>13.1</b>	<b>0.600</b>	<b>10.2</b>	<b>LOS A</b>	<b>57</b>	<b>0.41</b>	<b>0.54</b>	<b>57.2</b>
<b>Cabbage Tree Rd west</b>										
10	L	335	10.1	0.633	15.6	LOS B	44	0.95	1.07	45.4
11	T	16	0.0	0.211	11.0	LOS A	10	0.84	0.91	49.5
12	R	68	2.9	0.211	19.5	LOS B	10	0.84	0.96	43.9
<b>Approach</b>		<b>420</b>	<b>8.6</b>	<b>0.633</b>	<b>16.1</b>	<b>LOS B</b>	<b>44</b>	<b>0.93</b>	<b>1.05</b>	<b>45.3</b>
<b>All Vehicles</b>		<b>3389</b>	<b>13.2</b>	<b>0.798</b>	<b>14.1</b>	<b>LOS A</b>	<b>108</b>	<b>0.71</b>	<b>0.83</b>	<b>53.1</b>

## 7.0 Movement Summary

Roundabout at Nelson Bay Rd, Cabbage Tree Rd, Lavis Lane

2018 Traffic + Sand Extraction Traffic - AM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Nelson Bay Rd south</b>										
1	L	65	4.6	0.591	10.6	LOS A	55	0.71	0.71	54.8
2	T	950	36.0	0.591	12.6	LOS A	55	0.72	0.77	57.1
3	R	10	10.0	0.588	20.1	LOS B	55	0.73	0.82	50.2
<b>Approach</b>		<b>1025</b>	<b>33.8</b>	<b>0.591</b>	<b>12.5</b>	<b>LOS A</b>	<b>55</b>	<b>0.71</b>	<b>0.77</b>	<b>56.9</b>
<b>Lavis Lane East</b>										
4	L	23	4.3	0.174	19.9	LOS B	9	0.90	0.96	48.8
5	T	21	9.5	0.174	17.5	LOS B	9	0.90	0.95	48.2
6	R	10	9.1	0.175	26.9	LOS B	9	0.90	0.88	44.4
<b>Approach</b>		<b>55</b>	<b>7.3</b>	<b>0.174</b>	<b>20.4</b>	<b>LOS B</b>	<b>9</b>	<b>0.90</b>	<b>0.94</b>	<b>47.5</b>
<b>Nelson Bay Rd north</b>										
7	L	6	14.3	0.636	9.8	LOS A	66	0.48	0.54	58.2
8	T	1425	36.0	0.848	10.2	LOS A	156	0.64	0.52	57.8
9	R	260	11.9	0.847	15.2	LOS B	156	0.76	0.54	48.9
<b>Approach</b>		<b>1692</b>	<b>32.2</b>	<b>0.848</b>	<b>11.0</b>	<b>LOS A</b>	<b>156</b>	<b>0.66</b>	<b>0.52</b>	<b>56.3</b>
<b>Cabbage Tree Rd west</b>										
10	L	225	9.8	0.312	9.9	LOS A	16	0.79	0.76	49.1
11	T	6	16.7	0.133	10.1	LOS A	6	0.74	0.81	50.3
12	R	56	10.7	0.133	18.6	LOS B	6	0.74	0.93	44.7
<b>Approach</b>		<b>287</b>	<b>10.1</b>	<b>0.312</b>	<b>11.6</b>	<b>LOS A</b>	<b>16</b>	<b>0.78</b>	<b>0.80</b>	<b>48.1</b>
<b>All Vehicles</b>		<b>3059</b>	<b>30.2</b>	<b>0.848</b>	<b>11.7</b>	<b>LOS A</b>	<b>156</b>	<b>0.69</b>	<b>0.64</b>	<b>55.4</b>

## 8.0 Movement Summary

Roundabout at Nelson Bay Rd, Cabbage Tree Rd, Lavis Lane

2018 Traffic + Sand Extraction Traffic - PM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Nelson Bay Rd south</b>										
1	L	105	5.7	0.802	15.7	LOS B	108	0.93	0.99	50.0
2	T	1400	16.0	0.799	17.2	LOS B	108	0.93	1.04	52.2
3	R	7	12.5	0.800	25.7	LOS B	104	0.94	1.08	45.3
<b>Approach</b>		<b>1513</b>	<b>15.3</b>	<b>0.799</b>	<b>17.1</b>	<b>LOS B</b>	<b>108</b>	<b>0.93</b>	<b>1.04</b>	<b>52.0</b>
<b>Lavis Lane East</b>										
4	L	36	2.8	0.115	12.9	LOS A	5	0.71	0.87	56.3
5	T	16	6.2	0.114	10.5	LOS A	5	0.71	0.80	55.7
6	R	20	4.8	0.115	20.0	LOS B	5	0.71	0.85	50.1
<b>Approach</b>		<b>73</b>	<b>4.1</b>	<b>0.115</b>	<b>14.4</b>	<b>LOS A</b>	<b>5</b>	<b>0.71</b>	<b>0.85</b>	<b>54.1</b>
<b>Nelson Bay Rd north</b>										
7	L	3	25.0	0.444	9.2	LOS A	32	0.37	0.57	59.1
8	T	995	12.0	0.601	8.6	LOS A	57	0.40	0.51	60.2
9	R	385	16.1	0.602	14.6	LOS B	57	0.44	0.62	50.6
<b>Approach</b>		<b>1384</b>	<b>13.2</b>	<b>0.601</b>	<b>10.2</b>	<b>LOS A</b>	<b>57</b>	<b>0.41</b>	<b>0.54</b>	<b>57.2</b>
<b>Cabbage Tree Rd west</b>										
10	L	335	10.1	0.634	15.7	LOS B	44	0.95	1.07	45.4
11	T	16	6.2	0.213	11.2	LOS A	10	0.84	0.91	49.5
12	R	68	2.9	0.213	19.6	LOS B	10	0.84	0.96	43.8
<b>Approach</b>		<b>420</b>	<b>8.8</b>	<b>0.633</b>	<b>16.1</b>	<b>LOS B</b>	<b>44</b>	<b>0.93</b>	<b>1.05</b>	<b>45.3</b>
<b>All Vehicles</b>		<b>3390</b>	<b>13.4</b>	<b>0.802</b>	<b>14.1</b>	<b>LOS A</b>	<b>108</b>	<b>0.72</b>	<b>0.83</b>	<b>53.0</b>



## 9.0 Movement Summary

Roundabout at Nelson Bay Rd, Lemon Tree Passage Rd, Oakvale Dr

2008 Traffic - AM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Oakvale Dr south</b>										
1	L	3	33.3	0.038	18.3	LOS B	2	0.77	0.83	39.1
2	T	1	0.0	0.038	16.5	LOS B	2	0.77	0.76	39.7
3	R	5	80.0	0.038	25.0	LOS B	2	0.77	0.79	36.9
<b>Approach</b>		<b>9</b>	<b>55.6</b>	<b>0.038</b>	<b>21.8</b>	<b>LOS B</b>	<b>2</b>	<b>0.77</b>	<b>0.80</b>	<b>37.9</b>
<b>Nelson Bay Rd east</b>										
4	L	7	71.4	0.875	18.9	LOS B	99	0.92	1.09	48.4
5	T	783	0.9	0.848	17.3	LOS B	99	0.92	1.06	51.2
6	R	20	15.0	0.833	23.8	LOS B	99	0.92	1.04	46.5
<b>Approach</b>		<b>810</b>	<b>1.9</b>	<b>0.848</b>	<b>17.5</b>	<b>LOS B</b>	<b>99</b>	<b>0.92</b>	<b>1.06</b>	<b>51.1</b>
<b>Lemon Tree P Rd north</b>										
7	L	71	2.8	0.220	11.4	LOS A	10	0.48	0.69	57.0
8	T	3	0.0	0.214	9.3	LOS A	10	0.48	0.64	56.3
9	R	402	1.0	0.220	16.5	LOS B	10	0.49	0.75	52.3
<b>Approach</b>		<b>476</b>	<b>1.3</b>	<b>0.220</b>	<b>15.7</b>	<b>LOS B</b>	<b>10</b>	<b>0.48</b>	<b>0.74</b>	<b>52.9</b>
<b>Nelson Bay Rd west</b>										
10	L	102	7.8	0.100	10.4	LOS A	5	0.15	0.60	59.4
11	T	330	3.3	0.204	9.3	LOS A	11	0.14	0.56	60.6
12	R	14	14.3	0.203	16.8	LOS B	11	0.14	0.71	51.7
<b>Approach</b>		<b>446</b>	<b>4.7</b>	<b>0.204</b>	<b>9.8</b>	<b>LOS A</b>	<b>11</b>	<b>0.14</b>	<b>0.57</b>	<b>60.0</b>
<b>All Vehicles</b>		<b>1741</b>	<b>2.7</b>	<b>0.875</b>	<b>15.1</b>	<b>LOS B</b>	<b>99</b>	<b>0.60</b>	<b>0.85</b>	<b>53.5</b>

## 10.0 Movement Summary

Roundabout at Nelson Bay Rd, Lemon Tree Passage Rd, Oakvale Dr

2008 Traffic - PM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Oakvale Dr south</b>										
1	L	12	75.0	0.042	12.9	LOS A	2	0.54	0.72	44.0
2	T	3	0.0	0.042	9.5	LOS A	2	0.54	0.61	44.7
3	R	5	60.0	0.042	17.5	LOS B	2	0.54	0.72	41.0
<b>Approach</b>		<b>20</b>	<b>60.0</b>	<b>0.042</b>	<b>13.5</b>	<b>LOS A</b>	<b>2</b>	<b>0.54</b>	<b>0.70</b>	<b>43.3</b>
<b>Nelson Bay Rd east</b>										
4	L	5	80.0	0.357	11.8	LOS A	19	0.40	0.65	56.4
5	T	331	2.4	0.346	10.0	LOS A	19	0.40	0.61	58.3
6	R	66	0.0	0.346	15.6	LOS B	19	0.40	0.70	52.7
<b>Approach</b>		<b>402</b>	<b>3.0</b>	<b>0.346</b>	<b>10.9</b>	<b>LOS A</b>	<b>19</b>	<b>0.40</b>	<b>0.62</b>	<b>57.3</b>
<b>Lemon Tree P Rd north</b>										
7	L	38	0.0	0.124	14.7	LOS B	7	0.75	0.79	54.0
8	T	1	0.0	0.125	12.6	LOS A	7	0.75	0.77	53.4
9	R	132	3.8	0.124	20.3	LOS B	7	0.75	0.81	49.1
<b>Approach</b>		<b>171</b>	<b>2.9</b>	<b>0.124</b>	<b>19.0</b>	<b>LOS B</b>	<b>7</b>	<b>0.75</b>	<b>0.81</b>	<b>50.1</b>
<b>Nelson Bay Rd west</b>										
10	L	376	1.3	0.310	10.3	LOS A	16	0.26	0.60	58.5
11	T	805	1.0	0.517	9.5	LOS A	36	0.30	0.55	59.2
12	R	25	16.0	0.521	17.0	LOS B	36	0.30	0.68	51.0
<b>Approach</b>		<b>1206</b>	<b>1.4</b>	<b>0.517</b>	<b>9.9</b>	<b>LOS A</b>	<b>36</b>	<b>0.29</b>	<b>0.57</b>	<b>58.8</b>
<b>All Vehicles</b>		<b>1799</b>	<b>2.6</b>	<b>0.521</b>	<b>11.0</b>	<b>LOS A</b>	<b>36</b>	<b>0.36</b>	<b>0.61</b>	<b>57.2</b>

## 11.0 Movement Summary

Roundabout at Nelson Bay Rd, Lemon Tree Passage Rd, Oakvale Dr

2008 Traffic + Sand Extraction Traffic - AM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Oakvale Dr south</b>										
1	L	10	80.0	0.089	22.6	LOS B	5	0.80	0.91	37.5
2	T	1	0.0	0.091	19.1	LOS B	5	0.80	0.83	38.1
3	R	6	83.3	0.090	27.7	LOS B	5	0.80	0.83	35.6
<b>Approach</b>		<b>17</b>	<b>76.5</b>	<b>0.089</b>	<b>24.2</b>	<b>LOS B</b>	<b>5</b>	<b>0.80</b>	<b>0.88</b>	<b>36.8</b>
<b>Nelson Bay Rd east</b>										
4	L	8	75.0	0.889	19.9	LOS B	104	0.94	1.12	47.4
5	T	783	0.9	0.860	18.2	LOS B	104	0.94	1.10	50.3
6	R	20	15.0	0.870	24.6	LOS B	104	0.94	1.07	45.8
<b>Approach</b>		<b>811</b>	<b>2.0</b>	<b>0.861</b>	<b>18.4</b>	<b>LOS B</b>	<b>104</b>	<b>0.94</b>	<b>1.10</b>	<b>50.2</b>
<b>Lemon Tree P Rd north</b>										
7	L	71	2.8	0.222	11.5	LOS A	10	0.49	0.70	56.9
8	T	3	0.0	0.214	9.3	LOS A	10	0.49	0.65	56.2
9	R	402	1.0	0.222	16.6	LOS B	10	0.49	0.75	52.2
<b>Approach</b>		<b>476</b>	<b>1.3</b>	<b>0.222</b>	<b>15.8</b>	<b>LOS B</b>	<b>10</b>	<b>0.49</b>	<b>0.74</b>	<b>52.9</b>
<b>Nelson Bay Rd west</b>										
10	L	102	7.8	0.103	10.4	LOS A	5	0.15	0.60	59.4
11	T	330	3.3	0.210	9.3	LOS A	12	0.15	0.56	60.5
12	R	21	42.9	0.210	16.5	LOS B	12	0.14	0.69	51.7
<b>Approach</b>		<b>453</b>	<b>6.2</b>	<b>0.210</b>	<b>9.9</b>	<b>LOS A</b>	<b>12</b>	<b>0.15</b>	<b>0.57</b>	<b>59.8</b>
<b>All Vehicles</b>		<b>1757</b>	<b>3.6</b>	<b>0.889</b>	<b>15.5</b>	<b>LOS B</b>	<b>104</b>	<b>0.61</b>	<b>0.86</b>	<b>52.9</b>

## 12.0 Movement Summary

Roundabout at Nelson Bay Rd, Lemon Tree Passage Rd, Oakvale Dr

2008 Traffic + Sand Extraction Traffic - PM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Oakvale Dr south</b>										
1	L	19	84.2	0.066	13.9	LOS A	3	0.55	0.75	43.4
2	T	3	0.0	0.065	10.2	LOS A	3	0.55	0.63	44.2
3	R	6	66.7	0.066	18.4	LOS B	3	0.55	0.74	40.6
<b>Approach</b>		<b>28</b>	<b>71.4</b>	<b>0.066</b>	<b>14.5</b>	<b>LOS A</b>	<b>3</b>	<b>0.55</b>	<b>0.74</b>	<b>42.8</b>
<b>Nelson Bay Rd east</b>										
4	L	6	83.3	0.353	12.0	LOS A	19	0.42	0.66	56.2
5	T	331	2.4	0.354	10.1	LOS A	19	0.42	0.62	58.2
6	R	66	0.0	0.353	15.7	LOS B	19	0.42	0.70	52.6
<b>Approach</b>		<b>403</b>	<b>3.2</b>	<b>0.354</b>	<b>11.0</b>	<b>LOS A</b>	<b>19</b>	<b>0.42</b>	<b>0.63</b>	<b>57.2</b>
<b>Lemon Tree P Rd north</b>										
7	L	38	0.0	0.127	14.8	LOS B	7	0.76	0.80	53.7
8	T	1	0.0	0.125	12.8	LOS A	7	0.76	0.78	53.1
9	R	132	3.8	0.127	20.5	LOS B	7	0.76	0.81	48.9
<b>Approach</b>		<b>171</b>	<b>2.9</b>	<b>0.127</b>	<b>19.2</b>	<b>LOS B</b>	<b>7</b>	<b>0.76</b>	<b>0.81</b>	<b>49.9</b>
<b>Nelson Bay Rd west</b>										
10	L	376	1.3	0.312	10.3	LOS A	16	0.27	0.60	58.5
11	T	805	1.0	0.527	9.5	LOS A	37	0.31	0.55	59.1
12	R	32	34.4	0.525	16.9	LOS B	37	0.31	0.68	50.9
<b>Approach</b>		<b>1213</b>	<b>2.0</b>	<b>0.527</b>	<b>9.9</b>	<b>LOS A</b>	<b>37</b>	<b>0.30</b>	<b>0.57</b>	<b>58.7</b>
<b>All Vehicles</b>		<b>1815</b>	<b>3.4</b>	<b>0.527</b>	<b>11.1</b>	<b>LOS A</b>	<b>37</b>	<b>0.37</b>	<b>0.61</b>	<b>57.0</b>

## 13.0 Movement Summary

Roundabout at Nelson Bay Rd, Lemon Tree Passage Rd, Oakvale Dr

2018 Traffic - AM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Oakvale Dr south</b>										
1	L	3	33.3	0.049	22.4	LOS B	3	0.83	0.88	36.7
2	T	1	0.0	0.050	20.5	LOS B	3	0.83	0.81	37.3
3	R	5	80.0	0.049	29.1	LOS C	3	0.83	0.80	34.9
<b>Approach</b>		<b>9</b>	<b>55.6</b>	<b>0.049</b>	<b>25.9</b>	<b>LOS B</b>	<b>3</b>	<b>0.83</b>	<b>0.83</b>	<b>35.7</b>
<b>Nelson Bay Rd east</b>										
4	L	7	71.4	1.400	568.6	LOS F	2595	1.00	8.70	3.5
5	T	1160	0.9	1.305	567.0	LOS F	2595	1.00	10.24	4.1
6	R	24	12.5	1.333	573.3	LOS F	2595	1.00	9.98	4.2
<b>Approach</b>		<b>1191</b>	<b>1.5</b>	<b>1.305</b>	<b>567.1</b>	<b>LOS F</b>	<b>2595</b>	<b>1.00</b>	<b>10.22</b>	<b>4.1</b>
<b>Lemon Tree P Rd north</b>										
7	L	87	2.3	0.297	12.2	LOS A	14	0.58	0.76	56.3
8	T	3	0.0	0.300	10.1	LOS A	14	0.58	0.72	55.4
9	R	490	0.8	0.297	17.4	LOS B	14	0.59	0.81	51.8
<b>Approach</b>		<b>580</b>	<b>1.0</b>	<b>0.297</b>	<b>16.6</b>	<b>LOS B</b>	<b>14</b>	<b>0.59</b>	<b>0.80</b>	<b>52.4</b>
<b>Nelson Bay Rd west</b>										
10	L	123	6.5	0.135	10.3	LOS A	7	0.14	0.60	59.4
11	T	483	2.3	0.276	9.2	LOS A	16	0.14	0.55	60.6
12	R	19	36.8	0.275	16.6	LOS B	16	0.14	0.70	51.7
<b>Approach</b>		<b>625</b>	<b>4.2</b>	<b>0.276</b>	<b>9.7</b>	<b>LOS A</b>	<b>16</b>	<b>0.14</b>	<b>0.57</b>	<b>60.0</b>
<b>All Vehicles</b>		<b>2405</b>	<b>2.3</b>	<b>1.400</b>	<b>287.4</b>	<b>LOS F</b>	<b>2595</b>	<b>0.68</b>	<b>5.41</b>	<b>7.8</b>

## 14.0 Movement Summary

Roundabout at Nelson Bay Rd, Lemon Tree Passage Rd, Oakvale Dr

2018 Traffic - PM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Oakvale Dr south</b>										
1	L	12	75.0	0.052	14.8	LOS B	3	0.63	0.80	42.5
2	T	3	0.0	0.052	11.4	LOS A	3	0.63	0.68	43.2
3	R	5	60.0	0.052	19.4	LOS B	3	0.63	0.75	39.8
<b>Approach</b>		<b>20</b>	<b>60.0</b>	<b>0.052</b>	<b>15.4</b>	<b>LOS B</b>	<b>3</b>	<b>0.63</b>	<b>0.77</b>	<b>41.9</b>
<b>Nelson Bay Rd east</b>										
4	L	5	80.0	0.500	12.1	LOS A	33	0.53	0.68	55.3
5	T	492	2.4	0.501	10.2	LOS A	33	0.53	0.64	57.3
6	R	80	0.0	0.500	15.9	LOS B	33	0.53	0.70	52.1
<b>Approach</b>		<b>577</b>	<b>2.8</b>	<b>0.501</b>	<b>11.0</b>	<b>LOS A</b>	<b>33</b>	<b>0.53</b>	<b>0.65</b>	<b>56.5</b>
<b>Lemon Tree P Rd north</b>										
7	L	46	0.0	0.277	22.4	LOS B	19	1.00	0.96	46.1
8	T	1	0.0	0.250	20.3	LOS B	19	1.00	0.96	44.6
9	R	160	3.1	0.278	28.7	LOS C	19	0.98	0.92	42.3
<b>Approach</b>		<b>207</b>	<b>2.4</b>	<b>0.278</b>	<b>27.3</b>	<b>LOS B</b>	<b>19</b>	<b>0.98</b>	<b>0.93</b>	<b>43.1</b>
<b>Nelson Bay Rd west</b>										
10	L	460	1.1	0.402	10.5	LOS A	24	0.33	0.61	58.0
11	T	1192	1.0	0.754	9.9	LOS A	82	0.50	0.55	57.5
12	R	25	16.0	0.758	17.4	LOS B	82	0.50	0.64	50.1
<b>Approach</b>		<b>1677</b>	<b>1.3</b>	<b>0.755</b>	<b>10.1</b>	<b>LOS A</b>	<b>82</b>	<b>0.46</b>	<b>0.57</b>	<b>57.5</b>
<b>All Vehicles</b>		<b>2481</b>	<b>2.2</b>	<b>0.758</b>	<b>11.8</b>	<b>LOS A</b>	<b>82</b>	<b>0.52</b>	<b>0.62</b>	<b>55.5</b>

## 15.0 Movement Summary

Roundabout at Nelson Bay Rd, Lemon Tree Passage Rd, Oakvale Dr

2018 Traffic + Sand Extraction Traffic - AM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
<b>Oakvale Dr south</b>										
1	L	10	80.0	0.112	27.2	LOS B	7	0.85	0.93	35.0
2	T	1	0.0	0.111	23.7	LOS B	7	0.85	0.89	35.6
3	R	6	83.3	0.113	32.3	LOS C	7	0.85	0.86	33.5
<b>Approach</b>		<b>17</b>	<b>76.5</b>	<b>0.112</b>	<b>28.8</b>	<b>LOS C</b>	<b>7</b>	<b>0.85</b>	<b>0.90</b>	<b>34.5</b>
<b>Nelson Bay Rd east</b>										
4	L	8	75.0	1.333	581.5	LOS F	2642	1.00	8.77	3.4
5	T	1160	0.9	1.312	579.8	LOS F	2642	1.00	10.39	4.0
6	R	24	12.5	1.333	586.1	LOS F	2642	1.00	10.13	4.2
<b>Approach</b>		<b>1192</b>	<b>1.6</b>	<b>1.312</b>	<b>579.9</b>	<b>LOS F</b>	<b>2642</b>	<b>1.00</b>	<b>10.38</b>	<b>4.0</b>
<b>Lemon Tree P Rd north</b>										
7	L	87	2.3	0.298	12.3	LOS A	15	0.59	0.76	56.3
8	T	3	0.0	0.300	10.1	LOS A	15	0.59	0.73	55.3
9	R	490	0.8	0.298	17.4	LOS B	15	0.59	0.81	51.7
<b>Approach</b>		<b>580</b>	<b>1.0</b>	<b>0.298</b>	<b>16.6</b>	<b>LOS B</b>	<b>15</b>	<b>0.59</b>	<b>0.80</b>	<b>52.4</b>
<b>Nelson Bay Rd west</b>										
10	L	123	6.5	0.137	10.3	LOS A	7	0.15	0.60	59.4
11	T	483	2.3	0.279	9.2	LOS A	16	0.15	0.55	60.5
12	R	21	42.9	0.280	16.5	LOS B	16	0.15	0.69	51.7
<b>Approach</b>		<b>627</b>	<b>4.5</b>	<b>0.279</b>	<b>9.7</b>	<b>LOS A</b>	<b>16</b>	<b>0.15</b>	<b>0.57</b>	<b>59.9</b>
<b>All Vehicles</b>		<b>2416</b>	<b>2.7</b>	<b>1.333</b>	<b>292.8</b>	<b>LOS F</b>	<b>2642</b>	<b>0.68</b>	<b>5.47</b>	<b>7.7</b>

## 16.0 Movement Summary

Roundabout at Nelson Bay Rd, Lemon Tree Passage Rd, Oakvale Dr

2018 Traffic + Sand Extraction Traffic - PM Peak

Roundabout

### Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued Eff.	Stop Rate	Aver Speed (km/h)
<b>Oakvale Dr south</b>										
1	L	19	84.2	0.081	16.1	LOS B	4	0.64	0.83	41.8
2	T	3	0.0	0.081	12.4	LOS A	4	0.64	0.70	42.5
3	R	6	66.7	0.081	20.6	LOS B	4	0.64	0.78	39.2
<b>Approach</b>		<b>28</b>	<b>71.4</b>	<b>0.081</b>	<b>16.7</b>	<b>LOS B</b>	<b>4</b>	<b>0.64</b>	<b>0.81</b>	<b>41.3</b>
<b>Nelson Bay Rd east</b>										
4	L	6	83.3	0.500	12.3	LOS A	33	0.54	0.68	55.2
5	T	492	2.4	0.510	10.4	LOS A	33	0.54	0.65	57.2
6	R	80	0.0	0.510	16.0	LOS B	33	0.54	0.71	52.0
<b>Approach</b>		<b>578</b>	<b>2.9</b>	<b>0.511</b>	<b>11.2</b>	<b>LOS A</b>	<b>33</b>	<b>0.54</b>	<b>0.66</b>	<b>56.4</b>
<b>Lemon Tree P Rd north</b>										
7	L	46	0.0	0.289	22.9	LOS B	20	1.00	0.96	45.6
8	T	1	0.0	0.333	20.9	LOS B	20	1.00	0.96	44.1
9	R	160	3.1	0.288	29.3	LOS C	20	0.99	0.92	41.9
<b>Approach</b>		<b>207</b>	<b>2.4</b>	<b>0.289</b>	<b>27.8</b>	<b>LOS B</b>	<b>20</b>	<b>0.99</b>	<b>0.93</b>	<b>42.6</b>
<b>Nelson Bay Rd west</b>										
10	L	460	1.1	0.404	10.5	LOS A	24	0.34	0.61	58.0
11	T	1192	1.0	0.766	9.9	LOS A	85	0.52	0.55	57.3
12	R	32	34.4	0.762	17.3	LOS B	85	0.52	0.65	50.0
<b>Approach</b>		<b>1684</b>	<b>1.7</b>	<b>0.765</b>	<b>10.2</b>	<b>LOS A</b>	<b>85</b>	<b>0.47</b>	<b>0.57</b>	<b>57.3</b>
<b>All Vehicles</b>		<b>2497</b>	<b>2.8</b>	<b>0.766</b>	<b>12.0</b>	<b>LOS A</b>	<b>85</b>	<b>0.53</b>	<b>0.62</b>	<b>55.3</b>