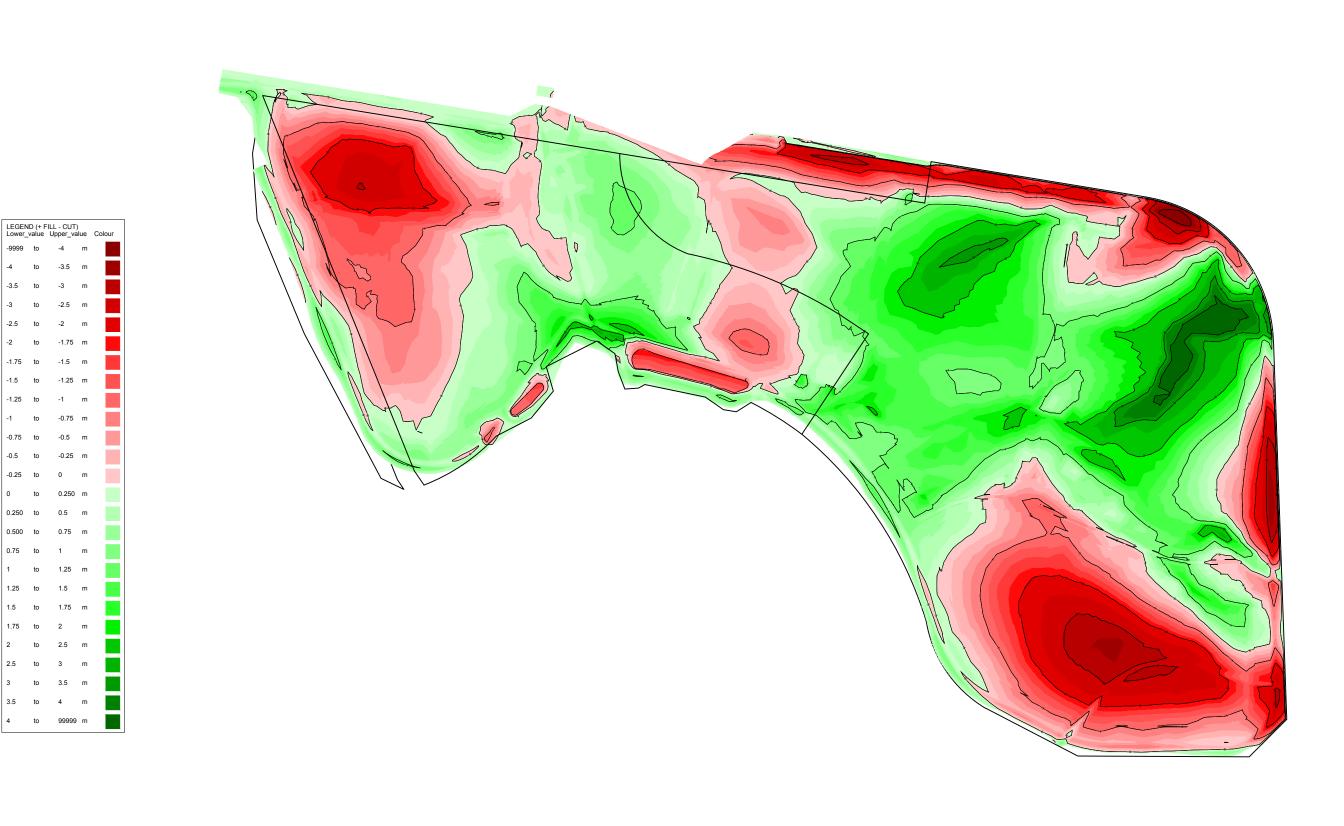


## Appendix C CUT / FILL PLAN



2.5



## Appendix D TRAFFIC ASSESSMENT REPORT



NORDS WHARF SUBDIVISION

**LOT 1 & 2 IN DP 1180292 2 – 12 BRANTER ROAD, NORDS WHARF** 

PREPARED FOR: NORDS WHARF DEVELOPMENT COMPANY PTY LTD

**APRIL 2018** 



**REF: 16/108** 

TRAFFIC IMPACT ASSESSMENT
RESIDENTIAL SUBDIVISION
NORDS WHARF DEVELOPMENT COMPANY PTY LTD

LOT 1 & 2 IN DP 1180292 2 - 12 BRANTER ROAD, NORDS WHARF

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This document has been prepared, checked and released in accordance with the Quality Control Standards established by Intersect Traffic Pty Ltd.

Issue	Date	Description	Ву
Α	01/09/17	Draft	PA
В	12/09/17	Edit	JG
С	16/04/18	Final Proof	JG
D	20/04/18	Approved	JG

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This document has been authorised by

Date 20<sup>th</sup> April 2018

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## 1. INTRODUCTION

Intersect Traffic Pty Ltd (Intersect Traffic) was engaged by Nords Wharf Development Company Pty Ltd to prepare a traffic impact assessment for the proposed residential subdivision of Lot 1 & 2 in DP 1180292, 2 – 12 Branter Road, Nords Wharf into 100 residential lots. The development is to be accessed directly off Branter Road, Nords Wharf via five (5) new subdivision roads.

This traffic impact assessment is required to support a modification to the Concept Plan approval MP 10\_0088 Nords Wharf Residential Development, being assessed by The NSW Department of Planning. The concept subdivision plan for the proposal is shown in *Appendix 1*. The proposal alters the previous development application by increasing the lot numbers from 84 to 100 and maintaining the existing intersection layout and control at the Pacific Highway / Awabakal Drive intersection. The assessment includes addressing issues raised by Roads and Maritime Services (RMS) in their letter of 5 July 2017. The RMS's letter is provided in *Appendix 2*.

The aim of this assessment is to determine the likely impact of the proposal on the adjacent local road network due to the traffic generated by the development. This report presents the findings of the traffic impact assessment and includes the following:

- 1. An outline of the existing road network near the proposed development.
- 2. An assessment of the likely peak traffic generation from the proposed development.
- 3. An assessment of the likely traffic impacts of the proposal on the adjacent road network regarding the operation of existing intersections linking to the sub-arterial and arterial road network.
- 4. An assessment of the proposed development access locations.
- 5. An assessment of the impact of the development on alternate transport mode services and facilities near the site.
- 6. Presentation of conclusions and any recommendations.

This assessment has been carried out regarding the RMS' *Guide to Traffic Generating Developments*, Austroads *Guide to Road Design Guidelines* (2009), Lake Macquarie Council's DCP (2014) as well as utilising information provided by the client.



## 2. SITE DESCRIPTION

The subject site is located at the southern end of the current village area of Nords Wharf. It adjoins and is 2 to 3 kilometres south of the nearby lakeside villages of Cams Wharf and Murrays Beach, is approximately 4 kilometres west of the seaside village of Catherine Hill Bay and approximately 8.5 kilometres south of Swansea CBD. Lake Macquarie waterfront is approximately 200 metres west of the current western access at the development site. *Figure 1* below shows the location of the site in the context of its surrounding areas and the major road intersections.

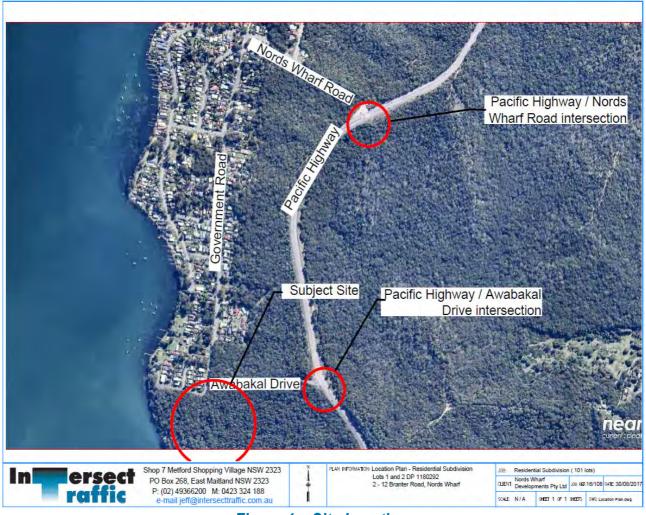


Figure 1 - Site Location.

The site is titled Lots 1 and 2 in DP 1180292 and is formally addressed as 2-12 Branter Road, Nords Wharf. The subject land is vacant land and has a total developable area of approximately 10.2 hectares for the 100 proposed allotments. The land is currently zoned R2 – Low Density Residential under the provisions of the Lake Macquarie Local Environmental Plan 2014.

Two accesses to the site currently exist at Branter Road; one via a formed gravel driveway opposite the end of Government Road and another via a formed gravel driveway at the western end of the development. **Photograph 1** shows the existing site conditions while **Photograph 2** shows the existing western access at Branter Road.





Photograph 1 – Existing site conditions



Photograph 2 -site access at western end



## 3. EXISTING ROAD NETWORK

In terms of traffic impact, it is considered that the local and state road network that may be significantly impacted on by this proposed development includes:

- Branter Road;
- Government Road:
- Crangan Bay Drive;
- Cams Wharf Road;
- Awabakal Drive;
- Nords Wharf Road: and
- The Pacific Highway.

### 3.1 Pacific Highway

The Pacific Highway (SH 10) is a major transportation route near the site. It connects the site to the regional areas such as Newcastle and the Central Coast and provides access to other major transport routes. Under a functional hierarchy it is a sub-arterial road therefore it is under the care and control of NSW Roads and Maritime Services (RMS).

Near the development it is a four lane two way sealed rural road with two lanes per direction except where widening has occurred near intersections to facilitate turning movements. 'Brifen' wire crash barrier has been installed along the sealed median for much of the length of the Pacific Highway between the intersections of Awabakal Drive, Nords Wharf Road and Cams Wharf Road separating traffic travelling in opposite directions near the site.

The travel lanes are approximately 3.5 metres wide, sealed shoulders vary from 2 to 4 metres in width whilst road verges are mostly grassed and vegetated in this area. The Pacific Highway has a 90 km/h speed zoning in this area and at the time of inspection, the Pacific Highway was observed to be in good condition. *Photograph 3* below shows the Pacific Highway south of the Awabakal Drive intersection near the site.



Photograph 3 – The Pacific Highway near the site



#### 3.2 Nords Wharf Road

Nords Wharf Road is approximately 800 metres in length and runs west from the Pacific Highway to the Nords Wharf village and onto the Lake Macquarie waterfront. Under a functional road heirarchy, it is a local collector road and therefore under the care and control of Lake Macquarie City Council.

Nords Wharf Road is a two-way two-lane sealed road with centre and edge line markings. The road constructed area between the Pacific Highway and Government Road is approximately an 8-metre wide rural type, with sealed / gravel shoulders and grassed verges. However, in the urban type constructed area between Government Road and Marine Parade, where kerb and gutter and grassed footways exist, the sealed road width is approximately 9.5 metres wide.

Nords Wharf Road has a 60 km/h speed zoning near the Pacific Highway and has a 50 km/h speed zoning in the residential area. At the time of inspection Nords Wharf Road was found to be in good condition. **Photograph 4** below shows Nords Wharf Road near the Pacific Highway.



Photograph 4 – Nords Wharf Road near the site

#### 3.3 Awabakal Drive

Awabakal Drive is approximately 450 metres in length and runs west from the Pacific Highway to Government Road, near the site, at the southern end of Nords Wharf village. Under a functional road classification, it is a local collector road and therefore under the care and control of Lake Macquarie City Council.

Awabakal Drive is a two-way two lane rural type sealed road with centre line markings. The sealed road width is approximately 7 metres wide with gravel shoulders and grassed verges. Awabakal Drive has a 60 km/h speed zoning near the Pacific Highway and has a 50 km/h speed zoning adjacent to Government Road. At the time of inspection Awabakal Drive was found to be in good condition. **Photograph 5** below shows Awabakal Drive near the Pacific Highway.





Photograph 5 - Awabakal Drive near the site

#### 3.4 Cams Wharf Road

Cams Wharf Road is approximately 1.3 kilometres in length and runs west from the Pacific Highway to Crangan Bay Drive adjacent to the Lake Macquarie waterfront at the southern end of the Cams Wharf village. Under a functional road classification, it is a local collector road and therefore under the care and control of Lake Macquarie City Council. Cams Wharf Road is a two-way two-lane sealed road with centre and edge line markings. The sealed road width is approximately 8 metres with 0.3 to 2.0 metre sealed shoulders and grassed verges. Cams Wharf Road has a 60 km/h speed zoning near the Pacific Highway and has a 50 km/h speed zoning in the residential area. At the time of inspection Cams Wharf Road was found to be in good condition. **Photograph 6** below shows Cams Wharf Road near the Pacific Highway.



Photograph 6 – Cams Wharf Road near the site



### 3.5 Crangan Bay Drive

Crangan Bay Drive is approximately 900 metres in length and runs south from Cams Wharf Road, south of Cams Wharf village, to Nords Wharf Road at the north-eastern side of the Nords Wharf village. Under a functional road classification, it is a local road and therefore under the care and control of Lake Macquarie City Council.

Crangan Bay Drive is a two-way two-lane sealed road with centre line markings. The sealed road width is approximately 7 metres wide with gravel and / or grassed shoulders or verges existing for its full length except for an 8.5-metre wide, 120 metre section at the southern end of the road that is kerb and guttered on the western side. Crangan Bay Drive has a 50 km/h speed zoning.

At the time of inspection Crangan Bay Drive was found to be in good condition. *Photograph 7* below shows Crangan Bay Drive near Nords Wharf Road.



Photograph 7 - Crangan Bay Road near Nords Wharf Road

#### 3.6 Government Road

Government Road is a local residential road approximately 1.6 kilometres in length that provides direct access to the development site from both Awabakal Drive and Nords Wharf Road. It runs from Branter Road at its southern end and connects to Nords Wharf Road and extends a further 200 metres north of Nords Wharf Road to a dead end. Under a functional road hierarchy, it is a local collector road and therefore is under the care and control of Lake Macquarie City Council.

Government Road is a two-way two-lane sealed urban road. The section of road between Branter Road and Nords Wharf Road is sealed, approximately 10.8 metres wide, has centre line markings and longitudinal drainage. This section is kerb and guttered for its full length except for a 160-metre section (east side only) north of Branter Road. The 200-metre section of road north of Nords Wharf Road is sealed, approximately 5.5 metres wide with gravel or grassed shoulders / verges.

A 50 km/h speed zoning applies to Government Road which on inspection was found to be in good condition. *Photograph 8* shows Government Road near the site.





Photograph 8 – Government Road near the site

#### 3.7 Branter Road

Branter Road is a local residential road approximately 200 metres in length that provides frontage and access to the development site. It runs from Government Road to a dead end at the Lake Macquarie waterfront. Under a functional road hierarchy, it is a local road and therefore is under the care and control of Lake Macquarie City Council.

Branter Road is a two-way two-lane sealed urban road. It is sealed, varying in width between 6 and 9 metres, with kerb and gutter on part of the north side and at the cul-de-sac end and has a gravel shoulder and grassed table drain on its southern side as shown in **Photograph 9**. A 50 km/h speed zoning applies to Branter Road which on inspection was found to be in good condition.



Photograph 9 -Branter Road adjacent to the site



## 4. ROAD NETWORK IMPROVEMENTS

There are no known planned road improvements near the site that would increase the capacity of the local and state road network. Road network improvements would be undertaken on a regular basis near the site as per Lake Macquarie City Council's and RMS maintenance programs.

## 5. TRAFFIC VOLUMES

For the approved development Intersect Traffic had previously undertaken manual traffic counts on Friday 29 July 2016 to determine traffic volumes at the Pacific Highway / Nords Wharf Road and the Pacific Highway / Awabakal Drive T-intersections during the likely morning peak hour of  $8.00 \, \text{am} - 9.00 \, \text{am}$  and likely evening peak hour of  $4.00 \, \text{pm} - 5.00 \, \text{pm}$ .

The traffic count tally sheets at these intersections are provided in *Appendix 2*.

The July 2016 AM and PM peak period traffic counts for the Pacific Highway and Nords Wharf Road intersection were:

- Pacific Highway northbound 1,371 vtph AM and 1,697 PM;
- Pacific Highway southbound 1,307 vtph AM and 1,618 vtph PM; and
- Nords Wharf Road 114 vtph AM and 121 vtph PM.

The July 2016 AM and PM peak period traffic counts for the Pacific Highway and Awabakal Road intersection were:

- Pacific Highway northbound 1,294 vtph AM and 1,613 vtph PM;
- Pacific Highway southbound 1,320 vtph AM and 1,650 vtph PM; and
- Awabakal Drive 56 vtph AM and 61 vtph PM.

To determine the estimated likely traffic volumes in 2018 on the Pacific Highway these peak hour traffic count figures have been increased by 1.5 % per annum for 2 years. The projected 2018 peak hour traffic figures have then been increased by a further 1.5 % per annum for a further 10 years to estimate likely traffic volumes in 2028. The resultant 2018 and 2028 peak hour traffic midblock volumes for the roads at all the above intersections, adopted within this report for road network capacity assessment, are as shown below in **Table 1**.

To facilitate an assessment of the impact of the modification application on the road network Intersect Traffic also undertook manual traffic counts to determine current traffic volumes at the Nords Wharf Road / Government Road four-way cross intersection on Thursday 24 August 2017 (PM count) and Friday 25 August 2017 (AM count); and at the Nords Wharf Road / Crangan Bay Drive T-intersection on Thursday 31 August 2017, during the likely morning peak hour of 8.00 am – 9.00 am and the likely evening peak hour of 3.00 pm – 4.00 pm for both intersections. The traffic count tally sheets at these intersections are also provided in *Appendix 2*.

The August 2017 AM and PM peak period traffic counts for the Nords Wharf Road / Government Road 4-way cross intersection and the Nords Wharf Road / Crangan Bay Drive T-intersection were similarly increased by 1.5 % per annum for 10 years to estimate likely traffic volumes in 2028.

The resultant 2018 and 2028 peak hour traffic mid-block volumes for the roads at all the above intersections, adopted within this report for road network capacity assessment, are as shown below in *Table 1*.



Table 1- Mid-block peak hour traffic volumes 2018 and 2028

Road	Section	2018		2028		Road
		AM (vtph)	PM (vtph)	AM (vtph)	PM (vtph)	Capacity
Pacific Highway	North of Nords Wharf Road	1392	1704	1615	1978	4300
Pacific Highway	South of Nords Wharf Road	1327	1642	1540	1906	4300
Nords Wharf Road	West of the Pacific Highway	116	123	134	143	1800
Pacific Highway	North of Awabakal Drive	1313	1637	1524	1900	4300
Pacific Highway	South of Awabakal Drive	1340	1675	1555	1944	4300
Awabakal Drive	West of the Pacific Highway	57	62	66	72	1800
Nords Wharf Road	East of Government Road	133	147	162	179	1800
Nords Wharf Road	West of Government Road	64	77	78	94	1800
Government Road	South of Nords Wharf Road	67	74	82	90	1800
Government Road	North of Nords Wharf Road	12	6	15	7	1800
Nords Wharf Road	East of Crangan Bay Road	145	162	177	197	1800
Nords Wharf Road	West of Crangan Bay Road	141	172	172	210	1800
Crangan Bay Road	North of Nords Wharf Road	28	50	34	61	1800

The Pacific Highway / Nords Wharf Road T-intersection, the Pacific Highway / Awabakal Drive T-intersection, the Nords Wharf Road / Government Road four-way cross intersection and the Nords Wharf Road / Crangan Bay Drive T-intersection where the traffic counts were undertaken are shown respectively in *Photographs 10, 11, 12 & 13* below.



Photograph 10 – Pacific Highway / Nords Wharf Road T-intersection





Photograph 11 – Pacific Highway / Awabakal Drive T-intersection



Photograph 12 – Nords Wharf Road / Government Road 4 way-intersection





Photograph 13 – Nords Wharf Road / Crangan Bay Drive T-intersection

## 6. ROAD CAPACITIES

The capacity of urban and rural roads is generally determined by the capacity of intersections. However, Tables 4.3, 4.4 & 4.5 of the *RTA's Guide to Traffic Generating Developments* provides some guidance on mid-block capacities for urban and rural roads and likely levels of service. These tables are reproduced below.

Table 4.3

Typical mid-block capacities for urban roads with interrupted flow

Type of Road	One-Way Mid-block Lane Capacity (pcu/hr)			
Madian arinas laus	Divided Road	1,000		
Median or inner lane:	Undivided Road	900		
7 - 7 7 7 7 7 7	With Adjacent Parking Lane	900		
Outer or kerb lane:	Clearway Conditions	900		
	Occasional Parked Cars	600		
4 long undivided:	Occasional Parked Cars	1,500		
4 lane undivided:	Clearway Conditions	1,800		
4 lane divided:	Clearway Conditions	1,900		

Table 4.4 Urban road peak hour flows per direction

Level of Service	A CONTRACTOR OF THE PROPERTY O	
Α	200	900
В	380	1400
С	600	1800
D	900	2200
E	1400	2800



Table 4.5
peak hour flow on two-lane rural roads (veh/hr)
(Design speed of 100km/hr)

Tannain	Level of Service	Percent of Heavy Vehicles					
Terrain	Level of Service	0	5	10	15		
	В	630	590	560	530		
Level	С	1030	970	920	870		
Level	D	1630	1550	1480	1410		
	E	2630	2500	2390	2290		
	В	500	420	360	310		
Rolling	C	920	760	650	570		
Koming	D	1370	1140	970	700		
	E	2420	2000	1720	1510		
	В	340	230	180	150		
Mountainous	С	600	410	320	260		
Modritalilous	D	1050	680	500	400		
	Е	2160	1400	1040	820		

The data for Table 4.5 assumes the following criteria:

- terrain level with 20% no overtaking.
- rolling with 40% no overtaking.
- mountainous with 60% no overtaking.
- 3.7 m traffic lane width with side clearances of at least 2m.
- 60/40 directional split of traffic.

The criteria for the Pacific Highway are rural road, a level terrain, 10% heavy vehicles and 90 km/h speed zoning. Therefore, the use of Table 4.5 above is warranted, noting the level of service (LoS), vehicles per hour and conservatively factoring by 0.9 for a reduction of the speed travel from 100 km/h to 90 km/h. A desirable level of service on a rural road is generally considered to be a level of service (LoS) C or better however on a sub-arterial road such as the Pacific Highway a LoS D is still considered acceptable. Utilising this criterion, and from Table 4.5 above a LoS E for two-way two lane of flow occurs when mid-block traffic volumes exceed 2,390 vtph x 0.90 = 2,150 vtph. Therefore, the two-way two lane mid-block traffic volume threshold for a LoS D is 2,150 vtph. This means the two-way four lane mid-block traffic volume threshold for a LoS D for the Pacific Highway is 4,300 vtph.

The criteria for Nords Wharf Road, Awabakal Drive, Cams Wharf Road, Crangan Bay Road, Government Road and Branter Road are urban road as the speed zonings are either 60 km/h or 50 km/h with one lane per direction. Therefore, the use of Table 4.4 above is warranted. The desirable level of service on an urban road is generally considered to be a level of service (LoS) C or better. This level of service is only exceeded when it becomes the minimum value for a LoS D. Therefore, for a LoS C on a two-way flow occurs when mid-block traffic volumes exceed 900 vtph per lane per direction; the two-way two lane mid-block traffic volume threshold for a LoS C is 1,800 vtph. This means the two-way two lane mid-block traffic volume thresholds for a LoS C for Nords Wharf Road, Awabakal Drive, Cams Wharf Road, Crangan Bay Road, Government Road and Branter Road is 1,800 vtph for each road.

However, with residential development in Government Road and Branter Road it is also considered that the environmental capacity goals set by NSW RMS will be applicable to these two



roads. These environmental capacity goals are shown in Table 4.6 of the *RTA's Guide to Traffic Generating Developments* reproduced below;

Table 4.6
Environmental capacity performance standards on residential streets

Road class	Road type	Maximum Speed (km/hr)	Maximum peak hour volume (veh/hr
	Access way	25	100
Local	Otrock	40	200 environmental goal
	Street	40	300 maximum
0-11	Otro- et	50	300 environmental goal
Collector	Street	50	500 maximum

**Note:** Maximum speed relates to the appropriate design maximum speeds in new residential developments. In existing areas maximum speed relates to 85th percentile speed.

With Government Road being a collector road and Branter Road a local road the environmental capacities of these roads are 500 vtph and 300 vtph respectively.

2018 and 2028 AM and PM peak hour traffic volume data as shown in *Table 1* are all well below these two-way mid-block capacity levels confirming observations undertaken on site that there is spare capacity within the existing local and state road network.

## 7. ALTERNATE TRANSPORT MODES

Hunter Valley Buses operates public transport services in the area with route 99 Lake Haven to Charlestown via Blue Haven, Gwandalan and Swansea servicing the Nords Wharf area with a limited service on Mondays to Saturdays. The local bus route extract is shown in *Figure 2* below. The nearest bus stops are located on either side of Government Road approximately 170 metres north of the site. This is considered within convenient walking distance of the site and provides a public transport service back north and south of the site connecting to bus interchanges and / or train stations for further travel by public transport within the Central Coast and Hunter areas.

There is one constructed concrete pedestrian footpath near the site. It is located on the eastern side of Government Road and is approximately 150 metres long and approximately 1.0 metre wide. It runs north / south and commences approximately 220 metres north of the site. Pedestrians would currently be required to utilise the existing grassed footpaths / verge areas for travel in all other locations near the site.

There are no on or off-road cycleways near the site meaning currently cyclists would be required to share the travel lanes / parking lanes and/or sealed shoulders in the area with other vehicles on the road network. **Photographs 14 & 15** below show the alternate transport facilities in Government Road near the site.

The revised proposal following consideration of all additional data, the submissions recieved from the Community and those from relevant Authorities will have no impact on the existing bus services and route.





Figure 2 – Existing Bus Services



Photograph 14 – Bus stops in Government Road near the site





Photograph 15 – Footpath in Government Road near the site

## 8. PROPOSED DEVELOPMENT

The proposal is to subdivide the existing property Lot 1 & 2 in DP 1180292, 2 – 12 Branter Road, Nords Wharf into 100 residential lots. Specifically, the development will include;

- Subdivision of the site into 100 residential lots ranging in size from 505 m² to 1,059 m²;
- Construction of 6 new internal subdivision roads to Lake Macquarie City Council requirements - one as an extension of Government Road and 5 additional roads, all as through roads; and
- Drainage and landscaping works to Lake Macquarie City Council requirements.

The concept subdivision plan for the proposal is shown in *Appendix 1*. In line with the local communities desire and preliminary advice provided by NSW RMS the proposal seeks to maintain the existing layout at the Pacific Highway / Nords Wharf Road intersection (rural seagull) while modifying the Pacific Highway / Awabakal Drive intersection to prohibit right turn movements out of Awabakal Drive.



## 9. TRAFFIC GENERATION

The RMS' *Guide to Traffic Generating Development's* provides specific advice on the traffic generation potential of various land uses. However, the RMS has released a Technical Direction (TDT 2013/4) releasing the results of updated traffic surveys and as a result amended land use traffic generation rates. Regarding low density residential dwellings the following amended advice is provided within the Technical Direction.

Daily vehicle trips = 10.7 per dwelling in Sydney, 7.4 per dwelling in regional areas

Weekday average evening peak hour vehicle trips = 0.99 per dwelling in Sydney (maximum 1.39), 0.78 per dwelling in regional areas (maximum 0.90).

Weekday average morning peak hour vehicle trips = 0.95 per dwelling in Sydney (maximum 1.32), 0.71 per dwelling in regional areas (maximum 0.85).

(The above rates do **not** include trips made internal to the subdivision, which may add up to an additional 25 %).

Adopting the maximum rate approach for regional areas the following additional development traffic from the proposed planning proposal can be calculated (rounded up) as:

Daily vehicle trips  $100 \times 7.4 = 740 \text{ vtpd}$ 

PM weekday peak hour  $100 \times 0.90 = 90 \text{ vtph}$ 

AM weekday peak hour  $100 \times 0.85 = 85 \text{ vtph}$ 

These rates have been adopted for assessment purposes in this report.

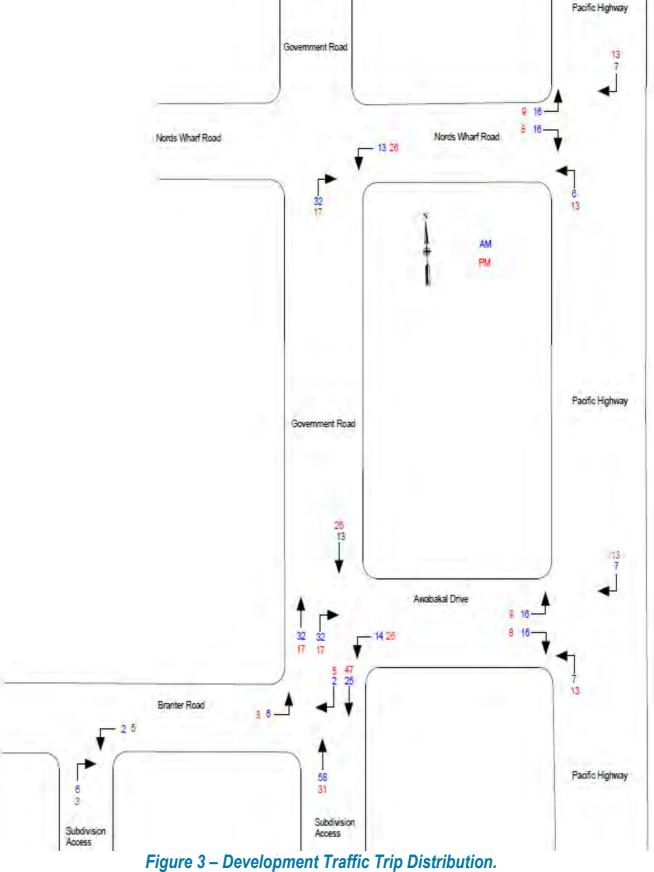
## 10. TRIP DISTRIBUTION

Before carrying out an assessment of the impacts of the additional traffic on the local road network the additional vehicle trips from the development must be assigned to the network. The manual traffic counts carried out as part of this assessment is used to provide guidance as to trip distribution along with identification of likely origin destinations. Some traffic may choose other routes not shown in the distribution however the number of vehicle trips will be very minor and their impact on other sections of the network will be negligible. In distributing the development traffic onto the local road network, the following assumptions have been made:

- In the AM peak 70 % of development traffic is outbound while 30 % is inbound;
- In the PM peak 40 % of development traffic is outbound while 60 % is inbound;
- In the AM and PM peak origin / destinations via the Pacific Highway will be 50 % from and to the north and south.
- Inbound traffic from the Pacific Highway south will be split 50:50 to Awabakal Drive and Nords Wharf Road;
- Inbound traffic from the Pacific Highway north will be split 50:50 to Awabakal Drive and Nords Wharf Road;
- Outbound traffic from the development will be split 75:25 to Nords Wharf Road west and Awabakal Drive respectively;
- Outbound traffic from Nords Wharf Road will be split 67:33 to the Pacific Highway northbound and the Pacific Highway southbound respectively.



The resulting development traffic trip distribution on the local road network is shown below in Figure 2.





## 11. TRAFFIC IMPACT ASSESSMENT

#### 11.1 Road Network Mid-Block Capacity

It has previously been shown in **Section 6** of this report that the local road network is currently operating within its technical two-way mid-block capacity. Based on the trip distributions contained in **Figure 3** the additional peak two-way mid-block traffic volumes generated by the development of the subject residential estate, on the critical sections of the road network are:

- Pacific Highway north of Nords Wharf Road AM peak 46 vtph & PM peak 43 vtph;
- Pacific Highway south of Nords Wharf Road AM peak 45 vtph & PM peak 43 vtph;
- Pacific Highway south of Awabakal Drive AM peak 45 vtph & PM peak 42 vtph;
- Awabakal Drive west of the Pacific Highway AM peak 46 vtph & PM peak 43 vtph;
- Nords Wharf Road west of the Pacific Highway AM peak 45 vtph & PM peak 43 vtph;
- Government Road south of Nords Wharf Road AM peak 45 vtph & PM peak 43 vtph;
- Government Road south of Awabakal Drive AM peak 91 vtph & PM peak 86 vtph;
- Branter Road west of Government Road AM peak 8 vtph & PM peak 8 vtph;
- Access south of Government Road AM peak 83 vtph & PM peak 78 vtph;
- Access south of Branter Road AM peak 8 vtph & PM peak 8 vtph.

Therefore, the likely mid-block two-way traffic volumes on the road network, post development compared to the road network capacity would be as shown in *Table 2* below;

Table 2 – Two-way mid-block capacity assessment

Road	Section	2018		2028		Road	Development Traffic	
		AM (vtph)	PM (vtph)	AM (vtph)	PM (vtph)	Capacity	AM	PM
Pacific Highway	North of Nords Wharf Road	1438	1747	1661	2021	4300	46	43
Pacific Highway	South of Nords Wharf Road	1372	1685	1585	1949	4300	45	43
Nords Wharf Road	West of the Pacific Highway	161	166	179	186	1800	45	43
Pacific Highway	North of Awabakal Drive	1358	1680	1569	1943	4300	45	43
Pacific Highway	South of Awabakal Drive	1385	1717	1600	1986	4300	45	42
Awabakal Drive	West of the Pacific Highway	103	105	112	115	1800	46	43
Nords Wharf Road	East of Government Road	178	190	207	222	1800	45	43
Nords Wharf Road	West of Government Road	64	77	78	94	1800	0	0
Government Road	South of Nords Wharf Road	112	117	127	133	1800	45	43
Government Road	North of Nords Wharf Road	12	6	15	7	1800	0	0
Nords Wharf Road	East of Crangan Bay Road	190	205	222	240	1800	45	43
Nords Wharf Road	West of Crangan Bay Road	186	215	217	253	1800	45	43
Crangan Bay Road	North of Nords Wharf Road	28	50	34	61	1800	0	0

All these volumes are below the capacity thresholds of 4,300 vtph for the Pacific Highway and 1,800 vtph or 500 vtph for the all the local roads, respectively. It is concluded from the above table that as 2018 and 2028 traffic volumes post development will be below the relevant technical two-way mid-block road or environmental capacities, the arterial and local road network have sufficient spare capacity to cater for the proposed residential estate.



#### 11.2 Intersection Capacity

The main external intersections to be impacted on by this development are:

- Pacific Highway / Nords Wharf Road Seagull T-intersection (no changes proposed);
- Pacific Highway / Awabakal Drive T-intersection (no changes proposed)
- Nords Wharf Road / Government Road four way give way controlled priority intersection;
   and
- Government Road / Awabakal Drive give way controlled priority T-intersection.

The proposed intersection layouts for the Pacific Highway / Nords Wharf Road Seagull T-intersection and the Pacific Highway / Awabakal Drive T-intersection have been modelled for post development to 2028 using the SIDRA intersection analysis program. This software package predicts likely delays, queue lengths and thus levels of service that will occur at intersections. Assessment is then based on the level of service requirements of the RMS shown below:

Table 4.2 Level of service criteria for intersections

		Give Way & Stop Signs
< 14	Good operation	Good operation
15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
29 to 42	Satisfactory	Satisfactory, but accident study required
43 to 56	Operating near capacity	Near capacity & accident study required
57 to 70	At capacity; at signals, incidents will cause excessive delays	At capacity, requires other control mode
	Vehicle (secs/veh)  < 14  15 to 28  29 to 42  43 to 56	Vehicle (secs/veh)  414 Good operation 15 to 28 Good with acceptable delays & spare capacity 29 to 42 Satisfactory 43 to 56 Operating near capacity 57 to 70 At capacity; at signals, incidents will cause

Assumptions made in this modelling were;

- Post development AM and PM peak hours were modelled as well as predicted traffic volumes in 2028;
- Background traffic growth to 2028 was assumed to be 1.5 % per annum on the Pacific Highway; and
- Development traffic was distributed as per Figure 3.
- It was noted in the modelling that the observed delays at the Pacific Highway / Awabakal Drive intersection did not match the modelled delays for a normal give way controlled intersection. It was noted during the traffic counts that vehicles turning right out of Awabakal Drive would commence their movement prior to the southbound traffic passing and store within the centre median. Therefore the intersection was modelled as a seagull intersection and the modelled delays matched the observed delays.

As a sensitivity analysis the capacity of the Pacific Highway / Nords Wharf Road signalised intersection in 2028 was also assessed using double the predicted right turn movements into and



out of Nords Wharf Road as well as double the predicted left turn movements out of the intersection to consider the likely impacts on the intersection of a future linkage of Murrays Beach (and interaction with Cams Wharf and Catherine Hill Bay residences) with proposed modifications to the Pacific Highway / Cams Wharf Road intersection and the Pacific Highway / Flowers Avenue intersection to left in, left out and right in only and left in and left out only intersection respectively well as construction of a U-turn bay on the Pacific Highway or in Nords Wharf Road. This was requested by NSW RMS in preliminary advice to the applicant. The results of the Sidra modelling for the Pacific Highway / Nords Wharf Road and the Pacific Highway / Awabakal Drive priority controlled intersections for the all vehicles case and worst movement level of service are shown in *Table 3 & Table 4* below respectively. The Sidra Movement Summary Tables are contained in *Attachment C*.

Table 3 – Pacific Highway / Nords Wharf Road rural seagull – Sidra results summary

Modelled Peak	Degree of Saturation (v/c)	Average Delay (s)	Level of Service	95% back of queue length (cars)
2028 AM + development	0.423	1.6	D	1.0
2028 PM + development	0.386	1.3	С	1.0
2028 AM + dev + other road changes	0.423	2.4	D	1.2
2028 PM + dev + other road changes	0.575	2.4	С	2.5

Table 4 – Pacific Highway / Awabakal Drive—Sidra results summary

Modelled Peak	Degree of Saturation (v/c)	Average Delay (s)	Level of Service	95% back of queue length (cars)
2028 AM + development	0.331	1.3	С	1.1
2028 PM + development	0.319	0.9	С	0.7

This modelling shows that the Pacific Highway / Nords Wharf Road rural seagull will operate satisfactorily in 2028 in both the AM and PM peaks with all additional development traffic with average delays, LoS and queue lengths all meeting the acceptable standards recommended by the RMS for satisfactory performance.

The Pacific Highway / Awabakal Drive intersection will continue to operate satisfactorily through to 2028 with average delays, LoS and queue lengths all well within the acceptable standards recommended by NSW RMS for satisfactory performance.

It should also be noted that the safety of this intersection as presented by NSW RMS 13<sup>th</sup> June 2017 (please refer to *Appendix 5*) is not an issue as only a single 'on other path' accident has occurred at the intersection which resulted in injury i.e. no tow away accidents and zero fatalities. As such the intersections performance has not triggered any improvement measures to be implemented under its current function and responsibility as determined by NSW RMS.

The additional traffic generated by the proposed development results in all intersections with the state road network operating at acceptable levels of service which will not compromise the safe operation of the intersection from how it operates today.

The local road intersections i.e. Nords Wharf Road / Government Road and Government Road / Awabakal Drive and the new internal subdivision intersections will operate with major and minor road traffic volumes well below the thresholds for uninterrupted flow conditions as shown in the table sourced from Austroads Guide to Traffic Management – Part 6 – Intersections, Interchanges and Crossings for which the Guide states 'The following table may be used as an initial guide to determine the need for a detailed traffic analysis in accordance with the procedure provided in Part 3 of the Guide to Traffic Management. When the volumes at an intersection are less than those shown, a detailed analysis to demonstrate that adequate capacity is available is unlikely to be necessary.'



Based on this table there is no need for further analysis of these intersections and it is reasonable to conclude that the intersections will continue to operate with uninterrupted flow conditions i.e. little or no delay to motorists (LoS A) post development and with a further ten years background traffic growth through to 2028.

Major road type <sup>1</sup>	Major road flow (vph) <sup>2</sup>	Minor road flow (vph) <sup>3</sup>
	400	250
Two-lane	500	200
	650	100
	1000	100
Four-lane	1500	50
	2000	25

Source: - Austroads Guide to Traffic Management- Part 6 - Intersections, Interchanges and Crossings

It is therefore concluded that the proposed development will not adversely impact on the local and state road network due to unsatisfactory intersection operation however future road network changes at the Pacific Highway / Cams Wharf Road and pacific Highway / Flowers Avenue intersections are likely to require that the Pacific Highway / Nords Wharf Road rural seagull intersection be upgraded to a signalised seagull intersection should these developments ever proceed (uncertainty around essential infrastructure servicing, mine subsidence and ultimate project viability may delay these developments from ever proceeding).

#### 11.3 On-Site Car Parking

The proposed subdivision will itself not generate an on-site car parking demand with this demand being generated by future development of the lots. As such assessment of on-site car parking needs to be undertaken with future development applications for development of the individual allotments. However, with lot sizes ranging from 505 m² to 1,059 m² it is reasonable to conclude that there is sufficient room on each lot for any future proposal to provide sufficient on-site car parking to meet the requirements of Lake Macquarie City Council's DCP.

#### 11.4 Subdivision Design

A review of the subdivision plan has noted that the road network which is to be constructed to Lake Macquarie City Council requirements has been designed in line with current best practice in that perimeter roads for bushfire protection are provided and all internal intersections are designed as priority controlled (give-way) T-intersections ensuring vehicle conflict points are minimised. The horizontal road alignment is also conducive to the movement of a typical HRV waste collection vehicle to easily manoeuvre through the site. Therefore the subdivision design is supported from a traffic impact perspective.

The proposed lots have sufficient frontage to allow property accesses (access crossings) compliant with Lake Macquarie City Council and Australian Standard requirements to be constructed to each of the lots. Again, this would be further assessed at development application stage for the future development of each of the new lots.

## 11.5 Alternate Transport Modes

This development will not generate enough additional demand for a requirement for the provision of additional alternative transport mode infrastructure or additional public transport services to be placed on the developer. The existing public transport services including school services are considered suitable for the development without the need to design additional bus routes in the subdivision. Overall it is concluded the proposed development will not adversely impact on the existing public transport services and alternative transport mode infrastructure in the area.



## 12. CONCLUSIONS

This traffic impact assessment for the proposed modification to the residential subdivision of Lot 1 & 2 in DP 1180292, 2 – 12 Branter Road, Nords Wharf into 100 residential lots has determined the following:

- The existing state and local road network is currently operating satisfactorily with spare capacity to cater for this additional development.
- The proposed development is likely to generate approximately an additional 85 vtph in the AM peak traffic period and 90 vtph in the PM peak traffic period.
- The local and state road network has sufficient spare two-way mid-block road capacity to cater for the development.
- Sidra modelling of the Pacific Highway / Nords Wharf Road rural seagull demonstrated this intersection will operate satisfactorily post development through to 2028 in both the AM and PM peaks with average delays, LoS and queue lengths all meeting the acceptable standards recommended by NSW RMS for satisfactory performance. The intersection will also continue to operate satisfactorily through to 2028 if an additional traffic from north of the intersection is directed to the intersection with the construction of a U-turn bay at the intersection.
- Sidra modelling of the Pacific Highway / Awabakal Drive intersection shows this intersection as currently constructed will continue to operate satisfactorily through to 2028 with average delays, LoS and queue lengths all well within the acceptable standards recommended by NSW RMS for satisfactory performance.
- The local road intersections i.e. Nords Wharf Road / Government Road and Government Road / Awabakal Drive and the new internal subdivision intersections will operate with major and minor road traffic volumes well below the thresholds for uninterrupted flow conditions i.e. little or no delay to motorists (LoS A) both post development and through to 2028.
- The proposed development following this detailed review, input from NSW RMS and submissions received from the community has determined the existing intersections can remain as is with no changes and provide acceptable LoS and safety following the proposed development to 2028 and beyond.
- NSW RMS has confirmed the Awabakal Drive / Pacific Highway intersection does not have an adverse crash data history with only a single accident resulting in injury occurring in recent history. This accident history has not triggered any improvement works as a result under NSW RMS's care and maintenance.
- No changes to existing bus routes will occur as a result of the proposed development.
- With lot sizes ranging from 505 m<sup>2</sup> to 1,059m<sup>2</sup> it is reasonable to conclude that there is sufficient room on each lot for any future proposal to provide sufficient on-site car parking to meet the requirements of Lake Macquarie City Council's DCP.
- The proposed subdivision design is consistent with best practice subdivision design and is supported from a traffic impact perspective.
- This development is unlikely to generate enough additional demand for a requirement for the provision of additional alternative transport mode infrastructure or additional public transport services to be placed on the developer. The existing public transport services including school services are considered suitable for the development without the need to design additional bus routes in the subdivision.



## 13. RECOMMENDATION

Having undertaken this traffic impact assessment for the proposed modification to the residential subdivision of Lot 1 & 2 in DP 1180292, 2 – 12 Branter Road, Nords Wharf into 100 residential lots it is recommended that the proposal can be supported from a traffic impact perspective as the development will not have an adverse impact on the local and state road network and will comply with all the requirements of Lake Macquarie City Council, Australian Standard and NSW Roads and Maritime Services (RMS) requirements.

JR Garry BE (Civil), Masters of Traffic

Director

Intersect Traffic Pty Ltd

Cloursey





# APPENDIX 1 CONCEPT SUBDIVISION PLAN

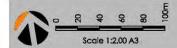




Stage 1 - 80 Lots Stage 2 - 20 lots Total - 100 Lots

#### Notes:

- Road hierarchy and road reserve allocation as per previously approved Concept plan.
- 2. Where required excessive cut or fill batters will be replaced with retaining walls subject to LMCC approval.



Project No 025/2016 Suburb Nords Wharf Street Branter Road Lot & DP 1 & 2 Site area NA Dwg Title Residential Subdivision Sheet Title Subdivision Layout Number of Sheets 1 Sheet Number 1 Issued 07/04/2018





# APPENDIX 2 MANUAL TRAFFIC COUNT TALLY SHEETS



Date	29/07/2016					
Day	Friday			In erse	ρĎ	
Time	8:00am - 9:00am			0130	VI.	
Weather	Fine			- Paffi	2	
Conducted by:	Pete			- 1 41111		
MOVEMENT	1	2	3	4	5	6
8:00 - 8:15	149	0	5	5	3	223
8:15 - 8:30	141	2	1	9	7	192
8:30 - 8:45	135	0	4	5	4	159
8:45 - 9:00	115	2	1	6	2	165
SUM	540	4	11	25	16	739
PEAK	540	4	11	25	16	739
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4:00 - 4:15	211	1	2	7	8	202
4:15 - 4.30	231	2	0	4	6	161
4:30 - 4:45	228	1	2	6	7	180
4:45 - 5:00	219	3	1	4	7	169
SUM	889	7	5	21	28	712
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PEAK	889	7	5	21	28	712
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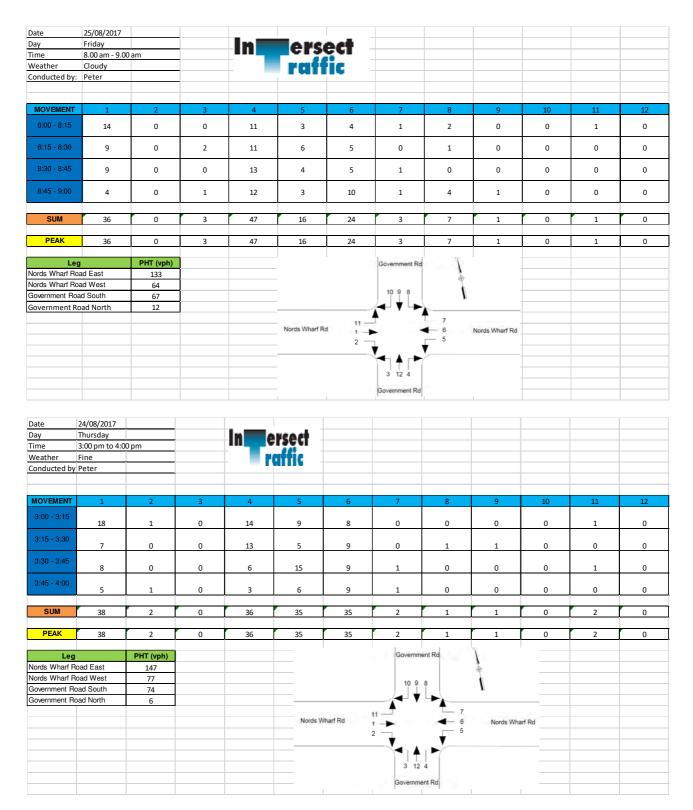


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Time	8:00am - 9:00am			CISCO		
Weather	Fine			raffic		
Conducted by:	Jeff			- 1 41114		
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MOVEMENT	1	2	3	4	5	D
8:00 - 8:15	144	5	12	5	2	222
8:15 - 8:30	133	4	13	4	4	194
8:30 - 8:45	148	6	15	1	1	165
8:45 - 9:00	99	12	22	6	2	177
SUM	524	27	62	16	9	758
PEAK	524	27	62	16	9	758
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Weather	Fine			= raffic		
Conducted by:	Jeff			- 1 411114		
MOVEMENT	1	2	3	4	5	6
4:00 - 4:15	218	15	11	3	5	194
4:15 - 4.30	219	11	8	1	4	160
4:30 - 4:45	236	15	11	1	9	178
4:45 - 5:00	219	12	8	3	4	164
SUM	892	53	38	8	22	696
PEAK	892	53	38	8	22	696
Le		PHT (vph)		7		
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8:15 - 8:30	8	1	1	2	2	25
8:30 - 8:45	14	4	2	0	1	11
8:45 - 9:00	14	0	1	2	3	31
SUM	42	7	9	6	6	87
PEAK	42	7	9	6	6	87
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Nords Wharf Road		145		Crangan Bay Rd		
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MOVEMENT	1	2	3	4	5	6
3:00 - 3:15	16	2	5	3	7	28
3:15 - 3:30	15	5	4	5	4	26
3:30 - 3:45	9	2	1	4	1	11
3:45 - 4:00	24	0	1	4	2	13
SUM	64	9	11	16	14	78
PEAK	64	9	11	16	14	78
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Nords Wharf Road	west	172		<b>*</b>		
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			Nords Wharf Rd	5 —	2 Nords Whar	f Rd
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## APPENDIX 3 SIDRA MOVEMENT SUMMARY TABLES



V Site: 2028 AM + dev

Pacific Hwy / Nords Wharf Road rural seagull with development Giveway / Yield (Two-Way)

Mov	OD	Demand	Flows	Deg.	Average	Level of	95% Back of Queue		Prop.	Effective	Average
ID	Mov	Total veh/h	HV %	Satn v/c	Delay sec	Service	Vehicles veh	Distance m	Queued	Stop Rate per veh	Speed km/h
NorthE	East: Pacific		70	*/-	000		7011			por von	IXIII.I
25	T1	658	10.0	0.180	0.0	LOSA	0.0	0.0	0.00	0.00	89.9
26	R2	36	5.0	0.173	23.9	LOS B	0.5	3.9	0.82	0.94	45.3
Approach		694	9.7	0.180	1.2	NA	0.5	3.9	0.04	0.05	85.5
North	West: Nords	Wharf Road									
27	L2	82	5.0	0.076	5.4	LOSA	0.3	2.0	0.29	0.55	53.7
29	R2	34	5.0	0.321	43.0	LOS D	1.0	7.4	0.91	1.00	34.8
Appro	ach	116	5.0	0.321	16.4	LOS B	1.0	7.4	0.47	0.68	46.4
South	West: Pacific	Highway									
30	L2	16	5.0	0.009	7.5	LOSA	0.0	0.0	0.00	0.65	68.7
31	T1	958	10.0	0.423	0.1	LOSA	0.0	0.0	0.00	0.00	89.7
Appro	ach	974	9.9	0.423	0.2	NA	0.0	0.0	0.00	0.01	89.3
All Veh	nicles	1783	9.5	0.423	1.6	NA	1.0	7.4	0.05	0.07	82.9

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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V Site: 2028 PM + dev

Pacific Hwy / Nords Wharf Road rural seagull with development Giveway / Yield (Two-Way)

Mov	OD	Demand	Flows	Deg.	Average	Level of	95% Back	of Queue	Prop.	Effective	Average
ID	Mov	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%	V/C	sec		veh	m		per veh	km/r
NorthE	ast: Pacific	Highway									
25	T1	1122	10.0	0.306	0.0	LOSA	0.0	0.0	0.00	0.00	89.8
26	R2	69	5.0	0.287	23.1	LOS B	1.0	7.2	0.82	0.96	45.7
Approach		1192	9.7	0.306	1.4	NA	1.0	7.2	0.05	0.06	85.0
NorthV	Vest: Nords	Wharf Road									
27	L2	48	5.0	0.044	5.3	LOSA	0.2	1.1	0.27	0.53	53.8
29	R2	18	5.0	0.148	32.4	LOSC	0.4	3.2	0.87	0.94	38.7
Approa	ach	66	5.0	0.148	12.6	LOSA	0.4	3.2	0.43	0.64	48.7
South\	West: Pacific	Highway									
30	L2	37	5.0	0.021	7.5	LOSA	0.0	0.0	0.00	0.65	68.7
31	T1	874	10.0	0.386	0.0	LOSA	0.0	0.0	0.00	0.00	89.8
Approa	ach	911	9.8	0.386	0.3	NA	0.0	0.0	0.00	0.03	88.7
All Veh	nicles	2168	9.6	0.386	1.3	NA	1.0	7.2	0.04	0.06	84.5

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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Project: H:\16.108 - Nords Wharf Murray Towndrow\amended subdivision plan\PacHwy\_NordsWharfno changes.sip6



V Site: 2028 AM + dev + other dev

Pacific Hwy / Nords Wharf Road rural seagull with development Giveway / Yield (Two-Way)

Move	ment Perf	ormance - V	/ehicles								
Mov ID	OD Mov	Demand Total veh/h	l Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthE	ast: Pacific	Highway									
25	T1	658	10.0	0.180	0.0	LOS A	0.0	0.0	0.00	0.00	89.9
26	R2	72	5.0	0.346	27.1	LOS B	1.2	8.8	0.85	0.98	43.5
Approa	ach	729	9.5	0.346	2.7	NA	1.2	8.8	0.08	0.10	81.4
NorthV	Vest: Nords	Wharf Road									
27	L2	164	5.0	0.152	5.5	LOS A	0.6	4.3	0.31	0.56	53.7
29	R2	34	5.0	0.346	47.0	LOS D	1.1	8.0	0.92	1.01	33.5
Approa	ach	198	5.0	0.346	12.6	LOSA	1.1	8.0	0.41	0.64	48.7
South	Vest: Pacifi	c Highway									
30	L2	16	5.0	0.009	7.5	LOS A	0.0	0.0	0.00	0.65	68.7
31	T1	958	10.0	0.423	0.1	LOS A	0.0	0.0	0.00	0.00	89.7
Approa	ach	974	9.9	0.423	0.2	NA	0.0	0.0	0.00	0.01	89.3
All Veh	nicles	1901	9.2	0.423	2.4	NA	1.2	8.8	0.08	0.11	79.4

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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 $Project: \ H:\ 16.108-Nords\ Wharf\ Murray\ Towndrow\ amended\ subdivision\ plan\ PacHwy\_Nords\ Wharfno\ changes. sip 6.108-Nords\ Wharfno\ changes. sip 6$ 



 $\nabla$  Site: 2028 PM + dev + other

Pacific Hwy / Nords Wharf Road rural seagull with development Giveway / Yield (Two-Way)

Move	ment Perfo	ormance - \	/ehicles								
Mov ID	OD Mov	Demand Total veh/h	I 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 per veh	Average Speed km/h
North	East: Pacific	Highway									
25	T1	1122	10.0	0.306	0.0	LOS A	0.0	0.0	0.00	0.00	89.8
26	R2	139	5.0	0.575	28.9	LOS C	2.5	18.5	0.88	1.05	42.6
Appro	ach	1261	9.4	0.575	3.2	NA	2.5	18.5	0.10	0.12	80.0
North\	Vest: Nords	Wharf Road									
27	L2	97	5.0	0.088	5.4	LOS A	0.3	2.4	0.28	0.54	53.8
29	R2	18	5.0	0.171	37.7	LOS C	0.5	3.6	0.89	0.95	36.6
Appro	ach	115	5.0	0.171	10.4	LOS A	0.5	3.6	0.37	0.61	50.1
South	Nest: Pacific	: Highway									
30	L2	37	5.0	0.021	7.5	LOS A	0.0	0.0	0.00	0.65	68.7
31	T1	874	10.0	0.386	0.0	LOS A	0.0	0.0	0.00	0.00	89.8
Appro	ach	911	9.8	0.386	0.3	NA	0.0	0.0	0.00	0.03	88.7
All Vel	nicles	2286	9.4	0.575	2.4	NA	2.5	18.5	0.07	0.10	80.7

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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∇ Site: 2028 AM + development

Pacific Highway / Awabakal Drive give way with development Giveway / Yield (Two-Way)

Mov	OD	Demand	Flows	Deg.	Average	Level of	95% Back	of Queue	Prop.	Effective	Average
ID	Mov	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/l
South	East: Pacific	Highway									
21	L2	24	5.0	0.014	7.5	LOS A	0.0	0.0	0.00	0.65	68.
22	T1	924	10.0	0.328	0.0	LOS A	0.0	0.0	0.00	0.00	89.8
Approa	ach	948	9.9	0.328	0.2	NA	0.0	0.0	0.00	0.02	89.
NorthV	Vest: Pacific	: Highway									
28	T1	687	5.0	0.182	0.0	LOS A	0.0	0.0	0.00	0.00	89.9
29	R2	12	10.0	0.052	21.8	LOS B	0.2	1.2	0.78	0.92	46.
Approa	ach	699	5.1	0.182	0.4	NA	0.2	1.2	0.01	0.02	88.
South\	Nest: Awaba	akal Drive									
30	L2	28	5.0	0.031	6.1	LOS A	0.1	8.0	0.39	0.59	53.
32	R2	43	5.0	0.331	35.7	LOS C	1.1	8.0	0.89	0.99	37.
Approa	ach	72	5.0	0.331	23.9	LOS B	1.1	8.0	0.69	0.83	42.
All Veh	nicles	1719	7.7	0.331	1.3	NA	1.1	8.0	0.03	0.05	85.

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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∇ Site: 2028 PM + development

Pacific Highway / Awabakal Drive give way Giveway / Yield (Two-Way)

Mov	OD	Demand		Deg.	Average	Level of	95% Back	of Queue	Prop.	Effective	Average
ID	Mov	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/r
South	East: Pacific	Highway									
21	L2	43	5.0	0.024	7.5	LOS A	0.0	0.0	0.00	0.65	68.
22	T1	898	10.0	0.319	0.0	LOS A	0.0	0.0	0.00	0.00	89.8
Approa	ach	941	9.8	0.319	0.4	NA	0.0	0.0	0.00	0.03	88.6
NorthV	Vest: Pacific	Highway									
28	T1	1114	5.0	0.295	0.0	LOS A	0.0	0.0	0.00	0.00	89.8
29	R2	21	10.0	0.093	21.7	LOS B	0.3	2.1	0.79	0.92	46.5
Approa	ach	1135	5.1	0.295	0.4	NA	0.3	2.1	0.01	0.02	88.3
South\	Nest: Awaba	akal Drive									
30	L2	15	5.0	0.016	6.0	LOS A	0.1	0.4	0.38	0.56	53.
32	R2	31	5.0	0.228	31.9	LOS C	0.7	5.2	0.87	0.96	38.9
Approa	ach	45	5.0	0.228	23.5	LOS B	0.7	5.2	0.71	0.83	42.
All Veh	nicles	2121	7.2	0.319	0.9	NA	0.7	5.2	0.02	0.04	86.

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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## APPENDIX 4 NSW RMS SUBMISSION





5 July 2017

CR2017/001900 SF2012/014082 MJD

NSW Department of Planning and Environment Modification Assessments GPO Box 39 Sydney NSW 2001

Attention: Emma Butcher

### NORDS WHARF CONCEPT APPROVAL MODIFICATION - MAJOR PROJECT MP10\_0088 MOD1

Reference is made to the Department's email dated 17 May 2017 regarding the abovementioned application which was referred to Roads and Maritime Services (Roads and Maritime) for comment in accordance with the *State Environmental Planning Policy (Infrastructure)* 2007.

Roads and Maritime understands the development to be for the following amendments to the Concept Plan approval:

- Increase the number of approved lots from 90 to 101,
- Amend the requirement to upgrade the intersection of Pacific Highway and Awabakal Drive from a signalised seagull to a left in left out intersection,
- Upgrade the intersection of the Pacific Highway and Nords Wharf Road to a signalised seagull.

#### Roads and Maritime response & requirements

Roads and Maritime has reviewed the submitted information and object to the development in its current form. Roads and Maritime requests the traffic impact study be updated to assess the following:

 The impacts of the proposed altered intersection upgrades on the local area, in particular Nords Wharf Road, Marine Parade and Government Road. The study is to consult with relevant stakeholders, including Lake Macquarie City Council (LMCC) and the local community,

#### **Roads and Maritime Services**

Level 8, 266 King Street, Newcastle NSW 2300 | Locked Bag 30, Newcastle NSW 2300 |

www.rms.nsw.gov.au | 13 22 13



- The impacts of the altered intersection upgrades on the Pacific Highway, to determine if the proposal is the optimal outcome,
- The impact that the proposed future connection of Murrays Beach to Cams Wharf by LMCC will have on the upgrade of the Nords Wharf Road proposal, as signalisation may draw motorists to this intersection and to the local school,
- Concept approval MP10\_0089 for the Middle Camp (Catherine Hill Bay) 222 lot subdivision required an upgrade at the intersection of the Pacific Highway, Cams Wharf Road and Flowers Drive, restricting Flowers Drive to left in, left out. It was further conditioned that a U-turn bay be provided on the Pacific Highway for traffic from Flowers Drive to be able to travel in the northbound direction. The U-turn bay is to be provided on the Pacific Highway or at Nords Wharf Road. Assess the impact that signalising the Nords Wharf Road intersection has on the U-turn bay required as part of MP10\_0089.

It is recommended that an updated Traffic Impact Statement include (but not be limited to) the following detail:

- o Current traffic counts for the intersections and routes within the study are,
- The distribution of the trips generated by the proposed development, and the redistribution of trips currently on the network as a result of the proposed upgrades and turn bans. This is to be shown diagrammatically,
- Traffic analysis of the proposed intersection using Sidra 7, including submission of electronic files,
- The peak hour traffic generation is to be taken at as the maximum from the RMS Technical Direction, and not the minimum. The minimum is not considered adequate for the residential trips as the site is isolated and it will be likely that residents will travel external to the site for shopping and employment.
- Future expansion of the school to accommodate increased students from the development in the catchment

Should you require further information please contact Hunter Land Use on 4908 7688 or by email at <a href="mailto:development.hunter@rms.nsw.gov.au">development.hunter@rms.nsw.gov.au</a>.

Yours sincerely

David Collaguazo

A/Manager Land Use Assessment

Hunter Region



### APPENDIX 5 NSW RMS COMMUNITY PRESENTATION

# Nords Wharf Progress Association Roads & Maritime

13 June 2017 - 8pm Nords Wharf Community Hall







## Nords Wharf: Current status

## **Existing Approvals**

DPE Major Project concept plan approval - MP09\_0088 - allowed up to 90 Lots, required:

Upgrade of Awabakal Drive at Pacific Highway to signalised seagull

Subsequent Council approved 84 Lots

# Proposed Modification to Approvals

Proposal is to increase from approved maximum 90 Lots to 101 Lots

Developer has requested alteration to intersection upgrades

- Alter Awabakal Drive at Pacific Highway to left in, left out
- Upgrade of Nords Wharf Road at Pacific Highway to signalised seagull.



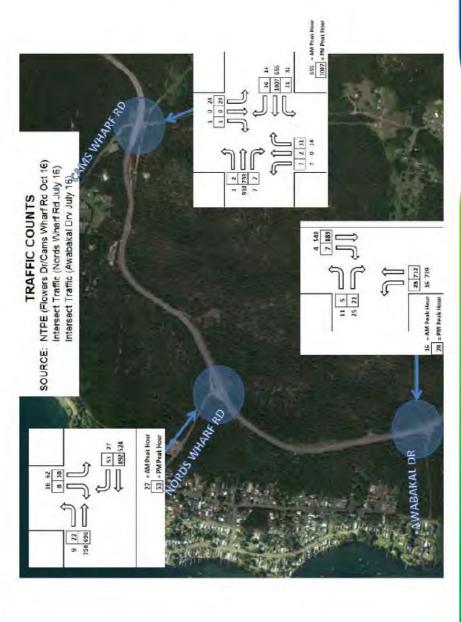
## Nords Wharf: New Development Proposal

- Technically either intersection upgrade option can work
- Further assessment required to understand impacts on local road network
- RMS will work with Council to understand impacts on local road network
- RMS will advise DPE that a local network assessment be undertaken in consultation with Council and the community to decide best option.





# Traffic counts at the intersections with the Pacific Highway







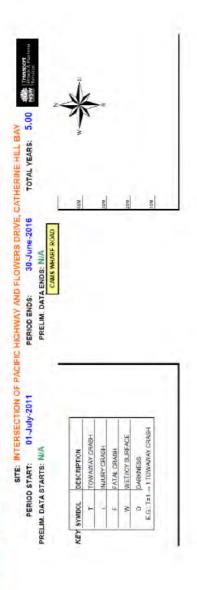
# Crash data at the intersections with the Pacific Highway

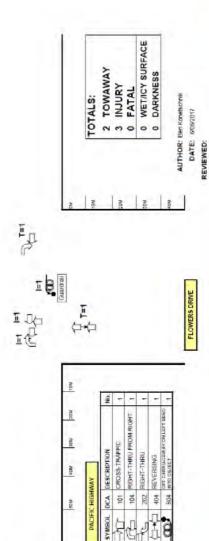






# Intersection of Cams Wharf Road and Flowers Drive Crash Diagram





200

NOTE: FOR FURTHER DETAILS REGARDING MOIVIDUAL CRASHES - REFER TO CRASH PROFILE



## UPDATE:

# Intersection of Cams Wharf Road and Flowers Drive

RMS committed to investigate the safety at the intersection and to develop and submit a Blackspot nomination to improve safety at the location.

Proposed Upgrads of Pacific Highway inforsection with Cams Wharf Road and Flowers Drive, Catherine Hill Bay









# every journey matters

# Intersection of Cams Wharf Road and Flowers Drive

JPDATE:

- Blackspot Criteria overview Project may not be competitive due to low numbers of crashes against cost of treatment.
- successful projects is at the discretion of the minister typically between Nomination closing date is the end of July and announcement of April and June.



# Intersection of Cams Wharf and Flowers Drive Other Suggestions from the community:

Suggestion from the community for the intersection of Cams Wharf Road and Flowers Drive – Grade Separated Interchange, Over or Underpass

Grade separated interchanges are typically more than \$50M in cost - recent examples from east to west is more feasible from a constructability point of view, but there is little highway runs along a ridge line - Cams Wharf Road and Flowers Drive travel downhill from the highway making an overpass from north to south very difficult. An overbridge include the overpass at Maitland and the proposed interchange at Kings Hill. The ustification for providing such a project in this location.

Mick. P to add to this

