8570_traffic_assessment_lane-change

9 November 2018

General Manager
Byron Shire Council
PO Box 219
Mullumbimby NSW 2482

Attention: Josh Winter

Dear Sir/Madam,

RE: Ewingsdale Road / Bayshore Drive Roundabout – Change of Lane Use Analysis

Ardill Payne & Partners has been commissioned to assess a proposed change in lane use of the Ewingsdale Road / Bayshore Drive Roundabout in Byron Bay. A set of design plans for the current roundabout layout have been provided (Project No. B154084). The proposed change in lane use is the removal of the through manoeuvres from the left lane on the western approach and the right lane on the eastern approach.

Intersection Analysis

Assessment of the intersection was undertaken using traffic volumes provided by Byron Shire Council. These volumes are available **Attachment 1**. Using these volumes, turning movements were estimated for the 2017 AM and PM cases. These calculations are available in **Attachment 2**. All assessments of the intersection were assessed based on a 10 year (2028) design horizon. To achieve this a 2% growth rate was applied over 11 years (in SIDRA) to achieve an assessment of the 2028 year design horizon.

In order to assess the impact of the proposed lane change a SIDRA analysis of the intersection was undertaken for the following scenarios:

- AM Base Case (With through manoeuvres) - 2028 design horizon
- PM Base Case (With through manoeuvres) - 2028 design horizon
- AM Alternate Case (Without through manoeuvres) - 2028 design horizon
- PM Alternate Case (Without through manoeuvres) - 2028 design horizon

Outputs from the SIDRA are summarized in **Tables 1, 2, and 3**. SIDRA reports for each scenario along with the model layout are located in **Attachment 3**. It should be noted that the approx. 20m long southern leg of the roundabout was removed from the analysis.

Table 1 – SIDRA Outputs – Level of Service

Test Scenario	Ewingsdale Road (Eastern Approach)		Ewingsdale Road (Western Approach)		Bayshore Drive (Northern Approach)	
	Left Lane	Right Lane	Left Lane	Right Lane	Left Lane	Right Lane
AM Base Case	A	A	A	A	A	B
PM Base Case	A	A	A	A	A	A
AM Alternate Case	A	A	A	A	B	B
PM Alternate Case	B	A	A	A	A	B

Table 2 – SIDRA Outputs – Average Delay (Seconds)

Test Scenario	Ewingsdale Road (Eastern Approach)		Ewingsdale Road (Western Approach)		Bayshore Drive (Northern Approach)	
	Left Lane	Right Lane	Left Lane	Right Lane	Left Lane	Right Lane
AM Base Case	5.9	10.0	9.9	10.2	9.9	15.0
PM Base Case	9.4	13.1	6.2	6.1	8.4	13.7
AM Alternate Case	6.0	10.8	9.1	13.0	15.7	26.8
PM Alternate Case	16.5	13.7	6.5	7.7	12.1	23.3

Table 3 – SIDRA Outputs – 95% Back of Queue (Veh)

Test Scenario	Ewingsdale Road (Eastern Approach)		Ewingsdale Road (Western Approach)		Bayshore Drive (Northern Approach)	
	Left Lane	Right Lane	Left Lane	Right Lane	Left Lane	Right Lane
AM Base Case	3.4	3.3	8.8	11.2	1.7	3.5
PM Base Case	6.7	6.4	3.3	3.9	1.9	4.7
AM Alternate Case	4.3	2.8	7.0	16.0	3.2	7.7
PM Alternate Case	15.7	4.0	1.9	7.5	3.4	10.4

From the above it is concluded that the Ewingsdale Road / Bayshore Drive Roundabout will function more effectively in the base case. In particular, the functioning of the Bayshore Drive (northern) approach and the eastern approach left lane are impacted by the proposed change to the eastern and western approach lanes.

Intersection Safety

It is also necessary to assess the safety impacts of the proposed change in lane use. Changing to the alternate case layout reduces the number of lanes merging into the right (continuing) lane exiting the roundabout traveling east and traveling west. The safety of cars traveling through the roundabout along Ewingsdale Road would be improved as they would no longer have to merge. However, vehicles turning from Bayshore Drive would be presented with a single lane of traffic with which to merge.

Removal of the secondary through lanes will also eliminate overtaking through the roundabout.

If the removal of the secondary through lanes were to be undertaken it should be incorporated with removal of the outside circulating lane on the north and south sides of the roundabout (similar to that provided on the other two legs). Pavement turn arrows should be extended in the western and eastern approach lanes.

Conclusion

It is concluded that removal of the through manoeuvre from the left lane on the western approach and the right lane on the eastern approach of the Ewingsdale Road / Bayshore Drive Roundabout would result in a reduced level of service in the Bayshore Drive approach. However, the proposed change of lane use would potentially reduce the number of merge manoeuvres and therefore reduce potential conflict and improve safety.

Yours faithfully

Tony Cromack

ARDILL PAYNE & PARTNERS

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ATTACHMENT 1

Attachment 1: Traffic Counts Provided by Council

Figure 2-3: Peak Hour Movements (4 May 2017).on Adjacent Road Segments

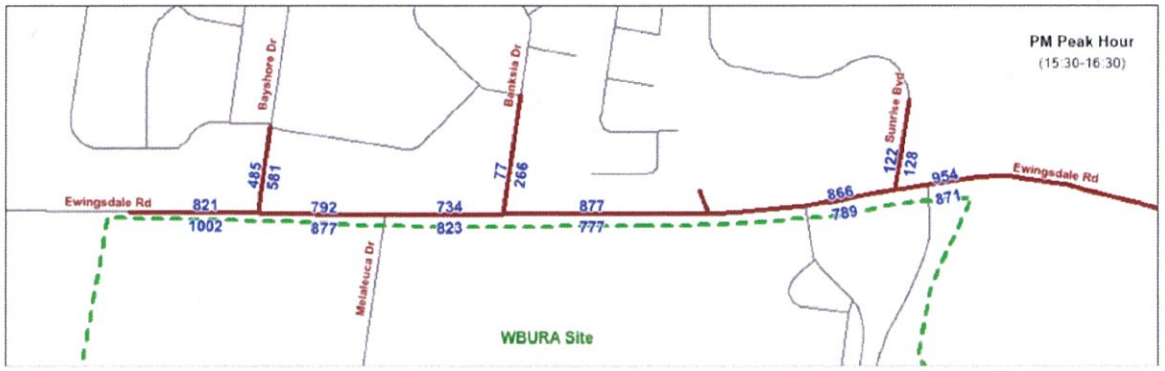


Table 2-1: Summary of Classified Count Data (May 2017)

Traffic Count Parameter	West of Bayshore Dr. (4-10 May)	East of Sunshine Blvd. (5-11 May)
7-day Average	20,604	20,810
Weekday Average % of Heavy Vehicles (Class 3+)	21,446 5.5%	21,296 6.1%
AM Peak Hour 2-way Volume % of Heavy Vehicles (Class 3+)	0830-0930 1,882 5.8%	0830-0930 1,768 6.5%
PM Peak Hour (time) 2-way Volume % of Heavy Vehicles (Class 3+)	1530-1630 1,788 4.1%	1530-1630 1,761 5.4%

ATTACHMENT 2

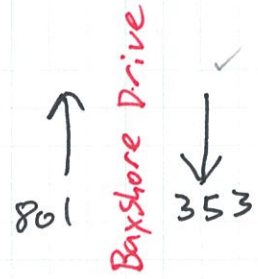
Attachment 2: Turning Movement Calculations

ARDILL, PAYNE & PARTNERS

JOB NO. 8570
PAGE: 1 of 4
DATE: 5 / 11 / 2018
ENGR: AH
CHKD: TC

JOB NAME: Bayshore Roundabout
SUBJECT: Sidra modeling for que length

AM Peak



→ 1249 Ewingsdale Rd
← 693

→ 864 Ewingsdale Rd
← 756

all In = 1249 + 353 + 756 = 2358
all out = 693 + 801 + 864 = 2358
∴ Balanced.

Split Based on Proportions onto Bayshore drive

1) $\frac{1249}{1249+756} = 62\%$ $\frac{756}{1249+756} = 38\%$ (note: No 180 degree movements considered.)

$801 \times 62\% = 499$ $801 \times 38\% = 302$

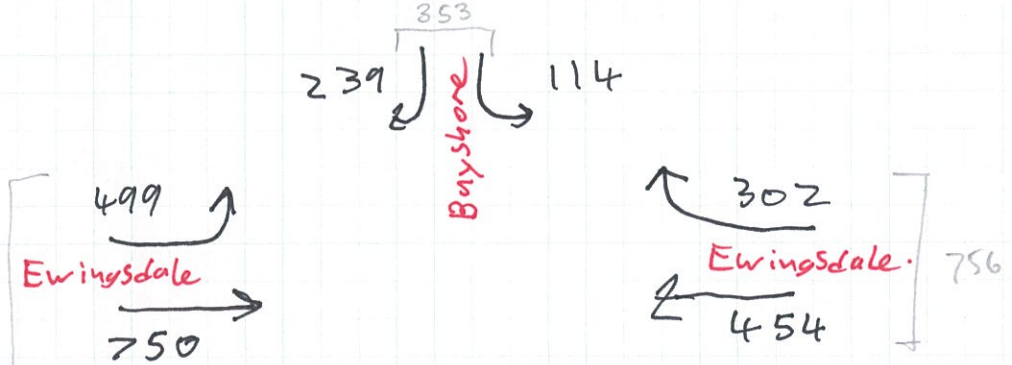
2) determine remaining Through volumes.

$1249 - 499 = 750$ $756 - 302 = 454$

3) Split Bayshore out movements Based on required

$864 - 750 = 114$ $693 - 454 = 239$.

4) transpose to turning movements.



Split based on Proportions onto Ewingsdale traveling west.

1) $\frac{353}{353+756} = 32\%$ $\quad \frac{756}{353+756} = 68\%$

$693 \times 32\% = 221$ $\quad 693 \times 68\% = 472$

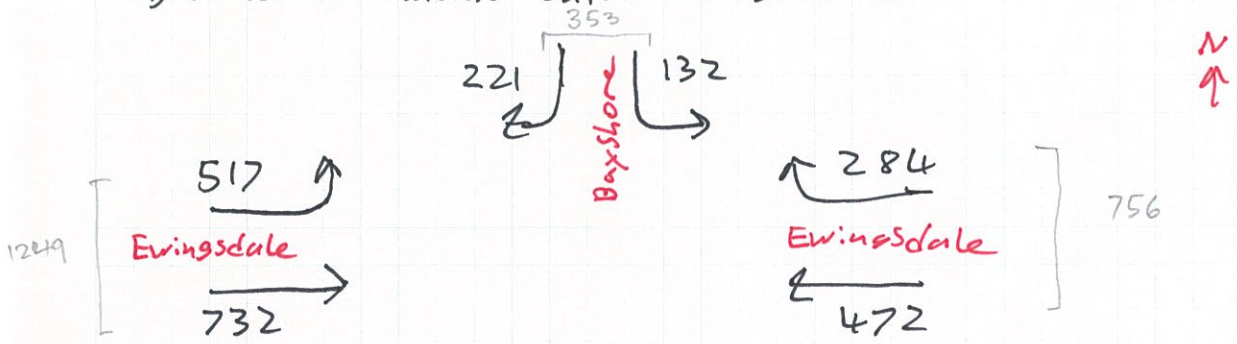
2) determining remaing vols from ↳ and ↰

$353 - 221 = 132$ $\quad 756 - 472 = 284$

3) Split Ewingsdale from west movements to suit.

$864 - 132 = 732$ $\quad 801 - 284 = 517$

4) Place movements onto Intersection.



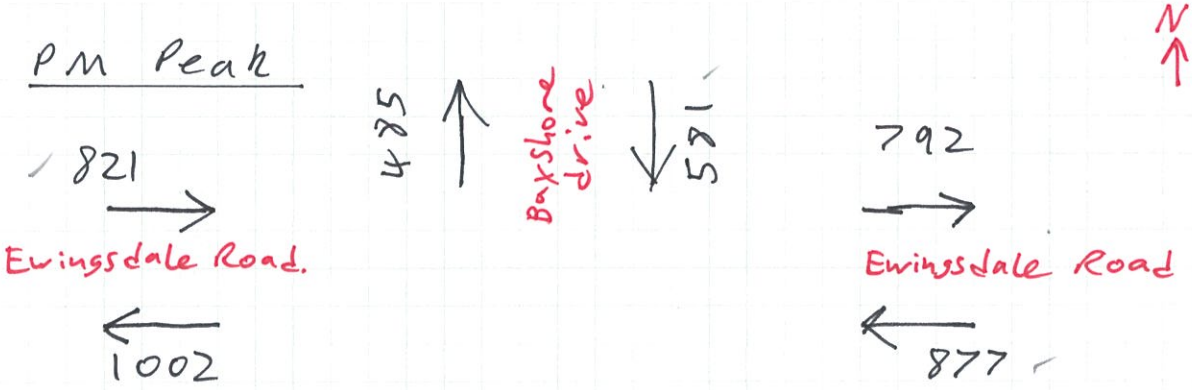
Variation Between methods.

Split Bayshore Volumes	Split Ewingsdale Volumes	% variation.
750	732	2.5 %
499	517	3.5 %
239	221	8.1 %
114	132	13.6 %
302	284	6.3 %
454	472	3.8 %
2358	2358	0.0 %

Method 1 causes slightly more queing Based on Higher → movements. ✓

AM Peak hour HV % 3+ class = 5.8% ✓

PM Peak



all In = 821 + 581 + 877 = 2279

all out = 1002 + 485 + 792 = 2279

Split Based on Proportions onto Bayshore drive.

1) $\frac{821}{821+877} = 48\%$ $\frac{877}{821+877} = 52\%$

485 × 48% = 235 485 × 52% = 250

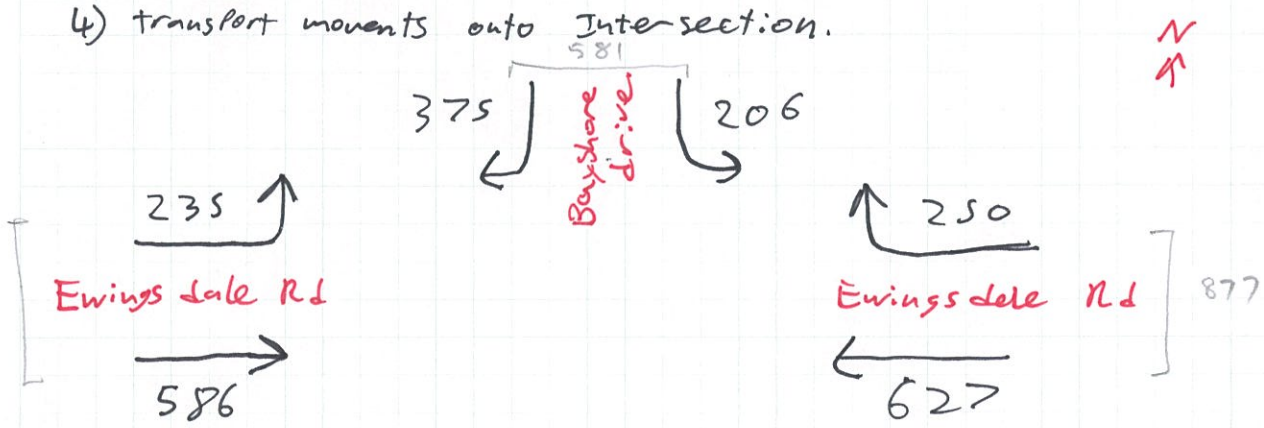
2) determine remaining through volumes.

821 - 235 = 586 877 - 250 = 627

3) split Bayshore out movements Based on required vols.

792 - 586 = 206 1002 - 627 = 375

4) transport movents onto Intersection.



JOB NAME: Bayshore Roundabout
SUBJECT: Sidra modeling for que length

Split Based on proportions onto Ewingsdale Rd traveling west.

1) $\frac{581}{581+877} = 40\%$ $\quad \frac{877}{581+877} = 60\%$

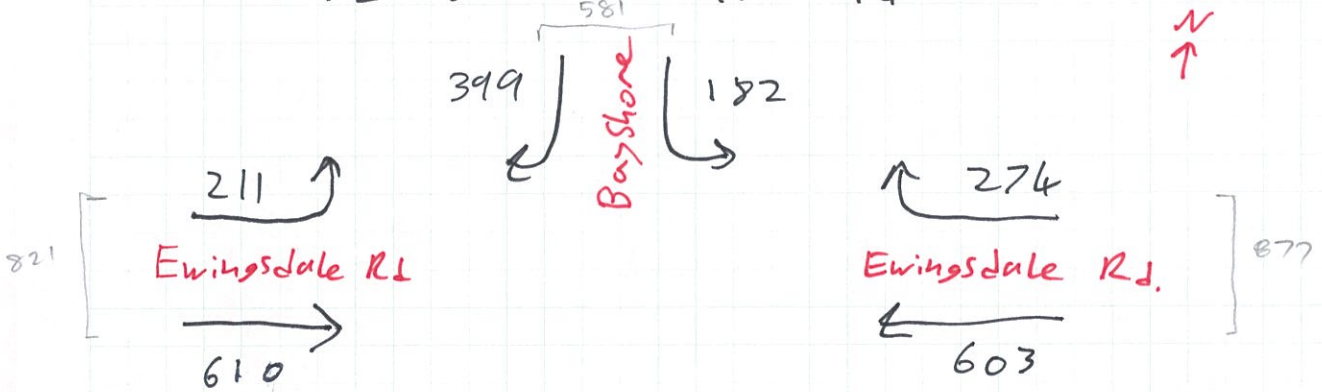
$1002 \times 40\% = 399$ $\quad 1002 \times 60\% = 603$

2) determine remaing volumes from ↳

$581 - 399 = 182$ $\quad 877 - 603 = 274$

3) Split Ewingsdale from west to suit

$792 - 182 = 601$ $\quad 485 - 274 = 211$



Variation In methods.

split Bayshore volumes	split Ewingsdale volumes	% variation
586	610	4.1 %
235	211	10.2 %
375	399	6.4 %
206	182	11.7 %
250	274	9.6 %
627	603	3.8 %
2279	2279	0.0 %

method 2 IS expected to cause more queing Based on higher → movements.

PM Peak hour HV % (3+ class) = 4.1 %

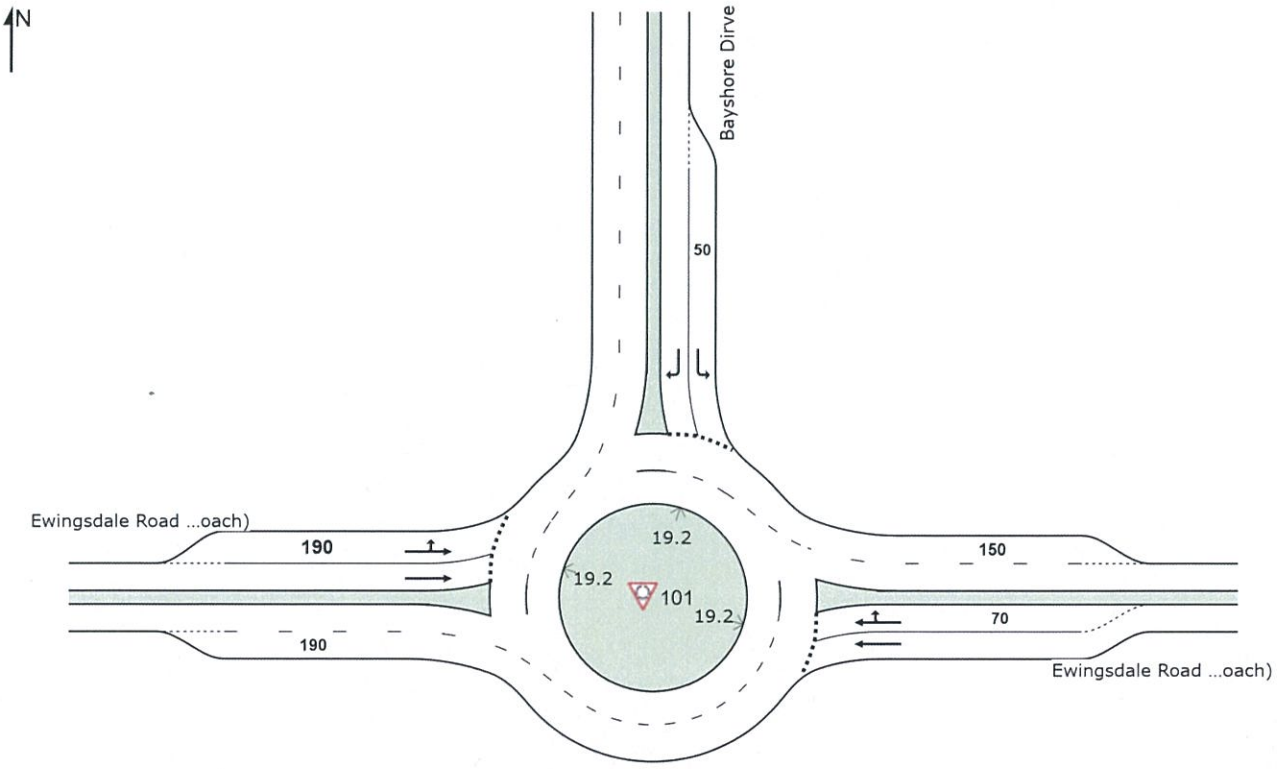
ATTACHMENT 3

Attachment 3: Sidra Layouts and Outputs

SITE LAYOUT

Site: 101 [Bay-Round_AM-Through]

New Site
Site Category: (None)
Roundabout



LANE SUMMARY

Site: 101 [Bay-Round_AM-Through]

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 11 years

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Ewingsdale Road (Eastern Approach)													
Lane 1[d]	518	5.8	1110	0.467	100	5.9	LOS A	3.4	24.7	Full	210	0.0	0.0
Lane 2	472	5.8	1011	0.467	100	10.0	LOS A	3.3	23.9	Short	70	0.0	NA
Approach	989	5.8		0.467		7.9	LOS A	3.4	24.7				
North: Bayshore Dirve													
Lane 1	149	5.8	484	0.308	100	9.9	LOS A	1.7	12.4	Short	50	0.0	NA
Lane 2[d]	313	5.8	647	0.484	100	15.0	LOS B	3.5	26.0	Full	120	0.0	0.0
Approach	462	5.8		0.484		13.3	LOS A	3.5	26.0				
West: Ewingsdale Road (Western Approach)													
Lane 1	738	5.8	978	0.754	94[6]	9.9	LOS A	8.8	64.5	Short	190	0.0	NA
Lane 2[d]	897	5.8	1113	0.805	100	10.2	LOS A	11.2	82.4	Full	290	0.0	0.0
Approach	1635	5.8		0.805		10.0	LOS A	11.2	82.4				
Intersection	3086	5.8		0.805		9.8	LOS A	11.2	82.4				

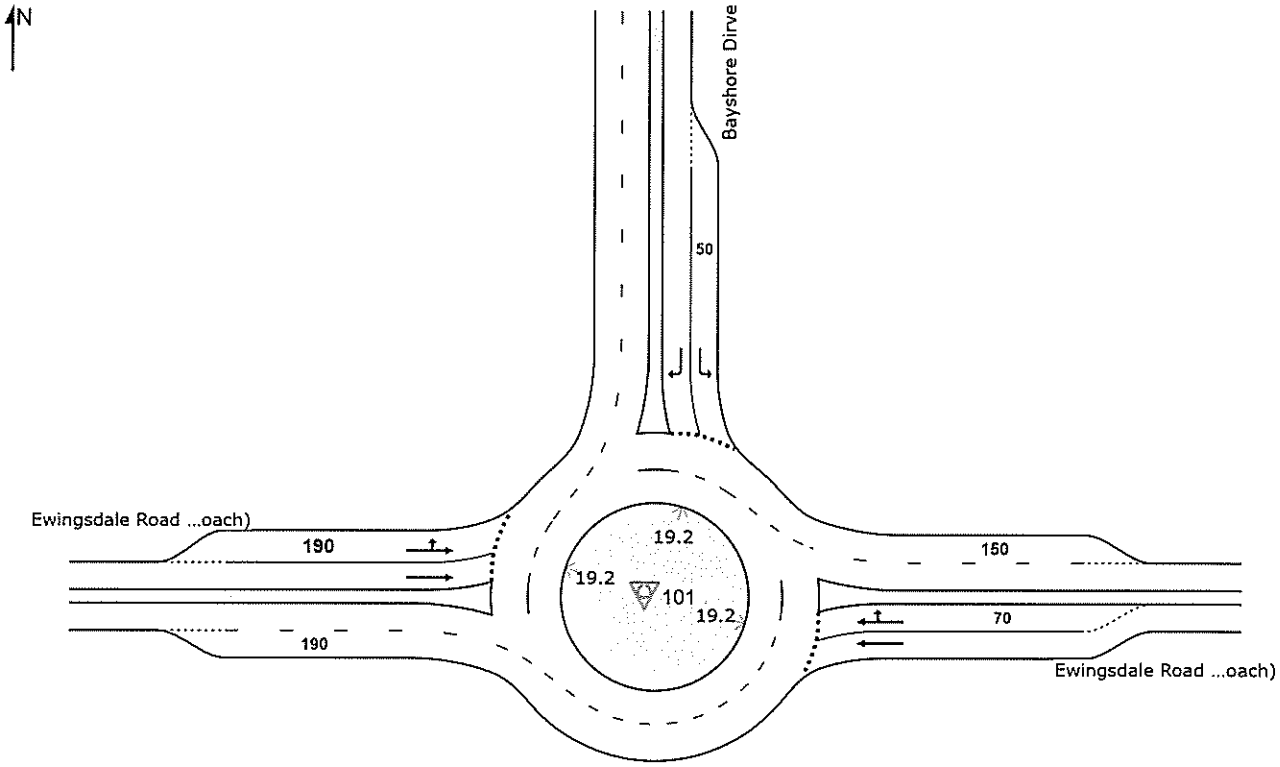
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

SITE LAYOUT

Site: 101 [Bay-Round_PM-Through]

New Site
Site Category: (None)
Roundabout



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LANE SUMMARY

Site: 101 [Bay-Round_PM-Through]

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 11 years

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Ewingsdale Road (Eastern Approach)													
Lane 1[d]	607	4.1	935	0.649	100	9.4	LOS A	6.7	48.4	Full	210	0.0	0.0
Lane 2	541	4.1	834	0.649	100	13.1	LOS A	6.4	46.5	Short	70	0.0	NA
Approach	1148	4.1		0.649		11.2	LOS A	6.7	48.4				
North: Bayshore Dirve													
Lane 1	238	4.1	638	0.373	100	8.4	LOS A	1.9	13.9	Short	50	0.0	NA
Lane 2[d]	522	4.1	857	0.609	100	13.7	LOS A	4.7	33.8	Full	120	0.0	0.0
Approach	760	4.1		0.609		12.1	LOS A	4.7	33.8				
West: Ewingsdale Road (Western Approach)													
Lane 1	489	4.1	996	0.491	94[6]	6.2	LOS A	3.3	24.2	Short	190	0.0	NA
Lane 2[d]	586	4.1	1118	0.524	100	6.1	LOS A	3.9	28.0	Full	290	0.0	0.0
Approach	1075	4.1		0.524		6.1	LOS A	3.9	28.0				
Intersection	2983	4.1		0.649		9.6	LOS A	6.7	48.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
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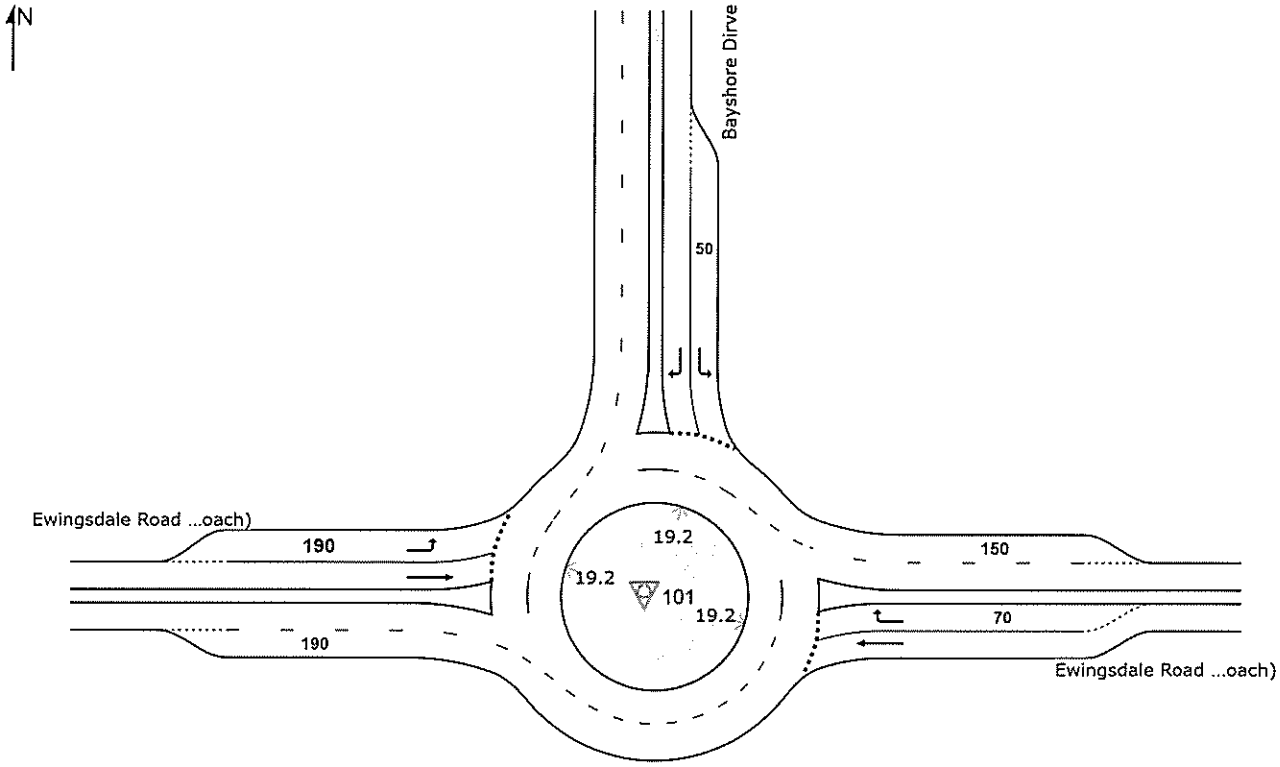
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

SITE LAYOUT

Site: 101 [Bay-Round_AM-Turn Only]

New Site
Site Category: (None)
Roundabout



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Project: S:\01 Jobs\8500-8599\8570 Bayshore Roundabout - Ewingsdale_Bayshore Drive, Byron Bay\02 Engineering\01 Calculations\Traffic \Bayshore Roundabout-Right&Left-Turns.sip8

LANE SUMMARY

Site: 101 [Bay-Round_AM-Turn Only]

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 11 years

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Ewingsdale Road (Eastern Approach)													
Lane 1[d]	594	5.8	1104	0.538	100	6.0	LOS A	4.3	31.3	Full	210	0.0	0.0
Lane 2	395	5.8	935	0.423	100	10.8	LOS A	2.8	20.7	Short	70	0.0	NA
Approach	989	5.8		0.538		7.9	LOS A	4.3	31.3				
North: Bayshore Dirve													
Lane 1	149	5.8	339	0.441	100	15.7	LOS B	3.2	23.5	Short	50	0.0	NA
Lane 2[d]	313	5.8	450	0.696	100	26.8	LOS B	7.7	56.3	Full	120	0.0	0.0
Approach	462	5.8		0.696		23.3	LOS B	7.7	56.3				
West: Ewingsdale Road (Western Approach)													
Lane 1	653	5.8	936	0.698	100	9.1	LOS A	7.0	51.2	Short	190	0.0	NA
Lane 2[d]	982	5.8	1117	0.879	100	13.0	LOS A	16.0	117.6	Full	290	0.0	0.0
Approach	1635	5.8		0.879		11.4	LOS A	16.0	117.6				
Intersection	3086	5.8		0.879		12.1	LOS A	16.0	117.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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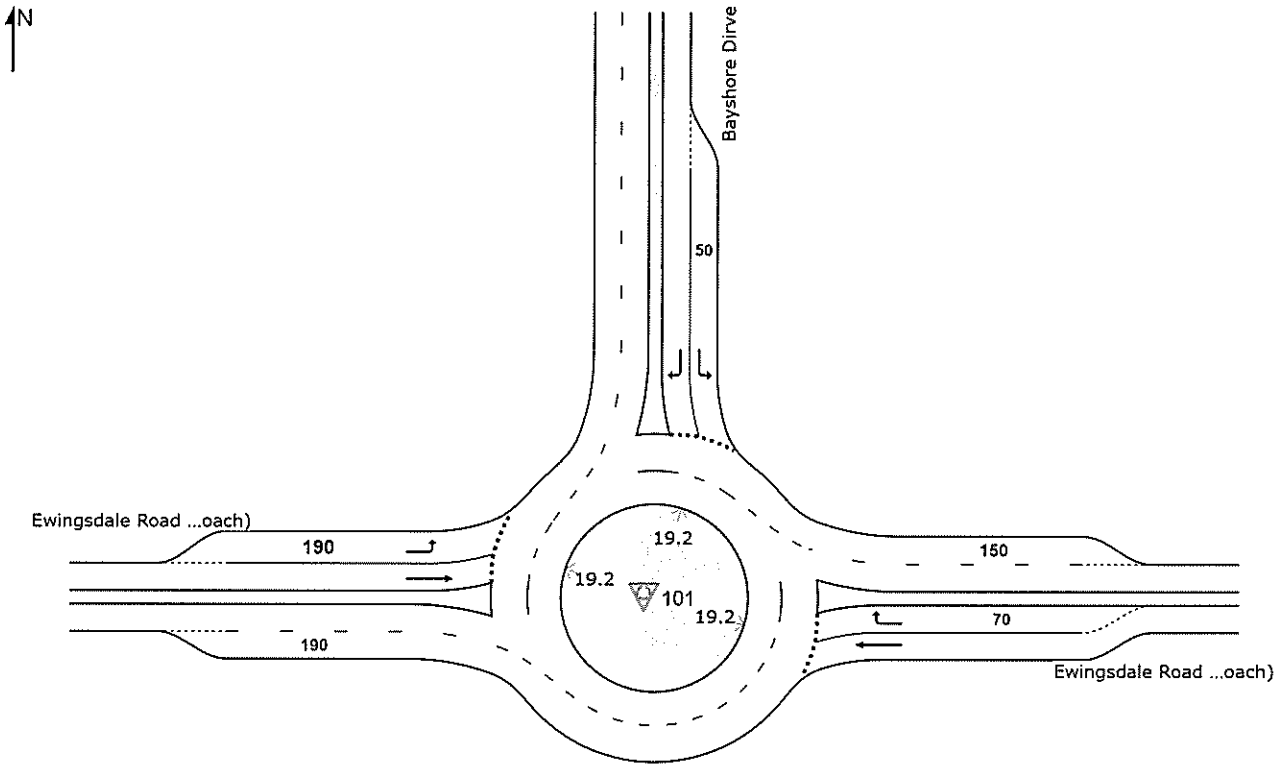
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

SITE LAYOUT

Site: 101 [Bay-Round_PM-Turn Only]

New Site
Site Category: (None)
Roundabout



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New Site
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	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Ewingsdale Road (Eastern Approach)													
Lane 1[d]	789	4.1	908	0.869	100	16.5	LOS B	15.7	114.1	Full	210	0.0	0.0
Lane 2	359	4.1	689	0.521	100	13.7	LOS A	4.0	29.0	Short	70	0.0	NA
Approach	1148	4.1		0.869		15.7	LOS B	15.7	114.1				
North: Bayshore Dirve													
Lane 1	238	4.1	505	0.471	100	12.1	LOS A	3.4	24.7	Short	50	0.0	NA
Lane 2[d]	522	4.1	672	0.777	100	23.3	LOS B	10.4	75.2	Full	120	0.0	0.0
Approach	760	4.1		0.777		19.8	LOS B	10.4	75.2				
West: Ewingsdale Road (Western Approach)													
Lane 1	276	4.1	790	0.350	100	6.5	LOS A	1.9	13.8	Short	190	0.0	NA
Lane 2[d]	798	4.1	1137	0.702	100	7.7	LOS A	7.5	54.5	Full	290	0.0	0.0
Approach	1075	4.1		0.702		7.4	LOS A	7.5	54.5				
Intersection	2983	4.1		0.869		13.7	LOS A	15.7	114.1				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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Intersection and Approach LOS values are based on average delay for all lanes.
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach