



# Traffic and Transport Impact Assessment

## Heartwood Residential Precinct Planning Proposal

### Endeavour Drive Bellingen

November 2020





Development: Heartwood Residential Precinct

Site Address: Lot 456 DP 755557

Prepared for:

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**Appendix A Proposed plan of Subdivision**

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# 1 Introduction

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## 1.1 Scope

This Traffic and Transport impact assessment report has been prepared as part of a planning proposal application to Bellingen Shire Council for rezoning of land at Endeavour Drive Bellingen.

The land has an area of 75.07 hectares and is zoned RU1 Primary Production and E3 Environmental Management. The land is an existing holding with one dwelling entitlement. The land has frontage to Endeavour Drive to the north, Hill Street to the west and Nobles Lane to the south east.

The proposal comprises a potential rezoning of the northern part of the land from RU1 Primary Production to E4 Environmental Living.

This report assesses the impact of the proposed rezoning on the operation of the surrounding transport network infrastructure and services.

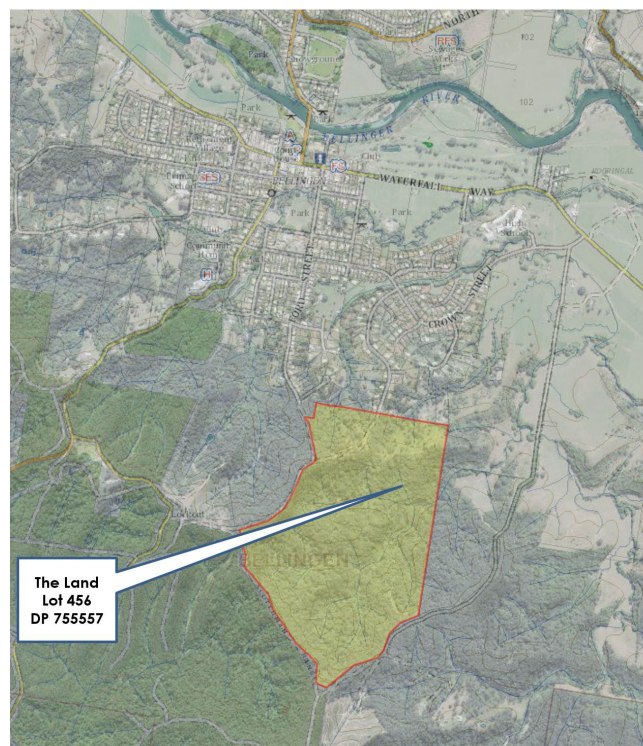
## 2 Existing Conditions

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### 2.1 Location

The planning proposal encompasses Lot 456 DP 755557 shown in Figure 1. The land has frontage to Endeavour Drive to the north, Hill Street to the west and Nobles Lane to the south east.

Primary vehicular access to the land is via Endeavour Drive and Crown Street to the Waterfall Way.



Source: SixMaps 2018

**Figure 1 Site location**



## 2.2 Existing Transport Network

### Roads

**Waterfall Way** is a State Road providing connection between the Pacific and New England highways. It provides the main road transport access between the Pacific Highway and the Bellingen township. Waterfall Way is generally constructed as a two-lane rural road on the eastern approach to Bellingen.

Crown Street intersects with Waterfall Way within the 50km/h speed zone on the approach to Bellingen township.

**Crown Street** is a two-lane local collector road of variable width providing access from the Waterfall Way to residential areas of South Bellingen. It also provides access to Bellingen High School, including the school bus bay.

Crown Street is within the 50km/h urban speed zone and includes a 40km/h school zone adjacent the Bellingen High School access.

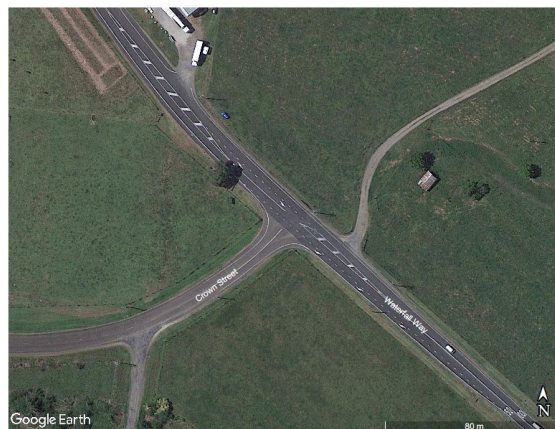
**Endeavour Drive** is a two-lane urban local road providing access to approximately 40 residential properties and terminates close to the northern boundary of the subject property. Endeavour Drive comprises 8.0m wide carriageway with roll over kerb and gutter and is within the 50km/h urban speed zone. The road geometry is generally undulating with large radius horizontal curves providing good sight distance and traffic calming characteristics.

Endeavour Drive intersects at its north end with Crown Street and is approximately 600m long. It terminates at Lot71DP785443 which is owned by Bellingen Shire Council. It is expected that the proposed development will link into Endeavour Drive through this lot, with the lot dedicated as road reserve as part of the development process.

**Hill Street** is a two-lane urban/rural road servicing a small number of residential properties and the rural land to the south. The road is partially constructed with approximately 300m in length from the intersection at Evans Street formed only as a 3.0m wide gravel track.

### Main Intersections

The **Waterfall Way / Crown Street** intersection is an Austroads rural AUL type 'T' intersection and provides a 35m storage length protected right turn bay and a 60m long left turn auxiliary lane to Crown Street. Good sight distance is available on Waterfall Way in both directions.



**Crown Street at Waterfall Way**



The **Crown Street /Endeavour Drive** intersection is a standard urban 'T' intersection with a right-angle configuration and good sight distance in both directions.



***Endeavour Drive at Crown Street looking west***



***Endeavour Drive at Crown Street looking east***



### **Footpath and Shared Path network**

The south Bellingen residential area generally comprises wide local street pavements and verges with no formed footpath network. A Shared Path link between Crown Street at Endeavour Drive to the Bellingen High School traverses local reserves.

### **Bus Services**

Crown Street forms part of the Coffs Harbour to Bellingen bus service (361) and the local school bus service network. Bus stop facilities are located on Crown Street at Endeavour Drive.

## **2.3 Existing Traffic Volumes**

The Roads and Maritime Services (RMS) Waterfall Way Draft Corridor Strategy July 2017 indicates that Average Daily Traffic (ADT) volumes on the Waterfall Way are in the order of 6,700 v.p.d. between the Pacific Highway and Bellingen.

As validation of these indicative traffic volumes, intersection turning movement counts were undertaken at the Waterfall Way / Crown Street intersection during the morning and afternoon peaks. Surveys were conducted on Thursday 29 October 2020 from 7:45am – 9:00am and 3:00pm – 4:00pm.

The survey shows traffic volumes consistent with the RMS data and confirms that minor traffic currently uses the Crown Street / Waterfall Way intersection compared to the standard of intersection provided.

	Waterfall Way				Crown Street	
	Eastbound	Right turn in	Westbound	Left turn in	Left turn out	Right turn out
AM	296	25	296	62	26	97
H	9	6	13	5	3	6
PM	306	19	288	67	41	75
H	17	4	7	5	6	5

#### ***Peak Hour (7:45am – 8:45am, 3:00pm – 4:00pm) intersection count 29 Oct 2020***

Endeavour Drive is a non through road so indicative daily traffic volumes can be determined from likely traffic generation from the direct access land uses. Endeavour Drive (including George Hewitt Close and Wattle Close) comprises of approximately 40 dwellings. Using a new development planning generation rate of 7.4 daily vehicle trips per dwelling (RMS Technical Direction TDT 2013/04a), existing traffic volumes on the north end of Endeavour Drive would be in the order of 300 v.p.d.

Intersection turning movement counts were undertaken at the Crown Street / Endeavour Drive intersection during the morning and afternoon peaks on Thursday 29 October 2020. Surveys were conducted 7:45 – 9:00am and 3:00pm – 5:00pm. The surveys show peak hour vehicle movements to and from Endeavour Drive at 25 vehicles per hour. This correlates with an average weekday volume on Endeavour Drive of 250 – 300 v.p.d.



	Crown Street				Endeavour Drive	
	Eastbound	Right turn in	Westbound	Left turn in	Left turn out	Right turn out
AM	96	4	52	5	7	9
H	4		8	1		
PM	102	9	70	3	8	5
H	9		5			

*Peak Hour (8:00am – 9:00am, 3:00pm – 4:00pm) intersection count 29 Oct 2020*

### 3 Development Description

The proposed development comprises a potential rezoning of part of the land indicated in Figure 1 from RU1 Primary Production to E4 Environmental Living.

A preliminary lot and road layout for a community title subdivision in accordance with the LEP provisions for E4 Environmental Living zone has been prepared for the proposal generally considering the site constraints.

The preliminary development plan is shown in Appendix A. The plan shows a potential yield of 80 residential lots with most of the lot reserved for environmental protection.

Primary access to the community title subdivision will be from Endeavour Drive. An emergency access path from the development to Hill street is also proposed.

### 4 Traffic Impact Assessment

#### 4.1 Development Traffic Generation

Using a daily vehicle trip generation rate of 7.4 daily vehicle trips per dwelling, the proposal as detailed in Appendix A could generate an additional 600 trips per day on Endeavour Drive.

The resulting daily volumes on Endeavour Drive, including traffic generated from the proposed development would still be less than 1,000 v.p.d. well within the bounds of the environmental and amenity capacity of a two-lane 8.0m wide local street.

Peak Hour traffic generation from the proposal can be estimated from RMS TDT 2013/04a with the highest peak hour residential traffic generation for regional areas at 0.9 trips per dwelling.

The proposed rezoning will consequently be likely to generate approximately 72 additional peak hour trips to the road network.

#### 4.2 Intersection analysis

##### Waterfall Way / Crown Street intersection

While it is clear that the estimated minor increase in traffic from the proposed rezoning will have little impact on the Waterfall Way / Crown Street intersection it would be prudent to carry out a simple assessment of likely intersection performance to gauge



the capacity of the intersection, particularly in relation to potential growth in traffic on Waterfall Way.

The Waterfall Way / Crown Street intersection has been assessed using a SIDRA Intersection model. Input data is the 2020 turning movement counts factored to 2030 volumes (assuming 3% annual growth on Waterfall Way) with the proposed development traffic added (conservatively assuming 2/3 of development traffic is distributed to the east from Endeavour Drive).

	Waterfall Way				Crown Street	
	Eastbound	Right turn in	Westbound	Left turn in	Left turn out	Right turn out
AM	398	33	398	78	34	113
H	11	6	17	5	3	6
PM	411	27	387	83	49	91
H	23	4	9	5	6	5

**Estimated Peak Hour intersection turning movements to 2030 (3% growth + rezoning)**

Results of SIDRA modelling of the intersection turning movements are summarised in Appendix B and the tables below.

Level of Service (LOS) RMS NSW

Level of Service	Average Delay per Vehicle (secs/veh)	Give Way & Stop Signs
A	< 14	Good operation
B	15 to 28	Acceptable delays & spare capacity
C	29 to 42	Satisfactory, but accident study required
D	43 to 56	Near capacity & accident study required
E	57 to 70	At capacity, requires other control mode

Waterfall Way / Crown Street 2030 PLUS DEVELOPMENT	Peak Hour	Degree of Saturation	Average Delay	LOS
Movement				
Waterfall Way right turn in to Crown Street	AM	0.058	7.9	A
	PM	0.044	7.6	A
Waterfall Way left turn in to Crown Street	AM	0.049	4.6	A
	PM	0.052	4.6	A
Crown Street left turn out	AM	0.558	13.0	A
	PM	0.489	11.1	A
Crown Street right turn out	AM	0.558	26.7	B
	PM	0.489	25.1	B



The 2030 plus development SIDRA analysis shows that the Waterfall Way / Crown Street intersection remains at LOS A/B in 2030 following the addition of potential traffic generation from the proposed rezoning.

### **Endeavour Drive / Crown Street Intersection**

SIDRA modelling of the peak traffic flows at the Endeavour Drive / Crown Street intersection is summarised in Appendix B.

The intersection modelling, with estimated traffic flows from the proposed development included, shows that all movements at the Endeavour Drive / Crown Street intersection remain at level of service 'A' with no impacts from the proposed rezoning.

	Crown Street				Endeavour Drive	
	Eastbound	Right turn in	Westbound	Left turn in	Left turn out	Right turn out
AM	96	16	52	29	19	33
H	4		8	1		
PM	102	21	70	27	20	29
H	9		5			

### ***Estimated Peak Hour intersection turning movements with rezoning***

The intersection has significant spare capacity (as detailed in the table below) to cater for any additional growth in traffic on Crown Street due to additional infill residential development in the south Bellingen catchment.

Endeavour Drive / Crown Street Intersection Model	Peak Hour	Degree of Saturation	Average Delay	LOS
<b>Movement</b>				
Crown Street right turn in to Endeavour Drive	AM	0.066	4.9	A
	PM	0.077	4.9	A
Crown Street left turn in to Endeavour Drive	AM	0.053	5.6	A
	PM	0.068	5.5	A
Endeavour Drive left turn out	AM	0.045	4.8	A
	PM	0.043	4.8	A
Endeavour Drive right turn out	AM	0.045	5.3	A
	PM	0.043	5.4	A

Reference to Austroads Guide to Road Design Part 4: Intersections and Crossings Figure A 10 also shows that traffic volumes at the Endeavour Drive / Crown Street intersection will remain significantly below the warrants for intersection turn treatments.

### **4.3 Road Geometry**

Road geometry requirements are specified in Section 0041 Geometric Road Layout of the Bellingen Shire Council Development Design Specifications and Section 3.7.4 of Bellingen Shire DCP 2017.



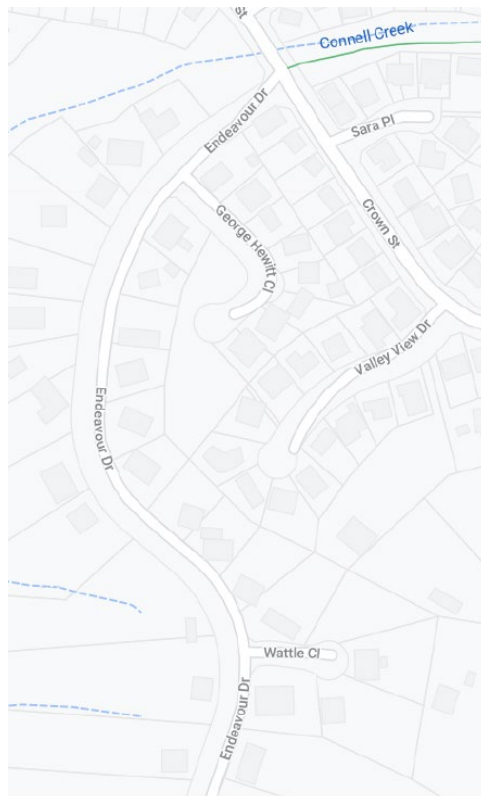
### **Endeavour Drive**

Endeavour Drive is constructed as a local access street with roll over kerb and gutter both sides and 8.0m wide pavement.

The road is characterised by large radius horizontal curves and minor undulations in vertical geometry. These characteristics aid in the control of vehicle speeds on Endeavour Drive.

Endeavour Drive has well-spaced driveway access to low density residential development and two minor access street intersections (George Hewitt Close and Wattle Close) with good sight distance available at all conflict points.

The projected increase in daily traffic volumes from the rezoning proposal will not compromise the requirements of Bellingen Shire Council Development Design Specifications.



***Endeavour Drive configuration***

### **Hill Street**

Hill Street varies significantly in standard of construction and width between Evans Street and the Hill Street connection to Ford Street and the local road network.

Approximately 300m length of Hill Street from the intersection at Evans Street to the proposed development access is formed only as a 3.0m wide gravel track.

No additional daily vehicular traffic will impact on Hill Street as a result of the proposed rezoning. The proposal does however rely on Hill Street as an emergency/alternative access to the proposed new residential area.



### **New Development Roads and Emergency Access**

Concept design for roads and stormwater management within the proposed community title subdivision in has been prepared with consideration of the site constraints.

The concept design proposes an 8.0m wide perimeter road in accordance with Planning for Bushfire Protection 2019 (PBP 2019) requirements. All roads within the proposed community title subdivision are able to meet the requirements of Bellingen Shire Council Development Design Specifications and the Bellingen Shire DCP 2017.

The preliminary development plan is shown in Appendix A. The plan shows potential yield of 80 residential lots with most of the lot reserved for environmental protection.

Primary access to the community title subdivision will be from Endeavour Drive. An emergency access path from the development to Hill street is also proposed.

Endeavour Drive is a non through road currently servicing approximately 40 residential dwellings. The rezoning proposal would see an additional 80 residential dwellings with primary vehicular access to Endeavour Drive.

With an 8.0m pavement width, roll over kerb and gutter and wide verges over most of its length, Endeavour Drive can safely cater for increased traffic volumes from the proposed development in a bush fire emergency.

Emergency service vehicles will have two-way all-weather access to the site via Endeavour Drive which will continue to be a Council maintained asset.

Emergency access to the site is proposed from Hill Street which is a Council/Crown Road. The development proposal would see Hill Street between Evans Street and the connection to the development perimeter road upgraded to a 5.5 m wide gravel road. The remainder of the Hill Street connection to Ford Street and the local road network is two way and capable of safely taking emergency service vehicles and if required, evacuation traffic during a bushfire emergency.

All roads within the proposed community title subdivision and providing access to the subdivision are capable of (or can be upgraded to) carrying fully loaded firefighting vehicles (up to 23 tonnes).



***Hill Street looking toward the site***





***Hill Street at Evans Street***

#### **4.4 Public Transport and Pedestrian/Cycleway access**

Endeavour Drive is served by both Town bus and school bus services with bus stops located on Crown Street adjacent the Endeavour Drive intersection.

The majority of the proposed residential lots will be within 750m of the bus stops located on Crown Street providing reasonably good access to public transport services and to the Shared Path link to the Bellinghen High School for the proposed land use density.

## **5 Conclusion**

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- 1 The proposed rezoning of part of the land at Lot 456 DP 755557 from RU1 Primary Production to E4 Environmental has a potential yield of 80 residential lots with most of the lot reserved for environmental protection.
- 2 A concept design for roads and stormwater management within a proposed community title subdivision on the land has been prepared with consideration of the site constraints. The concept design proposes and 8.0m wide perimeter road in accordance with Planning for Bushfire Protection 2019 (PBP 2019) requirements. All roads within the proposed community title subdivision are able to meet the requirements of PBP 2019, Bellinghen Shire Council Development Design Specifications and the Bellinghen Shire DCP 2017.
- 3 Primary access to the community title subdivision will be from Endeavour Drive. An emergency access path from the development to Hill street is also proposed.
- 4 The proposed community title subdivision could generate an additional 600 vehicle trips per day on Endeavour Drive. The resulting daily volumes on Endeavour Drive, including traffic generated from the proposed development would be less than 1,000 v.p.d. well within the bounds of the environmental and amenity capacity of a two-lane 8.0m wide local street.



- 5 The proposed community title subdivision will have no impact on traffic safety, level of service or amenity on the Waterfall Way - Crown Street intersection.
- 6 Traffic volumes at the Crown Street / Endeavour Drive intersection will remain significantly below any warrants for intersection turn treatments as a result of the proposed rezoning.
- 7 All roads within the proposed community title subdivision and providing access to the subdivision are capable of (or can be upgraded to) carrying fully loaded firefighting vehicles (up to 23 tonnes).
- 8 Endeavour Drive is served by both Town bus and school bus services with bus stops located on Crown Street adjacent the Endeavour Drive intersection. The majority of the proposed residential lots will be within 750m of the bus stops located on Crown Street providing reasonably good access to public transport services and to the Shared Path link to the Bellinghen High School for the proposed land use density.

## 9 References

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*Roads and Maritime Services Guide to Traffic Engineering Developments*

*Bellinghen Shire Council Development Specifications*

*Bellinghen Shire Council Development Control Plan 2017*

*Roads and Maritime Services (RMS) Waterfall Way Draft Corridor Strategy July 2017*

*Austroads Guides to Road Design*







## Appendix B – SIDRA analysis summaries

### Waterfall Way / Crown Street 2030 plus development AM peak

#### MOVEMENT SUMMARY

 **Site: 101 [Waterfall Way - Crown Street intersection]**

2030 + rezoning AM peak  
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Crown Street											
1	L2	39	8.1	0.558	13.0	LOS A	2.9	21.0	0.83	1.10	37.5
3	R2	125	5.0	0.558	26.7	LOS B	2.9	21.0	0.83	1.10	37.4
Approach		164	5.8	0.558	23.5	LOS B	2.9	21.0	0.83	1.10	37.4
East: Waterfall Way											
4	L2	87	6.0	0.049	4.6	LOS A	0.0	0.0	0.00	0.53	46.5
5	T1	437	4.1	0.230	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		524	4.4	0.230	0.8	NA	0.0	0.0	0.00	0.09	49.4
West: Waterfall Way											
11	T1	431	2.7	0.225	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R2	41	15.4	0.058	7.9	LOS A	0.2	1.7	0.53	0.71	44.1
Approach		472	3.8	0.225	0.7	NA	0.2	1.7	0.05	0.06	49.4
All Vehicles		1160	4.4	0.558	4.0	NA	2.9	21.0	0.14	0.22	47.2

### Waterfall Way / Crown Street 2030 plus development PM peak

#### MOVEMENT SUMMARY

 **Site: 101 [Waterfall Way - Crown Street intersection]**

2030 + rezoning PM peak  
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Crown Street											
1	L2	58	10.9	0.489	11.1	LOS A	2.4	17.8	0.77	1.03	38.9
3	R2	101	5.2	0.489	25.1	LOS B	2.4	17.8	0.77	1.03	38.8
Approach		159	7.3	0.489	20.0	LOS B	2.4	17.8	0.77	1.03	38.8
East: Waterfall Way											
4	L2	93	5.7	0.052	4.6	LOS A	0.0	0.0	0.00	0.53	46.5
5	T1	417	2.3	0.217	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		509	2.9	0.217	0.9	NA	0.0	0.0	0.00	0.10	49.3
West: Waterfall Way											
11	T1	457	5.3	0.242	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R2	33	12.9	0.044	7.6	LOS A	0.2	1.3	0.51	0.69	44.3
Approach		489	5.8	0.242	0.5	NA	0.2	1.3	0.03	0.05	49.5
All Vehicles		1158	4.7	0.489	3.4	NA	2.4	17.8	0.12	0.20	47.6



**Crown Street / Endeavour Drive 2030 plus development AM peak****MOVEMENT SUMMARY****Site: 101 [Crown Street - Endeavour Drive intersection]**Crown Street - Endeavour Drive + development AM  
Giveaway / Yield (Two-Way)**Movement Performance - Vehicles**

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Endeavour Drive											
1	L2	20	0.0	0.045	4.8	LOS A	0.2	1.1	0.18	0.54	46.2
3	R2	35	0.0	0.045	5.3	LOS A	0.2	1.1	0.18	0.54	45.8
Approach		55	0.0	0.045	5.1	LOS A	0.2	1.1	0.18	0.54	45.9
East: Crown Street											
4	L2	32	3.3	0.053	5.6	LOS A	0.0	0.0	0.00	0.20	56.4
5	T1	63	13.3	0.053	0.0	LOS A	0.0	0.0	0.00	0.20	58.1
Approach		95	10.0	0.053	1.9	NA	0.0	0.0	0.00	0.20	57.5
West: Crown Street											
11	T1	105	4.0	0.066	0.1	LOS A	0.1	0.8	0.06	0.08	49.4
12	R2	17	0.0	0.066	4.9	LOS A	0.1	0.8	0.06	0.08	48.4
Approach		122	3.4	0.066	0.7	NA	0.1	0.8	0.06	0.08	49.2
All Vehicles		272	5.0	0.066	2.0	NA	0.2	1.1	0.06	0.21	51.1

**Crown Street / Endeavour Drive 2030 plus development PM peak****MOVEMENT SUMMARY****Site: 101 [Crown Street - Endeavour Drive intersection]**Crown Street - Endeavour Drive + development PM  
Giveaway / Yield (Two-Way)**Movement Performance - Vehicles**

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Endeavour Drive											
1	L2	21	0.0	0.043	4.8	LOS A	0.1	1.0	0.20	0.54	46.2
3	R2	31	0.0	0.043	5.4	LOS A	0.1	1.0	0.20	0.54	45.8
Approach		52	0.0	0.043	5.2	LOS A	0.1	1.0	0.20	0.54	45.9
East: Crown Street											
4	L2	28	0.0	0.058	5.5	LOS A	0.0	0.0	0.00	0.16	56.9
5	T1	79	6.7	0.058	0.0	LOS A	0.0	0.0	0.00	0.16	58.5
Approach		107	4.9	0.058	1.5	NA	0.0	0.0	0.00	0.16	58.1
West: Crown Street											
11	T1	117	8.1	0.077	0.1	LOS A	0.1	1.0	0.08	0.09	49.3
12	R2	22	0.0	0.077	4.9	LOS A	0.1	1.0	0.08	0.09	48.3
Approach		139	6.8	0.077	0.8	NA	0.1	1.0	0.08	0.09	49.1
All Vehicles		298	4.9	0.077	1.8	NA	0.1	1.0	0.07	0.19	51.4



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

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

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

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.