

WEST NOWRA STAGE 4 LANDFILL EXTENSION

Traffic Impact Assessment

04 JULY 2018

Incorporating



CONTACT

OMER KHAN
Principal Transport Modeller

T + 61 7 3337 0000
M + 61 0 406 334 355
E Omer.Khan@arcadis.com

Arcadis
Level 5, 120 Edward Street,
Brisbane, QLD 4000, Australia

SHOALHAVEN CITY COUNCIL WEST NOWRA STAGE 4 LANDFILL EXTENSION ENVIRONMENTAL IMPACT ASSESSMENT

Traffic Impact Assessment

Author	Luke Goldsworthy	_____
Checker	Zoe Wood	_____
Approver	Omer Khan	_____
Report No	AA008737	
Date	4/07/2018	
Revision Text	D	

This report has been prepared for Shoalhaven City Council in accordance with the terms and conditions of appointment for the extension of West Nowra Waste and Recycling Facility project dated 16 February 2016. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
A	19/07/2017	Draft TIA for Client Review	LG	OK
B	02/08/2017	Final TIA	LG	OK
C	15/12/2017	Final TIA with updated opening and closing year	LG	OK
C	04/07/2018	Final TIA with updated opening and closing year	ZW	ZW

CONTENTS

1 INTRODUCTION	9
1.1 Proposal overview	9
1.2 Purpose of this report	10
1.3 Study assumptions and limitations	10
1.4 Report structure.....	12
2 METHODOLOGY	13
2.1 Traffic impact assessment methodology	13
3 EXISTING CONDITIONS	15
3.1 Surrounding road network.....	15
3.1.1 Flatrock Road.....	17
3.1.2 Yalwal Road.....	18
3.1.3 Albatross Road	19
3.1.4 Kalandar Street.....	20
3.1.5 Princes Highway	21
3.2 Existing traffic conditions.....	22
3.2.1 Yalwal Road / Flatrock Road intersection	22
3.2.2 Princes Highway / Kalandar Street intersection	24
4 TRAFFIC IMPACT ASSESSMENT.....	25
4.1 Scope of assessment	25
4.2 Assessment criteria.....	25
4.2.1 Adopted assessment criterion	26
4.3 Proposal traffic generation.....	26
4.4 Site traffic distribution	27
4.5 Future traffic forecast.....	29
4.6 Impacts to the road network.....	29
4.6.1 Yalwal Road / Flatrock Road intersection	29
4.6.2 Princes Highway / Kalandar Street intersection	30
4.7 Onsite traffic flows.....	31
4.8 Onsite parking.....	33
4.9 Road safety.....	33
4.10 Crash statistics	35

5 MITIGATION MEASURES	37
6 CONCLUSION	38
REFERENCES	39

APPENDICES

APPENDIX A – TURN MOVEMENT DIAGRAMS

APPENDIX B – SIDRA OUTPUTS

APPENDIX C – CRASH DATA

1 INTRODUCTION

Shoalhaven City Council (SCC), as part of waste management planning for the Shoalhaven region, is proposing to extend the current landfilling area at the West Nowra Recycling and Waste Facility (WNRWF) at 120 Flatrock Road, Mundamia (the Proposal).

1.1 Proposal overview

The Proposal would involve the progressive construction, operation and rehabilitation of the Stage 4 landfill extension at the WNRWF. The landfill extension and associated areas (including access roads, sediment basins, fire trails and a conservation area) would occur on Lot 1 DP 1104402, Lot 1 DP 870268 and Lot 1 DP 847203, with the leachate management system extending into Lot 1 DP 1018193. The location of the Proposal is shown on Figure XX with the Proposal Site boundary shown on Figure XX. The Proposal Site is owned by SCC.

The Proposal Site is predominantly set within undeveloped bushland. The Shoalhaven River is located approximately 1 km north of the Proposal Site, with two tributary creeks, Sandy Creek and Cabbage Tree Creek, within 500 m to the west and east of the Proposal Site respectively. Semi-rural properties are located to the south and south-east of the Facility. The main township of Nowra is located approximately 3.8 km to the east of the Proposal Site.

The Proposal Site is approximately 17 ha and is on land appropriately zoned SP2 Infrastructure–Waste /Resource Management Facilities. The Proposal would be managed under Council's existing and varied Environmental Protection Licence (No 5877) conditions.

SCC considered a range of waste generation and disposal scenarios to develop estimates of future waste and disposal rates. Under the worst case scenario, the current operational landfill (Stage 3) would reach capacity in approximately 2024.

The Proposal would commence operation from approximately 2026 and would provide capacity for a minimum of five years (i.e. to end 2034 under a worst case scenario) and up to 15 years (under a reduced waste disposal scenario) (SCC, 2017). The preparatory and completion works for the landfill extension (e.g. landfill cell construction, construction of leachate barrier systems, and final rehabilitation) may commence/conclude up to two years before/after these timeframes. The filling rates and landfill capacity would be reviewed on an ongoing basis. The final landfill capacity would be approximately 1.4 Mm³ upon completion, with an approximate elevation of RL 59 m.

Approval is sought for the Proposal in the form of a Development Application (DA) under Part 4, Division 4.1 of the EP&A Act. SCC submitted a request for the Secretary's Environmental Assessment Requirements (SEARs) for the Proposal on 22 July 2015. SEARs were issued on 19 August 2015 (Reference SSD 15_7187) and were subsequently updated on 11 July 2017. An extension to the SEARs was granted on 22 September 2017.

The Proposal would receive waste from all areas within the SCC local government area (LGA) including the major township of Nowra. Waste would include general solid waste (i.e. putrescible and non-putrescible materials) and asbestos from domestic and commercial and industrial (C&I) sources.

The key works for which approval is sought include:

- Progressive landfill cell construction, operation and rehabilitation of the Stage 4 landfill extension including:
 - Clearing of 9.87 ha of existing vegetation
 - Construction of access tracks and fire trails

- Earthworks for cell formation including extraction and stockpiling of materials and the reapplication to form the leachate barrier (cell liner) as well as for daily, intermediate and final cover
- Installation of leachate management structures including the leachate barrier, collection, storage and disposal system (including construction of a rising main to transfer leachate to the existing leachate collection dam within the WNRWF)
- Installation of a surface water management system, including sediment dams, sediment erosion control measures and surface diversion bunds/swale drains
- Progressively increasing the annual waste acceptance rate at the landfill
- Signage and other ancillary works
- Rehabilitation of closed sub-cells
- Delineation and ongoing management of a conservation area along the southern and eastern boundary of the Proposal Site.

The Proposal is expected to receive a total of approximately 1.4 Mm³ of waste over the life of the landfill extension and would be developed in sub-cells.

1.2 Purpose of this report

This traffic report has been prepared to support the Environmental Impact Statement (EIS) for approval of the Proposal.

This traffic report has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act). This report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (ref: SSD 15_7187 dated 19 August 2015 and amended on 11 July 2017). Table 1-1 provides a summary of the SEARs which are relevant to this report and the section where they have been addressed in this report.

The report provides an assessment of potential traffic impacts on the road network during operation of the Proposal, and identifies mitigation measures to address any potential impacts.

Table 1-1 SEARs (SSD 15_7187) compliance table

Issue	Environmental assessment requirements	Where addressed in this report
Traffic	• Details of all traffic types and volumes likely to be generated; • Plans demonstrating how all vehicles likely to be generated during construction and operation and awaiting loading, unloading or servicing can be accommodated on the site to avoid queuing in the street network; • Assessment of predicted impacts on road safety and the capacity of the road network to accommodate the project; and • Assessment of where off site infrastructure works are required as a result of traffic impacts.	• Section 4.3 • Section 4.7 • Sections 4.6, 4.9 & 4.10 • Section 5

1.3 Study assumptions and limitations

For the purpose of this Traffic Impact Assessment (TIA) the following assumptions were made:

- A 2% p.a. linear growth rate for background traffic has been assumed and is based on the growth rate for the West Nowra Resource Recovery Park EIS prepared by GHD in November 2015. This growth rate accounts for the expected increase in traffic associated with proposed land release and development expected in the area.
- A 5% p.a. linear growth rate for waste related traffic generated by the Proposal has been adopted for this assessment. This rate is based on the 2% growth rate adopted for background traffic and a 3% waste generation medium-growth rate as advised by Shoalhaven City Council (SCC) based on estimates in the *National Waste Report 2010* (Australian Government, 2010).
- Assessment years are as follows:
 - ‘opening year’ (2026)
 - ‘closing year’ (2034).
- It was observed from the Yalwal Road / Flatrock Road intersection counts (2016) provided by SCC that no vehicles entered Flatrock Road from the west (Yalwal Road) or exited from Flatrock Road towards the west (Yalwal Road) in the AM and PM peak. Therefore, the assumed distribution of traffic entering and exiting the West Nowra Recycling and Waste Facility (WNRWF)/Proposal Site via Flatrock Road during the peak hour periods for all assessment years is 100% to/from the east only (Yalwal Road).
- Based on 2014 intersection count data provided by SCC for the Princes Highway / Kalandar Street intersection, the distribution below was adopted for this assessment:

– AM Peak ▪ To the Proposal Site: • 40% from the north • 1% from the south • 59% from the east ▪ From the Proposal Site: • 20% to the north • 47% to the south • 33% to the east	– PM Peak ▪ To the Proposal Site: • 34% from the north • 24% from the south • 43% from the east ▪ From the Proposal Site: • 14% to the north • 36% to the south • 50% to the east
--	---
- Potential urban land releases fronting Flatrock Road (as shown in the SCC *Interactive SLEP 2014 web maps* (2016)), were not considered at the time of the traffic assessment due to uncertainty regarding the timing of the land releases. A growth rate (2% p.a. population) was applied to background traffic on Flatrock Road to account for any potential development along the road.
- “Study Intersections” adopted for this assessment, and shown on Figure 3-1, are:
 - Yalwal Road / Flatrock Road intersection – This is the primary intersection providing connectivity between the Proposal Site and the surrounding local road network
 - Princes Highway / Kalandar Street intersection – This is the most direct intersection providing connectivity to the state road network.
- Traffic count data used for this assessment is as follows:
 - 2014 intersection count data for Princes Highway / Kalandar Street intersection – provided by Shoalhaven City Council (SCC).

- 2016 intersection count data for Yalwal Road / Flatrock Road intersection – provided by SCC
- 2016 weighbridge data for the WNRWF – provided by SCC.
- A review of available Average Annual Daily Traffic data on the Princes Highway showed that weekday peaks were considerably higher than the weekend. As such, only the weekday AM and PM peak periods were assessed.
- It is noted that SCC recently received concept approval for development of a Resource Recovery Park (RRP) on Flatrock Road. It has been assumed for the purpose of this TIA that any traffic accessing the future RRP would consist of traffic diverted from the recycling operations at the existing WNRWF and therefore this assessment takes such traffic into account.

1.4 Report structure

This Traffic Impact Assessment contains the following six chapters describing the assessment of the traffic issues relating to the proposed operation of the Proposal:

Section 1: Introduction – Provides background information on the Proposal, the SEARs and assumptions made for the assessment.

Section 2: Methodology – Provides an account of the steps undertaken to assess the potential traffic impacts related to the Proposal

Section 3: Existing Conditions – Provides an overview of the existing road and traffic conditions within proximity of the Proposal Site.

Section 4: Traffic Impact Assessment – Presents the findings and likely impacts from a traffic perspective as a result of the traffic generated by the Proposal.

Section 5: Mitigation Measures – Identifies any mitigation measures that would need to be implemented to reduce or mitigate the likely impacts caused by the Proposal.

Section 6: Conclusion – Provides the recommendations of the traffic impact assessment and any required mitigation.

2 METHODOLOGY

To assess any potential impacts of the Proposal during operation, the following tasks were undertaken:

1. Identification of existing road network conditions and performance (Section 3) including:
 - a. Review of the existing configuration of the surrounding road network and its function
 - b. Review of the existing traffic volumes on key roads providing access to/from the Proposal Site
2. Identification of traffic related to the Proposal (Proposal Traffic) generation and traffic distribution onto the surrounding road network (Section 4.3 and Section 4.4)
3. An assessment to identify the likely traffic impacts as a result of the Proposal on the Study Intersections for the peak periods (Section 4.6). A detailed breakdown of the traffic impact assessment methodology is provided in Section 2.1
4. An assessment of the likely impacts the Proposal will have on parking, road safety and crashes (Sections 4.7 to 4.10)
5. Identification of mitigation measures to minimise and/or manage any potential impacts at the Study Intersections, based on the results of the assessment (Section 5)
6. Summarise the findings of the Traffic Impact Assessment (Section 6).

2.1 Traffic impact assessment methodology

To undertake the assessment the following methodology was adopted for this Traffic Impact Assessment:

1. Based on traffic count data provided by SCC for both the Yalwal Road / Flatrock Road and Princes Highway / Kalandar Street Study Intersections, undertake a peak hour analysis to determine the AM and PM weekday peak periods for each intersection
2. Determine existing landfill traffic accessing the WNRWF (separately from all other waste related traffic) for the peak periods identified in step 1 by separating traffic identified as accessing the landfill from all data recorded at the weighbridge
3. Determine the remaining traffic accessing other properties on Flatrock Road from the Yalwal Road / Flatrock Road intersection counts for the peak periods identified in step 1
4. Apply 2% p.a. traffic growth rate to all vehicles not accessing the West Nowra WMF and grow to the existing year (2017) and the assessment years (2026 and 2034)¹.
5. Apply 5% p.a. traffic growth rate to both the landfill related traffic (Proposal Traffic) and all other waste related traffic and grow to the assessment years

¹ The assessment years (opening year 2026 and closing year 2034) are based on the landfill life expectancy estimates established by SCC and documented in the EIS for the Proposal. This represents a worst case scenario and provides a conservative assessment of traffic demand on the road network.

6. Apply the in/out percentage splits identified in Section 1.3 to the Proposal Traffic (landfill only traffic) for the opening year (2026) and closing year (2034) at the Study Intersections for the peak periods identified in step 1
7. Input estimated traffic volumes into SIDRA intersection modelling software, examine intersection performance and extract results for all assessment years.

3 EXISTING CONDITIONS

3.1 Surrounding road network

The key roads providing access to and from the Proposal Site are presented in Figure 3-1 and comprise:

- Flatrock Road
- Yalwal Road
- Albatross Road
- Kalandar Street
- Princes Highway

A description of each of the roads is provided below in Sections 3.1.1 to 3.1.5.

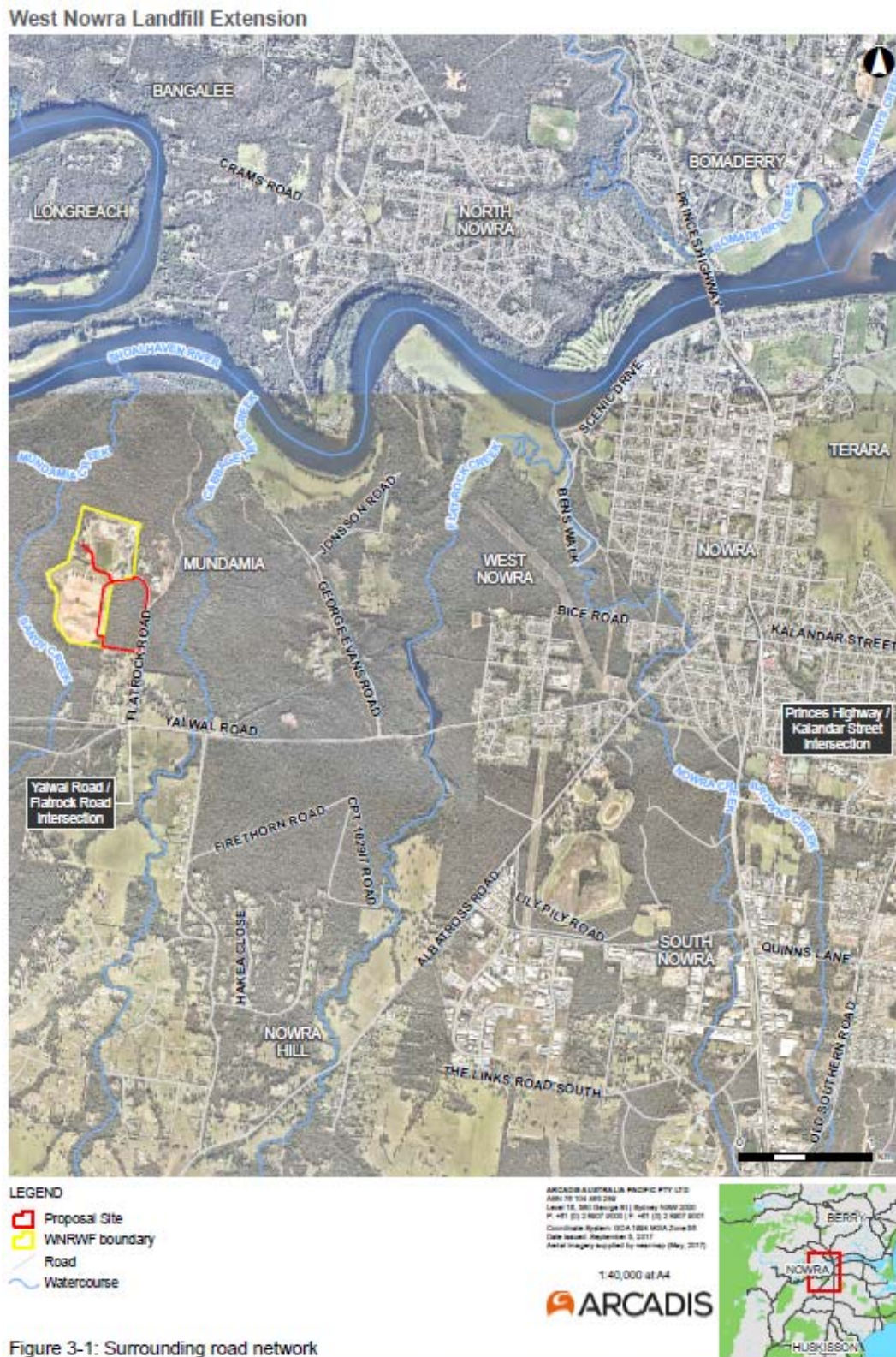


Figure 3-1: Surrounding road network

3.1.1 Flatrock Road

Flatrock Road is a SCC controlled road and is considered a local road providing access primarily to the WNRWF and a small number of residential and commercial properties (see Figure 3-2). Flatrock Road has the following characteristics:

- The road is a two-way sealed carriageway road (approx. 6.5m wide)
- The carriageway contains no line markings or sealed shoulders
- No posted speed limits exist on this road, however, based on Table 2.1 of the *NSW speed zoning guidelines* (Roads and Maritime Services, 2009) the default rural speed limit for an undivided rural road with seal pavement greater than 5.6 metres is 100km/h.



Figure 3-2 Flatrock Road looking south (Source: Arcadis)

3.1.2 Yalwal Road

Yalwal Road is a SCC controlled road and is classified as a collector road which connects West Nowra to Danjera Dam, located approximately 25km to the west of West Nowra (see Figure 3-3).

The following characteristics of Yalwal Road were identified within close proximity of Flatrock Road:

- The road is a two-way sealed road with one lane in each direction (approx. eight metres wide)
- The road contains centreline road markings, with no sealed shoulders within the vicinity of the Yalwal Road / Flatrock Road intersection
- It has a posted speed of 100km/h.



Figure 3-3 Yalwal Road looking east at the intersection of Yalwal Road / Flatrock Road (Source: Arcadis)

3.1.3 Albatross Road

Albatross Road is classified as a collector road and connects Nowra (from Kalandar Street) to the Nowra Airport, located approximately eight kilometres south-west of Nowra (See Figure 3-4).

For the purpose of this TIA, only the section of Albatross Road between Kalandar Street and Yalwal Road was considered as Proposal related traffic is only anticipated to utilise this section of Albatross Road. The following characteristics of the road have been observed:

- The road is a two-way sealed road with one lane in each direction (approx. 11m wide)
- There is unrestricted on street parking between Maclean Street and Kalandar Street
- There are footpaths on the western side between Yalwal Road and Kalandar Street
- The road has a sign posted speed limit of 60km/h.



Figure 3-4 Albatross Road looking northeast (Source: Google)

3.1.4 Kalandar Street

Kalandar Street is classified as a collector road which connects the Princes Highway and Albatross Road. Kalandar Street has the following characteristics (See Figure 3-5):

- The road is a two-way sealed road with one lane in each direction (approx. 10 metres wide)
- The sign posted speed limit on Kalandar Street is 60km/h.



Figure 3-5 Kalandar Street looking west (Source: Google)

3.1.5 Princes Highway

The Princes Highway is a State Controlled Road and is classified as a major arterial road with regional significance. The Princes Highway extends from Sydney to Port Augusta in South Australia generally following the coastline through the states of New South Wales, Victoria and South Australia. Within Nowra, the Princes Highway is also known as East Street to the north and Hollands Road to the south of Kalandar Street.

In the vicinity of Kalandar Street, the Princes Highway has the following characteristics (See Figure 3-6):

- The road has two lanes provided in each direction (approx. 14m wide)
- There is a footpath along the eastern side of Princess Highway only
- The sign posted speed limit in the vicinity of Princes Highway / Kalandar Street intersection is 70km/h.



Figure 3-6 Princes Highway looking south (Source: Google)

3.2 Existing traffic conditions

3.2.1 Yalwal Road / Flatrock Road intersection

The Yalwal Road / Flatrock Road intersection is a three-leg priority controlled intersection consisting of one lane on each approach with Yalwal Road as the major road.

Traffic counts for the Yalwal Road / Flatrock Road intersection were undertaken by SCC on 9th November 2016 in 15-minute increments for both Light Vehicles (LV) and Heavy Vehicles (HV) between the hours of 7:00am-10:00am and 2:00pm-5:00pm.

Based on the observed traffic volumes at the intersection, it was determined that the AM peak hour occurs between 7:45am and 8:45am with a total of 141 vehicles and 25% heavy vehicles. The PM peak hour was determined to occur between 2:45pm and 3:45pm with a total of 150 vehicles and 28% heavy vehicles. A breakdown of the hourly vehicle volumes and percentage HVs is presented in Table 3-1 with the peak hours shown in bold.

Table 3-1 2017 Peak Hour Analysis and Vehicle Composition for Yalwal Road / Flatrock Road intersection

Time Period	Light Vehicles	Heavy Vehicles	Total Vehicles	% Heavy Vehicles
AM				
7:00 AM to 8:00 AM	64	23	88	27%
7:15 AM to 8:15 AM	71	32	103	31%
7:30 AM to 8:30 AM	84	37	121	31%
7:45 AM to 8:45 AM	105	36	141	25%
8:00 AM to 9:00 AM	105	35	140	25%
8:15 AM to 9:15 AM	96	29	124	23%
8:30 AM to 9:30 AM	94	22	116	19%
8:45 AM to 9:45 AM	77	27	104	26%
9:00 AM to 10:00 AM	67	28	95	29%
PM				
2:00 PM to 3:00 PM	92	31	123	25%
2:15 PM to 3:15 PM	95	41	136	30%
2:30 PM to 3:30 PM	103	46	149	31%
2:45 PM to 3:45 PM	109	41	150	28%
3:00 PM to 4:00 PM	114	35	149	24%
3:15 PM to 4:15 PM	111	23	134	17%
3:30 PM to 4:30 PM	120	16	136	12%

West Nowra Stage 4 Landfill Extension

Time Period	Light Vehicles	Heavy Vehicles	Total Vehicles	% Heavy Vehicles
3:45 PM to 4:45 PM	110	15	125	12%
4:00 PM to 5:00 PM	104	13	117	11%

Existing AM and PM traffic volumes at the intersection are provided in Appendix A of this report.

3.2.2 Princes Highway / Kalandar Street intersection

The Princes Highway / Kalandar Street intersection is a four-leg signalised intersection consisting of two through lanes, a short-length right-turn lane and a short-length left-turn slip-lane on the north approach, one through/left-turn lane, one through lane and one short-length right-turn lane on the south approach, one left/through/right turn lane and one right turn lane on the west approach and one through/left-turn lane and one through/right-turn lane on the east approach. Pedestrian crossings are provided on all approaches with the exception of the east approach.

Traffic counts for the study intersection of Princes Highway / Kalandar Street were provided by SCC and undertaken by SkyHigh on 14th March 2014 in 15-minute increments for LV, Light Commercial Vehicle (LCV), rigid trucks, articulated trucks and buses between the hours of 8:00am-9:00am and 3:00pm-6:00pm.

The provided intersection count data only contained AM traffic volumes between the hours of 8:00am and 9:00am and as such the AM peak hour adopted for this TIA occurs between 8:00am and 9:00am with a total of 3,203 vehicles and 19% heavy vehicles. Based on the observed traffic volumes at the intersection, it was determined that the PM peak hour occurs between 4:00pm and 5:00pm with a total of 4,007 vehicles and 17% heavy vehicles. A breakdown of the hourly vehicle volumes and percentage HVs is presented in Table 3-2 with the peak hours shown in bold.

Table 3-2 2017 Peak hour analysis and vehicle composition for Princes Highway / Kalandar Street intersection

Time Period	Light Vehicles	Heavy Vehicles	Total Vehicles	% Heavy Vehicles
AM				
8:00 AM to 9:00 AM	2,590	613	3,203	19%
PM				
3:00 PM to 4:00 PM	3,249	723	3,972	18%
3:15 PM to 4:15 PM	3,261	723	3,984	18%
3:30 PM to 4:30 PM	3,275	689	3,964	17%
3:45 PM to 4:45 PM	3,292	679	3,971	17%
4:00 PM to 5:00 PM	3,340	667	4,007	17%
4:15 PM to 5:15 PM	3,345	650	3,995	16%
4:30 PM to 5:30 PM	3,276	622	3,898	16%
4:45 PM to 5:45 PM	3,352	604	3,956	15%
5:00 PM to 6:00 PM	3,308	546	3,854	14%

Existing AM and PM traffic volumes at the intersection are provided in Appendix A of this report.

4 TRAFFIC IMPACT ASSESSMENT

The WNRWF has been identified as a 'Traffic Generating Development under Schedule 3 of the *State Environmental Planning Policy (Infrastructure) 2007*². This section has been prepared to assess the potential impacts on road capacity, efficiency and safety associated with the Proposal. The assessment has been undertaken for the adjacent major road and key intersections to assess potential impacts from operational traffic.

4.1 Scope of assessment

The existing on-site equipment and plant will be used to construct the additional waste cells, therefore no construction related traffic will be generated externally and a construction traffic impact assessment was not conducted. The assessment analysed the anticipated impacts in the opening (2026) and closing (2034) year of the Proposal. The design horizons for this traffic assessment are as follows:

- Opening year – 2026: Weekday AM Peak and PM Peak
- Closing year – 2034: Weekday AM Peak and PM Peak

As identified in Section 1.3, two Study Intersections were identified for consideration in this TIA as follows:

1. Yalwal Road / Flatrock Road intersection – This is the primary intersection providing connectivity between the Proposal Site and the surrounding local road network
2. Princes Highway / Kalandar Street intersection – this is the most direct intersection providing connectivity to the state road network.

4.2 Assessment criteria

An analysis of the likely impact of the Proposal on the Study Intersections has been undertaken using the traffic analysis software SIDRA (Version 6.1 at the time of undertaking the assessment). Table 4-1 below shows the Level of Service (LoS) criteria (used for the intersection assessment as per the *Guide to Traffic Generating Developments* (Roads and Maritime, 2002).

Table 4-1 Level of service criteria for intersection capacity analysis

LoS	Average delay per vehicle (seconds)	Traffic signals, roundabouts	Give way and stop signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays	At capacity, requires other control mode

² It is noted that a landfill of any size or capacity meets the requirements to be identified as a Traffic Generating Development.

LoS	Average delay per vehicle (seconds)	Traffic signals, roundabouts	Give way and stop signs
		Roundabouts require other control modes	
F	>70	Over capacity, unstable operation	Over capacity, unstable operation

Source: *Guide to Traffic Generating Developments* (Roads and Maritime, 2002)

4.2.1 Adopted assessment criterion

A performance criterion of a LoS D or better was adopted for the purpose of this assessment. This is in line with RMS guidelines regarding acceptable LoS.

4.3 Proposal traffic generation

Traffic related to the Proposal (Proposal Traffic) would comprise of typically Austroads Class 5 trucks and a limited number of LV's accessing the landfill. Peak traffic volumes generated by the WNRWF have been determined based on Yalwal Road / Flatrock Road intersection counts and correlated with weighbridge data provided by SCC.

Table 4-2 shows the estimated average weekday vehicle trips associated with the landfill for the year of opening (2026) and final year of operation (2034) in the morning between 7:00am and 10:00am and in the afternoon between 2:00pm and 5:00pm.

As discussed in Section 1.3, the existing (2016) landfill traffic volumes were grown by 5% p.a. to generate the opening and closing year traffic volumes.

The total traffic estimated to access the Proposal Site in the year of opening (2026) on a weekday is estimated to be 10 and 38 during the morning and afternoon periods, respectively. In the year of closing (2034) on a weekday is estimated to be a total of 16 and 48 vehicles during the morning and afternoon periods, respectively.

Table 4-2 Weekday morning and afternoon Proposal traffic generation (two-way trips/period)

Vehicle type	Opening year (2026)		Closing year (2034)	
	Morning	Afternoon	Morning	Afternoon
LV	2	6	4	8
HV	8	32	12	40
Total	10	38	16	48

Note: Morning (7:00am to 10:00am) / Afternoon (2:00pm to 5:00pm)

A breakdown of Proposal Traffic for the weekday AM peak (7:45am-8:45am) and PM peak (2:45pm-3:45pm) is tabulated below in Table 4-3.

Table 4-3 Proposal Traffic generation (two-way trips/peak period)

Peak Period	Opening Year (2026)			Closing Year (2034)		
	LV	HV	Total	LV	HV	Total
Weekday AM peak (7:45am-8:45am)	20*	20*	40	20*	20*	40
Weekday PM peak (2:45pm-3:45pm)	20*	30	50	20*	38	58

Note: *Due to peak hour volumes being considered low, more conservative volumes were used. If the calculated trips were less than five the trips they were rounded up to five and any trips greater than five and less than ten were rounded up to ten.

4.4 Site traffic distribution

All vehicles currently access the Proposal Site via Flatrock Road with connectivity to the Princes Highway via Yalwal Road, Albatross Road and Kalandar Street.

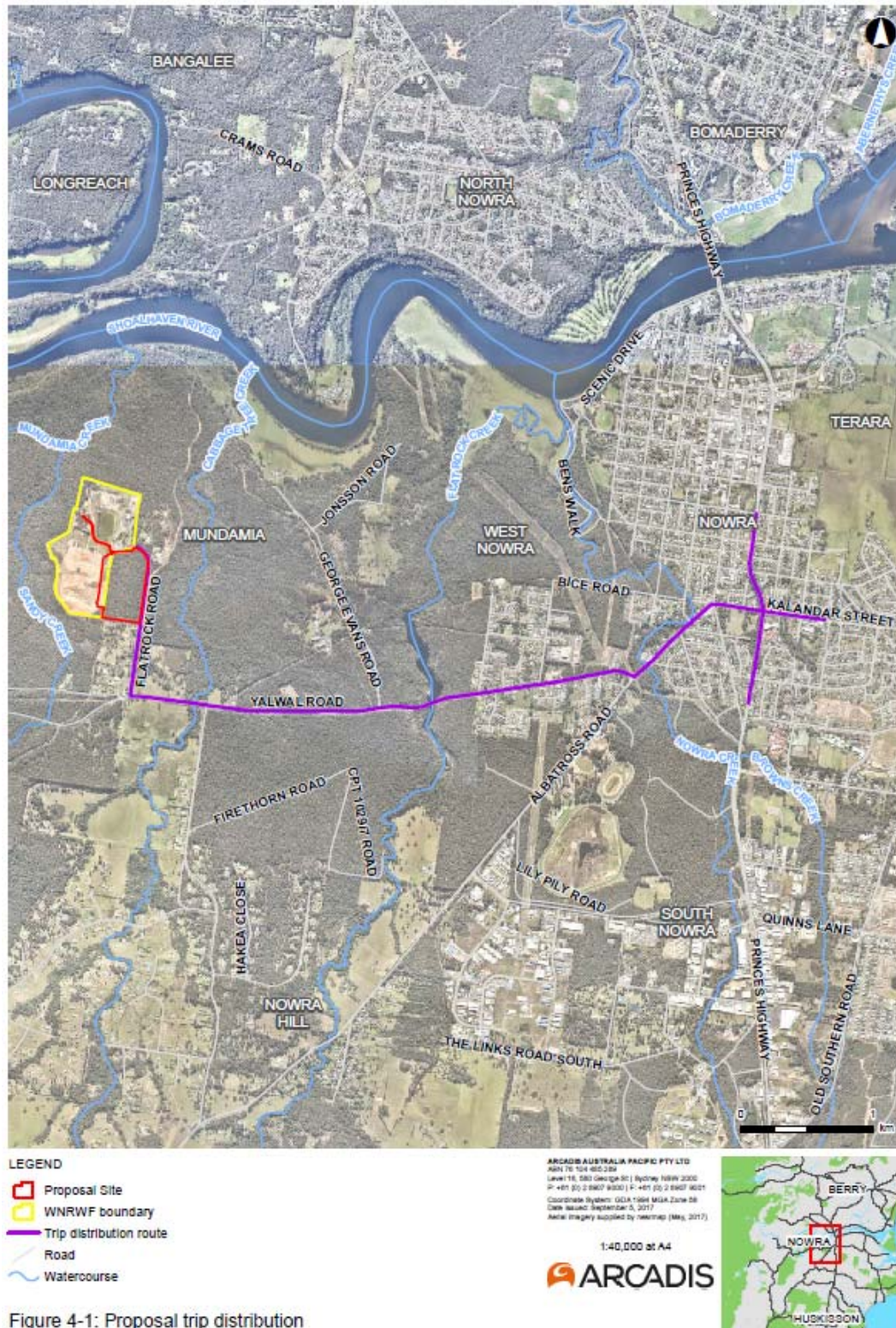
It was observed from the Yalwal Road / Flatrock Road intersection counts provided by SCC that no vehicles entered Flatrock Road from the west (Yalwal Road) and as such the assumed distribution of traffic entering and exiting the Proposal Site via Flatrock Road during the peak hour periods for all assessment years is 100% to/from the east only (Yalwal Road).

Similarly, based on intersection count data for the Princes Highway / Kalandar Street intersection, the distribution below was adopted for this assessment:

- AM Peak
 - To the Proposal Site:
 - 40% from the north
 - 1% from the south
 - 59% from the east
 - From the Proposal Site:
 - 20% to the north
 - 47% to the south
 - 33% to the east
- PM Peak
 - To the Proposal Site:
 - 34% from the north
 - 23% from the south
 - 43% from the east
 - From the Proposal Site:
 - 14% to the north
 - 36% to the south
 - 50% to the east

Figure 4-1 presents a graphical representation of the trip distribution adopted for this TIA.

West Nowra Landfill Extension



Date: 5/09/2017 Path: S:\nowra-4\01\GIS\AA2017\21-GEN-004_Current\Map\AA2017_21_GEN_004_TripDistribution_A4P_14.mxd
 Created by: GC
 QA by: CC

4.5 Future traffic forecast

Based on the traffic generation and traffic distribution outlined in Section 4.3 and Section 4.4, respectively, the future traffic volumes at the Study Intersections were estimated for the years 2026 (opening year) and 2034 (closing year) and are presented in Appendix A of this report. A summary of the forecasted volumes is provided below.

4.6 Impacts to the road network

4.6.1 Yalwal Road / Flatrock Road intersection

Table 4-4 and Table 4-5 show the estimated delay and LoS results from SIDRA at the Yalwal Road / Flatrock Road intersection for all relevant assessment years and peak periods.

As shown in Table 4-4, the SIDRA model predicts LoS A at the Yalwal Road / Flatrock Road intersection, *without Proposal Traffic*, in the weekday AM and PM peaks for both assessment years (opening and closing years).

Table 4-4 SIDRA summary results for the Yalwal Road / Flatrock Road intersection – without Proposal

Year	Weekday AM (7:45am-8:45am)			Weekday PM (2:45pm-3:45pm)		
	Volume*	Delay (s)	LoS	Volume*	Delay (s)	LoS
Opening year (2026)	183	3	A	182	4	A
Closing year (2034)	213	3	A	215	4	A

Note: *An uplift of 5% has been applied to the volumes within SIDRA as a result of the Peak Flow Factor being applied.

As shown in Table 4-5, the SIDRA model predicts LoS A at the Yalwal Road / Flatrock Road intersection, *with Proposal Traffic*, in the weekday AM and PM peaks for both assessment years (opening and closing years³).

Table 4-5 SIDRA summary results for the Yalwal Road / Flatrock Road intersection – with Proposal

Year	Weekday AM (7:45am-8:45am)			Weekday PM (2:45pm-3:45pm)		
	Volume*	Delay (s)	LoS	Volume*	Delay (s)	LoS
Opening year (2026)	225	4	A	235	4	A
Closing year (2034)	255	4	A	276	5	A

³ Proposal Traffic applies only to the opening and closing years (i.e. does not apply to the existing year)

Note: *An uplift of 5% has been applied to the volumes within SIDRA as a result of the Peak Flow Factor being applied.

The results of this assessment show that the Proposal meets the adopted assessment criterion of LoS D or better at the Yalwal Road / Flatrock Road intersection and no upgrades to this intersection are required due to the Proposal.

4.6.2 Princes Highway / Kalandar Street intersection

Table 4-6 and Table 4-7 show the estimated delay and LoS results from SIDRA at the Princes Highway / Kalandar Street intersection for all relevant assessment years and peak periods.

As shown in Table 4-6, the SIDRA model predicts a LoS F at the Princes Highway / Kalandar Street intersection, *without Proposal Traffic*, in the weekday AM and PM peaks for both assessment years (opening and closing years). This indicates that even without the Proposal Traffic, the intersection will operate at unacceptable level-of-service during both peak periods for both assessment years.

Table 4-6 SIDRA summary results for the Princes Highway / Kalandar Street intersection – *without Proposal*

Year	Weekday AM (8:00am-9:00am)			Weekday PM (4:00pm-5:00pm)		
	Volume*	Delay (s)	LoS	Volume*	Delay (s)	LoS
Opening year (2026)	3,941	>200	F	4,934	>200	F
Closing year (2034)	4,453	>200	F	5,571	>200	F

Note: *An uplift of 5% has been applied to the volumes within SIDRA as a result of the Peak Flow Factor being applied.

As shown in Table 4-7, the SIDRA model predicts a LoS F at the Princes Highway / Kalandar Street intersection, *with Proposal Traffic*, on the weekday AM and PM peaks for both assessment years, which is similar to the without proposal scenario.

Table 4-7 SIDRA Summary Results for the Princes Highway / Kalandar Street intersection – *with Proposal*

Year	Weekday AM (8:00am-9:00am)			Weekday PM (4:00pm-5:00pm)		
	Volume*	Delay (s)	LoS	Volume*	Delay (s)	LoS
Opening year (2026)	3,983	>200	F	4,986	>200	F
Closing year (2034)	4,494	>200	F	5,632	>200	F

Note: *An uplift of 5% has been applied to the volumes within SIDRA as a result of the Peak Flow Factor being applied.

The results of this assessment show that the intersection is unlikely to perform at an acceptable level-of-service, with or without the Proposal.

The Proposal is expected to add 42 vehicles in the AM peak and 41 in the PM peak for the opening year, and 52 vehicles in the AM peak and 61 in the PM peak for the closing year. This represents an approximately 1% increase in the total intersection

demand, which is deemed minimal in comparison to the total demand at the intersection.

The analysis shows that the impact of Proposal Traffic is insignificant and no upgrades are needed to the Princes Highway / Kalandar Street because of the additional traffic generated due to the Proposal.

4.7 Onsite traffic flows

As discussed in Section 4.3, the total number of vehicles to access the Proposal Site on a weekday in the opening year 2026 would be 40 in the AM Peak period and 50 in the PM peak period. During a weekday in the closing year 2034, the total number of vehicles will remain the same⁴ in the AM peak period however will increase to 58 vehicles in the PM Peak period.

All vehicles will enter the Proposal Site from Flatrock Road via a two-way access point, which will be the only point of access / egress to the site. Waste disposal vehicles would enter the site, travel approximately 240m on the internal road network and pass through a weighbridge prior to circulating to the designated waste disposal area. The waste disposal vehicle would then exit the site via the same point of entry via the weighbridge. Figure 4-2 illustrates the onsite circulation of Proposal traffic and the 240m (approx.) of onsite queue space.

⁴ The AM Peak traffic volumes remain the same in the opening and closing years due to the low volumes in the opening year and the approach taken to rounding up the volumes as a conservative approach to assessing intersection capacity.

West Nowra Landfill Extension



Figure 4-2: Onsite circulation and queue space

Date: 3/2/2017 Path: \\p:\sub-area\figs\AND\TSTL-GDA_CoverSR_Stage4\CDT3D_SDR_205_QueueSpace_A4P_75.mxd
 Created by: GC
 QA by: GC

4.8 Onsite parking

Carpark

There are currently 12 car parking spaces for site office and operational staff at the WNRWF, as well as car parking for members of the public accessing the recycling and buyback areas at the WNRWF. Additional parking (for staff and/or members of the public) as a result of the Proposal is not required.

4.9 Road safety

The existing posted speed limit along Yalwal Road is currently 100km/h. The required sight distance used in the report has been derived from the *Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections* (Austroads, 2010) which specifies the following:

Approach Sight Distance (ASD)

This is the minimum requirement to provide the driver of a vehicle adequate distance to observe the road layout, including pavement markings, kerbs, islands, etc. in sufficient time to react and stop if necessary before entering the conflict area.

Approach Sight Distance is measured from driver eye height (1.05m) to 0.0m (i.e. the road surface).

Safe Intersection Sight Distance (SISD)

It provides sufficient sight distance for a driver of a vehicle on the major road to observe a vehicle from the minor road approach moving into a collision situation (e.g. in the worst case stalling across the traffic lanes), and to decelerate to stop before reaching the collision point. Safe Intersection Sight Distance is measured from the driver eye height (1.05) on the approach with priority to eye height of a driver in the side street (1.05m).

A comparison of the required and available ASD and SISD for vehicles approaching and departing the Yalwal Road / Flatrock Road intersection is set out in Table 4-8 for a vehicle speed of 100km/h.

Table 4-8 Sight distance requirements

Minor road (Entry/Exit)	ASD (minimum requirement)		SISD (desirable requirement)	
	Required distance (metres)	Measured at intersection entrance (metres)	Required distance (metres)	Measured at intersection entrance (metres)
Westbound (Yalwal Road)	165m	175m	248m	810m
Eastbound (Yalwal Road)	165m	205m	248m	170m

Table 4-8 shows that the Yalwal Road / Flatrock Road intersection satisfies the minimum sight distance requirement (ASD) for both directions (eastbound and westbound), and the desirable sight distance requirement (SISD) for the westbound direction only. However, the sight distance for the eastbound movement does not satisfy the desirable sight distance (SISD) requirements.

It should be noted that there is an existing physical geometrical alignment constraint in the eastbound direction of Yalwal Road approaching the intersection with Flatrock Road. There is a horizontal curve and hill (uphill) on the approach to the intersection. Signage warning vehicles of the Yalwal Road / Flatrock Road intersection on approach from the west currently exists (as shown in Figure 4-3).

The Proposal is not expected to exacerbate the existing condition (existing SISD deficiency in the eastbound direction). Proposal Traffic growth is not expected to be higher than the existing trend as the Proposal is a continuation of the existing landfill operation (i.e. as one landfill cell is decommissioned another is commissioned).

Regardless of the increase in traffic utilising the intersection, the total estimated volume of the eastbound traffic on Yalwal Road (west approach) for 2034 is considered to be relatively low with 70 vehicles (or 1 vehicle every minute) in the AM peak and 44 vehicles (or 1 vehicle every 1.5 minutes) in the PM peak. The low volume of vehicles from the western approach (heading eastbound) would provide sufficient gaps for vehicles exiting the intersection from the north.

Crash data (see Section 4.10 and Appendix C) did not record any crashes at the intersection in the last 5-years (2011-2015).

Although the desirable SISD requirement was not satisfied, the combination of the existing geometrical conditions and warning signs, low future traffic volumes and no recorded crashes at or near the intersection suggests that, although the existing SISD is approximately 78m shorter than desired, the intersection operates satisfactorily from a safety perspective and is not anticipated to be exacerbated by the Proposal.

In addition to the existing warning signage, it is suggested that driver training (i.e. such as a driver code of conduct, safety toolbox, or similar) is to be implemented to ensure staff and contractors are aware of the existing sight distance issue.



*Figure 4-3 Existing warning sign on Yalwal Road on approach to Flatrock Road from the west
(Source: Google)*

4.10 Crash statistics

The Roads and Maritime Services (Roads and Maritime) Crash Analysis Department provided Arcadis with crash statistics for a five-year period from 01/01/2011 to 31/12/2015. Based on the provided crash statistics it was determined that no fatal crashes were recorded. A breakdown of the crash data is provided in Table 4-9.

Table 4-9 Crash statistics (01/01/2011 - 31/12/2015)

Location	Non-casualty crash	Minor/other injury crash	Moderate injury crash	Serious injury crash	Fatal crash
Flatrock Road	0	0	0	0	0
Flatrock Road / Yalwal Road intersection	0	0	0	0	0
Yalwal Road	5	1	1	1	0
Albatross Road	3	2	2	0	0
Kalandar Street	0	0	0	0	0
Princes Highway / Kalandar Street intersection	3	2	2	0	0

Detailed crash data and a crash location map is provided in Appendix C of this report.

5 MITIGATION MEASURES

Based on the findings of this TIA, it was determined that traffic generated from the Proposal does not necessitate any road or intersection upgrades in the study area. Driver training (i.e. such as a driver code of conduct, safety toolbox, or similar) would need to be implemented to ensure staff and contractors are aware of the existing sight distance issue at the Yalwal Road / Flatrock Road intersection. This mitigation measure has been identified as a precaution against any road safety and intersection capacity impacts associated with the operation of the Proposal.

6 CONCLUSION

This TIA was undertaken to determine the potential impacts of the Proposal at two intersections, namely Yalwal Road / Flatrock Road intersection (access to the Proposal) and Princes Highway / Kalandar Street intersection (access for Proposal Traffic to the state road network). The TIA determined the following:

- The background future traffic (i.e. without Proposal Traffic) on Yalwal Road / Flatrock Road intersection is assessed to result in acceptable operational performance of the intersection
- The Proposal Traffic is analysed to cause no significant operational impacts on the Yalwal Road / Flatrock Road intersection in the opening (2026) or closing (2034) year of the Proposal; thus, no upgrades are proposed for the intersection due to Proposal Traffic
- The background future traffic (i.e. without Proposal Traffic) on Princes Highway / Kalandar Street intersection is assessed to result in unacceptable operational performance of the intersection with significantly high delays
- The Proposal Traffic is analysed to cause no significant operational impacts on the Princes Highway / Kalandar Street intersection in the opening (2026) or closing (2034) year of the Proposal; thus, no upgrades are proposed for the intersection due to Proposal Traffic
- The crash analysis identified that there have been no recorded crashes at the Yalwal Road / Flatrock Road intersection
- The Yalwal Road / Flatrock Road intersection satisfies the minimum sight distance requirement (ASD) and the desirable sight distance requirement (SISD) measured in accordance with the Austroads requirements, with the exception of the SISD for the eastbound movement. It is suggested that driver training (i.e. such as a driver code of conduct, safety toolbox, or similar) is to be implemented to ensure staff and contractors are aware of the existing sight distance issue.

REFERENCES

Australian Government (2010) *National Waste Report 2010*, accessed 20/3/2017 at <http://www.environment.gov.au/system/files/resources/af649966-5c11-4993-8390-ab300b081f65/files/national-waste-report-2010.pdf>

Shoalhaven City Council (2016) *Interactive SLEP 2014 web maps*, accessed 3/11/2016 <http://maps2.shoalhaven.nsw.gov.au/slep2014/>

Austroads (2010) *Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections*

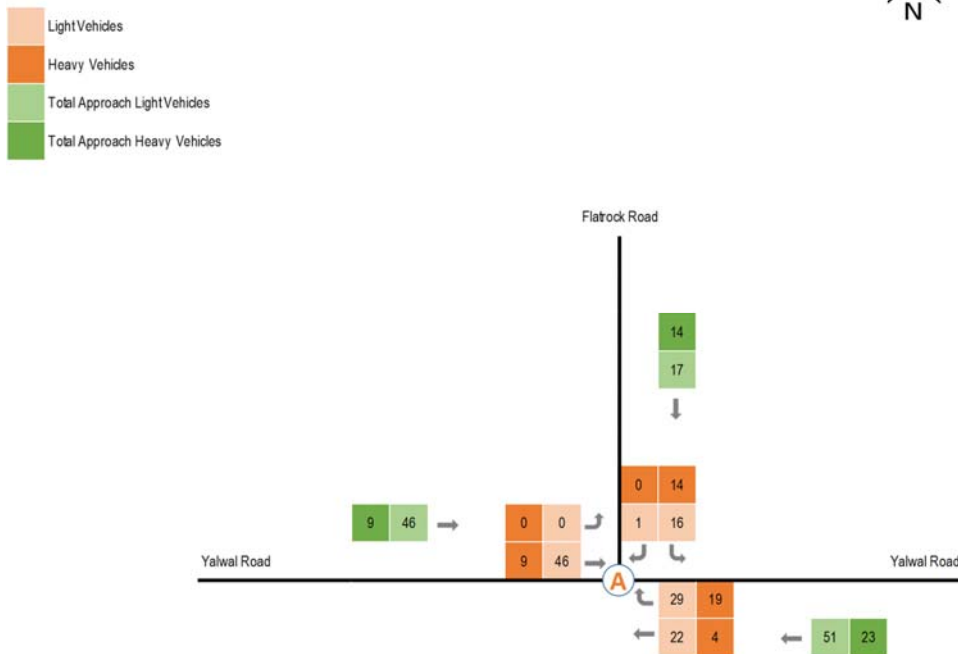
Roads and Maritime Services (2009) *NSW speed zoning guidelines*

APPENDIX A – TURN MOVEMENT DIAGRAMS

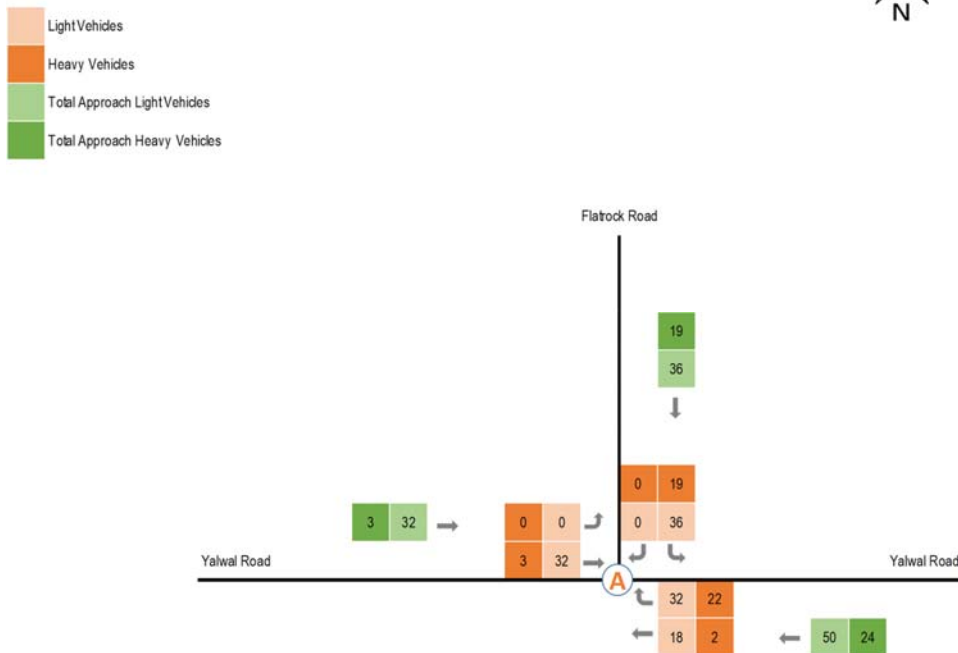
Yalwal Road / Flatrock Road Intersection

Existing 2017

2017 AM Peak - Existing



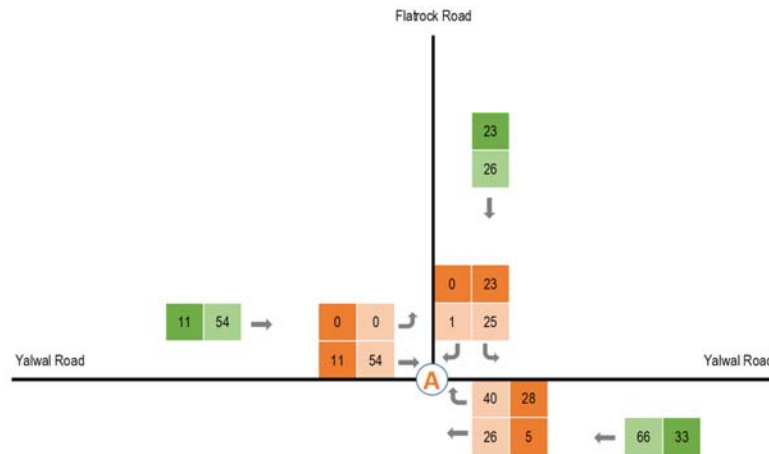
2017 PM Peak - Existing



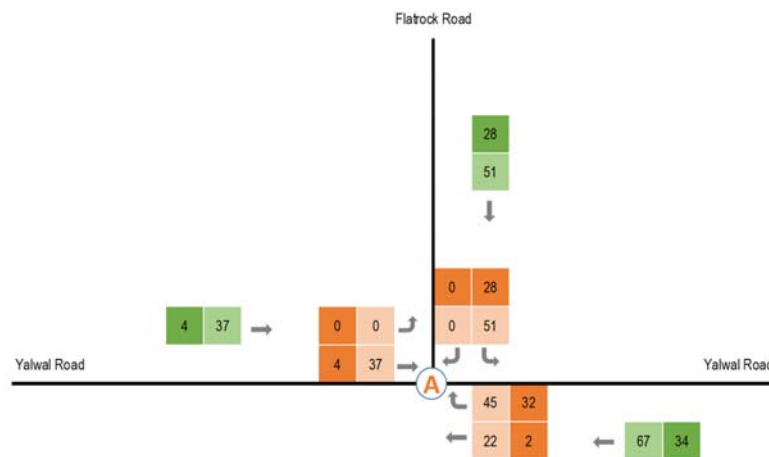


Opening 2026 – With Proposal

2026 AM Peak - With Proposal

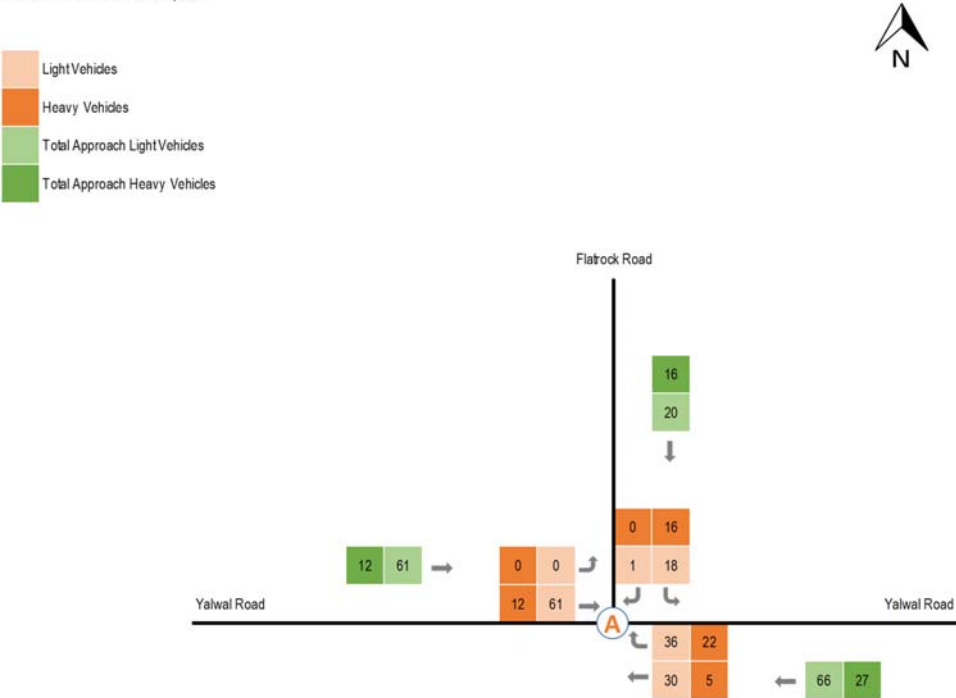


2026 PM Peak - With Proposal

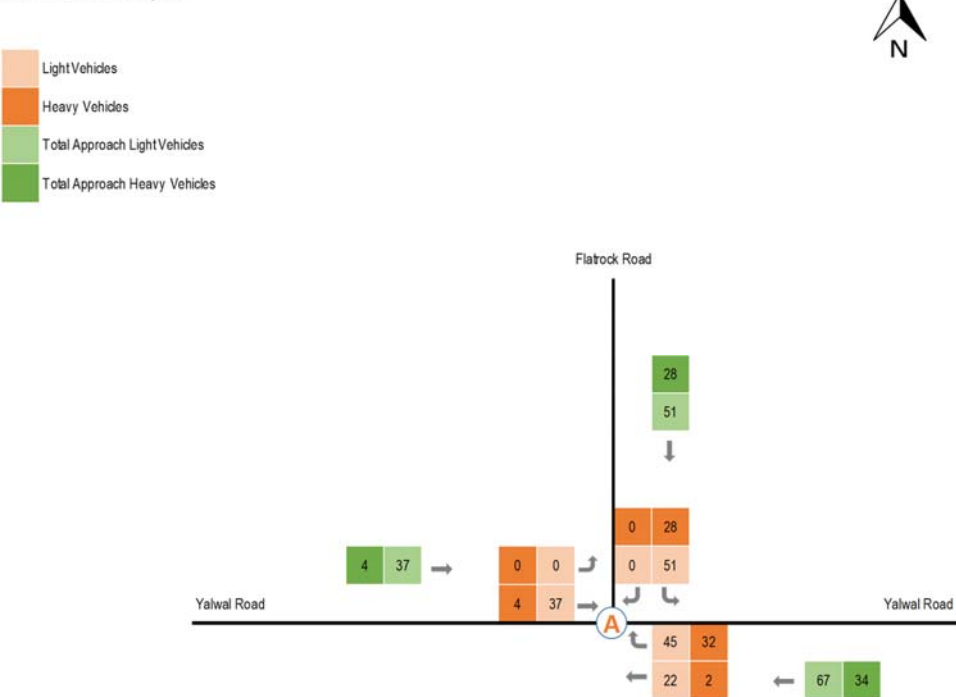


Closing 2034 – Without Proposal

2034 AM Peak - Without Proposal

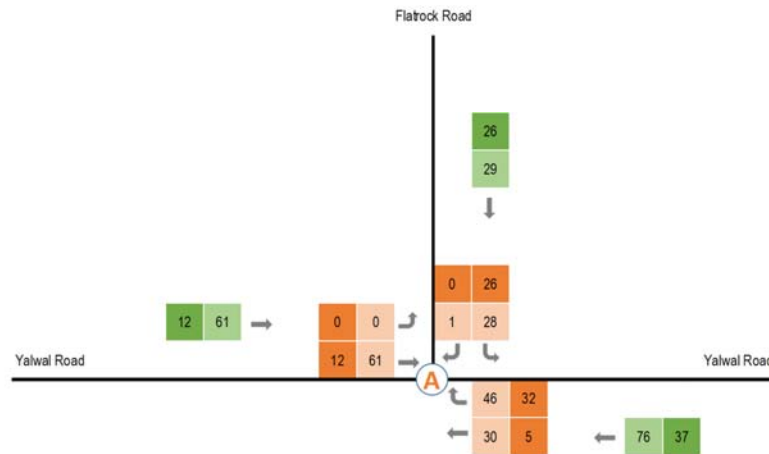


2026 PM Peak - With Proposal

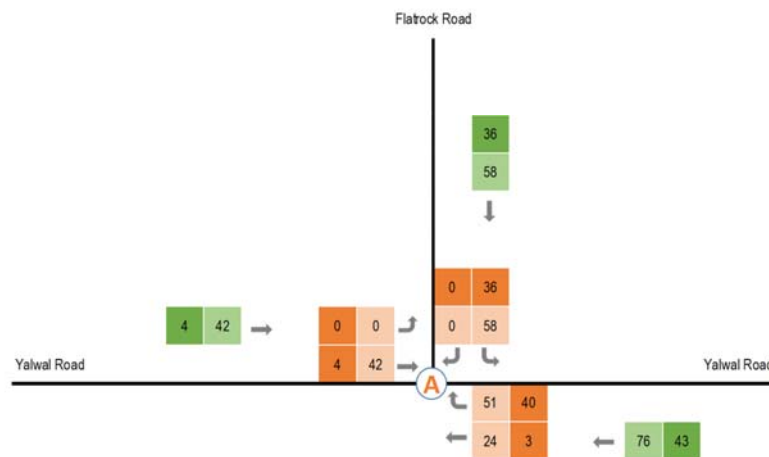


Closing 2034 – With Proposal

2034 AM Peak - With Proposal



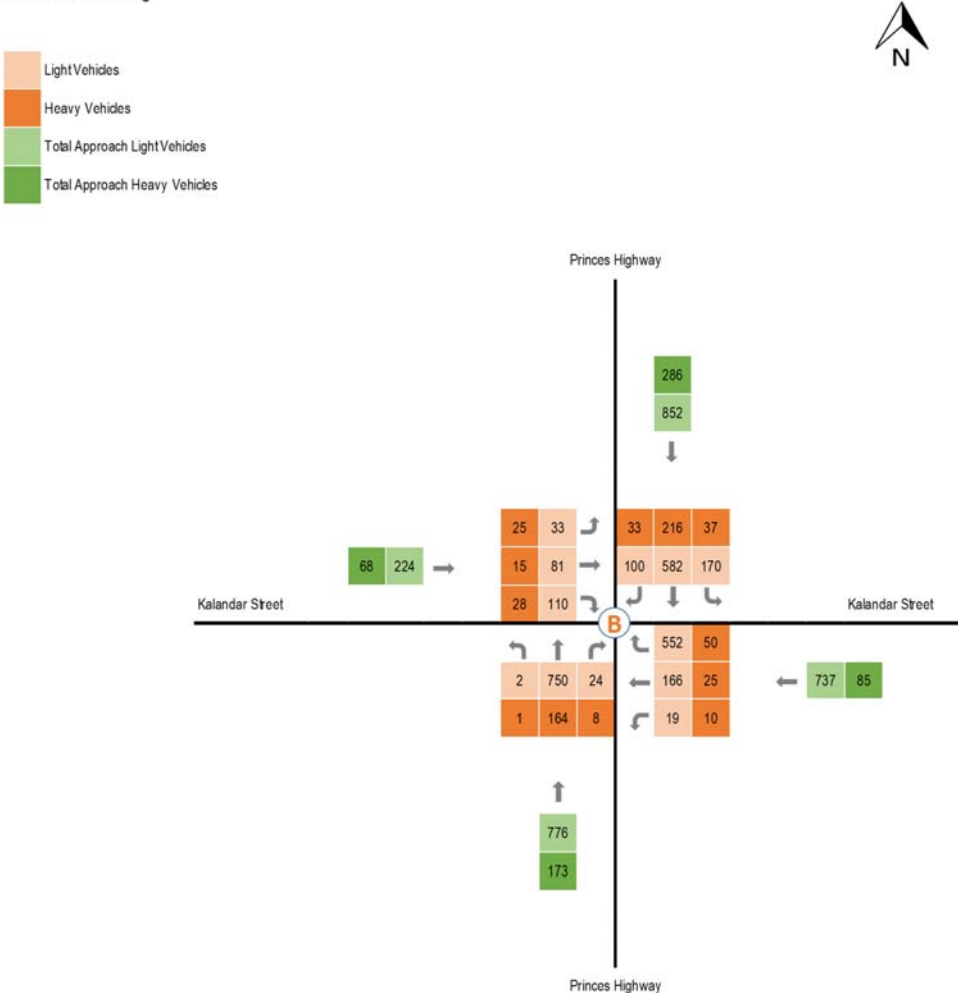
2034 PM Peak - With Proposal



Princes Highway / Kalandar Street Intersection

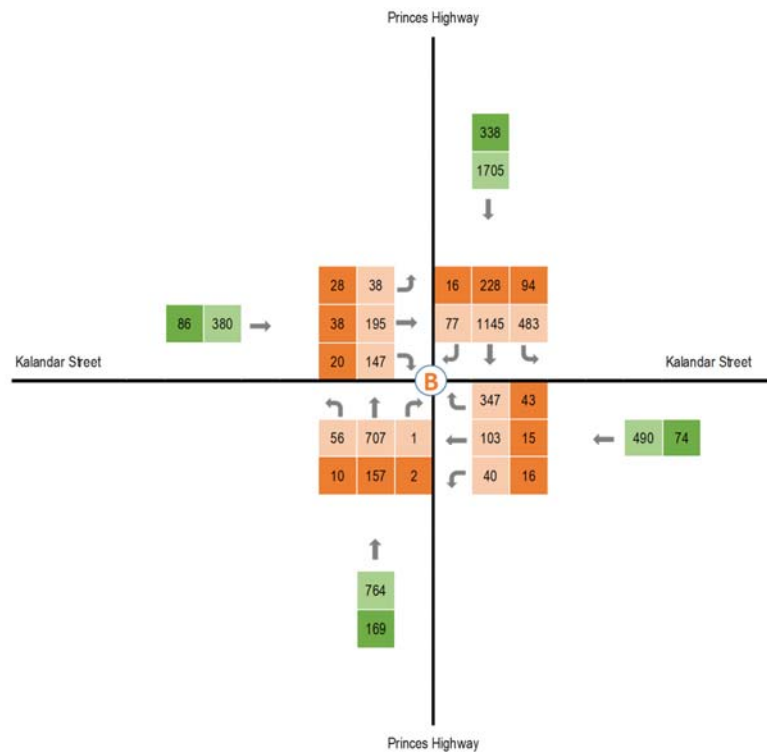
Existing 2017

2017 AM Peak - Existing



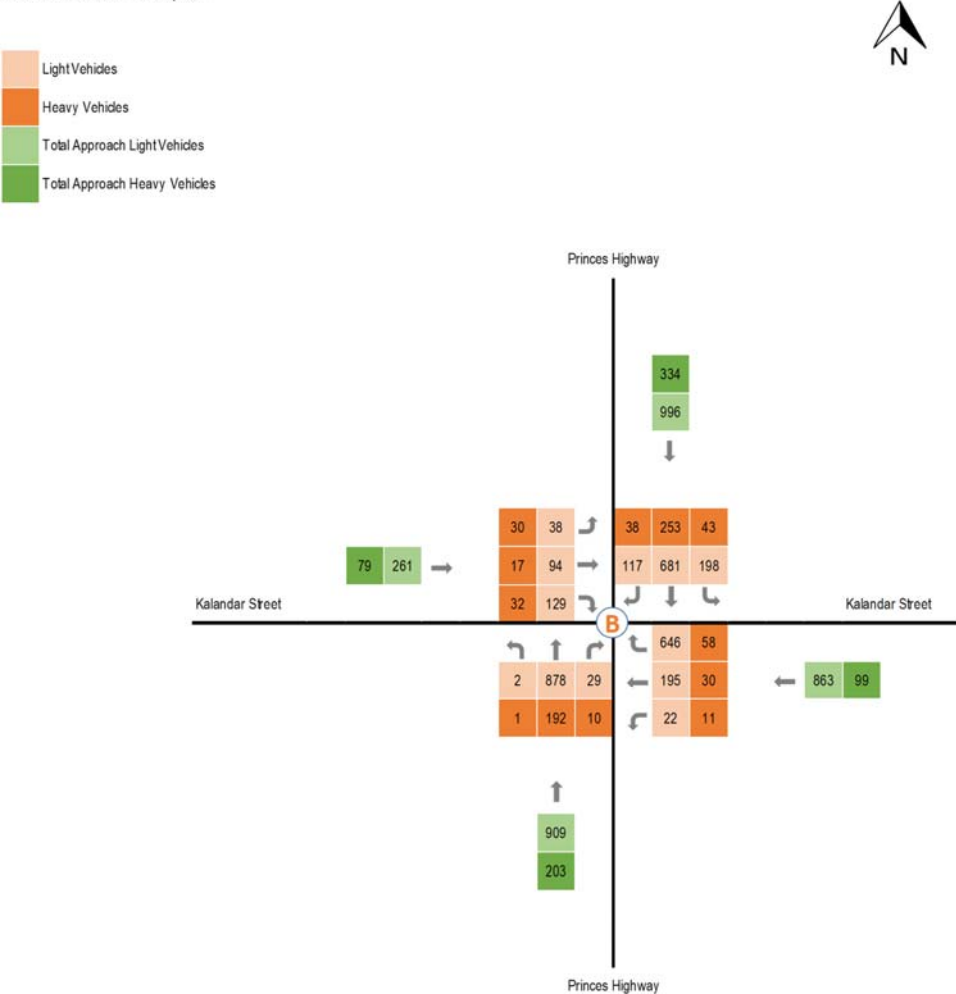
West Nowra Stage 4 Landfill Extension

2017 PM Peak - Existing



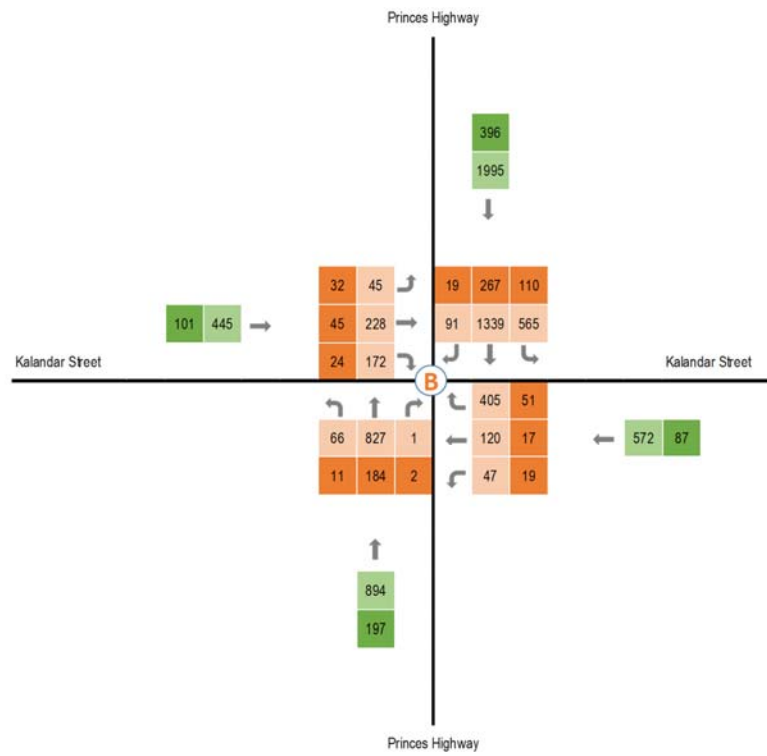
Opening 2026 – Without Proposal

2026 AM Peak - Without Proposal



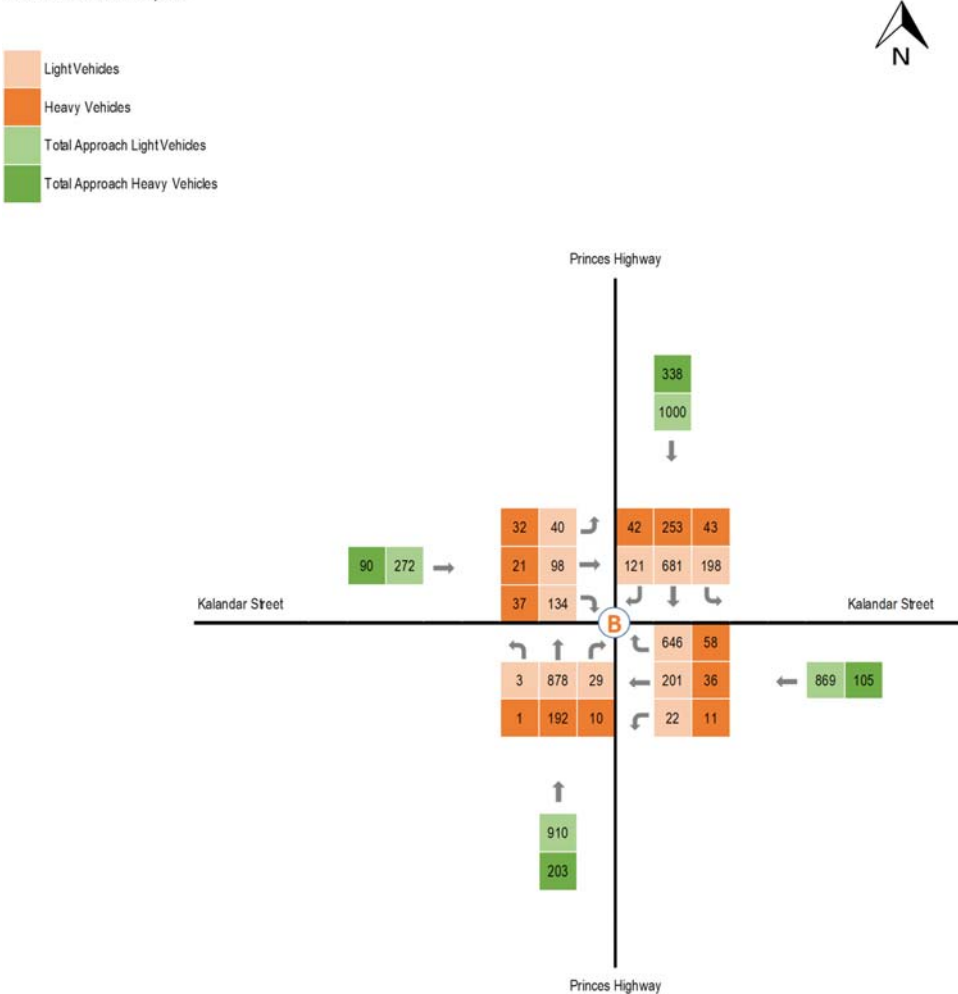
West Nowra Stage 4 Landfill Extension

2026 PM Peak - Without Proposal



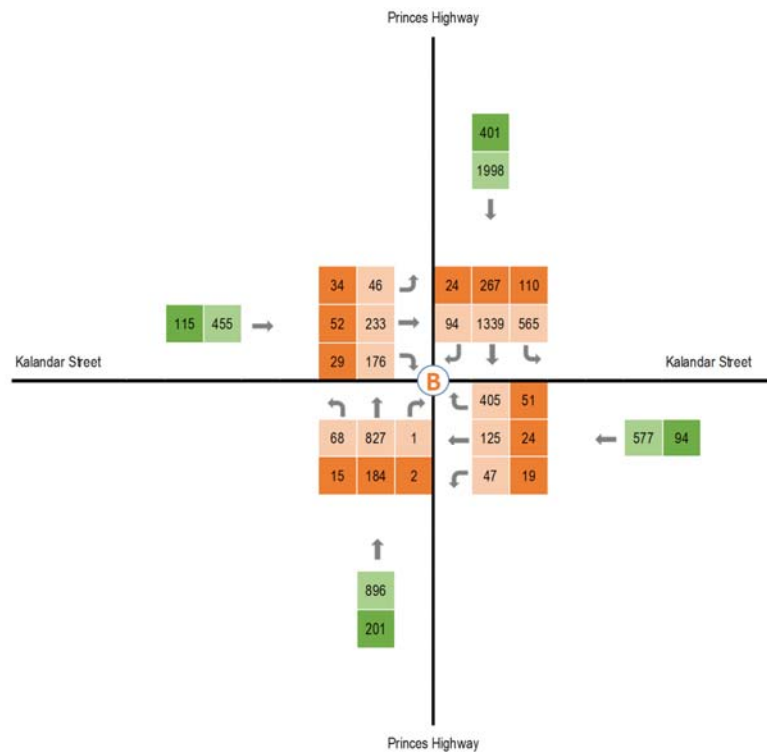
Opening 2026 – With Proposal

2026 AM Peak - With Proposal



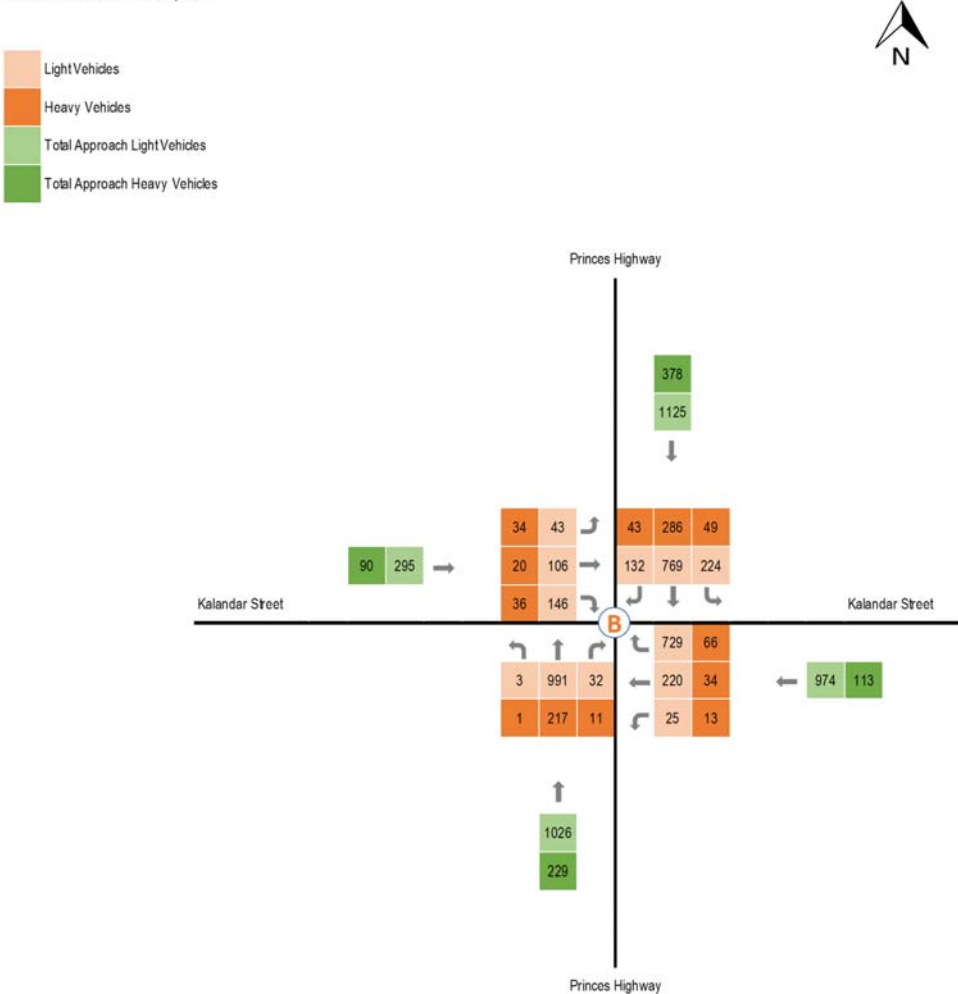
West Nowra Stage 4 Landfill Extension

2026 PM Peak - With Proposal



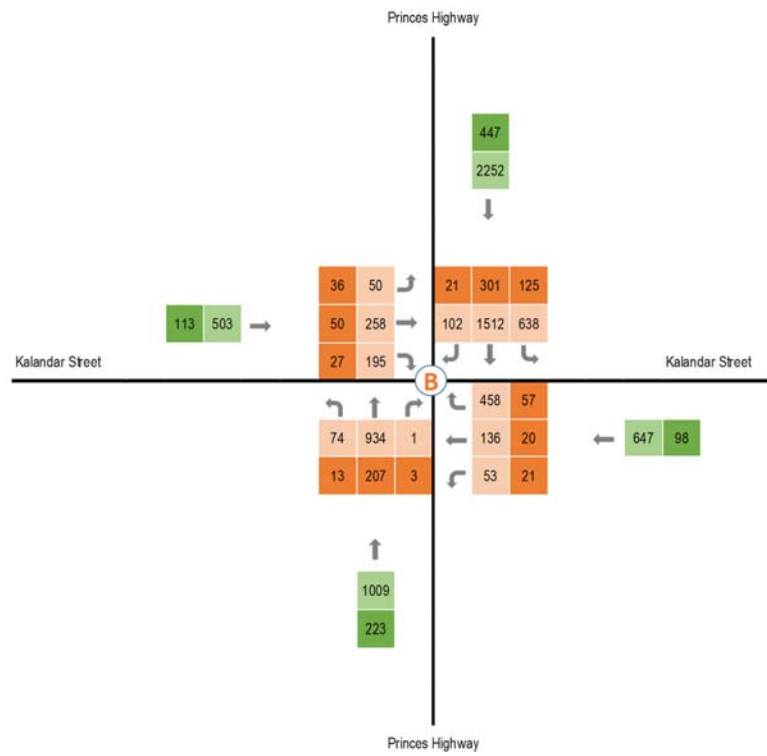
Closing 2034 – Without Proposal

2034 AM Peak - Without Proposal



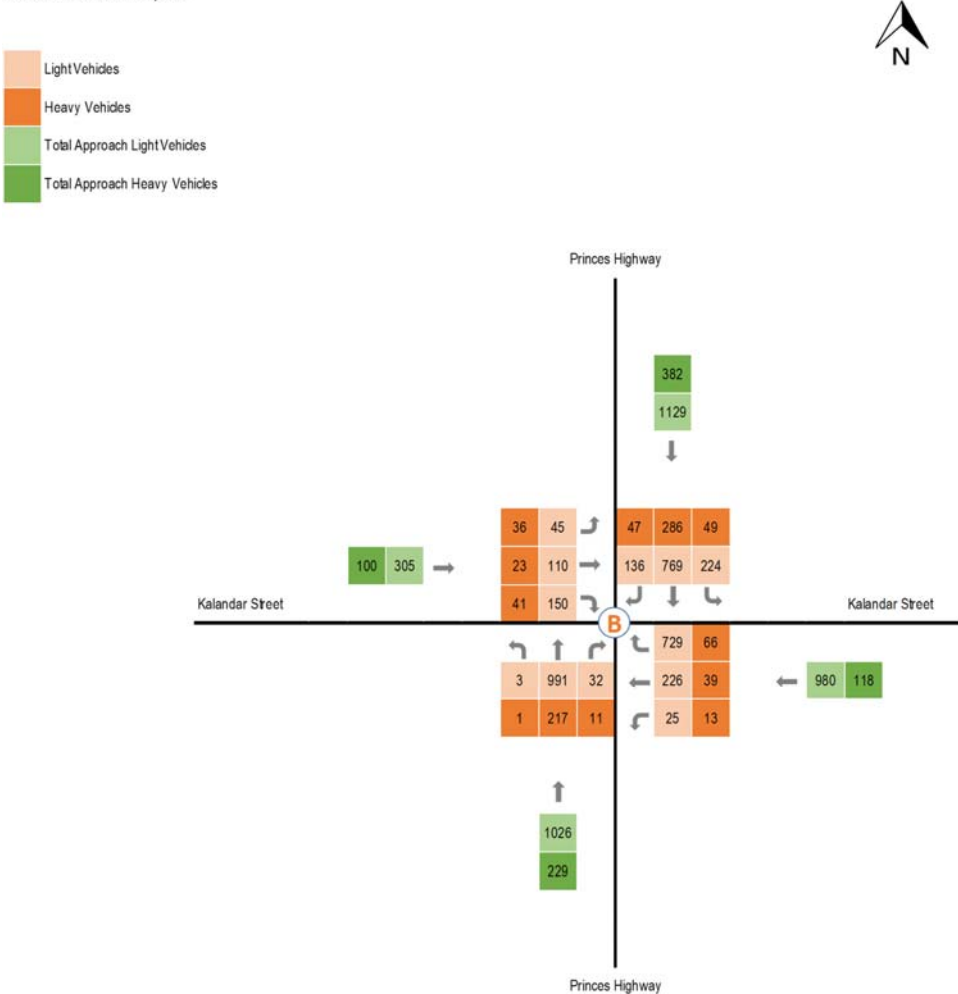
West Nowra Stage 4 Landfill Extension

2034 PM Peak - Without Proposal



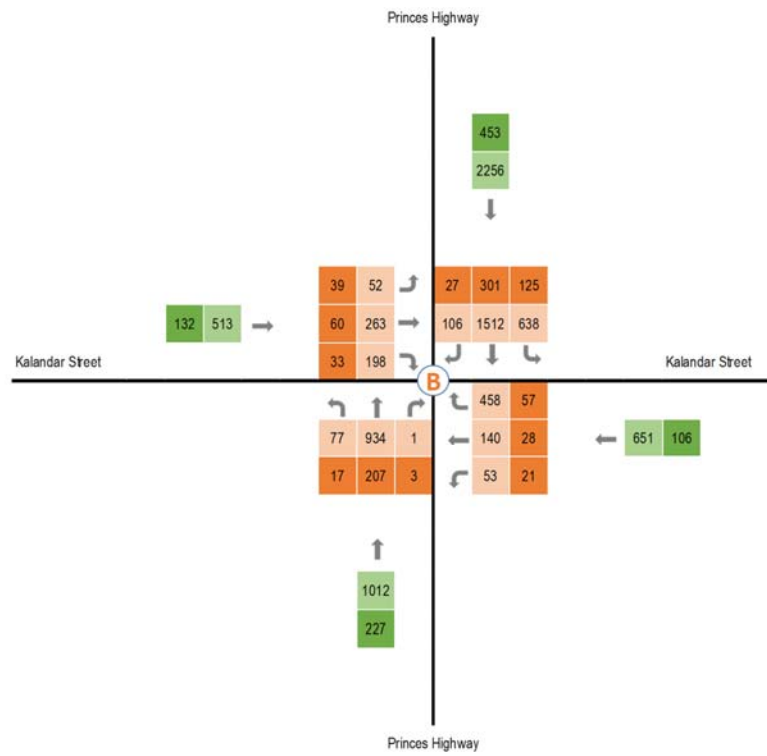
Closing 2034 – With Proposal

2034 AM Peak - With Proposal



West Nowra Stage 4 Landfill Extension

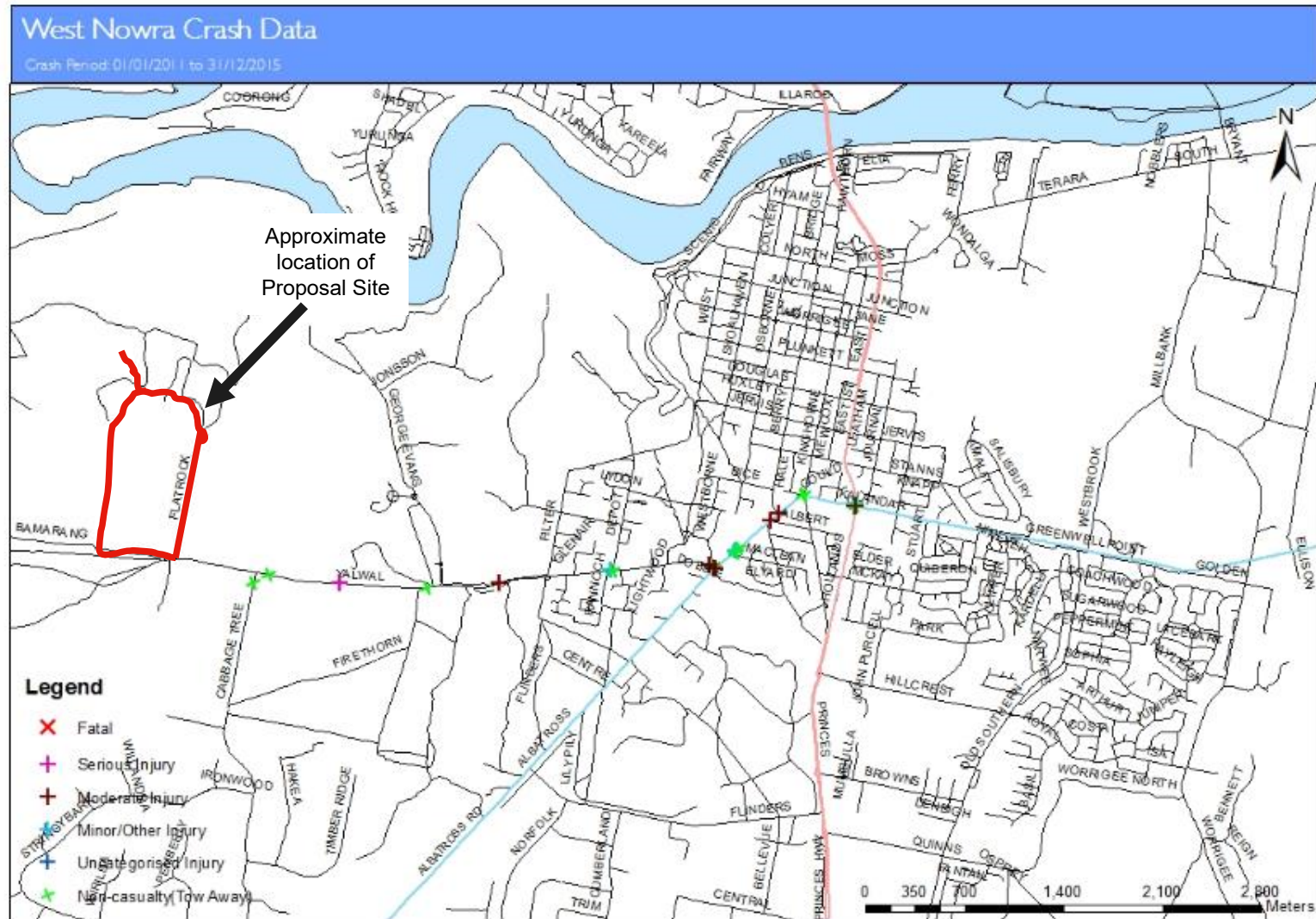
2034 PM Peak - With Proposal



APPENDIX B – SIDRA OUTPUTS

APPENDIX C – CRASH DATA

West Nowra Stage 4 Landfill Extension



Crash Data Map (source: Transport for NSW)

