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15 January 2013

Expansion of the Advanced Waste Treatment Facility, Kemps Creek Resource Recovery Precinct

Traffic Impact Assessment

Expansion of the Advanced Waste Treatment Facility, Kemps Creek Resource Recovery Precinct

Traffic Impact Assessment

Prepared for

SITA Australia Pty Ltd

Prepared by

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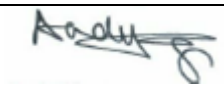
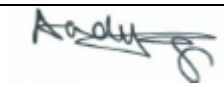
1	1-Jan-2013	Draft for Client Review	Andy Yung Principal Transport Planner – Strategic Planning & Advisory	
2	16-Jan-2013	Final	Andy Yung Principal Transport Planner – Strategic Planning & Advisory	

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1.0 Introduction

1.1 Purpose and Scope

AECOM has been engaged by SITA to prepare a Traffic Impact Assessment (TIA) to support an Environmental Impact Statement (EIS) for the proposed expansion of the existing SITA Advanced Waste Treatment (SAWT) facility at its Kemps Creek Resource Recovery Precinct in Western Sydney (the Development). The Development would comprise an expansion of the existing SAWT facility only and would not change operations at the adjacent Elizabeth Drive landfill.

The purpose of the EIS is to anticipate environmental the impacts of this expansion, and suggest mitigation measures, if necessary. The purpose of the TIA is to determine the impacts of the proposed development during the construction phase and the operation phase, recommending any infrastructure upgrades required to alleviate any traffic impacts.

Consultation was undertaken with Roads and Maritime Service (RMS) on 27 June, 2012 to discuss the scope and methodology for the TIA. Given the relatively small amount of additional traffic as a result of the Development, RMS agreed that the scope of the TIA would only require the assessment of three key intersections along Elizabeth Drive. This assessment has been undertaken using SIDRA 5.1. The intersections RMS agreed should be modelled are:

- Elizabeth Drive/access to Kemps Creek Resource Recovery Precinct
- Elizabeth Drive/The Northern Road
- Elizabeth Drive/Mamre Road.

These intersections have been modelled for the AM (7:30am-8:30am) and PM (4:45pm-5:45pm) peak periods, as well as a different morning peak hour of 5:00am-6:00am for the construction peak period. The agreed years of assessment for each intersection are:

- 2014 (Construction year)
- 2016 (Full operation)
- 2026 (Full operation + ten years)

1.1.1 Report Structure

This report is structured as follows:

- **Section 2** summarises the existing transport conditions in the area surrounding the Site;
- **Section 3** considers the likely future transport conditions in the area without the Development;
- **Section 4** provides an assessment of the trip generation and distribution associated with the Development for both construction and operation, together with a review of their impacts on the local road network. Details of recommended works required to mitigate any potential impacts associated with the Development for both construction and operation are discussed in this section;
- **Section 5** provides a summary and study conclusions.

2.0 Existing Conditions

2.1 Site Location

The Site is located approximately 41 kilometres west of the Sydney Central Business District (CBD). The towns of Kemps Creek and Badgerys Creek are located approximately five kilometres (km) east and five km south west of the Site, respectively. The Site is located within the Penrith Local Government Area (LGA). The regional context in which the Site is situated is illustrated in **Figure 1**.

The Site is located within the boundary of the existing Kemps Creek Resource Recovery Precinct (refer to **Figure** 2). The Site covers an area of approximately eight hectares and is located in the north eastern corner of the Resource Recovery Precinct. The Site currently comprises the existing Kemps Creek Resource Recovery Precinct.

Access to the Precinct is via Elizabeth Drive, which is an east-west connector road providing access from the M7 Westlink from the east, and The Northern Road from the west. The existing Kemps Creek Resource Recovery Precinct is located within a fully fenced compound at the end of a dedicated access road between the facility and the main entrance to the Resource Recovery Precinct.

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SITE LOCATION AND ROAD NETWORK

Environmental Impact Statement - Expansion of the Advanced Waste Treatment Facility, Kemps Creek Resource Recovery Precinct

FIGURE 1

G:\Projects\602 Projects\60250100 Kemps Creek\FIGURES\EIS\Traffic and Transport\60250100 F2 Existing Elizabeth Drive and Site Access Road Intersection 15 01 2013 TO Rev B

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EXISTING LAYOUT OF ELIZABETH DRIVE AND SITE ACCESS ROAD INTERSECTION

Environmental Impact Statement - Expansion of the Advanced Waste Treatment Facility, Kemps Creek Resource Recovery Precinct

FIGURE 2

2.2 Road Network

The Site has a good vehicular connection to major arterial roads and the highway network in western Sydney. Access to the facility is via an existing access road off Elizabeth Drive, midway between Mamre Road and Luddenham Road. Elizabeth Drive is a major east-west arterial road connecting The Northern Road and the Westlink M7 and currently provides local access to many rural and industrial developments along its length. Traffic flow gradually increases from the west to the east as it approaches the Westlink M7. In addition, a number of roads in the vicinity of the site are classified as 25 to 26-metre B-Double routes. This includes Elizabeth Drive, Mamre Road, The Northern Road and Badgerys Creek Road.

2.2.1 Strategic Road Network

Westlink M7

Westlink M7 is an urban motorway that forms part of the Sydney Orbital Network. It connects three Metroads: M5 at Prestons, M4 at Eastern Creek and M2 at Baulkham Hills. It is a high standard four-lane two way toll road with a posted speed of 100 kilometres per hour (km/h).

Elizabeth Drive

Elizabeth Drive is an arterial road connecting the Westlink M7 and The Northern Road. It is predominantly a two-lane road with an upgraded section to four lanes east of the M7. The posted speed limit on the road is 80 km/h from The Northern Road to Westlink M7 and 70 km/h to the east of Westlink M7.

The Northern Road

The Northern Road is a major arterial road to the west of Sydney. It runs parallel to the Westlink M7 as an outer ring road connecting the south-west and north-west regions. It connects to Elizabeth Drive via a two-lane roundabout approximately six km west of the Site. The posted speed limit on The Northern Road is 80 km/h.

Mamre Road

Mamre Road is an arterial road linking the M4 motorway and Elizabeth Drive. It is a two-lane road with a posted speed limit of 80 km/h. It connects to Elizabeth Drive via a two-lane roundabout approximately four km east of the Site.

Luddenham Road

Luddenham Road is a sub-arterial road linking the M4 motorway to the western section of Elizabeth Drive. It is a two-lane road with a posted speed limit of 80 km/h. Luddenham Road is not classified as a B-Double route and connects to Elizabeth Drive via a priority intersection four km west of the Site.

2.2.2 Local Road Network

There are two local roads on the opposite side of Elizabeth Drive namely; Lawson Road and Martin Road, providing access to a few houses and small scale agricultural operations. The nearest residential area to the Site by road is Kemps Creek which is located approximately 2.5 km to the east of the Site. It should also be noted that the Twin Creeks residential estate is the closest residential area to the north of the Site; however this is accessed from Luddenham Road, approximately nine km by road from the Kemps Creek Resource Recovery Precinct.

2.2.3 Traffic Accident History

A review of historical crash data on Elizabeth Drive between The Northern Road and Cowpasture Road (a 16 km stretch of road) was undertaken to establish the number of traffic accidents over the five year period between 2006 and 2011. The review indicates:

- A total of 200 reported crashes, including;
    - 101 (50.5 percent) injury accidents;
    - 96 (48.0 percent) non-casualty accidents; and
    - 3 (1.5 percent) fatal accidents.

Further assessment of these accidents revealed:

- 33 accidents (16.5 percent) occurred on or adjacent to an intersection;
- 167 accidents (83.5 percent) occurred at areas other than intersections; and
- 90 accidents (45.0 precent) involved light, rigid and articulated trucks.

Records indicate that no accidents were reported at the intersection of Elizabeth Drive and the existing Resource Recovery Precinct Access Road between 2006 and 2011. The nearest traffic incidents reported are shown in **Table 1**.

Table 1: Accident Data in the Vicinity of the Site

Accident Date and Time	Location	Accident Severity	Colliding Objects	Accident Type
Thursday 09/06/11, 12:50 pm	140 m east of Resource Recovery Precinct Access Road intersection	Non-Casualty	Lorry/4WD	Turning right from Martin Road
Monday 19/04/10, 9:00 pm	60 m west of Resource Recovery Precinct Access Road intersection	Non-Casualty	Car/Bush	Off road to the Left
Tuesday 23/12/08, 10:29 pm	210 m west of Resource Recovery Precinct Access Road intersection	Injury	Car/Car	Emerging from Drive
Monday 8/12/08, 2:50 pm	220 m east of Resource Recovery Precinct Access Road intersection	Injury	Wagon/Car	Performing U-Turn

Source: RMS Accident Records, 2006 - 2011

The accidents shown in **Table 1** did not occur at the Resource Recovery Precinct Access Road. As the data does not capture trip purpose it is not possible to determine if any of these nearby accidents had any association with traffic associated with the Resource Recovery Precinct.

2.2.4 Daily Traffic Volumes (AADT)

Several RMS permanent vehicle counting stations are located on the road network in the vicinity of the Site. RMS Annual Average Daily Traffic (AADT) data is shown in **Table 2** and provides a summary of traffic volumes recorded at these stations between 1996 and 2005. More recent AADT data is not available from the RMS. Traffic volumes and trends indicate that:

- Traffic flow on Elizabeth Drive gradually increases from the west to the east as it approaches the Westlink M7.
- AADT on Elizabeth Drive near the entrance to the Resource Recovery Precinct Access Road (Station no. 64.037) increased by approximately 2.2 percent per annum between 1996 and 2005.
- AADT on Elizabeth Drive, west of Luddenham Road (Station no. 64.032) experienced an annual growth rate of approximately 2.5 percent between 1996 and 2005, while AADT on Elizabeth Drive between Cecil Park and Wallgrove Road remained constant over the 10 year period between 1996 and 2005.

Table 2: Average Annual Daily Traffic (AADT) on Adjacent Road Network

Station Number	Station Location	AADT Volumes - Year				Annual Growth Rate (1996 – 2005)
		1996	1999	2002	2005	
64.037	Elizabeth Drive at South Creek Bridge	8,041	9,117	9,098	9,757	2.2%
64.032	Elizabeth Drive between The Northern Road and Luddenham Road	5,879	6,753	6,592	7,311	2.5%
64.033	Elizabeth Drive between Cecil Park and Wallgrove Road	17,274	19,180	17,910	17,311	0.0%
86.044	Mamre Road between Bakers Lane and Erskine Park	10,859	12,153	12,446	14,074	2.9%

Source: RMS Traffic Volume Data 2005 Sydney Region Volume 1.

2.2.5 Peak Hour Traffic Volumes

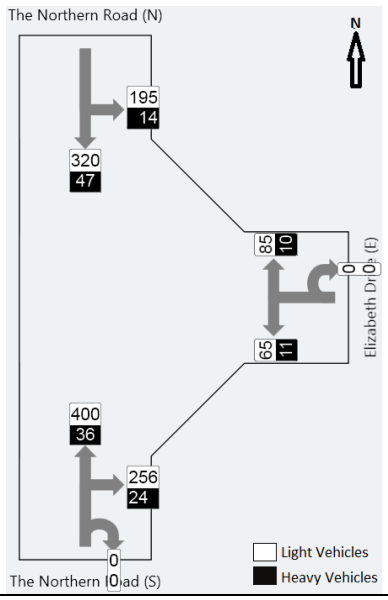
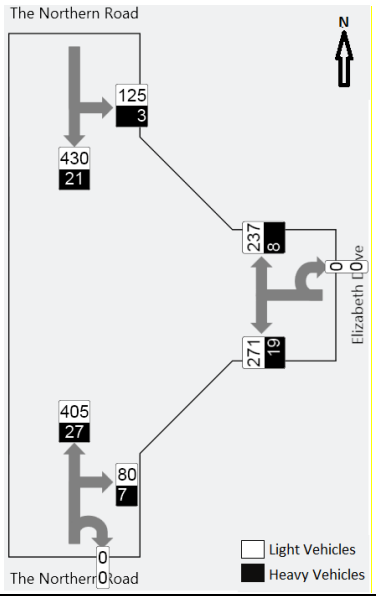
To provide a better understanding of peak hour traffic conditions, a classified Intersection traffic count was conducted by AECOM on 19 June 2012 for the following three intersections:

- Elizabeth Drive / The Northern Road
- Elizabeth Drive / Resource Recovery Precinct Access Road
- Elizabeth Drive / Mamre Road

The survey was conducted for two hours in the AM peak (7:00 to 9:00 am) and the PM peak (4:30 to 6:30 pm) at the three intersections above. The survey identifies network peak hours of 7:30 to 8:30 am and 4:45 to 5:45 pm in the AM and PM, respectively with PM peak hour demand approximately nine percent higher than AM peak hour demand.

Table 3 illustrates the existing traffic movements at the intersection of Elizabeth Drive and The Northern Road in the AM and PM peak hour.

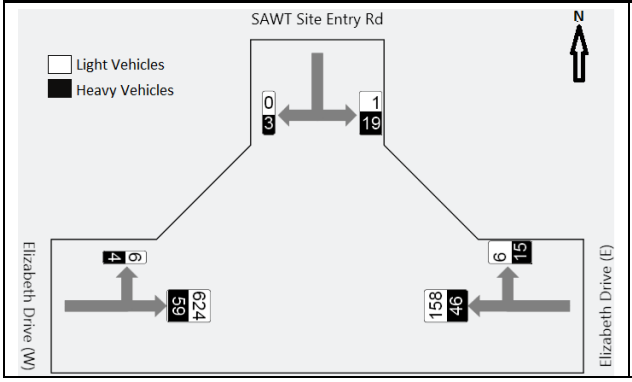
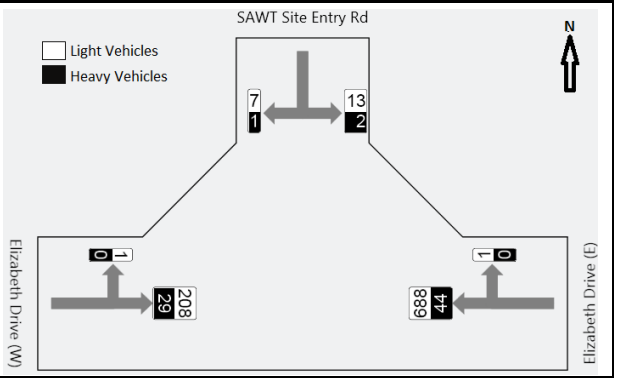
Table 3: Existing Traffic Volume on Elizabeth Drive / The Northern Road

Elizabeth Drive / The Northern Road – AM Peak	Elizabeth Drive / The Northern Road – PM Peak
	

Source: AECOM

Table 4 illustrates the existing traffic movements at the intersection of Elizabeth Drive and the Resource Recovery Precinct Access Road in the AM and PM peak hour.

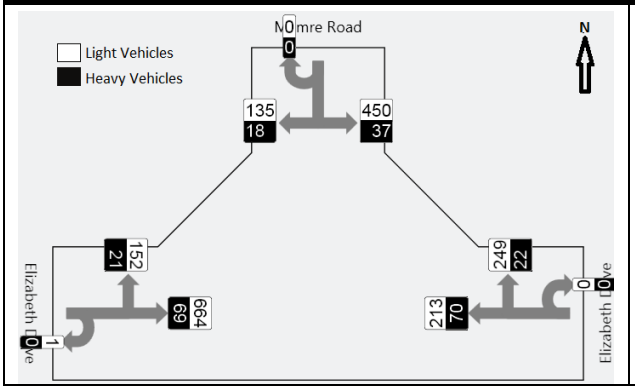
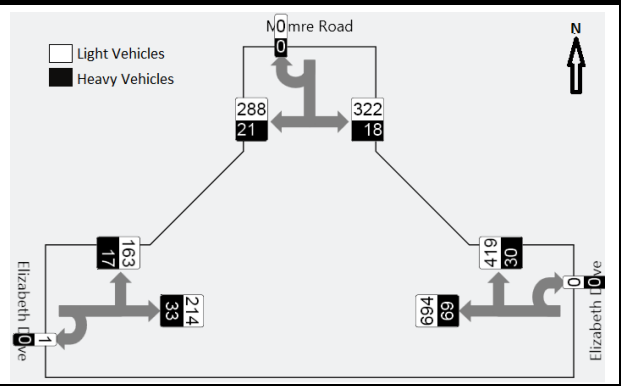
Table 4: Existing Traffic Volume on Elizabeth Drive / Resource Recovery Precinct Access Road

Elizabeth Drive / Resource Recovery Precinct Access Road – AM Peak	Elizabeth Drive / Resource Recovery Precinct Access Road – PM Peak
	

Source: AECOM

Table 5 illustrates the existing traffic movements at the intersection of Elizabeth Drive and Mamre Road in the AM and PM peak hour.

Table 5: Existing Traffic Volume on Elizabeth Drive / Mamre Road

Elizabeth Drive / Mamre Road – AM Peak	Elizabeth Drive / Mamre Road – PM Peak
	

Source: AECOM

2.2.6 Existing Operational Performance

The performance of three intersections has been evaluated using SIDRA Intersection 5.1, a computer based modelling package designed for calculating isolated intersection performance. The intersections modelled are:

- Elizabeth Drive / The Northern Road
- Elizabeth Drive / Resource Recovery Precinct Access Road
- Elizabeth Drive / Mamre Road

The main performance indicators for SIDRA 5.1 include:

- Degree of Saturation (DoS) – a measure of the ratio between traffic volumes and capacity of the intersection is used to measure the performance of isolated intersections. As DoS approaches 1.0, both queue length and delays increase rapidly. Satisfactory operations usually occur with a DoS range between 0.7 to 0.8 or less;
- Average Delay – duration, in seconds, of the average vehicle waiting at an intersection; and
- Level of Service (LoS) – a measure of the overall performance of the intersection (this is explained further in **Table 6**).

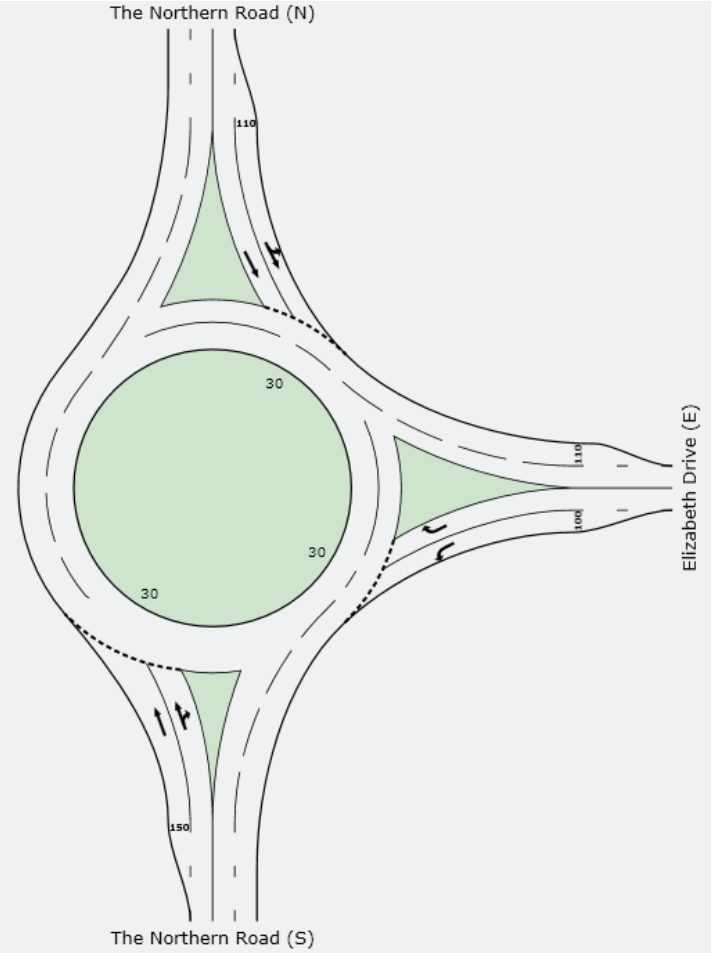
Table 6: Performance Criteria for Intersection Assessment

Level of Service (LoS)	Average Delay (secs/veh)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Less than 14	Good Operation	Good Operation
B	15 to 28	Good with acceptable delays and 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
F	>70	Roundabouts require other control mode	At capacity; requires other control mode

Source: Guide to Traffic Generating Developments, RMS, 2002.

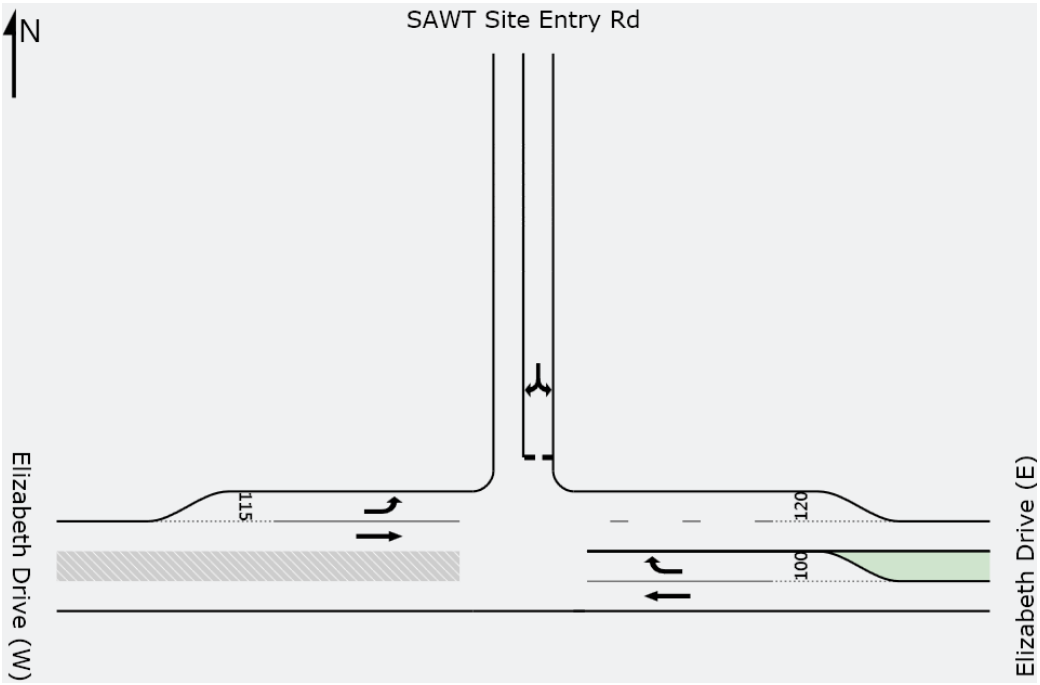
Each intersection has been modelled in SIDRA 5.1 as per the existing arrangement. A schematic of the current intersection layouts are shown below in **Figures 3, 4** and **5**. This is followed by intersection analysis results under existing traffic conditions.

Figure 3: Existing Layout of Elizabeth Drive and The Northern Road Intersection



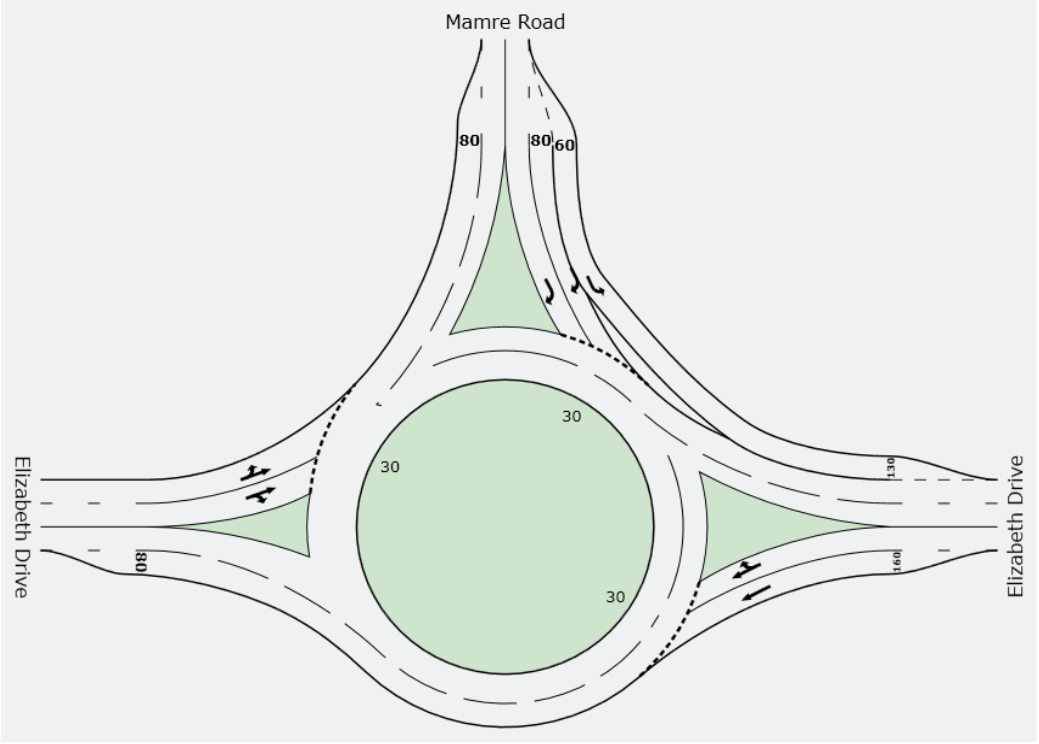
Source: AECOM, 2013

Figure 4: Existing layout of Elizabeth Drive and Resource Recovery Precinct Access Road intersection



Source: AECOM, 2013

Figure 5: Existing Layout of Elizabeth Drive and Mamre Road Intersection



Source: AECOM, 2013

The existing Kemps Creek Resource Recovery Precinct Access Road intersection with Elizabeth Drive has been modelled based on the layout shown in **Figure 4**. Note that in reality a 500-metre-long auxiliary lane exists to the south of the westbound traffic lane as shown in the figure. However this lane has been excluded from the modelled layout as it is not used by through traffic. In practice the lane operates as an entry/exit lane for vehicles

accessing Lawson Road and Martin Road. Also note that roundabouts at The Northern Road and Mamre Road with Elizabeth Drive were both modelled as two-lane roundabouts.

Table 7 shows that The Northern Road / Elizabeth Drive and the Mamre Road / Elizabeth Drive roundabouts operate with minimal queuing under existing traffic flows (LoS B) during both the AM peak (7:30 to 8:30 am) and PM peak (4:45 to 5:45 pm) hour periods. The Elizabeth Drive / Resource Recovery Precinct Access Road intersection currently operates at LoS F during the AM Peak period. This is due to the high average delay caused by Heavy Goods Vehicles (HGVs) seeking to exit the Resource Recovery Precinct during peak hour traffic flows on Elizabeth Drive. The traffic flows along Elizabeth Drive make it difficult for HGVs to exit, particularly in a westbound direction. The Elizabeth Drive / Resource Recovery Precinct Access Road intersection currently operates at LoS B during the PM Peak period.

Table 7: SIDRA Intersection Assessment Results for 2012 Base Case

Intersection	AM Peak				PM Peak			
	Peak hour volume	DoS	Average Delay	LoS	Peak hour volume	DoS	Average Delay	LoS
The Northern Road / Elizabeth Drive	1,463	0.256	16.7	B	1,633	0.246	16.9	B
Elizabeth Drive / Resource Recovery Precinct Access Road	941	0.370	156.7	F	994	0.390	25.5	B
Elizabeth Drive / Mamre Road	2,101	0.376	19.8	B	2,289	0.667	20.8	B

DoS – Degree of Saturation
LoS – Level of Service
Source: AECOM, 2013

2.3 Public and Active Transport

The Site is not well serviced by public transport, with one bus route (Badgerys Creek to Liverpool) passing in proximity to the Resource Recovery Precinct access road with a combined total of six daily services during morning and evening peak. Given the low level of public transport service, the rural nature of the surrounding area and the distance to nearby centres, the likelihood or opportunity for employees to travel to and from the Site via public transport is minimal. However, as the region develops further, public transport provision may be provided.

The area is not well suited to walking, with footways or leisure routes not provided. This reflects the nature of land use in the vicinity of the site. In addition, Elizabeth Drive is not well utilised by cyclists, however there is scope for this to occur in future, with Elizabeth Drive potentially suited to the development of cycleway as the area continues to develop.

3.0 Future Year Base Case Traffic Conditions

This section assesses the impacts of forecast background traffic growth on the surrounding transport network, including the operational performance of the three assessed intersections during the expected peak construction and operational years for the proposed Development.

This section of the report considers.

- 2014 - Peak construction period (including background traffic growth).
- 2016 - Opening of the fully operational Development (including background traffic growth).
- 2026 - Ten years post opening of the Development with 10 additional years of background traffic growth.

3.1 Peak Hour Traffic Volumes (EMME)

The RMS EMME model represents the estimated traffic flows on the Sydney road network for a number of future year scenarios. The model assumes the level of future year traffic based on forecast population and employment growth.

EMME traffic flows are available for the road network within the study area. They have been used to determine forecast background traffic growth rates along Elizabeth Drive by measuring traffic growth between the years 2011, 2016 and 2026. The growth rates generated were then used to factor up the survey data collected at three key intersections in 2012. The resulting data was then modelled in SIDRA 5.1 as part of 2014, 2016 and 2026 future year assessments.

It was found during analysis that growth rates varied considerably within the study area. The most sensitive location on the local road network is Elizabeth Drive in the vicinity of the Resource Recovery Precinct Access Road, which demonstrates a traffic growth rate of 6.9 percent per annum to 2016 (Elizabeth Drive eastbound in the PM Peak). In order to reflect this high forecast growth rate, it was deemed appropriate to calculate the traffic growth rate for each of the eight movements (intersection approaches) on an individual basis. This provided a higher level of accuracy compared to the application of a single traffic growth rate.

This method for determining the growth rate was agreed with RMS in a meeting on 24 September 2012. The growth rate applied to each movement is shown in **Table 8**. Note that the table shows forecast negative growth rates for some movements which have also been applied and assessed in SIDRA 5.1.

Table 8: RMS EMME Peak Hour Forecast Traffic Growth Rates

Intersection with Elizabeth Drive	Approach	Annual Growth Rates (%)			
		2011-2016		2016-2026	
		AM	PM	AM	PM
The Northern Road	The Northern Road southbound	2.3	5.2	-0.4	1.7
The Northern Road	The Northern Road northbound	4.8	2.2	2.5	0.1
The Northern Road	Elizabeth Drive westbound	5.4	3.0	2.6	1.2
Resource Recovery Precinct Access Road	Elizabeth Drive eastbound	4.4	6.9	0.9	2.9
Resource Recovery Precinct Access Road	Elizabeth Drive westbound	6.0	6.1	4.9	1.5
Mamre Road	Elizabeth Drive eastbound	7.1	4.4	4.0	3.2
Mamre Road	Elizabeth Drive westbound	3.8	-0.3	1.2	1.3
Mamre Road	Mamre Road southbound	-3.5	8.5	1.4	3.2

Source: RMS EMME Traffic Forecast, 2012.

Future performance and capacity assessment using background traffic growth has been undertaken to provide a base case and benchmark for the impact assessment presented in **Section 4.0**. Note that no growth rate has been applied to the Resource Recovery Precinct Access Road in the future base year as this traffic is dependent on any increase in the SAWT facility and landfill operations.

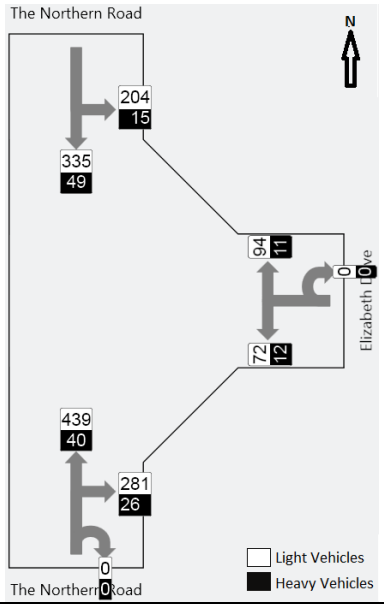
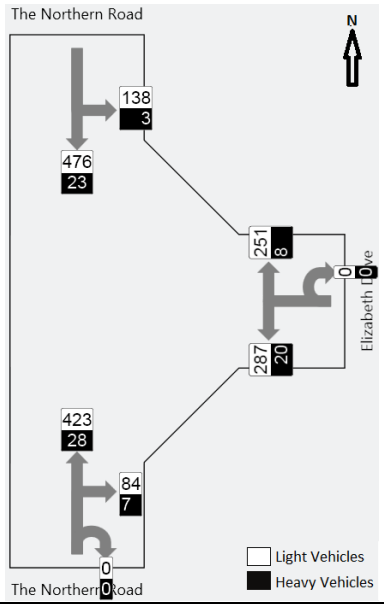
3.2 Future Road Upgrades

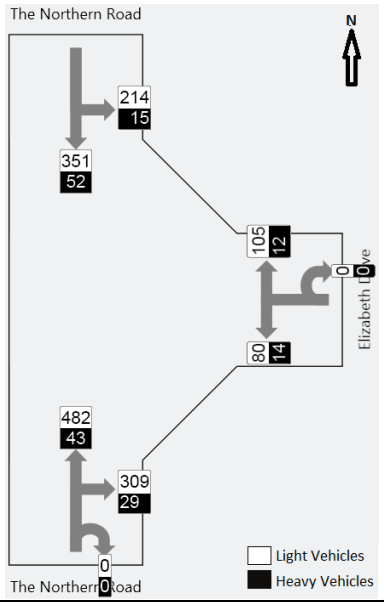
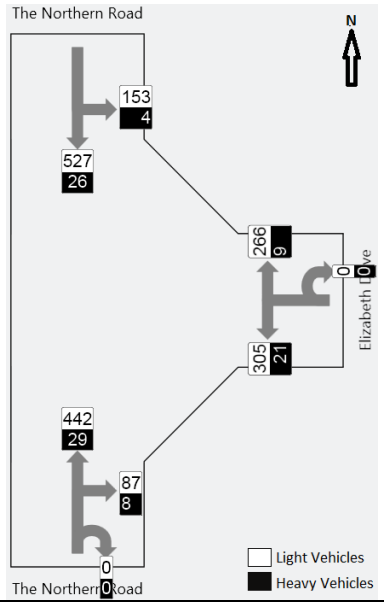
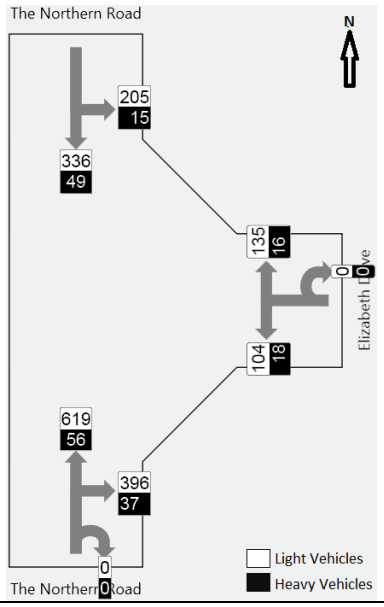
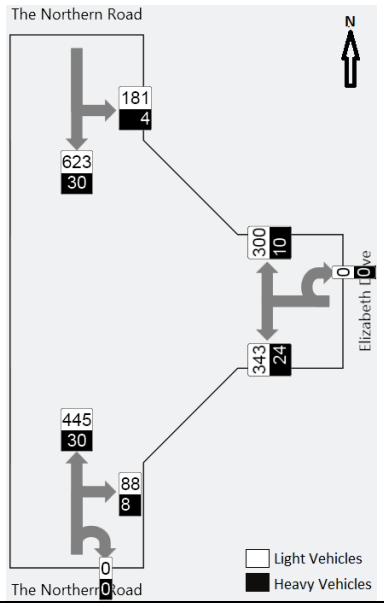
Based on consultation with RMS, it is understood that no major road upgrades are proposed for Elizabeth Drive during the assessment years of 2014 and 2016. According to the forecast traffic volumes, Elizabeth Drive may need to be widened to four lanes after 2021. However, no upgrade strategy including intersection layout for Elizabeth Drive has been determined by the RMS. Therefore, it was agreed with the RMS that the intersections have been assessed using existing layouts, with appropriate upgrades recommended if required.

3.3 Future Year Traffic Volumes (Without Development)

The peak hour traffic forecasts for 2014, 2016 and 2026 at each of the three assessed intersections, determined using growth rates as shown in **Table 8** are provided in **Table 9**, **Table 10** and **Table 11**.

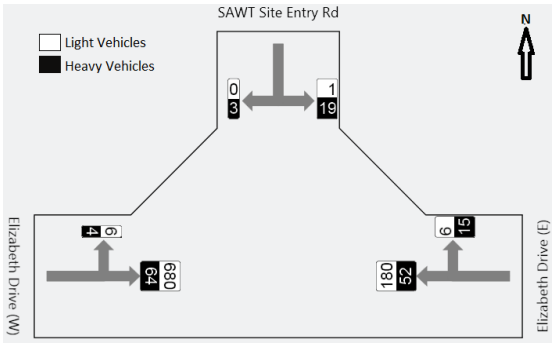
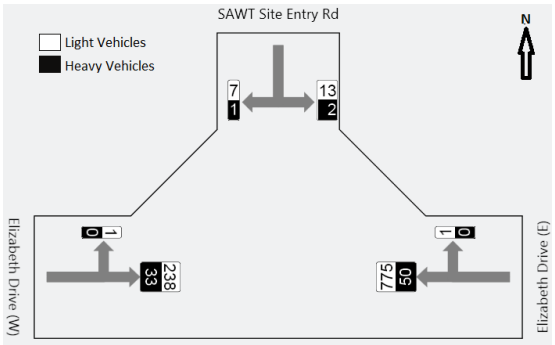
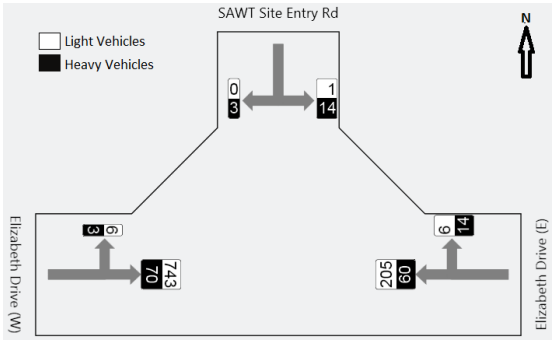
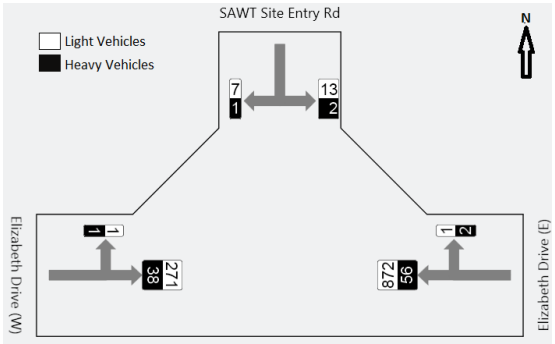
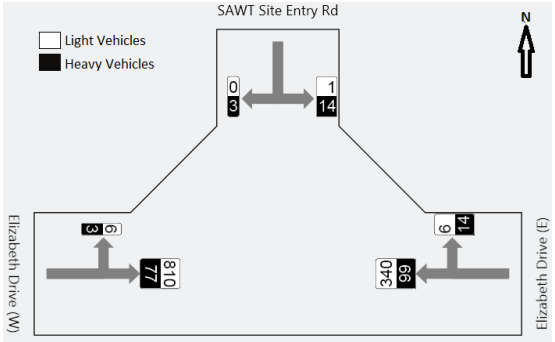
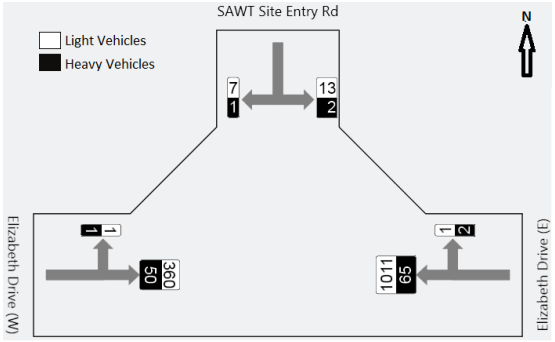
Table 9: Future Year Traffic Volume at the Elizabeth Drive / The Northern Road Intersection (Without Development)

Year	Elizabeth Drive / The Northern Road – AM Peak	Elizabeth Drive / The Northern Road – PM Peak
2014		

Year	Elizabeth Drive / The Northern Road – AM Peak	Elizabeth Drive / The Northern Road – PM Peak
2016		
2026		

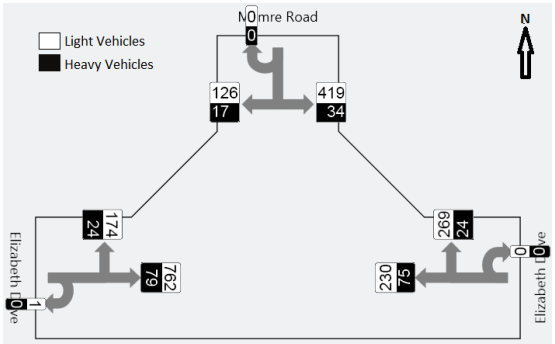
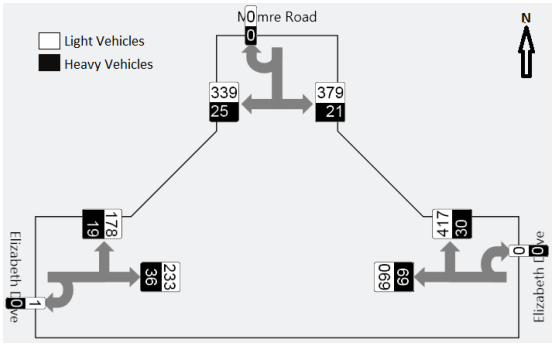
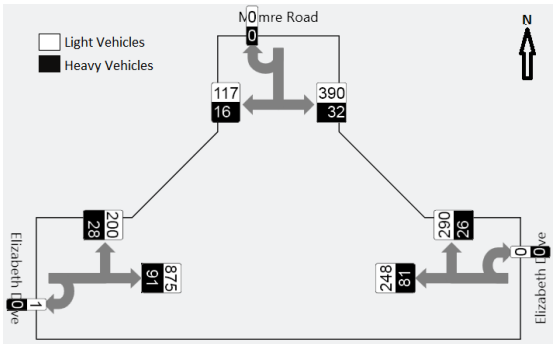
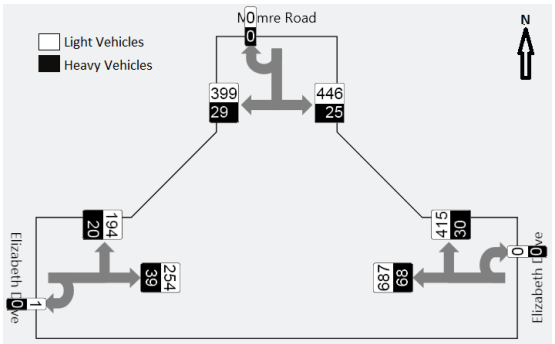
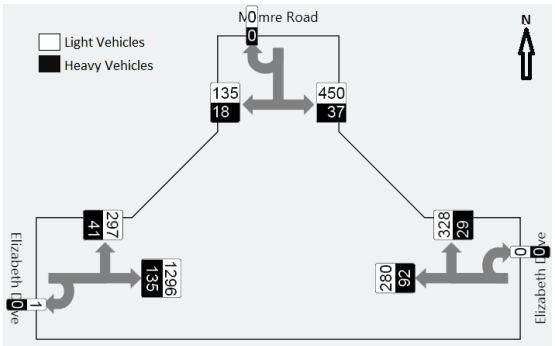
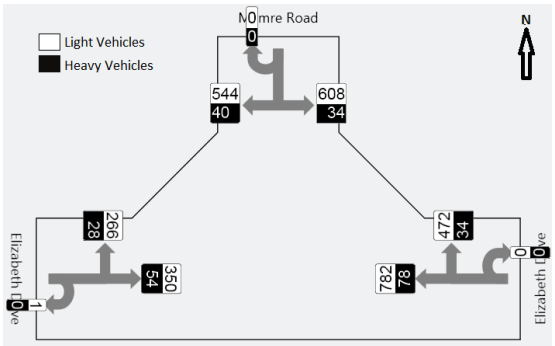
Source: AECOM, 2013

Table 10: Future Year Traffic Volume at Elizabeth Drive / Resource Recovery Precinct Access Road Intersection (Without Development)

Year	Elizabeth Drive / Resource Recovery Precinct Access Road – AM Peak	Elizabeth Drive / Resource Recovery Precinct Access Road – PM Peak
2014		
2016		
2026		

Source: AECOM, 2013

Table 11: Future Year Traffic Volume at the Elizabeth Drive / Mamre Road Intersection (Without Development)

Year	Elizabeth Drive / Mamre Road – AM Peak	Elizabeth Drive / Mamre Road – PM Peak
2014		
2016		
2026		

Source: AECOM, 2013

3.4 Intersection Performance (Without Development)

Intersections have been assessed using SIDRA 5.1 for the future construction year of 2014 and operation years of 2016 and 2026 based on the existing intersection layouts.

3.4.1 Elizabeth Drive / The Northern Road

As shown in **Table 12**, The Northern Road / Elizabeth Drive roundabout continues to operate satisfactorily with minimal delays and queuing through to 2026, with the intersection operating at LoS B in all assessment years during both the AM peak and PM peak hour periods.

Table 12: SIDRA Outputs for The Northern Road / Elizabeth Drive Roundabout, Without Development

Year	AM Peak				PM Peak			
	Peak hour volume	DoS	Average Delay	LOS	Peak hour volume	DoS	Average Delay	LOS
2014	1,578	0.277	16.7	B	1,774	0.276	17.0	B
2016	1,710	0.309	16.8	B	1,877	0.288	17.2	B
2026	1,990	0.409	16.8	B	2,086	0.338	17.6	B

DoS – Degree of Saturation, LoS – Level of Service
Source: AECOM

3.4.2 Elizabeth Drive / Resource Recovery Precinct Access Road

As shown in **Table 13**, the Elizabeth Drive / Resource Recovery Precinct Access Road intersection continues to operate at LoS F in 2014, 2016 and 2026 in the AM peak with the existing intersection layout. This is due to the high average delay caused by HGVs seeking to exit the Precinct and the level of background growth on Elizabeth Drive. This level of service is not considered satisfactory, indicating that the intersection is in need of an upgrade.

Table 13: SIDRA Outputs for Elizabeth Drive / Resource Recovery Precinct Access Road Intersection, Without Development

Year	AM Peak				PM Peak			
	Peak hour volume	DoS	Average Delay	LOS	Peak hour volume	DoS	Average Delay	LOS
2014	1,030	0.403	225.9	F	1,121	0.440	31.5	C
2016	1,125	0.440	351.5	F	1,265	0.495	40.9	C
2026	1,373	0.729	2,118.6	F	1,514	0.573	68.6	E

DoS – Degree of Saturation, LoS – Level of Service
Source: AECOM, 2013

3.4.3 Elizabeth Drive / Mamre Road

As shown in **Table 14**, The Northern Road / Mamre Road roundabout continues to operate satisfactorily with minimal delays and queuing through to 2026. The intersection operates at LoS B in all assessment years during both the AM peak and PM peak hour periods.

Table 14: SIDRA Outputs for Elizabeth Drive / Mamre Road Roundabout, Without Development

Year	AM Peak				PM Peak			
	Peak hour volume	DoS	Average Delay	LOS	Peak hour volume	DoS	Average Delay	LOS
2014	2,234	0.439	20.1	B	2,541	0.691	20.8	B
2016	2,415	0.522	20.5	B	2,607	0.713	20.8	B
2026	3,158	0.797	26.2	B	3,291	0.894	24.7	B

DoS – Degree of Saturation, LoS – Level of Service
Source: AECOM

Overall, the analysis indicates that the Northern Road / Elizabeth Drive and Mamre Road / Elizabeth Drive roundabouts would continue to operate effectively through 2026 with their existing layouts and the expected forecast background traffic growth.

The Elizabeth Drive / Resource Recovery Precinct Access Road intersection is currently operating at LoS F in the AM peak period and continues to do so with background traffic growth. In the PM Peak the intersection continues to operate satisfactorily in 2014 and 2016 (LoS C), however in 2026 background traffic growth causes the intersection to operate at LoS E.

Through consultation with the RMS, it was acknowledged that the Elizabeth Drive / Resource Recovery Precinct Access Road intersection requires an upgrade to cater for any additional background traffic growth. However, the RMS currently has no plan and funding to upgrade this intersection. Therefore, SITA has considered appropriate upgrades at this intersection that can be undertaken as part of the expansion of the Facility, to improve the safety and capacity of this intersection. This is further discussed in **Section 4.2.4**.

4.0 Impacts of Development

SITA is seeking approval for the expansion of the existing SAWT facility (the Development) at its Kemps Creek Resource Recovery Precinct in Western Sydney. The Development would comprise an expansion of the existing SAWT facility only and would not change operations at the adjacent Elizabeth Drive Landfill. The existing SAWT facility currently accepts up to 134,400 tonnes per annum (tpa) of MSW materials, SSO materials and biosolids. This is sourced from a number of councils including Penrith, Campbelltown, Camden, Wollondilly, Wingecarribee, Liverpool, Randwick City and City of Sydney.

The Development would result in the following key changes:

- An increase in capacity of the facility to 220,000 tpa of input waste
- Modifications to the current layout of operations at the Site and enhancements to the management of waste material (including a fully enclosed composting process) and process water
- An increase in operating hours for indoor operations from 7 am to 11 pm Monday through Saturday to 24 hours per day, seven days a week.

The Development would be entirely contained within areas which are already occupied by the existing SAWT facility and landfill.

It is anticipated that construction of the Development would commence in mid-2013 and would be completed in mid-2015. The Development would not immediately accept 220,000 tpa of waste but would accept a gradual increase in the volume of waste material over time as new contracts become available. It is anticipated that the Development would be at full operational capacity sometime in 2016.

This section assesses the impacts of the proposed Development on the surrounding transport network during both the construction and operational phases. This includes:

- An evaluation of potential impacts associated with construction and operation of the proposed development
- Consideration of measures to mitigate traffic impacts, if required.

4.1 Construction Phase

4.1.1 Hours and Workforce

Construction would be carried out over a period of approximately two years, commencing in June 2013 and being completed in May 2015. The construction peak is proposed to occur in 2014, thus 2014 has been assessed for construction traffic impacts. The majority of staff-related light vehicle movements would be travelling in and out of the Site at the start and end of the construction hours, respectively. Construction hours would be from 6 am to 4 pm on weekdays and between 7 am and 4 pm on Saturday.

The onsite construction workforce would vary, peaking at a maximum of approximately 130 workers per day. Construction activities would generate a maximum of 60 heavy vehicle movements in a typical day during the peak construction periods. As these vehicle movements would occur during off peak traffic hours, these vehicles are unlikely to impact upon the road network or the operation of the Resource Recovery Precinct Access Road. Note that during construction there would also be a total of 10 deliveries using oversize vehicles. These additional 20 movements would occur throughout the entire construction period.

4.1.2 Traffic Generation

The construction stage of the Development is likely to result in a short term and temporary spike in traffic flows of construction machinery, private vehicles and delivery vehicles.

Operation of the existing SAWT facility and landfill would continue during the construction phase, therefore construction vehicle impacts have been considered together with existing base (operational) traffic.

The construction workforce would include up to 130 people at its peak. With limited public transport provision in the surrounding area; it is assumed that all staff would travel in their own private vehicle to the Site. Given the work hours described in **Section 4.1.1**, workers would be arriving/departing the Site outside the peak hour periods.

The peak construction period in terms of the operation of heavy equipment would occur between February and May 2014 when buildings would be constructed. The peak construction period in terms of the construction workforce would occur between June 2014 and January 2015 when plant and services would be installed and internal fit out and miscellaneous works conducted.

4.1.3 Light Vehicle Traffic and Parking Requirements

Table 15 outlines the light vehicle movements associated with the construction personnel estimated for various phases during the construction of the facility. A ratio of 1.0 construction personnel per vehicle has been assumed for car parking requirements and vehicles travelling to and from Site.

Table 15: Light Vehicle Movements and Parking Requirements

Activity	Timeframe	Vehicles per Day and Minimum Car Parking Requirements	Vehicle Movements
Site establishment and establishment of temporary facilities	November 2013 to December2013	15	30
Earthworks and civil Infrastructure	January 2014 to February2014	50	100
Construction of building foundations and buildings	February 2014 to May 2014	85	170
Plant and services installation	June 2014 to January 2015	130	260
Internal fit out and miscellaneous works	December 2014 to January 2015		
Commissioning	February 2015 to May 2015	58	116

Construction personnel would require on-site parking for the duration of the construction program, with the greatest number of parking spaces required between June 2014 and January 2015 during plant and services installation and internal fit out. During the peak, it is estimated that up to approximately 260 light vehicle movements would be generated in a typical day, with the need for up to 130 on-site parking spaces.

It should be noted that existing operations would continue during the construction period, and as such, car parking for the construction workforce would be provided in addition to those existing car parks allocated to operational personnel.

4.1.4 Heavy Vehicle Traffic

Construction heavy vehicles would also be generated on a regular basis to support construction activities in relation to the expanded facility. **Table 16** summarises the expected amount of heavy vehicles to be generated during the whole construction period. At peak times for heavy vehicle movements between February and March 2014, it is expected there would be up to 30 heavy vehicles (60 heavy vehicle movements) generated per day. Information provided by SITA indicates that the majority of these heavy vehicles are most likely to originate from the east.

Table 16: Construction Heavy Vehicle Movements (Daily)

Activity	Time Period	Type of Vehicle Deliveries	Maximum Number of Heavy Vehicles per Day
Average deliveries for the whole of construction period	November 2013 to June 2015	Couriers, steel and equipment except concrete trucks	20
Additional vehicles during peak construction period	February 2014 to March 2014	Concrete Trucks	10

4.1.5 Traffic Distribution

It is assumed that 80 percent of construction traffic would travel to and from the east and the remaining 20 percent would do so from the west.

4.1.6 Impact of Construction Traffic

The 2014 intersection assessment has been undertaken during a morning period of 5 to 6 am and an afternoon period of 4 to 5 pm to reflect the time when the majority of construction vehicle movements are expected to enter and leave the Site. Any safety implications of the construction activities to the operation of the intersections will be reviewed and addressed as part of the preparation of a Construction Traffic Management Plan (CTMP).

Table 17 summarises the 2014 intersection performance of the three assessed intersections during 2014. This assessment is undertaken using the existing intersection layout.

Table 17: SIDRA Results for 2014 Construction Traffic

Intersection	AM Peak (5 to 6 am)				PM Peak (4 to 5 pm)			
	Peak hour volume	DoS	Average Delay	LOS	Peak hour volume	DoS	Average Delay	LOS
The Northern Road / Elizabeth Drive	874	0.149	10.9	B	1,774	0.276	17.0	B
Elizabeth Drive / Resource Recovery Precinct Access Road	676	0.218	2.4	A	1,154	0.440	29.0	C
Elizabeth Drive / Mamre Road	1,303	0.208	10.4	B	2,541	0.691	20.8	B

DoS – Degree of Saturation, LoS – Level of Service

Source: AECOM, 2013

Due to the lower level of traffic along Elizabeth Drive between 5 to 6 am and 4 to 5 pm (compared to the traffic peak hours of 7:30 to 8:30 am and 4:45 to 5:45 pm) the Elizabeth Drive / Resource Recovery Precinct Access Road intersection is expected to operate at LoS A between 5 to 6 am The results also demonstrate that additional light vehicle traffic associated with the construction staff does not impact the level of service during the PM Peak period, with the LoS being comparable to the LoS in 2014 without development. The LoS of The Northern Road / Elizabeth Drive and Mamre Road / Elizabeth Drive intersections would be the same in 2014 with or without development. It can therefore be concluded that there is minimal impact to the road network as a result of construction traffic generated by the proposed Development.

Although no intersection upgrade is required for the construction stage , SITAs preference is to undertake part of the proposed operational upgrade discussed in **Section 4.2.4** (widening on the Resource Recovery Precinct Access Road) prior to construction in 2013 in order to enhance the operability of the intersection during construction.

4.1.7 Construction Traffic Management Plan (CTMP)

Although construction traffic is expected to have negligible impacts on the surrounding road network during the peak construction period, it is however, recommended that a CTMP be put in place during construction in order to ensure the safest possible management of construction traffic. The CTMP would detail vehicle routes, the number of construction vehicles, hours of operation, access arrangements and traffic control measures. Traffic control measures in the CTMP would include, but not be limited to:

- Implementing appropriate signage to warn road users of the presence of construction vehicles
- Ensuring heavy vehicles meet the Australian Road Rules and RMS standards so that road safety is not compromised
- Proper safety signs to be placed in the event of a road closure
- Notifying the local community by means of public notifications and advertisements on the progress of the works and the scheduling of works so as to inform the local community of any additional vehicles added to the local road network

- Transporting oversized equipment and machinery in accordance with the RMS guidelines for oversized movements
- Parking for employees and construction vehicles would be provided on-site
- Employees would be encouraged to travel to the Site by car-pool where possible.

4.2 Operation Phase

4.2.1 Hours and Workforce

At full development, the operational workforce at the entire Resource Recovery Precinct would remain approximately the same. An increase in the number of SAWT staff by 22 would be offset by the loss of 24 staff due to the relocation of the Waste Collection Fleet Depot to another site (planned to take place in 2013 as part of a separate proposal). The shift times for all staff under future operations would be:

- 5 am to 2 pm (24 staff)
- 7 am to 5 pm (6 staff)
- 8 am to 5 pm (2 staff)
- 2 pm to 10 pm (23 staff)
- 9 pm to 6 am (5 staff)

It is anticipated that there will be an additional 36 heavy vehicle movements and 10 light vehicle movements per day as a result of the Development.

A breakdown of existing and future staff numbers and existing and future expected light and heavy vehicle movements as a result of the proposed Development is summarised in **Table 18** and **Table 19**.

Table 18: Operation Staff Numbers and Light Vehicle Movements (Daily)

Operations	Existing Staff Numbers	Changes due to Modification	Staff Numbers Post-modification	Existing Light Vehicle Movements	Post-modification Light Vehicle Movements
Collections	24	-24	0	48	0
Landfill Operations	27	0	27	54	54
SAWT Staff	38	22	60	76	120
Additional Admin, Couriers and Maintenance	-	-	-	-	14
Total	**89**	**-2**	**87**	**178**	**188**

Table 19: Operational Heavy Vehicle Movements (Daily)

Waste Type	Existing Daily Vehicles	Additional Daily Vehicles	Total Daily Vehicles	Existing Daily Movements	Additional Daily Vehicles	Total Daily Vehicles
Collections	19	-19	0	38	-38	0
Council delivered tonnes	51	17	82	102	34	164
Transfer trailer tonnes		14			28	
Recovered Steel/Aluminium	4	1	10	8	2	20
Compost Sales		5			10	
Total	**74**	**18**	**92**	**148**	**36**	**184**

During operations, there would be an increase of both light and heavy vehicles due to the expansion of the SAWT facility. At the peak of operation of the expanded facility, it is anticipated that an additional 46 vehicle movements per day would be generated, of which 10 are light vehicle movements generated by operation staff and 36 are heavy vehicle movements generated by waste deliveries and compost sales.

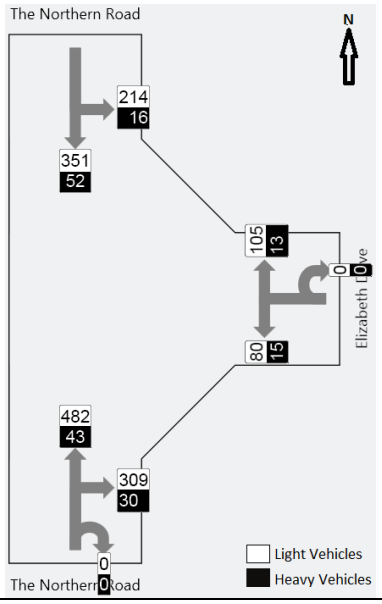
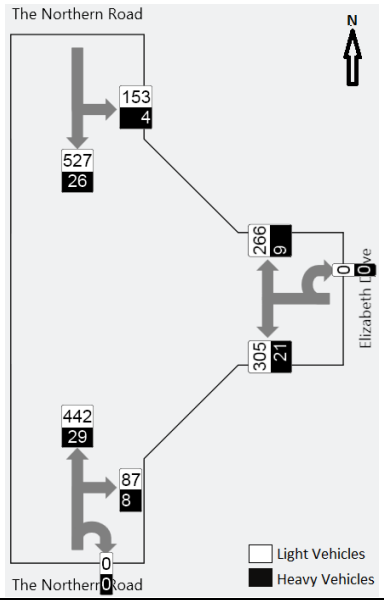
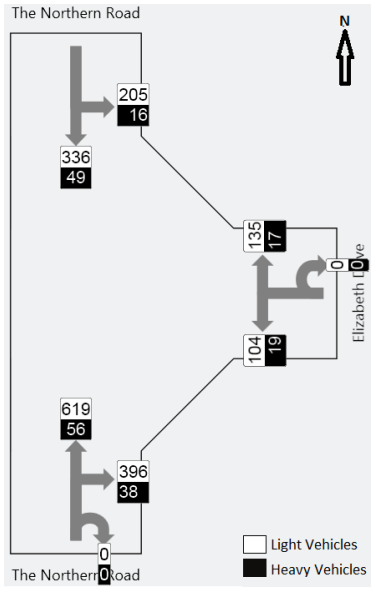
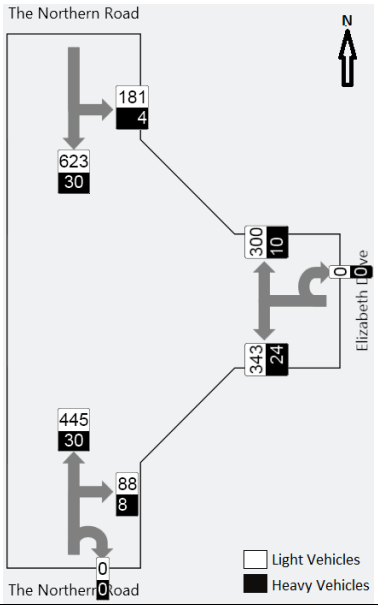
4.2.2 Traffic Distribution

Based on existing vehicle movements, information provided by SITA, and forecast traffic growth, it is assumed that 80 percent of the operation traffic would travel to and from the east and the remaining 20 percent from the west. Note that the majority of urban development and population of Sydney is located to the east of the Site.

4.2.3 Future Year Traffic Volumes (With Development)

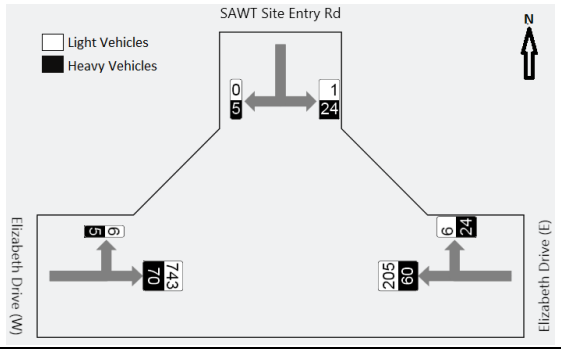
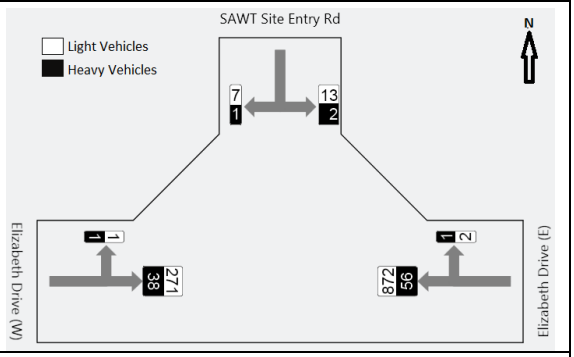
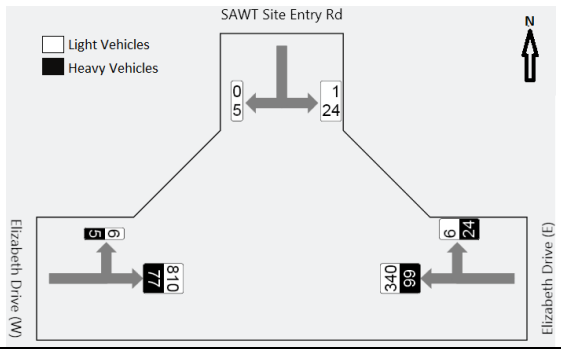
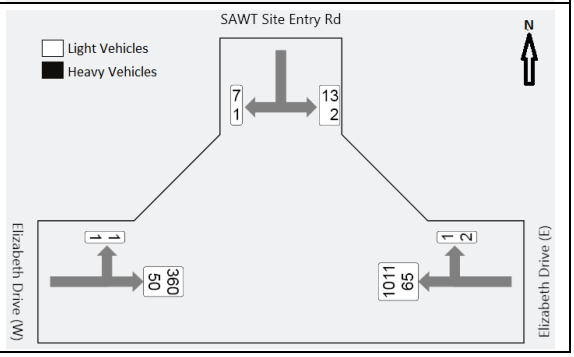
The traffic forecasts for 2016 and 2026 at each of the three assessed intersections, with the addition of operation vehicles associated with the proposed Development are provided in **Table 20**, **Table 21** and **Table 22**.

Table 20: Traffic Volume on Elizabeth Drive / The Northern Road (With Development)

Year	Elizabeth Drive / The Northern Road – AM Peak (7-8am)	Elizabeth Drive / The Northern Road – PM Peak (4:45-5:45pm)
2016		
2026		

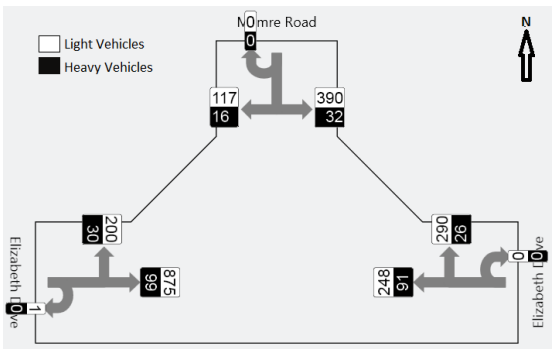
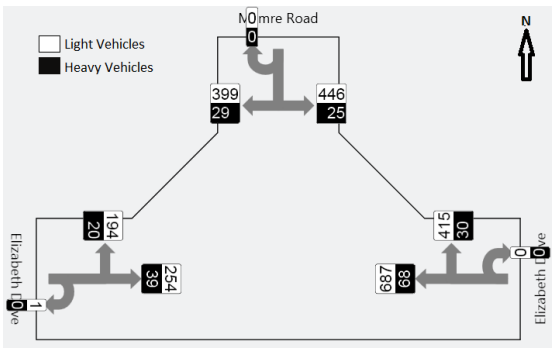
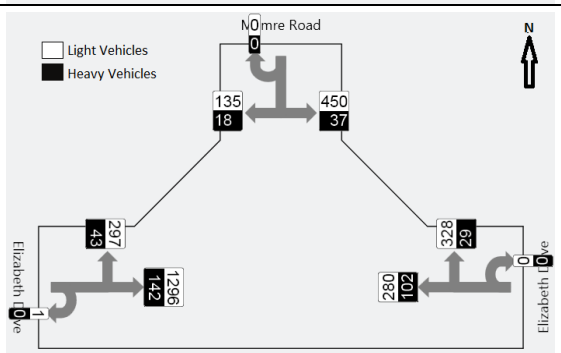
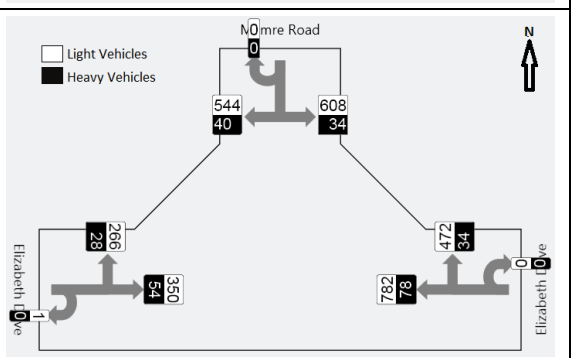
Source: AECOM, 2013

Table 21: Traffic Volume on Elizabeth Drive / Resource Recovery Precinct Access Road (With Development)

Year	Elizabeth Drive / Resource Recovery Precinct Access Road – AM Peak (7-8am)	Elizabeth Drive / Resource Recovery Precinct Access Road – PM Peak (4:45-5:45am)
2016		
2026		

Source: AECOM, 2013

Table 22: Traffic Volume on Elizabeth Drive / Mamre Road Roundabout (With Development)

Year	Elizabeth Drive / Mamre Road – AM Peak (7-8am)	Elizabeth Drive / The Mamre Road – PM Peak (4:45-5:45pm)
2016		
2026		

Source: AECOM, 2013

4.2.4 Intersection Upgrade

The assessment has shown that there are currently delays experienced at the Elizabeth Drive/Resource Recovery Precinct Access Road intersection during the AM peak hour. Background traffic growth on Elizabeth Drive necessitates that this intersection is upgraded to improve capacity and safety for vehicles exiting the Resource Recovery Precinct Access Road.

Consultation was undertaken with RMS on 24 September 2012 to discuss the most appropriate intersection treatment for the intersection between the Resource Recovery Precinct Access Road and Elizabeth Drive. RMS expressed a preference for the intersection to be upgraded to a 'seagull' intersection and agreed that the traffic assessment ought to assume that the intersection is upgraded to a 'seagull' intersection. Thus, for future years during the full operation of the expanded facility, this report has assessed this intersection with the upgrade as described in further detail below.

The improvements include dedicated left and right turn lanes for vehicles exiting the site and any associated widening of the kerb. This would reduce queuing exiting the site, particularly for left (eastbound) turning vehicles. In addition, a seagull intersection will be provided to include a waiting bay for westbound vehicles exiting the Resource Recovery Precinct. This would be located in the median of the major intersection arm. In this instance a waiting bay would be provided in the median of Elizabeth Drive immediately to the west of the Resource Recovery Precinct Access Road. Westbound vehicles leaving the Site turn into this bay before merging with other westbound traffic. Although the detailed design is yet to be undertaken, this type of intersection layout ensures that vehicles do not need to cross two lanes of traffic in a single manoeuver, improving the operation of the intersection. A concept of the proposed upgrade is shown in **Figure 6**.

The upgrades described above are not required until full operation of The Development. Nevertheless, SITAs preference is to undertake part of this upgrade (widening on the Resource Recovery Precinct Access Road) prior to construction in 2013 in order to enhance the operability of the intersection during construction. The RMS will be consulted prior to this work going ahead in order to ensure compatibility with the proposed 'seagull' upgrade required at full operation of The Development.

CONCEPT ONLY. SUBJECT TO DETAILED DESIGN

G:\Projects\602 Projects\60250100 Kemps Creek\FIGURES\EIS\Traffic and Transport\60250100 F6 Modified Elizabeth Drive and Site Access Road Intersection 15 01 2013 TO Rev B

AECOM

MODIFIED ELIZABETH DRIVE AND SITE ACCESS ROAD INTERSECTION

Environmental Impact Statement - Expansion of the Advanced Waste Treatment Facility,
Kemps Creek Resource Recovery Precinct

FIGURE 6

4.2.5 Impacts of Operation Traffic

In order to assess the impact of future Site traffic, the additional traffic movements were applied to the 2016 and 2026 traffic flows and assessed with SIDRA 5.1. This assessment includes an upgraded Elizabeth Drive/Resource Recovery Precinct Access Road Intersection as discussed in **Section 4.2.4**. This includes dedicated left and right turn lanes exiting the Resource Recovery Precinct Access Road and a waiting lane ('seagull' intersection) on Elizabeth Drive for westbound vehicles exiting the Site. The following tables show the traffic impacts of operations traffic at full development for the future years 2016 and 2026 (including background traffic growth).

Table 23: SIDRA Results for Elizabeth Drive / The Northern Road, With Development

	AM Peak (7-8am)				PM Peak (4:45-5:45pm)			
	Peak hour volume	DoS	Average Delay	LOS	Peak hour volume	DoS	Average Delay	LOS
2016	1,710	0.309	16.8	B	1,877	0.288	17.2	B
2026	1,990	0.409	16.8	B	2,086	0.338	17.6	B

DoS – Degree of Saturation, LoS – Level of Service

Source: AECOM, 2013

Table 24: SIDRA Results for Elizabeth Drive / Resource Recovery Precinct Access Road, With Development

Year	AM Peak (7-8am)				PM Peak (4:45-5:45pm)			
	Peak hour volume	DoS	Average Delay	LOS	Peak hour volume	DoS	Average Delay	LOS
2016	1,125	0.440	57.1	E	1,265	0.495	16.8	B
2026	1,397	0.481	68.7	E	1,514	0.573	22.9	B

DoS – Degree of Saturation, LoS – Level of Service

Source: AECOM, 2013

Table 25: SIDRA Results for Elizabeth Drive / Mamre Road Roundabout, With Development

Year	AM Peak (7-8am)				PM Peak (4:45-5:45pm)			
	Peak hour volume	DoS	Average Delay	LOS	Peak hour volume	DoS	Average Delay	LOS
2016	2,415	0.522	20.5	B	2,607	0.713	20.8	B
2026	3,158	0.797	26.2	B	3,291	0.894	24.7	B

DoS – Degree of Saturation, LoS – Level of Service

Source: AECOM, 2013

The future year assessment for 2016 and 2026 shows that the Elizabeth Drive / Resource Recovery Precinct Access Road intersection operates at LoS E during the AM Peak (with the proposed upgrade). This is considered acceptable given the improvement on the existing situation and the likelihood of further upgrades to this intersection as part of the overall strategy for the upgrade of Elizabeth Drive post-2021. In 2026 it can be expected that HGVs departing the Site may still experience some delays when turning to the west despite the upgrade (due to the increasing eastbound traffic volume on Elizabeth Drive during the AM Peak). Other movements at the intersection show improved performance, particularly as eastbound vehicles departing the Site are no longer required to wait behind westbound vehicles. This allows for the safer and more efficient operation of the intersection. The Elizabeth Drive / The Northern Road and Elizabeth Drive / Mamre Road intersections continue to operate at LoS B during both the AM and PM peak hours in 2016 and 2026.

5.0 Conclusions

5.1 Trip Generation

Construction activities would generate a maximum of 30 heavy vehicles per day or approximately 60 vehicle movements per day. As these vehicle movements would occur during off peak traffic hours, these vehicles are unlikely to impact upon the road network. During operations, there would be an increase of both light and heavy vehicles. At the peak of operation of the expanded facility, it is anticipated that an additional 46 vehicle movements per day would be generated, of which 10 are light vehicle movements generated by operations staff and 36 are heavy vehicle movements generated by waste deliveries and compost sales.

The construction and additional operations traffic would access the site via the existing Resource Recovery Precinct Access Road at Elizabeth Drive (between Lawson Road and Martin Road).

5.2 Project Construction Impacts

The 2014 intersection assessment has been undertaken during a morning period of 5-6am and an afternoon period of 4-5pm to reflect the time when the majority of construction vehicle movements are expected to enter and leave the Site. This includes both heavy vehicles and up to 130 construction light vehicles (staff). Due to the lower traffic volumes on Elizabeth Drive at these times, the Elizabeth Drive / Resource Recovery Precinct Access Road intersection is expected to operate at LoS A during the 5-6am construction peak. The results demonstrate that additional light vehicle traffic associated with the construction staff does not impact the level of service, with LoS being comparable to 2014 without the Development. The LoS of The Northern Road / Elizabeth Drive and Mamre Road / Elizabeth Drive intersections would be the same in 2014 with or without development. It can therefore be concluded that there is minimal impact to the road network as a result of construction traffic generated by the proposed Development. Having construction vehicles arrive and depart the Resource Recovery Precinct outside peak traffic hours ensures minimal conflict between construction vehicles and Elizabeth Drive traffic, improving the safety of intersections and the local road network. Nevertheless, to ensure the safe operation of construction vehicles it is recommended that a CTMP be put in place to manage the traffic generated during construction.

Although no intersection upgrade is required for the construction stage , SITAs preference is to undertake part of the proposed operational upgrade discussed below in **Section 5.1.3** (widening on the Resource Recovery Precinct Access Road) prior to construction in 2013 in order to enhance the operability of the intersection during construction. The RMS will be consulted prior to this work going ahead in order to ensure compatibility with the proposed ‘seagull’ upgrade required at full operation of The Development.

5.3 Project Operation Impacts

Background traffic growth on Elizabeth Drive is the major traffic issue for The Development, with high volumes of additional traffic forecast to use the road in future years. This growth necessitates that the Elizabeth Drive/Resource Recovery Precinct Access Road intersection is upgraded prior to full operations commencing at The Development in order to improve the safe and efficient operation of the intersection. Recommended improvements include a dedicated left and right turn lane for vehicles exiting the site and any associated widening of the kerb. This would reduce queuing exiting the site, particularly for left (east) turning vehicles. The intersection would also be upgraded to include a waiting bay for westbound vehicles exiting the Site located in the median of Elizabeth Drive immediately to the west of the Resource Recovery Precinct Access Road (a ‘seagull’ intersection). Westbound vehicles leaving the site turn into this bay before merging with other westbound traffic. This layout improves the operation of the intersection from both a traffic and safety perspective and has been agreed to in principle with the RMS.

With the intersection upgrade, the future year assessment for 2016 and 2026 shows that the Elizabeth Drive / Resource Recovery Precinct Access Road intersection operates at LoS E during the AM Peak. This is a considerable improvement on the existing situation and the likelihood of further upgrades to this intersection as part of the overall strategy for the upgrade of Elizabeth Drive post-2021. In 2026 HGVs departing the site may still experience some delays when turning to the west. Other movements at the intersection, namely eastbound traffic exiting the site, show improved performance as they are no longer required to wait behind westbound vehicles. The Elizabeth Drive / The Northern Road and Elizabeth Drive / Mamre Road intersections continue to operate at LoS B during both the AM and PM peak hours in 2016 and 2026 and therefore are not impacted by the proposed Development.