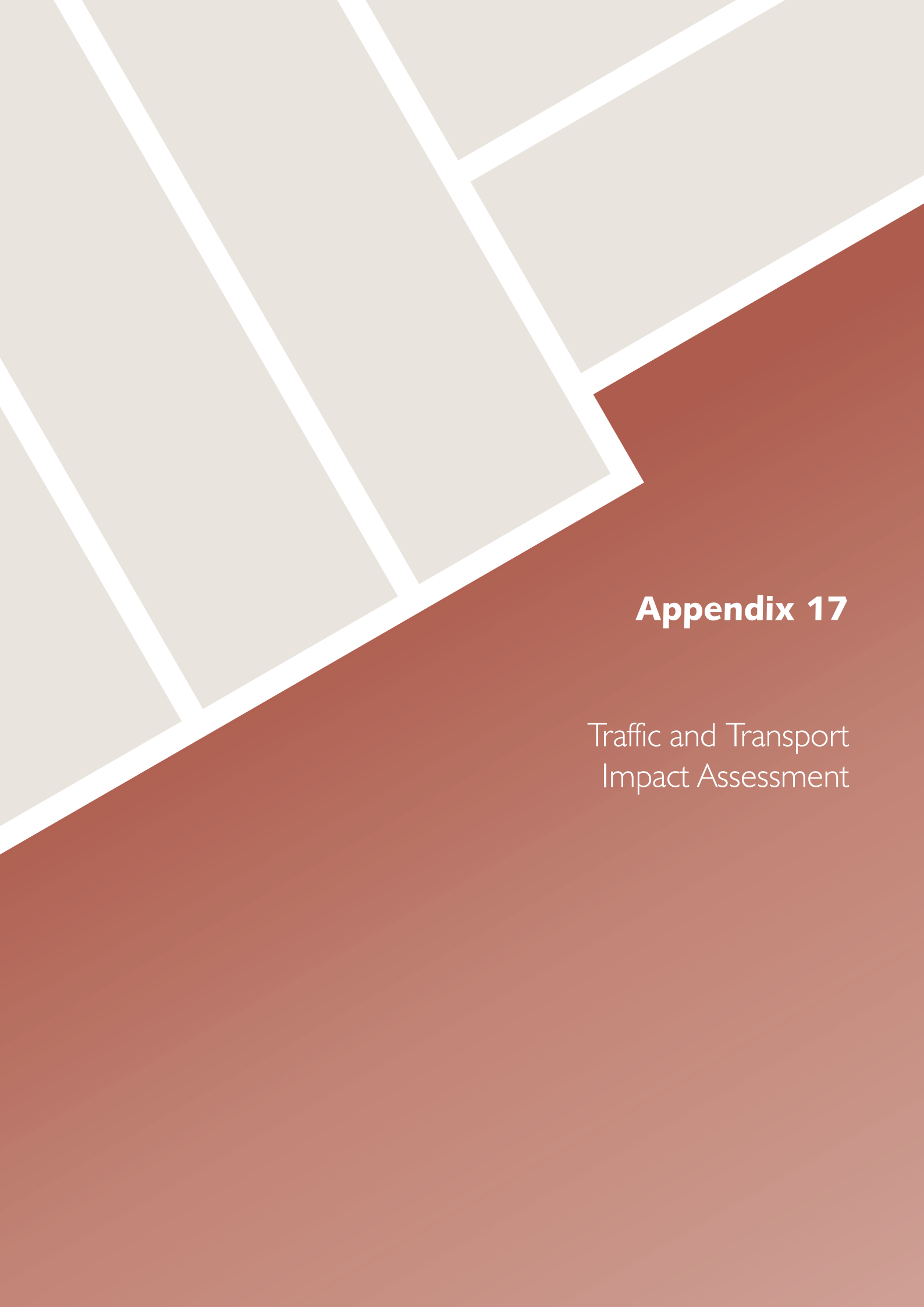




Appendix 17

Traffic and Transport Impact Assessment

FINAL

**TRAFFIC AND TRANSPORT IMPACT
ASSESSMENT**

FOR

**UNITED AND WAMBO
OPEN CUT PROJECT**

AT

**GOLDEN HIGHWAY
WARKWORTH**

Ref. 15032r

18 May 2016

Prepared By

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CONTENTS

1.0	INTRODUCTION	1
1.1	Introduction	1
1.2	Authority Requirements	1
1.3	Structure of this Report	1
2.0	PROJECT	3
2.1	Existing Wambo and United Mines	3
2.2	The Project	3
3.0	EXISTING TRAFFIC CONDITIONS	7
3.1	Principal Road Network	7
3.2	Description of Existing Roads	7
3.3	Existing Traffic Conditions on the Road Network	9
3.3.1	Existing Traffic Volumes	9
3.3.2	Daily Volumes and Vehicle Classifications	10
3.3.3	Intersections	15
3.4	Historical Traffic Growth and Future Growth in Background Traffic	15
3.5	Road Crashes	16
4.0	ASSESSMENT OF IMPACTS OF THE PROJECT	17
4.1	Realignment of Golden Highway	17
4.2	Additional Workforce	17
4.3	Traffic Generation	18
4.3.1	Traffic Generation	18
4.3.2	Vehicle Access to the Project Site	19
4.4	Changes to the Road Network from Other Projects	19
4.5	Traffic Impact in the Operational Phase	19
4.5.1	Principal Intersections	19
4.5.2	Impacts on the Golden Highway and the Wider Road Network	23
4.6	Cumulative Impacts	23
4.7	Construction Traffic Impacts	24
4.8	Heavy Vehicles	25
4.9	Impacts on Road Safety	26
4.10	Impact on Other Road Users	26
4.11	Impact Mitigation	26
5.0	CONCLUSIONS	27

REFERENCES

ILLUSTRATIONS

Figure 1	Location
Figure 2	The Project
Figure 3	Principal Roads and Traffic Count Locations
Figure 4	Existing Daily Volumes and Vehicle Classifications
Figure 5	AM Peak Hour Traffic Volumes near Project Site
Figure 6	PM Peak Hour Traffic Volumes near Project Site
Figure 7	Conceptual Golden Highway Realignment
Figure 8	2018 Operational AM Peak Hour Traffic Volumes for Project
Figure 9	2018 Operational PM Peak Hour Traffic Volumes for Project

Figure 10	2028 Operational AM Peak Hour Traffic Volumes for Project
Figure 11	2028 Operational PM Peak Hour Traffic Volumes for Project
Figure 12	2018 Construction AM Peak Hour Traffic Volumes for Project

APPENDICES

Appendix 1	Aerial Photographs of Principal Intersections
Appendix 2	SIDRA Traffic Modelling Results

1.0 INTRODUCTION

1.1 Introduction

The United and Wambo mines are neighbouring mining operations located approximately 16 kilometres (km) west of Singleton in the Hunter Valley region of New South Wales (NSW) (refer to **Figure 1**). United Collieries Pty Limited (United) the operator of United mine and Wambo Coal Pty Limited (Wambo) the operator of Wambo mine, have formed a Joint Venture which includes the proposed development of the United Wambo Open Cut Coal Mine Project (the Project).

The Project proposes open cut coal mining for a period of 23 years, with mining in a new open cut mine at United (the United Open Cut) combined with ongoing mining at the existing, approved Wambo Open Cut under a modified mine plan. The Project will optimise future mining operations across these two adjoining open cut mining areas, maximising coal recovery and the efficient use of existing mining infrastructure, while providing the operational flexibility required to actively manage the mine to minimise environmental impacts.

The Project is State Significant Development as defined under *State Environmental Planning Policy (State and Regional Development) 2011* and will require development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project will also require a modification to the existing Wambo mine development consents under section 75W of the EP&A Act to harmonise these consents with the Project. An Environmental Impact Statement (EIS) has been prepared to accompany these applications.

This Traffic and Transport Impact Assessment has been prepared by Transport and Urban Planning Pty Ltd on behalf of Umwelt (Australia) Pty Limited (Umwelt) as part of the environmental assessment for the Project. The Traffic and Transport Impact Assessment has been undertaken in accordance with the Secretary of the Department of Planning and Environment's Environmental Assessment Requirements (SEARs) for the Project. The SEARs were issued on 15 December 2015.

1.2 Authority Requirements

The Secretary's Environmental Assessment Requirements (SEARS) for transport include;

- An assessment of the likely transport impacts on the development of the capacity, condition, safety and efficiency of the local and State road and rail networks, having regard to RMS's and Singleton Shire Council's requirements and paying particular attention to the proposed realignment of the Golden Highway

1.3 Structure of this Report

This report has been prepared to support the EIS, to assess the road transport and traffic impacts associated with the Project. Rail matters are addressed in the EIS.

The assessment has been undertaken in accordance with the requirements of Roads and Traffic Authority's Guide to Traffic Generating Developments October 2002, addressing those matters identified in the SEARS having regard to the RMS's and Singleton Council's requirements. Singleton Council did not identify specific road and traffic matters and the RMS matters are covered in the SEARS.

Other technical standards/publications referenced in this assessment include:



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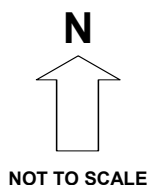


FIGURE 1
 UNITED WAMBO OPEN CUT COAL MINE PROJECT
 HUNTER VALLEY
LOCALITY PLAN
 JOB NO. 15032

- Austroads Guide to Road Design (2008 - 2014) and RMS supplements (various dates from 2009).
- Austroads Guide to Traffic Management (2008 - 2014) and RMS supplements (various dates from 2009).

The remaining sections of this report address the following;

- Section 2 – provides an overview of the existing operations at the mines and describes the Project;
- Section 3 – examines the existing traffic conditions on the road network;
- Section 4 – evaluates the traffic impacts of the Project and identifies mitigation measures; and
- Section 5 – presents conclusions.

2.0 PROJECT

2.1 Existing Wambo and United Mines

The existing Wambo and United mines are located on the southern side of the Golden Highway, west of Wallaby Scrub Road at Warkworth.

The United mine is not currently producing any coal and has operated under care and maintenance mode since 2010.

Wambo currently employs a total of approximately 490 people over a range of shift times during the week with up to approximately 418 workers on a weekday and approximately 202 workers on weekends. Daytime shifts, during weekdays, result in approximately 282 workers on site with the afternoon/night shifts accounting for between approximately 98-103 workers.

On weekends, daytime shifts account for approximately 102 workers, with the night shifts accounting for approximately 100 workers.

Vehicle access to Wambo is via the Main Access Road which is located west of Wallaby Scrub Road.

All coal produced by Wambo is transported via rail, except in the case of emergency, as provided for by the current consent.

Traffic generated by Wambo is predominantly light vehicles (i.e. Austroads Classes 1 and 2 vehicles) associated with the employees/contractors work trips to and from the mine, plus visitor trips.

Heavy vehicles (Austroad Class 3-12 vehicles) generated by the mine are associated with maintenance and the deliveries of equipment, fuel and other supplies.

Section 3.3 provides details on the existing traffic generation of Wambo .

2.2 The Project

Mining has been occurring at Wambo since the late 1960's and at United since 1989, with both mines previously undertaking both open cut and underground mining operations. Over this time the two mines have regularly cooperated, including sharing access to coal resources, where appropriate, to provide for more efficient recovery of the State's coal resources. The two mines have also shared some mining infrastructure including the joint use of the Wambo train loading facility, and share water to minimise external water demand.

Building on this long history of cooperative operations, in November 2014 United and Wambo announced a 50:50 Joint Venture between the two companies. The Joint Venture agreement outlines how the two companies will work together to develop the open cut coal resources held by the two mines.

Whilst open cut coal mining has previously been undertaken at United, over the last two decades the focus has been on underground mining. Underground longwall mining operations were approved to provide up to 2.95 million tonnes per annum (Mtpa) of saleable coal. Operations were suspended at United in March 2010 with the mine entering a period of care and maintenance. At that time, exploration and pre-feasibility works were commenced to determine the potential for future mining activities within United's mining lease. Ongoing exploration has identified substantial reserves of coal suitable for open cut mining.

Ongoing open cut and underground mining is occurring at Wambo, with the mine having approval to extract up to 8 million tonnes per annum (Mtpa) of run of mine (ROM) coal by open cut

methods. The combined Wambo underground and open cut operations have approval to extract up to 14.7 Mtpa ROM coal, and to transport up to 15 Mtpa of product coal via the train loading facility.

As discussed above, the Project includes open cut mining operations in two areas, the proposed United Open Cut and modified operations in the approved Wambo Open Cut for a period of approximately 23 years. The existing Wambo Open Cut has approval for continued open cut mining until March 2017 (with a modification currently being sought to extend this to 2020). Due to the progression of mining being slower than originally planned, there will be substantial coal resources remaining in this approved mining area at March 2017 and the Project proposes to continue mining in this approved area. The Project also seeks some minor extensions to the approved Wambo Open Cut surface mining area and will seek approval to mine deeper resources below the approved Wambo Open Cut area.

The Project will produce up to 10 Mtpa of ROM coal. The existing Wambo CHPP and train loading facility will be utilised for the Project. These facilities will also continue to receive coal from the ongoing Wambo underground mine (that is not the subject of this Project).

The Project also requires a number of changes to the layout of existing mining, public and private infrastructure within the Project Area.

The key aspects of the Project are shown on **Figure 2** and a summary of the key Project details is provided in **Table 2.1**.

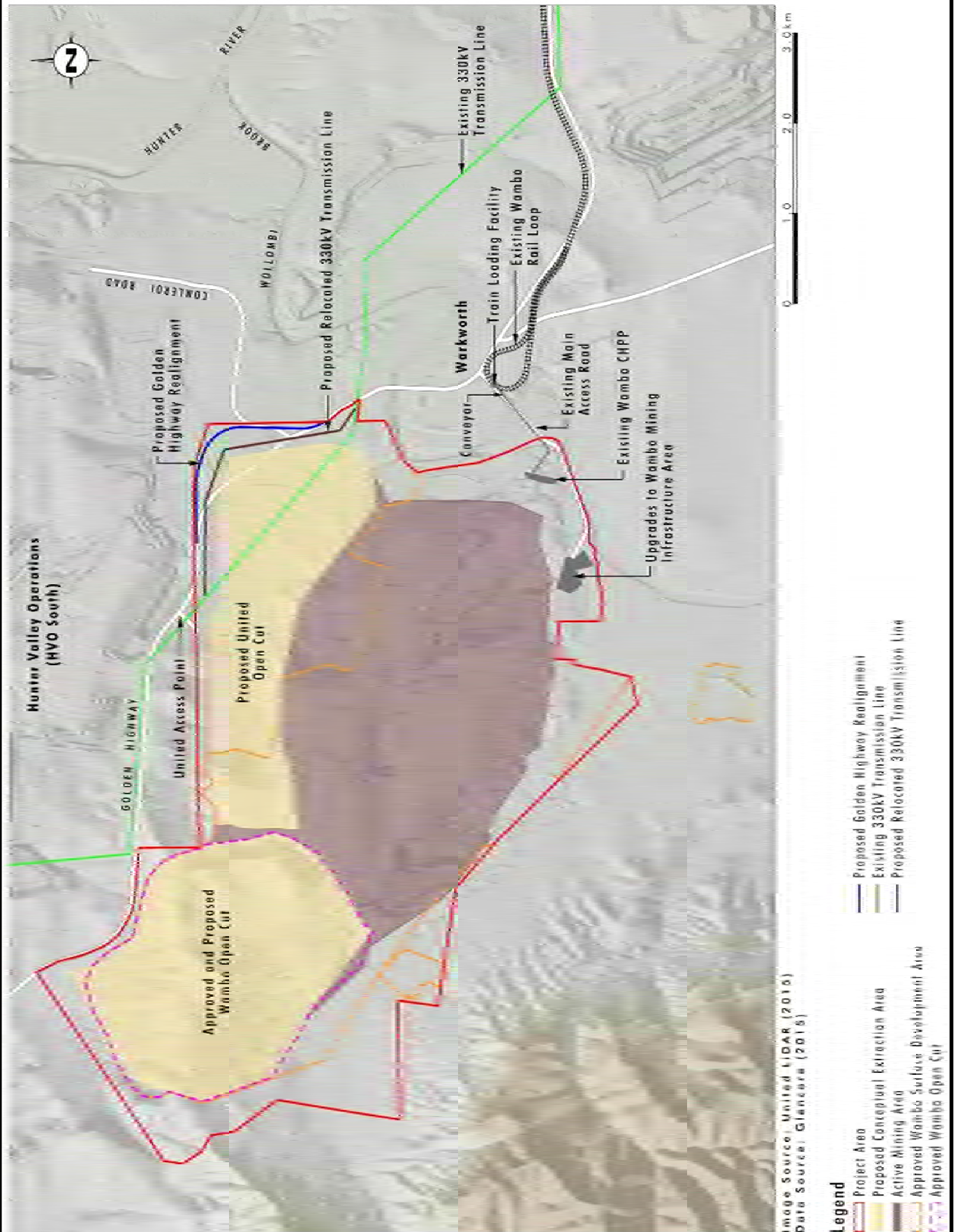
Table 2.1 Summary of Key Project Details

Key Project Components/Aspects	Proposed Operations
Key feature of the Project	The operation of a multi-seam open cut mining operation integrating the existing and approved Wambo Open Cut under a modified mine plan and the proposed United Open Cut.
Total Economically Recoverable Reserve	Approximately 176 Mt of ROM coal recovered from the two open cut mining operations, made up of: - approximately 110 Mt of ROM coal from the United Open Cut. - approximately 66 Mt of ROM coal in total from the Wambo Open Cut, including an additional 40 Mt accessed from the increased depth of mining.
Extraction Rates	Up to 10 Mtpa ROM coal.
Life-of- Mine	Approximately 23 years from the date of Project approval.
Operating Hours	24 hours per day, 7 days per week.
Number of Employees	Up to approximately 500 total operational employees (at peak production).
Mining Methods	Open cut mining using a truck and excavator/shovel fleet.

Key Project Components/Aspects	Proposed Operations
Extent of Mining Areas	Refer to Figure 2 for the proposed extent of open cut mining. The Project proposes to modify the Wambo Open Cut boundary to maximise resource recovery. The modification to the approved Wambo Open Cut boundary will result in a minor surface adjustment of approximately 3.8 hectares of additional disturbance. The modification also includes accessing deeper seams within the existing Wambo Open Cut.
Infrastructure	Initial use of existing United mine infrastructure area prior to its decommissioning and removal due to the progression of the United Open Cut. Construction of temporary facilities during the construction phase of the Project. Ongoing use, expansion and upgrade of the Wambo Mining Infrastructure Area. Use of existing Wambo CHPP and train loading facility within their currently approved annual capacities of 14.7 Mtpa ROM coal and 15 Mtpa product coal respectively.
Tailings and Rejects Strategy	Decommissioning and capping of existing tailings storage facilities located in areas proposed for overburden emplacement and ongoing use of existing tailings storage facilities and storages established in other mine voids as required. Coarse rejects from coal preparation to be transported by truck to the open cut overburden areas for emplacement and subsequent covering by overburden material. Coarse rejects will continue to be co-disposed within the open cut overburden areas for the life of operations.
External Coal Transport	Product coal will continue to be transported off site via rail from the existing Wambo train loading facility. Product coal transport rates proposed to increase from a maximum of six to eight trains per day. No change to total approved 15 Mtpa product coal tonnage transported by train.
Roads	Realignment of a 2 kilometre section of the Golden Highway to accommodate the proposed United Open Cut. The main entrance to the Project will be via the existing entrance to Wambo. The existing United access road will be used in the initial phase of the Project for construction and ancillary services with limited ongoing use as a property access point.
Power Infrastructure	An existing 330 kV transmission line which traverses the proposed United Open Cut mining area is proposed to be relocated as part of the Project (refer to 2). Several other 66 kV and 11kV power lines will also require relocation to outside of proposed mining areas. Some existing telecommunications and associated infrastructure are located adjacent to the existing alignment of the Golden Highway and will also require relocation as part of the Project.

Key Project Components/Aspects	Proposed Operations
Water Management	Construction of additional mine water management controls including dams. Use of the United underground mining voids for water storage.

United is owned 95 per cent by Abelshore Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore) and 5 per cent by the Construction, Forestry, Mining and Energy Union (CFMEU) and is managed by Glencore. Wambo is a subsidiary of Peabody Energy Australia Pty Limited (Peabody).



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NOT TO SCALE

FIGURE 2

UNITED WAMBO OPEN CUT COAL MINE PROJECT
HUNTER VALLEY

THE PROJECT

JOB NO. 15032

3.0 EXISTING TRAFFIC CONDITIONS

3.1 Principal Road Network

The principal road network that provides access to the Project includes Golden Highway, Wambo Mine Main Access Road and United Mine Main Access Road. Other minor roads in the area include Wallaby Scrub Road and Comleroi Road. **Figure 3** shows the location of these roads.

3.2 Description of Existing Roads

The Golden Highway, adjacent to United and Wambo, is predominantly a 2 lane rural road, constructed to a highway standard with channelised intersection treatments at major intersections.

The Golden Highway is constructed with a minimum 7.0 metre sealed road carriageway and wide sealed shoulders/gravel shoulders. It has centreline and edgeline road markings to define the travel lanes, together with Raised Reflective Pavement Markers (RRPM's) and guideposts/reflectors.

The horizontal alignment in the section adjacent the Project site is a mixture of straight sections with large radius curves. The horizontal alignment is relatively flat with sections of modest up/down grades.

The speed limit in this section of Golden Highway is a mixture of 80km/h and 100km/h, with the 80km/h limit posted between 300m east of Wallaby Scrub Road and 900 metres east of Comleroi Road.

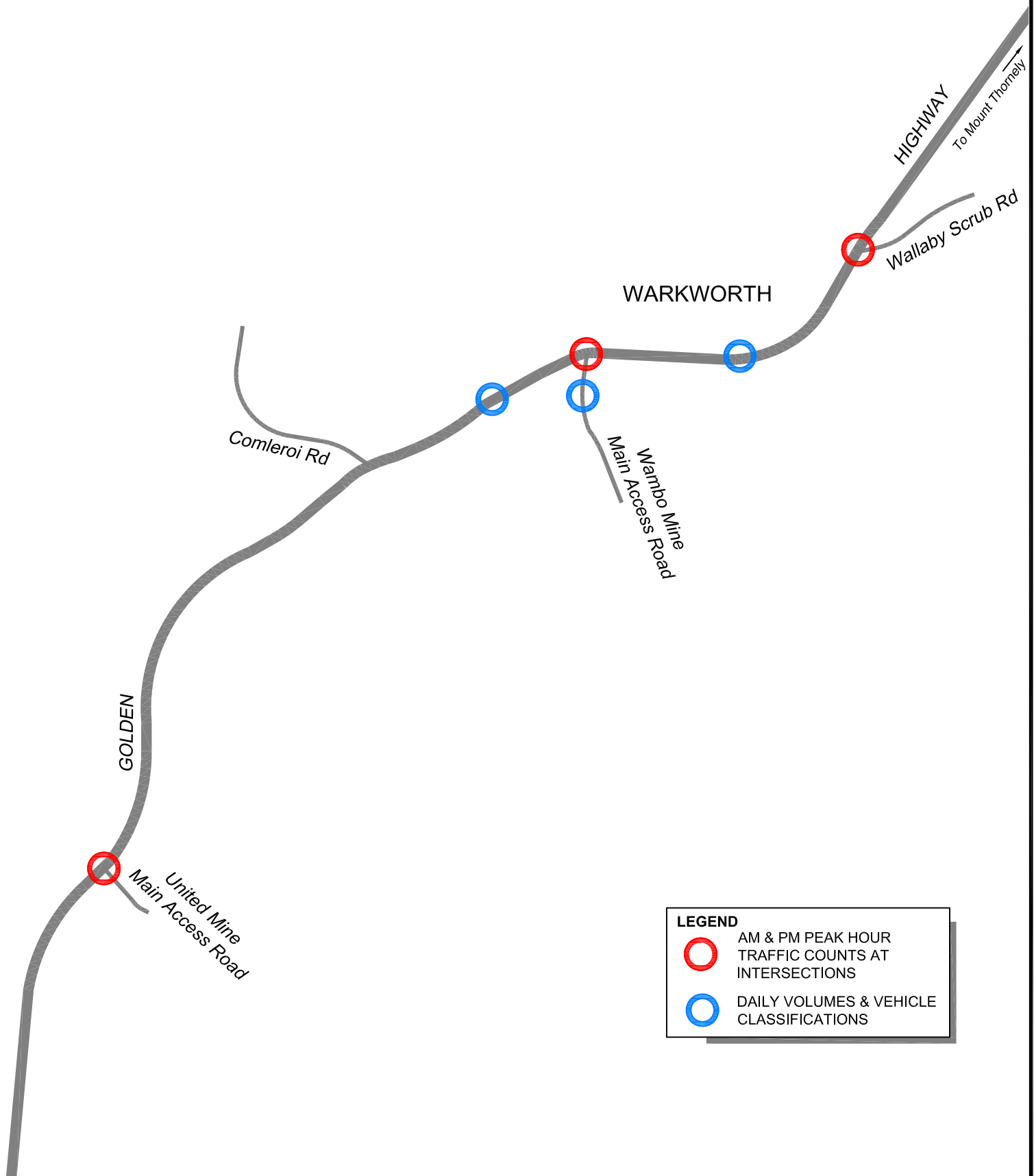
The Wambo Mine Main Access Road intersects Golden Highway on its southern side approximately 420 metres east of Wallaby Scrub Road. This Access Road is a 2 lane road and provides the principal road access to Wambo and will be the principal access road for the Project.

The United Mine Main Access Road intersects Golden Highway some 4.75kms west of the Wambo Mine Access Road. The United Mine Access Road is a 2 lane road and provides the principal access to the United Mine, which is currently in care and maintenance. As part of the Project, the United Mine Access Road will be used in the initial phase for construction and ancillary services with limited ongoing use as a property access point.

Wallaby Scrub Road is a local road that connects between Golden Highway and Putty/Broke Road near Bulga. Wallaby Scrub Road is a 2 lane rural road with a sealed carriageway 7.0 metres wide and gravel shoulders. It has an 80km/h speed limit and sections of centre line marking. It intersects the Golden Highway on its southern side.

Comleroi Road is a 2 lane road that provides access to the Hunter Valley Mine and the Hunter Valley Glider Club, which are located on the northern side of the Golden Highway. The Comleroi Road intersection is located some 2.3kms west of the Wambo Mine Main Access Road.

The principal intersections in this section of the Golden Highway are shown in **Figure 3** and are described below. Appendix 1 shows aerial photographs of the intersections.



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FIGURE 3 UNITED WAMBO OPEN CUT COAL MINE PROJECT HUNTER VALLEY

PRINCIPAL ROADS & TRAFFIC COUNT LOCATIONS

JOB NO.15032

Wambo Mine Access Road

Wambo Mine Access Road forms a seagull T junction intersection with Golden Highway. The speed limit at the intersection is 80km/h. Channelisation at this intersection includes:

- A CHR right turn lane treatment which is 115 metres long including taper, in the western approach of Golden Highway.
- A CHL left turn lane treatment, 140 metres long including taper in the eastern approach of the Golden Highway.
- A right turn acceleration lane, 230 metres long including taper in the eastern approach of the Golden Highway for the right turn out of the mine.
- A short median in Wambo Mine Access Road, together with Give Way/Priority Control. Flaring and large radius corners are provided to cater for the left turns into and out of the Mine Access Road, by heavy vehicles.

Sight distance to the east in Golden Highway from/to the Wambo Mine Access Road exceeds 300 metres. The sight distance to/from the west is slightly restricted by a curve in the Golden Highway, but provides for 270 metres to/from the intersection.

Advance Intersection Warning Signs are provided in both approaches in the Golden Highway and the Mine Access Road is signposted at the intersection. Street lighting is also provided at the intersection.

United Mine Main Access Road

United Mine Main Access Road forms a T junction intersection with Golden Highway. The speed limit at the intersection is 100km/h. The existing channelisation at the intersection includes:

- A CHR right turn lane treatment, 250 metres long including taper, in the western approach of Golden Highway.
- A CHL left turn lane treatment, 130 metres long including taper, in the eastern approach of Golden Highway.
- Give Way/Priority Control in the United Mine Access Road, together with flaring and large radius corners to cater for the left turns into and out of the United Mine Access Road, by heavy vehicles. Sight distance in Golden Highway to/from the intersection is good in both approaches and exceed 300 metres. Advance Intersection Warning Signs are provided in both approaches of Golden Highway.

Wallaby Scrub Road

Wallaby Scrub Road forms a T junction intersection with Golden Highway on its southern side. The speed limit at the intersection is 80km/h.

The channelisation includes:

- Basic Right (BAR) and Left Turn (BAL) Treatments in the Golden Highway with the eastern approach to the intersection in Golden Highway having a wider lane to cater for left turns into Wallaby Scrub Road.
- Give Way/Priority Control in Wallaby Scrub Road.

Sight distance to/from the intersection in Golden Highway is in excess of 200 metres in the eastern approach and 350 metres in the western approach.

Street lighting is provided at the intersection and Advance Intersection Warning Signs are also provided in Golden Highway.

High Street, a minor local road which forms a minor T junction intersection with Golden Highway is located approximately 115 metres west of Wallaby Scrub Road.

Comleroi Road

Comleroi Road forms a T junction intersection with Golden Highway. Comleroi Road is located 70 metres west of a closed secondary access road to the United area. The speed limit at the Comleroi Road intersection is 100km/h..

The channelisation includes:

- A CHL left turn lane treatment 85 metres long including taper in the western approach of Golden Highway.
- A short auxiliary lane, as well as the through lane in the eastern approach of the Golden Highway. This short auxiliary lane was originally provided for the left turn into secondary United Mine's Access Road (which is now closed), but also provides space for westbound through vehicles to pass any right turn vehicles into Comleroi Road.
- Give Way/Priority Control in Comleroi Road together with flaring and large radii corners to cater for the left turns into and out of Comleroi Road, by heavy vehicles.

Sight distance to/from the intersection in both approaches of Golden Highway is good and exceed 300 metres in both directions.

There are several other minor roads that intersect the Golden Highway associated with either Wambo and or United .

These are only used by the occasional maintenance vehicle and typically have Basic Right (BAR) and Left Turn (BAL) treatments, which are appropriate for the intersections.

3.3 Existing Traffic Conditions on the Road Network

3.3.1 Existing Traffic Volumes

Traffic counts on the road network were undertaken as part of this assessment to establish current traffic volumes using the road network

This included daily volume and vehicle classification counts in Golden Highway near the United and Wambo sites and in the Wambo Mine Main Access Road, which were undertaken for the 7 day (week) period between 10 and 16 October 2015.

In addition, intersection turning volumes were undertaken in the weekday AM and PM periods that covered the main shift time changes at the mines at the intersections of:

- Golden Highway/Wallaby Scrub Road;
- Golden Highway/Wambo Mine Access Road; and
- Golden Highway/United Mine Main Access Road.

The intersection counts were undertaken on Tuesday 13 October 2015 between 5.30am and 9.00am and 2.30pm and 6.00pm.

The count locations are shown in **Figure 3**.

For the purpose of describing the traffic count locations and directions in simple terms, the Golden Highway is described as generally running in an east/west direction and the access roads to Wambo and United are described as generally running in a north/south direction.

3.3.2 Daily Volumes and Vehicle Classifications

Tables 3.1 and 3.2 show the daily volumes including heavy vehicles using Golden Highway on a typical week day and per day at the following locations.

- East of Wambo Mine Access Road; and
- West of Wambo Mine Access Road.

Reference to these tables shows that weekdays have the highest traffic volumes.

Typical two way traffic volumes using the Golden Highway, adjacent the Project site on an average weekday (5 day average) are;

- 4392 vehicles per day (vpd) east of the Wambo Mine Main Access Road; and
- 3229 vpd west of the Wambo Mine Access Road.

Heavy vehicles (Austroad Class 3-12 vehicles) represent around 17.9% to 20.0% of the total vehicles using Golden Highway on an average weekday.

Tables 3.3 and 3.4 show the hourly traffic volumes using the Golden Highway at the above locations on an average weekday (5 day average) and daily (7 day average).

Figure 4 provides a summary of the traffic volumes using the Golden Highway adjacent the Project site on an average weekday (5 day average) and daily (7 day average) and Wambo Mine Access Road.



AWT	ADT
3229	3052
20%	17.6%

AWT	ADT
1158	934
12.4%	11.5%

AWT	ADT
4392	3992
17.9%	16.1%

LEGEND

AWT	AVERAGE WEEKDAY VOLUME (5 DAY) TWO WAY
ADT	AVERAGE DAILY VOLUME (7 DAY) TWO WAY
270	DIRECTIONAL TOTAL WEEKDAY VOLUME (5 DAY)
(93)	DIRECTIONAL TOTAL OF DAILY VOLUME (7 DAY)
7.7%	% OF HEAVY VEHICLES (AUSTROADS CLASS 3-12)

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FIGURE 4

UNITED WAMBO OPEN CUT COAL MINE PROJECT
HUNTER VALLEY

EXISTING DAILY VOLUMES AND VEHICLE CLASSIFICATIONS

JOB NO.15032

TABLE 3.1

**GOLDEN HIGHWAY EAST OF WAMBO MINE MAIN ACCESS ROAD
5 DAY AVERAGE AND 7 DAY AVERAGE
TRAFFIC VOLUMES AND VEHICLE CLASSIFICATION**

Direction of Travel	5 Day Average (Weekday)			7 Day Average (ADT)		
	Light ¹	Heavy ²	Total	Light ¹	Heavy ²	Total
East	1852	430	2282	1713	358	2071
West	1754	356	2110	1638	283	1921
Total	3606	786	4392	3351	641	3992
Proportion of Total	82.1%	17.9%	100.0%	73.9%	16.1%	100.0%

Source: Traffic Counts undertaken 10-16 October 2016

¹Light Vehicles – Austroads 1 and 2 vehicle classification and motorbikes

²Heavy Vehicles – Austroads 3-12 vehicle classifications

TABLE 3.2

**GOLDEN HIGHWAY WEST OF WAMBO MINE MAIN ACCESS ROAD
5 DAY AVERAGE AND 7 DAY AVERAGE
TRAFFIC VOLUMES AND VEHICLE CLASSIFICATION**

Direction of Travel	5 Day Average (Weekday)			7 Day Average (ADT)		
	Light ¹	Heavy ²	Total	Light ¹	Heavy ²	Total
East	1344	360	1704	1297	306	1603
West	1239	286	1525	1218	231	1449
Total	2583	646	3229	2515	537	3052
Proportion of Total	80.0%	20.0%	100.0%	82.4%	17.6%	100.0%

Source: Traffic Counts undertaken 10-16 October 2016

¹Light Vehicles – Austroads 1 and 2 vehicle classification and motorbikes

²Heavy Vehicles – Austroads 3-12 vehicle classifications

TABLE 3.3**HOURLY TRAFFIC VOLUMES IN GOLDEN HIGHWAY EAST OF WAMBO MINE MAIN ACCESS ROAD FOR AVERAGE WEEKDAY AND AVERAGE DAY**

Time	5 Day Average			7 Day Average		
	*West	*East	Total	*West	*East	Total
Midnight – 1am	8	14	22	8	12	20
1am-2am	4	7	11	4	7	11
2am-3am	5	26	31	5	22	27
3am-4am	10	10	20	8	13	21
4am-5am	43	12	55	35	11	45
5am-6am	211	51	262	170	44	214
6am-7am	206	89	295	169	74	242
7am-8am	138	118	256	114	104	218
8am-9am	119	103	222	109	89	198
9am-10am	129	116	245	120	109	229
10am-11am	134	125	259	128	118	246
11am-12 noon	127	152	279	126	142	267
12 noon-1pm	126	167	293	124	153	277
1pm-2pm	130	181	311	127	162	289
2pm-3pm	126	188	314	118	176	294
3pm-4pm	139	247	385	131	211	342
4pm-5pm	132	219	351	121	197	318
5pm-6pm	102	173	275	99	149	248
6pm-7pm	85	89	175	82	87	169
7pm-8pm	43	75	118	42	76	118
8pm-9pm	30	37	67	27	39	67
9pm-10pm	35	26	62	30	26	57
10pm-11pm	16	20	37	15	23	38
11pm-Midnight	12	35	47	10	29	39

Source: Traffic Counts undertaken 10-16 October 2015

*Direction of Travel

NB: Hourly directional volumes may not total due to rounding.

TABLE 3.4**HOURLY TRAFFIC VOLUMES IN GOLDEN HIGHWAY WEST OF WAMBO MINE MAIN ACCESS ROAD FOR AVERAGE WEEKDAY AND AVERAGE DAY**

Time	5 Day Average			7 Day Average		
	*West	*East	Total	*West	*East	Total
Midnight – 1am	7	9	16	7	8	15
1am-2am	3	6	9	3	6	9
2am-3am	4	5	9	4	4	8
3am-4am	9	4	13	8	4	12
4am-5am	30	9	39	24	8	32
5am-6am	57	39	96	47	33	80
6am-7am	92	74	166	79	60	139
7am-8am	104	76	180	89	65	154
8am-9am	98	86	184	94	76	170
9am-10am	109	101	210	105	98	203
10am-11am	117	107	224	115	104	218
11am-12 noon	112	131	243	114	126	240
12 noon-1pm	111	147	258	113	137	250
1pm-2pm	95	151	247	102	140	242
2pm-3pm	105	151	256	102	148	250
3pm-4pm	111	150	260	106	141	247
4pm-5pm	105	137	242	97	128	225
5pm-6pm	83	114	196	80	104	184
6pm-7pm	71	68	140	65	69	134
7pm-8pm	39	58	97	39	56	95
8pm-9pm	26	32	58	24	34	58
9pm-10pm	17	21	38	17	22	39
10pm-11pm	10	16	26	10	19	29
11pm-Midnight	10	12	22	9	12	21

Source: Traffic Counts undertaken 10-16 October 2015

*Direction of Travel

NB: Hourly directional volumes may not total due to rounding.

Wambo Mine

Table 3.5 shows the daily volumes including heavy vehicles generated by Wambo on a typical weekday and per day as recorded in the traffic counts for the week of 10-16 October 2015.

Reference to Table 3.5 shows that the mine, on typical weekday (5 day average), generated a total of 1158 vehicle trips (582 in and 576 out). Heavy vehicles number 71 inbound vehicle trips and 73 outbound vehicle trips and represent around 12.4% of the total number of vehicle trips into and out of the mine.

Table 3.6 shows a breakdown of the hourly volumes for an average weekday (5 day average) and daily (7 day average) generated by Wambo.

Peak times for inbound trips to the mine occur between 5.00am and 7.00am and for outbound trips between 3.00pm to 5.00pm.

TABLE 3.5

**WAMBO MINE MAIN ACCESS ROAD
5 DAY AVERAGE AND 7 DAY AVERAGE
TRAFFIC VOLUMES AND VEHICLE CLASSIFICATION**

Direction of Travel	5 Day Average (Weekday)			7 Day Average (ADT)		
	Light ¹	Heavy ²	Total	Light ¹	Heavy ²	Total
South (in)	511	71	582	416	53	469
North (out)	503	73	576	411	54	465
Total	1014	144	1158	827	107	934
Proportion of Total	87.6%	12.4%	100.0%	88.5%	11.5%	100.0%

Source: Traffic Counts undertaken 10-16 October 2016

¹Light Vehicles – Austroads 1 and 2 vehicle classification and motorbikes

²Heavy Vehicles – Austroads 3-12 vehicle classifications

TABLE 3.6

**HOURLY TRAFFIC VOLUMES IN WAMBO MINE MAIN ACCESS ROAD FOR AVERAGE
WEEKDAY AND AVERAGE DAY**

Time	5 Day Average			7 Day Average		
	*South (In)	*North (Out)	Total	*South (In)	*North (Out)	Total
Midnight – 1am	1	6	7	1	4	5
1am-2am	0	1	2	1	1	2
2am-3am	1	22	23	1	18	19
3am-4am	1	6	7	1	8	9
4am-5am	13	3	16	11	2	14
5am-6am	154	12	166	123	11	134
6am-7am	114	16	130	90	13	104
7am-8am	34	42	76	25	39	64
8am-9am	21	16	37	16	12	28
9am-10am	20	15	35	15	11	26
10am-11am	17	17	34	14	13	27
11am-12 noon	16	20	36	12	15	27
12 noon-1pm	14	20	34	11	15	26
1pm-2pm	34	29	63	26	21	47
2pm-3pm	21	37	59	16	27	43
3pm-4pm	28	97	125	25	70	95
4pm-5pm	27	82	109	24	68	92
5pm-6pm	20	59	79	18	46	64
6pm-7pm	13	21	34	16	18	34
7pm-8pm	3	17	21	3	20	23
8pm-9pm	4	4	8	3	6	9
9pm-10pm	18	5	23	14	4	18
10pm-11pm	6	5	11	5	4	9
11pm-Midnight	2	23	25	1	17	18

Source: Traffic Counts undertaken 10-16 October 2015

*Direction of Travel

NB: Hourly directional volumes may not total due to rounding.

3.3.3 Intersections

Figures 5 and 6 shows the peak traffic volumes using the principal intersections adjacent the Project site during the AM peak hour generally between 5.30am – 6.30am, (**Figure 5**) and PM peak hour between 3.30pm – 4.30pm (**Figure 6**).

The AM peak hour varied between the intersections with highest hourly vehicle volumes occurring at the Wambo Mine Main Access Road and Wallaby Scrub Road intersections between 5.30am – 6.30am and at the United Mine Main Access Road between 6.30am – 7.30am.

The Golden Highway in this section carries relatively low east and westbound through volumes in the AM peak hours. West of the United Mine Main Access Road eastbound and westbound volumes ranged between 57 – 79vph. The highest westbound volumes occurred east of Wambo Mine Main Access Road and numbered 227vph, which include vehicles which turned left out of Wallaby Scrub Road.

At Wambo Mine Main Access Road the left turn into the mine from Golden Highway numbered 156vph while the right turn into the mine from Golden Highway numbered 16vph. Also shown in **Figure 5** are the intersection volumes between 6.30am – 7.30am one hour period, as these times will coincide with the expected shift change times for the Project.

Traffic volumes using the Golden Highway during the PM peak hour (3.30pm to 4.30pm) (**Figure 6**) are slightly higher than in the AM peak hour, but are still relatively low traffic volumes in real terms.

West of United Mine Main Access Road, east and westbound traffic volumes in the Golden Highway number 110-120vph. East of Wambo Mine Main Access Road, eastbound and westbound traffic volumes using the Golden Highway number 232vph eastbound and 125vph westbound, respectively.

Turning volumes out of Wambo Mine Main Access Road during the PM peak hour number 104vph turning right to travel east and 10 vehicles turning left to travel west.

At Wallaby Scrub Road, some 191vph of the eastbound vehicles continued east along the Golden Highway towards Mount Thorley and 41vph turned right into Wallaby Scrub Road.

Also shown in **Figure 6** are intersection volumes between 5pm to 6pm which are lower than for the 3.30pm – 4.30pm period. These times will coincide with the PM peak hour for the Project.

Observations during the AM and PM peak hours at all the above intersections confirm that traffic conditions are good with plenty of large gaps occurring in the major traffic movements to allow the minor movements, which are subject to priority control, to turn left or right out of the minor road and or right from the Golden Highway into the minor road.

3.4 Historical Traffic Growth and Future Growth in Background Traffic

Historical traffic growth in the Golden Highway as measured at Mount Thorley (RMS Count Station 5481) and north of Denman (RMS Count Station 5223) has varied.

The Mount Thorley count station only has traffic volumes recorded to 2004. Over the 24 year period between 1980 and 2004, the average lineal growth per year was 3.3%. For the 12 year period between 1992 and 2004, traffic growth was lower and averaged 2.0% per year.



AM HOUR
0630 - 0730

AM PEAK HOUR
0530 - 0630

AM PEAK HOUR
0530 - 0630

AM HOUR
0630 - 0730

AM PEAK HOUR
0630 - 0730

AM HOUR
0530 - 0630

LEGEND	
38	TOTAL VEHICLES
(2)	HEAVY VEHICLES

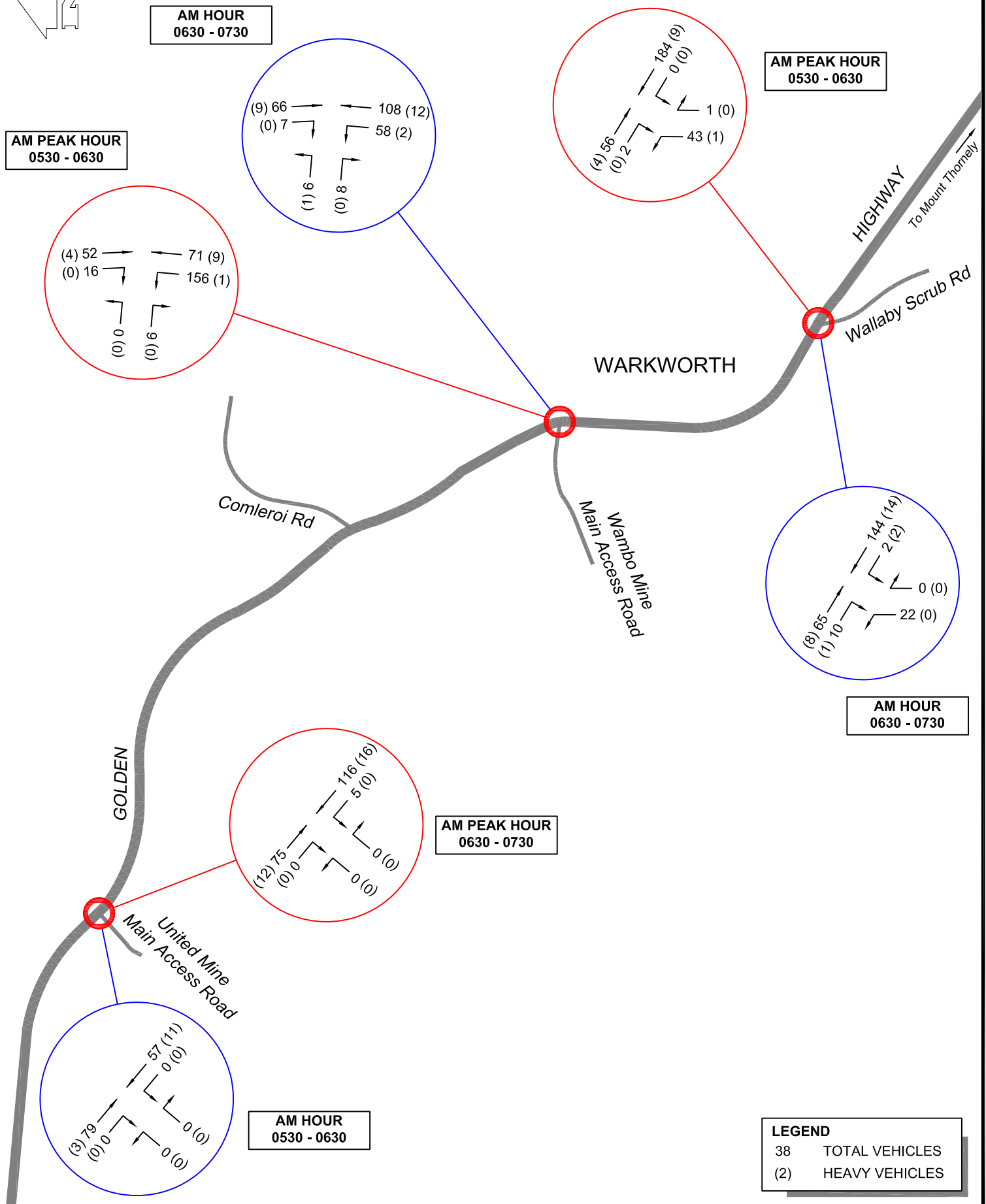
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FIGURE 5 UNITED WAMBO OPEN CUT COAL MINE PROJECT HUNTER VALLEY AM PEAK HOUR TRAFFIC VOLUMES NEAR PROJECT SITE

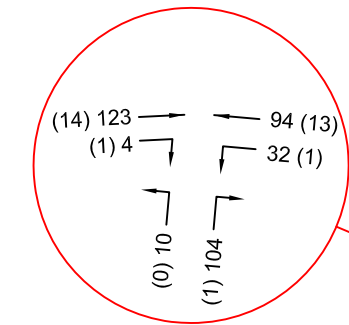
JOB NO.15032



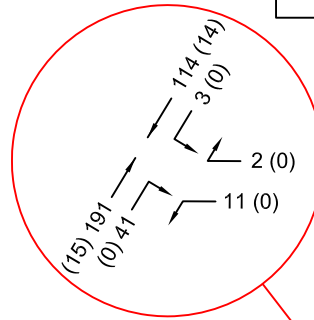
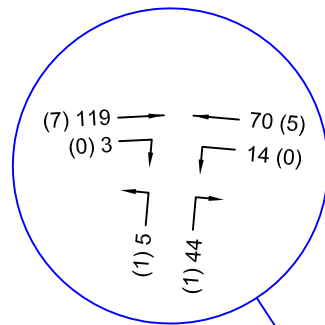


**PM HOUR
1700 - 1800**

**PM PEAK HOUR
1530 - 1630**



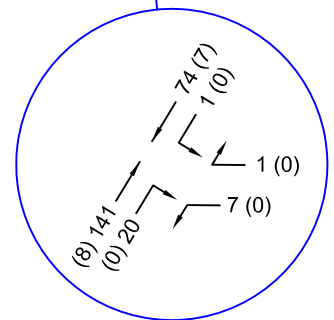
**PM PEAK HOUR
1530 - 1630**



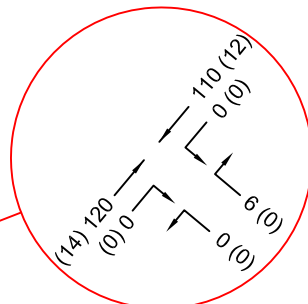
WARKWORTH

Comleroi Rd

Wambo Mine
Main Access Road



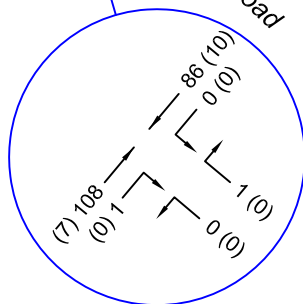
**PM HOUR
1700 - 1800**



**PM PEAK HOUR
1530 - 1630**

GOLDEN

United Mine
Main Access Road



**PM HOUR
1700 - 1800**

LEGEND

38 TOTAL VEHICLES
(2) HEAVY VEHICLES

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FIGURE 6

UNITED WAMBO OPEN CUT COAL MINE PROJECT
HUNTER VALLEY

**PM PEAK HOUR TRAFFIC VOLUMES
NEAR PROJECT SITE**

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The count station north of Denman has traffic volume counts to 2012 and for the 11 year period between 2001 and 2012 the average lineal growth was 2.0% per year.

This historical growth provides some guidance on the likely future growth in background traffic. While the more recent growth in traffic on the Golden Highway has averaged around 2.0% per year, earlier traffic growth was higher, averaging around 3.3%.

For the purpose of this traffic assessment, a future average lineal growth rate of 2.6% per year will be adopted for future increases in background traffic. This is likely to be higher than actual traffic growth, given the down turn in mining, but will provide for a robust assessment.

3.5 Road Crashes

Road crash statistics for the 3 year period between 1 January 2012 and 31 December 2014 for the Golden Highway between Jerrys Plains Road and Wallaby Scrub Road were obtained from the RMS.

During this period there was a total of 5 crashes, two (2) of which were injury crashes. One (1) of the injury accidents was a head on crash which occurred 500 metres north west of Comleroi Road. The other injury crash involved a vehicle striking an animal at night at Simpson Street which is north west of the Wambo Mine Access Road.

Two (2) of the property damage crashes involved vehicles running off the road on separate left hand bends and speed and fatigue were considered factors. These crashes occurred near Simpson Street and south east of Comleroi Road.

The remaining property damage crash occurred at the Golden Highway/Wallaby Scrub Road intersection and involved a right rear crash with a vehicle turning right from the Golden Highway colliding with a stationery vehicle in Wallaby Scrub Road.

No crashes were recorded at the intersections of Golden Highway/Wambo Mine Access Road and or Golden Highway/United Mine Main Access Road.

There is no particular pattern to the above crashes that is considered to be treatable with the use of engineering remedial measures.

4.0 ASSESSMENT OF IMPACTS OF THE PROJECT

4.1 Realignment of Golden Highway

The Project will require the realignment of a 2 kilometre section of the Golden Highway north west of Comleroi Road. The realignment may affect the existing intersection of Comleroi Road with the Golden Highway and this will be taken into consideration when the design for the proposed realignment works is being prepared.

The Joint Venture (United and Wambo) have held preliminary discussions about the proposed realignment of the Highway with the RMS. A preliminary meeting was held on 15 July 2015, and discussions have been ongoing since that time.

If the Project is approved, the Joint Venture will prepare a concept design plan for the realignment of Golden Highway in accordance with Austroad and RMS requirements and submit this to the RMS for their agreement. As part of the concept design the Joint Venture will consult with all other stakeholders, as required. The Joint Venture has begun consultation with Ausgrid and Transgrid in regards to the design and construction of the 330kV and 66kV powerline realignment and the interaction between the powerlines and the proposed Golden Highway realignment.

Following RMS agreement to the concept design, the Joint Venture will enter into a Works Agreement Deed (WAD) with the RMS for the detailed design of the proposed re- alignment and construction of the new section of the Golden Highway.

As the proposed realignment of Golden Highway will be designed and constructed to Austroad and RMS requirements, it would be expected that the impacts associated with the realignment will be satisfactory. In accordance with Austroads guidelines, the proposed realignment of the Golden Highway will have two 3.5m wide lanes with 2.0m wide shoulders. The proposed realignment will have minimal impact on travel distances whilst also retaining the current road speed limit of 100km/hr. The conceptual location of the realigned Golden Highway can be seen in **Figure 7**.

4.2 Additional Workforce

The Project, if approved, is expected to commence in mid-2017 and operate until 2039.

The Project will require an operational workforce of approximately 500 people, between 2017 and 2023. Between 2024 and 2039 the operational workforce is expected to reduce to 450 people.

In the order of 250 employees/contractors of the Project's operational workforce are planned to be drawn from the existing Wambo Open Cut Operations and therefore the additional operational workforce for the Project will be approximately 250 persons up to 2023 and approximately 200 persons from 2024 onwards.

The Wambo underground operation (which is not part of the Project) has approval to operate until 2032, with a total operational workforce of 361 employees/contractors, including those associated with the operation of the CHPP. Unless otherwise approved, Wambo's underground operation will cease after 2032 and the total operational workforce on the site will reduce to approximately 481 persons consisting of approximately 450 from the Project and approximately 31 persons at the CHPP and other areas.

During the construction period between mid-2017 and the end of 2018, an additional maximum of approximately 120 persons associated with construction will be working on the Project, at the same time. This is planned to occur in the first half of 2018, subject to project approval.

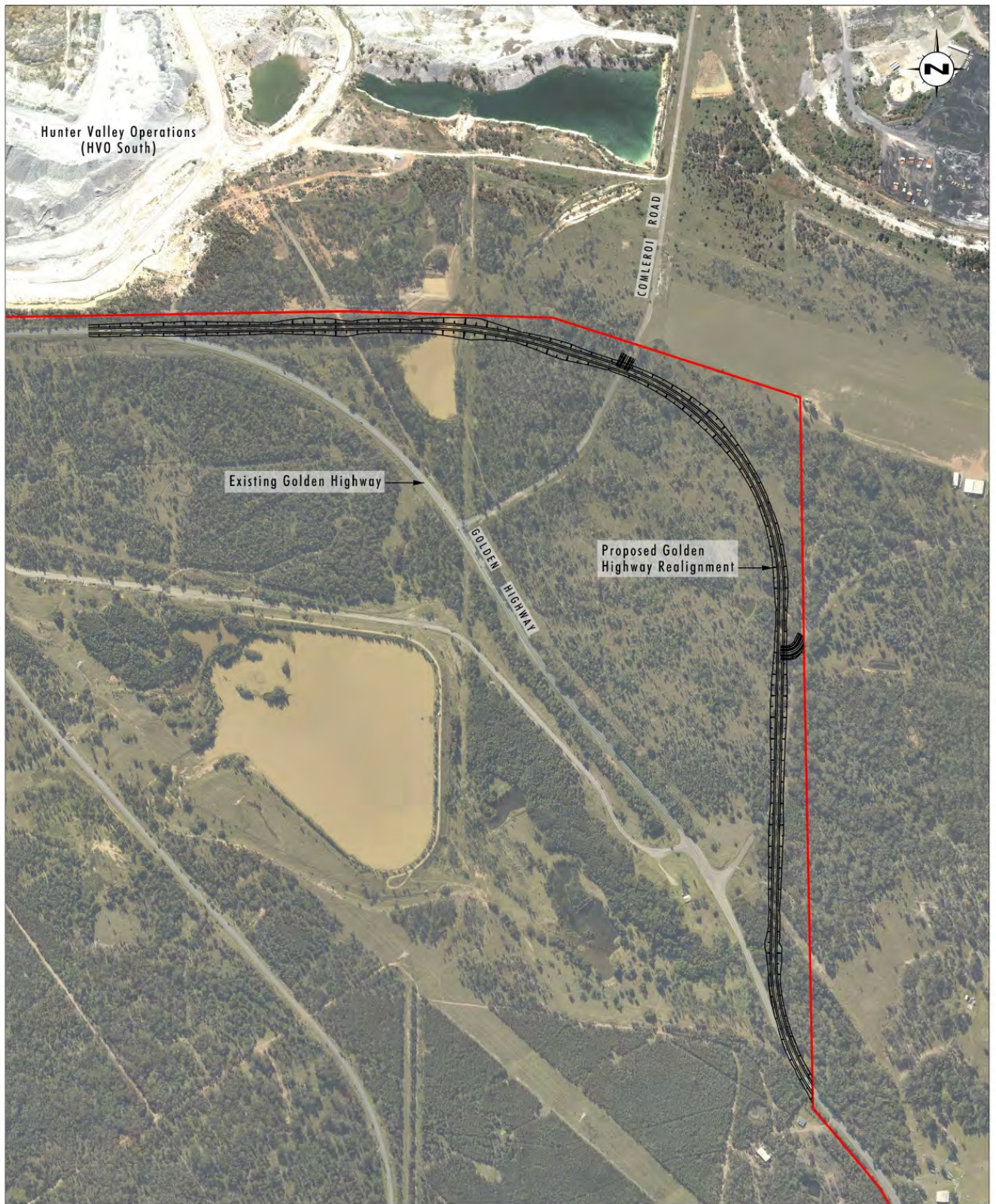


Image Source: AAM (2012), United (2015)
Base Data Source: Glencore (2015)

Legend

- Project Area
- Proposed Golden Highway Realignment

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N



NOT TO SCALE

FIGURE 7

UNITED WAMBO OPEN CUT COAL MINE PROJECT HUNTER VALLEY CONCEPTUAL GOLDEN HIGHWAY REALIGNMENT

JOB NO. 15032

4.3 Traffic Generation

4.3.1 Traffic Generation

Operational Phase

Weekdays will continue to be the busiest days in terms of traffic generation.

Based on vehicle occupancies of 1.2 persons per car, workers trips associated with the operational phase of the Project on a weekday will number:

- 238 vehicle trips in/238 vehicle trips out per day between 2017 and 2023.

Of these, around 50% will be new vehicle trips over a full week. All of these are expected to be light vehicle trips (i.e. Austroad Class 1 and 2 vehicles).

Additional visitor trips which will also be light vehicle trips are expected to number up to:

- 30 trips in/30 trips out per day.

Additional heavy vehicle trips (i.e Austroad Class 3-12) associated with the Project are expected as:

- 8 heavy vehicles in and 8 heavy vehicles out per day, associated with the delivery of supplies and equipment.

The total additional vehicle trips on weekdays due to the Project are estimated to be 157 trips in/157 trips out comprising of 149 light vehicles and 8 heavy vehicles arriving and departing the mine.

The mining workforce trips associated with the Project are expected to be split into two shifts between 7am and 7pm and 7pm to 7am. Arrival and departure trips will occur around these shift time changes.

Managers and staff work trips will occur around a start time of 7am and a finish time of 5pm.

Visitor trips will occur between 7am to 6pm and most heavy vehicle trips will also occur during the same hours.

Those employees/contractors and staff working at the existing Wambo underground (which is not part of the Project) will continue to work to their existing shifts, which do not overlap with the expected shift time changes for the Project which are 7am and 7pm.

Construction Phase

Subject to project approval, the schedule for the construction works involves:

- The expansion and upgrading of the Mining Infrastructure Area (MIA) which is scheduled for mid 2017 to mid 2018;
- The realignment of the Golden Highway which is scheduled from the end of 2017 to the end of 2018;
- The relocation of Electricity Infrastructure which is scheduled from mid 2017 to the end of 2018; and

- The construction of the Water Management System, which is scheduled for 9 months in 2017.

Construction hours will primarily be 6am to 6pm, Monday to Friday and Saturday 8am to 1pm. Some construction activities associated with the realignment of the Golden Highway and electrical infrastructure may be required outside these hours where there is a requirement to sustain the operational integrity of public infrastructure.

The maximum number of light vehicle trips associated with the construction workforce will be approximately 100 vehicle arrivals in the morning before 6am and approximately 100 vehicle departures in the afternoon after 6pm.

Heavy vehicles generated by construction of the Project will be a maximum of 60 heavy vehicles per day (ie. 60 in/60 out). This will occur during the construction of the section of the Golden Highway which is to be realigned, as part of the Project. As noted above, these road works are planned for a 12 month period, at this stage from the end of 2017 to the end of 2018.

During the early stages of construction, ie. mid 2017 to the end of 2017, the maximum number of heavy vehicles associated with construction are estimated as approximately 30 heavy vehicles per day (ie. 30 in/30 out).

4.3.2 Vehicle Access to the Project Site

Other than for a construction related vehicles during the construction phase and some maintenance vehicles which will use United Mine Access Road, all vehicles accessing the Project site will use the Wambo Mine Access Road to enter and exit the Project site from the Golden Highway. The construction related traffic using United Mine Access Road will be well within the capacity of the existing intersection which was designed to cater for mine traffic when the mine was operational.

Due to the nature and duration of use of United Mine Access Road, combined with the existing small volume of traffic using this road, no traffic modelling has been undertaken for the Golden Highway/United Mine Access Road as part of this assessment.

4.4 Changes to the Road Network from Other Projects

The Warkworth Continuation Project (SSD6464) has approval to mine through Wallaby Scrub Road without relocating this road. All traffic using Wallaby Scrub Road will be detoured via the Golden Highway and Putty Road. The approval based on the traffic assessment for Warkworth Continuation Project confirms that Wallaby Scrub Road will be closed in 2017.

When this occurs it is assumed that Wallaby Scrub Road will be closed at Golden Highway and no intersection will be retained at this location.

For the assessment of the Project, it has been assumed that Wallaby Scrub Road may still be open to traffic in 2018, but will be closed in future years.

4.5 Traffic Impact in the Operational Phase

4.5.1 Principal Intersections

The Project is expected to commence in mid 2017, subject to approval.

The traffic impacts associated with the operation of the Project have been examined for 2018, which represents the peak year for operational and construction traffic associated with the Project and also for the future year 2028.

The largest impact will occur on weekdays during the 6.30am to 7.30am hour associated with shift time change which will occur at 7.00am. During this hour the day shift workforce and contractors, plus the staff and managers, will arrive at the mine and the night shift workers will depart. During this period it is estimated that there will be a total of approximately 238 worker vehicle trips (148 in/90 out) as well as an additional approximately 2 heavy vehicles entering and exiting the mine.

Not all of these trips are new trips to the mine, as a proportion of the Project's workforce will be drawn from the existing workforce of Wambo's Open Cut. These personnel currently arrive/depart the mine between the 5.30am/6.30am period.

Figure 8 shows the total predicted traffic volumes in the 6.30am – 7.30am period arriving and departing the mine in 2018 via the Golden Highway, as well as at the adjoining Wallaby Scrub Road intersection. The traffic generation of existing Wambo underground AM shift is not included in these volumes as it has a different shift time.

Currently 90% of traffic generated by the mine arrives and departs from/to the east with 10% arriving and departing from/to the west. This traffic assignment split has been retained for the Project, as has the existing traffic split for traffic using Wallaby Scrub Road.

The through volumes in the Golden Highway have been increased by an average of 2.6% per year between 2015 and 2018 to account for background traffic growth.

Traffic dispersal from the mine during the weekday PM period will be spread over the 3.30pm to 7.30pm period.

Due to the different shift time changes between the Project and the existing Wambo operations, the Project will decrease the existing PM peak hour volumes during the 3.30pm to 4.30pm period and spread some of this traffic, as well as the additional Project's traffic to the 5.00pm – 6.00pm and the 6.30pm to 7.30pm periods.

The Golden Highway carries higher traffic volumes during the 5.00pm – 6.00pm hour than during the 6.00pm – 7.00pm and 7.00pm – 8.00pm hours and therefore the 5.00pm – 6.00pm hour will represent the PM peak hour associated with the Project.

During the 5.00pm – 6.00pm hour some 60 vehicles associated with the managers and staff are expected to leave the mine, as well as up to 2 heavy vehicles.

Figure 9 shows the 2018 weekday PM peak hour volumes during the 5.00pm – 6.00pm hour at the intersections in the Golden Highway at Wambo Access Road and Wallaby Scrub Road.

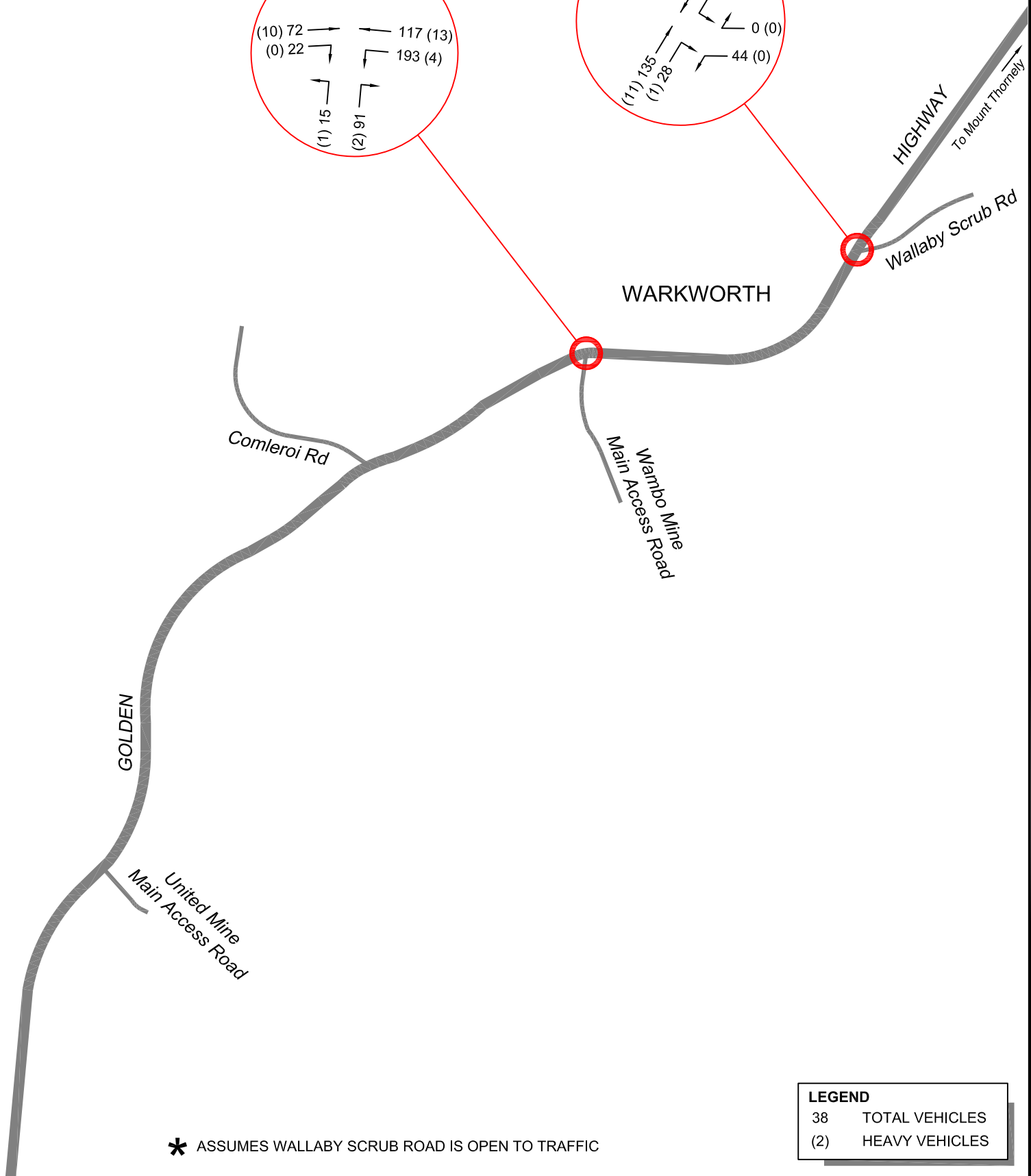
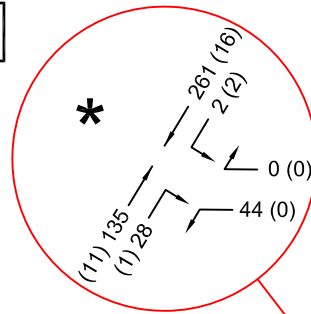
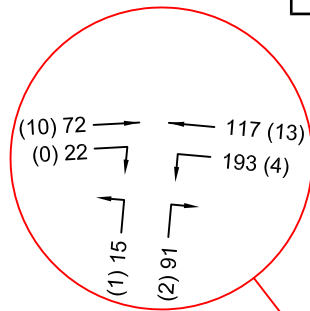
The weekday AM and PM peak hour volumes for the year 2028 are shown on **Figures 10 and 11**.

While there will be a decrease in the operational workforce from 500 persons to 450 persons by 2028, no reduction has been made to the workforce trips between 2018 and 2028, as the decrease is relatively small at around 12-13 vehicle trips in the AM peak period. Background traffic growth of 2.6% per year, as averaged over a 13 year period between 2015 and 2023, has been added to the through volumes in Golden Highway.

To examine the impacts of the additional traffic associated with the operational phase of the Project on the principal intersections on the adjacent road network, traffic modelling using



AM PEAK HOUR
0630 - 0730



LEGEND	
38	TOTAL VEHICLES
(2)	HEAVY VEHICLES

* ASSUMES WALLABY SCRUB ROAD IS OPEN TO TRAFFIC

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FIGURE 8

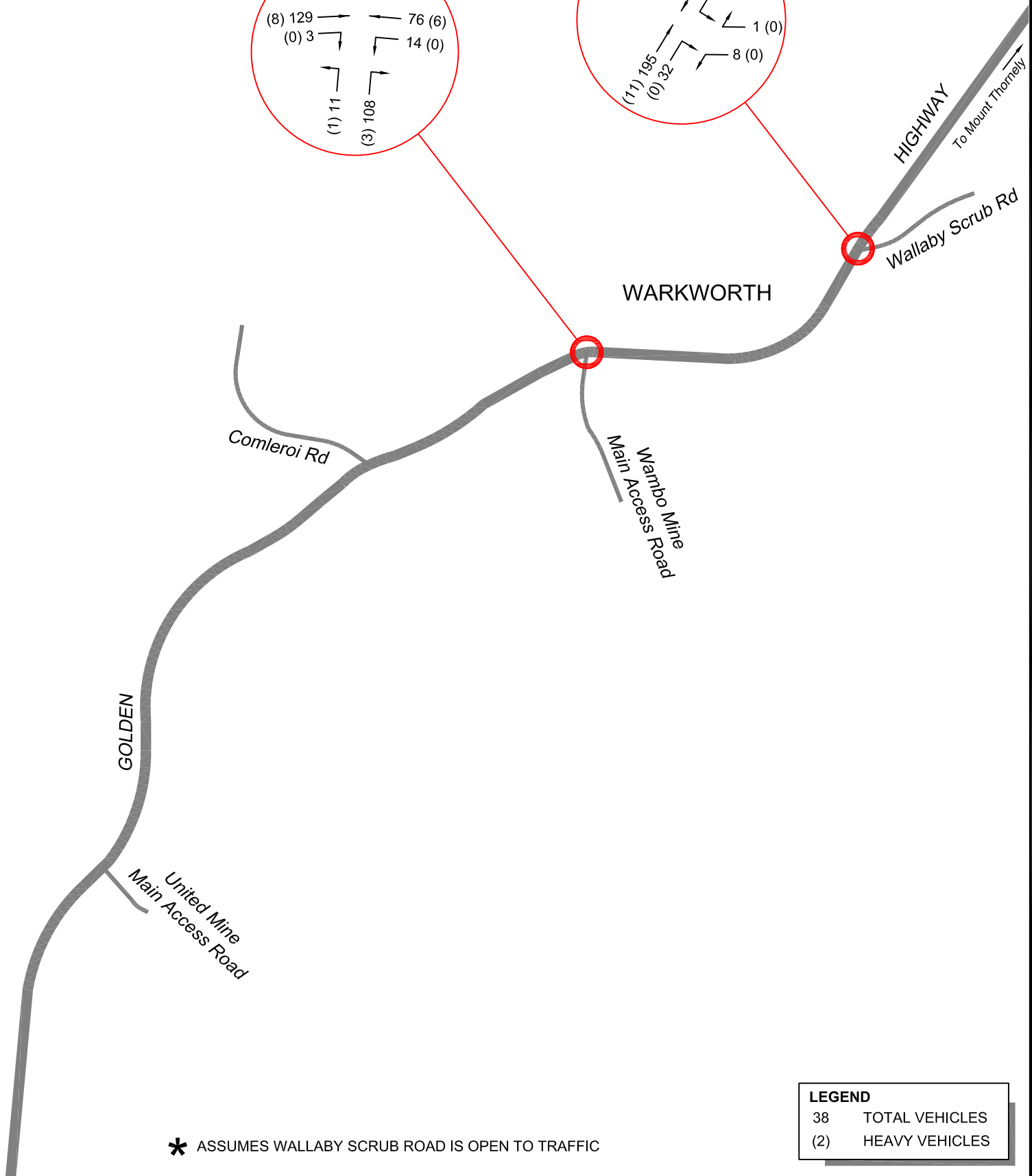
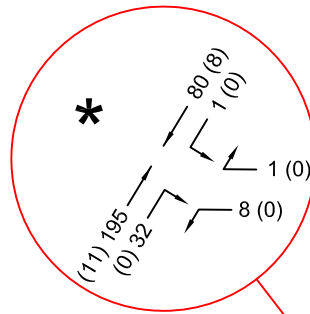
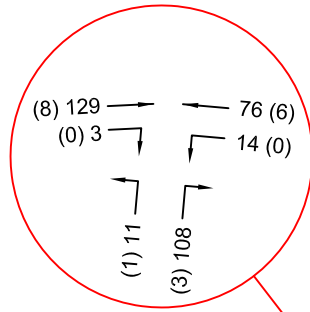
UNITED WAMBO OPEN CUT COAL MINE PROJECT
HUNTER VALLEY

2018 OPERATIONAL AM PEAK HOUR TRAFFIC VOLUMES FOR PROJECT

JOB NO.15032



PM PEAK HOUR
1700 - 1800



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FIGURE 9

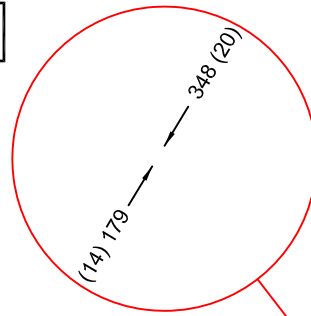
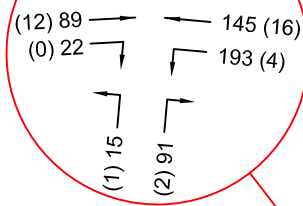
UNITED WAMBO OPEN CUT COAL MINE PROJECT
HUNTER VALLEY

2018 OPERATIONAL PM PEAK HOUR TRAFFIC VOLUMES FOR PROJECT

JOB NO.15032



AM PEAK HOUR
0630 - 0730



WARKWORTH

HIGHWAY

To Mount Thornely

Wallaby Scrub Rd

ROAD CLOSED

Comleroi Rd

Wambo Mine
Main Access Road

GOLDEN

United Mine
Main Access Road

LEGEND

38 TOTAL VEHICLES
(2) HEAVY VEHICLES

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FIGURE 10

UNITED WAMBO OPEN CUT COAL MINE PROJECT
HUNTER VALLEY

2028 OPERATIONAL AM PEAK HOUR
TRAFFIC VOLUMES FOR PROJECT

JOB NO.15032

JOB NO.15032

the SIDRA 6.1 software package has been undertaken for the 2018 and 2028 AM and PM periods. The modelling has adopted the existing channelisation and traffic management at Golden Highway intersections with Wambo Main Access Road and Wallaby Scrub Road, as well as the AM and PM traffic volumes in **Figures 8, 9, 10 and 11**.

SIDRA assesses the operational performance of intersections under traffic signal, roundabout or sign control. The best criteria for assessing intersections controlled by traffic signals are Level of Service (LS), Degree of Saturation (DS) and Average Vehicle Delay (AVD). Table 4.1 shows the Level of Service Criteria for intersections as presented in the RMS (formerly RTA) Guide to Traffic Generating Developments.

For intersections controlled by Give Way/Stop signs, the Level of Service of the intersection is determined by the movement with the highest average vehicle delay (highest movement delay) and not the average vehicle delay for all vehicles using the intersection.

RMS Guidelines indicate that a Level of Service D operation, or better (ie. A, B, C or D) is desirable design criteria for intersections.

TABLE 4.1

LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<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. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Intersection is oversaturated	Oversaturated, requires other control mode

Source: Table 4.1 Guide to Traffic Generating Developments October 2002

The results of the traffic modelling for the Golden Highway intersections with Wambo Access Road and Wallaby Scrub Road in 2018 with the Project are shown in Tables 4.2 and 4.3. Reference to these tables show that both intersections will operate at a very good level of service (a Level of Service A operation) with very low vehicle delays occurring at both intersections, with the Project in place.

Table 4.4 shows the modelling results for the future 2028 year at the Golden Highway/Wambo Mine Access Road intersection with the Project. Reference to Table 4.4 shows that traffic conditions at this intersection will continue to remain very good with a Level of Service A operation and low vehicle delays.

No traffic modelling has been undertaken for the Golden Highway/Wallaby Scrub Road intersection for 2028, as Wallaby Scrub Road will be closed.

The SIDRA Traffic Modelling Outputs are contained in Appendix 2.

In summary, the principal intersections on the road network adjacent the site will continue to operate at very good levels of service with the Project in place.

TABLE 4.2

SIDRA MODELLING RESULTS FOR GOLDEN HIGHWAY AND WAMBO MINE ACCESS ROAD IN 2018 FOR BASE CASE (WITHOUT PROJECT) AND WITH OPERATIONAL TRAFFIC FROM PROJECT

Criteria	2018 Base Case		2018 With Project	
	AM	PM	AM	PM
LS	A	A	A	A
DS	0.064	0.069	0.122	0.132
AVD (secs)	2.1	1.7	4.6	2.8
HMD (secs)	7.4	7.1	8.1	7.1
Highest 95 th % Queue Length	0.3	1.5	3.5	3.9

Where: LS Level of Service
DS Degree of Saturation
AVD Average Vehicle Delay
HMD Highest Movement Delay
Highest 95th% Queue Length – Longest 95th% Queue Length in Metres at the Intersection

TABLE 4.3

SIDRA MODELLING RESULTS FOR GOLDEN HIGHWAY AND WALLABY SCRUB ROAD IN 2018 FOR BASE CASE (WITHOUT PROJECT) AND WITH OPERATIONAL TRAFFIC FROM PROJECT

Criteria	2018 Base Case		2018 With Project	
	AM	PM	AM	PM
LS	A	A	A	A
DS	0.087	0.094	0.141	0.123
AVD (secs)	0.9	0.8	1.2	0.9
HMD (secs)	7.9	7.9	7.9	7.9
Highest 95 th % Queue Length	0.5	0.9	1.6	1.5

Where: LS Level of Service
DS Degree of Saturation
AVD Average Vehicle Delay
HMD Highest Movement Delay
Highest 95th% Queue Length – Longest 95th% Queue Length in Metres at the Intersection

TABLE 4.4**SIDRA MODELLING RESULTS FOR GOLDEN HIGHWAY AND WAMBO MINE ACCESS ROAD IN 2028 WITH OPERATIONAL TRAFFIC FROM PROJECT**

Criteria	AM	PM
LS	A	A
DS	0.130	0.142
AVD (secs)	4.3	2.6
HMD (secs)	8.3	7.7
Highest 95 th % Queue Length	3.7	4.1

Where: LS Level of Service
DS Degree of Saturation
AVD Average Vehicle Delay
HMD Highest Movement Delay
Highest 95th% Queue Length – Longest 95th% Queue Length in Metres at the Intersection

4.5.2 Impacts on the Golden Highway and the Wider Road Network

The impact on the Golden Highway east and west of the Project site and on the wider road network is expected to be relatively minor.

Two way weekday volumes in the Golden Highway east of the Wambo Mine Main Access Road will increase by an estimated 282 vehicles per day (vpd) from 4392vpd to 4674vpd. West of the Mine Access Road the increase will be 32vpd, from 3229vpd to 3261vpd.

These additional traffic volumes represent an increase of 6.4% and 1.1% over the existing weekday volumes using the Golden Highway, east and west of Wambo Mine Main Access Road.

Traffic conditions on this section of the Golden Highway are relatively good and the additional traffic from the Project will not alter this. Similarly the impacts on the wider road network are expected to be satisfactory..

4.6 Cumulative Impacts

The intersection analysis for this Project for the future 2028 timeframe has included background traffic growth of 2.5% per year, as averaged over the years between 2015 and 2028.

This background traffic growth would account for the cumulative impacts of the other projects in the surrounding areas that have been approved, but have not commenced operations as yet. As the mining boom in Australia has ended, anecdotal evidence suggests that some mines in the Hunter Region have reduced operations and therefore future traffic volume increases on the road network are likely to be lower than annual increases over the last decade.

As identified in the assessment of the principal intersections in the Golden Highway, these intersections have plenty of spare capacity with very low vehicle delays and therefore could easily absorb higher traffic volumes, if these occurred.

4.7 Construction Traffic Impacts

As noted in Section 4.3, the largest impacts associated with construction will occur on weekdays before 6.00am (ie. 5.30am – 6.30am) and after 6.00pm (6.00pm – 7.00pm) associated with worker trips.

These times do not coincide with the shift times for the operational workforce of the Project.

The AM hour between 5.30am – 6.30am is expected to have the highest traffic volumes during construction and **Figure 12** shows construction traffic volumes overlaid to the base 2018 volumes for the 5.30am – 6.30am period.

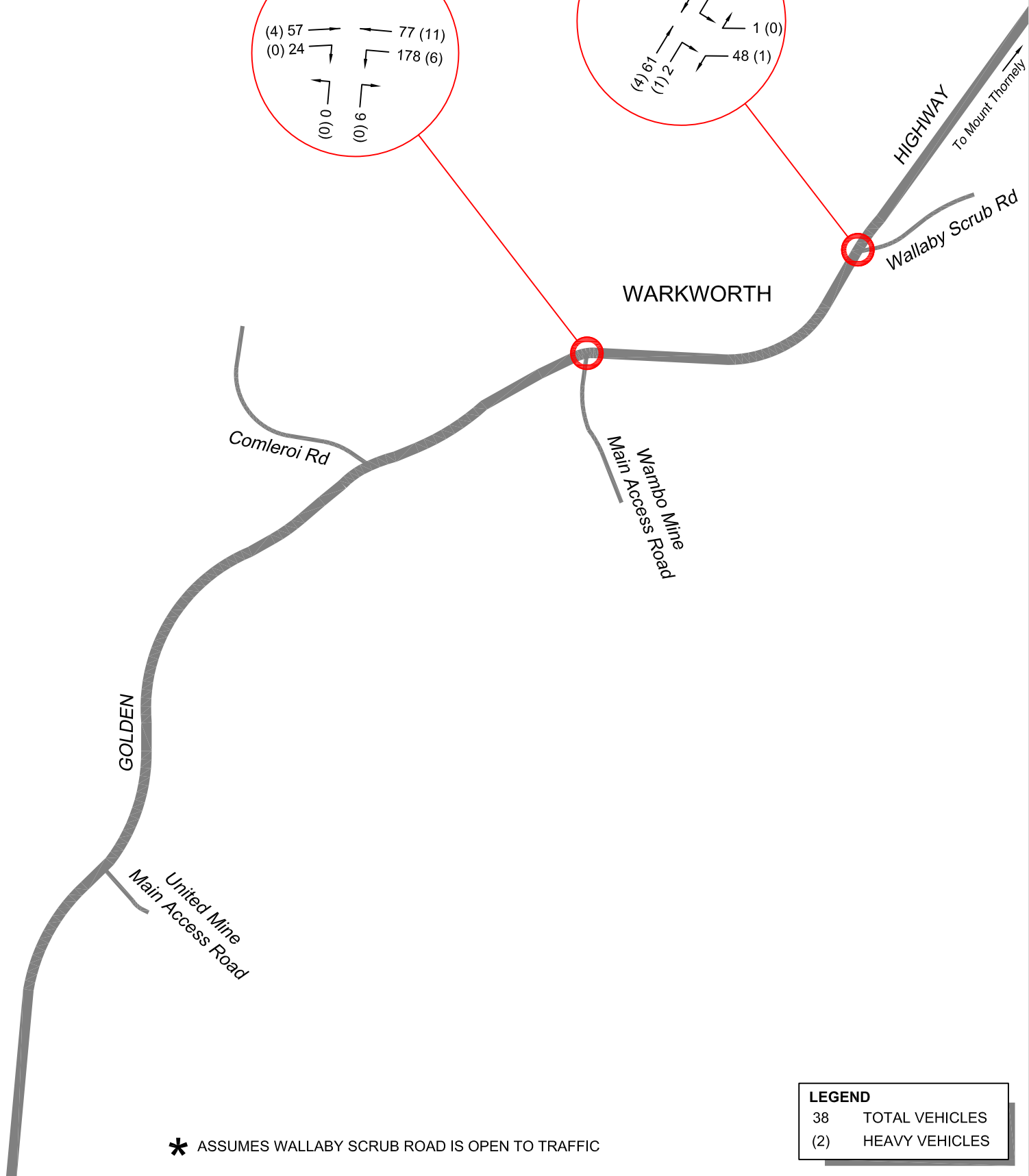
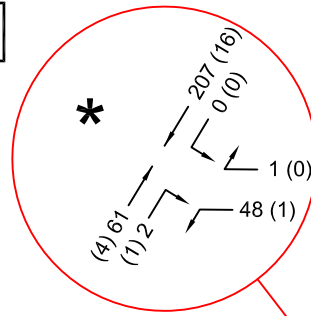
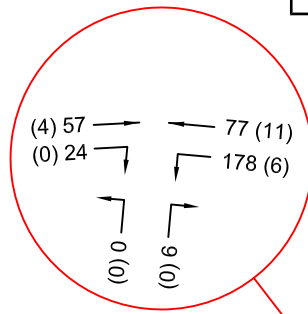
SIDRA traffic modelling has been undertaken on the Golden Highway intersections of the Wambo Mine Access Road and Wallaby Scrub Road to assess the impacts of the construction traffic on these intersections.

Tables 4.5 and 4.6 shows the modelling results for these intersections and reference to these tables shows that both intersections will retain a very good operation with a Level of Service A operation and low vehicle delays.

Based on this, the impacts on the adjacent principal intersections during construction are considered to be satisfactory.



AM PEAK HOUR
0530 - 0630



* ASSUMES WALLABY SCRUB ROAD IS OPEN TO TRAFFIC

LEGEND	
38	TOTAL VEHICLES
(2)	HEAVY VEHICLES

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FIGURE 12

UNITED WAMBO OPEN CUT COAL MINE PROJECT
HUNTER VALLEY

2018 CONSTRUCTION AM PEAK HOUR TRAFFIC VOLUMES FOR PROJECT

JOB NO.15032

TABLE 4.5**SIDRA MODELLING RESULTS FOR GOLDEN HIGHWAY AND WAMBO MINE ACCESS ROAD IN 2018 WITH CONSTRUCTION TRAFFIC**

Criteria	AM
LS	A
DS	0.094
AVD (secs)	4.5
HMD (secs)	7.7
Highest 95 th % Queue Length	0.6

Where: LS Level of Service
DS Degree of Saturation
AVD Average Vehicle Delay
HMD Highest Movement Delay
Highest 95th% Queue Length – Longest 95th% Queue Length in Metres at the Intersection

TABLE 4.6**SIDRA MODELLING RESULTS FOR GOLDEN HIGHWAY AND WALLABY SCRUB ROAD IN 2018 WITH CONSTRUCTION TRAFFIC**

Criteria	AM
LS	A
DS	0.105
AVD (secs)	1.0
HMD (secs)	7.9
Highest 95 th % Queue Length	1.0

Where: LS Level of Service
DS Degree of Saturation
AVD Average Vehicle Delay
HMD Highest Movement Delay
Highest 95th% Queue Length – Longest 95th% Queue Length in Metres at the Intersection

As noted in Section 4.3.2 there will also be some use of the United Mine Main Access intersection with Golden Highway during the early stages of construction by some construction vehicles including workers vehicles.

As noted in Section 3.2, this intersection has a high level of traffic management including left and right turn lanes in Golden Highway, as well as very good sight distance. The current traffic volumes entering and exiting United are very low.

The use of this intersection by some construction vehicles will be easily accommodated, with minimal impact on traffic conditions at the intersection, due to high level of capacity that is available at this intersection.

4.8 Heavy Vehicles

Existing heavy vehicles generated by Wambo include rigid trucks and articulated vehicles, as well as the occasional oversized vehicle.

This will continue with the Project. Any oversize vehicles delivering equipment or materials during the Construction Stage of the Project, or in the Operational Stage will have the appropriate permits as required.

4.9 Impacts on Road Safety

The Project is not expected to have any adverse impacts on road safety on the road network.

While there will be an increase in traffic using the Wambo Mine Main Access Road intersection with the Golden Highway, traffic conditions at this intersection are expected to remain satisfactory in terms of level of service and vehicle delays. Other adjacent intersections in the Golden Highway carry relatively low traffic volumes.

The realignment of the section of the Golden Highway, which is proposed as part of the Project will be designed and constructed to Austroad and RMS standards and therefore should have no adverse impact on road safety in the Golden Highway.

4.10 Impact on Other Road Users

The Project is not expected to have any negative impacts to other road users. As noted previously, the impacts are relatively minor and the assessment has demonstrated that traffic conditions will remain satisfactory on the road network.

Mitigation measures are proposed and these will be designed and constructed to the relevant Austroads and RMS standards.

4.11 Impact Mitigation

The recommended mitigation measures include;

- i) The proposed realignment of a 2km section of the Golden Highway north west of Comleroi Road, which is required as part of the Project.

This road change will be designed and constructed in accordance with Austroad and RMS standards following approval by the RMS, who is the consent road authority. The proposed realignment road section will retain two 3.5 metre wide travel lanes with two metre wide road shoulders and will be designed to retain existing 100km/h speed limit. The proposed road alignment will have minimal impact on travel distances in this section of The Golden Highway.

5.0 CONCLUSIONS

This report documents an assessment of the road transport and traffic impacts of the United and Wambo Open Cut Project which is a joint venture proposal by United and Wambo.

The Project is located adjacent the Golden Highway at Warkworth at the existing coal mines operated by United and Wambo.

The Project is expected to employ up to 500 people which will reduce to 450 people after 7 years. Approximately 50% of the Project workforce will be drawn from the existing Wambo Coal's workforce.

If approved, the Project will commence in 2017 and operate to 2039. All coal produced by the Project will continue to be transported from the mine by rail.

Vehicle access to and from the Project site will be via Wambo Mine Main Vehicle Access Road which intersects with the Golden Highway.

Traffic generated by the existing Wambo mine and the Project consist of trips associated with the workforce and visitors, as well as deliveries associated with equipment and supplies to the mine.

An assessment of the traffic impacts of the Project during the Operational Phase indicates that traffic conditions on the adjacent road will remain good with minimal delays at principal intersections.

Construction associated with the Project is expected to take approximately two years and the assessment of the construction impacts has found that these impacts will also be satisfactory.

Recommended mitigation measures include the realignment of a section of Golden Highway, to be designed and constructed in accordance with Austroad and RMS standards, following approval by RMS.

REFERENCES

1. Austroads Guide to Road Design (2008 – 2014)
2. Austroads Guide to Road Safety – Version 1 Dec 2010
3. Austroads Guide to Traffic Management (2008 – 2014)
4. RTA (now RMS) Austroads Guide Supplements – Austroads Guide to Traffic Management – (Various dates from 2009 onwards)
5. RTA (now RMS) Supplement to Austroads Guide to Road Design Parts 1-5, 6 and 8 (various dates from 2009 onwards)
6. RMS Supplements to Austroads Guide to Road Safety
7. RTA/RMS Traffic Volumes Data for Hunter and Northern Regions

APPENDIX 1

AERIAL PHOTOGRAPHS OF PRINCIPAL INTERSECTIONS

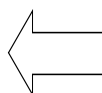


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INTERSECTION

GOLDEN VALLEY HWY &
WAMBO MINE MAIN ACCESS ROAD
JOB NO. 15032



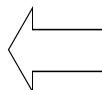
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INTERSECTION

**GOLDEN VALLEY HWY &
UNITED MINE MAIN ROAD**

JOB NO. 15032



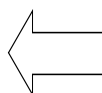
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INTERSECTION

**GOLDEN VALLEY HWY &
WALLABY SCRUB ROAD**

JOB NO. 15032

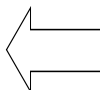


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INTERSECTION
GOLDEN VALLEY HWY &
COMLEROI ROAD
JOB NO. 15032

APPENDIX 2

SIDRA MODELLING OUTPUTS

MOVEMENT SUMMARY

▽ Site: Golden Hwy & Wambo Rd - 2018 AM

AM 2018 Base

Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wambo Access Rd											
1	L2	6	16.7	0.006	6.2	LOS A	0.0	0.2	0.22	0.53	53.7
3	R2	8	0.0	0.010	6.9	LOS A	0.0	0.3	0.35	0.57	57.3
Approach		14	7.2	0.010	6.6	LOS A	0.0	0.3	0.30	0.55	55.7
East: Golden Hwy											
4	L2	58	3.5	0.032	7.0	LOS A	0.0	0.0	0.00	0.63	64.2
5	T1	117	11.1	0.064	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		175	8.6	0.064	2.3	NA	0.0	0.0	0.00	0.21	73.9
West: Golden Hwy											
11	T1	72	13.9	0.040	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R2	7	0.0	0.006	7.4	LOS A	0.0	0.2	0.28	0.58	57.9
Approach		79	12.7	0.040	0.7	NA	0.0	0.2	0.02	0.05	77.4
All Vehicles		268	9.7	0.064	2.1	NA	0.0	0.3	0.02	0.18	73.6

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

MOVEMENT SUMMARY

Site: Golden Hwy & Wambo Rd - 2018 PM

PM 2018 Base

Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wambo Access Rd											
1	L2	5	20.0	0.004	6.1	LOS A	0.0	0.1	0.17	0.53	53.1
3	R2	44	2.5	0.054	7.0	LOS A	0.2	1.5	0.36	0.60	56.6
Approach		49	4.3	0.054	6.9	LOS A	0.2	1.5	0.34	0.60	56.2
East: Golden Hwy											
4	L2	14	0.0	0.008	6.9	LOS A	0.0	0.0	0.00	0.63	65.4
5	T1	76	7.9	0.041	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		90	6.7	0.041	1.1	NA	0.0	0.0	0.00	0.10	77.3
West: Golden Hwy											
11	T1	129	6.2	0.069	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R2	3	0.0	0.002	7.1	LOS A	0.0	0.1	0.19	0.57	58.2
Approach		132	6.1	0.069	0.2	NA	0.0	0.1	0.00	0.01	79.3
All Vehicles		271	5.9	0.069	1.7	NA	0.2	1.5	0.06	0.15	73.2

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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MOVEMENT SUMMARY

Site: Golden Hwy & Wambo Rd - 2018 AM - Operational

AM 2018 with Project
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wambo Access Rd											
1	L2	15	6.7	0.013	6.1	LOS A	0.0	0.3	0.21	0.54	56.2
3	R2	91	2.0	0.122	7.8	LOS A	0.5	3.5	0.44	0.67	56.0
Approach		106	2.7	0.122	7.6	LOS A	0.5	3.5	0.41	0.65	56.0
East: Golden Hwy											
4	L2	193	3.5	0.107	7.0	LOS A	0.0	0.0	0.00	0.63	64.2
5	T1	117	11.1	0.064	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		310	6.4	0.107	4.4	NA	0.0	0.0	0.00	0.39	69.4
West: Golden Hwy											
11	T1	72	13.9	0.040	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R2	22	0.0	0.021	8.1	LOS A	0.1	0.6	0.38	0.62	57.6
Approach		94	10.6	0.040	1.9	NA	0.1	0.6	0.09	0.15	73.3
All Vehicles		510	6.4	0.122	4.6	NA	0.5	3.5	0.10	0.40	66.7

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

MOVEMENT SUMMARY

▽ Site: Golden Hwy & Wambo Rd - 2018 PM - Operational

PM 2018 with Project
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wambo Access Rd											
1	L2	11	9.1	0.009	5.9	LOS A	0.0	0.2	0.17	0.54	55.7
3	R2	108	3.0	0.132	7.2	LOS A	0.5	3.9	0.38	0.63	56.3
Approach		119	3.6	0.132	7.1	LOS A	0.5	3.9	0.36	0.62	56.2
East: Golden Hwy											
4	L2	14	0.0	0.008	6.9	LOS A	0.0	0.0	0.00	0.63	65.4
5	T1	76	7.9	0.041	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		90	6.7	0.041	1.1	NA	0.0	0.0	0.00	0.10	77.3
West: Golden Hwy											
11	T1	129	6.2	0.069	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R2	3	0.0	0.002	7.1	LOS A	0.0	0.1	0.19	0.57	58.2
Approach		132	6.1	0.069	0.2	NA	0.0	0.1	0.00	0.01	79.3
All Vehicles		341	5.3	0.132	2.8	NA	0.5	3.9	0.13	0.25	69.0

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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MOVEMENT SUMMARY

Site: Golden Hwy & Wallaby Scub Rd - 2018 AM

AM 2018 Base
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wallaby Scub Rd											
1	L2	24	0.0	0.018	6.0	LOS A	0.1	0.5	0.25	0.54	57.8
3	R2	1	0.0	0.018	6.3	LOS A	0.1	0.5	0.25	0.54	57.4
Approach		25	0.0	0.018	6.0	LOS A	0.1	0.5	0.25	0.54	57.8
East: Golden Hwy											
4	L2	2	100.0	0.087	7.9	LOS A	0.0	0.0	0.00	0.02	57.2
5	T1	156	10.3	0.087	0.0	LOS A	0.0	0.0	0.00	0.02	79.8
Approach		158	11.4	0.087	0.2	NA	0.0	0.0	0.00	0.02	79.4
West: Golden Hwy											
11	T1	70	12.9	0.046	0.1	LOS A	0.1	0.5	0.08	0.08	77.9
12	R2	10	10.0	0.046	7.4	LOS A	0.1	0.5	0.08	0.08	63.6
Approach		80	12.5	0.046	1.0	NA	0.1	0.5	0.08	0.08	75.8
All Vehicles		263	10.7	0.087	0.9	NA	0.1	0.5	0.05	0.09	75.6

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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MOVEMENT SUMMARY

▽ Site: Golden Hwy & Wallaby Scub Rd - 2018 PM

PM 2018 Base
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wallaby Scub Rd											
1	L2	8	0.0	0.006	5.8	LOS A	0.0	0.2	0.16	0.54	58.1
3	R2	1	0.0	0.006	6.3	LOS A	0.0	0.2	0.16	0.54	57.8
Approach		9	0.0	0.006	5.8	LOS A	0.0	0.2	0.16	0.54	58.1
East: Golden Hwy											
4	L2	1	100.0	0.045	7.9	LOS A	0.0	0.0	0.00	0.02	57.2
5	T1	80	10.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.02	79.8
Approach		81	11.1	0.045	0.2	NA	0.0	0.0	0.00	0.02	79.4
West: Golden Hwy											
11	T1	153	5.9	0.094	0.0	LOS A	0.1	0.9	0.05	0.08	78.2
12	R2	20	0.0	0.094	6.9	LOS A	0.1	0.9	0.05	0.08	64.5
Approach		173	5.2	0.094	0.8	NA	0.1	0.9	0.05	0.08	76.3
All Vehicles		263	6.9	0.094	0.8	NA	0.1	0.9	0.04	0.07	76.4

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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Project: C:\Users\Terry\Documents\15032 - Wambo.sip6

MOVEMENT SUMMARY

▽ Site: Golden Hwy & Wallaby Scub Rd - 2018 AM Operational

AM 2018 with Project
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wallaby Scub Rd											
1	L2	44	0.0	0.035	6.4	LOS A	0.1	1.0	0.34	0.58	57.5
3	R2	1	0.0	0.035	7.2	LOS A	0.1	1.0	0.34	0.58	57.1
Approach		45	0.0	0.035	6.4	LOS A	0.1	1.0	0.34	0.58	57.5
East: Golden Hwy											
4	L2	2	100.0	0.141	7.9	LOS A	0.0	0.0	0.00	0.01	57.2
5	T1	261	6.1	0.141	0.0	LOS A	0.0	0.0	0.00	0.01	79.9
Approach		263	6.8	0.141	0.1	NA	0.0	0.0	0.00	0.01	79.6
West: Golden Hwy											
11	T1	135	8.1	0.094	0.3	LOS A	0.2	1.6	0.15	0.11	76.8
12	R2	28	3.6	0.094	7.7	LOS A	0.2	1.6	0.15	0.11	63.3
Approach		163	7.3	0.094	1.5	NA	0.2	1.6	0.15	0.11	74.1
All Vehicles		471	6.3	0.141	1.2	NA	0.2	1.6	0.08	0.10	74.9

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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MOVEMENT SUMMARY

▽ Site: Golden Hwy & Wallaby Scub Rd - 2018 PM Operational

PM 2018 with Project
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wallaby Scub Rd											
1	L2	8	0.0	0.006	5.8	LOS A	0.0	0.2	0.16	0.54	58.1
3	R2	1	0.0	0.006	6.6	LOS A	0.0	0.2	0.16	0.54	57.8
Approach		9	0.0	0.006	5.9	LOS A	0.0	0.2	0.16	0.54	58.1
East: Golden Hwy											
4	L2	1	100.0	0.045	7.9	LOS A	0.0	0.0	0.00	0.02	57.2
5	T1	80	10.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.02	79.8
Approach		81	11.1	0.045	0.2	NA	0.0	0.0	0.00	0.02	79.4
West: Golden Hwy											
11	T1	195	5.6	0.123	0.1	LOS A	0.2	1.5	0.06	0.09	77.8
12	R2	32	0.0	0.123	6.9	LOS A	0.2	1.5	0.06	0.09	64.2
Approach		227	4.8	0.123	1.0	NA	0.2	1.5	0.06	0.09	75.6
All Vehicles		317	6.3	0.123	0.9	NA	0.2	1.5	0.05	0.08	75.9

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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MOVEMENT SUMMARY

▽ Site: Golden Hwy & Wambo Rd - 2028 AM - Operational

AM 2028 with Project
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wambo Access Rd											
1	L2	15	6.7	0.013	6.2	LOS A	0.0	0.3	0.24	0.55	56.1
3	R2	91	2.0	0.130	8.3	LOS A	0.5	3.7	0.47	0.70	55.6
Approach		106	2.7	0.130	8.0	LOS A	0.5	3.7	0.44	0.67	55.7
East: Golden Hwy											
4	L2	193	3.5	0.107	7.0	LOS A	0.0	0.0	0.00	0.63	64.2
5	T1	145	11.1	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		338	6.8	0.107	4.0	NA	0.0	0.0	0.00	0.36	70.1
West: Golden Hwy											
11	T1	89	13.9	0.050	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R2	22	0.0	0.022	8.2	LOS A	0.1	0.6	0.40	0.63	57.5
Approach		111	11.1	0.050	1.6	NA	0.1	0.6	0.08	0.13	74.2
All Vehicles		555	6.9	0.130	4.3	NA	0.5	3.7	0.10	0.37	67.5

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

MOVEMENT SUMMARY

▽ Site: Golden Hwy & Wambo Rd - 2028 PM - Operational

PM 2028 with Project
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wambo Access Rd											
1	L2	11	9.1	0.009	6.0	LOS A	0.0	0.2	0.19	0.54	55.7
3	R2	108	3.0	0.142	7.7	LOS A	0.6	4.1	0.43	0.66	55.9
Approach		119	3.6	0.142	7.5	LOS A	0.6	4.1	0.41	0.65	55.8
East: Golden Hwy											
4	L2	14	0.0	0.008	6.9	LOS A	0.0	0.0	0.00	0.63	65.4
5	T1	94	10.6	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		108	9.2	0.052	0.9	NA	0.0	0.0	0.00	0.08	77.7
West: Golden Hwy											
11	T1	163	6.2	0.087	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R2	3	0.0	0.002	7.2	LOS A	0.0	0.1	0.21	0.57	58.2
Approach		166	6.1	0.087	0.1	NA	0.0	0.1	0.00	0.01	79.4
All Vehicles		393	6.2	0.142	2.6	NA	0.6	4.1	0.12	0.22	70.0

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

MOVEMENT SUMMARY

Site: Golden Hwy & Wambo Rd - 2018 AM - Construction

AM 2018 Construction (530am -630am)
 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wambo Access Rd											
1	L2	1	0.0	0.001	5.8	LOS A	0.0	0.0	0.15	0.53	58.2
3	R2	9	0.0	0.011	6.8	LOS A	0.0	0.3	0.34	0.57	57.4
Approach		10	0.0	0.011	6.7	LOS A	0.0	0.3	0.32	0.56	57.5
East: Golden Hwy											
4	L2	171	3.5	0.094	7.0	LOS A	0.0	0.0	0.00	0.63	64.2
5	T1	67	16.4	0.038	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		238	7.1	0.094	5.0	NA	0.0	0.0	0.00	0.45	68.0
West: Golden Hwy											
11	T1	52	8.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
12	R2	24	0.0	0.021	7.7	LOS A	0.1	0.6	0.33	0.61	57.7
Approach		76	5.5	0.028	2.4	NA	0.1	0.6	0.10	0.19	71.3
All Vehicles		324	6.5	0.094	4.5	NA	0.1	0.6	0.03	0.39	68.3

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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MOVEMENT SUMMARY

Site: Golden Hwy & Wallaby Scub Rd - 2018 AM Construction

AM 2018 with Construction (530am - 630am)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wallaby Scub Rd											
1	L2	45	2.5	0.034	6.2	LOS A	0.1	1.0	0.29	0.56	57.0
3	R2	1	0.0	0.034	6.4	LOS A	0.1	1.0	0.29	0.56	57.3
Approach		46	2.4	0.034	6.2	LOS A	0.1	1.0	0.29	0.56	57.0
East: Golden Hwy											
4	L2	1	100.0	0.105	7.9	LOS A	0.0	0.0	0.00	0.01	57.2
5	T1	193	8.3	0.105	0.0	LOS A	0.0	0.0	0.00	0.01	79.9
Approach		194	8.8	0.105	0.1	NA	0.0	0.0	0.00	0.01	79.7
West: Golden Hwy											
11	T1	61	6.6	0.035	0.1	LOS A	0.0	0.2	0.03	0.02	79.6
12	R2	2	50.0	0.035	8.6	LOS A	0.0	0.2	0.03	0.02	62.1
Approach		63	8.0	0.035	0.3	NA	0.0	0.2	0.03	0.02	78.9
All Vehicles		303	7.6	0.105	1.0	NA	0.1	1.0	0.05	0.09	75.0

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

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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