Gemini Project
Traffic Impact Assessment

Gemini Project

QTT19061

Prepared for
Magnetic South Pty Ltd

1 October 2019

Cardno

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Abbreviations

Abbreviations	
Mtpa	Million Tonnes Per Annum
ROM	Run of Mine
CHPP	Coal Handling Preparation Plant
MIA	Mining Infrastructure Area
TLO	Train Load-Out
TMR	Department of Transport and Main Roads
GTIA	Guide to Traffic Impact Assessments
SISD	Safe Intersection Sight Distance
DOS	Degree of Saturation
LOS	Link Level of Service
AADT	Annual Average Daily Traffic
SCR	State Controlled Road
QTRIP	Queensland Transport and Roads Investment Program
T	Tonnes
Tcu/hr	Through Car Units/Hour
BG	Background
AV	Articulated Vehicle
PCI	Pulverised Coal Injection
BAL	Basic Left Turn
BAR	Basic Right Turn
CHR	Channelised Right Turn
AUL(s)	Channelised Left Turn (short)

1 Introduction

1.1 Project Background

Cardno (QLD) Pty Ltd (Cardno) has been commissioned by Magnetic South Pty Ltd (Magnetic South) to prepare a Traffic Impact Assessment (TIA) for the Gemini Project.

The Gemini Project is located on Exploration Permit for Coal (EPC) 881 tenement in the Bowen Basin, Central Queensland and within the proposed Mining Lease Application (MLA) area. Located approximately 15km east of Bluff and 3km west of Dingo, the tenement straddles the Capricorn Highway and the Blackwater-Gladstone rail network.

The Gemini Project involves hauling coal from the Pit AB and Pit C to a Coal Handling Preparation Plant (CHPP) as represented in Figure 1-1. The CHPP will utilise a conveyor to a Train-Load Out (TLO) facility on the north side of the Capricorn Highway. Coal haulage will only be internal as illustrated in Figure 1-2. The only impacts on the surrounding road network will be project traffic due to the construction of the mine and the operations of the mine.

The following TIA has been prepared to understand the traffic impacts associated with the Gemini Project.

1.2 Project Description

Magnetic South is developing the Gemini Project as a greenfields open cut mine providing pulverised coal injection (PCI) coal and coking coal to the export market.

The proposed open cut mine will target the Rangal coal measures. The mine will utilise diesel powered excavators and rear dump trucks to remove overburden and mine coal at a rate of 1.9 Mtpa run of mine (ROM). The mine is scheduled to operate 363 days a year, 24 hours a day. Due to the steeply dipping coal seams a terrace mining operation will be used. Up to seven seams/plies are targeted, ranging in thickness from 0.5 m to 3.0 m. The seams are impacted by faulting and seam splitting and are typically overlain by overburden ranging in depth from 45 m to 60 m (interburden thicknesses vary).

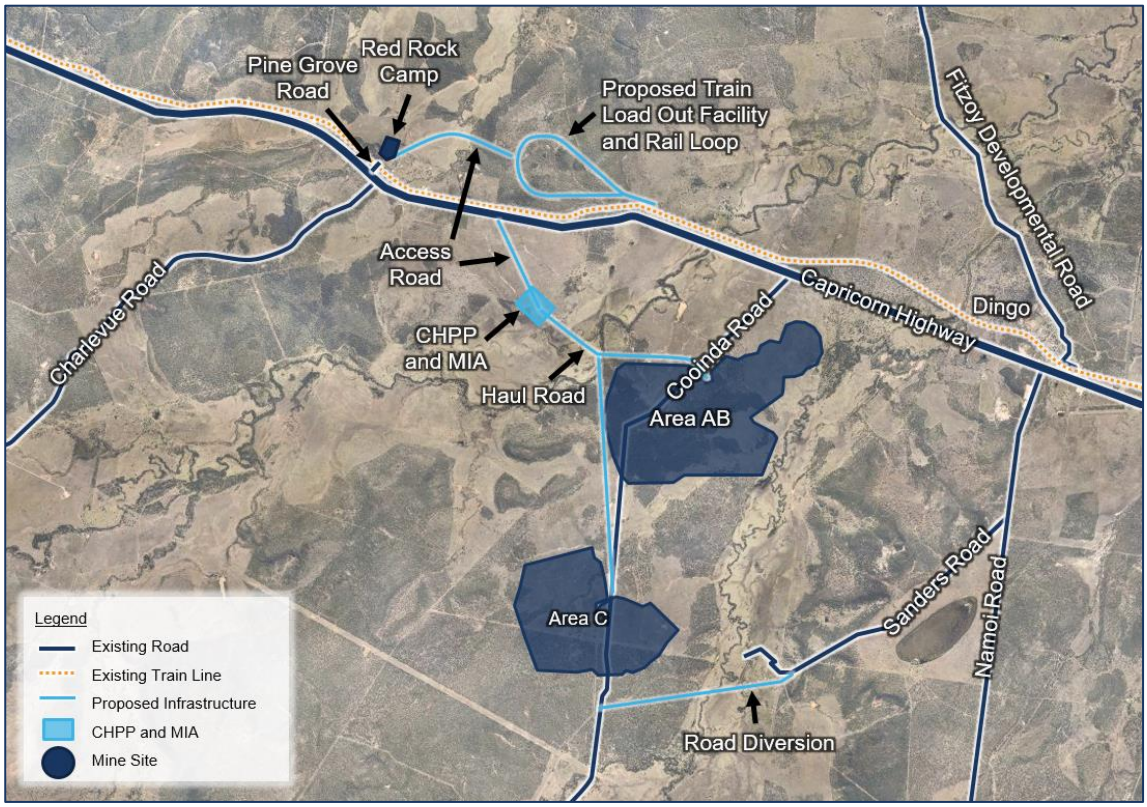
The mined coal will be beneficiated in the CHPP. Low volatile PCI coal or coking coal will be railed to export coal terminals at Gladstone for shipping to international customers.

1.3 References

The following documents have been used in the preparation of this report:

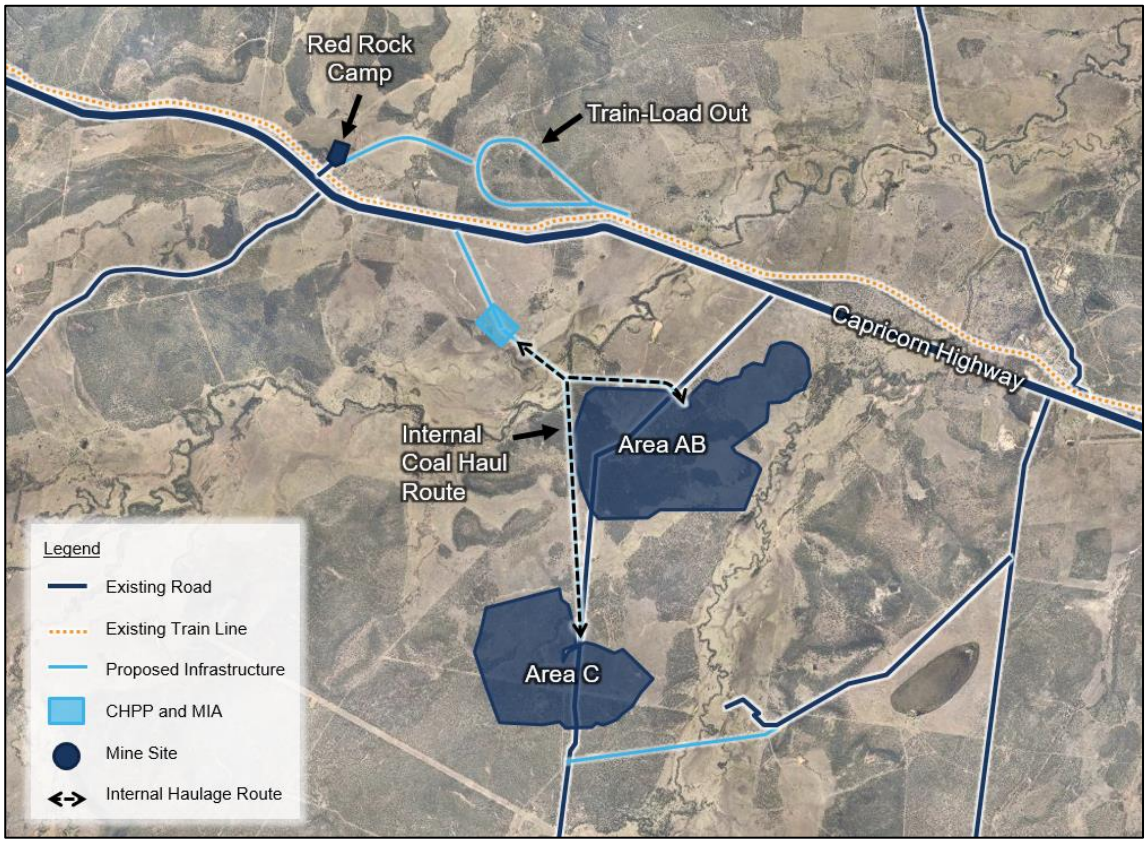
- Traffic Count Data undertaken by Austraffic on Tuesday 23rd July 2019
- Transport Main Roads Guide to Traffic Impact Assessment (GTIA), December 2018
- Austroads Guide to Road Design Part 4A
- Road Planning and Design Manual Edition 2: Volume 3 (Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections)
- Austroads Guide to Traffic Engineering Practice – Part 2 Roadway Capacity. (This document is superseded by Austroads Guide to Traffic Management)

Figure 1-1 Gemini Project Proposed Location and Surrounding Infrastructure



Source: Nearmaps

Figure 1-2 Internal Coal Haul Route



Source: Nearmaps

2 Project Assessment Methodology

The Gemini Project assesses the traffic impacts generated by the proposed Gemini Mine (two deposits referred to as Pit AB and Pit C). Magnetic South have provided the locations of the proposed open pits and associated infrastructure (e.g. CHPP and MIA) shown in Figure 1-2. Magnetic South are proposing a new access road and associated intersection onto the Capricorn Highway and an access road from the Redrock accommodation camp connecting to the proposed TLO location in Figure 1-1.

Coal produced will be hauled from the two deposits (Pit AB and Pit C) to the CHPP and Mining Infrastructure Area (MIA) location. Figure 1-2 illustrates the internal haul routes.

The time periods assessed will be the peak construction phase (worst case construction scenario) and end of operations phase (worst case operations scenario). These scenarios will be assessed in isolation and in combination with growth background traffic in order to best reflect actual conditions.

The assessment measures the construction and operations traffic associated with the project during each respective phase. The assessment will utilise all traffic generation information provided by Magnetic South (in Section 5) in order to accurately model the impacted routes of each phase. The coal haulage operations are not considered as these are only operating on internal roads.

The road link capacity and queuing of the roads that are impacted by the Dingo West Project traffic have been assessed according to the GTIA. This will determine any mitigation works required and potentially any impacts that cannot be accommodated by infrastructure upgrades alone.

The Capricorn Highway / Pine Grove Road Intersection and the proposed Mine Access Intersection have been assessed for operation and capacity against the GTIA. The warrants for Turn Treatments and Safe Intersection Sight Distance (SISD) have been assessed in accordance with Austroads Guide to Road Design Part 4A, to ensure adequate protection is proposed for turning vehicles.

2.1 Assessment Scope

The scope of this assessment is limited to the roads used by the proposed Gemini Project traffic. The judgement of whether a road carries a significant amount of traffic is based on Transport Main Roads (TMR) *Guidelines to Traffic Impact Assessments.* These guidelines state that a road carries a significant proportion of project traffic when traffic volumes reach 5% over the existing traffic volumes. Therefore, the following roads and intersections have been assessed:

2.1.1 State Controlled Roads (SCR):

- Capricorn Highway.

2.1.2 Local Council Roads:

- Namoi Road
- Cooinda Road
- Charlevue Road.

2.1.3 State Intersections:

- Capricorn Highway / Namoi Road
- Capricorn Highway / Cooinda Road
- Capricorn Highway / Charlevue Road
- Capricorn Highway / Pine Grove Road.

In addition, the proposed Capricorn Highway / Mine Access intersection, the proposed diversion of an access track connecting Sanders Road to Cooinda Road, and an access road on the north side of the rail network connecting to the TLO is within the scope of this impact assessment.

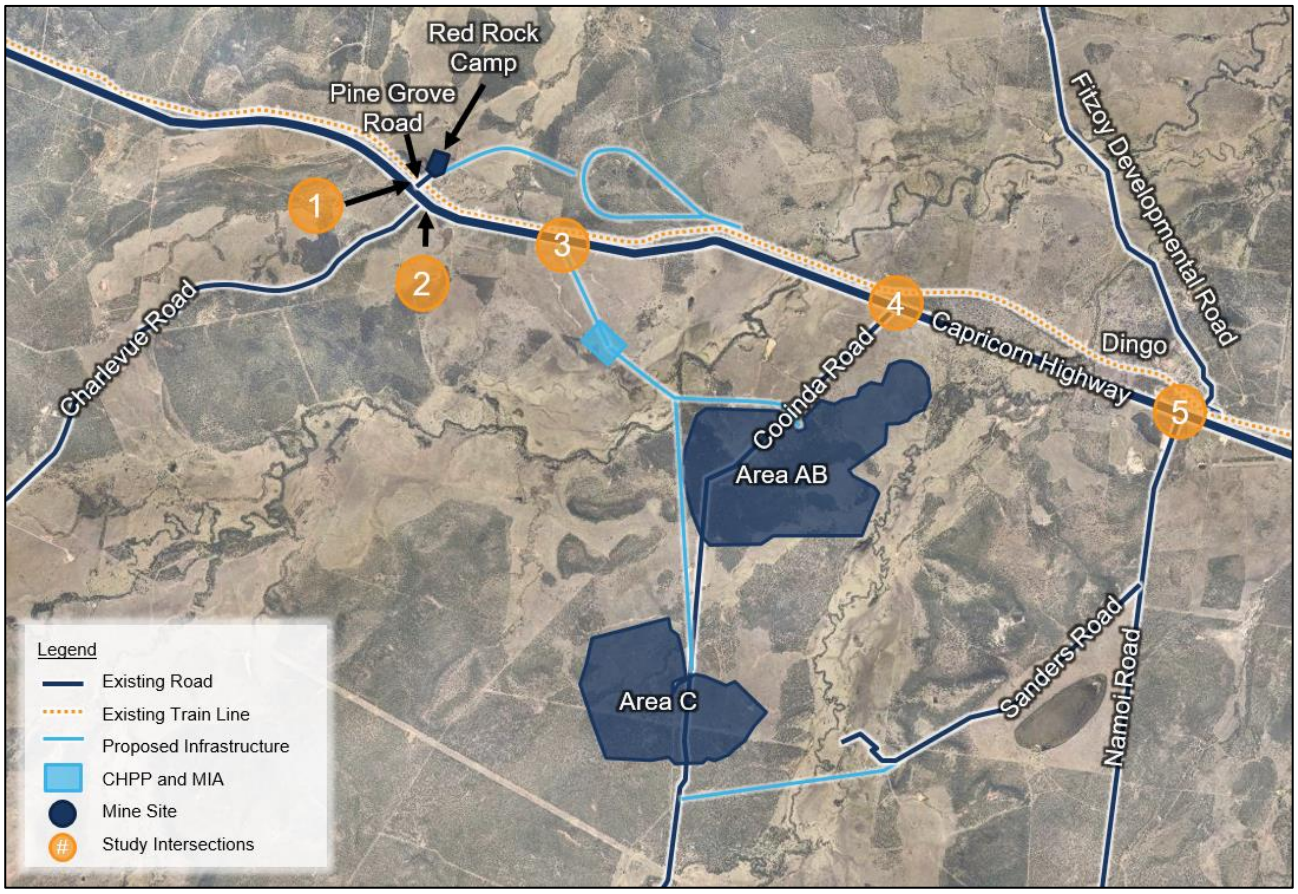
The existing study intersections are outlined in Figure 2-1 and are listed in Table 2-1.

Section 6 illustrates the Capricorn Highway / Pine Grove Road intersection and the proposed mine access intersection are assessed for capacity and operation. It is not considered necessary to assess intersections for their capacity and operation where no turning movements occur from development traffic.

Table 2-1 List of study intersections

Intersection #	Intersection Name
1	Capricorn Highway / Pine Grove Road / Redrock Camp Access Road Intersection
2	Capricorn Highway / Charlevue Road Intersection
3	Capricorn Highway / Proposed Main Access Road Intersection
4	Capricorn Highway / Cooinda Road Intersection
5	Capricorn Highway / Namoi Road Intersection

Figure 2-1 Study Intersection Locations



Source: Nearmaps

2.2 Intersection Safety Criteria

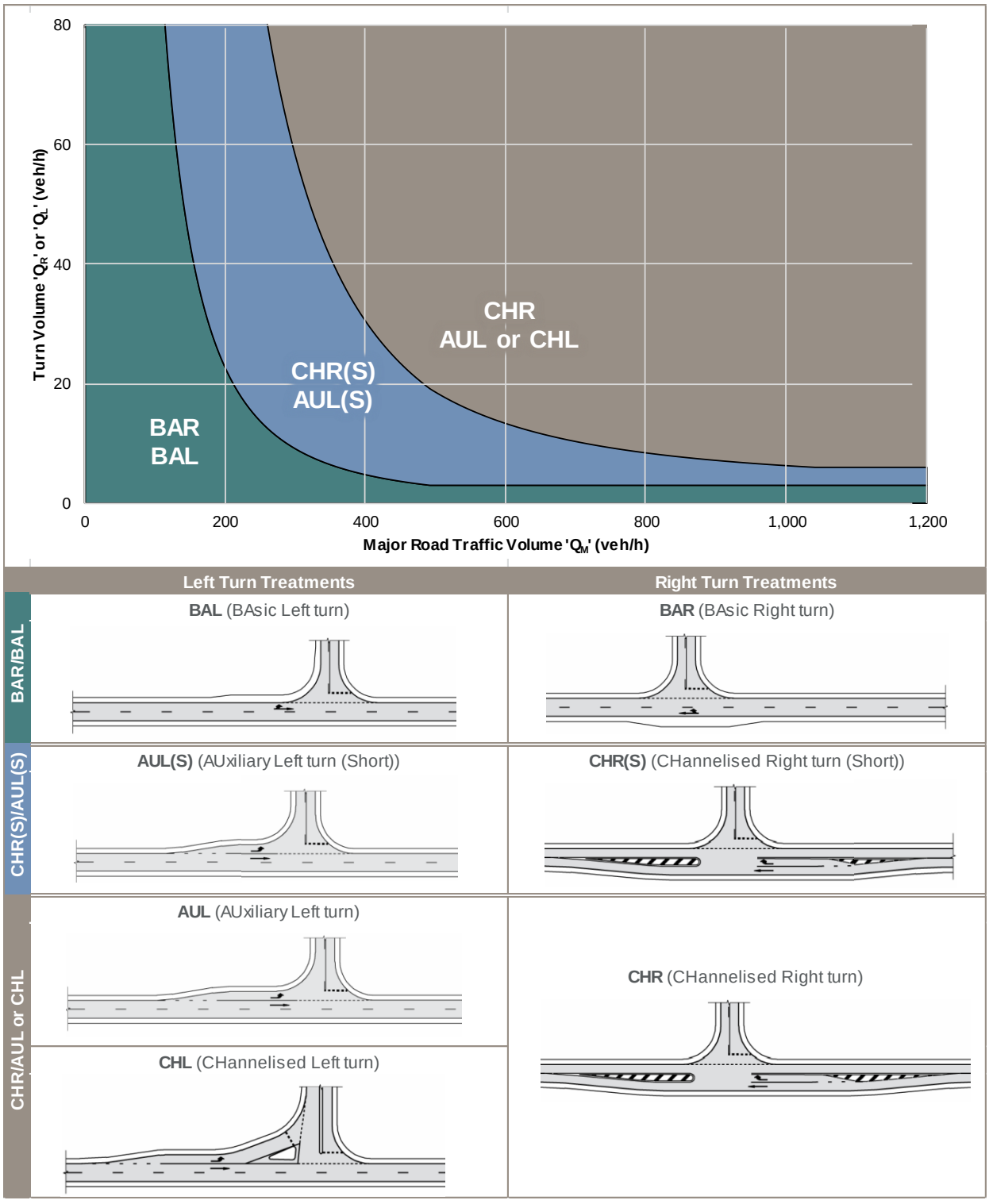
2.2.1 Warrants for turn treatment

While the Degree of Saturation (DOS) and critical delay statistic provide an indication of the operational performance of an intersection, the Austroads warrants for turn treatments provide an indication of which turn treatments will likely provide an appropriate level of safety.

The warrants for turn treatment provide guidance where deceleration lanes and turning lanes should be used based on traffic volumes. The warrants were developed by Arndt, Troutbeck, Handley & Slattery (2006) and were produced by identifying the location at which the benefits of providing a higher-level treatment (the reduction in estimated crash costs) are equal to additional construction costs associated with the treatment. The benefits and costs of a higher-level treatment were compared to the base case (minimum turn treatments) to develop the curves demonstrated on Figure 2-2. Figure 2-2 reproduces the warrants for turn treatments for rural roads with speeds greater than or equal to 100 kilometres per hour (km/h). For design

speeds between 70km/h and 100km/h the turn warrant boundary slopes illustrated in Figure 2-2 are amended to suit.

Figure 2-2 Warrants for Turn Treatments for Design Speed Greater Than or Equal to 100km/h



Source: Austroads 2010

2.3 Link Capacity Criteria

Link Level of Service (LOS) relates to the operating conditions encountered by traffic. It is a qualitative measure of factors as speed, trip time, interruptions, interference, freedom to overtake, ability to manoeuvre, safety, comfort, convenience and vehicle operating costs. TMR's definitions of LOS for uninterrupted flow are defined in terms of traffic flow as detailed in Table 2-2, in addition to indicative photographs.

The performance of the assessed links were analysed including and excluding project traffic using the link LOS methodology detailed in Austroads *Guide to Traffic Engineering Practice Part 2 Roadway Capacity.* Table 2-3 identifies the level of service thresholds specified for varying K factors which represents the ratio of the design hour volume to the annual average daily traffic (AADT). It is noted that the *Guide to Traffic Engineering Practice* has been superseded, by the Austroads *Guide to Traffic Management*. However, as the *Guide to Traffic Engineering Practice* contains the source research for contemporary standards, it has been listed here as the source.

Table 2-2 Level of Service Definitions

LOS	Level of Service Description		LOS	Level of Service Description	
A	Free flow conditions where drivers are unaffected by the presence of others in the traffic stream		D	Close to the limit of stable flow and is approaching unstable flow. Drivers are severely restricted to select their speed and manoeuvre.	
B	Stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream.		E	Traffic volumes are at or close to capacity and there is virtually no freedom to select desired speeds or to manoeuvre.	
C	Stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre.		F	Forced flow. Traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs.	

Source: TMR's Road Planning and Design Manual

Table 2-3 Maximum AADT Thresholds for Level Terrain on Two-Lane Two-Way Rural Roads

K factor	Level of Service				
	A	B	C	D	E
0.10	2,400	4,800	7,900	13,500	22,900
0.11	2,200	4,400	7,200	12,200	20,800
0.12	2,000	4,000	6,600	11,200	19,000
0.13	1,900	3,700	6,100	10,400	17,600
0.14	1,700	3,400	5,700	9,600	16,300
0.15	1,600	3,200	5,300	9,000	15,200

Source: Traffic Engineering Practice Part 2 Roadway Capacity (1988)

3 Existing Road Network

3.1 Road Conditions

3.1.1 Capricorn Highway

The Capricorn Highway is the only identified SCR within the study area. Recent AADT Segment Analysis Reports for the Capricorn Highway were provided by TMR. The 2018 AADT Segment Analysis Report indicated the Capricorn Highway covering the study area had an AADT of 2,836 with 25% classed as heavy vehicles (HV). In comparison, the 2017 AADT for this segment was 2,475 with 24.5% classed as HV.

Table 3-1 summarises the existing road conditions for SCR within the study area. Further information from site investigations and Queensland Government sources assisted in the generation of Table 3-1.

Table 3-1 State Controlled Roads Summary

Road	Hierarchy	Form	Posted Speed Limit	AADT	HV%	Stock Route
Capricorn Highway	Highway	2 lane 2 way undivided	80km/h - 100km/h	2,836	25%	Primary

Figure 3-1 illustrates a typical section of the Capricorn Highway as of July 2019 conditions. The Highway did not contain signs of rutting or shoving and appeared to be in relatively good condition. The Highway had clear zones on both sides of the road for large sections within the study area.

A few private properties have access onto the Capricorn Highway within the study area.

Figure 3-1 Typical section of Capricorn Highway (facing west)

Source: Site Investigation conducted by Cardno on 16th July 2019

3.1.2 Capricorn Highway / Namoi Road Intersection

Namoi Road connects onto the Capricorn Highway forming the Capricorn Highway / Namoi Road intersection, approximately 420m west from the Capricorn Highway / Fitzroy Developmental Road intersection. Figure 3-2 gives a visual representation of the intersection looking east toward the Dingo

township. The posted speed limit is 80km/h when passing this intersection and consists of BAL and BAR (refer to Figure 2-2) turning treatments. Namoi Road currently only services a small number of private properties.

Namoi Road is approximately 4.6km east from Cooinda Road Intersection in Figure 2-1.

Figure 3-2 Capricorn Highway / Namoi Road Intersection (facing east)

Source: Site Investigation conducted by Cardno on 16th July 2019

3.1.3 Capricorn Highway / Cooinda Road Intersection

Cooinda Road connects onto the Capricorn Highway forming Capricorn Highway / Cooinda Road intersection approximately 7.9km east of the Capricorn Highway / Charlevue Road intersection. Figure 3-3 gives a visual representation of the intersection looking west. The posted speed limit is 100km/h when passing this intersection and consists of BAL and BAR turning treatments (refer to Figure 2-2). This intersection only provides access to a few private properties.

Figure 3-3 Capricorn Highway / Cooinda Road Intersection

Source: Site Investigation conducted by Cardno on 16th July 2019

3.1.4 Capricorn Highway / Charlevue Road Intersection

Charlevue Road connects onto the Capricorn Highway forming Capricorn Highway / Charlevue Road intersection. Figure 3-4 gives a visual representation of the intersection looking east. The posted speed limit is 100km/h passing this intersection and consists of AUL(S) and CHR turning treatments (refer to Figure 2-2).

This intersection is staggered with the Capricorn Highway / Pine Grove Road intersection. Capricorn Highway / Charlevue Road intersection is approximately 140m east of the Capricorn Highway / Pine Grove Road Intersection.

Figure 3-4 Capricorn Highway / Charlevue Road Intersection (facing east)

Source: Site Investigation conducted by Cardno on 16th July 2019

3.1.5 Capricorn Highway / Pine Grove Road Intersection

Pine Grove road connects onto the Capricorn Highway forming Capricorn Highway / Pine Grove Road intersection. Figure 3-5 gives a visual representation of the Capricorn Highway / Pine Grove Road intersection looking east toward Capricorn Highway / Charlevue Road intersection. The posted speed limit is 100km/h passing this intersection and consists of BAL and CHR turning treatments (refer to Figure 2-2). This intersection provides access to the existing Red Rock Camp and the proposed Train Load Out Facility.

Figure 3-5 Capricorn Highway / Pine Grove Road Intersection

Source: Site Investigation conducted by Cardno on 16th July 2019

3.2 Background Traffic Volumes

In order to understand the existing traffic conditions within the study area, a traffic survey was undertaken by Austraffic for 3-hour AM and PM periods on Tuesday 23rd July 2019. The survey included the Capricorn Highway / Cooinda Road Intersection, Capricorn Highway / Charlevue Road Intersection, and Capricorn Highway / Namoi Road Intersection (traffic counts and traffic volumes are supplied in Appendix A and B respectively).

A review of the surveys indicated that the AM and PM network peak hour across the three intersections was:

- 8:00 AM – 9:00 AM
- 3:30 PM – 4:30 PM

Figure 3-6 illustrates the AM peak period (08:00 – 09:00) background traffic volumes. It is evident that the traffic turning off the Capricorn Highway at the minor roads is insignificant in comparison to the through movements at each intersection. The highest identified traffic volume during the AM peak hour was 104 vehicles heading eastbound on the Capricorn Highway after the Capricorn Highway / Charlevue Road Intersection.

Along sections of the Capricorn Highway a few private properties exist and this is reflected in the traffic counts where slight differences in volumes can be seen in-between intersections.

Figure 3-6 AM Peak Background Traffic

Source: Nearmap and Austraffic

Figure 3-7 illustrates the PM peak period (15:30 – 16:30) background traffic volumes. The peak movement is 150 vehicles per hour heading westbound on the Capricorn Highway past Capricorn Highway / Charlevue Road Intersection. The majority of vehicle movements are heading westbound in the PM peak and eastbound in the AM peak. Charlevue Road and Namoi Road road carry an insignificant percentage of the traffic compared to the through movements on the Capricorn Highway.

Figure 3-7 PM Peak Background Traffic

Source: Nearmap and Austraffic

3.3 Capricorn Highway / Pine Grove Road Background Traffic Volumes

At the time of the traffic counts (23rd July 2019) the proposed route for project traffic (TLO access and accommodation) was not confirmed by Magnetic South. This means turning movements into Pine Grove Road were not assessed by Austraffic and therefore in order to best model the Capricorn Highway / Pine Grove Road intersection engineering assumptions must be made. Traffic Volumes are supplied in Appendix B.

Figures 3-6 and 3-7 currently illustrate the background traffic volumes for the three intersections assessed. These figures clearly illustrate the low portions of traffic utilising Charlevue Road, Cooinda Road, and Namoi Road. Each road generally services only a few private properties which confirms the low activity on these side roads. Similarly, Pine Grove Road services only a few private properties as well as the Red Rock Camp.

3.3.1 Pine Grove Road Traffic Volume Assumptions

The Redrock Camp contains up to 280 rooms as mentioned in Section 5.4.4 however, movements will be a mixture of bus and LV. Conservative assumptions for both AM and PM peaks are as follows:

- 5 vehicles in both directions travel along Pine Grove Road due to the private properties. 50% will travel to/from Blackwater and the other 50% to/from Dingo.
- Background trips for the Red Rock Camp will be the equal to the trips generated by the Dingo West Project as a worst case scenario (see below). This is a conservative assumption which assumes the Red Rock Camp is full at the time of surveys.

Magnetic South have indicated the following traffic generations to/from Redrock Camp (adapted from Table 5-2):

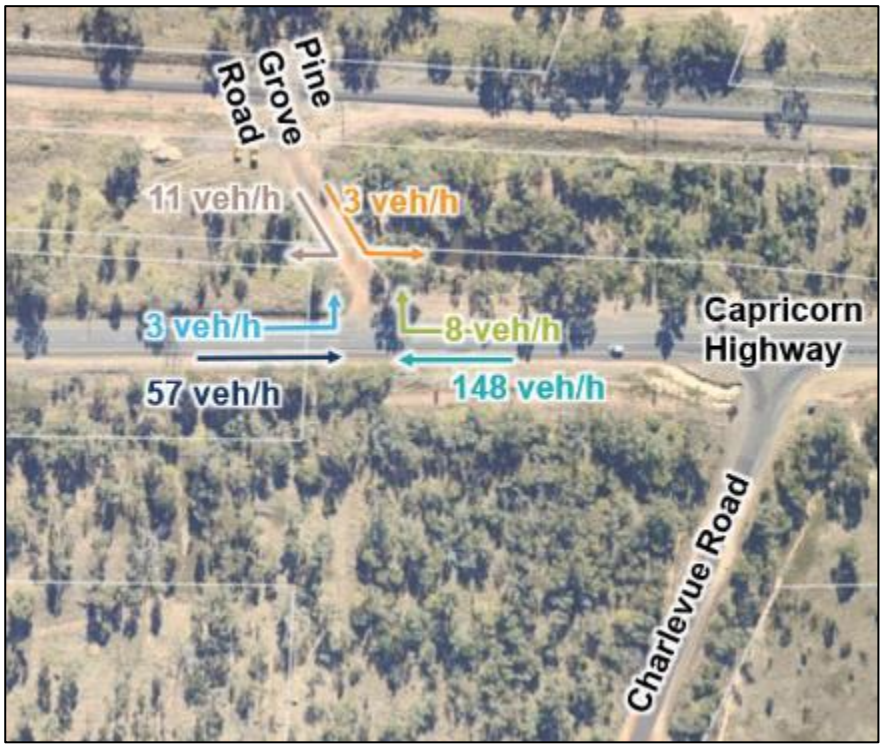
- Workforce Shift Change will produce 10 buses per day from Redrock Camp to the mine (worst case). According to Table 5-4 50% of buses will travel during the peak hours
- Workforce Roster Change (DIDO) will produce 25 LV trips per day from Central Queensland Region to Redrock Camp (worst case). According to Table 5-4, 30% will travel during the peak hours.

Figures 3-8 and 3-9 outline the movements on the Capricorn Highway / Pine Grove Road intersection which includes the traffic generated by the Redrock Camp and private properties. These movements are balanced with the current background 2019 survey data such that no additional vehicles are accumulated heading eastbound.

Figure 3-8 AM Peak Pine Grove Road Intersection Movements (2019 Background)

Source: Nearmaps

Figure 3-9 PM Peak Pine Grove Road Intersection Movements (2019 Background)



Source: Nearmaps

3.4 Active Transport

A site visit was undertaken for all the study road networks on the 16th of July 2019. The site visit did not identify any pedestrian or cycling facilities. Due to the rural nature of the study area and associated road networks, there is a very low level of pedestrians and cyclist usage. Active Transport facilities are not considered to be required.

3.5 Public Transport

Greyhound Australia offer multiple bus services that stop at Dingo. One Emerald bus service route originates from Dingo departing at 8:30pm each day. The return bus service from Emerald to Dingo departs at 1:30pm.

Rockhampton to Emerald and Longreach bus service stops at Dingo at 10:00am on a Tuesday and Saturday and at 8:20pm Monday, Wednesday, Thursday, Friday, and Sunday.

The Longreach/Emerald to Rockhampton services pass through Dingo at 7:00am on Monday, Tuesday, Thursday, Friday, and Saturday and 3:00pm on a Sunday and Wednesday.

3.6 Future Network Planning

Future network planning for State Controlled roads is derived from TMR who produce the Queensland Transport and Roads Investment Program (QTRIP) every two years. This document reports the planned spending committed to by the state government for all state funded transport initiatives in Queensland.

QTRIP indicates pavement rehabilitation is planned throughout 2018-2020 for sections of the Capricorn Highway between Duaringa and Emerald (sections 14.65km – 140.39km). The indicative total cost for the works is $618,000.

Overtaking lanes are also planned for construction throughout 2018-2020 for sections from Gracemere to Emerald. The indicative total cost for these works are $19,000,000.

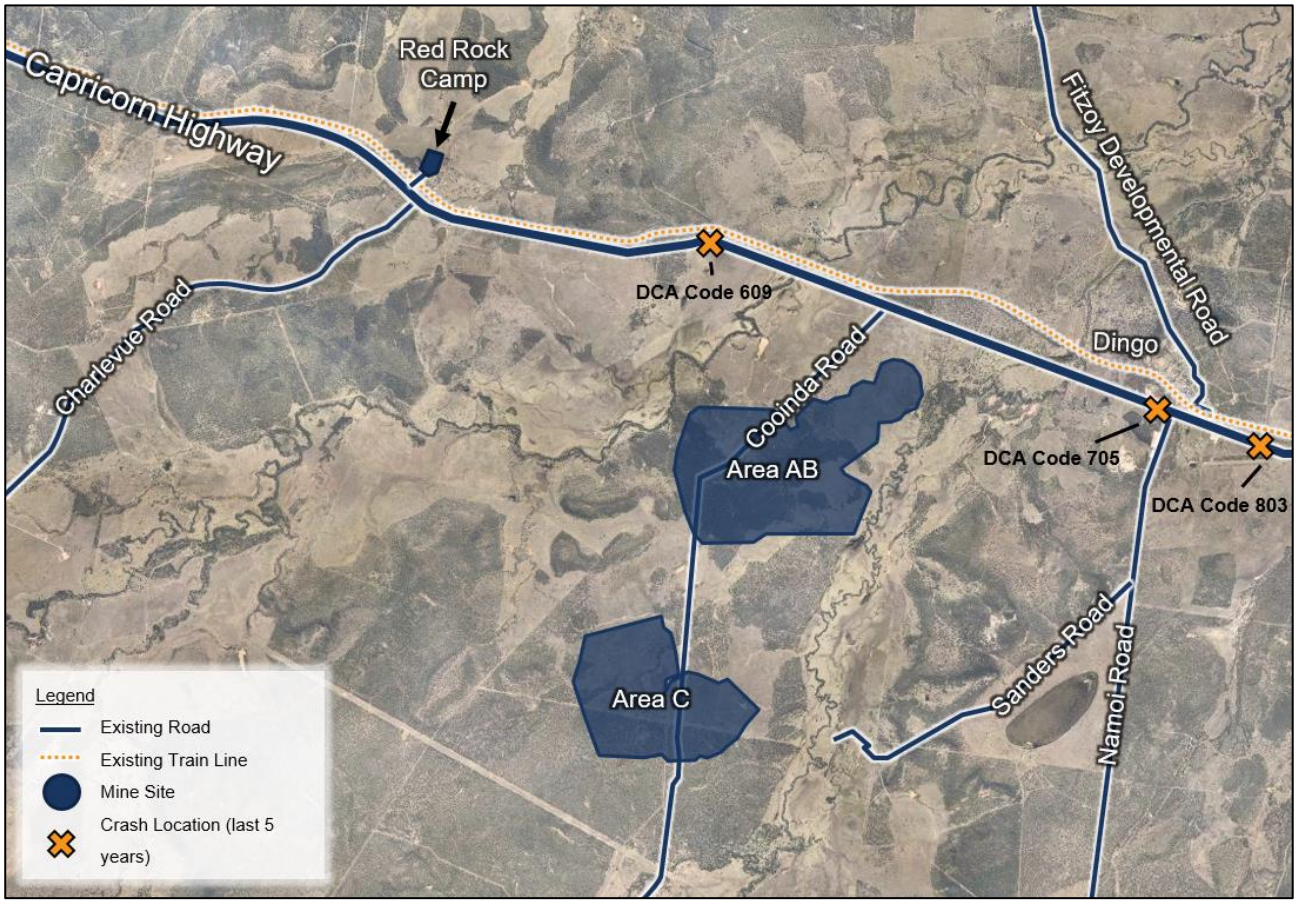
4 Crash History

In order to determine any incident trends in the vicinity of the haulage route, crash data was obtained from TMR. Data was collected from 1st January 2001 to 30th June 2018 and then filtered to the last 5 years of crashes (2014 – 2019). The filtered data shows three reported crashes within close proximity of the project. Table 4-1 lists the crashes identified, these are also displayed graphically on Figure 4-1. A common indicator of these crashes is driver error in darkness.

Table 4-1 Summary of haulage route crash sites

Location	Date	Type and DC Code	Crash Severity
Capricorn Highway	July 2015	Hit Animal - 609	Minor Injury
Capricorn Highway	April 2016	Off Path-Straight: Out of Control - 705	Hospitalisation
Capricorn Highway	March 2014	Off Path-Curve: Hit Object - 803	Hospitalisation

Figure 4-1 Crash locations in the vicinity of the subject area



Source: Nearmaps and TMR crash data 2014-2019

5 Proposed Operation

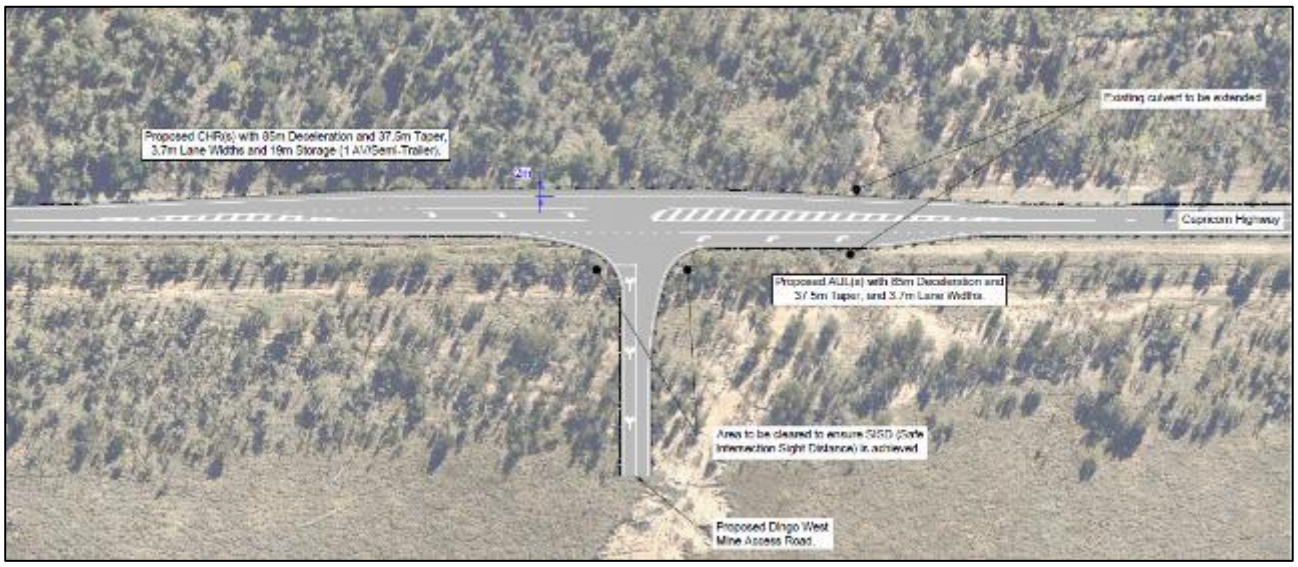
The greenfield open cut mine is expected to produce up to 1.9 Mtpa saleable coal. Subject to granting of the Project ML and EA, construction of the mine and infrastructure will begin in July 2021 and peak construction is anticipated to occur during January 2022. It is anticipated that it will take approximately six months to establish the necessary infrastructure to commence overburden removal and 18 months to commence coal production. Coal production is expected to finish in 2040.

5.1 Proposed Mine Access Intersection

The proposed mine access intersection is located approximately 2.65km east of the Capricorn Highway / Charlevue Road intersection (Intersection 3 on Figure 2-1). This access will be primarily used for all mine access, deliveries, waste removal, and workforce shift changes.

Figure 5-1 illustrates the concept layout of the proposed mine access intersection (refer to Appendix D for all concept drawings). The design includes a AUL (S) and a CHR (S) turning treatment with 85m deceleration lanes and 37.5m tapers, which has been designed in accordance with Austroads Guide to Road Design Part 4A.

Figure 5-1 Proposed Mine Access Intersection Concept Design



5.1.2 Swept Path

Swept paths included in Appendix D show 19m Articulated Vehicles (AV) can adequately achieve 500mm clearances whilst make turning movements into and out of the proposed mine access road.

5.2 Diversion of Non-Gazetted Access Track

To maintain the connection of Cooinda Road to the Capricorn Highway (via Sanders Road and Namoi Road), the access track extending from Sanders Road is proposed to be diverted. The diversion will be approximately 2 km in length and will connect onto Cooinda Road approximately 1 – 1.2 km south of its current connection. The diversion works are located outside of the MLA and will be subject to separate approval from the Central Highlands Regional Council (i.e. approval is not being sought by this EA application). Notwithstanding, the approximate location of the proposed diversion is shown on **Error! Reference source not found.** 1-1.

The 2019 background traffic counts confirm 7 and 2 vehicles in both directions use Namoi Road in the AM and PM peak hours, respectively. These counts confirm the portion of traffic utilising Namoi Road (and therefore Sanders Road) is insignificant and any diversion will have minimal disturbance to users.

5.3 Train Load Out Access

Construction and/or operations traffic will have access to the TLO via an access track connecting from the Pine Grove off the Capricorn Highway. The access road will straddle around adjacent properties as indicated in Figure 1-1. TLO deliveries, concrete deliveries, and construction materials outlined in the traffic generation summary (Table 5-2) will all utilise the access road. Section 5.4 outlines the workforce summary that will also use the access track.

5.4 Workforce

Traffic assumptions have been confirmed with Magnetic South in order for Cardno to accurately model the workforce traffic generation for the Dingo West Project.

The confirmed assumptions are presented below.

5.4.1 Construction and Operations Workforce

Table 5-1 outlines the peak construction and operations workforce split across the mine and TLO. During the construction phase 88% of workers will service the mine and only 12% at the TLO. During operations phase, 100% of the workforce will service the mine.

Peak construction and peak operations workforce are 260 and 330 workers in total, respectively.

Table 5-1 Workforce Summary

	Construction	Operations
Mine	230	330
TLO	30	0
Total	260	330

Source: Magnetic South

5.4.2 Workforce Origin

Staff will originate from a number of sources:

- 80% Drive-in-Drive-Out (DIDO) stay in camp and bused to site
- 20% Local Staff (Local to Dingo/Blackwater region).

Of the DIDO Staff, 80% will travel by car from Rockhampton region to the Redrock camp, with 20% of staff arriving by car from Emerald region to the camp, at the start and end of their roster.

The remaining staff traveling daily from Dingo (50%) and Blackwater (50%) to the mine site will use light vehicle.

5.4.3 Workforce Roster

Mining operations will operate on a 24-hour shift cycle roster, working 7 days on, 7 days off. Technical staff will work 10 hours per day, on a 5 days on, 2 days off roster. Senior management and staff will work on a 5 days on, 2 days off roster.

5.4.4 Accommodation

Accommodation options include the following:

- Use of the Redrock camp containing up to 280 rooms
- Use of Magnetic South owned or leased houses in the Dingo/Blackwater vicinity (any location between Dingo and Blackwater) (20 houses); or
- Self-accommodation and rental accommodation (60 rooms).

Approximately 20% of the workforce would be self-accommodated with the remaining 80% being accommodated by Magnetic South (in Redrock camp or in Magnetic South houses).

Local staff living in Dingo to Blackwater region are expected to travel to the mine site in light vehicles with 50% carpooling.

5.5 Traffic Generation

The following assumptions will be used to calculate staff trips:

- Light vehicles are assumed to carry 1.2 passengers (carpooling);
- Buses have a capacity of 25-40 people (55 seat coach);
- Workforce shift change movements are considered to be from the accommodation camp, to the mine;
- Workforce roster change movements are considered to be from accommodation camp to home-town.

Table 5-2 summarises all assessed traffic generation for the Dingo West Project during the Construction and Operations phases separately.

Table 5-2 Traffic Generation Summary

Item	Origin	Destination	Typical Vehicle	Average Loads per Day	
				Construction/Operation	Operation
Deliveries – parts, explosives, waste	Rockhampton/Gladstone	Mine	Class 9 truck	2	1
Oversized Loads	Rockhampton/Gladstone/ Brisbane	Mine	Low Loader	1	0
Other deliveries – small trucks	Emerald/ Rockhampton	Mine	Class 3 truck	1	1
Fuel	Gladstone	Mine	B-Double	0.5	1
HDPE Pipes and concrete culverts	Rockhampton/ Gladstone	Mine	B-Double	0.5	0
Mine equipment for facilities and operations e.g. CHPP	Gladstone/ Brisbane	Mine	Low Loader/ B-Double	0.5	0
Construction materials for all infrastructure at the mine (not covered in other items)	Emerald/Rockhampton/ Gladstone	Mine	Low Loader/ B-Double	1	0
TLO Deliveries (Ballast, sleepers, rail tracks)	Rockhampton/ Gladstone	TLO	Semi	1	0
Food	Blackwater/Rockhampton	Mine	Class 3 truck	0.5	0.5
Water	Blackwater	Mine	23,000 Litre Tanker Tri-Axle Trailer	0.2	0.2
Concrete	Blackwater	Mine	Five Axle Articulated	1	0

Item	Origin	Destination	Typical Vehicle	Average Loads per Day	
Concrete	Blackwater	TLO	Five Axle Articulated	0.2	0
Quarry Materials for road construction	Site/Blackwater	Mine	Five Axle Dump Truck	1	0
Quarry Materials for road construction	Site/Blackwater	TLO	Five Axle Dump Truck	0.2	0
Solid waste	Mine	Blackwater Sewage Treatment Plant	Quad Axle Truck Dog, Twin Steer with Triple Axle Prime Mover	0.2	0.2
Liquid Waste	Mine	Gladstone Waste Facility	Single Steer Twin Axle	0.2	0.2
General waste	Mine	Blackwater Waste Facility	Single Steer Twin Axle	0.2	0.2
Workforce Shift Change	Dingo/Blackwater	Mine	Light Vehicle	50	20
	Redrock Camp	Mine	Buses	10	8
Workforce Roster Change (DIDO)					
	Central Queensland region	Redrock Camp	Light Vehicle	25	20
Total				**96.2**	**52.3**

Source: Magnetic South

Table 5-3 below summarises the total trips from each origin/destination for the items illustrated in Table 5-2. During the construction phase, 96.2 (97) loads are expected per day. On average this equates to 4 loads every hour (in a single direction). During the operations phase a total of 52.3 (53) loads are expected per day this equates on average 2 loads every hour (in a single direction).

A graphical display of the data presented in Table 5-3 and the associated routes are provided in Figures 5-2 and 5-3 on the following page. The number of vehicles per day shown in Figures 5-2 and 5-3 are rounded up to the nearest number.

Trips using the east route include trips to Rockhampton, Gladstone, Dingo, and Brisbane. Trips using the west route include trips to Blackwater, Emerald, and Central Queensland Region. The other routes included are the Redrock Camp and TLO routes.

Referring to Figures 5-2 and 5-3 the following statements are made:

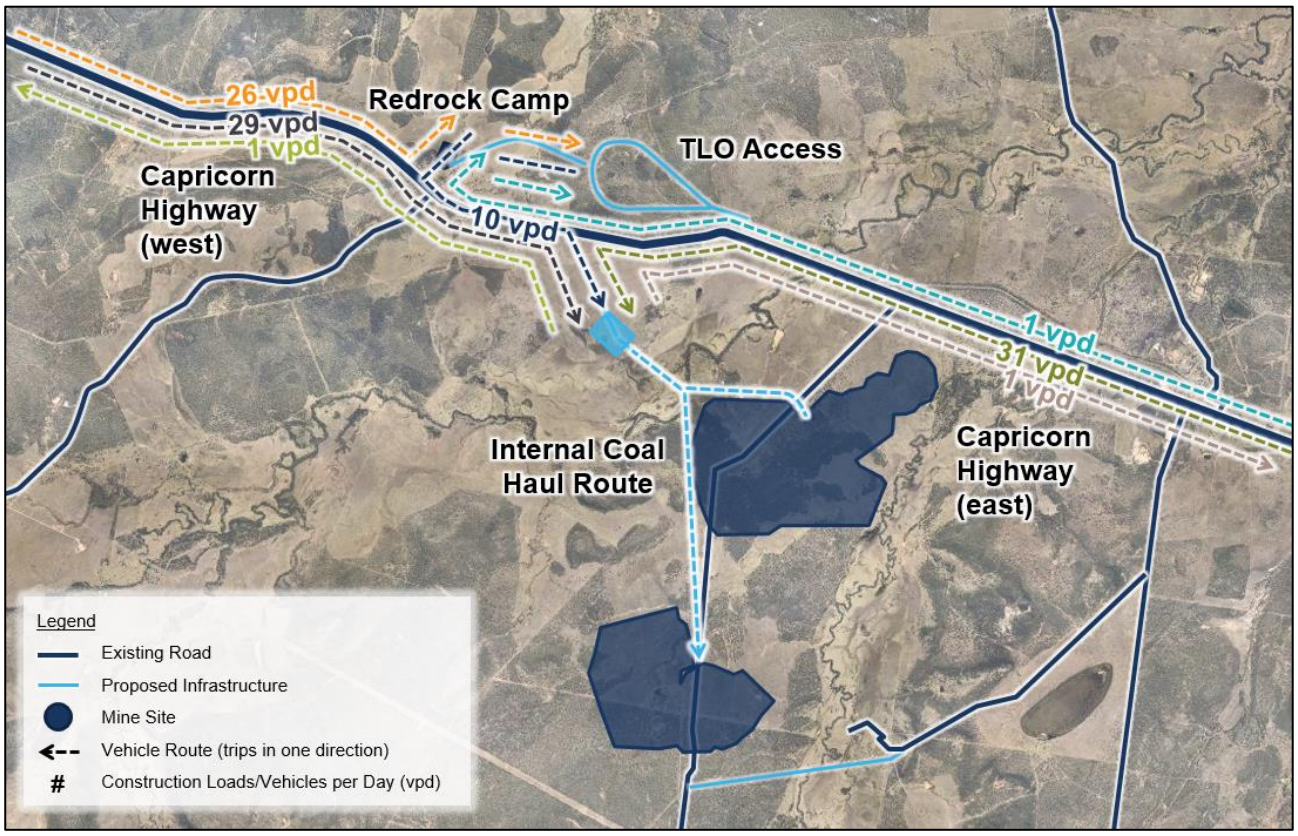
- During the construction and operations phases an additional 33 and 14 vehicles per day respectively will utilise the Capricorn Highway east segment.
- During construction and operations phases an additional 56 and 32 vehicles per day respectively will utilise the Capricorn Highway west segment.
- During construction and operations phases an additional 41 and 20 vehicles per day respectively will utilise sections of the Capricorn Highway between the proposed mine access intersection and Capricorn Highway / Pine Grove Road Intersection.

Table 5-3 Total Development Trips for Each Origin/Destination Route from Table 5-2

Origin/Destination		Total Loads Per Day	
From	To	Construction	Operations
Capricorn Highway (via east route)	Mine	30.75	12.75
Capricorn Highway (via east route)	TLO, or Redrock Camp	1	0
Capricorn Highway (via west route)	Mine	28.45	10.95
Capricorn Highway (via west route)	TLO, or Redrock Camp	25.4	20
Redrock or TLO	Mine	10	8
Mine	Capricorn Highway (via east route)	0.2	0.2
Mine	Capricorn Highway (via west route)	0.4	0.4
Total		**96.2**	**52.3**

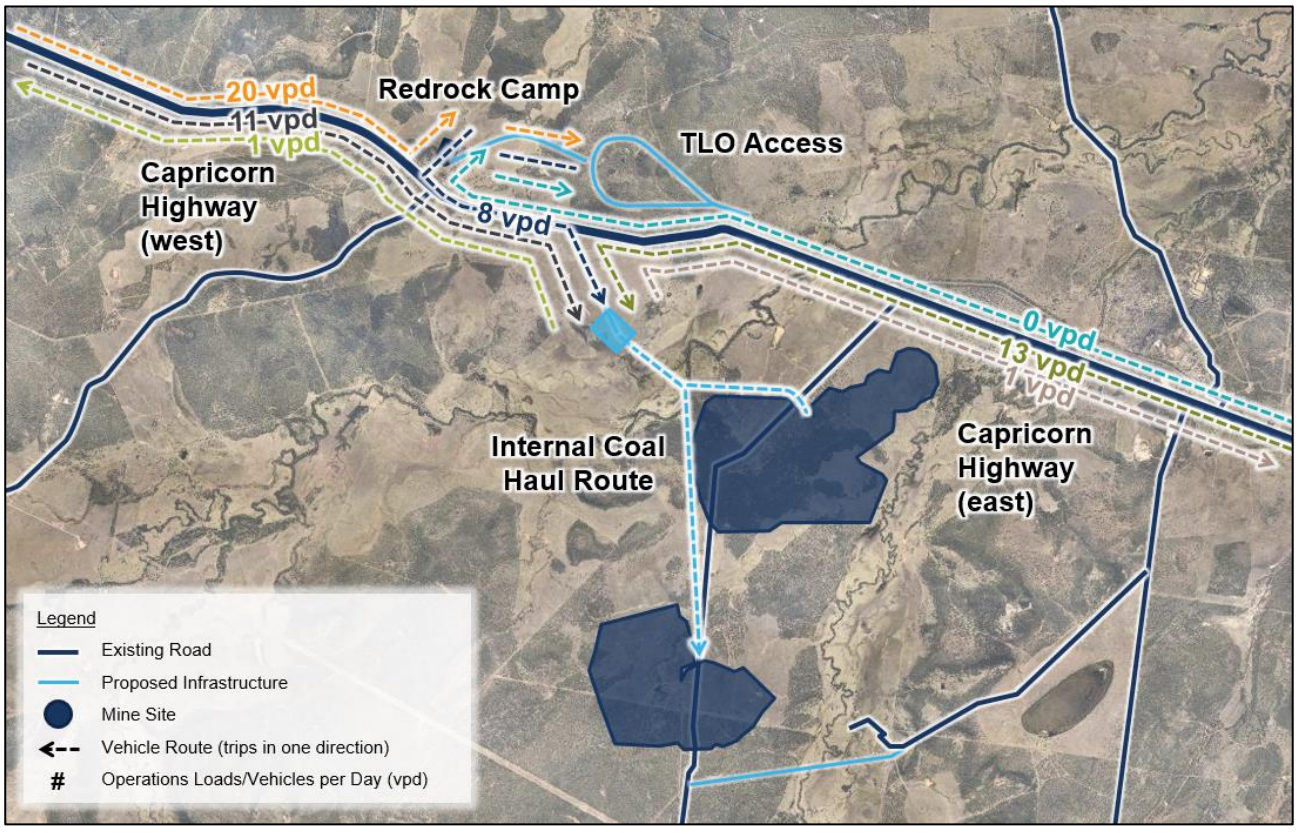
Source: Calculated from Table 5-2

Figure 5-2 Construction Vehicles per Day (Rounded Nearest Number)



Source: Nearmaps and Magnetic South

Figure 5-3 Operations Vehicles per Day (Rounded Nearest Number)



Source: Nearmaps and Magnetic South

The percentage of trips to occur during the peak hours (8:00AM – 9:00AM and 3:30PM – 4:30PM) for different items are illustrated below in Table 5-4. When assessing the peak hour networks, the following percentages will be applied to the loads per day vehicle volumes in order to best model the peak hour scenarios.

Table 5-4 Percentage of Peak Hour Trips

Item/Operation	% Trips During Peak Hour
Deliveries and Waste Removal	10%
Shift Change Bus and Roster Change	50%
Shift Change LV	30%

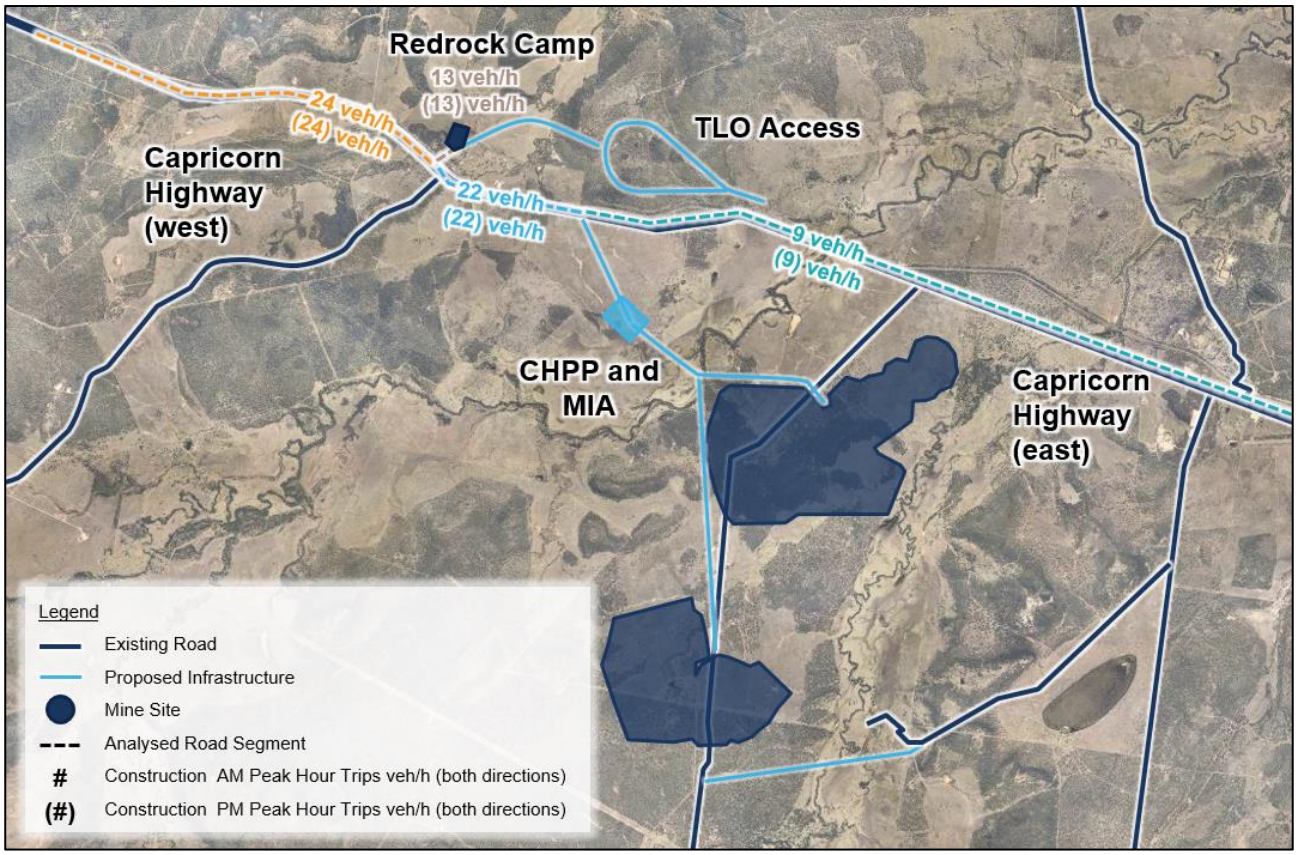
Source: Previous Cardno assessments in nearby regions

Figures 5-4 and 5-5 display the expected trips during both the peak hours (including return trips) with the applied percentages illustrated in Table 5-4.

Figure 5-4 represents the construction phase and Figure 5-5 represents the operations phase. Both figures look at each individual segment of road as per their colour scheme.

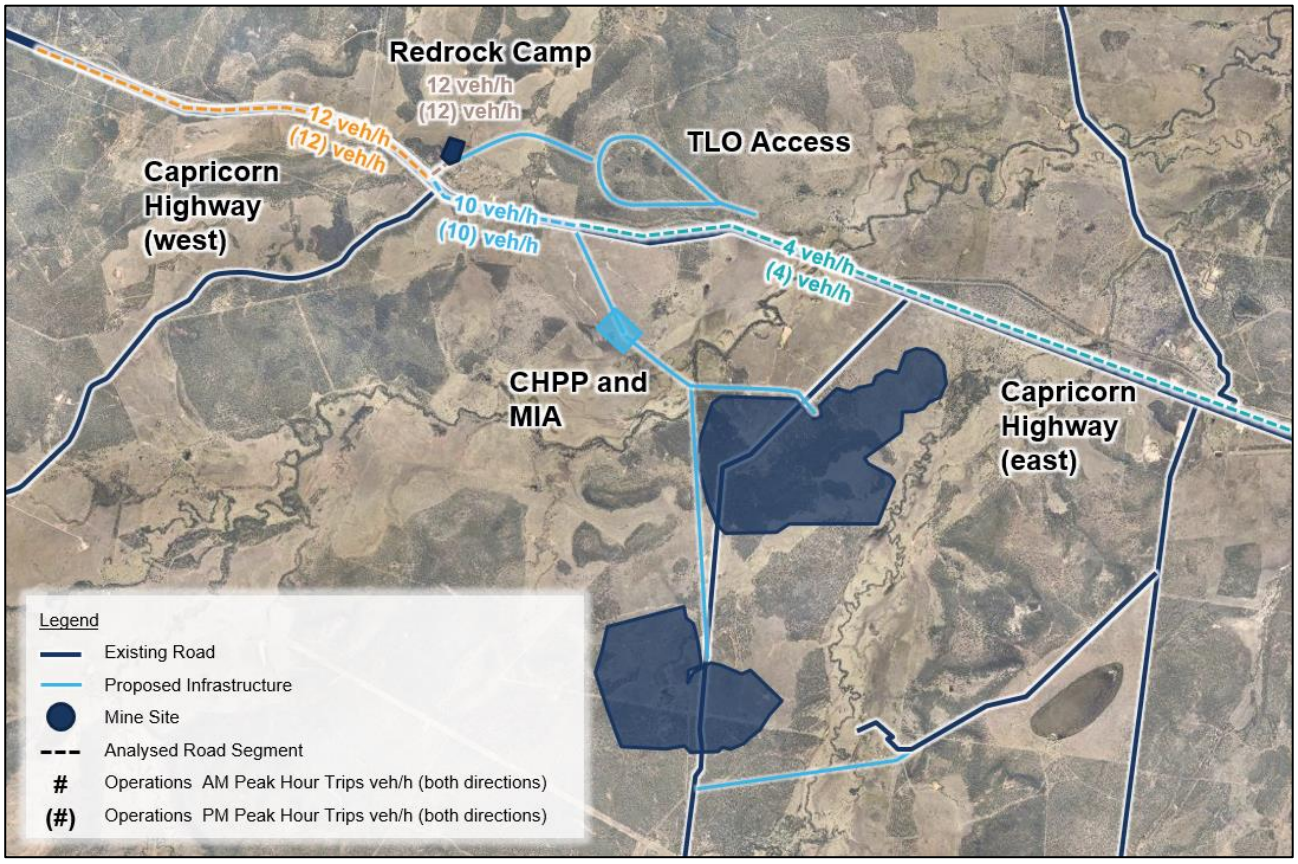
It is assumed all returning trips head back on the same route to their origin. Workforce trips are assumed to travel to the desired destination in the AM peak hour and return in the PM peak hour, all other items are expected to return in the same peak hour.

Figure 5-4 Construction Peak Hour Trips (Including Return Trips) on Various Road Segments



Source: Nearmaps

Figure 5-5 Operations Peak Hour Trips (Including Return Trips) on Various Road Segments



Source: Nearmaps

5.6 Safe Intersection Sight Distance

Site investigation has been undertaken for the Safe Intersection Sight Distance (SISD) at the location of the study intersections illustrated in Figure 2.1. Table 5-5 outlines the Austroads Guide to Road Design Part 4a, minimum sight distance requirements are 285m for 110km/h and 214m for 90km/h design speeds. From onsite SISD checks, all intersections meet the required distances as illustrated in Table 5-5.

It is to be noted that the design speeds are 10km/h higher than the posted speed. Additionally, if reaction times were increased from 2 seconds to 2.5 seconds, a 90km/h and 110km/h SISD requirement would increase to 226m and 300m, respectively.

Table 5-5 Minimum Safe Intersection Sight Distance (Normal Design Domain)

Intersection Approach	Design Speed	Reaction Time	Minimum SISD Required	Recorded SISD	Meet 2 second requirement
Capricorn Highway / Charlevue Road					
East	110km/h	2 seconds	285m	500m+	✓
West	110km/h	2 seconds	285m	300m	✓
Capricorn Highway / Cooinda Road					
East	110km/h	2 seconds	285m	700m+	✓
West	110km/h	2 seconds	285m	580m+	✓
Capricorn Highway / Namoi Road					
East	90km/h	2 seconds	214m	323m	✓
West	90km/h	2 seconds	214m	260m	✓
Proposed Mine Access Intersection					
East	110km/h	2 seconds	285m	350m	✓
West	110km/h	2 seconds	285m	300m	✓
Pine Grove Road / Redrock Park Access Road / Capricorn Highway Intersection					
East	110km/h	2 seconds	285m	385m+	✓
West	110km/h	2 seconds	285m	500m+	✓

Table 5-5 clearly indicates all existing intersections meet the 2 second reaction time SISD requirement. It is to be noted all existing intersections also meet 2.5 second reaction time SISD requirements except the west direction of Capricorn Highway / Namoi Road intersection.

6 Intersection Assessment

In accordance with the DTMR G*uide to Traffic Impact Assessment* (2017), the impact assessment year has been assumed as the whole project life.

The assessment scenarios are selected to accurately compare the worst case development and background scenarios with the non-developed background scenarios for that year. Therefore, the impact assessment year for the site access should be the peak construction (worst case construction) and worst case project traffic. Table 6-1 summarises the impact assessment scenarios.

Table 6-1 Impact Assessment Scenarios

Impact Assessment Scenario	Study Intersections
2019 Background (surveyed year)	Pine Grove Road / Redrock Park Access Road Intersection
2022 Background	Pine Grove Road / Redrock Park Access Road Intersection
2022 Background + Peak Construction	Proposed Mine Access Intersection and Pine Grove Road / Redrock Park Access Road Intersection
2040 Background	Pine Grove Road / Redrock Park Access Road Intersection
2040 Background + Peak Operations (End of Operations)	Proposed Mine Access Intersection and Pine Grove Road / Redrock Park Access Road Intersection

6.2 Assessment Criteria

The performance of the study intersections have been analysed using SIDRA Intersection 8 (SIDRA). SIDRA is an industry recognised analysis tool that estimates the capacity and performance of intersections based on input parameters, including geometry and traffic volumes, and provides estimates of an intersection's Degree of Saturation (DOS), queues, and delays.

6.2.1 Intersection Delay

The TMR GTIA recognises the intersection delay as a greater indicator of intersection performance in comparison to the previous TMR GARID's focus on the degree of saturation (DOS) criteria. The TMR GTIA appreciates that in urban networks, the DOS of an intersection may not be the most accurate representation of the intersection's operation as it is expected that existing intersections are approaching capacity with the growth of our cities.

The desired outcome outlined by the GTIA is to ensure that the sum of all intersection delays on the base traffic within the study area does not significantly worsen (i.e. does not increase average delays by more than 5% in aggregate) as a result of the development.

The TMR GTIA outlines that the proposed development should seek to achieve no net worsening to efficiency across the impact assessment area. While Council intersections should be included in the impact assessment area, the no net worsening calculations should only apply to intersections with at least one state-controlled road approach, unless otherwise stated by Council.

Intersection mitigation measures (avoid, manage or mitigate) must be considered where the sum of all intersection delays on the base traffic is greater than 5% in aggregate.

Furthermore, for priority controlled intersections and roundabouts, where the average peak hour delays for any movement exceeds 42 seconds, as outlined in the GTIA, the intersection should be upgraded for safety reasons. At an individual intersection-level, where this threshold has been exceeded, Cardno has made further comments. For signalised intersections, given the delay is dependent on the cycle length and phasing arrangement, the DOS is still considered.

6.2.2 Intersection Degree of Saturation

While the movement delay is considered to provide a better indication of intersection performance and safety for priority controlled intersections and roundabouts, the DOS should still be considered when assessing the performance of the intersection.

Table 6-2 provides the DOS thresholds adopted for the assessment.

Table 6-2 Adopted Intersection Performance Threshold – Degree of Saturation

Intersection Treatment	DOS Threshold
Priority controlled intersections	Less than or equal to 0.80

Source: TMR Guidelines for Assessment of Road Impacts Development

6.3 Modelling Parameters

A summary of the SIDRA Modelling parameters adopted for this assessment are summarised below:

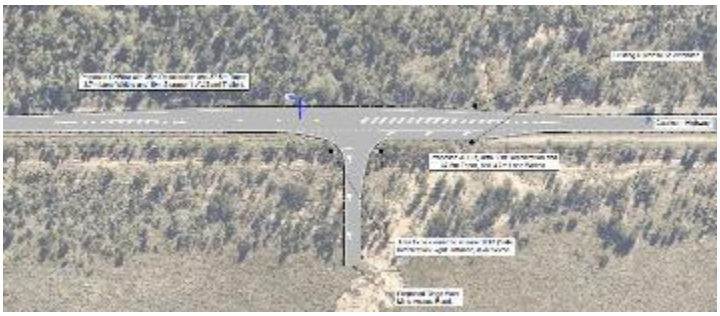
- Peak Flow Factor – 0.95 (30min/60min)
- Basic Saturation Flow – 1,950tcu/hr.
- Heavy vehicle proportion as surveyed for all movements

6.4 Capricorn Highway / Proposed Mine Access Intersection

The proposed configuration of this intersection is a three-way priority controlled arrangement. The proposed layout and intersection assessment is illustrated on Table 6-3. Appendix C supplies all SIDRA layouts and summaries.

Table 6-3 Existing layout and intersection assessment for Capricorn Highway / Proposed Mine Access Road Intersection

Capricorn Highway / Proposed Mine Access Intersection



Safety Assessment at 2040 with Gemini Project traffic:	
Required Left Turn Standard:	BAL
Required Right Turn Standard:	BAR
Proposed Left Turn Treatment	AUL (S)
Proposed Right Turn Treatment	CHR (S)

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95th %ile Queue	DOS	Critical Delay	95th %ile Queue
2022 BACKGROUND + PEAK CONSTRUCTION	0.066	6.0 sec	0.6m	0.080	6.1 sec	0.4m
2040 BACKGROUND + PEAK OPERATIONS	0.073	6.0 sec	0.3m	0.094	6.1 sec	0.2m

This intersection is intended for project traffic only and thus only the peak construction and peak operations scenarios are assessed. The proposed formation consists of a AUL (S) and a CHR. Turn warrant analysis performed for 2040 background plus worst case operations traffic indicate that this formation will satisfactorily cater for the traffic volumes assessed.

The results of the performance analysis indicate that the three-way priority controlled arrangement operates within the typical performance thresholds (DOS ≤ 0.80 for priority controlled) for all assessed scenarios.

6.5 Capricorn Highway / Pine Grove Road Intersection

The current configuration of this intersection is a three-way prioritised controlled arrangement. Table 6-4 outlines the existing conditions and SIDRA results. Appendix C supplies all SIDRA layouts and summaries.

Table 6-4 Existing layout and intersection assessment for Capricorn Highway / Pine Grove Road Intersection

Capricorn Highway / Proposed Mine Access Intersection	
	**Existing Condition:**
	Formation: Sealed
	Left Turn Standard: AUL
	Right Turn Standard: CHR
	Speed Limit: 100km/h
	Accident History: 0
	Safety Assessment at 2040 with Dingo West Operations Project traffic:
	Required Left Turn Standard: BAL
	Required Right Turn Standard: BAR
	Proposed Left Turn Treatment AUL
	Proposed Right Turn Treatment CHR

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95th %ile Queue	DOS	Critical Delay	95th %ile Queue
2019 BACKGROUND	0.052	5.8 sec	0.3m	0.080	6.3 sec	0.4m
2022 BACKGROUND	0.053	5.8 sec	0.3m	0.082	6.3 sec	0.4m
2022 BACKGROUND + PEAK CONSTRUCTION	0.057	5.9 sec	0.4m	0.086	6.6 sec	0.7 m
2040 BACKGROUND	0.063	6.3 sec	0.4m	0.096	6.6 sec	0.5m
2040 BACKGROUND + PEAK OPERATIONS	0.064	5.9 sec	0.4m	0.098	6.8 sec	0.7m

The existing formation consists of an AUL, and CHR. Turn warrant analysis performed for 2040 background plus worst case operations traffic indicate that this formation will satisfactorily cater for the traffic volumes assessed.

No crashes were reported at the intersection within the TMR reporting period observed as illustrated in Section 4.

The results of the performance analysis indicate that the three-way priority controlled arrangement operates within the typical performance thresholds (DOS ≤ 0.80 for priority controlled), for all assessed scenarios. It is noted that with the inclusion of the proposed development traffic, the average delay and 95th percentile queue are not significantly impacted, when compared to the background scenarios.

Although a BAL and BAR is all that is required for this intersection, the existing AUL and CHR provides improved safety at the intersection. This will provide further separation for turning movements at the intersection and reduce the possibility of a rear end crash.

7 Link Capacity Assessment

Link capacity has been assessed under the worst case scenario for the end of operations for the development (2040). The analysis has been performed according to the methodology established in Section 2. The results of this analysis are shown on Table 7-1 and Table 7-2.

A K factor of 0.10 is used as illustrated in Table 2-3 in Section 2. The K factor is the ratio of the design hour volume to the AADT volume.

Table 7-1 is calculated based off background traffic counts which best represent the roads AADT rather than 2018 AADT supplied by TMR.

Table 7-1 Link Performance with Baseline Traffic Volumes

Road	Section	2040	
		AADT	LOS
Capricorn Highway	East of Charlevue Road Intersection	2305	A

Table 7-2 Link Performance with Baseline and Dingo West End of Operations Project Traffic Volumes

Road	Section	2040		
		AADT	LOS	Dingo West Impact
Capricorn Highway	East of Charlevue Road Intersection	2510	B	8.8%

The above analysis suggests that the study network operates at the highest level of service under baseline traffic conditions to the end of operations. The addition of the Dingo West Project traffic lowers the performance of the network to a LOS B according to the Austroads Guide to Traffic Engineering Practice.

The definition of LOS B is as follows:

- “Stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream”

Therefore, it is considered that the study network will operate acceptably to the end of operations without the addition of overtaking lanes.

8 Summary and Conclusions

Based on the review the following statements are made:

- The Gemini Project proposes to produce up to 1.9 Mtpa saleable coal Construction is expected to begin in July 2021. It is anticipated that it will take approximately six months to establish the necessary infrastructure to commence overburden removal and 18 months to commence coal production. Coal production is expected to finish in 2040.
- Haulage will be internal and the only impacts will be associated project construction and operations traffic. Coal will be beneficiated in the CHPP and conveyed to a TLO facility north of the Capricorn Highway.
- The current AADT on the Capricorn Highway within the study area is 2,836 (with 25% HV) based off 2018 AADT segment analysis reports provided by TMR.
- The Austraffic Surveys indicated the AM peak and PM peak hours were 8:00AM – 9:00AM and 3:30PM – 4:30PM, respectively. A maximum traffic volume of 150veh/h occurred heading west on the Capricorn Highway during the PM peak. It was identified the majority of vehicles travelled east on the Capricorn Highway in the AM and west in the PM.
- TMR crash data showed three reported crashes in the study area within the last five years. Two crashes required hospitalisation and the other was a minor injury crash. Driver error and darkness are identified as common factors for all the reported crashes.
- A proposed mine access intersection is located approximately 2.65km east of the Capricorn Highway / Charlevue Road intersection. This access will be primarily used for mine access deliveries, waste removal, and workforce shift changes.
- TLO access will be via an access road off Pine Grove Road. The access road will straddle adjacent properties as indicated in Figure 1-1.
- All study intersections including the proposed mine access intersection location successfully meet SISD requirements.
- The Austroads turn warrant assessment requires a BAL and BAR for the proposed Mine Access intersection however, a higher order turn facility AUL (S) and CHR lane are proposed to improve road safety.
- Traffic generation assumptions confirmed with Magnetic South indicated a total of 97 and 53 total loads per day will occur during the construction and operations phases of the mine, respectively. The majority of the trips originated from the west via Capricorn Highway.
- The access track extending from Sanders Road is proposed to be diverted. The diversion will be approximately 2 km in length and will connect onto Cooinda Road approximately 1 – 1.2 km south of its current connection The diversion works are located outside of the MLA and will be subject to separate approval from the Central Highlands Regional Council.
- SIDRA modelling and analysis indicated that both the proposed Mine Access Intersection and Pine Grove Road intersection three-way priority-controlled arrangements operated within the performance thresholds (≤ 0.80 for priority controlled), indicating the intersections can accommodate anticipated design horizon development traffic.
- The link capacity assessment indicated that the study network operates at the second highest level of service under development traffic conditions to the end of project life according to Austroads: Traffic Engineering Practice Part 2 Roadway Capacity.

APPENDIX

A

TRAFFIC COUNTS

AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 1 **Weather:** Fine

Location: Capricorn Highway/Namoi Road, Dingo

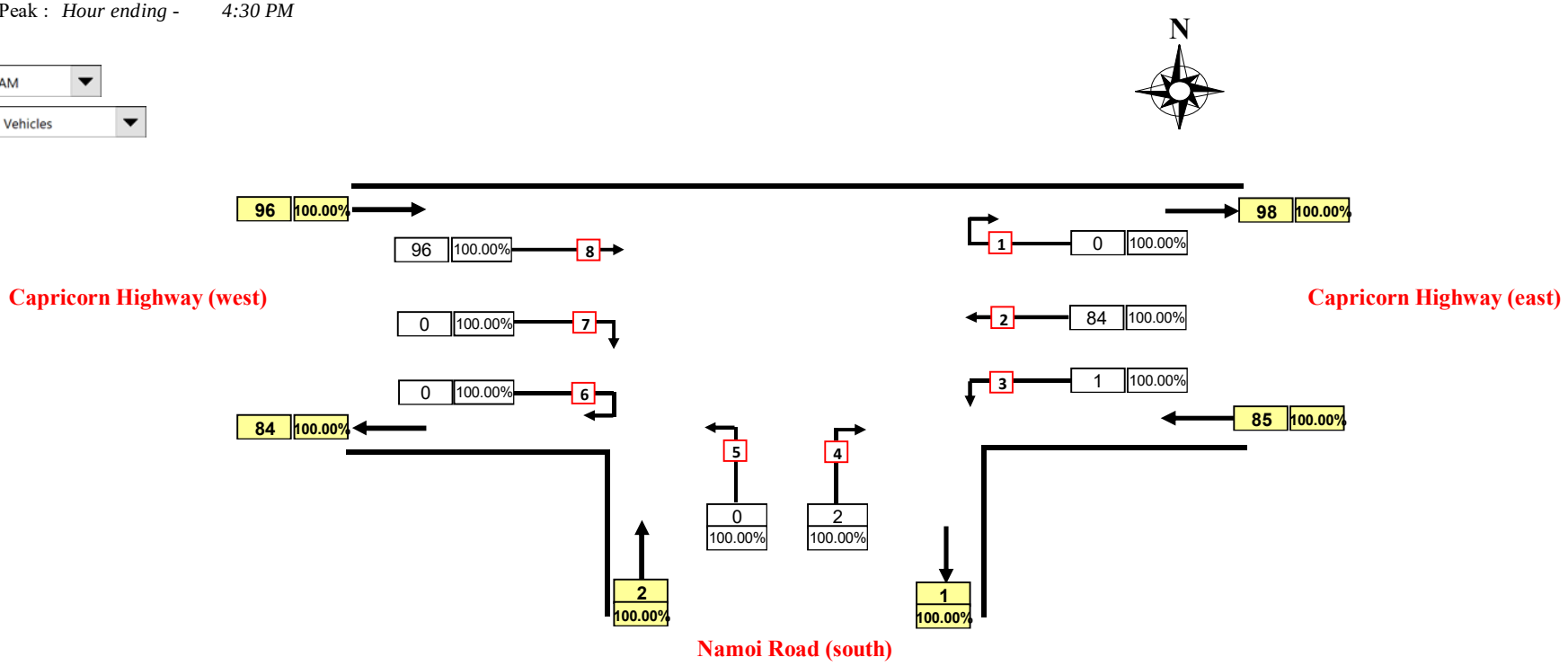
Day/Date: Tuesday, 23 July 2019

Summary: AM Peak : *Hour ending - 9:00 AM*

PM Peak : *Hour ending - 4:30 PM*

Hour Ending: 9:00 AM

Classification: Total Vehicles



AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 1 **Weather:** Fine

Location: Capricorn Highway/Namoi Road, Dingo

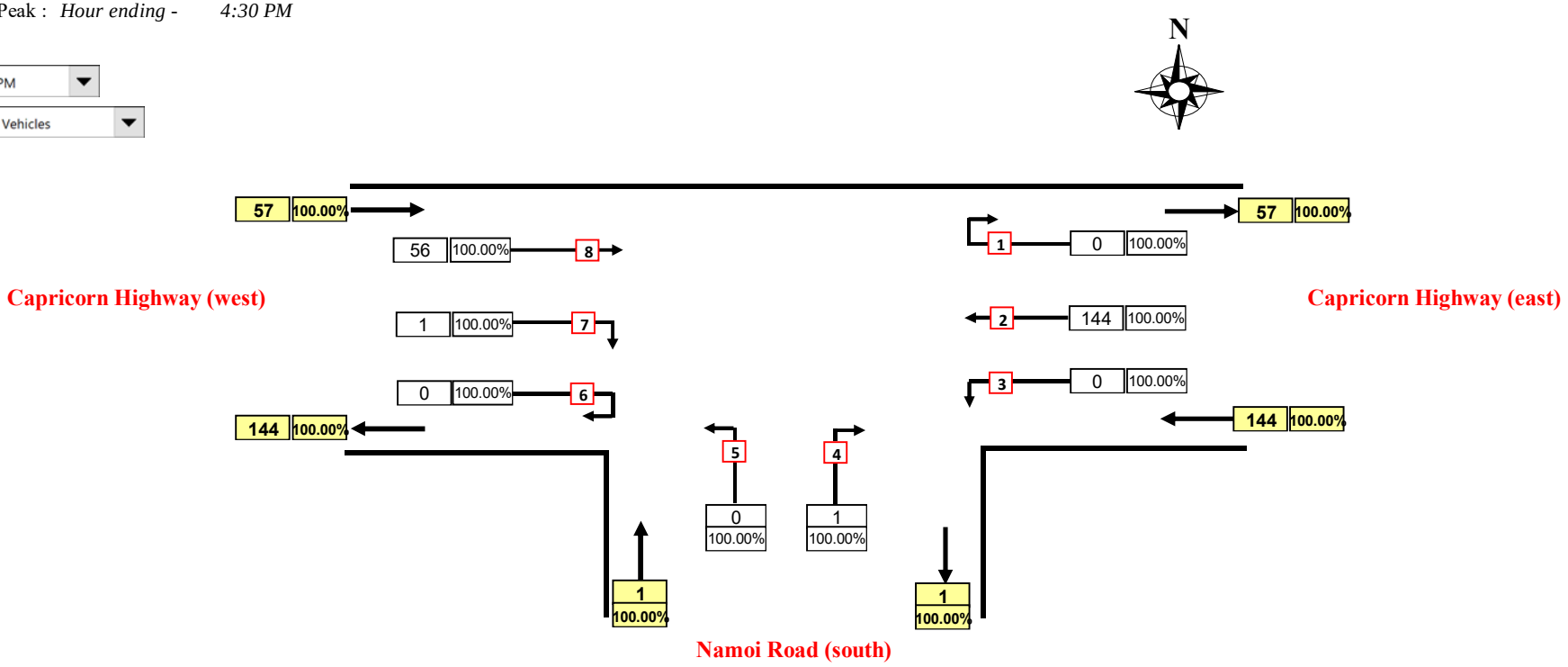
Day/Date: Tuesday, 23 July 2019

Summary: AM Peak : *Hour ending - 9:00 AM*

PM Peak : *Hour ending - 4:30 PM*

Hour Ending: 4:30 PM

Classification: Total Vehicles



AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 2 **Weather:** Fine

Location: Capricorn Highway/Cooinda Road, Dingo

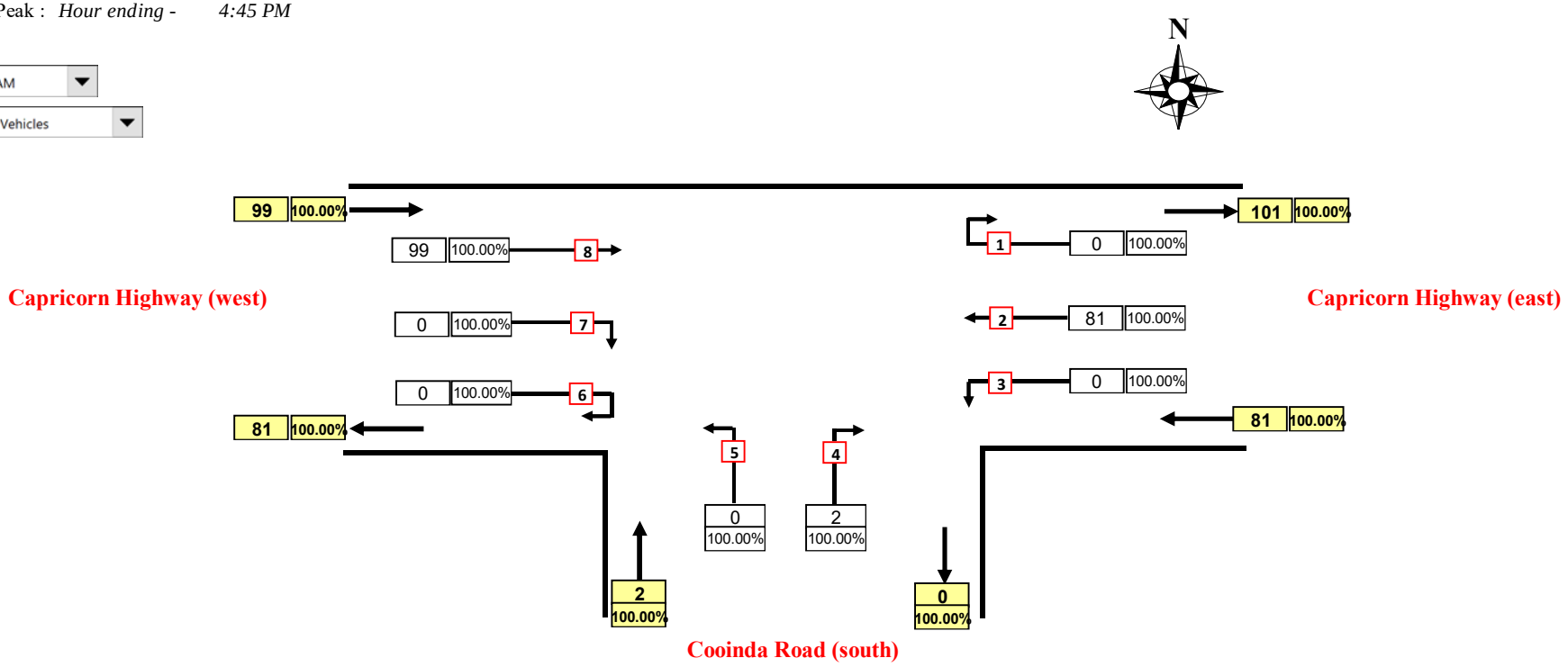
Day/Date: Tuesday, 23 July 2019

Summary: AM Peak : *Hour ending - 9:00 AM*

PM Peak : *Hour ending - 4:45 PM*

Hour Ending: 9:00 AM

Classification: Total Vehicles



AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 2 **Weather:** Fine

Location: Capricorn Highway/Cooinda Road, Dingo

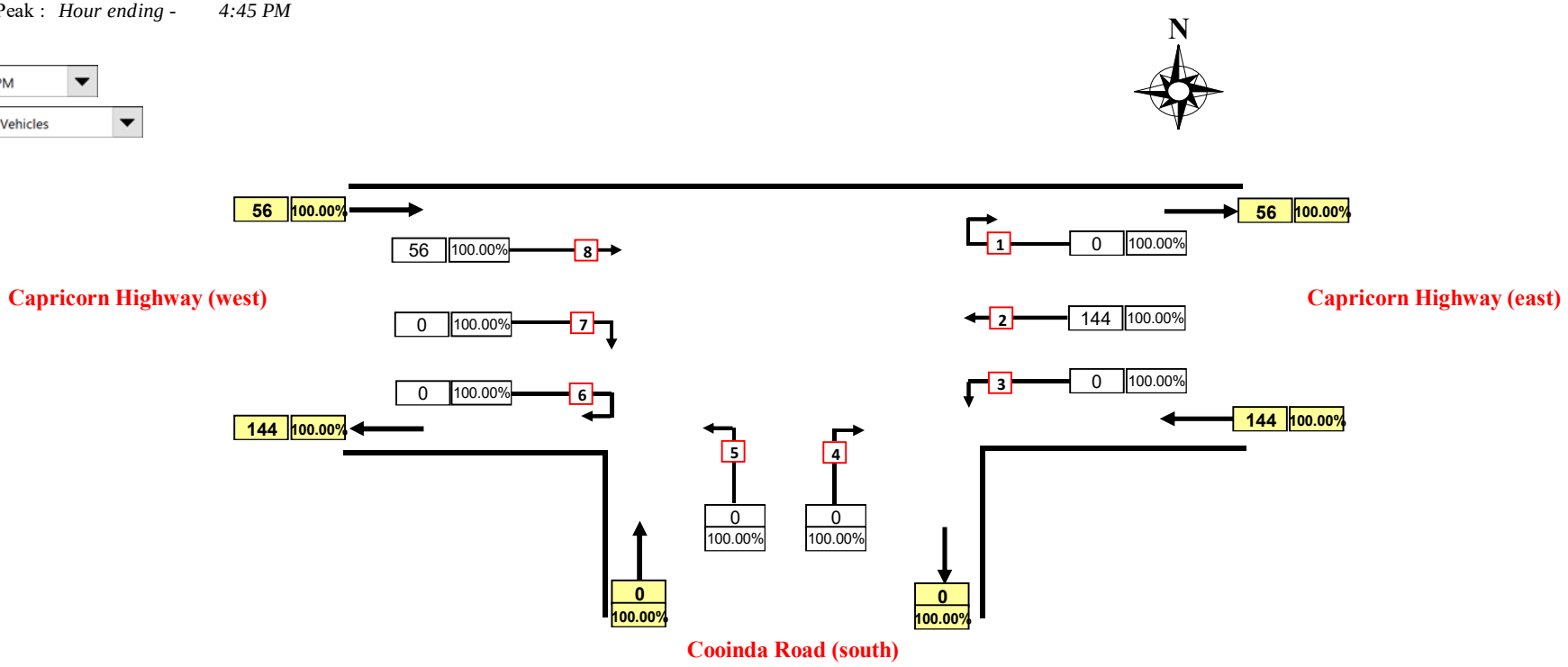
Day/Date: Tuesday, 23 July 2019

Summary: AM Peak : *Hour ending - 9:00 AM*

PM Peak : *Hour ending - 4:45 PM*

Hour Ending: 4:30 PM

Classification: Total Vehicles



AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 3 **Weather:** Fine

Location: Capricorn Highway/Charlevue Road, Dingo

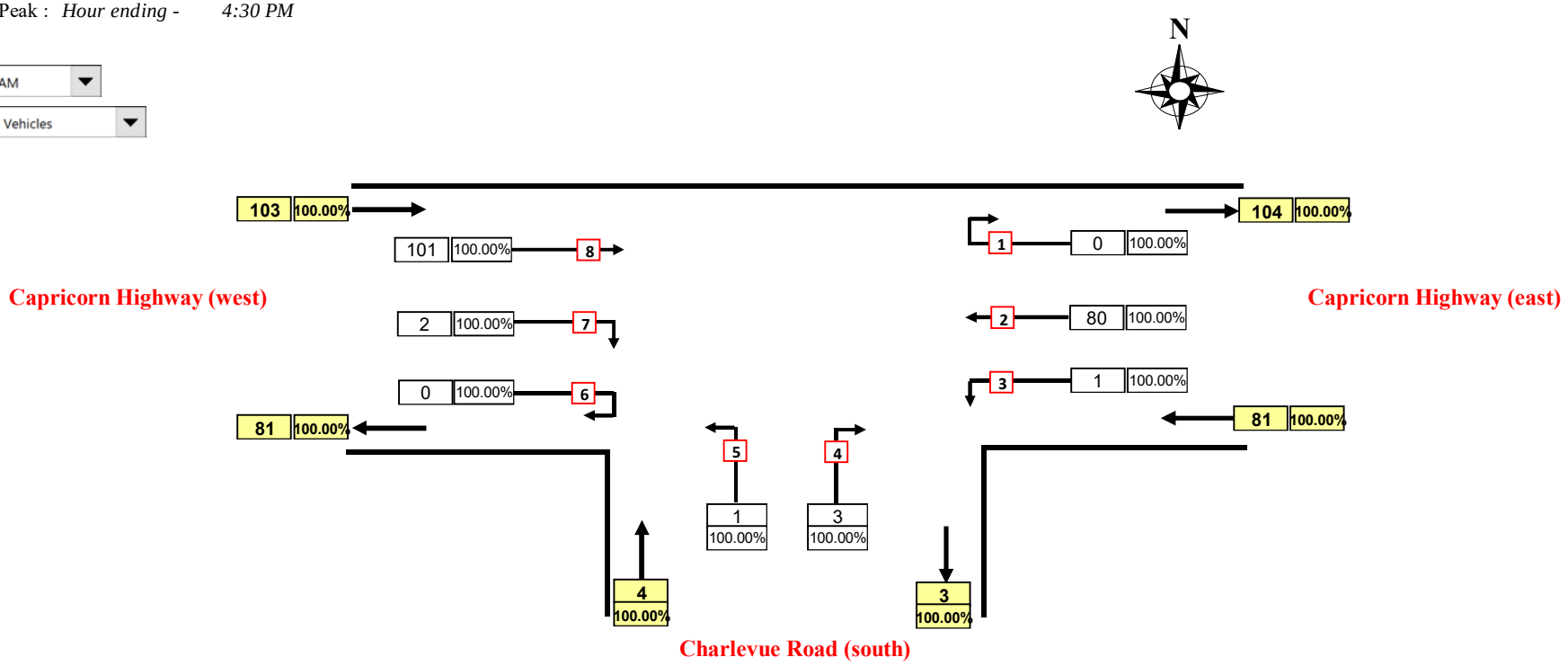
Day/Date: Tuesday, 23 July 2019

Summary: AM Peak : *Hour ending - 9:00 AM*

PM Peak : *Hour ending - 4:30 PM*

Hour Ending: 9:00 AM

Classification: Total Vehicles



AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 3 **Weather:** Fine

Location: Capricorn Highway/Charlevue Road, Dingo

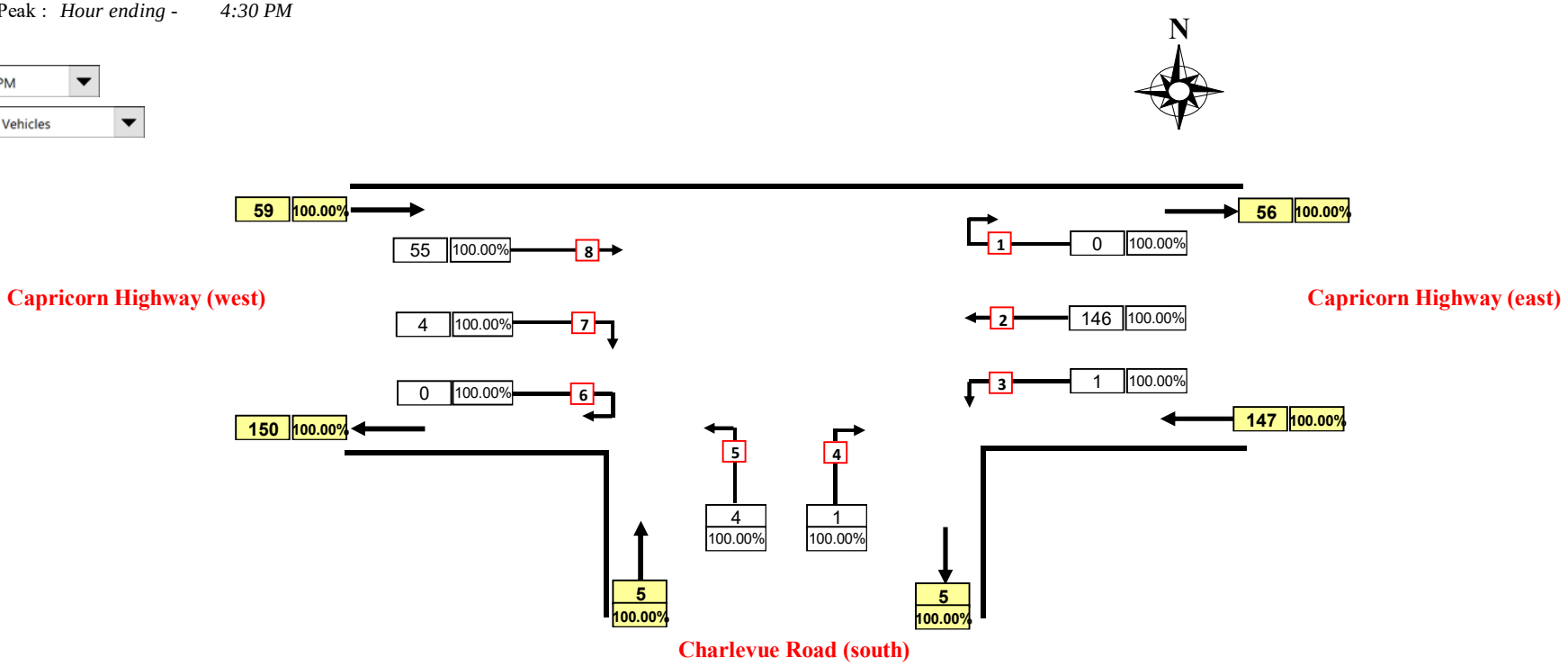
Day/Date: Tuesday, 23 July 2019

Summary: AM Peak : *Hour ending - 9:00 AM*

PM Peak : *Hour ending - 4:30 PM*

Hour Ending: 4:30 PM

Classification: Total Vehicles



APPENDIX

B

TRAFFIC VOLUMES

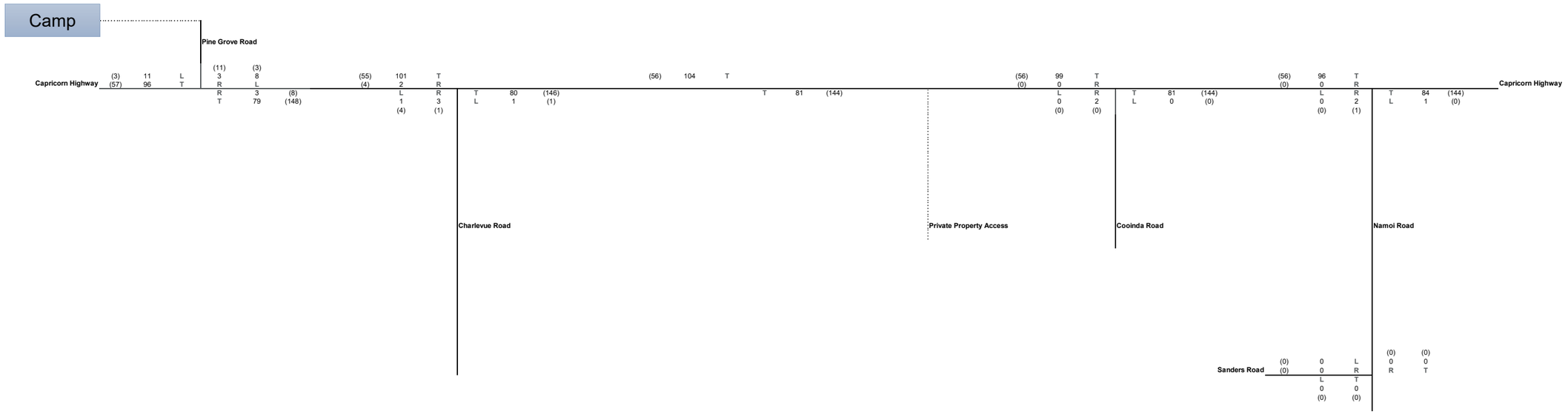


Figure Background 2019 Traffic Flow Diagram

Project no. QTT19061
Prepared by Nicholas Stone

Project Gemini Project TIA
Reviewed by John Peace

Legend

L	Left turn	**00**	AM Peak Volume
T	Through	**(00)**	PM Peak Volume
R	Right turn		
U	U-turn		

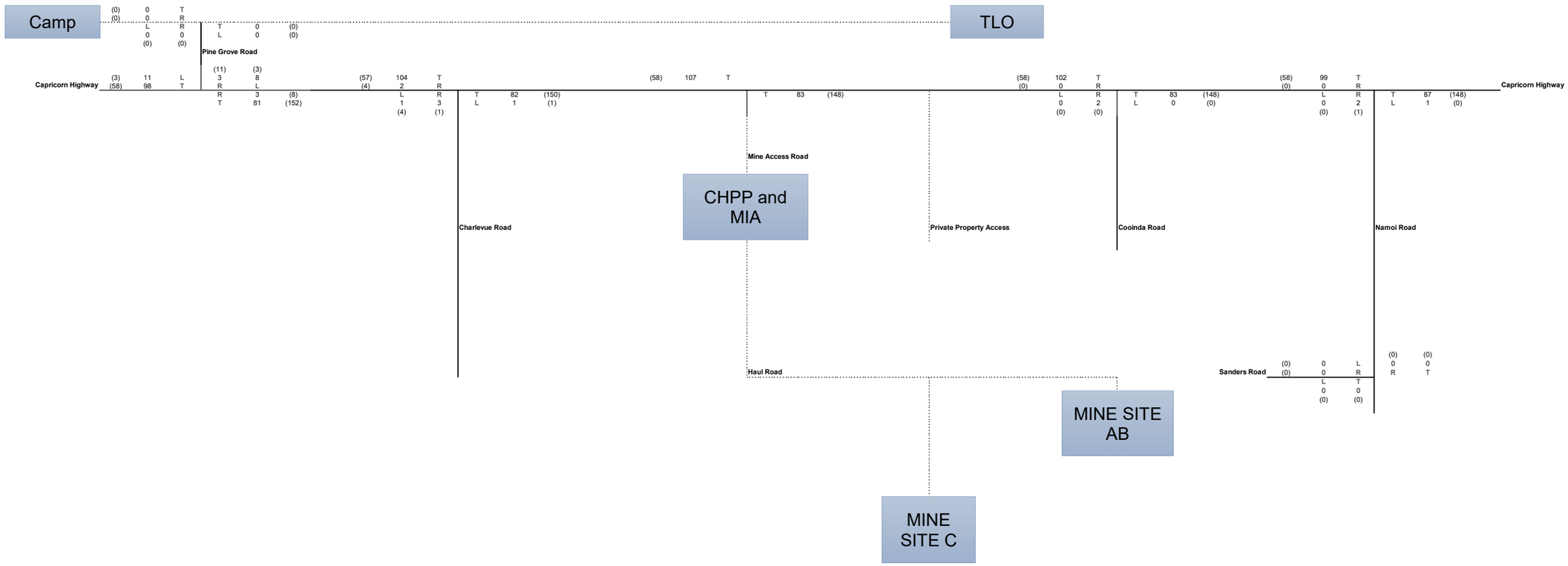


Figure **Background 2022 Traffic Flow Diagram (1% p.a. Growth on 2019 Background Volumes)**

Project no. QTT19061
Prepared by Nicholas Stone
Project Gemini Project TIA
Reviewed by John Peace

Legend

L	Left turn	**00**	AM Peak Volume
T	Through	**(00)**	PM Peak Volume
R	Right turn		
U	U-turn		

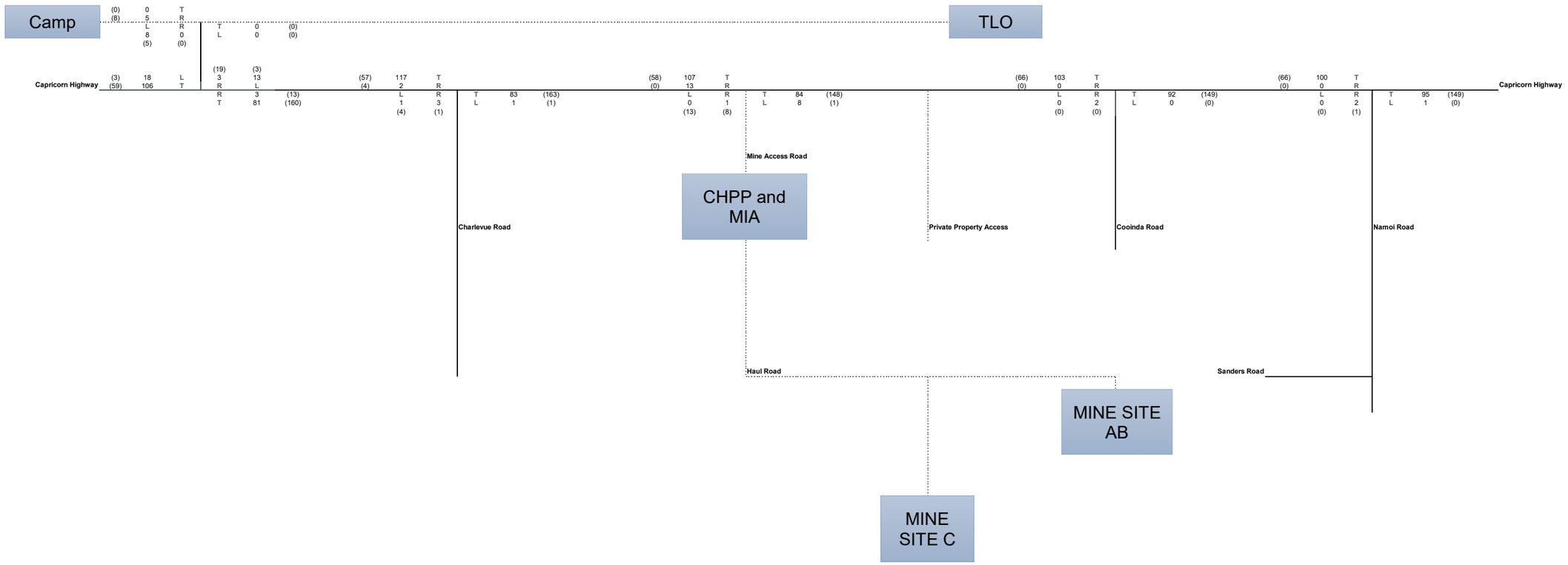


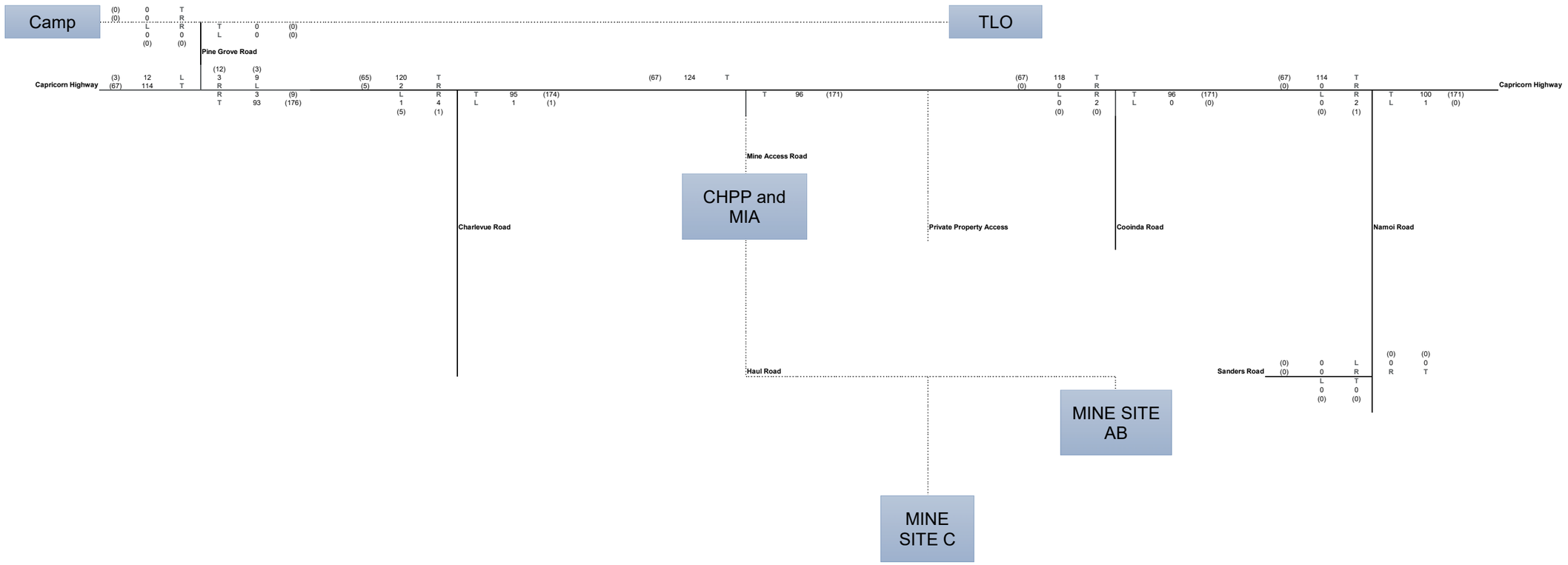
Figure Background 2022 + Peak Construction Traffic Flow Diagram

Project no. QTT19061
Prepared by Nicholas Stone

Project Gemini Project TIA
Reviewed by John Peace

Legend

L	Left turn	**00**	AM Peak Volume
T	Through	**(00)**	PM Peak Volume
R	Right turn		
U	U-turn		



Cardno

Figure Background 2038 Traffic Flow Diagram (1% p.a. Growth on 2019 Background Volumes)

#N/A

Project no. QTT19061
Prepared by Nicholas Stone

Project Gemini Project TIA
Reviewed by John Peace

Legend

L	Left turn	**00**	AM Peak Volume
T	Through	**(00)**	PM Peak Volume
R	Right turn		
U	U-turn		

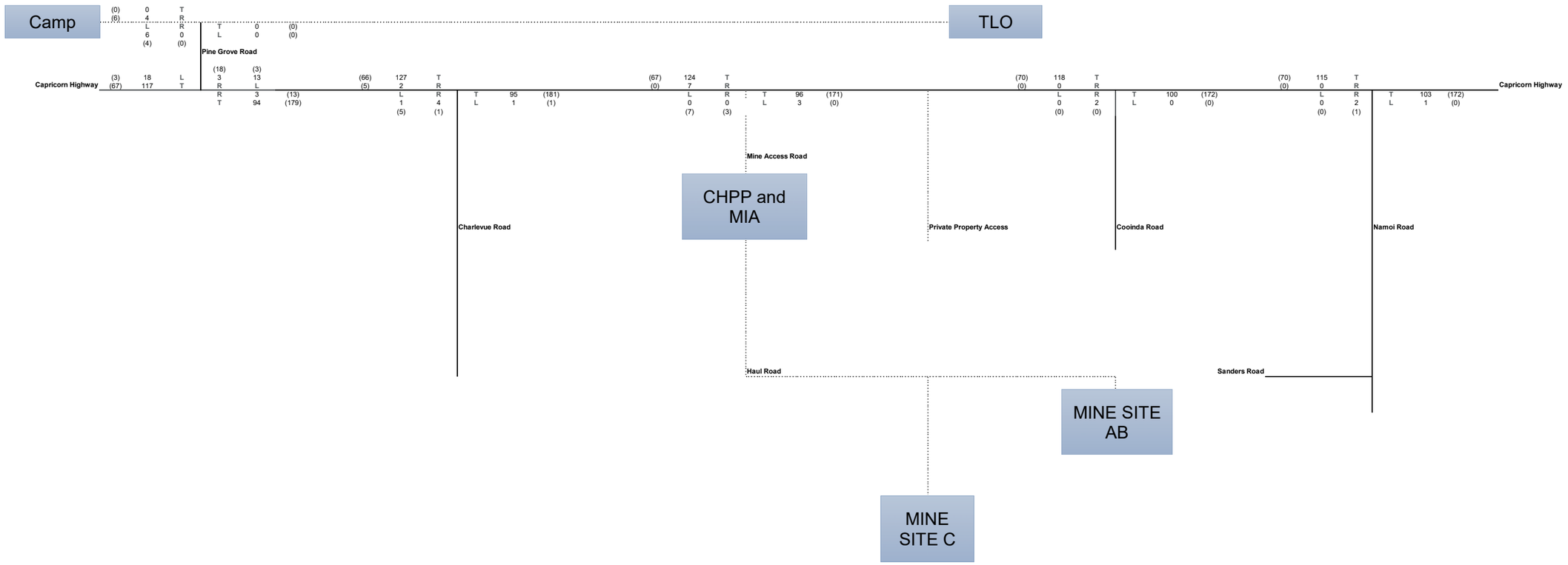


Figure Background 2038 + End of Operations Traffic Flow Diagram

Project no. QTT19061
Prepared by Nicholas Stone

Project Gemini Project TIA
Reviewed by John Peace

Legend

L	Left turn	00	AM Peak Volume
T	Through	(00)	PM Peak Volume
R	Right turn		
U	U-turn		

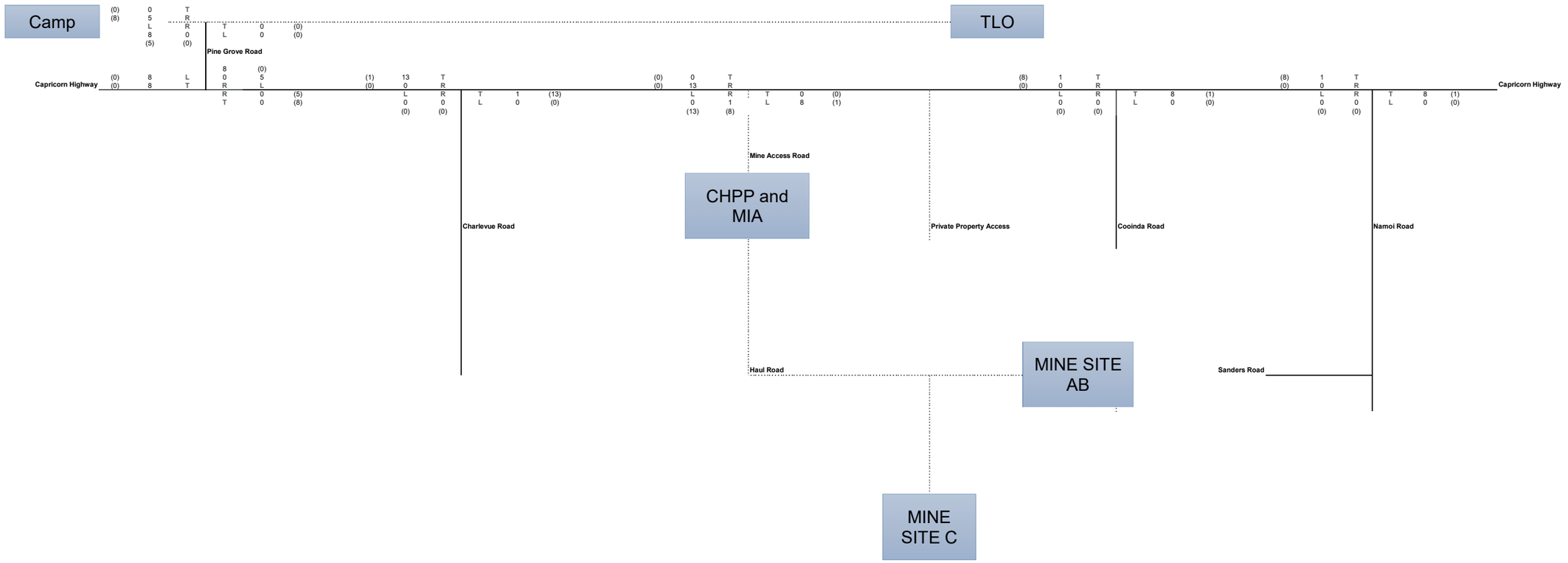


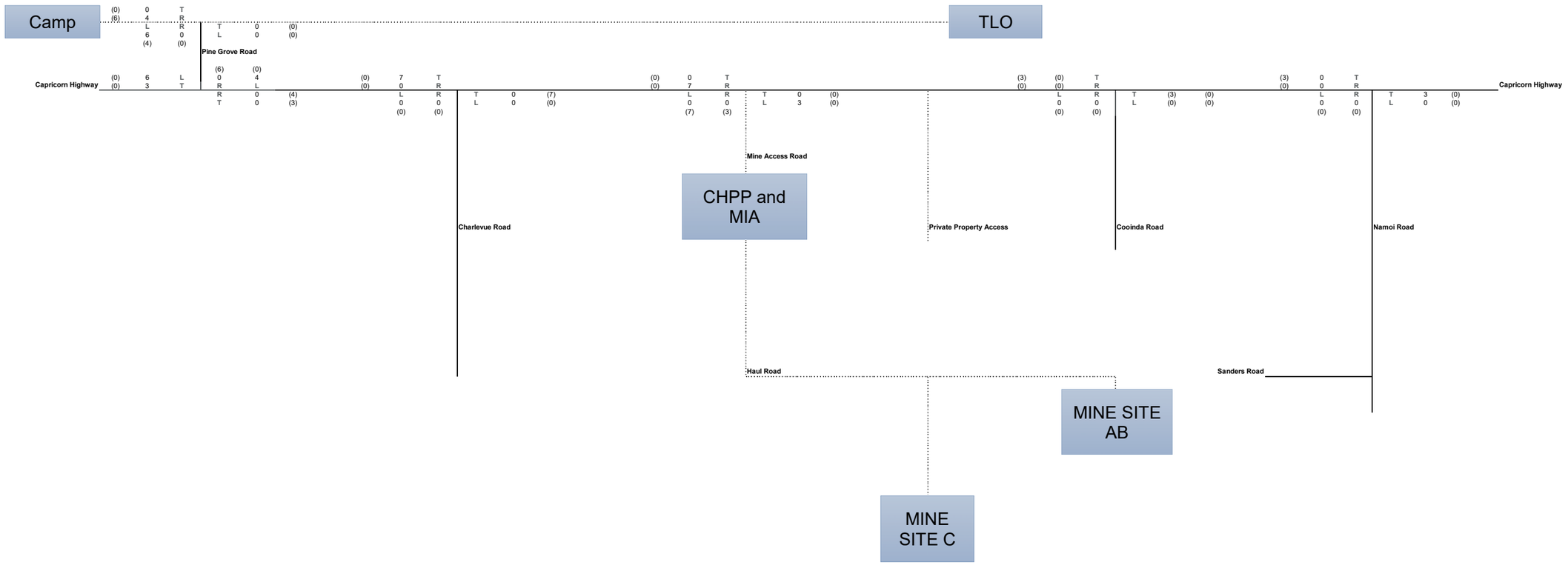
Figure **Peak Construction Traffic Flow Diagram**

Project no. QTT19061
Prepared by Nicholas Stone

Project Gemini Project TIA
Reviewed by John Peace

Legend

L	Left turn	**00**	AM Peak Volume
T	Through	**(00)**	PM Peak Volume
R	Right turn		
U	U-turn		



Cardno

Figure End of Operations Traffic Flow Diagram

Project no. QTT19061
Prepared by Nicholas Stone

Project Gemini Project TIA
Reviewed by John Peace

Legend

L	Left turn	00	AM Peak Volume
T	Through	(00)	PM Peak Volume
R	Right turn		
U	U-turn		

APPENDIX

C

SIDRA LAYOUT, RESULTS, AND TURN WARRANT TREATMENTS

LANE SUMMARY

Site: 101 [2022 BG + PEAK CONSTRUCTION AM PEAK]

Capricorn Highway / Proposed Mine Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

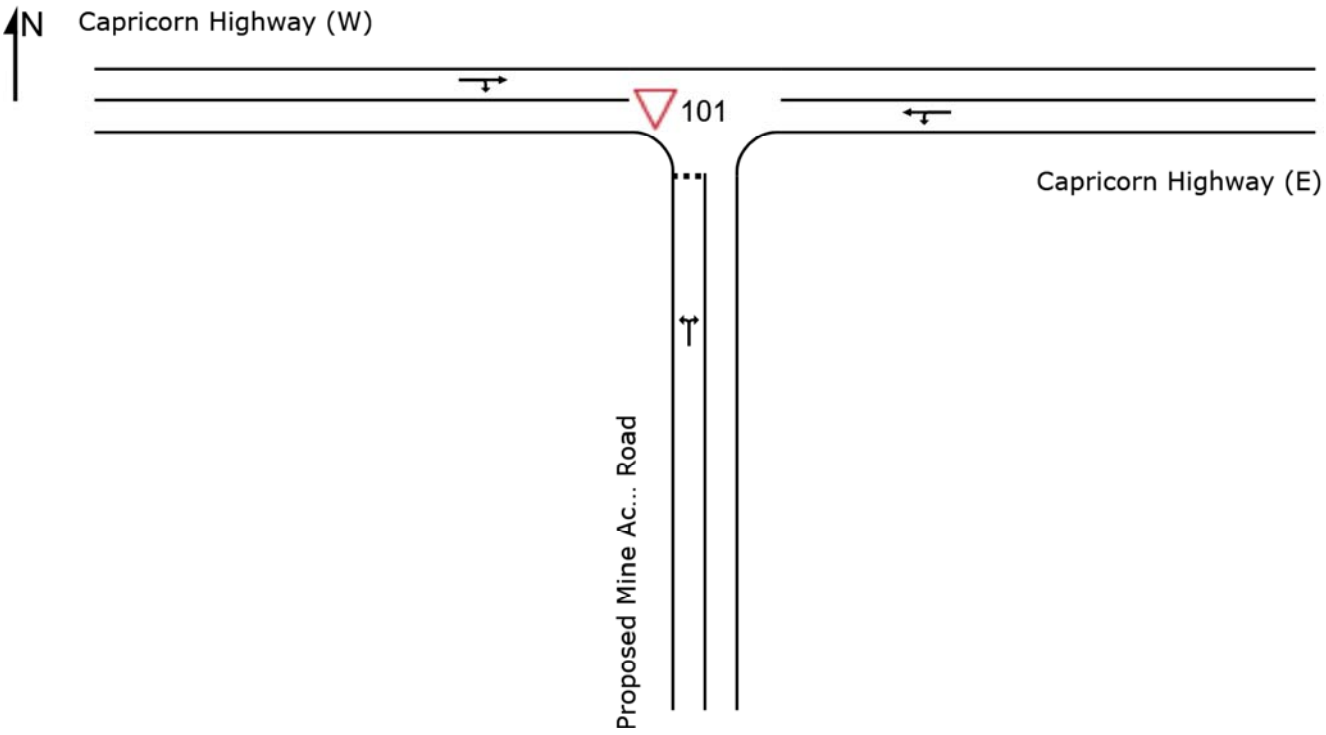
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Proposed Mine Access Road													
Lane 1	2	0.0	1253	0.002	100	6.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.0	LOS A	0.0	0.0				
East: Capricorn Highway (E)													
Lane 1	97	0.0	1942	0.050	100	0.5	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	97	0.0		0.050		0.5	NA	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	126	0.0	1904	0.066	100	0.7	LOS A	0.1	0.6	Full	800	0.0	0.0
Approach	126	0.0		0.066		0.7	NA	0.1	0.6				
Intersection	225	0.0		0.066		0.6	NA	0.1	0.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

SITE LAYOUT

Site: 101 [2022 BG + PEAK CONSTRUCTION AM PEAK]

Capricorn Highway / Proposed Mine Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2022 BG + PEAK CONSTRUCTION PM PEAK]

Capricorn Highway / Proposed Mine Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Proposed Mine Access Road													
Lane 1	22	0.0	1266	0.017	100	6.1	LOS A	0.1	0.4	Full	500	0.0	0.0
Approach	22	0.0		0.017		6.1	LOS A	0.1	0.4				
East: Capricorn Highway (E)													
Lane 1	157	0.0	1949	0.080	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	157	0.0		0.080		0.0	NA	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	62	0.0	1940	0.032	100	0.1	LOS A	0.0	0.1	Full	800	0.0	0.0
Approach	62	0.0		0.032		0.1	NA	0.0	0.1				
Intersection	241	0.0		0.080		0.6	NA	0.1	0.4				

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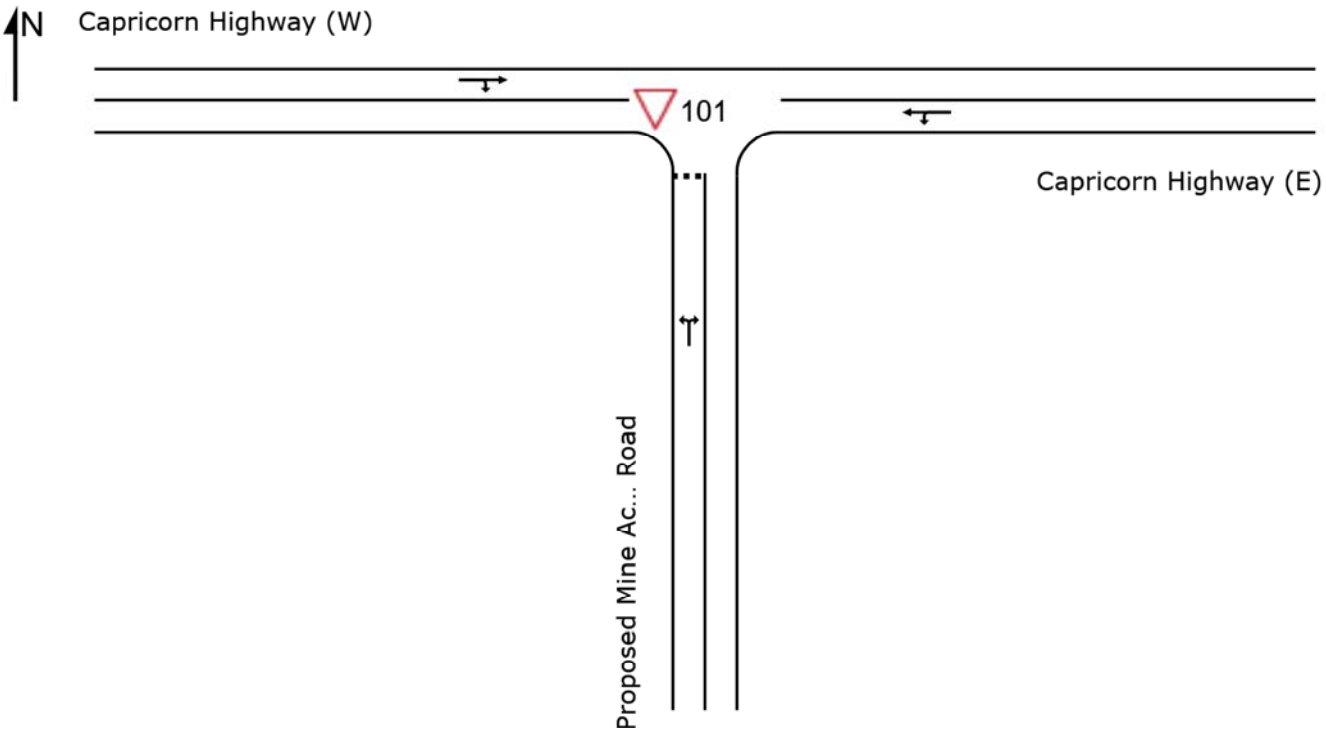
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [2022 BG + PEAK CONSTRUCTION PM PEAK]

Capricorn Highway / Proposed Mine Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2038 BG + PEAK OPERATION AM PEAK]

Capricorn Highway / Proposed Mine Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

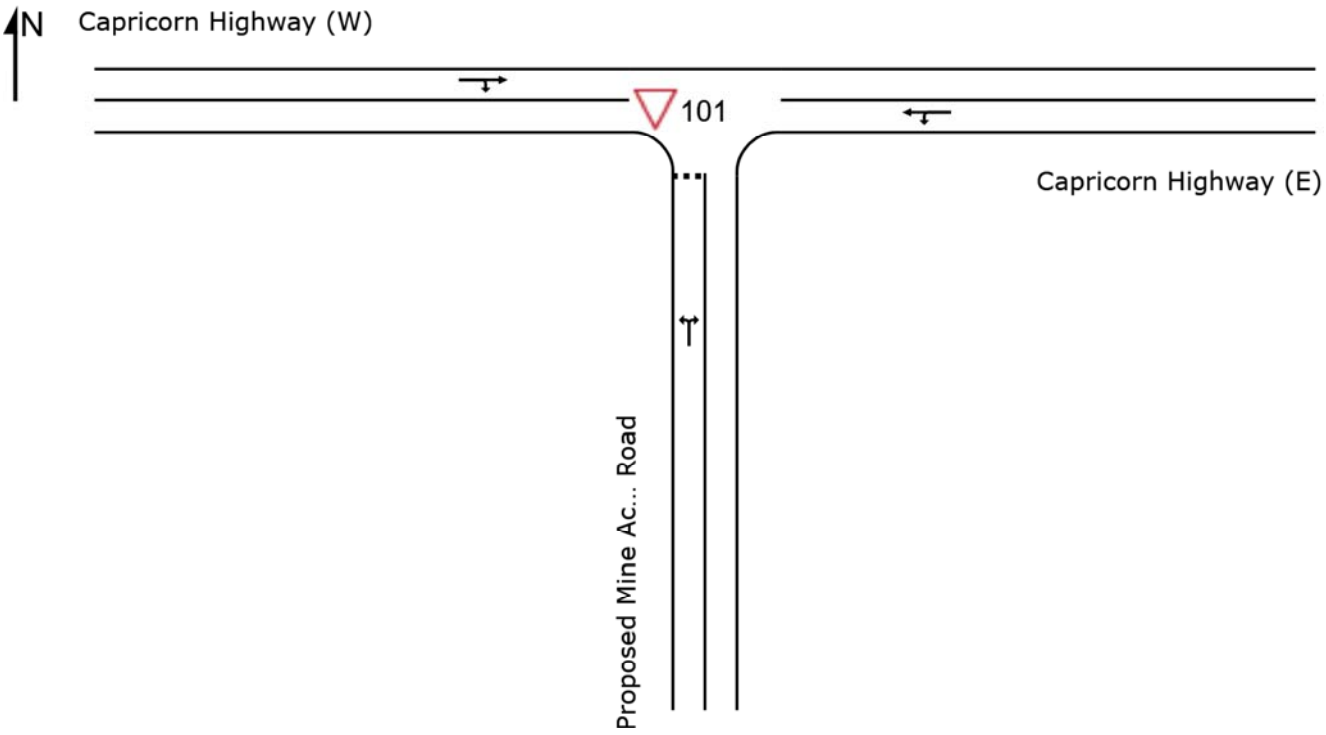
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Proposed Mine Access Road													
Lane 1	2	0.0	1233	0.002	100	6.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.0	LOS A	0.0	0.0				
East: Capricorn Highway (E)													
Lane 1	104	0.0	1947	0.054	100	0.2	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	104	0.0		0.054		0.2	NA	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	138	0.0	1926	0.072	100	0.3	LOS A	0.0	0.3	Full	800	0.0	0.0
Approach	138	0.0		0.072		0.3	NA	0.0	0.3				
Intersection	244	0.0		0.072		0.3	NA	0.0	0.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

SITE LAYOUT

Site: 101 [2038 BG + PEAK OPERATION AM PEAK]

Capricorn Highway / Proposed Mine Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2038 BG + PEAK OPERATION PM PEAK]

Capricorn Highway / Proposed Mine Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

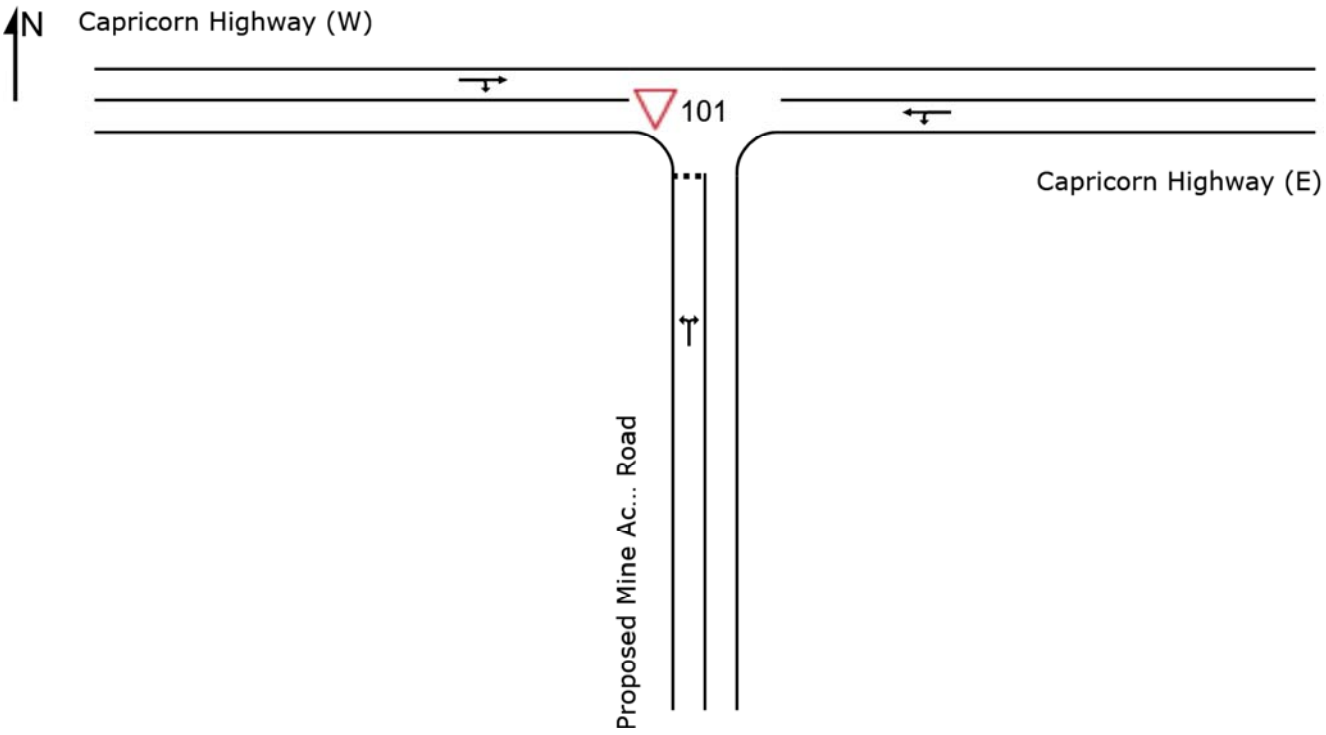
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Proposed Mine Access Road													
Lane 1	11	0.0	1265	0.008	100	6.1	LOS A	0.0	0.2	Full	500	0.0	0.0
Approach	11	0.0		0.008		6.1	LOS A	0.0	0.2				
East: Capricorn Highway (E)													
Lane 1	181	0.0	1949	0.093	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	181	0.0		0.093		0.0	NA	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	72	0.0	1941	0.037	100	0.1	LOS A	0.0	0.1	Full	800	0.0	0.0
Approach	72	0.0		0.037		0.1	NA	0.0	0.1				
Intersection	263	0.0		0.093		0.3	NA	0.0	0.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

SITE LAYOUT

Site: 101 [2038 BG + PEAK OPERATION PM PEAK]

Capricorn Highway / Proposed Mine Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2019 BG AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	83	0.0	1950	0.043	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	3	0.0	1296	0.002	100	5.8	LOS A	0.0	0.1	Short	60	0.0	NA
Approach	86	0.0		0.043		0.2	NA	0.0	0.1				
North: Pine Grove Road													
Lane 1	12	0.0	1094	0.011	100	5.7	LOS A	0.0	0.3	Full	80	0.0	0.0
Approach	12	0.0		0.011		5.7	LOS A	0.0	0.3				
West: Capricorn Highway (W)													
Lane 1	12	0.0	1857	0.006	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	101	0.0	1950	0.052	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	113	0.0		0.052		0.6	NA	0.0	0.0				
Intersection	211	0.0		0.052		0.7	NA	0.0	0.3				

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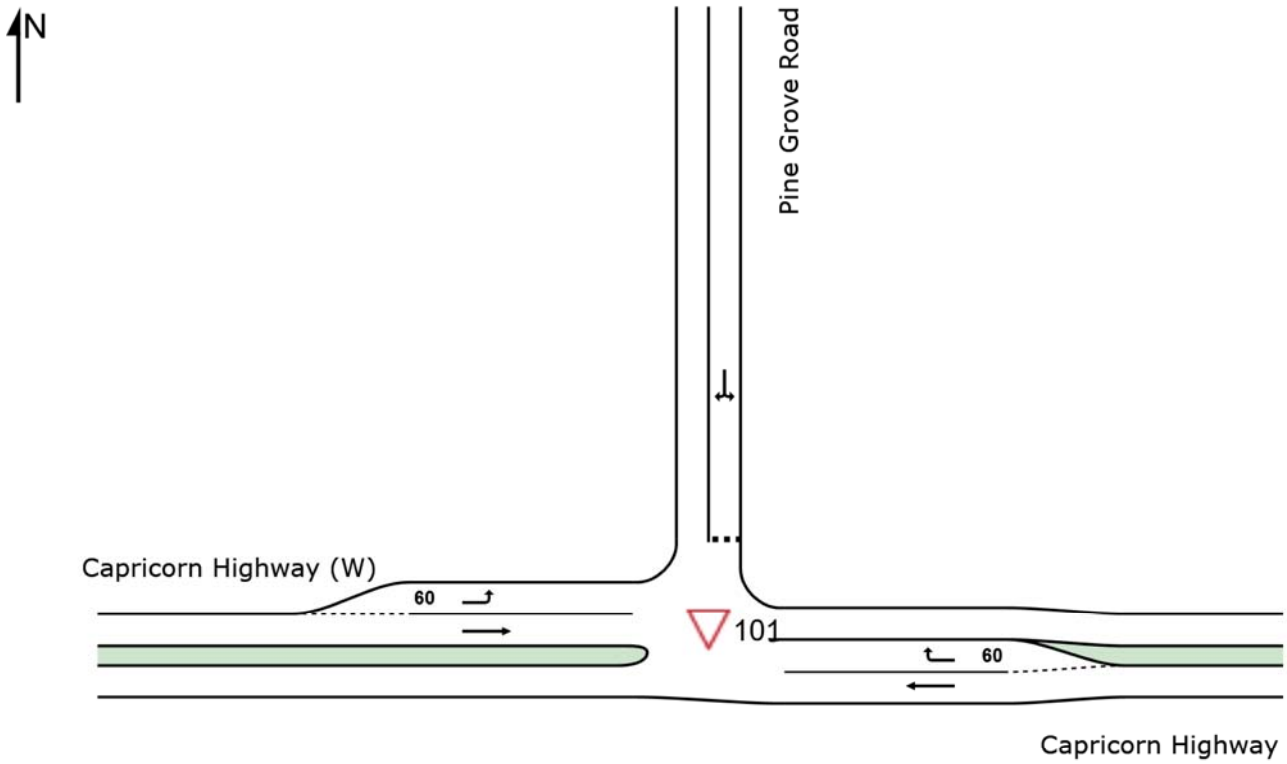
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [2019 BG AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2019 BG PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	156	0.0	1950	0.080	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	8	0.0	1358	0.006	100	5.7	LOS A	0.0	0.2	Short	60	0.0	NA
Approach	164	0.0		0.080		0.3	NA	0.0	0.2				
North: Pine Grove Road													
Lane 1	15	0.0	892	0.017	100	6.3	LOS A	0.1	0.4	Full	80	0.0	0.0
Approach	15	0.0		0.017		6.3	LOS A	0.1	0.4				
West: Capricorn Highway (W)													
Lane 1	3	0.0	1857	0.002	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	60	0.0	1950	0.031	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	63	0.0		0.031		0.3	NA	0.0	0.0				
Intersection	242	0.0		0.080		0.7	NA	0.1	0.4				

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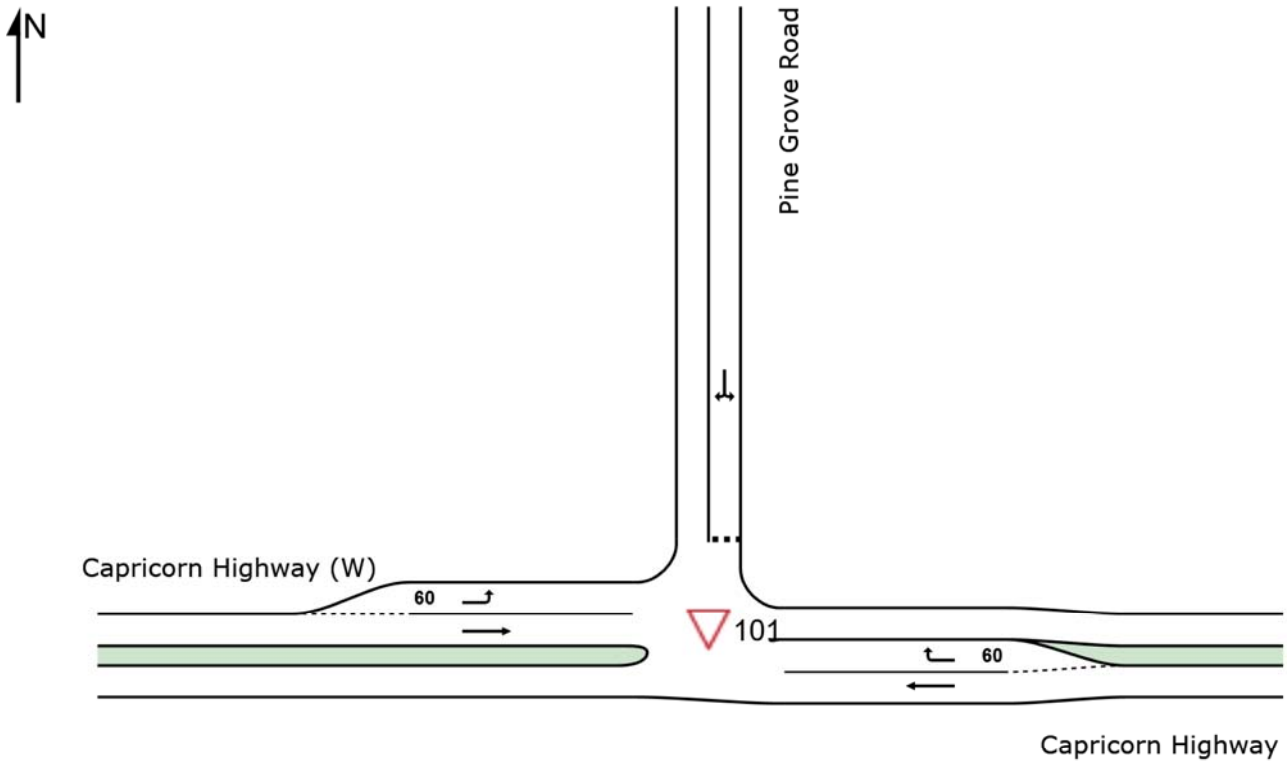
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [2019 BG PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2022 BG + PEAK CONSTRUCTION AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	85	0.0	1950	0.044	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	3	0.0	1273	0.002	100	5.9	LOS A	0.0	0.1	Short	60	0.0	NA
Approach	88	0.0		0.044		0.2	NA	0.0	0.1				
North: Pine Grove Road													
Lane 1	17	0.0	1115	0.015	100	5.7	LOS A	0.1	0.4	Full	80	0.0	0.0
Approach	17	0.0		0.015		5.7	LOS A	0.1	0.4				
West: Capricorn Highway (W)													
Lane 1	19	0.0	1857	0.010	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	112	0.0	1950	0.057	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	131	0.0		0.057		0.8	NA	0.0	0.0				
Intersection	236	0.0		0.057		0.9	NA	0.1	0.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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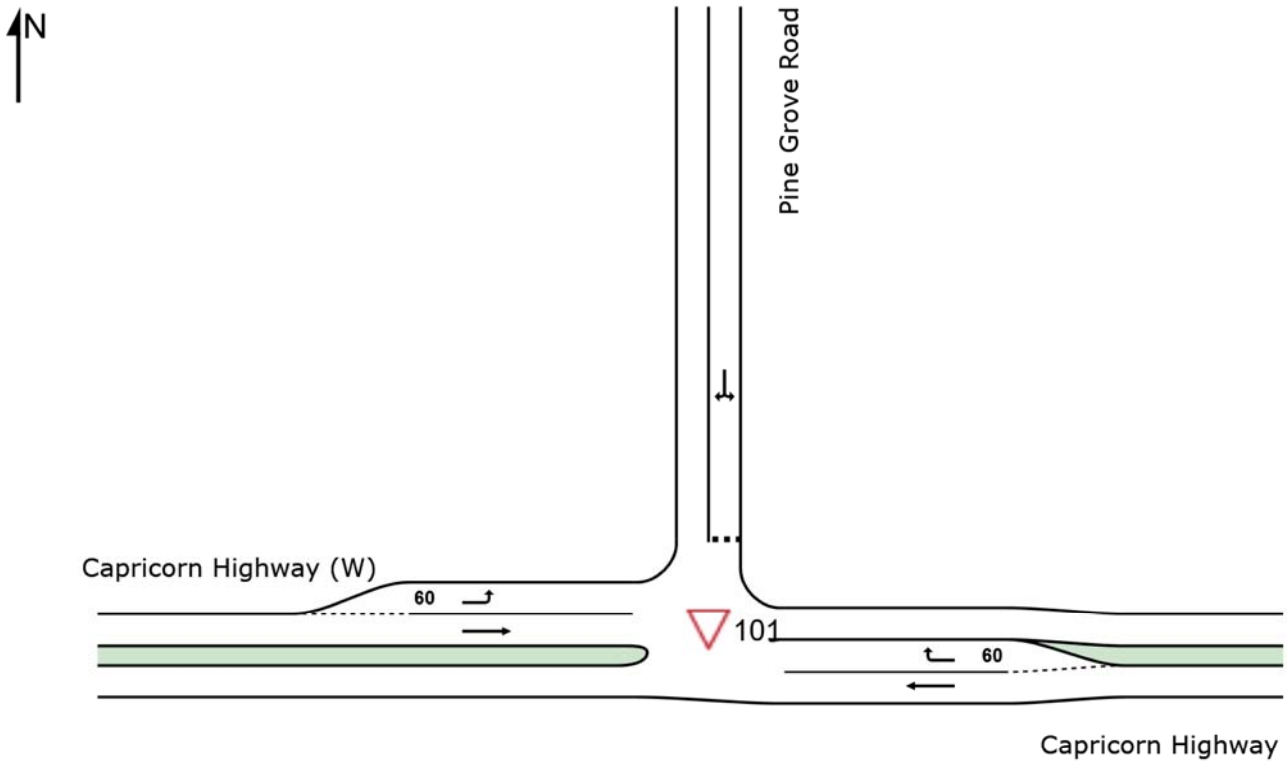
SITE LAYOUT

Site: 101 [2022 BG + PEAK CONSTRUCTION AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2022 BG + PEAK CONSTRUCTION PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	168	0.0	1950	0.086	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	14	0.0	1356	0.010	100	5.7	LOS A	0.0	0.3	Short	60	0.0	NA
Approach	182	0.0		0.086		0.4	NA	0.0	0.3				
North: Pine Grove Road													
Lane 1	23	0.0	846	0.027	100	6.6	LOS A	0.1	0.7	Full	80	0.0	0.0
Approach	23	0.0		0.027		6.6	LOS A	0.1	0.7				
West: Capricorn Highway (W)													
Lane 1	3	0.0	1857	0.002	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	62	0.0	1950	0.032	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	65	0.0		0.032		0.3	NA	0.0	0.0				
Intersection	271	0.0		0.086		0.9	NA	0.1	0.7				

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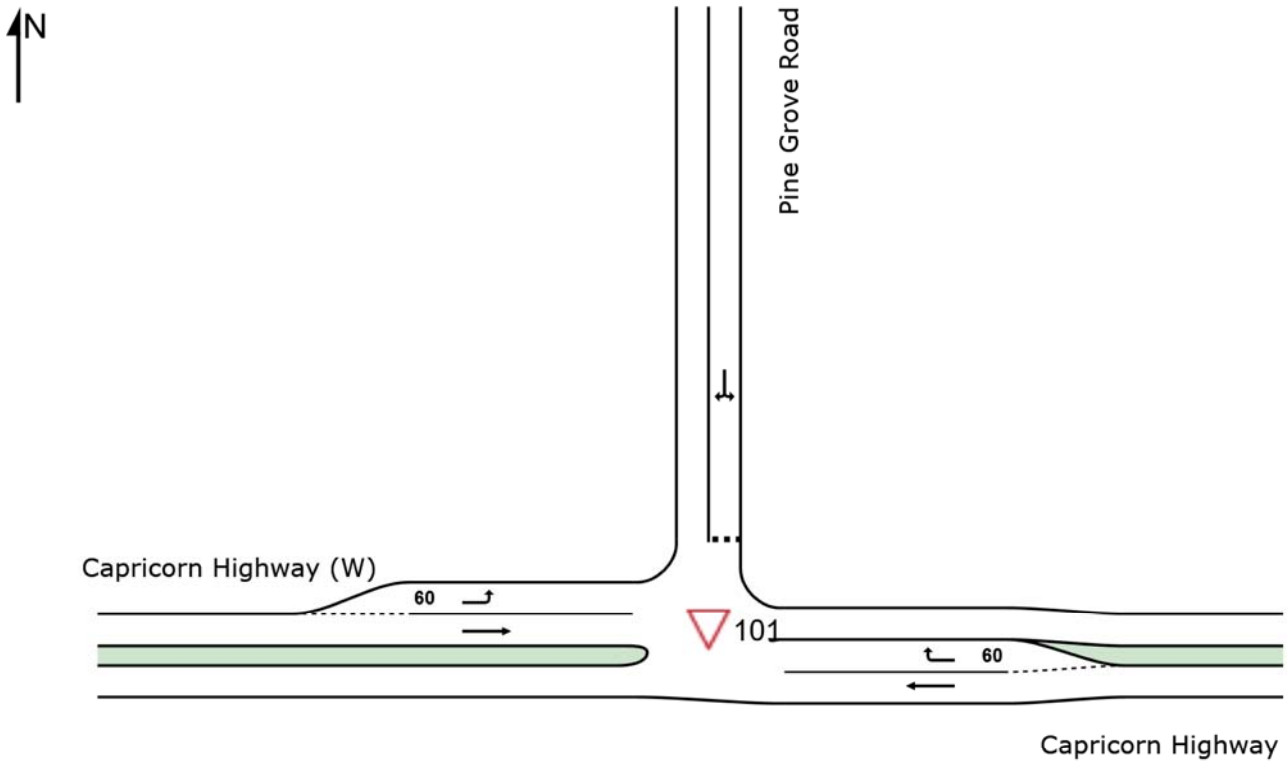
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [2022 BG + PEAK CONSTRUCTION PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

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Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	85	0.0	1950	0.044	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	3	0.0	1293	0.002	100	5.8	LOS A	0.0	0.1	Short	60	0.0	NA
Approach	88	0.0		0.044		0.2	NA	0.0	0.1				
North: Pine Grove Road													
Lane 1	12	0.0	1091	0.011	100	5.7	LOS A	0.0	0.3	Full	80	0.0	0.0
Approach	12	0.0		0.011		5.7	LOS A	0.0	0.3				
West: Capricorn Highway (W)													
Lane 1	12	0.0	1857	0.006	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	103	0.0	1950	0.053	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	115	0.0		0.053		0.6	NA	0.0	0.0				
Intersection	215	0.0		0.053		0.7	NA	0.0	0.3				

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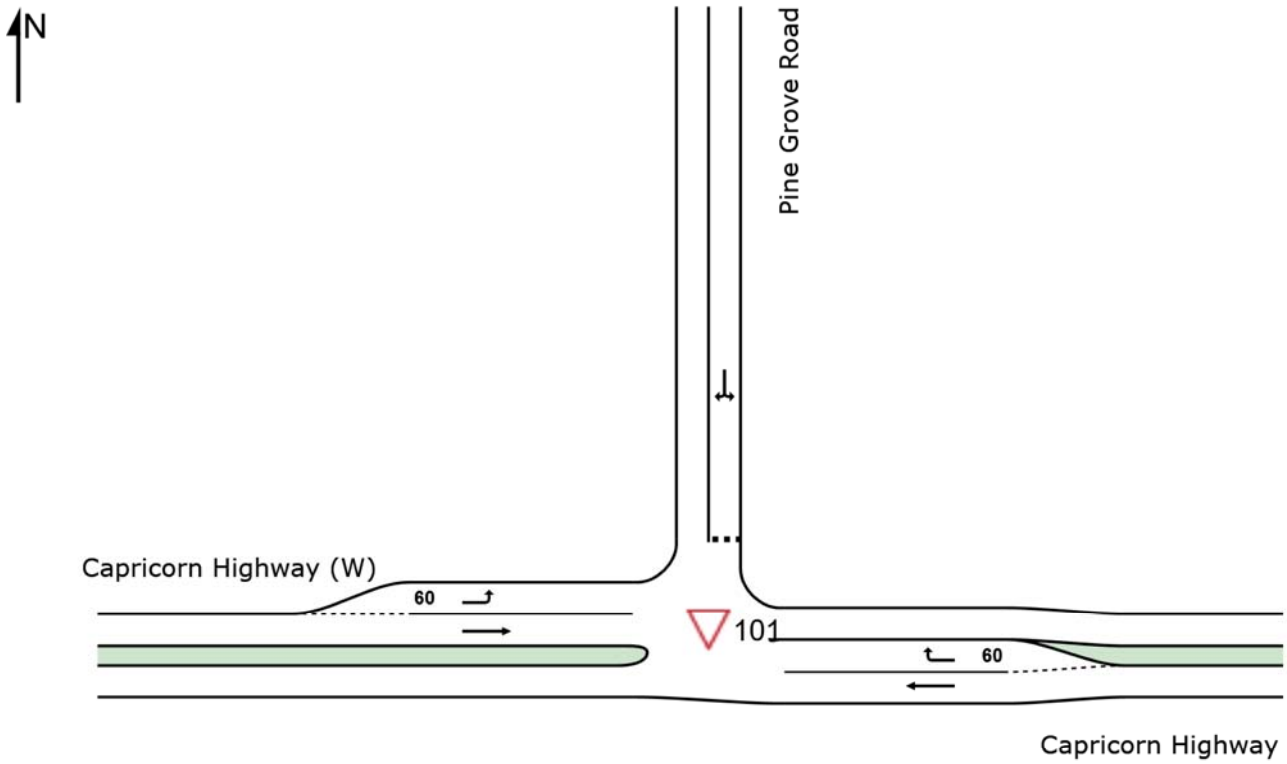
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [2022 BG AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2022 BG PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

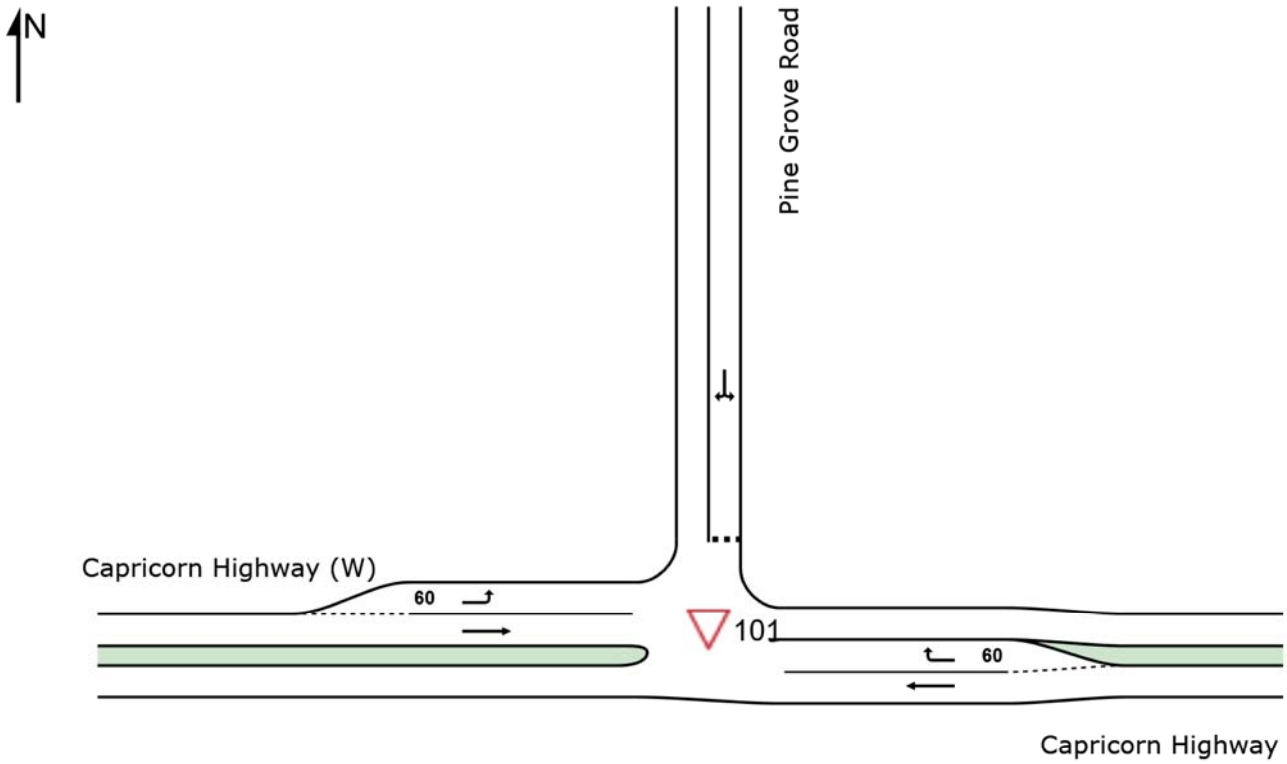
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	160	0.0	1950	0.082	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	8	0.0	1357	0.006	100	5.7	LOS A	0.0	0.2	Short	60	0.0	NA
Approach	168	0.0		0.082		0.3	NA	0.0	0.2				
North: Pine Grove Road													
Lane 1	15	0.0	887	0.017	100	6.3	LOS A	0.1	0.4	Full	80	0.0	0.0
Approach	15	0.0		0.017		6.3	LOS A	0.1	0.4				
West: Capricorn Highway (W)													
Lane 1	3	0.0	1857	0.002	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	61	0.0	1950	0.031	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	64	0.0		0.031		0.3	NA	0.0	0.0				
Intersection	247	0.0		0.082		0.6	NA	0.1	0.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

SITE LAYOUT

Site: 101 [2022 BG PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



Organisation: CARDNO (QLD) PTY LTD | Created: Tuesday, 1 October 2019 9:10:02 AM
Project: G:\QTT19061 - Dingo West Coal Mine TIA\5_PROJECT ANALYSIS\Analysis\SIDRA\Pine Grove Road.sip8

LANE SUMMARY

Site: 101 [2040 BG + PEAK OPERATIONS AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

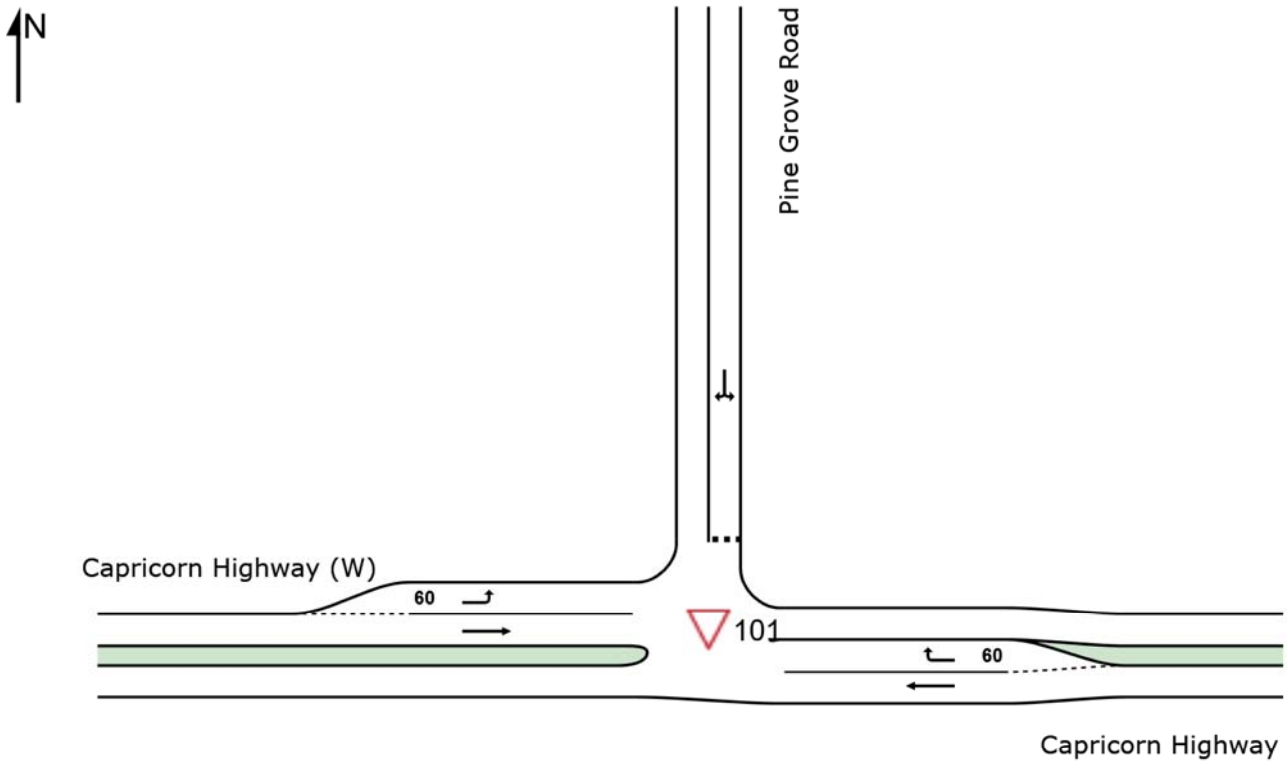
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	100	0.0	1950	0.051	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	3	0.0	1255	0.003	100	5.9	LOS A	0.0	0.1	Short	60	0.0	NA
Approach	103	0.0		0.051		0.2	NA	0.0	0.1				
North: Pine Grove Road													
Lane 1	17	0.0	1094	0.015	100	5.8	LOS A	0.1	0.4	Full	80	0.0	0.0
Approach	17	0.0		0.015		5.8	LOS A	0.1	0.4				
West: Capricorn Highway (W)													
Lane 1	20	0.0	1857	0.011	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	125	0.0	1950	0.064	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	145	0.0		0.064		0.8	NA	0.0	0.0				
Intersection	265	0.0		0.064		0.9	NA	0.1	0.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

SITE LAYOUT

Site: 101 [2040 BG + PEAK OPERATIONS AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



Organisation: CARDNO (QLD) PTY LTD | Created: Tuesday, 1 October 2019 9:09:43 AM
Project: G:\QTT19061 - Dingo West Coal Mine TIA\5_PROJECT ANALYSIS\Analysis\SIDRA\Pine Grove Road.sip8

LANE SUMMARY

Site: 101 [2040 BG + PEAK OPERATIONS PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

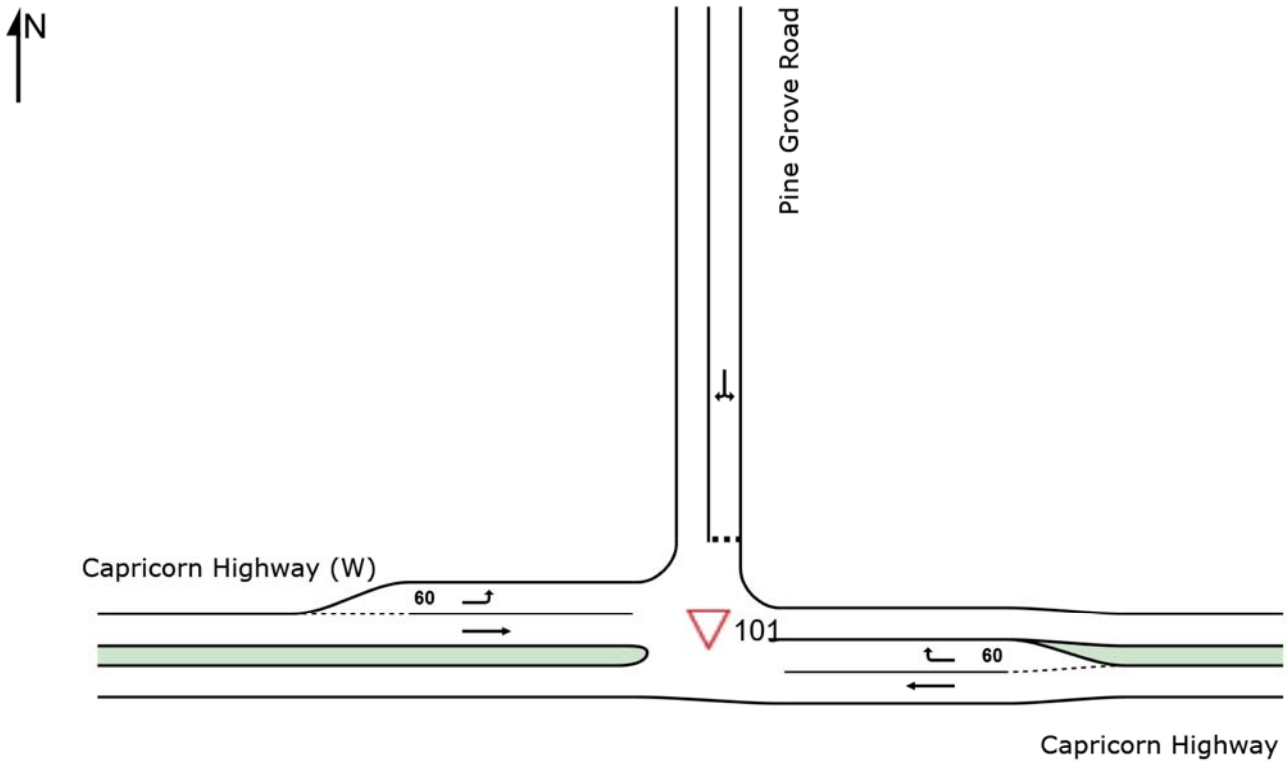
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	192	0.0	1950	0.098	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	14	0.0	1342	0.010	100	5.7	LOS A	0.0	0.3	Short	60	0.0	NA
Approach	205	0.0		0.098		0.4	NA	0.0	0.3				
North: Pine Grove Road													
Lane 1	23	0.0	812	0.029	100	6.8	LOS A	0.1	0.7	Full	80	0.0	0.0
Approach	23	0.0		0.029		6.8	LOS A	0.1	0.7				
West: Capricorn Highway (W)													
Lane 1	3	0.0	1857	0.002	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	73	0.0	1950	0.037	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	76	0.0		0.037		0.2	NA	0.0	0.0				
Intersection	304	0.0		0.098		0.8	NA	0.1	0.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

SITE LAYOUT

Site: 101 [2040 BG + PEAK OPERATIONS PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2040 BG AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

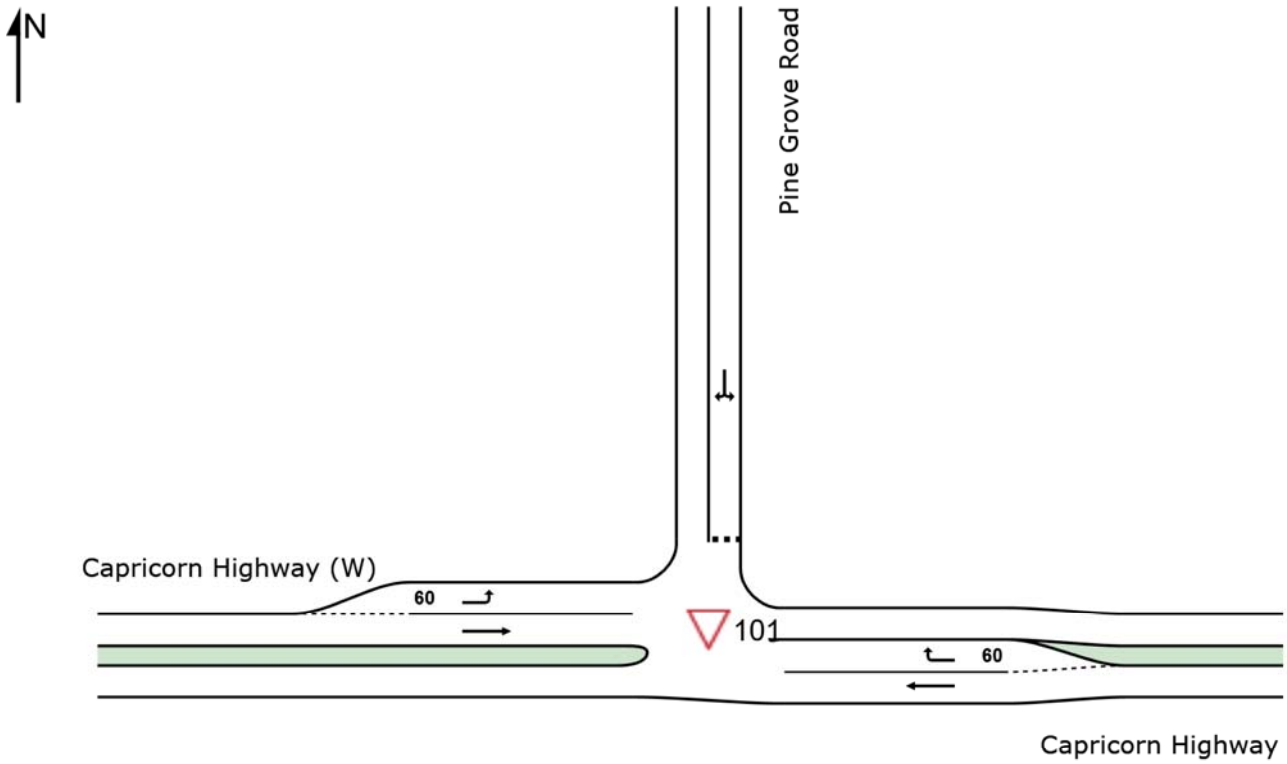
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	100	0.0	1950	0.051	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	3	0.0	1267	0.002	100	5.9	LOS A	0.0	0.1	Short	60	0.0	NA
Approach	103	0.0		0.051		0.2	NA	0.0	0.1				
North: Pine Grove Road													
Lane 1	13	0.0	890	0.014	100	6.3	LOS A	0.1	0.4	Full	80	0.0	0.0
Approach	13	0.0		0.014		6.3	LOS A	0.1	0.4				
West: Capricorn Highway (W)													
Lane 1	14	0.0	1857	0.007	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	122	0.0	1950	0.063	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	136	0.0		0.063		0.6	NA	0.0	0.0				
Intersection	252	0.0		0.063		0.7	NA	0.1	0.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

SITE LAYOUT

Site: 101 [2040 BG AM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)



LANE SUMMARY

Site: 101 [2040 BG PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

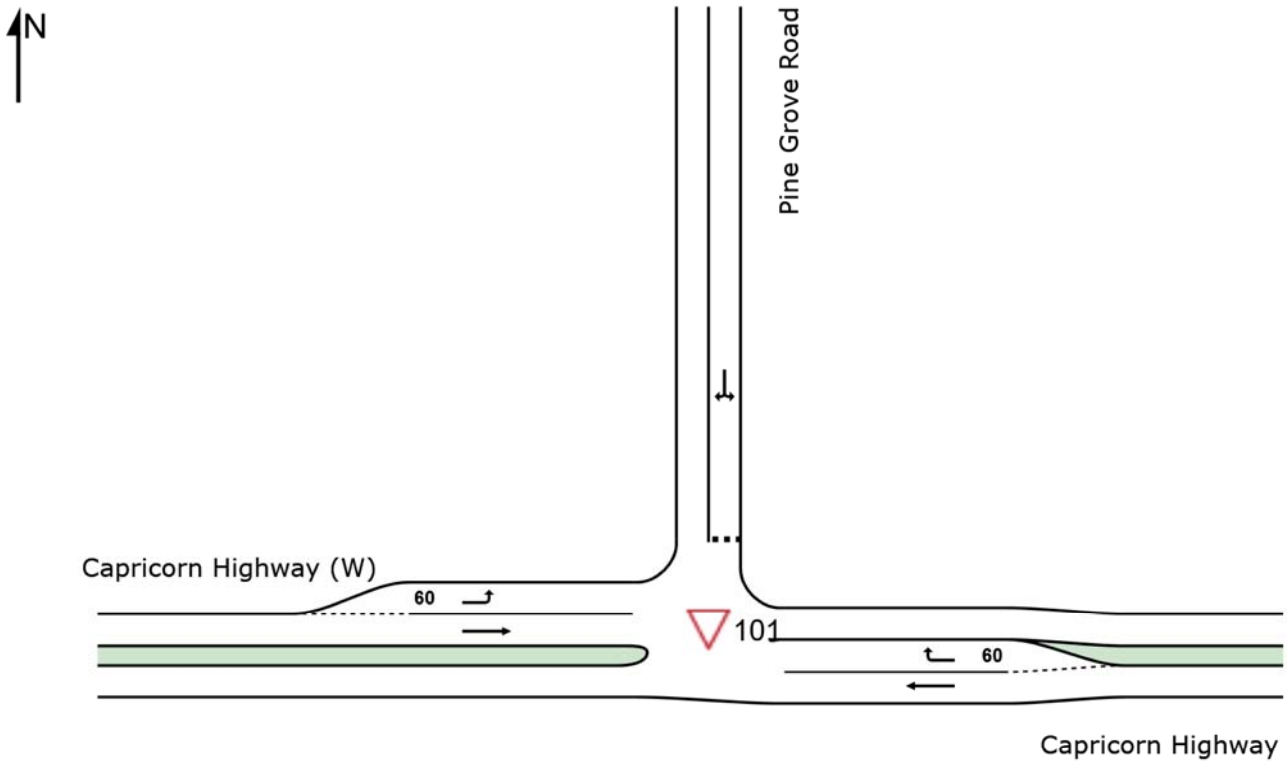
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Capricorn Highway (E)													
Lane 1	187	0.0	1950	0.096	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Lane 2	9	0.0	1344	0.007	100	5.7	LOS A	0.0	0.2	Short	60	0.0	NA
Approach	197	0.0		0.096		0.3	NA	0.0	0.2				
North: Pine Grove Road													
Lane 1	17	0.0	838	0.020	100	6.6	LOS A	0.1	0.5	Full	80	0.0	0.0
Approach	17	0.0		0.020		6.6	LOS A	0.1	0.5				
West: Capricorn Highway (W)													
Lane 1	3	0.0	1857	0.002	100	5.5	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	72	0.0	1950	0.037	100	0.0	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	75	0.0		0.037		0.2	NA	0.0	0.0				
Intersection	288	0.0		0.096		0.6	NA	0.1	0.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

SITE LAYOUT

Site: 101 [2040 BG PM PEAK]

Capricorn Highway / TLO Access Road
Site Category: (None)
Giveway / Yield (Two-Way)

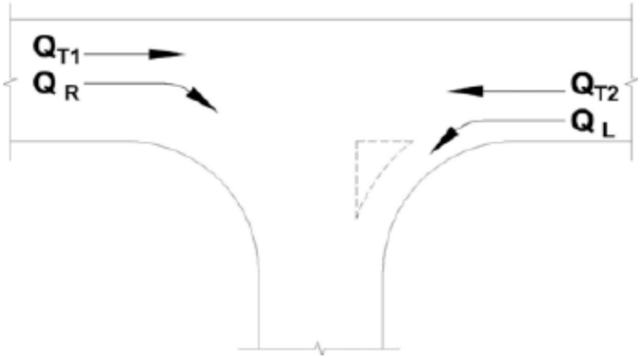


Organisation: CARDNO (QLD) PTY LTD | Created: Tuesday, 1 October 2019 9:10:06 AM
Project: G:\QTT19061 - Dingo West Coal Mine TIA\5_PROJECT ANALYSIS\Analysis\SIDRA\Pine Grove Road.sip8

Capricorn Highway / Charlevue Road Intersection

2038 BG + End of Operations

Q_{T1}=	127
Q_R=	2

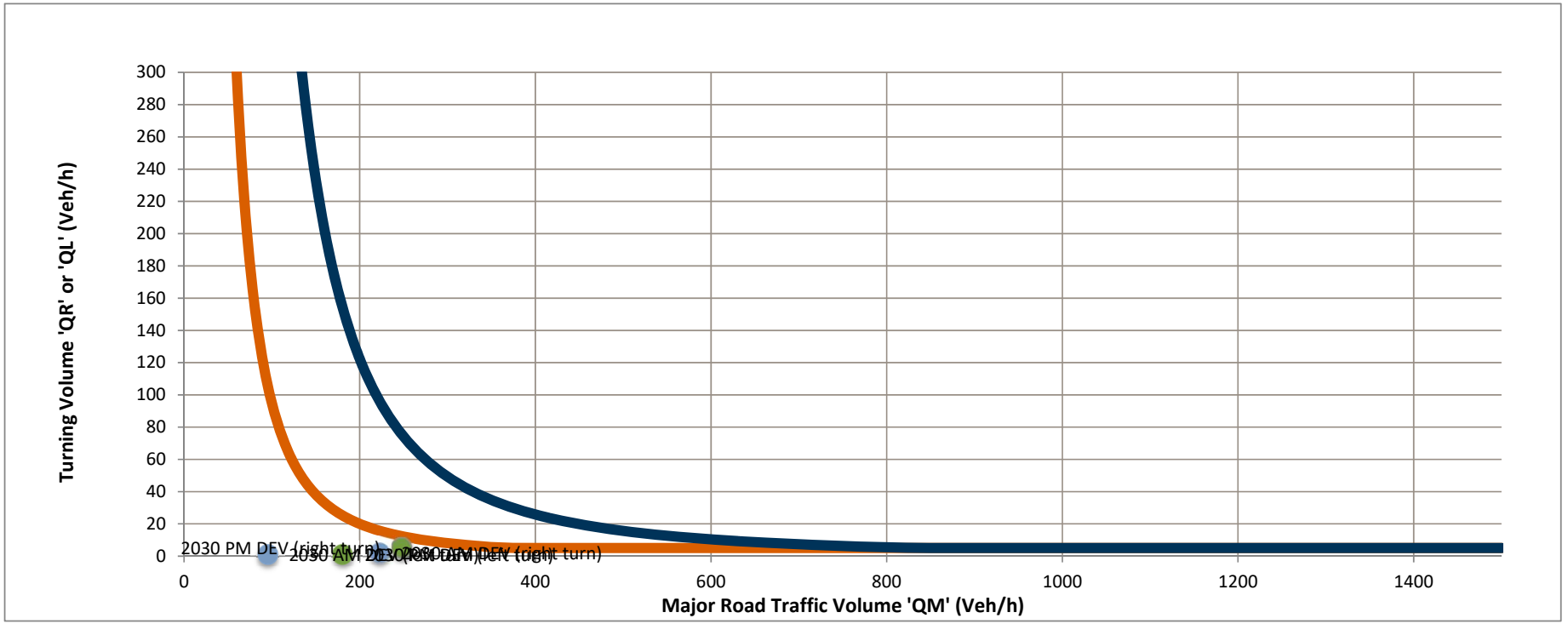


Q_{T2}=	95
Q_L=	1

Through Road	2L2W
Design Year (use 10 as default)	10
Splitter Island?	No
Speed Limit?	>=100km/h

	Q_M	Q_R/Q_L
Right	223	2
Left	95	1

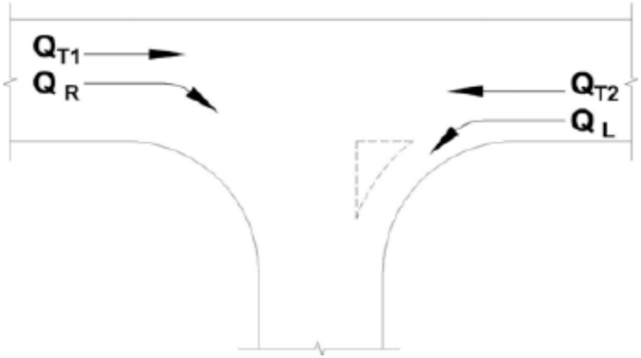
Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Capricorn Highway / Cooinda Road Intersection

2038 Background + End of Operations

Q_{T1}=	118
Q_R=	0

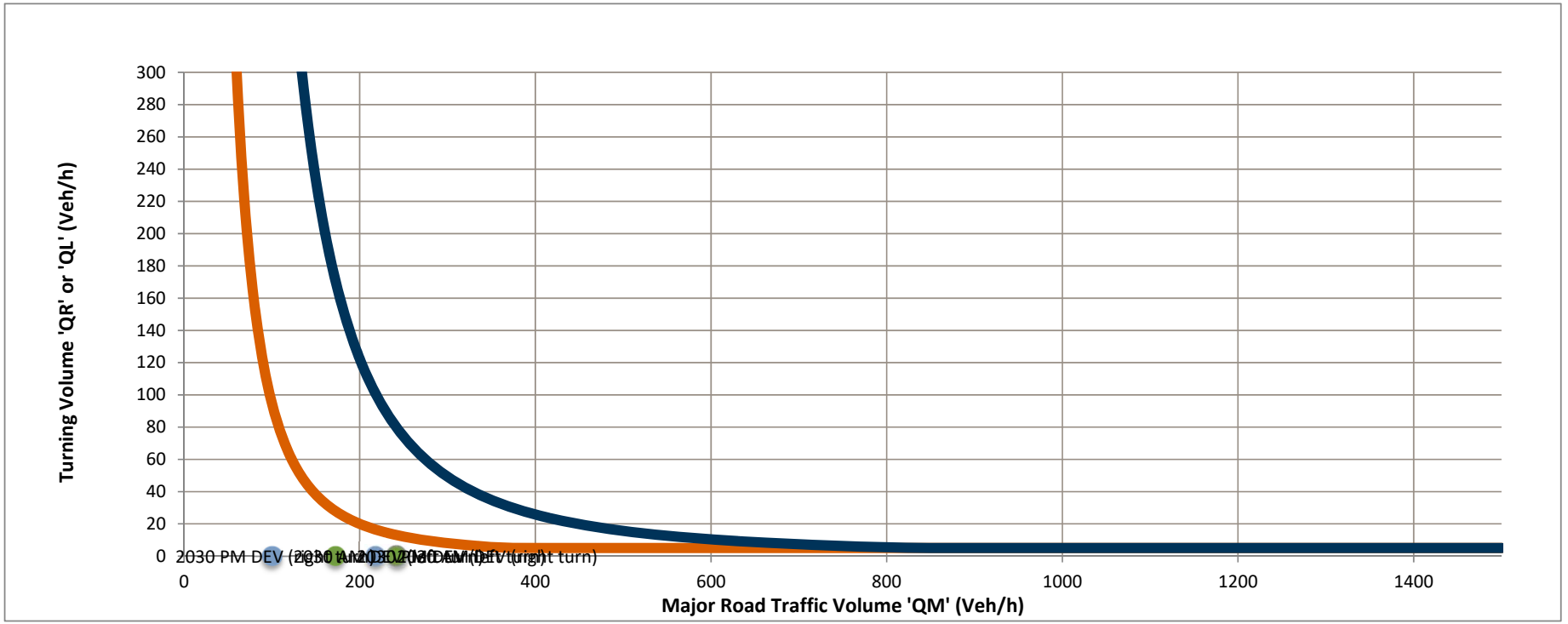


Q_{T2}=	100
Q_L=	0

Through Road	2L2W
Design Year (use 10 as default)	10
Splitter Island?	No
Speed Limit?	>=100km/h

	Q_M	Q_R/Q_L
Right	218	0
Left	100	0

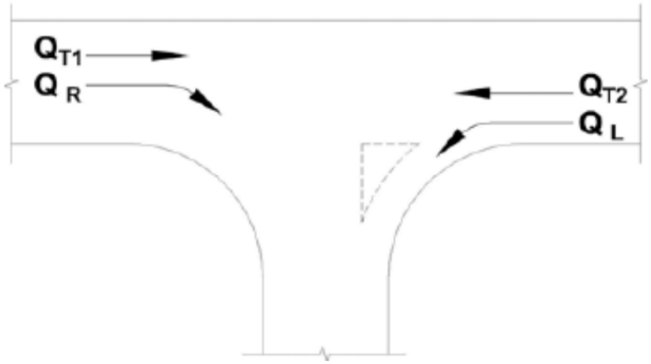
Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Capricorn Highway / Namoi Road Intersection

2030 Background + End of Operations

Q_{T1}=	115
Q_R=	0

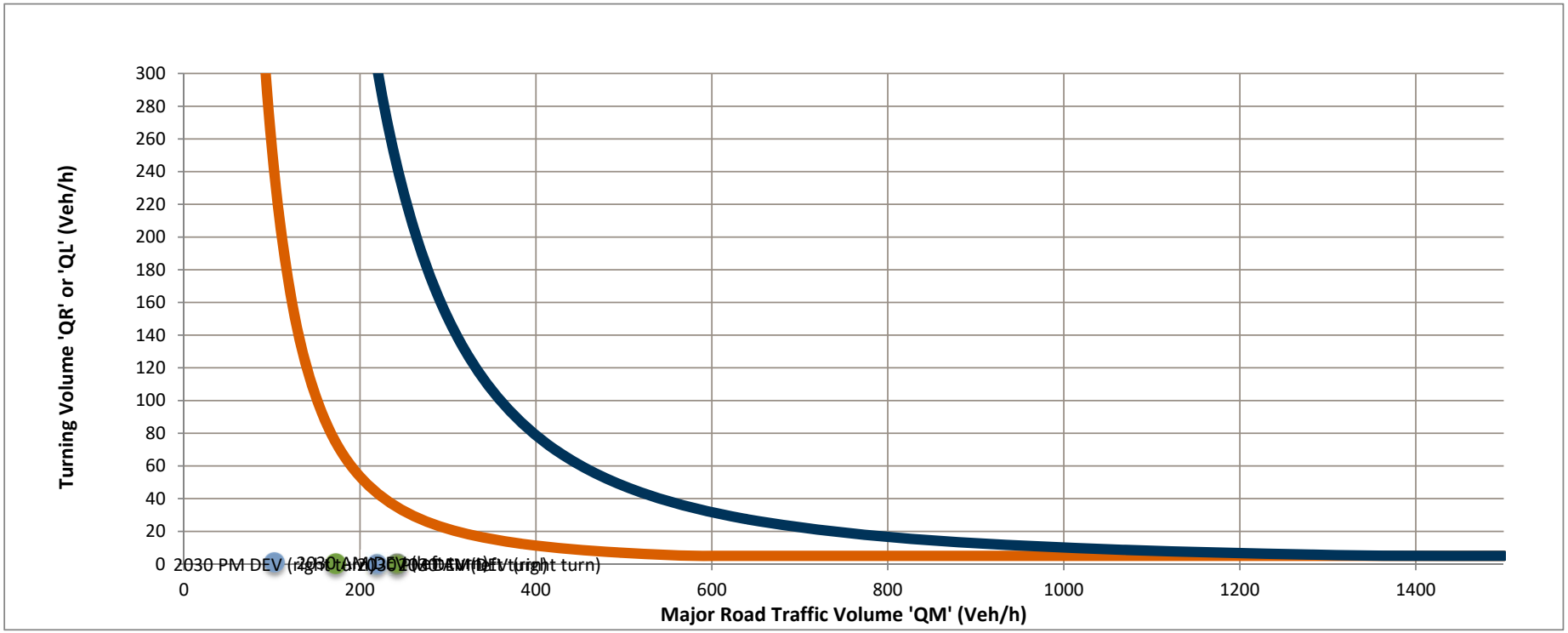


Q_{T2}=	103
Q_L=	1

Through Road	2L2W
Design Year (use 10 as default)	10
Splitter Island?	No
Speed Limit?	70km/h<Design Speed <100km/h

	Q_M	Q_R/Q_L
Right	219	0
Left	103	1

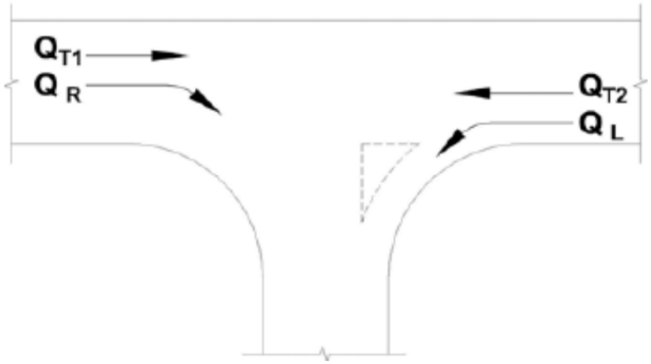
Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Capricorn Highway / Proposed Mine Access Intersection

2038 Background + End of Operations

Q_{T1}=	124
Q_R=	7

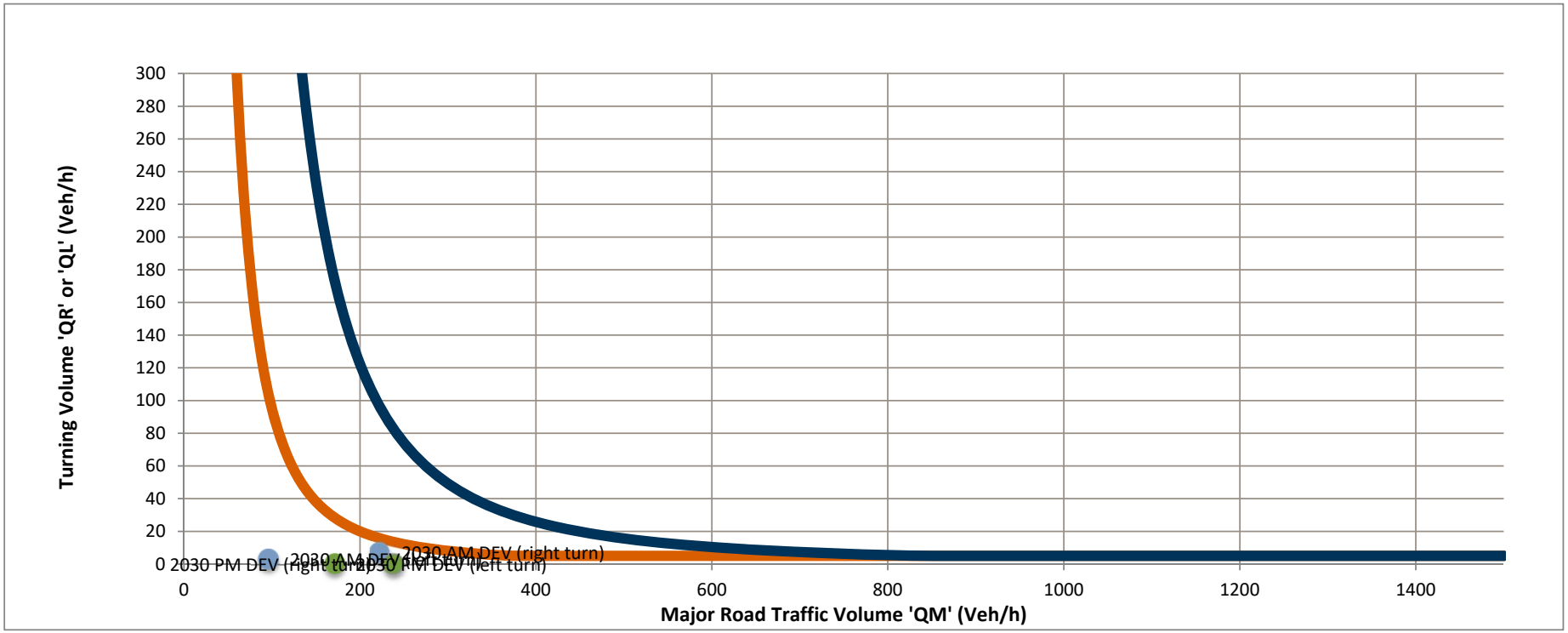


Q_{T2}=	96
Q_L=	3

Through Road	2L2W
Design Year (use 10 as default)	10
Splitter Island?	No
Speed Limit?	>=100km/h

	Q_M	Q_R/Q_L
Right	223	7
Left	96	3

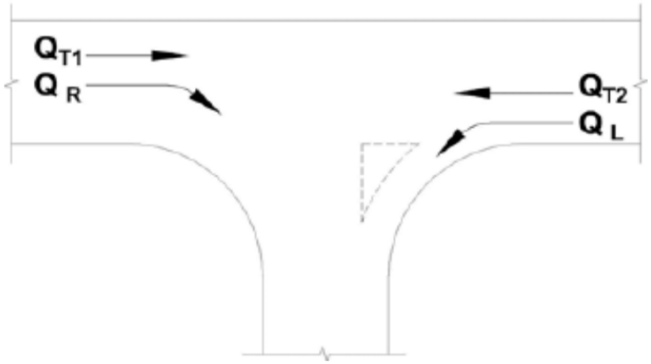
Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Capricorn Highway / TLO Access Intersection

2038 Background + End of Operations (AM and PM peak)

Q_{T1}=	94
Q_R=	3

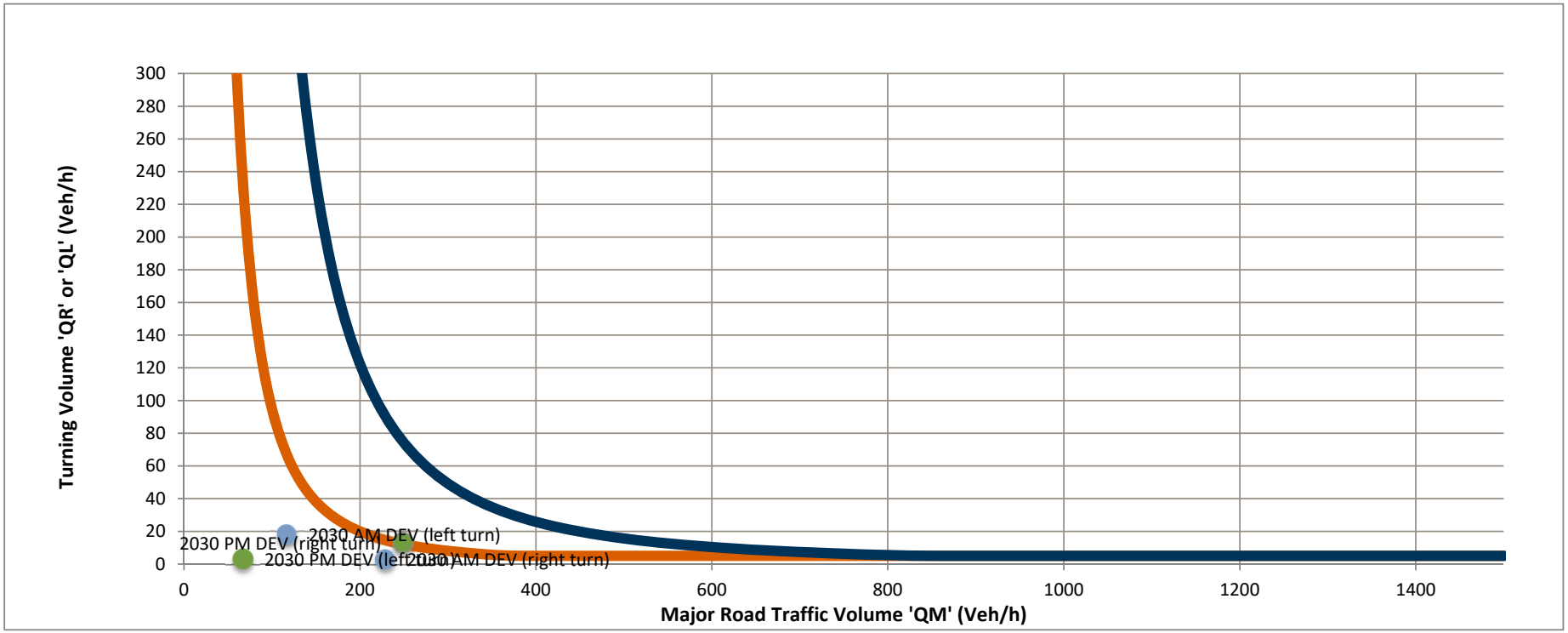


Q_{T2}=	117
Q_L=	18

Through Road	2L2W
Design Year (use 10 as default)	10
Splitter Island?	No
Speed Limit?	>=100km/h

	Q_M	Q_R/Q_L
Right	229	3
Left	117	18

Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL

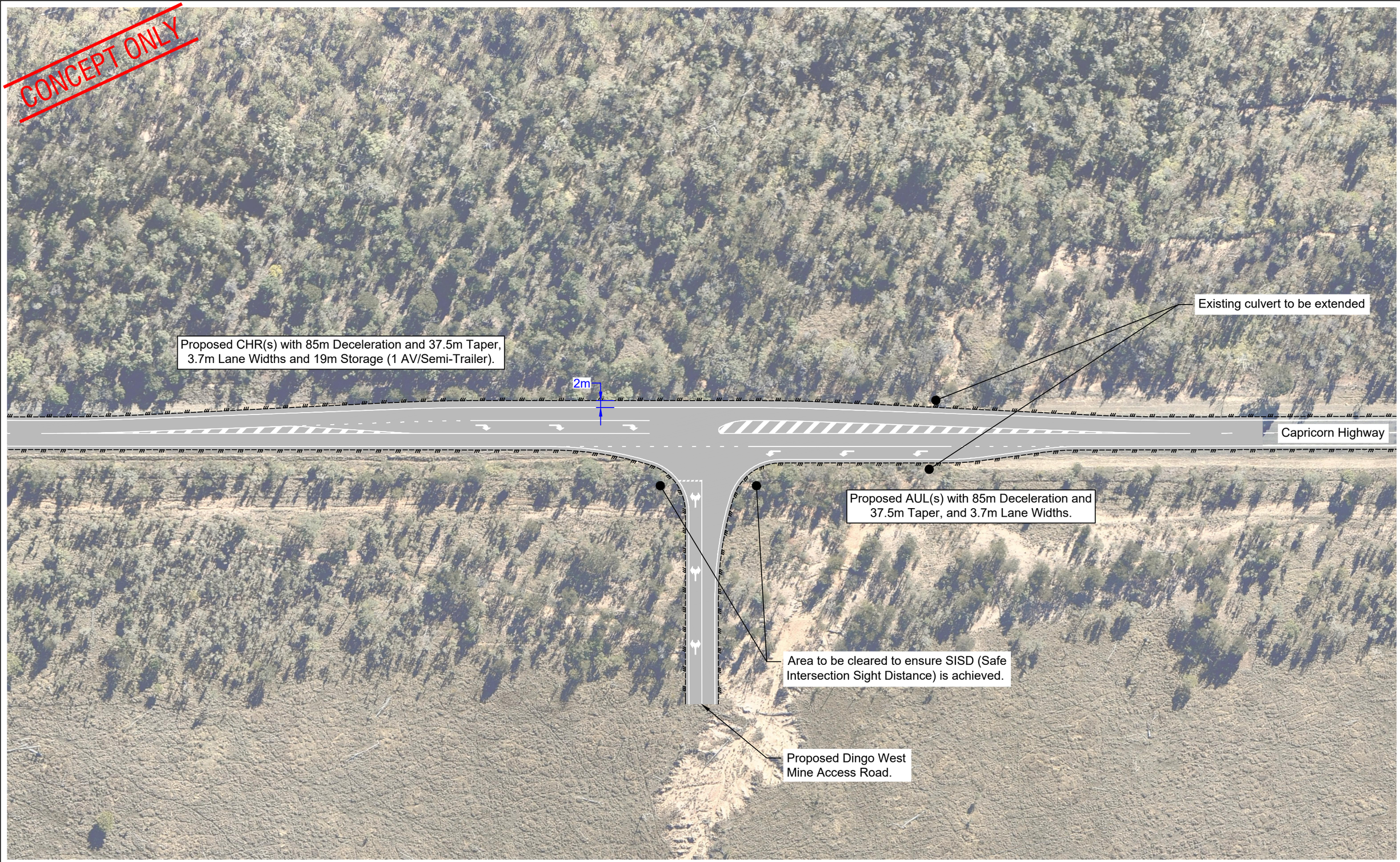


APPENDIX

D

PROPOSED MINE ACCESS DRAWINGS

CONCEPT ONLY



Safe Intersection Sight Distance (SISD)			
Westbound		Eastbound	
Required	Achieved	Required	Achieved
285m	350m+	285m	350m+

0 10 20 30 40 50m
10 8 6 4 2
SCALE 1:1000 @ A3

Cardno (Qld) Pty Ltd | ABN 57 051 074 992
Level 11, 515 St Paul's Terrace
Fortitude Valley, QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722
Web: www.cardno.com.au

Magnetic South Pty Ltd
Gemini Project Proposed Mine Access

Drawn	Date	Scale	Size
R.Woods	31/07/2019	1:1000	A3

Drawing Number: QTT19061 - SK01
Revision: A

CAD File: G:\QTT19061 - Dingo West Coal Mine TIA\6_ACAD\QTT19061 - SK01_SK03 - A.dwg

Imagery supplied by nearmap, July 2019

CONCEPT ONLY

SISD Required = 285m

Capricorn Highway

Proposed Dingo West Mine Access Road.

NORTH

0 10 20 30 40 50m

10 8 6 4 2

SCALE 1:1000 @ A3

Cardno (Qld) Pty Ltd | ABN 57 051 074 992
Level 11, 515 St Paul's Terrace
Fortitude Valley, QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722
Web: www.cardno.com.au

Magnetic South Pty Ltd
Gemini Project Proposed Mine Access
SISD Review - West

Drawn	Date	Scale	Size
R.Woods	31/07/2019	1:1000	A3

Drawing Number: QTT19061 - SK02
Revision: A

CAD File: G:\QTT19061 - Dingo West Coal Mine TIA\6. ACAD\QTT19061 - SK01_SK03 - A.dwg

Imagery supplied by nearmap, July 2019

CONCEPT ONLY

SISD Required = 285m

Capricorn Highway

Proposed Dingo West Mine Access Road.

NORTH

0 10 20 30 40 50m

10 8 6 4 2

SCALE 1:1000 @ A3

Cardno (Qld) Pty Ltd | ABN 57 051 074 992
Level 11, 515 St Paul's Terrace
Fortitude Valley, QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722
Web: www.cardno.com.au

Magnetic South Pty Ltd
Gemini Project Proposed Mine Access
SISD Review - East

Drawn	Date	Scale	Size
R.Woods	31/07/2019	1:1000	A3

Drawing Number	Revision
QTT19061 - SK03	A

CAD File: G:\QTT19061 - Dingo West Coal Mine TIA\6. ACAD\QTT19061 - SK01_SK03 - A.dwg

Imagery supplied by nearmap, July 2019

CONCEPT ONLY

Capricorn Highway

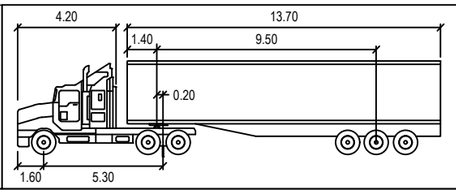
Proposed Dingo West Mine Access Road.

Capricorn Highway

Proposed Dingo West Mine Access Road.

SWEPT PATH LEGEND

- VEHICLE BODY
- FRONT TIRES
- VEHICLE PATH
- VEHICLE CLEARANCE (500mm)
- VEHICLE



19M AV

	Meters
Tractor Width	: 2.50
Trailer Width	: 2.50
Tractor Track	: 2.50
Trailer Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 27.7
Articulating Angle	: 70.0

NORTH

0 5 10 15 20 25m

5 4 3 2 1

SCALE 1:500 @ A3

Cardno (Qld) Pty Ltd | ABN 57 051 074 992
Level 11, 515 St Paul's Terrace
Fortitude Valley, QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722
Web: www.cardno.com.au

Magnetic South Pty Ltd
Gemini Project Proposed Mine Access
Swept Path Assessment - 19m AV

Drawn	Date	Scale	Size
R.Woods	31/07/2019	1:500	A3

Drawing Number	Revision
QTT19061 - SK04	A

CAD File: G:\QTT\19061 - Dingo West Coal Mine TIA\6_ACAD\QTT19061 - SK01_SK03 - A.dwg

Imagery supplied by nearmap, July 2019