Gemini Project
Traffic Impact Assessment

Gemini Project

QTT19061

Prepared for
Magnetic South Pty Ltd

30 April 2021

Cardno

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Abbreviations

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

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, Train Load Out facility 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 greenfield 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).

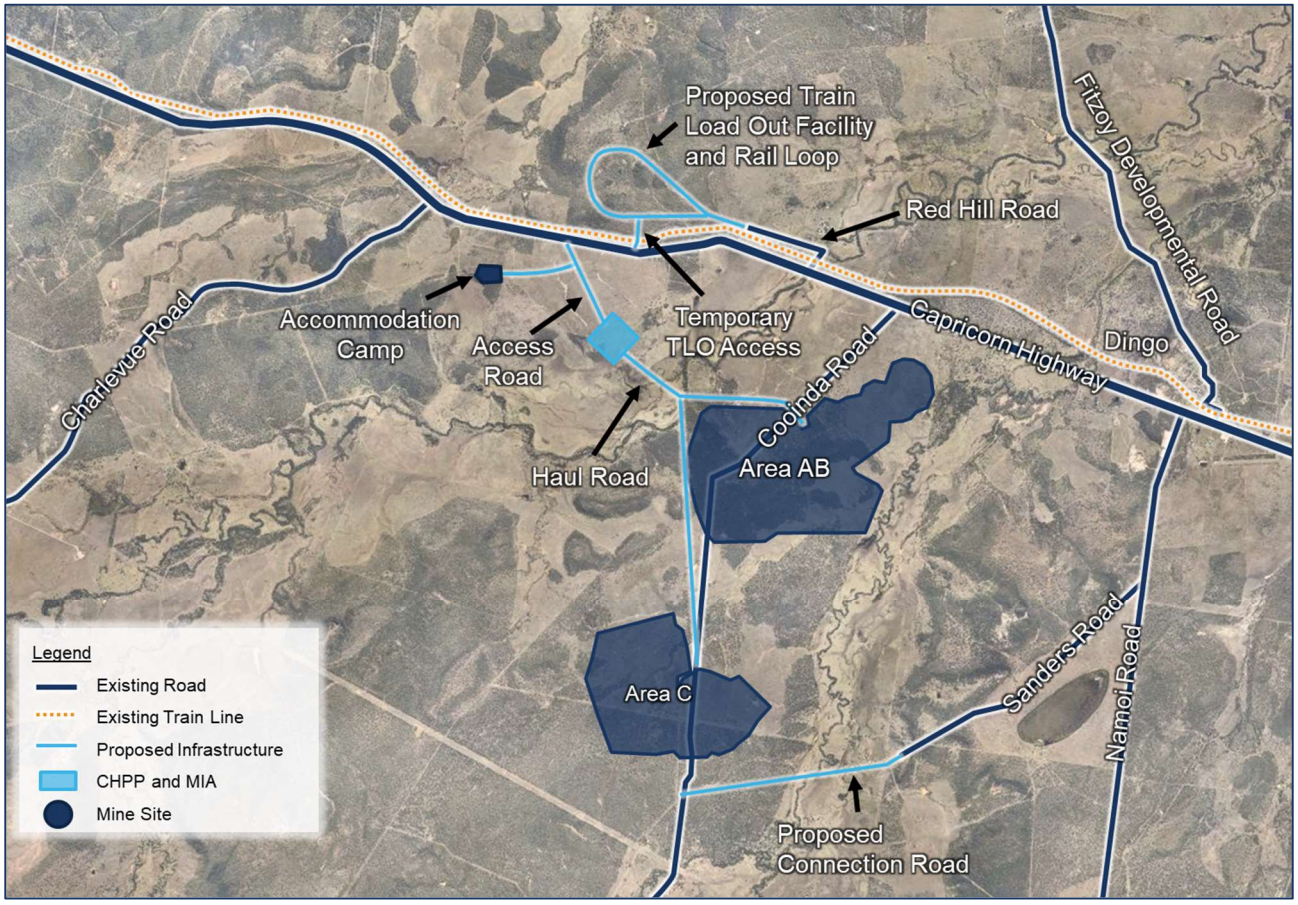
The mined coal will be beneficiated in the CHPP. Low volatile PCI coal or coking coal will be railed to export coal terminals at Gladstone for shipping to international customers.

1.3 References

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

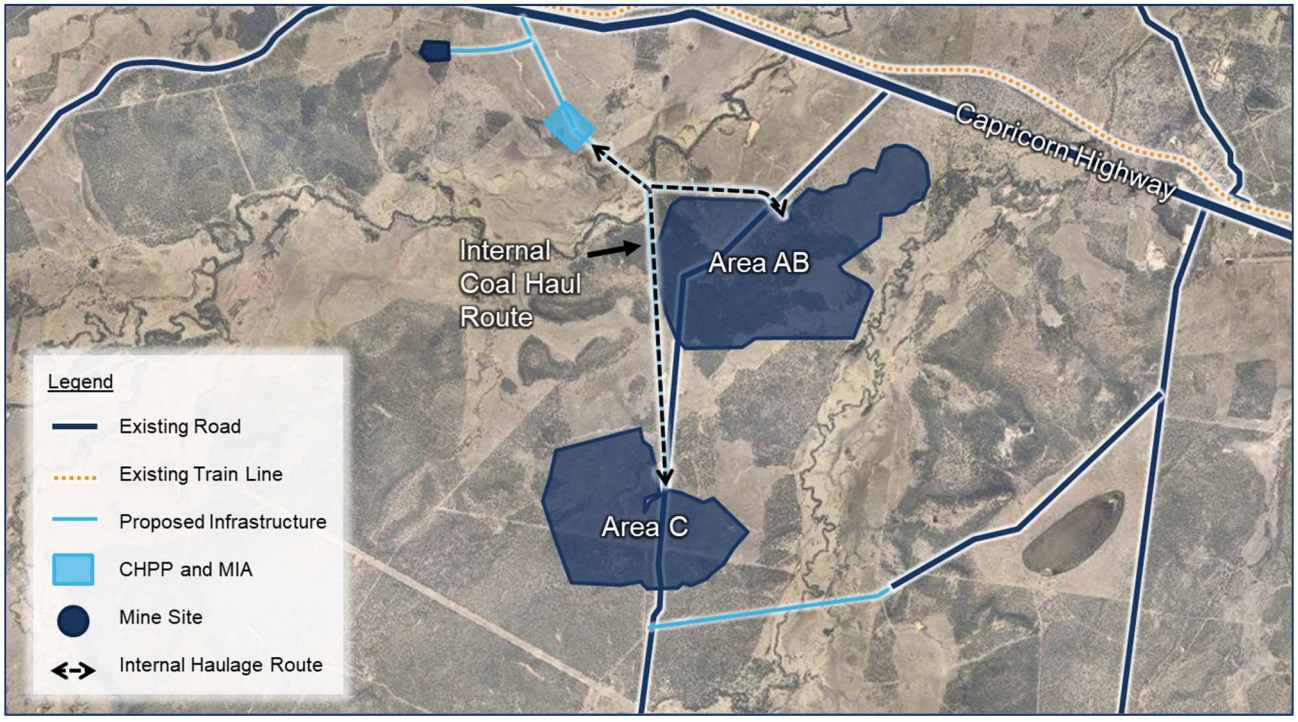
- Traffic Count Data undertaken by Austraffic on Tuesday 23rd July 2019
- Transport and Main Roads - Guide to Traffic Impact Assessment (GTIA), December 2018
- Austroads - Guide to Road Design Part 4A
- Road Planning and Design Manual Edition 2: Volume 3 (Supplement to Austroads Guide to Road Design 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

This report assesses the traffic impacts generated by the proposed Gemini Mine. 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 an access facility via Red Hill Road.

Coal produced will be hauled from the two deposits (Pit AB and Pit C) to the CHPP and Mining Infrastructure Area (MIA) location.

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 Gemini 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 / Proposed Mine Access Intersection has 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 TMR's Road Planning and Design Manual and 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
- Sanders Road
- Red Hill Road
- Cooinda Road
- Charlevue Road.

2.1.3 State Intersections:

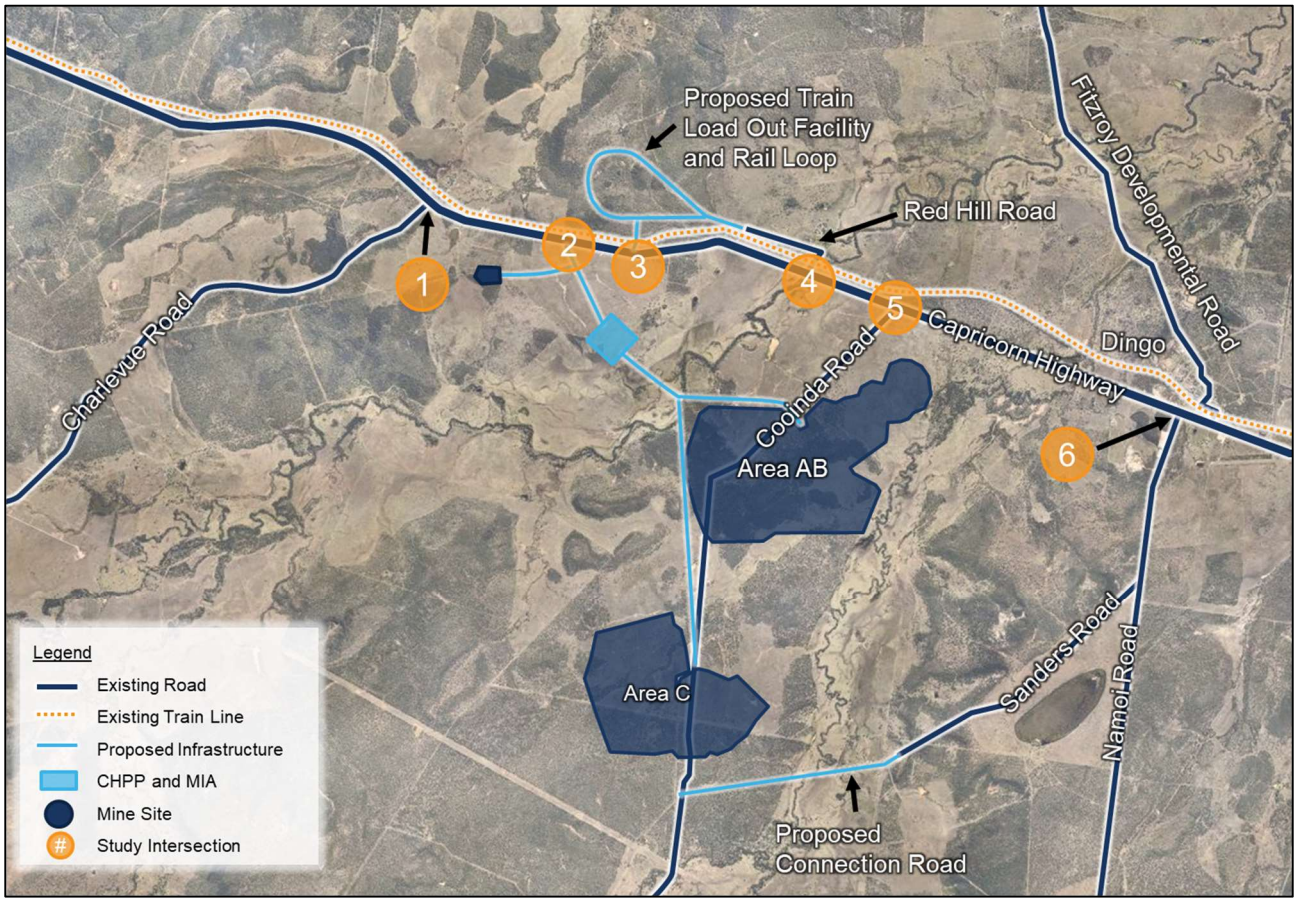
- Capricorn Highway / Namoi Road
- Capricorn Highway / Cooinda Road
- Capricorn Highway / Charlevue Road
- Capricorn Highway / Red Hill Road
- Capricorn Highway / Proposed Mine Access intersection,
- Capricorn Highway / Proposed Temporary TLO construction access.

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

Table 2-1 List of study intersections

Intersection #	Intersection Name
1	Capricorn Highway / Charlevue Road Intersection
2	Capricorn Highway / Proposed Mine Access Road Intersection
3	Capricorn Highway / Proposed Temporary TLO Access
4	Capricorn Highway / Red Hill Road
5	Capricorn Highway / Cooinda Road Intersection
6	Capricorn Highway / Namoi Road Intersection

Figure 2-1 Study Intersection Locations



Source: Nearmaps

2.2 Intersection Safety Criteria

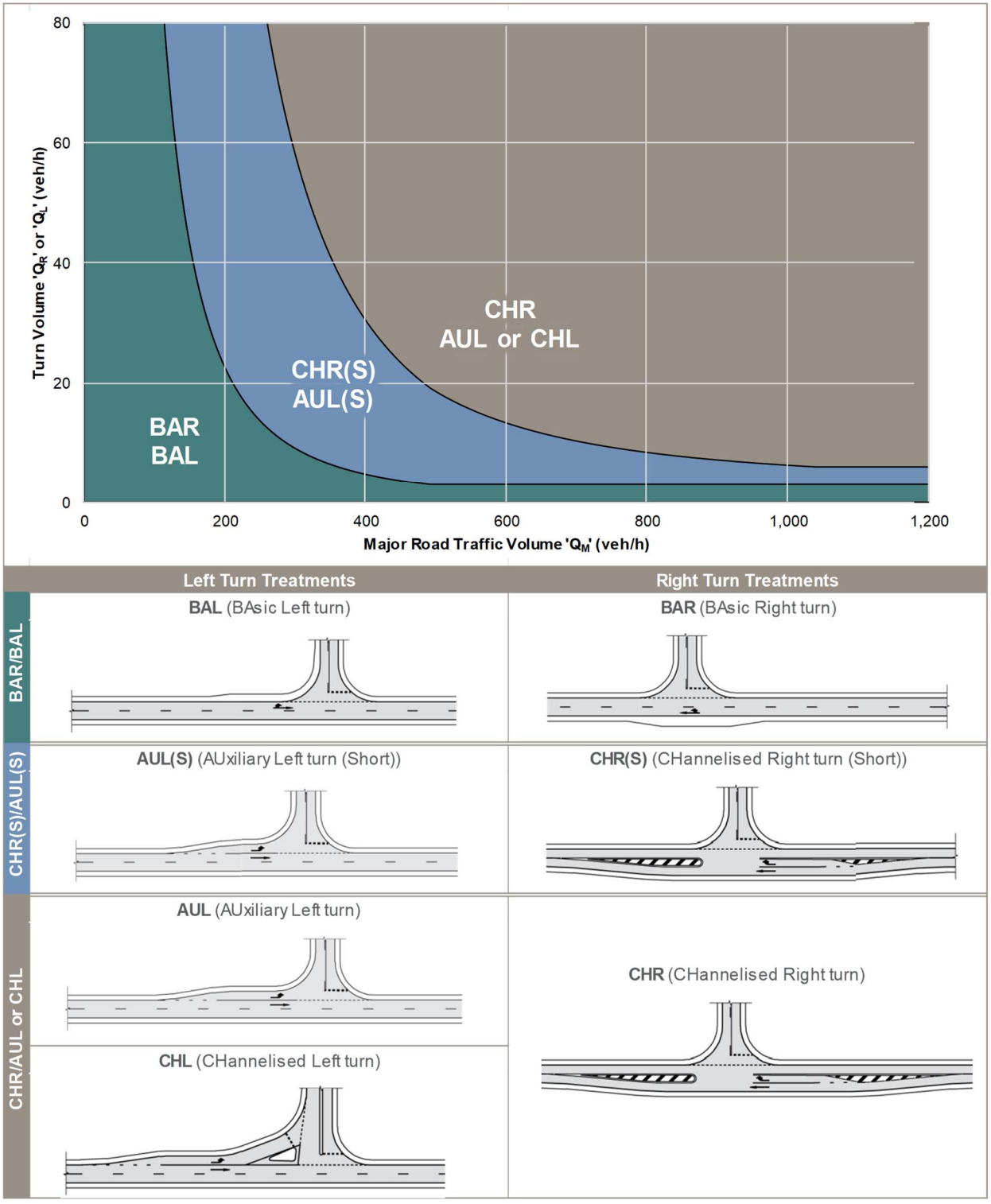
2.2.1 Warrants for turn treatment

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 are referenced in the Road Planning and Design Manual (RPDM) Volume 3 Part 4A. They 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 was 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 state controlled road (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 (veh/day) with 25% classed as heavy vehicles (HV). In comparison, the 2017 AADT for this segment was 2,475 (veh/day) 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 pavement 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, 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 along this section of the Capricorn Highway with the provisions of BAL and BAR (refer to Figure 2-2) turning treatments.

Namoi Road currently services only a small number of private properties.

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 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 along this section and has provisions of BAL and BAR turning treatments (refer to Figure 2-2).

This intersection provides access to a few private properties.

Figure 3-3 Capricorn Highway / Cooinda Road Intersection (facing west)

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.

The 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 / Red Hill Road

Red Hill Road connects onto the Capricorn Highway forming Capricorn Highway / Red Hill Road intersection. Figure 3-4 gives a visual representation of the intersection looking east. The posted speed limit is 100km/h along this section and has provisions of BAL and BAR turning treatments.

Figure 3-5 Capricorn Highway / Red Hill Road (facing east)

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

3.2 Safe Intersection Sight Distance

Site investigation has been undertaken for the Safe Intersection Sight Distance (SISD) at the location of the study intersections. According to 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 3-2.

Table 3-2 Minimum Safe Intersection Sight Distance (Normal Design Domain)

Intersection Approach	Design Speed	Reaction Time	Minimum SISD Required		Recorded SISD	Meet 2 second reaction requirement
Capricorn Highway / Charlevue Road			Light Vehicle	Truck (2.5 sec reaction time)		
East	110km/h	2 seconds	285m	317m	500m+	✓
West	110km/h	2 seconds	285m	317m	300m	✓
Capricorn Highway / Cooinda Road						
East	110km/h	2 seconds	285m	317m	700m+	✓
West	110km/h	2 seconds	285m	317m	580m+	✓
Capricorn Highway / Namoi Road						
East	90km/h	2 seconds	214m	227m	323m	✓
West	90km/h	2 seconds	214m	227m	260m	✓
Capricorn Highway / Red Hill Road Intersection						
East	110km/h	2 seconds	285m	317m	500m+	✓
West	110km/h	2 seconds	285m	317m	500m+	✓

* The recorded SISD column is recorded at an eye height of approximately 1.2m, tolerance of +10% is expected for truck observations. Therefore, the recorded SISD will increase to approximately 330m for trucks.

3.3 Background Traffic Volumes

3.3.1 Sensitivity Testing

In order to understand the existing traffic conditions within the study area, a traffic survey was undertaken by Austraffic for 3-hour during both 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 (Austraffic traffic count data and TMR TDSM traffic volumes are supplied in Appendix A).

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

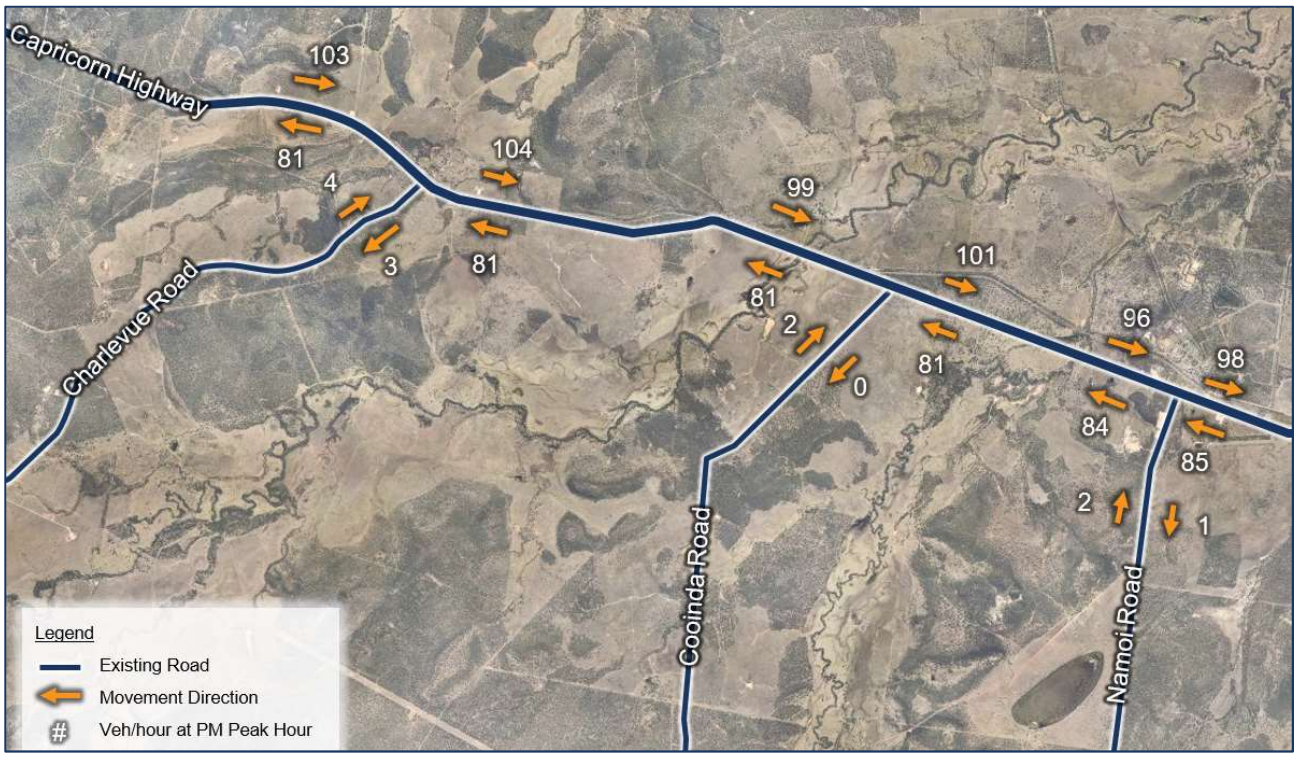
- 8:00 AM – 9:00 AM
- 3:30 PM – 4:30 PM

Figure 3-6 illustrates the AM peak period (08:00 – 09:00) background traffic volumes. It is evident that the traffic volumes turning off the Capricorn Highway at the minor roads are 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, east of the Capricorn Highway / Charlevue Road intersection.

Along sections of the Capricorn Highway a few private properties exist, access and egress to/from these properties causes just minor differences in traffic volumes in-between intersections, that means that there is minimal interference between the major route traffic on Capricorn Highway and local traffic.

Figure 3-6 AM Peak Background Traffic

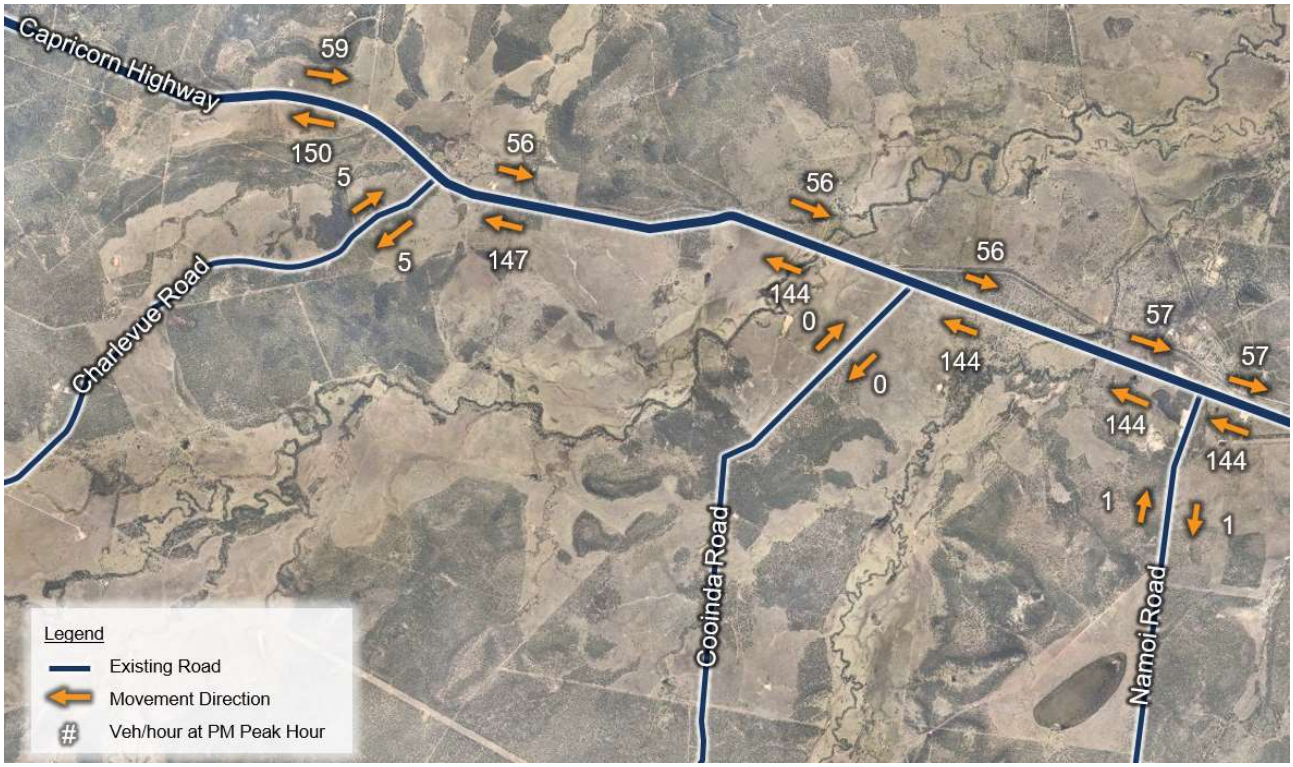


Source: Nearmap and Austraffic

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 the 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 carry an insignificant percentage of the traffic as compared to the through movements on the Capricorn Highway.

Figure 3-7 PM Peak Background Traffic



Source: Nearmap and Austraffic

3.4 Transport Main Roads Traffic Census Background Volumes

TMR have raised concerns about the 2019 recorded traffic volumes, as TMR's TDSM traffic indicates an AADT of 2,947veh/day (site 15001 - 8, 5km east of Bridgewater Creek) indicates higher traffic volumes than indicated in the Austraffic peak hour traffic counts.

Cardno has undertaken a sensitivity test were traffic volumes have been adjusted to match TMR's 2019 data, as follows:

- 147 veh/hour along the Capricorn Highway in each direction in the PM peak,

Whilst Cardno consider the for 3-hour during both AM and PM periods on Tuesday 23rd July 2019 to be an accurate recording of traffic volumes along the Capricorn Highway, for completeness the sensitivity testing has been undertaken using the adjusted volumes.

3.5 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 as part of development proposals.

All development related travel between accommodation and the mine will be undertaken by light vehicles or bus and cycling will not be encouraged by Magnetic South due to potential safety risk associated to the relatively high-speed environment along the Capricorn Highway.

3.6 Public Transport

Greyhound Australia offer multiple bus services that stop at Dingo. An 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.

3.7 Future Network Planning

Future network planning for State Controlled roads is derived from TMR's Queensland Transport and Roads Investment Program (QTRIP) which is updated every two years.

The *Queensland Transport and Roads Investment Program 2019–20 to 2022–23* (QTRIP) details the current transport and road infrastructure projects that the Queensland Government plans to deliver over the next 4 years to meet the needs of growing Queensland state. 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 for sections from Gracemere to Emerald. The indicative total cost for these works is $19,000,000.

4 Crash History

The analysis of the crash data obtained from the TMR Webcrash database revealed that in the last 5 years (period 2015-2019) on Capricorn Highway between Charlevue Road and Dingo Township, three crashes have been recorded.

The location, type and description of the recorded crashes are shown in Figure 4-1 and detailed in Table 4-1.

Figure 4-1 5-year crash history – Capricorn Highway between Charlevue Road and Dingo Township

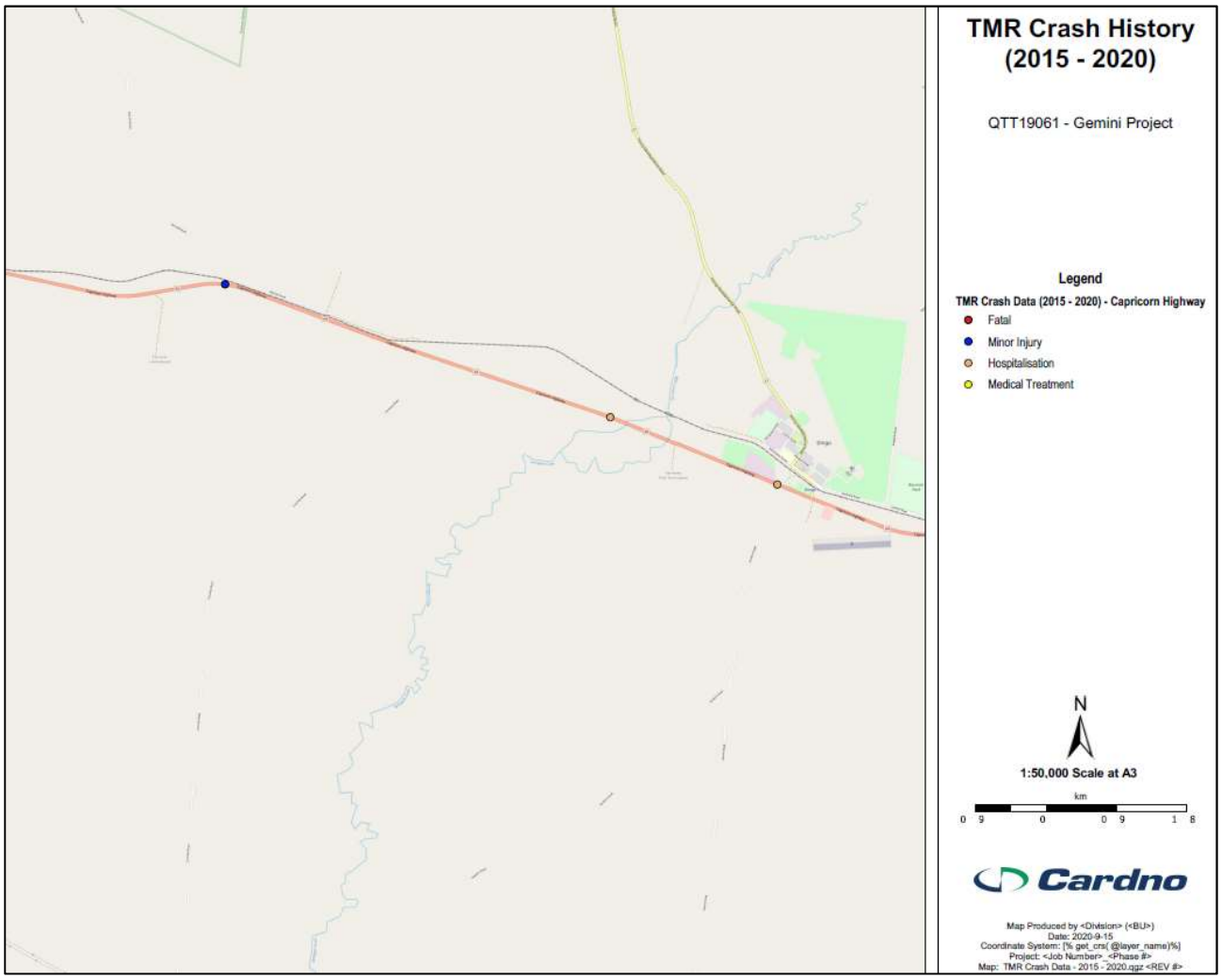


Table 4-1 5-year Crash history – Capricorn Highway between Charlevue Road and Dingo Township

Crash ID	DCA[1]	Severity	Crash Nature	Lighting
71141	609	Minor injury	Hit Animal	Dark – not lighted
242396	301	Hospitalisation	Rear-end	Daylight
283489	705	Medical treatment	Off Path - Straight: Out of Control on Carriageway	Dark – not lighted

[1] DCA Definition for Coding Accidents (Austroads Guide to Road Safety Part 8: Treatment of Crash Locations)

The analysis of the last 5 years recorded crashes shows that the crashes are of typical rural road nature. The number of crashes recorded are of no statistical significance to determine a crashes trend or clusters.

5 Proposed Access Locations

The Gemini Project 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 early 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 from late 2021. Coal production is expected to finish in 2040.

5.1 Access Locations

5.1.1 Train Load Out Construction Traffic Access

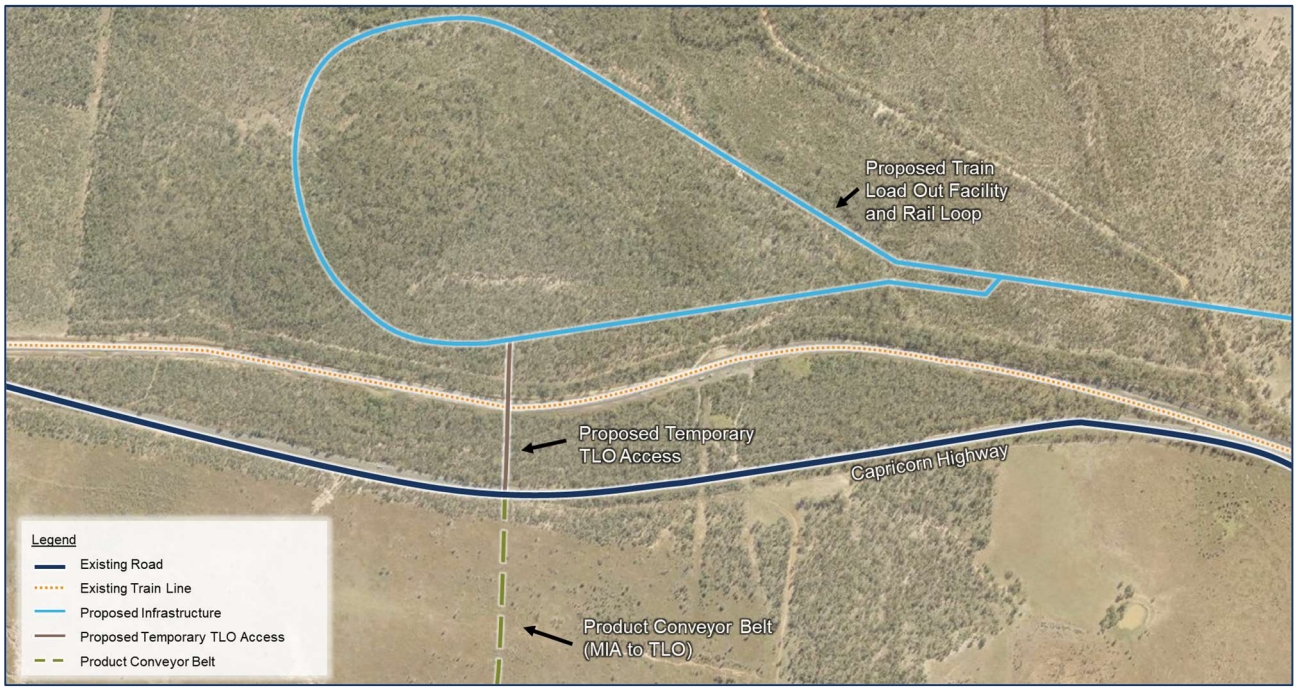
Construction traffic and workforce utilising Heavy Vehicles (HVs) will access the TLO via a temporary access track connecting from Capricorn Highway. TLO construction deliveries, concrete deliveries, and construction materials outlined in the traffic generation summary will mainly utilise the temporary access track but some materials will be delivered by rail.

The temporary TLO access track is proposed to be constructed in close proximity to the product conveyor belt crossing, located approximately 1,130m east of the proposed mine access intersection, for ease of construction by aligning with the construction of the product conveyor belt.

Given the temporary TLO access track is proposed to cross the existing train line, a temporary level crossing would be required and will be subject to Queensland Rail (QR) approval along the rail corridor.

The location of the proposed temporary TLO access from the Capricorn Highway is illustrated in Figure 5-1. Section 6.3 outlines the workforce summary that will also use the access track.

Figure 5-1 Proposed Temporary TLO Access Intersection Concept Design



5.1.2 Train Load Out Construction and Operations Traffic Access

The Train Load Out construction and operational workforce utilising Light Vehicles (LVs) will access the TLO facility via Red Hill Road off the Capricorn Highway (approximate 4 LVs per day).

5.1.3 Mine and CHPP Construction and Operations, Accommodation Camp Traffic Access

Construction traffic will access the mine sites and CHPP via a proposed mine access intersection located approximately 2.65km east of the Capricorn Highway / Charlevue Road intersection. This access will be primarily used for all mine access, deliveries, waste removal, workforce shift changes as well as the accommodation camp for the operational staff.

Figure 5-2 illustrates the concept layout of the proposed mine access intersection (refer to Appendix D for concept drawings). The design includes an AUL (S) and a CHR (S) turning treatment with 85m deceleration lanes and 37.5m tapers, which has been designed in accordance with RPDM and Austroads Guide to Road Design Part 4A.

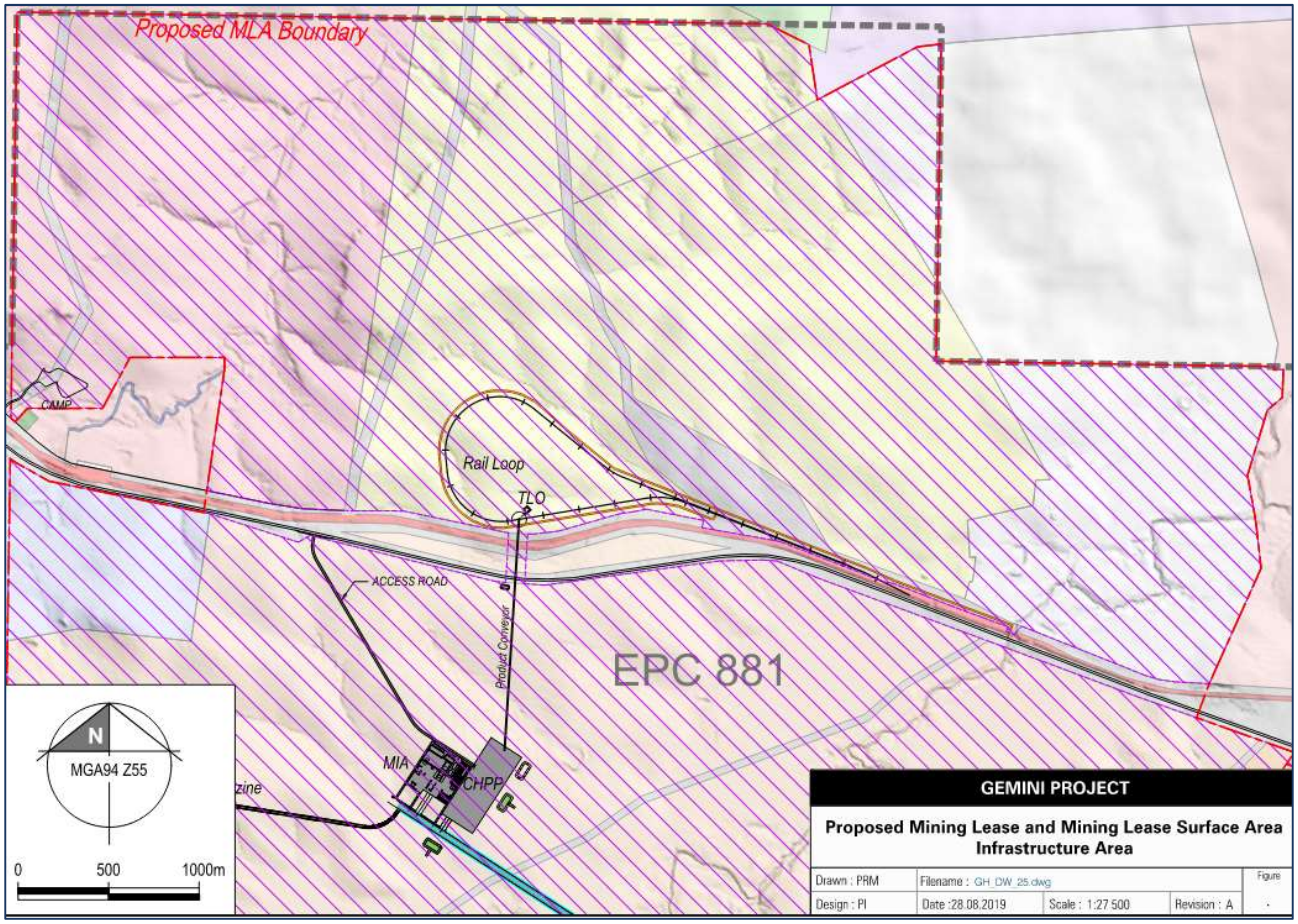
Swept paths included in Appendix D show 19m Articulated Vehicles (AV) can adequately achieve 500mm clearances whilst making turning movements into and out of the proposed mine access road.

Figure 5-2 Proposed Mine Access Intersection Concept Design

5.1.4 Location of Conveyor Belt over Capricorn Highway

The location of the proposed conveyor belt over the Capricorn Highway is illustrated in Figure 5-3.

Figure 5-3 Location of proposed conveyor belt



Source: Magnetic South

5.1.5 Diversion of Non-Gazetted Access Track

Local roads within the MLA to the south of the Capricorn Highway include Cooinda Road and an un-named road. Cooinda Road traverses the MLA from the south and connects to the Capricorn Highway. The un-named road traverses the MLA through Lot 1 HT424 from the east and connects to the Capricorn Highway. To the east of the MLA, Sanders Road originates from Namoi Road and extends to the Lot 2, HT138 property boundary. From the property boundary, Sanders Road becomes an access track within the property and connects to Cooinda Road within the MLA. These local roads and track with be temporarily closed to the public for the Project.

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.

The 2019 background traffic counts confirm 7 and 2 vehicles per hour 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.

5.2 Safe Intersection Sight Distance

According to Austroads Guide to Road Design Part 4A, minimum Safe Intersection Sight Distance (SISD) requirements are 285m for 110km/h along Capricorn Highway at the proposed mine and temporary TLO access locations. The SISD requirements for the proposed access locations are illustrated in Table 5-1.

Table 5-1 Minimum Safe Intersection Sight Distance (Proposed Access Locations)

Intersection Approach	Design Speed	Reaction Time	Minimum SISD Required	
Proposed Mine Access Intersection			Light Vehicle	Truck (2.5 sec reaction time)
East	110km/h	2 seconds	285m	317m
West	110km/h	2 seconds	285m	317m
Proposed Temporary TLO Access Intersection				
East	110km/h	2 seconds	285m	317m
West	110km/h	2 seconds	285m	317m

Prior to the construction of the project access locations, site investigations are required to be undertaken for the SISD at the location of the study intersections to confirm the access locations meet the minimum requirements outlined in Table 5-1 but previous site inspections did not identify any reasons for the proposed access locations did not meet these SISD requirements.

6 Traffic Generation

6.1 Construction Phase

6.1.1 Construction (Deliveries, Waste, Equipment etc.)

Table 6-1 illustrates a summary of the construction deliveries, waste, equipment etc. traffic generation. A number of deliveries, waste removal, and infrastructure deliveries have been rounded up to 1 trip during a peak day despite most of these trips occurring once per week or every second day. This illustrates a worst-case peak scenario of trips across the construction phase of the Gemini Project.

Table 6-1 Construction Deliveries, Waste, Equipment traffic generation (constructions phase only)

Item #	Item	Origin	Destination	Typical Vehicle	Peak Trips per Day	Return trip?
					Construction	
1	Deliveries – parts, explosives, waste	Rockhampton/ Gladstone	Mine	Class 9 truck	2	Yes
2	Oversized Loads	Rockhampton/ Gladstone/ Brisbane	Mine	Low Loader	1	Yes
3	Other deliveries – small trucks	Emerald/ Rockhampton	Mine	Class 3 truck	1	Yes
4	Fuel	Gladstone	Mine	B-Double	1	Yes
5	HDPE Pipes and concrete culverts	Rockhampton/ Gladstone	Mine	B-Double	1	Yes
6	Mine equipment for facilities and operations e.g. CHPP	Gladstone/ Brisbane	Mine	Low Loader/ B-Double	1	Yes
7	Construction materials for all infrastructure at the mine (not covered in other items)	Emerald/ Rockhampton/ Gladstone	Mine	Low Loader/ B-Double	1	Yes
8	TLO Deliveries (Ballast, sleepers, rail tracks)	Rockhampton/ Gladstone	TLO	Semi	1	Yes
10	Food	Blackwater /Rockhampton	Mine	Class 3 truck	1 (every 2 days)	Yes
11	Water	Blackwater	Mine	23,000 Litre Tanker Tri-Axle Trailer	1 (once a week)	Yes
12	Concrete	Blackwater	Mine	Five Axle Articulated	1	Yes
13	Concrete	Blackwater	TLO	Five Axle Articulated	1	Yes

14	Quarry Materials for road construction	Site/ Blackwater	Mine	Five Axle Dump Truck	1	Yes
15	Quarry Materials for road construction	Site/ Blackwater	TLO	Five Axle Dump Truck	1	Yes
16	Solid waste	Mine	Blackwater Sewage Treatment Plant	Quad Axle Truck Dog, Twin Steer with Triple Axle Prime Mover	1 (once a week)	Yes, once a week
17	Liquid Waste	Mine	Gladstone Waste Facility	Single Steer Twin Axle	1 (once a week)	Yes, once a week
18	General waste	Mine	Blackwater Waste Facility	Single Steer Twin Axle	1 (once a week)	Yes, once a week

6.1.2 Total Construction Workforce

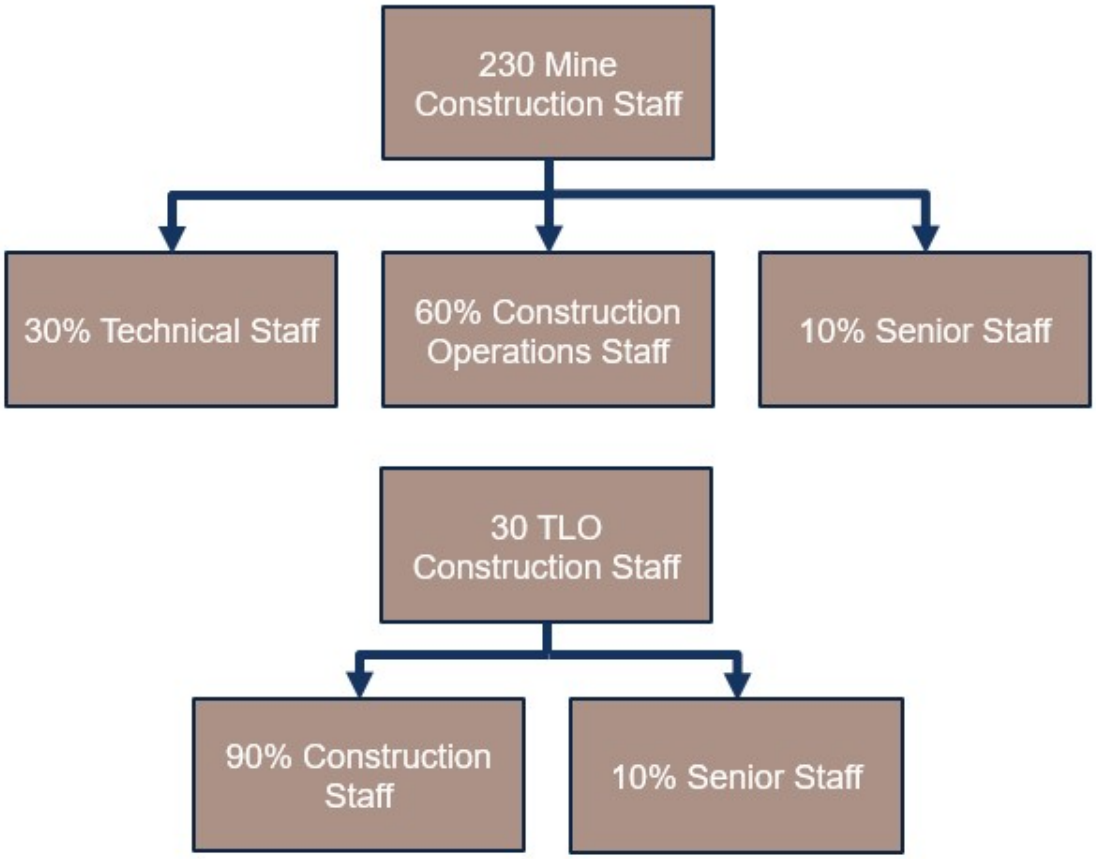
A total construction workforce (over the total construction period) is detailed down in Table 6-2.

Figure 6-1 displays a breakdown of the workforce in terms of technical staff, construction operations staff, and senior staff on site.

Table 6-2 Total workforce breakdown (across entire construction period)

Location	Construction Workforce (total across construction period)
Mine	230
TLO	30
Total	**260**

Figure 6-1 Construction workforce breakdown



6.1.3 Peak Weekly Workforce (Construction)

6.1.3.1 Mine Staff (Peak)

The construction workforce will rotate weekly (every 7 days) whereas technical and senior staff will work on 5 days on 2 days off roster.

Therefore, the maximum staff at the mine site operating weekly is broken down as:

230 staff x 30% = 69 technical staff

230 staff x 10% = 23 senior staff

230 staff x 60% divided by 2 = 69 construction operations staff (divided by 2 because the mine construction staff will be rotating weekly on and off and half of the staff will be on their rostered off week).

In summary, a peak of 161 staff will be constructing the mine site weekly where once per week a roster change will occur for various construction staff (rotating a new 69 construction staff).

6.1.3.2 Train Load-Out Staff (Peak)

The 30 train load out workforce will all operate at the train load out every week.

6.1.3.3 Peak Construction Bus Movements (Shift)

Provided that 80% of the 161 staff will be bused to site and buses are assumed to carry up to 40 people. Then the maximum number of buses daily for shift changes will be 161 staff x 80% = 129 staff getting bused to site. Therefore 129 / 40 = 3.225 or 4 bus movements across shift changes.

The bus movements will be 4 separate busses in the morning from Dingo to the mine, and the same 4 busses making a return trip at the end of each shift.

6.1.3.4 Peak Construction Light Vehicle Movements (Shift)

Given that 20% of the 161 staff will be local to the area and will utilise LV, the number of LV movements can be calculated as, 161 x 20% = 32 staff to utilise LV. It is assumed 1.2 staff utilise each LV (or 1 in every 5 staff members will carry an additional person as a carpool). Thus, 32 / 1.2 = 27 LV movements daily as per shift changes.

6.1.3.5 Construction Workforce Roster Changes (separate to shift changes)

Table 5-2 illustrates that mining operations staff will work a 7 day on and 7 day off roster, whereas technical staff and senior staff will work a 5 day on and 2 day off roster. Section 5.3.3 calculated that 99 mining operations staff will rotate using the 7 days on and 7 days off roster.

It is assumed all operations staff rotating 7 days on and 7 days off are DIDO and are split 80% to Rockhampton and 20% to Emerald.

Under peak conditions,

69 x 80% = 55 staff travelling to Rockhampton to/from the roster change (46 trips/day for one day a week)

69 x 20% = 14 staff traveling to Emerald to/from the roster change (12 trips/day for one day a week).

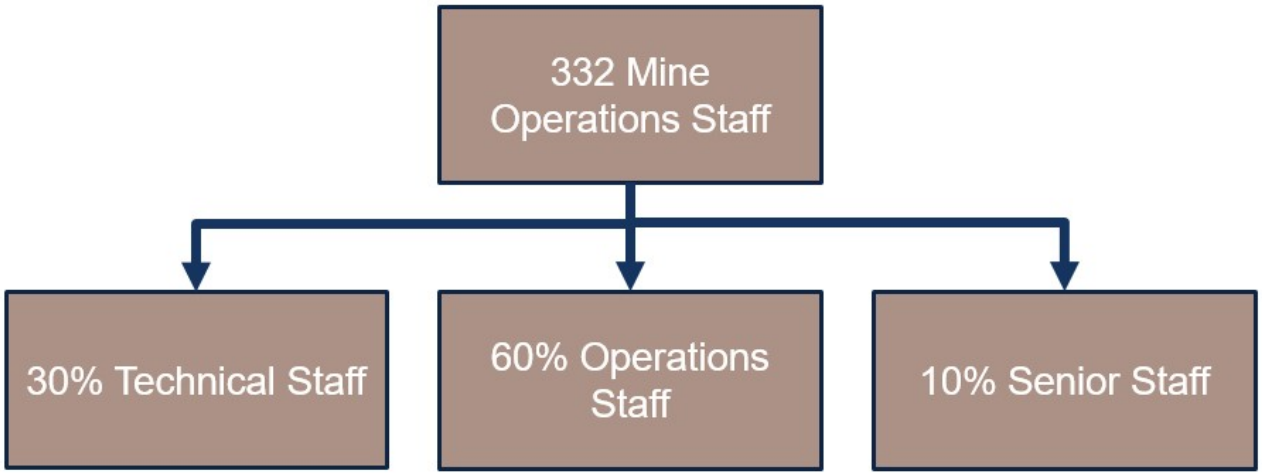
6.2 Operations Phase

The total operations workforce accessing the TLO and Mine are outlined in Table 6-3. Figure 6-2 depicts the breakdown of all operations staff into technical staff, operations staff, and senior staff.

Table 6-3 Operations workforce breakdown

Location	Operations Workforce (Total across operations period)
Mine	330
TLO	2
Total	**332**

Figure 6-2 Operations workforce breakdown



6.2.2 Workforce Roster (Operations)

Mining operations will operate on a 24-hour shift cycle roster. Technical staff and Senior Management will work 10 hours per day. Table 6-4 provides a breakdown of the rosters for each staff type.

Table 6-4 Staff Roster breakdown

Staff type	Roster
Operations Staff	7 days on, 7 days off
Technical Staff	5 days on, 2 days off
Senior Staff	5 days on, 2 days off

6.2.3 Peak Weekly Workforce (Operations)

Mining operations staff will rotate weekly (every 7 days) and therefore the maximum staff at the mine site operating weekly is broken down as:

- 332 staff x 30% = 100 technical staff
- 332 staff x 10% = 33 senior staff

332 staff x 60% divided by 2 = 100 operations staff (Divided by 2 because the mine operations staff will be rotating weekly on and off and half of the staff will be on their rostered off week).

In summary, a total of 233 staff will be operating at the mine site weekly where once per week a roster change will occur for operations staff (rotating a new 100 operations staff).

6.2.4 Workforce Origins and Destinations

The 233 staff on site will originate from a number of sources:

> 80% Drive-in-Drive-Out (DIDO) stay in the Accommodation Camp and bused to the CHPP and MIA

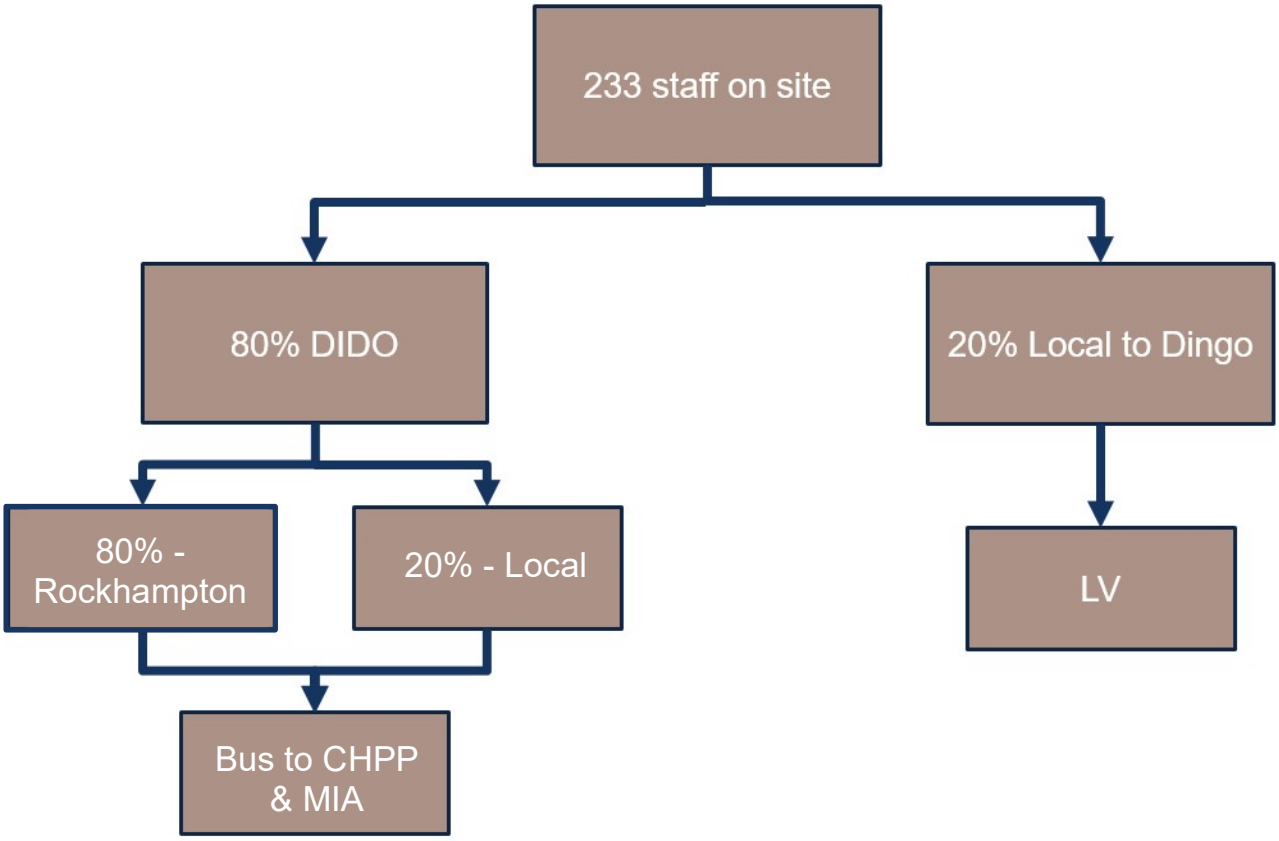
> 20% Local Staff (Local to Dingo/Blackwater region)

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

A breakdown of the workforce origins is displayed on Figure 6-3.

It is assumed vehicles coming onto the weekly roster shift will occur in the AM peak, and the staff going off the rostered week will occur in the PM peak.

Figure 6-3 Workforce Origin breakdown



6.2.4.2 Bus Movements (Shift)

The bus movements will be internal to the mine site and will not have a direct affect on the road network.

6.2.4.3 Light Vehicle Movements (Shift)

Given that 20% of the 233 staff will be local to the area and will utilise LV, the number of LV movements can be calculated as, 233 x 20% = 47 staff to utilise LV. It is assumed 1.2 staff utilise each LV (or 1 in every 5 staff members will carry an additional person as a carpool). Thus, 47 / 1.2 = 39 LV movements daily as per shift changes.

The light vehicle movements will be split between Dingo and Blackwater (50% each).

6.2.5 Workforce Roster Changes (separate to shift changes)

Section 6.2.2 calculated that 100 mining operations staff will rotate using the 7 days on and 7 days off roster.

It is assumed all operations staff rotating 7 days on and 7 days off are DIDO and are split 80% to Rockhampton and 20% to Emerald.

Under peak conditions,

100 x 80% = 80 staff travelling to Rockhampton to/from the roster change (67 trips/day for one day of the week)

100 x 20% = 20 staff traveling to Emerald to/from the roster change (17 trips/day for one day of the week).

It is assumed vehicles coming onto the weekly roster shift will occur in the AM peak, and the staff going off the rostered week will occur in the PM peak.

6.2.6 Accommodation

Operational workforce will be located in the on-site Accommodation Camp.

6.3 Traffic Generation Summary Tables

The following assumptions has been used to calculate workforce trips:

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

Table 6-5 summarises all assessed traffic generation for the Gemini Project during the Construction and Operations phases.

All trips occurring either 1 in every 5 days or 1 in every 2 days have been rounded up to the nearest decimal.

Table 6-5 Traffic Generation Summary

Item #	Item	Origin	Destination	Typical Vehicle	Peak Trips per Day		Return trip?
					Construction	Operation	
1	Deliveries – parts, explosives, waste	Rockhampton/ Gladstone	Mine	Class 9 truck	2	1	Yes
2	Oversized Loads	Rockhampton/ Gladstone/ Brisbane	Mine	Low Loader	1	0	Yes
3	Other deliveries – small trucks	Emerald/ Rockhampton	Mine	Class 3 truck	1	1	Yes
4	Fuel	Gladstone	Mine	B-Double	1	1	Yes
5	HDPE Pipes and concrete culverts	Rockhampton/ Gladstone	Mine	B-Double	1	0	Yes
6	Mine equipment for facilities and operations e.g. CHPP	Gladstone/ Brisbane	Mine	Low Loader/ B-Double	1	0	Yes
7	Construction materials for all infrastructure at the mine (not covered in other items)	Emerald/ Rockhampton/ Gladstone	Mine	Low Loader/ B-Double	1	0	Yes
8	TLO Deliveries (Ballast, sleepers, rail tracks)	Rockhampton/ Gladstone	TLO	Semi	1	0	Yes
9	TLO Operations	Dingo	TLO	LV	0	2	Yes
10	Food	Blackwater /Rockhampton	Mine	Class 3 truck	1 (every 2 days)	1	Yes
11	Water	Blackwater	Mine	23,000 Litre Tanker Tri-Axle Trailer	1 (once a week)	1	Yes

Item #	Item	Origin	Destination	Typical Vehicle	Peak Trips per Day		Return trip?
12	Concrete	Blackwater	Mine	Five Axle Articulated	1	0	Yes
13	Concrete	Blackwater	TLO	Five Axle Articulated	1	0	Yes
14	Quarry Materials for road construction	Site/ Blackwater	Mine	Five Axle Dump Truck	1	0	Yes
15	Quarry Materials for road construction	Site/ Blackwater	TLO	Five Axle Dump Truck	1	0	Yes
16	Solid waste	Mine	Blackwater Sewage Treatment Plant	Quad Axle Truck Dog, Twin Steer with Triple Axle Prime Mover	1 (once a week)	1	Yes, once a week
17	Liquid Waste	Mine	Gladstone Waste Facility	Single Steer Twin Axle	1 (once a week)	1	Yes, once a week
18	General waste	Mine	Blackwater Waste Facility	Single Steer Twin Axle	1 (once a week)	1	Yes, once a week
19	Workforce Shift Change	Dingo/ Blackwater	Mine	Light Vehicle	27	39	Yes
20	Workforce	Dingo	Mine	Buses	4	5	Yes
21	Workforce Roster Change (DIDO)	Rockhampton	Mine	Light Vehicle	46	66 (once a week)	Yes, once a week
22	Workforce	Emerald/Local Area	Mine	Light Vehicle	12	17 (once a week)	Yes, once a week
Total					**107**	**137**	

Source: Magnetic South

6.3.2 Percentage of Trips Occurring in Peak Hour

Table 6-6 Percentage of trips in peak hour split

Item/Operation	% Trips During Peak Hour
Deliveries and Waste Removal	10%
Shift Change Bus and Roster Change	50%
Shift Change LV	30%
Operations TLO Trips	100%

6.3.3 Trips in Peak Hour

Table 6-7 summarises the total trips from Table 6-4 as per the origin and destinations. That is, the summation of all trips for each destination from separate origins.

Table 6-7 Peak Trips per day and peak hour trips traffic generation

Item	Peak Trips per day (Construction)	Peak Trips per day (Operations)	% Trips in peak hour	Peak hour trips per item (Construction)	Peak trips per item (Operations)
Deliveries – parts, explosives, waste	2	1	10%	0.2	0.1
Oversized Loads	1	0	10%	0.1	0
Other deliveries – small trucks	1	1	10%	0.1	0.1
Fuel	1	1	10%	0.1	0.1
HDPE Pipes and concrete culverts	1	0	10%	0.1	0
Mine equipment for facilities and operations e.g. CHPP	1	0	10%	0.1	0
Construction materials for all infrastructure at the mine (not covered in other items)	1	0	10%	0.1	0
TLO Deliveries (Ballast, sleepers, rail tracks)	1	0	10%	0.1	0
TLO Operations	0	2	100%	0	2
Food	1	1	10%	0.1	0.1
Water	1	1	10%	0.1	0.1
Concrete	1	0	10%	0.1	0
Concrete	1	0	10%	0.1	0
Quarry Materials for road construction	1	0	10%	0.1	0
Quarry Materials for road construction	1	0	10%	0.1	0
Solid waste	1	1	10%	0.1	0.1
Liquid Waste	1	1	10%	0.1	0.1
General waste	1	1	10%	0.1	0.1
Workforce Shift Change (LV)	27	39	30%	8.1	11.7
Workforce Shift Change (Bus)	4	5	50%	2	2.5
Workforce Roster Change (DIDO)	58	83	30%	17.4	24.9
Total	**107**	**137**		**29.3 (Peak one way trips in peak hour)**	**41.9 (Peak one way trips in peak hour)**

Table 6-8 Origin Destination Table of Traffic Generation

Origin	Destination	Construction Peak Hour Trips (HV)	Construction Peak Hour Trips (LV)	Operations Peak Hour Trips (HV)	Operations Peak Hour Trips (LV)
Blackwater	Mine	0.350	4.050	0.200	5.850
Brisbane	Mine	0.083		0.000	
Emerald	Mine	0.083		0.050	
Gladstone	Mine	0.367		0.150	
Rockhampton	Mine	0.317		0.100	
Dingo	Mine	2.000	4.050	2.500	5.850
Rockhampton	TLO	0.050		0.000	
Gladstone	TLO	0.050		0.000	
Site	TLO	0.050		0.000	
Blackwater	TLO	0.150		0.000	
Dingo	TLO				2.000
Rockhampton	Mine		13.800		19.800
Emerald	Mine		3.600		5.100
Mine	Blackwater Sewage	0.200		0.200	
Mine	Gladstone Waste	0.100		0.100	
Total		**3.800**	**25.500**	**3.300**	**38.600**

Table 6-9 Destination summary table (Peak hour trips)

Destination	Total Construction Trips	Total Peak Operations Trips
Mine	11.300	14.700
TLO	0.300	2.000
Sewage	0.300	0.300
Mine	17.400	24.900
Total	**29.300**	**41.900**

7 Intersection Assessment

In accordance with the TMR 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 7-1 summarises the impact assessment scenarios.

Table 7-1 Impact Assessment Scenarios

Impact Assessment Scenario	Study Intersections
2022 Background + Peak Construction	Capricorn Highway / Proposed Mine Access, Capricorn Highway / Red Hill Road, Capricorn Highway / Temporary TLO Access
2040 Background + Peak Operations (End of Operations)	Capricorn Highway / Proposed Mine Access, Capricorn Highway / Red Hill Road

7.2 Assessment Criteria

The performance of the study intersections has 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.

7.2.1 Intersection Delay

The 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 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 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.

7.2.2 Intersection Degree of Saturation

Table 7-2 provides the DOS thresholds adopted for the assessment.

Table 7-2 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

7.3 Modelling Parameters

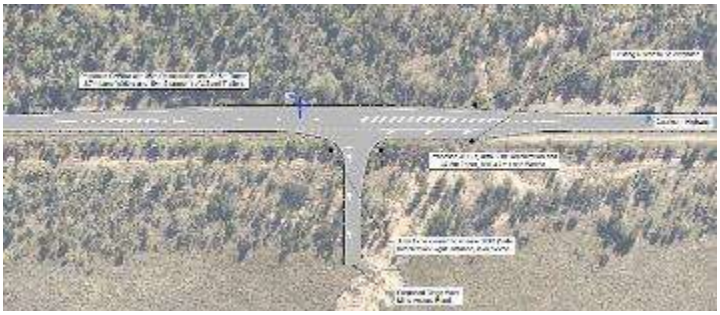
A summary of the SIDRA Modelling parameters adopted for this assessment are summarised below:

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

7.4 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 in Table 7-3. Appendix C contains all SIDRA layouts and summaries.

Table 7-3 Proposed 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: CHR (S)
	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	0.093	6.2 sec	0.5m	0.086	6.3 sec	0.2m
2040 BACKGROUND + PEAK OPERATIONS	0.112	6.3 sec	0.6m	0.100	6.5 sec	0.3m

The proposed intersection is intended to be the main mine access but will also be utilised as the construction access during the development of the Gemini Mine, thus the peak construction (2022) and peak operations scenarios (2040) are assessed. The proposed formation consists of an 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.

7.5

7.5 Capricorn Highway / Red Hill Road

The current configuration of the Capricorn Highway / Red Hill intersection is a three-way priority-controlled arrangement.

Table 7-4 outlines the existing conditions and SIDRA results. Appendix C contains all SIDRA layouts and summaries.

The Capricorn Highway / Red Hill Road intersection will only be used for Light Vehicles (LVs) accessing the proposed TLO for the construction and operations of the TLO. This amounts to approximately two light vehicles enter/existing the facility in a day.

Table 7-4 Existing layout and intersection assessment for Capricorn Highway / Red Hill Road Intersection

Capricorn Highway / Red Hill Road Intersection

Existing Condition:	
Formation:	Sealed
Left Turn Standard:	BAL
Right Turn Standard:	BAR
Speed Limit:	100km/h
Accident History:	0

Safety Assessment at 2040 with Gemini Operations Project traffic:	
Required Left Turn Standard:	BAL
Required Right Turn Standard:	BAR
Proposed Left Turn Treatment	BAL
Proposed Right Turn Treatment	BAR

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95th %ile Queue	DOS	Critical Delay	95th %ile Queue
2022 BACKGROUND + PEAK CONSTRUCTION	0.094	6.3 sec	0.1m	0.092	6.3 sec	0.1m
2040 BACKGROUND + PEAK OPERATIONS	0.113	6.5 sec	0.1m	0.100	6.4 sec	0.1m

The existing formation consists of a BAL and BAR. 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.

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

7.6 Capricorn Highway / Proposed Temporary TLO Access

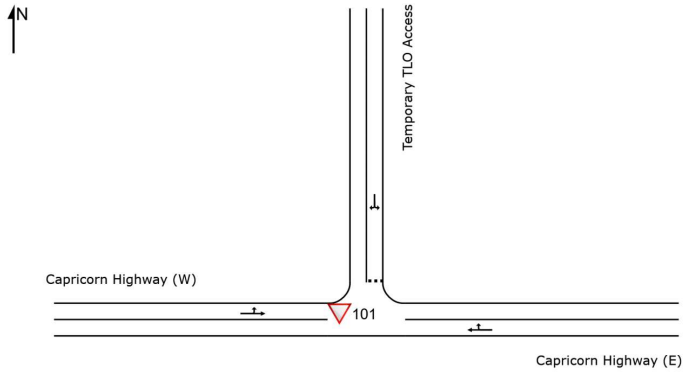
The proposed configuration of this intersection is a three-way prioritised controlled arrangement. Table 7-5 outlines the SIDRA results. Appendix C supplies all SIDRA layouts and summaries.

The Capricorn Highway / Proposed Temporary TLO Access intersection will only be used for Heavy Vehicles (HVs) accessing the proposed TLO for the construction of thee TLO.

Due to the intersection not existing currently, no turning movements currently exist and therefore only the 2022 Background + Peak Construction scenario has been assessed (no movements enter via the temporary access during the operations period).

Table 7-5 Proposed Layout and intersection assessment for Capricorn Highway / Proposed Temporary TLO Access Intersection

Capricorn Highway / Proposed Temporary TLO Access Intersection



Safety Assessment at 2040 with Gemini Operations Project traffic:	
Required Left Turn Standard:	BAL
Required Right Turn Standard:	BAR
Proposed Left Turn Treatment	BAL
Proposed Right Turn Treatment	BAR

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95th %ile Queue	DOS	Critical Delay	95th %ile Queue
2022 BACKGROUND + PEAK CONSTRUCTION	0.094	6.3 sec	0.1m	0.092	6.3 sec	0.1m
2040 BACKGROUND + PEAK OPERATIONS	0.112	6.5 sec	0.1m	0.103	6.sec	0.1m

This intersection is intended for HV project construction traffic only and thus only the peak construction (2022) and peak operations scenarios (2040) are assessed. The proposed formation consists of a BAL and BAR turn provision. 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.

7.7 Intersection impact due to connection of Cooinda Road to the Capricorn Highway via Sanders Road

Additional impacts onto the Capricorn Highway / Namoi Road intersection due to the connection of Sanders Road with Cooinda Road is less than 5% of the existing traffic. Currently, one property exists on Cooinda Road (south of the proposed mine site) and is expected to use the diverted road onto Namoi Road.

Therefore, it is considered that the existing intersection formations are adequate for the very small increase in traffic volumes and the existing turn warrants are satisfactory.

8 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 8-1 and Table 8-2.

A K factor of 0.10 is used, the K factor is the ratio of the design hour volume to the AADT volume.

Table 8-1 is calculated based off 2018 AADT supplied by TMR census data.

Table 8-1 Link Performance with Baseline Traffic Volumes

Road	Section	2040	
		AADT	LOS
Capricorn Highway	East of Charlevue Road Intersection	3520	A

Table 8-2 Link Performance with Baseline and Gemini Mine Project End of Operations Project Traffic Volumes

Road	Section	2040		
		AADT	LOS	Gemini Impact
Capricorn Highway	East of Charlevue Road Intersection	3794 (3520 + 137 + 137)	B	7.8%

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 Gemini Project traffic lowers the performance of the network to a LOS B according to the Austroads Guide to Traffic Engineering Practice.

QTRIP indicates pavement rehabilitation is planned throughout 2018-2020 for sections of the Capricorn Highway between Duaringa and Emerald (sections 14.65km – 140.39km). Overtaking lanes are also planned for construction for sections from Gracemere to Emerald. The indicative total cost for these works is $19,000,000.

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.

9 Summary and Conclusions

Based on the review the following statements are made:

1. The Gemini Project proposes to produce up to 1.9 Mtpa saleable coal.
2. Construction is expected to begin in 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.
3. 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.
4. The current AADT on the Capricorn Highway within the study area is 2,836 veh/day (with 25% HV) based off 2018 AADT segment analysis reports provided by TMR.
5. 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.
6. 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, workforce shift changes as well as on-site accommodation for operation mine workers.
7. TLO access will be via a temporary access road off Capricorn Highway located at the Conveyor Belt location approximately 1,130m east of the mine access intersection. The TLO access will be utilised for construction HV vehicles and will comprise of a temporary level crossing over the existing train line.
8. All study intersections including the proposed mine access intersection location successfully meet SISD requirements.
9. The Austroads turn warrant assessment requires a BAL and CHR (S) for the proposed Mine Access intersection however, a higher order turn facility AUL (S) and CHR lane are proposed to improve road safety.
10. Traffic generation assumptions confirmed with Magnetic South indicated a total of 107 and 137 total peak trips per day will occur during the construction and operations phases of the mine, respectively.
11. 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.
12. SIDRA modelling and analysis indicated that both the proposed Mine Access Intersection and Temporary Access 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.
13. 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.

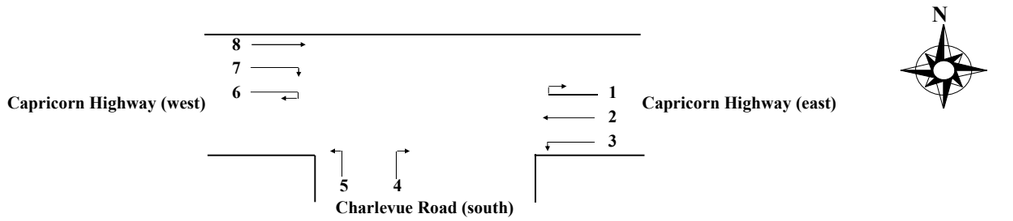
APPENDIX

A

TRAFFIC COUNTS

AUSTRAFFIC INTERSECTION COUNT

Site No.: 3 **Weather:** Fine
Location: Capricorn Highway/Charlevue Road, Dingo
Day/Date: Tuesday, 23 July 2019
AM Peak: *Hour ending - 9:00 AM*
PM Peak: *Hour ending - 4:30 PM*

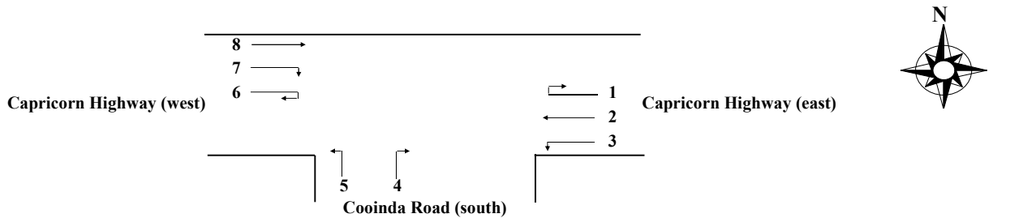


TIME (1/4 hr end)	Movement 1				Movement 2				Movement 3				Movement 4				Movement 5				Movement 6				Movement 7				Movement 8			
	Light Vehicles	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*
6:15 AM	0	0	**0**	0	2	3	**5**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	1	0	**1**	0	9	0	**9**	0
6:30 AM	0	0	**0**	0	10	7	**17**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	14	0	**14**	0
6:45 AM	0	0	**0**	0	4	4	**8**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	8	3	**11**	0
7:00 AM	0	0	**0**	0	3	1	**4**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	1	0	**1**	0	10	6	**16**	0
7:15 AM	0	0	**0**	0	10	6	**16**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	18	0	**18**	0
7:30 AM	0	0	**0**	0	5	4	**9**	0	1	0	**1**	0	1	0	**1**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	19	0	**19**	0
7:45 AM	0	0	**0**	0	3	1	**4**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	15	2	**17**	0
8:00 AM	0	0	**0**	0	8	5	**13**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	15	2	**17**	0
8:15 AM	0	0	**0**	0	15	5	**20**	0	0	0	**0**	0	0	0	**0**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	19	4	**23**	0
8:30 AM	0	0	**0**	0	13	3	**16**	0	0	0	**0**	0	3	0	**3**	0	0	0	**0**	0	0	0	**0**	0	2	0	**2**	0	22	4	**26**	0
8:45 AM	0	0	**0**	0	20	4	**24**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	18	5	**23**	0
9:00 AM	0	0	**0**	0	13	7	**20**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	22	7	**29**	0
3 hr Total	**0**	**0**	**0**	**0**	**106**	**50**	**156**	**0**	**4**	**0**	**4**	**0**	**4**	**0**	**4**	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**	**0**	**189**	**33**	**222**	**0**
AM Peak	**0**	**0**	**0**	**0**	**61**	**19**	**80**	**0**	**1**	**0**	**1**	**0**	**3**	**0**	**3**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**0**	**81**	**20**	**101**	**0**

TIME (1/4 hr end)	Movement 1				Movement 2				Movement 3				Movement 4				Movement 5				Movement 6				Movement 7				Movement 8			
	Light Vehicles	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*
3:45 PM	0	0	**0**	0	29	4	**33**	0	1	0	**1**	0	1	0	**1**	0	1	0	**1**	0	0	0	**0**	0	2	0	**2**	0	11	4	**15**	0
4:00 PM	0	0	**0**	0	35	2	**37**	0	0	0	**0**	0	0	0	**0**	0	2	0	**2**	0	0	0	**0**	0	0	0	**0**	0	9	4	**13**	0
4:15 PM	0	0	**0**	0	28	1	**29**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	2	0	**2**	0	13	4	**17**	0
4:30 PM	0	0	**0**	0	44	3	**47**	0	0	0	**0**	0	0	0	**0**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	9	1	**10**	0
4:45 PM	0	0	**0**	0	31	4	**35**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	10	2	**12**	0
5:00 PM	0	0	**0**	0	25	0	**25**	0	0	1	**1**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	13	2	**15**	0
5:15 PM	0	0	**0**	0	25	4	**29**	0	1	0	**1**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	7	5	**12**	0
5:30 PM	0	0	**0**	0	17	1	**18**	0	0	0	**0**	0	0	0	**0**	0	2	0	**2**	0	0	0	**0**	0	0	0	**0**	0	9	4	**13**	0
5:45 PM	0	0	**0**	0	19	2	**21**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	10	1	**11**	0
6:00 PM	0	0	**0**	0	13	0	**13**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	16	4	**20**	0
6:15 PM	0	0	**0**	0	21	3	**24**	0	0	0	**0**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	9	3	**12**	0
6:30 PM	0	0	**0**	0	24	6	**30**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	9	4	**13**	0
3 hr Total	**0**	**0**	**0**	**0**	**311**	**30**	**341**	**0**	**2**	**1**	**3**	**0**	**4**	**0**	**4**	**0**	**6**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**	**0**	**125**	**38**	**163**	**0**
PM Peak	**0**	**0**	**0**	**0**	**136**	**10**	**146**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**	**0**	**42**	**13**	**55**	**0**

AUSTRAFFIC INTERSECTION COUNT

Site No.: 2 **Weather:** Fine
Location: Capricorn Highway/Cooinda Road, Dingo
Day/Date: Tuesday, 23 July 2019
AM Peak: *Hour ending - 9:00 AM*
PM Peak: *Hour ending - 4:45 PM*

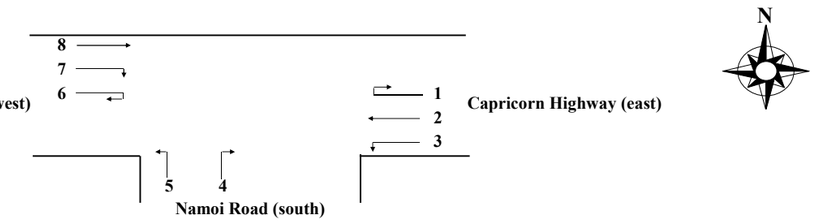


TIME (1/4 hr end)	Movement 1				Movement 2				Movement 3				Movement 4				Movement 5				Movement 6				Movement 7				Movement 8			
	Light Vehicles	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*
6:15 AM	0	0	**0**	0	3	7	**10**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	7	0	**7**	0
6:30 AM	0	0	**0**	0	9	3	**12**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	14	0	**14**	0
6:45 AM	0	0	**0**	0	3	5	**8**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	11	3	**14**	0
7:00 AM	0	0	**0**	0	6	3	**9**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	9	6	**15**	0
7:15 AM	0	0	**0**	0	7	4	**11**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	17	0	**17**	0
7:30 AM	0	0	**0**	0	6	4	**10**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	23	0	**23**	0
7:45 AM	0	0	**0**	0	8	2	**10**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	13	2	**15**	0
8:00 AM	0	0	**0**	0	12	3	**15**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	16	2	**18**	0
8:15 AM	0	0	**0**	0	13	6	**19**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	20	4	**24**	0
8:30 AM	0	0	**0**	0	14	3	**17**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	21	3	**24**	0
8:45 AM	0	0	**0**	0	20	10	**30**	0	0	0	**0**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	23	6	**29**	0
9:00 AM	0	0	**0**	0	13	2	**15**	0	0	0	**0**	0	0	1	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	16	6	**22**	0
3 hr Total	**0**	**0**	**0**	**0**	**114**	**52**	**166**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**190**	**32**	**222**	**0**
AM Peak	**0**	**0**	**0**	**0**	**60**	**21**	**81**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**80**	**19**	**99**	**0**

TIME (1/4 hr end)	Movement 1				Movement 2				Movement 3				Movement 4				Movement 5				Movement 6				Movement 7				Movement 8			
	Light Vehicles	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*
3:45 PM	0	0	**0**	0	31	2	**33**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	12	5	**17**	0
4:00 PM	0	0	**0**	0	33	2	**35**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	10	4	**14**	0
4:15 PM	0	0	**0**	0	36	0	**36**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	11	5	**16**	0
4:30 PM	0	0	**0**	0	36	4	**40**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	8	1	**9**	0
4:45 PM	0	0	**0**	0	30	4	**34**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	15	2	**17**	0
5:00 PM	0	0	**0**	0	31	2	**33**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	10	2	**12**	0
5:15 PM	0	0	**0**	0	19	3	**22**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	11	4	**15**	0
5:30 PM	0	0	**0**	0	22	2	**24**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	11	4	**15**	0
5:45 PM	0	0	**0**	0	15	1	**16**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	9	2	**11**	0
6:00 PM	0	0	**0**	0	18	0	**18**	0	0	1	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	18	4	**22**	0
6:15 PM	0	0	**0**	0	21	1	**22**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	10	1	**11**	0
6:30 PM	0	0	**0**	0	12	7	**19**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	8	3	**11**	0
3 hr Total	**0**	**0**	**0**	**0**	**304**	**28**	**332**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**133**	**37**	**170**	**0**
PM Peak	**0**	**0**	**0**	**0**	**135**	**10**	**145**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**44**	**12**	**56**	**0**

AUSTRAFFIC INTERSECTION COUNT

Site No.: 1 **Weather:** Fine
Location: Capricorn Highway/Namoi Road, Dingo
Day/Date: Tuesday, 23 July 2019
AM Peak: *Hour ending - 9:00 AM*
PM Peak: *Hour ending - 4:30 PM*



TIME (1/4 hr end)	Movement 1				Movement 2				Movement 3				Movement 4				Movement 5				Movement 6				Movement 7				Movement 8			
	Light Vehicles	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*
6:15 AM	0	0	**0**	0	3	9	**12**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	5	1	**6**	0
6:30 AM	0	0	**0**	0	6	5	**11**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	9	0	**9**	0
6:45 AM	0	0	**0**	0	3	4	**7**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	16	2	**18**	0
7:00 AM	0	0	**0**	0	6	3	**9**	0	0	0	**0**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	9	3	**12**	0
7:15 AM	0	0	**0**	0	6	5	**11**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	16	4	**20**	0
7:30 AM	0	0	**0**	0	6	4	**10**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	19	1	**20**	0
7:45 AM	0	0	**0**	0	8	2	**10**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	16	2	**18**	0
8:00 AM	0	0	**0**	0	13	2	**15**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	13	3	**16**	0
8:15 AM	0	0	**0**	0	12	7	**19**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	21	6	**27**	0
8:30 AM	0	0	**0**	0	14	3	**17**	0	0	0	**0**	0	2	0	**2**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	20	3	**23**	0
8:45 AM	0	0	**0**	0	20	13	**33**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	15	6	**21**	0
9:00 AM	0	0	**0**	0	12	3	**15**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	21	4	**25**	0
3 hr Total	**0**	**0**	**0**	**0**	**109**	**60**	**169**	**0**	**1**	**0**	**1**	**0**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**180**	**35**	**215**	**0**
AM Peak	**0**	**0**	**0**	**0**	**58**	**26**	**84**	**0**	**1**	**0**	**1**	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**77**	**19**	**96**	**0**

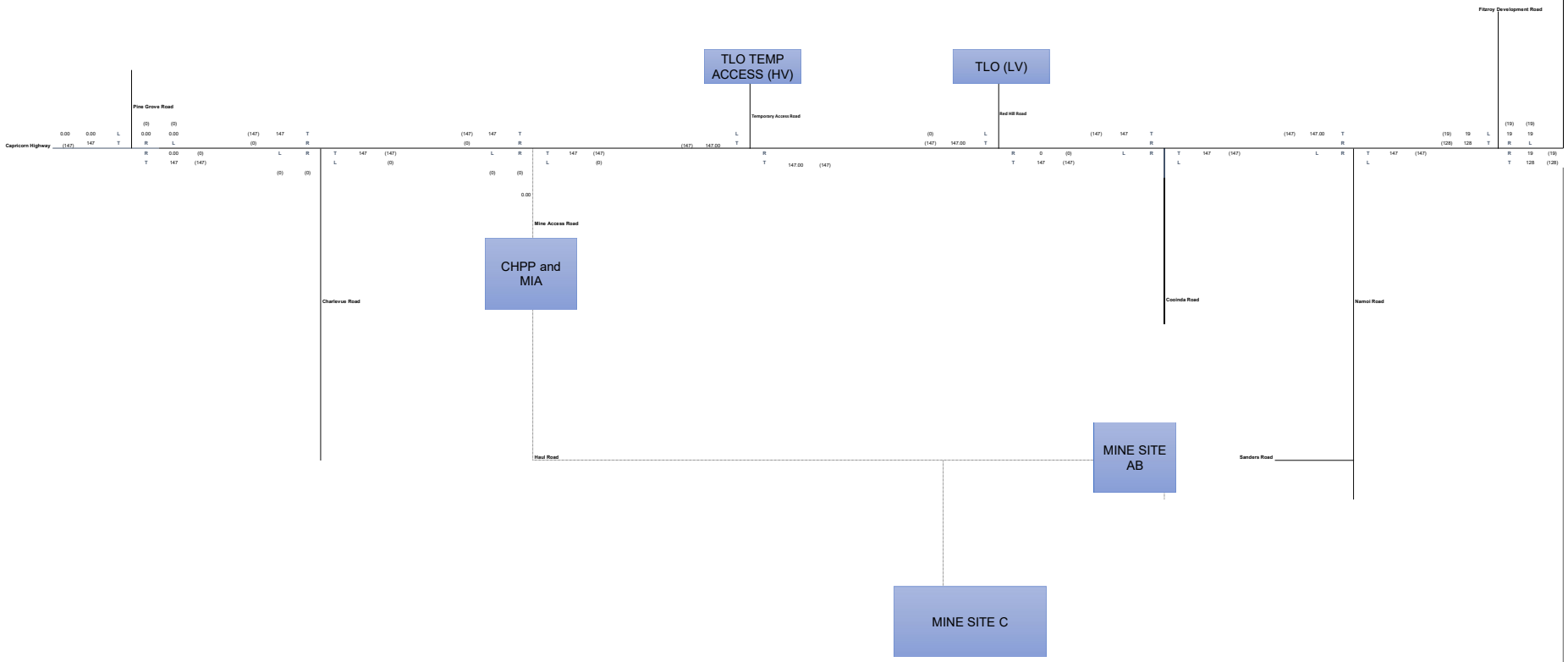
TIME (1/4 hr end)	Movement 1				Movement 2				Movement 3				Movement 4				Movement 5				Movement 6				Movement 7				Movement 8			
	Light Vehicles	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*	*Light Vehicles*	*Heavy Vehicles*	***Total***	*Cyclists*
3:45 PM	0	0	**0**	0	32	2	**34**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	10	4	**14**	0
4:00 PM	0	0	**0**	0	37	2	**39**	0	0	0	**0**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	1	**1**	0	16	4	**20**	0
4:15 PM	0	0	**0**	0	33	1	**34**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	7	3	**10**	0
4:30 PM	0	0	**0**	0	33	4	**37**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	7	5	**12**	0
4:45 PM	0	0	**0**	0	28	3	**31**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	12	1	**13**	0
5:00 PM	0	0	**0**	0	31	2	**33**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	9	2	**11**	0
5:15 PM	0	0	**0**	0	21	3	**24**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	12	4	**16**	0
5:30 PM	0	0	**0**	0	15	1	**16**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	9	2	**11**	0
5:45 PM	0	0	**0**	0	15	1	**16**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	11	4	**15**	0
6:00 PM	0	0	**0**	0	17	3	**20**	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	12	1	**13**	0
6:15 PM	0	0	**0**	0	24	3	**27**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	13	4	**17**	0
6:30 PM	0	0	**0**	0	16	4	**20**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	4	0	**4**	0	11	2	**13**	0
3 hr Total	**0**	**0**	**0**	**0**	**302**	**29**	**331**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**1**	**5**	**0**	**129**	**36**	**165**	**0**

PM Peak	0	0	0	0	135	9	144	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	40	16	56	0

APPENDIX

B

TRAFFIC VOLUMES



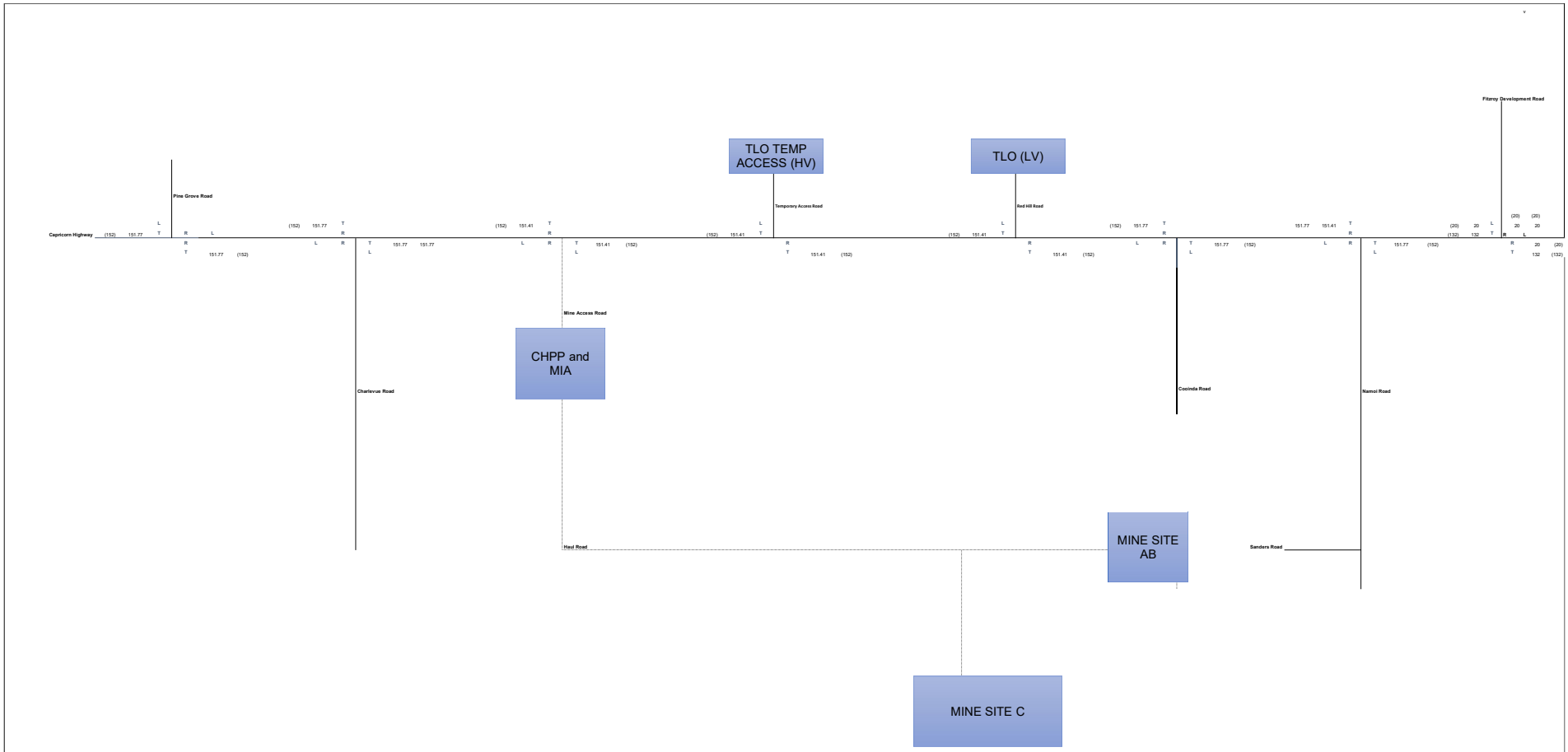
Cardno

Figure: Background 2019 Traffic

Project no. QTT19061
Prepared by Bradley Fuller

Project Gemini Project Tia
Reviewed by John Peace

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



Cardno

Figure: Background 2022 Traffic

Project no. QTT19061

Prepared by Bradley Fuller

Project Gemini Project Tia

Reviewed by John Peace

Legend

L Left turn

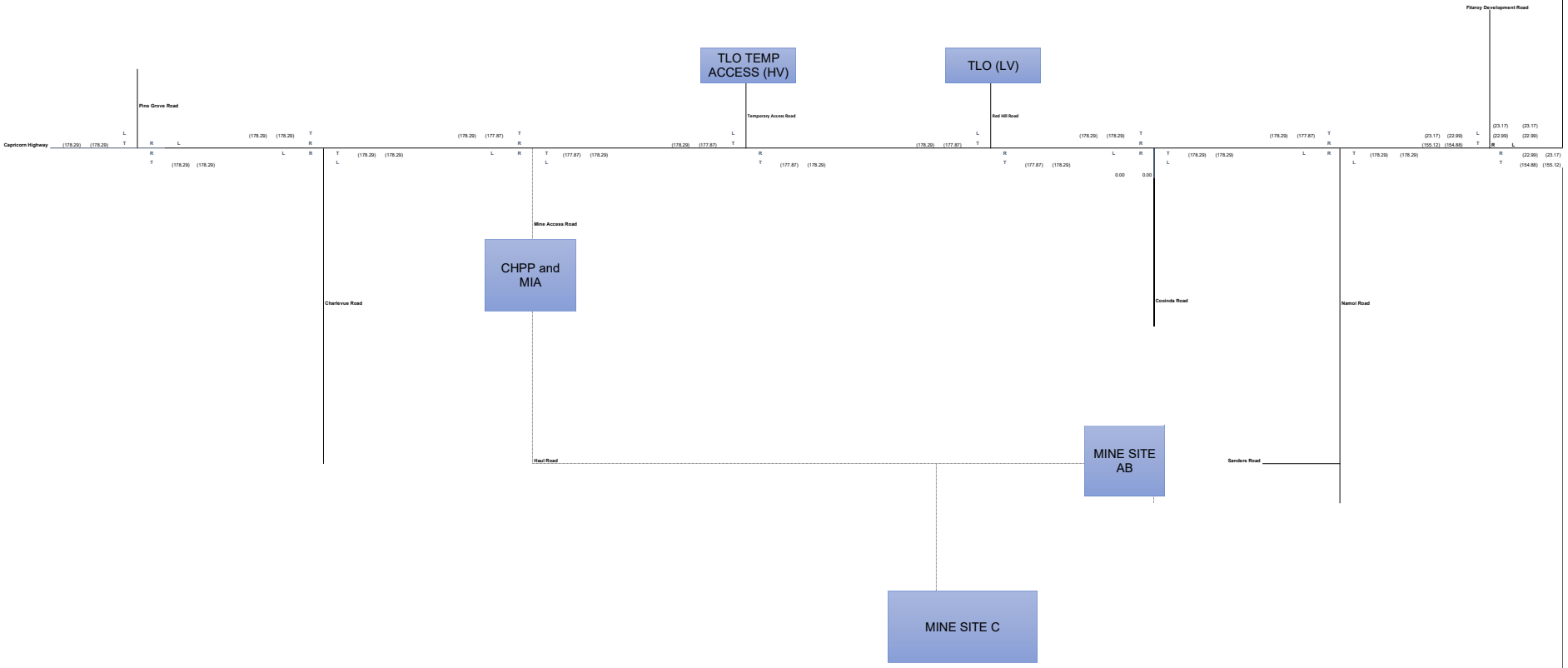
T Through

R Right turn

U U-turn

00 AM Peak Volume

(00) PM Peak Volume



Cardno

Figure: Background 2040 Traffic

Project no. QTT19061

Prepared by Bradley Fuller

Project Gemini Project Tia

Reviewed by John Peace

Legend

L Left turn

T Through

R Right turn

U U-turn

00 AM Peak Volume

(00) PM Peak Volume

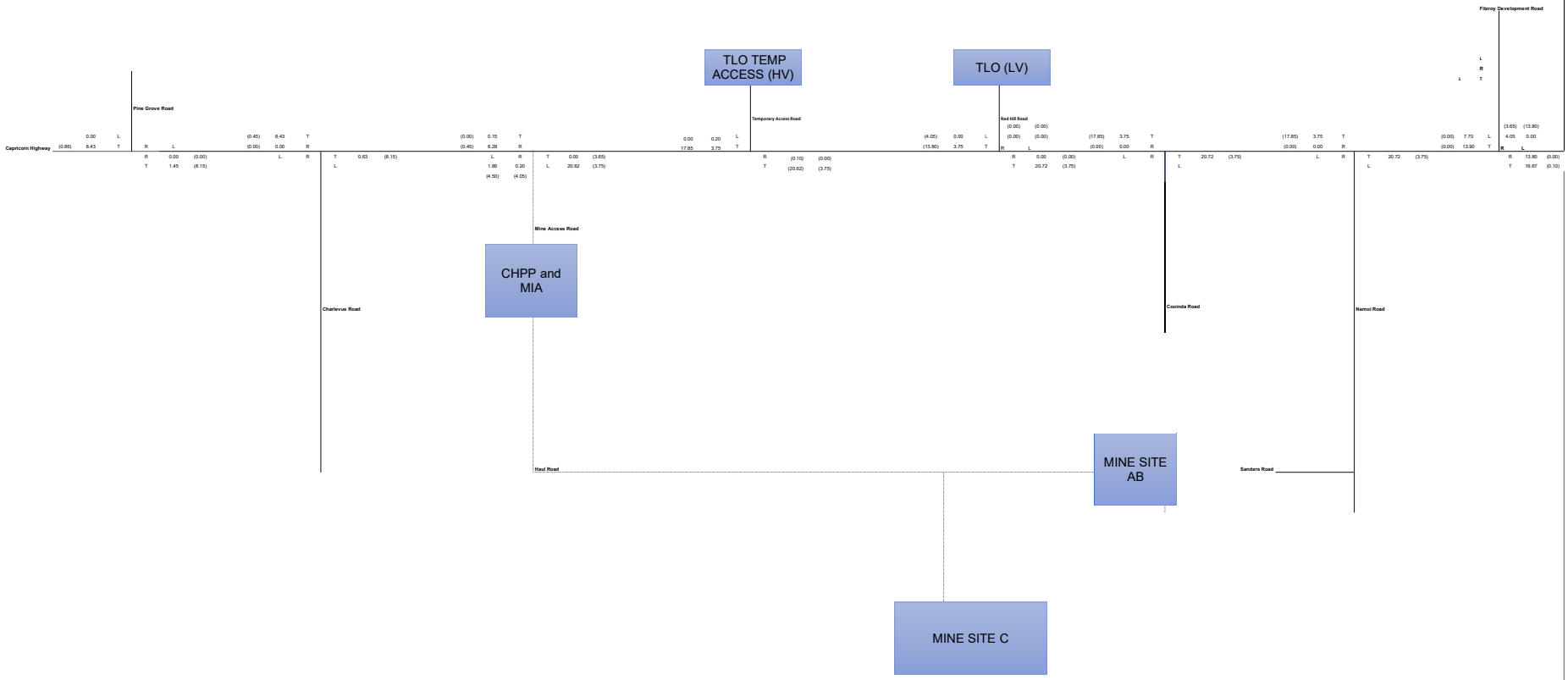


Figure **Peak Construction Traffic**

Project no. QTT19061 **Project** Gemini Project Tia

Prepared by Bradley Fuller **Reviewed by** John Peace

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

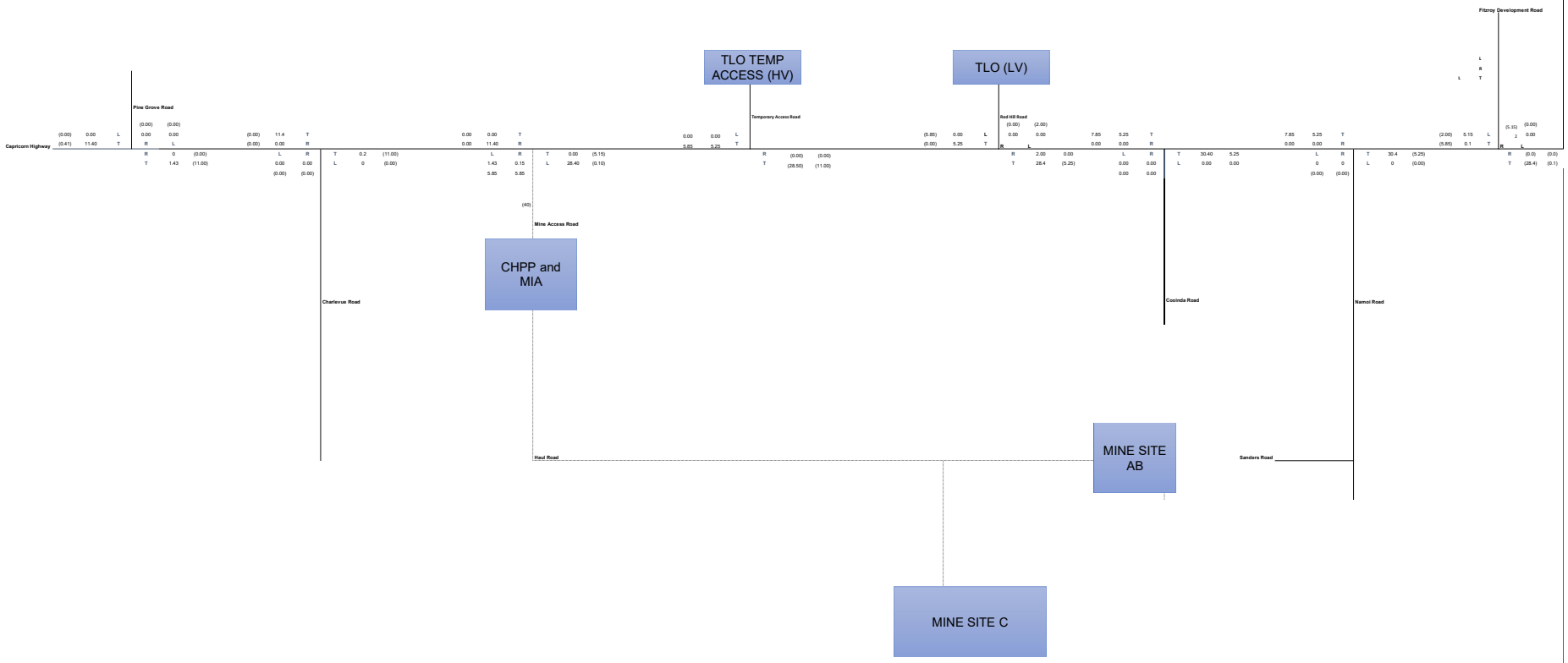


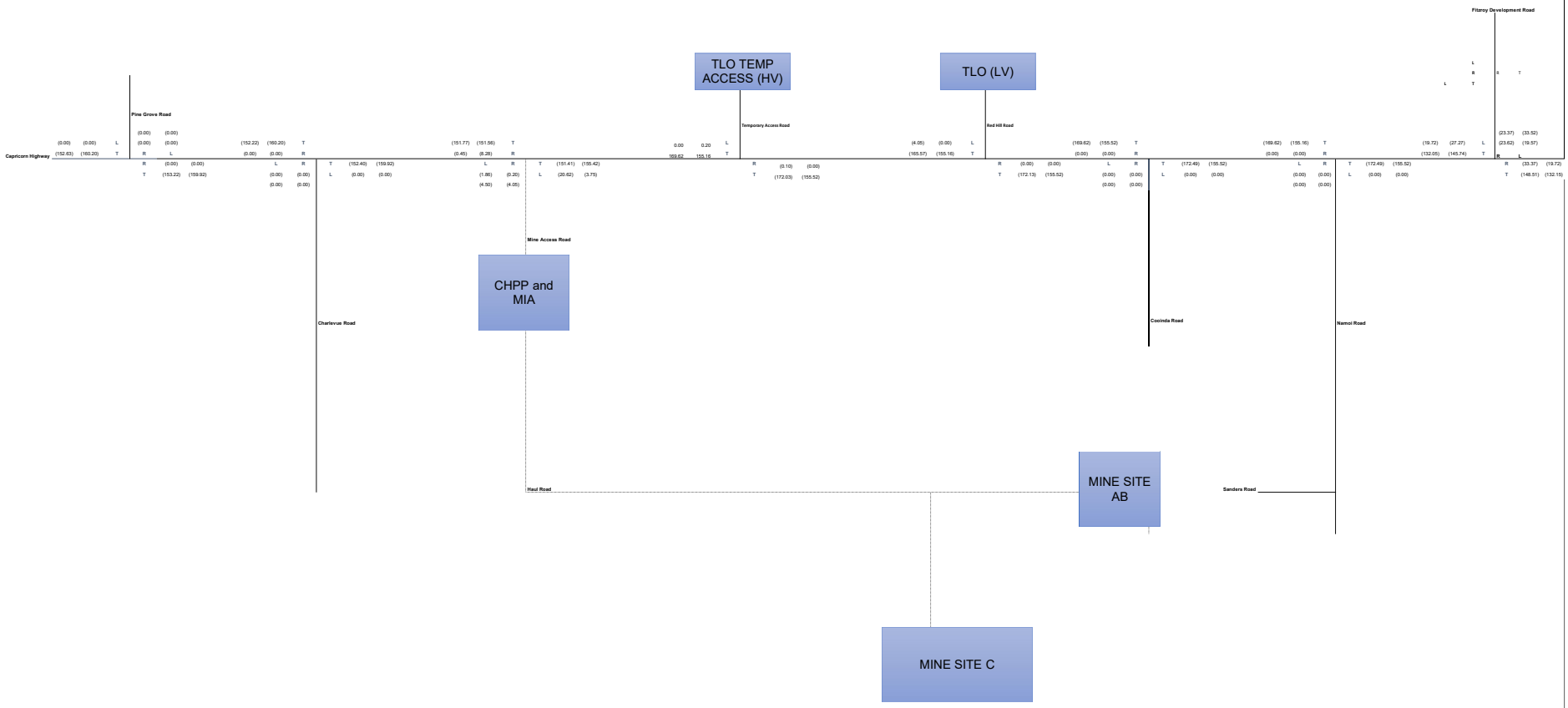
Figure: Peak Operations Traffic

Project no. QTT19061
Prepared by Bradley Fuller

Project Gemini Project Tia
Reviewed by John Peace

Legend
L Left turn
T Through
R Right turn
U U-turn

00 AM Peak Volume
(00) PM Peak Volume



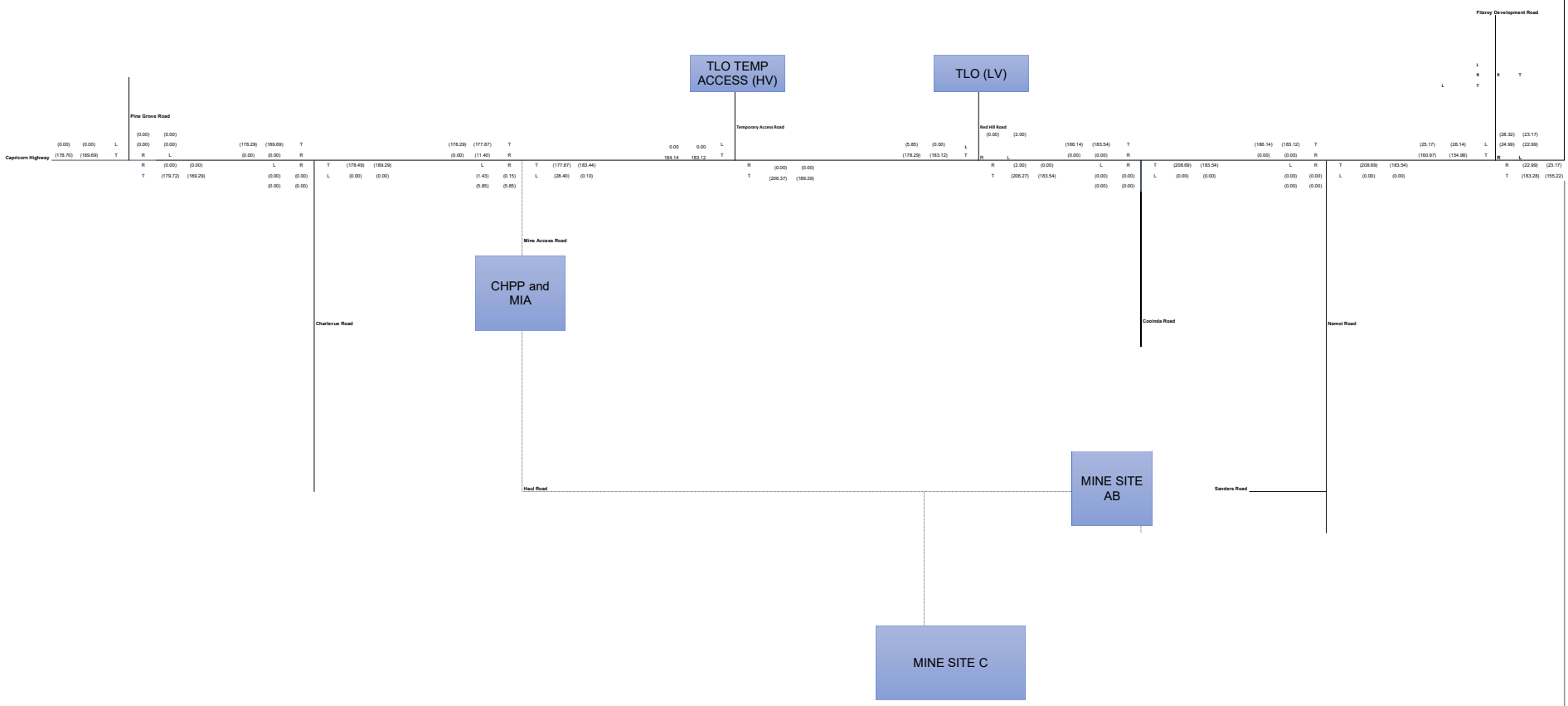
Cardno

Figure: Background 2022 and Peak Construction Combined Traffic

Project no. QTT19061
Prepared by Bradley Fuller

Project Gemini Project Tia
Reviewed by John Peace

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



Cardno

Figure: Background 2040 and Peak Operations Combined Traffic

Project no. QTT19061
Prepared by Bradley Fuller

Project Gemini Project Tia
Reviewed by John Peace

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

APPENDIX

C

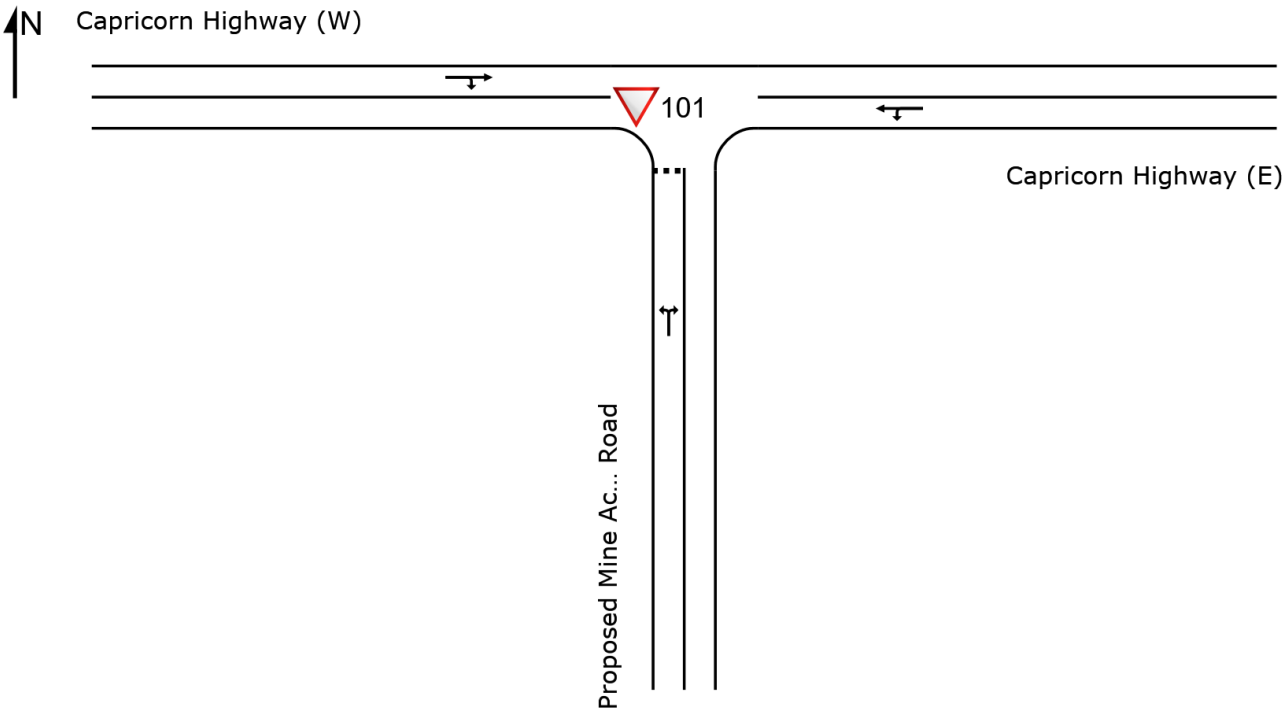
SIDRA LAYOUT, RESULTS, AND TURN WARRANT TREATMENTS

SITE LAYOUT

Site: 101 [2022 BG + PEAK CONSTRUCTION AM PEAK (Site Folder: General)]

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [2022 BG + PEAK CONSTRUCTION AM PEAK (Site Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	3	0.0	1224	0.003	100	6.2	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	3	0.0		0.003		6.2	LOS A	0.0	0.1				
East: Capricorn Highway (E)													
Lane 1	181	0.0	1938	0.093	100	0.7	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	181	0.0		0.093		0.7	NA	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	169	0.0	1916	0.088	100	0.4	LOS A	0.1	0.5	Full	800	0.0	0.0
Approach	169	0.0		0.088		0.4	NA	0.1	0.5				
Intersection	354	0.0		0.093		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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Proposed Mine Access Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	2	1	3	0.0	1224	0.003	100	NA	NA
Approach	2	1	3	0.0		0.003			

East: Capricorn Highway (E)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	22	159	181	0.0	1938	0.093	100	NA	NA
Approach	22	159	181	0.0		0.093			

West: Capricorn Highway (W)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	160	9	169	0.0	1916	0.088	100	NA	NA
Approach	160	9	169	0.0		0.088			

	Total	%HV	Deg.Satn (v/c)

Intersection	354	0.0	0.093

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Proposed Mine Access Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [2022 BG + PEAK CONSTRUCTION PM PEAK (Site Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	9	0.0	1175	0.008	100	6.3	LOS A	0.0	0.2	Full	500	0.0	0.0
Approach	9	0.0		0.008		6.3	LOS A	0.0	0.2				
East: Capricorn Highway (E)													
Lane 1	167	0.0	1948	0.086	100	0.2	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	167	0.0		0.086		0.2	NA	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	160	0.0	1946	0.082	100	0.0	LOS A	0.0	0.1	Full	800	0.0	0.0
Approach	160	0.0		0.082		0.0	NA	0.0	0.1				
Intersection	337	0.0		0.086		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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Proposed Mine Access Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	4	9	0.0	1175	0.008	100	NA	NA
Approach	5	4	9	0.0		0.008			

East: Capricorn Highway (E)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	163	167	0.0	1948	0.086	100	NA	NA
Approach	4	163	167	0.0		0.086			

West: Capricorn Highway (W)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	159	1	160	0.0	1946	0.082	100	NA	NA
Approach	159	1	160	0.0		0.082			

	Total	%HV	Deg.Satn (v/c)

Intersection	337	0.0	0.086

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Proposed Mine Access Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [2040 BG + PEAK OPERATION AM PEAK (Site Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	3	0.0	1175	0.003	100	6.3	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	3	0.0		0.003		6.3	LOS A	0.0	0.1				
East: Capricorn Highway (E)													
Lane 1	217	0.0	1937	0.112	100	0.8	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	217	0.0		0.112		0.8	NA	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	199	0.0	1909	0.104	100	0.4	LOS A	0.1	0.6	Full	800	0.0	0.0
Approach	199	0.0		0.104		0.4	NA	0.1	0.6				
Intersection	419	0.0		0.112		0.7	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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Proposed Mine Access Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	2	1	3	0.0	1175	0.003	100	NA	NA
Approach	2	1	3	0.0		0.003			

East: Capricorn Highway (E)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	29	187	217	0.0	1937	0.112	100	NA	NA
Approach	29	187	217	0.0		0.112			

West: Capricorn Highway (W)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	187	12	199	0.0	1909	0.104	100	NA	NA
Approach	187	12	199	0.0		0.104			

	Total	%HV	Deg.Satn (v/c)

Intersection	419	0.0	0.112

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Proposed Mine Access Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [2040 BG + PEAK OPERATION PM PEAK (Site Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	13	0.0	1100	0.011	100	6.5	LOS A	0.0	0.3	Full	500	0.0	0.0
Approach	13	0.0		0.011		6.5	LOS A	0.0	0.3				
East: Capricorn Highway (E)													
Lane 1	195	0.0	1949	0.100	100	0.1	LOS A	0.0	0.0	Full	800	0.0	0.0
Approach	195	0.0		0.100		0.1	NA	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	188	0.0	1946	0.097	100	0.0	LOS A	0.0	0.1	Full	800	0.0	0.0
Approach	188	0.0		0.097		0.0	NA	0.0	0.1				
Intersection	396	0.0		0.100		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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Proposed Mine Access Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	6	6	13	0.0	1100	0.011	100	NA	NA
Approach	6	6	13	0.0		0.011			

East: Capricorn Highway (E)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	194	195	0.0	1949	0.100	100	NA	NA
Approach	1	194	195	0.0		0.100			

West: Capricorn Highway (W)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	187	1	188	0.0	1946	0.097	100	NA	NA
Approach	187	1	188	0.0		0.097			

	Total	%HV	Deg.Satn (v/c)

Intersection	396	0.0	0.100

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

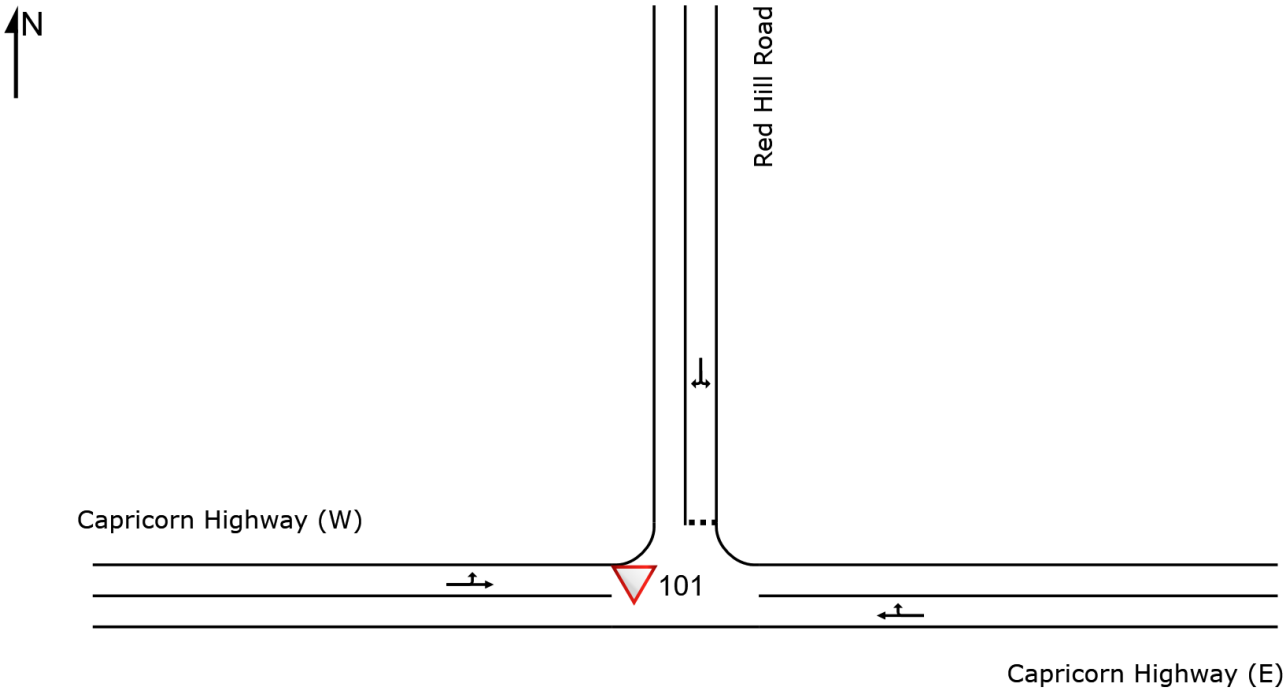
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Proposed Mine Access Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 101 [BG 2022 + Peak Cons - AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [BG 2022 + Peak Cons - AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	182	0.0	1947	0.094	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	182	0.0		0.094		0.0	NA	0.0	0.1				
North: Red Hill Road													
Lane 1	2	0.0	1136	0.002	100	6.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.3	LOS A	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	164	0.0	1949	0.084	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	164	0.0		0.084		0.1	NA	0.0	0.0				
Intersection	348	0.0		0.094		0.1	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Capricorn Highway (E)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	181	1	182	0.0	1947	0.094	100	NA	NA
Approach	181	1	182	0.0		0.094			

North: Red Hill Road

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1136	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

West: Capricorn Highway (W)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	163	164	0.0	1949	0.084	100	NA	NA
Approach	1	163	164	0.0		0.084			

	Total	%HV	Deg.Satn (v/c)
Intersection	348	0.0	0.094

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Red Hill Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG 2022 + Peak Cons - PM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	165	0.0	1946	0.085	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	165	0.0		0.085		0.0	NA	0.0	0.1				
North: Red Hill Road													
Lane 1	2	0.0	1134	0.002	100	6.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.3	LOS A	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	179	0.0	1948	0.092	100	0.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	179	0.0		0.092		0.2	NA	0.0	0.0				
Intersection	346	0.0		0.092		0.1	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Capricorn Highway (E)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	164	1	165	0.0	1946	0.085	100	NA	NA
Approach	164	1	165	0.0		0.085			

North: Red Hill Road

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1134	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

West: Capricorn Highway (W)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	175	179	0.0	1948	0.092	100	NA	NA
Approach	4	175	179	0.0		0.092			

	Total	%HV	Deg.Satn (v/c)
Intersection	346	0.0	0.092

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Red Hill Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG 2040 + Peak Ops - AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	219	0.0	1944	0.113	100	0.1	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	219	0.0		0.113		0.1	NA	0.0	0.1				
North: Red Hill Road													
Lane 1	2	0.0	1080	0.002	100	6.5	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.5	LOS A	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	194	0.0	1949	0.099	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	194	0.0		0.099		0.1	NA	0.0	0.0				
Intersection	415	0.0		0.113		0.1	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Capricorn Highway (E)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	217	2	219	0.0	1944	0.113	100	NA	NA
Approach	217	2	219	0.0		0.113			

North: Red Hill Road

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1080	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

West: Capricorn Highway (W)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	193	194	0.0	1949	0.099	100	NA	NA
Approach	1	193	194	0.0		0.099			

	Total	%HV	Deg.Satn (v/c)
Intersection	415	0.0	0.113

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Red Hill Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG 2040 + Peak Ops - PM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	195	0.0	1946	0.100	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	195	0.0		0.100		0.0	NA	0.0	0.1				
North: Red Hill Road													
Lane 1	2	0.0	1101	0.002	100	6.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.4	LOS A	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	194	0.0	1947	0.099	100	0.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	194	0.0		0.099		0.2	NA	0.0	0.0				
Intersection	391	0.0		0.100		0.2	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Capricorn Highway (E)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	194	1	195	0.0	1946	0.100	100	NA	NA
Approach	194	1	195	0.0		0.100			

North: Red Hill Road

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1101	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

West: Capricorn Highway (W)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	6	187	194	0.0	1947	0.099	100	NA	NA
Approach	6	187	194	0.0		0.099			

	Total	%HV	Deg.Satn (v/c)
Intersection	391	0.0	0.100

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

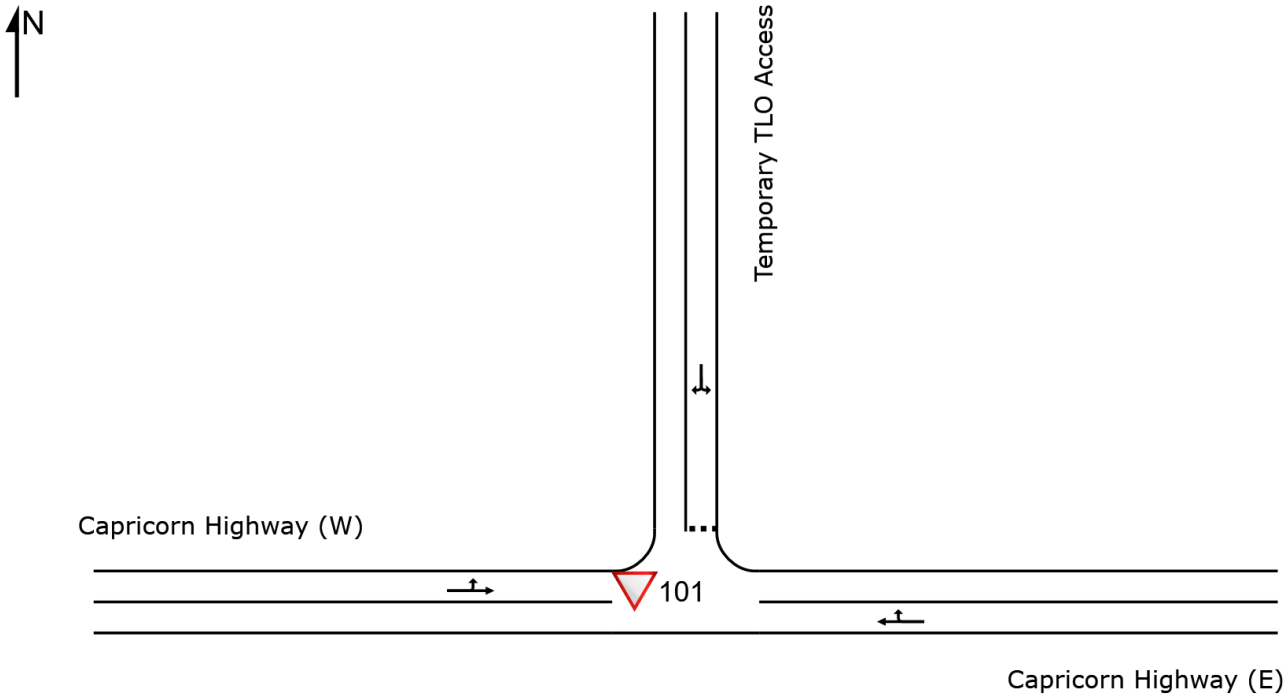
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Red Hill Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 101 [BG 2022 + Peak Cons - AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [BG 2022 + Peak Cons - AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	182	0.0	1947	0.094	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	182	0.0		0.094		0.0	NA	0.0	0.1				
North: Temporary TLO Access													
Lane 1	2	0.0	1136	0.002	100	6.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.3	LOS A	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	164	0.0	1949	0.084	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	164	0.0		0.084		0.1	NA	0.0	0.0				
Intersection	348	0.0		0.094		0.1	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Capricorn Highway (E)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	181	1	182	0.0	1947	0.094	100	NA	NA
Approach	181	1	182	0.0		0.094			

North: Temporary TLO Access

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1136	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

West: Capricorn Highway (W)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	163	164	0.0	1949	0.084	100	NA	NA
Approach	1	163	164	0.0		0.084			

	Total	%HV	Deg.Satn (v/c)
Intersection	348	0.0	0.094

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Temporary TLO Access Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG 2022 + Peak Cons - PM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	165	0.0	1946	0.085	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	165	0.0		0.085		0.0	NA	0.0	0.1				
North: Temporary TLO Access													
Lane 1	2	0.0	1130	0.002	100	6.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.3	LOS A	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	180	0.0	1949	0.092	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	180	0.0		0.092		0.1	NA	0.0	0.0				
Intersection	347	0.0		0.092		0.1	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Capricorn Highway (E)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	164	1	165	0.0	1946	0.085	100	NA	NA
Approach	164	1	165	0.0		0.085			

North: Temporary TLO Access

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1130	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

West: Capricorn Highway (W)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	179	180	0.0	1949	0.092	100	NA	NA
Approach	1	179	180	0.0		0.092			

	Total	%HV	Deg.Satn (v/c)
Intersection	347	0.0	0.092

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Temporary TLO Access Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG 2040 + Peak Ops - AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	218	0.0	1947	0.112	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	218	0.0		0.112		0.0	NA	0.0	0.1				
North: Temporary TLO Access													
Lane 1	2	0.0	1081	0.002	100	6.5	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.5	LOS A	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	194	0.0	1949	0.099	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	194	0.0		0.099		0.1	NA	0.0	0.0				
Intersection	414	0.0		0.112		0.1	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Capricorn Highway (E)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	217	1	218	0.0	1947	0.112	100	NA	NA
Approach	217	1	218	0.0		0.112			

North: Temporary TLO Access

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1081	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

West: Capricorn Highway (W)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	193	194	0.0	1949	0.099	100	NA	NA
Approach	1	193	194	0.0		0.099			

	Total	%HV	Deg.Satn (v/c)
Intersection	414	0.0	0.112

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Temporary TLO Access Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [BG 2040 + Peak Ops - PM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. 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	200	0.0	1947	0.103	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	200	0.0		0.103		0.0	NA	0.0	0.1				
North: Temporary TLO Access													
Lane 1	2	0.0	1092	0.002	100	6.5	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		6.5	LOS A	0.0	0.0				
West: Capricorn Highway (W)													
Lane 1	195	0.0	1949	0.100	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	195	0.0		0.100		0.1	NA	0.0	0.0				
Intersection	397	0.0		0.103		0.1	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Capricorn Highway (E)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	199	1	200	0.0	1947	0.103	100	NA	NA
Approach	199	1	200	0.0		0.103			

North: Temporary TLO Access

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1092	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

West: Capricorn Highway (W)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	194	195	0.0	1949	0.100	100	NA	NA
Approach	1	194	195	0.0		0.100			

	Total	%HV	Deg.Satn (v/c)
Intersection	397	0.0	0.103

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

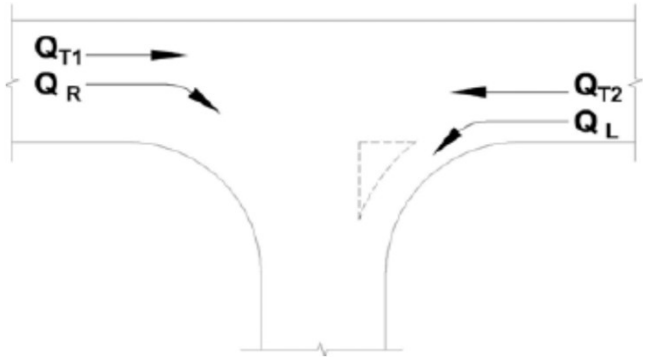
Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Capricorn Highway (E) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Temporary TLO Access Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Capricorn Highway (W) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

Capricorn Highway / Proposed Mine Access Road

2022 BG + Peak Construction

Q_{T1}=	152
Q_R=	8

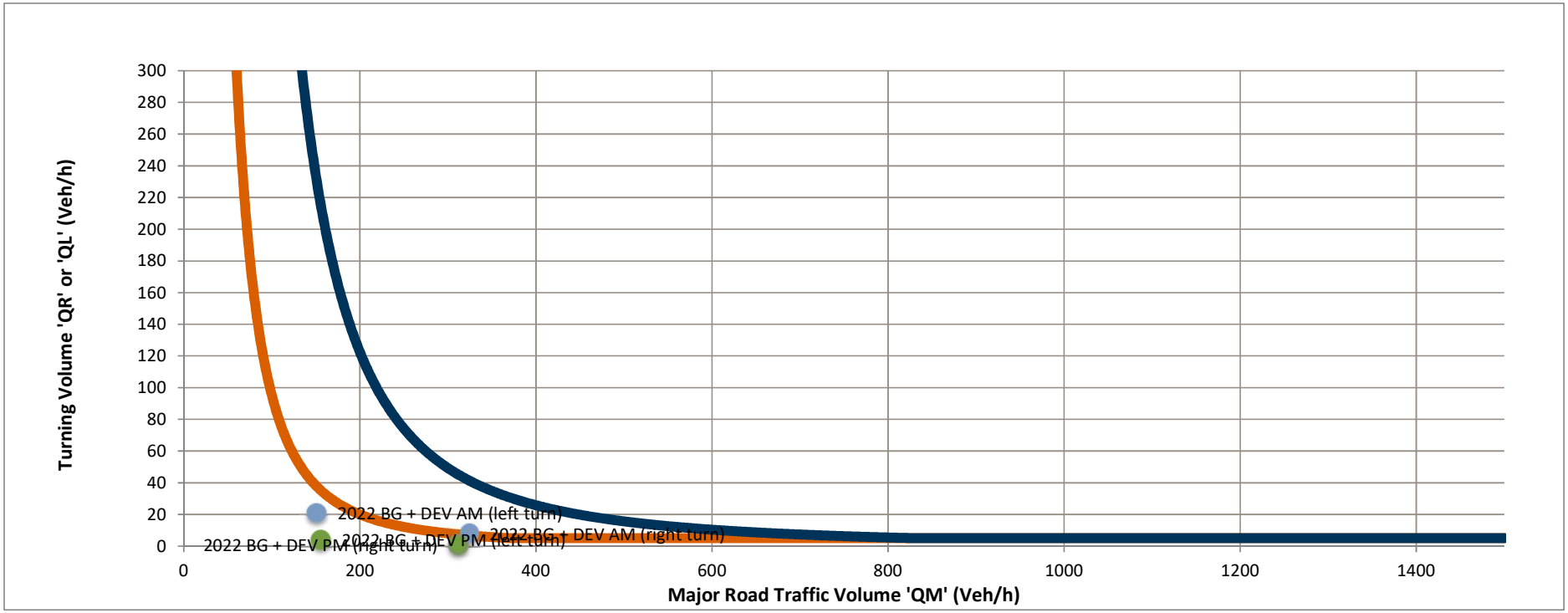


Q_{T2}=	151
Q_L=	21

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

	Q_M	Q_R/Q_L
Right	324	8
Left	151	21

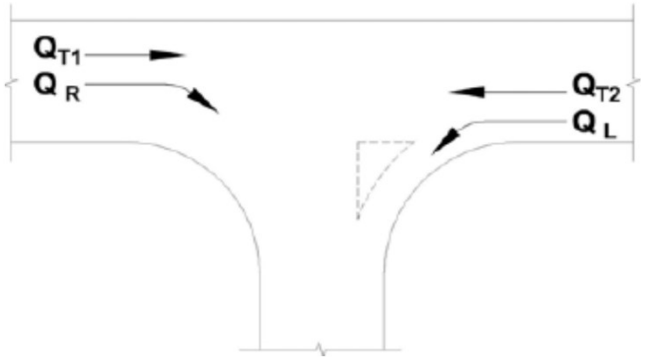
Right Turn Treatment Required	CHR(S)
Left Turn Treatment Required	BAL



Capricorn Highway / Proposed Mine Access Road

2040 BG + Peak Operations

Q_{T1}=	178
Q_R=	11

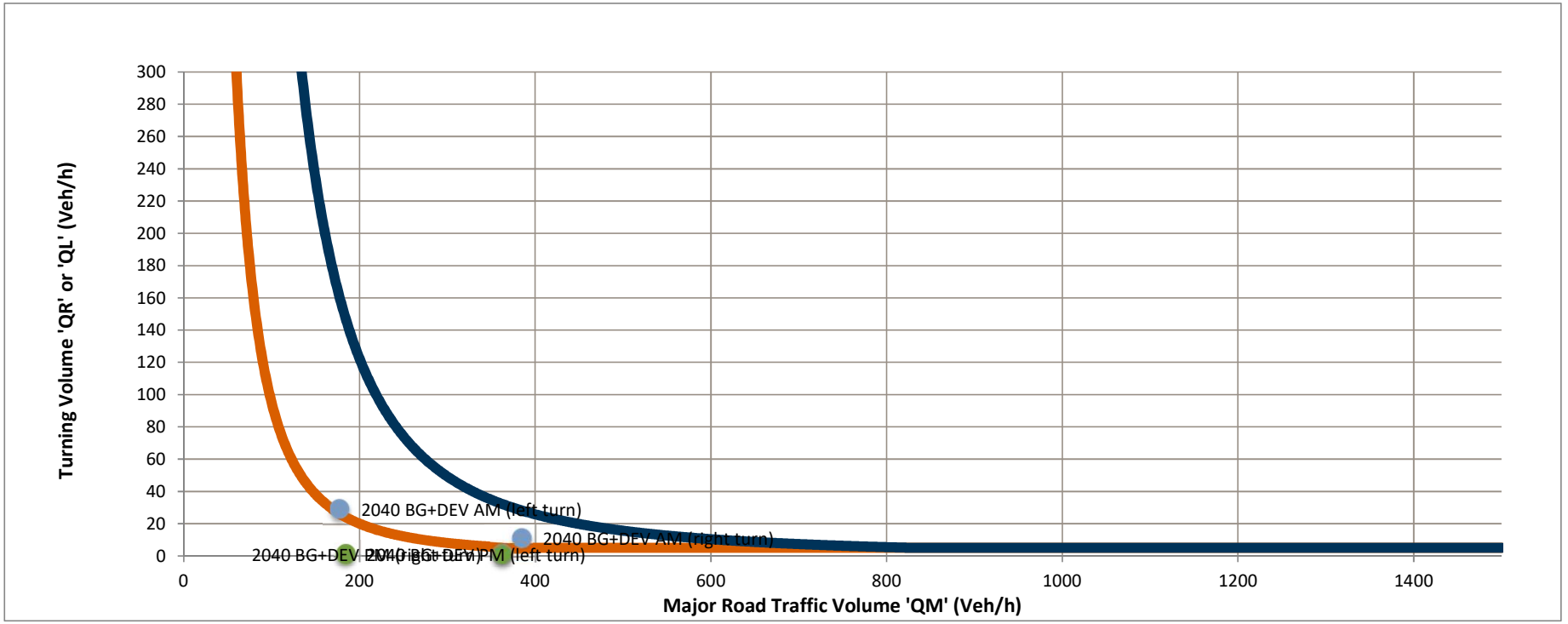


Q_{T2}=	178
Q_L=	29

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

	Q_M	Q_R/Q_L
Right	385	11
Left	178	29

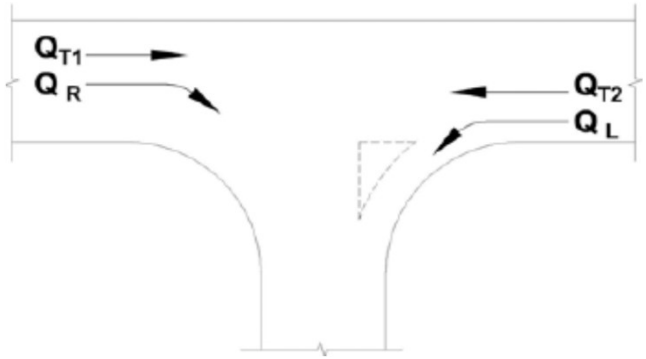
Right Turn Treatment Required	CHR(S)
Left Turn Treatment Required	AUL(S)



Capricorn Highway / Red Hill Road

2022 BG + Peak Construction

Q_{T1}=	172
Q_R=	1

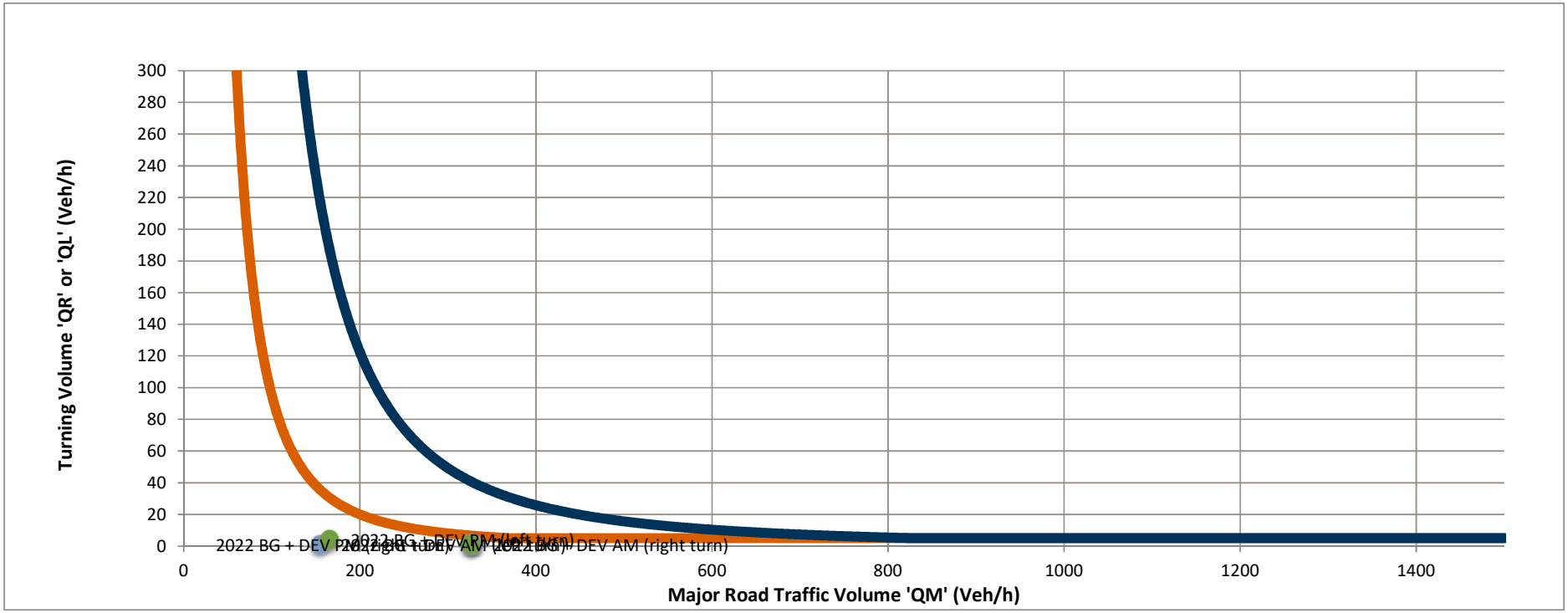


Q_{T2}=	155
Q_L=	1

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

	Q_M	Q_R/Q_L
Right	328	1
Left	155	1

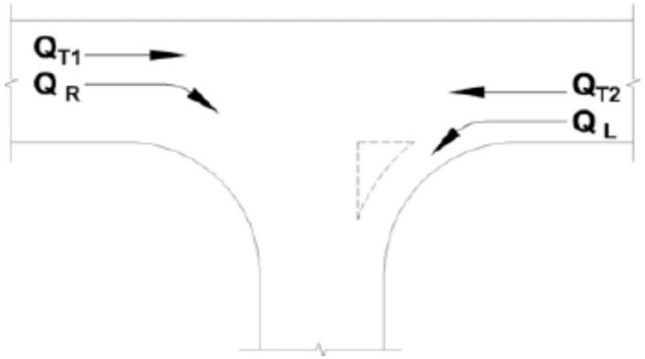
Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Capricorn Highway / Red Hill Road

2040 BG + Peak Operations

Q_{T1}=	206
Q_R=	2

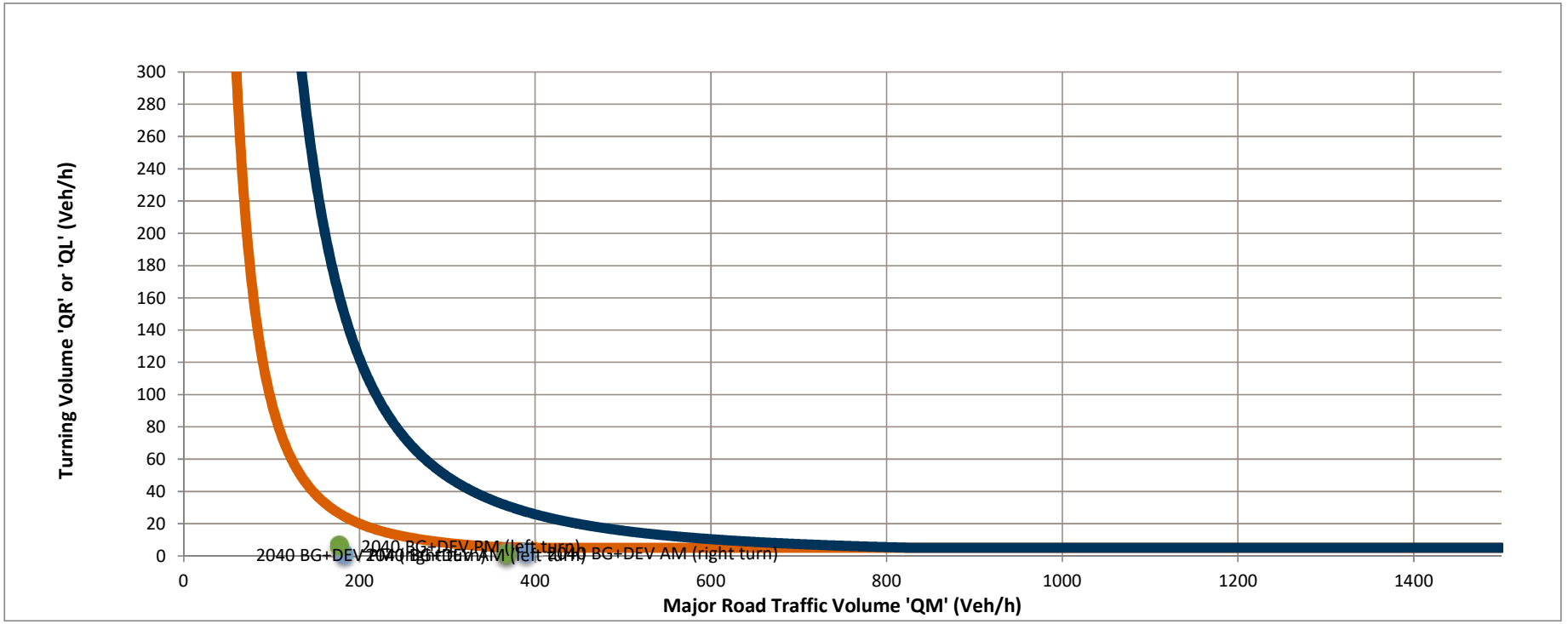


Q_{T2}=	183
Q_L=	1

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

	Q_M	Q_R/Q_L
Right	390	2
Left	183	1

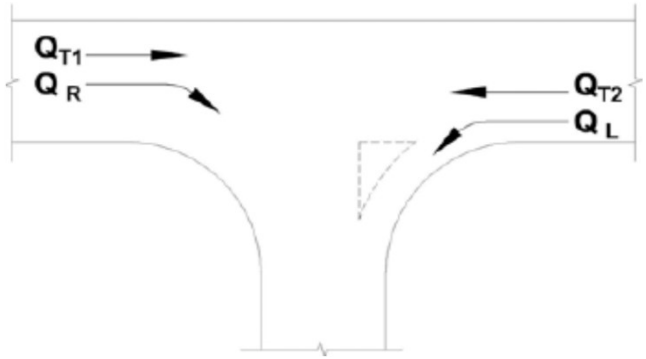
Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Capricorn Highway / Temporary TLO Access

2022 BG + Peak Construction

Q_{T1}=	172
Q_R=	1

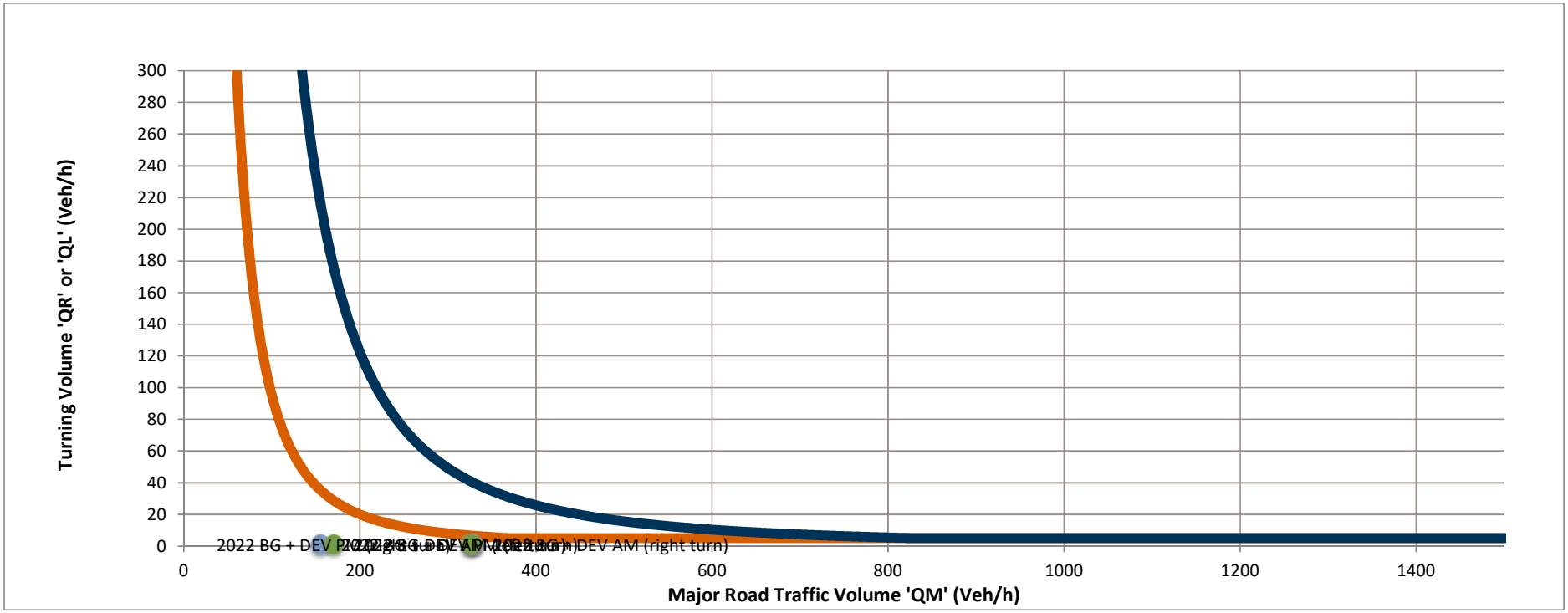


Q_{T2}=	155
Q_L=	1

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

	Q_M	Q_R/Q_L
Right	328	1
Left	155	1

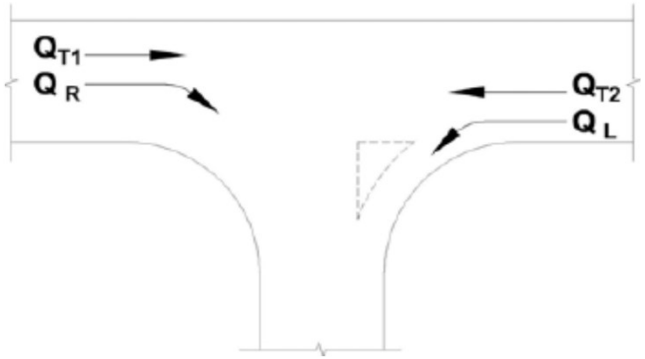
Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Capricorn Highway / Temporary TLO Access

2040 BG + Peak Operations

Q_{T1}=	206
Q_R=	1

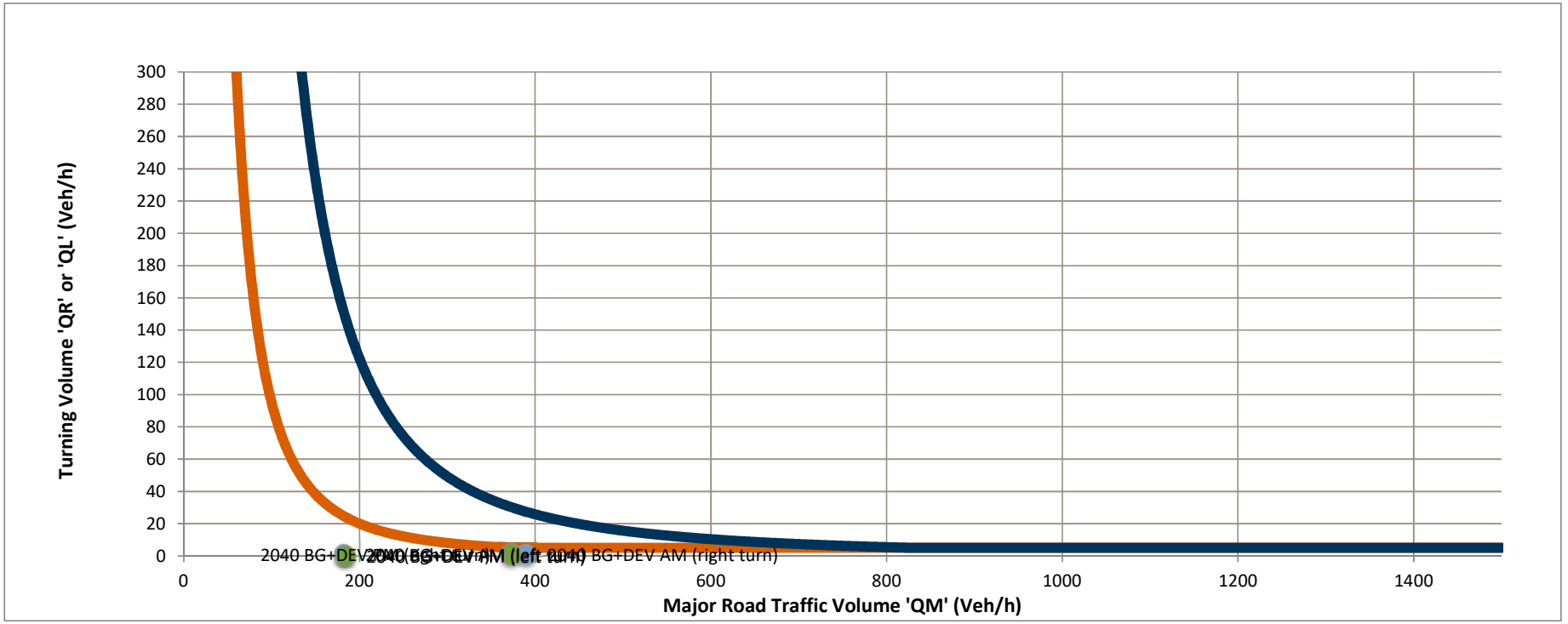


Q_{T2}=	183
Q_L=	1

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

	Q_M	Q_R/Q_L
Right	390	1
Left	183	1

Right Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



APPENDIX

D

PROPOSED MINE ACCESS DRAWINGS

CONCEPT ONLY

Proposed CHR(s) with 85m Deceleration and 37.5m Taper, 3.7m Lane Widths and 19m Storage (1 AV/Semi-Trailer).

2m

Existing culvert to be extended

Capricorn Highway

Proposed AUL(s) with 85m Deceleration and 37.5m Taper, and 3.7m Lane Widths.

Area to be cleared to ensure SISD (Safe Intersection Sight Distance) is achieved.

Proposed Gemini Mine Access Road.

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 Geminii
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 Gemini
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

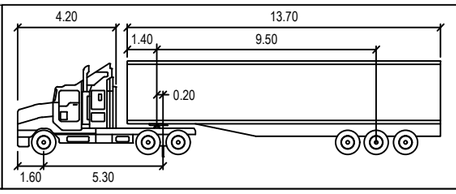
Proposed Dingo West
Mine Access Road.

Capricorn Highway

Proposed Gemini
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