Traffic Impact Assessment

Perdaman Urea Project

CW1055600

Prepared for

Perdaman Chemicals and Fertilisers Pty Ltd

28 August 2019

Cardno

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PERDAMAN INDUSTRIES
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FOREWORD

CLARIFICATION OF PROJECT AREA

Some technical reports, including this one, were completed in the early planning and design phases of the Project. As such, some of the maps / and aerial views depict the following anomalies associated with the actual Project area:

i. The Project boundary of Site F does not have an extension from the south west corner.

ii. The southern alignment of Hearson Cove Road is not applicable. Only the alignment on the north side of Site F will apply to the Project.

iii. The footprint of the port area is limited to the area depicting the *Storage Shed – Port* and *Shiploader – Feed Conveyor.* It does not extend out along the Bulk Liquids Berth Jetty.

Figures A and B below provides further clarification of this discrepancy.

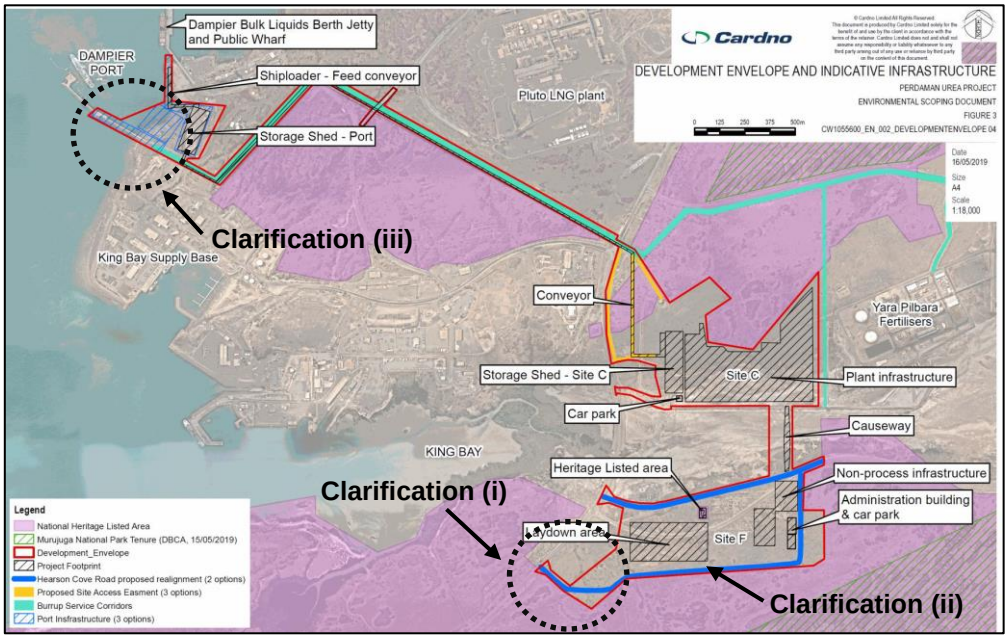

Figure A: Incorrect / superseded Project Area.

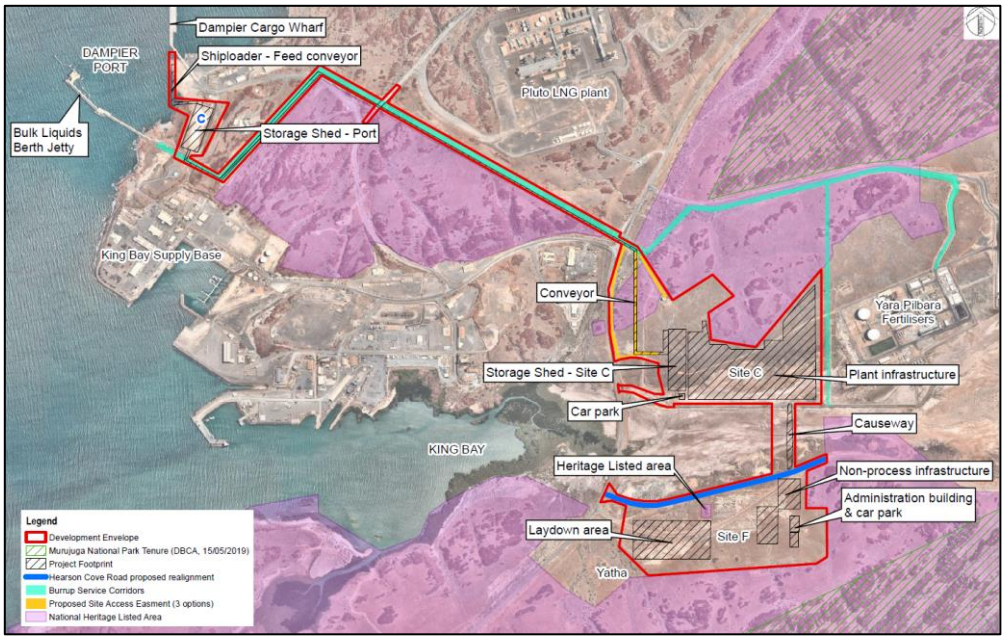

Figure B: Correct Project Area.

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1 Introduction

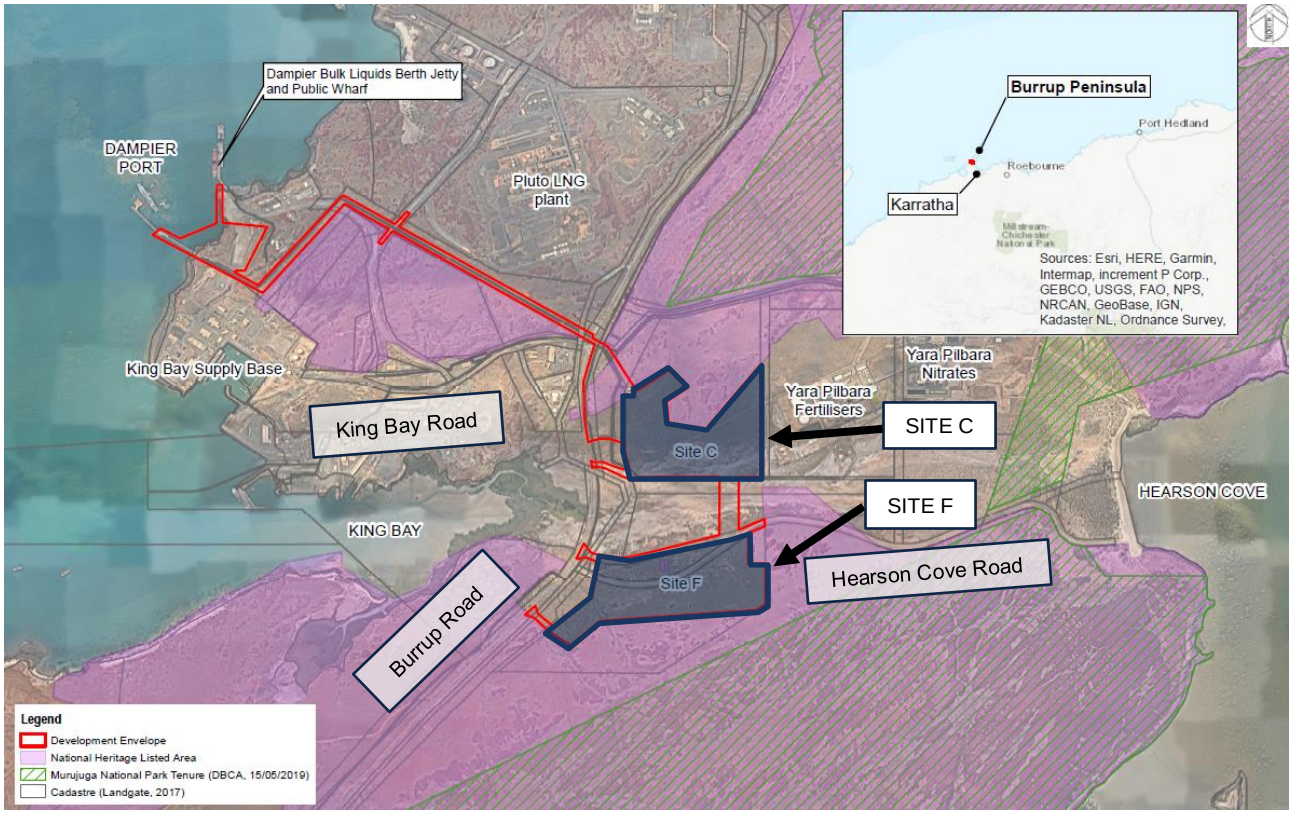
1.1 Background

Cardno has been commissioned by Perdaman Chemical and Fertilisers Pty Ltd (The Client) to prepare a Traffic Impact Assessment (TIA) for the proposed industrial development in Murujuga (also known as the Burrup Peninsula). The report aims to outline in detail the traffic impacts of the development to the surrounding road network during its construction and operation phases.

1.2 Site Location

The development is called the Perdaman Urea Project, also known as Project Destiny (The Project), which is located in the proposed Burrup Strategic Industrial Area (BSIA) at Murujuga as shown in **Figure 1-1**. Specifically, the TIA focuses on Sites C and F of this project. The two Sites are located in vacant land approximately 8 km from Dampier and 20 km north-west of Karratha on the north-west coastline of Western Australia.

Figure 1-1 Site Location

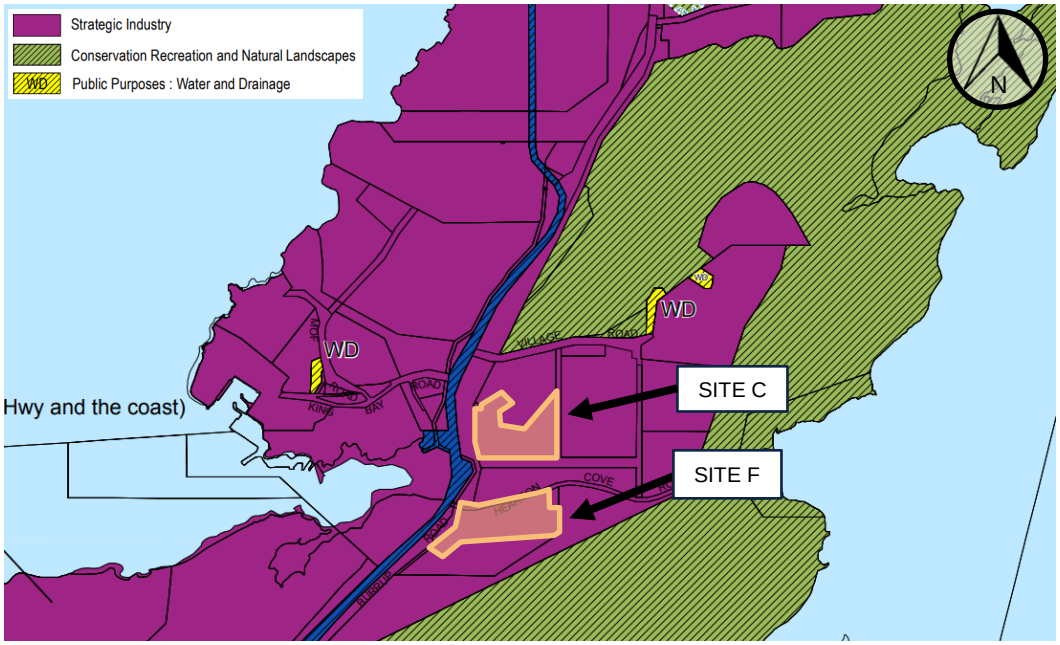


Source: Environmental Review Document

1.3 Land Use

As shown in **Figure 1-2**, the Sites are currently zoned under “Strategic Industry” according to the City of Karratha Local Planning Scheme.

Figure 1-2 Zoning Map



Source: City of Karratha Local Planning Scheme

1.3.2 Surrounding Land Uses

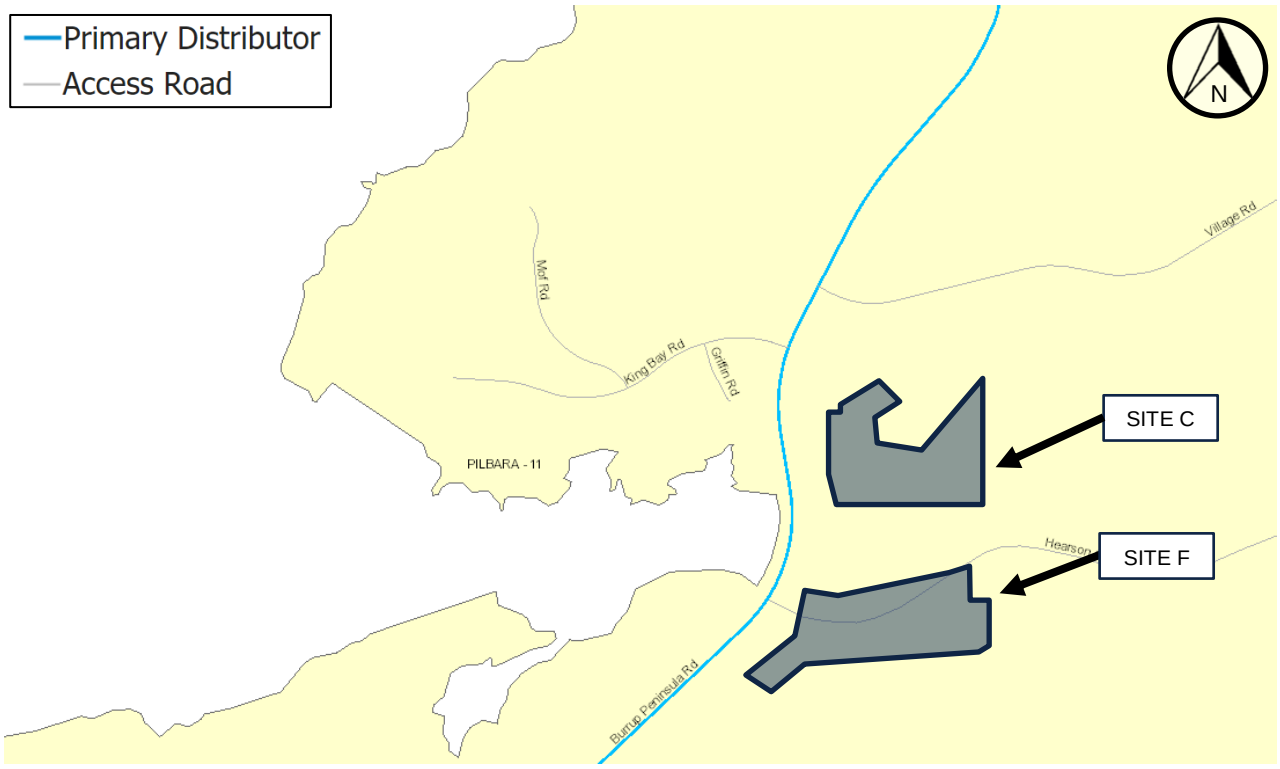
Nearby land uses comprise of other industrial facilities. Dampier is located approximately 8km southwest and Karratha is located approximately 20km southeast.

2 Existing Situation

2.1 Existing Road Network

The layout and classification of the roads under the *Main Roads WA Road Hierarchy* surrounding the two Sites are presented in **Figure 2-1.**

Figure 2-1 Road Network Classification



Source: MRWA Road Information Mapping System

The characteristics of the existing surrounding road network are described in **Table 2-1**.

Table 2-1 Existing Road Network

Road Name	Road Network					
	Road Hierarchy	Jurisdiction	No. of Lanes	No. of Footpaths	Width (m)	Posted Speed Limit (km/h)
Burrup Road	Primary Distributor	MRWA	2	0	7-11	80/100
Hearson Cove Road	Access Road	Local Govt.	2	0	7	60
King Bay Road	Access Road	Local Govt.	2	0	7.5	60
Mof Road	Access Road	Local Govt.	2	0	7.2	60

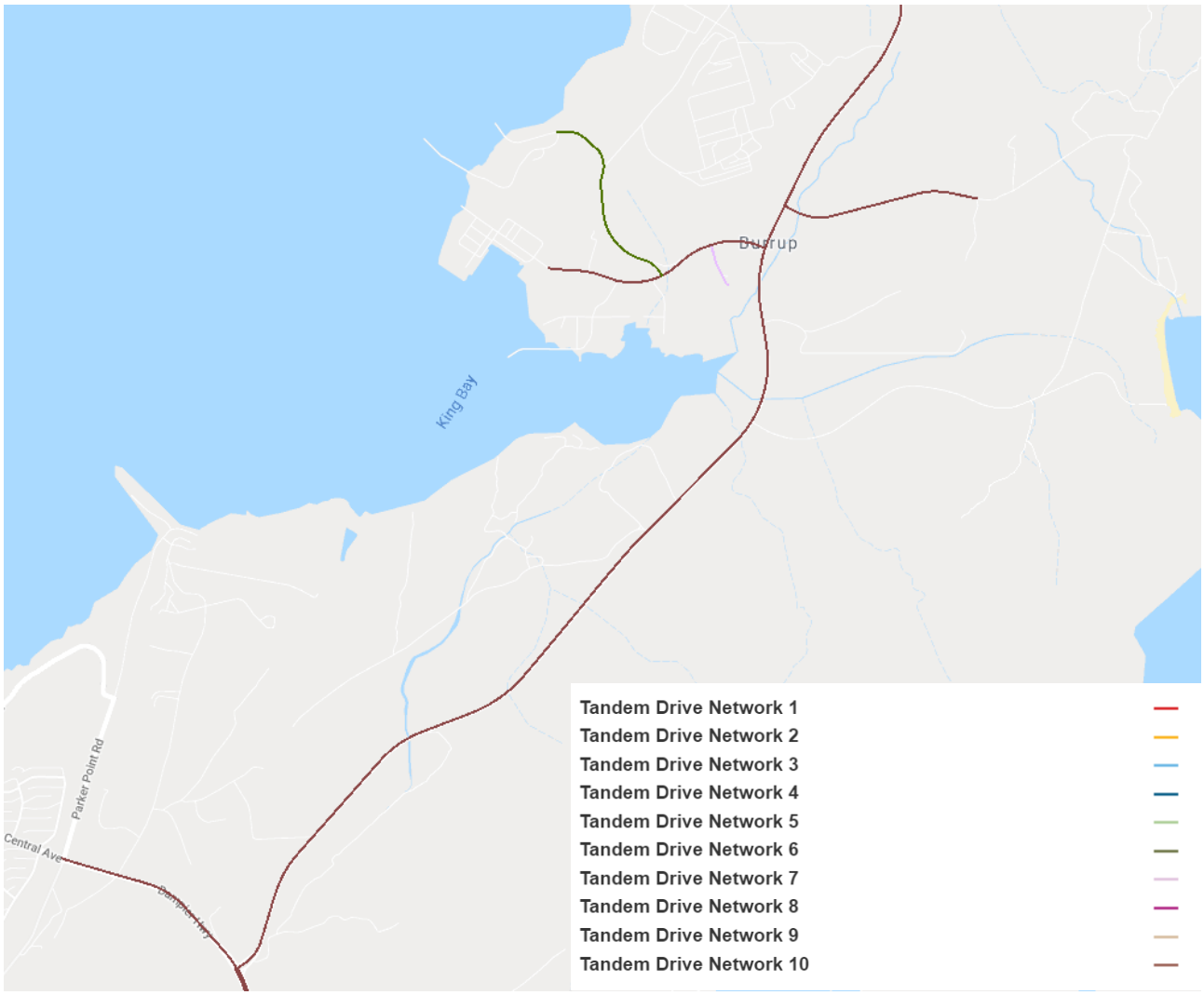
Source: MRWA Road Information Mapping System; Nearmap

Burrup Road is a primary distributor connecting the industrial areas of Burrup to Dampier Highway, while Hearson Cove Road is an access road leading to Hearson's Cove. King Bay Road and Mof Road are access roads connecting jetties and industrial areas to Burrup Road.

2.1.2 RAV Network

Figure 2-2 shows the RAV network within the surrounding area of the Site. Burrup Road is classified as part of the RAV Network 10.

Figure 2-2 RAV Network



Source: Main Roads WA

2.2 Existing Intersections

Burrup Road/Hearson Cove Road intersection is located west of the Site and is a give-way controlled T-intersection, with priority given to Burrup Road (**Figure 2-3**).

Figure 2-3 Burrup Road/Hearson Cove Road Intersection

Source: Nearmap

Burrup Road/King Bay Road intersection is located north of the Site and is a give-way controlled T-intersection, with priority given to Burrup Road (**Figure 2-4**).

Figure 2-4 Burrup Road/King Bay Road Intersection

Source: Nearmap

Burrup Road/Dampier Highway Road intersection is located south of the Site and is a signal controlled T-intersection (**Figure 2-5**).

Figure 2-5 Burrup Road/Dampier Highway Intersection

Source: Nearmap

2.3 Existing Traffic Volumes

Existing traffic volumes near the Site were sourced from Main Roads Traffic Map and are shown in **Table 2-2.**

Table 2-2 Traffic Volumes

Location	Year	Average Daily Traffic (%HV)
Burrup Road (North of Hearson Cove Road)	2017/18	2,600 (16.0%)
Burrup Road (North of Village Road)	2015/16	1,413 (19.4%)

Source: MRWA Traffic Map

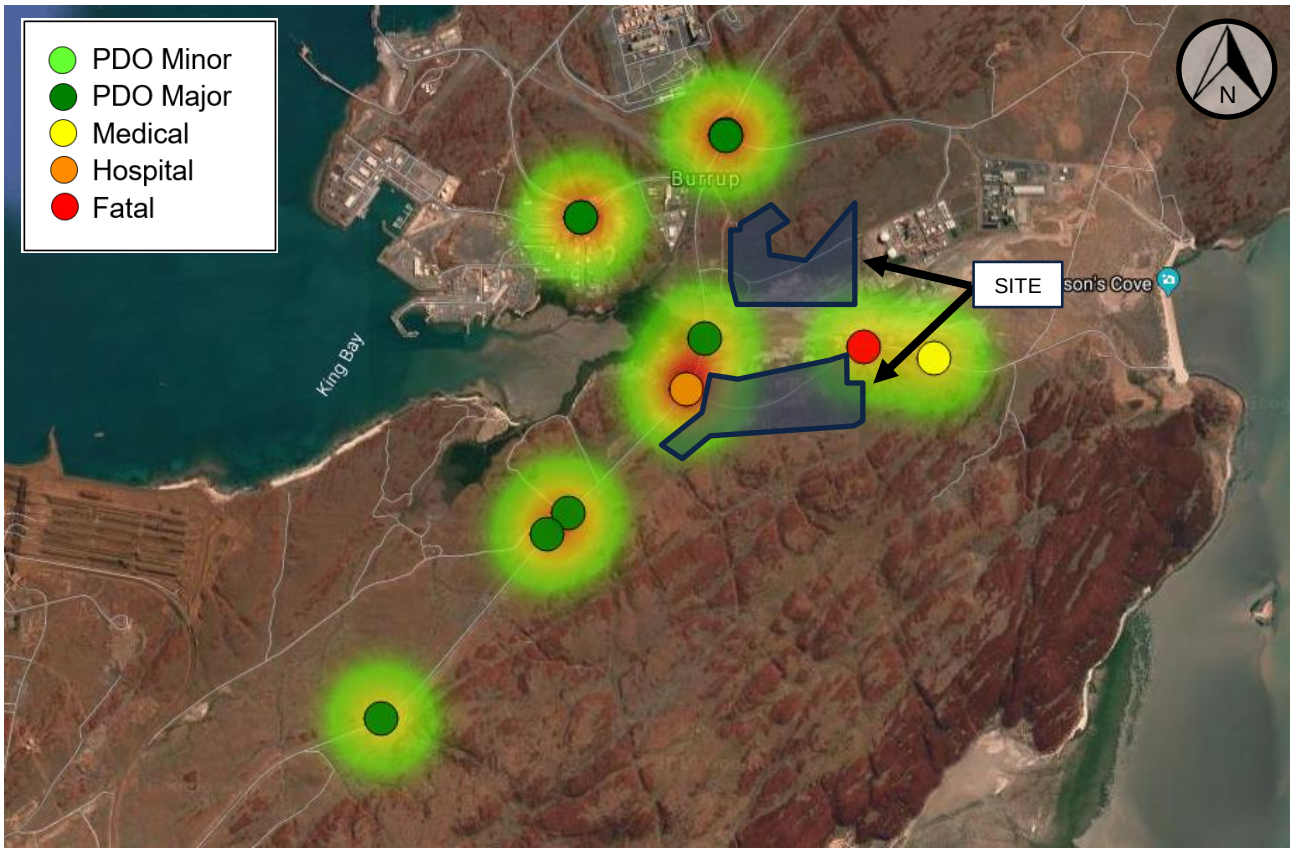
2.4 Crash assessment

Crash data were obtained from the Main Roads Crash Reporting Centre. The search covered all recorded traffic accidents within 5 kilometres from the site, between 1 January 2014 and 31 December 2018, for the following roads:

- Burrup Road
- Hearson Cove Road
- King Bay Road

Figure 2-6 shows the locations and severity of recorded crashes near the Site, where red areas are locations where accidents occur more often. **Table 2-3** to **Table 2-7** shows the breakdown of each crash categorised in terms of crash type and severity.

Figure 2-6 Crash Locations and Severity



Source: MRWA Crash Reporting Centre

Table 2-3 Hearson Cove Road Midblock Crash Data (entire length)

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Hit Object	1	-	1	-	-	2
Total	**1**	**0**	**1**	**0**	**0**	**2**

Table 2-4 Burrup Road Midblock Crash Data (From Dampier Highway to Village Road)

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Hit Object	-	-	-	2	-	2
Unspecified	-	-	-	2	-	2
Right Angle	-	-	-	1	-	1
Total	**0**	**0**	**0**	**5**	**0**	**5**

Table 2-5 King Bay Road – Mof Road Intersection Crash Data

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Non Collision	-	-	-	1	-	1
Rear End	-	-	-	1	-	1
Total	**0**	**0**	**0**	**2**	**0**	**2**

Table 2-6 Burrup Road – Hearson Cove Road Intersection Crash Data

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Rear End	-	-	-	1	-	1
Non Collision	-	1	-	-	-	1
Total	**0**	**1**	**0**	**1**	**0**	**2**

Table 2-7 Burrup Road – Village Road Intersection Crash Data

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Right Turn Thru	-	-	-	1	-	1
Total	**0**	**0**	**0**	**1**	**0**	**1**

Source: MRWA Crash Reporting Centre

A review of the crash data shows:

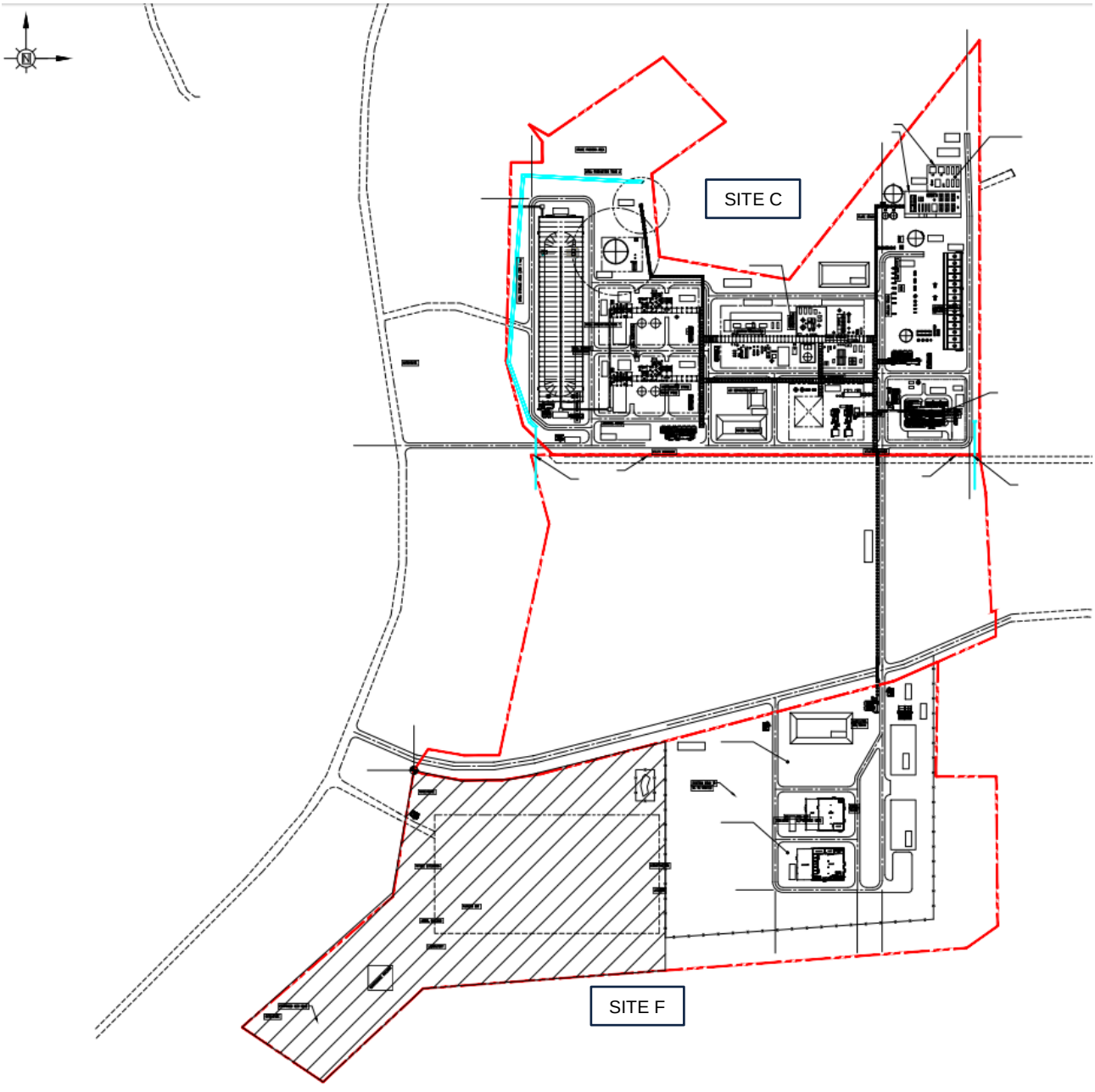
- One fatal crash was recorded along Hearson Cove Road caused by an out of control vehicle hitting an object;
- One crash requiring hospitalization were recorded;
- The most common crash type is Hit Object with 4 recorded incidents; and
- The most common crash severity is Major Property Damage with 9 recorded incidents.

3 Proposed Development

3.1 Development Overview

The proposed development consists of a chemical and fertiliser production plant. The main plant infrastructure/equipment is located in Site C and administrative buildings are located in Site F. The proposed development concept shown in **Figure 3-1.**

Figure 3-1 Indicative Infrastrcture



Source: Perdaman

The development concept layout plan is included in **Appendix A.**

3.1.1 Project Timeline

The project timeline for Project Destiny is shown in **Figure 3-2**.

Figure 3-2 Project Timeline

PROJECT TIMELINE	
Public announcement of project	October 2018
Commencing community consultation	February 2019
Permitting and environment approvals	December 2019 – March 2020
Engineering	October 2018
Construction contract arrangements finalised	June 2019
Financial close	2nd quarter 2020
Field construction start	2nd quarter 2020
Mechanical completion	4th quarter 2023
Startup begins	1st quarter 2024
Full production	2nd quarter 2024

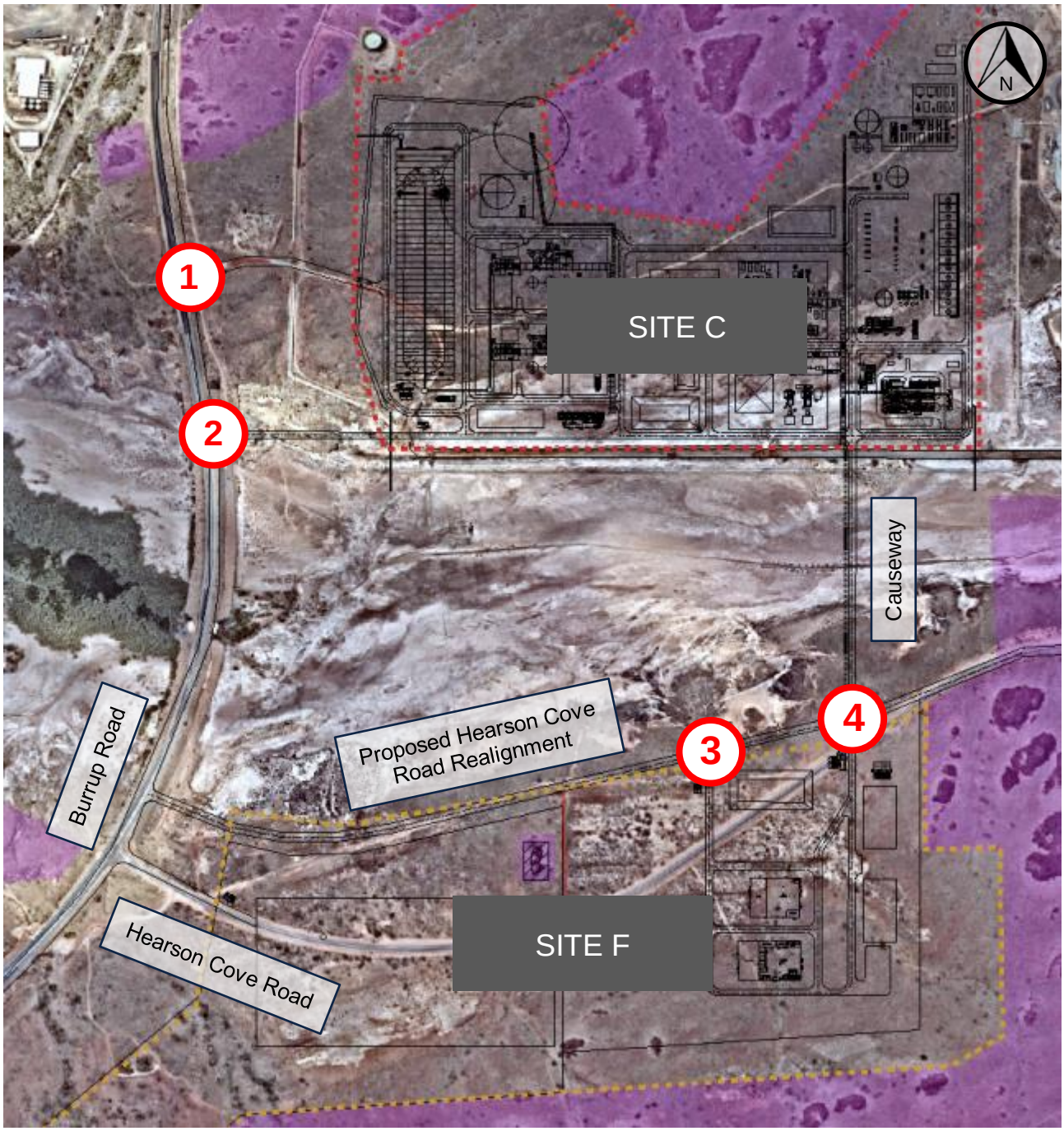
Source: Perdaman Chemical and Fertilisers

3.2 Access Arrangements

The proposed access arrangements for the Site are shown in **Figure 3-3**. These include:

- Access 1 and 2 provide access to Site C off Burrup Road. These two access connections will provide access to Site C during different phases of construction and also provide movement between Sites C & F, until the Causeway is established. During operations, Access 2 will be the primary access point into the plant area (mostly for trucks) and include a gatehouse. Traffic volumes at both of these accesses are expected to be very low.
- Access 3 and 4 provide access to Site F off the realigned Hearson Cove Road. Construction traffic and material deliveries will access the Site primarily via these two accesses and into the proposed laydown area. Vehicles, plant and machinery will then move across the Causeway to access Site C once constructed, prior to this there will be a short period where construction traffic will travel between Site C and F using the Burrup Road and after the Causeway is constructed only light vehicles and bus traffic will enter and exit the site via the southern entrance on Site C.
- A causeway connecting Site C and Site F.
- The existing intersection of Burrup Road / Hearson Cove Road will be closed once the Hearson Cove Road realignment has been completed. It is recommended that all access to Site F be from the new alignment of Hearson Cove Road once operational.

Figure 3-3 Site Accesses



3.3 Car Parking Provision

According to the *City of Karratha Town Planning Scheme No.8*, car parking requirements for an industrial facility is at the council's discretion. During day-to-day operations, approximately 200 people will be employed and the proposed parking provision will need to accommodate these employees as well as visitors.

4 Changes to Surrounding Transport Network

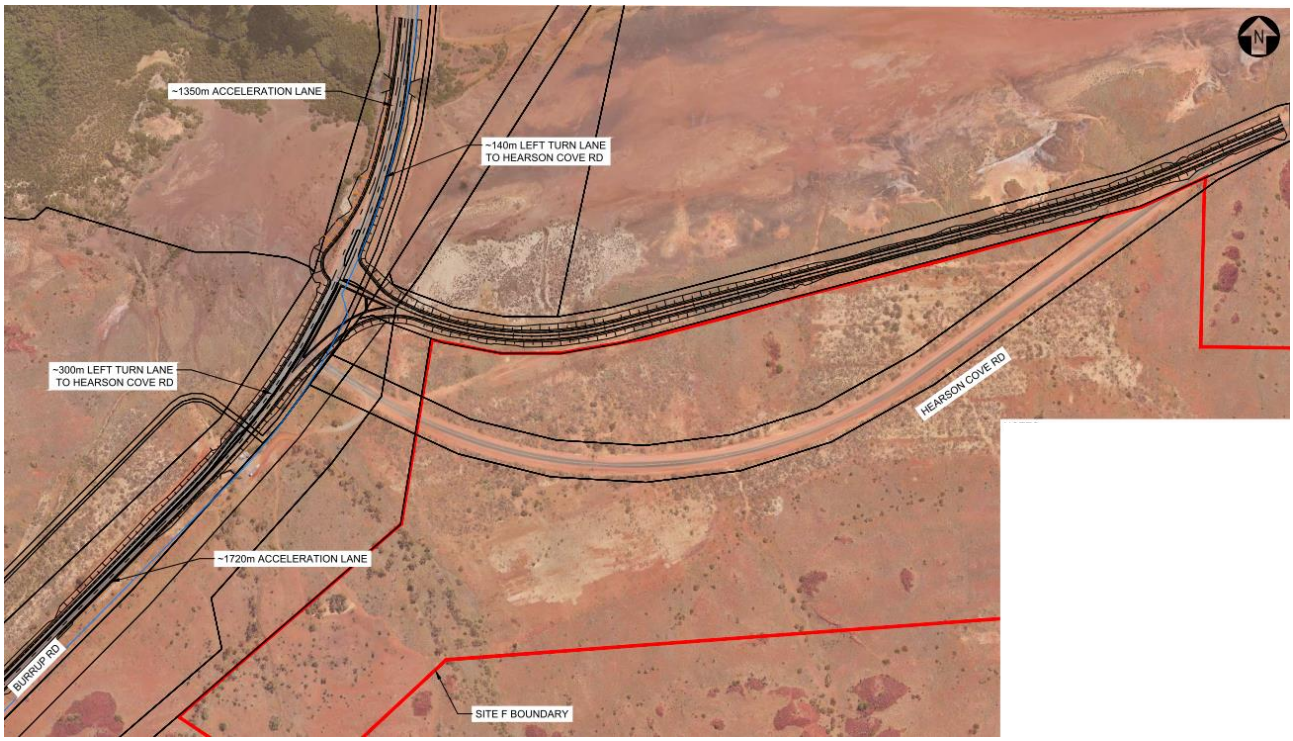
4.1 Road Network

4.1.1 Hearson Cove Road Realignment

The realignment of Hearson Cove Road will include shifting part of the road to the north to improve the road alignment as well as improving accessibility for heavy vehicles. **Figure 4-1** shows the proposed changes to the road.

The road realignment will be completed prior to the commencement of construction works for Site C and F.

Figure 4-1 Proposed Realignment of Hearson Cove Road



Source: Landcorp

4.2 Intersection Controls

As part of the proposed realignment of Hearson Cove Road, the Burrup Road/Hearson Cove Road intersection will also be upgraded as shown in **Figure 4-1** above. The proposed upgrades include turning pockets for the left and right turn movements into Hearson Cove Road as well as acceleration lanes for movements out onto Burrup Road.

5 Analysis of Transport Network

5.1 Assessment Years and Time Period

5.1.1 Key Intersections

A detailed traffic analysis has been undertaken at the following key intersections:

- Burrup Road/Dampier Highway
- Burrup Road/Hearson Cove Road
- Burrup Road/Access 2 (during construction phase only, Scenario 2)

Access 1, 3 and 4 have not been assessed as the anticipated traffic volumes at these access points are considered to be low and the associated traffic impacts are considered to be negligible.

5.1.2 Assessment Years

The following scenarios have been assessed:

- Scenario 1 – 2019 Existing traffic without development traffic
- Scenario 2 – 2021 Traffic with construction development traffic
- Scenario 3 – 2024 Traffic with operational development traffic
- Scenario 4 – 2034 Traffic with operational development traffic

Each scenario has been assessed for the Weekday AM (6:00am to 7:00am) and Weekday PM (5:00pm to 6:00pm) Peak Periods as per the requirements of the WAPC *Transport Assessment Guidelines*.

Background traffic growth forecasts are not available, therefore a conservative linear growth rate of 2% per annum has been used to estimate increases in background traffic flows for Scenarios 2, 3 and 4.

Table 5-1 provides a summary of which intersections will be assess for each scenario.

Table 5-1 Summary of Assessment Scenarios and Intersections

	Burrup Road/Hearson Cove Road	Burrup Road/Access 2	Burrup Road/Dampier Highway
Scenario 1	✓	✕	✓
Scenario 2	✓	✓	✓
Scenario 3	✓	✕	✓
Scenario 4	✓	✕	✓

5.2 Traffic Generation

The peak traffic generation for the proposed Site is likely to vary depending on the various stages during development. The peak trip generation periods will generally occur at the following stages:

- The construction phase – this stage generally involves an influx of traffic from construction workers, truck deliveries and materials transportation. Approximately, 1,500 construction staff are expected at the peak of the construction phase.
- The operation phase – this refers to day-to-day operations when the Site is completed and fully operational. The traffic generated primarily comprises Site employees with an estimated 200 employees living and working within the region.

The process used to derive the trip generation during the construction and operational phase are detailed in the sections below.

5.2.1 Construction Phase Trip Generation

The trip generation for the construction phase is made up of two components; earthworks truck trips and construction staff trips. The following information and assumptions have been determined in regards to earthworks truck trips

- The estimated earthworks volumes (to be transported to and from the Site) have been provided by the Client which will are used to estimate truck traffic volumes. Approximately, 1,200,000 m^3 of earthwork material will be transported to and from the construction sites.
- To convert volume into weight, the density of the earthwork material needs to be known. Therefore, it is assumed that the majority of earthworks material consists of dry soil clay which has a density of 2,000 kg/m^3.
- The total weight of the earthworks material is given by the following equation, Weight = Volume x Density. Approximate 2,400,000 tonnes of earthworks material will be transported to and from the Site during the construction period.
- The bulk earthworks period is estimated to be 5 months. Excluding weekends, this equates to approximately 110 construction days.
- The construction peak is assumed to be during 2021.
- It is assumed that the class of trucks used for materials transport will be B-triples, which have an average payload of 53 tonnes.
- It is assumed that, in a worst-case scenario, 30% of these trucks will arrive/depart during the morning and afternoon peak periods.

Based on the above assumptions, the estimated traffic volumes for construction trucks during the peak period is 124 vph.

The information and assumptions for construction staff trips are as follows:

- The maximum number of construction staff on-site is approximately 1,425 workers. (1,500 construction workers in total with 5% working at the port).
- All workers will travel to and from the Site via private bus service. A bus service arrives on site in the morning peak to drop off workers and picking them up in the afternoon peak.
- The estimated bus capacity is 56 passengers.
- Only senior staff will likely travel by car which comprises of approximately 20 vehicle trips.

Based on the above assumptions, the anticipated traffic volumes for operational staff during the peak period is 45 vph. Overall, the peak period trip generation during the construction period is 169 vph.

5.2.2 Operational Phase Trip Generation

The following information and assumptions have been determined in regards to trip generation when the Site is operational:

- Employee shifts comprise of 12 hour shifts. During the AM peak hour, day shift workers will arrive on Site while the night shift workers leave the Site and vice versa.
- Private vehicle mode share is conservatively assumed to be 100%, i.e. it is assumed that all employees will drive to and from the Site, with no ride-sharing or car-pooling.
- The products produced by the Site will be transported to Dampier Port via a conveyor system. As a result, heavy vehicles traveling to and from the Site during day-to-day operation is expected to be low. Therefore, the heavy vehicle percentage is assumed to be 5% to account for delivery, maintenance and other trucks traveling to and from the Site.

Based on the above assumptions, the anticipated traffic volumes for construction staff during the peak period is 200 vph.

5.2.3 Trip Distribution

The inbound and outbound trip distribution for during the construction phase is based on the *Institute of Transportation Engineers (ITE) "Trip Generation" 10th Edition* which is shown in **Table 5-2**.

Table 5-2 Directional Distribution

Land Use	Weekday AM Peak		Weekday PM Peak	
	In	**Out**	**In**	**Out**
Industrial	87%	13%	21%	79%

All Site traffic arriving/departing from the Site will be traveling from the south of Burrup Road which lead to key areas such as Dampier and Karratha. It is unlikely that any development traffic will travel north as it only leads to other industrial sites.

5.2.4 Total Trip Generation

The total two-way trip generation for the proposed development is summarised in **Table 5-3**.

Table 5-3 Total Trip Generation – Peak Hours

Peak Period	Weekday AM Peak	Weekday PM Peak
Construction Peak	169	169
Operation Peak	200	200

5.3 Traffic Volumes

Figure 5-1 through to **Figure 5-4** shows the traffic volumes for each scenario. Background traffic volumes comprised of data obtained from various sources which include Main Roads Traffic Map, SCATS and Hearson Cove Foreshore Management Plan.

Figure 5-1 Scenario 1 – 2019 Existing traffic without development traffic

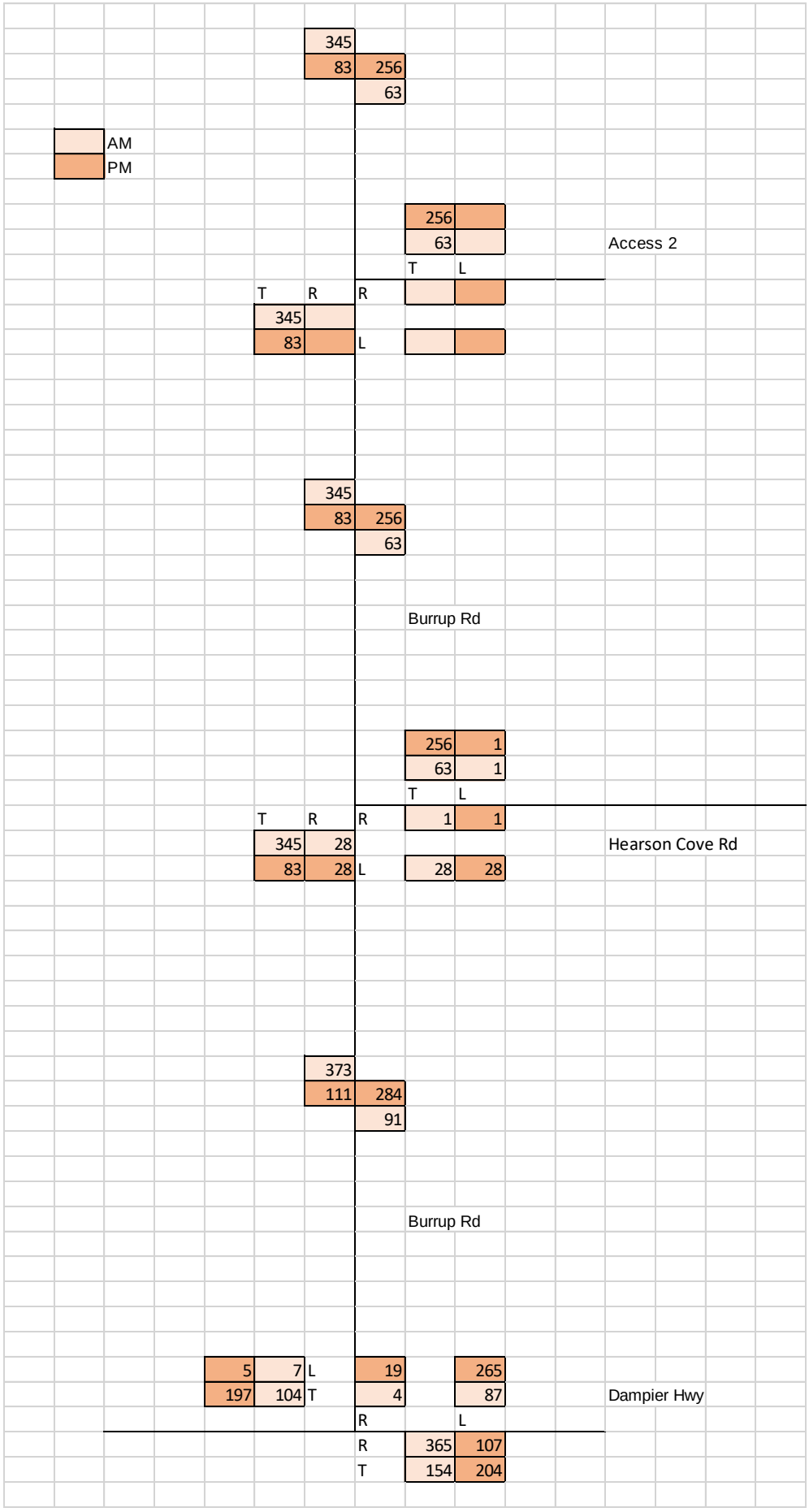


Figure 5-2 Scenario 2 – 2021 Traffic with construction development traffic

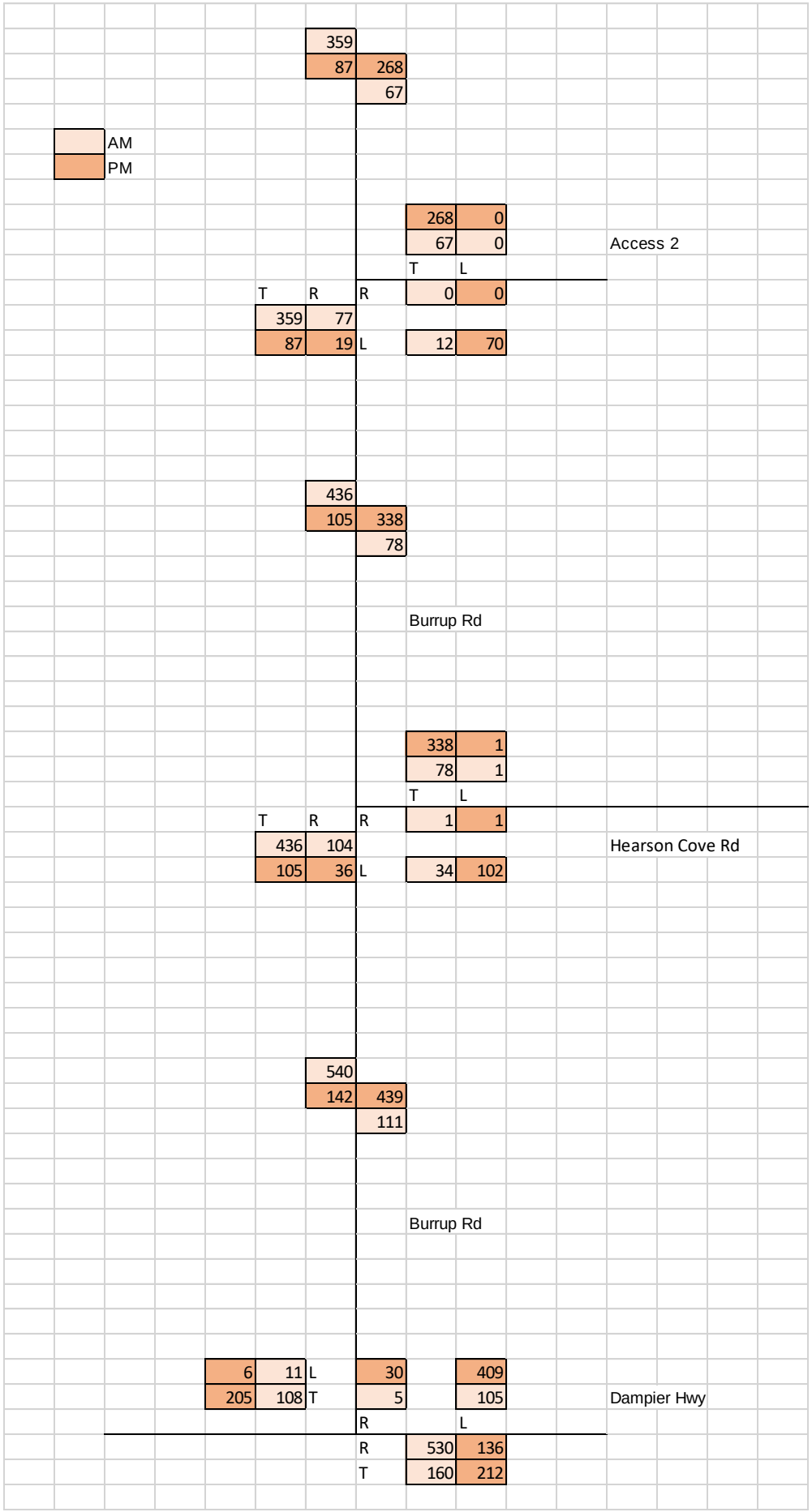


Figure 5-3 Scenario 3 – 2024 Traffic with operational development traffic

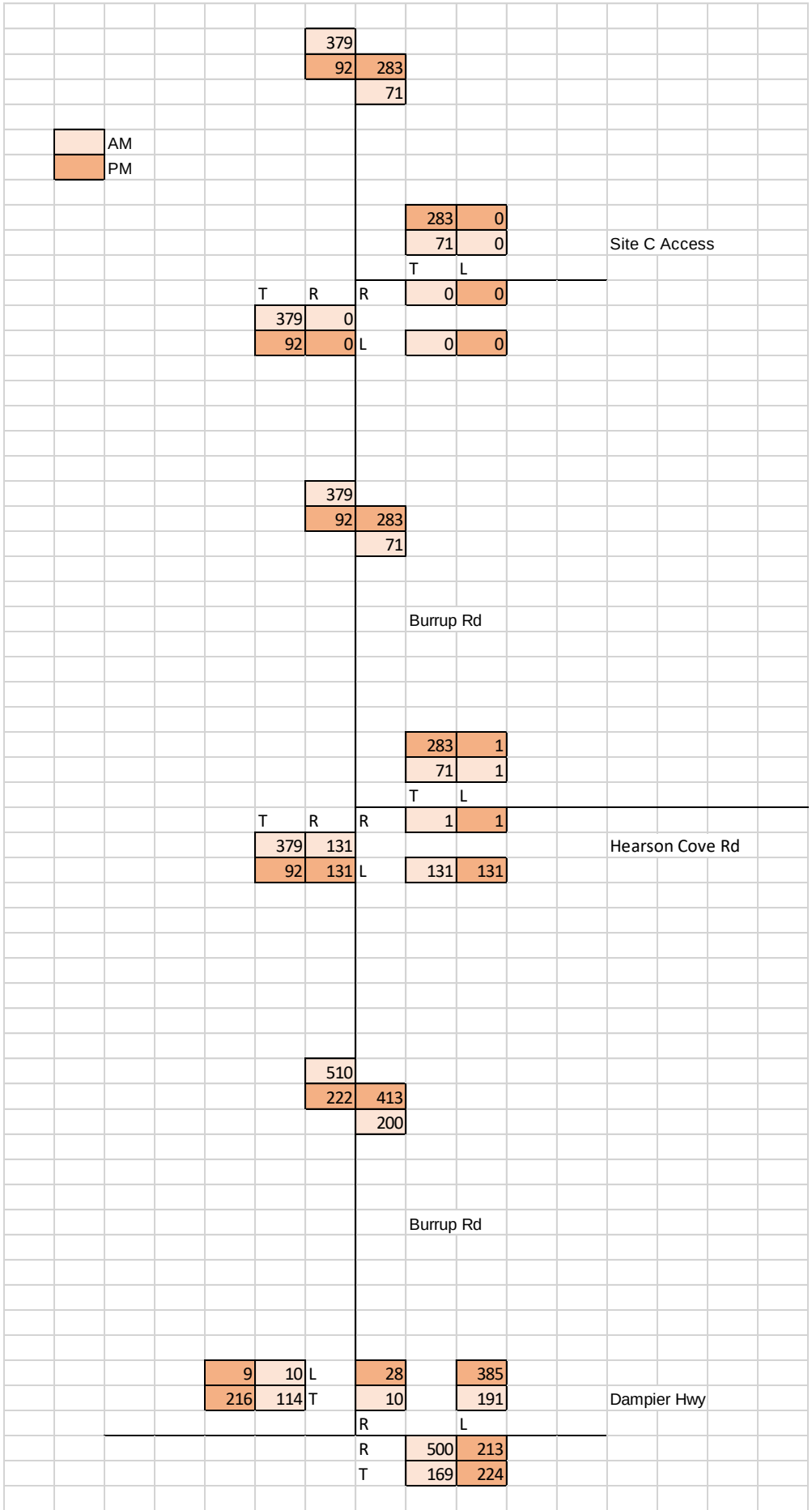
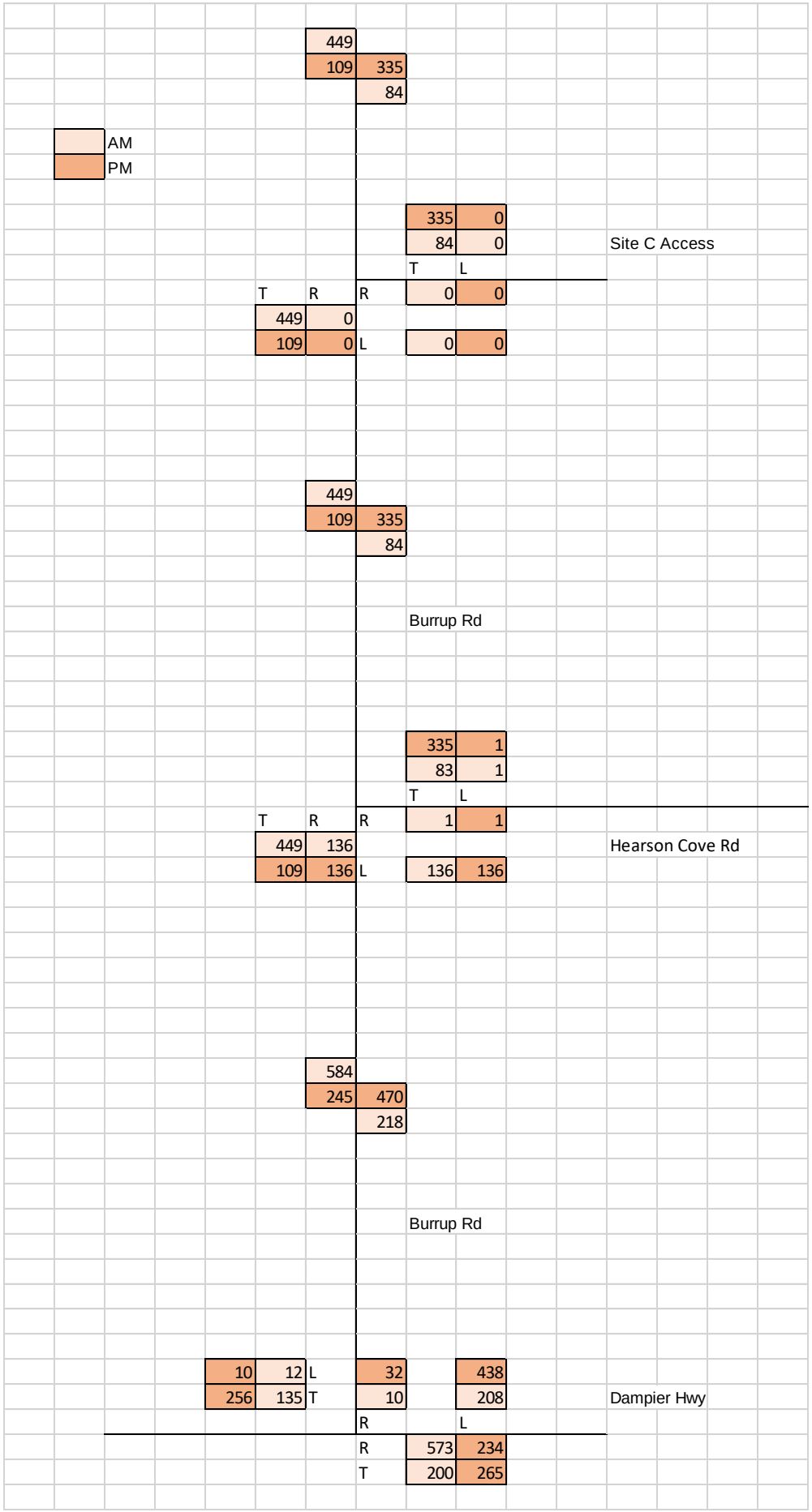


Figure 5-4 Scenario 4 – 2034 Traffic with operational development traffic



5.4 Key Assumptions

The key traffic assumptions for this development are as follows:

5.4.1 General Assumptions

- The anticipated opening year of the development is 2024 as per the project timeline
- It is assumed that the construction peak period will likely occur during 2021.
- Morning and afternoon peak periods are based on the current traffic volumes from Main Roads Traffic Map which are 6:00am to 7:00am and 5:00pm to 6:00pm respectively.
- Heavy vehicle volumes are based on Main Roads WA Traffic Map.

5.4.2 Trip Generation, Distribution and Assignment

The trip generation, distribution and assignment assumptions are provided in **Section 5.2**.

5.4.3 SIDRA Assumptions

- Vehicle user classes have been set up based on Main Roads WA Operational Modelling Guidelines.
- The geometry for Burrup Road/Hearson Cove Road intersection in Scenarios 2-4 is based on the modified layout from the proposed realignment of Hearson Cove Road as shown in **Figure 4-1**.
- Signal phasing and timing for Burrup Road/Dampier Highway is based on the SCATS data obtained from Main Roads WA.

5.5 Intersection Performance

5.5.1 Scenario 1 – 2019 Existing traffic without development traffic

5.5.1.1 Burrup Road/Hearson Cove Road

The following presents the Burrup Road/Hearson Cove Road intersection results for Scenario 1. **Figure 5-5** is a SIDRA layout representation of the intersection and **Table 5-4** shows the results of the analysis.

Figure 5-5 SIDRA Layout for Burrup Road/Hearson Cove Road Intersection (Existing)

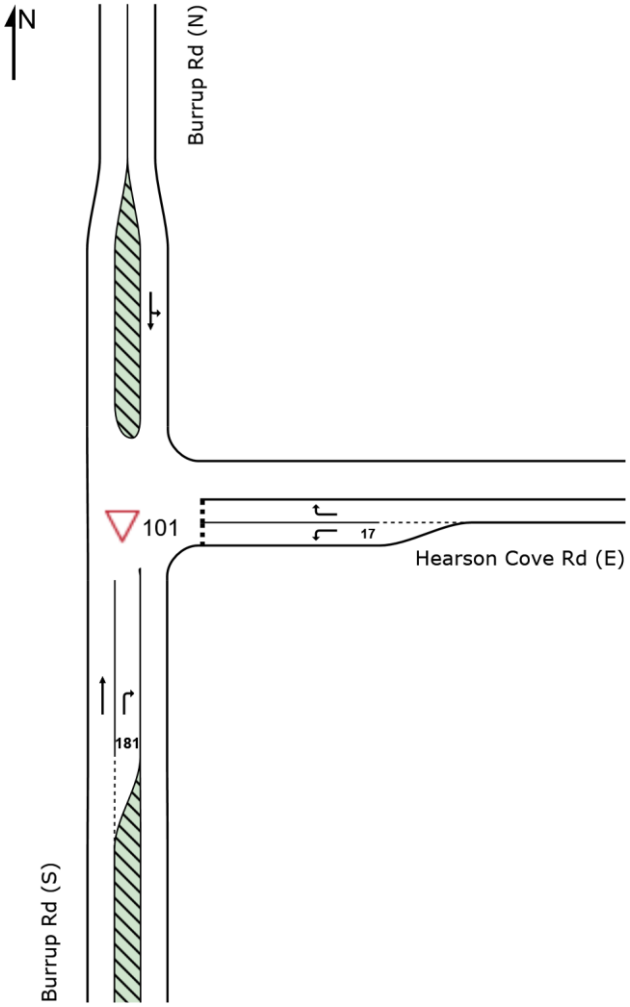


Table 5-4 Burrup Road/Hearson Cove Road Intersection Operation – Scenario 1

Intersection Approach		Scenario 1 (AM)				Scenario 1 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Burrup Rd (S)	T	0.22	0	A	0	0.053	0	A	0
	R	0.017	7.1	A	0.5	0.02	7.8	A	0.6
Hearson Cove Rd (E)	L	0.018	5.7	A	0.5	0.022	6.4	A	0.6
	R	0.002	8.6	A	0	0.001	7.9	A	0
Burrup Rd (N)	L	0.04	6.9	A	0	0.163	7	A	0
	T	0.04	0	A	0	0.163	0	A	0

5.5.1.2 Burrup Road/Dampier Highway

The following presents the Burrup Road/Dampier Highway intersection results for Scenario 1. **Figure 5-6** is a SIDRA layout representation of the intersection and **Table 5-5** shows the results of the analysis.

Figure 5-6 SIDRA Layout for Burrup Road/Dampier Highway Intersection

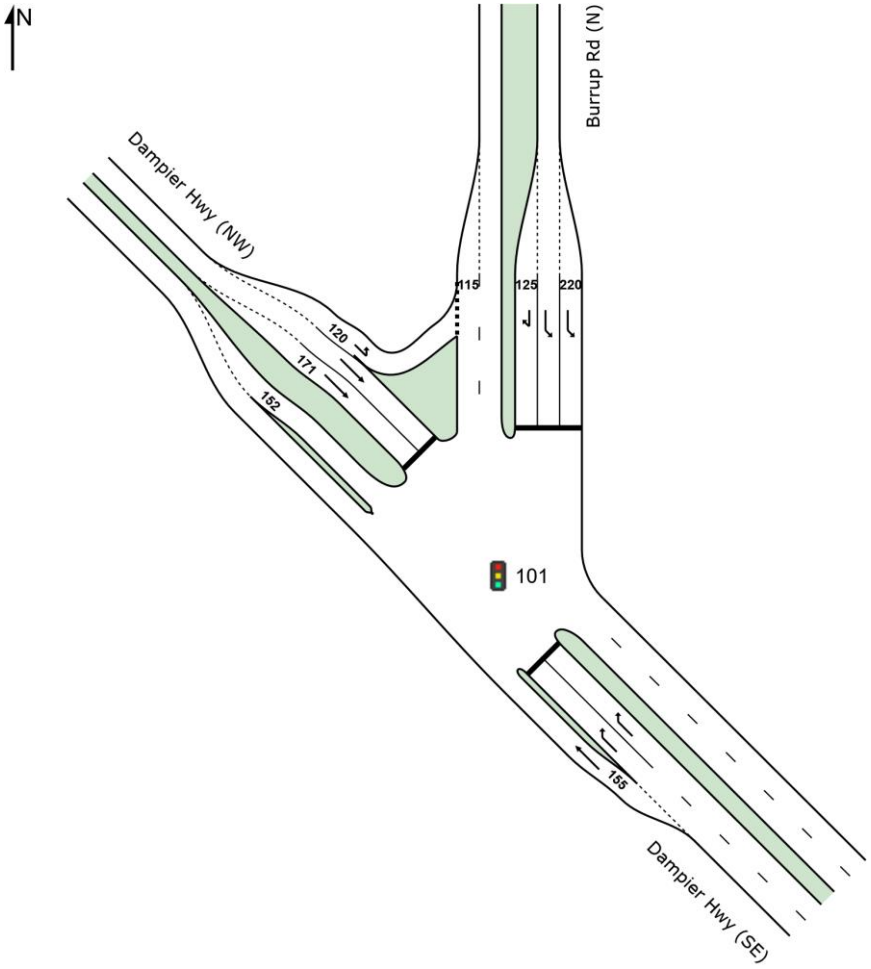


Table 5-5 Burrup Road/Dampier Highway Intersection Operation – Scenario 1

Intersection Approach		Scenario 1 (AM)				Scenario 1 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Dampier Hwy (SE)	T	0.099	0	A	0	0.131	0	A	0
	R	0.193	10.3	B	29.1	0.082	15	B	9.6
Burrup Rd (N)	L	0.038	9.6	A	4.8	0.147	12.9	B	17.4
	R	0.331	80.7	F	2.4	0.246	44.9	D	6.1
Dampier Hwy (NW)	L	0.007	9.1	A	0.2	0.004	9.2	A	0.1
	T	0.255	47.5	D	21.3	0.262	23.9	C	22.9

5.5.2 Scenario 2 – 2021 Traffic with construction development traffic

5.5.2.1 Burrup Road/Access 2

The following presents the Burrup Road/Access 2 intersection results for Scenario 2. **Figure 5-7** is a SIDRA layout representation of the intersection and **Table 5-6** shows the results of the analysis.

Figure 5-7 SIDRA Layout for Burrup Road/Access 2 Intersection (with CHR)

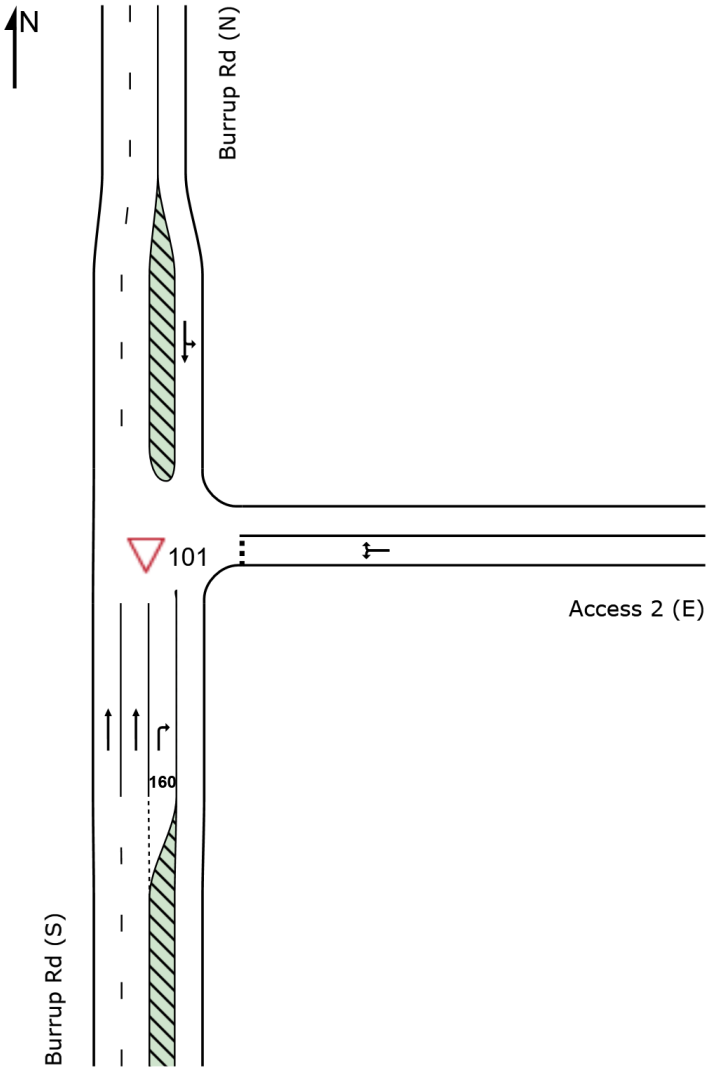


Table 5-6 Burrup Road/Access 2 Intersection Operation – Scenario 2

Intersection Approach		Scenario 2 (AM)				Scenario 2 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Burrup Rd (S)	T	0.116	0	A	0	0.028	0	A	0
	R	0.126	9.9	A	23.9	0.055	16.1	C	8.8
Access 2 (E)	L	0.029	8.4	A	3.8	0.289	19.8	C	47
	R	0.029	11.6	B	3.8	0.289	10.7	B	47
Burrup Rd (N)	L	0.043	6.9	A	0	0.173	7	A	0
	T	0.043	0	A	0	0.173	0	A	0

5.5.2.2 Burrup Road/Hearson Cove Road

The following presents the Burrup Road/Hearson Cove Road intersection results for Scenario 2. **Figure 5-8** is a SIDRA layout representation of the modified intersection and **Table 5-7** shows the results of the analysis.

Figure 5-8 SIDRA Layout for Burrup Road/Hearson Cove Road Intersection (modified)

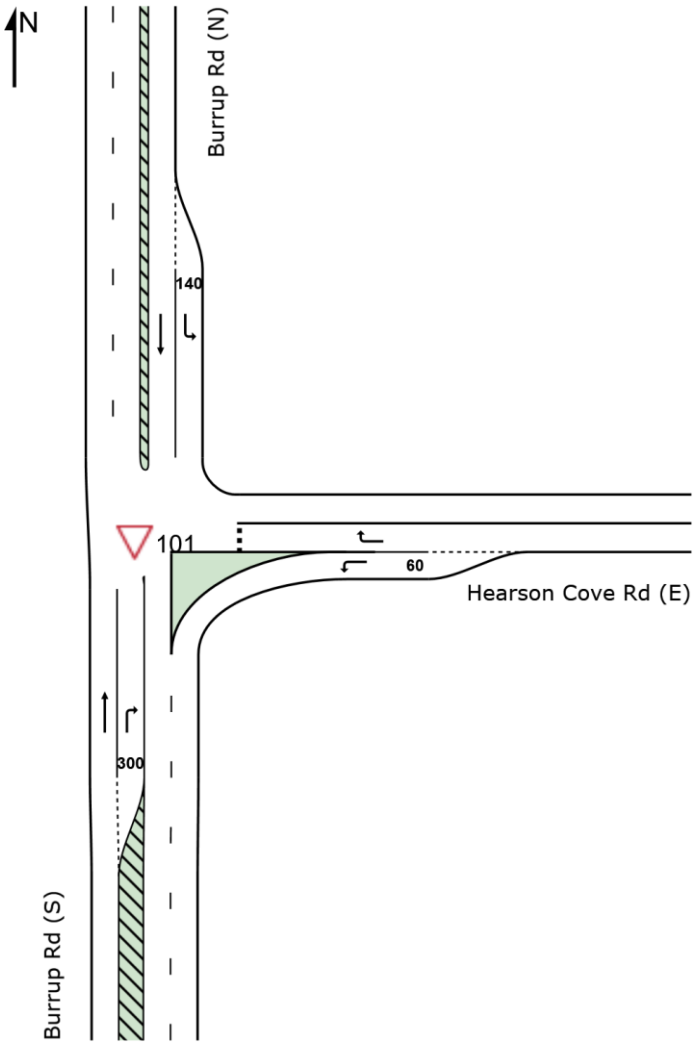


Table 5-7 Burrup Road/Hearson Cove Road Intersection Operation – Scenario 2

Intersection Approach		Scenario 2 (AM)				Scenario 2 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Burrup Rd (S)	T	0.283	0	A	0	0.068	0	A	0
	R	0.108	8.5	A	6.2	0.058	11.3	B	3
Hearson Cove Rd (E)	L	0.031	6.2	A	0	0.094	6.2	A	0
	R	0.003	12.4	B	0.1	0.002	9.9	A	0
Burrup Rd (N)	L	0.001	6.9	A	0	0.001	6.9	A	0
	T	0.05	0	A	0	0.217	0	A	0

5.5.2.3 Burrup Road/Dampier Highway

The following presents the Burrup Road/Dampier Highway intersection results for Scenario 2. **Table 5-8** shows the results of the analysis.

Table 5-8 Burrup Road/Dampier Highway Intersection Operation – Scenario 2

Intersection Approach		Scenario 2 (AM)				Scenario 2 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Dampier Hwy (SE)	T	0.103	0	A	0	0.136	0	A	0
	R	0.28	10.6	B	46	0.104	15.1	B	12.3
Burrup Rd (N)	L	0.045	9.6	A	5.9	0.227	13.2	B	28.4
	R	0.414	81.2	**F**	3	0.388	45.6	D	9.8
Dampier Hwy (NW)	L	0.013	9.2	A	0.3	0.005	9.2	A	0.1
	T	0.265	47.6	D	22.1	0.273	23.9	C	23.9

5.5.3 Scenario 3 – 2024 Traffic with operational development traffic

5.5.3.1 Burrup Road/Hearson Cove Road

The following presents the Burrup Road/Hearson Cove Road intersection results for Scenario 3. **Table 5-9** shows the results of the analysis.

Table 5-9 Burrup Road/Hearson Cove Road Intersection Operation – Scenario 3

Intersection Approach		Scenario 3 (AM)				Scenario 3 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Burrup Rd (S)	T	0.257	0	A	0	0.06	0	A	0
	R	0.101	7.4	A	3.1	0.13	8.6	A	3.9
Hearson Cove Rd (E)	L	0.074	5.7	A	0	0.074	5.7	A	0
	R	0.002	11.5	B	0.1	0.002	9.9	A	0
Burrup Rd (N)	L	0.001	6.9	A	0	0.001	6.9	A	0
	T	0.045	0	A	0	0.182	0	A	0

5.5.3.2 Burrup Road/Dampier Highway

The following presents the Burrup Road/Dampier Highway intersection results for Scenario 3. **Table 5-10** shows the results of the analysis.

Table 5-10 Burrup Road/Dampier Highway Intersection Operation – Scenario 3

Intersection Approach		Scenario 3 (AM)				Scenario 3 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Dampier Hwy (SE)	T	0.109	0	A	0	0.144	0	A	0
	R	0.264	10.5	B	42.7	0.163	15.4	B	20
Burrup Rd (N)	L	0.083	9.7	A	11	0.214	13.2	B	26.5
	R	0.827	84.6	**F**	6.3	0.363	45.5	D	9.1
Dampier Hwy (NW)	L	0.012	9.2	A	0.2	0.008	9.2	A	0.2
	T	0.279	47.7	D	23.4	0.287	24	C	25.3

5.5.4 Scenario 4 – 2034 Traffic with operational development traffic

5.5.4.1 Burrup Road/Hearson Cove Road

The following presents the Burrup Road/Hearson Cove Road intersection results for Scenario 4. **Table 5-11** shows the results of the analysis.

Table 5-11 Burrup Road/Hearson Cove Road Intersection Operation – Scenario 4

Intersection Approach		Scenario 4 (AM)				Scenario 4 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Burrup Rd (S)	T	0.291	0	A	0	0.071	0	A	0
	R	0.106	7.4	A	3.3	0.146	9	A	4.3
Hearson Cove Rd (E)	L	0.077	5.7	A	0	0.077	5.7	A	0
	R	0.003	12.8	B	0.1	0.002	11	B	0.1
Burrup Rd (N)	L	0.001	6.9	A	0	0.001	6.9	A	0
	T	0.053	0	A	0	0.215	0	A	0

5.5.4.2 Burrup Road/Dampier Highway

The following presents the Burrup Road/Dampier Highway intersection results for Scenario 4. **Table 5-12** shows the results of the analysis.

Table 5-12 Burrup Road/Dampier Highway Intersection Operation – Scenario 4

Intersection Approach		Scenario 4 (AM)				Scenario 4 (PM)			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Dampier Hwy (SE)	T	0.128	0	A	0	0.17	0	A	0
	R	0.303	10.6	B	50.8	0.179	15.4	B	22.2
Burrup Rd (N)	L	0.09	9.7	A	12.1	0.244	13.3	B	30.8
	R	0.827	84.6	**F**	6.3	0.414	45.7	D	10.5
Dampier Hwy (NW)	L	0.015	9.3	A	0.3	0.009	9.3	A	0.2
	T	0.331	48.1	D	28	0.34	24.4	C	30.4

5.5.5 Analysis Results Summary

A summary of the SIDRA results are as follows:

- The SIDRA results for the Burrup Road/Access 2 intersection show it will operate at an acceptable level of service for all scenarios.
- The SIDRA results for the Burrup Road/Hearson Cove Road intersection show it will operate at an acceptable level of service for all scenarios.
- The SIDRA results for the Burrup Road/Dampier Highway intersection show it will operate at an acceptable level of service for all scenarios. The right turn movement from Burrup Road onto Dampier Highway shows LoS F during the AM peak for all scenarios, including existing (Scenario 1). However, this is considered to be satisfactory given that the volumes for the right turn are very low. As a result of the low traffic volumes, the signal frequency for this movement likely only triggers when a car approaches the right turn lane. Increasing the frequency of the phase that controls this movement will improve the LoS (as shown in **Table 5-13** for Scenario 4 which is the worst case) however, this is not necessary given the low right turn volumes and negligible queuing.

Table 5-13 Burrup Road/Dampier Highway Intersection Operation – Scenario 4 (with increased signal frequency for Burrup Road right turn)

Intersection Approach	Scenario 4 (AM)				
		DOS	Delay (s)	LOS	95% Queue (m)
Dampier Hwy (SE)	T	0.128	0	A	0
	R	0.345	15.6	B	80.1
Burrup Rd (N)	L	0.087	9.3	A	12.1
	R	0.094	66.8	E	5.3
Dampier Hwy (NW)	L	0.015	10.4	B	0.9
	T	0.377	56.7	E	32.4

5.5.6 Intersection Turn Warrant Assessment

As Access 1 and 2 are located along Burrup Road which is under the authority of Main Roads WA, a check against the warrants for turn pockets from the Main Roads WA *Supplement to Austroads Guide to Road Design - Part 4* was conducted. The results in **Figure 5-9** show that a channelised right turn treatment (CHR) and a basic left turn treatment (BAL) is required for these intersections. However, it is important to note that outside of the construction period, traffic volumes at Access 1 and 2 will be very low as the accesses will only be used on rare occasions by heavy vehicles.

Figure 5-9 Intersection Warrants

INTERSECTION WARRANTS

Main Roads WA Supplement to Austroads Guide to Road Design - Part 4 A.8

DESIGN SPEED =	90km/h
SPLITTER ISLAND YES / NO =	No
DUAL CARRIAGEWAY YES / NO =	No

MOVEMENT	**COUNT (v/h)**	**HV (%)**
Q_{T1} =	359	20
Q_R =	77	100
Q_{T2} =	66	20
Q_L =	0	0

RIGHT TURN ASSESSMENT

Q_m =	425
% HV =	20.000
x =	3.56
TREATMENT =	**CHR**

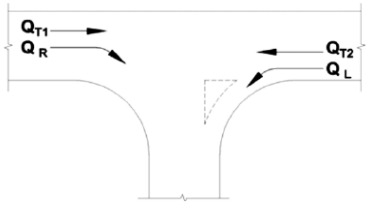
LEFT TURN ASSESSMENT

Q_m =	66
% HV =	20.000
x =	0.00
TREATMENT =	**BAL**

Source: Austroads GTM Part 6 - 2017

Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings

Figure 2.27: Calculation of the major road traffic volume Q_M



Road type	Turn type	Splitter island	Q_M (veh/h)
Two-lane two-way	Right	No	= Q_{T1} + Q_{T2} + Q_L
		Yes	= Q_{T1} + Q_{T2}
	Left	Yes or no	= Q_{T2}
Four-lane two-way	Right	No	= 50% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 50% x Q_{T1} + Q_{T2}
	Left	Yes or no	= 50% x Q_{T2}
Six-lane two-way	Right	No	= 33% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 33% x Q_{T1} + Q_{T2}
	Left	Yes or no	= 33% x Q_{T2}

Source: TMR (2016a).

6 Summary

Construction traffic primarily comprise of bulk material transport to and from the Site by large trucks (up to B-Triple). During construction, the majority of trucks will arrive on Site via the accesses on Burrup Road. The completion of the Causeway between Site C and F will also minimise the impacts at this access as alternate access arrangements are available. Construction workers will be transported to and from the Site via a shuttle bus service thereby significantly reducing the number of private vehicle trips.

During the operational phase, approximately 200 people will be employed and residing within the region. The traffic generated during this phase is slightly higher compared to the operational phase but the resulting traffic impacts remained relatively unchanged.

The main road linking to the Site is Burrup Road. All traffic to and from the Sites will be from the south of this road which leads to key areas such as Dampier and Karratha. Traffic from the north of Burrup Road is unlikely as the only developments further north are the ports and other industrial development.

The realignment of Hearson Cove Road and the relocation of the Burrup Road/Hearson Cove Road intersection will improve heavy vehicle accessibility and movement at this location.

As demonstrated in the Transport Impact Assessment (TIA), the overall traffic impacts on the existing road network during construction and day-to-day operations is considered to be minor and is unlikely to result in any capacity constraints.

The Transport Impact Assessment report has been prepared in accordance with the Western Australian Planning Commission (WAPC) *Transport Assessment Guidelines for Developments: Volume 4 – Individual Development*. The following conclusions have been made in regards to the proposed development:

- The proposed development comprises of a chemical and fertiliser production plant facility.
- The access arrangement for the Site include access off Burrup Road and Hearson Cove Road.
- The traffic generated during the construction and operational peaks is 169 vph and 200 vph respectively.
- The SIDRA results show that the intersections and accesses surrounding the Site operate at an acceptable level of service for all scenarios. The right turn movement from Burrup Road onto Dampier Highway shows LoS F during the AM peak for all scenarios, including existing (Scenario 1). However, this is considered to be satisfactory as the volumes are very low and queuing is negligible.
- Overall, there is a relatively low volume of crashes within the surrounding area of the Site.

Perdaman Urea Project

APPENDIX A

WAPC CHECKLIST FOR TIA

Item	Provided	Comments/Proposals
Summary		
Introduction/Background		
name of applicant and consultant	Included in Section 1	
development location and context	Included in Section 3	
brief description of development proposal	Included in Section 3	
key issues	N/A	
background information	Included in Section 1	
Existing situation		
existing site uses (if any)	Included in Section 1	
existing parking and demand (if appropriate)	N/A	
existing access arrangements	Included in Section 2	
existing site traffic	Included in Section 2	
surrounding land uses	Included in Section 1	
surrounding road network	Included in Section 2	
traffic management on frontage roads	Included in Section 2	
traffic flows on surrounding roads (usually am and pm peak hours)	Included in Section 2	
traffic flows at major intersections (usually am and pm peak hours)	Included in Section 2	
operation of surrounding intersections	Included in Section 5	
existing pedestrian/cycle networks	N/A	
existing public transport services surrounding the development	N/A	
Crash data	Included in Section 2	
Development proposal		
regional context	Included in Section 3	
proposed land uses	Included in Section 3	
table of land uses and quantities	Included in Section 3	
access arrangements	Included in Section 3	
parking provision	Included in Section 3	
end of trip facilities	N/A	
any specific issues	N/A	
road network	N/A	
intersection layouts and controls	N/A	

Item	Provided	Comments/Proposals
pedestrian/cycle networks and crossing facilities	N/A	
public transport services	N/A	
Integration with surrounding area	Included in Section 1	
surrounding major attractors/generators	Included in Section 1	
committed developments and transport proposals	N/A	
proposed changes to land uses within 1200 metres	N/A	
travel desire lines from development to these attractors/generators	Included in Section 5	
adequacy of existing transport networks	N/A	
deficiencies in existing transport networks	N/A	
remedial measures to address deficiencies	N/A	
Analysis of transport networks		
assessment years	Included in Section 5	
time periods	Included in Section 5	
development generated traffic	Included in Section 5	
distribution of generated traffic	Included in Section 5	
parking supply & demand	N/A	
base and "with development" traffic flows	Included in Section 5	
analysis of development accesses	Included in Section 5	
impact on surrounding roads	Included in Section 5	
impact on intersections	Included in Section 5	
impact on neighbouring areas	Included in Section 5	
road safety	Included in Section 2	
public transport access	N/A	
pedestrian access / amenity	N/A	
cycle access / amenity	N/A	
analysis of pedestrian / cycle networks	N/A	
safe walk/cycle to school (for residential and school site developments only)	N/A	
Traffic management plan (where appropriate)	N/A	

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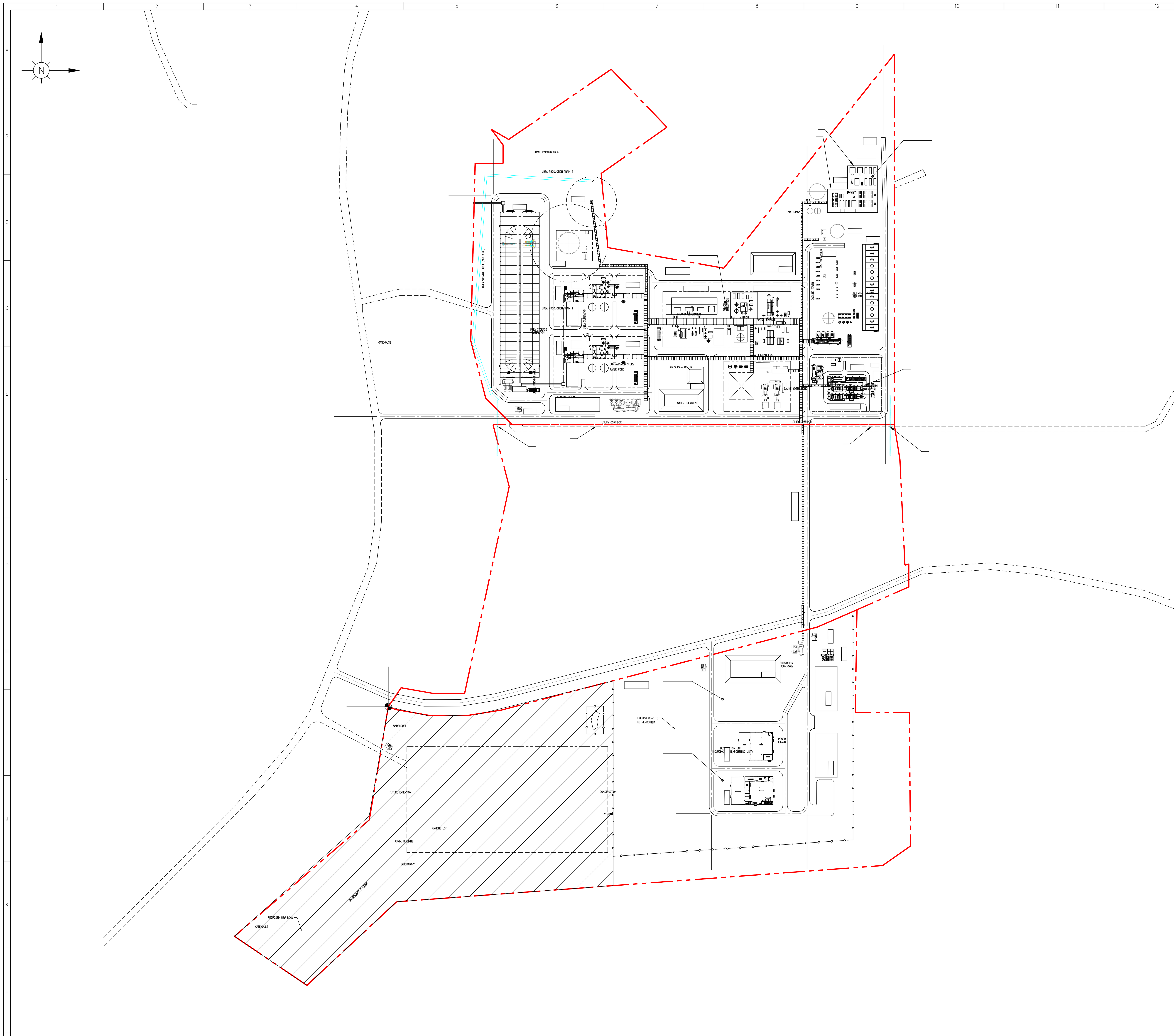
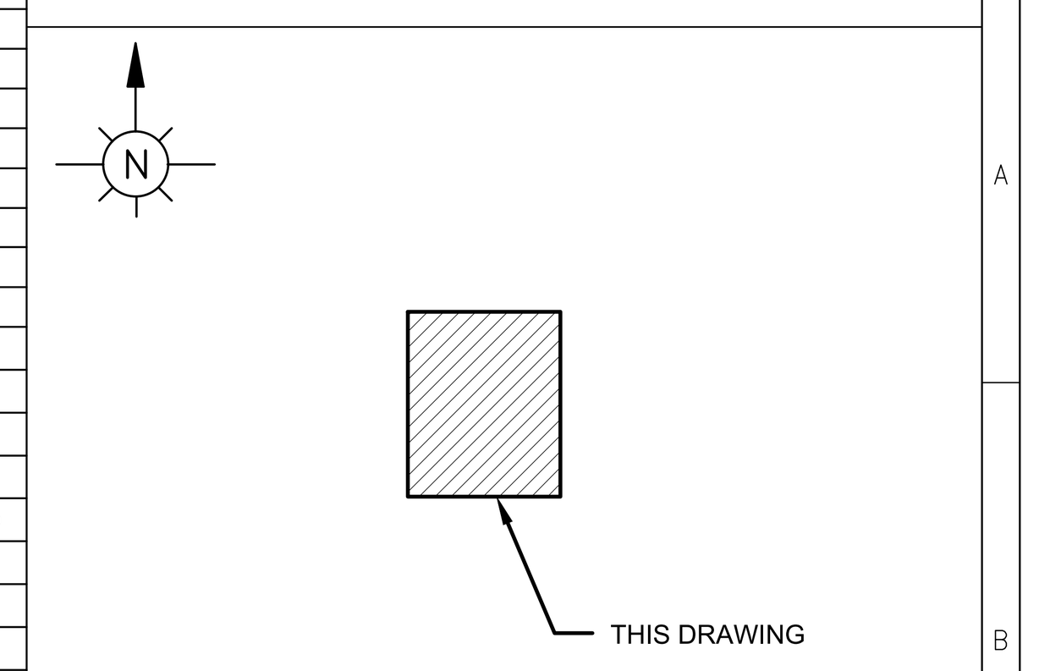
APPENDIX B

SITE PLANS



0000	GENERAL	0000	GENERAL		
1000	SYNGAS BLOCK	1100	REFORMING		
		1200	CO SHIFT		
		1300	CO2 REMOVAL SECTION		
2000	PRODUCT BLOCK	2400	CO2 COMPRESSION		
		2500	AMMONIA SYNTHESIS		
		2600	UREA SYNTHESIS	2610	TRAIN 1
				2620	TRAIN 2
		2700	UREA GRANULATION	2710	TRAIN 1
				2720	TRAIN 2
3000	UTILITY BLOCK	3100	PLANT & INSTRUMENT AIR	3110	PLANT AIR (BACK-UP)
				3120	INSTRUMENT AIR (BACK-UP)
		3200	E & I SYSTEMS	3210	POWER DISTRIBUTION SYSTEMS (LV AND MV)
				3220	SUBSTATIONS
				3230	EMERGENCY POWER (DIESEL GEN SETS)
				3240	UPS
				3250	PLANT LIGHTING
				3260	DCS
				3270	RIE's
				3280	ANALYZER PACKAGES
		3300	STEAM & CONDENSATE	3310	BFW/ CONDENSATE
				3320	STEAM SYSTEMS
		3400	FLARE	3410	AMMONIA FLARE
				3420	SYNGAS FLARE
				3430	TANK FLARE
		3500	AIR SEPARATION UNIT	3510	AIR COMPRESSION
				3520	SEPARATION
				3530	LOX
				3540	COMPRESSED AIR
				3550	N2 COMPRESSION
				3560	LIN
		3600	POWER GENERATION	3610	GAS/ STEAM TURBINE
				3620	HRSG
				3630	STEAM TURBINE
				3640	AUXILIARY BOILER
		3700	WATER TREATMENT PACKAGE	3710	DESALINATION
				3720	POTABLE WATER
				3730	DEMINERALISATION
				3740	PROCESS WATER
				3750	PROCESS CONDENSATE POLISHING
		3800	SAFETY SYSTEMS	3810	FIRE DETECTION AND PROTECTION
				3820	GAS DETECTION
				3830	SAFETY SHOWER
		3900	OTHER UTILITIES	3910	COOLING WATER- ONCE-THROUGH SEA WATER
				3920	COOLING WATER - CLOSED LOOP
				3930	FIRE WATER
				3940	DRAINAGE (CIVIL)
				3950	PONDS
				3960	PROCESS WASTE WATER
				3965	STORMWATER
				3970	POTENTIALLY CONTAMINATED WATER
				3975	OILY WATER
				3980	SANITARY WASTE
				3985	SOLID WASTE
				3990	RETURN SALINE WATER PUMP/ STORAGE
				3995	FUEL GAS
4000	OFFSITE SERVICES	4100	UREA HANDLING	4110	PRODUCT CONVEYING- TO STORAGE
				4120	PRODUCT STORAGE
				4130	PRODUCT CONVEYING- TO PORT
				4140	PRODUCT STORAGE- PORT
				4150	PRODUCT SHIPLOADING
		4200	STORAGE	4210	AMMONIA STORAGE TANK
				4220	AMMONIA STORAGE TANK BOIL-OFF UNIT
				4230	DIESEL STORAGE
				4240	LPG STORAGE
				4250	HYDROGEN BULLET
		4300	OSBL PIPERACKS		
		4400	BUILDINGS	4410	ENTRANCE GATE
				4420	LABORATORY
				4430	ADMINISTRATION
				4440	MAINTENANCE
				4450	ROADS
				4460	WAREHOUSE
				4470	CONTROL ROOM
				4480	CHEMICAL STORAGE



1. PLANT COORDINATES N= 1,000 AND E= 1,000 WILL BE ESTABLISHED AT THE DATUM POINT FOR SITE "F", AND WILL BE EQUIVALENT TO N= 7,718,236 AND E= 475,951 BASED ON DATUM GDA 94, MGA ZONE 50.
2. REFERENCE PLANT ELEVATION 100,000 HPP (HIGH POINT PAVING) EQUALS 6.500 MASL (METERS ABOVE SEA LEVEL) ON SITES C AND F, ASSUMING A ROUGH GRADE ELEVATION OF 6.000 AND 10.000 MASL ON BOTH SITES.
3. COORDINATES AND ELEVATIONS ARE EXPRESSED IN METERS; DIMENSIONS ARE EXPRESSED IN mm.
4. ALL EQUIPMENT LOCATIONS AND SIZES SHOWN ARE PRELIMINARY AND WILL BE FINALIZED DURING DETAILED ENGINEERING.
5. ROADS ARE 6 OR 8 METERS WIDE AND MAY BE OPTIMIZED BASED ON PROJECT NEEDS DURING DESIGN DEVELOPMENT.
6. THE VERTICAL CLEARANCE FOR THE PIPE RACKS AT ALL ROAD CROSSINGS IS MINIMUM 5.5 METERS.
7. THE COOLING WATER SUPPLY AND RETURN DISTRIBUTION HEADERS WILL RUN UNDERGROUND. THE SUPPLY AND RETURN COOLING WATER LINES TO/ FROM VARIOUS USERS WILL BRANCH FROM THE UNDERGROUND RUN OF COOLING WATER LINES IN UNITS AND WILL THEN RUN ABOVEGROUND.

1. HOLD ALL PACKAGE DIMENSIONS AND BATTERY LIMITS.
2. HOLD FLARE THERMAL RADIATION ZONES.

SITE BOUNDARY
PACKAGE/BATTERY LIMITS OR EXCLUSION ZONE
CENTERLINE
NEW EQUIPMENT/FACILITIES/ROADS
EXISTING EQUIPMENT/FACILITIES/ROADS
FENCING
ENVIRONMENTAL EXCLUSION ZONE (NO PERMANENT FACILITIES)

FOR INFORMATION- NOT TO BE USED FOR CONSTRUCTION

DOCUMENT NUMBER	REFERENCE DOCUMENTS
Z593-88733	STAMICARBON 3100 MTPD UREA MELT/GRANULATION PLANT
9002-8273	SCC-800 2x1 OUTDOOR POWER PLANT LAYOUT
S-08508-M71001	HALDOR-TOPSOE GAS-BASED3,507 MTPD AMMONIA PLOT PLAN
140436-0000-41DD-0001	PRELIMINARY GRADING- PLAN AND SECTIONS

REV	DATE	REVISION DESCRIPTION	DRN	CHK	DOA	DISL	EM
00	14/03/19	ISSUED FOR ESTIMATION	RJ	CEC	BR		
B1	14/02/19	ISSUED FOR CLIENT REVIEW	RJ	CEC	BR		
A2	08/02/19	ISSUED FOR INTERNAL REVIEW	RJ	CEC	BR		
A1	01/02/19	ISSUED FOR INTERNAL REVIEW	RJ	CEC	BR		

SNC·LAVALIN

PERDAMAN INDUSTRIES
Perdaman Chemicals and Fertilisers (Perth, Australia)

DESIGN OFFICE	DESIGNED	C. CLOGHESY	08/02/19
	DRAWN	R. JOKI	08/02/19
	CHECKED	C. CLOGHESY	08/02/19
	APPROVED	B. RANKIN	08/02/19
ENGINEERING MANAGEMENT	DISC. LEAD		
	ENG. MGR.		
	SCALE 1:2500	A0	

PERDAMAN PROJECT DESTINY
2.05 MTPA GRANULAR UREA PLANT
OVERALL PLOT PLAN
SITE 'C' AND SITE 'F'

DRAWING NUMBER: 140436-0000-46D1-0001
REV: 00