


**APPENDIX C
TRAFFIC REPORT**

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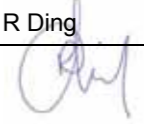


Latitude 32 Area 2 – Traffic Engineering Report
LandCorp



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Acknowledgements and Recognition

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Contents

Executive Summary	i
1 Introduction	1
1.1 Purpose of This Report	1
1.2 Background	1
1.3 Report Structure	3
2 Existing Transport Environment	4
2.1 Existing Road Network	4
2.1.1 Within or Bordering Area 2	4
2.1.2 In the Vicinity of Area 2	5
2.2 Existing Public Transport	5
2.3 Existing Pedestrian and Cycle Network	6
2.4 Existing Freight Railway	6
3 Planned Transport Environment	8
3.1 Proposed Road Network	8
3.1.1 North-South Regional Roads	8
3.1.2 East-West Regional Roads	8
3.2 Proposed Public Transport	9
3.3 Proposed Kwinana Freight Handling Facility and Rail Extensions	9
4 Proposed Area 2 Development	11
5 Traffic Flow Assessment of Road Network	12
5.1 Traffic Analysis	12
5.2 Trip Generation	12
5.3 Trip Distribution & Assignment	13
5.4 Traffic Flows	13
5.5 Network Capacity & Levels of Service	14
5.6 Findings	16
6 Internal Movement Network and Regional Road Integration	17
6.1 Western Frontage Road Along the Current Rockingham Road Southbound Carriageway	17
6.2 Regional Road Network Integration – FRCAH and EW Distributor	17
6.3 North-South Connectivity – Flinders Precinct and Russell Road	18
6.4 Other Roads	19
7 Intersection Treatments	20



7.1 NS Collector/EW Distributor	20
7.2 NS Collector/Dalison Avenue	20
7.3 NS Collector/Wattleup Road	21
7.4 Other Intersections	21
7.5 Interim Access at Rockingham Road/Dalison Avenue	21
8 Public Transport	22
9 Pedestrians & Cyclists	24
10 Conclusions	25
Appendix A Local Structure Plan	
Appendix B Traffic Impact	
Appendix C Road Network, Pedestrians & Cyclists	
Appendix D Bus Routes	



Executive Summary

The Latitude 32 development is one of the most significant industrial project in Western Australia with a land area of approximately 1,400ha. The Area 2 development of the wider Latitude 32 is a first step towards the delivery of this overall project. Under the Master Plan for Latitude 32, Area 2 is located within Precinct 4 Central transport, Precinct 5 Wattleup Townsite and Precinct 7 Northern Transport.

The intent of this project is to develop a Local Structure Plan (LSP) for the delivery of Area 2.

LandCorp appointed CPG Australia Pty Ltd to prepare a Traffic Engineering Report (also known as a Transport Statement) to assist the project team in the preparation and delivery of a Local Structure Plan for Area 2.

Provision of access to Area 2 was found to be problematic with the:

- provision of the EW Distributor possibly affected by a number of issues, these being the continuation of the City of Cockburn Resource Recovery operations and the future Kwinana Freight Handling facility;
- the location of a possible interchange at the intersection of the EW Distributor and the Fremantle-Rockingham Controlled Access Highway due to the proximity of the Lake Mount Brown wetland buffer and the proximity of the interchange to other possible interchanges north and south of this proposed interchange;
- access to Flinders Precinct across Rowley Road and future rail spurs to the possible Kwinana Quay (Outer Harbour).

What has been developed and proposed to address the above issues are:

- an interim access arrangement with traffic control signals at the intersection of Rockingham Road and Dalison Avenue;
- maintenance of the Wattleup Road connection to Rowley Road over the Midland-Kwinana railway; and,
- direct frontage to Rockingham Road for western lots in Area 2.

With the ultimate development of Area 2 and surrounding road network and other Latitude 32 precincts:

- When Rockingham Road is upgraded to the FRCAH this will trigger the requirement to build at least the western portion of the EW Distributor to connect to the NS Collector of Area 2, requiring the removal of traffic signals at Dalison Avenue. The southbound carriageway of Rockingham Road is to remain for exclusive use as access to lots in Area 2;
- The development of the Kwinana Freight handling facility will trigger the need to build the eastern portion of the EW Distributor as Wattleup Road is closed; and,



- When Rowley Road is extended to the FRCAH, the NS Collector connection to the Flinders Precinct area will need to be maintained in some format across Rowley Road and the adjacent future rail spurs.

Traffic flows and impacts were found to be acceptable for the road network with a good pedestrian and cycling network. Public transport may be problematic as the current Route 920 is most likely to be relocated to east of Area 2 beyond an 800m walkable catchment and loop feeder routes are implemented between current and future railway stations on the Perth to Mandurah railway to counterbalance the loss of public transport access.



1 Introduction

1.1 Purpose of This Report

CPG Australia Pty Ltd was commissioned by LandCorp to provide a Traffic Engineering Report (or more accurately a Transport Statement in WAPC parlance) in support of the local structure plan (LSP) for Area 2 of Latitude 32. This report draws upon and confirms various assumptions and ideas developed during the formulation of the district structure plan (DSP) for Latitude 32.

1.2 Background

Latitude 32 (formerly the Hope Valley – Wattleup Redevelopment Project) is one of the most significant industrial land development projects being undertaken in Western Australia and seeks to provide a stock of industrial land for the needs of the region for the next 25 years.

Latitude 32 covers an area of approximately 1,400ha encompassing the former Hope Valley and Wattleup town sites and the surrounding rural area.

Area 2 comprises a Gross Area of 123ha with an approximate Net Developable Area of 100ha within Latitude 32, refer to the locality plan at **Figure 1.1**. The Wattleup townsite is situated within Area 2, totalling approximately 40ha with the majority of which is owned by LandCorp. Under the Master Plan, Area 2 is located within Precinct 4 Central transport, Precinct 5 Wattleup Townsite and Precinct 7 Northern Transport.

The remainder of the land within Area 2 is owned by a variety of private parties, the City of Cockburn and key government agencies, including the Department of Education and Training and the WAPC. LandCorp has initiated a compulsory acquisition process (under Section 6 of the *Hope Valley Wattleup Redevelopment Act 2000*) to secure the four (4) remaining landowners within the Wattleup townsite. At the conclusion of the compulsory acquisition process the road reservations will be closed and a number of large super lots created.

In October 2010 LandCorp endorsed for noting the Latitude 32 Industry Zone Implementation Plan to provide a clear road map, for the delivery of Areas 2, 3 and 4 as identified in the DSP. This report provides validation of the information contained within the DSP, particularly in relation to the infrastructure/servicing considerations, land tenure and assembly issues, and planning and delivery costs for the three Areas.

During the development of the District Structure Plan and the Implementation Plan, consideration was given to the various Areas to determine their appropriate land use and tender, anticipated lot sizes, existing landform, infrastructure (existing and proposed), accessibility, environment and heritage.

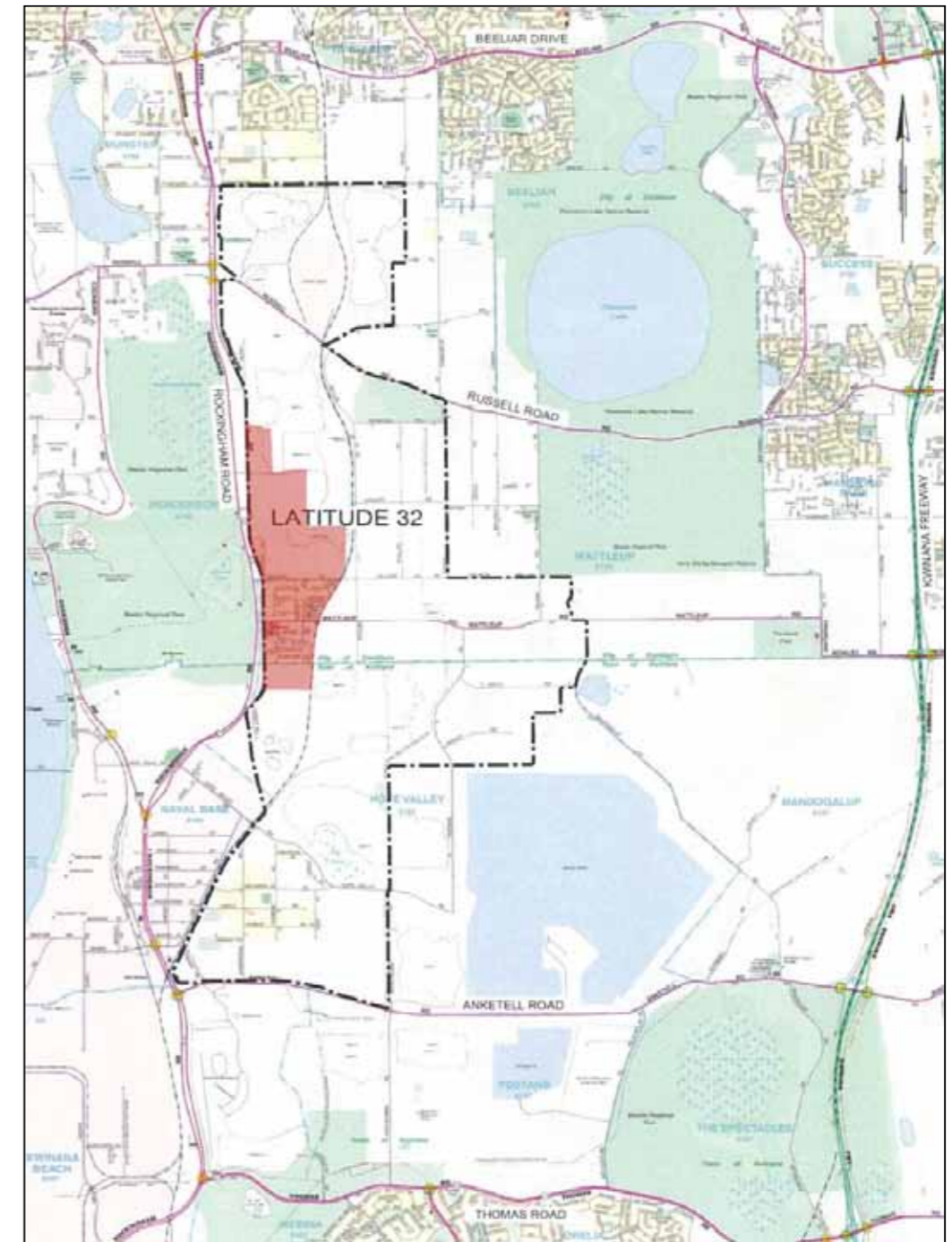


Figure 1.1 – Locality Plan



1.3 Report Structure

This report discusses the current transport infrastructure in the vicinity of Area 2 and then discusses the currently planned transport infrastructure in the same vicinity. It then goes on to discuss the planned Area 2 and the expected traffic flows within Area 2 and on links to external destinations. Based on this assessment the report then goes on to discuss the internal road structure and intersection treatments and then the public transport and pedestrian and cyclists networks to support the LSP.



2 Existing Transport Environment

2.1 Existing Road Network

The proposed site of Area 2 is currently bordered by one existing road (Rockingham Road to the west) and has the Midland-Kwinana freight railway as its eastern border. Within Area 2 there are numerous roads, but the majority of these roads are not expected to be retained in a revised lot and road layout. Below is a description of existing roads that may be retained in some form in the LSP.

2.1.1 Within or Bordering Area 2

- Rockingham Road
Rockingham Road has a Primary Distributor classification in the Main Roads WA Metropolitan Functional Road Hierarchy. It is currently classified as a Red Road under the care and control of Main Roads Western Australia. It is a dual carriageway urban road with each carriageway being approximately 7.0m width (with two 3.5m wide lanes in each direction) and sealed shoulders within a 170m wide reservation. Rockingham Road has a speed limit of 70km/h. Main Roads Western Australia has advised that the average daily traffic volumes on Rockingham Road in 2008 was approximately 35,100 vehicles per day (vpd) south of Russell Road.
- Wattleup Road
Wattleup Road runs east to west through Area 2 and connects Rockingham Road through to the Kwinana Freeway via Rowley Road well east of Latitude 32. Wattleup Road has a Regional Distributor classification in the Main Roads WA Metropolitan Functional Road Hierarchy. It is a single carriageway rural road with an 8.0m sealed width and kerbed on both sides other road within a 20m wide reserve. Wattleup Road has a speed limit of 50km/h. The City of Cockburn has advised that the average daily traffic volumes on Wattleup Road in 2006 were approximately 2,500 vpd at the railway level crossing. Wattleup Road intersects with Rockingham Road at a Stop sign controlled T-junction with Wattleup Road forming the terminating road.
- Dalison Avenue
This road also runs east to west through Area 2 but it does not cross the Midland-Kwinana railway like Wattleup Road does. Dalison Avenue has an Access Road classification in the Main Roads WA Metropolitan Functional Road Hierarchy. It is a single carriageway urban road with a 6.0m sealed width and kerbed on both sides within a 20m wide reserve. Dalison Avenue has a speed limit of 50km/h. The City of Cockburn has advised that there are no traffic counts for the road. However it is expected that there would be approximately 500 vpd east of Rockingham Road. Dalison Avenue Road intersects with Rockingham Road at a Stop sign controlled T-junction with Dalison Avenue forming the terminating road.



- Wenlock Road
Wenlock is a local road that runs north to south in Area 2. Wenlock Road has an Access Road classification along the southern boundary of Lot 9500 in the Main Roads WA Metropolitan Functional Road Hierarchy. It is a single carriageway rural road with a 6.0m sealed width kerbed road in a 20m wide reserve. Wenlock Road has a speed limit of 50km/h. The City of Cockburn has advised that the average daily traffic volumes on Wenlock Road in 1993 were approximately 650 vpd north of Wattleup Road. Wenlock Road intersects with Dalison Avenue to the north and Wattleup Road to the south, both at priority controlled T-junctions with Wenlock Road forming the terminating road.
- Other Local Roads
Within Area 2 there are numerous other local streets classified as local roads under the Main Roads WA Metropolitan Functional Road Hierarchy. These are not expected to be retained in the LSP and thus have not been discussed. These roads include:
 - Hitchcock Place;
 - Collova Way;
 - Rothwell Way;
 - Miro Street;
 - Vodice Street;
 - Tomislav Place;
 - Marban Way;
 - Corin Way;
 - Deepdene Road;
 - Stamford Way; and,
 - Usher Place.

2.1.2 In the Vicinity of Area 2

- Moylan Road
East of Area 2 and the Midland-Kwinana railway is this north to south road. Moylan Road has an Access Road classification in the Main Roads WA Metropolitan Functional Road Hierarchy. It is a single carriageway road with a 7.2m sealed width, unsealed shoulders and table drains. Moylan Road has a speed limit of 50km/h. The City of Cockburn has advised that the average daily traffic volumes on Moylan Road in 1997 were approximately 500 vpd north of Wattleup Road. Moylan Road intersects with Wattleup Road at a four-way junction with the Moylan Road approaches under Give Way control.

2.2 Existing Public Transport

- Route 920 on Rockingham Road
Currently there is a bus rapid transit (Route 920) on Rockingham Road. This runs between Fremantle and Rockingham with a service running in each direction approximately every 15 minutes. There are bus stops on Rockingham Road



located near Dalison Avenue and Wattleup Road. The location of these stops would allow approximately 90% of Area 2 to be within 800m of a high frequency bus route.

- Other Routes
There are peripheral bus routes that provide limited access to the wider Latitude 32 precinct but do not come within an 800m walkable catchment of Area 2. These routes include:
 - Route 825 from Fremantle to Rockingham via Munster, Henderson and Kwinana Beach industrial area; and,
 - Routes 522, 531 and 533 from Fremantle to Cockburn Central Station via Hamilton Hill, Spearwood and Henderson.
- Perth to Mandurah Railway
The Perth to Mandurah railway is located approximately 6km east of Area 2. This railway currently has stations located at Cockburn Central (approximately 13km by road to the north east) and Kwinana (approximately 12km by road to the south east). Due to the distance to these stations the benefits to Area 2 would be insignificant.

2.3 Existing Pedestrian and Cycle Network

There is currently sporadic and disjointed provision for pedestrians and cyclists within and adjoining Area 2.

Some local roads within Area 2 have footpaths, but as the reserve widths and cross sections of the roads are to change significantly with the development Area 2 it is doubtful if the footpath network would be retain in its current state.

Rockingham Road is proposed to be retained in its current state. It has a seal should of approximately 1.5m width that does allow for on-road cycling by experienced cyclists (given the speed and traffic composition of traffic on Rockingham Road). There is a footpath that runs along the southbound carriageway of Rockingham Road close to the current property boundary. It is approximately 1.2m in width.

2.4 Existing Freight Railway

The Midland – Kwinana freight railway (operated by WestNet Rail) runs north-south through Latitude 32. The railway provides strategic connections to:

- Fremantle Inner Harbour;
- Proposed Kwinana Quay (Outer Harbour);
- Kwinana Industrial Area;
- Kewdale / Forrestfield;
- Eastern States; and,



- Country Western Australia (north and south west).

As freight demand increases, the existing railway would likely be duplicated. The existing rail reserve would largely be sufficient to accommodate a dual railway. The railway is expected to become the primary freight rail access to the proposed Kwinana freight handling facility.



3 Planned Transport Environment

3.1 Proposed Road Network

3.1.1 North-South Regional Roads

Rockingham Road is currently a 4 lane expressway servicing approximately 35,500 vehicles a day (vpd). It runs along the western side of Latitude 32 and provides the main north-south mobility and access function to the Latitude 32 area (and in this instance, Area 2).

The proposed Fremantle-Rockingham Controlled Access Highway or FRCAH (6 lane freeway-standard) is planned to follow the Rockingham Road corridor from Russell Road to the proposed interchange with Rowley Road. Current planning includes interchanges on the FRCAH at Russell Road, Rowley Road and Anketell Road. Once constructed, the FRCAH will become the main north-south regional road connecting Fremantle with Rockingham. Approximately 50,000 vpd are forecast to travel on the FRCAH (through the Latitude 32 area) in the year 2031.

Early work with Latitude 32 has indicated that there could also be an interchange placed on the FRCAH allowing direct access to it from Latitude 32 (from Area 2).

3.1.2 East-West Regional Roads

– Russell Road

Russell Road is an existing two lane road linking Kwinana Freeway with Rockingham Road and is placed north of Area 2. The observed daily traffic on Russell Road is approximately 9,000 vehicles. The section of Russell Road east of Henderson Road services residential land uses whilst the western section traverses the northern precincts of Latitude 32 providing access to a number of lots. Russell Road crosses the existing Midland – Kwinana freight railway at grade and with traffic increase (to approximately 12,000 vpd in 2031 without Latitude 32) this is expected to become a safety concern and may require grade separation at some point in the future.

– Rowley Road

Rowley Road presently terminates well east of Latitude 32 (and hence Area 2) but there are plans to extend this road through Latitude 32 (and along the southern boundary of Area 2) to provide a possible access to Kwinana Quay (Outer Harbour) and the primary access to the Kwinana freight handling facility. Approximately 5,000 vpd are expected on Rowley Road in 2031 without the introduction of Latitude 32.

Both Rowley Road (and Anketell Road further to the south away from Area 2 but within Latitude 32) are planned to provide 4 lanes expressway access to Kwinana Freeway to the east of Latitude 32 (and Area 2).



Both routes are planned freight routes with Anketell Road being a designated high/wide load route. One of these two routes will become the main access route to the proposed Kwinana Quay (Outer Harbour). The planning designs for both routes are being finalised by the Department of Planning (DoP).

The planned access location strategy for Rowley Road in the vicinity of Area 2 includes:

- A bridge (or bridges) over the Midland – Kwinana railway and spur lines to the Kwinana Quay (Outer Harbour);
- an at grade intersection at the Abercrombie Road / Phillips Road alignment,
- a partial cloverleaf interchange at the FRCAH, and,
- a signalised T-intersection at Rockingham Road.

3.2 Proposed Public Transport

The main public transport proposal that may have an effect of Area 2 and Latitude 32 is the Fremantle to Rockingham Transit Way. This will formalise the current Route 920 that operates along Rockingham Road. Advice and discussions with the Department of Transport have indicated that once Rockingham Road is upgraded to the FRCAH (or possibly sooner, should the wider Latitude 32 be developed) then this route may be re-routed down Phillips Road, the new north-south arterial to the east of the Midland-Kwinana railway. This will have the effect of placing Area 2 outside the 800m catchment of the Transitway (compared to the current situation where 90% of the Area 2 would be within the 800m catchment for Route 920).

3.3 Proposed Kwinana Freight Handling Facility and Rail Extensions

The West Australian Planning Commission commissioned GHD Pty Ltd and Meyrick and Associates to undertake a site evaluation and planning study for the proposed freight handling facility to be located in the Kwinana area.

The final option chosen from a series of five options was for the facility to be placed between the Midland-Kwinana railway and Phillips Road north of the proposed extension of Rowley Road. **Figure 3.1** on the following page shows the final option and layout.

The layout of this facility provided for extensive warehousing and service areas along the eastern boundary of the facility along Phillips Road with a short-train terminal in the south western corner of the facility butting up against the common boundary with Area 2 to the west.

The location of this facility will impact the provision of the EW Distributor across Area 2 and the Midland-Kwinana railway due to the length of span that a structure



would need to be to span the freight facility. Work to prove the design of the EW Distributor is being undertaken by GHD Pty Ltd.

In addition to the freight handling facility there is proposed to be a spur line from the Midland-Kwinana railway along the northern side of the future Rowley Road alignment to a proposed Kwinana Quay (or Outer Harbour) at a northern location opposite Rowley Road. If a southern location for the port is chosen, the rail spurs may run along Anketell Road to the proposed port.

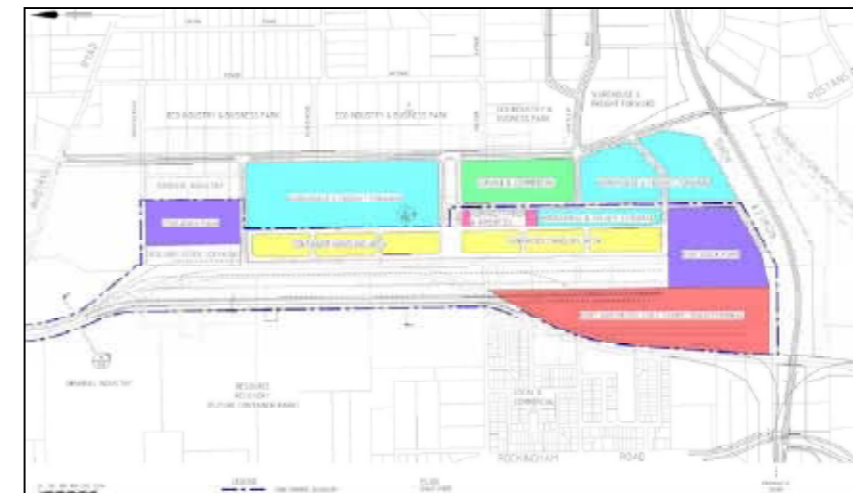


Figure 3.1 - Proposed Kwinana Freight Handling Facility



4 Proposed Area 2 Development

The proposed development area of Area 2 is proposed to consist of the following:

- Transport Industry consisting of approximately 71.4ha;
- Transport Industry earmarked for the City of Cockburn’s Resource Recovery Expansion of approximately 12.2ha;
- General Industry consisting of approximately 6.1ha;
- On the corner of Dalison Avenue and the NS Collector there is proposed to be a Local Commercial Centre of approximately 5,000m². This is in addition to the 2,600m² of commercial land adjacent to Rockingham Road near Wattleup Road; and,
- The remainder of the structure plan area will consist road reserves, drainage areas and infrastructure sites.

The proposed road network consists of the following currently existing roads:

- Rockingham Road bordering the development to the west (initially with direct frontage as a one-way road and then ultimately as a two-way road);
- Wattleup Road in a modified format;
- Dalison Road in a modified format; and,
- Wenlock Road in a modified format.

The new road network will include the following major new roads:

- A main north to south road tentatively called the NS Collector; and,
- A east to west road that will ultimately connect Area 2 and latitude 32 to Rockingham Road (and then the FRCAH) called the EW Distributor.

The main access points to Area 2 are ultimately proposed to be via the FRCAH through an interchange with the EW Distributor, a bridge connection over the freight facility to the east and a link across Rowley Road to the south for the NS Collector to link through to the Flinders Precinct area.

The interim access (until such time as the FRCAH is built) is proposed to be through a signalised intersection at Rockingham Road and Dalison Avenue with Wattleup Road remaining open across the Midland-Kwinana railway, so as to provide a local east to west link.

Appendix A contains plans detailing the LSP.



5 Traffic Flow Assessment of Road Network

5.1 Traffic Analysis

The trip rates for Area 2 has been based on the work undertaken by Aecom in the development of the DSP. These rates were developed in consultation with TPG (the current planning consultant for Area 2) and is based Guide to Trip Generating Developments, RTA, 2002 and Commercial Land Use Survey, Ministry for Planning, 1997.

5.2 Trip Generation

Based on the unrestrained traffic generation rates in **Table 5.1** below, the traffic generation due to the development would be as per, **Table 5.2**.

The detailed trip generation rates are summarised below.

Table 5.1 Daily Trip Generation Rates

Land Use Type	trips per 100m ² (GFA)	m ² (GFA) per employee	trips per employee	trips per ha (GFA)
Shop/Retail	-	31.4	2.3	732
Storage/Distribution	-	70.4	2.3	327
Service Industry	-	72.5	2.3	317
Office – Medium Density	10.0	-	-	1,000
Office – Low Density	5.0	-	-	500



Table 5.2 Daily Trip Generation for Area 2

Land Use Type	Area (ha)	% Developable	GFA (ha)	trips per ha (GFA)	Total Daily Trips
Shop/Retail	0.8	100%	0.8	732	586
Storage/Distribution	71.4	70%	49.98	327	16,343
Service Industry	6.1	70%	4.27	317	1,354
Office – Medium Density	0	-	0	1,000	0
Office – Low Density	0	-	0	500	0
Total	78.3	70.31%	55.05	331	18,283

The entire proposed development should thus generate in the order of 18,300 trips per day exiting the LSP area. In addition to this there is expected to be approximately 2,000 (this consisting slightly more than 10% of the trips expected for the LSP) internal trips per day either consisting of simple trips to and from land uses within the LSP and trips from external precincts travelling through the LSP along roads such as the NS Collector.

5.3 Trip Distribution & Assignment

The distribution of external traffic flows from the Area 2 LSP onto the network has been based distribution splits assessed by Aecom in the development of the DSP. The proportion of traffic exiting Area 2 would be based on the splits below:

- Rockingham Road/FRCAH North 28%
- Rockingham Road/FRCAH South 24%
- NS Distributor/Phillips Road North 15%
- NS Distributor/Phillips Road South 34%

This is based on the assumption that the EW Distributor is constructed. Not included above are external trips and trips to other precincts within the DSP. As discussed in Section 5.2, slightly more than 10% of the daily trips expected for Area 2 would be localised intra Latitude 32 trips.

5.4 Traffic Flows

The traffic flows derived from the adoption of the directional splits and total traffic generation for Area 2 is shown in Appendix B. The main traffic flows are expected



to be on the EW Distributor with 20,000 to 28,000 vpd utilising this road. For roads wholly within Area 2, the NS Collector is expected to have traffic flows of close to 13,500 vpd south of the EW Distributor as this would be the main entry into Area 2. North of the EW Distributor, the NS Collector should have traffic flows in the order of 5,000 vpd due to Area 2 traffic and the effects of general north to south traffic flows through Area 2 between the Flinders Precinct to the south and Precinct 10 to the north, outside Area 2.

5.5 Network Capacity & Levels of Service

The capacity values used in the assessment of the links within Area 2 used the same methodology as the process for the DSP. For road links the level of service of a link was based on the values in **Table 5.3**. For this assessment, the daily traffic flows assessed throughout Area 2 would need to be converted to peak hour directional flows. For this purpose it was assumed that 8% of the daily traffic flow occurs in the peak period with a 70/30 directional split depending on peak period (70% enters in the AM peak, 70% exit in the PM peak).

Table 5.3 Indicative Road Link Level of Service

Road Type	Lanes	Upper Limit Volume for LOS (Veh / Hour / Direction)				
		A	B	C	D	E
Undivided Road	1	527	615	702	790	878
	2	1,054	1,230	1,404	1,580	1,756
Divided Clearway	2	1,406	1,640	1,874	2,108	2,340
	3	2,108	2,460	2,810	3,160	3,512
Expressway	2	1,370	2,150	2,730	3,420	3,900
Freeway	3	1,900	2,980	4,340	5,570	6,200

The level of service concept describes the quality of traffic service in terms of six levels, designated A to F, with level of service A (LOS A) representing the best operating condition (i.e. at or close to free flow), and level of service F (LOS F) the worst (i.e. forced flow). More specifically:

- **LOS A:** Individual drivers are virtually unaffected by others in the traffic stream. Their freedom to select their own desired speed and to manoeuvre in the traffic stream is extremely high, and the general level of comfort and convenience is excellent;
- **LOS B:** Individual drivers still have reasonable freedom to select their desired speed and to manoeuvre in the traffic stream, although the general level of comfort and convenience is less than at LOS A;



- **LOS C:** Most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre in the traffic stream;
- **LOS D:** All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre in the traffic stream. Traffic is close to the upper limit of stable flow, the general level of comfort and convenience is poor, and small increases in traffic flow will usually cause operational problems;
- **LOS E:** Traffic volumes are at, or close to capacity, and drivers have virtually no freedom to select their desired speed or to manoeuvre. Traffic flow is unstable and minor disturbances will result in stop-start conditions; and,
- **LOS F:** Flow is forced and the amount of traffic approaching the point under consideration exceeds that which it can handle. Stop-start conditions apply and queuing and delays result.

Using the directional splits and daily traffic flows **Table 5.4** was derived. This shows the expected link level of service within Area 2 (including the EW Distributor).

Table 5.4 Area 2 Link Level of Service

Road	Location	Daily Flow	Peak Hour Flow	Peak Flow Direction	LoS
NS Collector	N of Rowley	5,000	400	280	A
	N of Wattleup	10,000	800	560	B
	S of EW Dist	13,500	1,080	756	D
	N of EW Dist	5,000	400	280	A
EW Distributor	W of NS Coll	28,000	2,240	1,568	B
	E of NS Coll	20,000	1,600	1,120	A

For the critical intersections within the LSP Sidra Intersection 5 was utilised to assess the intersection level of service given the expected traffic volumes. This was an iterative process in the case of the intersection of the EW Distributor and the NS Collector as the most suitable and appropriate intersection arrangement had to be developed based on the output of the analysis.

A summary of the intersection performances are shown in Table 5.5 on the following page. Generally the level of service for the intersections was found to be acceptable.



Table 5.5 Area 2 Critical Intersections Level of Service

Intersection	Control	Period	N LoS	E LoS	S LoS	W LoS	Intersection LoS
NS Collector/EW Distributor	TCS	AM	D	C	E	C	D
		PM	D	B	E	D	D
NS Collector/Dalison Avenue	TCS	Both	A	C	A	C	B
NS Collector/Wattleup Road	Roundabout	Both	B	B	B	-	A

5.6

Findings

An assessment of the expected traffic flows of Area 2 as part of the wider DSP is shown attached. Generally within the LSP the level of service of roads will typically be LoS A for the NS Collector and the intersecting local roads as well as at intersections. On a daily basis traffic flows on the NS Collector are expected to be approximately 5,000 vehicles per day (vpd) north of the EW Distributor and vary from 3,000 vpd to 13,500 vpd south of the EW Distributor. The connecting EW local roads within the LSP are expected to carry in the order of 1,000 to 1,500 vpd.

Traffic flows on the EW Distributor are expected to vary from 20,000 east of the NS Collector to 28,000 west of the NS Collector. The intersection of the EW Distributor and the NW Collector is expected to operate at LoS D at peak periods (assuming good intersection channelization involving left and right turn pockets with two lanes in each direction of traffic flow on the EW Distributor). The LoS of the EW Distributor is expected to be B west of the NS Collector and A east of it, whilst the NS Collector is expected to operate at LoS D south of the EW Distributor.

The intersection levels of services are also acceptable, with the worst LoS expected to be D for the intersection of the EW Distributor and NS Collector in both the AM and PM peak periods.

In all these instances of the LoS they meet the minimum requirement of LoS D and thus will be acceptable.

Refer to the sketch in **Appendix B**.



6 Internal Movement Network and Regional Road Integration

The internal road network is proposed to consist of a north to south road (called the NS Collector) and a main east to west road (called the EW Distributor) which provides access to other precinct within Latitude 32 as well as Area 2. The NS Collector extends further north beyond the north side of the EW Distributor to provide access to lots of Area 2 north of the EW Distributor and eventually links with Russell Road to the north.

There is one other north to south road of some length, this being on the western side of Area 2. Other roads in Area 2 are generally short east to west or north to south local roads.

Within Area 2 intersections are generally T-junctions with a single four way intersection at where Dalison Avenue intersects with Wenlock Road.

These components are discussed in more detail below.

In terms of road hierarchy, all roads are to be Local Distributor type roads (with the exception of the EW Distributor) with a short section of road proposed along the current alignment of Hitchcock Place being classified as a Local Road.

6.1 Western Frontage Road Along the Current Rockingham Road Southbound Carriageway

The ultimate design for Area 2 provides two north-south roads through the area. The main link (the NS Collector) provides access to the EW Distributor and through to the Flinders precinct across Rowley Road.

The western north-south road is proposed to be the current southbound carriageway of Rockingham Road. In the initial stages of Area 2 access is proposed to be direct onto Rockingham Road (as is presently the case with many smaller lots having direct access onto Rockingham Road) with the one-way flow maintained. With the upgrade of Rockingham Road to the FRCAH the eastern carriageway will be retained and converted to two way access for lots that would have one-way access in the initial stages of Area 2.

The main carriageways for the upgraded FRCAH would be separate to the old southbound carriageway of Rockingham Road and there would be no direct connection between the two.

6.2 Regional Road Network Integration – FRCAH and EW Distributor

At a regional road level Area 2 is proposed to link to the Fremantle-Rockingham Controlled Access Highway [FRCAH] once constructed via a new road called the East-West Distributor (EW Distributor). The alignment of this distributor and the location of the future interchange has been determined based on external limiting



factors, namely the proximity to the Lake Mount Brown wetland buffer and the City of Cockburn Resources Recovery. Its ultimate form Area 2 is proposed to connect to the EW Distributor at a four-way intersection with the main North-South collector (NS Collector) road running along the length of Area 2. This intersection is proposed to be controlled with Traffic Control Signals (TCS). The intersection of the EW Distributor and the FRCAH is proposed to be controlled with a diamond freeway type interchange with TCS at the top of the ramps.

In the initial staging of Area 2 access is proposed to be via an at-grade TCS controlled intersection at the intersection of Rockingham Road/Dalison Avenue. This intersection will allow direct entry and controlled access into AREA 2 as well as providing an interim EW link via the NS Collector/Wattleup Road over the railway line at the eastern boundary of Area 2.

Wattleup Road is to be retained between the NS Collector and the railway level crossing to provide an interim east to west connection, prior to the full development of the EW Distributor.

The timing of the EW Distributor construction would be determined by the timing of the upgrade of Rockingham Road to the FRCAH and/or the future freight handling facility east of Area 2. If the FRCAH is constructed the TCS at the intersection of Rockingham Road/Dalison Avenue would need to be removed and the portion of the EW Distributor between the NS Collector and the FRCAH would need to be constructed (leaving the Wattleup Road level crossing still in use). Once the freight handling facility is constructed the Wattleup Road railway crossing would need to be closed and the portion of the EW Distributor east of the NS Collector would need to be constructed.

The FRCAH/EW Distributor interchange and the EW Distributor are currently being designed by other consultants. In general terms the EW Distributor is proposed to be within a 50m wide reserve except where there is an embankment to accommodate level differences.

Refer to the sketch in **Appendix C**.

6.3 North-South Connectivity – Flinders Precinct and Russell Road

Running along the entire length of Area 2 is the NS Collector. This road is proposed to be a 10m wide pavement for two-way traffic flow, plus 2.5m either side of this for embayed parking within a 25m wide reservation. This road will provide a collector role for the Area 2 development to allow traffic activity to utilise direct frontage and local roads to access it and then to access the EW Distributor at a four-way intersection controlled by TCS. With the change in traffic flows and the location of the Local Commercial Centre on the north-west corner (with likelihood of pedestrian activity), the intersection of the NS Collector and Dalison Ave is proposed to have TCS installed. The phasing of the TCS may need to alter



as the road access to AREA 2 is changed from Dalison Avenue to the EW Distributor/FRCAH and closure of Wattleup Road.

The NS Collector is proposed to connect to Russell Road to the north at an at-grade intersection and to the Flinders Precinct at Hope Valley Road. Access to Hope Valley Road is proposed to initially be at grade across the future Rowley Road alignment. When the Rowley Road corridor is developed the NS Collector will need to be accommodated. With the three levels required (rail at level 0, Rowley Road over the rail at level 1 and the NS Collector at a yet to be determined level) it is expected that the NS Collector will need to be tunnelled under the rail.

Traffic flows for Area 2 are expected to change over time as the initial east west connection is proposed to be via Wattleup Road and then via the EW Distributor. To cater for the change in the direction of traffic flows, the intersection of Wattleup Road and the NS Collector should have a roundabout installed. The main traffic flows in the initial stages of Area 2 will be on the northern and eastern leg of the intersection and once Wattle Road is closed at the railway crossing, the main traffic flows will revert to the northern and southern legs of the intersection (the NS Collector).

6.4 Other Roads

All other roads within Area 2 are proposed to be of similar cross section to the NS Collector within a 25m wide reserve except for the single section of local road which is to have the same cross sectional elements within a 20m wide reserve. The EW Distributor to be design by a consultant under a separate contract outside the scope of works of this study report.



7 Intersection Treatments

7.1 NS Collector/EW Distributor

This intersection is proposed to be controlled by traffic control signals (TCS). The initial stage of Area 2 is proposed to have the main access to Area 2 via Dalison Avenue at Rockingham Road and this intersection will not exist in the initial stages of the project.

The ultimate design should provide for:

1. Western Approach
 - One left turn lane under Give Way control
 - Two through lanes
 - Two right turn lanes
2. Northern Approach
 - One left turn lanes under Give Way control
 - Two through lanes
 - One right turn lane
3. Eastern Approach
 - One left turn lane under Give Way control
 - Two through lanes
 - One right turn lane
4. Southern Approach
 - Two left turn lanes under TCS control
 - Two through lanes
 - One right turn lane

This design should be adaptive to cater for the opening of the FRCAH and the interchange at the EW Distributor prior to the construction of the EW Distributor over the freight handling facility to the east.

7.2 NS Collector/Dalison Avenue

Dalison Avenue is proposed to be the interim access to Area 2 prior to the construction of the FRCAH. On the north western corner of Dalison Avenue and the NS Collector is proposed to be the Precinct 5 Local Commercial Centre. With Dalison Avenue intersecting with the NS Collector there will be a need for intersection control at this four way intersection.

The location of the local commercial centre at this intersection will probably cause workers within the area to walk to the centre to buy lunches or do other activities during their breaks. Thus there is an expectation of a high pedestrian activity at this intersection.



Because of the expected high pedestrian activity and requirement for control, traffic signals are considered the best option for safe intersection control.

The ultimate design should provide for the following on all approaches:

- One left turn lane/through lane; and,
- One right turn lane.

The design may need to adapt to the main traffic flows changing from the western and southern legs to the northern and southern legs as the interim access at the intersection of Rockingham Road and Dalison Avenue is closed.

7.3 NS Collector/Wattleup Road

With the initial development of Area 2, prior to the development of the freight facility, and possibly following on with development of other areas within Latitude 32, there will be a requirement of a local east to west connection in the structure plan area. This link will also need to provide local access for traffic generators and attractors outside Latitude 32. As this interim access is proposed to be a retained Wattleup Road access this will intersect with the NS Collector (close to Wattleup Road intersection with Wenlock Road). As Wattleup Road is closed at the railway level crossing at some future point, traffic flow patterns will change significantly at the intersection of Wattleup Road and Wenlock Road from predominantly east to north to south to north. With the change in traffic patterns and the volumes expected to change, a roundabout should be provided at this intersection.

This roundabout should be of sufficient diameter to cater for the size of vehicles up to B-double size, which could be an internal island diameter of 20m and external inscribed diameter of approximately 40m between diagonal sides of the intersection.

7.4 Other Intersections

Within Area 2 other intersections are proposed to be T-junctions. The NS Collector is proposed to have two north of the EW Distributor and three south of the EW Distributor. These intersections should be controlled by Give Way signs to ensure that road priority is clear.

7.5 Interim Access at Rockingham Road/Dalison Avenue

In the initial stages of Area 2 and prior to the construction of the FRCAH, access to Area 2 is proposed to be via a TCS at the intersection of Dalison Avenue and Rockingham Road. This interim access will allow the continued use of Rockingham Road southbound carriageway as a one-way road for lots directly fronting this section of Rockingham Road.



8 Public Transport

The modification and change to the road network as the LSP and DSP develop will have a major impact on the public transport accessibility. The various stages of the development of the LSP within the wider DSP are described below.

– Present

– Route 920 on Rockingham Road

Currently there is a bus rapid transit (Route 920) on Rockingham Road. This runs between Fremantle and Rockingham with a service running in each direction approximately every 15 minutes. There are bus stops on Rockingham Road near Dalison Avenue and Wattleup Road.

– Initial Stage of Area 2

With the initial stage of Area 2, Rockingham Road would largely remain as is with access to Area 2 via TCS at Dalison Avenue. Based on this the proposed public transport access could be as described below:

– Route 920 on Rockingham Road

This route is expected to remain on Rockingham Road in the initial stages of Area 2. This service will serve Area 2 quite well with the initial stages of the project with the majority of the area within an 800m walkable catchment.

– Loop Feeder between Cockburn and Kwinana train stations

What can possibly develop is a loop feeder bus route between train stations on the Perth to Mandurah railway line. The route could run between Cockburn and Kwinana Stations with a service running once every 40 minutes (approximately how long it would take to run between the stations). This route could also service the Flinders Precinct to the south via the NS Collector. This loop feeder route would compete with Route 920 near Area 2 but would ultimately serve different users. The loop feeder route would serve rail users, who could come as far as Armadale/Midland/Clarkson/Mandurah, whilst the Route 920 service would serve workers coming from Fremantle and Rockingham and areas between. The route would access Area 2 via Wattleup Road from the east and the NS Collector from the south via the Flinders Precinct.

– Area 2 within the Ultimate DSP

With the ultimate road connections and development of Area 2 (the FRCAH constructed, EW Distributor built) the expected public transport services for Area 2 are:



– Route 920 on Transit Way on NS Distributor east of Area 2

In discussion with the Department of Transport, the route of the Fremantle-Rockingham Transit Way (which builds upon Route 920) has not yet been determined. However, given the development in the area it appears that a likely route will be through the Latitude 32 area via the NS Distributor well to the east of Area 2. This diversion of the Route 920 away from Rockingham Road will reduce the public transport access that Route 920 would afford Area 2 in the initial stages of its development.

– Loop Feeder between Cockburn and Kwinana train stations

This route is proposed to continue as in the initial stages with the only change being that it would access Area 2 via the EW Distributor instead of Wattleup Road. If a station on the Perth to Mandurah Railway is constructed at Rowley Road there is the possibility of two loop feeder routes (Cockburn to Rowley and Rowley to Kwinana)

Refer to **Appendix D** for a sketch of these routes..



9 Pedestrians & Cyclists

Given the expected traffic volumes on roads within the LSP, pedestrian footpaths should be provided on both sides of all roads (except for the NS Collector where one would be on the eastern side of the road, with a shared path on the western side). The only exception is the service road along Rockingham Road reserve, where the path need only be provided on the eastern side of the road. The provision of footpaths will address sustainability issues and encourage non-motorised transport within the LSP. These paths will link to the Local Commercial Centre at the intersection of Dalison Avenue and the NS Collector, where TCS are proposed to be installed and should have pedestrian signals installed across all legs of the intersection to further encourage pedestrian use.

The trafficable road width of all roads will allow on-road use by cyclists with ease on local roads. For the NS Collector and the EW Distributor a shared path is proposed to be installed along with on-road marked cycle lanes. Within the Area 2 LSP the shared path is proposed to be provided on the western side of the NS Collector, so that the path runs directly past the Local Commercial Centre on the correct side of the road, thus avoiding the need to cross the NS Collector. The on-road cycle lanes can be used by commuter cyclists, whilst the shared path can be utilised by workers to access lunch bars and the Local Commercial Centre on recreational/casual basis.

Refer to the sketch in **Appendix A**.



10 Conclusions

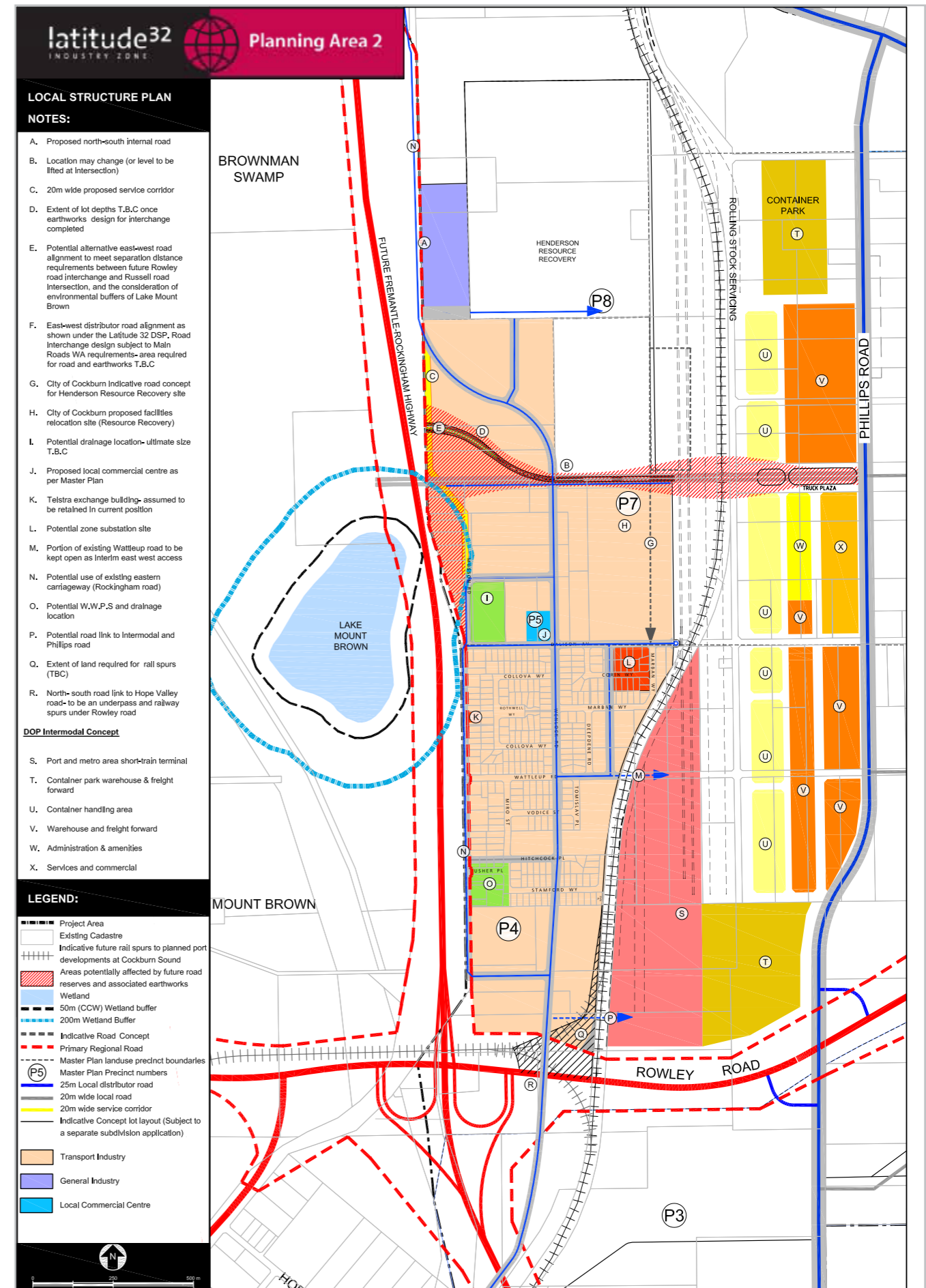
The proposed access, road layout and public transport initiatives will generally support the implementation of Area 2 towards the full development of Latitude 32. Other conclusions that have been drawn include:

- Interim access arrangements will be required and can work in the initial stages of Area 2;
- The LSP design is flexible to accommodate changes in access from interim to ultimate;
- The road network has ample capacity for expected traffic flows;
- Public transport access will decrease with the relocation of the Fremantle Rockingham Transit Way away from Rockingham Road;
- Provision of loop service bus routes are important to counter balance the effects of the relocation of the transit way;
- Access to the Flinders Precinct can be achieved via the NS Collector but design considerations needed to ensure its compatibility with a future Rowley Road and rail spurs along the north side of Rowley Road; and,
- Possible use of Area 2 to access the freight handling facility is minimal given the internal design proposed for the freight facility.

Outstanding matters (which are to be resolved outside the scope of this study) include:

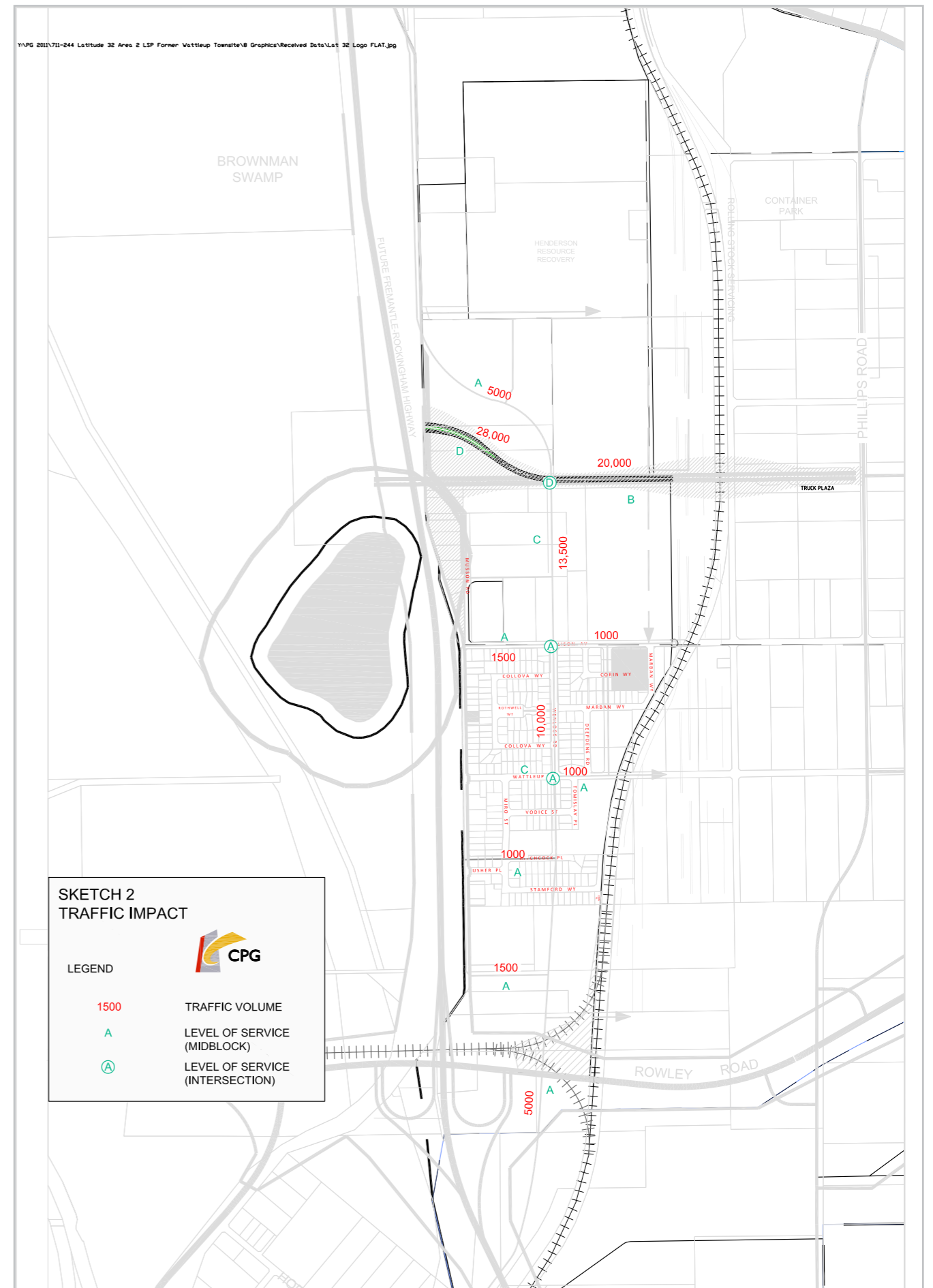
- The location and provision of an interchange for the FRCAH/EW Distributor;
- EW Distributor design and crossing of freight facility to be designed; and,
- Design of ultimate access to Flinders Precinct.

Appendix A Local Structure Plan

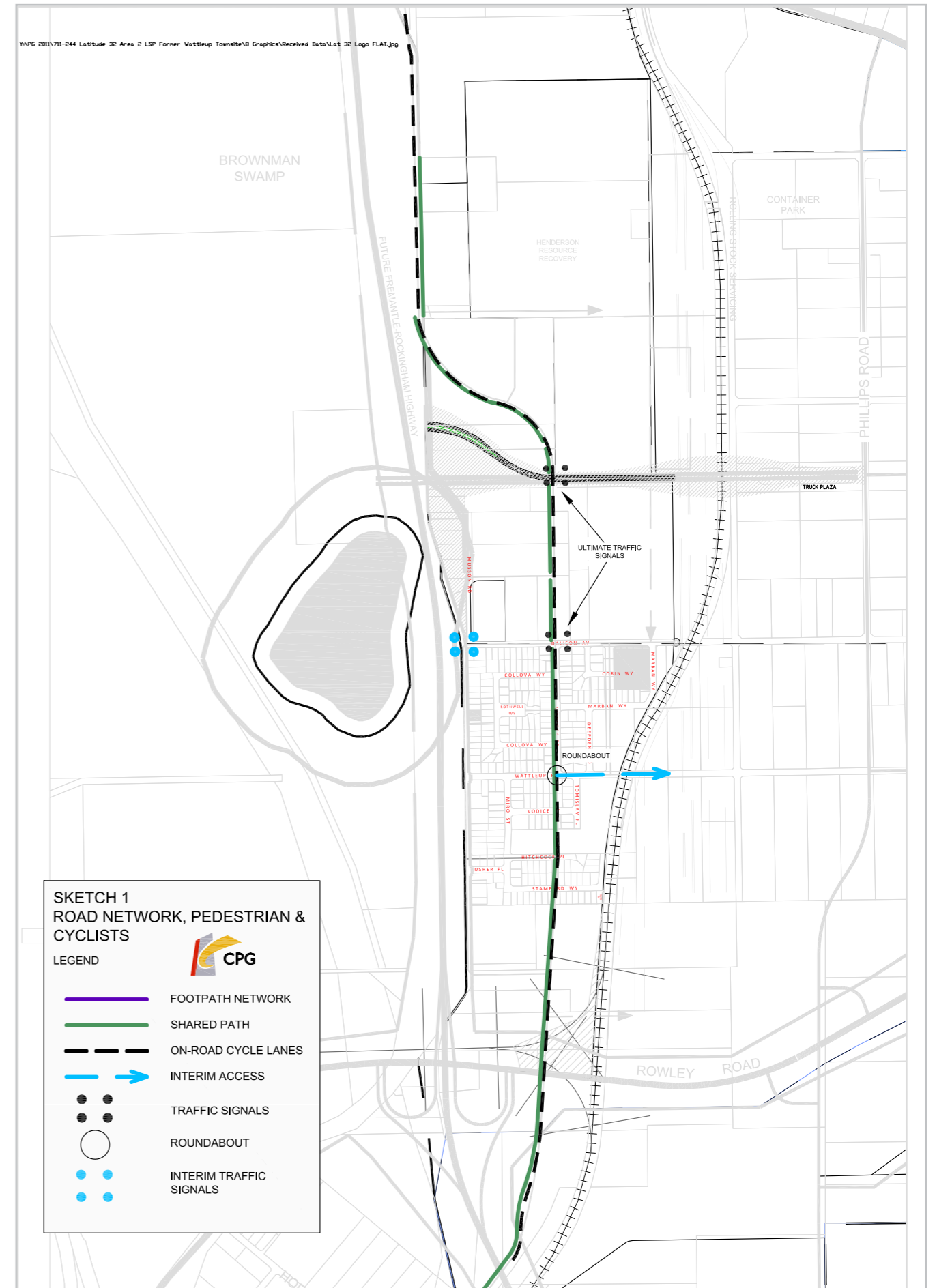




Appendix B Traffic Impact



Appendix C Road Network, Pedestrians & Cyclists





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