

**Maddington Kenwick Strategic
Employment Area**

Preliminary Transport Study

Prepared for: City of Gosnells

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EXECUTIVE SUMMARY

The City of Gosnells, through the Maddington Kenwick Sustainable Communities Partnership, is progressing the initial stages of planning for the rural area of Maddington and Kenwick. This study is one of a number which have been commissioned by the City to gain a greater understanding of the opportunities and constraints for this area. The land use planning concepts presented in the study have been based on the maximum possible yield of development that could be achieved from this area to ascertain the maximum impact and requirement for transport related infrastructure. The findings from this study will inform future land use planning and further stakeholder engagement; as such the recommendations from this study should be considered preliminary only.

ROAD ACCESS

It is estimated that the proposed industrial development and intermodal terminal when fully developed will generate some 13,038 vpd and a peak hour flow in the morning of 1,917 vpd. A total of 39% of this traffic is commercial. This volume of traffic is significant and will have a major impact on existing road access from Welshpool Road and to a lesser extent on Tonkin Highway.

Existing road access to the study area from the regional road system is generally poor but can be improved and new facilities added to provide an acceptable level service for the ultimate industrial development as currently envisaged. The most significant improvement will be required at the intersection of Welshpool and Coldwell Roads which will have to handle in excess of two thirds of the commercial traffic estimated to be generated by the study area. The proposed future grade separation of the Tonkin Highway and Kelvin Road intersection will further improve the level of service.

The improvements required to achieve the road access standards necessary to provide an acceptable level of service for the ultimate industrial development are listed in the Summary and Conclusions at section 9.2. These include the construction of an internal spine road, a temporary left in and out access from Victoria road to Tonkin Highway and an extension of the HWL Route from Tonkin Highway along Kelvin Road.

However if recommendation contained in the “Engineering Feasibility Study prepared by GHD” for the area between Yule Brook and Victoria Road to be excluded from the proposed industrial development is accepted the traffic generated would be greatly reduced as only the land south of Victoria Road would be developed.. If this were to transpire this preliminary transport study would need to be revisited to determine traffic distribution and impact on the regional road system.

RAIL ACCESS

The Public Transport Authority have indicated support for the proposed site for an intermodal freight terminal and confirm good rail access to the Forrestfield / Fremantle rail freight line is achievable.

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1. INTRODUCTION

The services of Cardno BSD have been retained by the City of Gosnells to undertake a Preliminary Transport Study for the proposed industrial development which is to form the Maddington Kenwick Strategic Employment Area. This area is bounded by Roe Highway, Welshpool Road, Tonkin Highway and Bickley Road and is generally referred to in this report as the study area.

The purpose of this Preliminary Transport Study is to conduct an initial assessment of the main transport issues which will impact on the industrial development proposed for the study area. These issues include the following

- Traffic Generation
- Traffic Distribution Patterns
- Stakeholder Comments
- Major access points to the study area via the regional road network
- Internal road layout options

In addition to the above comment is provided on the opportunities for rail access to the proposed intermodal freight terminal. This is dealt at Section 5.1.

This study is one of a number which have been commissioned by the City to gain a greater understanding of the opportunities and constraints for this area. The land use planning concepts presented in the study have been based on the maximum possible yield of development that could be achieved from this area to ascertain the maximum impact and requirement for transport related infrastructure. The findings from this study will inform future land use planning and further stakeholder engagement; as such the recommendations from this study should be considered preliminary only.

2. PROPOSED INDUSTRIAL DEVELOPMENT

2.1 DESCRIPTION

The proposed industrial development is currently zoned rural with future industrial zoning. The area extends over 585 hectares. The study area is bounded to the west by Roe Highway to the north by Welshpool Road, to the east by Tonkin Highway, and to the south by Bickley Road.

The City of Gosnells have prepared the proposed industrial land use mix which is summarised as follows and shown on a City of Gosnells plan entitled “Maddington Kenwick Strategic Employment Area”. (Refer Appendix A)

- 1 x 150,000 m² rail shunting and container yard
- 1 x 320,000 m² rail shunting and container yard
- 1 x 270,000 m² warehouse / large intermodal distributor
- 5 x 100,000 m² general industrial lots
- 122 x 10,000 m² general industrial lots
- 74 x 5,000 m² light industrial lots
- 87 x 2,000 m² light industrial/showrooms lots
- 60 x 2000 m² residential / light industrial lots.

2.2 ACCESS

The proposed industrial area identified as the study area in this report is well situated with access being available to the regional road network and being possible to the rail freight system. However the existing access to the regional road network is considered poor and there is no existing access to the rail system. The study area is positioned between two primary distributor roads these being Roe Highway and Tonkin Highway while the Forrestfield/Fremantle rail freight line runs along the western boundary of the study area.

There are four existing points of road access to the study area and these are:

- Signalised intersection of Tonkin Highway and Kelvin Road
- Welshpool Road and Coldwell Road
- Welshpool Road and Brook Road
- Bickley Road via Wanaping Road, Belmont Road or Kenwick Road.

3. EXISTING ROAD NETWORK

3.1 SURROUNDING ROAD NETWORK

The study area is currently serviced from the regional road network by all four classes of distributor roads at the access points as described below. **Drawing T5021-SK02** shows the study area and its relationship to the surrounding regional road network. Definitions of the functional classes of road are provided in **Appendix B** to this report.

Welshpool Road – District Distributor A - 70km/hr – 4 lane divided carriageway

Right turn slip into Coldwell Road – District Distributor B

Primary school on corner of Brook Road – Access Road - (40km/hr school zones)

Tonkin Hwy – Primary Distributor – 100km/hr reduced to 80km/hr at intersections– 4 lane divided carriageway

Advance Prepare to stop lights at Kelvin Road

Single diamond phasing on Tonkin Highway and Kelvin Road, all movements on Kelvin Road west, all movements on Kelvin Road east. Left turns give way.

Kelvin Road – District Distributor A - 4 lanes divided (new)

Opening at Clifford Road - Access Road with right turn slip

Dual lane roundabout at Bickley Road

Bickley Rd – Part District Distributor B and Local Distributor - 2 lane undivided

Kenwick Road – District Distributor B - 2 lane divided (painted)

Bickley Road – 2 lane divided (school along here 40km/hr)

Bickley/Brook/Grove/Coldwell Roads– 2 lane undivided

Roe Highway – Primary Distributor – 100km/hr reduced to 80 km/hr at intersections - 4 lane divided carriageway. Nearest access to Roe highway is available at the Welshpool Road and the Kenwick Link.

3.2 EXISTING TRAFFIC VOLUMES

The most recent historic traffic count information on the surrounding regional road network held by Main Roads Western Australia was sourced. This data is shown in **Table 1** below which is to be read in conjunction with **T5021-SK01** which shows diagrammatically the traffic volumes of the surrounding regional road network. These volumes include the average weekday traffic as recorded by Main Road WA in October 2004 as well as forecast traffic volumes from the Main Roads WA traffic model for the year 2011. It is important to note these forecast volumes do not include the additional traffic attracted to and generated by the study area.

TABLE 1 – EXISTING TRAFFIC VOLUMES ON REGIONAL NETWORK – OCTOBER 2004													
Location		AAWT			Am Peak				Pm Peak				Date
		Total	N/E	S/W	Total	N/E	S/W	Time	Total	N/E	S/W	Time	
Tonkin Hwy	south of Kelvin Road	28,885	14,647	14,238	2,541	1,737	804	7.00am	2,633	896	1,737	4.30pm	Oct-04
Tonkin Hwy	north of Welshpool Road	29,758	15,025	14,733	2,588	1,582	1,006	7.00am	2,641	1,070	1,571	4.00pm	Oct-04
Tonkin Hwy	south of Welshpool Road	35,732	18,177	17,555	3,068	1,995	1,073	6.45am	3,145	1,217	1,928	4.00pm	Oct-04
Welshpool Rd	east of Tonkin Hwy	15,735	7,794	7,941	1,520	341	1,179	7.15am	1,461	1,079	382	4.45pm	Oct-04
Welshpool Rd	west of Tonkin Hwy	21,205	10,512	10,693	2,022	469	1,553	7.00am	1,911	1,377	534	4.30pm	Oct-04
Coldwell Rd	south of Welshpool Road	3,961	1,949	2,012	287	152	135	10.00am	379	143	236	3.15pm	Oct-04
Bickley Rd	north of Wanaping Rd	4,931	2,429	2,502	348	207	141	7.00am	469	186	283	3.15pm	Oct-04
Bickley Rd	west of Kelvin Rd	4,989	2,969	2,020	316	146	170	7.00am	421	248	173	4.00pm	Oct-04
Kelvin Rd	west of Maddington Rd	17,411	8,844	8,567	1,324	728	596	7.30am	1,501	738	763	3.30pm	Oct-04
Kelvin Rd	east of Tonkin Hwy	5,236	2,537	2,699	485	178	663	7.45am	465	235	230	3.00pm	Oct-04
Kelvin Rd	west of Tonkin Hwy	15,511	7,847	7,664	1,203	524	679	7.15am	1,436	822	614	4.00pm	Oct-04
Kelvin Rd	west of Bickley Rd	14,393	7,360	7,033	1,105	572	533	7.15am	1,237	693	544	4.00pm	Nov-05
Roe Hwy	bridge over Welshpool Rd	33,273	17,140	16,133	3,028	1,723	1,305	7.00am	3,003	1,462	1,540	4.15pm	Oct-04
Roe Hwy ramp	Welshpool on ramp	5,388	5,388		320	320		10.00am	645	645		4.15pm	Oct-04
Roe Hwy ramp	Welshpool off ramp	7,669	7,669		816	816		7.00am	550	550		2.15pm	Oct-04

4. TRAFFIC GENERATION

A trip generation exercise was undertaken to estimate the volume of traffic to be generated by the proposed industrial development.

A document review of the manuals “*Guide to Traffic Generating Developments*”, *Road and Traffic Authority, NSW, October 2002* and ‘*Trip Generation – 6th Edition (1997)*’ *Institute of Transportation Engineers, USA* as well as previous reports produced by Cardno BSD for industrial estates was undertaken to ascertain suitable trip generation rates.

4.1 INTERMODAL TERMINAL

The northwest corner of the study area is primarily proposed to be an Intermodal Freight Terminal (road and rail). The total study area for this land use is proposed to be approximately 74 hectares. Trip generation rates documented in ITE for a truck terminal were in the order of 2 trips per 100m² per day based on data from sites approximately 5-6 hectares in size. Adopting this generation rate was not considered to be appropriate for the large site proposed and resulted in the estimation of excessive trips. It is considered that the proposed terminal would be very similar to the facilities at the existing Kewdale Freight Terminal. A study completed in August 2004 by BSD titled “*Kewdale Freight Terminal, Traffic Study for Stage 1 of the Master Plan*” provided detailed information pertaining to the existing and proposed generation rates of the site.

The existing Kewdale Freight Terminal occupies about half the total site area of 110 hectares. The redeveloped Terminal when complete will occupy the whole of the site. Stage 1 of this redevelopment when complete will occupy an area in the order of 75 hectares. Consequently the 74 ha in the study area proposed for an intermodal freight terminal is comparable in size. The average trip generation rate based on the existing situation and the future development of the Kewdale Terminal is approximately 22 trips per hectare per day. This equates to approximately 2.4 and 2.9 trips per hectare during the am and pm peak hours respectively. It should be noted that these rates are primarily for heavy vehicles i.e. commercial trips travelling in/out of the terminal gates and do not include light vehicles that would be typically generated by employees and their visitors.

No specific rates are available for the generation of employee traffic. Stage 1 of the Kewdale Freight Terminal redevelopment proposes approximately 500 parking bays. As previously indicated this is comparable in size and use to the proposed intermodal terminal in the study area. Therefore this information can be used to estimate the number of light vehicles generated i.e. employees and visitors. Based on this information it is assumed that the car park use would be 80% employees and 20% visitors, 30% travel off site once a day for meetings/lunch, 80% and 10% of employees and visitors respectively arrive/depart during the peak hours, the average utilisation of the visitor car park is 40% 5% of employees use public transport. Therefore it is estimated that approximately 420 employees could work at the site resulting in a daily trip generation rate of 4.0 trips/employee/day which corresponds to 0.78trips/employee/hr.

4.2 RESIDENTIAL/INDUSTRIAL BUFFER

A length of land fronting Bickley Road, between Kenwick and Belmont Roads, adjacent to the existing residential area is also proposed to be zoned residential/light industry. It is envisaged that these would be residential homes including a small business. Accordingly, the typical single residential trip generation rate of 9 trips per dwelling is proposed. While trips to work would be less due to working from home these are considered to be balanced by additional work based commercial trip to the residence/work site.

4.3 GENERAL / LIGHT INDUSTRIAL PARK

The remaining southeast portion of the study area (approximately 226.4ha) will primarily comprise of a range of lots sizes including 100,000m², 10,000m², 5,000m² and 2,000m². General light industry would be permitted including warehouse and showroom type facilities. The most appropriate rate for this large industrial area would be that for an industrial park. The ITE rates for an industrial park are provided by number of employees, GFA and site area. The rates by GFA and site area appeared to more appropriate for smaller sites eg: up to 60 hectares. While the data for employees was typically based on up to 3,000 employees with as many as 6,000 employees. The City of Gosnells have advised that approximately 14-18 employees are expected per hectare. Adopting the average rate of 16 employees per hectare it was estimated that the industrial park site may employ 3,622 persons. The regression equation for the trip generation i.e. $\ln(\text{daily trips}) = \ln(\text{employees}) + 2.57$.

4.4 SUMMARY

Table 2 below details the key land uses within the study area and the associated trip generation rates and numbers. In summary the industrial development will generate an additional 13,038 daily trips. This corresponds to approximately 1,917 and 1,867 trips during the am and pm peak hours respectively.

Table 2: Trip Generation of Proposed Industrial Site

Land Use	Site Area /Employees	Comments	Trip Generation Rates			Trip Generation		
			Daily	Am Peak	Pm Peak	Daily	Am Peak	Pm Peak
Intermodal freight Terminal	74 ha	Commercial Trips	22/ha	2.9/ha	2.4/ha	1,628	178	215
Intermodal freight Terminal	420 empl	Employee Trips	4.0emp	0.78/emp	0.78/emp	1,680	328	328
Industrial Park	226.4ha	3622 employees	Regression Equation Used			9,190	1,360	1,274
<i>(Boundary to Victoria)</i>	<i>121.6ha</i>	<i>1946 employees</i>				<i>4,937</i>	<i>731</i>	<i>684</i>
<i>(Victoria to Kelvin)</i>	<i>81.4ha</i>	<i>1302 employees</i>				<i>3,303</i>	<i>489</i>	<i>458</i>
<i>(south of Kelvin)</i>	<i>23.4</i>	<i>374 employees</i>				<i>949</i>	<i>140</i>	<i>132</i>
Residential / Light Industrial	90 dwells		9/dwell	0.85/dwell	0.85/dwell	540	51	51
						13,038	1,917	1,867

5. STAKEHOLDER COMMENTS

The proposed industrial development area bounded by Roe Highway / Welshpool Road / Tonkin Highway and Bickley Road is shown on a City of Gosnell's plan entitled "Maddington Kenwick Strategic Employment Area" was canvassed with the following organisations to obtain advice on transport planning, traffic and road access issues. The comments and advice provided at these meetings is summarised in sections 5.1 to 5.4 below and where appropriate has been incorporated into this study.

5.1 PUBLIC TRANSPORT AUTHORITY

The proposal to develop an intermodal freight terminal including rail sidings a container yard and warehousing at the north west corner of the proposed industrial development was canvassed with the PTA's (Public Transport Authority) Manager Planning and Property, Laurie Piggott, at a meeting on 23 February 2006 at the Rail Centre East Perth.

The Manager Planning and Property considered the proposed site would have good access to the Forrestfield/Fremantle dual track and dual gauge freight rail line. In addition it would have convenient road access to the adjacent proposed industrial development and good road links to the industrial areas at Canningvale, Belmont, Kewdale and the Airport via Welshpool Road. It would also have direct rail access to the main intermodal terminal at Kewdale currently being redeveloped.

Advice on rail design for the terminal or its connection to the mainline was not able to be provided. However it was agreed that the construction of the spur line to service the terminal as a loop should provide the best level of service.

The option of road access to the Roe Highway via a crossing of the Forrestfield /Fremantle freight line was discussed. It was noted that a grade separation would be impracticable due to physical constraints and advice was given that a level crossing would not be approved. Consequently access to Roe Highway would have to be via Welshpool Road.

In summary the Manager Planning and Property considered the site of the proposed intermodal terminal would provide a good opportunity for private rail transport operators and should be supported.

5.2 MAIN ROADS WA

Road access to and from the proposed industrial development was canvassed with the Project Development Manager, Road Network Operation Branch, MRWA (Main Roads Western Australia), Craig Wooldridge, at a meeting on 23 February 2006 at the MRWA offices in East Perth.

It was confirmed that Tonkin Highway was planned as a future freeway standard route and that the Roe Highway was already grade separated at and south of the Welshpool Road interchange. It was

further indicated that further access to the Tonkin and Roe Highways beyond existing intersections was opposed.

The Project Development Manager acknowledged the intersection of Tonkin Highway and Kelvin Road required expansion with additional right turning capacity needing to be provided to reduce the level of congestion currently being experienced. This task is to be considered for inclusion in a future works programme. In the future grade separation at this intersection should be sufficient to handle traffic from the proposed industrial development in the study area. However an impediment to the future grade separation was the “Bush for Ever” site on the north side of Kelvin Road and on the west side of Tonkin Highway. This would need to be resolved if the future grade separation is to be constructed.

The requirement for road access to Welshpool Road between Tonkin Highway and Hale Road from the study area was appreciated and noted. In addition Main Roads WA is willing to consider access to the proposed intermodal terminal at Hale Road traffic signals.

At the time of preparing this draft report comment is awaited from the MRWA on the intersection with Coldwell Road and a proposed new intersection some 100 metres to the east with a yet to be constructed road Lancelot Green.

5.3 DEPARTMENT FOR PLANNING AND INFRASTRUCTURE

The proposed industrial development was canvassed with the DPI’s (Department for Planning and Infrastructure) Project Manager Strategic Planning and Infrastructure Branch, David McCleod, at a meeting on 27 February 2006 at the DPI’s office in Albert Facey House Forrest Place.

The Project Manager commented the demand for industrial land is strong (Frank Knight Report-October 2005) and that the views of the PTA on the intermodal terminal were generally supported. It was confirmed the proposed industrial development had been identified in the Industrial Land Development Programme being prepared by the DPI. In the draft programme the land was categorised as a future long term industrial development area (greater than 5 years).

It was considered the proposed industrial development should first focus on providing road access. In this regard a north to south spine road through the proposed development connecting Welshpool and Kelvin roads was suggested. It was thought this would provide sufficient access and connectivity for the proposed development. No opinion was expressed on the option of providing an additional temporary access to Tonkin Highway to service the proposed development prior to the eventual grade separation at the Tonkin Highway /Kelvin Road intersection. The provision of HWL (High Wide Load) access to the development connecting to the proposed main HWL route on Tonkin Highway was considered necessary.

5.4 SHIRE OF KALAMUNDA

The proposed industrial development was discussed with the Executive Manager Planning & Development Services, Sue Burrows and the Executive Manager Engineering Services, Mahesh Singh of the Shire of Kalamunda at their offices on 2 March 2006. The Manager Technical Services for the City of Gosnells, Brad Harris and the Coordinator Strategic Planning for the Shire of Kalamunda, Simon Wilkes were also in attendance at this meeting.

The following points were raised with the request they be addressed during the planning and design process for the development.

- There is major residential development occurring immediately north of Welshpool Road. The development is identified as Wattle Grove Urban Cell U9. This residential development is adjacent to the proposed industrial development and intermodal terminal. Accordingly noise and vibration levels need to be mitigated to protect the amenity of residents.
- The next stage of construction of urban cell U9 involves the construction of a new subdivisional road named Lancelot Green with access to Welshpool Road. This will be close to the existing intersection of Coldwell Road with Welshpool Road. A realignment of Coldwell Road to line up with Lancelot Green should be investigated.
- The Wattle Grove Primary School on the south side of Welshpool Road is to remain. It should be noted that standard 40KPH speed zones are in place. As far as practicable the primary school should be isolated from and protected from heavy traffic movements in and out of the proposed industrial area.
- The Hale/ Welshpool Road intersection is badly congested and there is concern that the proposed industrial area will add to the congestion. Mitigation measures should be investigated.
- It should be noted that the MRWA is responsible for the section of Welshpool Road west of the Tonkin Highway that is in the Shire of Kalamunda.

6. INTERNAL ROAD NETWORK LAYOUT OPTIONS

6.1 OPPORTUNITIES AND CONSTRAINTS

In order to develop the internal road network layout the various opportunities and constraints were mapped on the study area. **T5021-SK03** summarises these graphically.

Opportunities with respect to study area access were investigated. While the study area is strategically located in close proximity to key transportation routes such as Tonkin Highway and Roe Highway it is poorly serviced by the regional road network. Roe Highway and Tonkin Highway to the west and east effectively constrain the study area along these boundaries. Access is currently only available at the northern and southern boundaries via Welshpool Road and Kelvin Road/Bickley Road.

Existing access to the study area is provided at two T-junctions along Welshpool Road namely Brook and Coldwell Roads. Wattle Grove Primary School is located on the corner of Welshpool Road and Brook Road which is categorised as an access road. As the primary school is to be maintained and Brook Road's functional class is an access road it is therefore not supported as an appropriate access route for heavy vehicles into the study area.

Coldwell Road is well located centrally along the study area's Welshpool Road boundary and thus would provide an appropriate access point from the north. Welshpool Road in this vicinity provides adequate width for turning pockets. However the impact of the proposed construction of a new subdivisional road 'Lancelot Green' to service the new residential area being developed on the north side of Welshpool Road in the Shire of Kalamunda is an issue. This road will intersect with Welshpool Road on the west side of the existing service station on the north side of Welshpool Road just to the east of Coldwell Road. This new intersection is estimated to be approximately 100m to the east of the existing Coldwell Road intersection. Consideration needs to be given to the type and number of movements to be permitted at the Lancelot Green intersection and how this interacts with the existing and proposed Coldwell Road intersection.

Three configurations at this preliminary stage have been identified as the most likely options. Option 1, Lancelot Green is left turn access only hence its interaction with Coldwell Road is minimal thus existing geometry would be adequate. Option 2, Lancelot Green is to permit all turn movements but does not require signalisation. As such Coldwell Road could be realigned slightly to the west to increase the distance between the two intersections (>100m) so potential queuing does not impact the operation of Lancelot Green. Option 3, Lancelot Green is to permit all turn movements but does require signalisation. As such the creation of a 4 way signalised intersection with Coldwell Road should be investigated through realignment of the roads. The requirements of the Lancelot Green need to be considered further and are outside the scope of this project.

A third opportunity to gain access along Welshpool Road exists at the signalised T-junction of Hale Road and Welshpool Road. It should be noted the Main Roads have indicated they are prepared to consider modification of this intersection into a 4 way to allow access into the north-west corner of the study area via the traffic signals. The two main disadvantages of this option is that the access is not

centrally located for the south-east corner and there is limited length along Welshpool Road and over the Rail bridge before the Roe Highway interchange for a turning lane to be accommodated. It would therefore appear preferable for traffic from the intermodal terminal to use Coldwell Road for access. However there may still be a requirement for some intermodal terminal traffic to have access to the Hale Road intersection (eg: exit movements). Consequently this option should be left open until more accurate traffic predictions are available

Kelvin Road and Bickley Road form the southern boundary of the study area. Kelvin Road connects to Tonkin Highway with the intersection being controlled via traffic signals. Liaison with Main Roads has indicated that this intersection will ultimately become grade separated to allow Tonkin Highway to be uninterrupted flow as per freeway standards. While the existing signalised intersection of Kelvin Road and Tonkin Highway is possibly approaching its capacity as evidenced from visual siting of queue lengths, it is expected that a grade separated intersection which effectively removes the Tonkin Highway through traffic from the equation would have ample capacity to cater for full development of the study area. In the meantime Main Roads should be requested to mitigate the congestion of the existing intersection by the addition of an additional right turning lane on Tonkin Highway for traffic travelling south.

Kelvin Road adjacent to the study area between Tonkin Highway and Bickley Road is constructed to a four lane divided carriageway standard with the provision for right hand turning lanes. As such a new intersection needs to be created along this length of Kelvin Road in order to provide access into the study area. The existing intersection of Clifford Street with Kelvin Road is considered too close to the signalised intersection of Kelvin Road and Tonkin Highway. It is likely that queuing from this signalised intersection would disrupt traffic flow at Clifford Street. Additionally, there is inadequate width on Kelvin Road at Clifford Street to provide adequate turning lanes for heavy vehicles.

The first opportunity to provide access to the study area along Kelvin Road would be to create a new 4 way intersection at the existing Kenwick Road / Kelvin Road intersection. It is likely such an intersection could operate without traffic signals and normally roundabout control would be preferred to stop/give way control with respect to through movements along Kenwick Road. However consideration needs to be given to HWL (high-wide load access) to connect with the proposed HWL route along Tonkin Highway. Roundabouts do not typically facilitate the turning movements of such vehicles. Accordingly this option is not the preferred location for a new access point to the study area.

The preferred option for another major access to the study area is to connect the proposed internal spine road as a T intersection mid way between the intersections of Bickley / Kelvin Roads and Kelvin / Kenwick Roads. This is dealt with in more detail at Section 8.3.

Roe Highway adjacent to the site between the Kenwick Link and Welshpool Road is approximately 4km in length. As such the opportunity to provide a new connection half way along this section of Roe Highway say at Bickley Road was investigated. This option of road access from Roe Highway would require crossing of the Forrestfield /Fremantle rail freight line. This was discussed with the Public Transport Authority. It was noted that a grade separation would be impracticable due to physical constraints and advice was given that a level crossing would not be approved. In any event

Roe Highway is grade separated south of Welshpool Road and MRWA would not accept an at grade intersection. Consequently access to Roe Highway would have to be via Welshpool Road.

Tonkin Highway bounds the eastern side of the site. There is approximately 2km between the existing signals at Welshpool Road and Kelvin Road. As such an additional access point into the site controlled by signals between these two existing signals would not be permitted by Main Roads. The opportunity to provide a left turn access along this length say at Victoria or Brentwood Roads with appropriate acceleration and deceleration facilities may exist if a strong case can be developed. The provision of a left turn access along Tonkin Highway south of Kelvin at Bickley Road may also be an option. It should however be noted that Main Roads have previously provided a negative response to both these propositions by the City of Gosnells.

Several roads to the south of the study area have residential frontage. These include Wanaping Road, Belmont Road, Bickley Road and Kenwick Road. As such the use of these roads by heavy vehicular traffic is undesirable and should be discouraged. Traffic travelling along Roe Highway, south of the Kenwick Link could potentially use these residential roads. This traffic has two options for accessing the industrial development. North of the site by travelling along Roe Highway to Welshpool Road or alternatively exiting Roe Highway at the Kenwick Link. The desirable route from the Kenwick Link would be to travel to Kelvin Road to directly access the site however there is the possibility that traffic may elect to travel along Royal St/Wanaping Rd or Austin Ave/Belmont Rd. Appropriate LATM devices may need to be used to discourage the use of these routes by heavy vehicular traffic.

6.2 INTERNAL ROAD NETWORK LAYOUTS

For the optimum servicing of the internal road layout for the proposed industrial development an internal spine road through the study area should be provided. This would allow easy access to either end of the study area via either the north (Welshpool Road) or the south (Kelvin Road). Additionally, it is likely that within the study area there would be internal traffic movements in particular from the industrial park to the rail yard. It is more desirable to accommodate this internal traffic within the study area on an internal spine road than direct it back onto the external primary distributor road network (i.e. Tonkin and Roe Highway) or onto the residential road network i.e. (Kenwick Road and Bickley Road). Therefore an internal spine road is preferred linking the Welshpool Road access at Coldwell Road and Kelvin Road, midway between the intersection with Kenwick and Bickley Roads. Unfortunately, the presence of the Greater Brixton Street Wetlands and Bush Forever Site 387 which bisects the proposed study area is likely to prohibit the construction of an internal spine road that directly links these two access points.

Two internal spine road options are therefore canvassed. Option 1 provides for an internal spine road directly linking Welshpool and Kelvin Roads. Option 2 provides for an internal spine road that is central through the southern part of the study area following the line of Option prior to diverting and linking indirectly to Coldwell Road before travelling north to Welshpool Road. These two options have been developed based on the study area's environmental constraints. **T5021-SK05** shows the proposed internal road network and the two internal spine road options.

There is the potential without appropriate LATM devices that unwanted heavy vehicular traffic from Roe Highway, south of the Kenwick Link may elect to use Wanaping Rd and Belmont Rd to access the industrial development. It is considered that this is more likely to occur under Option 2 with the indirect internal spine road than with Option 1.

It would be undesirable for heavy vehicle traffic to use Brook Road near the Welshpool Road end as this intersection is the address for the Wattle Grove Primary School. It would therefore be recommended that some LATM device be installed to prevent access to/from this intersection by heavy vehicle traffic or alternatively a road closure.

7. TRAFFIC DISTRIBUTION

7.1 TRIP PURPOSE

The distribution patterns of the industrial trips will vary depending on the trip purpose. Two main trip purposes were identified. These being work-home based trips and work-commercial based trips.

To assist with developing the distribution patterns of the work-home based trips data from the Australian Bureau of Statistics was sourced for those persons currently working within the City of Gosnells and where they reside within the Perth Metropolitan region.

For the distribution of work-commercial based trips a review of the major transportation attractors was undertaken. These included Fremantle Port, Perth Airport, Kewdale Freight Terminal, Forrestfield Marshalling Rail Yard and the Kwinana Industrial Area.

The approach/departures routes for the various trip purposes were then estimated as shown in **Table 3**.

Table 3: Trip Distribution Patterns by Trip Purpose

Route	Home Based	Commercial Based
Roe Hwy (north)	3%	15%
Tonkin Hwy (north)	5%	20%
Orrong Road (west)	10%	25%
Welshpool Rd (east)	5%	5%
Tonkin Hwy (south)	20%	15%
Roe Hwy (south)	17%	10%
Leach Hwy (west)		(10%)
Brixton/Wanaping/Bickley (west)	2%	1%
Royal/Wanaping/Bickley (south)	10%	1%
Belmont/Bickley (south/west)	13%	4%
Kelvin Rd (south)	15%	4%
	100%	100%

7.2 APPROACH/DEPARTURE PATTERNS

The approach and departure patterns into the industrial development will also be dependent on the internal road layout and road access points. As outlined in section 6.0 two main access points have been proposed. These are Welshpool Road in the north and Kelvin Road to the south. A temporary left in/left out access is proposed along Tonkin Highway. The results of the trip distribution are shown diagrammatically in **Drawing T5021-SK04** for option 1 and 2 for the internal spine road and with the proposed left turn access to and from Tonkin Highway in place.

It should be noted that the traffic distribution exercise assumes that heavy vehicular traffic entering via the south along Wanaping Road and Belmont Road would be minimal i.e. some single units and would already be local traffic. The same distribution of traffic has been adopted for Option 1 and 2 assuming

appropriate LATM devices are in place to discourage the use of these routes by Roe Highway traffic, south of the Kenwick Link.

8. INTERSECTION CONFIGURATIONS

The configurations of the major intersections servicing the study area are discussed in the paragraphs below. Indicative layouts and locations of these intersections are shown on **Drawing T5021-SK06**.

8.1 WELSHPOOL / COLDWELL ROADS INTERSECTION

The intersection of Welshpool Road and Coldwell Road is likely to require signalisation with the ultimate development of the industrial area. Existing traffic volumes along Welshpool Road, west of Tonkin Highway are in the order of 21,000vpd and these are expected to increase slightly to 22,000vpd in the year 2011. It is estimated that the development traffic only along Coldwell Road will be approximately 5-7,000 vpd depending on the internal road layout. The existing volume of Coldwell Road is 4,000 vpd which is largely attributed to through traffic from the surrounding residential areas using Roe Highway, Orrong Road and Tonkin Highway. It is therefore unlikely that this existing volume would decrease significantly

While the existing intersection operates satisfactorily as a channelised T-junction with a right turning pocket this will need to be upgraded to traffic signals based on several factors. These being traffic volumes, traffic composition and safety. It is suggested that a left turn pocket on Welshpool Road be constructed to minimise disruption to through traffic. The Shire of Kalamunda also advised that a new sub-divisional access road “Lancelot Green” is proposed to the east of Coldwell Road, north of Welshpool Road. The approximate distance between these intersection is 100m. Depending on the traffic movements to be permitted and type of control required at the Lancelot Green intersection three main options have been identified:

1. Lancelot Green is left turn access only hence its interaction with Coldwell Road is minimal thus existing geometry would be adequate.
2. Lancelot Green is to permit all turn movements but does not require signalisation. Coldwell Road could be realigned slightly to the west to increase the distance between the two intersections (>100m) so potential queuing does not impact the operation of Lancelot Green.
3. Lancelot Green is to permit all turn movements but does require signalisation. The creation of a 4 way signalised intersection with Coldwell Road should be investigated through realignment of the roads.

No traffic assessment is currently available regarding the new Lancelot Green connection to estimate the ultimate traffic to use the intersection to access Welshpool Road and thus the appropriate intersection layout. The requirements of this new Lancelot Green connection need to be considered in conjunction with the requirements of the Coldwell Road industrial development connection in order to determine the appropriate configuration and traffic treatments along Welshpool Road.

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8.2 KELVIN / PROPOSED INTERNAL SPINE ROAD INTERSECTION

Kelvin Road, near Tonkin Highway currently carries approximately 15,500 vpd. It has been estimated from the Main Road WA modelling that this figure may actually decrease to 13,500 vpd in 2011. This is considered to be an impractical modelling result as no other road network alterations in the

immediate vicinity are proposed in the next 5 years which could explain this loss and there is expected to be growth in both industrial and residential land uses in Maddington. Consequently at the very least there would be minimal traffic growth. It is estimated that approximately 2-4,000 vpd would access the proposed industrial development area along the proposed internal spine road.

Due to the presence of heavy vehicles it is important that adequate turning lanes on Kelvin Road be provided at the intersections with Kenwick Road and the proposed internal spine road in order to minimise the disruption of turning vehicles to through traffic. At the Kenwick Road intersection adjacent right turning lanes need to be developed in Kelvin Road to service both side roads. The location of the intersection of the internal spine road with Kelvin Road mid way between the intersections of Bickley / Kelvin Road and Kelvin / Kenwick Roads will allow sufficient room for these turning lanes to be developed.

Based on these numbers the operation of the internal spine road intersection would be similar to the existing unsignalised intersection of Welshpool / Coldwell Roads. Accordingly it is proposed the intersection not be signalised. The intersection would operate as a staggered T arrangement with the existing Kenwick Road /Kelvin Road intersection allowing for through traffic north and south of Kelvin Road.

8.3 KELVIN ROAD / TONKIN HIGHWAY

The existing intersection of Tonkin Highway and Kelvin Road is controlled via traffic signals. On site observation has indicated the presence of long queues during the peak hours. SCATS data indicates that this intersection carries up to 3,400- 3,800 vph during the am and pm peak periods. The proposed development will require approximately an additional 340-450 vph to travel through this intersection. This represents approximately 10% of the total intersection traffic volume or more if the respective intersection legs are considered. For example 25-45% along the Kelvin Road west approach during the am and pm peak hours. Traffic volumes along Tonkin Highway in this vicinity are expected to increase from 35,700 (2004) to 37,200 (2011). This is a 4% increase in traffic along Tonkin Highway over 7 years.

An additional right turn pocket on Tonkin Highway would reduce current congestion and mitigate congestion once the projected future traffic from the study area comes on stream. However the intersection may not operate with an acceptable level of service once the projected future traffic from the study area is fully on stream until it is grade separated.

Introducing a left turn in and out to service the study area from Tonkin Highway may also provide some interim relief as it is possible this would remove the need for some of the study area traffic to pass through the intersection. It is appreciated that it is the left turning traffic from the intersection that is being removed which does not always improve the operation of other traffic movements at the intersection except at congested intersections. At congested intersections it is likely that the through traffic queues back preventing the clearing of left turn traffic thus disrupting the through traffic or excessive left turning traffic blocking the through lane thus disrupting through traffic. This is likely to occur on Kelvin Road were the approach width is narrow. By allowing a left in and out off Tonkin

Highway, north of Kelvin Road the volume of traffic through the intersection can be reduced to 220-330vph. By allowing a left turn in and out off Tonkin Highway, south of Kelvin Road the traffic through the intersection can be further reduced to 190-300vph. This is not as significant as the reduction attributed from the provision of the left turn north of Kelvin Road. This is discussed further in section 8.5 below.

8.4 TEMPORARY LEFT TURN ACCESS TO TONKIN HIGHWAY

The MRWA have advised in a letter to the City of Gosnells that Tonkin Highway is to be upgraded in the future to freeway standard with grade separation to be provided at Welshpool and Kelvin Roads. MRWA have therefore advised left turn access to and from the Tonkin Highway would not be permitted. However a temporary left turn access could be provided at Victoria Road about halfway between the Welshpool and Kelvin Road intersections prior to the proposed freeway standard being achieved without significant impact on Tonkin Highway. Acceleration and deceleration lanes will need to be provided on Tonkin Highway for this access. Based on the preliminary evaluation there is little reduction to the traffic through the intersection of Kelvin Road and Tonkin Highway with the provision of a left turn, south of Kelvin Road.

Once the grade separated intersection at Kelvin Road is in place the increased capacity of the intersection would mean the temporary left turn access to Tonkin Highway would no longer be required and could be removed. This requirement could be covered by an appropriate development approval condition set by the Western Australian Planning Commission.

8.5 WELSHPOOL/HALE ROADS INTERSECTION

The intersection of Welshpool Road and Hale Road has previously been identified as a possible access point into the development via the creation of a four way intersection at the existing traffic signals. While the preliminary traffic distribution does not allow for this access it should not be discounted at this preliminary stage. This access point would solely service the Intermodal terminal site. Unfortunately the existing Hale Road intersection is in close proximity to the Roe Highway bridge and as such the available queue length and width for the provision of a right turn pocket is restricted. Hence it is not recommended for the entire development. This creation of a 4 way intersection should be further evaluated as part of a more detailed traffic assessment with respect to right turn capacity or even just as an egress from the site. Consideration will also need to be given to the advantages an additional access both entry and exit creates including the disadvantages such as the additional delay that could be incurred by through traffic along Welshpool Road due to increased cycle times to accommodate additional turning movements associated with a 4 way intersection compared to a T-junction.

9. SUMMARY AND CONCLUSION

9.1 TRAFFIC GENERATION AND DISTRIBUTION

It is estimated that the proposed industrial development and intermodal terminal when fully developed will generate some 13,038 vpd and a peak hour flow in the morning of 1,917 vpd. A comparison of the estimated 24 hour study area traffic (at the main access points) with the estimated traffic on the regional road system in 2011 excluding the study traffic is shown in Table 4 below. This table indicates that the intersection of Coldwell and Welshpool Roads will have the greatest use by Study area traffic whether the Option 1 or 2 layouts for the internal spine road is adopted. In addition the greatest increase in the regional road traffic as a result of the study area traffic will be on Welshpool Road. Table 4 also demonstrates that between two thirds and three quarters of all study area commercial traffic will use the intersection of Coldwell and Welshpool Roads.

Table 4: Comparison Estimated Study Area Traffic with Estimated 2011 Traffic				
Location	24 Hour Traffic Volumes			
	2011	Study Area Traffic	%	
			Study Area Traffic	Regional Road Traffic
Welshpool Road Study Traffic accessing at Coldwell	34,400	6,845 (3,867)	52 (76)	20
		<i>5,318 (3,270)</i>	<i>41(67)</i>	<i>15</i>
Tonkin Highway Study Traffic accessing at Kelvin	37,200	1,473 (390)	11 (8)	4
		<i>2,230 (858)</i>	<i>17(18)</i>	<i>6</i>
Tonkin Highway Study Traffic accessing at Victoria	37,200	860 (215)	7 (4)	2
		<i>860 (215)</i>	<i>7 (4)</i>	<i>2</i>
Study Traffic accessing from south via Kelvin	NA	1,522 (238)	12 (5)	NA
		<i>2,511 (238)</i>	<i>19 (5)</i>	<i>NA</i>
Study Traffic accessing from south via Wanaping, Kenwick,Belmont	NA	2,339 (386)	18 (8)	NA
		<i>2,118 (285)</i>	<i>16 (6)</i>	<i>NA</i>

Note - Option 2 road layout results are shown in Italics

- (222) Numbers in brackets represent commercial vehicle component.

9.2 ROAD ACCESS

The impact of the estimated study area traffic is significant and will have a major impact on existing road access from Welshpool Road and to a lesser extent on Tonkin Highway. Consequently the existing road access to the study area which is generally poor will need to be improved and new

facilities added to provide an acceptable level service for the ultimate industrial development as currently envisaged.

However it is noted from the Engineering Feasibility Study prepared by GHD for the proposed development for the City of Gosnells recommends that the area between Yule Brook and Victoria Road be excluded from the proposed industrial development. The rationale for this recommendation is that the land includes a number of conservation category and resource enhancement wetlands. *“The development of land in areas identified as conservation category and resource enhancement wetlands are contrary to a number of State Government policies and position statements and are unlikely to be supported by the Department of Environment”*

If this occurs only the land south of Victoria Road would be developed so the traffic generated would be much smaller and the impact on the regional network proportionately reduced. Should it be confirmed that these environmental constraints will indeed apply then this preliminary transport study will need to be revisited.

On the basis that the ultimate industrial development proceeds, both road access standards and intersection layouts need to improve. For such a significant industrial development an extension of the proposed HWL (High Wide Loads) Route on Tonkin Highway may be required to service the study area. This is covered in Item 9.2 below. To achieve the road access standards necessary to provide an acceptable level of service for the ultimate industrial development the following actions are proposed -

- 9.1 The construction of internal spine road to service the development linking the Coldwell Road intersection with Welshpool Road to Kelvin Road midway between the intersections with Kenwick and Bickley Roads.
- 9.2 In the event that an extension of the HWL Route from Tonkin Highway is required to service the proposed industrial development this should be provided along Kelvin Road to the intersection with the proposed internal spine road and then along the spine road. If access to the HWL route is required from the proposed industrial development to the east of Kelvin Road then this will need to be by an improved intersection with Kenwick Road.
- 9.3 Modification of the signalised Welshpool / Hale Road intersection to four way to service the proposed intermodal freight terminal. This is provisional on an acceptable level of service of access for intermodal terminal traffic not being achievable via Coldwell Road.
- 9.4 Investigation of the layout required for the intersection of Welshpool Road and Coldwell given the possible interaction with traffic movements at Lancelot Green.
- 9.5 Provision of left turn access to and from Tonkin Highway with acceleration and deceleration lanes at the eastern end of Victoria Road. (to be removed when the Kelvin Road / Tonkin Highway intersection is grade separated)
- 9.6 Short term - Provision of an additional right turn lane on Tonkin Highway for south travelling traffic at the intersection with Kelvin Road.
- 9.7 Long term –Grade separation at the intersection of Tonkin Highway and Kelvin Road.
- 9.8 Provision of right turn lanes to service both side roads at the intersection of Kelvin / Kenwick Roads

9.9 Provision of a new unsignalised T intersection on Kelvin Road midway between Kenwick and Bickley road intersections. Right turn lanes to be provided in Kelvin Road and the proposed Internal Spine Road.

9.10 Implementation of LATM devices to discourage heavy traffic through adjacent residential areas.

9.11 Implementation of LATM devices to discourage heavy traffic using Brook Road or alternatively implement a road closure to prevent through traffic.

9.3 RAIL ACCESS

Advice from the PTA is that good rail access to the Forrestfield / Fremantle rail freight line is achievable to service the proposed intermodal freight terminal.

APPENDIX A - FIGURES

Drawing T5021-SK02	Study Area
Drawing T5021-SK01	Existing and Future Road Network Volumes
Drawing T5021-SK03	Opportunities and Constraints
Drawing T5021-SK05	Internal Road Network Layout
Drawing T5021-SK04	Trip Distribution
Drawing T5021-SK06	Concept Intersection Layouts

APPENDIX B - FUNCTIONAL ROAD TYPES

Functional Road types and Criteria

Primary Distributors: These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic. Some are strategic freight routes and all are National or State roads. They are managed by Main Roads.

District Distributor A: These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by Local Government.

District Distributor B: Perform a similar function to type A district distributors but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with a traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and generally not through them, forming a grid which would ideally space them around 1.5 kilometres apart. They are managed by Local Government.

Local Distributors: Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local government.

Access Roads: Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local government.