COOLIMBA POWER PROJECT

TRAFFIC IMPACT STATEMENT

transport planning • traffic engineering • project management

Coolimba Power Project

Traffic Impact Statement

Prepared for:
Aviva Corporation Limited

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1. INTRODUCTION

This Traffic Impact Study has been prepared by Transcore on behalf of Aviva Corporation Limited, with regard to the environmental assessment of a proposed Power Station (the Coolimba Power Project) to be located southwest of Eneabba townsite.

The site is located approximately 230km northwest of Perth and 180km southeast from Geraldton, in the vicinity of the Eneabba townsite (approximately 17km southwest of the Eneabba townsite and approximately 5.5km west of the Brand Highway). Refer to **Figures 1** and **2** for more details of the site location. The project includes the construction of a Power Station and the support auxiliary systems.

Figure 1. Regional setting of the Site

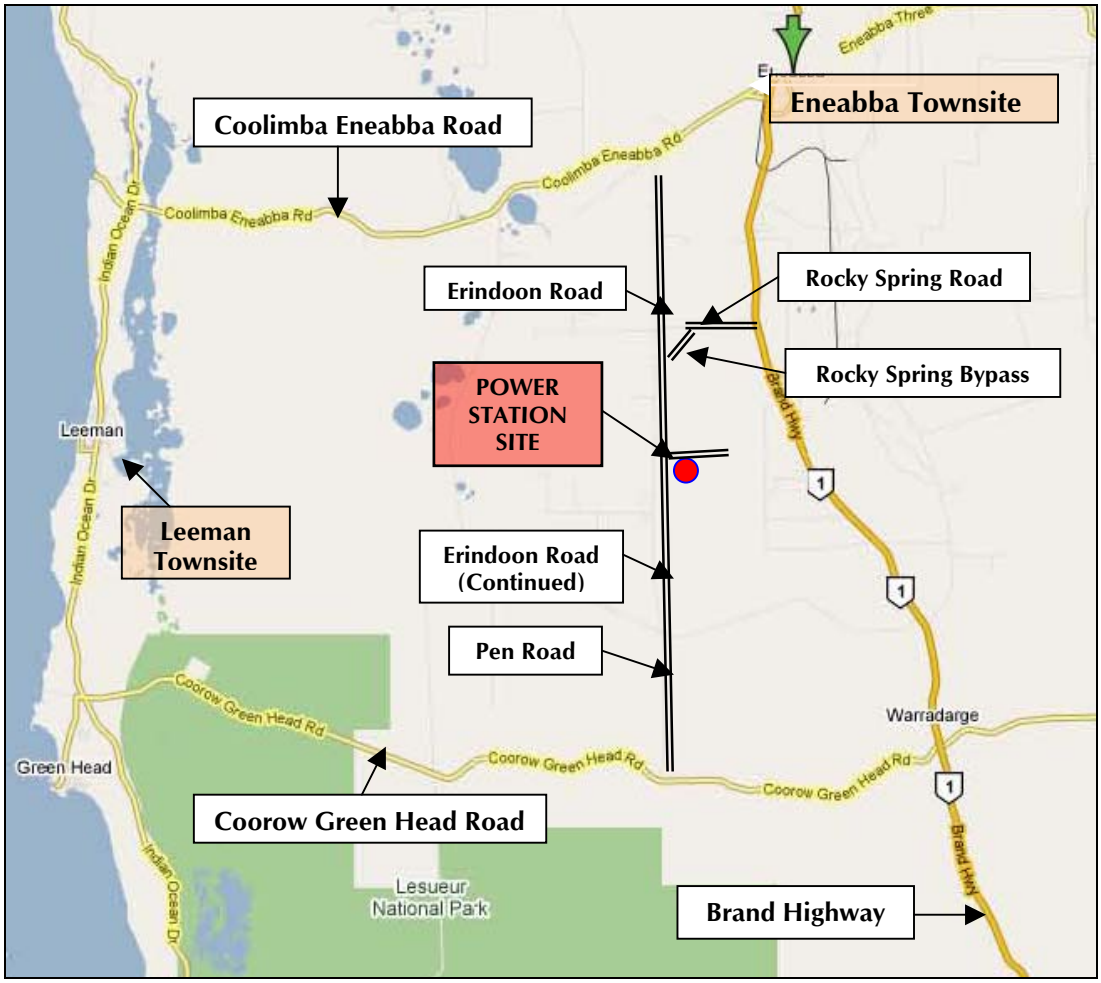

Figure 2: Location of the Power Station Site

The key road network in the vicinity of the project includes Brand Highway, Coolimba Eneabba Road, Erindoon Road, Rocky Spring Road, Coorow Green Head Road and the respective intersections.

2. METHODOLOGY

This report will initially assess the geometry of the existing road network (carriageway and intersection standards, existing traffic management measures, etc) in the vicinity of the subject site, current traffic load and identify and address potential existing problems relating to safety and capacity aspects. This assessment will be based on the relevant traffic-related information sourced from the local authorities (Shire of Carnamah-Eneabba and Coorow), government agencies (Main Roads WA) and the client (URS, Aviva). To collect the relevant information, Transcore has also undertaken a comprehensive site visit during April 2008.

This report will further assess the impact of the proposed development upon the local road network during the construction period, when the traffic activity is expected to peak. This conclusion is made based on the information available to Transcore regarding the operation of the power station and traffic movement during the construction. However, since it is common traffic engineering practice to assess relevant traffic conditions only during the peak traffic periods, the post-development (operational) phase of the subject development will not be assessed as the peak is traffic conditions is expected during the construction period.

Once the estimated future construction traffic is established and loaded onto the road network the directional assignment is undertaken to establish the most likely transport routes for this traffic to access the subject site. These routes (roads and intersections) are then assessed for adequacy and their ability to satisfactorily accommodate the estimated construction traffic.

Road and intersection capacity and performances are then assessed using guidelines in Austroads "*Guide to Traffic Engineering Practice Part 2 — Roadway Capacity and Part 5 — Intersections at Grade*" and SIDRA Intersection modelling software. Indicators such as Level of Service, Theoretical Volumes, Average Delays, 95% Vehicle Queues and Degree of Saturation are used to estimate the future performance of the road network.

3. EXISTING SITUATION

The proposed project is to be located just east of the Erindoon Road and approximately 6.5km southwest of the Brand Hwy/Rocky Spring Road intersection. The general location of the proposed power station is approximately 17km southwest of the Eneabba townsite, which is approximately 240km northwest of Perth. The site is currently vacant.

3.1 Abutting Road Network Description

Brand Highway is categorized as a State Highway according to Main Road WA road network classification. It connects Perth and Geraldton with a total length of approximately 350 km and together with North West Coastal Highway forms the WA's Coastal Route (total length approximately 510km). It is a sealed 8m wide, two-lane single carriageway with 3m wide shoulders on each side. Passing lanes in both directions exist along its length at regular intervals. According to the Main Roads WA, AADT of approximately 1,500 vehicles per day was recorded in 2003/04 (currently estimated 1,700vpd – relevant growth factor implemented). Recorded percentage of heavy vehicles for this road is approximately 17%. The sign-posted speed limit in the vicinity of the site (and along most of the Highway) is 110km/h. Refer to **Figure 3**.

Figure 3. View northbound along Brand Highway in the vicinity of the site

Coorow-Green Head Road is a regional road, which, in the vicinity of the site forms a west-east link between Brand Highway (to the east) and Indian Ocean Drive (to the west). No traffic data for this road was available at the time of the preparation of this report, however the site inspection conducted in April 2008 confirmed that local residents and occasional tourist traffic are the main users of this road. It is estimated that daily vehicle traffic is in order of several hundred

vehicles per day. The Coorow-Green Head Road is a sealed 6m wide, two-lane single carriageway road with approximately 1.5m wide shoulders and sign-posted speed limit of 110km/h. Refer to **Figure 4**.

Figure 4. View westbound along Coorow-Green Head Road at its intersection with Pen Road (to the right)

Indian Ocean Drive is a regional coastal road linking several coastal townsites including Jurien Bay, Green Head and Leeman. It runs from Cervantes further north to its merger point with Brand Highway, with a total length of approximately 140km. In the vicinity of the site Indian Ocean Drive passes through Leeman townsite — the proposed site of the construction camp. This road is a sealed 6m wide, two-lane single carriageway road with wide shoulders on both sides. Its sign-posted speed limit is 110km/h but is restricted to 80km/h on its approach to Leeman townsite.

No traffic count data is available for this road, however low traffic volume, mostly consisting of local residents and tourists visiting the region, was observed during the site visit. It is estimated that traffic is in order of several hundred vehicles per day but likely to be increased during the peak tourism season. Refer to **Figure 5.**

Coolimba-Eneabba Road is a regional road connecting Indian Ocean Drive to the west with Eneabba townsite and Brand Highway (to the east). It is a sealed, approximately 6m wide, two-lane single carriageway road with 2m wide gravel shoulders. Main Roads WA have recorded AADT of 146 vehicles per day (May 2006), with a low percentage of heavy vehicles[1]. Site inspection confirmed the same traffic conditions at present. The Coolimba-Eneabba Road operates under a sign-posted speed limit of 110km/h. Refer to **Figure 6.**

[1] Typical percentage of heavy vehicle traffic for this type of road is 2%

Figure 5. Indian Ocean Drive at its approach to Leeman townsite – northbound view

Figure 6. Eastbound view along Coolimba-Eneabba Road (railway crossing with advanced warning flashing signals)

Rocky Spring Road is a regional road linking Brand Highway with Erindoon Road. It consists of two sections: Rocky Spring Road and Rocky Spring Bypass. First section is a sealed 6m wide two-lane single carriageway road with 2m wide shoulders on both sides. This road forms a T-intersection with Brand Hwy to the east. The second half of the road extends further to the west and is closed to public access (Iluka mining operations). The Rocky Spring Bypass continues south, looping around the Iluka mining operation site and connects to Erindoon Road just south of the site.

Rocky Spring Bypass is an 8m wide gravel road. No traffic data was available for the Rocky Spring Road at the time of this report. However, the site inspection and discussions with local residents have revealed that the traffic mainly comprises of local resident and heavy vehicles accessing the Iluka west site operations. Refer to **Figure 7**.

Figure 7. Westbound view along Rocky Spring Road

Erindoon Road and **Pen Road** (representing southern extension of Erindoon Road) are both 8m wide gravel rural roads (**Figure 8**). They run north to south adjacent to the sites western boundary and connect with Coorow Green Head Road to the south. These roads are also providing access to local farming fields and are utilised by local residents. Traffic along these roads is occasional and predominantly comprises of 4WDs, utes and farm vehicles. No traffic data was available for these roads at the time of this report.

Figure 8. Northbound view along Erindoon Road

The two proposed access points, "Big Valley" (northern) and "Langford" (southern), to the site are both located on Erindoon Road and are approximately 2kms apart. Refer to **Figures 9** and **10** for more details.

Figure 9. "Big Valley" Access Point

Figure 10. "Langford" Access Point

3.2 Key Nearby Intersections

Several key intersections in the vicinity of the proposed power station facilitate access to the site. These intersections were inspected and are described as following:

Indian Ocean Drive and **Coorow-Green Head Road Intersection** form a priority controlled, full movement, T-intersection. On its eastern approach, Coorow-Green Head Road is 7m wide flaring to approximately 40m at the connection point with Indian Ocean Drive. Indian Ocean Drive, at this intersection, entails

localised widening in the northbound direction by approximately 10m. This widening extends approximately 150m north and south from the intersection. Refer to **Figures 11** and **12.**

Figure 11. Westbound view along Corrow-Green Head Road at the intersection

Figure 12. Southbound view long Indian Ocean Drive at the intersection

Coorow-Green Head Road and **Pen Road** intersection is a priority controlled, full movement T-intersection. Pen Road at its northern approach flares into 25m wide approach. There is no localised widening on Coorow-Green Head Road at this intersection. Refer to **Figures 13** and **14**.

Figure 13. Southbound view along Pen Road at the intersection

Figure 14. Eastbound view along Corrow Green Head at the intersection

Brand Highway and **Coorow-Green Head Road Intersection** is a staggered T-intersection, functioning as a "dog leg", with the existing Brand Highway/Coorow Green Head Road (West) intersection located to the south of the Brand Highway/Coorow Green Head Road (East) intersection. However, only the southern intersection (Brand Highway/ Coorow Green Head Road West) is considered here as it facilitates access to the site from south.

At its western approach, Coorow Green Head Road is 7m wide flaring to approximately 35m (at intersection with Brand Hwy). Brand Hwy this intersection

includes a dedicated left-turn lane (approximately 300m long) in the northbound direction and a localised widening (passing lane) in the southbound direction and a right-turn lane (approximately 100m long). Refer to **Figures 15, 16, 17 and 18**.

Figure 15. Southbound view along Brand Hwy

Figure 16. Northbound view along Brand Hwy

Figure 17. Eastbound view along Coorow Green Head Road

Figure 18. Westbound view at Coorow Green Head Road

Brand Highway and **Rocky Spring Road Intersection** form a full movement, priority controlled, T-intersection. Rocky Spring Road at its western approach flares to 30m wide. Brand Highway includes a localised widening with a right-turn pocket (approximately 80m long) on its northern approach and a dedicated left-turn lane (approximately 130m long) on its southern approach. Refer to **Figures 19, 20** and **21**.

Figure 19. Southbound view along Brand Highway

Figure 20. Northbound view along Brand Highway

Figure 21. Eastbound view along Rocky Spring Road towards the intersection

4. PROPOSED DEVELOPMENT

The subject development, Coolimba Power Project, is proposed to be located in the mid west of WA, approximately 230km northwest of Perth, in vicinity of the Eneabba townsite (approximately 17km southwest of the Eneabba townsite). The total construction period is estimated at 4 years.

According to the site plans provided by Aviva (drawing: g1570_Site_f11.dgn, Rev A3 from November 2008), the proposed development consists of following the elements:

- Power Plant;
- Support and Auxiliary on-site Systems;
- Access Roads;

The relevant information for this project are discussed for two major phases:

- Construction phase and;
- Operational phase.

It is envisaged that the workforce camp (likely to be located near Leeman) would provide accommodation for the power station construction workforce. It is estimated that this camp will accommodate up to 600 people during the peak of the *combined mine and power station* construction period. All support and auxiliary power plant systems are to be located within or near the site.

For the construction phase of the project, heavy vehicle traffic carrying equipment and materials required for the construction and bus and private cars carrying the workforce from the camp to the site is anticipated. During the operational phase the type of traffic expected is mainly private cars and 4WDs with some heavy vehicle traffic during the shut down and maintenance.

Section 4 of this report demonstrates that the peak traffic situation for the project occurs during the construction phase and therefore all the analysis and assessment are undertaken for this phase. It is envisaged that the site shall be accessed from three main directions: north, south and west. The workforce traffic is expected to travel from the camp site to the west (and to the lesser extent north), while the heavy vehicle construction traffic is expected to access the site both from the north and south. **Table 1** illustrates the directional movement and the preferred route to access/egress the site. Some of the links comprising the preferred routes are to track standards at present and would need to be upgraded and sealed.

Aviva Corporation Limited has indicated that the power station construction period will take 4 years. It is expected however, that the peak construction

period, which is also a traffic-intensive period, would last for approximately 18 months.

Direction Approach	Preferred Route	Type of Traffic
West	Indian Ocean Dr–Coorow Green Head Road–Pen Road -Erindoon Road	Busses, private vehicles
North	Brand Hwy-Rocky Spring Road-Rocky Spring Bypass-Erindoon Road	Heavy Vehicles, some private vehicles
South	Brand Hwy-Coorow Green Head Road-Pen Road-Erindoon Road	Heavy Vehicles

Table 1. Directional movement and preferred traffic and transport routes for the site

The indicative construction stage period and peak traffic operation phase for the power station are shown in **Figure 22.**

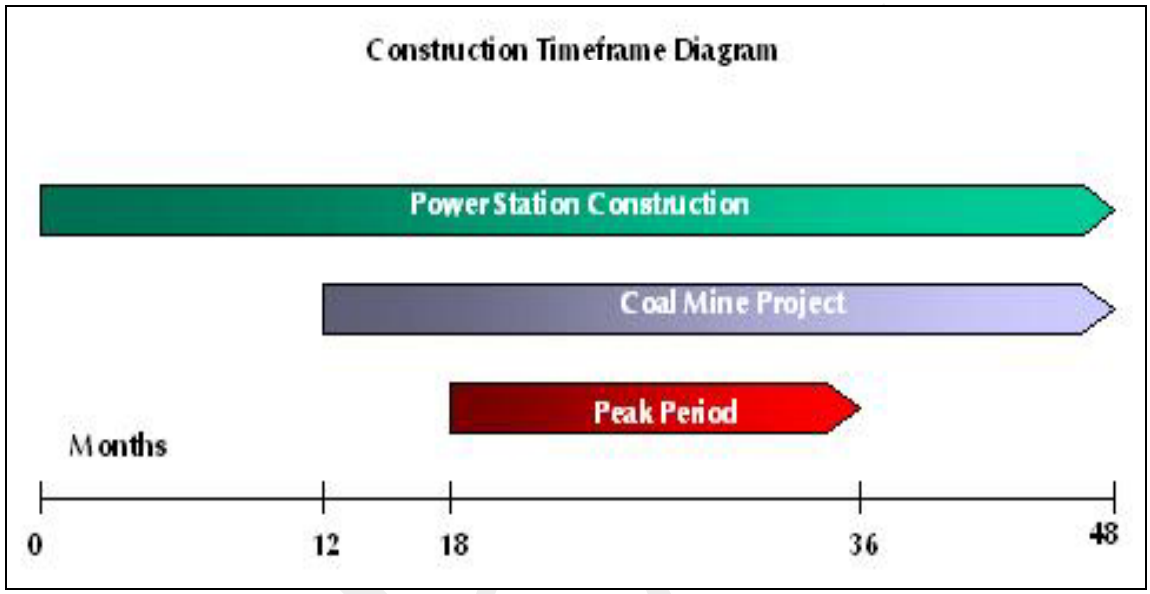

Figure 22. Power Station Construction Timeframe Diagram

The illustration of the site in relation to the surrounding area is shown in **Figure 23**.

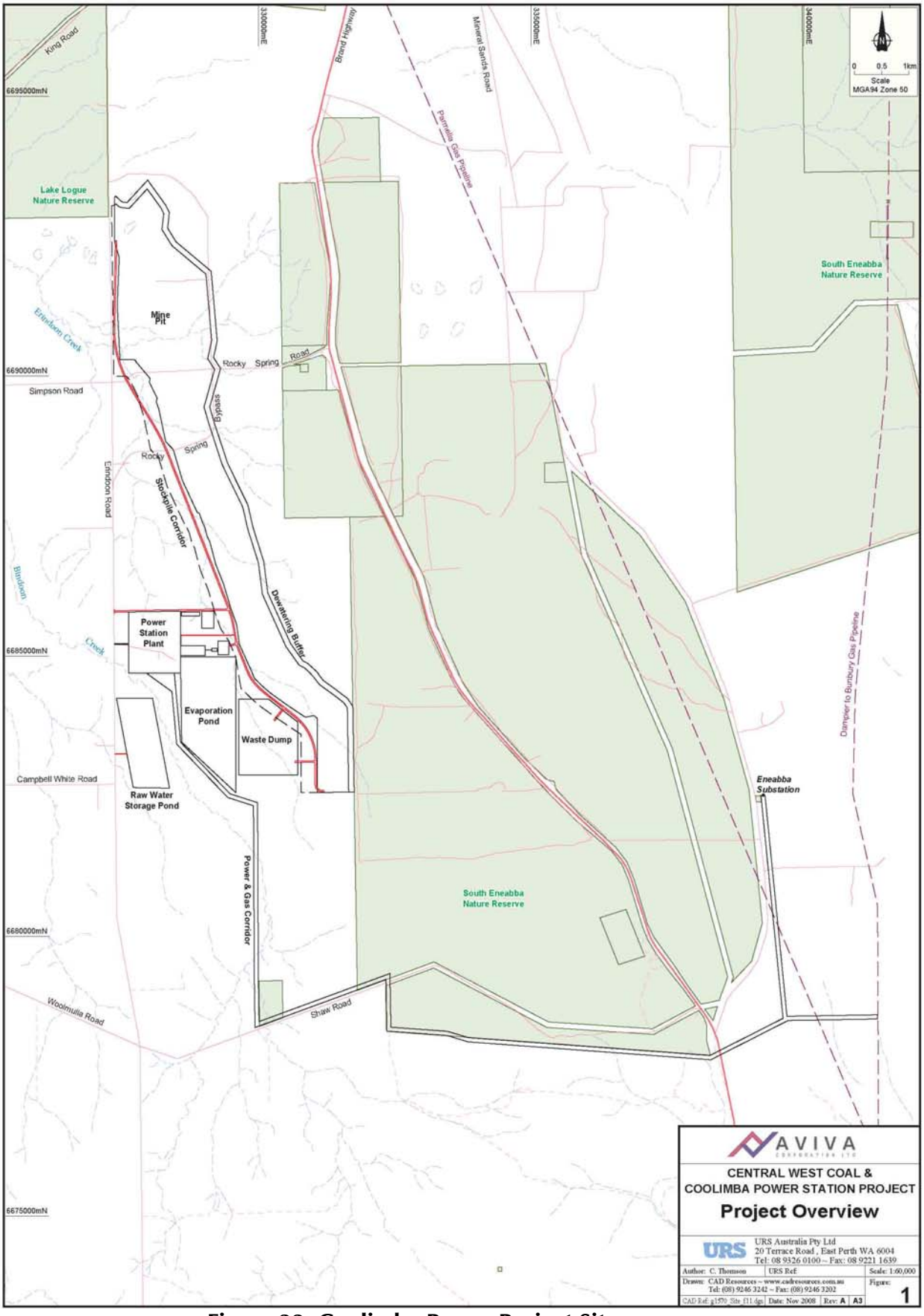

Figure 23. Coolimba Power Project Site

5. TRAFFIC ANALYSIS

The potential traffic impact of the proposed power station is assessed through a traffic generation and distribution exercise. The aim of this exercise is to establish the traffic that would be generated from the proposed Project and quantify the potential impacts of the additional traffic on the operations of the surrounding road network, specifically the intersections of Coorow Green Head Road/Pen Road, Brand Highway/Coorow Green Head Road and Brand Highway/Rocky Spring Road. Ultimately, the aim of this analysis is to establish if the capacity and standard of the existing road network is sufficient to accommodate the power station associated traffic and wether further upgrades and traffic management measures are required to achieve this objective.

5.1 Traffic Generation/Distribution

Traffic movement and pattern data for the proposed Project was derived from the data provided by Aviva. As the construction phase of the project is established to represent the peak traffic movement period (refer **Tables 2** and **3**), the traffic assessment was only undertaken for this phase of the project. It is confirmed that the peak construction traffic period would occur during a regular weekday, 18 – 36 months from the start of the construction phase (refer **Figure 22**). It is assumed that the daily inbound/outbound directional traffic split is 50%/50%.

During the construction phase, the workforce is transported from the camp site near Leeman by buses and light vehicles (cars and four-wheel drives) to the construction site. It is envisaged that this traffic would use the Indian Ocean Drive—Coorow Green Head Road—Pen Road—Erindoon Road route.

During the operation phase of the power station, employees will commute daily between the power station and their residences, which are likely to be located within the local towns such as Eneabba, Leeman, Greenhead and Dongarra.

The heavy traffic during the construction phase will transport materials and equipment to the construction site. No detailed information was available at the time of this report with regards to the material and equipment sources, however certain assumptions were made for the truck routes. Therefore, it is assumed that equipment (if locally manufactured) will be transported from Perth while, if imported, would probably be hauled from either Geraldton or Perth (nearest major ports). The required construction materials would predominantly be sourced from local or regional sites.

For both equipment and materials, it is envisaged that the heavy traffic would predominantly use two major routes: From the north, Brand Highway—Rocky Spring Road—Rocky Spring Bypass—Erindoon Road and from the south, Brand Hwy—Coorow Green Head Road—Pen Road—Erindoon Road. Part of each route (Rocky Spring Road By pass-Erindoon Road from North and Pen Road-Erindoon

Road from south) would need to be upgraded and sealed to form part of the heavy vehicle transportation routes for this project.

For the purpose of this report both of the heavy vehicle transportation routes are assessed. After the construction phase, a significant reduction in the heavy vehicle traffic is expected. Estimated traffic load and vehicular route patterns for both the construction and operation phase of the Coolimba Power Station and other known major projects in the area (such as Central West Coal Mine Project) are illustrated in **Tables 2, 3** and **Figure 24**.

Coolimba Power Project Traffic Generation					
Type of Traffic	Use	Total Traffic over Period	Period	Peak Period Trips (Between18–36month)	
				Peak Daily	Peak Hour
During Construction Phase					
Cars, 4WD	Workforce	135,000	4 years	130	65
Bus	Workforce	56,200	4 years	54	27
Semi-trailers	Material/ Equipment	810	4 years	2	1
B Double	Material/ Equipment	320	2 years	1	1
Oversize Loads	Equipment	34	2 years	Negligible	Negligible
Licensed Loads	Material/ Equipment	12	1 year	Negligible	Negligible
During Operation Phase					
Cars, 4WD	Workforce	21,000	1 year	80	40
Road Train	Material	3,000	1 year	12	2
Licensed Loads	Equipment/ Material	2	1 week	1	Negligible

Table 2. Estimated traffic load for the Coolimba Power Station Project

Central West Coal Mine Project					
Type of Traffic	Use	Total Traffic over Period	Period	Peak Period Trips (Between 21–27 month)	
				Peak Daily	Peak Hour
During Construction Period					
Cars, 4WD	Workforce	40,000	2 years	75	75
Concrete Trucks	Material	200	2 years	1	1
Semi-trailers	Material/ Equipment	200	2 years	1	1
Licensed Loads	Material/ Equipment	20	2 years	Negligible	Negligible

Table 3. Estimated traffic load for Central West Coal Mine Project

Based on these data, the site location, the location of the existing local communities in the local road network and the road network configuration, **Figure 24** illustrates the transport and traffic route assumptions made for the distribution of the Coolimba Power Project traffic.

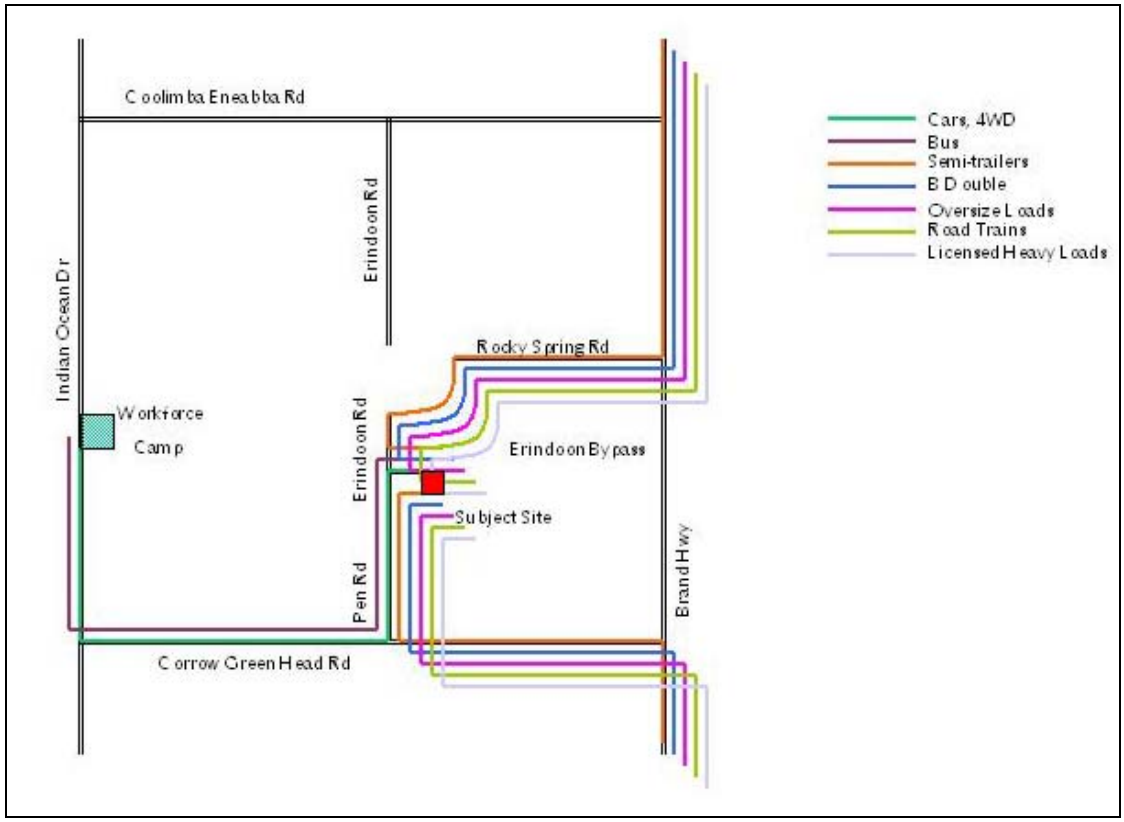

Figure 24. Coolimba Power Project generated traffic – Assumed traffic and transport routes

5.2 Road Network Capacity/Geometry Analysis

In order to assess the existing and construction phase road capacity for Brand Highway the *Austroads, Guide to Traffic Engineering Practice, Part 2 & 5* were sourced. The relevant elements of the road network in the area were assessed during the site visit.

The Brand Highway is a major regional road and transport route carrying substantial traffic, with an above average percentage of heavy vehicle traffic. This road represents the main access corridor for the site.

According to the guidelines outlined in the *Austroads Part 2* document (*Section 3, Uninterrupted Two-Lane Two-way Roads*), Brand Highway is classified as a rural highway with a design speed equal or greater than 100km/h. The following factors are established based on the site visit and the relevant information sourced from Main Roads WA for the Austroads assessment:

- Traffic lane widths are equal to or greater than 3.7m;
- Clear shoulder widths are equal or greater than 2m;
- There are less than 20% of road lengths with a sight distance of less than 450m;
- Traffic stream consists of passenger cars and 17% heavy vehicle traffic;
- Directional split of 60%/40% is assumed (during peak periods);
- Terrain is predominantly level;

Brand Highway, with the established conditions, is theoretically able to accommodate up to 190 vehicles per hour (bi-directionally) to retain its current highest level of service[2] (Level of Service A). Assuming the 10% of the total traffic volume for the peak hour calculation, Brand Highway (according to Main Roads WA traffic volumes information for AADT) carries approximately 170 vehicles per hour at present. The calculation shows that Brand Highway currently operates with Level of Service A and with approximately 9% spare capacity to maintain the most favourable service level (Level of Service A).

Applying the same set of factors for the construction stage period for Brand Highway road capacity indicates that the highest Level of Service A would be maintained. Therefore, it can be concluded that the Brand Highway operating conditions will not be compromised by the additional traffic generated during the construction and operational phases of the Coolimba Power Project.

The site inspection undertaken by Transcore has revealed that the road capacity is not an issue for the Indian Ocean Drive, Coorow Green Head Road, Pen Road and Erindoon Road.

These roads are currently carrying low traffic volumes (in order of several hundred vehicles per day) and are mostly frequented by local residents and, during the peak season, tourists. The standard of these roads enables them to theoretically carry between 170 - 225 vehicles per hour, bi-directionally (Level of Service A). It is therefore concluded that these roads have significant spare capacities even during the peak tourist season and shall therefore be capable of accommodating additional traffic associated with the Coolimba Power Project.

Aviva Corporation Limited is considering two possible access links to the site ("Big Valley" and "Langford"). In the vicinity of the site, Erindoon Road entails rolling topography and therefore occasionally may entail limited sightlines. Site inspection has confirmed that the southern access link ("Langford") with Erindoon Road provides better sightlines along Erindoon Road. Therefore, it is recommended that southern access link ("Langford") be used to provide access to the site.

[2] Level of Service (LoS) — qualitative measure describing operational conditions within traffic stream and its perception by motorists. It is defined in terms of factors such as speed, travel time, comfort manoeuvring and safety. There are six levels of service (A to F), with A being the best operating condition.

5.3 Intersection Capacity Analysis

SIDRA is a commonly used intersection-modelling tool by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- **Degree of Saturation**: is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- **Level of Service**: is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of services, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- **Average Delay**: is the average of all travel time delays for vehicles through the intersection.
- **95% Queue**: is the queue length below which 95% of all observed queue lengths fall.

Site inspection undertaken by Transcore has confirmed that the Coorow Green Head Road/Pen Road (heavy vehicle route) and Indian Ocean Drive/Coorow Green Head Road (cars/busses route) do not present a capacity issue due to the low traffic volumes recorded utilising these intersections. Therefore, respective intersections shall not be further analysed for traffic capacity.

Capacity analysis using SIDRA computer package was undertaken at the key regional intersections of Brand Highway/Rocky Spring Road and Brand Highway/Coorow Green Head Road intersections to assess the traffic operations under existing conditions and with the addition of the Coolimba Power Project traffic.

The results of the SIDRA analysis for the intersection of Brand Highway/Rocky Spring Road and Brand Highway/Coorow Green Head Road for the existing and future (during the construction stage) traffic volumes are detailed in **Tables 4**, **5**.

In order to undertake a robust assessment, four different scenarios have been simulated for each of the intersections:

- Traffic approaching/exiting site from/to Brand Hwy north via Rocky Spring Road intersection;
- Traffic approaching/exiting site from/to Brand Hwy south via Rocky Spring Road intersection;
- Traffic approaching/exiting site from/to Brand Hwy south via Coorow Green Head Road intersection;
- Traffic approaching/exiting site from/to Brand Hwy south via Coorow Green Head Road intersection;

In each of the four scenarios, all of the heavy vehicle traffic has been "assumed" to use the same inbound route (via Brand Highway North/South to Coorow Green Head Road or Rocky Spring Road) and outbound route (via Coorow Green Head Road or Rocky Spring Road to Brand Highway North/South).

Also, for the purposes of robustness of the analysis it is assumed that all of the project's heavy traffic is represented as 4-passenger vehicle equivalent[3] (i.e. B-Double vehicle – 25m length, 67.5 tonnes). Assuming these parameters for each of the four simulated scenarios a "worst case scenario" is simulated. However, according to the Aviva's advice, it is expected that the inbound and outbound traffic streams are likely to be split between northbound and southbound directions. Therefore it can be concluded that the actual impact on the relevant intersections may be reduced.

Approach	Movement Type	Degree of Saturation	Level of Service	Average Delay (sec)	95 % [4]Queue (m)
Existing Weekday Peak Hour					
Brand Hwy	Left	0.003	B	13.2	0
South	Through	0.061	A	0.0	0
Approach		**0.061**	**A**	**0.6**	**0**
Brand Hwy	Through	0.042	A	0.4	2
North	Right	0.042	B	13.3	2
Approach		**0.042**	**A**	**1.2**	**2**
Coorow GH	Left	0.027	B	14.4	1
Road West	Right	0.027	B	14.3	1
Approach		**0.027**	**B**	**14.3**	**1**
All Vehicles		**0.061**	**N/A**	**2.3**	**2**
Weekday Future Peak Hour (additional inbound traffic approaching from South)					
Brand Hwy	Left	0.011	C	16.6	0
South	Through	0.061	A	0.0	0
Approach		**0.061**	**A**	**2.2**	**0**
Brand Hwy	Through	0.037	A	0.4	2
North	Right	0.037	B	13.4	2
Approach		**0.037**	**A**	**1.3**	**2**
Coorow GH	Left	0.007	B	14.9	0
Road West	Right	0.007	B	14.8	0
Approach		**0.007**	**B**	**14.8**	**0**
All Vehicles		**0.061**	**N/A**	**2.2**	**2**

[3] In SIDRA heavy vehicle is typically represented with 2-passanger vehicle equivalent
[4] Note: The 95th percentile queuing predicted in the SIDRA analysis is indicative only.

Weekday Future Peak Hour (additional outbound traffic heading South)					
Brand Hwy	Left	0.003	B	13.2	0
South	Through	0.041	A	0.0	0
Approach		**0.041**	**A**	**0.9**	**0**
Brand Hwy	Through	0.061	A	0.2	3
North	Right	0.061	B	13.1	3
Approach		**0.061**	**A**	**0.8**	**3**
Coorow GH	Left	0.083	D	29.1	4
Road West	Right	0.082	D	32.5	4
Approach		**0.082**	**D**	**32.3**	**4**
All Vehicles		**0.083**	**N/A**	**3.4**	**4**
Weekday Future Peak Hour (additional inbound traffic approaching from North)					
Brand Hwy	Left	0.003	B	13.2	0
South	Through	0.061	A	0.0	0
Approach		**0.061**	**A**	**0.6**	**0**
Brand Hwy	Through	0.066	A	2.4	7
North	Right	0.066	C	20.0	7
Approach		**0.066**	**A**	**5.6**	**7**
Coorow GH	Left	0.007	C	15.3	0
Road West	Right	0.007	C	15.2	0
Approach		**0.007**	**C**	**15.2**	**0**
All Vehicles		**0.066**	**N/A**	**3.1**	**7**
Weekday Future Peak Hour (additional outbound traffic heading North)					
Brand Hwy	Left	0.003	B	13.2	0
South	Through	0.041	A	0.0	0
Approach		**0.041**	**A**	**0.9**	**0**
Brand Hwy	Through	0.061	A	0.2	3
North	Right	0.061	B	13.1	3
Approach		**0.061**	**A**	**0.8**	**3**
Coorow GH	Left	0.047	C	21.8	2
Road West	Right	0.047	C	16.9	2
Approach		**0.047**	**D**	**20.2**	**2**
All Vehicles		**0.061**	**N/A**	**2.4**	**3**

Table 4. SIDRA Result – Brand Highway and Coorow Green Head Road

Approach	Movement Type	Degree of Saturation	Level of Service	Average Delay (sec)	95 % [5]Queue (m)
Existing Weekday Peak Hour					
Brand Hwy	Left	0.034	B	14.9	0
South	Through	0.061	A	0.0	0
Approach		**0.061**	**A**	**0.8**	**0**
Brand Hwy	Through	0.045	A	0.5	2
North	Right	0.045	C	15.3	2
Approach		**0.045**	**A**	**1.6**	**2**
Rocky Spring	Left	0.017	C	16.5	1
Road West	Right	0.017	C	16.4	1
Approach		**0.017**	**C**	**16.4**	**1**
All Vehicles		**0.061**	**N/A**	**2.0**	**2**
Weekday Future Peak Hour (additional inbound traffic approaching from South)					
Brand Hwy	Left	0.011	C	17.1	0
South	Through	0.061	A	0.0	0
Approach		**0.061**	**A**	**2.3**	**0**
Brand Hwy	Through	0.039	A	0.6	2
North	Right	0.039	C	15.4	2
Approach		**0.039**	**A**	**1.7**	**2**
Rocky Spring	Left	0.015	C	16.5	1
Road West	Right	0.015	C	16.5	1
Approach		**0.015**	**C**	**16.5**	**1**
All Vehicles		**0.061**	**N/A**	**2.9**	**2**
Weekday Future Peak Hour (additional outbound traffic heading South)					
Brand Hwy	Left	0.004	B	14.9	0
South	Through	0.041	A	0.0	0
Approach		**0.041**	**A**	**1.1**	**0**
Brand Hwy	Through	0.064	A	0.3	3
North	Right	0.064	C	15.1	3
Approach		**0.064**	**A**	**1.1**	**3**
Rocky Spring	Left	0.109	D	31.2	6
Road West	Right	0.110	D	33.3	6
Approach		**0.110**	**D**	**32.8**	**6**
All Vehicles		**0.110**	**N/A**	**4.5**	**6**

[5] Note: The 95th percentile queuing predicted in the SIDRA analysis is indicative only.

Weekday Future Peak Hour (additional inbound traffic approaching from North)					
Brand Hwy	Left	0.004	B	14.9	0
South	Through	0.061	A	0.0	0
Approach		**0.061**	**A**	**0.8**	**0**
Brand Hwy	Through	0.073	B	2.8	8
North	Right	0.073	C	21.4	8
Approach		**0.073**	**C**	**6.4**	**8**
Rocky Spring	Left	0.015	C	16.9	1
Road West	Right	0.015	C	16.8	1
Approach		**0.015**	**C**	**16.8**	**1**
All Vehicles		**0.073**	**N/A**	**4.0**	**8**
Weekday Future Peak Hour (additional outbound traffic heading North)					
Brand Hwy	Left	0.004	B	14.9	0
South	Through	0.041	A	0.0	0
Approach		**0.041**	**A**	**1.1**	**0**
Brand Hwy	Through	0.064	A	0.3	3
North	Right	0.064	C	15.1	3
Approach		**0.064**	**A**	**1.1**	**3**
Rocky Spring	Left	0.052	C	24.0	3
Road West	Right	0.052	C	20.0	3
Approach		**0.052**	**C**	**22.6**	**3**
All Vehicles		**0.064**	**N/A**	**2.9**	**3**

Table 5. SIDRA Result – Brand Highway and Rocky Spring Road

The results of the SIDRA analysis indicate that the Brand Hwy/Coorow Green Head Road intersection (**Table 4**) currently operates with an overall Level of Service of A during the peak hour. With the introduction of the project construction heavy vehicle traffic, Level of Service for the critical movements drops to C (D in the case of the right turn out movements from Coorow Green Head Road onto Brand Hwy). Considering the reported queues (one vehicle for the inbound approach from Brand Hwy North) and delays (33 seconds for the right-turn onto Brand Hw South), this level of traffic operation for heavy vehicles during peak periods is acceptable.

The results of the SIDRA analysis indicate that the Brand Hwy/Rocky Spring Road intersection (**Table 5**) currently operates with an overall Level of Service of B during the peak hour. With the addition of the project's heavy vehicle traffic, Level of Service for the critical movements drops to C (D in the case of the right turn movements from Rocky Spring Road onto Brand Highway). Considering the reported queues (up to one vehicle for the inbound approach from Brand Hwy North) and delays (34 seconds for the outbound right-turn onto Brand Hw

South), this level of traffic operation for heavy vehicles during peak periods is acceptable.

It is important to note that all four assessed scenarios represent the "worst case scenario" and that the subject intersections are likely to perform better in most cases than the SIDRA analysis suggests due to the anticipated split in construction traffic transport routes.

5. LOCALISED ROAD/ACCESS IMPROVEMENTS

Table 6 details the transport routes for the Coolimba Power Project.

Route	Type
Brand Highway (North)—Rocky Spring Road—Rocky Spring Bypass-Erindoon Road	Heavy Transport
Brand Hwy (North)—Coorow Green Head Road—Pen Road—Erindoon Road	Heavy Transport
Brand Highway (South)—Coorow Green Head Road—Pen Road—Erindoon Road	Heavy Transport
Brand Highway (South)—Rocky Spring Road—Rocky Spring Bypass—Erindoon Road	Heavy Transport
Indian Ocean Drive—Coorow Green Head Road—Pen Road—Erindoon Road	Workforce Traffic

Table 6. Anticipated transport routes for Coolimba Power Project

The identified transport routes entail utilisation of four key intersections (Indian Ocean Drive/Coorow Green Head Road, Coorow Green Head Road/Pen Road, Brand Highway /Coorow Green Head Road and Brand Highway/Rocky Spring Road). These intersections, along with the adjacent roads and the proposed access link, will carry all of the Coolimba Power Project traffic. To successfully accommodate the anticipated overall increase in traffic, the following improvements are therefore proposed:

Coorow Green Head Road/Pen Road intersection requires localised widening on all approaches and formalisation of a westbound right-turn slip-lane to rural standard (*Austroad Part 5*) to accommodate heavy vehicles. Pen Road is recommended to be sealed. It is also recommended that appropriate traffic signage are erected on Coorow Green Head Road at this intersection to indicate trucks entering;

Brand Hwy/Rocky Spring Road intersection currently entails a substandard right-turn pocket and as such it's upgrade (extension to 180m) is required. However, it has been noted that this intersection, even though substandard, is currently being used by various traffic including Iluka traffic. Therefore, it is recommended that Aviva Corporation Limited negotiate with relevant authorities upgrade and contribution opportunities.
Pen Road, Erindoon Road and Rocky Spring Road (currently wide gravel roads) are recommended to be sealed to heavy vehicle standard.

The preferred southern access link to the subject site (Langford) is recommended to be sealed and the intersection with Erindoon Road is to be formalised to accommodate heavy vehicle.

All key intersections are to be kept clear of vegetations and other over ground furniture to ensure adequate sight distances.

Appropriate signage indicating “Trucks Entering” is proposed at all key intersections.

If any large loads including ‘High and Wide” loads are to be carried to the site, appropriate measure would need to be undertaken (envoy and “leading” flashing vehicles) to ensure safety and facilitate the material/equipment transport.

6. GLOSSARY

AADT – (Annual Average Daily Traffic), bi-directional traffic count representing an average 24-hour day in a year;

Road Capacity — the maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of the roadway (lane) during a given time period under the prevailing roadway, traffic and control conditions

Peak construction period – The most activity/traffic intensive period within total construction period of 4 years, estimated to occur between 18 – 36 month;

Peak hour (period) –1-hour period during which highest traffic flows of an average 24-hour day are recorded. Typically AM and PM peak hours are used for road and intersection analysis.

Peak daily (period) – 1-day period during which highest traffic flows of a week/month/year are recorded.

Peak traffic situation – situation during which highest traffic flows are expected to occur;

Level of Service – Qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers;

SIDRA – Signalised and unsignalised Intersection Design and Research Aid (traffic engineering software);