



CONSULTING CIVIL & TRAFFIC ENGINEERS, RISK MANAGERS.



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1. Background

Aigle Royal Developments are proposing to extract sand from a property located on Lots 1 and 2 Baldivis Road Baldivis. The site is located adjacent to the Rockingham Regional Memorial Park to the north, the City of Rockingham Landfill Facility to the west and MRWA reserved land to the south.

It is intended to extract a total of 600,000 cubic metres of sand over a 5 year period with the pit planned to operate 6 days a week.

Subsequent to lodging an application for an extractive licence, the City of Rockingham advised Aigle Royal that additional information was required in support of the application. In part this included more details with regards to the development and traffic, specifically:

1. The construction and operational life of the development (i.e how long is this development intending to operate), and details of any other infrastructure construction on site and anticipated utilisation area of extracted material;
2. Details of shakedown areas or properly controlled truck wash facilities (if any);
3. The intended use of the pit after the operation life.
4. The anticipated traffic generation by the development and make up of traffic movements in terms of vehicle classification;
5. A Sidra analysis of the staggered T junction of Mundijong/Baldivis Road, to determine the impact of the proposed development on generated traffic; and
6. The sightline requirements at the proposed crossover.

This report reviews those items listed above that refer to traffic flows and traffic operations.

2. Network Context

2.1. Existing Road Network

The site together with the existing adjacent road network is shown on Figure 1.

Baldivis Road and Mundijong Road are classified as Regional Distributors under the MRWA Functional Road Hierarchy and each provide connection to the regional road network. Baldivis Road runs parallel to the Kwinana Freeway and provides connections between the adjacent residential cells and various Freeway on ramps and off ramps including those at Mundijong Road. In the vicinity of the site Baldivis Road is a sealed two lane road with traffic lanes of 3.5 metres and a combination of sealed and unsealed shoulders. North of Mundijong Road, Baldivis Road carries approximately 3,870 vehicles per day (vpd); south of Mundijong Road daily traffic volumes are in the order of 10,960 vpd. Mundijong Road runs east west and provides a connection

between Mandurah Road to the west and the Kwinana Freeway to the east. It currently carries approximately 5,000 vpd.

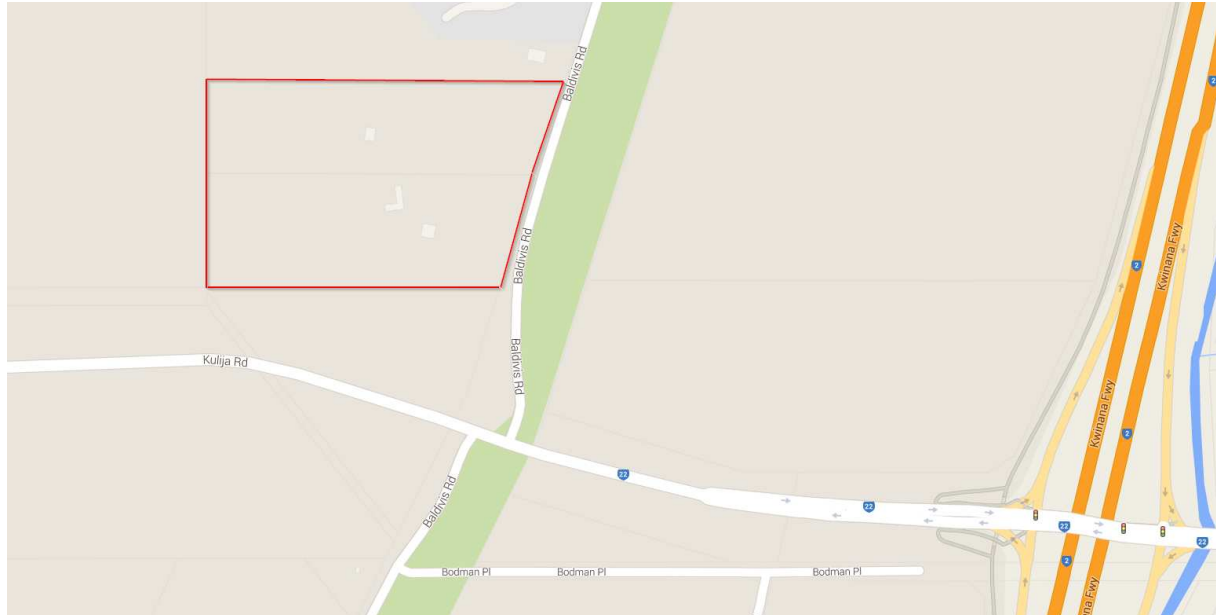


Figure 1 - Site Location

2.2. Operational Aspects

The programmed extraction from the site is planned to occur over a five year period with a total of 600,000 cubic metres of sand removed. The anticipated extraction volumes for each year are as follows:

Initial Year 1	80,000 cubic metres,
Year 2	140,000 cubic metres,
Year 3	140,000 cubic metres,
Year 4	140,000 cubic metres,
Year 5	100,000 cubic metres,

At peak annual extraction rates of 140,000 cubic metres, it is anticipated that the operation will occur over a 6 day week and for a total of 312 days. This will require an average of 450 cubic metres to be loaded and transported from the site every day. It is intended to cart with 19 metre semi-trailers which have a capacity of about 20 cubic metres. Assuming a 10 hour working day, daily trips to and from the site are estimated to be in the order of 22 leaving and 22 arriving or a combined daily trip rate of 44 and an hourly trip rate of 5 (2 to 3 trips entering and 2 to 3 trips egressing).

2.3. Intersection Assessment

The Intersection of Baldivis Road and Mundijong Road forms a staggered “T” with a “right – left” configuration. The distance between the staggered legs is approximately 40 metres with the intersection configured as shown on Figure 2.



Figure 2 - Intersection Configuration

In order to assess the impact on the intersection of Baldivis Road and Mundijong Road, peak hour turning movement counts were undertaken between 7:15 AM and 8:15 AM and between 4:00 PM and 5:00 PM on a typical Thursday. The results of the survey are shown on Figure 3 and Figure 4.

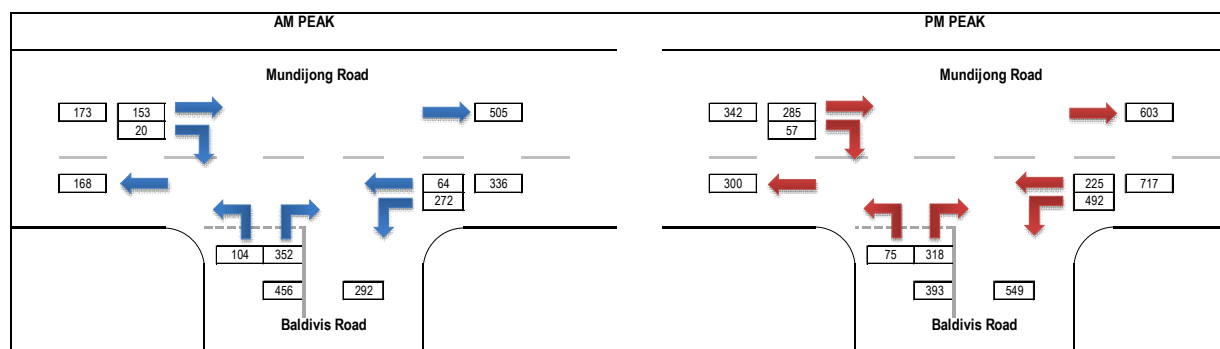


Figure 3 - Peak Hour Counts - Southern "T"

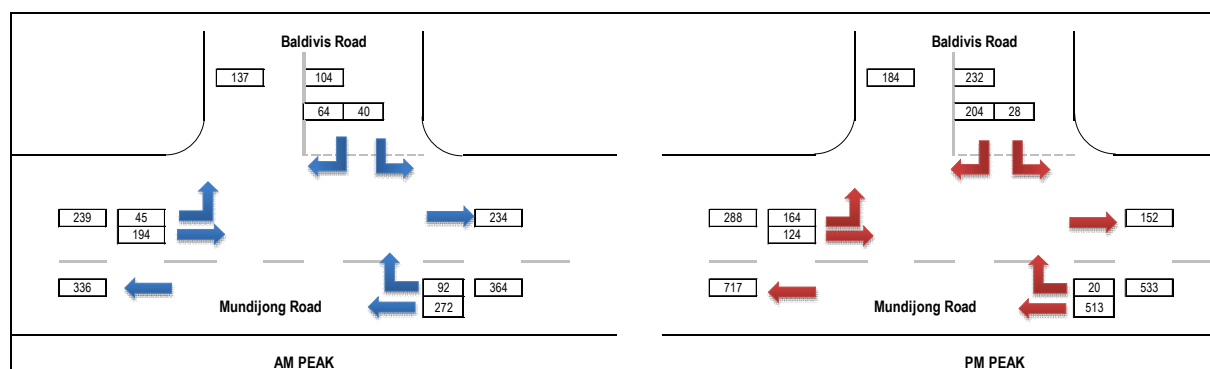


Figure 4 - Peak Hour Counts - Northern "T"

Twenty four hour traffic counts were also sourced from MRWA together with SCATS counts obtained from the Freeway ramp signals located on Mundijong Road to the east of the intersection.

Sidra Intersection 6.0 was used to model the performance of each leg of the intersection with the intersection treated as two separate T junctions. The Network function in Sidra was then applied to model the impact of the intersection as a staggered "T".

Modelled performance of the intersections under current flows for both the AM and PM peak hours is shown on Figure 5, Figure 6, Figure 7 and Figure 8.

Movement Performance - Vehicles										
Mov ID	ODMo	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate
	v	Total	HV				Vehicles	Distance		
		veh/h	%	v/c	sec		veh	m		per veh
East: Mundijong Road										
5	T1	286	5.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00
6	R2	97	5.0	0.125	8.6	LOS A	0.5	3.5	0.53	0.75
Approach		383	5.0	0.152	2.2	NA	0.5	3.5	0.13	0.19
North: Baldvis Road										
7	L2	42	5.0	0.048	7.3	LOS A	0.2	1.2	0.41	0.64
9	R2	67	5.0	0.217	17.0	LOS C	0.8	5.8	0.76	0.91
Approach		109	5.0	0.217	13.3	LOS B	0.8	5.8	0.62	0.81
West: Mundijong Road										
10	L2	173	5.0	0.096	5.6	LOS A	0.0	0.0	0.00	0.58
11	T1	358	5.0	0.190	0.0	LOS A	0.0	0.0	0.00	0.00
Approach		531	5.0	0.190	1.8	NA	0.0	0.0	0.00	0.19
All Vehicles		1023	5.0	0.217	3.2	NA	0.8	5.8	0.12	0.25

Figure 5 - Northern Leg - AM Peak

Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Baldvis Road											
1	L2	109	5.0	0.090	5.9	LOS A	0.3	2.5	0.16	0.55	52.9
3	R2	371	5.0	0.587	13.1	LOS B	4.8	35.2	0.69	1.04	47.9
Approach		480	5.0	0.587	11.5	LOS B	4.8	35.2	0.57	0.93	49.0
East: Mundijong Road											
4	L2	286	5.0	0.160	5.6	LOS A	0.0	0.0	0.00	0.57	53.4
5	T1	67	5.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		354	5.0	0.160	4.5	NA	0.0	0.0	0.00	0.47	54.5
West: Mundijong Road											
11	T1	161	5.0	0.085	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	21	5.0	0.022	7.2	LOS A	0.1	0.6	0.42	0.61	52.0
Approach		182	5.0	0.085	0.8	NA	0.1	0.6	0.05	0.07	58.9
All Vehicles		1016	5.0	0.587	7.2	NA	4.8	35.2	0.28	0.61	52.4

Figure 6 - Southern Leg - AM Peak.

Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
East: Mundijong Road											
5	T1	540	5.0	0.286	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
6	R2	21	5.0	0.020	6.9	LOS A	0.1	0.6	0.38	0.59	52.1
Approach		561	5.0	0.286	0.3	NA	0.1	0.6	0.01	0.02	59.6
North: Baldvis Road											
7	L2	29	5.0	0.026	6.1	LOS A	0.1	0.7	0.23	0.55	52.7
9	R2	215	5.0	0.670	25.8	LOS D	4.2	30.4	0.88	1.18	41.1
Approach		244	5.0	0.670	23.5	LOS C	4.2	30.4	0.80	1.10	42.2
West: Mundijong Road											
10	L2	173	5.0	0.096	5.6	LOS A	0.0	0.0	0.00	0.58	53.4
11	T1	131	5.0	0.069	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		303	5.0	0.096	3.2	NA	0.0	0.0	0.00	0.33	56.0
All Vehicles		1108	5.0	0.670	6.2	NA	4.2	30.4	0.18	0.34	53.8

Figure 7 - Northern Leg - PM Peak

Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed	
		Total	HV			Vehicles	Distance				
		veh/h	%			v/c	sec				veh
South: Baldvis Road											
1	L2	79	5.0	0.077	6.7	LOS A	0.3	2.0	0.33	0.60	52.4
3	R2	335	5.0	0.884	32.8	LOS D	8.7	63.6	0.94	1.59	38.1
Approach		414	5.0	0.884	27.8	LOS D	8.7	63.6	0.82	1.40	40.2
East: Mundijong Road											
4	L2	518	5.0	0.289	5.6	LOS A	0.0	0.0	0.00	0.57	53.4
5	T1	237	5.0	0.125	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		755	5.0	0.289	3.9	NA	0.0	0.0	0.00	0.39	55.3
West: Mundijong Road											
11	T1	300	5.0	0.159	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	60	5.0	0.107	10.7	LOS B	0.4	2.8	0.63	0.85	49.5
Approach		360	5.0	0.159	1.8	NA	0.4	2.8	0.10	0.14	57.9
All Vehicles		1528	5.0	0.884	9.9	NA	8.7	63.6	0.25	0.61	50.7

Figure 8 - Southern Leg - PM Peak

Queue lengths shown in the modelling outputs are generally representative of those observed onsite.

Further Sidra analysis of the intersections applying the Network function indicates that at current volumes, the staggered “T” Junction is operating within an acceptable Degree of Saturation and at an acceptable Level of Service. Output from the modelling is shown on Figure 9 and Figure 10.

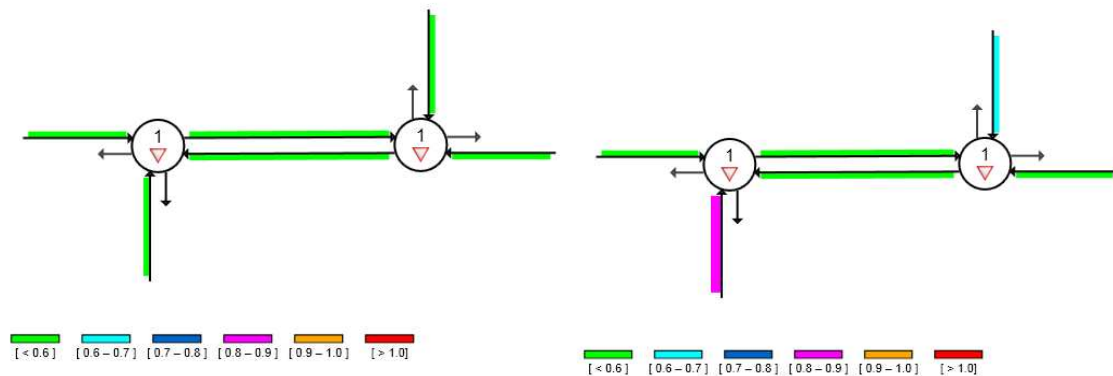


Figure 9 - Intersection Degree of Saturation (AM Peak – PM Peak)

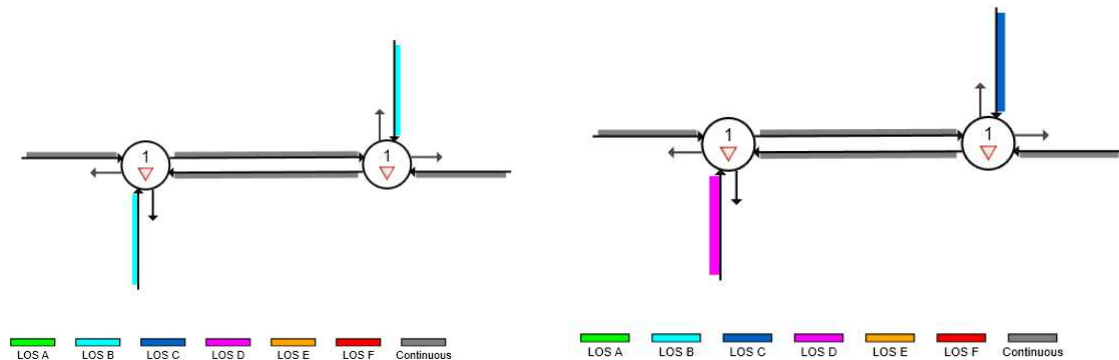


Figure 10 - Intersection Level of Service (AM Peak – PM Peak)

With the sand quarry operating it is expected that traffic flow from the pit will predominantly involve loaded trucks turning right onto Baldivis Road and thence left onto Mundijong Road; returning trucks are expected to predominantly access the site via the Kwinana Freeway, turning right from Mundijong Road northbound into Baldivis Road. Introduction of the additional truck movements onto the road network does not measurably alter the Sidra assessment and the intersection performance is expected to remain generally as currently experienced.

2.4. Access Considerations

Sight distance from the proposed access point located adjacent to the northern boundary of the site is estimated as being approximately 250 metres to the south and 400+ metres to the north. With a zoned speed

limit of 80 km/h the required sight distance for a truck is calculated as being:

Approach Sight Distance: 139 metres.

Safe Intersection Sight Distance: 252 metres.

Minimum Gap Sight Distance: 125 metres.

Therefore it is concluded that the available sight distance is adequate and meets the design requirement for Approach Sight Distance, Safe Intersection Sight Distance and Minimum Gap Sight Distance.



Figure 11 - Looking South from the Proposed Access Point



Figure 12 - Looking North from the Proposed Access Point

3. Conclusion.

A review of the impact associated with the proposed extraction and cartage of sand from Lot 1 and Lot 2 Baldivis Road indicates that based on expected extraction rates over a 5 year life of the resource, a maximum of 6 movements per hour by semi-trailers will occur. It is anticipated that these will typically involve 3 movements from the site southbound on Baldivis Road thence eastbound on Mundijong Road with 3 movements to the site involving the reverse path.

Based on surveyed turning movements at the current intersection, Sidra modelling indicates that during peak hours in both the morning and afternoon, the staggered T intersection is operating within the limits of practical capacity and at an acceptable Level of Service. Modelling with additional traffic expected to be added by the operation of the sand pit shows no measurable change to the intersection performance.

A review of available sight distance from the location of the proposed access to the site indicates that Approach Sight Distance, Safe Intersection Sight Distance and Minimum Gap Sight Distance should meet Austroads guideline requirements.

Based on the above assessment it is considered that impacts associated with the proposal are slight and well within acceptable limits.