Traffic Engineering Letter
KC01338.000 508 King Road, Oldbury

26-08-2021

Ashwin Nair
Manager Statutory Planning & Compliance

Shire of Serpentine Jarrahdale
6 Paterson Street Mundijong, WA 6123

Attn: Ashwin Nair

Re: 508 King Road, Oldbury – review of access arrangement

Ashwin,

This letter was prepared to examine specific elements of access arrangements for 508 King Road, Oldbury, as requested by the Shire of Serpentine Jarrahdale. These elements are as follows:

a) Determine applicable standards for determining appropriate sight distances
b) Confirm whether the current configuration conforms to the applicable standard
c) Provide an opinion on whether the location of the access/egress can be deemed safe

In summary, we found that the appropriate standard for assessing sight distances is AS2890.02, as that is the standard specified in the Shire of Serpentine Jarrahdale's crossover policy. While the existing crest on King Road restricts sight distances to the north, no traffic incident was recorded in the vicinity (within 50m) of the subject site in the last five years.

On the following pages are the details of our analysis and findings. If you have any queries, please don't hesitate to contact me.

Regards,

Marina Kleyweg
Director | Principal of Traffic and Transport

1. Traffic Engineering Letter

1.1 Background and Purpose of This Letter

The proponent applied for retroactive approval for a "Transport Depot" and a "Shed" in February 2021. At the ordinary council meeting held on 19th April 2021, the council refused the application despite the officer's recommendation of approval with conditions. Subsequently, the proponent appealed the decision to the State Administrative Tribunal (SAT).

In July 2021, the Shire of Serpentine Jarrahdale requested advice on a specific concern pertaining to SAT proceedings for the property 508 King Road Oldbury. The particulars this letter will address are as follows:

a) What is an appropriate sight distance criteria to be applied for a transport depot, being either **Safe Intersection Sight Distance** as specified in *AustRoads Part 4 A*: *Unsignalised and Signalised Intersections,* or the **Sight Distance Requirements at Access Driveways** criteria as specified in *AS2890.2-2018 Parking facilities, Part 2*: *Off-street commercial vehicle facilities.*
b) Whether the proposal complies with the relevant sight distance standard; and
c) Whether the access point is considered safe, regarding the number and type of vehicles that will use it.

1.2 Location

Street Number	508
Road Name	King Road
Suburb	Oldbury
Local Government	Shire of Serpentine Jarrahdale
Description of Site	The subject site is occupied by a single residential dwelling, various outbuildings and an effective transport depot. The access to the site is approximately 270m north of the intersection of King Road and Boomerang Road

1.3 Development Application Proposal

The subject site is operating as a transport depo for three years. Based on the information presented in the Meeting Minutes (19th April 2021 Shire of Serpentine Jarrahdale's Council Ordinary Meeting), four (4) people are employed at

present. Based on the information received from the proponent, the site is expected to generate up to four (4) vehicular trips per day for heavy vehicles and eight (8) vehicular trips for light vehicles.

The proponent provided the list of available heavy vehicles, and it is as follows:

Number of Vehicles	Vehicle	Length	AS2890.02 Classification
3	Scania 6 wheel tippers	7.6-8.8m	MRV
2	Dinosaur Water Carts	4.2m (cart) +4.4m (tractor)	MRV*
1	Telehandler	5.7m+forks	SRV-MRV

The proponent did not supply the exact dimensions of the specified heavy vehicles; therefore, the lengths in the table were obtained through an internet search.

Scania appears to offer various "6-wheel tippers" slightly varying in length; however, all of these vehicles can be classified as Medium Rigid Vehicles (MRV).

Similarly, dinosaur water carts' dimensions depend on the capacity; however, the water cart itself is in Small Rigid Vehicle (SRV) class. The water cart must be pulled by a tractor (prime-mover), and the combined length is within Medium Rigid Vehicle (MRV) specification. It should be noted that this composition is, in fact, articulated, not rigid.

The dimension of a telehandler depends on its capacity. In all of the examples found, the length of a telehandler remains within the SRV class, excluding the forks.

Further, there is unspecified farm machinery and four unspecified construction vehicles to be repaired and auctioned.

1.4 Local Road Network Information

How many roads front the subject site?	1

Name of Roads Fronting Subject Site / Road Classification and Description:

Road 1

Road Name	King Road
Number of Lanes	two way, one lane each direction, undivided
Road Reservation Width	20.0m
Road Pavement Width	7m
Classification	Regional Distributor
Speed Limit	100kph
Bus Route	NO
On-street parking	NO
RAV Route	YES
If YES, specify the route	4 (27.5m)

1.5 Traffic Volumes

The Shire of Serpentine Jarrahdale provided the following traffic count data:

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)		Heavy Vehicle %	Date of Traffic Count	*If older than 3 years multiply with a growth rate*
			AM Peak Time - AM Peak VPH	PM Peak Time - PM Peak VPH	*If HV count is Not Available, are HV likely to be in higher volumes than generally expected?*		
King Road	600m north of Mundijong Road	3,852	07:00 – 366	16:00 – 437	16.6%	2020	–
King Road	500m north of Orton Road	1,482	06:00 – 105	16:00 – 139	19.4%	2019	–

1.6 Vehicular Crash Information and Risk Assessment

Is Crash Data Available on Main Roads WA website?	YES
If YES, nominate important survey locations:	
Location 1	King Road [3.2 – 3.5]
Period of crash data collection	01/01/2016 - 31/12/2020

Road / Intersection Name	SLK	Road Hierarchy	Speed Limit	Crash Statistics			
				No of KSI Crashes	No of Medical Attention Crashes	No of PDO Major Crashes	No of PDO Minor Crashes
King Road	3.2-3.5	Regional Distributor	100kph	0	0	1	0
No of MVKT Travelled at Location			≈3,000 VPD * 365 * 5 years * 0.3 km = 1.64 MVKT				
KSI Crash Rate			0 KSI crashes / 1.64 MVKT = 0 KSI crashes/MVKT				
All Crash Rate			1 crashes / 1.64 MVKT = 0.61crashes/MVKT				
Comparison with Crash Density and Crash Rate Statistics			0.61 crashes/MVKT is lower than the network average for midblock crashes on local roads of 0.86 crashes/MVKT.				

The following tables show the Crash Density and Crash Rates on Metropolitan Local and Regional Roads as obtained from Main Roads WA on the 13th May 2020 by email request:

Crash Density and Crash Rate on Metropolitan Local Roads Network only

	All Crashes		Serious Injury Crashes (Fatal+Hospital)	
	Average Annual Crash Density (All Crashes/KM)	Average Annual Crash Rate (All Crashes/MVKT)	Average Annual Crash Density (Ser. Inj. Crashes/KM)	Average Annual Crash Rate (Ser. Inj. Crashes/MVKT)
Metro Local Road - Midblock	2.67	0.86	0.11	0.04
Metro Local Road - All	5.70	1.83	0.22	0.07

Note: Based on 5-years data for the period 2015 to 2019.

In the last 5 years, only one incident was recorded in a relative vicinity of the subject site. According to the MRWA portal, this incident (No 2016165141) occurred approximately 400m north of the intersection with Boomerang Road, where rear-end collision of two vehicles was recorded. Both vehicles were travelling southbound. This crash was Property Damage Only (PDO).

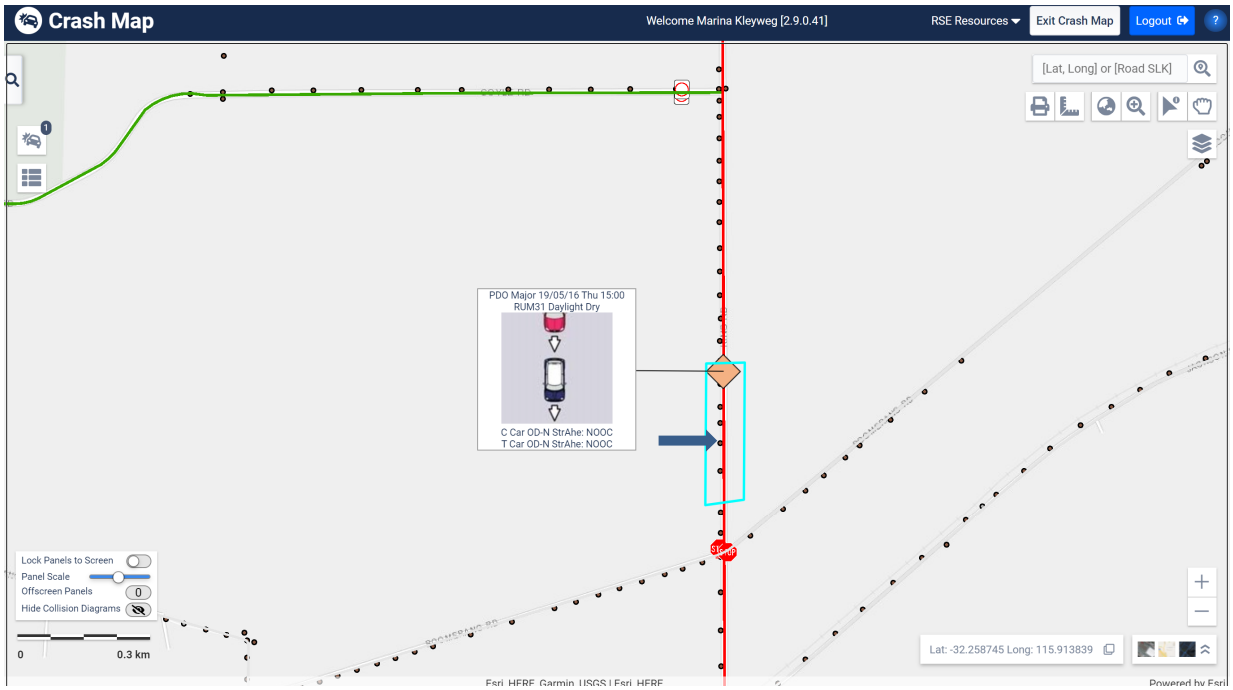


Figure 1 - Recorded crash incidents - 2016-2020 (arrow showing an approximate location of the 508 King Road Oldbury driveway).

1.7 Relevant Regulatory Documents

One of the key questions to be answered in this letter is the applicable standard to be used for assessing appropriate sight distance. We will examine both relevant documents in the following sections.

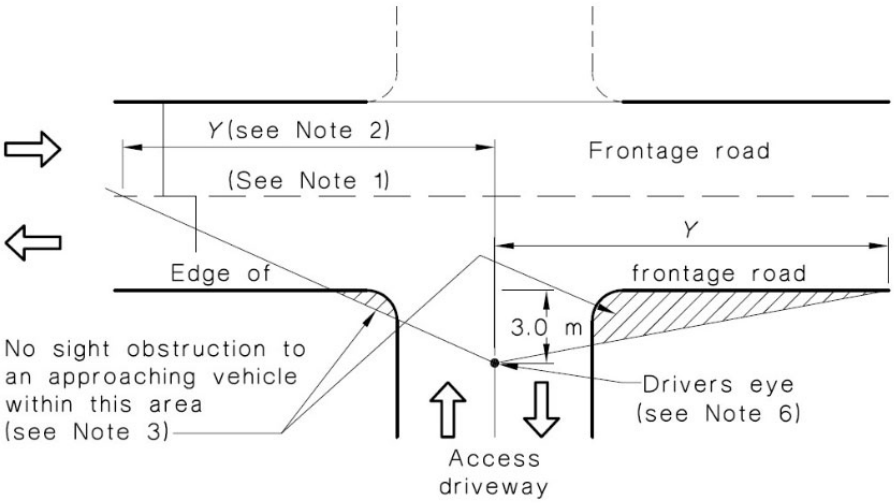
1.7.1 AS 2890.02 - 2002 Off-Street Commercial Vehicle Facilities

Section 3 – Access Driveways and Circulation Driveways prescribes the requirements for designing the driveways in accordance with AS2890.02. In general, the driveways' design is divided into two broad categories – driveways to minor and major roads. As the subject site enjoys direct access to King Road, classed as a Regional Distributor, RAV4 route and sign-posted speed limit of 100km/h, it is logical to apply design requirements for the latter category – driveways to major roads.

Sight distances are discussed in Section 3.4.5 and are classified into two specific categories:

- Sight distance to oncoming traffic on the public roadway, and
- Sight distance to pedestrians.

As King Road does not feature pedestrian paths, and the road environment is not conducive to pedestrian traffic, this section will focus on the sight distance to on-coming traffic. Relevant Figure 3.3 was reproduced below.



Frontage road speed (Note 4) km/h	Distance (Y) along frontage road (Note 5) m	
	5 s gap	8 s gap
40	55	89
50	69	111
60	83	133
70	97	156
80	111	178
90	125	200
100	139	222
110	153	244

Figure 2 - Figure 3.3 Sight distance requirements at access driveway exits (source: AS2890.02:2002)

Note 5 to this drawing specifies that the distance (Y) is based on a minimum gap sight distance (MGSD), where 5s is the minimum for roads with less than six lanes, while 8s is the minimum requirement for roads with six lanes without appropriate median refuge.

1.7.2 Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (and MRWA supplement to this document)

Austroads Guide To Road Design Part 4A (AGRD4A) examines several parameters regarding sight distances. The focus of this section is namely on the Safe Intersection Sight Distance (SISD). This parameter is discussed in Section 3.2.2 of the abovementioned document.

Table 3.2 (page 20) provides standard SISD dimensions for various design speeds. As the design speed is 10km/h above the signposted speed, the relevant parameter for King Road is 110km/h.

Table 3.2: Safe intersection sight distance (SISD) and corresponding minimum crest vertical curve size for sealed roads (S < L)

Design speed (km/h)	Based on safe intersection sight distance for cars[1] h_1 = 1.1; h_2 = 1.25, d = 0.36[2]; Observation time = 3 sec					
	R_T = 1.5 sec[3]		R_T = 2.0 sec		R_T = 2.5 sec	
	SISD (m)	K	SISD (m)	K	SISD (m)	K
40	67	4.9	73	6	–	–
50	90	8.6	97	10	–	–
60	114	14	123	16	–	–
70	141	22	151	25	–	–
80	170	31	181	35	–	–
90	201	43	214	49	226	55
100	234	59	248	66	262	74
110	–	–	285	87	300	97
120	–	–	324	112	341	124
130	–	–	365	143	383	157

Figure 3 - Nominal SISD parameters (source: AGRD4A)

Based on this table, Austroads recommend 285m SISD for a reaction time of 2.0 seconds and 300m for 2.5 seconds. The MRWA supplement supports these volumes.

It is important to note that these values are for cars (light vehicles), and the values for trucks (heavy vehicles) need to be calculated separately. The calculation formula is Equation 2 (page 18, AGRD4A) as follows:

$$SISD = \frac{Dt\ x\ V}{3.6} + \frac{V^2}{254\ x\ (d + 0.01\ x\ a)}$$

Where:

SISD = safe intersection sight distance (m)
Dt = decision time (s) = observation time + reaction time
V= operating 85% speed (km/h)
d= coefficient of deceleration
a= longitudinal grade in % (in direction of travel: positive for uphill grade, negative for downhill grade.

The AGRD4A and the MRWA supplement provide two differing recommendations on check cases for trucks, with the key difference being d (coefficient of deceleration). Below are the parameters as prescribed by both – Austroads and Main Roads WA:

Dt = decision time (s) = observation time (3 seconds) + reaction time (2.0s – 2.5s)
V= operating 85% speed (km/h) = 101.9km/h (as supplied by the Shire of Serpentine Jarrahdale)
d= coefficient of deceleration = 0.24 according to Austroads (table 3.3, page 20); 0.29 according to the MRWA supplement
a= longitudinal grade in % (in the direction of travel: positive for an uphill grade, negative for downhill grade) – 1.3% for northbound carriageway; -2.9% for southbound carriageway (sourced from Google Earth), both in approach to the subject driveway.

Based on these parameters, SISD minimum values are as follows:

	Reaction time 2.0s	Reaction Time 2.5s
Austroads d=0.24	**303.12m** / 335.28m	**317.27m** / 349.43m
MRWA d=0.29	**276.45m** / 298.15m	**290.6m** / 312.3m

The bolded values represent relevant parameters for the northbound approach (south of the intersection), while the other values represent the southbound approach (north of the intersection).

1.8 Precedence of Documentation

The Main Roads WA (MRWA) Driveways policy pertains to roads under the control of the MRWA, which are defined as "*A highway or main road under the control of Main Roads Western Australia and includes national highways"* in Section 2.1 of the policy. "Western Australian Road Hierarchy" document (MRWA document D10#156630) states explicitly that The local government manages regional Distributors. Further, the subject driveway is not located in the vicinity of signalised intersections or intersections with state roads. Given that King Road is classified as a Regional Distributor, is not classed as a state-managed road in the current Metropolitan Regional Scheme, and the driveway is not located in the vicinity of state-controlled intersections, the responsible authority for this road is the Shire of Serpentine Jarrahdale (the local government).

Therefore, the local government policies are the relevant documents to consider.

The Shire of Serpentine Jarrahdale has an operational policy for crossovers titled "Standard Specification For Crossover Construction" (document reference E03/4619). Page 1 of this document specifies required sight distances, and the extract is provided in the figure below:

Sight Distance to Roadway Traffic:

The Requirements for minimum sight distance at the road interface are defined in the Australian Standard AS 2890.2-2002 Parking facilities.

Frontage Road Speed (km/hr)	Domestic Property Absolute Minimum (m)	Minimum SSD (m)	Desirable: 5s gap (m)
40	30	35	55
50	40	45	69
60	55	65	83
70	70	85	97
80	95	105	111
90	130	130	125
100	160	160	139
110	190	190	153

Figure 4 - Sight distances at driveways (source: Standard Specification For Crossover Construction, Shire of Serpentine Jarrahdale)

The document references AS2890.02-2002 as a guideline; therefore, AS2890.02-2002 is the relevant document to consider for this property, not Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections.

1.9 Compliance With the Relevant Standard

The site visit was conducted on Thursday, 5th August 2021, between 10:30 and 11:00. The weather was sunny and dry. Sight distances were assessed from approximately 3m behind the carriageway, as stipulated in AS2890.02. Images are shown below.

Figure 5 - Sight distance - to the north (southbound lane)

The figure above shows that a passenger vehicle (red circle) can be seen approaching the crest. Video recorded at the site shows approximately 4.5 seconds of the travel time from the moment the vehicle became visible to the moment the travelling vehicle traversed the potential conflict point.

The image below is an extract from Google Earth Pro, showing an approximate vertical profile of King Road, north of No 508. While the crest builds rapidly within 60-70m north of the subject driveway, the grade plateaus allow the top of the vehicle to be seen 115-120m north from the driveway.

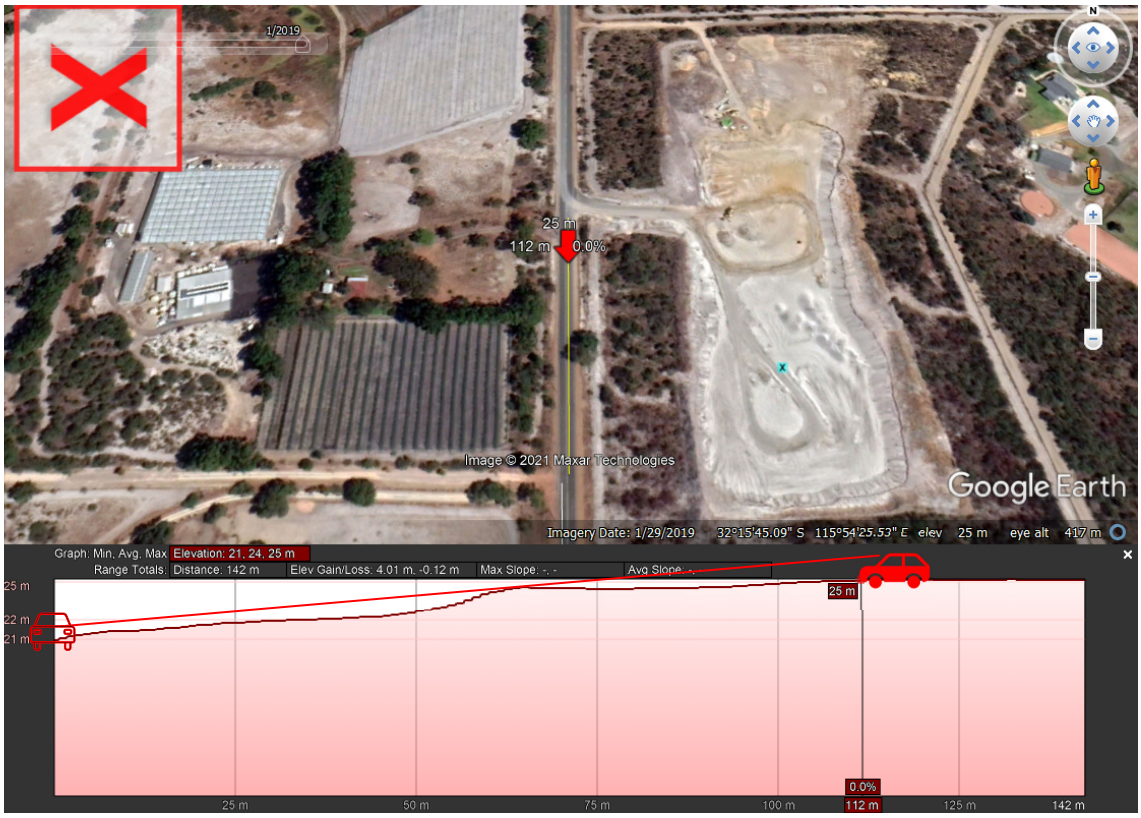


Figure 6 - Vertical profile - King Road north of No 508

The figure below illustrates sight distances to the south of the driveway. As per the image, King Road dips, enabling uninterrupted sight distance for vehicles egressing No 508 King Road. The signage for the King Road / Boomerang Road intersection can be seen from the subject driveway.

Figure 7 - Sight distance - to the south (northbound lane)

Based on the available information, sight distance to the south complies with AS2890.02, while the sight distance to the north doesn't comply with AS2890.02.

	Sight Distance to the North (115-120m)	Sight Distance to the South (250-260m)
5s gap – 139m	✗	✓
8s gap – 222m	✗	✓

1.10 Safety of 508 King Road, Oldbury Access/ Egress Point

While the site visit showed that sight distances to the north do not comply with the AS2890.02 requirement, only one incident was reported in the last five years in a relative vicinity of the property. Given that the incident was recorded approximately 130m north from the property (approximately at the top of the crest), it is safe to assume that vehicles involved in the incident were unrelated to 508 King Road, Oldbury.

Furthermore, the site has been in operation for the last three years, and during that period, no incident was recorded.

Notwithstanding that the sight distances to the north are lower than prescribed by AS2890.02, due to the road geometry and the terrain features, the incident rate is quite low considering the number of properties in the area facilitating small scale commercial operations.

With all this in mind, the access point to 508 King Road, Oldbury, cannot be considered unsafe if the traffic movement is limited to the same amount of daily vehicular trips generated and attracted over the previous three years.

The safety of the location can be improved by installing advance warning signage on the southbound carriageway. Signs such as W5-205B or W5-22A can be considered. Similar signs are installed along King Road in approach to properties with some commercial activity.