



Shire of Dardanup Road Safety Analysis 2023

Site 1 Ferguson/Dowdells/Depiazzi staggered intersection, Dardanup

Site Background

This site is the intersection between Ferguson Road (80km/h speed zoned rural road) and Depiazzi Road (unposted rural road) and Dowdells Line (unposted rural road) in Dardanup within the rural zone. The surrounding land use is grazing.

The staggered intersection has an additional short auxiliary lane on either side of Ferguson Rd to provide for turning vehicles. The westbound auxiliary lane has been lengthened by approximately 70m to provide a short acceleration lane onto Ferguson Rd.

The Shire has received several requests from the public to improve the intersection as there have been reports of westbound vehicles on Ferguson Rd having to apply heavy braking to avoid colliding with slow moving trucks which have just exited Depiazzi Rd.

Crash History

5-year history 1/1/2018 to 31/12/2022:

Total Number of Crashes: 0

Traffic Count Data

Traffic counts were conducted in December 2022 with the following results.

Road Name	Distance from intersection (m)	Traffic count (vpd)	85 th % speed (km/h)	% heavy vehicles
Ferguson Rd	166	1668	90	25.1
Depiazzi Rd	288	472	84	63.1
Dowdells Rd	170	418	76	16.6

Restricted Access Vehicle Approval

Tandem Drive Network 3

Ferguson Road – Waterloo Rd to Donnybrook – Balingup LGA Boundary

Depiazzi Road – Ferguson Road to Banksia Road

Banksia Road – Depiazzi Road to tip access road

Tandem Drive Network 4

Ferguson Road – Waterloo Rd to Depiazzi Road

Depiazzi Road – Ferguson Road to Banksia Road

Banksia Road – Depiazzi Road to tip access road

Site Inspection

The site was inspected by Andrew Coulson (Development Engineer) on 20/02/2023 at 3:30pm

Nature of concern confirmed following Site Inspection

Vehicles approaching Ferguson Rd along Depiazzi Rd are failing to give way to other vehicles approaching from the right.

Sightlines eastwards along Ferguson Rd are compromised by verge vegetation.

The intersection design is confusing with line marked auxiliary lanes which are mistaken for acceleration lanes.

The road name sign opposite Depiazzi Rd is very low.

The edges of the Dowdells line intersection are undefined and a large amount of sand and gravel debris is accumulating in the traffic lanes.

Treatment Options

Option 1 Improving intersection control Depiazzi Rd

The photos below show that there is no *Give Way* signage on the approach to Ferguson Rd and the give way holding line is deteriorated to being invisible.

AS 1742.2-2009 Manual of uniform traffic control devices indicates in clause 2.5.1(c) that GIVE WAY signs should be used for road safety reasons at unsignalised T-intersections where the continuing road is an arterial or sub-arterial road, urban or rural. Ferguson Rd is the major road servicing the Ferguson Valley with traffic counts in the order of 1668 vpd, and so would be considered a sub-arterial road warranting the installation of GIVE WAY signage at T-intersections.

There is evidence that a give way hold line was once installed at the intersection but has now deteriorated, but there are no GIVE WAY signs erected on the approach to Ferguson Rd.

The **recommended action** is to prepare a drawing for submission to MRWA to support an application to install a GIVE WAY sign and GIVE WAY holding line at the intersection of Depiazzi Rd and Ferguson Rd.



Option 2 Improving sightlines along Ferguson Rd

The available sightline measured from 5m back from the Depiazzi Rd hold line to the centre of the westbound traffic lane on Ferguson Rd east of the intersection is 146m.

Safe Intersection Sight Distance (SISD) is the minimum distance which should be provided on the major road at any intersection. Of particular note at this intersection, minimum SISD enables approaching drivers to see an articulated vehicle, which has properly commenced a manoeuvre from a leg without priority, but its length creates an obstruction.

The posted speed limit along this section of Ferguson Rd is 80km/h and the 85th % speed recorded from recent traffic counts is 90km/h, which both indicate that the design speed for this section of road is 90km/h.

Austrroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections Table 3.2 indicates that at a design speed of 90km/h and a minimum reaction time of 2.0 sec, the SISD should be 214m.

The Mainroads WA Standard Restricted Access Vehicle (RAV) Route Assessment Guidelines Appendix F – Entering Sight Distances, indicates that for RAV2-4 in an operating speed of 80km/h, the required entering sight distance is 220m and for a 90km/h speed is 260m.

The site visit revealed that a sight distance of 200m could be achieved by clearing vegetation in the verge which would include 10 trees, 4 of which were >0.5m diameter. Some regarding of the drain batter may also be required.

The **recommended action** is to prepare a drawing for submission to DWER in support of an application to clear native vegetation to create a sight line of 223m as shown below.

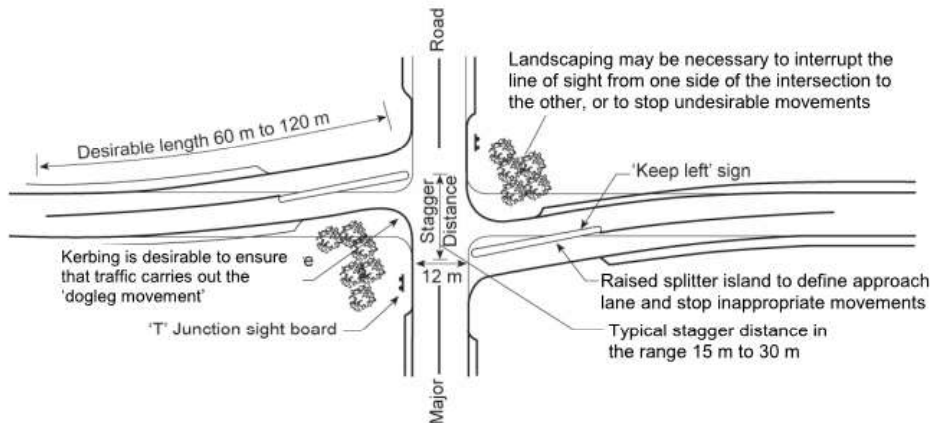


Option 3 Investigate Lane Linemarking

The intersection of the three roads is essentially a rural right-left staggered T – intersection with a stagger distance of 47 metres and major road width of 12 metres within the intersection.

Austrroads Guide to Road Design Part 4A indicates that these types of intersections should have a stagger distance of at least 30 metres and sufficient width is to be provided on the major road within the intersection to enable through vehicles to pass to the left of vehicles waiting to turn right e.g. 12m similar to the BAR treatment. A typical layout indicated is shown below.

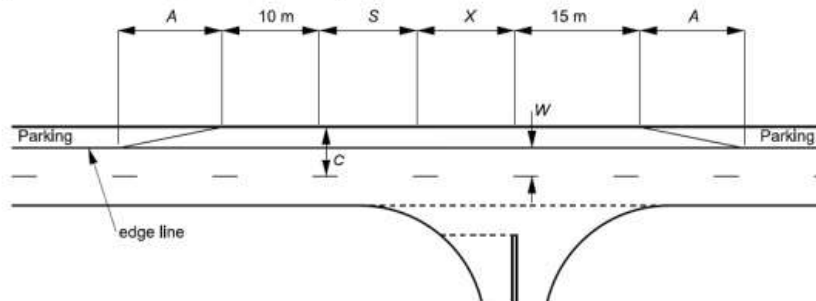
Figure 7.1: Right-left staggered T-intersection on a two-lane rural road (low turning volume)



Source: Based on Department of Main Roads (2006)²⁶.

The Basic Right-turn Treatment (BAR) is applicable at intersections of two lane roads where traffic volumes do not warrant a higher order treatment.

Figure 7.6: Basic right-turn treatment (BAR) for a two-lane urban road



Notes: This diagram does not show any specific bicycle facilities. Where required bicycle facilities should be provided in accordance with this Part.

The dimensions of the treatment are defined thus:

W = Nominal through lane width (m) (including widening for curves). Width to be continuous through the intersection.

C = On straights – 6.0 m minimum
 – 6.5 m minimum for 19 m semi-trailers and B-doubles
 – 7.0 m minimum for Type 1 and Type 2 road trains

On curves – widths as above + curve widening (based on widening for the design turning vehicle plus widening for the design through vehicle).

$$A = \frac{0.5V(C - W)}{3.6}$$

Increase length A on tighter curves (e.g. where side friction demand is greater than the maximum desirable). Where the design through vehicle is larger than or equal to a 19 m semi-trailer, the minimum speed used to calculate A is 80 km/h.

V = Design speed of major road approach (km/h).

S = Storage length to cater for one design turning vehicle (m) (minimum length 12.5 m).

X = Distance based on design vehicle turning path, refer to Design Vehicles and Turning Path Templates (Austrroads 2013f).

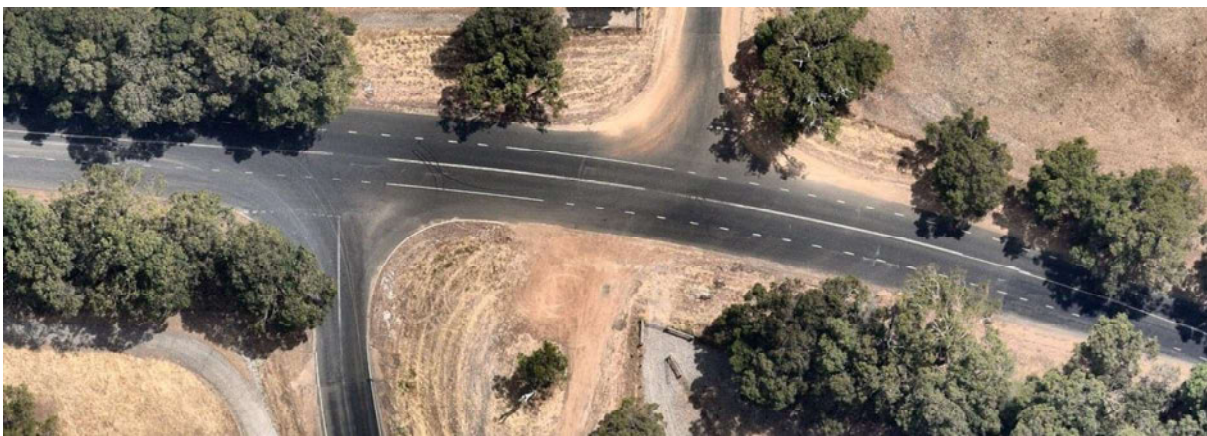
Source: Department of Main Roads (2006)³⁰.

The calculation of the auxiliary lane length equates to 115m which matches the existing length of the northern lane as shown below.



The southern auxiliary lane appears to be shorter than required before the intersection and longer after the intersection.

Austrroads Guide to Road Design Part 4A Clause 7.5.1 also indicates that no lane lines or right turn arrows should be marked on the pavement for a BAR turn treatment. The intersection does have line marking of the auxiliary lanes as shown below.



The existing situation of line marked lanes may give an impression to drivers that the auxiliary lanes are deceleration lanes before the intersections, and coupled with the absent GIVE WAY signage or hold lines on Depiazzi Rd, give the impression that the auxiliary lane to the west of Depiazzi Rd is an acceleration lane. This and the limited available sightlines are the likely reasons that drivers are failing to give way to approaching westbound traffic on Ferguson Rd.

The **recommended action** is to have the lane linemarking of the intersection further investigated with input from Mainroads WA and an independent traffic engineer to determine if it should be removed or modified to improve the road readability to drivers.

Option 4 – Relocate the road name sign opposite Depiazzi Rd to meet standards

The road name sign for Depiazzi Rd is positioned approximately 1.5m above ground level which presents a hazard to cyclists and pedestrians as shown below. AS 1742.2-2009 Manual of uniform traffic control devices Appendix D, D2.3.4 indicates that fingerboards and intersection direction signs should be located at a height of at least 2.0m.

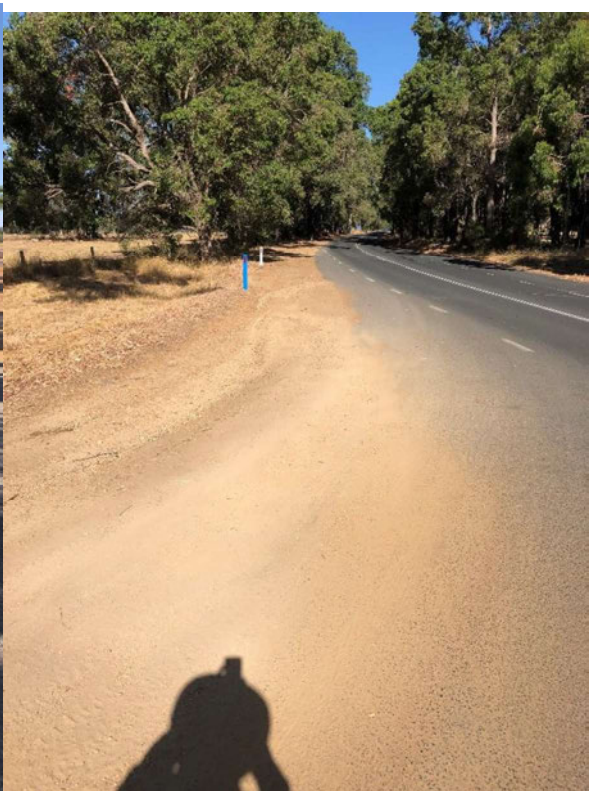


The **recommended action** is to have the signs relocated in accordance with AS 1742.2-2009.

Option 5 – Define and seal the edges of the Dowdells line intersection to avoid loose road materials accumulating in the traffic lanes.

The narrow seal of Dowdells Line combined with the addition of the auxiliary lane on Ferguson Rd which is being used as a deceleration lane, has resulted in inadequate sealed turning radii at both sides of the intersection. The inspection onsite revealed a substantial amount of sand and gravel debris spread across the traffic lanes. This issue creates the risk of skidding and loss of control as a result of a loss of pavement friction.

Austrroads Guide to Traffic Management Part 13: Road Environment Safety indicates that pavement friction can be significantly reduced by the presence of loose aggregate. If the friction supply drops to a low level in such situations, drivers can inadvertently demand more friction than the pavement can supply, leading to loss of control.



The **recommended action** is to prepare conceptual engineering drawings and costings for budget consideration in accordance with Austroads Guidelines to provide a sealed and kerbed intersection which will prevent road materials being transferred to the road surface from turning vehicles.

Other issues – Advance Warning Signage

The Mainroads WA Standard Restricted Access Vehicle (RAV) Route Assessment Guidelines Clause 2.4.5 Signage indicates that “Trucks on Road” signs may be necessary where any of the following factors are present:

- Roads are less than 5.5m wide;
 - Roads have adjoining side roads that the RAVs are utilizing;
 - There is a likelihood that other road users would be unaware of RAVs operating on the road;
- and
- Sight distances are less than 250m.

The existing sight distance on the westbound approach to Depiazzi Rd is 146m and it is recommended to increase this to 223m.

There is an existing TRUCKS ENTERING FROM LEFT sign located on the westbound approach 300m prior to the Depiazzi Rd intersection as below.

The **recommended action** is to leave this sign in place even after any sightline improvements are completed.



Option 6 Discussion – Acceleration Lanes

Once the above recommended actions are implemented, and if, after time, there are still issues being reported about the intersection, then Council may wish to consider an acceleration lane.

The AADT derived using the Passenger Car Equivalence factors for Depiazzi Road is 1167, and for Ferguson Rd is 2537, and as such, the Depiazzi Rd/ Ferguson Rd intersection appears to meet the requirements as set out in the Mainroads WA Standard Restricted Access Vehicle (RAV) Route Assessment Guidelines (excerpt next page):

2.8 RAV ACCELERATION LANES

2.8.1 Length of Acceleration Lane

The following requirement for length of acceleration lane strictly applies to situations where:

- the acceleration lane onto a highway or main road with a speed limit of at least 80 km/h and an AADT derived using the Passenger Car Equivalence factors (Table 3) is more than 1000; and
- there is no overtaking lane on the through road to overtake the RAV at or near the point of entry.

In other cases, it may still be desirable to apply the requirement.

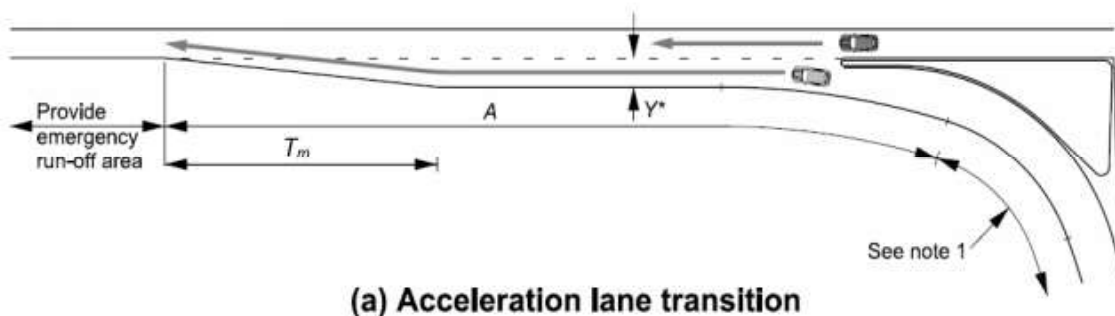
To avoid an undue hazard or obstruction to traffic, the length of any acceleration lanes provided on the route should be sufficient to allow RAVs, when fully loaded, to accelerate to within 70% of the operating traffic speed at the point where the lane merges with the through road. Table 8 shows the minimum length of acceleration lane for different vehicles and conditions.

Table 8: Minimum Length (m) of Acceleration Lane:
80 km/h Speed limit through road (i.e. required entry speed for RAV is 56 km/h)

Average gradient of entry lane (%)	Downhill			Level	Uphill	
	-4	-2	-1		1	2
RAVs Categories 2-6	190	270	350	510	1090	*
RAVs Categories 7-8	200	280	370	570	1500	*
RAVs Categories 9-10	220	330	460	790	*	*

If the Shire was to consider installing an acceleration lane, then a 510m long acceleration lane would be required along with channelisation of the entry, as shown in the figure below.

Figure 5.4: Options for auxiliary acceleration lanes



Construction of an acceleration lane would involve land acquisition and clearing, and two existing crossovers of adjacent landowners would end up being located within the acceleration lane area and the road effectively moved closer to their residences. It may also be beneficial to consider lowering the speed limit prior to the intersection to 70 km/h to reduce the risk of rear end collisions with large slow moving trucks.

In order for Council to consider such a project, the afore-mentioned options/recommendations would need to be demonstrated to have not been effective and that the benefit outweighs the cost of the acceleration lane and also its impact on the existing landowners.



Site 1 Ferguson /Depiazzi /Dowdells Line road intersection

Executive Recommendations

Agree with Options 1-6 as discussed in the report. **Liaise with Manager Assets re funding and timing of Options 2,3 and 5.**

Endorsed Options

1 - 6

Budget Allocations required

Options 1 and 4 should be able to be implemented within existing funds for road maintenance.

Options 2, 3 and 5 – Once works are defined, approvals in place and cost estimates complete, DI to advise whether a specific budget allocation is required for implementation.

Option 6 – Once the above recommended actions are implemented, and if, after time, there are still issues being reported about the intersection, then Council may wish to consider an acceleration lane.

Signed

