

# ROAD SAFETY INSPECTION

## **Yeriminup Road / Ballochmyle Road (Skewed) Intersection Cranbrook**



**Inspection Ref: PTS/RSB/RSI/PS/ 2023/010**

Prepared for:

**Shire of Cranbrook**

By:

**Road Safety Branch**

**Main Roads Western Australia**

Report Issue Date: **6/07/2023**

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**Road Safety Inspection Document Control Sheet**

<b>Project Location:</b>	Yeriminup Road / Ballochmyle Road (Skewed) Intersection Cranbrook
<b>Prepared for:</b>	Shire of Cranbrook
<b>Prepared by 1:</b>	Road Safety Branch
<b>Prepared by 2:</b>	Main Roads Western Australia
<b>Inspection Team Leader:</b>	Paul Starling
<b>Inspection Team Leader Organisation:</b>	Main Roads Western Australia
<b>Inspection Reference:</b>	PTS/RSB/RSI/PS/ 2023/010
<b>Report Issue Date:</b>	6/07/2023

## Contents

1.	INTRODUCTION.....	4
1.1	Scope of the Inspection .....	4
1.2	The Inspection Team.....	5
1.3	Specialist Advisors.....	5
	The were no specialist advisors present for this inspection.....	5
1.4	Safe System Findings.....	6
1.5	Previous Road Safety Inspections .....	6
1.6	Background Data.....	7
1.6.1	Crash History .....	7
1.6.2	Traffic and Speed Data.....	7
1.6.3	Appendices.....	7
2.	ITEMS RAISED IN THIS ROAD SAFETY INSPECTION .....	8
2.1	Finding – Safe Intersection Sight Distance.....	8
2.2	Finding – Unclear intersection priority .....	8
2.3	Finding – Lack of regulatory signage at intersection .....	9
2.4	Finding – Inadequate delineation to direct drivers to correct travel path .....	10
2.5	Finding – Trees within the clear zone (outside of curve).....	11
2.6	Finding – Curve warning signs.....	11
2.7	Finding – Loose aggregate at intersection .....	12
3.	ROAD SAFETY INSPECTION Team Statement.....	13

## **1. INTRODUCTION**

### **1.1 Scope of the Inspection**

A Road Safety Inspection is a formal examination of an existing road or road related area in which an independent, qualified team report on the crash potential and likely safety performance of the location. (Formerly known as an 'Existing Road Safety Audit')

This Road Safety Inspection has been conducted following the general principles detailed in *Austroads Guide to Road Safety Part 6: Road Safety Audit*.

This report results from a request for a Road Safety Inspection to be conducted at Yeriminup Road / Ballochmyle Road (Skewed) Intersection Cranbrook .

The background and objective of the inspection is this intersection has been the site of a number of 'near miss' events due to its configuration and geometry. The intersection layout poses issues with sight distance as well as vehicle positioning when entering or exiting Yeriminup Road.

The Road Safety Inspection was undertaken by Paul Starling of Main Roads Western Australia with reference to the details provided by the client.

The Road Safety Inspection comprised an examination of the area identified by Shire of Cranbrook .

All the findings described in Section 2 of this report are considered by the inspection team to require action in order to improve the safety of the existing road environment and to minimise the risk of crash occurrence and reduce potential crash severity.

The inspection team has examined and reported only on the road safety implications of the road infrastructure as presented.

## 1.2 The Inspection Team

<b>Auditor No.</b>	<b>Name</b>	<b>Role</b>	<b>Organisation</b>
702(S)	Paul Starling	Inspection Team Leader	Main Roads Western Australia
311(A)	Alan Millar	Inspection Team Member	City of Albany
952(T)	David Elliott	Inspection Team Trainee	City of Albany

The inspection team visited the site on 19<sup>th</sup> June 2023 at 1500hrs. At the time of the site visit the weather was fine and the existing road surface was dry.

A night-time site visit was undertaken on 19<sup>th</sup> June 2023 at 1900hrs

## 1.3 Specialist Advisors

There were no specialist advisors present for this inspection

## 1.4 Safe System Findings

The aim of Safe System Findings is to focus the Road Safety Inspection process on considering safe speeds and by providing forgiving roads and roadsides. This is to be delivered through the Road Safety Inspection process by accepting that people will always make mistakes and by considering the known limits to crash forces the human body can tolerate. This is to be achieved by focusing the Road Safety Inspection on particular crash types that are known to result in higher severity outcomes at relatively lower speed environments to reduce the risk of fatal and serious injury crashes.

The additional annotation **"IMPORTANT"** shall be used to provide emphasis to any Road Safety Inspection finding that has the potential to result in fatal or serious injury, or findings that are likely to result in the following crash types above the related speed environment: head-on (>70 km/h), right angle (>50 km/h), run off road impact object (>40 km/h), and crashes involving vulnerable road users (>30 km/h), as these crash types are known to result in higher severity outcomes at relatively lower speed environments.

The exposure and likelihood of crash occurrence shall then be considered for all findings deemed **"IMPORTANT"** and evaluated based on an auditors professional judgement. Auditors should consider factors such as, traffic volumes and movements, speed environment, crash history and the road environment, and apply road safety engineering and crash investigation experience to determine the likelihood of crash occurrence. The likelihood of crash occurrence shall be considered either **"VERY HIGH"**, **"HIGH"**, **"MODERATE"** or **"LOW"** and this additional annotation shall be displayed following the **"IMPORTANT"** annotation on applicable findings.

## 1.5 Previous Road Safety Inspections

A Road Safety Inspection was undertaken by Paul G Robertson Associates in May 2020 PGR/RSI/2020/CR02

The items raised in the previous Road Safety Inspection have been addressed with the exception of the items listed below. These items are discussed again in this Road Safety Inspection.

Earlier Inspection Finding Ref.	Description	Inspection Item Ref.
2.1	Safe Intersection Sight Distance	2.6
2.2	Intersection Advanced Warning Signs	2.5

## 1.6 Background Data

### 1.6.1 Crash History

A study of the recent crash history has been conducted in the location considered in the inspection for the five-year period to the end of December 2022. This showed that there were **0 reported crashes** within the extracted data.

### 1.6.2 Traffic and Speed Data

A summary of recent traffic data is provided below:

Location	Vehicles per day (% heavy vehicles)	Date	Source
Yeriminup Rd (Near Geekabe Rd)	39 (24%)	December 2020	Shire

A summary of recent speed data is provided below: **NO SPEED DATA PROVIDED**

Location	Average Speed (km/h)	85 <sup>th</sup> Percentile Speed (km/h)	Date	Source
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### 1.6.3 Appendices

Appendix A – Road Safety Inspection Findings Location Plan

Appendix B – Road Safety Inspection Photographs

Appendix C – Crash Reports

Appendix D – Corrective Action Report (CAR)

## **2. ITEMS RAISED IN THIS ROAD SAFETY INSPECTION**

### **2.1 Finding – Safe Intersection Sight Distance**

The curve and crest on Ballochmyle Road to the east of the intersection of Yeriminup Road obscures the available sight distance for vehicles travelling on Yeriminup Road.

#### ***Justification of the finding:***

There is a risk that vehicles travelling on Yeriminup Road may fail to observe vehicles travelling on Ballochmyle Road resulting in right angle or right turn through type crashes. This risk is further increased due to the potential for drivers on Ballochmyle Road failing to give way because of unclear intersection priority.

Available intersection sight distance from the intersection of Yeriminup Road was measured at 190m. *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersection* indicates that Safe Intersection Sight Distance is the minimum distance which should be provided on the major road at any intersection. Using an operating speed of 110 km/h and reaction time of 2.0 seconds the required Safe Intersection Sight Distance is 285 m measured 7 m back along the side road from the conflict point.

#### ***Recommendation***

If the intersection remains in its current configuration, the crest should be trimmed to a level that provides adequate Safe Intersection Sight Distance in accordance with Austroads Guidelines

**[IMPORTANT | MODERATE]**

### **2.2 Finding – Unclear intersection priority**

The existing intersection has confusing priority in relation to which road continues and which is considered the terminating leg.

#### ***Justification of the finding:***

There is a risk that drivers on Ballochmyle Road may fail to give way to entering or oncoming vehicles travelling on Yeriminup Road due to the give way provision being unclear with the continuing road (Yeriminup Road) effectively crossing the terminating road (Ballochmyle Road).

There is no advisory or regulatory signage on any of the approaches to the intersection to advise drivers of the intersection structure or to guide them in deciding who must give way in the case of multiple vehicles approaching at the same time.



*Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings states that consideration should be given to managing priority movements at intersections in line with driver expectations. Preference should be given to major movements.*

*There is high driver expectation that major rural routes will have a free-flowing alignment and priority and drivers who have travelled for long, uninterrupted distances at high-speed will be slow to react to a sudden change in alignment or to the entry of a high-speed vehicle from a minor road.*

*Minor movements should be clearly subordinated to major or high-speed movements by design, signing and/or speed control. Adequate warning should be provided:*

- *on major priority approaches through provision of adequate ASD and SISD*
- *on minor approaches by providing adequate ASD, and ESD where practicable or MGSD where appropriate*

### **Recommendation**

The intersection should be modified and defined to denote that Yeriminup Road is the continuing road with Ballochmyle Road being the terminating. This modification should include clear line marking and delineation to separate traffic effectively whilst negotiating the curve. Yeriminup Road should be sealed for approximately 100 -150m south east of Ballochmyle Road to provide adequate line marking and advisory speed reduction signage on the approach to the curve. Trees located on the north eastern verge of Yeriminup Road should be removed to provide adequate sight lines for traffic entering Yeriminup Road from Ballochmyle Road.

**[IMPORTANT | MODERATE]**

## **2.3 Finding – Lack of regulatory signage at intersection**

The intersection of Yeriminup and Ballochmyle Road is configured in such a manner that it is not immediately apparent to approaching road users which is the continuing or terminating road (skewed intersection). There is no regulatory or advisory signage to advise road users of who must give way to approaching traffic.

### **Justification of the finding:**

There is a risk that drivers could misinterpret the giveaway requirements associated with this intersection which could result in right angle or sideswipe crashes.

*Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings states that Stop or give way signs should always be installed at unsignalised intersections with four or more legs. They should also be provided at three-leg unsignalised intersections involving a major road and where the layout is such that it is not clear that the T-intersection rule would operate (e.g. at a skewed location)*

*A decision as to whether a stop sign rather than a give way sign is required is based on sight distance requirements for drivers on the minor road approach as shown in Figure 5.2, reproduced from AS 1742.2.*

**Recommendation**

Appropriate regulatory signage should be installed at the intersection in accordance with Austroads Guidelines.

**[IMPORTANT | MODERATE ]**

**2.4 Finding – Inadequate delineation to direct drivers to correct travel path**

The current intersection configuration provides for Yeriminup Road to continue from an easterly to a south easterly direction at the intersection with Ballochmyle Road as the continuing road. Eastbound traffic was observed to veer to the right to continue on Yeriminup Road and in doing so travelling into the opposing north bound lane at speed estimated to be in excess of 50km/h before crossing back to the correct (southbound) lane.

**Justification of the finding:**

There is a risk that vehicles travelling on Yeriminup Road may collide head on with traffic travelling in the opposing direction through the curve.

There is no dividing line marking or Retro-reflective Raised Pavement Markers on the approach to the intersection to readily distinguish the curve for night time delineation.

*Australian Standard 1742.2-2009: Traffic Control Devices for General Use* indicates clear and effective pavement marking is essential to provide guidance and may supplement other traffic devices to define the desired travel paths.

*Australian Standard 1742.2-2009: Traffic Control Devices for General Use* indicates retro-reflective raised pavement markers should be conspicuous in all conditions defining the desired travel paths.

*Austroads Guide to Road Design Part 6 (2018): Roadside Design, Safety and Barriers* indicate providing pavement marking is rated medium as an effective treatment to prevent an incident.

**Recommendation**

Line marking and Retro-reflective Raised Pavement Markers should be installed on the approach and through the curve in accordance with Australian Standards and Austroads guidelines

**[IMPORTANT | LOW]**

## 2.5 Finding – Trees within the clear zone (outside of curve)

There are two trees with a trunk diameter in excess of 100mm located on the north eastern side of the curve on Yeriminup Road situated within the clear zone.

These trees were measured to be 3 and 3.5m from the travel path.

### ***Justification of the finding:***

There is a risk that vehicles may fail to negotiate the bend when travelling from the west resulting in a run off road hit object crash.

*Austroads Guide to Road Design Part 6 (2018): Roadside Design, Safety and Barriers* indicates trees feature prominently as impacted hazards in run-off road crashes accounting for a large proportion of fatalities.

Hazards within the clear zone should be removed or suitably protected or be frangible to the impact of a vehicle. Main Roads determines effective clear zones using the Austroads method described in *Austroads Guide to Road Design Part 6 (2018): Roadside Design, Safety and Barriers*. Using a design speed of 110 km/h, <750 vehicles per day, batter slopes of 6.1 to flat and curve radius of 150 m, the required clear zone is 9 m on the outside of the curve.

*Austroads Guide to Road Design Part 6 (2018): Roadside Design, Safety and Barriers* indicates removal of roadside hazards is rated very high as an effective treatment for off path crash types.

### ***Recommendation***

Trees within the clear zone should be removed or protected from errant vehicles in accordance with Austroads Guidelines.

**[IMPORTANT | MODERATE]**

## 2.6 Finding – Curve warning signs

There are no Curve warning signs to adequately warn drivers of the presence and the severity of the curve on Yeriminup Road

### ***Justification of the finding:***

There are no curve warning signs to adequately warn drivers of the presence and severity of the curve.

*Australian Standard 1742.2-2009: Traffic Control Devices for General Use* indicates that curve warning signs should be provided when the existence or direction of the curve may not be clear

### **Recommendation**

Install a Curve (W1-3) warning sign on the approaches to the curve in accordance with Australian Standards and Main Roads guidelines.

**NOTE** - A Ball Bank assessment should be conducted on the curve as it is within a 110km/h speed environment with a measured radius of 150m. This would indicate a curve warning sign with an advisory speed reduction is warranted. As an advisory speed reduction sign cannot be placed on an unsealed road this would also require the existing unsealed section of Yeriminup Road be sealed for a distance of approximately 100-150 metres south east from the intersection of Ballochmyle Road.

**[IMPORTANT | MODERATE]**

## **2.7 Finding – Loose aggregate at intersection**

The road surface at the intersection of Yeriminup Road is predominately unsealed resulting in loose aggregate being dragged onto the traffic lanes and onto the sealed section of Yeriminup Road.

### ***Justification of the finding:***

The friction of the road pavement may have been reduced due to the presence of loose material.

*Austroads Guide to Traffic Management Part 13: Safe System Approach to Transport Management* indicates pavement friction can be significantly reduced by the presence of loose aggregate which can be dragged onto the roadway from vehicles exiting unsealed driveways or side roads, causing lower traction with the road surface that can lead to loss of control.

### **Recommendation**

Loose aggregate should be cleared from the travel lanes and resealing undertaken to prevent aggregate build up reoccurring

### 3. ROAD SAFETY INSPECTION TEAM STATEMENT

I hereby certify that the inspection team have examined the identified location in undertaking this Road Safety Inspection. I also confirm that this inspection has been conducted following the general principles detailed in *Austroads Guide to Road Safety Part 6: Road Safety Audit*.

The inspection has been carried out for the sole purpose of identifying any features of the existing road environment which could be altered or removed to improve the safety of the road infrastructure. The identified issues have been noted in this report. The accompanying findings and recommendations are put forward for consideration by the asset owner for implementation.

#### **Inspection Team Leader**

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*Paul Starling*

6/07/2023

Date

#### **Disclaimer**

*This report contains findings and recommendations based on examination of the site and/or relevant documentation. The report is based on the conditions viewed on the day of inspection and is relevant at the time of production of the report. Information and data contained within this report is prepared with due care by the Road Safety Inspection Team. While the Road Safety Inspection Team seeks to ensure accuracy of the data, it cannot guarantee its accuracy.*

*Readers should not solely rely on the contents of this report or draw inferences to other sites. Users must seek appropriate expert advice in relation to their own particular circumstances.*

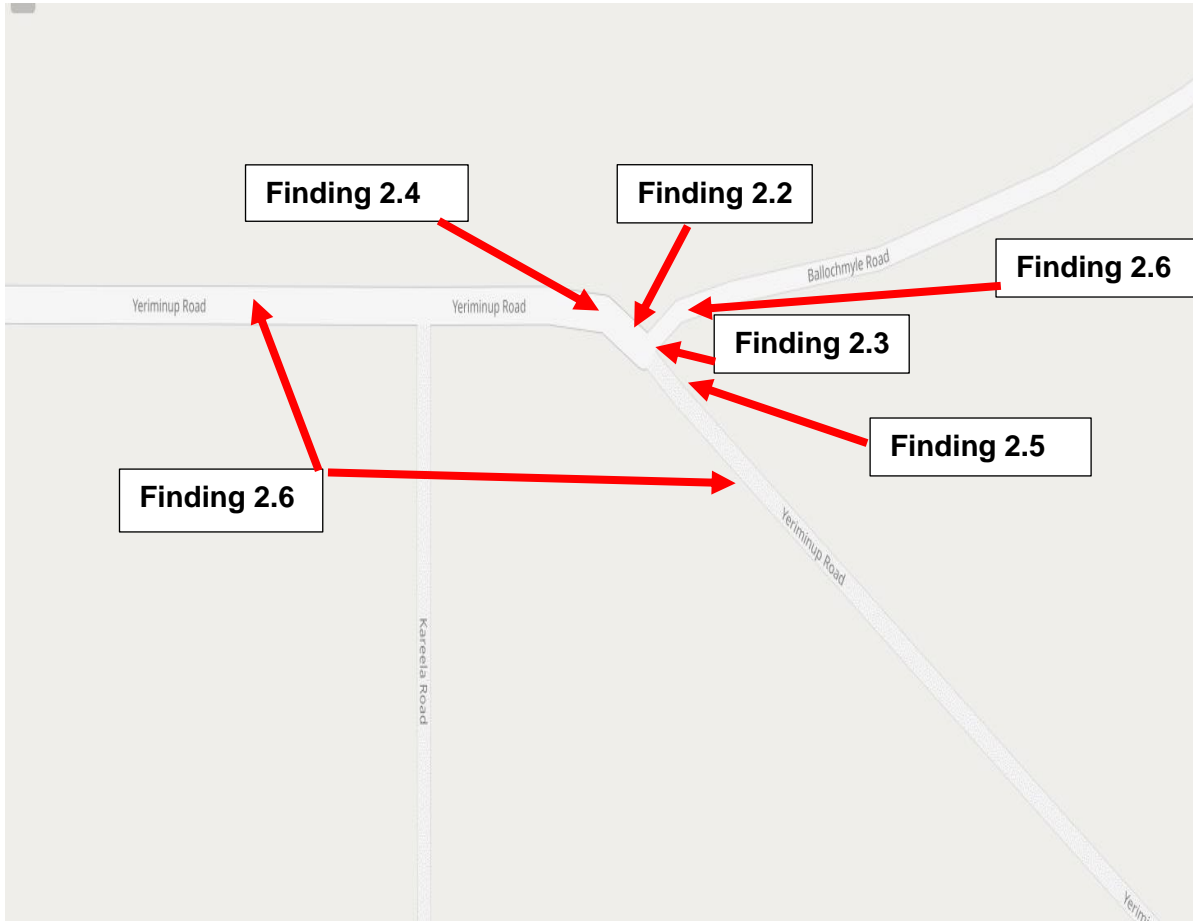
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*Subject to any responsibilities implied in law which cannot be excluded, the Road Safety Inspection Team is not liable to any party for any losses, expenses, damages, liabilities or claims whatsoever, whether direct, indirect or consequential, arising out of or referable to the use of this report, howsoever caused whether in contract, tort, statute or otherwise.*

## **APPENDIX A**

### **ROAD SAFETY INSPECTION FINDING'S LOCATION PLAN**

## Inspection Findings Location Plan



## **APPENDIX B**

### **ROAD SAFETY INSPECTION PHOTOGRAPHS**





**Finding 2.1 – Insufficient Safe Intersection Sight Distance**



**Finding 2.2 Unclear intersection priority**





**Finding 2.5 Trees within the Clearzone**



**Finding 2.7 Loose aggregate at intersection**

**Corrective Action Report – Yeriminup Road / Ballochmyle Road (Skewed) Intersection Cranbrook**  
**Road Safety Inspection**

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
<b>2.1 Finding – Safe Intersection Sight Distance</b>  The curve and crest on Ballochmyle Road to the east of the intersection of Yeriminup Road obscures the available sight distance for vehicles travelling on Yeriminup Road.	Choose an item.		
<b>Recommendation</b>  If the intersection remains in its current configuration, the crest should be trimmed to a level that provides adequate Safe Intersection Sight Distance in accordance with Austroads Guidelines  <b>[IMPORTANT   MODERATE]</b>	Choose an item.		

<p><b>2.2 Finding – Unclear intersection priority</b></p> <p>The existing intersection has confusing priority in relation to which road continues and which is considered the terminating leg.</p>	<p>Choose an item.</p>		
<p><b>Recommendation</b></p> <p>The intersection should be modified and defined to denote that Yeriminup Road is the continuing road with Ballochmyle Road being the terminating. This modification should include clear line marking and delineation to separate traffic effectively whilst negotiating the curve. Yeriminup Road should be sealed for approximately 100 -150m south east of Ballochmyle Road to provide adequate line marking and advisory speed reduction signage on the approach to the curve. Trees located on the north eastern verge of Yeriminup Road should be removed to provide adequate sight lines for traffic entering Yeriminup Road from Ballochmyle Road.</p> <p><b>[IMPORTANT   MODERATE]</b></p>	<p>Choose an item.</p>		

<p><b>2.3 Finding – Lack of regulatory signage at intersection</b></p> <p>The intersection of Yeriminup and Ballochmyle Road is configured in such a manner that it is not immediately apparent to approaching road users which is the continuing or terminating road (skewed intersection). There is no regulatory or advisory signage to advise road users of who must give way to approaching traffic.</p>	<p>Choose an item.</p>		
<p><b>Recommendation</b></p> <p>Appropriate regulatory signage should be installed at the intersection in accordance with Austroads Guidelines.</p> <p><b>[IMPORTANT   MODERATE ]</b></p>	<p>Choose an item.</p>		
<p><b>2.4 Finding – Inadequate delineation to direct drivers to correct travel path</b></p> <p>The current intersection configuration provides for Yeriminup Road to continue from an easterly to a south easterly direction at the intersection with Ballochmyle Road as the continuing road. Eastbound traffic was observed to veer to the right to continue on Yeriminup Road and in doing so travelling into the opposing north bound lane at speed estimated to be in excess of 50km/h before crossing back to the correct (southbound) lane.</p>	<p>Choose an item.</p>		

<p><b>Recommendation</b></p> <p>Line marking and Retro-reflective Raised Pavement Markers should be installed on the approach and through the curve in accordance with Australian Standards and Austroads guidelines</p> <p><b>[IMPORTANT   LOW]</b></p>	<p>Choose an item.</p>		
<p><b>2.5 Finding – Trees within the clear zone (outside of curve)</b></p> <p>There are two trees with a trunk diameter in excess of 100mm located on the north eastern side of the curve on Yeriminup Road situated within the clear zone.</p> <p>These trees were measured to be 3 and 3.5m from the travel path.</p>	<p>Choose an item.</p>		
<p><b>Recommendation</b></p> <p>Trees within the clear zone should be removed or protected from errant vehicles in accordance with Austroads Guidelines.</p>	<p>Choose an item.</p>		

<p><b>2.6 Finding – Curve warning signs</b></p> <p>There are no Curve warning signs to adequately warn drivers of the presence and the severity of the curve on Yeriminup Road</p>	<p>Choose an item.</p>		
<p><b>Recommendation</b></p> <p>Install a Curve (W1-3) warning sign on the approaches to the curve in accordance with Australian Standards and Main Roads guidelines.</p> <p><b>NOTE</b> - A Ball Bank assessment should be conducted on the curve as it is within a 110km/h speed environment with a measured radius of 150m. This would indicate a curve warning sign with an advisory speed reduction is warranted. As an advisory speed reduction sign cannot be placed on an unsealed road this would also require the existing unsealed section of Yeriminup Road be sealed for a distance of approximately 100-150 metres south east from the intersection of Ballochmyle Road.</p>	<p>Choose an item.</p>		



<p><b>2.7 Finding – Loose aggregate at intersection</b></p> <p>The road surface at the intersection of Yeriminup Road is predominately unsealed resulting in loose aggregate being dragged onto the traffic lanes and onto the sealed section of Yeriminup Road.</p>	<p>Choose an item.</p>		
<p><b><i>Recommendation</i></b></p> <p>Loose aggregate should be cleared from the travel lanes and resealing undertaken to prevent aggregate build up reoccurring</p>	<p>Choose an item.</p>		



## Corrective Action Report - Yeriminup Road / Ballochmyle Road (Skewed) Intersection Cranbrook

### Road Safety Inspection

**NOTE:**

- This Corrective Action Report is to be read in conjunction with the full Road Safety Inspection Report and its findings and recommendations.
- The asset owners (MRWA and/or LGA) **must** be informed of these findings, recommendations and proposed actions.
- Items not under the responsibility of this project representative must be forwarded to the persons / agencies who are responsible.

**These findings and recommendations have been considered, and the actions listed will be taken accordingly.**

<b>Responsible Project Representative</b>	<b>Company / Agency / Division</b>	<b>Position</b>	<b>Date</b>

<b>Asset Owner Representative</b>	<b>Company / Agency / Division</b>	<b>Position</b>	<b>Date</b>