# OUTBACK

## Regional Road Assessment


**August 2015**

RAA

**OUTBACK**
**Regional Road Assessment**


**Prepared By** Ian Bishop
Traffic Engineer

T: 08 8202 4703
E: ibishop@raa.com.au

Chris Whisson
Traffic & Road Safety Officer

T: 08 8202 4743
E: cwhisson@raa.com.au

**Date** 12/11/2015

**Reviewed By** Charles Mountain
Senior Manager Road Safety

T: 08 8202 4568
E: cmountain@raa.com.au

**Date** 28/01/2016

**Approved By** Charles Mountain
Senior Manager Road Safety

T: 08 8202 4568
E: cmountain@raa.com.au

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# Contents

# Executive Summary

For many years, RAA has performed assessments of the national highway network. The assessments aim to examine the level of safety built into the highway, identify infrastructure deficiencies and provide a critique from the point of view of the road user's experience. Since 2014, RAA has expanded the scope of the highway assessment program to include the regional B-class road network however to date; little of the unsealed network has been examined.

For the first time in 2015, RAA committed to undertake review and assessment of South Australia's Outback Roads. The Outback assessment was planned in 3 stages:

- Stage 1: The Outback Highway, Birdsville and Strzelecki Track
- Stage 2: Stuart Highway and Oodnadatta Track, including interconnecting tracks
- Stage 3: Tracks bounded by the Eyre and Stuart Highways and tracks bounded by the Barrier Highway and Strzelecki Track

Stage 1 was undertaken in August 2015 with stages 2 and 3 planned for mid to late 2016. This report presents the findings of the Stage 1 assessment and will be updated accordingly following the Stage 2 and 3 assessments.

Through its assessment, RAA identified a number of potential safety improvements, as well as measures that could improve the quality of the drive and keep sections of the track open for longer in the year.

There were recurring themes throughout the Outback Roads examined as part of this assessment. These were:

- Damaged or missing signs
- Damaged or missing hazard markers
- Road graded into landscape
- The presence of curves where they do not appear to be required

In a majority of the cases, the road signs had been knocked flat, a likely result of wind loading. RAA noted from examination of a number signs that the poles appear to be installed directly into the ground with no form of footing provided.

Several bends were noted to have damaged or missing hazard marker posts. These are important for delineation in low light and poor weather and are particularly important since passing vehicles can create dust clouds which severely restricts sight distance.

Another recurring issue was instances in which the road or track had been graded into the landscape. Since the road surface is then below the average ground level, water will collect in these areas, leading to rapid surface deterioration caused by traffic. It is recommended that additional drainage measures such as swales are considered for these areas. The grading of swales into the landscape may be a reasonably cost effective solution however where the catchment is deemed to be too large for the swales to offer notable benefit, alternative options, such as raising the road level, should be considered.

The assessment noted on a number of occasions that curves were present on an otherwise flat and open landscape. At these locations, there seemed no plausible reason to provide the curves and since curves increase crash risk, from a road safety perspective, the most appropriate treatment may be to straighten the alignment.

While RAA considered the Strzelecki Track to be in a good condition and able to safely accommodate light vehicles, construction of a sealed surface would be a considerable benefit to heavy traffic. The current surface is good but requires consistently high maintenance to provide the smooth and coherent surface and the surface can become unreliable in wetter weather. Although the capital cost of such work would be high, there would likely be longer term cost savings from reduced damage or wear and the associated ongoing grading and compaction work.

In addition to upgrading infrastructure, it is clear that there is still a lot of work to be done to educate tourists in preparing to drive in the outback. There were several occasions during RAA's assessment that the team encountered tourists driving a two wheel drive vehicle on sections of track that were inappropriate for a vehicle of this type.

A summary of RAA's recommendations following the assessment is provided in Table 5 below.

**Table 1 – Summary of Recommendations**

| Highway / Road | Outback Highway | Birdsville Track | Strzelecki Track | General |
|---|---|---|---|---|
| **Road Geometry & Pavement** | | | | |
| Re-align horizontal curves that are not required | | | ✓ | ✓ |
| Rut grading | | ✓ | ✓ | |
| Repair pavement edge break / edge drop | ✓ | | | |
| Raise pavement level at low points | | ✓ | | ✓ |
| Drainage improvements | | ✓ | | ✓ |
| **Signs** | | | | |
| Install "Road Narrows" signs on approach to grids | | ✓ | | |
| Install depth markers at floodways | ✓ | ✓ | ✓ | |
| Repair / replace damaged signage | ✓ | ✓ | ✓ | ✓ |
| **Delineation** | | | | |
| Additional hazard marker posts | ✓ | | | |
| Repair damaged hazard marker posts | ✓ | | ✓ | |
| Install Raised Reflective Pavement Markers (RRPMS) | | | | |
| **Hazard Protection** | | | | |
| Review / install barrier protection | ✓ | | | |
| Grade out material mounds at side of road | | ✓ | | |
| Extend unsealed edge to protect drop | | ✓ | ✓ | |
| **Tourist / Driver Education** | | | | |
| Production of literature for outback driving | | | | ✓ |
| Advisory signs at start and end of major routes | | | | ✓ |

# 1 Outback Highway

## 1.1 Overview

The Outback Highway runs for a distance of 273km between Hawker and Marree, passing through the towns of Leigh Creek, Copley and Lyndhurst. The Highway effectively provides a gateway to the northeastern Outback, connecting to the Strzelecki Track at Lyndhurst and the Birdsville Track at Marree. Unlike the other roads in the region, the Outback Highway is sealed for most of its length, to a point 5km north of Lyndhurst. The speed limit along the sealed section is 110km/h which reduces to the default limit of 100km/h when the highway becomes unsealed.

## 1.2 Traffic Volumes

Traffic volumes significantly vary between the towns along the Outback Highway, ranging between 110 and 550 vehicles per day. The traffic data shows that heavy vehicle volumes also vary with between 14 and 160 vehicles per day, which equates to between 12.5% and 30% of the total traffic volume.

## 1.3 Crash Statistics

Figure 1 shows the crash locations along the Outback Highway between 2010 and 2014. The lowest number of crashes was in 2013, with only three crashes occurring that year.

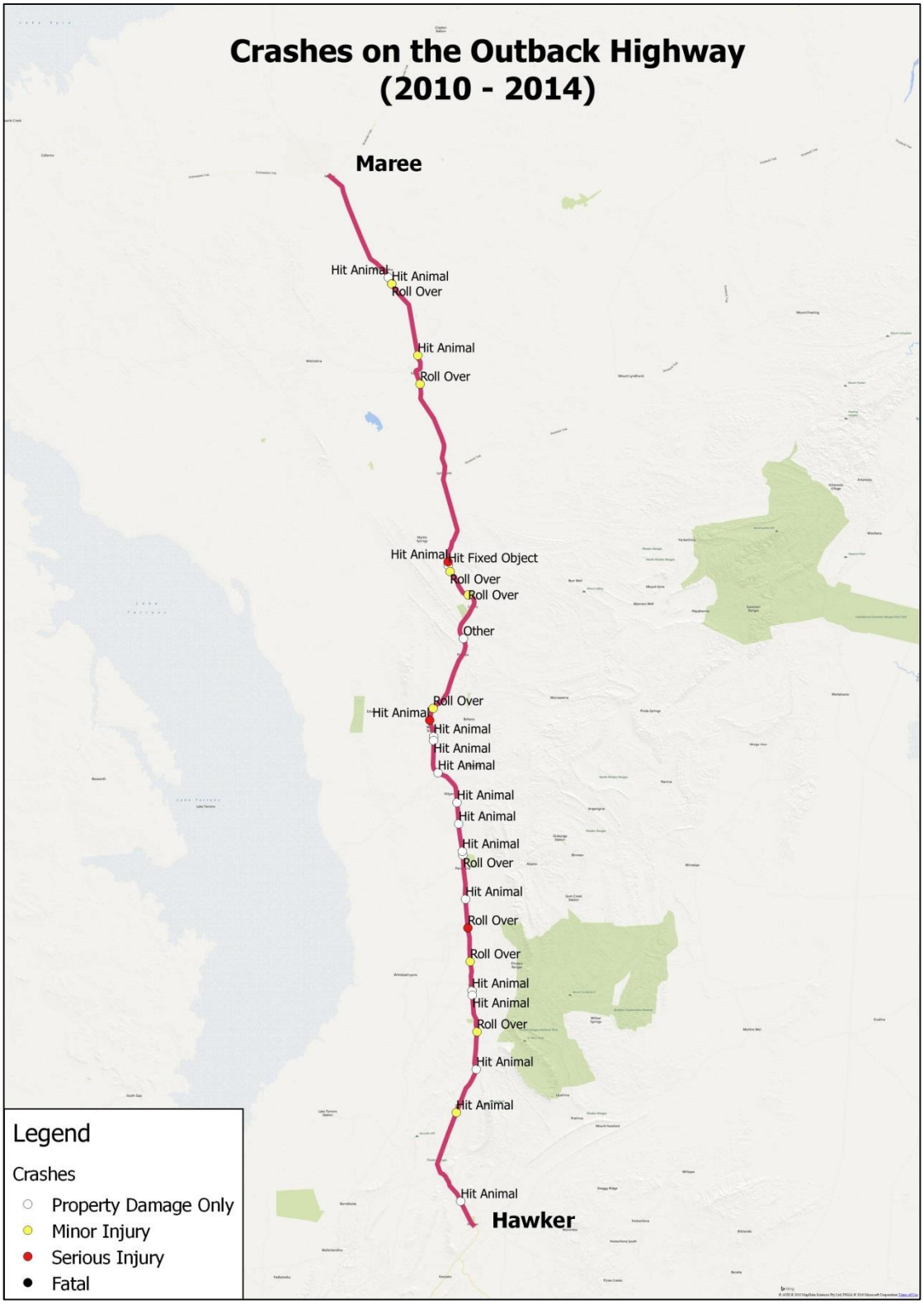


**Figure 1 – Outback Highway Crash Map**

The graph below shows the total number of crashes each year between 2010 and 2014.

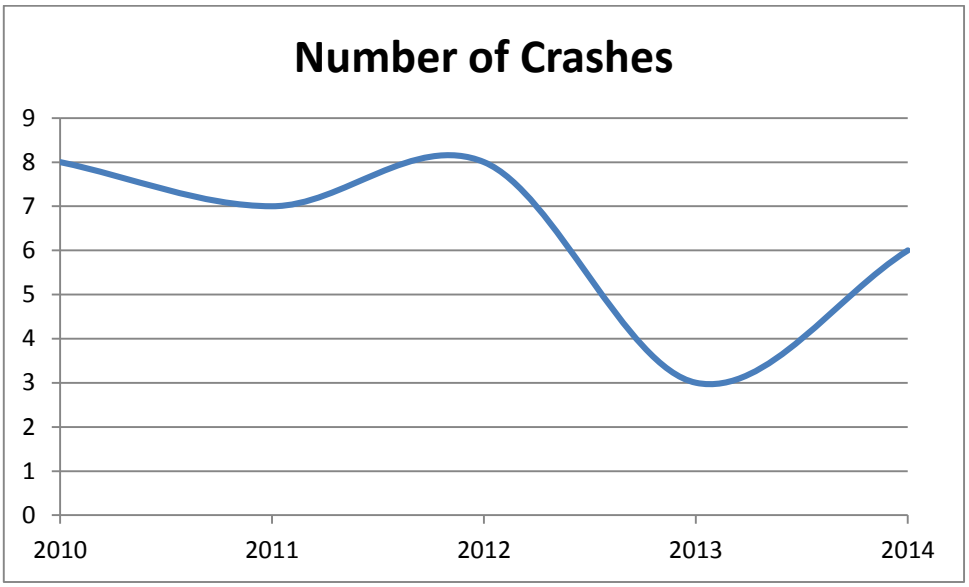


**Figure 2 – Outback Highway Total Crashes by Year**

Animal collisions (19 crashes) and vehicle rollovers (11 crashes) are the dominant crash type however other crashes have also occurred including one Hit Fixed Object crash and one other crash that was not clearly defined.

A large proportion of the crashes were Property Damage Only crashes but there were also a few minor and serious injuries.

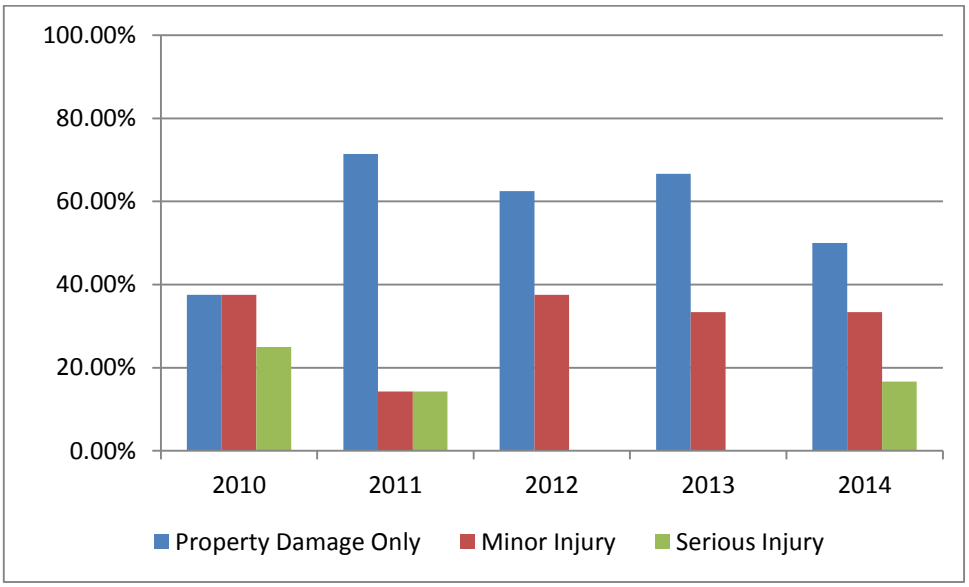


**Figure 3 – Outback Highway Crashes by Severity**

The estimated economic cost of crashes on the Outback Highway between Hawker and Maree from 2010 to 2014 is $1,763,680. This figure includes losses to workplace and households as well as a number of medical, insurance, accident investigation, legal and

repair costs. The table below breaks down the cost of crashes in the last five years by severity.

**Table 2 - Cost of Crashes on The Outback Highway (2015 Values), 2010-2014**

| Crash Severity | Cost per Crash[1] | Number of Crashes | Total Cost (2015 Values) |
|---|---|---|---|
| Property damage only | $12,330 | 18 | $221,940 |
| Minor injury | $18,174 | 10 | $181,740 |
| Serious injury | $340,000 | 4 | $1,360,000 |
| Fatal | $7,200,000 | 0 | $0 |

## 1.4 Infrastructure

### *1.4.1 Geometry*

Measurements along the Outback Highway found that lane widths throughout were 3.2m with a sealed shoulder of between 200 and 300mm. Unsealed shoulders were measured to be between 1.8m and 2.0m. Often, the total seal width increased over floodways, typically offering 3.4m wide lanes with sealed shoulders ranging between 300mm to 400mm. While the lane widths comply with the general guidelines offered in the AustRoads Guide to Road Design (AGRD) Part 3 - Geometric Design, it is recommended that the sealed shoulders are increased to 500mm to reflect the current traffic volumes. It is also noted that along some sections of the Road, heavy vehicle volumes exceed 15% in which case the road may be eligible for traffic lane widths of 3.5m.

The sealed sections of road over the flood plains have no line marking since the primary purpose of the seal is to protect the road structure. The total width of the seal is between 8 to 10m with a 1.5 to 2m unsealed shoulder.

### *1.4.2 Pavement*

The Outback Highway has a sealed pavement between Hawker and Lyndhurst but transitions into an unsealed pavement about 5km north of Lyndhurst. Some sections of seal have however been provided between Lyndhurst and Marree, primarily through the floodplains to protect the surface and ensure the road is trafficable after periods of flood.

The sealed pavement generally provided a smooth ride quality although there were some minor corrugations in places. The pavement has a medium to coarse texture

[1] Property damage only and minor injury costs derived from 'Cost of Crashes in Australia 2006', BITRE Research Report 118; Figures amended to reflect 2015 values. Serious jury and fatal costs derived from AusRAP 2013 'Star Rating Australia's National Roads'. Note that the costs displayed are for each crash type and not for each casualty.

which should offer good skid resistance and drainage performance. Some areas of bitumen bleeding were noted in the surface between Hawker and Lyndhurst but bleeding was particularly noticeable on the incline at many of the floodways.

Asphalt edge break was identified on a number of occasions between Hawker and Lyndhurst, with drops estimated to be on average 40mm high but some drops were estimated to be up to 80mm. Edge drop can be problematic for vehicles but particularly trailers that drift off the seal. The large difference in height between the two surfaces can make it difficult to draw the vehicle back onto the sealed pavement and in extreme cases could cause tyre blowouts. It is therefore recommended that edge break is addressed through either seal extensions or shoulder grading to provide a level joint between the sealed and unsealed surfaces.

On the unsealed section, north of Lyndhurst, the assessment noted soft material towards the edge of the road but the main trafficable area provided a reasonably sound surface.

A number of floodways had sediment deposits across the road and could present a skid hazard in wet weather. Warning signs to advise of slippery road conditions may be appropriate where consistent sediment deposits are found.

**Figure 4 – Sediment has washed across the road and could create a skid hazard under wet conditions.**

### *1.4.3 Signs and Delineation*

Between Hawker and Lyndhurst, hazard marker posts have been installed reasonably frequently on bends which improves night delineation but in some areas such as 62km north of Hawker, it appeared the hazard marker posts have been damaged and require replacing.

RAA is concerned that some of the floodways along the route did not have depth indicator markers. Depth markers provide the driver with a quick and clear guide as to whether it is safe to cross the floodway. It's therefore recommended that depth markers are reinstated prior to the next wet season as a priority.

The assessment noted that an 80km/h speed sign south of Lyndhurst had been knocked down and it is recommended that this reinstated to provide a speed buffer on approach to Lyndhurst.

Along the unsealed section north of Lyndhurst, hazard marker posts appear to be frequently spaced only around floodways. Night delineation could be improved along the unsealed section through an increased use of hazard marker posts on curves and on straight sections.

### *1.4.4 Road Hazards*

A number of steep embankments were noted along the edge of the highway which varied significantly between 1 to 5m unprotected. Embankments increase the risk of vehicle rollovers, particularly on bends, and high embankments can conceal vehicles that have run-off the road, increasing the potential severity of a crash. It is recommended that barrier protection is offered for significant embankments with those on the outside of bends being prioritised for treatment.

The assessment also noted the presence of culverts along the highway. The culverts had hazard boards installed to delineate the headwalls however this is a passive form of protection and more active protection treatments should be considered.

## 1.5 Tourism

There are few issues, if any, along the Outback Highway that would affect tourists beyond any other road user. Since part of the Outback Highway is unsealed and all other roads thereafter are also unsealed, it may be appropriate to develop literature or information aimed at inexperienced Outback drivers considering the route. Such information should discuss driving on unsealed roads, safe driving behaviour, and vehicle preparation. Hazards likely to be incurred on these roads should be discussed

since they may not be obvious to everyday road users. Information may also be provided about the floodways and road closures.

### 1.6 Summary and Recommendations

The Outback Highway provides a key link to other Outback tracks and is primarily used by a combination of the energy industry, tourists and four wheel drive enthusiasts. The limited traffic volume may limit infrastructure spend so it is therefore important to consider and prioritise the low cost treatments. It is recommended that the following treatments and actions are considered in order of priority:

- Seek to develop information guides for Outback motorists
- Extend the shoulder seal or regrade shoulders to address edge break / drop
- Install additional hazard marker posts to improve night and poor weather delineation
- Consider the installation of crash barrier to protect significant drops or embankments.

# 2 Birdsville Track

### 2.1 Overview

The Birdsville track is perhaps one of the most well-known tracks in South Australia. Opened in the 1860's to herd cattle from the Northern Territory and Queensland, the track was perhaps better known for the vital link it provided for the overland mail service, which started in 1884 and eventually ceased operation circa 1970, when the decision was made to transport the mail by air. At around 517km long, running between Marree, South Australia and Birdsville, Queensland, the track is completely unsealed and passes through the Tirari and Sturt Stony Deserts.

Marree and Birdsville are the only towns along the track, although there is a small settlement at Mungerannie that offers food, accommodation and fuel. The remaining settlements along the route, including Clayton and Mulka among many, were abandoned years ago and the ruins that remain pay tribute to the early pioneering days when the Birdsville Track was once a lifeline and livelihood to so many.

Nowadays the Birdsville Track services trucks accessing the many cattle stations in the Outback, while also providing access from SA to Birdsville for high profile events such as the horse racing. The track is used by four wheel driving enthusiasts and tourists seeking Outback camping adventures.

## 2.2 Traffic Volumes

2014 traffic volumes indicate that on average, only 46 vehicles per day use the Birdsville Track. The total heavy traffic volume is about 7 vehicles per day which equates to 15% of the total traffic. The data shows that between 2012 and 2013, traffic volume increased by 15% but the daily traffic has remained constant since then.

## 2.3 Crash Statistics

Figure 6 shows the crash locations along the Birdsville Track between 2010 and 2014. Vehicle rollovers are the most common type of crash occurring on the Birdsville Track with 9 crashes recorded. There have also been Hit Fixed Object (2 crashes) and hit objects on the road (1 crash).

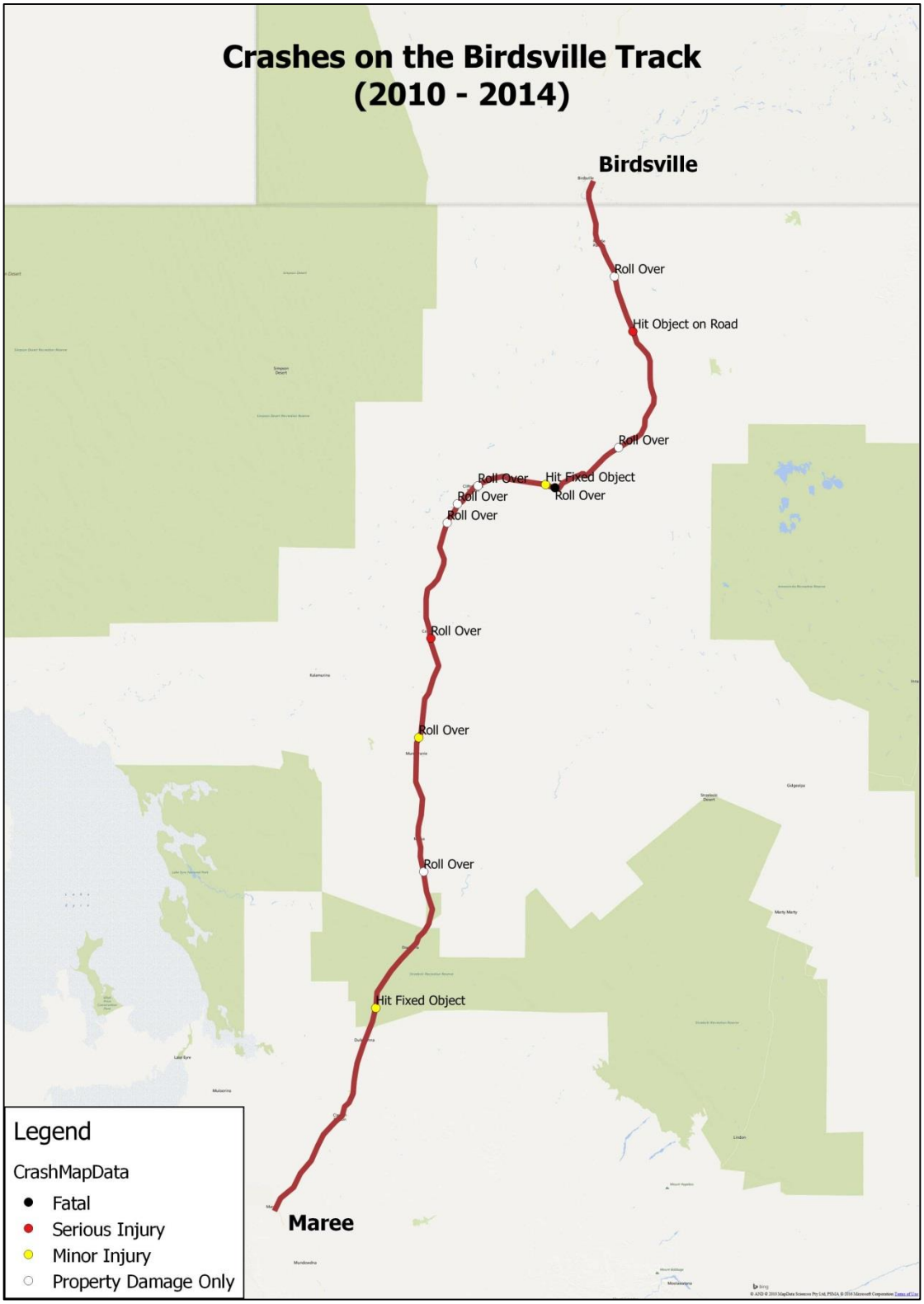


**Figure 5 – Birdsville Track Crash Map**

The graph below shows that there is a steady increase in crashes over the last 5 years, with no recorded crashes in 2010, rising to 5 crashes in 2014. The low number of crashes however makes it difficult to draw any conclusions for this increase.

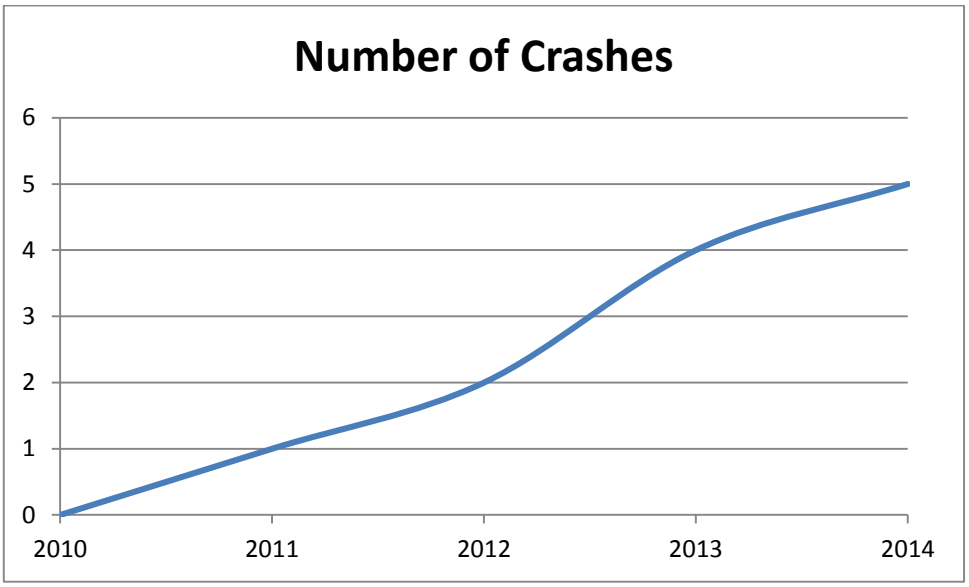


**Figure 6 – Birdsville Track Total Crashes by Year**

The degree of severity of the crashes along the Birdsville Track is shown in Figure 7. 2014 was by far the worst year with one fatality and two serious injuries. In previous years, only property damage or minor injuries crashes occurred.

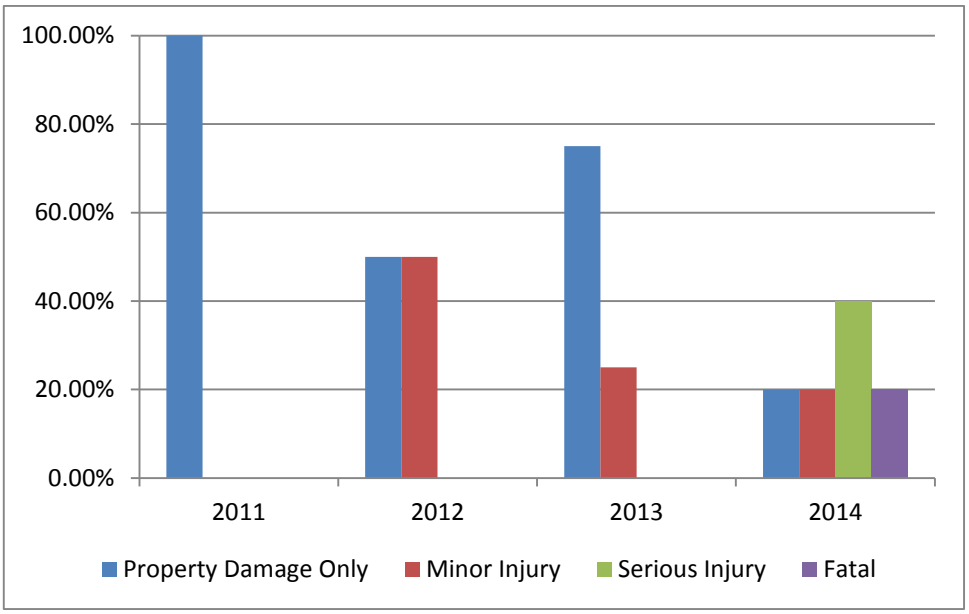


**Figure 7 – Birdsville Track Crashes by Severity**

The estimated economic cost of crashes on the Birdsville Track between Maree and Birdsville from 2010 to 2014 is $8,008,502. This figure includes losses to workplace and households as well as a number of medical, insurance, accident investigation, legal and repair costs. The table below breaks down the cost of crashes in the last five years by severity.

**Table 3 - Cost of Crashes on The Birdsville Track (2015 Values), 2010-2014**

| Crash Severity | Cost per Crash[2] | Number of Crashes | Total Cost (2015 Values) |
|---|---|---|---|
| Property damage only | $12,330 | 6 | $73,980 |
| Minor injury | $18,174 | 3 | $54,522 |
| Serious injury | $340,000 | 2 | $680,000 |
| Fatal | $7,200,000 | 1 | $7,200,000 |

## 2.4 Infrastructure

Discussions with residents in Maree suggested that the Birdsville Track is considered to be good quality at the southern end but the northern end is in a poorer state, particularly at certain times of the year following rainfall. The inner track was also discussed but falls out with the scope of the audit since the track is less reliable and is usually shut for most of the year due to weather. RAA examined the inside track but are of the view that it is best suited to four wheel drive vehicles and even then only for drivers who are experienced in 4WD driving. It is also worth noting that while the inner track provides a shorter route to Birdsville, the geometry of the track and speed at which it can be driven means that the journey time is actually longer than when travelling on the main Birdsville Track. The use of the track by inexperienced drivers is not recommended and two wheel drive vehicles should avoid the track at all costs.

### *2.4.1 Geometry*

The speed limit for the Birdsville Track is a default of 100km/h since the track is unsealed. The width of the track is approximately 12m however narrows down to around 8m when passing over cattle grids and along some sections in the flood plain. These widths comfortably accommodate vehicles passing each other. It was clear however that following periods of rainfall, motorists tended to keep either to the middle, or one side of the road to avoid flooded areas.

[2] Property damage only and minor injury costs derived from 'Cost of Crashes in Australia 2006', BITRE Research Report 118; Figures amended to reflect 2015 values. Serious jury and fatal costs derived from AusRAP 2013 'Star Rating Australia's National Roads'. Note that the costs displayed are for each crash type and not for each casualty.

### *2.4.2 Pavement*

The Birdsville Track generally tended to offer good ride quality in the southern sections, prior to Mungerannie. Through these sections, the road user may expect some rough areas of the road but otherwise, the surface provides a relatively smooth ride and can maintain a high speed. North of Mungerannie, longitudinal rutting was prevalent around a number of floodways, with some ruts estimated to have been between 200 and 300mm. These can pose a risk to vehicles by acting as guide rails, particularly for trailers. If a vehicle were to be pulled into the rut while travelling at high speed, there is a risk of vehicle rollover. Four wheel drive vehicles with roof loading may be particularly at risk due to the high centre of gravity, and in some areas, the ruts cross each other which could cause the vehicle to weave, shifting the centre of gravity.

The assessment also noted a number of locations along the Birdsville Track where the track has been cut into the landscape. In some areas, the track appeared to be around 400mm below average ground level and these areas tended to demonstrate bad rutting, since water frequently runs off adjacent land and pools on the track.

While a regular grading program will alleviate the rutting issues, it would be more cost effective in the long term to address the drainage issues. This could also reduce the number of closures of the track due to flooding. Building up the track above the mean ground level and providing a crossfall or camber to assist in drainage would form best practice. Due to the remote areas the track passes through however, it would not be cost effective to import material to undertake this work. Testing could be undertaken to determine if suitable material could be excavated from the surrounding area. An alternative option may be to grade drainage channels through the low points but this would be dependent on a number of factors including natural fall, annual rainfall and catchment areas.

Nevertheless, RAA recommend that further drainage investigation work is undertaken since there would be both safety and economic benefits resulting from drainage improvement.

### *2.4.3 Signs and Delineation*

There were only a few issues noted in relation to the signage and delineation along the Birdsville Track. On a few occasions, the warning signs were found to be damaged, either from a vehicle crash or wind damage and should be replaced. Some hazard marker posts appear to have been damaged, perhaps during grading works and again should be replaced to maintain night and poor weather delineation.

The survey noted that some warning signs had unauthorised promotional signage applied directly over the sign or on the same pole. This should be discouraged since the additional signs detract from the key message. DPTI may consider providing a facility in appropriate locations to allow promotional or community information signs to be displayed.


**Figure 8 – Additional unauthorised signs have made this warning sign cluttered and difficult for the motorist to read.**

On approach to cattle grids, warning signs for a grid ahead have been provided and the edges of the grid have been marked with hazard boards however due to the extent of the reduction in road width passing over the grid, “Road Narrows” signage should perhaps also be included.

**Figure 9 – Hazard boards have been provided at grids where the road narrows but little protection is offered from the drops on either side.**

### *2.4.4 Road Hazards*

The two prominent road hazards along the Birdsville Track are bull dust holes and floodways.

Bull dust holes are ruts or depressions in the road that gradually fill over time with a talcum-powder like dust and usually occur in areas that are subject to flooding or ponding and then dry. They are particularly dangerous because they are hard to see and often the road looks smooth and driveable. The dust has no bearing capacity and if hit at high speed, they have been known to cause blowouts, break suspension and cause vehicle rollovers. Passing over the bulldust holes at lower speed could still cause dust to suddenly rise around the vehicle and seriously restrict visibility. During the assessment, RAA encountered a number of bulldust holes, many of which had been marked with red flags to warn drivers of their presence. Because the surface of the road frequently changes between in the wet season between grading runs, the red flags seem to be most effective way of warning motorists about these hazards.

**Figure 10 – Bull dust holes have been marked with red flags. They create a rollover risk and severely restrict sight distance for any vehicles following or passing the vehicle travelling through them.**

Floodways were the second most prominent hazard. A number of floodways the survey team passed over had depth markers missing, which could pose a danger during the wet season if motorists try to cross them without checking the water depth. After the floods have finished, the ground remains soft for some time and can present a skidding hazard or vehicles risk becoming bogged and stranded. Deep ruts that had dried were present around some floodways and can be dangerous if hit at speed since they can act as guide rails and can cause vehicle rollovers.

Some minor drops were identified at the side of the road on the outside of bends. Ordinarily barrier protection would be recommended for such hazards however due to the low traffic volumes on the Birdsville Track, these are unlikely to be funded, and it is unlikely that the ground would be suitable for their footings. Instead, where drops occur, it may be worth considering, building up material on the outside of bends to provide additional protection in the form of an unsealed shoulder to allow additional time for a vehicle to correct its course should it start to drift.

Mounds along the side of the road were present in areas where the road had been graded into the landscape. Mounds, if hit at speed, could cause a vehicle with a high centre of gravity to roll over. The risk could be reduced by further grading work to achieve shallower slopes at the side of the road.

## 2.5 Tourism

The majority of traffic travelling on the Birdsville Track is likely to be composed of four wheel drive enthusiasts and tourists. In either case, the hazards that have been identified may not be obvious to those inexperienced in driving on unsealed roads.

During the course of the assessment, the team encountered a tourist group crawling through a rocky and particularly rough section in a van and this highlights the need to educate inexperienced drivers in preparing for Outback driving. Over the past two years RAA has received calls from members raising concerns with the lack of education after assisting international tourists who have been unprepared and subsequently encountered difficulty in remote areas.

RAA welcome the installation of an advisory sign at the start of the track that outlined basic considerations and survival requirements such as ensuring a plentiful supply of fuel and water. The sign however had a significant amount of text and there was no incentive for the motorist to pull over at the side of the road, so whether motorists read the full sign is questionable. Additionally the sign was faded and dirty and could be difficult to read under some conditions. It is recommended that a rest area is considered within the locality of the sign. It may also be beneficial to provide multi-lingual information displays at the rest area to cater for a majority of the international tourists that may visit. Education should however start early on and not be limited to the start of the track. RAA strongly recommends the development of educational literature that could be made available through the tourist information office that advises tourists how to prepare and what to expect during their journey.


**Figure 11 – At the start of the Birdsville Track a sign provides sound advice to those starting their journey.**

### 2.6 Summary and Recommendations

RAA recommend the following treatments and initiatives for the Birdsville Track:

- Increase the frequency of grading to reduce the instances of rutting and bulldust holes
- Raise the road level or create drainage channels in low areas to improve drainage
- Review and replace damaged signs and hazard marker posts
- Grade out the mounds of material at the side of the track
- Construct a rest stop at either end of the track which should include sheltered seating and information boards
- Develop literature to be distributed at tourist information centres that will guide tourists driving on the track.

## 3 Strzelecki Track

### 3.1 Overview

The Strzelecki track runs in a north-easterly direction for 371km between Lyndhurst and Innamincka. The track was originally pioneered by cattle rustler Henry Arthur Readford in 1870 but later gained fame in the book “Robbery Under Arms” by Rolf Boldrewood

who's lead character, Captain Starlight was partially based on Readford's life. The track was first used by cattle drovers in 1870 and used extensively for this purpose over the years until the 1930's when droving along the track ceased.

Nowadays the track is used primarily to service Moomba, where SANTOS conducts its natural gas operations. The track is also used by heavy vehicles to provide supplies to the inland cattle stations and the route has become popular with tourists and four wheel drive enthusiasts wishing to visit regional attractions including the Innamincka Regional Reserve and notably Burke and Wills dig tree located just over the Queensland border.

## 3.2 Traffic Volumes

The traffic volume data that's publicly available for the Strzelecki Track is very limited and suggests an average of 75 vehicles per day. Heavy vehicles represent 53.5% of the total traffic volume, reflecting the industrial nature of the track's present day purpose.

## 3.3 Crash Statistics

Figure 12 shows the crash locations along the Strzelecki Track between 2010 and 2014.

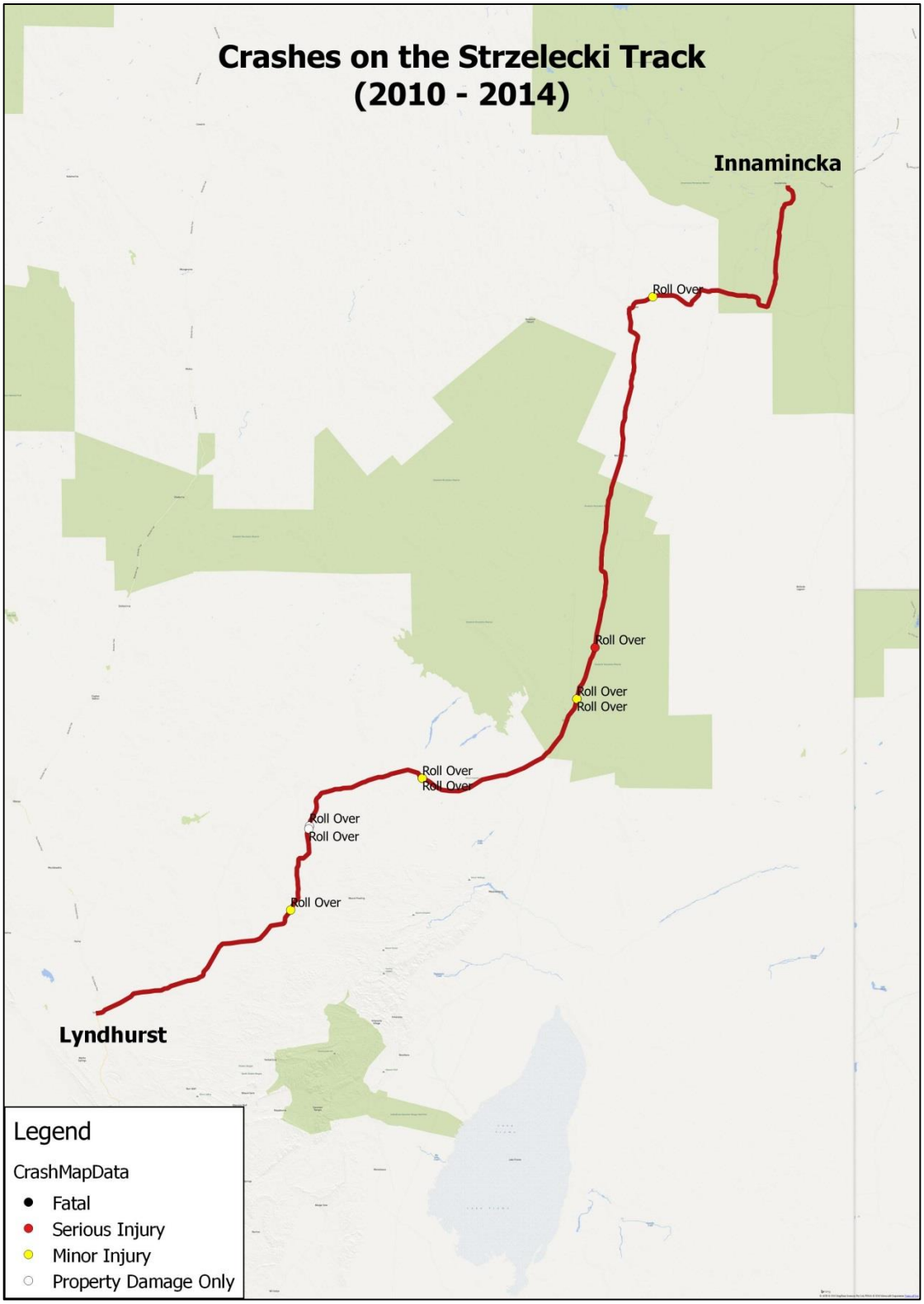


**Figure 12 – Strzelecki Track Crash Map**

There were 9 reported crashes on the Strzelecki Track between 2010 and 2014, all of which involved vehicle rollovers. 2013 was the worst year with 4 reported crashes compared to 2010 and 2014 during which no crashes occurred.

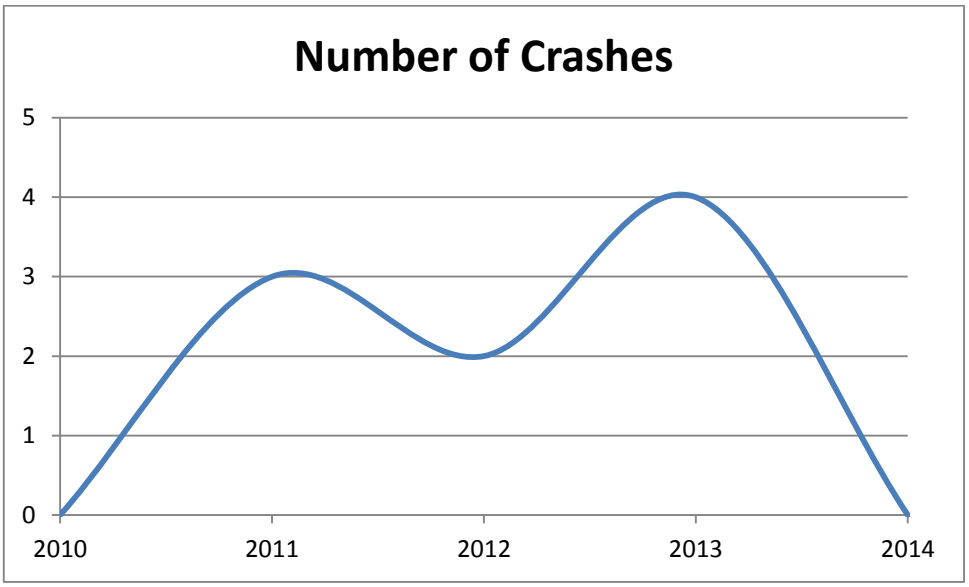


**Figure 13 – Strzelecki Track Crashes by Year**

The distribution of crash severity is shown below. Property damage only crashes and minor injuries were the most common, although there was one serious injury crash in 2013.

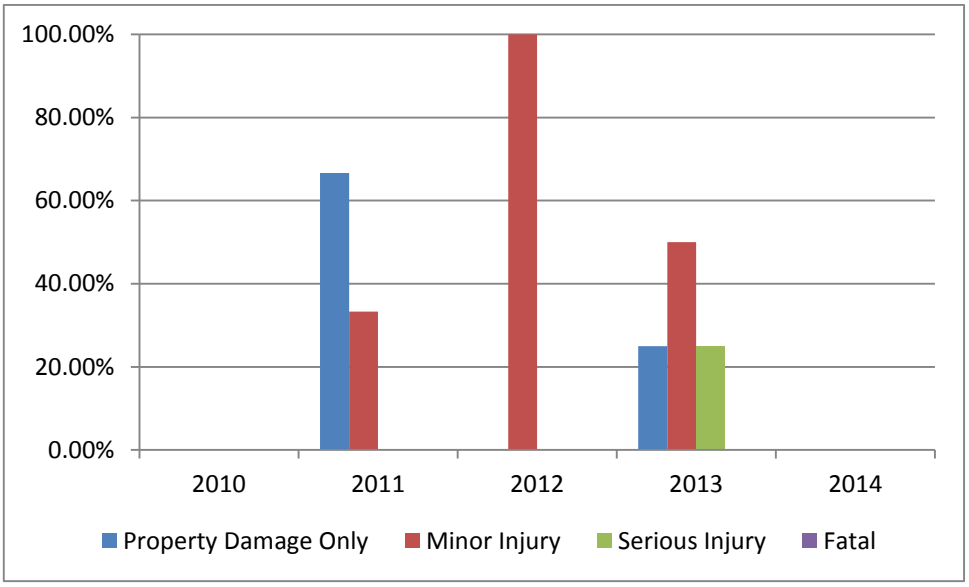


**Figure 14 – Strzelecki Track Crashes by Severity**

The estimated economic cost of crashes on the Strzelecki Track from 2010 to 2014 is $467,860. This figure includes losses to workplace and households as well as a number of medical, insurance, accident investigation, legal and repair costs. The table below breaks down the cost of crashes in the last five years by severity.

**Table 4 - Cost of Crashes on Strzelecki Track (2015 Values), 2010-2014**

| Crash Severity | Cost per Crash[3] | Number of Crashes | Total Cost (2015Values) |
|---|---|---|---|
| Property damage only | $12,330 | 3 | $36,990 |
| Minor injury | $18,174 | 5 | $90,870 |
| Serious injury | $340,000 | 1 | $340,000 |
| Fatal | $7,200,000 | 0 | $0 |

## 3.4 Infrastructure

Of all the tracks in the eastern Outback, the Strzelecki Track is perhaps the highest quality. A heavy Oil and Gas presence at Moomba has resulted in frequent maintenance in the immediate surround and also to the South of Moomba, creating a relatively smooth and well compacted surface that offers a similar comfort level to asphalt. The quality of the track south of Moomba is such that two wheel drive vehicles could safely use it in dry weather.

### *3.4.1 Geometry*

The width of the Strzelecki Track was generally between 10 and 12m but often narrowed down to about 8m or less when passing over cattle grids and some floodways.

South of Moomba, the track is sealed through some areas prone to flooding. The widths on the sealed sections are about 10m with edge of carriageway lines providing a modest sealed shoulder. At the southern end of the track, the track is sealed prior to joining the Outback Highway and provides 3.2m lane widths with a sealed shoulder of between 100 and 200mm.

The assessment identified some horizontal curves as a potential road safety risk. On a number of occasions, the Strzelecki track passed over a wide, open and flat landscape but the track has been graded with a series of curves through these sections. Horizontal curves increase the risk of a vehicle rollover, particularly where the curves are poorly delineated or there is deterioration in the road surface. Unless a curve is required to negotiate terrain or fixed objects, it is recommended that the track is maintained as straight as possible. It is therefore recommended that the track is realigned to eliminate non-essential curves and maintain a straight alignment.

[3] Property damage only and minor injury costs derived from 'Cost of Crashes in Australia 2006', BITRE Research Report 118; Figures amended to reflect 2015 values. Serious jury and fatal costs derived from AusRAP 2013 'Star Rating Australia's National Roads'. Note that the costs displayed are for each crash type and not for each casualty.

### *3.4.2 Pavement*

With only a few exceptions, the pavement quality along the Strzelecki Track was very good. At the northern end, within the locality of Dillon's Highway, the assessment noted that the pavement provided an excellent ride quality that could rival smooth asphalt. The pavement was well graded and compacted, providing a smooth surface that had little loose material.

Between Dillon's Highway and Moomba, the pavement was still reasonably good for an unsealed road but in some areas provided a rougher ride with ruts, corrugations or potholes. Warning signs have been installed at locations to advise of soft edges and the areas that demonstrated poor pavement characteristics were generally along sections in either flood plains or sections at which the road had been graded into the landscape resulting in ponding during wet weather. Grading drainage ditches along these sections may improve the durability of the pavement.

South of Moomba, the pavement was again in excellent condition, providing a relatively smooth ride that was comfortable to drive on at high speed. It was clear that there was an extensive and frequent grading program in place as the survey team passed a number of long distance road works where the track was being re-profiled and compacted. The increased maintenance south of Moomba may reflect the Oil and Gas industry traffic, since the higher volumes of heavy vehicles increase wear of the surface.

**Figure 15 – The survey team encountered graders undertaking maintenance along the track at a number of locations.**

There was one exception to the ride quality which occurred about 245km east of Lyndhurst. Along this section, severe rutting was noted with ruts estimated to be

between 200 and 300mm deep. This could cause potential roll over hazards for high centre of gravity vehicles and effect the tracking of trailers, so rehabilitation work should be undertaken soon as possible. It is likely that the rolling grader works will address this section, nevertheless it is recommended that the pavement continues to be monitored to determine if further pavement strengthening or drainage work is required.

**Figure 16 – Bad rutting recorded along the track.**

### *3.4.3 Signs and Delineation*

Damaged or missing hazard signs were a recurring theme through many parts of the Strzelecki Track. A sign review should be undertaken to identify precise locations and replacement requirements for signs. The assessment noted that the same was true for hazard marker posts on bends, which in many instances appeared to have blown over in high winds or possibly damaged during grader operations. Hazard markers are particularly important for delineating the track since there are few visual cues to indicate a change of direction. It is therefore essential that regular maintenance is undertaken to replace damaged or missing markers.

The assessment identified the need to replace the chevron boards at the intersection of Dillon's Highway and Strzelecki Track since they appeared to have been damaged following a vehicle crash. Since the vehicle appeared to have continued through the T intersection, there is a possible requirement to provide additional warning on approach to the intersection on Dillon's Highway.

Floodway signs also appeared to be missing at the floodways approximately 40km east of Moomba and should also be reinstated.

### *3.4.4 Road Hazards*

There were few roadside hazards along the Strzelecki Track. The assessment noted the presence of culverts which were unprotected and marked with hazard marker posts. These are unlikely to be high risk however culverts could be made safer through minor extension to provide a 2 or 3m shoulder between the traffic lane and headwall.

Where the track has been cut into the landscape, small mounds form on either side of the road. These could cause high centre of gravity vehicles to rollover if hit at speed and it is recommended that wherever the track is graded into the landscape, the side of the road is formed to provide a gentle slope up to ground level to reduce the risk of rollovers.

RAA welcome the provision of some of rest areas which can aid in reducing driver fatigue. The Leigh Creek rest area provided tables and sheltered seating. A further rest area was provided about 224km east of Lyndhurst.

### *3.4.5 Recommendations*

RAA recommend the following treatments for the Strzelecki Track:

- Realign the track to provide fewer horizontal curves
- Pavement rehabilitation to address rutting about 245km east of Lyndhurst
- Replace damaged or missing signs
- Replace damaged or missing hazard marker posts and increase post frequency on bends
- Grade out material mounds at the side of the road which could cause rollovers.

# 4 Summary and Recommendations

Through RAA's assessment of the Outback Highway, the Birdsville Track and the Strzelecki Track in 2015, RAA has identified a number of potential improvements. The recommendations aim to increase safety for motorists, improve the quality of the drive and keep sections of the track open for longer in the year.

There were recurring themes throughout the Outback Roads examined as part of this assessment. These were:

- Damaged or missing signs
- Damaged or missing hazard markers
- Road graded into landscape
- The presence of curves where they do not appear to be required.

In a majority of the cases, the road signs have been knocked flat, a likely result of wind loading. RAA noted from the examination of a number signs that the poles appear to be installed directly into the ground with no form of footing provided. It is therefore recommended that damaged signs are reinstated as part of a regional program, with footings that will adequately resist the wind loading.

**Figure 17 – A number of signs were found to be damaged along the track.**

Damaged or missing hazard marker posts were noted on a number of bends. These are important for delineation in low light, poor weather and particularly since passing vehicles can create dust clouds which severely restricts sight distance. It is recommended that a maintenance program be instated to review, replace and add

additional hazard marker posts in areas requiring clearer delineation of track. The location of the posts should also be considered to ensure that they are clear of the path of graders.

Another recurring issue was instances in which the road or track had been graded into the landscape. Since the road surface is then below the average ground level, water will collect in these areas, leading to rapid surface deterioration caused by traffic. It is recommended that additional drainage measures such as swales are considered for these areas. The grading of swales into the landscape may be a reasonably cost effective solution however where the catchment is deemed to be too large for the swales to offer notable benefit, alternative options, such as raising the road level, should be considered.

The assessment noted on a number of occasions that curves were present on an otherwise flat and open landscape. At these locations, there seemed no plausible reason to provide the curves and since curves increase crash risk, from a road safety perspective, the most appropriate treatment may be to straighten the alignment. It is therefore recommended that further investigation is undertaken to examine sections that could potentially be realigned.

While RAA considered the Strzelecki Track to be in a good condition and able to safely accommodate light vehicles, construction of a sealed surface would be a considerable benefit to heavy traffic. The current surface is good but requires consistently high maintenance to provide the smooth and coherent surface and the surface can become unreliable in wetter weather. Although the capital cost of such work would be high, there would likely be longer term cost savings from reduced damage or wear and the associated ongoing grading and compaction work.

In addition to upgrading infrastructure, it is clear that there is still a lot of work to be done to educate tourists in preparing to drive in the outback. There were several occasions during RAA's assessment that the team encountered tourists driving a two wheel drive vehicle on sections of track that were inappropriate for a vehicle of this type. Road hazards such as bulldust holes will not be obvious to those inexperienced in driving in the outback. Simple defensive driving techniques such as slowing down to pass vehicles and avoid loose material damaging windscreens form part of a larger educational campaign. RAA therefore recommends that a simple publication is developed that discusses journey preparation, types of hazards and defensive driving techniques for safe travel Outback. The publication should be made available through the South Australian Tourism Commission to capture not only the Australian market but also international tourism.

**Figure 18 – Tourists and those inexperienced driving in the outback should be made aware of some of the hazards, such as dust clouds, and the appropriate driving techniques required.**

A summary of RAA's recommendations following the assessment is provided in Table 5 below.

**Table 5 – Summary of Recommendations**

| Highway / Road | Outback Highway | Birdsville Track | Strzelecki Track | General | |
|---|---|---|---|---|---|
| Re-align horizontal curves that are not required | | | ✓ | ✓ | Road Geometry & Pavement |
| Rut grading | | ✓ | ✓ | | |
| Repair pavement edge break / edge drop | ✓ | | | | |
| Raise pavement level at low points | | ✓ | | ✓ | |
| Drainage improvements | | ✓ | | ✓ | |
| Install "Road Narrows" signs on approach to grids | | ✓ | | | Signs |
| Install depth markers at floodways | ✓ | ✓ | ✓ | | |
| Repair / replace damaged signage | ✓ | ✓ | ✓ | ✓ | |
| Additional hazard marker posts | ✓ | | | | Delineation |
| Repair damaged hazard marker posts | ✓ | | ✓ | | |
| Install Raised Reflective Pavement Markers (RRPMS) | | | | | |
| Review / install barrier protection | ✓ | | | | Hazard Protection |
| Grade out material mounds at side of road | | ✓ | | | |
| Extend unsealed edge to protect drop | | ✓ | ✓ | | |
| Production of literature for outback driving | | | | ✓ | Tourist / Driver Education |
| Advisory signs at start and end of major routes | | | | ✓ | |

# Appendix A – Pavement Performance Factors

# Overview of Pavement Properties

## Roughness

The pavement roughness refers to the irregularities in the road's surface in the direction of travel. These irregularities vary from 0.5 to 50m long and are measured in relation to the intended road surface and recorded in terms of the International Roughness Index (IRI). As the IRI increases, it indicates a rougher pavement surface which will produce an uncomfortable ride for the vehicle's occupants through bumps and undulations. Figure 1 shows the longitudinal profile of a road with an exaggerated surface. The red line indicates the intended surface level and the difference between the lines is the measured roughness.

The roughness is not only important for the ride quality experienced by the motorist but prolonged vehicle exposure to a rough road may also increase wear, maintenance and fuel consumption.

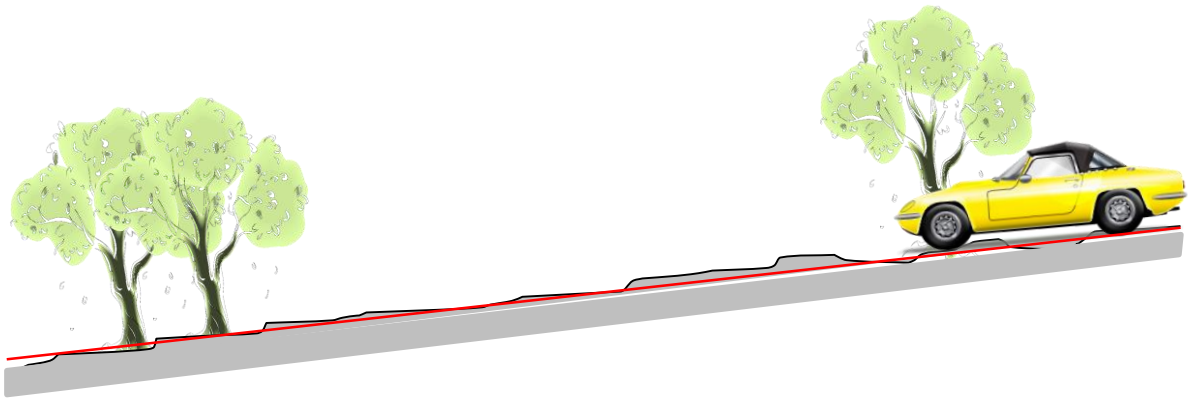

**Figure 1 – Longitudinal Road Section**

## Rutting

A rut is a defect in the form of a longitudinal depression in the pavement surface. It usually occurs in the wheel path of vehicles (Figure 2) and is caused by high volumes of heavy vehicles over time. Ruts can also form as a result of environmental influences such as extensive rainfall combined with a poorly sealed surface. This can permit moisture to enter the pavement foundations which can weaken the structure or cause movement in the soil beneath, both of which can lead to rutting.

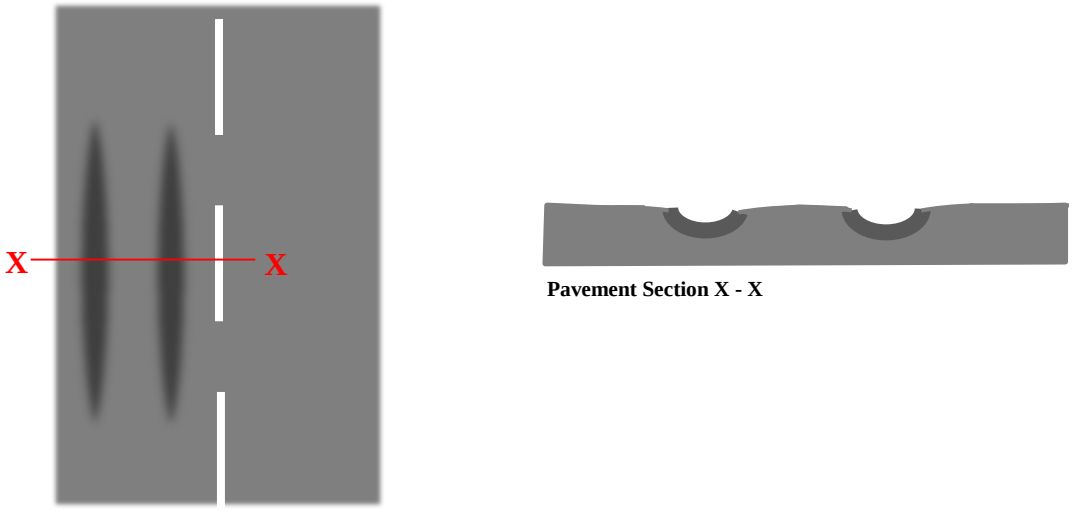


**Figure 2 – Pavement Rutting**

While rutting can lead to further pavement deterioration, several other problems may also arise as a result. Deep ruts can cause a “guide channel” for wheels and drivers may experience reduced steering performance or have difficulty with trailers tracking the vehicle. Ruts are also prone to filling with water which can increase the potential for aquaplaning, depending on the vehicle speed and depth of the rut. Drivers should always exercise caution when driving in wet weather but particularly on roads that are prone to bad rutting.

## Texture

The pavement texture is important to ensure safety for motorists as it provides friction between the contact area of the tyre and the pavement surface. If there is insufficient friction between the tyre and surface, the braking distance will be significantly reduced and if the vehicle speed is too high, there may be a loss of control on curves and bends resulting in collisions with roadside objects.

There are two forms of texture within the road surface, the microtexture and macrotexture. The microtexture is created by the rough surface of the aggregate in the surface of the road and contributes to the friction that ensures the vehicle maintains contact with the road and provides good braking performance. The macrotexture is formed from the grooves created in the road surface by the different heights and shape of the aggregate and is important to ensure that rainwater drains away from the tyre, reducing the potential for aquaplaning.

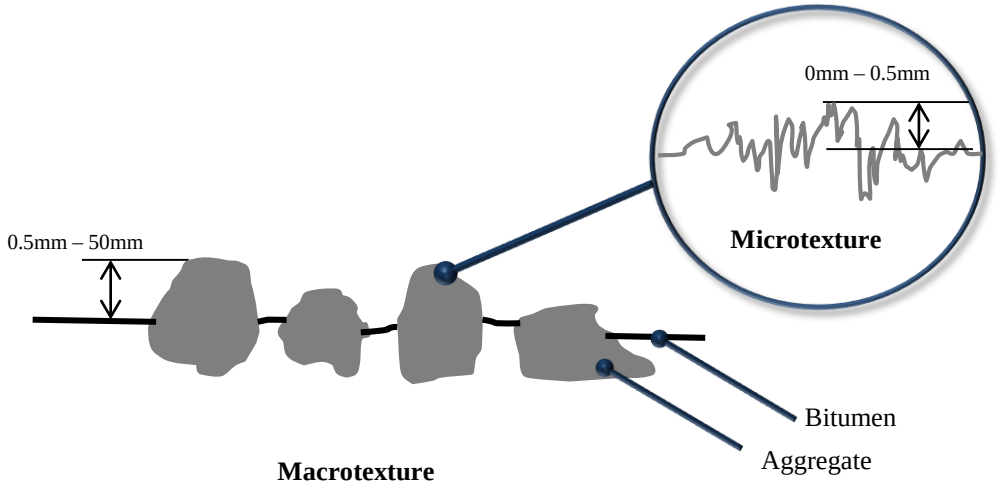


**Figure 3 – Pavement Texture**